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	APRIL 2016	Included in new manuals	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 #69 **April 2016**

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for use of Ontario Provincial Standards; therefore, manual holders are cautioned about immediately discarding superseded and cancelled standards.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	
400.080	2	400.080	3	**"CAST IRON, SIDE INLET FOR CATCH BASINS"** See Summary of Revisions.
512.010	0			**"CONCRETE STEPS SLAB ON GRADE WITH FOOTINGS"** This drawing has been cancelled as it is non-compliant with AODA.
512.011	0			**"CONCRETE STEPS SLAB ON GRADE"** This drawing has been cancelled as it is non-compliant with AODA.
		912.124	0	**"GUIDE RAIL SYSTEM, STEEL BEAM, TYPE M TRANSITION RAIL, COMPONENT"** This is a New Drawing.
		912.125	0	**"GUIDE RAIL SYSTEM, STEEL BEAM, TYPE M RAIL, COMPONENT"** This is a New Drawing.
		912.127	0	**"GUIDE RAIL SYSTEM, STEEL BEAM, M20 STEEL POST WITH OFFSET BLOCK, COMPONENT"** This is a New Drawing.
		922.161	0	**"ENERGY ATTENUATOR, END TREATMENT, STEEL BEAM ENERGY ATTENUATING TERMINAL, SOFTSTOP TERMINAL SYSTEM, INSTALLATION"** This is a New Drawing.
		922.170	0	**"ENERGY ATTENUATOR, END TREATMENT, STEEL BEAM ENERGY ATTENUATING TERMINAL, X-LITE TANGENT TERMINAL SYSTEM WITH STEEL POSTS, INSTALLATION"** This is a New Drawing.
3360.100	1	3360.100	2	**"DECK LIGHT POLE BASES STRUCTURAL WITH BARRIER WALLS"** See Summary of Revisions.

Superseded/Cancelled (Remove)		Revised/New (Insert)		Remarks
OPSD	Revision	OPSD	Revision	
3360.200	1	3360.200	2	**"DECK LIGHT POLE BASES STRUCTURAL WITH PARAPET WALLS"** See Summary of Revisions.
3920.110	0	3920.110	1	**"PRECAST REINFORCED CONCRETE BOX CULVERT WITH HEIGHT OF FILL < 0.6M"** See Summary of Revisions.

SUMMARY OF REVISIONS TO OPSD 400.080

CAST IRON, SIDE INLET FOR CATCH BASINS

- SLOT DETAIL updated to match the SLOT DETAIL in OPSD 400.020.

SUMMARY OF REVISIONS TO OPSD 3360.100

DECK LIGHT POLE BASES STRUCTURAL WITH BARRIER WALLS

- All coated steel (C) changed to stainless steel (S).
- Addition of Note C.

SUMMARY OF REVISIONS TO OPSD 3360.200

DECK LIGHT POLE BASES STRUCTURAL WITH PARAPET WALLS

- All coated steel (C) changed to stainless steel (S).
- Addition of Note C.

SUMMARY OF REVISIONS TO OPSD 3920.110

PRECAST REINFORCED CONCRETE BOX CULVERT WITH HEIGHT OF FILL < 0.6M

- Label containing 500m2 was corrected to 500mm2.
- Water proofing spelling corrected to Waterproofing.
- Addition of waterproofing extending 150mm beyond distribution slab joint when specified.

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 ≤ 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
2016 04	400.080	3	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

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
2016 04	912.124	0	Guide Rail System, Steel Beam, Type M Transition Rail, Component
2016 04	912.125	0	Guide Rail System, Steel Beam, Type M Rail, Component
2016 04	912.127	0	Guide Rail System, Steel Beam, M20 Steel Post with Offset Block, 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

DATE	OPSD NO.	REV.	TITLE
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
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

DATE	OPSD NO.	REV.	TITLE
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
2016 04	922.161	0	Energy Attenuator, End Treatment, Steel Beam Energy Attenuating Terminal, Soft Top Terminal System Installation
2016 04	922.170	0	Energy Attenuator, End Treatment, Steel Beam Energy Attenuating Terminal, X-Lite Tangent Terminal System With Steel Posts, Installation
2010 11	922.180	2	Energy Attenuator, End Treatment, Steel Beam Energy Attenuating Terminal, Sequential Kinking Terminal System with Wooden Posts, Installation
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

DATE	OPSD NO.	REV.	TITLE
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
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

DATE	OPSD NO.	REV.	TITLE
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
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

DATE	OPSD NO.	REV.	TITLE
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
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

DATE	OPSD NO.	REV.	TITLE
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
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

DATE	OPSD NO.	REV.	TITLE
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
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

DATE	OPSD NO.	REV.	TITLE
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
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

DATE	OPSD NO.	REV.	TITLE
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
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

DATE	OPSD NO.	REV.	TITLE
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
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

DATE	OPSD NO.	REV.	TITLE
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
2012 11	3349.101	2	Deck, Drains, Drainage of Existing Deck Below Asphalt Wearing Surface
2016 04	3360.100	2	Deck, Light Pole Bases, Structures with Barrier Walls
2016 04	3360.200	2	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

DATE	OPSD NO.	REV.	TITLE
2016 04	3920.110	1	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 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 C concrete CB concrete block F insulbrick F metal clad Fr frame M metal S stone St stucco	A apartment B barn C cabin F factory G garage Gr greenhouse H house O office PO post office R restaurant S shed SS service station ST store 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 2				Examples: Arena Building Church Fire Hall Hotel Library Motel Rec Hall 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. All descriptions shall contain this group.	Or combination of letters as a group, e.g., SS&R Service Station and Restaurant. 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

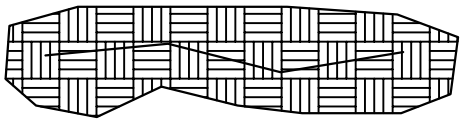
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

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 MONUMENT FEATURES			
	OPSD 101.010		

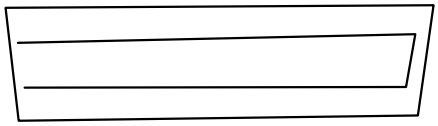
top of rock cut
hachure for rock/earth cut/fill
bottom of rock cut



rock outline & string
of rock outcrop, Note 1

asphalt outline &
asphalt string, Note 1

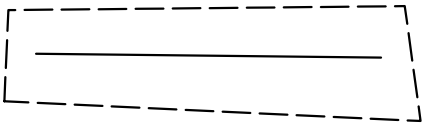
bank of river, Note 1



concrete outline &
concrete string, Note 1

door sill, Note 1

entrance centreline, Note 1

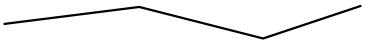


gravel outline &
gravel string, Note 1

railway ballast edge, Note 1

railway ballast top, Note 1

original ground string, Note 1



stream bed, Note 1

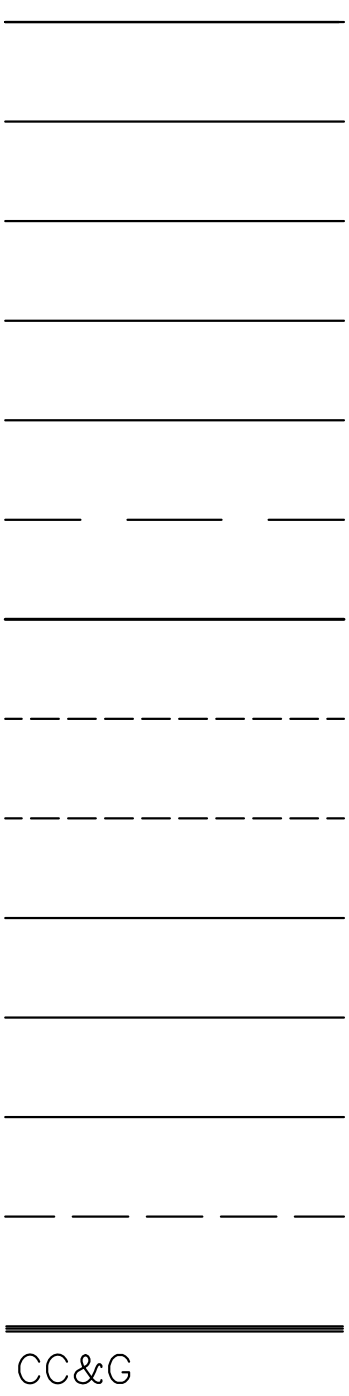
stock pile or pit

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 GROUND FEATURES			
	OPSD 101.011		



NOTE:

1 These items are not normally plotted.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev	1
TOPOGRAPHY PLAN FEATURES ROAD FEATURES			
	OPSD 101.012		

BARRIER FEATURES

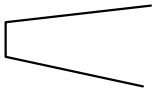
gate

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

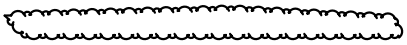
guide rail wire elevation, Note 1

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 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

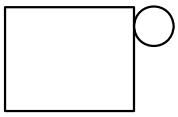
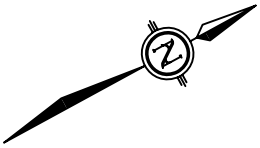
Nov 2006 | Rev 1

TOPOGRAPHY PLAN FEATURES

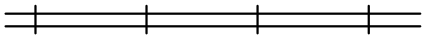
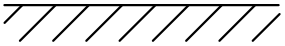
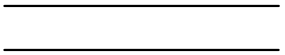
DRAINAGE FEATURES

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 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

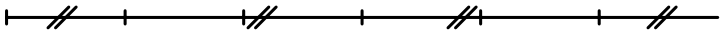
limited interest, temporary

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2008	Rev	3
TOPOGRAPHY PLAN FEATURES RIGHT–OF–WAY FEATURES			

OPSD 101.017

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

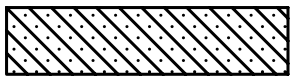
Examples:



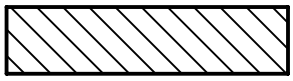
guide rail removal

culvert removal

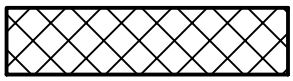
maintenance hole and sewer removal



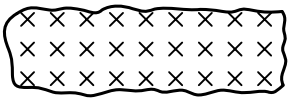
concrete pavement with bituminous surface to be removed



bituminous pavement to be removed

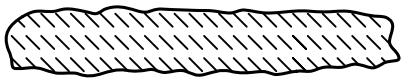


concrete pavement to be removed

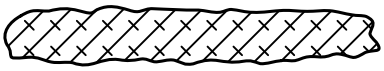


area to be close cut cleared

area to be cleared



area to be grubbed



area to be cleared and grubbed

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev	1
REMOVALS LEGEND			
	OPSD 102.010		

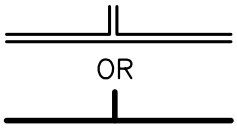
○ NUMBER	MH	existing	maintenance hole	● NUMBER	MH	new	
□ NUMBER	CB	existing	catch basin	■ NUMBER	CB	new	

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

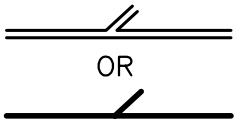
 sub–drain, flow indicated

 curb, gutter, or curb with gutter transition

 drop curb



gutter outlet 90 °

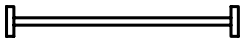


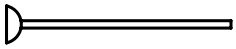
gutter outlet 45 °

storm sewer

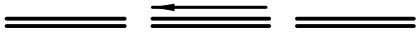
sanitary sewer

 culvert

 culvert with headwall

 culvert with steel end apron

 ditches, V type

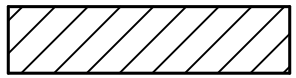
 ditches, flat bottom

watercourse, 3m wide and over

 flow arrow

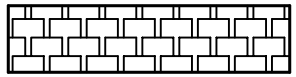
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev	1
NEW CONSTRUCTION LEGEND 1			
	OPSD 103.010		

backfill

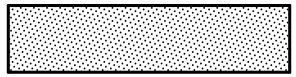


gore area

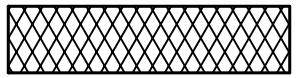
rip rap



gabions

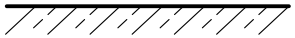


pavement



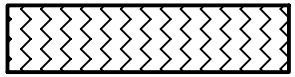
miscellaneous paving

concrete section

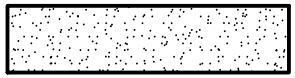


earth section

rock section

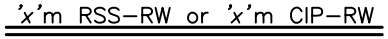


rock shatter



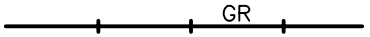
paved shoulder

pier



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

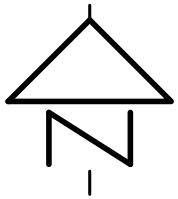
sidewalk



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

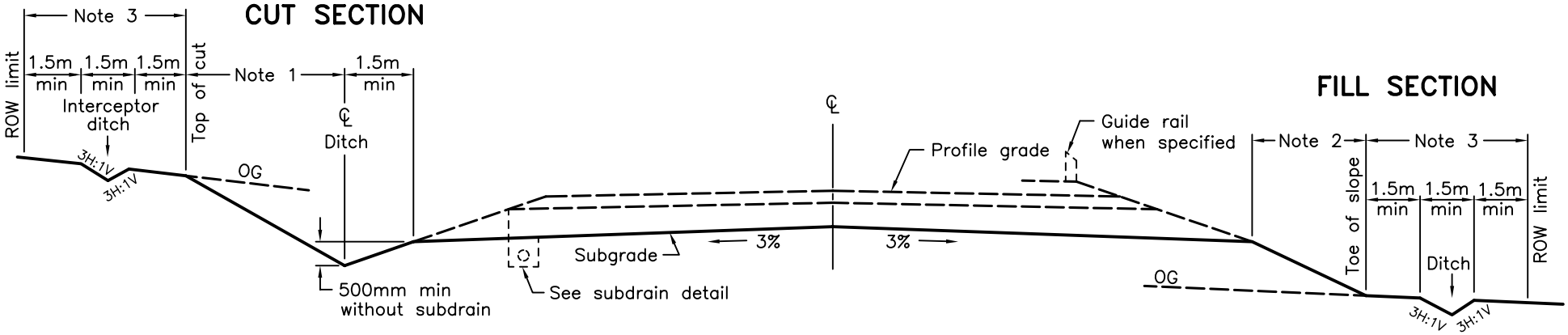
machined surface

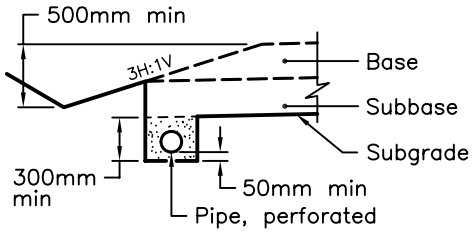
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2007 | Rev | 0

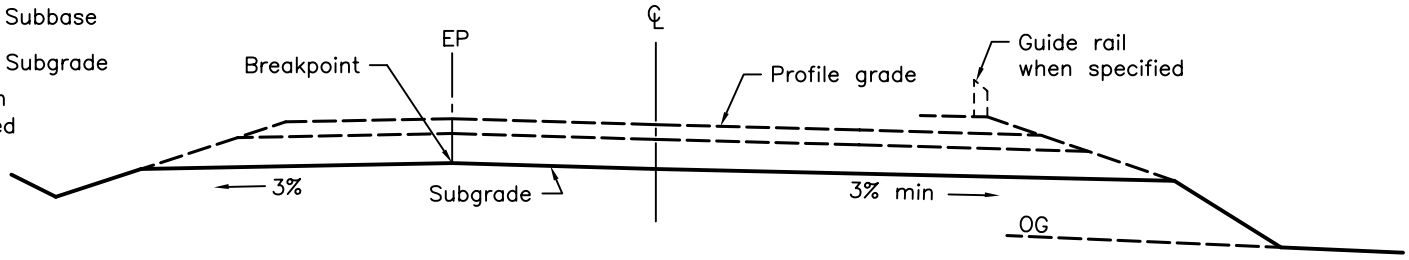
MISCELLANEOUS SYMBOLS

OPSD 104.010





SUBDRAIN DETAIL
WHERE APPLICABLE



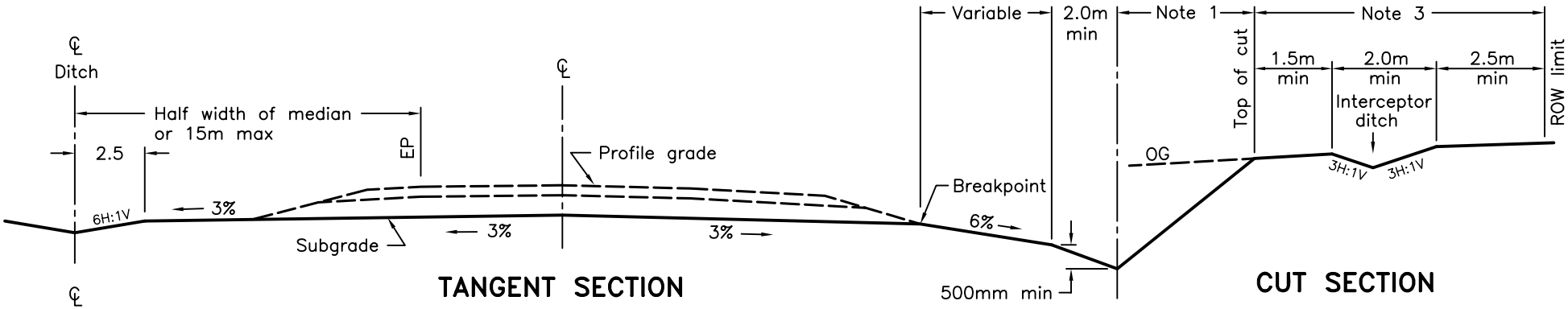
SUPERELEVATED SECTION

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.

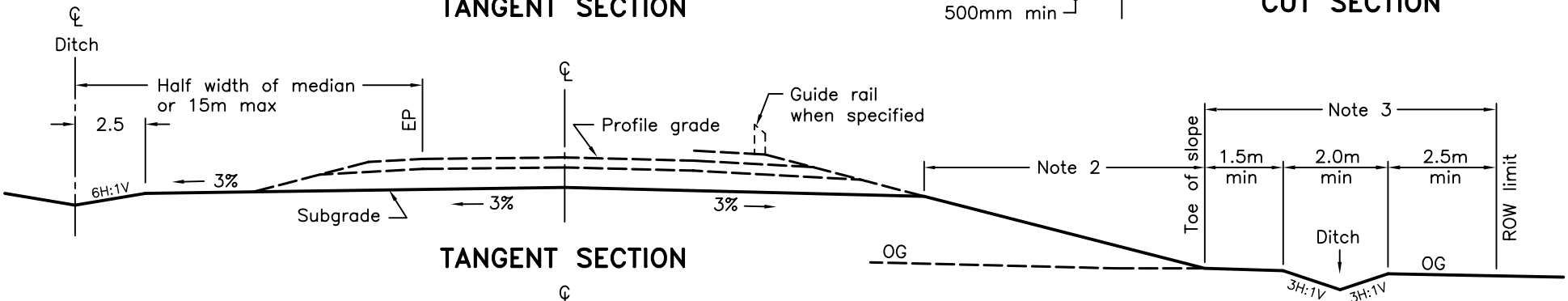
A This OPSD to be read in conjunction with OPSD 202.010 and OPSD 202.020.
B All dimensions are in metres unless otherwise shown.

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



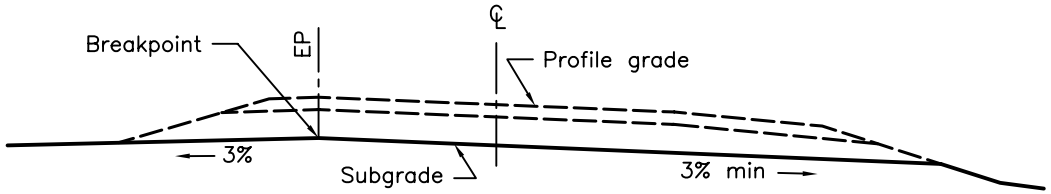
TANGENT SECTION

CUT SECTION



TANGENT SECTION

FILL SECTION



SUPERELEVATED SECTION

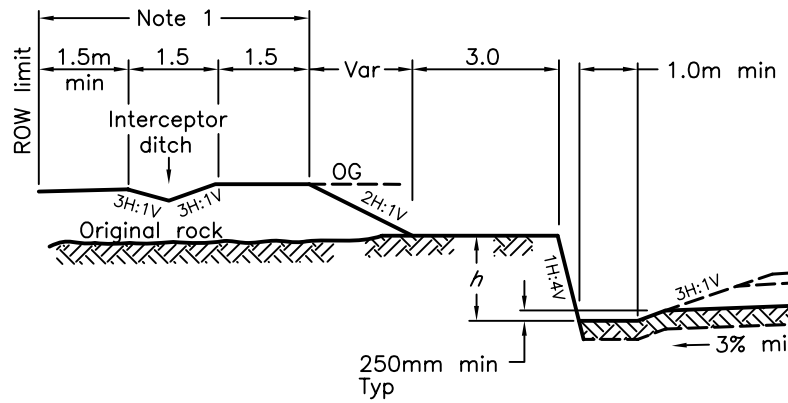
NOTES:

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.

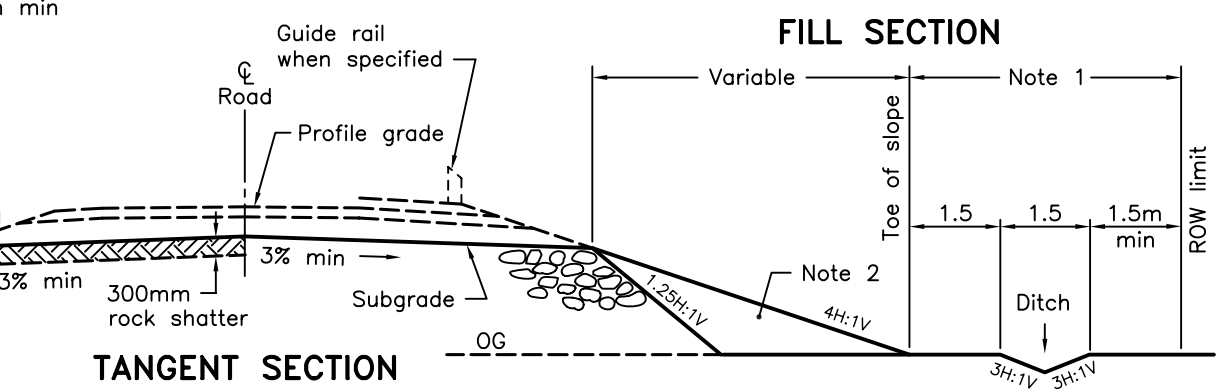
A This OPSD to be read in conjunction with OPSD 202.010 and OPSD 202.020.
B All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev	2
EARTH/SHALE GRADING DIVIDED RURAL			
	OPSD 200.020		

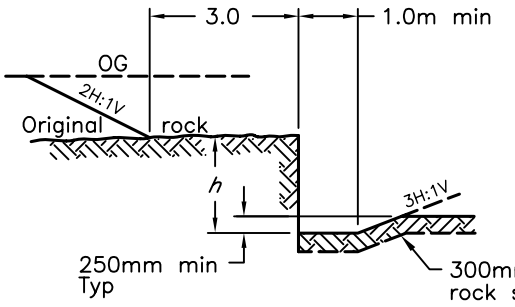
CUT SECTION



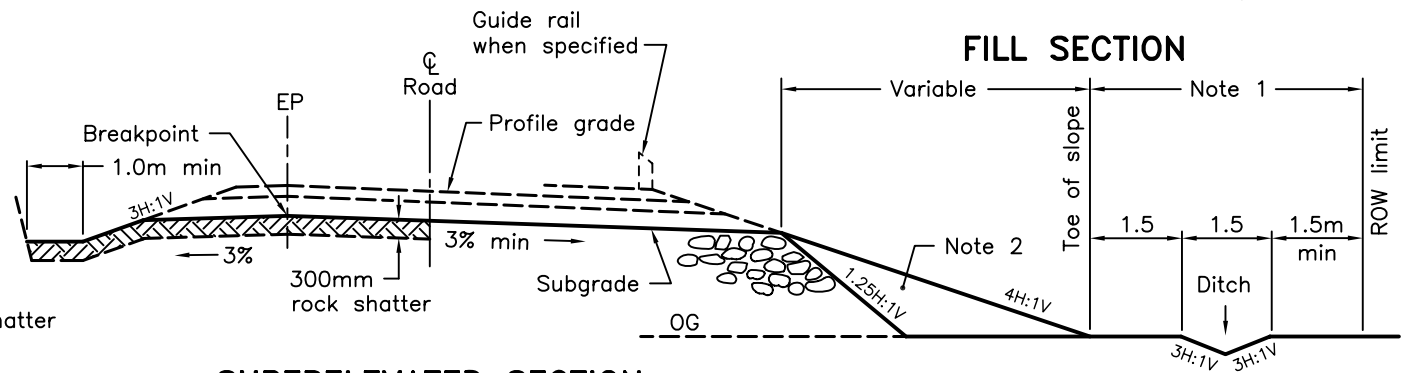
FILL SECTION



TANGENT SECTION



FILL 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

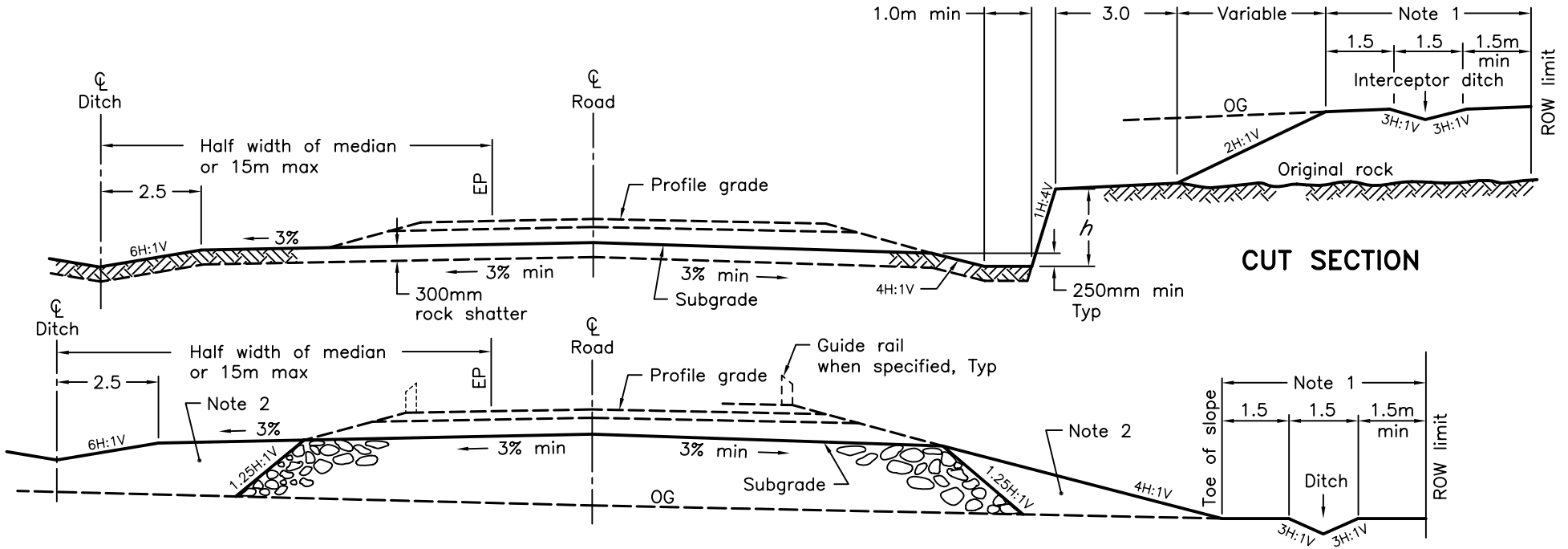
ROCK GRADING

UNDIVIDED RURAL

Nov 2009 | Rev 2

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

OPSD 201.010



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

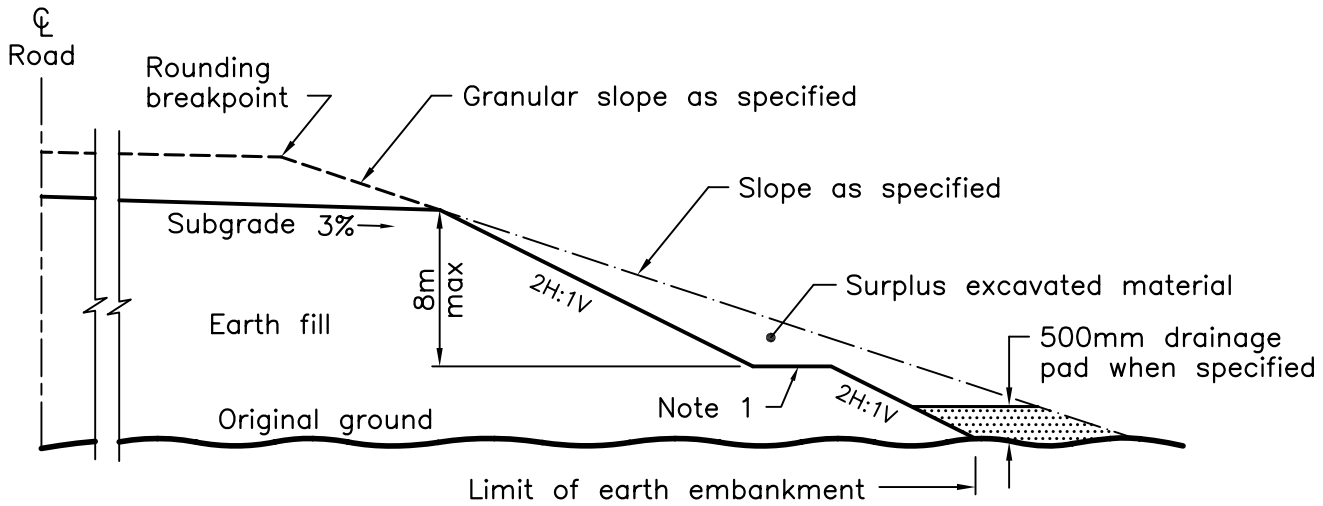
ROCK GRADING

DIVIDED RURAL

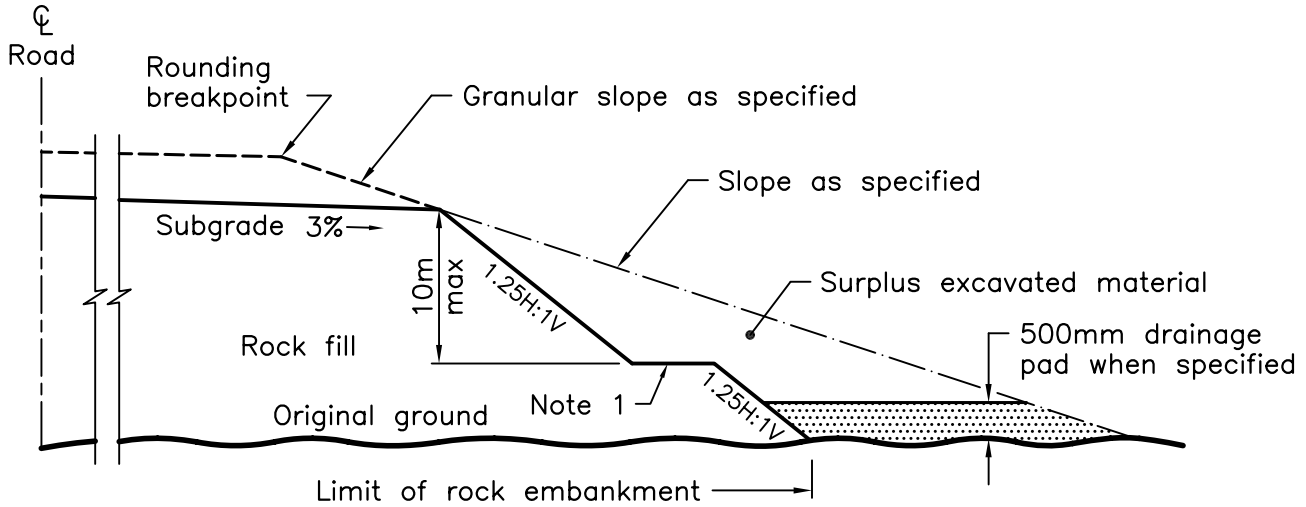
Nov 2009 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

OPSD 201.020



EARTH EMBANKMENT



ROCK EMBANKMENT

NOTES:

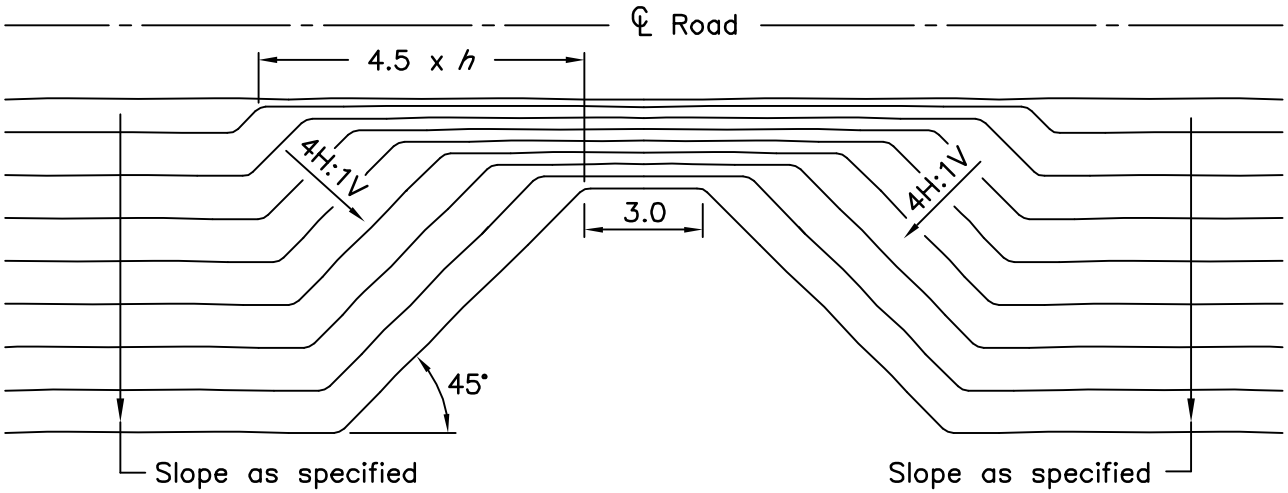
1 Benches 2m minimum in width are required along slopes at maximum vertical intervals as shown.

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

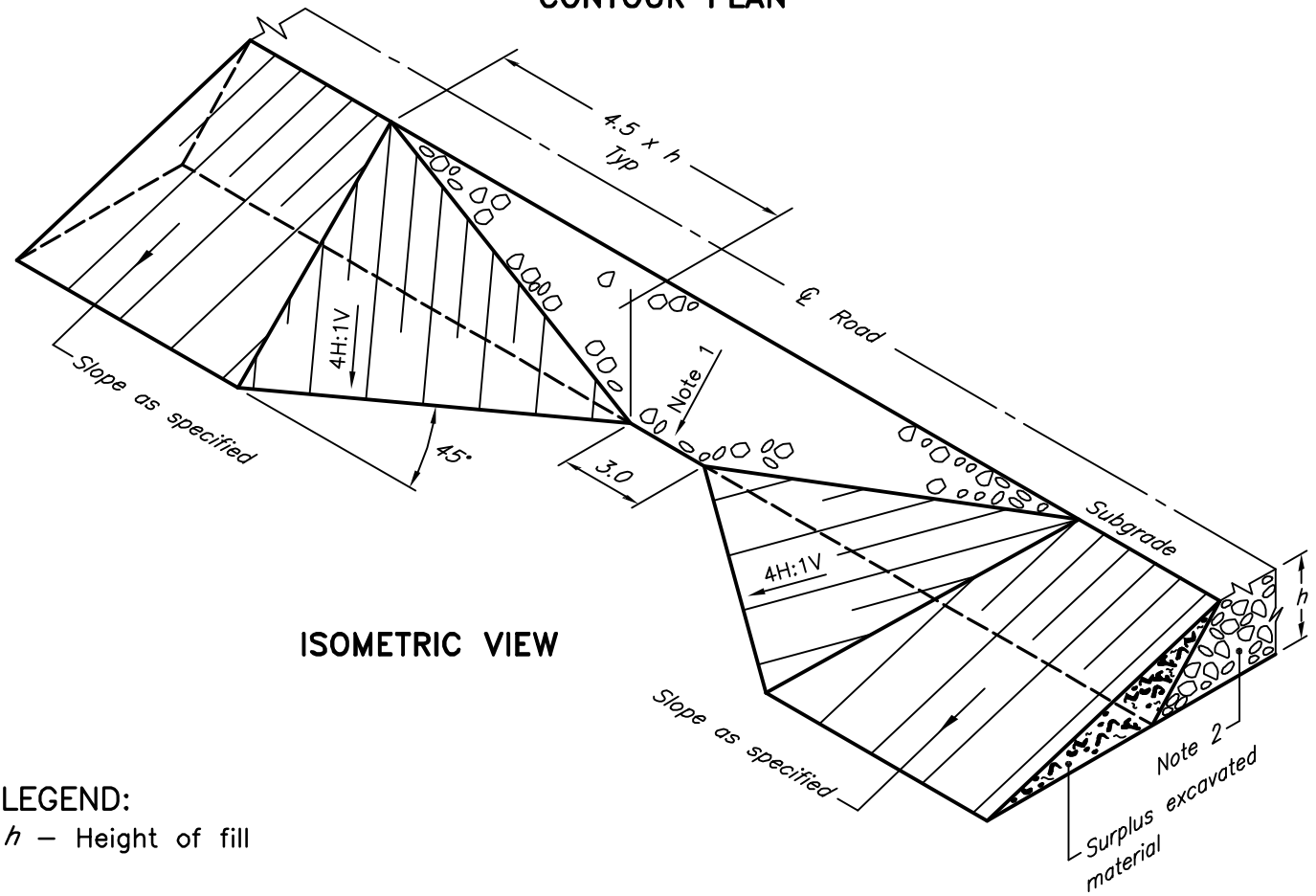
B Surplus excavated material placed shall not extend beyond the right–of–way.

C All dimensions are in metres unless otherwise shown.

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



CONTOUR PLAN



ISOMETRIC VIEW

LEGEND:

h – Height of fill

NOTES:

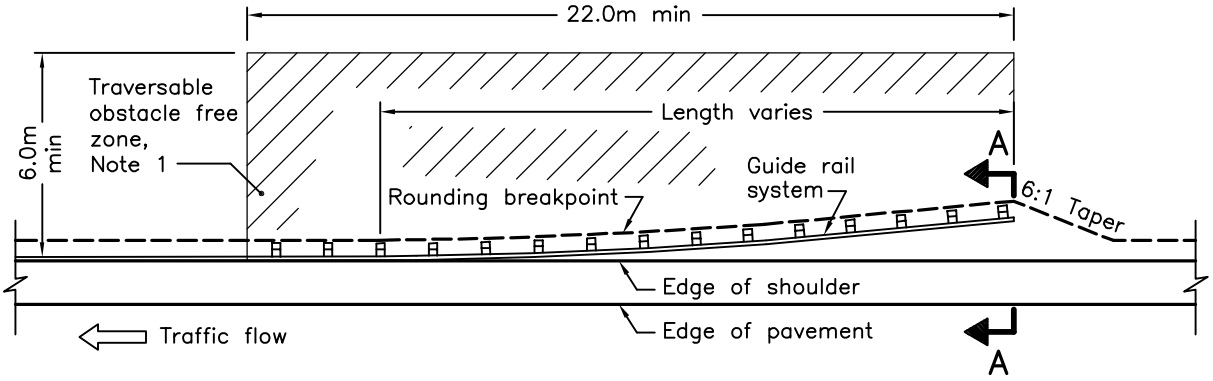
1 Slope shall be as specified.

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

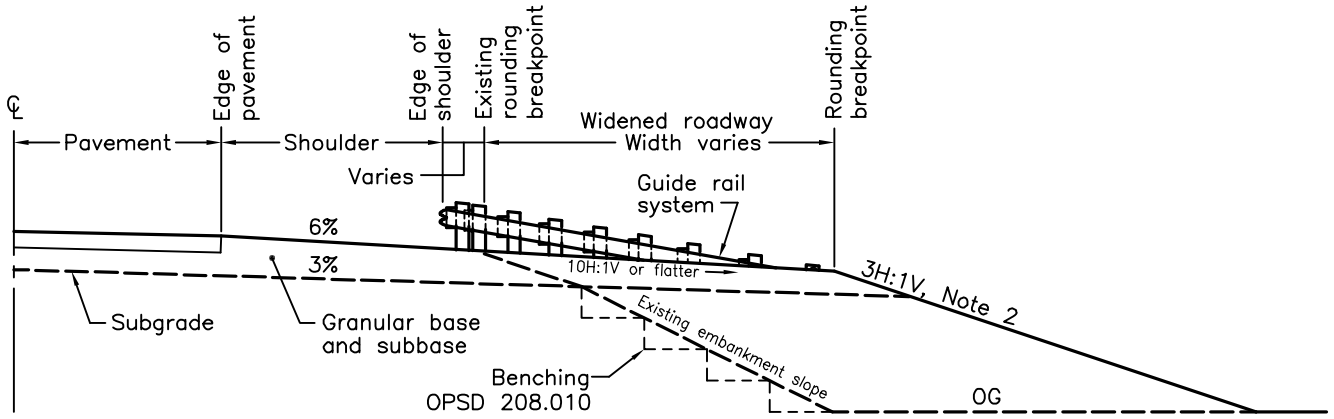
A Height of fill shall be the vertical difference between top of subgrade and top of original ground measured at new road centreline.

B All dimensions are in metres unless otherwise shown.

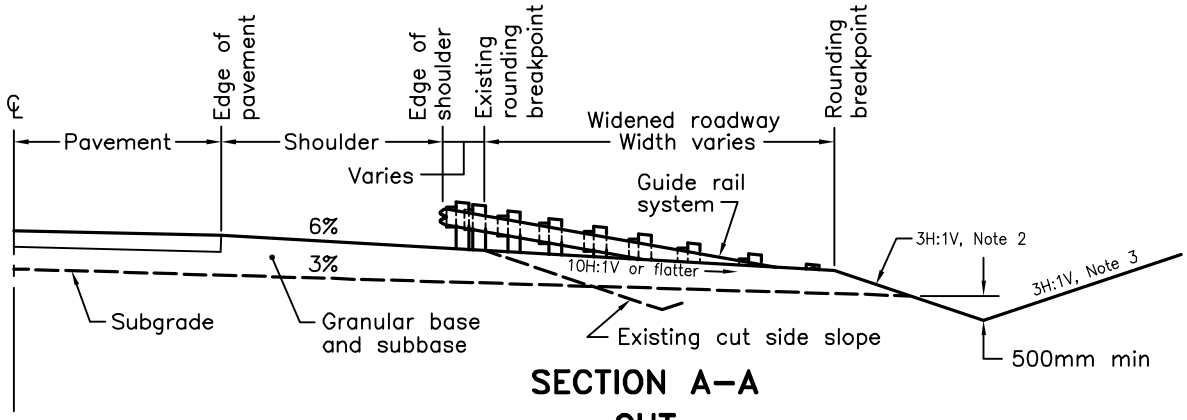
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	3
DRAINAGE GAP FOR SLOPE FLATTENING ON ROCK OR GRANULAR EMBANKMENT			
	OPSD 202.020		



PLAN VIEW OF WIDENED ROADWAY



SECTION A–A FILL



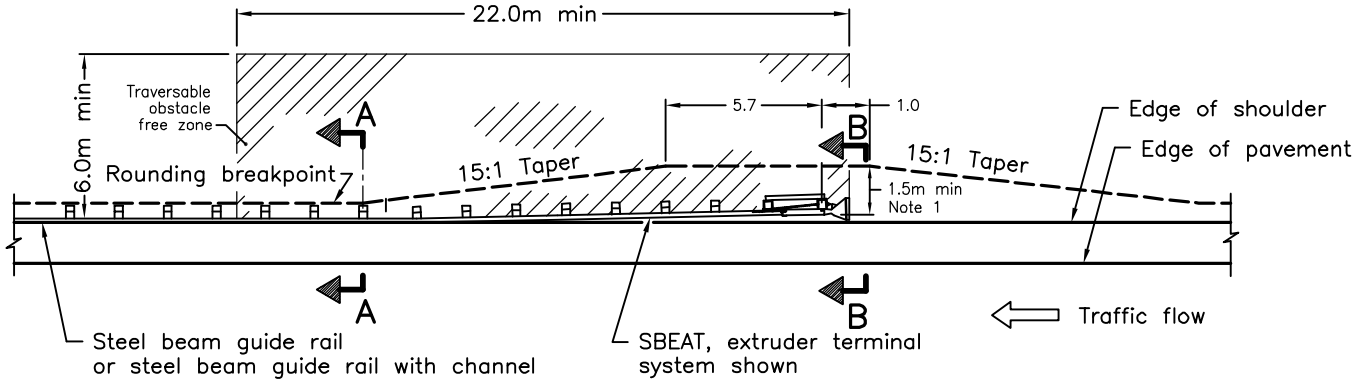
SECTION A–A CUT

NOTES:

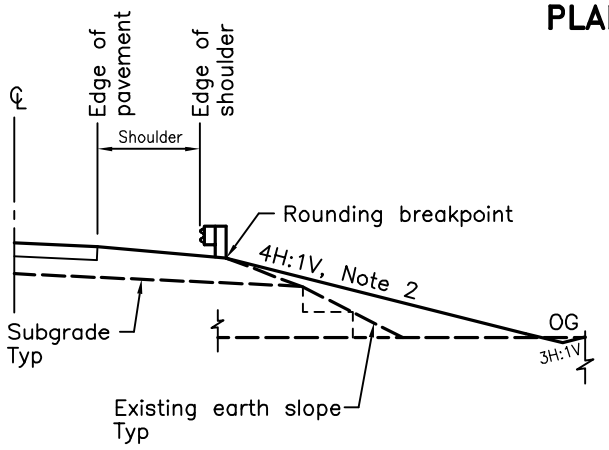
1 Required for steel beam guide rail with eccentric loader.
2 Slope shall be flatter when specified.
3 Slope shall be steeper when specified.

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.

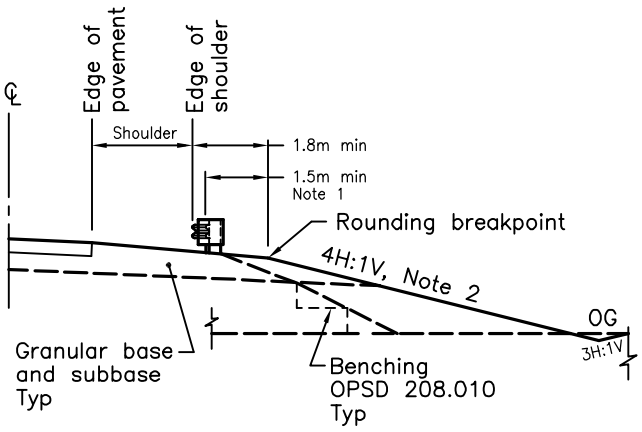
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev	5
ROADWAY WIDENING FOR GUIDE RAIL END TREATMENTS AND TRANSITIONS			
	OPSD 202.030		



PLAN

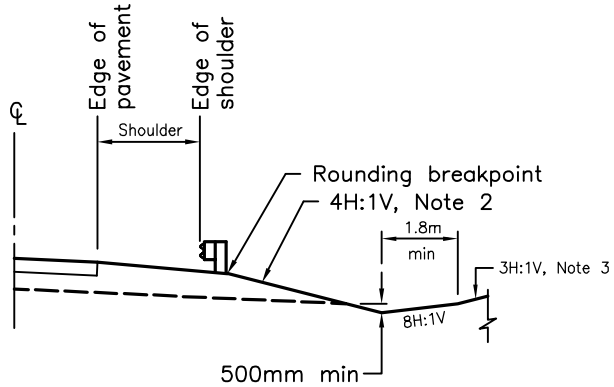


SECTION A–A

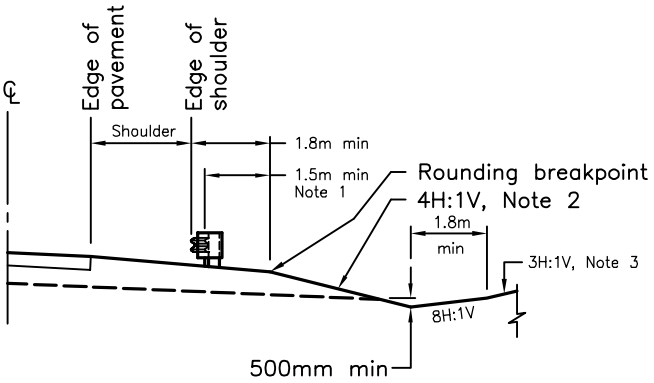


SECTION B–B

FILL SECTION



SECTION A–A



SECTION B–B

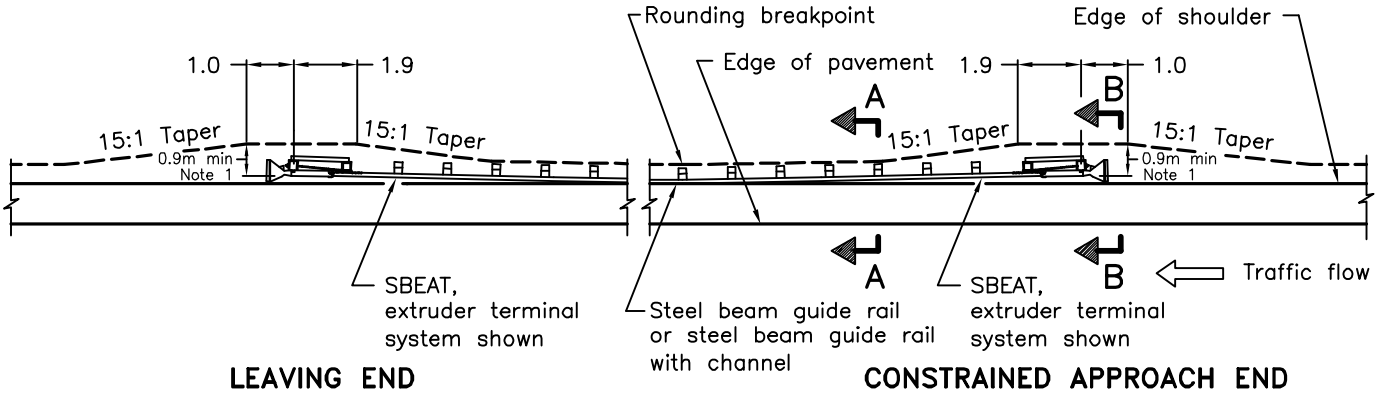
CUT SECTION

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.

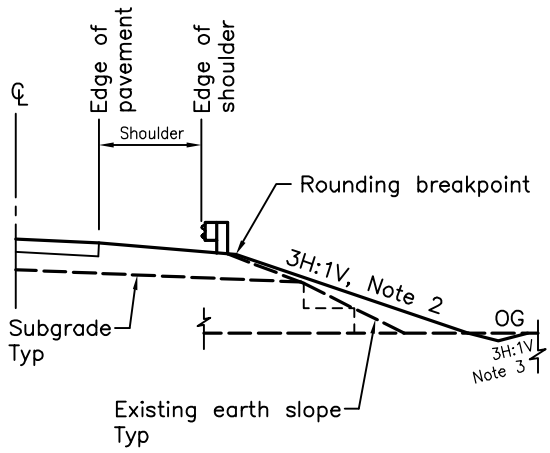
A For leaving end and constrained approach end applications, see OPSD 202.032.
B This OPSD to be read in conjunction with the OPSD 922 series SBEAT drawings.
C All dimensions are in metres unless otherwise shown.

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

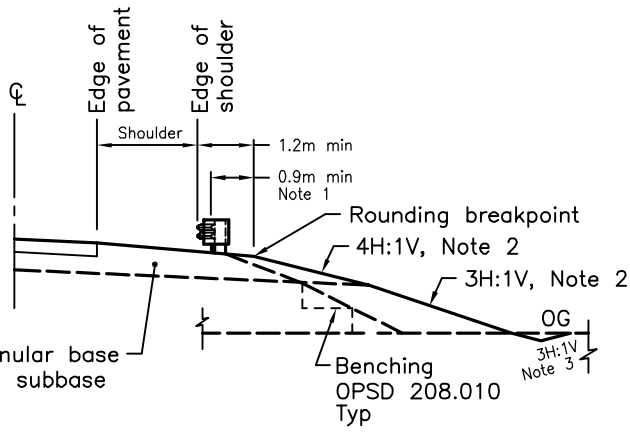


LEAVING END **CONSTRAINED APPROACH END**

PLAN

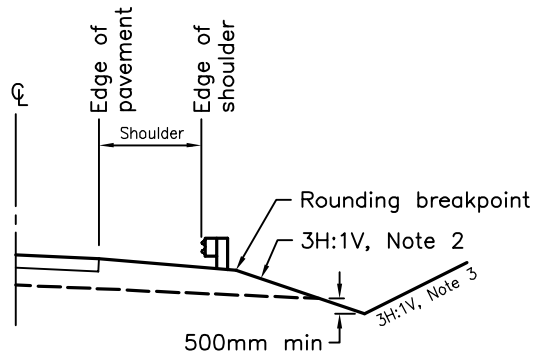


SECTION A–A

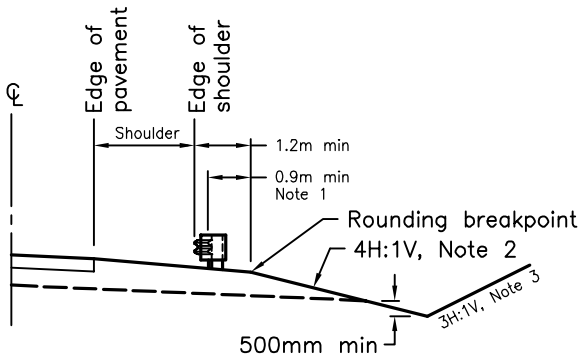


SECTION B–B

FILL SECTION



SECTION A–A



SECTION B–B

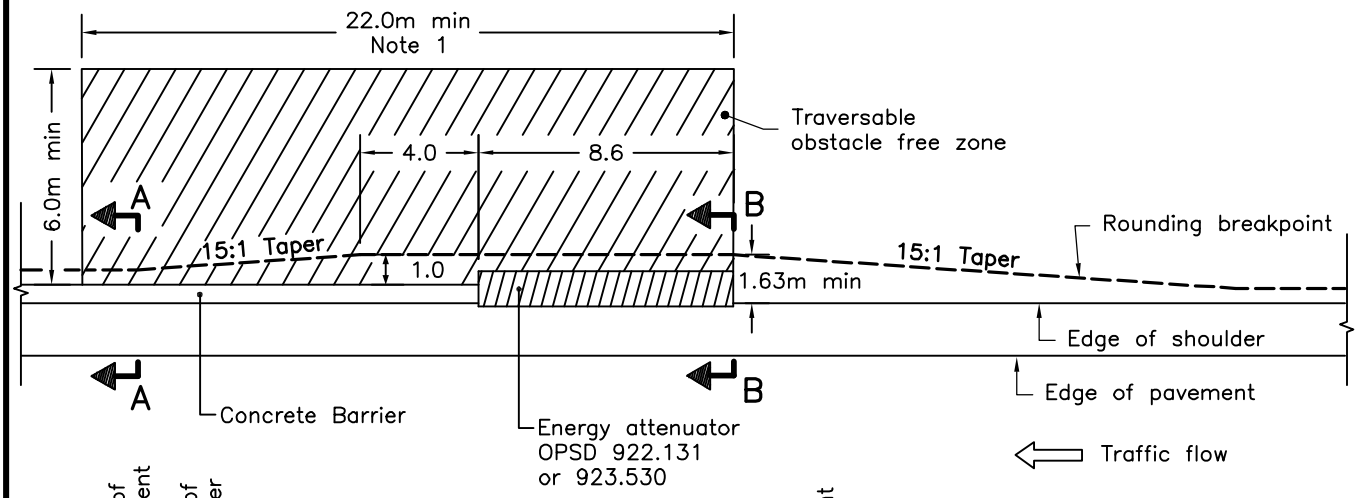
CUT SECTION

NOTES:

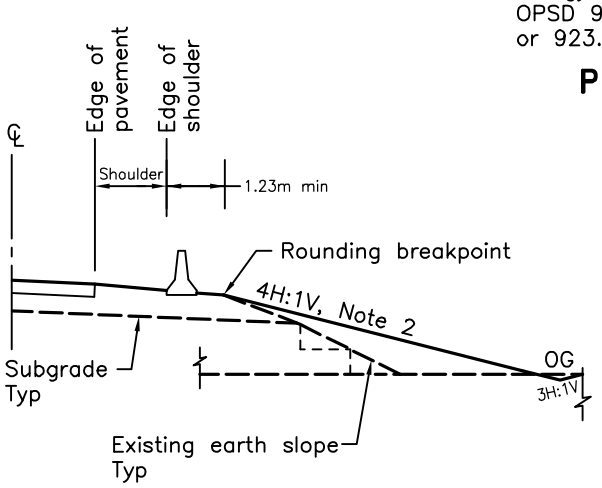
1 Measured from traffic side face of steel beam at the first post.
2 Slope shall be flatter when specified.
3 Slope shall be steeper when specified.

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.

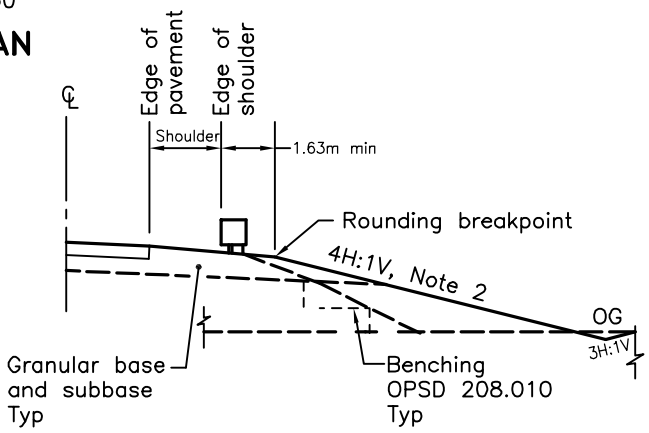
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2011	Rev	1
ROADWAY WIDENING FOR STEEL BEAM ENERGY ATTENUATING TERMINAL LEAVING END AND CONSTRAINED APPROACH END			
	OPSD 202.032		



PLAN

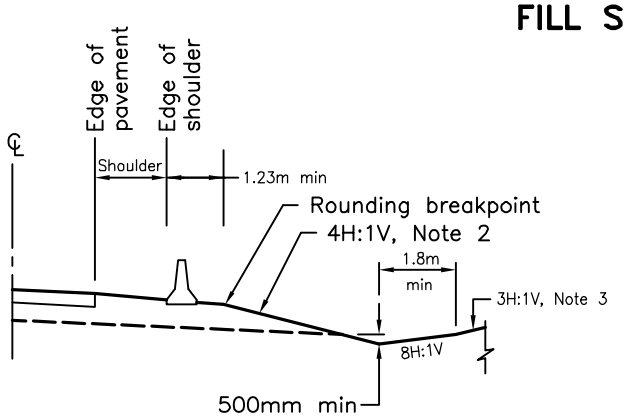


SECTION A–A

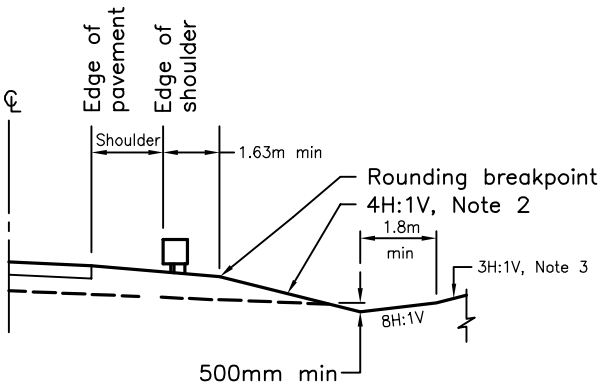


SECTION B–B

FILL SECTION



SECTION A–A



SECTION B–B

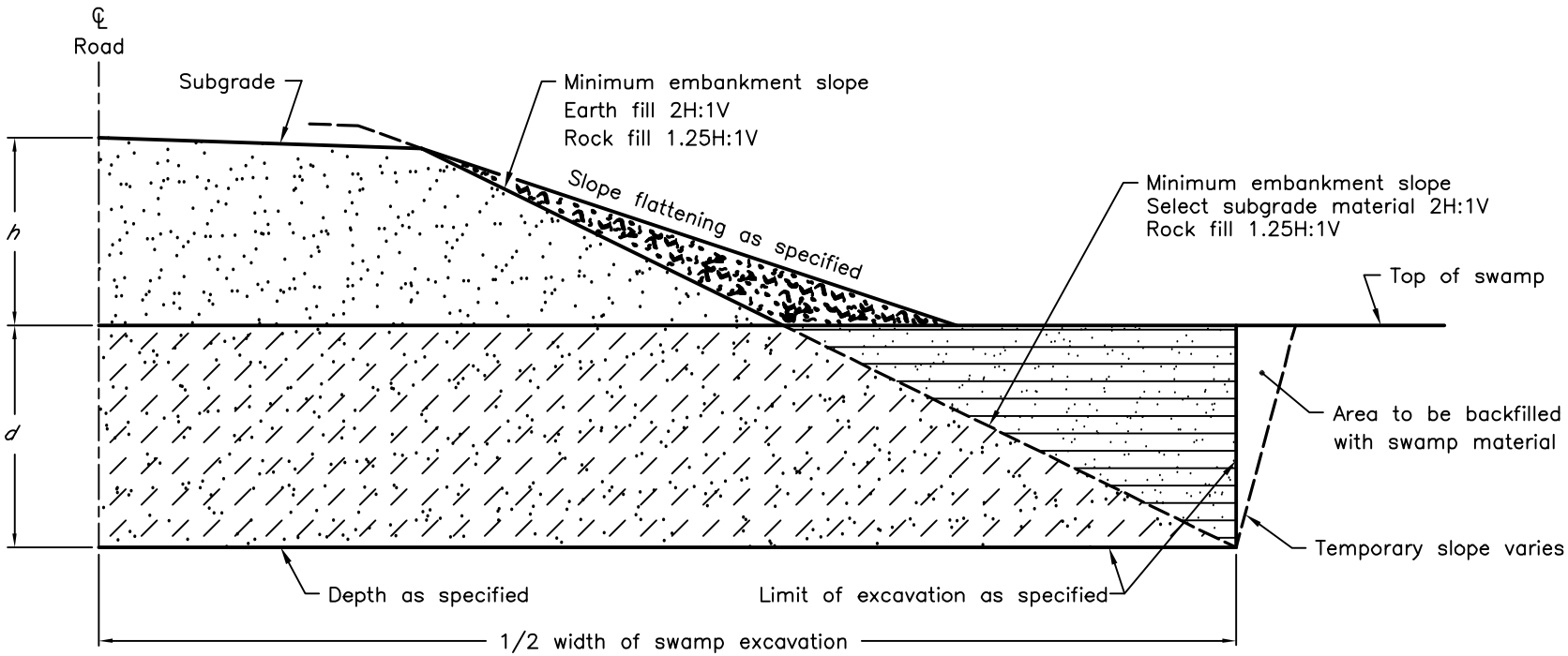
CUT SECTION

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 SINGLE SIDED ENERGY ATTENUATING TERMINALS 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

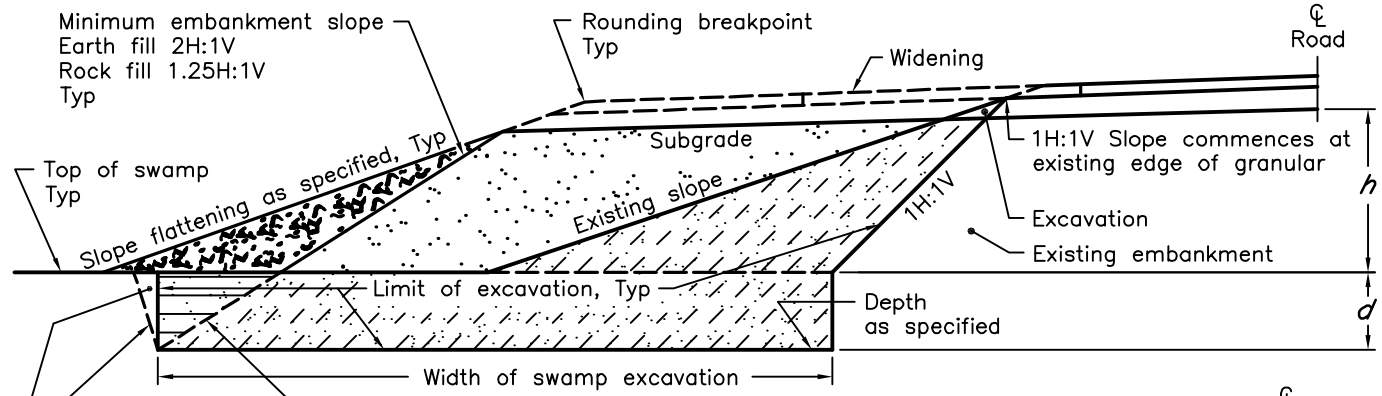
ONTARIO PROVINCIAL STANDARD DRAWING

EMBANKMENTS OVER SWAMP

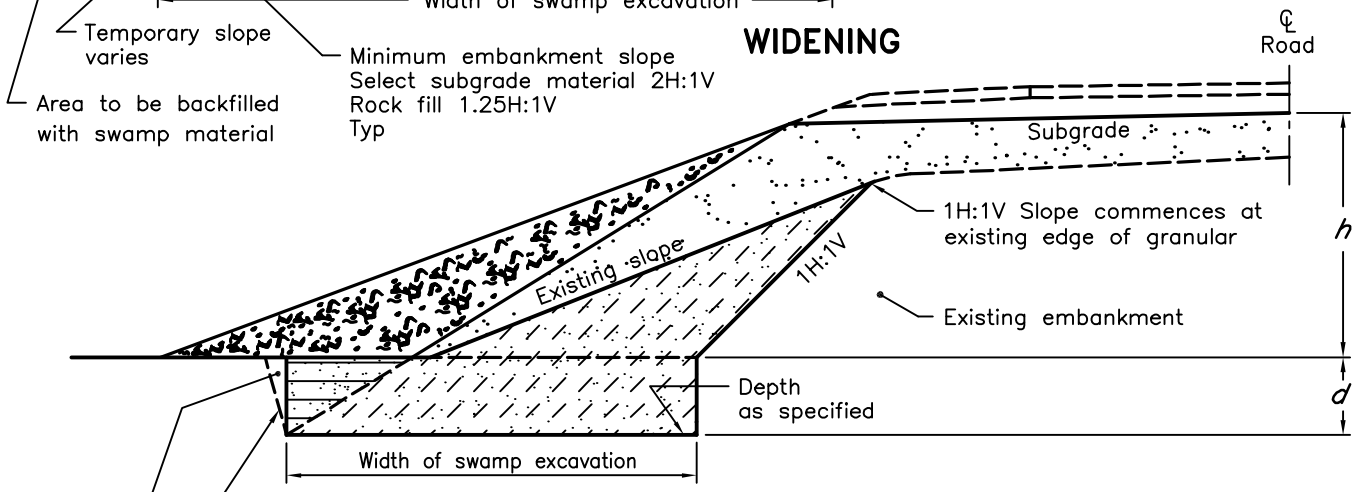
NEW CONSTRUCTION

Nov 2010 | Rev 3

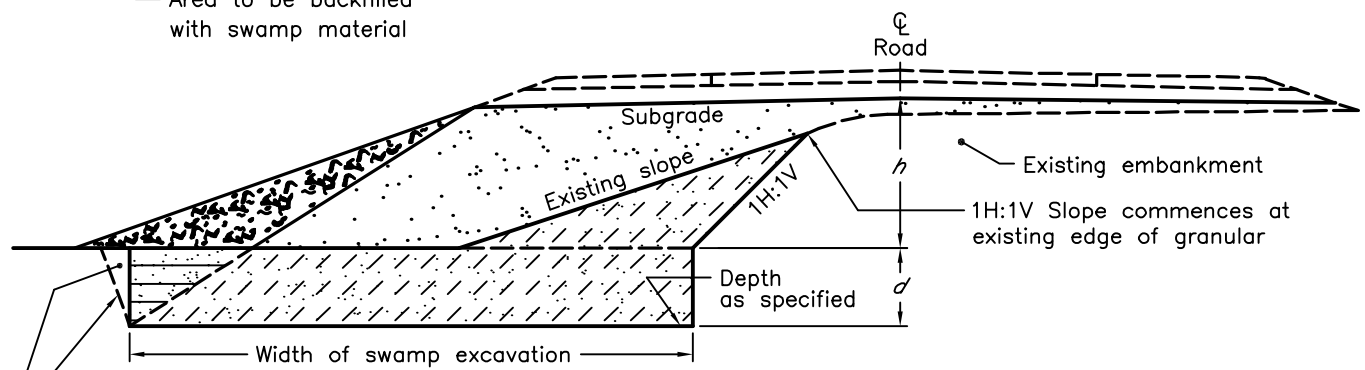
OPSD 203.010



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

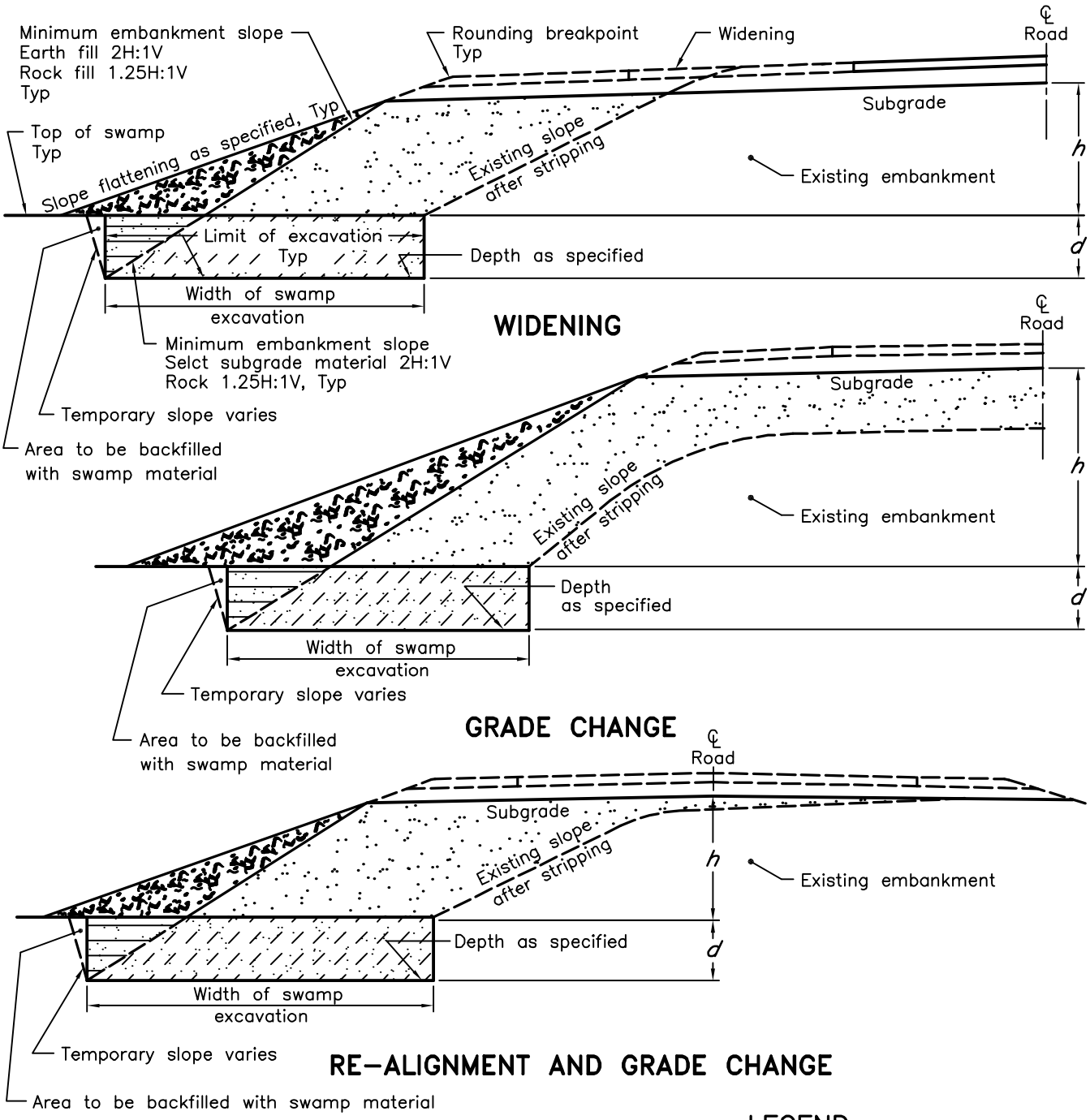
NOTES:

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 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.

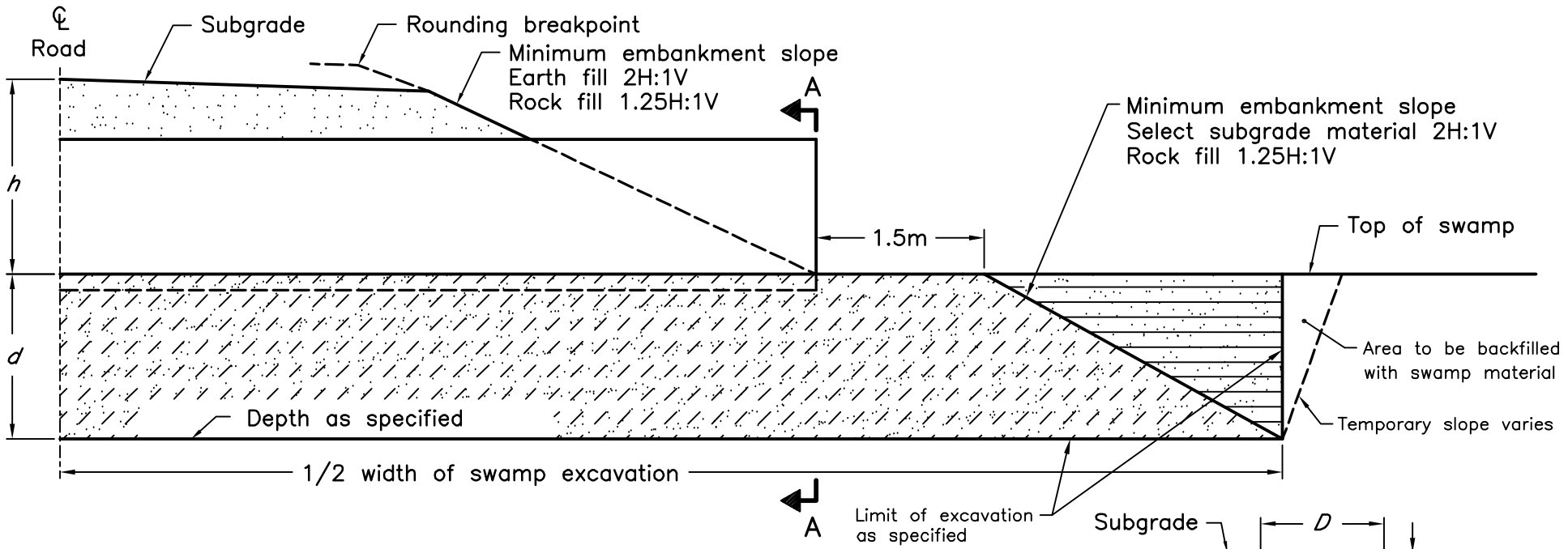
LEGEND:

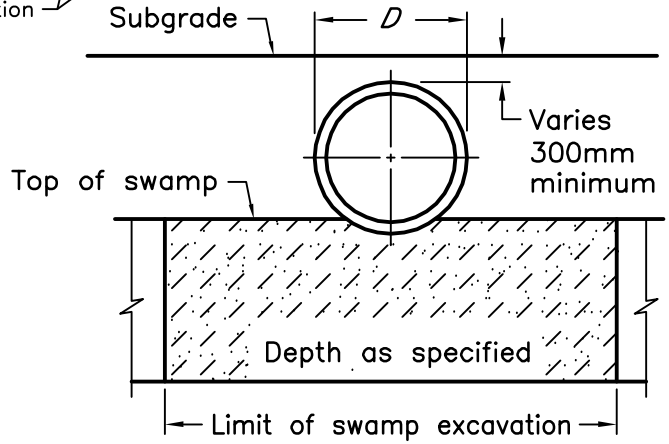
h – Height of fill

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 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

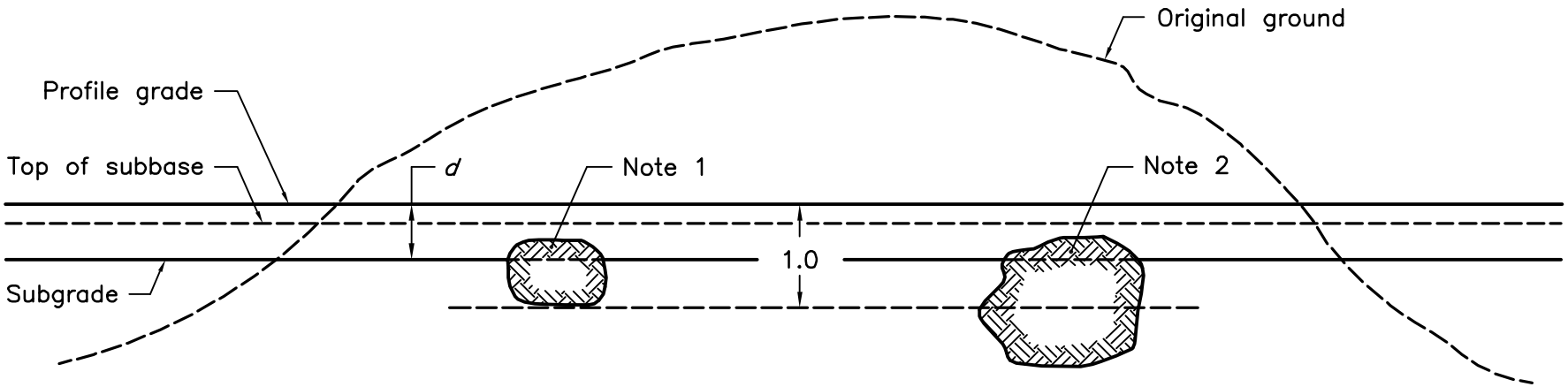
Excavate and backfill with swamp material

ONTARIO PROVINCIAL STANDARD DRAWING

EMBANKMENTS OVER SWAMP AT PIPE CULVERTS ≤ 1500mm

Nov 2010 | Rev 3

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.

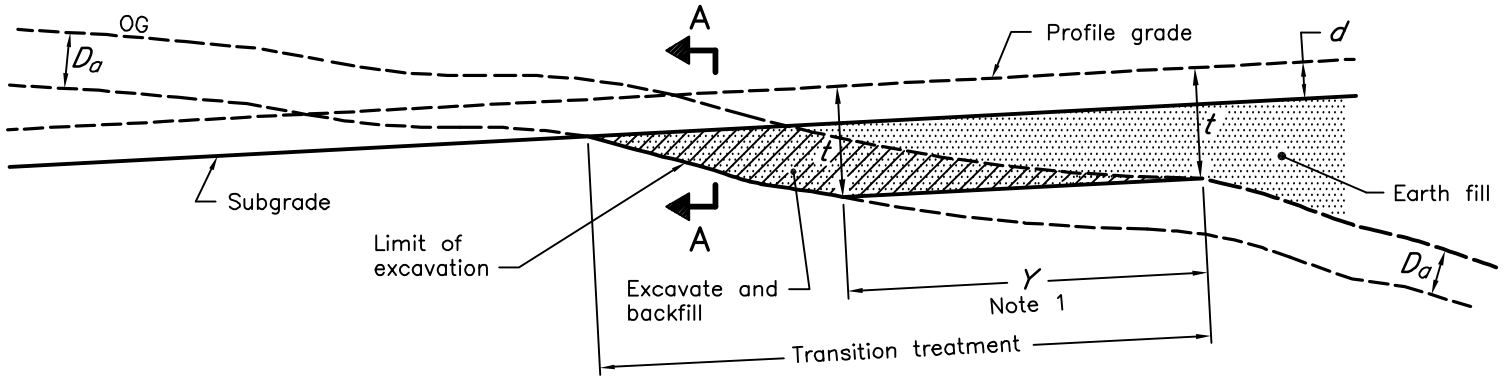
2 Boulders partially within depth d but deeper than 1.0m below profile grade shall be shattered to 0.6m below subgrade and then excavated to a minimum of 0.3m below subgrade.

A Excavation below subgrade shall be backfilled with approved material.

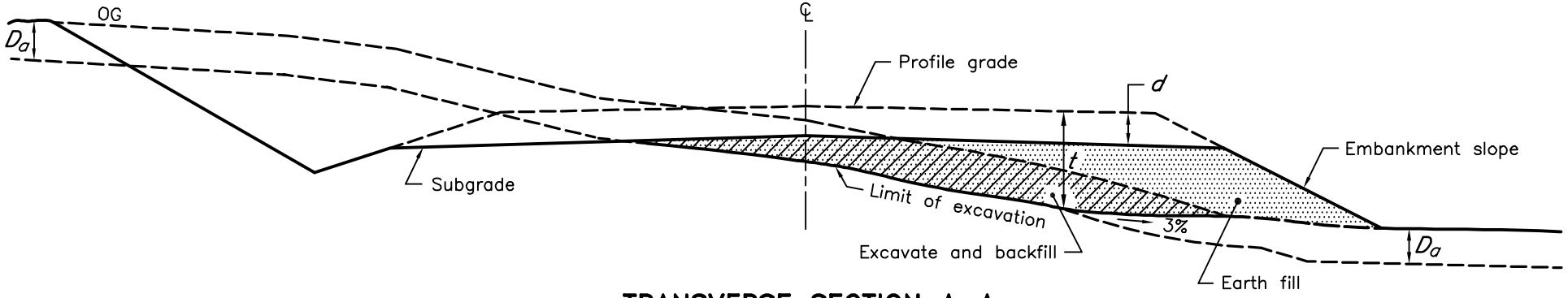
B Profile grade and subgrade lines apply across the transverse section.

C All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	3
BOULDER TREATMENT CUT SECTIONS–SUBGRADE			
	OPSD 204.010		



LONGITUDINAL SECTION



TRANSVERSE SECTION A–A

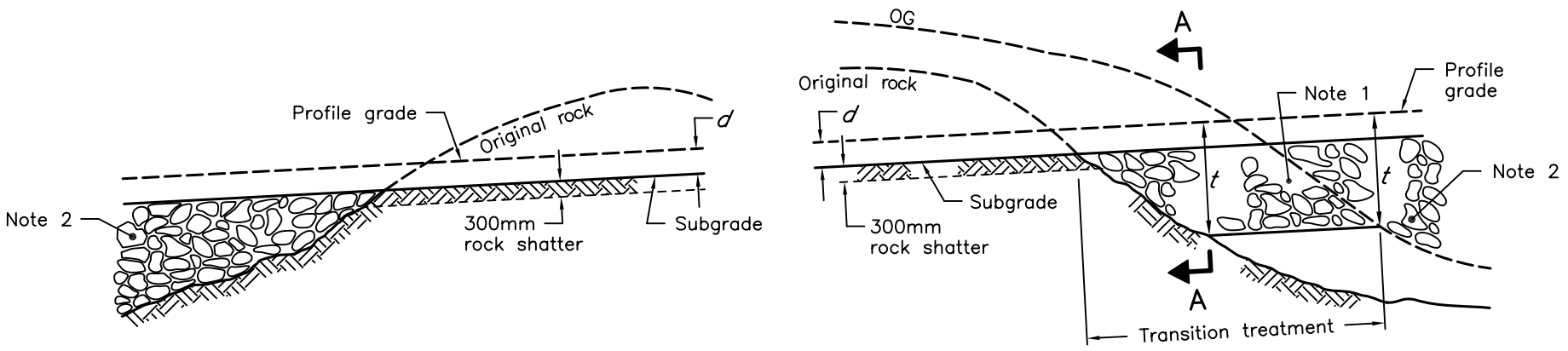
NOTES:

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

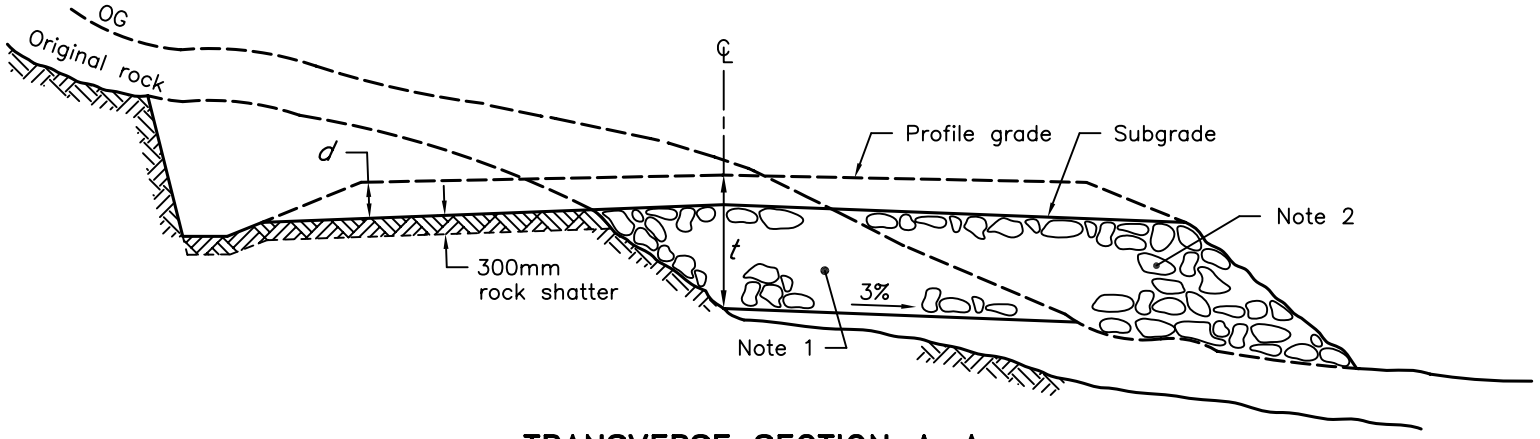
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev	2
TRANSITION TREATMENT EARTH CUT TO EARTH FILL			
	OPSD 205.010		



WITHOUT OVERBURDEN

WITH OVERBURDEN

LONGITUDINAL SECTIONS



TRANSVERSE SECTION A–A

NOTES:

1 Excavate overburden for transition where applicable.

2 Rock or granular fill.

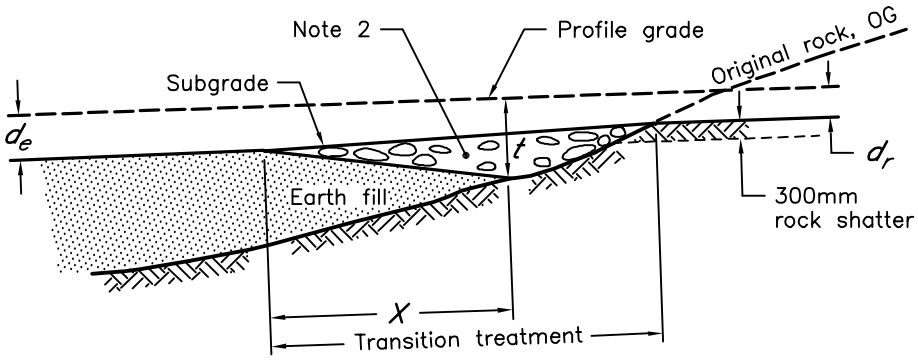
A All dimensions are in millimetres unless otherwise shown.

LEGEND:

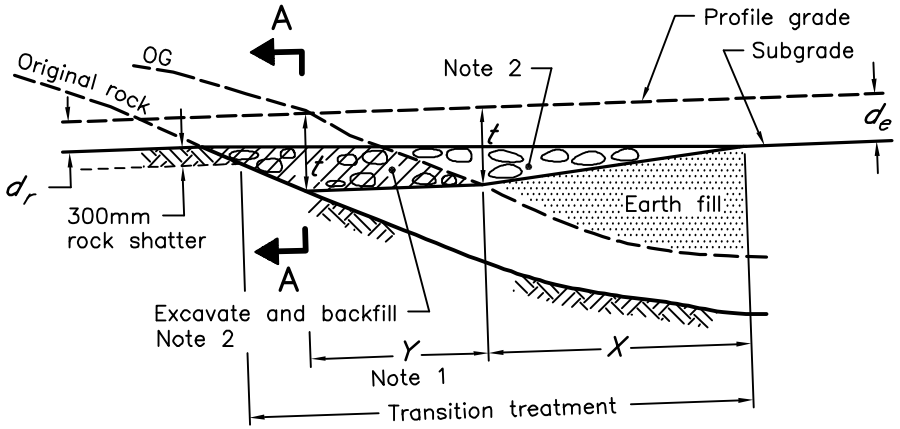
t – Transition treatment depth, as specified

d – Depth of granular base and subbase, as specified

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev	2
TRANSITION TREATMENT ROCK CUT TO ROCK FILL			
	OPSD 205.020		

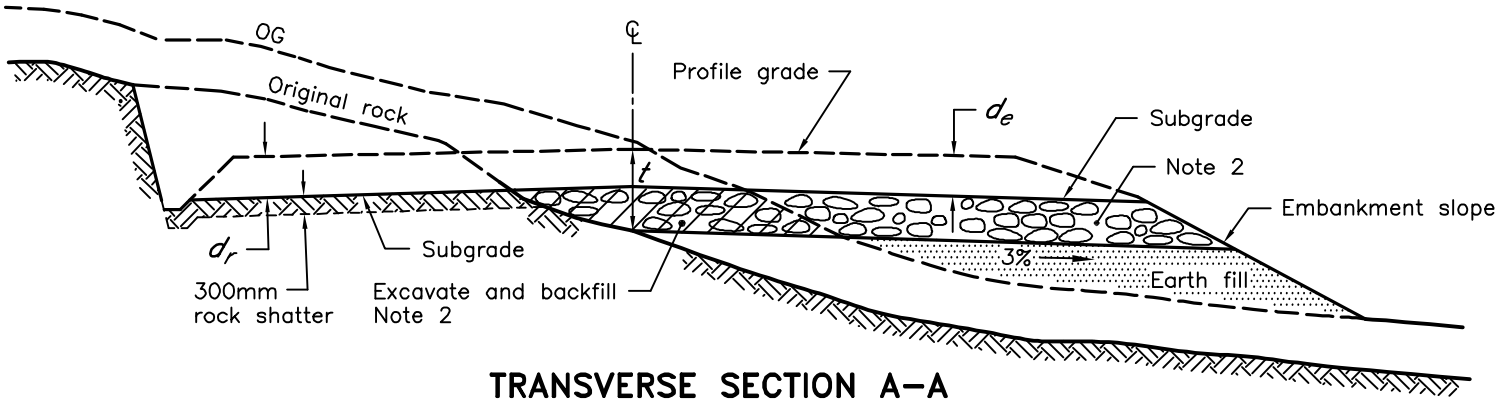


WITHOUT OVERBURDEN



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

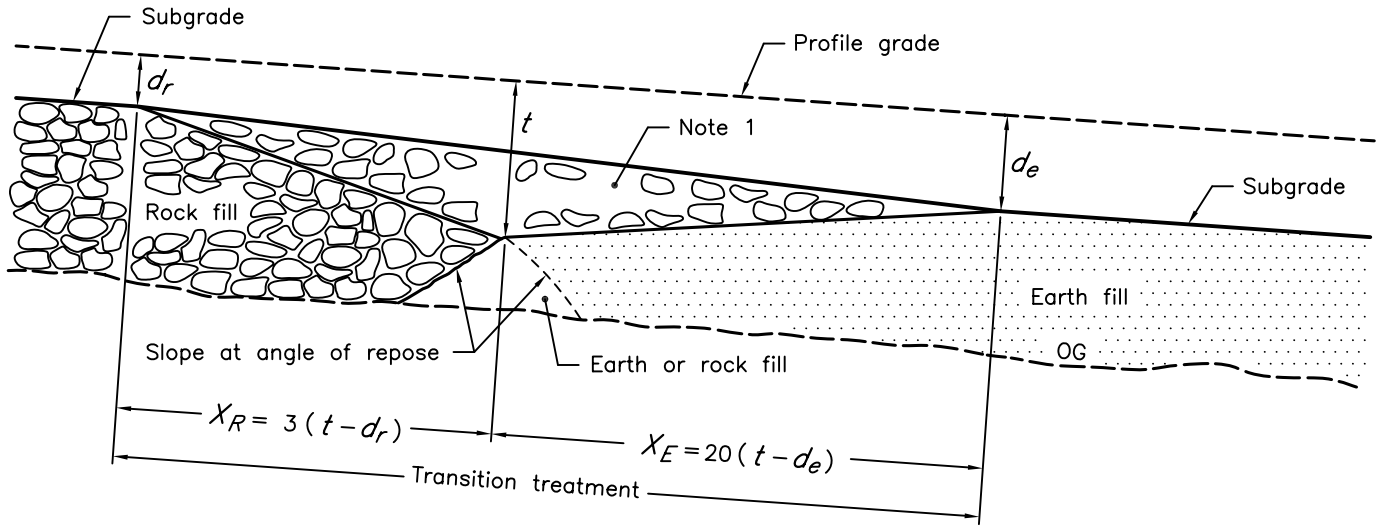
TRANSITION TREATMENT

ROCK CUT TO EARTH FILL

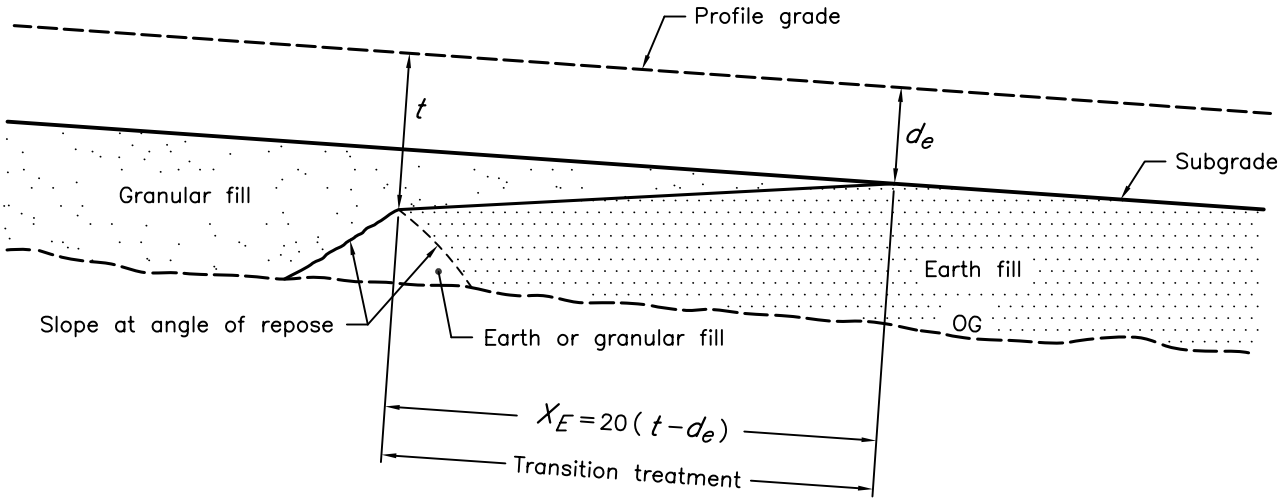
Nov 2009 | Rev 2

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

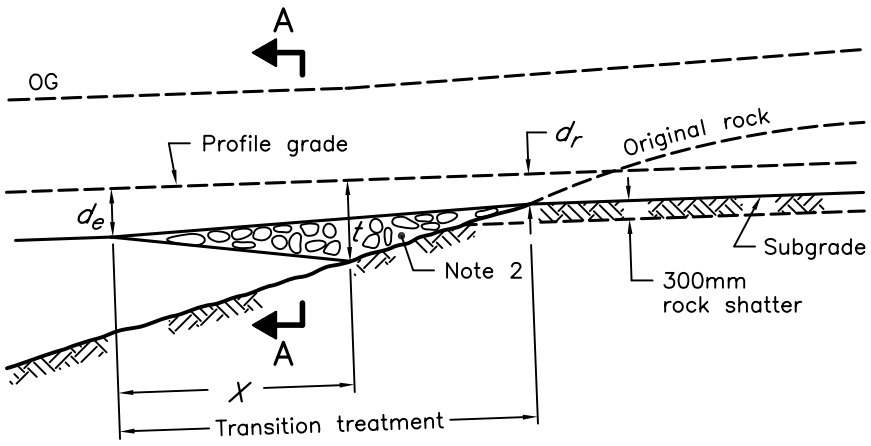
d_r – Depth of granular base and subbase over rock fill

t – Transition treatment depth, as specified

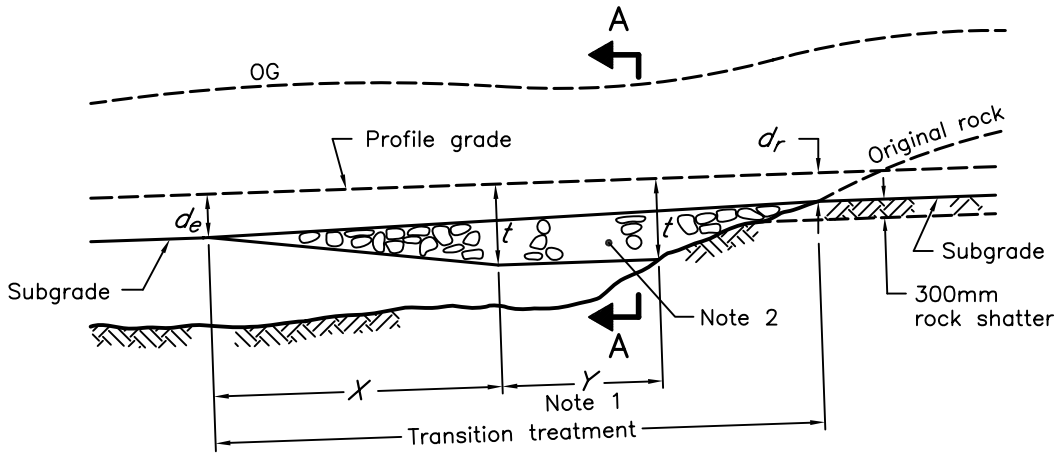
X_E – Length of transition for earth fill, 15m maximum

X_R – Length of transition in rock fill

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev	2
TRANSITION TREATMENT EARTH FILL TO ROCK FILL AND EARTH FILL TO GRANULAR FILL			
	OPSD 205.040		

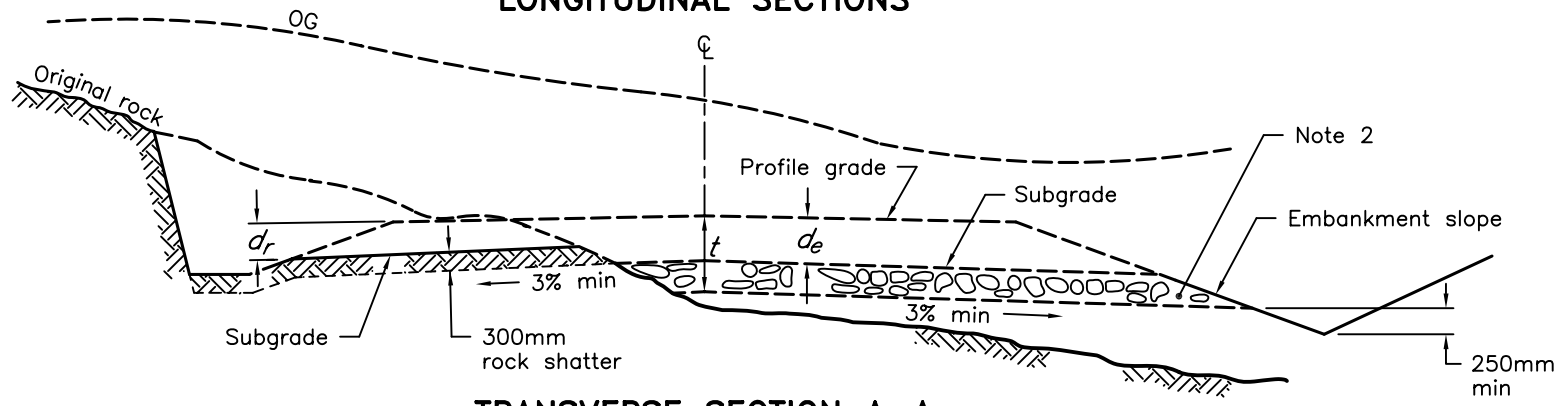


NON–FROST SUSCEPTIBLE SOILS



FROST SUSCEPTIBLE SOILS

LONGITUDINAL SECTIONS



TRANSVERSE SECTION A–A

NOTES:

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

2 Rock or granular fill.

A Carry out sufficient shatter at transitions to obtain drainage.

B All dimensions are in millimetres unless otherwise shown.

LEGEND:

t – Transition treatment depth, as specified

d_e – Depth of granular base and subbase over earth

d_r – Depth of granular base and subbase over rock

X – Taper to subgrade over $20(t - d_e)$

Y – Transition length, 15.0m maximum

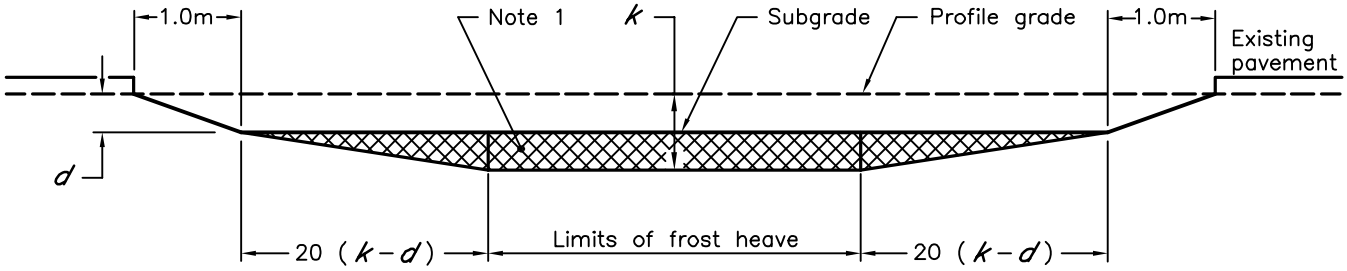
ONTARIO PROVINCIAL STANDARD DRAWING

TRANSITION TREATMENT

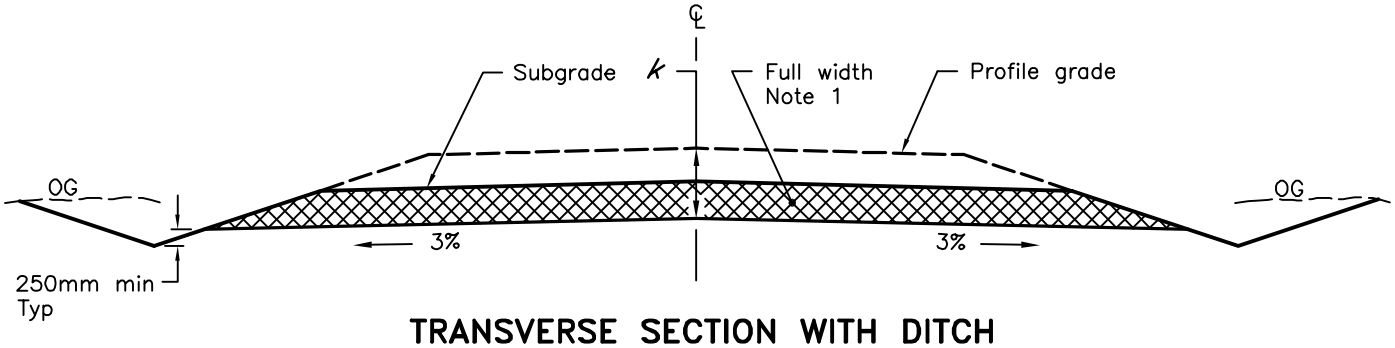
ROCK CUT TO EARTH CUT

Nov 2009 | Rev 2

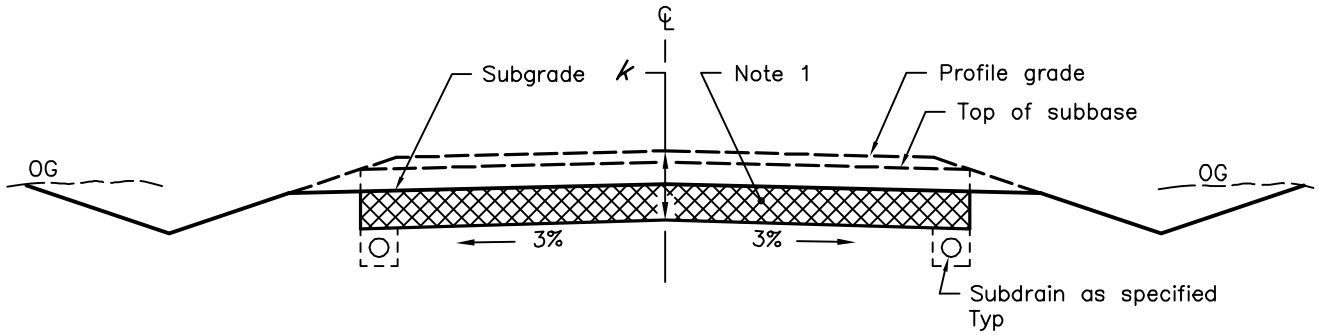
OPSD 205.050



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.

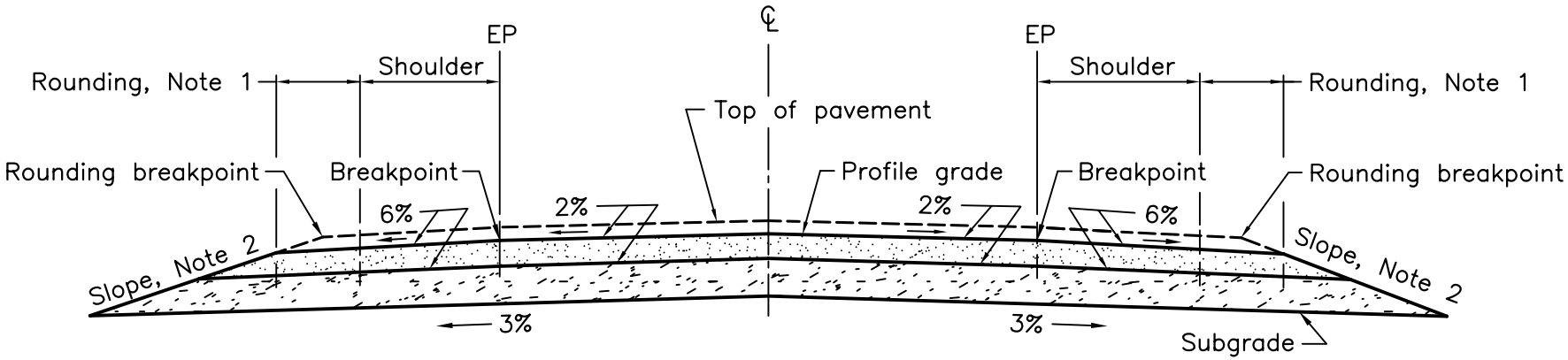
B All dimensions are in metres unless otherwise shown.

LEGEND:

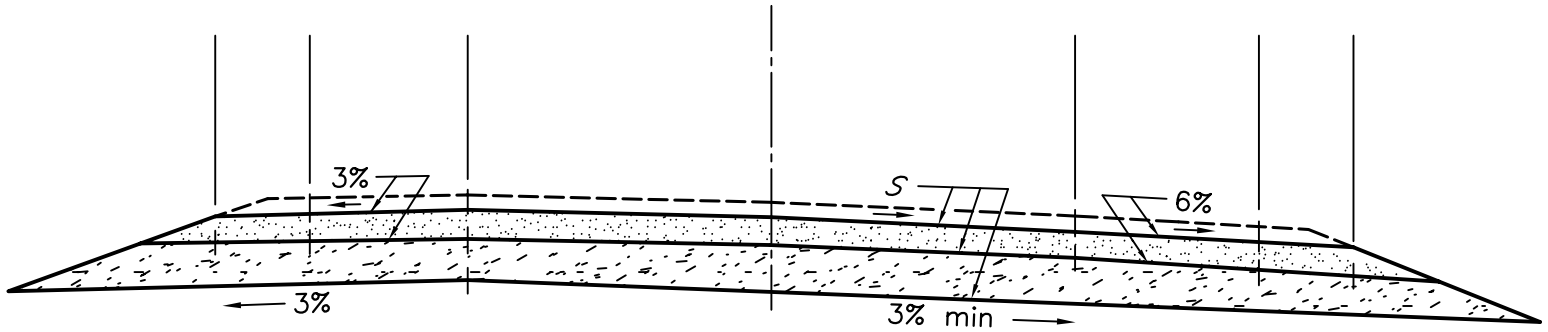
d – Depth of granular base and subbase

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.

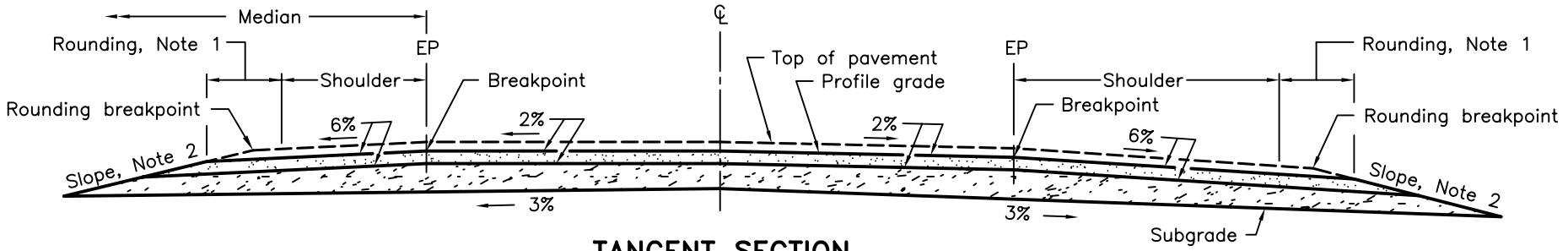
ONTARIO PROVINCIAL STANDARD DRAWING

GRANULAR COURSES

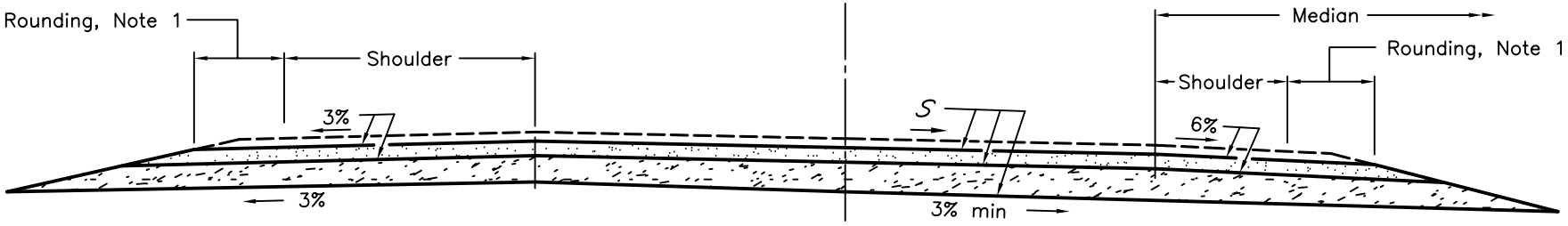
UNDIVIDED RURAL

Nov 2009 | Rev 1

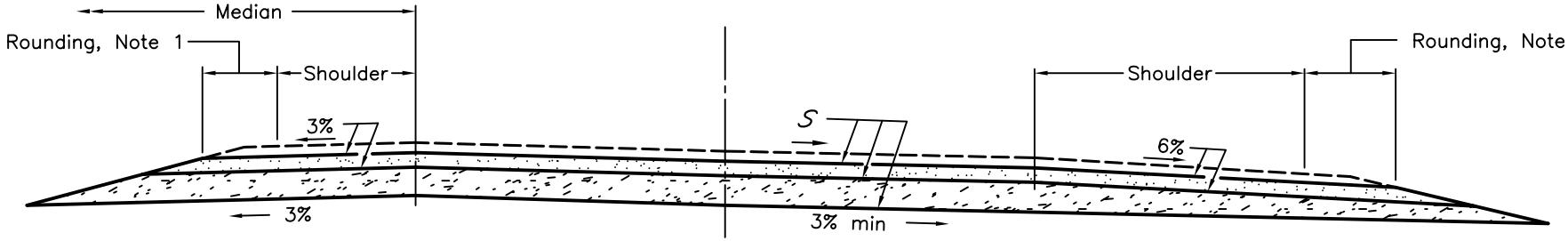
OPSD 206.010



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.

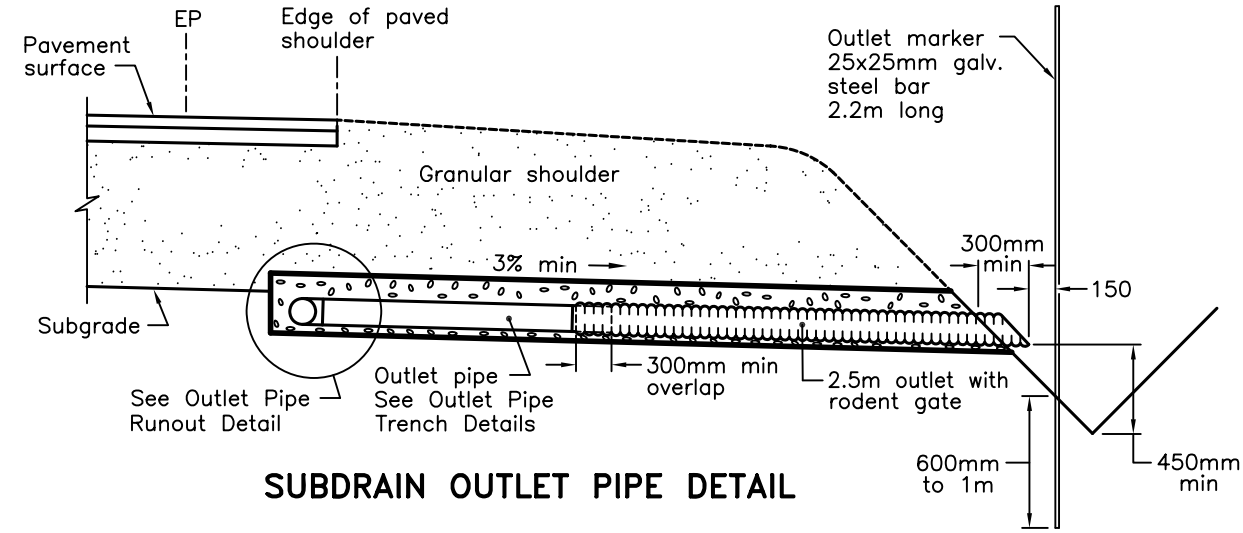
ONTARIO PROVINCIAL STANDARD DRAWING

GRANULAR COURSES

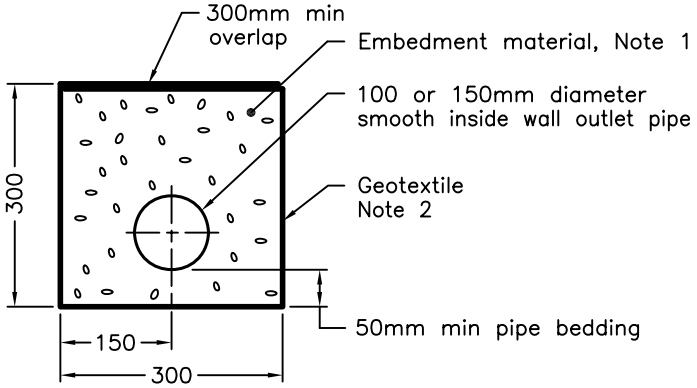
DIVIDED RURAL

Nov 2009 | Rev 1

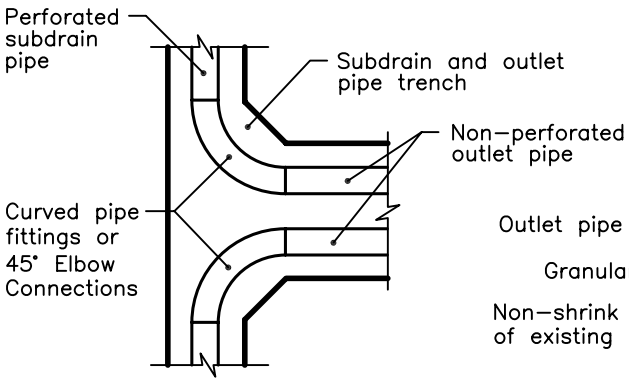
OPSD 206.020



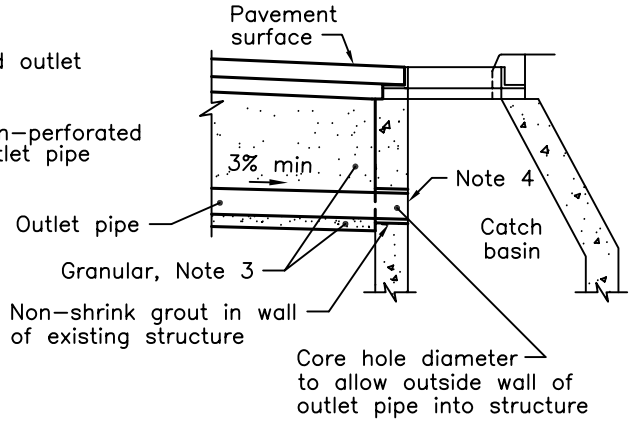
SUBDRAIN OUTLET PIPE DETAIL



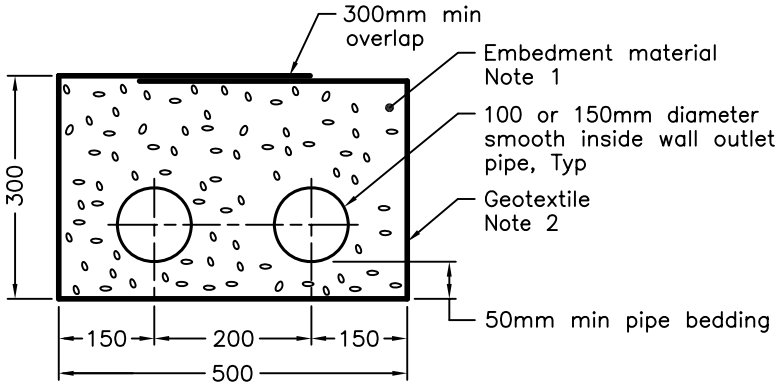
SINGLE OUTLET PIPE TRENCH DETAIL



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

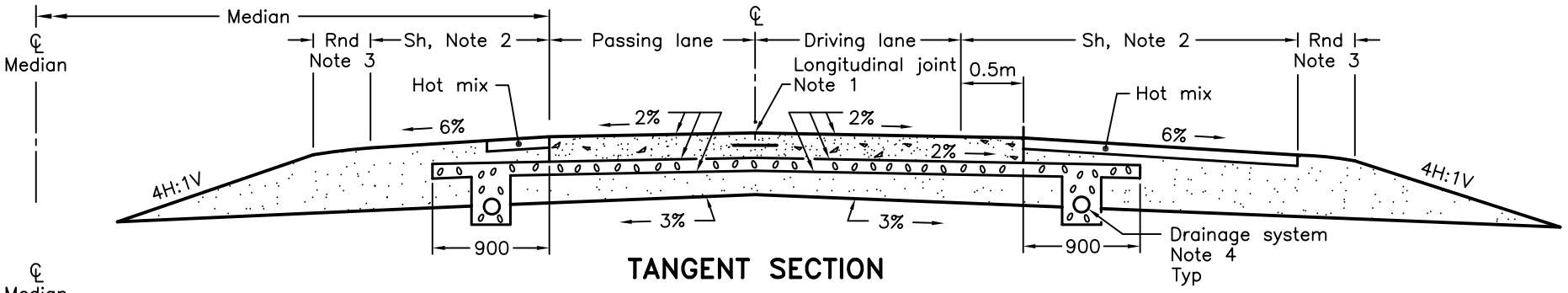
SUBDRAIN PIPE CONNECTION AND OUTLET

RURAL

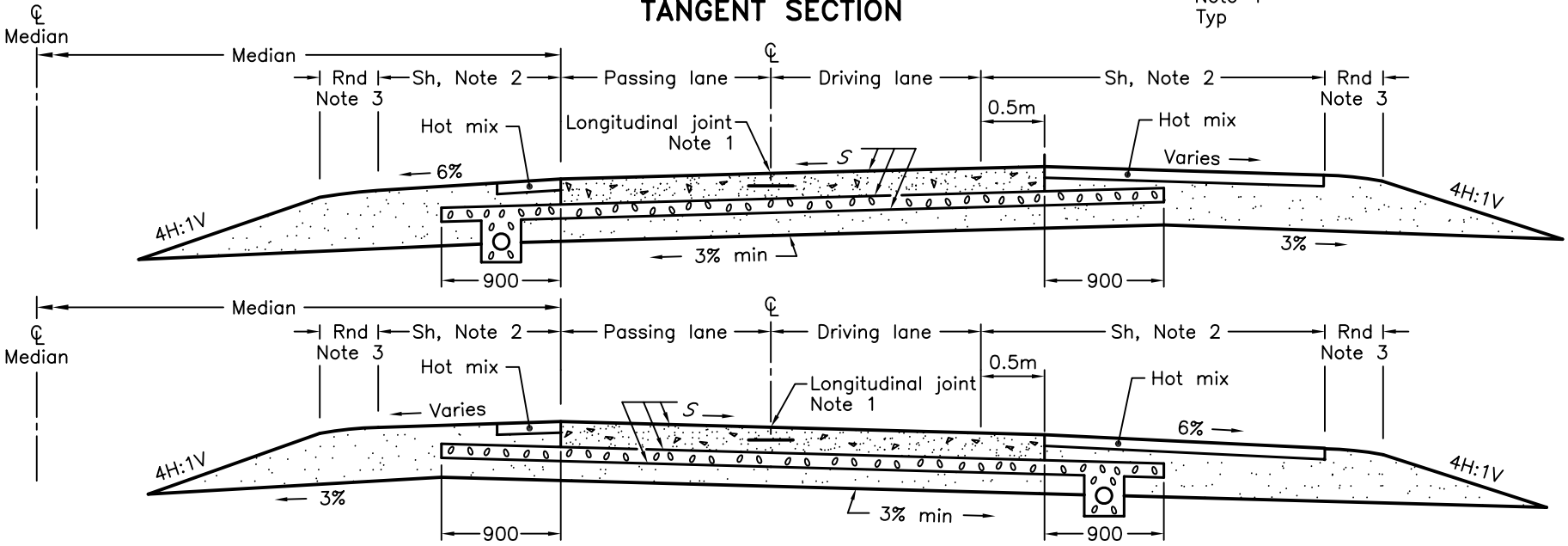
Nov 2008 | Rev 1

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.

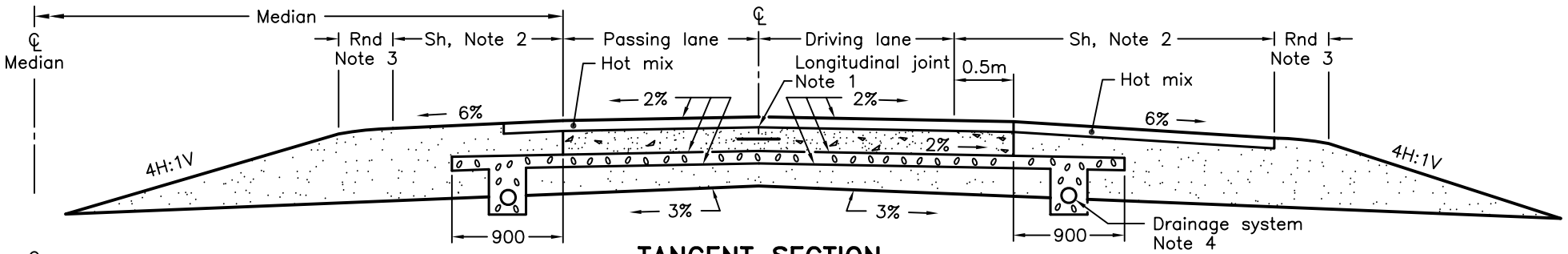
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

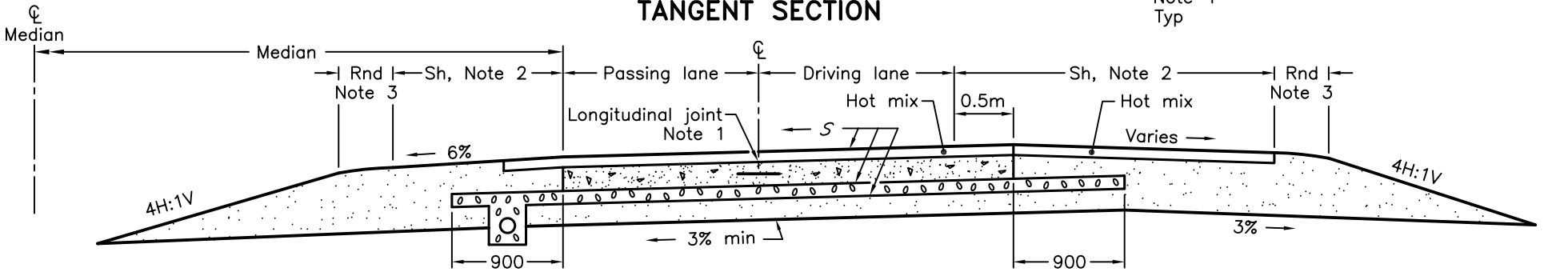
CONCRETE PAVEMENT ON OPEN GRADED DRAINAGE LAYER DIVIDED HIGHWAY

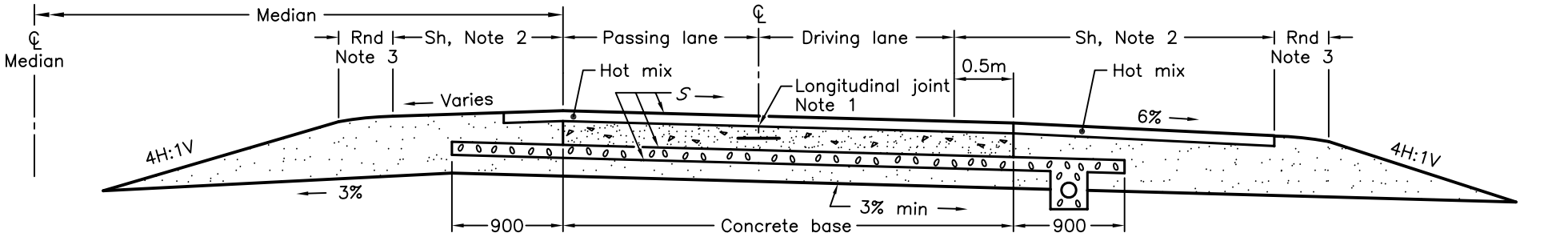
Nov 2007 | Rev 2

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.

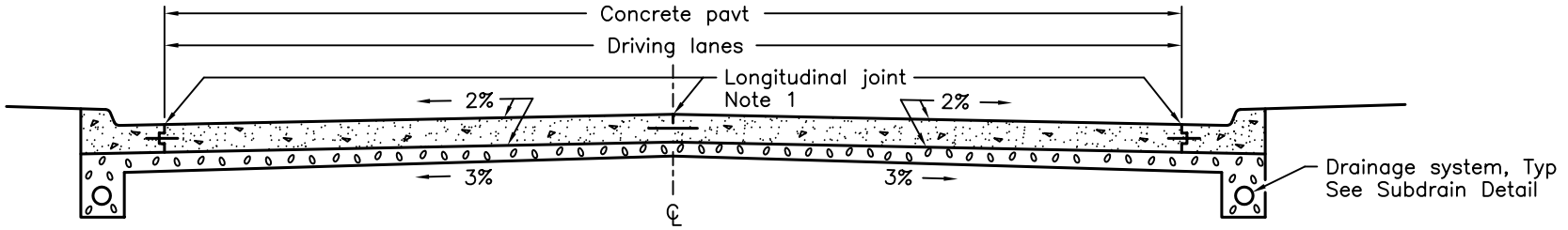
ONTARIO PROVINCIAL STANDARD DRAWING

COMPOSITE PAVEMENT ON OPEN GRADED DRAINAGE LAYER DIVIDED HIGHWAY

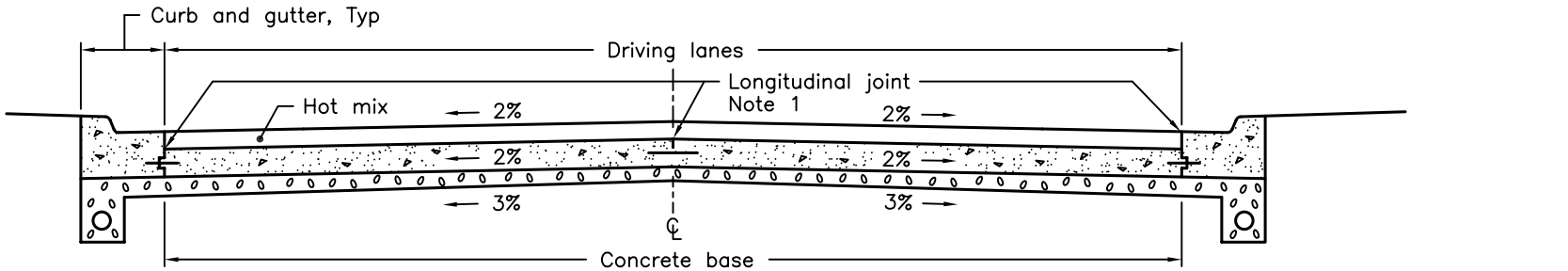
Nov 2007 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

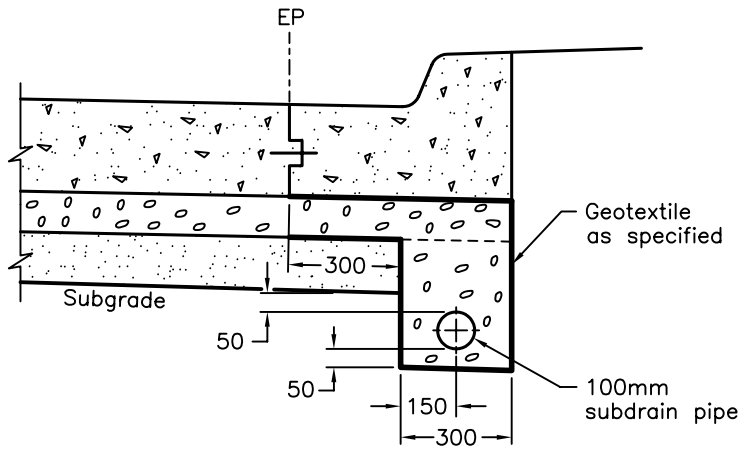
OPSD 207.020



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.

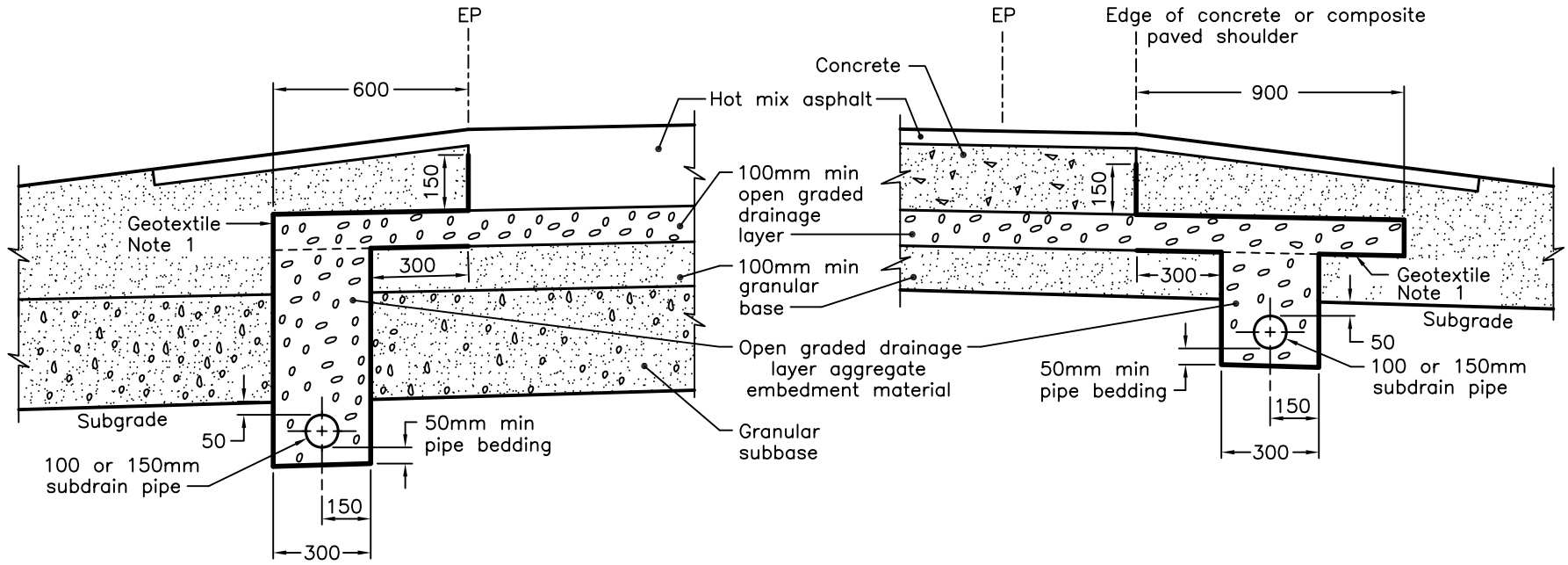
ONTARIO PROVINCIAL STANDARD DRAWING

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.

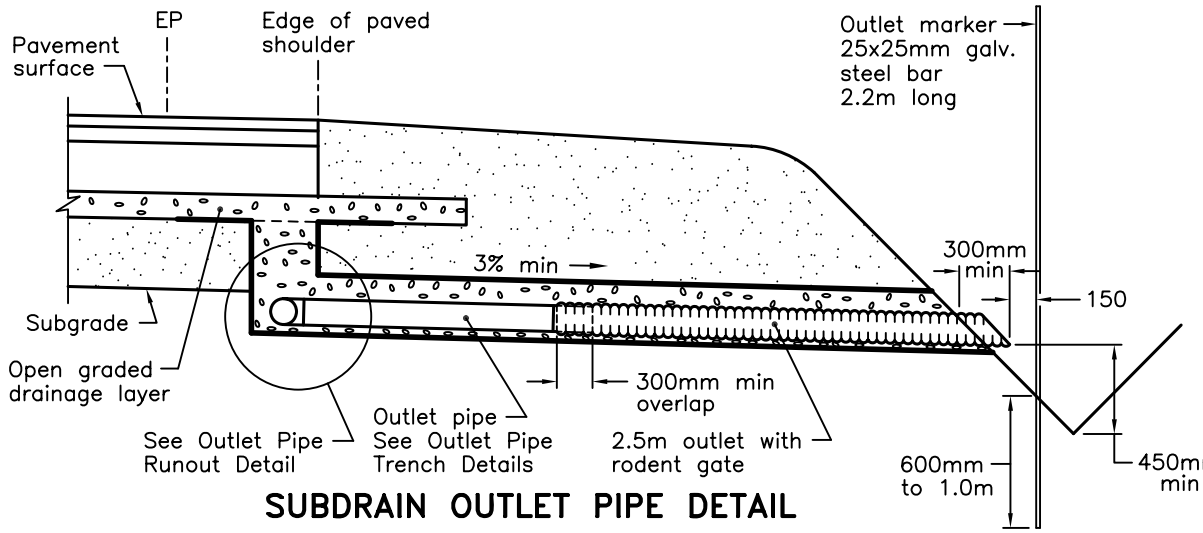
ONTARIO PROVINCIAL STANDARD DRAWING

SUBDRAIN PIPE OPEN GRADED DRAINAGE LAYER

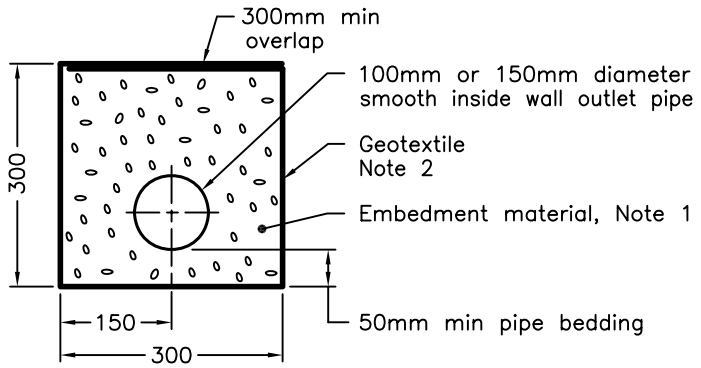
HOT MIX ASPHALT, CONCRETE, OR COMPOSITE PAVEMENT

Nov 2008 | Rev 3

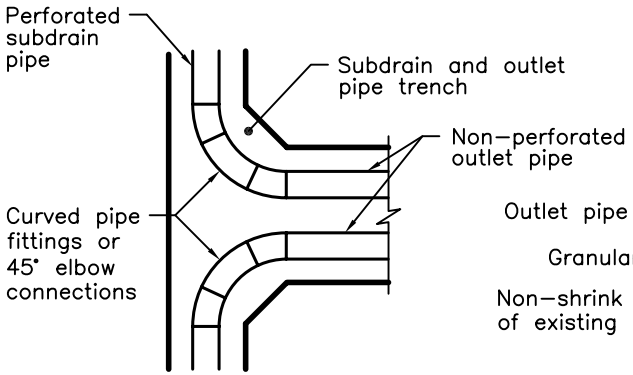
OPSD 207.041



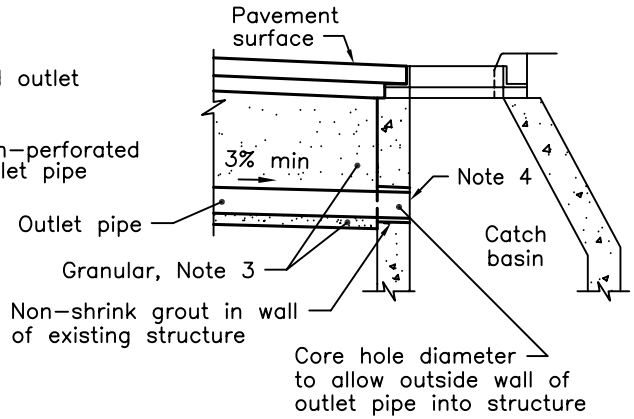
SUBDRAIN OUTLET PIPE DETAIL



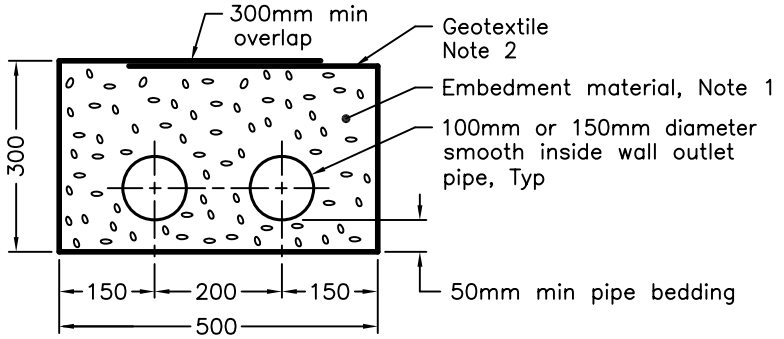
SINGLE OUTLET PIPE TRENCH DETAIL



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.

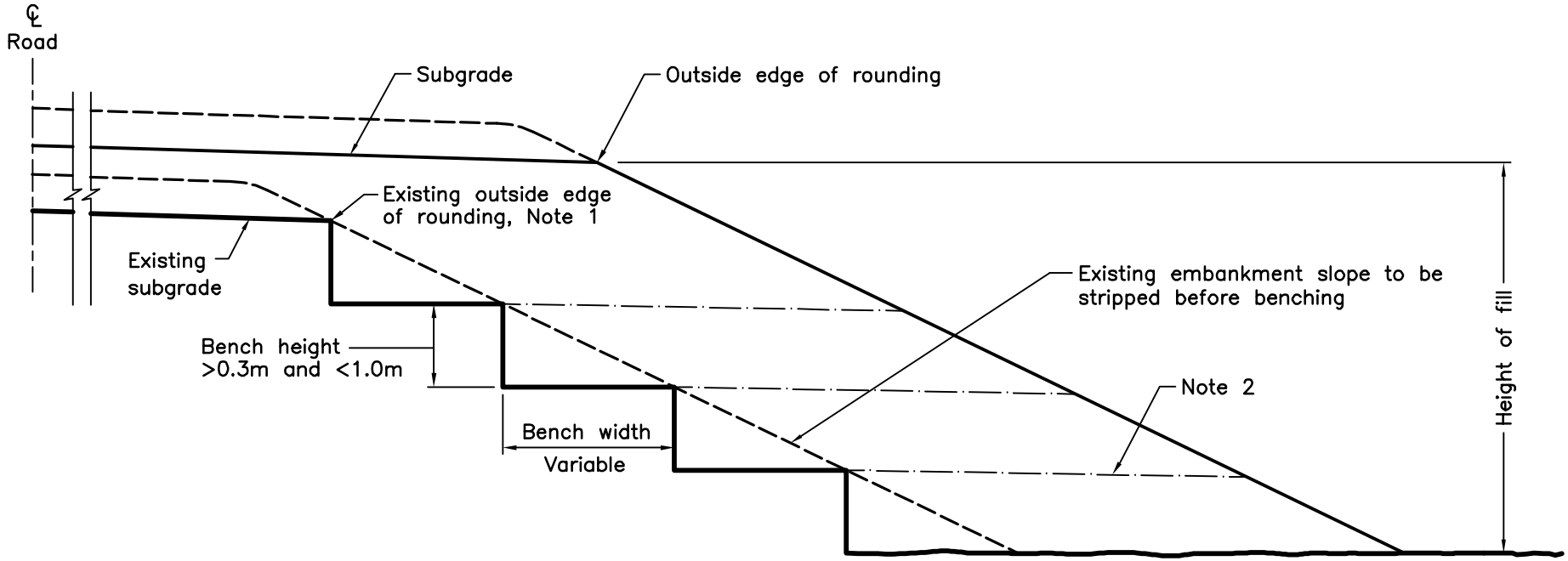
ONTARIO PROVINCIAL STANDARD DRAWING

SUBDRAIN PIPE CONNECTION AND OUTLET OPEN GRADED DRAINAGE LAYER

Nov 2008 | Rev 4

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 207.044



NOTES:

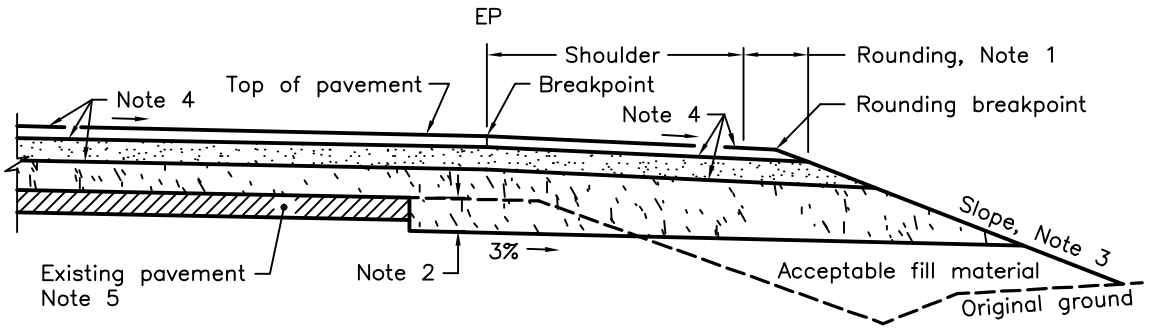
1 When the subgrade is below the existing outside edge of rounding, benching shall be carried out below the point where the subgrade intersects the existing slope.

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

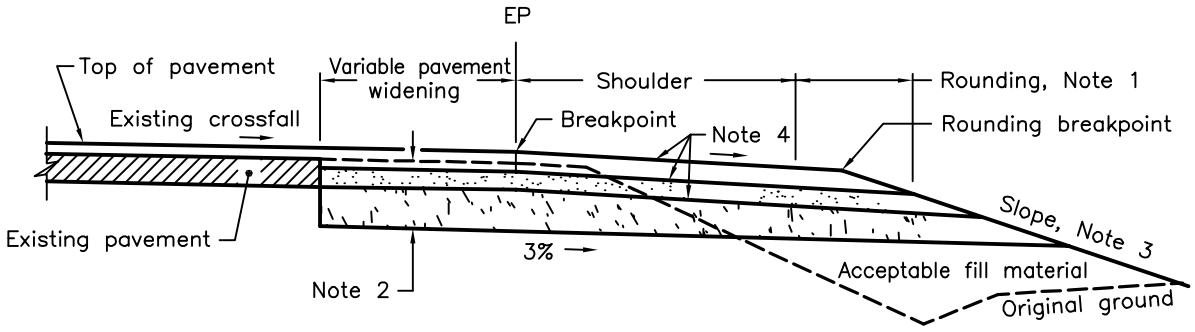
A Benching is not required on existing slopes flatter than 3H:1V.

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:

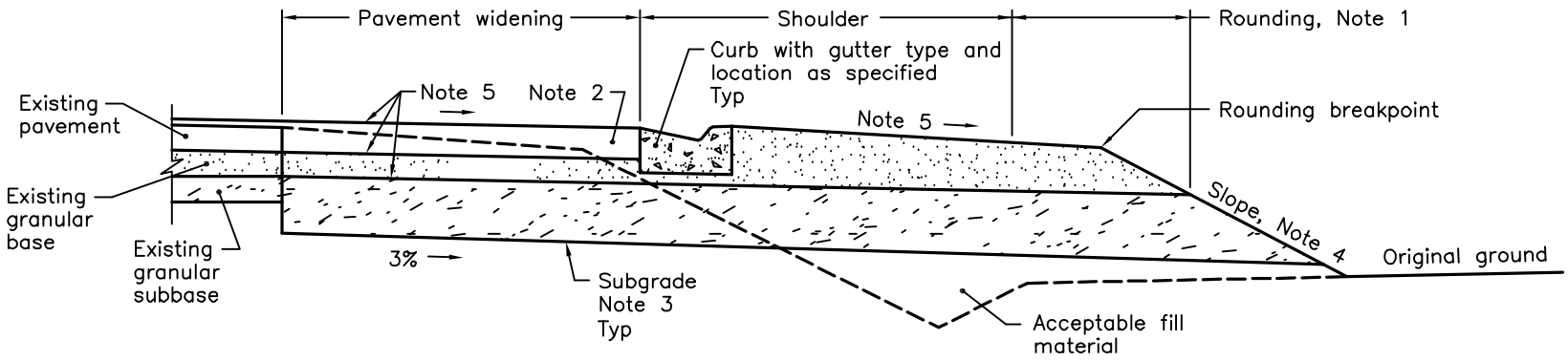
Granular base Granular subbase

NOTES:

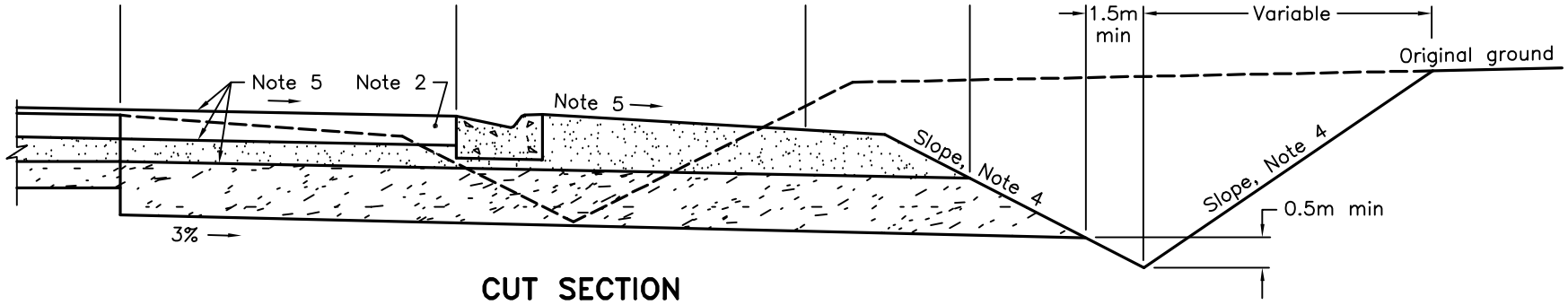
1 Rounding shall be 0.5m or greater when specified.
2 Depth of excavation shall be as specified.
3 Slope shall be as specified.
4 Crossfall shall be as specified.
5 Existing pavement under granular grade raise shall be removed, processed, or left in–place, as specified.

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

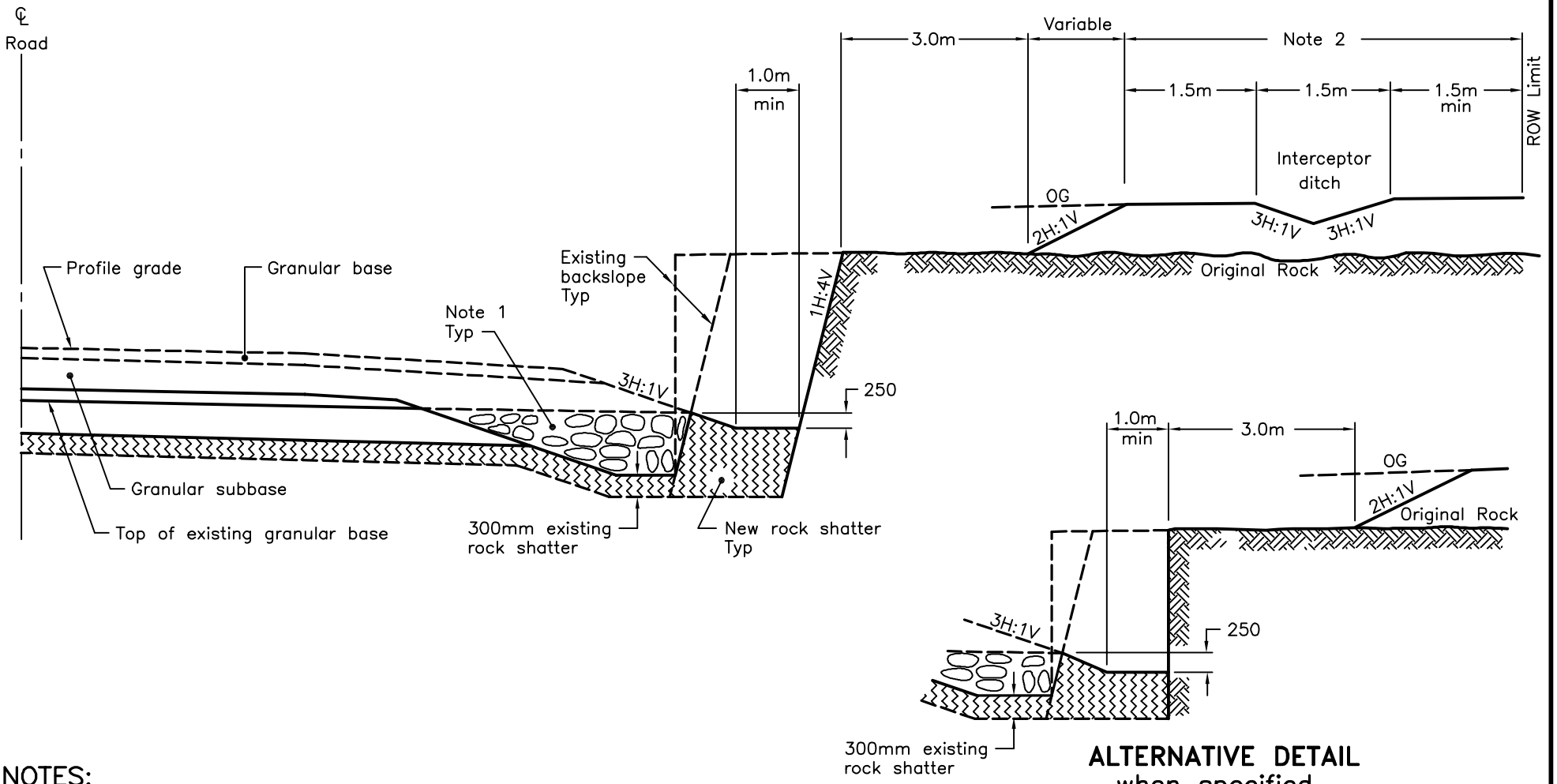
A For grading requirements beyond toe of embankment or CL of ditch, this OPSD to be read in conjunction with OPSD 200.010 or 200.020, as applicable.
B All dimensions are in metres unless otherwise shown.

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.

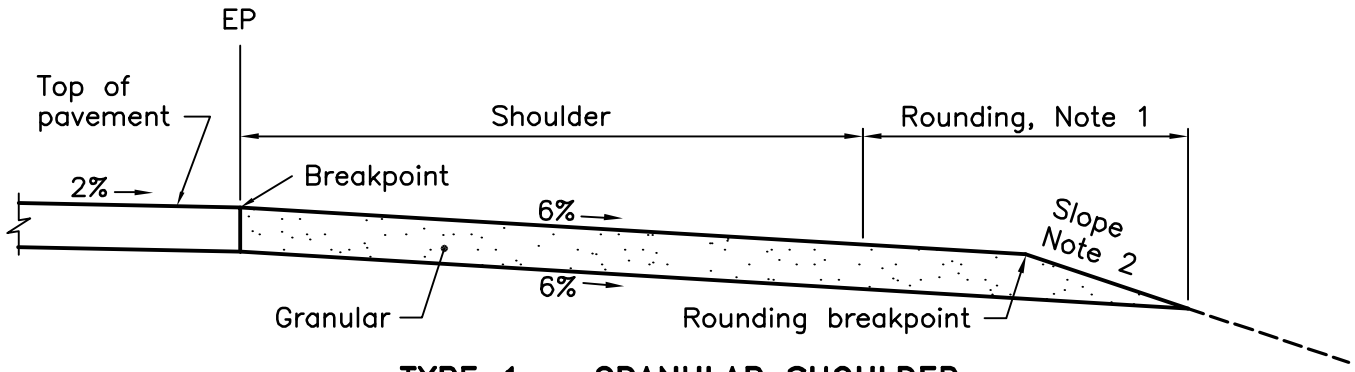
ONTARIO PROVINCIAL STANDARD DRAWING

WIDENING

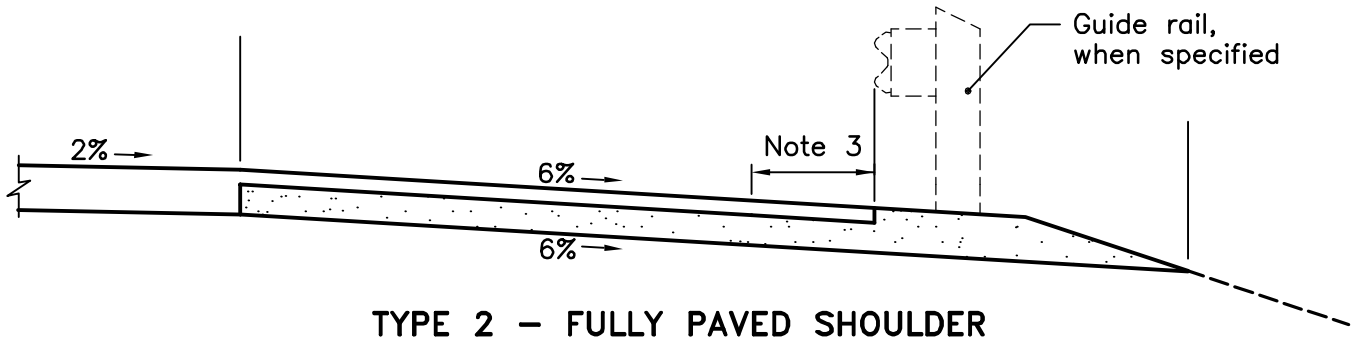
EXISTING ROCK CUT WITH GRADE RAISE

Apr 2010 | Rev 2

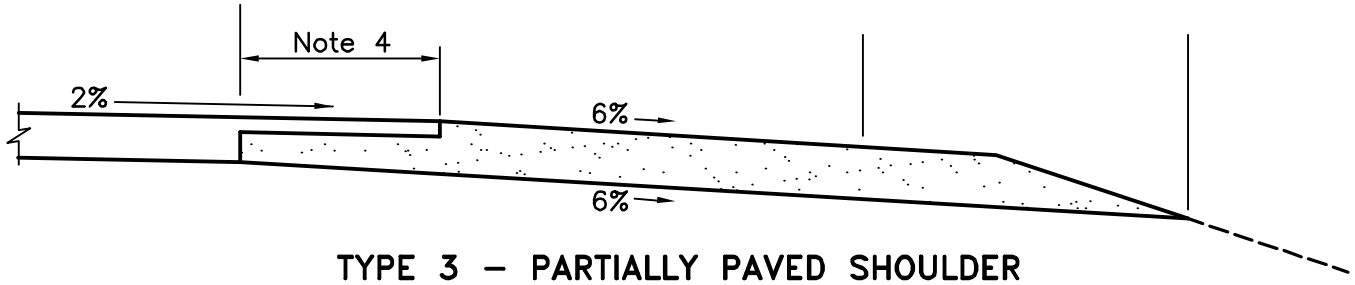
OPSD 209.020



TYPE 1 – GRANULAR SHOULDER



TYPE 2 – FULLY PAVED SHOULDER



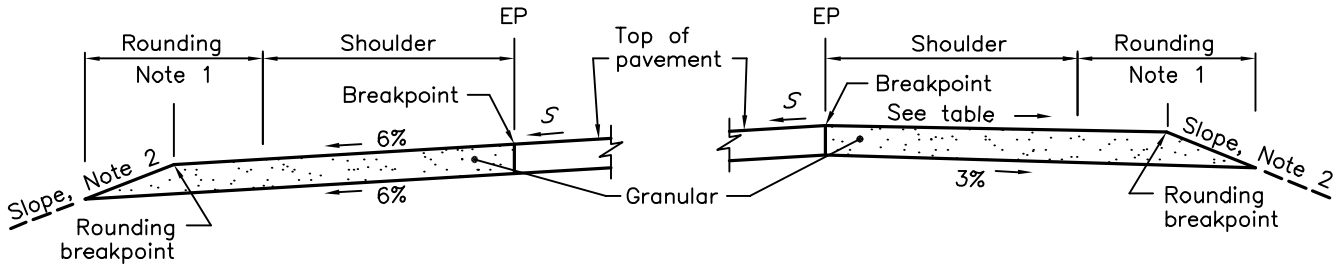
TYPE 3 – PARTIALLY PAVED SHOULDER

NOTES:

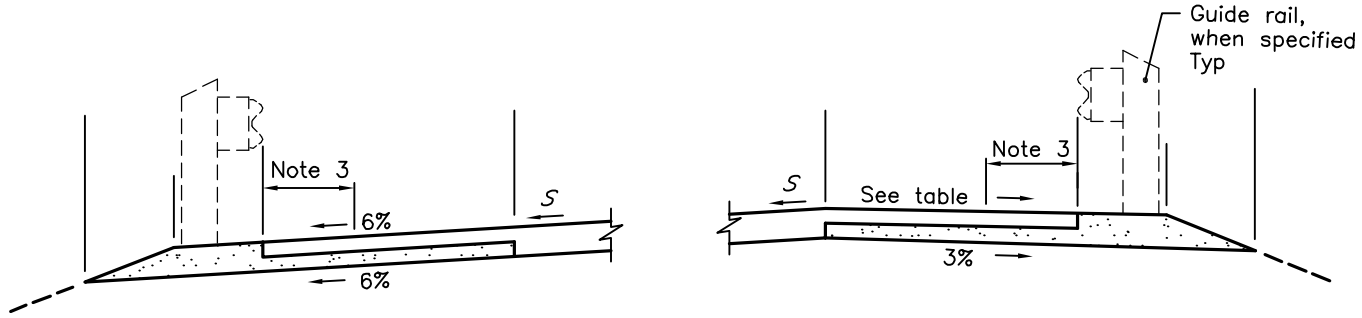
1 Rounding shall be 0.5m or greater when specified.
2 Slope shall be 3H:1V or flatter when specified.
3 Where cable and steel beam guide rail has been installed prior to shoulder paving and where shoulder paving is to be placed adjacent to the guide rail, the outside edge of shoulder paving shall end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

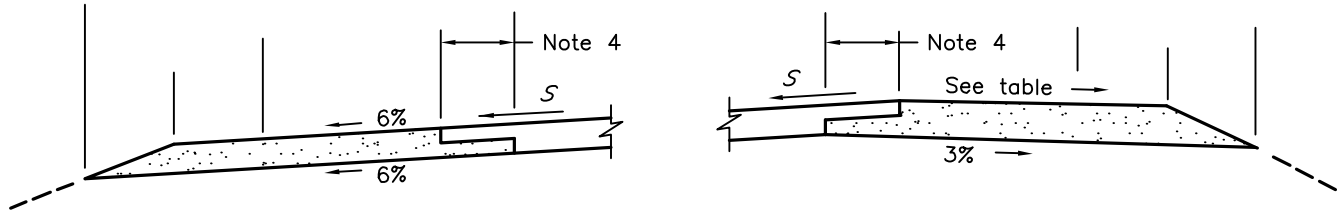
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
TANGENT SHOULDERS RURAL			
	OPSD 210.010		



TYPE 1 – GRANULAR SHOULDER



TYPE 2 – FULLY PAVED SHOULDER



TYPE 3 – PARTIALLY PAVED SHOULDER

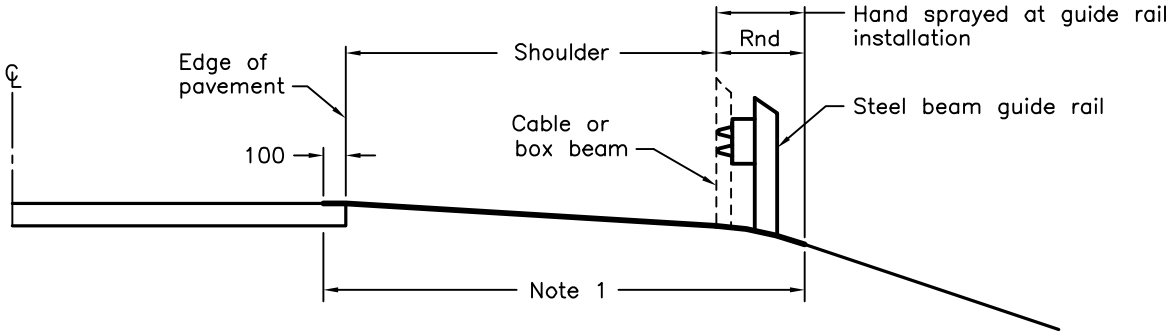
CROSSFALL, %													
Paved driving lane and partially paved shoulder	+6	+5	+4	+3	+2	+1	0	−1	−2	−3	−4	−5	−6
Shoulder	−2	−2	−2	−3	−3	−3	−4	−5	−6	−6	−6	−6	−6

NOTES:

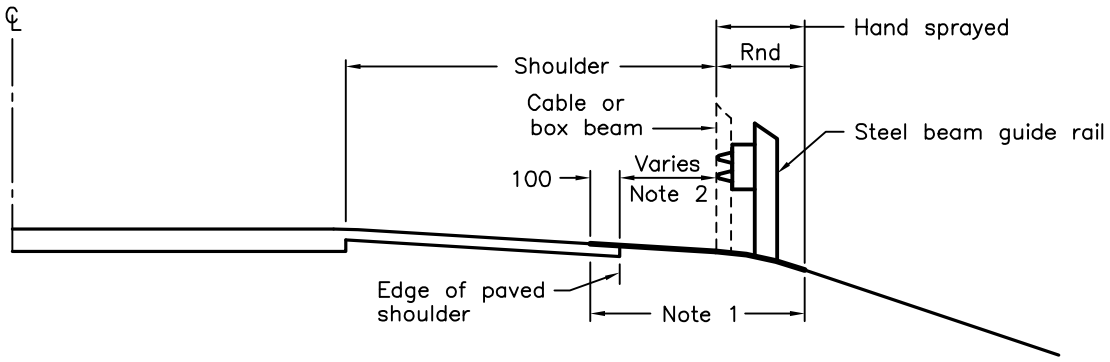
1 Rounding shall be 0.5m or greater when specified.
2 Slope shall be 3H:1V or flatter when specified.
3 Where cable and steel beam guide rail has been installed prior to shoulder paving and where shoulder paving is to be placed adjacent to the guide rail, the outside edge of shoulder paving shall end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

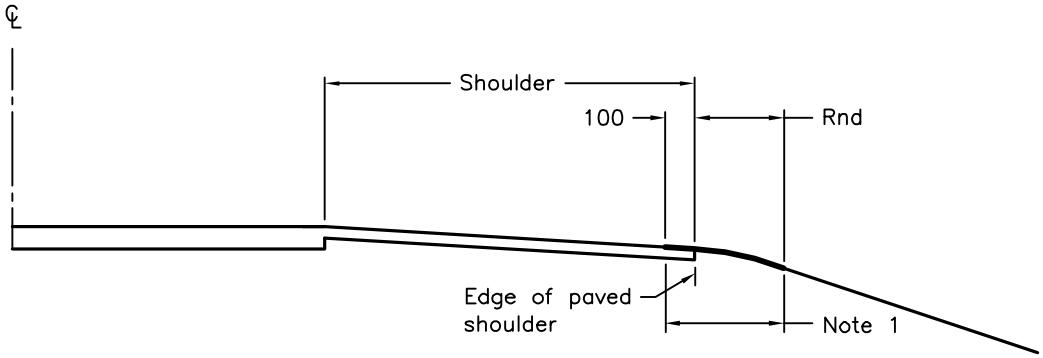
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
SUPERELEVATED SHOULDERS RURAL			
	OPSD 210.020		



GRANULAR SHOULDER WITH OR WITHOUT GUIDE RAIL



PAVED SHOULDER WITH GUIDE RAIL



PAVED SHOULDER WITHOUT GUIDE RAIL

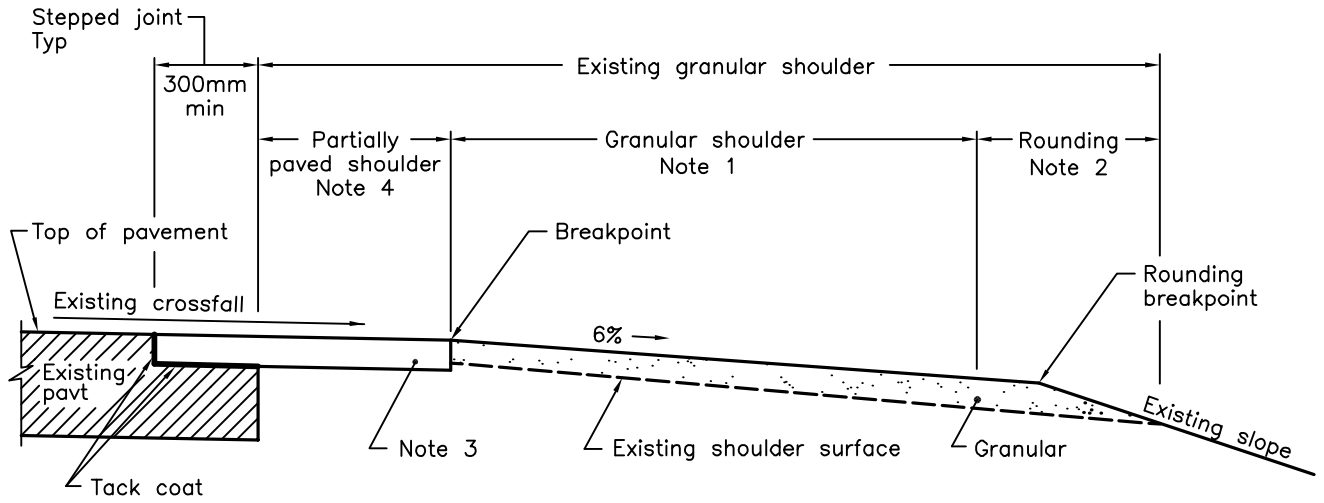
NOTES:

1 Extent of granular sealer.

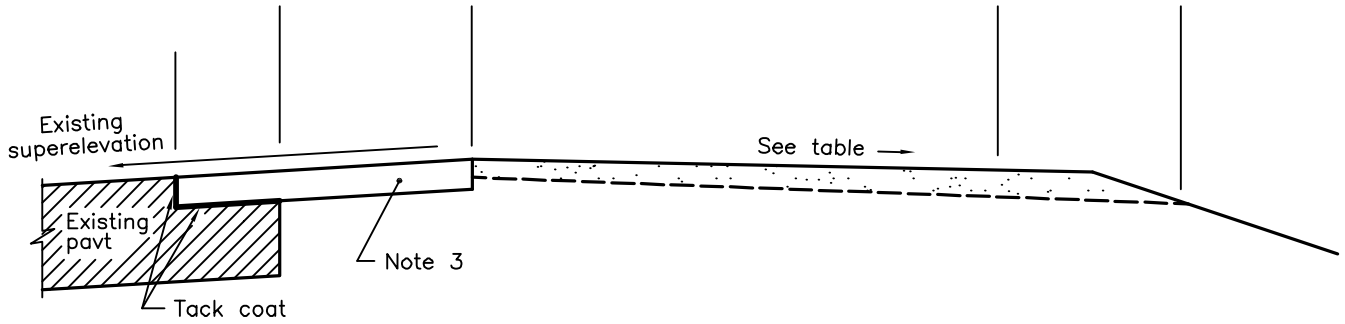
2 When the width of granular shoulder in front of the guide rail is 300mm or less, granular sealer may be applied by hand spraying for the full width of this application.

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

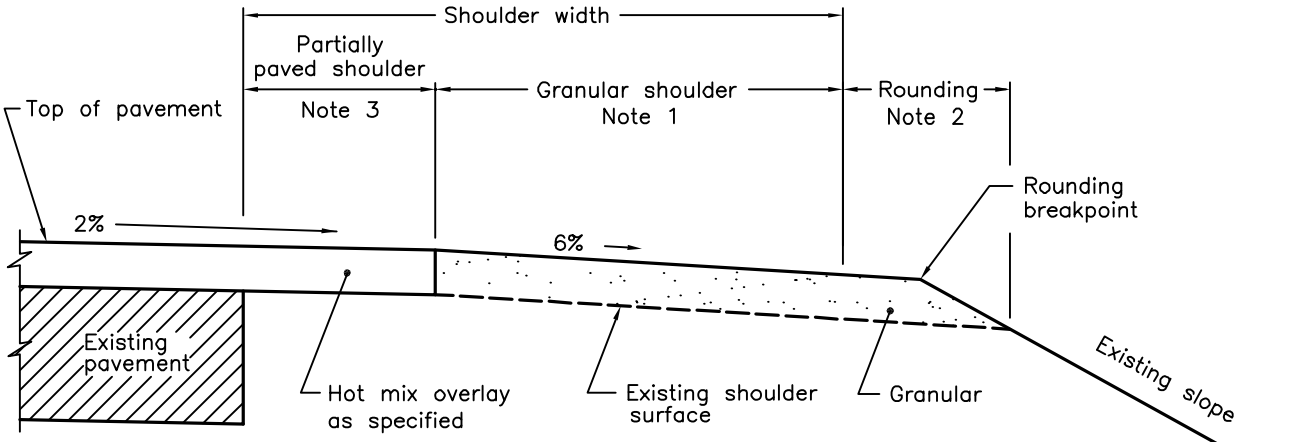
CROSSFALL TABLE, %													
Paved driving lane and partially paved shoulder	+6	+5	+4	+3	+2	+1	0	−1	−2	−3	−4	−5	−6
Granular shoulder	−2	−2	−2	−3	−3	−3	−4	−5	−6	−6	−6	−6	−6

NOTES:

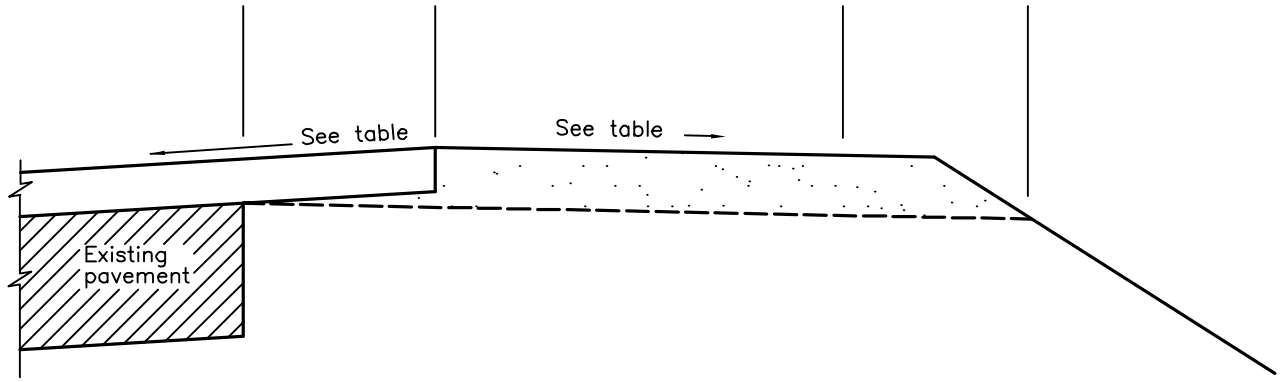
1 Minimum width of granular shoulder 1.0m.
2 Rounding shall be 0.5m or greater, when specified.
3 Thickness of hot mix paving courses as specified.
4 Partially paved shoulder shall be 0.5m minimum.

A All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	2
PARTIALLY PAVED SHOULDERS EXISTING PAVEMENT MAINTAINED			
	OPSD 211.010		



TANGENT SECTION



SUPERELEVATED SECTION

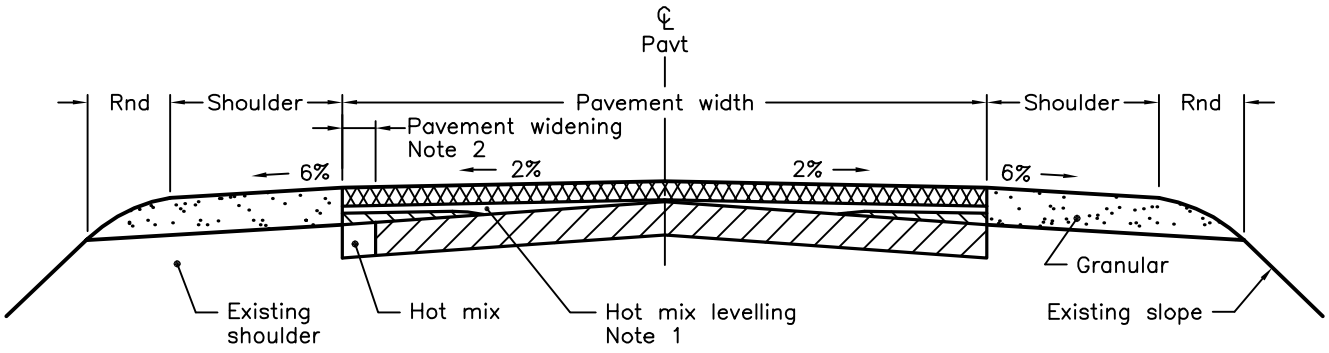
CROSSFALL TABLE, %													
Paved driving lane and partially paved shoulder	+6	+5	+4	+3	+2	+1	0	−1	−2	−3	−4	−5	−6
Granular shoulder	−2	−2	−2	−3	−3	−3	−4	−5	−6	−6	−6	−6	−6

NOTES:

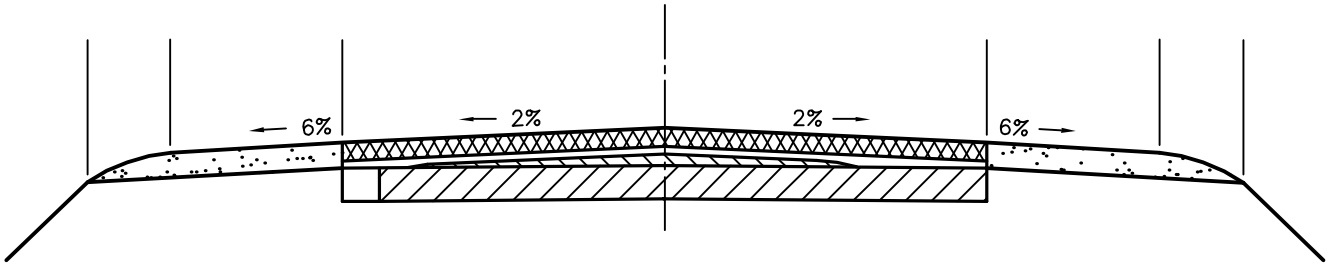
1 Minimum width of granular shoulder 1.0m.
2 Rounding shall be 0.5m or greater, when specified.
3 Partially paved shoulder shall be 0.5m minimum.

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

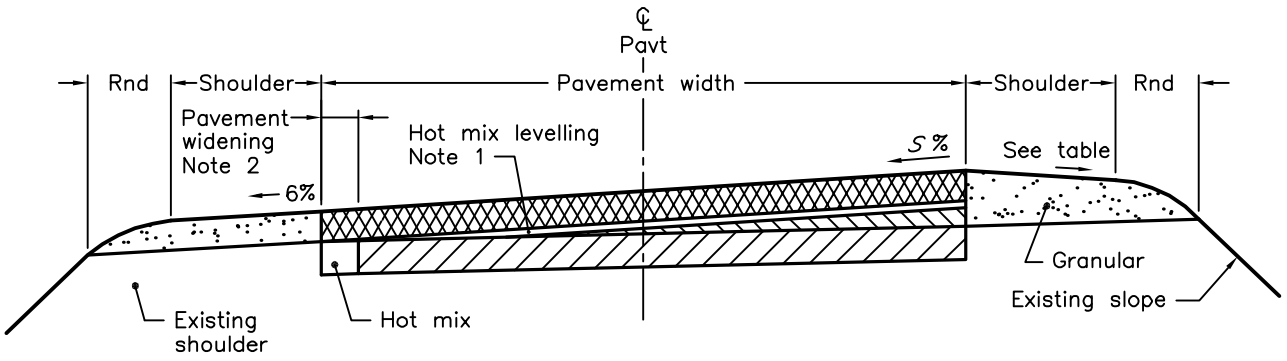
LEGEND:

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

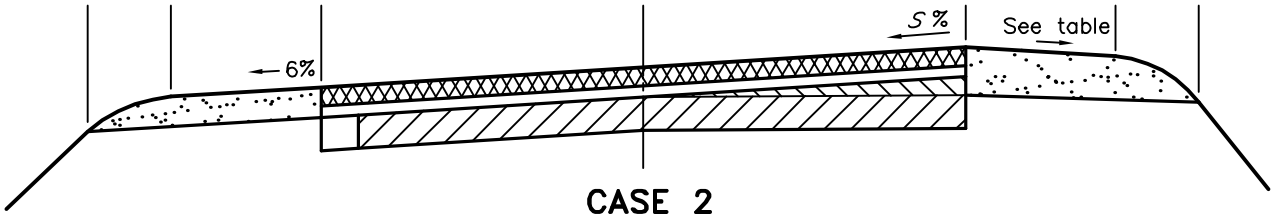
NOTES:

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

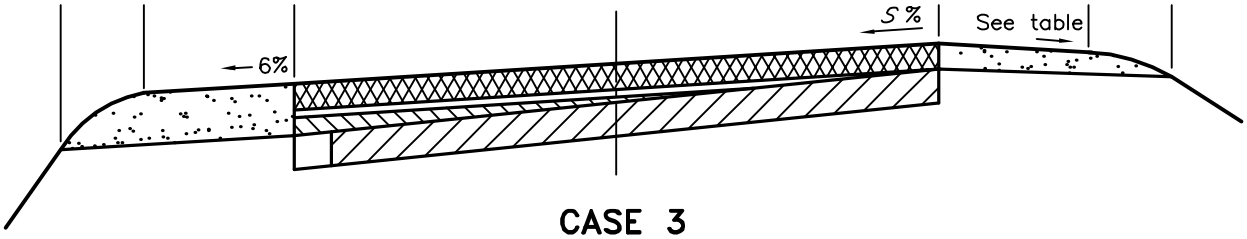
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev	1
RESURFACING WITH CROSSFALL CORRECTION WITH HOT MIX ASPHALT TANGENT SECTION			
	OPSD 212.010		



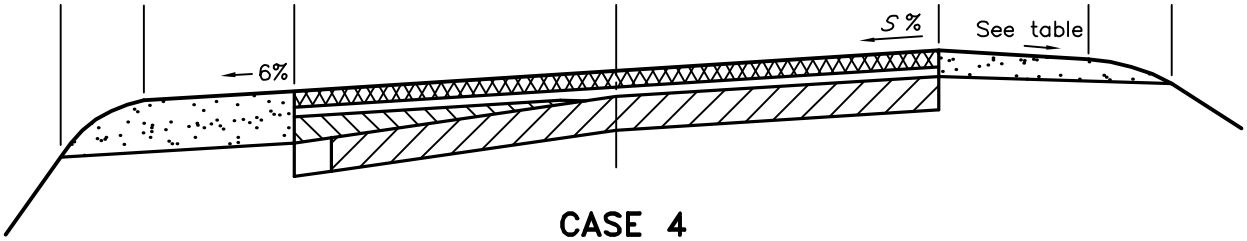
CASE 1



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:

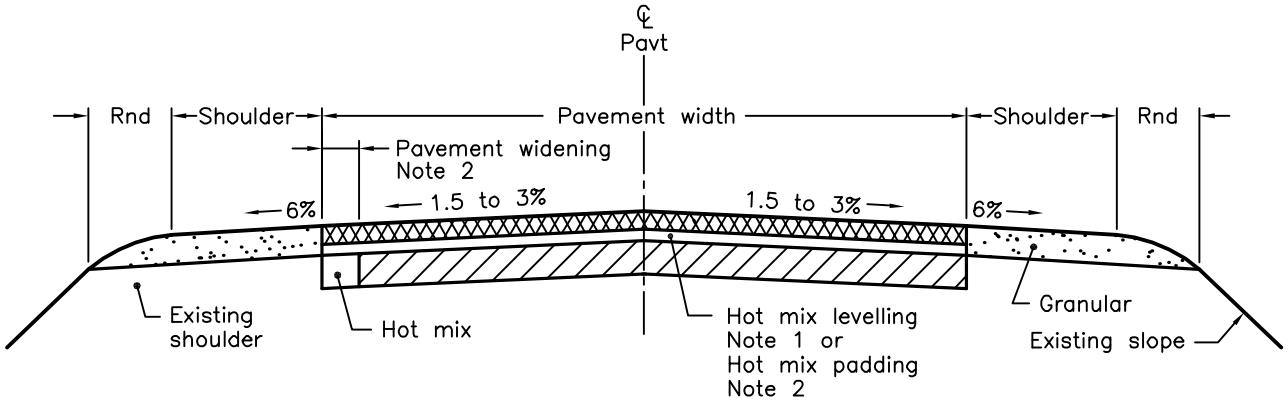
- Existing pavement
- Hot mix padding, Note 2
- Hot mix surface, hot mix binder, Note 1

NOTES:

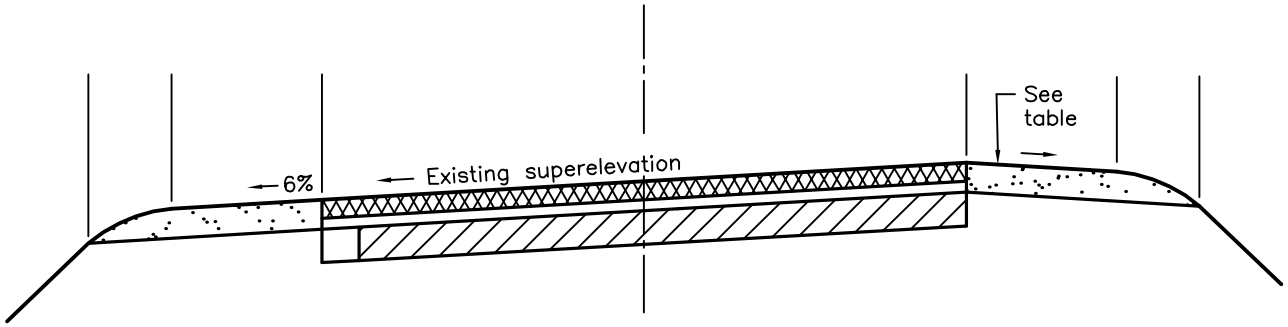
1 Depths and locations of paving or levelling courses or both shall be as specified.

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

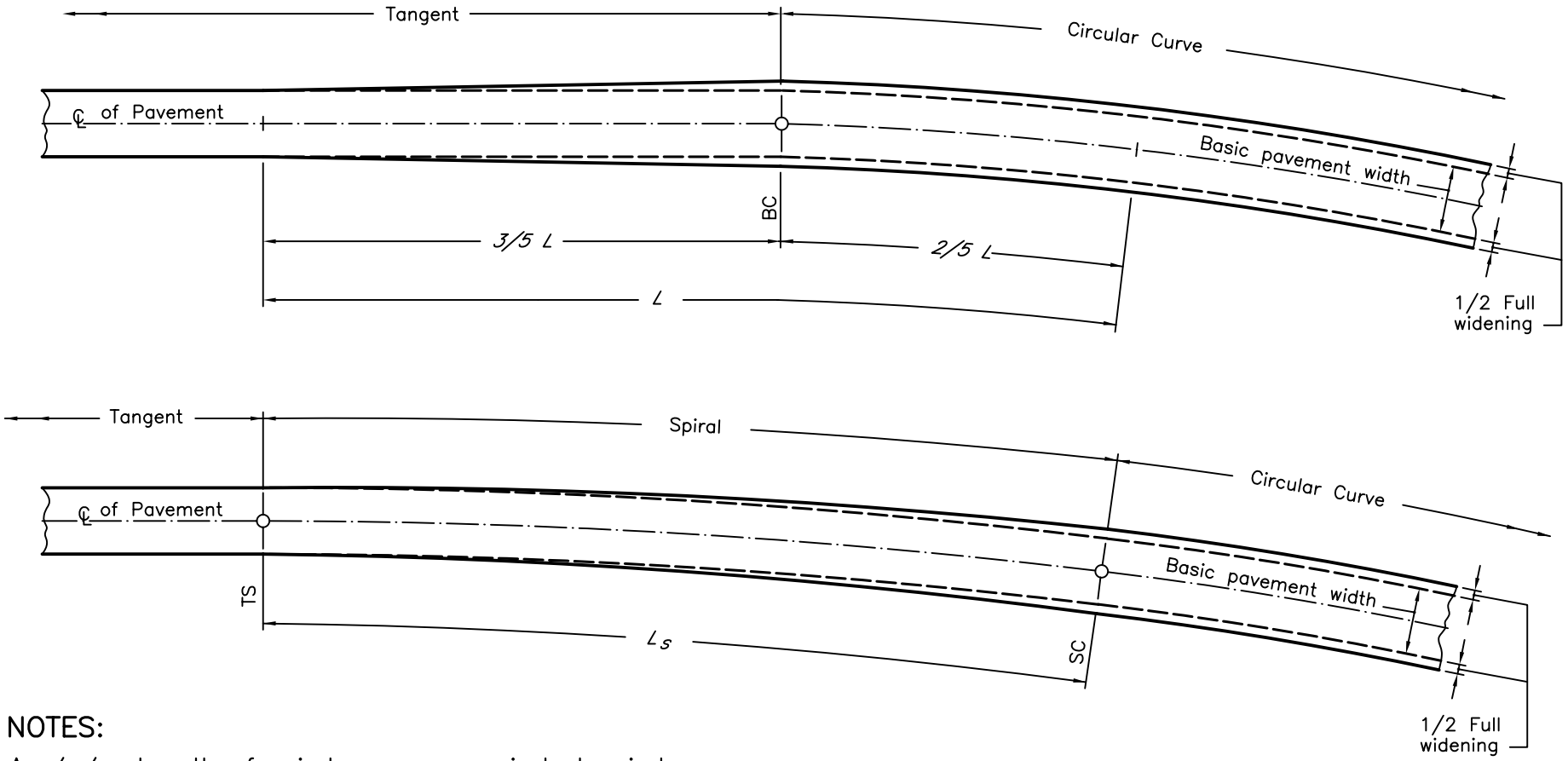
Hot mix surface, hot mix binder, Note 1

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.

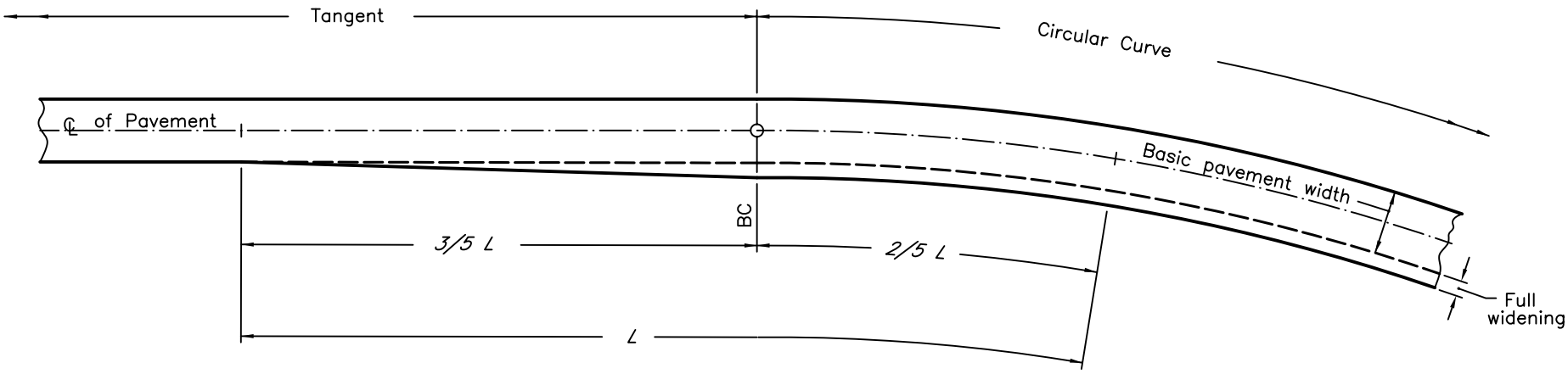
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev	1
RESURFACING EXISTING CROSSFALL MAINTAINED			
	OPSD 212.030		

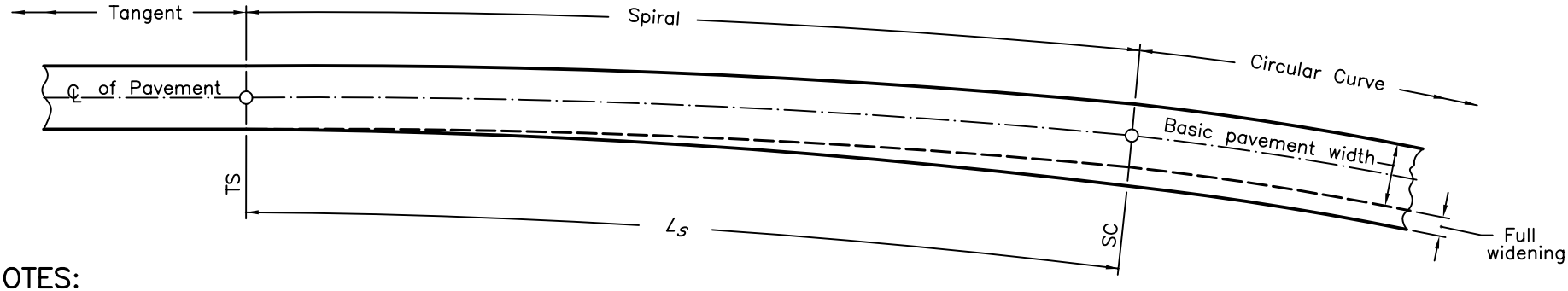


NOTES:

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 WIDENING ON BOTH SIDES OF CURVE 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

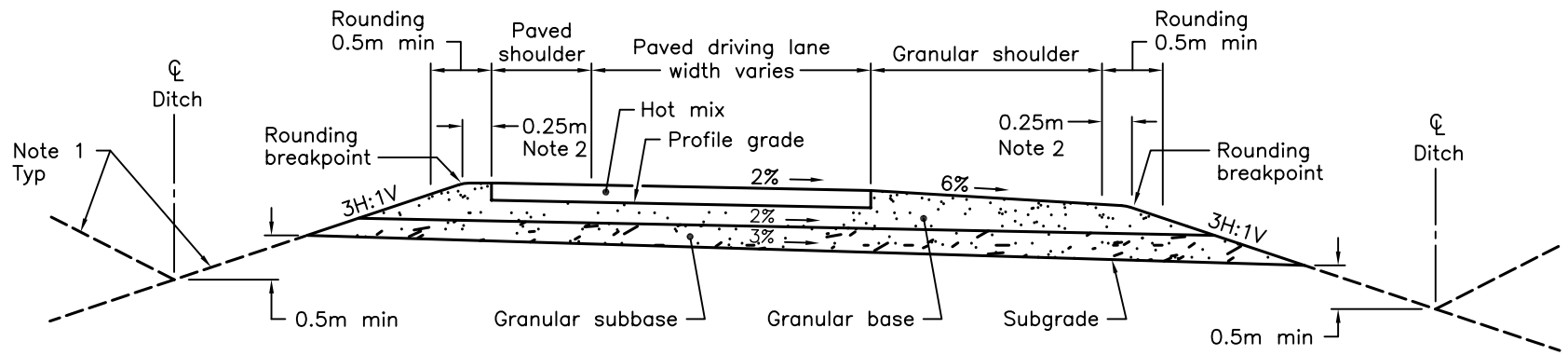
PAVEMENT WIDENING ON CURVES

WIDENING ON INSIDE OF CURVES
WITH OR WITHOUT SPIRALS

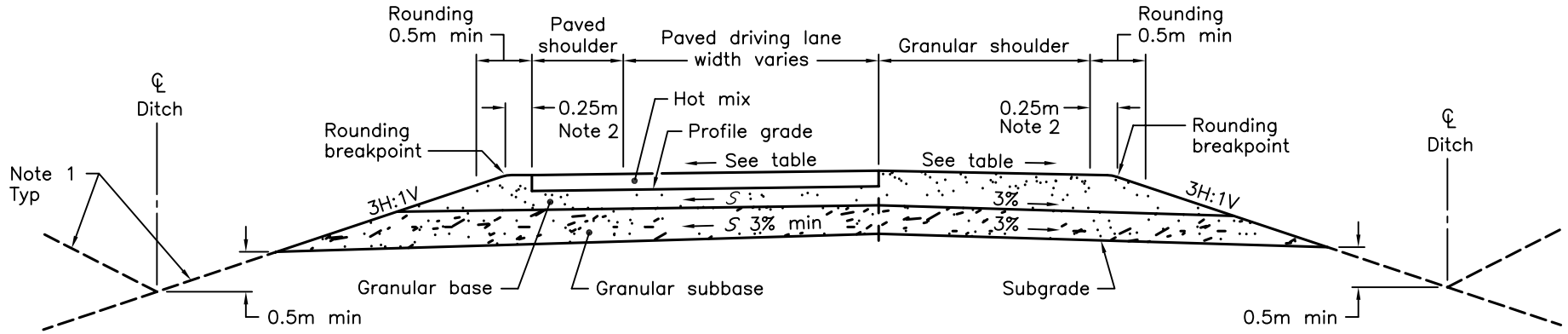
Dec 1983 | Rev 0

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

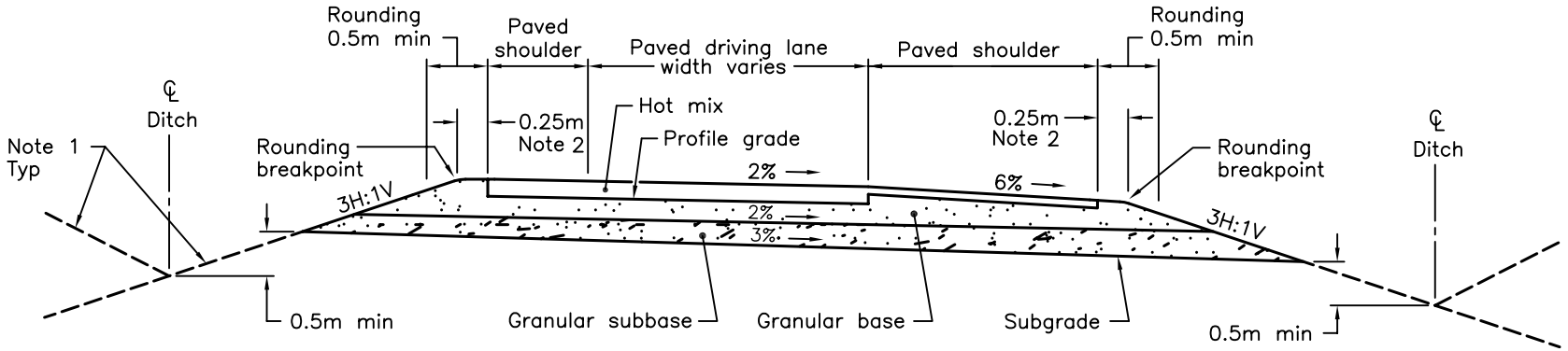
	CROSS FALL %												
Paved driving lane	+6	+5	+4	+3	+2	+1	0	−1	−2	−3	−4	−5	−6
Granular shoulder	−2	−2	−2	−3	−3	−3	−4	−5	−6	−6	−6	−6	−6

ONTARIO PROVINCIAL STANDARD DRAWING

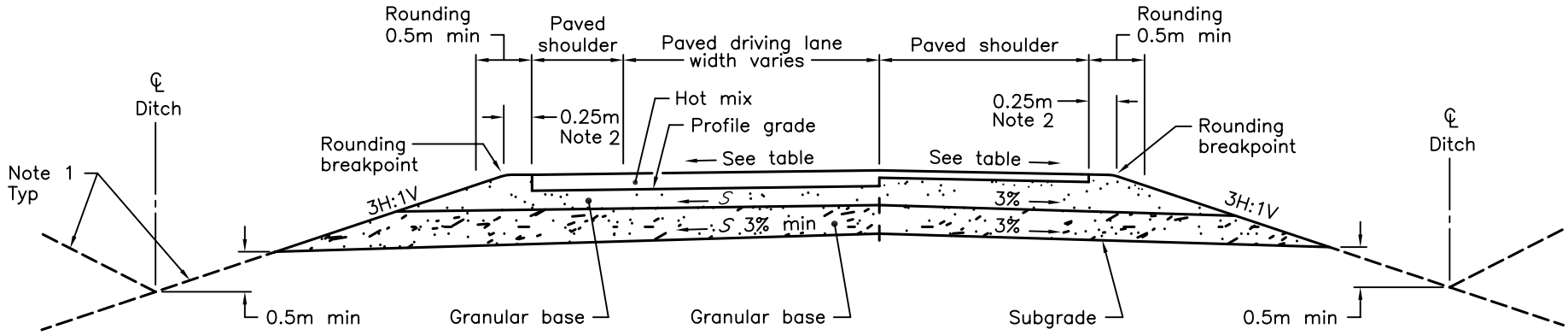
SINGLE LANE RAMP GRADING FOR ASPHALT PAVEMENT WITH GRANULAR BASE AND SHOULDER

Nov 2007 | Rev 1

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

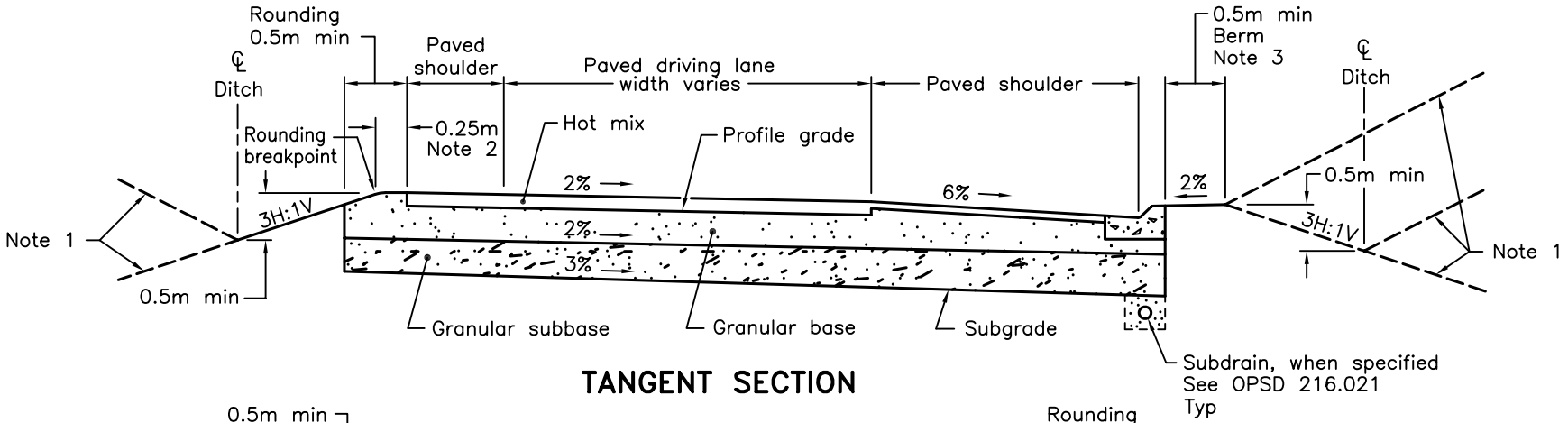
ONTARIO PROVINCIAL STANDARD DRAWING

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

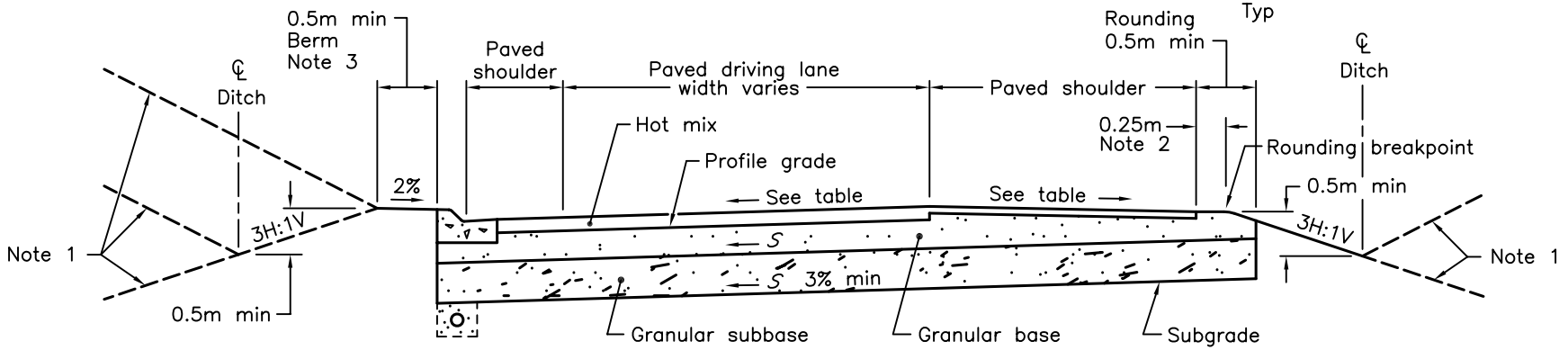
Nov 2007 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

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

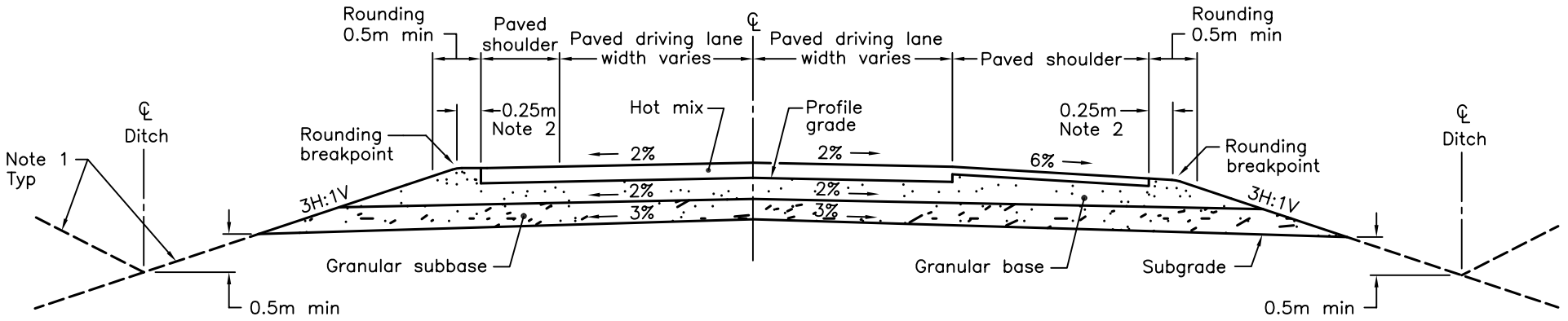
	CROSS FALL %												
Paved driving lane	+6	+5	+4	+3	+2	+1	0	−1	−2	−3	−4	−5	−6
Paved shoulder	−2	−2	−2	−3	−3	−3	−4	−5	−6	−6	−6	−6	−6

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2007 | Rev 2

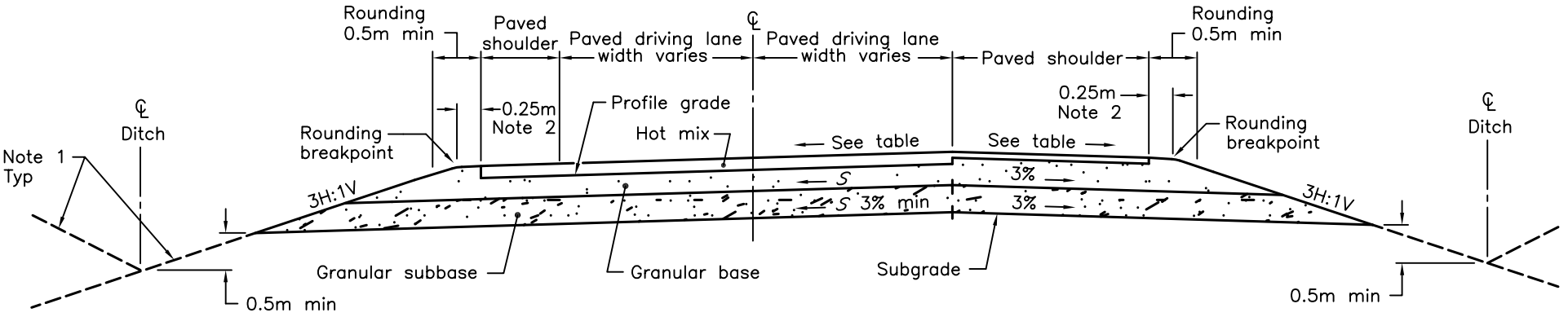
SINGLE LANE RAMP GRADING FOR ASPHALT PAVEMENT WITH GRANULAR BASE, ASPHALT SHOULDER, AND CURB WITH GUTTER

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.

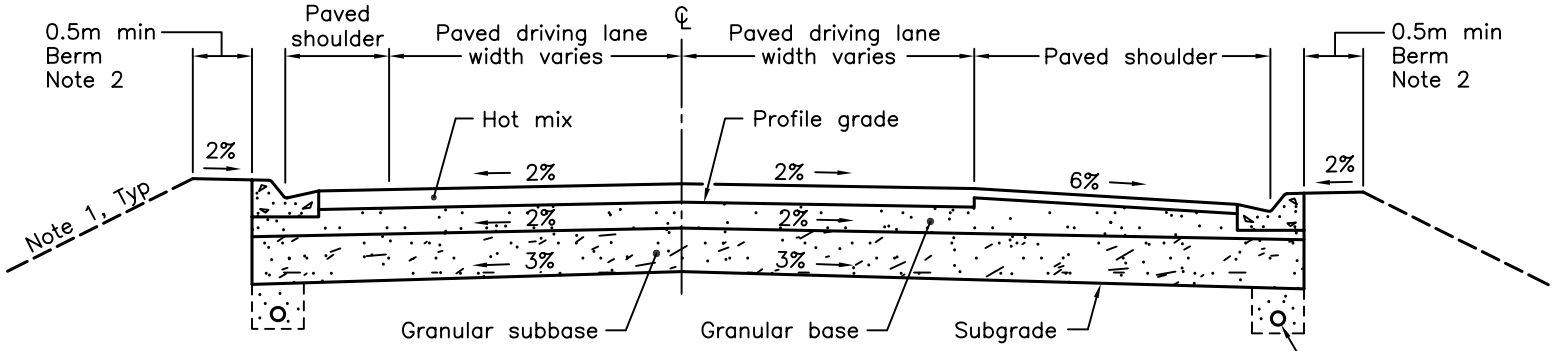
ONTARIO PROVINCIAL STANDARD DRAWING

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

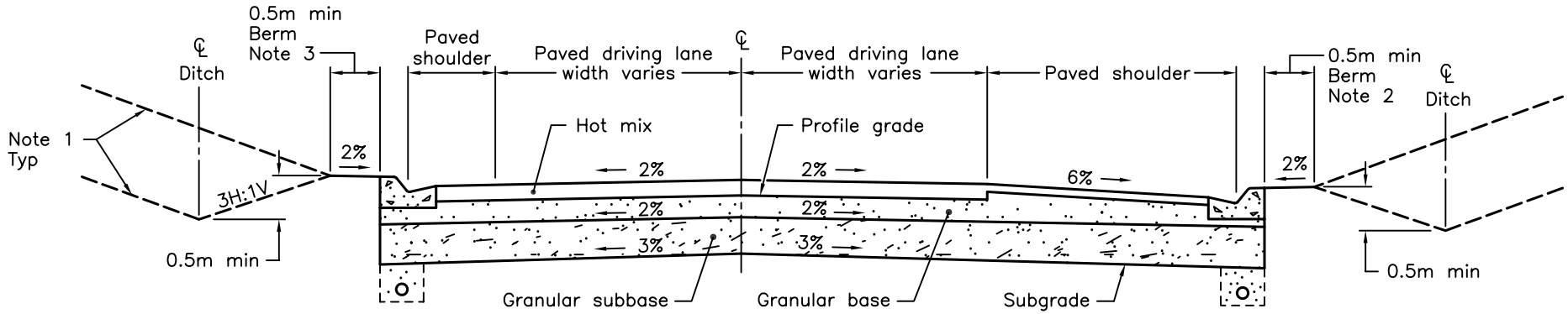
Nov 2007 | Rev 1

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.

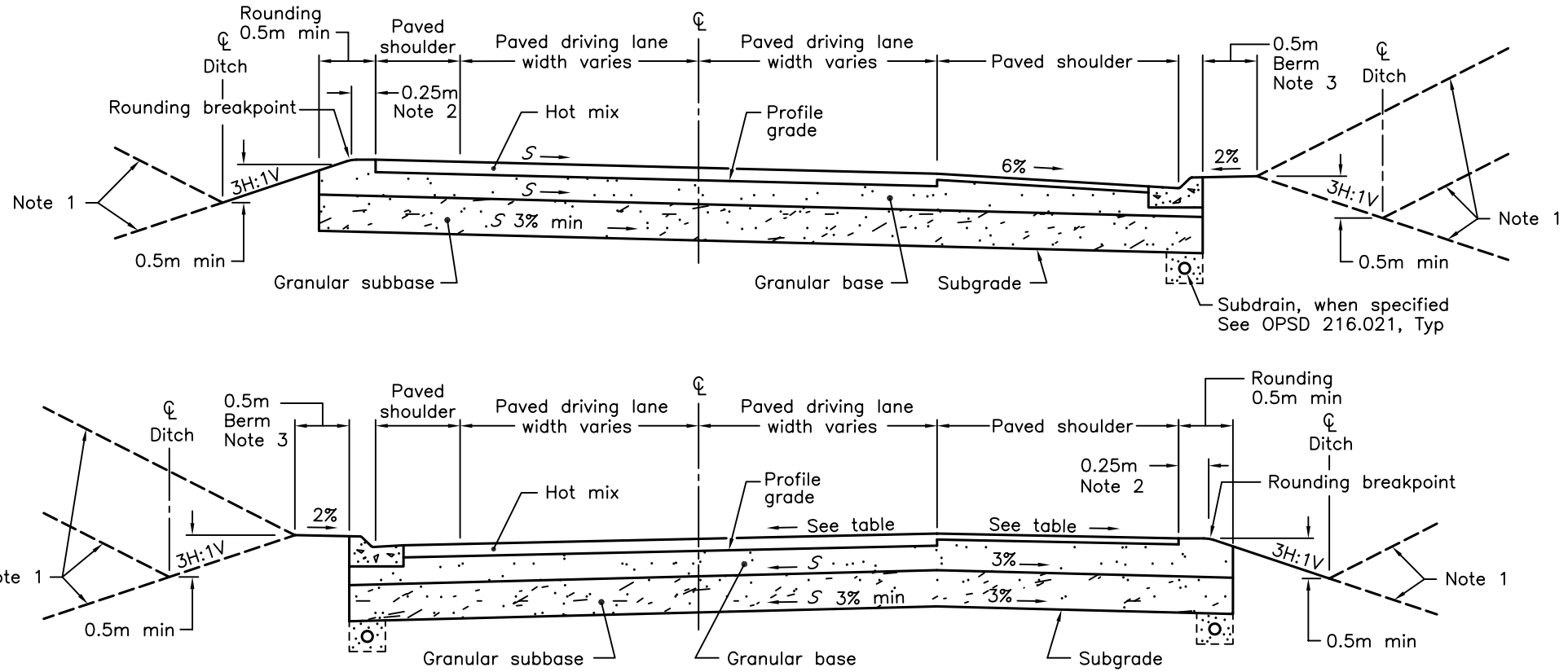
ONTARIO PROVINCIAL STANDARD DRAWING

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 ·

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

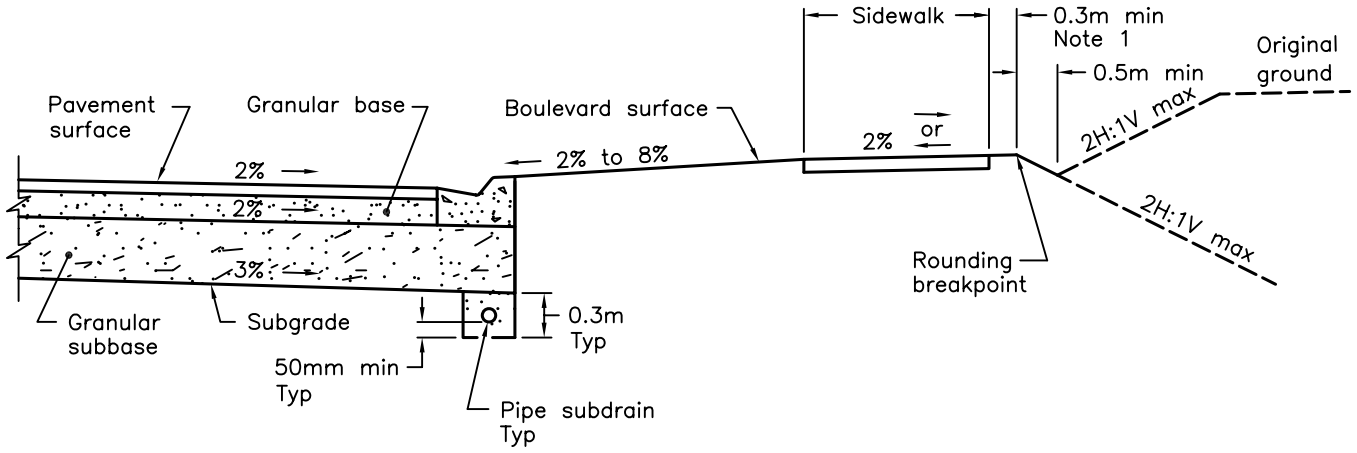
ONTARIO PROVINCIAL STANDARD DRAWING

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

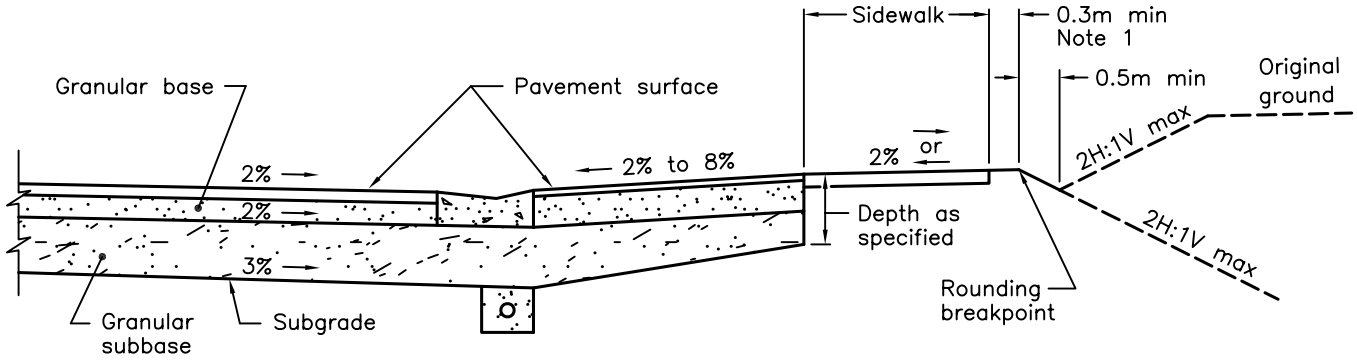
Nov 2007 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

OPSD 215.030



CUT AND FILL SECTION WITH BARRIER CURB



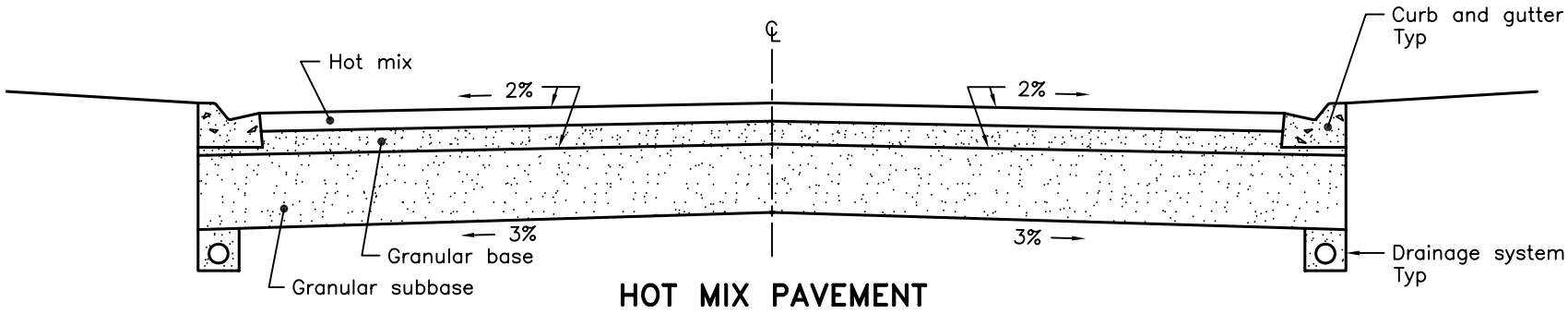
CUT AND FILL SECTION WITH MOUNTABLE CURB

NOTES:

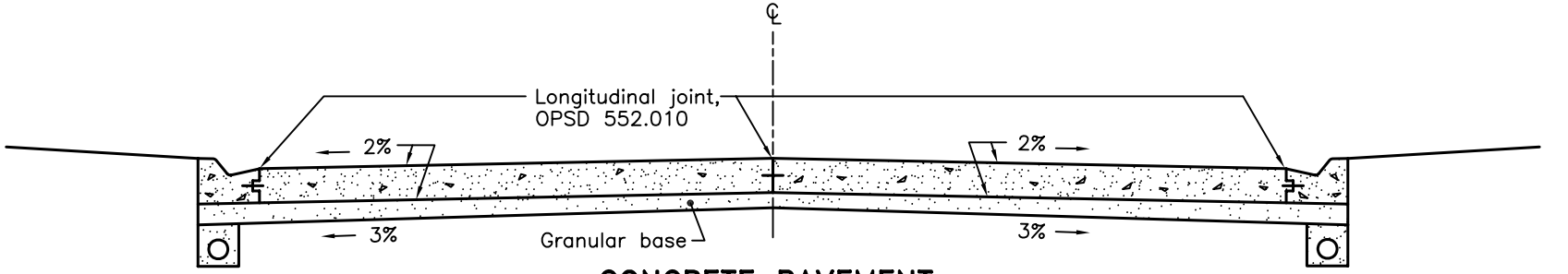
1 Where steel beam guide rail is indicated, the minimum rounding shall be 1.0m, with 0.5m required from edge of sidewalk to rounding breakpoint.

A All dimensions are in millimetres unless otherwise shown.

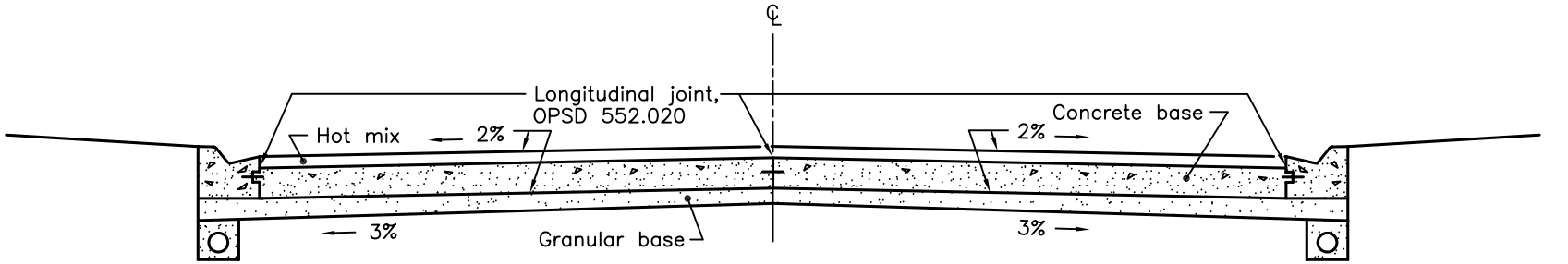
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev	1
BOULEVARD TREATMENTS URBAN SECTION			
	OPSD 216.010		



HOT MIX PAVEMENT



CONCRETE PAVEMENT



COMPOSITE PAVEMENT

NOTES:

A Drainage system connection at every catch basin.

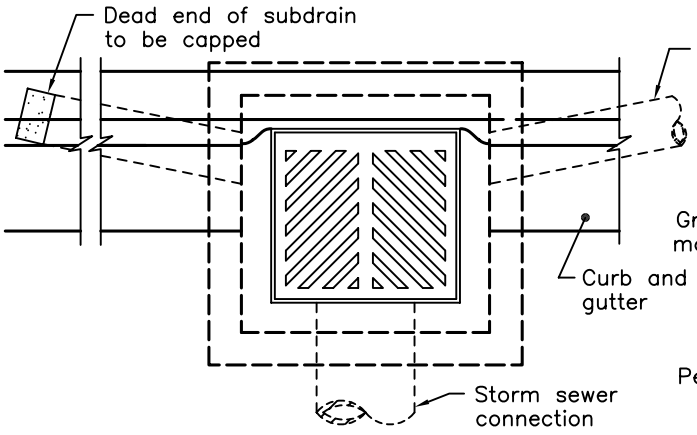
B Tie bars at all longitudinal joints.

ONTARIO PROVINCIAL STANDARD DRAWING

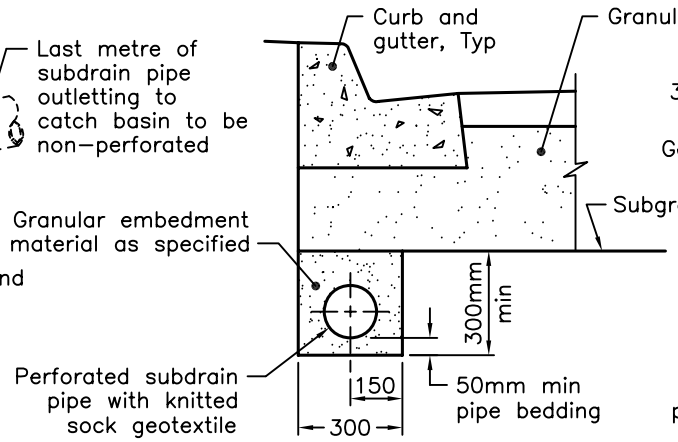
HOT MIX, CONCRETE, AND COMPOSITE PAVEMENT ON GRANULAR BASE URBAN SECTION

Nov 2008 | Rev 1

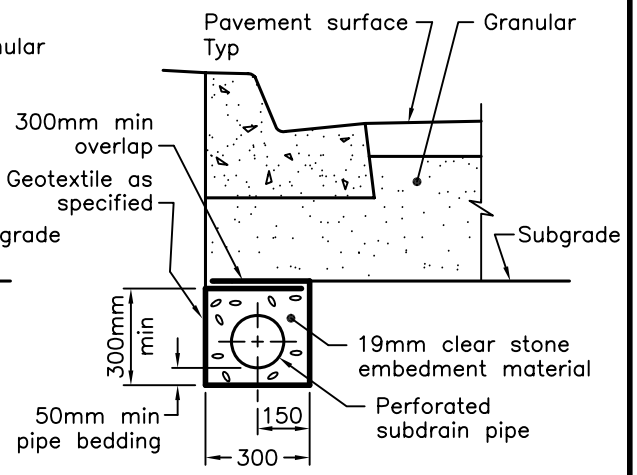
OPSD 216.020



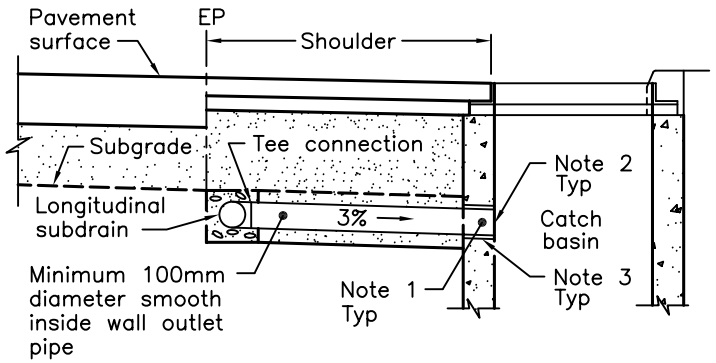
LONGITUDINAL SUBDRAIN CONNECTION TO CATCH BASIN



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.

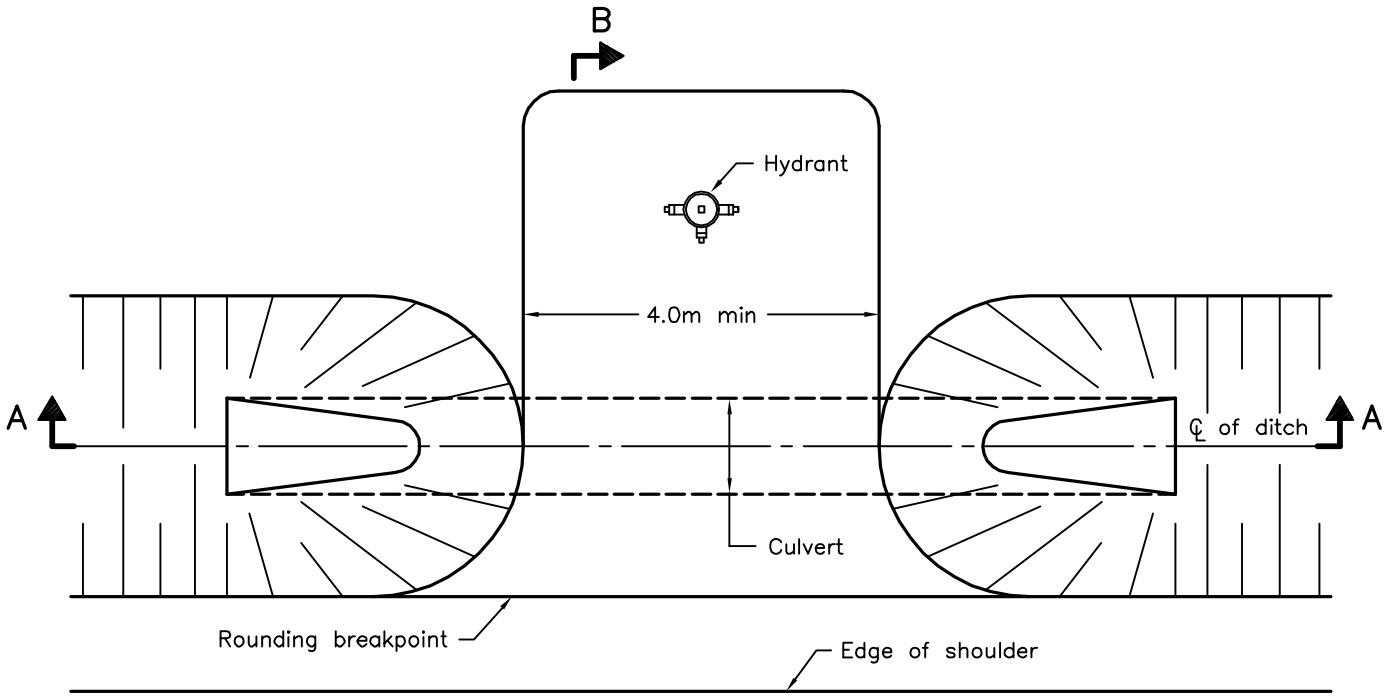
A Use compatible manufactured fittings for all connectors, couplings, and caps.

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

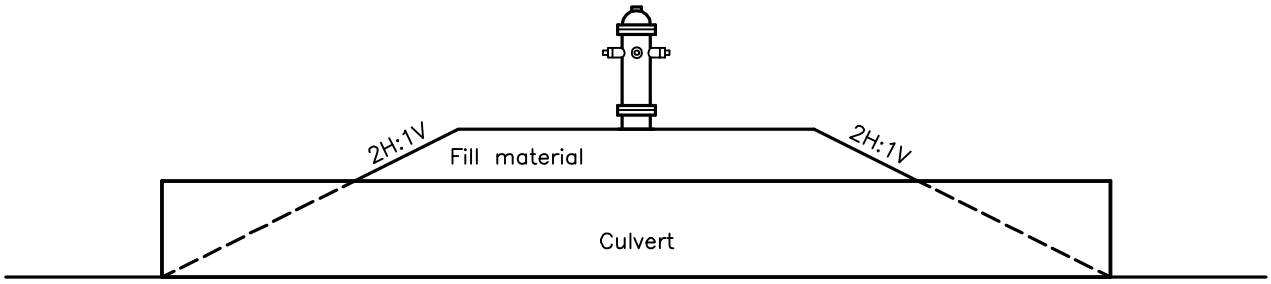
C Longitudinal subdrain pipe shall be installed parallel to the grade of the gutter.

D All dimensions are in millimetres unless otherwise shown.

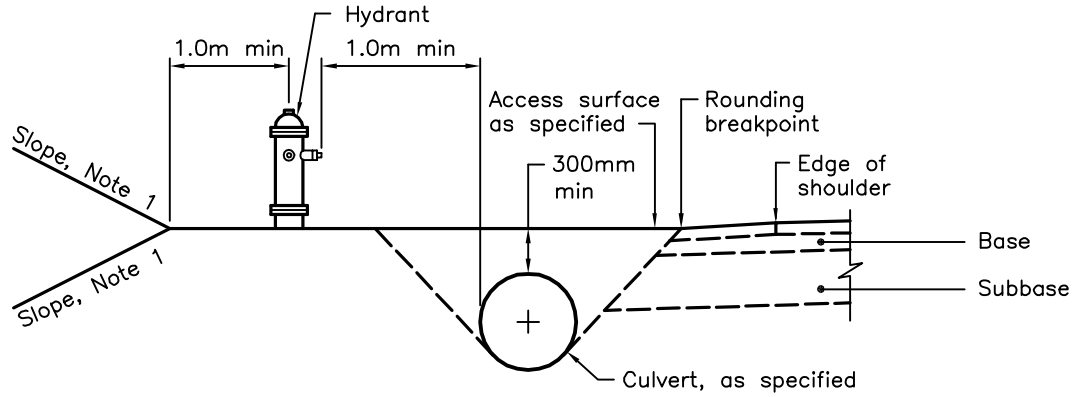
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2008	Rev	2
SUBDRAIN PIPE CONNECTION AND OUTLET URBAN			
			OPSD 216.021



PLAN



SECTION A–A



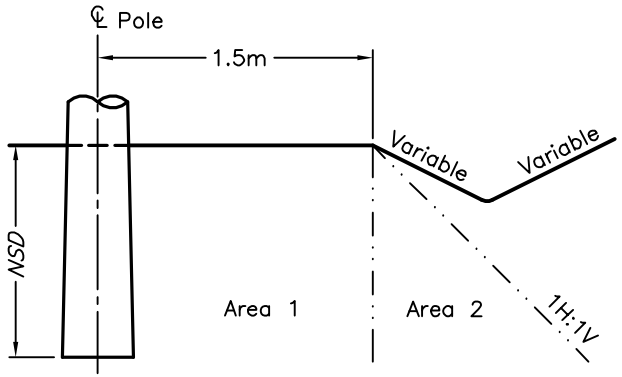
SECTION B–B

NOTE:

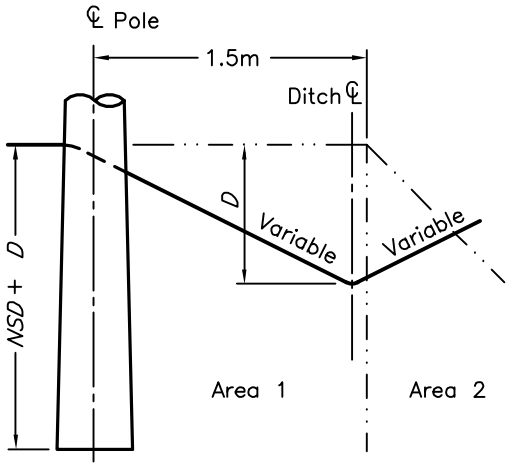
1 Slope shall be 2H:1V or flatter.

A All dimensions are in millimetres unless otherwise shown.

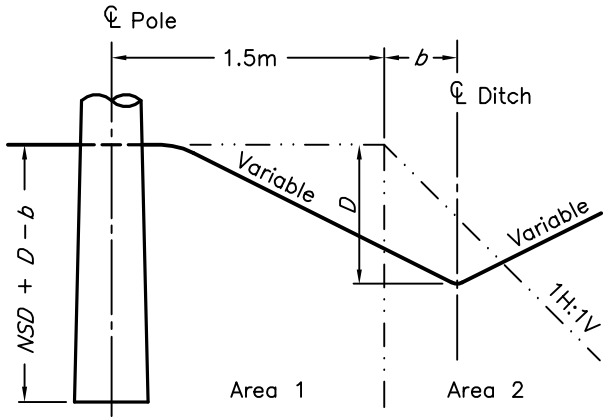
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2011	Rev	2
ACCESS TO HYDRANT ACROSS DITCH			
	OPSD 217.050		



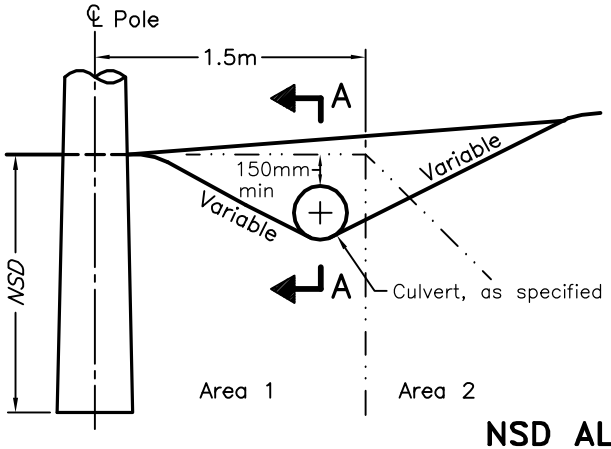
DITCH BEYOND AREAS 1 AND 2

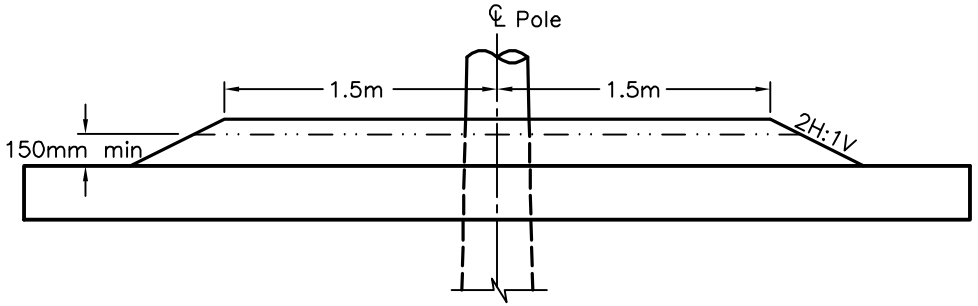


DITCH BOTTOM WITHIN AREA 1



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:

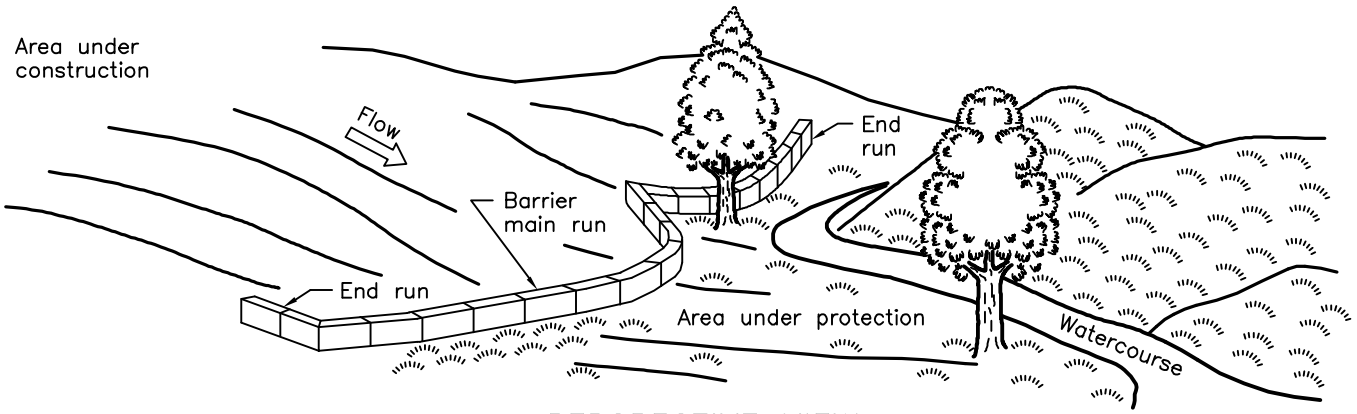
— · — · — – Boundary of theoretical area

NSD – Normal setting depth

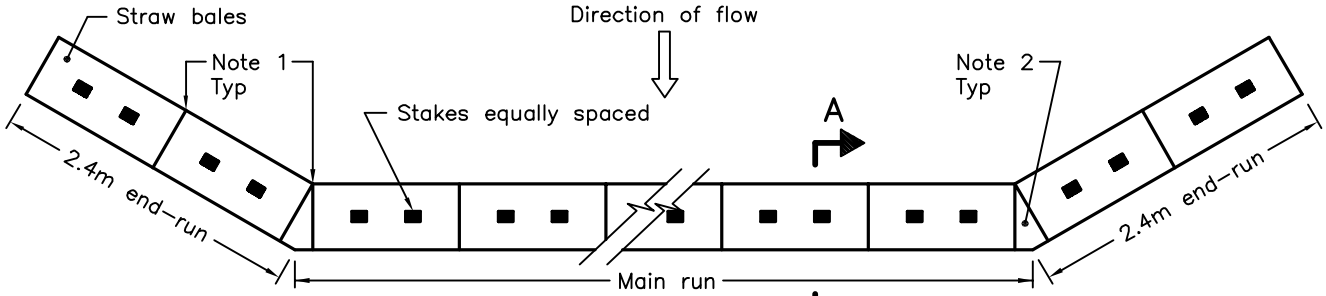
D – The difference in elevation between the ditch bottom and the ground line at the pole

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

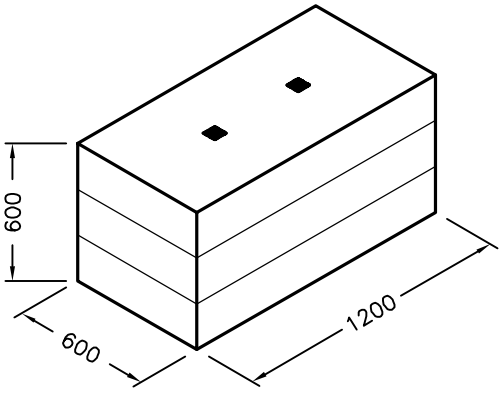
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2011	Rev	2
UTILITY POLE SETTING DEPTH AT DITCH LOCATIONS			
	OPSD 217.060		



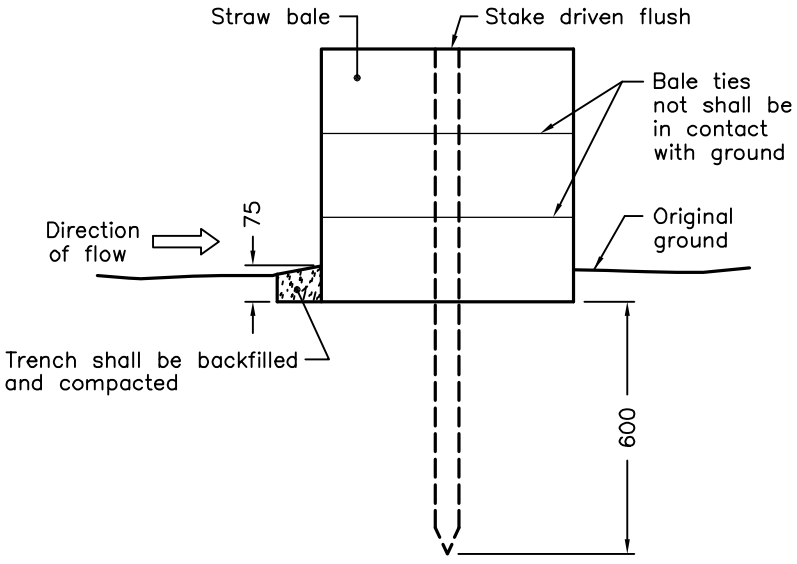
PERSPECTIVE VIEW



PLAN



ISOMETRIC VIEW



SECTION A–A

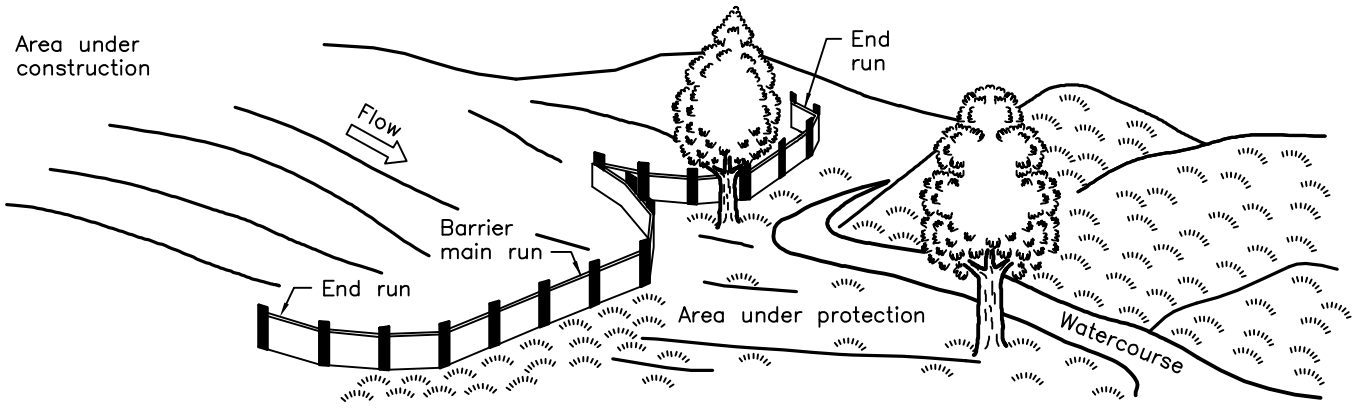
NOTES:

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

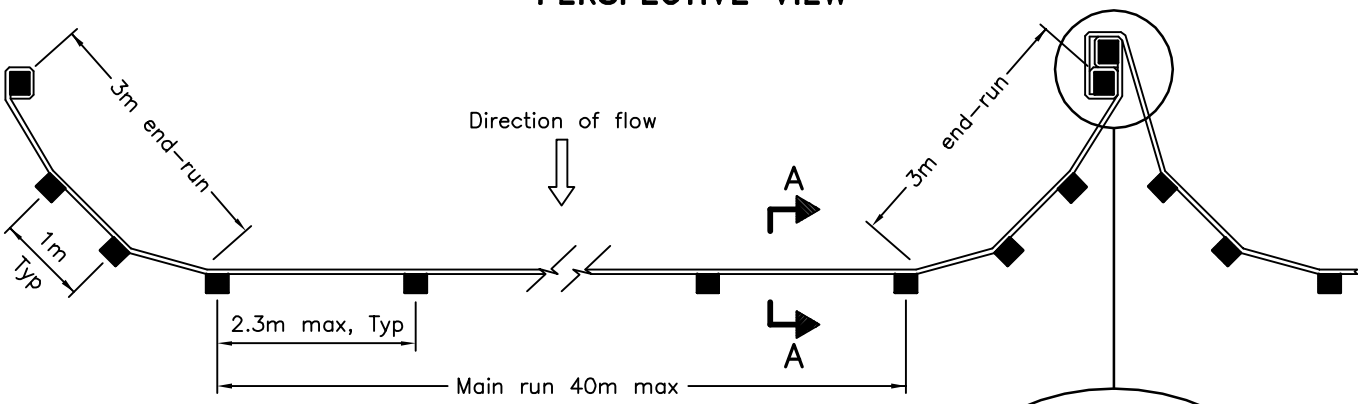
2 Caulk and compact gaps with loose straw.

A All dimensions are in millimetres unless otherwise shown.

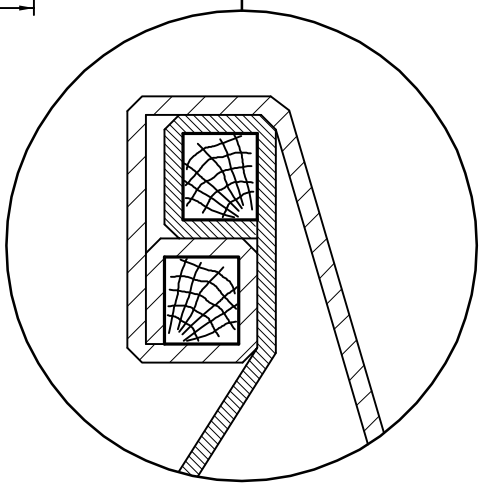
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
LIGHT–DUTY STRAW BALE BARRIER			
	OPSD 219.100		



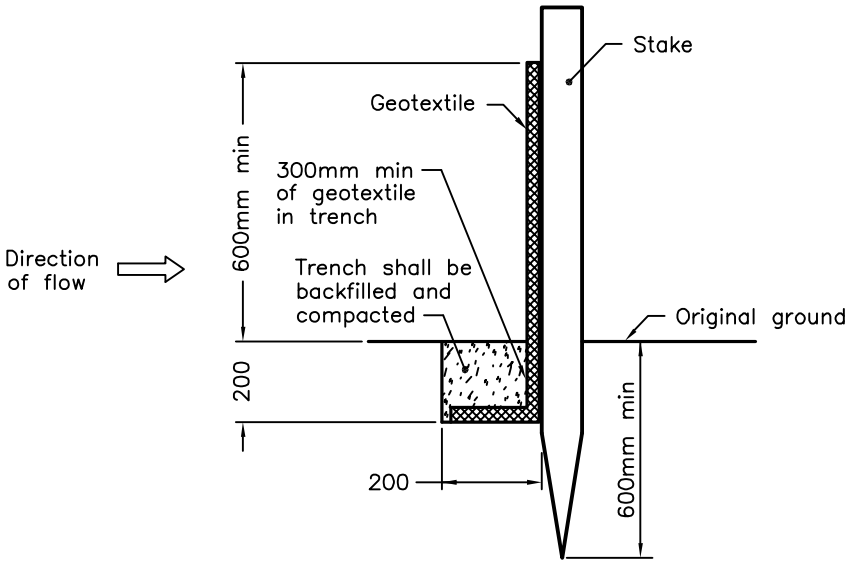
PERSPECTIVE VIEW



PLAN



JOINT DETAIL

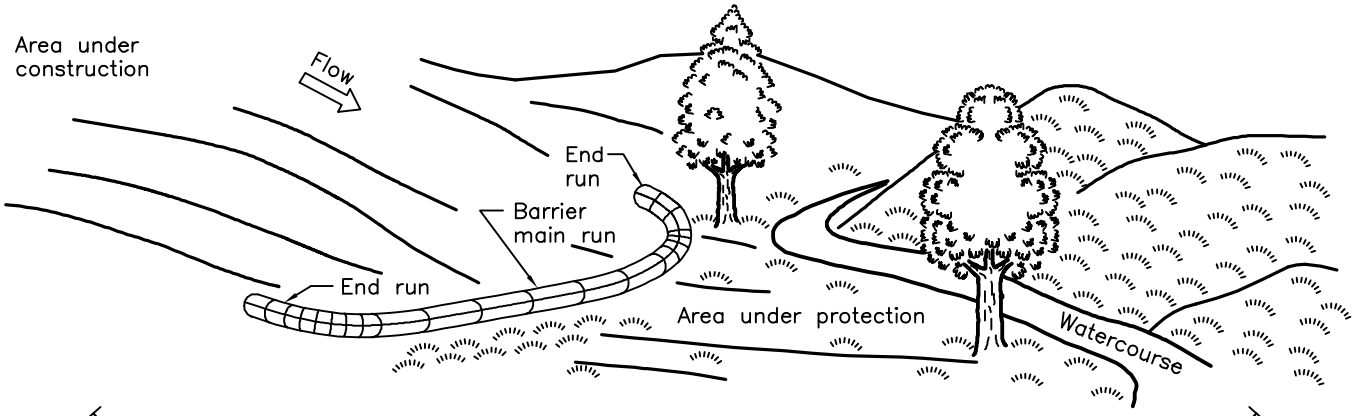


SECTION A–A

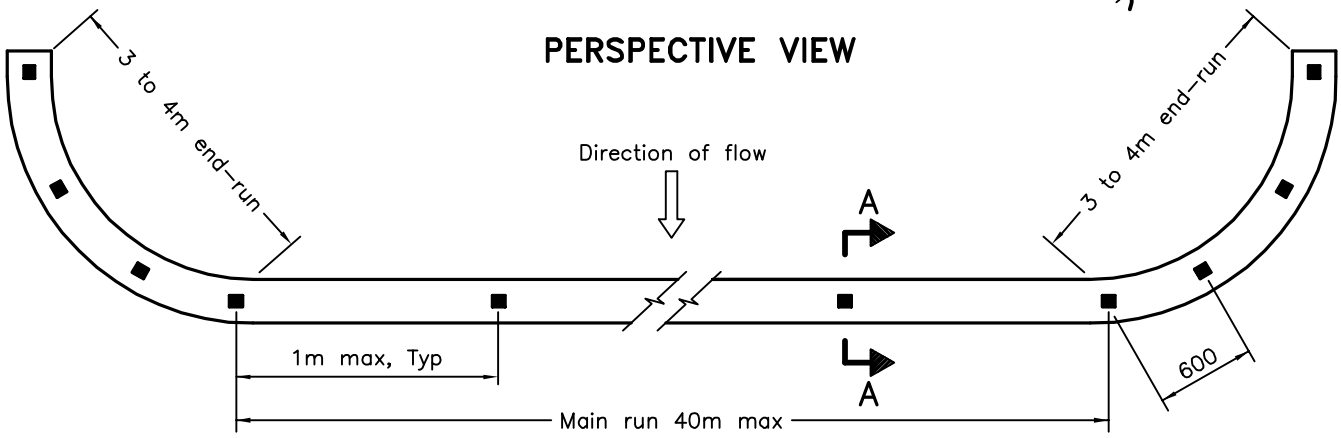
NOTE:

A All dimensions are in millimetres unless otherwise shown.

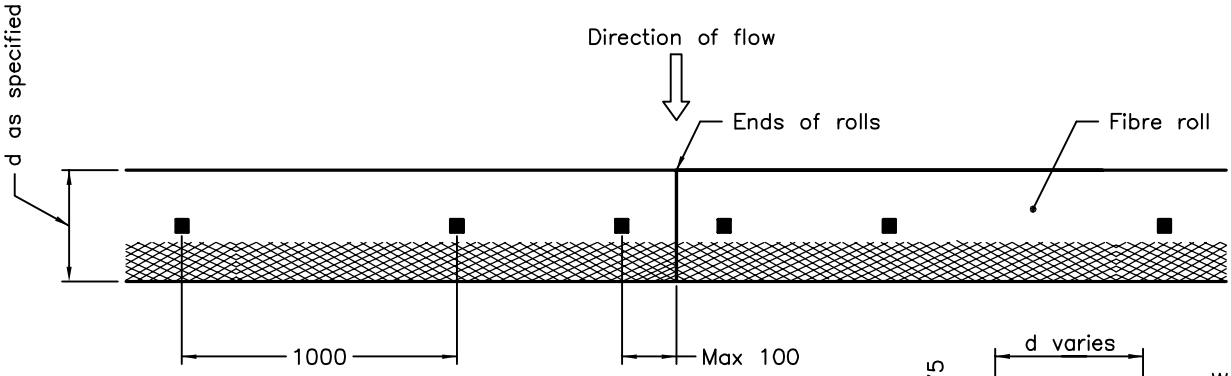
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
LIGHT–DUTY SILT FENCE BARRIER			
	OPSD 219.110		



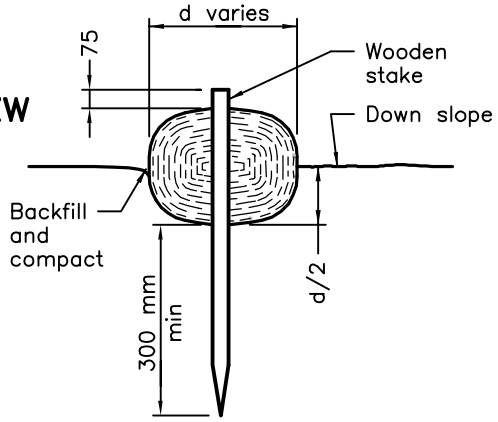
PERSPECTIVE VIEW



PLAN



FIBRE ROLL PLAN VIEW

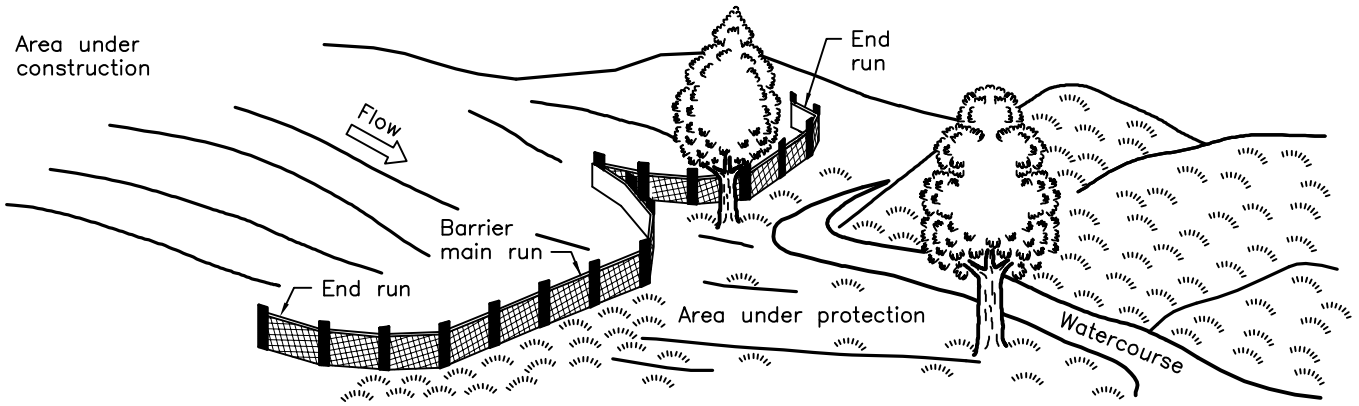


SECTION A–A

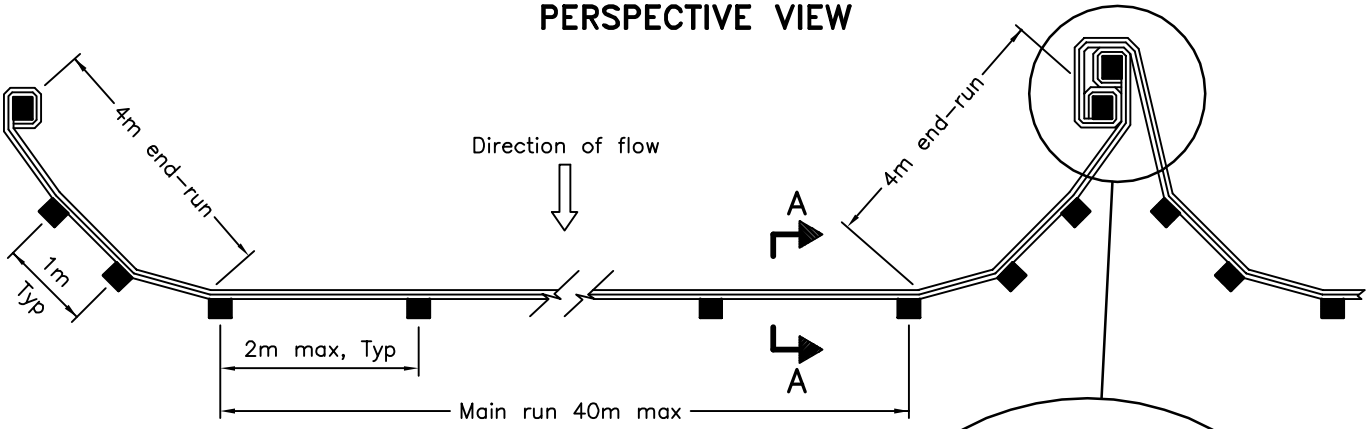
NOTES:

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.

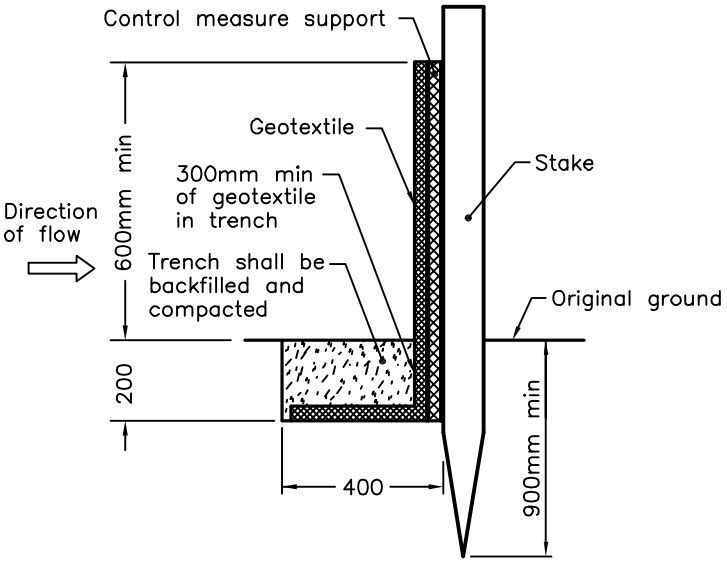
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	0
LIGHT–DUTY FIBRE ROLL BARRIER			
	OPSD 219.120		



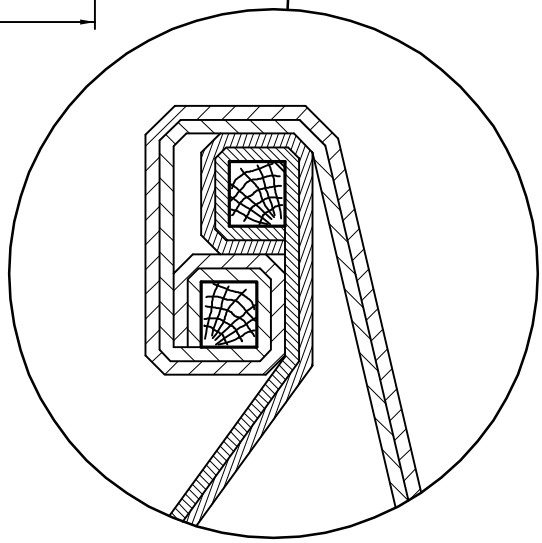
PERSPECTIVE VIEW



PLAN



SECTION A–A

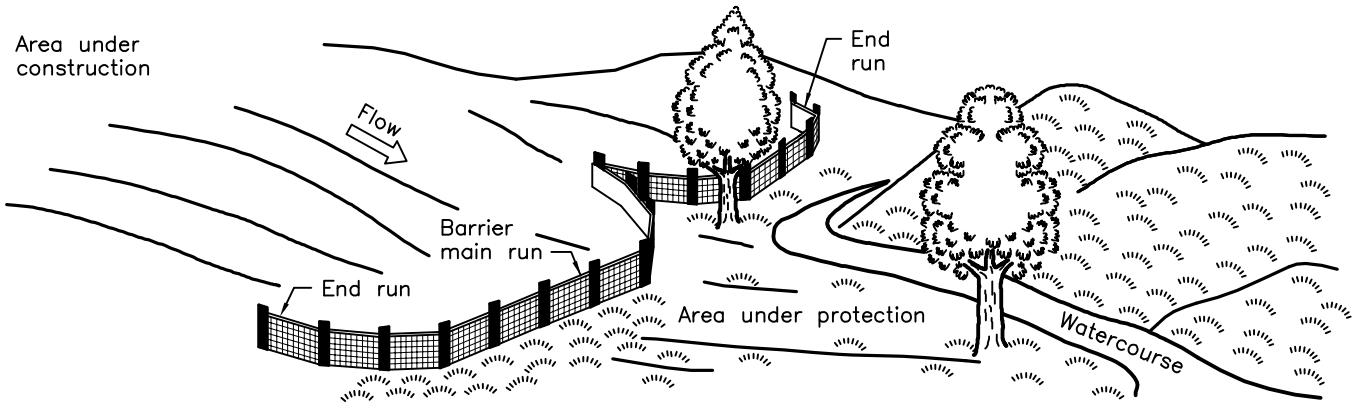


JOINT DETAIL

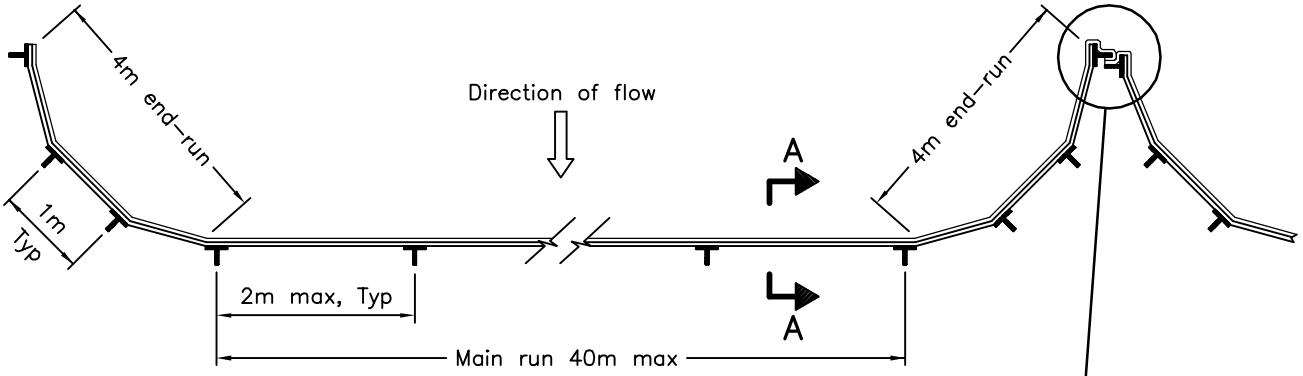
NOTE:

A All dimensions are in millimetres unless otherwise shown.

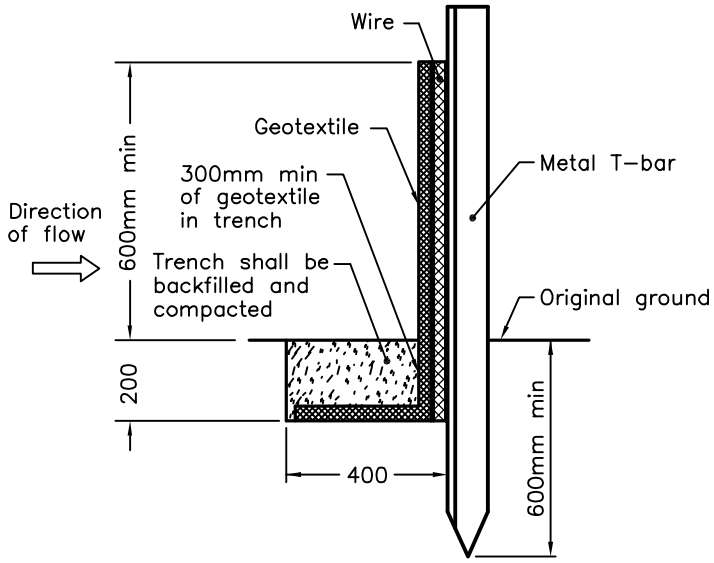
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
HEAVY–DUTY SILT FENCE BARRIER			
	OPSD 219.130		



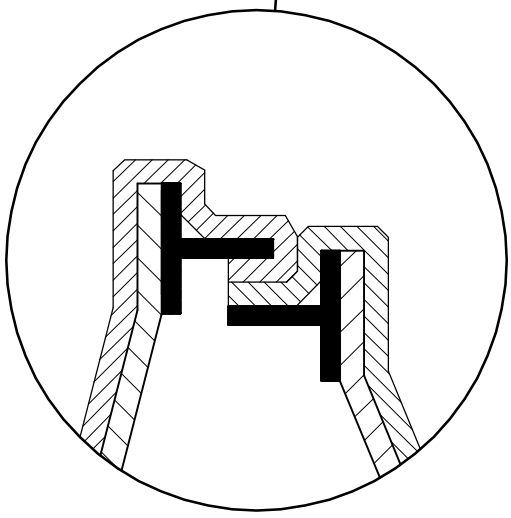
PERSPECTIVE VIEW



PLAN



SECTION A–A

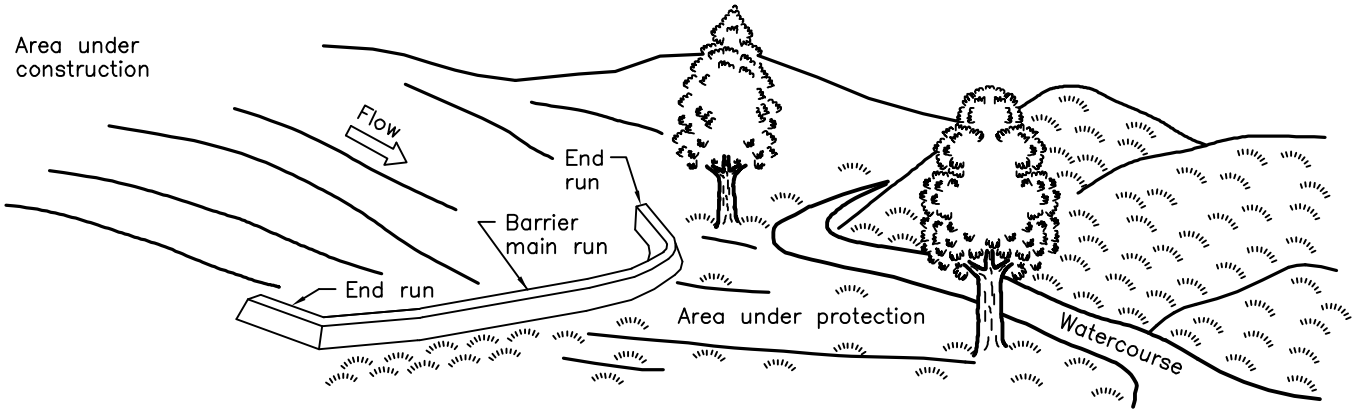


JOINT DETAIL

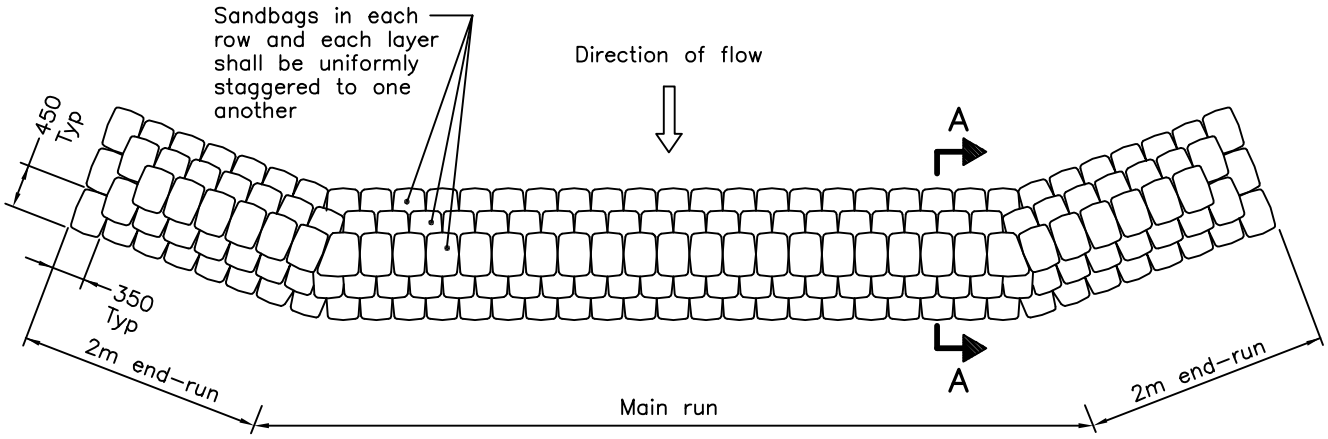
NOTE:

A All dimensions are in millimetres unless otherwise shown.

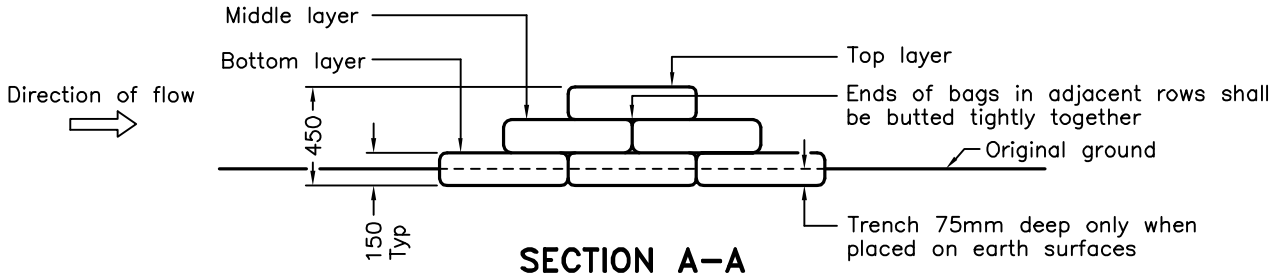
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	0
HEAVY–DUTY WIRE–BACKED SILT FENCE BARRIER			
	OPSD 219.131		



PERSPECTIVE VIEW



PLAN

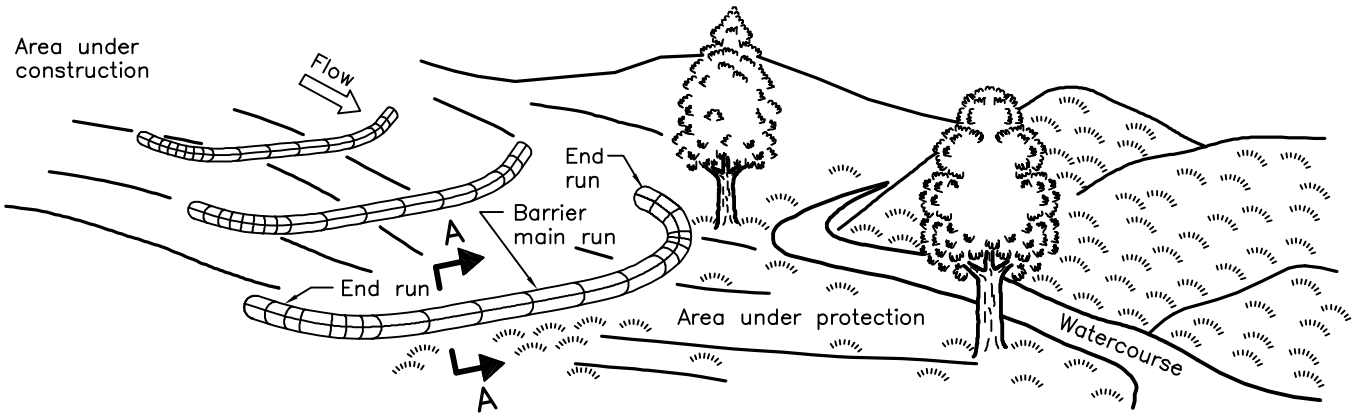


SECTION A–A

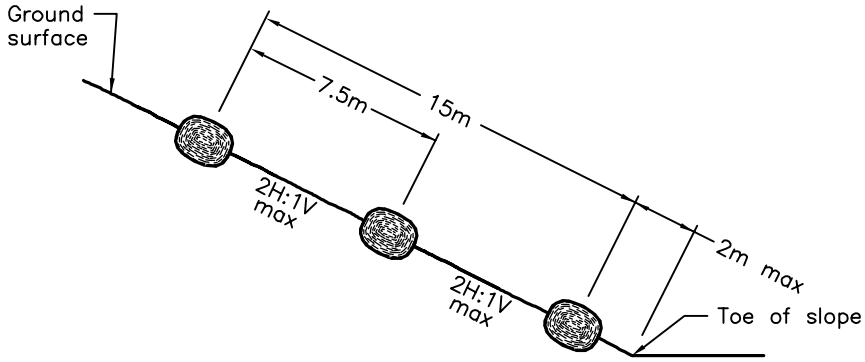
NOTE:

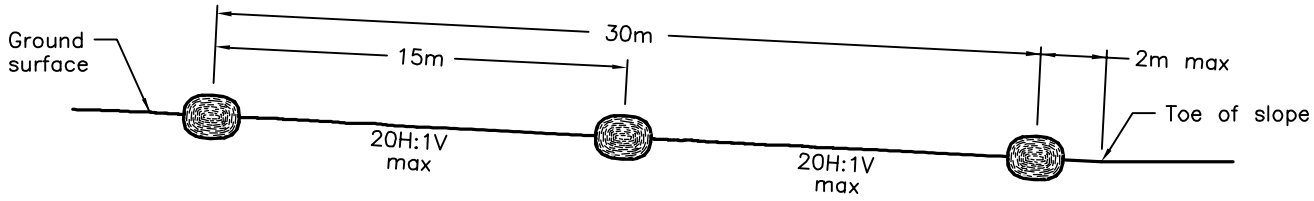
A All dimensions are in millimetres unless otherwise shown.

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

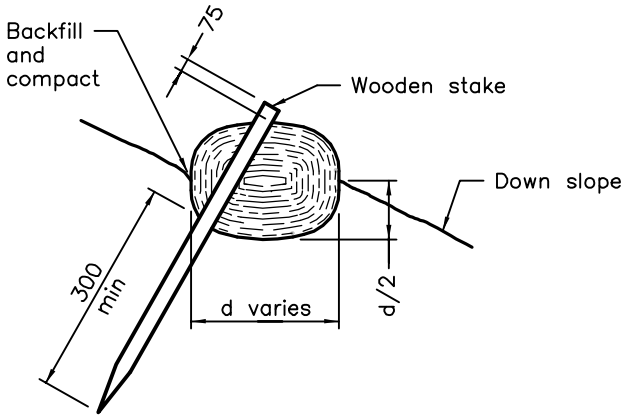


PERSPECTIVE VIEW





FIBRE ROLL SLOPE



SECTION A–A

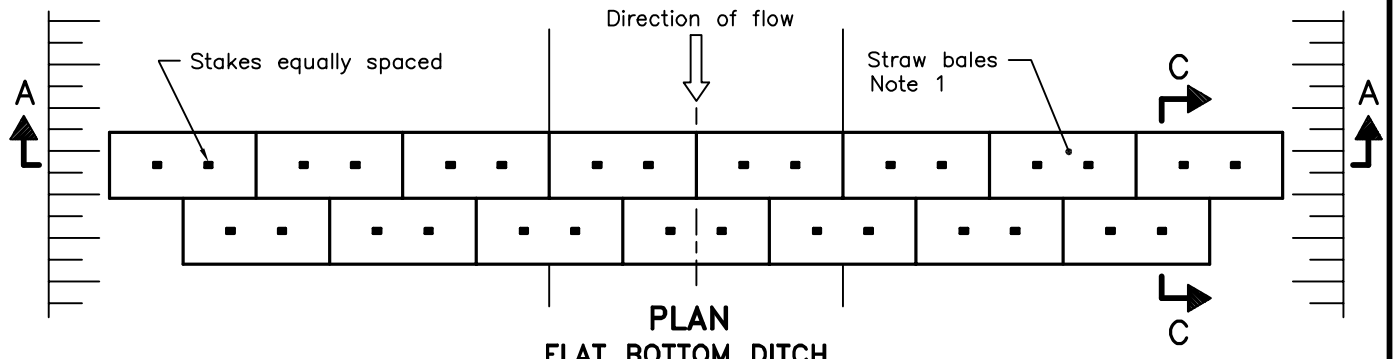
NOTES:

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

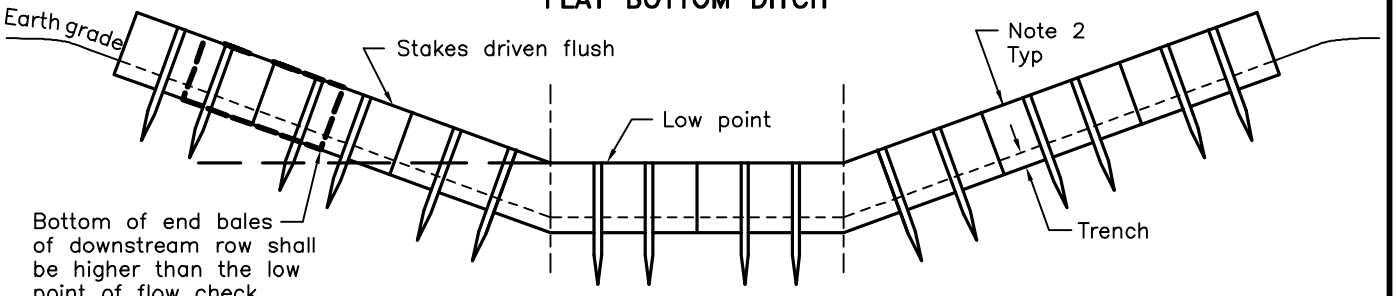
A This OPSD shall be read in conjunction with OPSD 219.120.

B All dimensions are in millimetres unless otherwise shown.

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

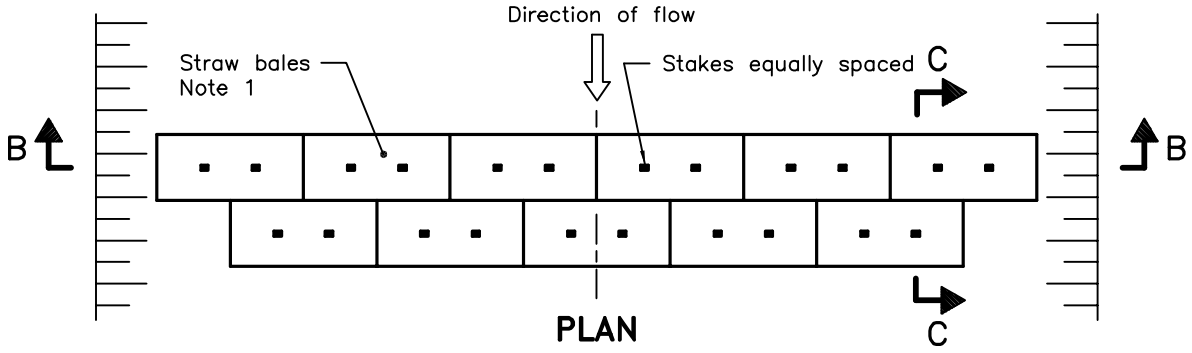


PLAN
FLAT BOTTOM DITCH

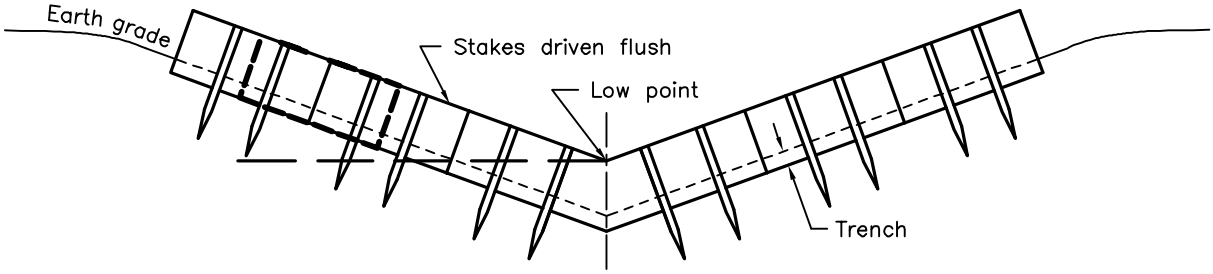


Bottom of end bales of downstream row shall be higher than the low point of flow check. Downstream bale position outlined. Typ

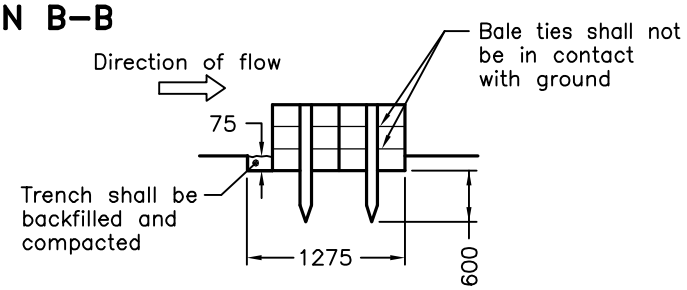
SECTION A–A



PLAN
V–DITCH



SECTION B–B



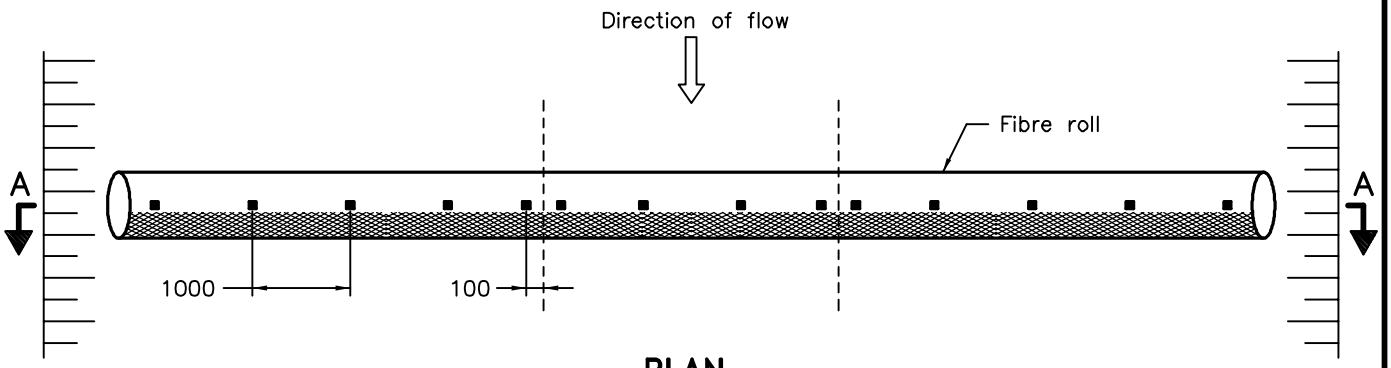
SECTION C–C

NOTES:

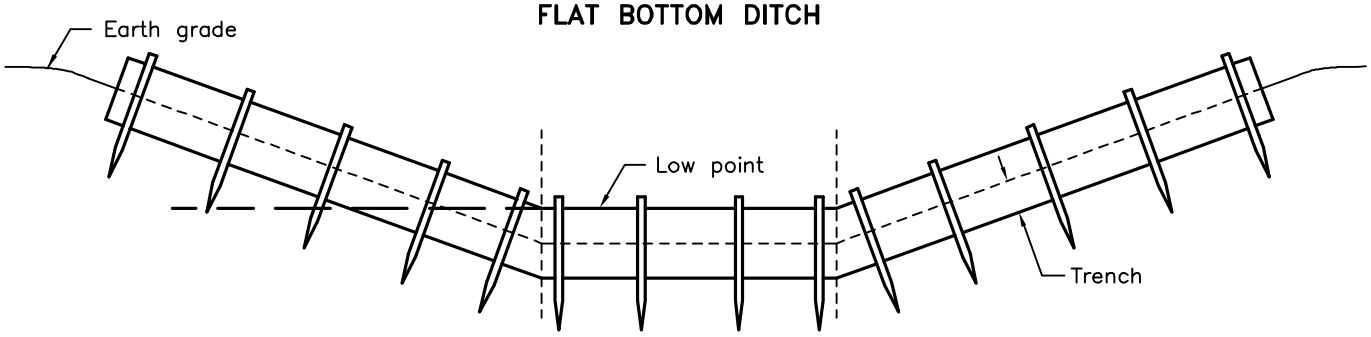
1 Number of bales varies and shall suit ditch.
2 Straw bales shall be butted tightly against adjoining bales and shaped to conform to the sides of the ditch to prevent water flow through barrier.

A All dimensions are in millimetres unless otherwise shown.

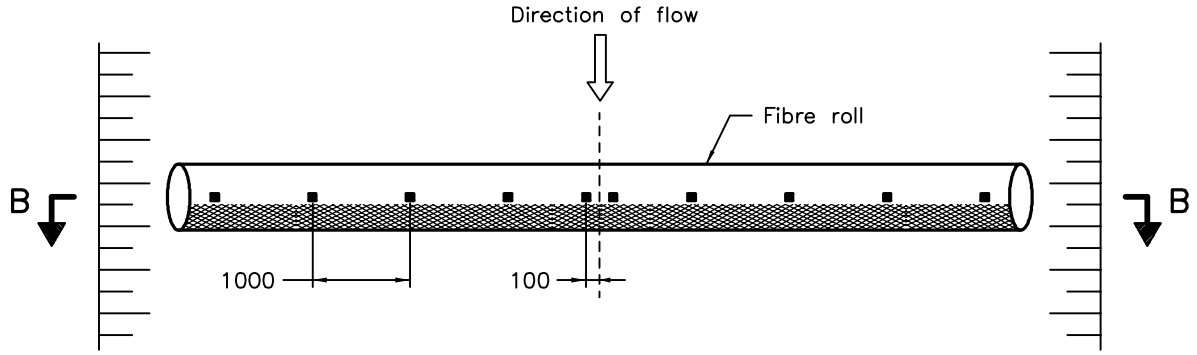
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
STRAW BALE FLOW CHECK DAM			
	OPSD 219.180		



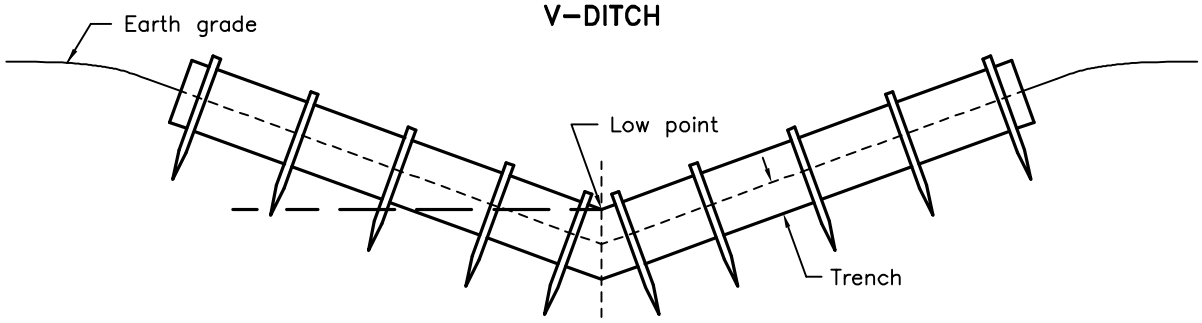
PLAN
FLAT BOTTOM DITCH



SECTION A–A



PLAN
V–DITCH



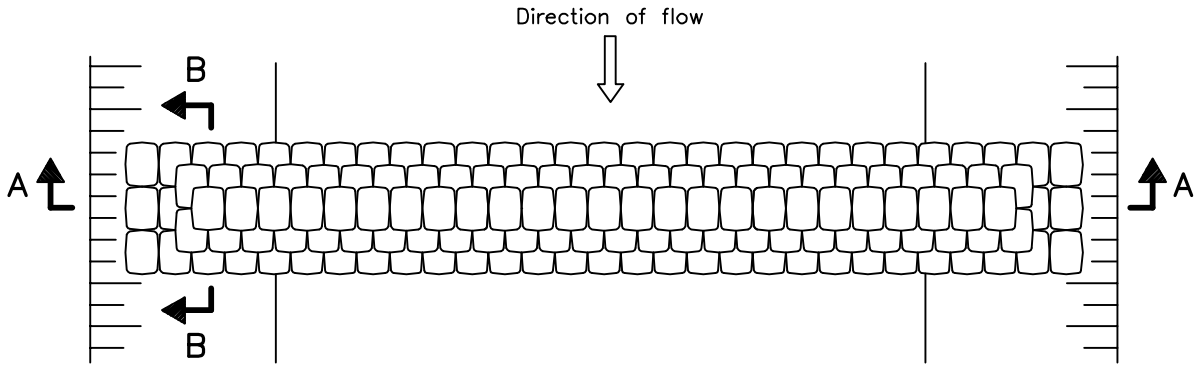
SECTION B–B

NOTES:

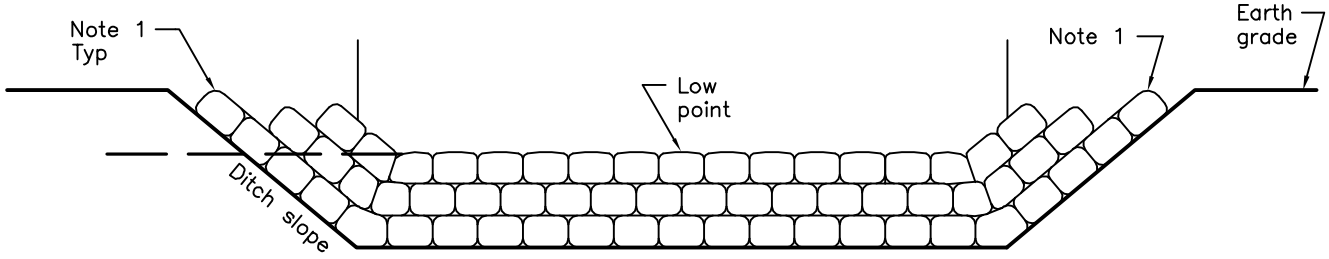
A Refer to OPSD 219.120 Section A–A installation detail.

B All dimensions are in millimetres unless otherwise shown.

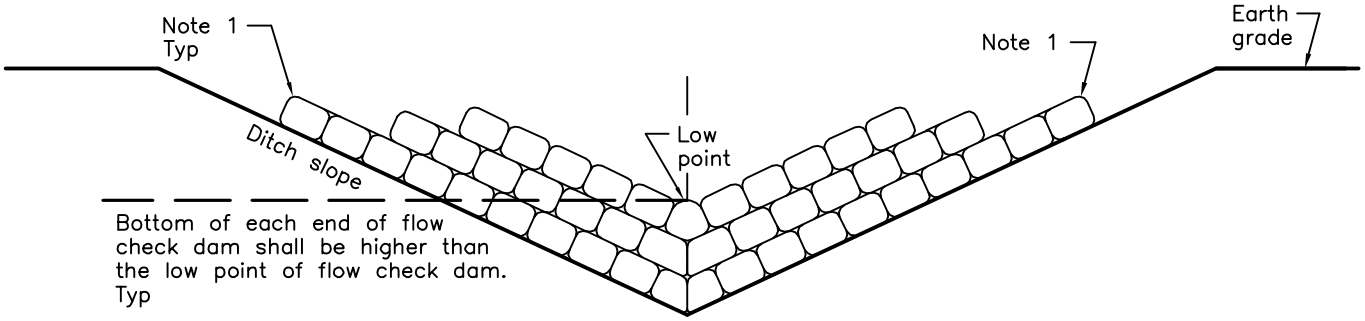
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	0
FIBRE ROLL FLOW CHECK DAMS			
	OPSD 219.191		



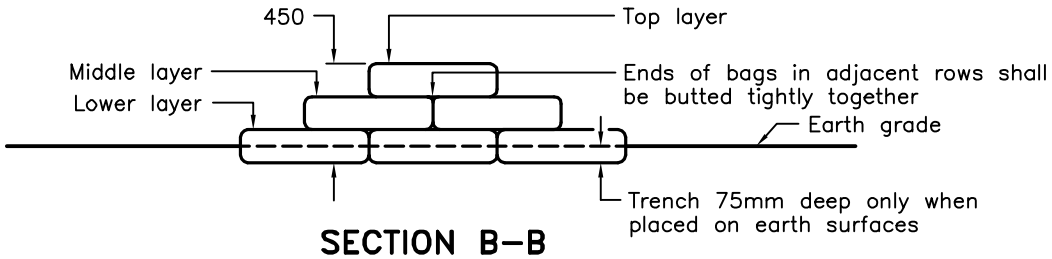
PLAN



SECTION A–A
FLAT BOTTOM DITCH



SECTION A–A
V–DITCH



SECTION B–B

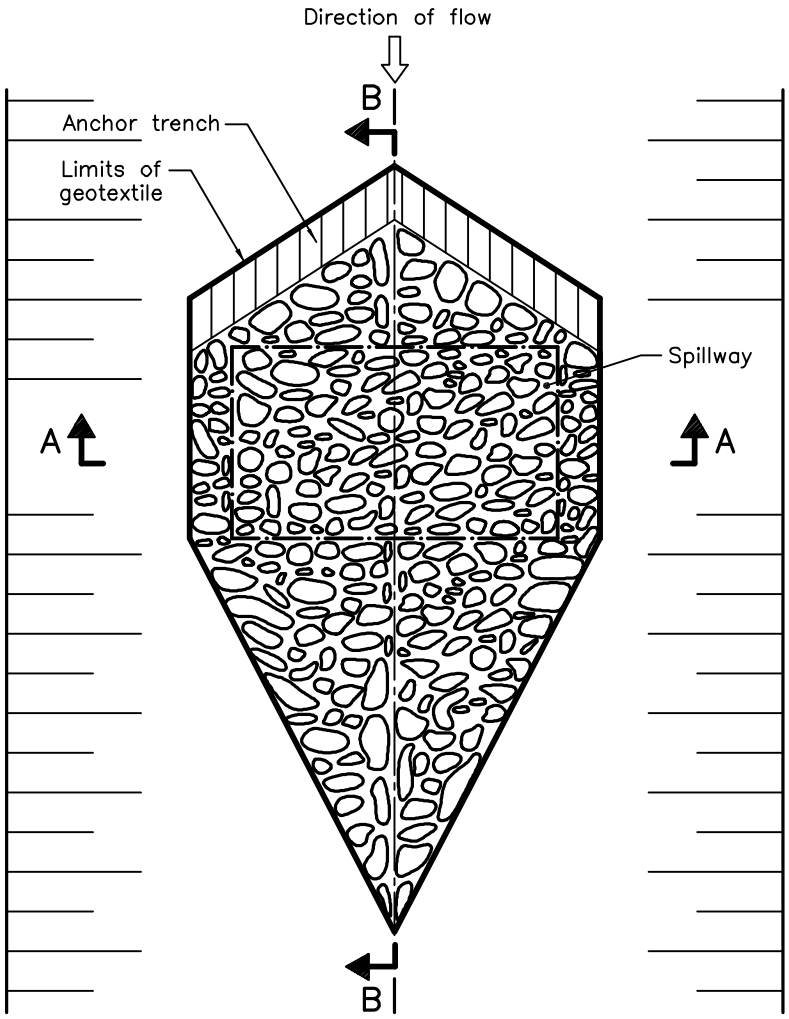
NOTES:

1 Sufficient sandbags shall be placed to prevent end scouring.

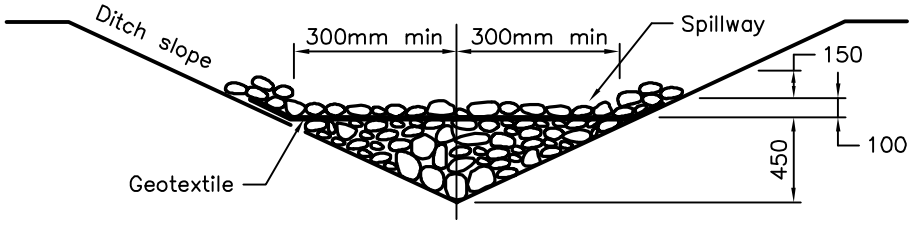
2 For sandbag dimensions see OPSD 219.150.

A All dimensions are in millimetres unless otherwise shown.

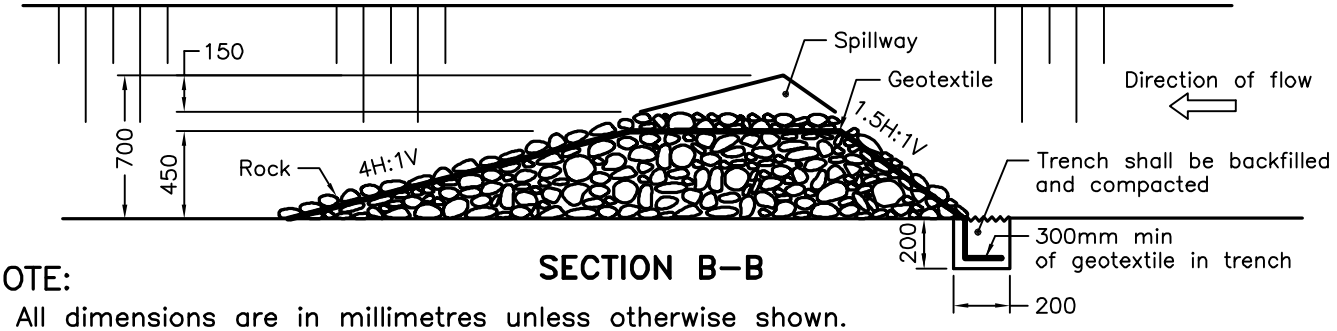
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
SANDBAG FLOW CHECK DAM			
	OPSD 219.200		



PLAN
SPILLWAY



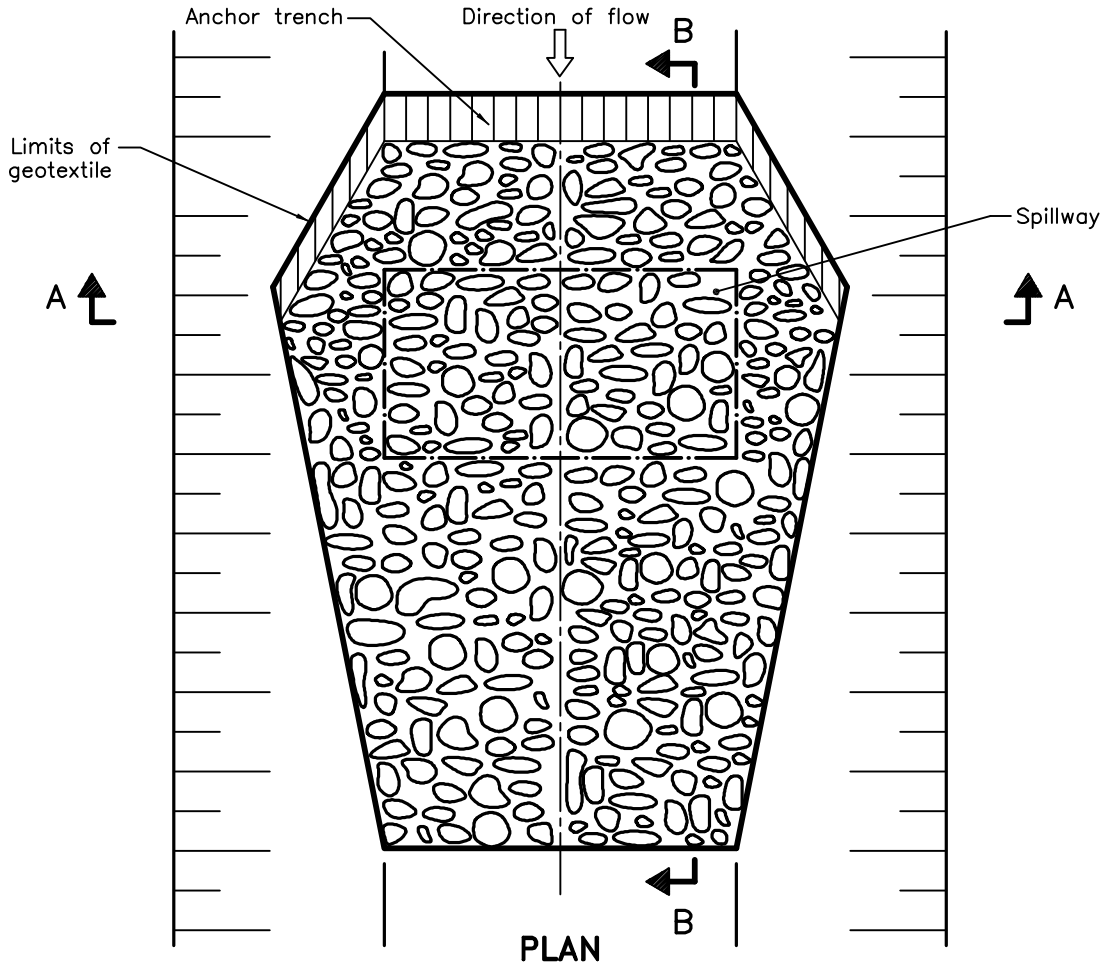
SECTION A–A



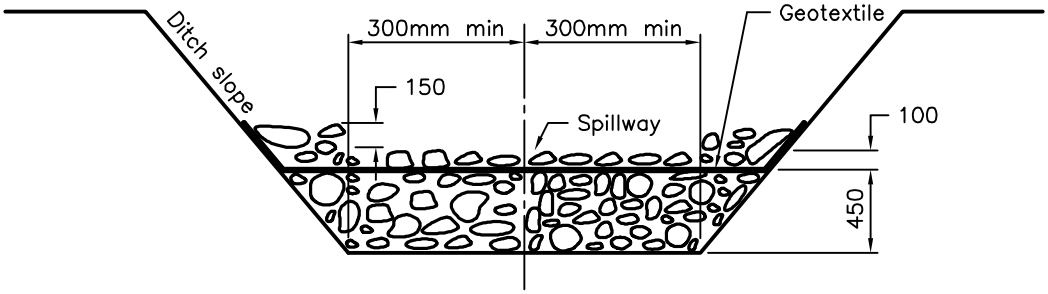
SECTION B–B

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

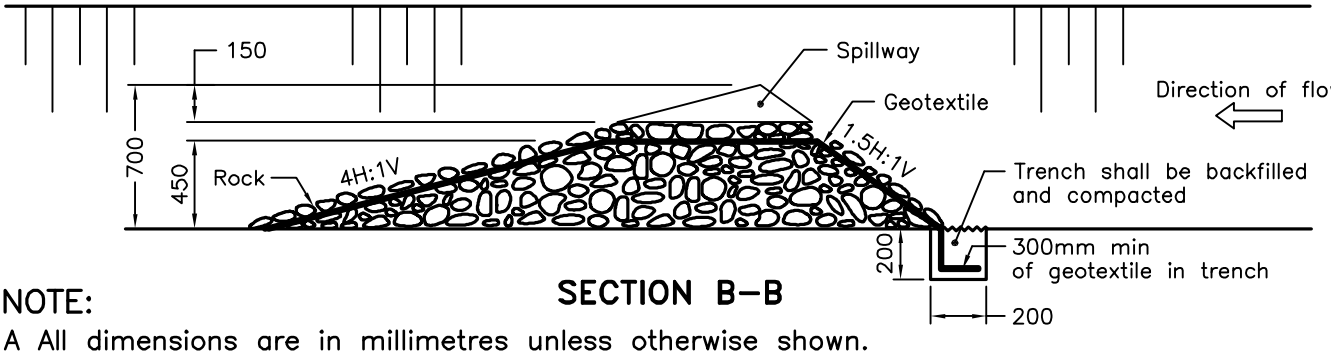
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
TEMPORARY ROCK FLOW CHECK DAM V–DITCH			
	OPSD 219.210		



PLAN
SPILLWAY



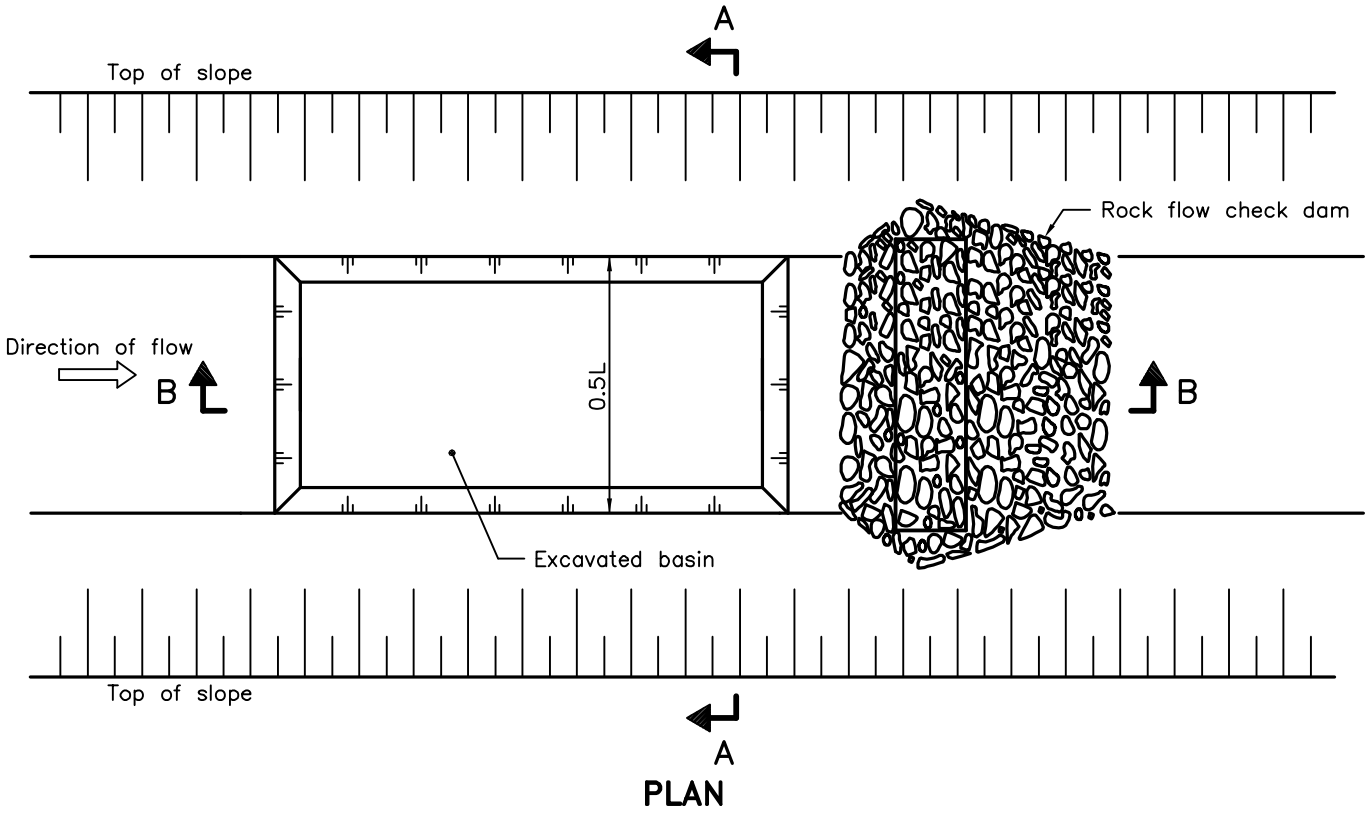
SECTION A–A



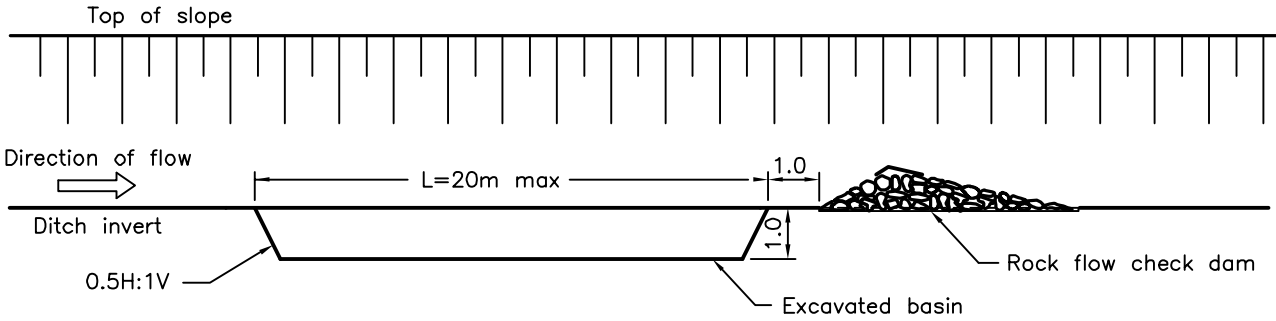
SECTION B–B

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

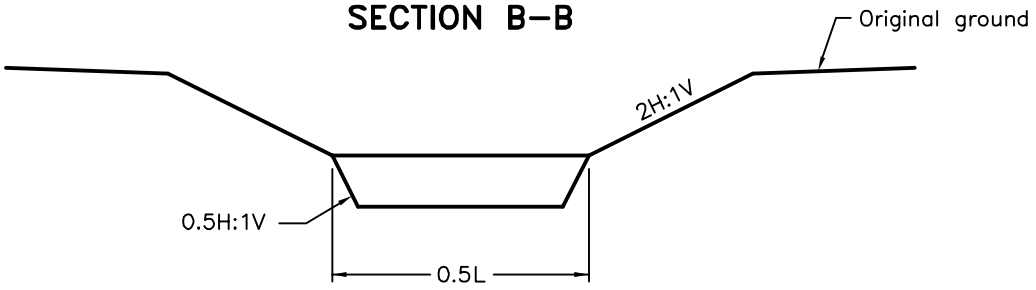
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
TEMPORARY ROCK FLOW CHECK DAM FLAT BOTTOM DITCH			
			OPSD 219.211



PLAN



SECTION B–B



SECTION A–A

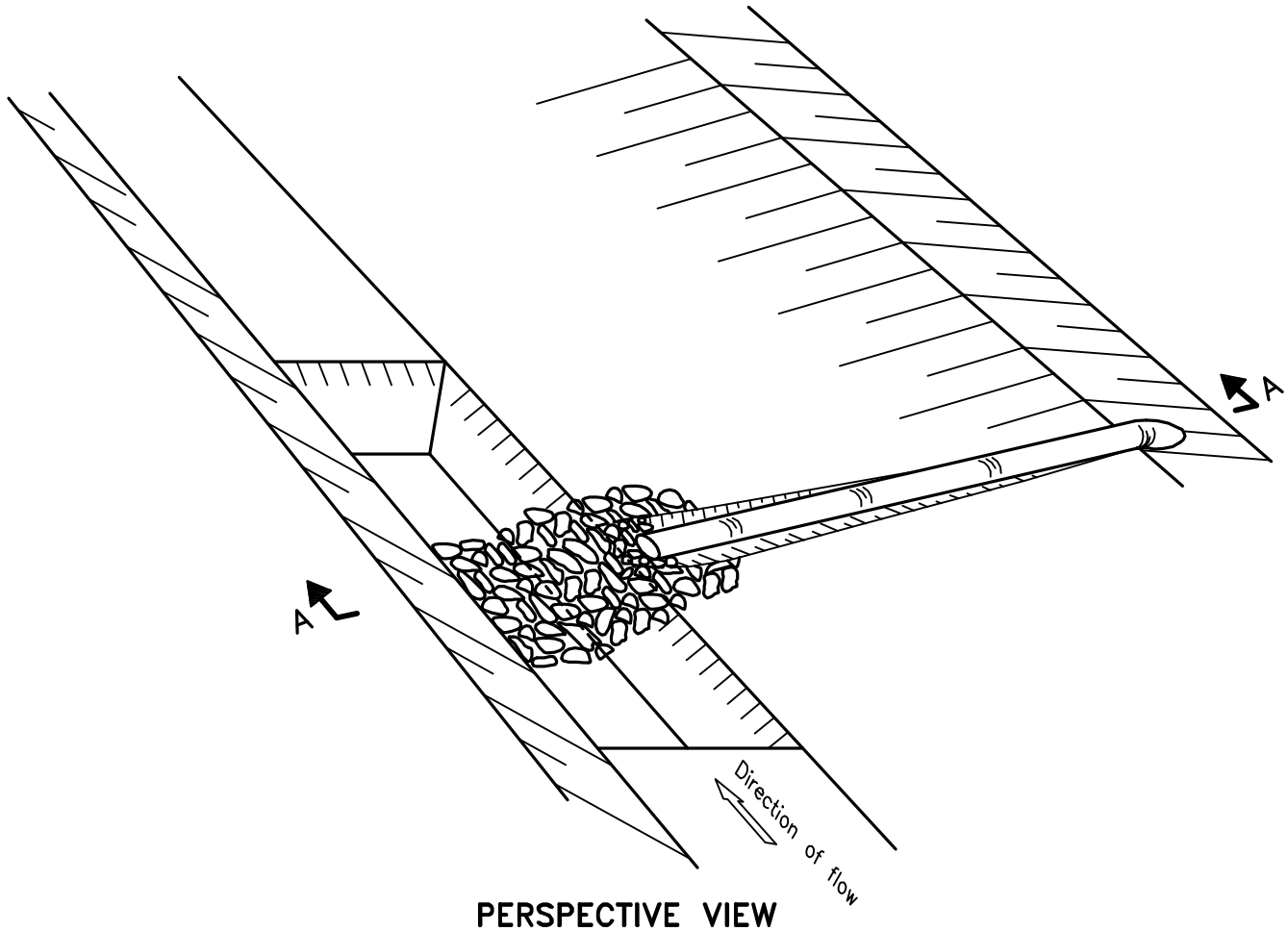
NOTES:

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

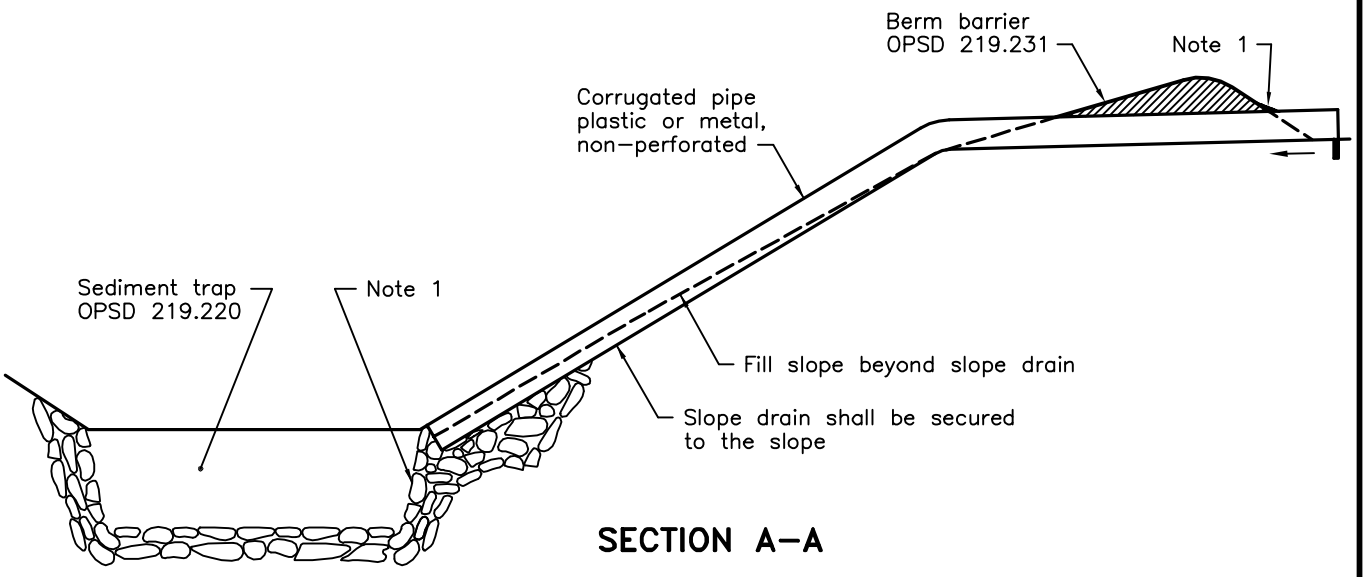
B This OPSD shall be read in conjuction with OPSD 219.210 or 219.211.

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

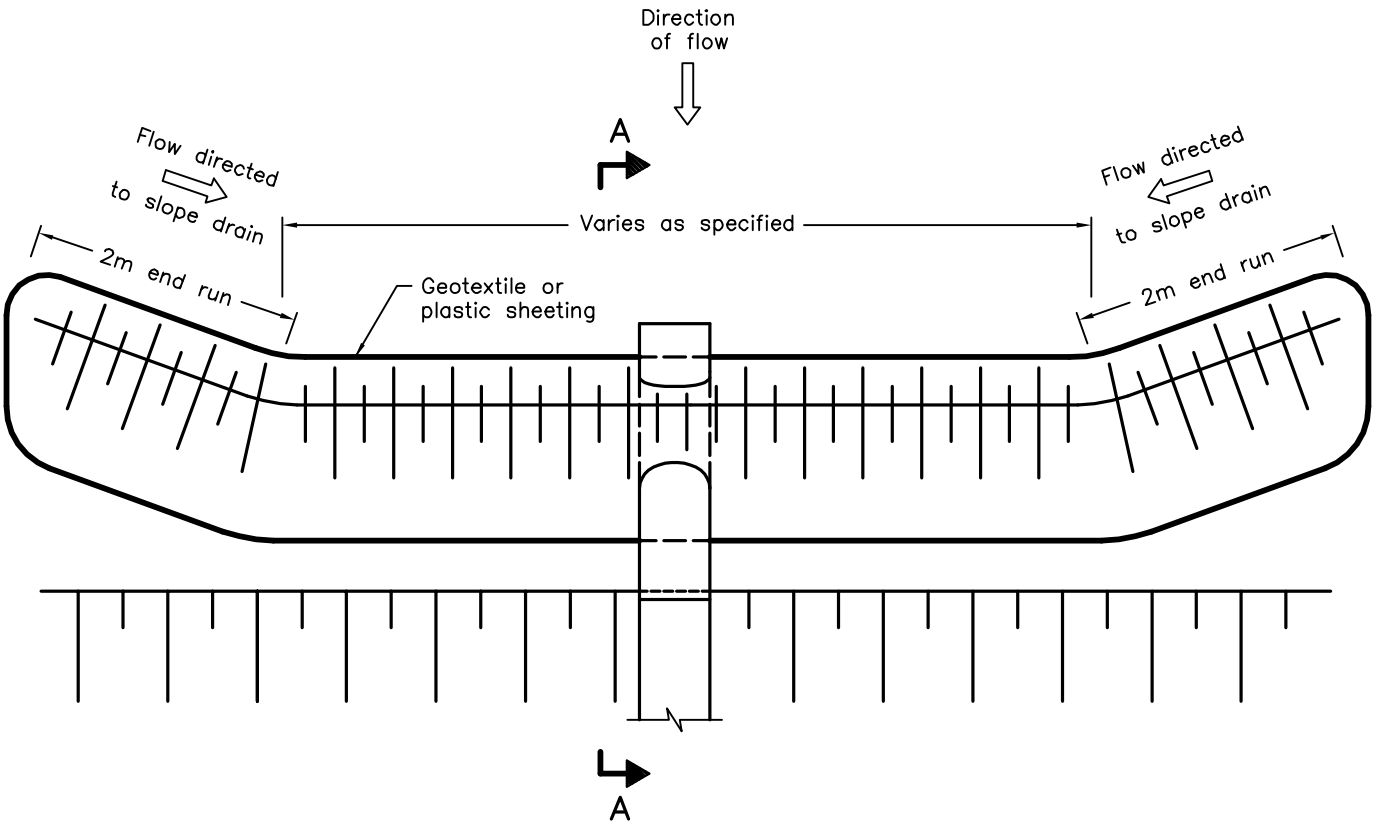


SECTION A–A

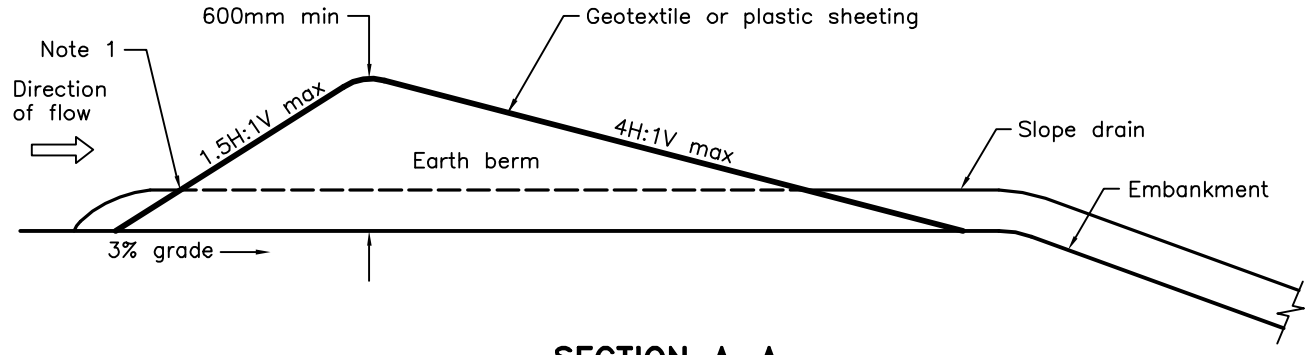
NOTES:

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

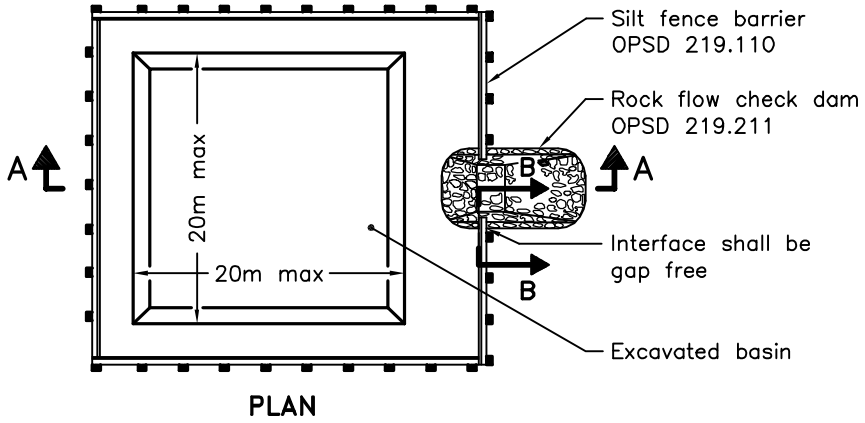
NOTES:

1 Scour protection according to OPSD 810.010.

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

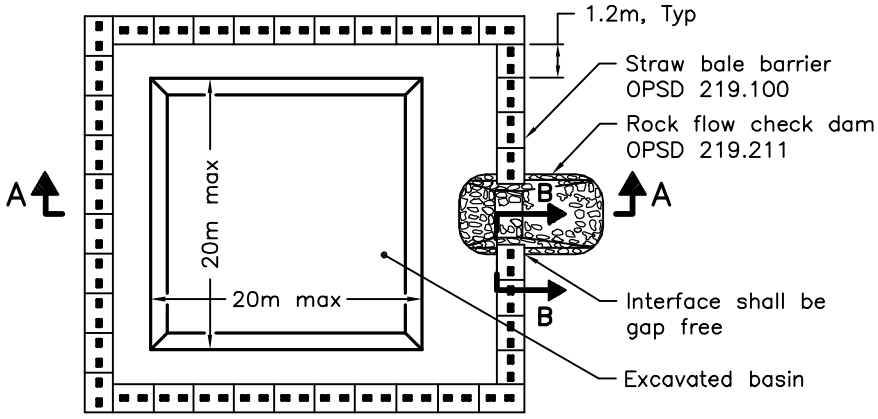
B All dimensions are in millimetres unless otherwise shown.

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



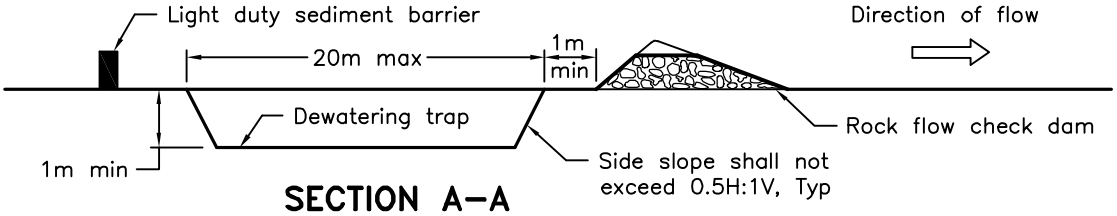
PLAN

DEWATERING TRAP WITH SILT FENCE

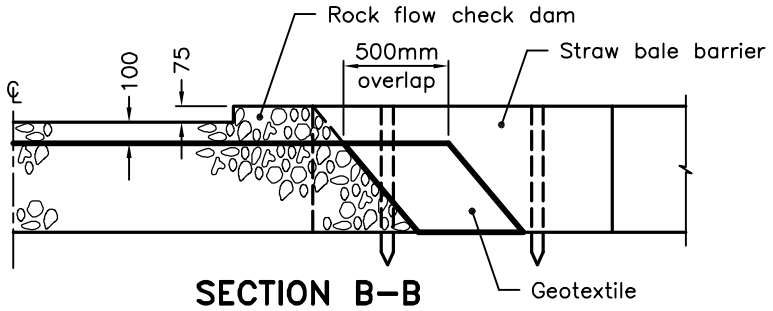


PLAN

DEWATERING TRAP WITH STRAW BALES



SECTION A–A



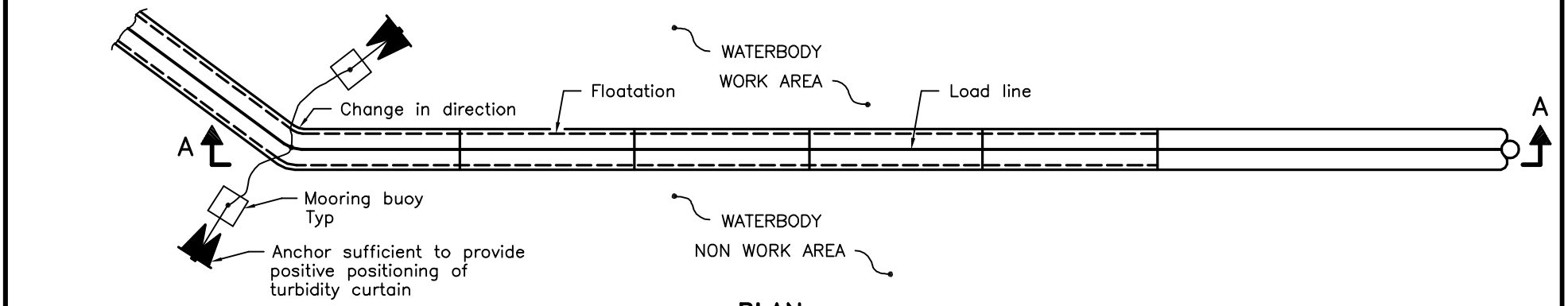
SECTION B–B

STRAW BALE BARRIER SHOWN

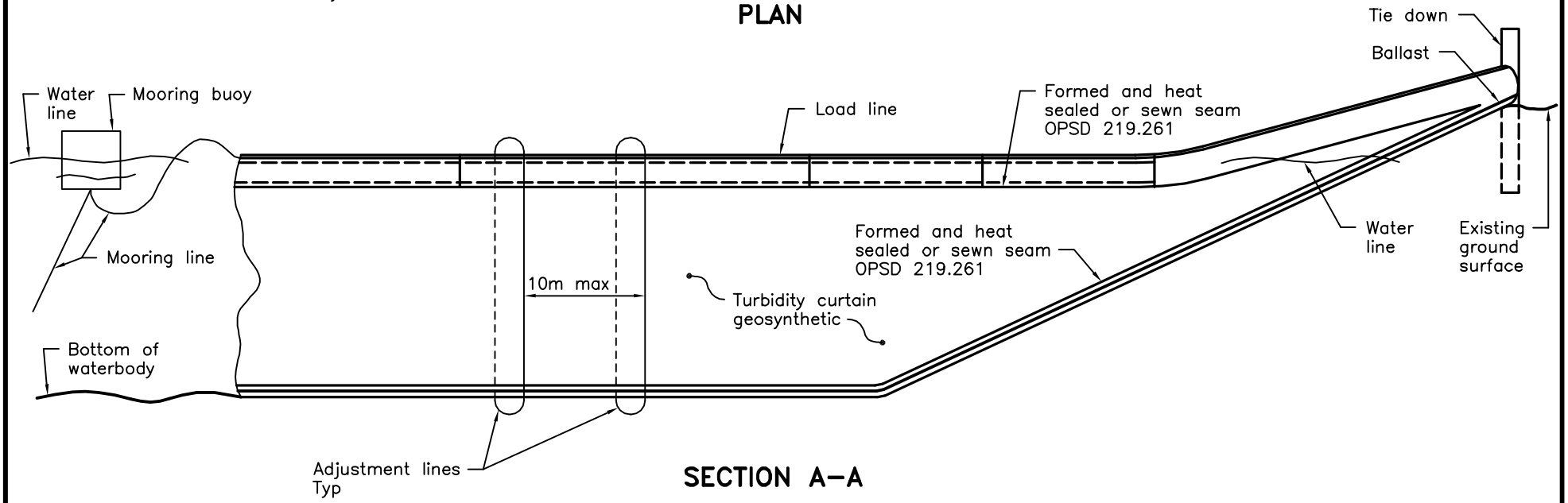
NOTE:

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

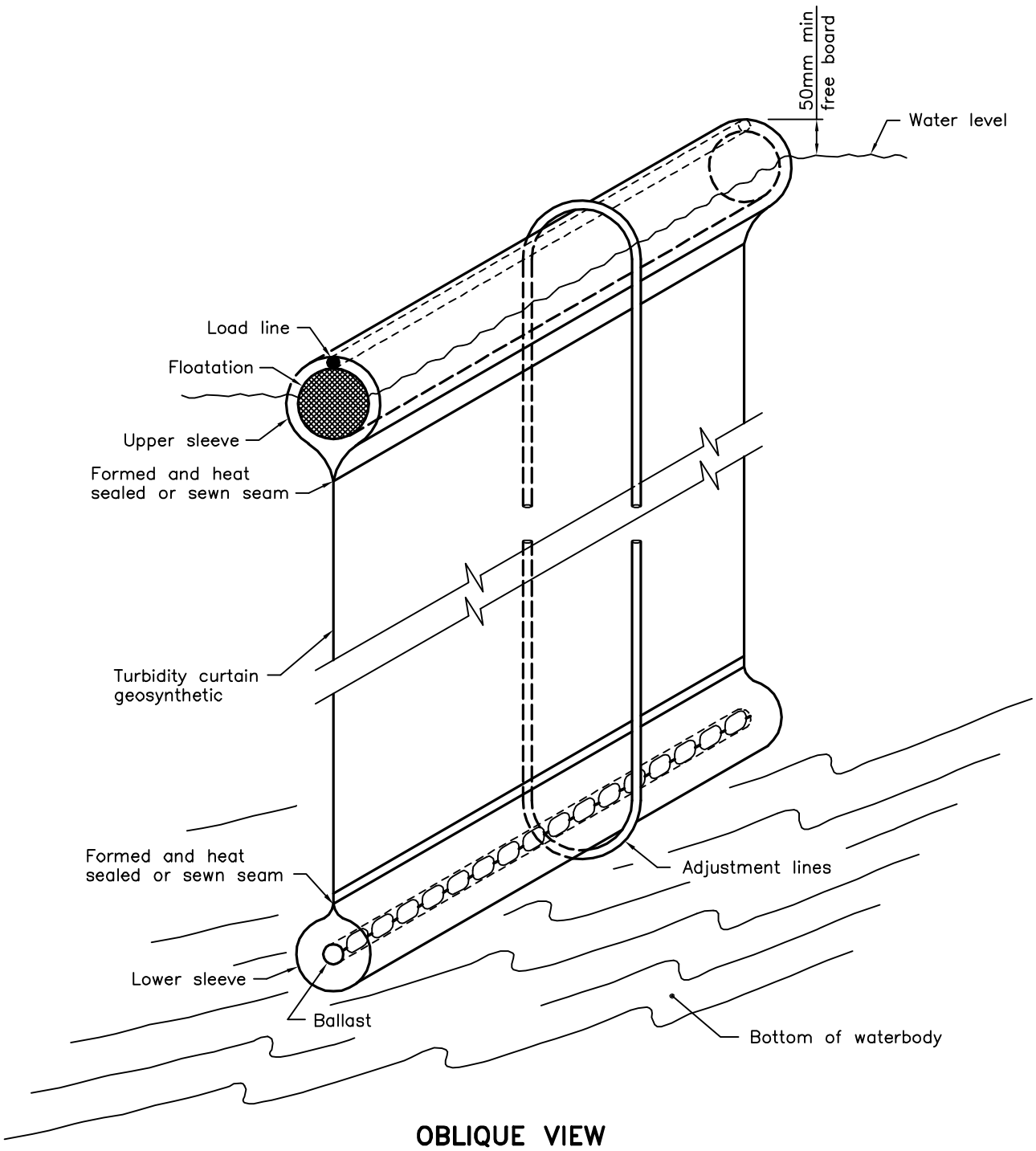


SECTION A–A

NOTES:

A All dimensions are in millimeters unless otherwise shown.

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

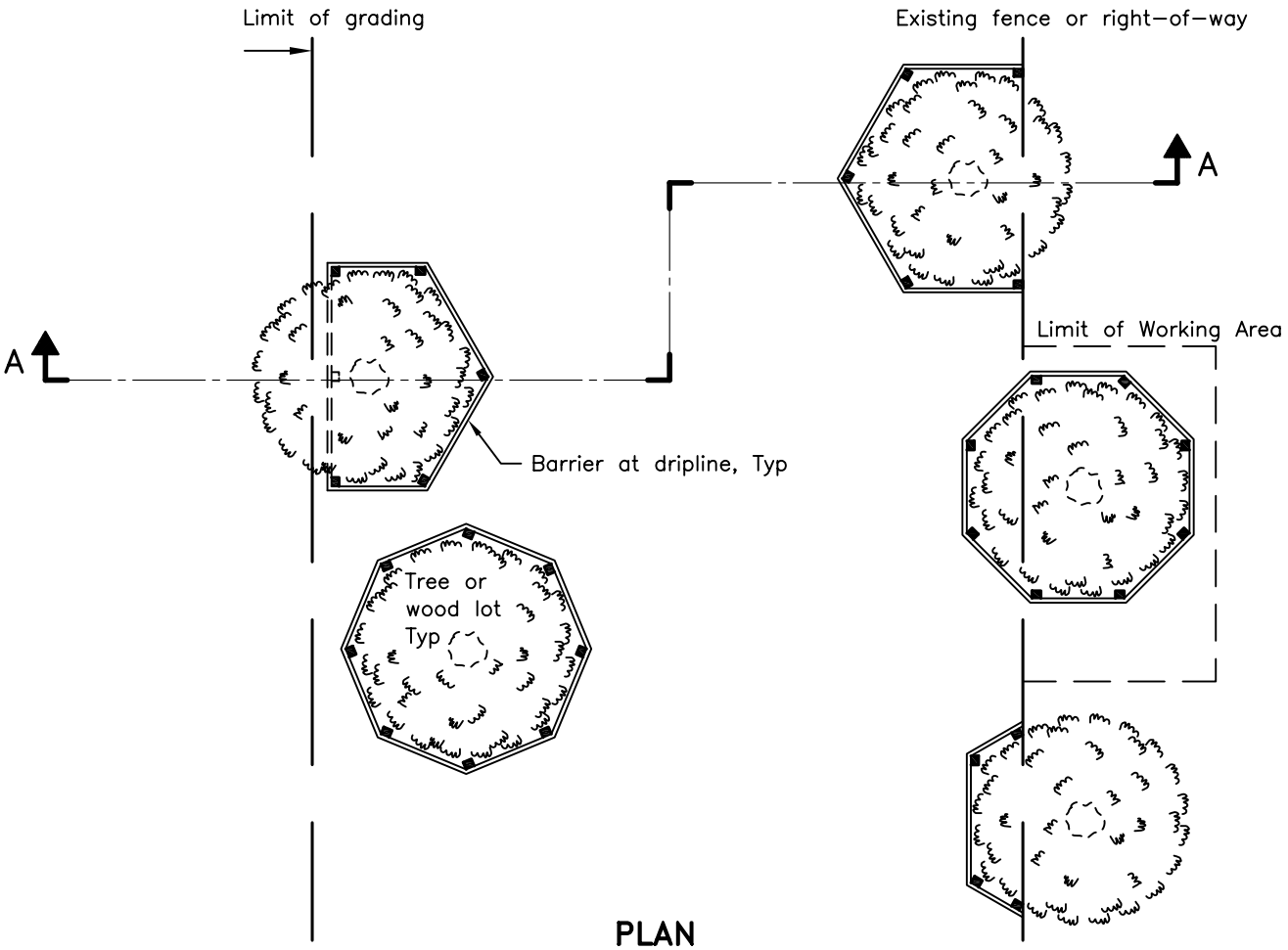


OBLIQUE VIEW

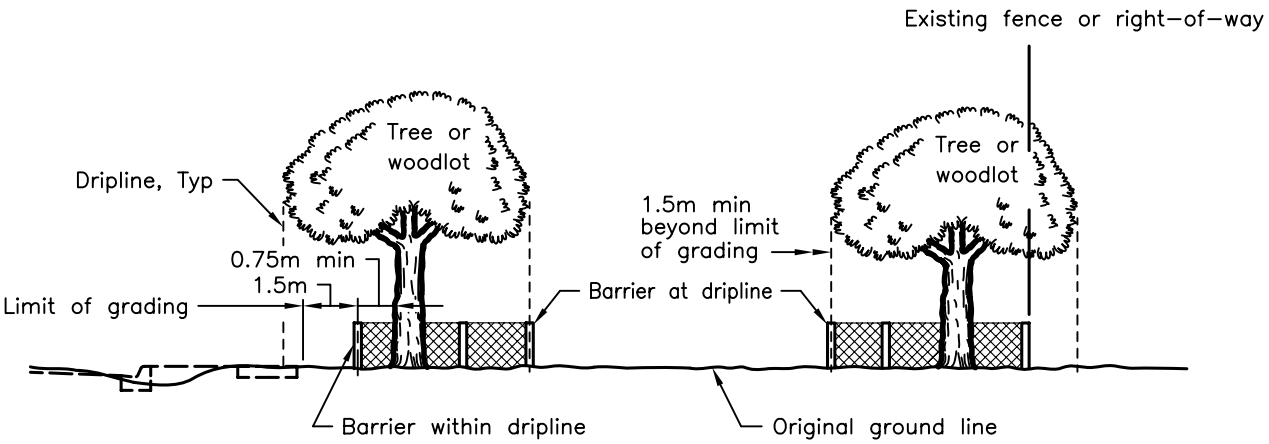
NOTES:

A All dimensions are in millimeters.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
TURBIDITY CURTAIN SEAM DETAIL			
	OPSD 219.261		

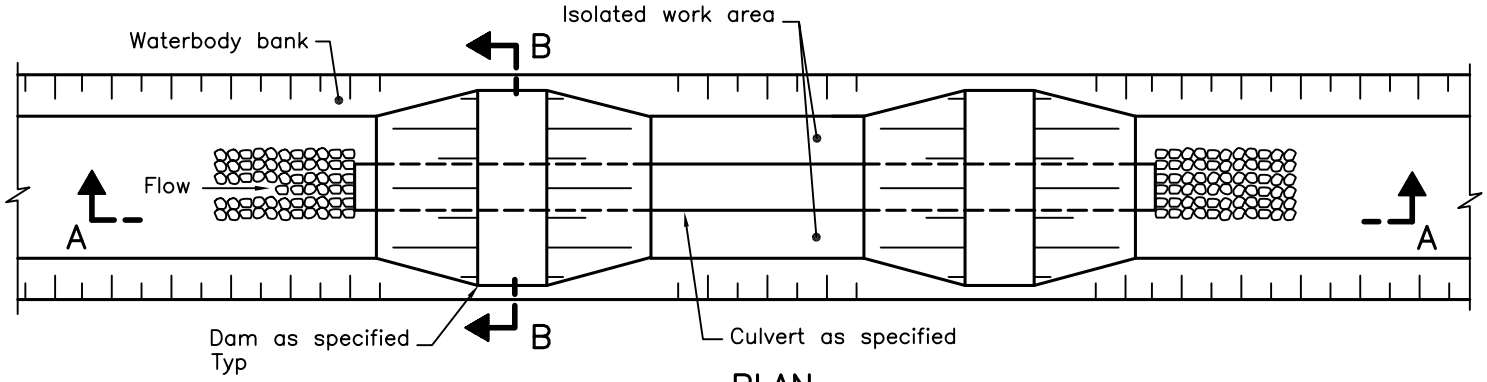


PLAN

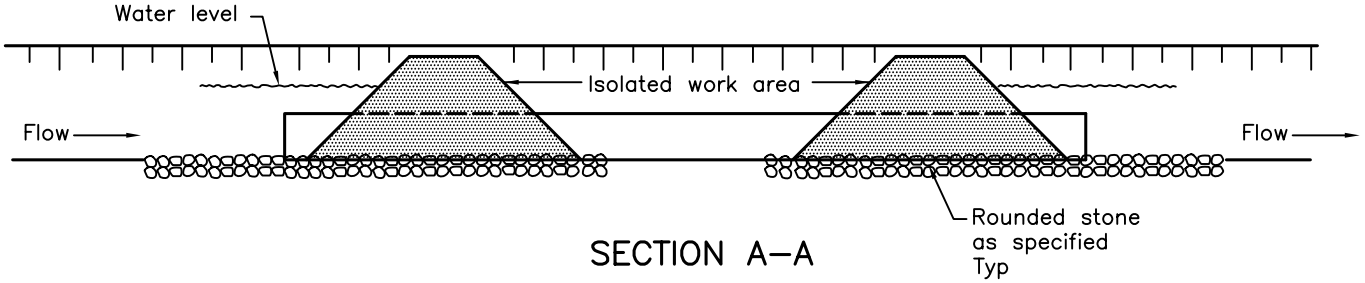


SECTION A–A

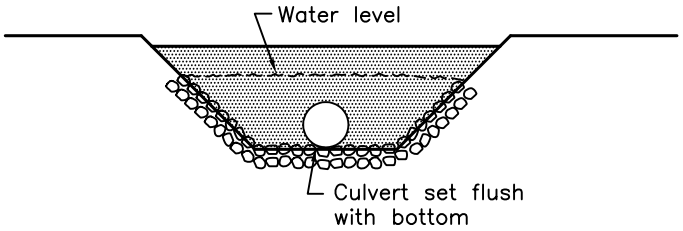
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2007	Rev	0
BARRIER FOR TREE PROTECTION			
	OPSD 220.010		



PLAN



SECTION A–A



SECTION B–B

NOTE:

A Schematic only.

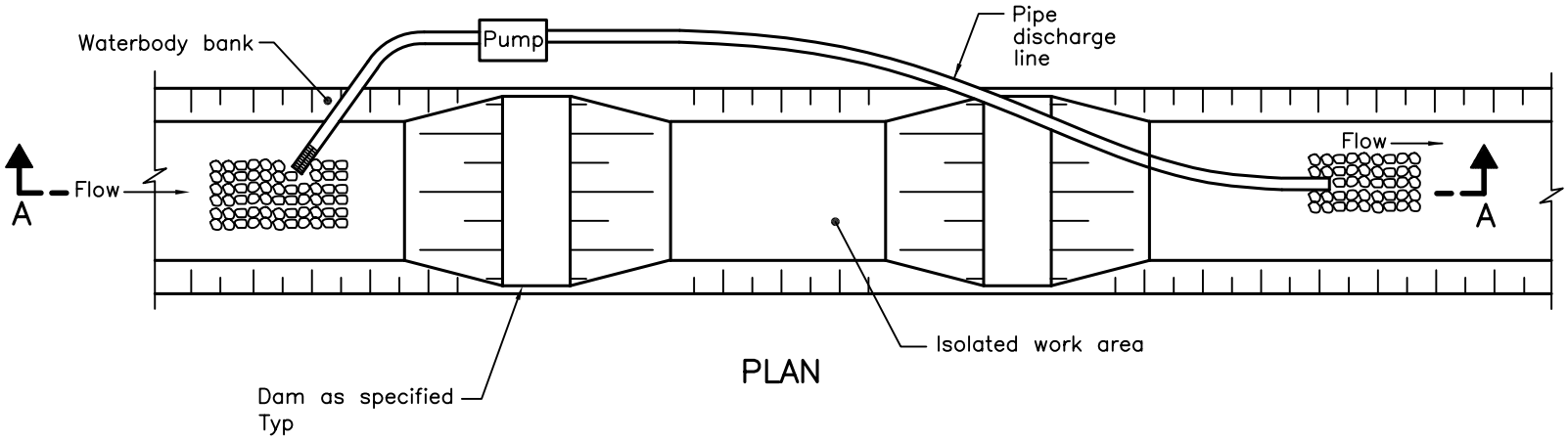
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2000 | Rev 0

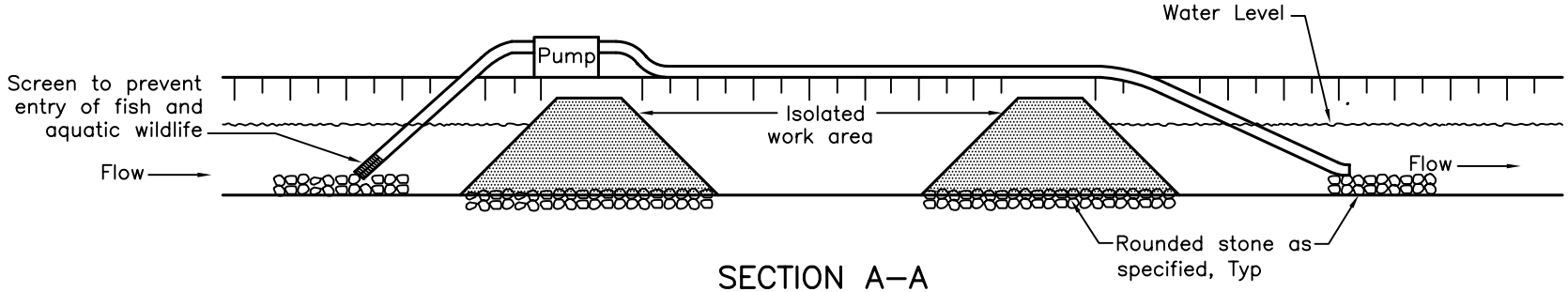
TEMPORARY WATER PASSAGE SYSTEM

CULVERT IN WATERCOURSE

OPSD – 221.010



PLAN



SECTION A–A

NOTE:
A Schematic only.

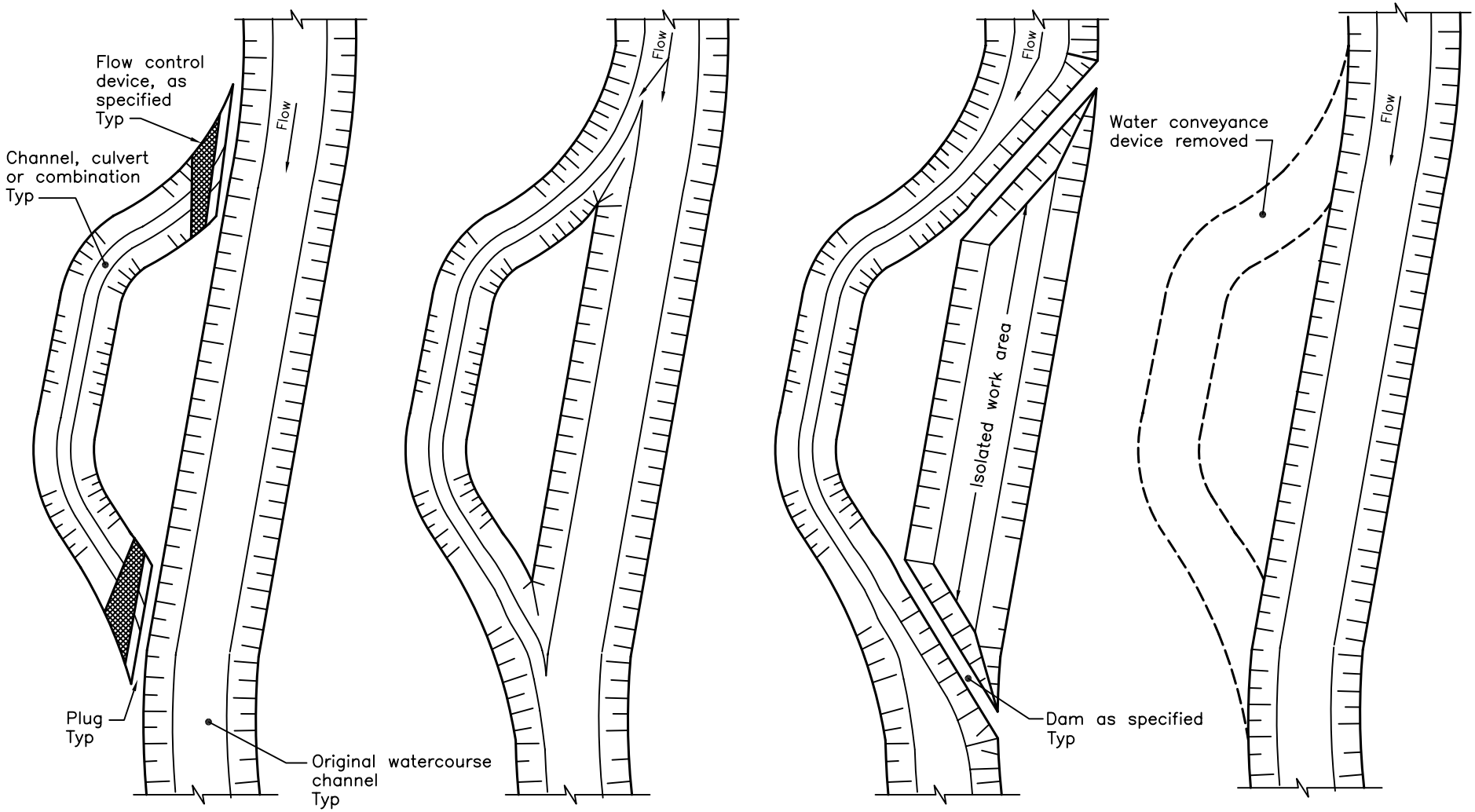
ONTARIO PROVINCIAL STANDARD DRAWING

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

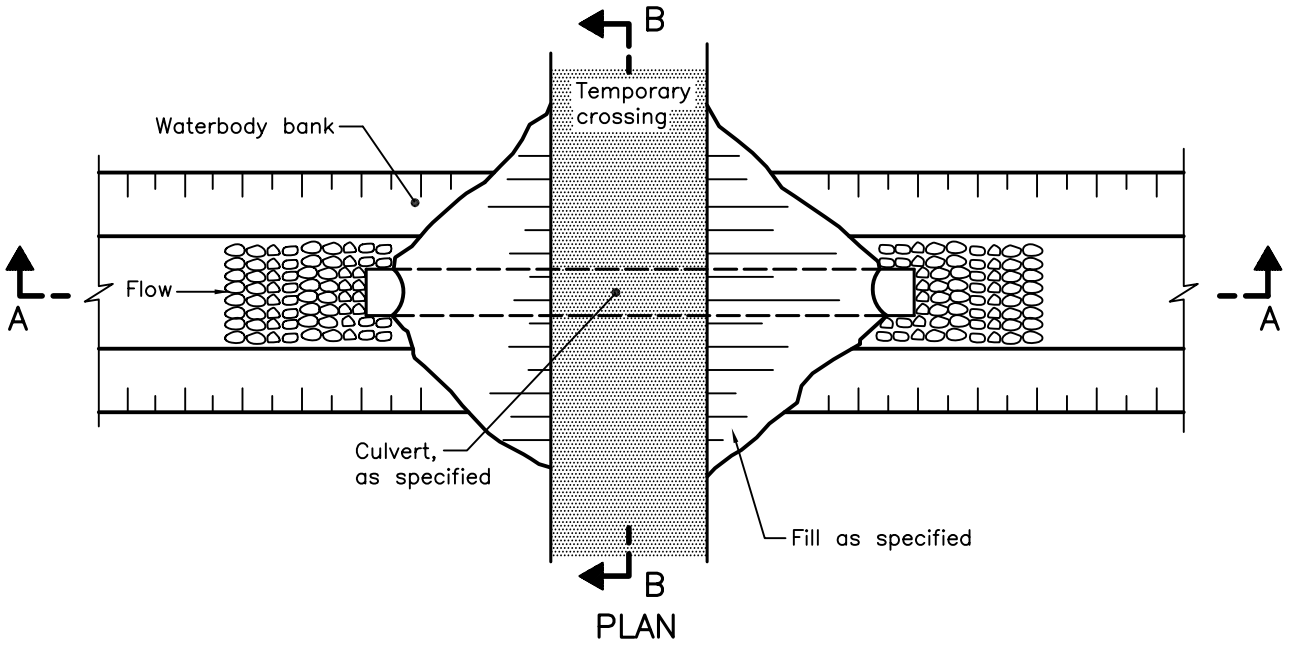
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2000 | Rev 0

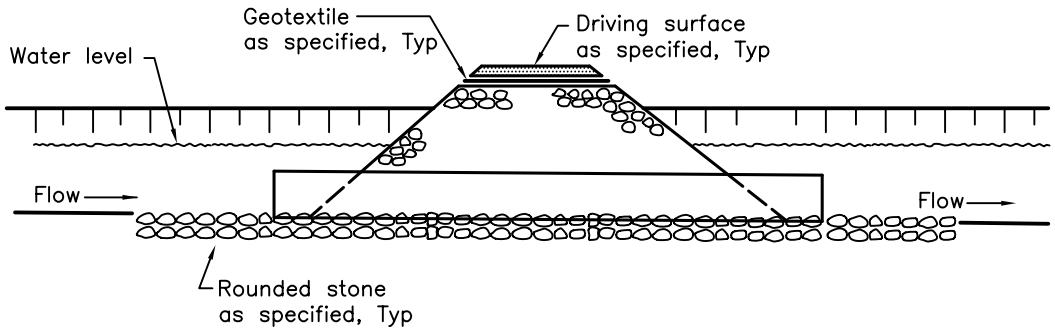
TEMPORARY WATER PASSAGE SYSTEM

TEMPORARY CHANNEL OR CULVERT OUTSIDE WATERCOURSE

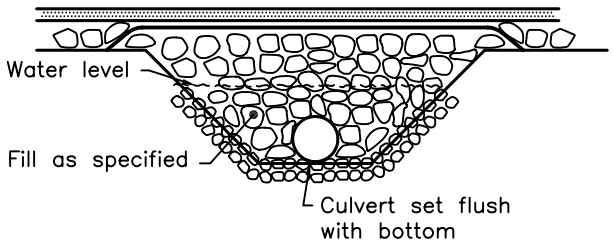
OPSD – 221.030



PLAN



SECTION A–A



SECTION B–B

NOTE:

A Approaches to the temporary crossing shall be clearly marked

B Schematic only.

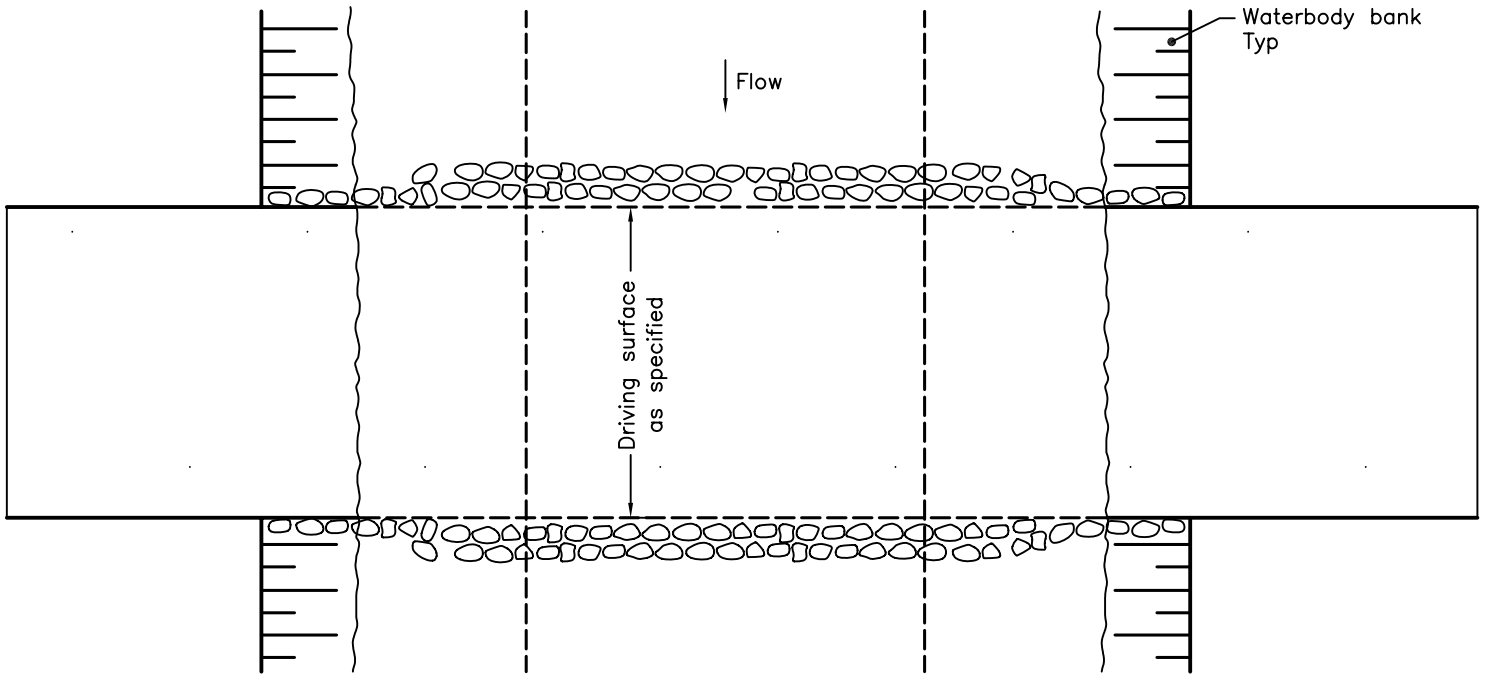
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2000 | Rev 0

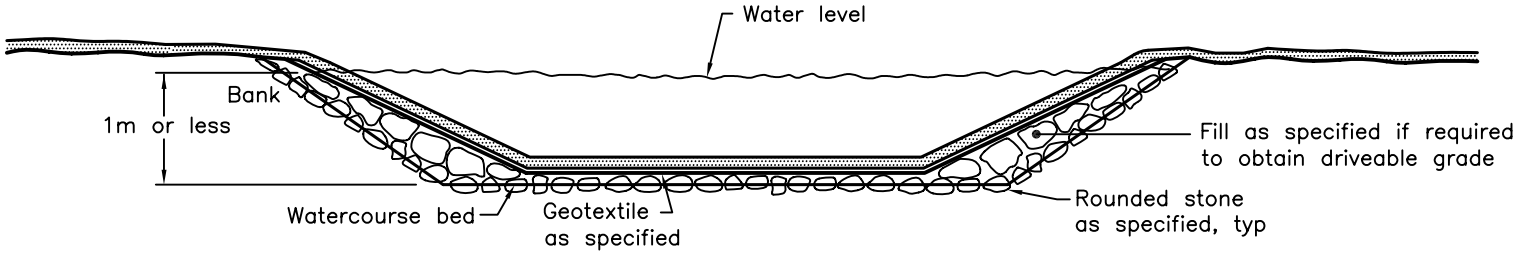
TEMPORARY WATERBODY CROSSING

FILL AND CULVERT

OPSD – 221.040



PLAN VIEW



PROFILE VIEW

NOTE:

A Approaches to the temporary crossing shall be clearly marked

B Schematic only.

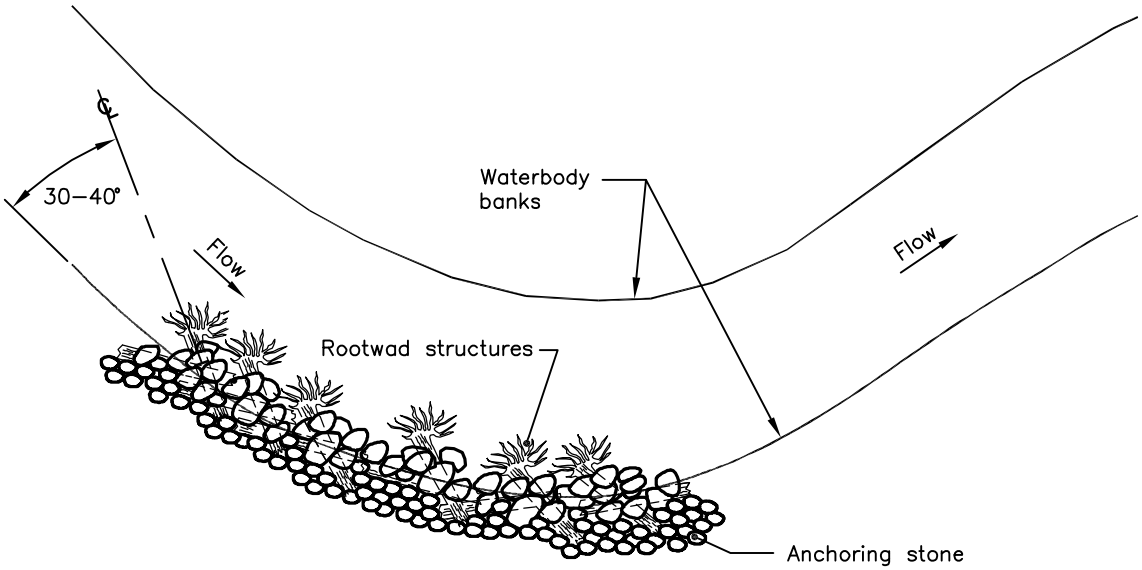
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2000 | Rev 0

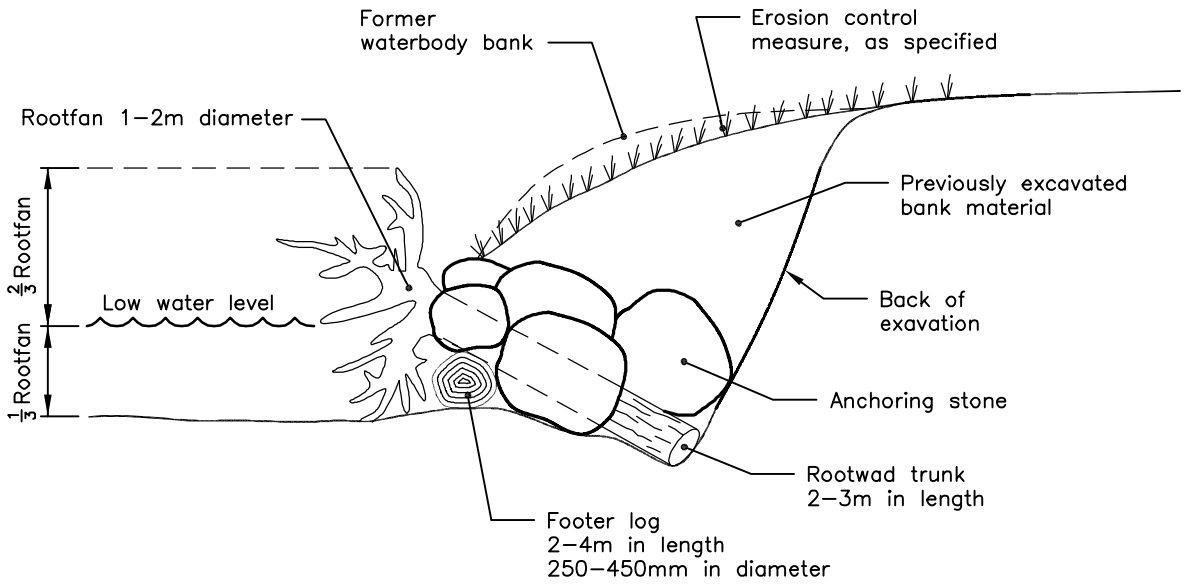
TEMPORARY WATERBODY CROSSING

FORD

OPSD – 221.050



PLAN
LOW WATER LEVEL

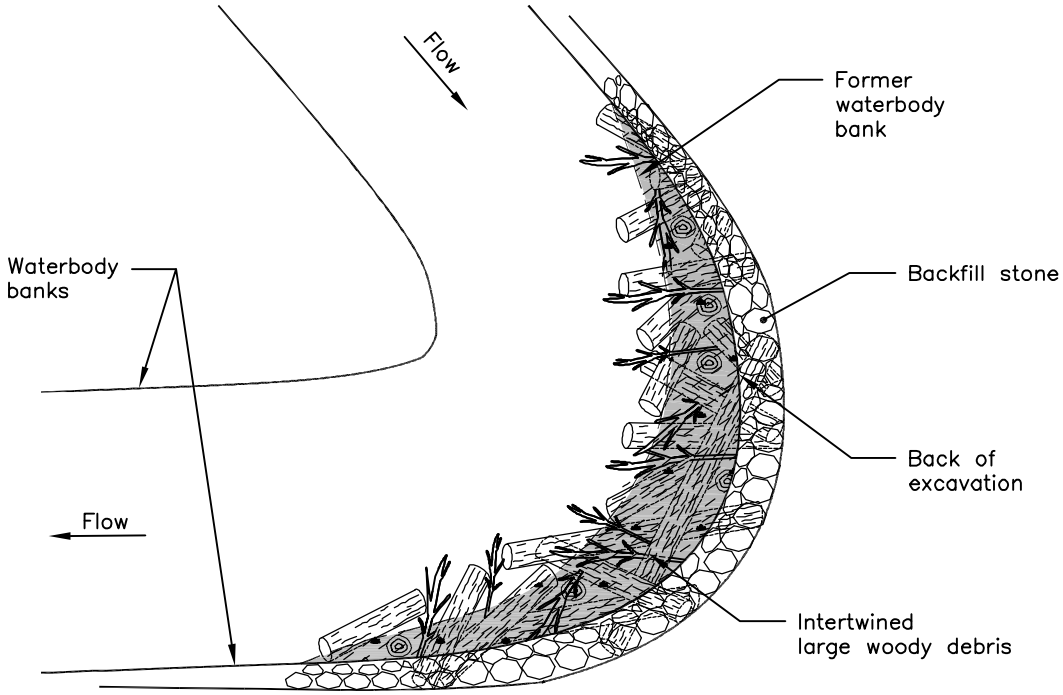


SECTION

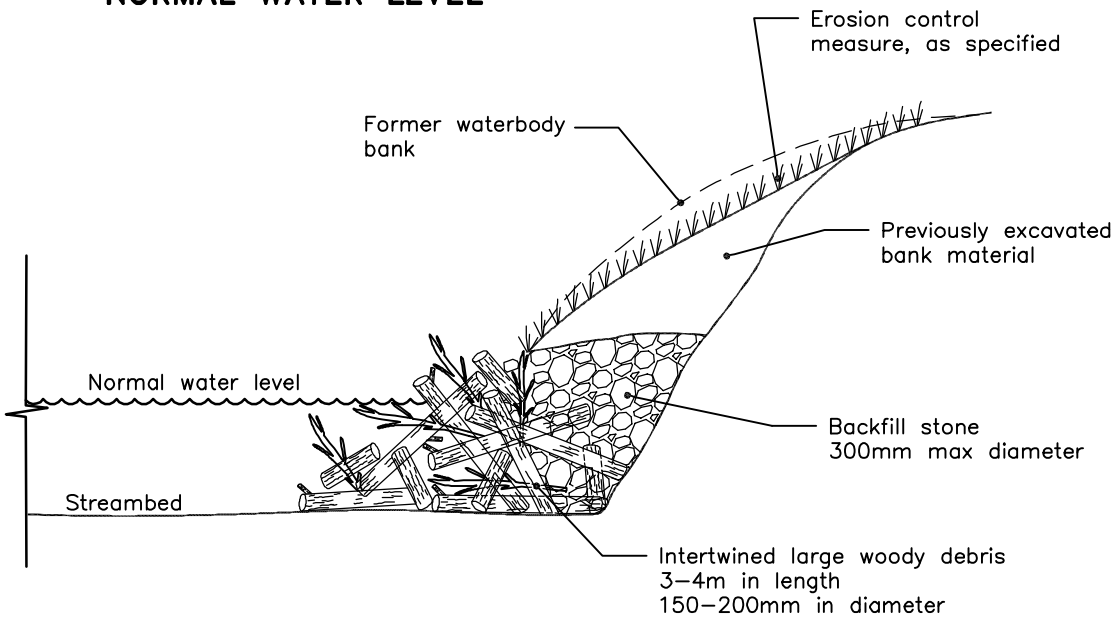
NOTE:

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		



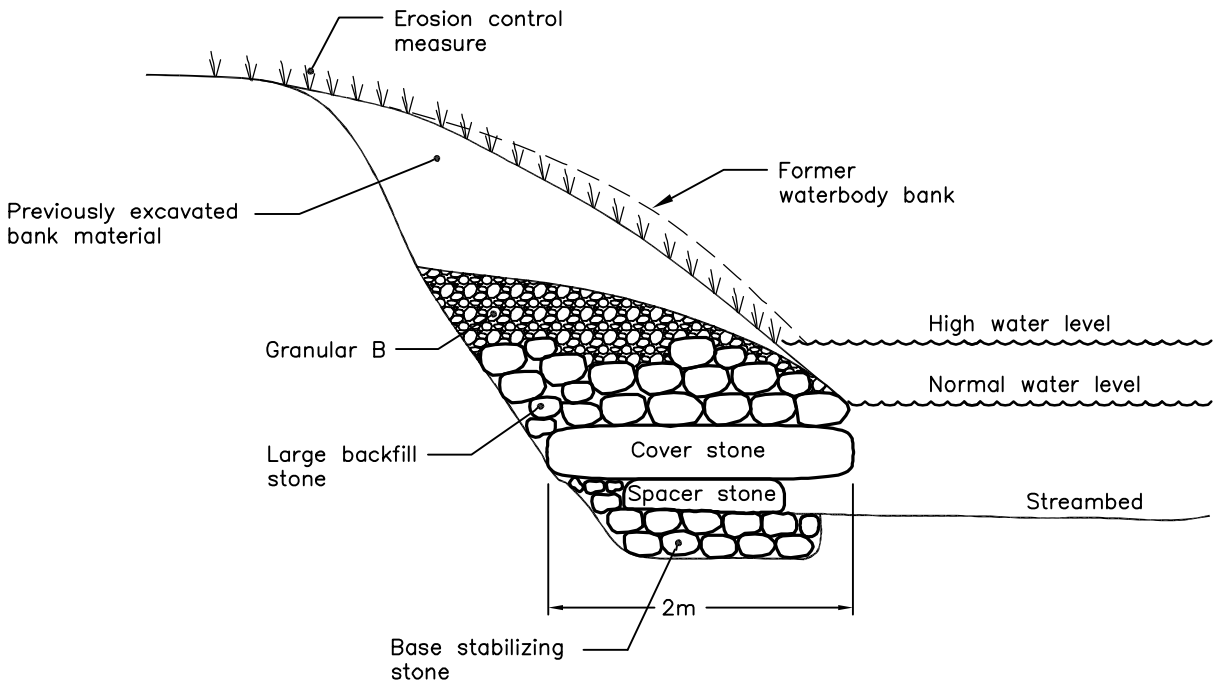
PLAN
NORMAL WATER LEVEL



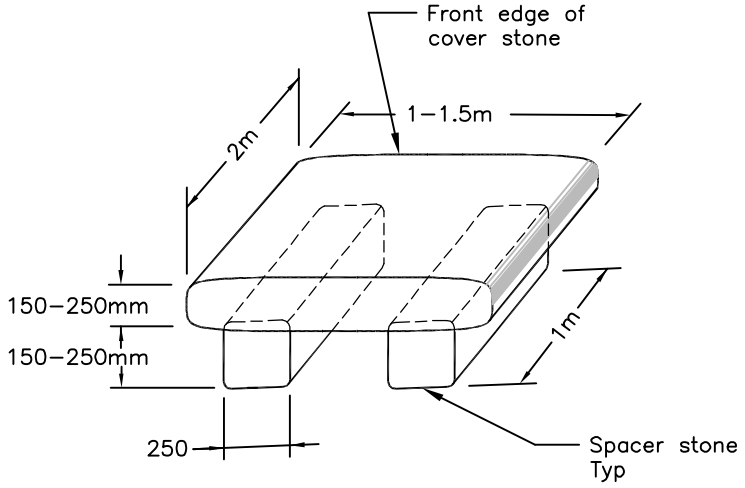
SECTION

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



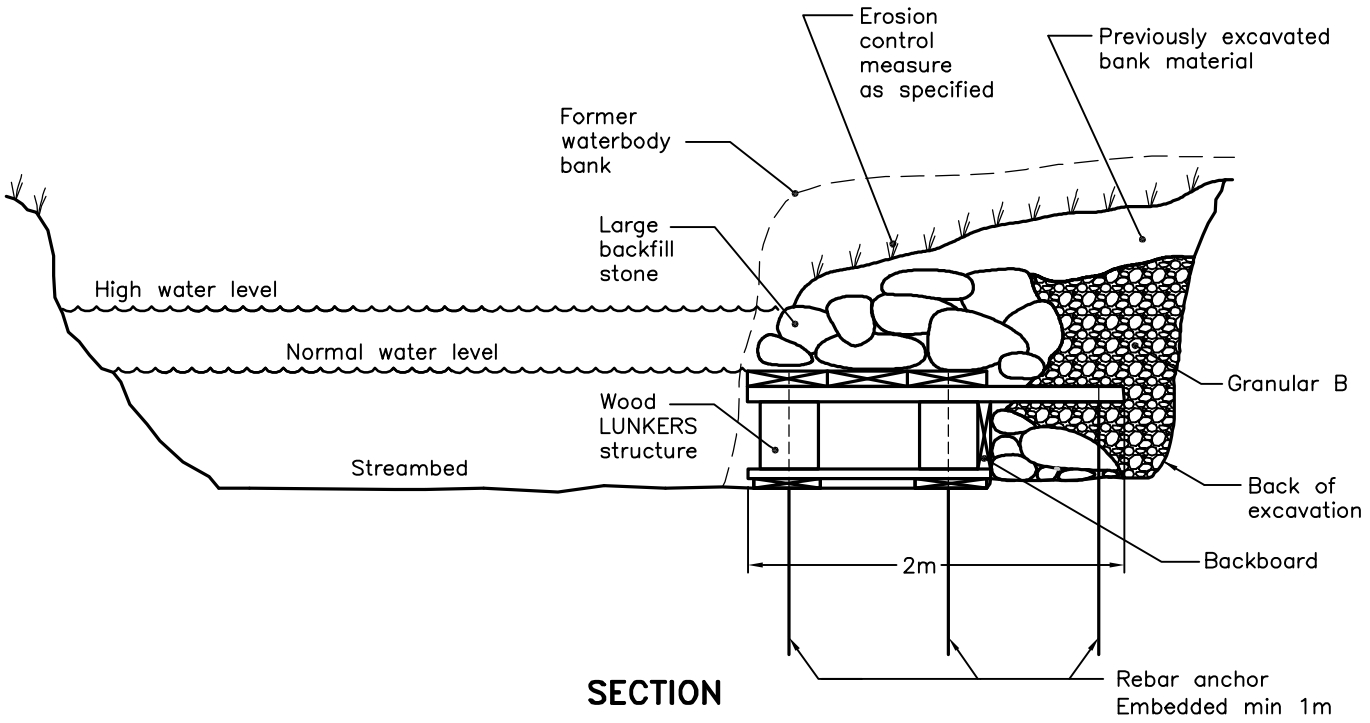
SCHEMATIC OF COVER STONE AND SPACER STONE SUPPORTS

NOTES:

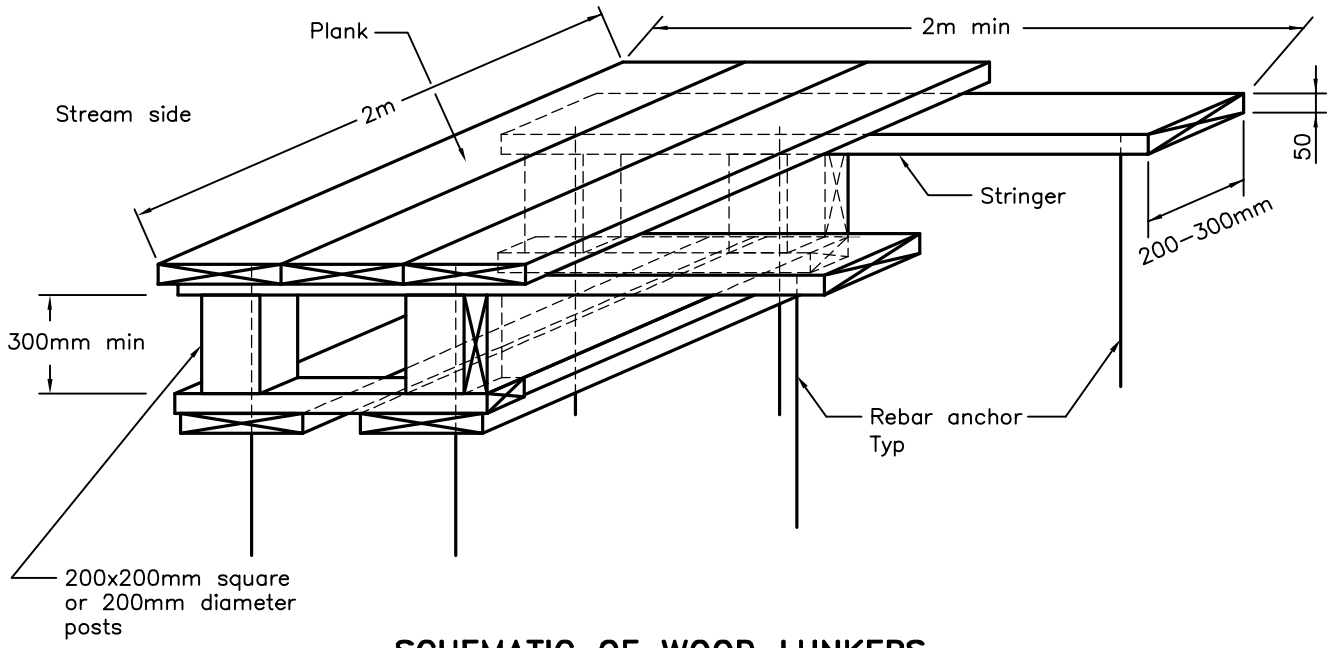
A Sound rock shall be placed so that there is solid contact and no movement.

B All dimensions are in millimetres unless otherwise shown.

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



SECTION



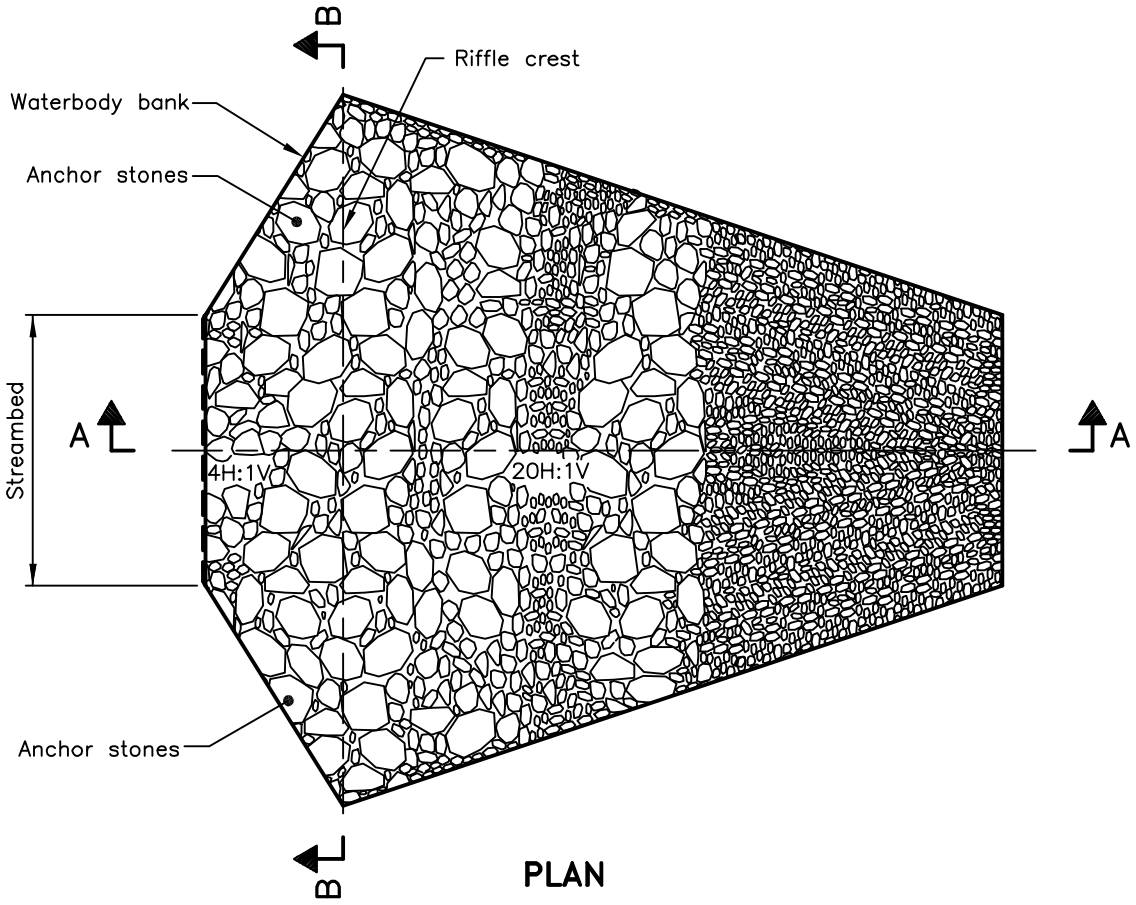
SCHEMATIC OF WOOD LUNKERS

NOTES:

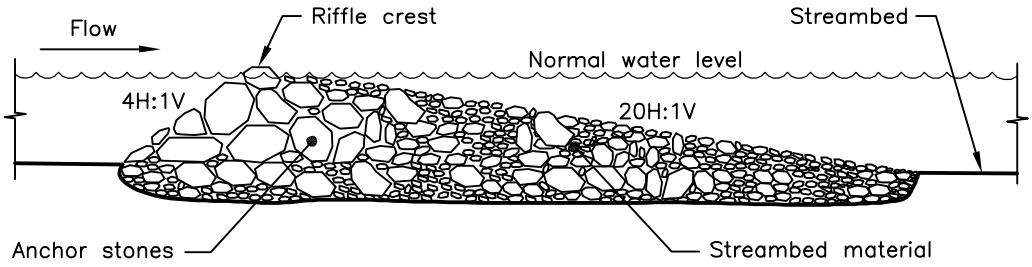
A All lumber sizes are nominal.

B All dimensions are in millimetres unless otherwise shown.

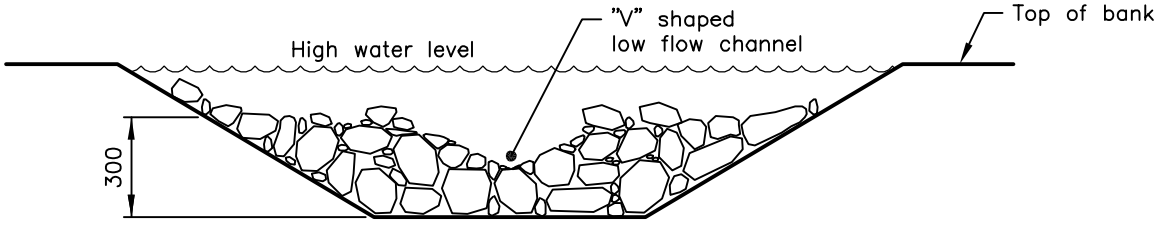
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	0
WOOD LUNKERS			
	OPSD 222.040		



PLAN



SECTION A–A

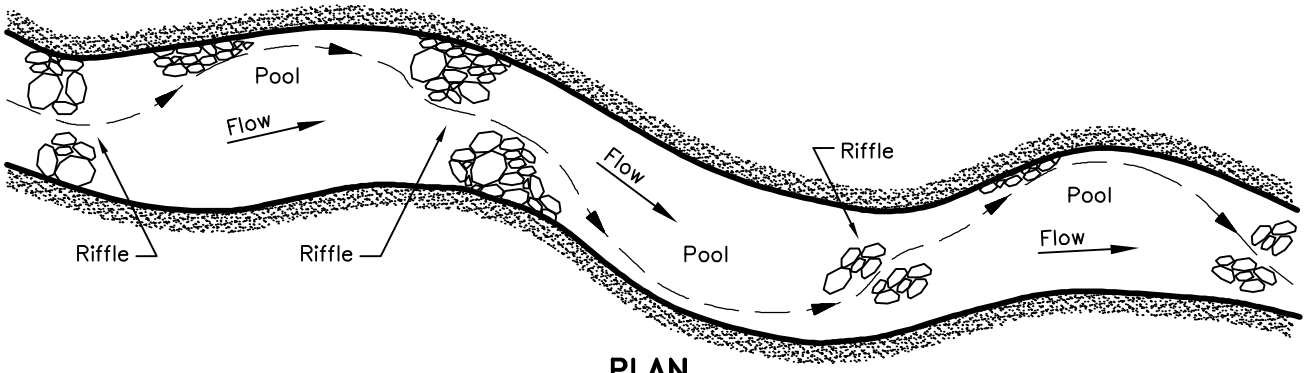


SECTION B–B

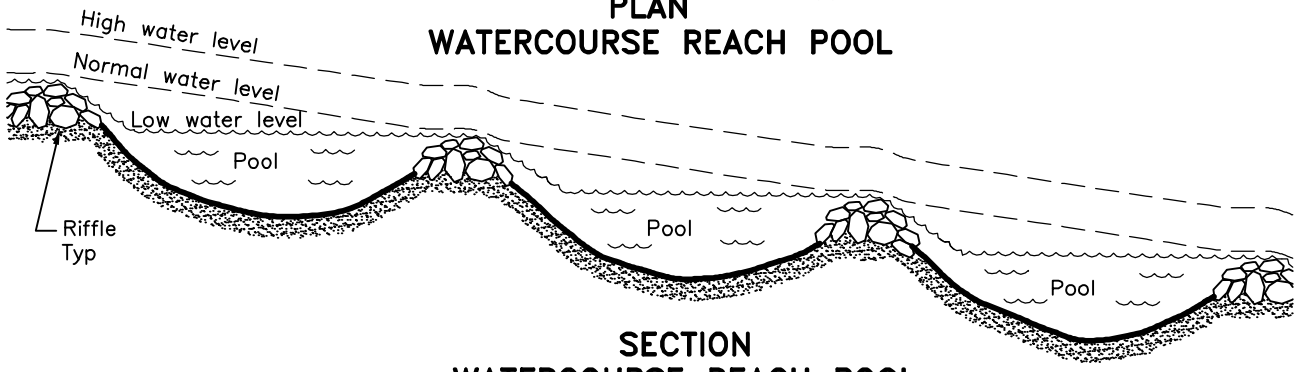
NOTES:

A All dimensions are in millimetres unless otherwise shown.

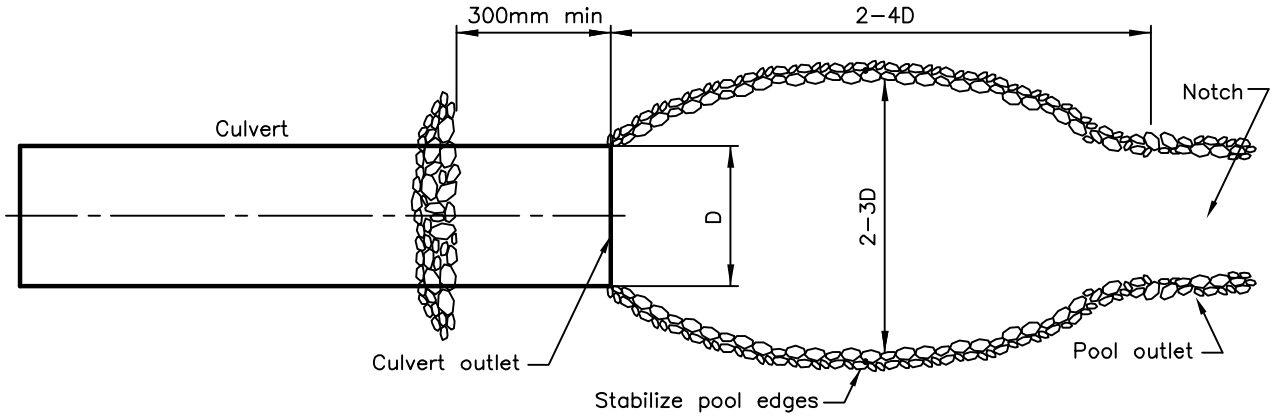
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	0
RIFFLES ON STREAMBEDS			
	OPSD 222.050		



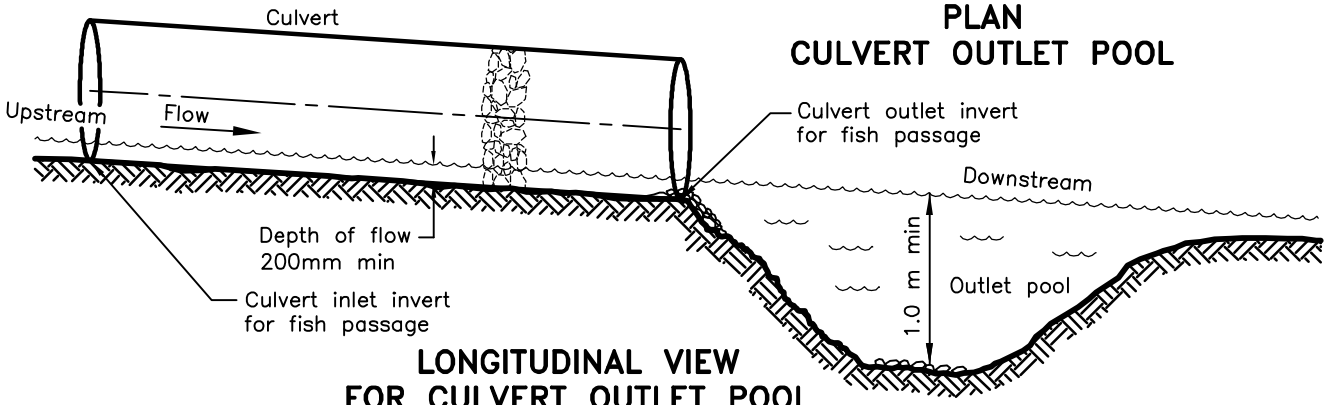
PLAN
WATERCOURSE REACH POOL



SECTION
WATERCOURSE REACH POOL



PLAN
CULVERT OUTLET POOL

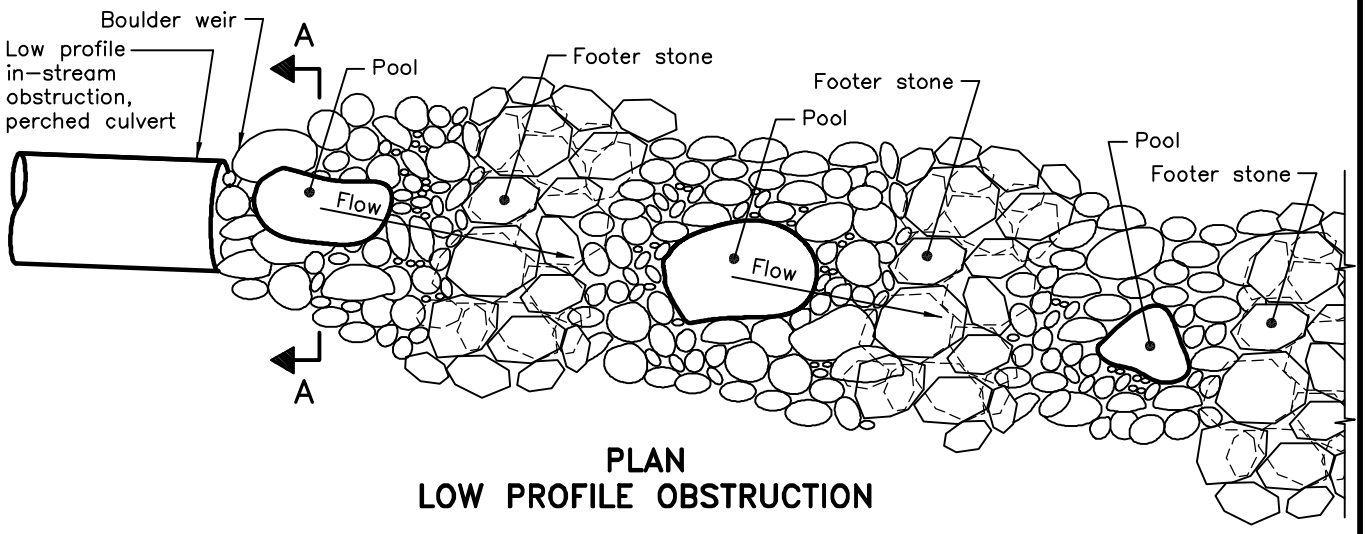


LONGITUDINAL VIEW
FOR CULVERT OUTLET POOL

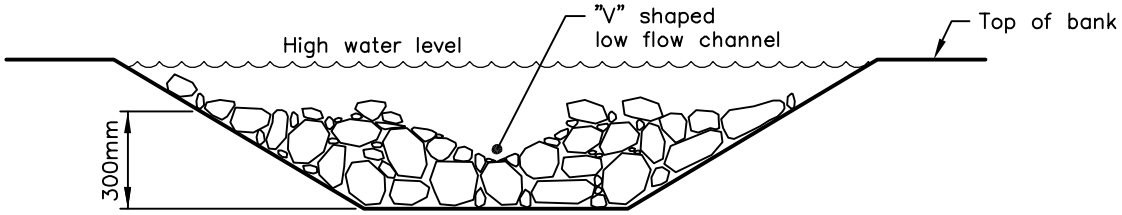
NOTES:

A All dimensions are in millimetres unless otherwise shown.

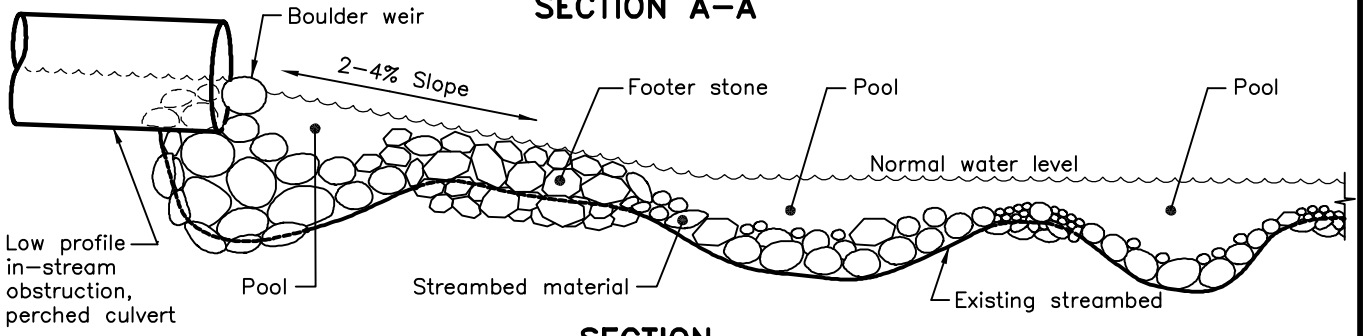
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	0
POOLS IN STREAMBEDS			
	OPSD 222.060		



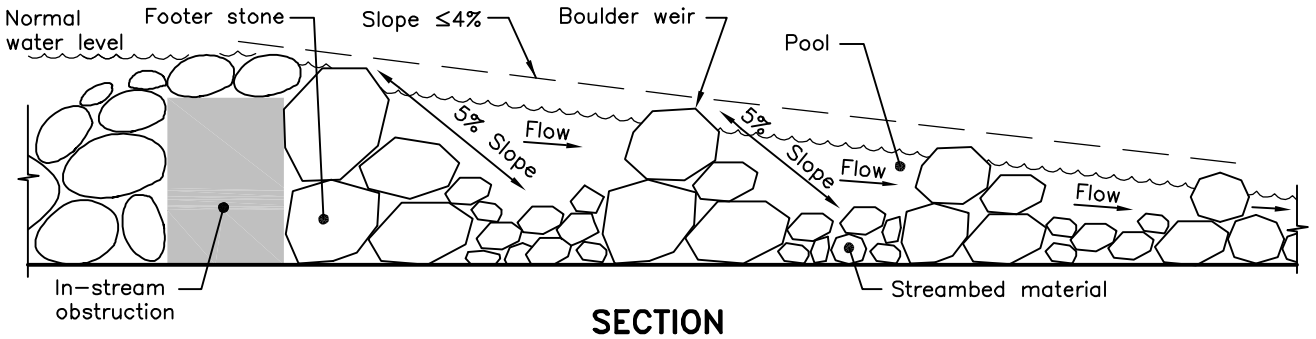
PLAN
LOW PROFILE OBSTRUCTION



SECTION A–A



SECTION
LOW PROFILE OBSTRUCTION

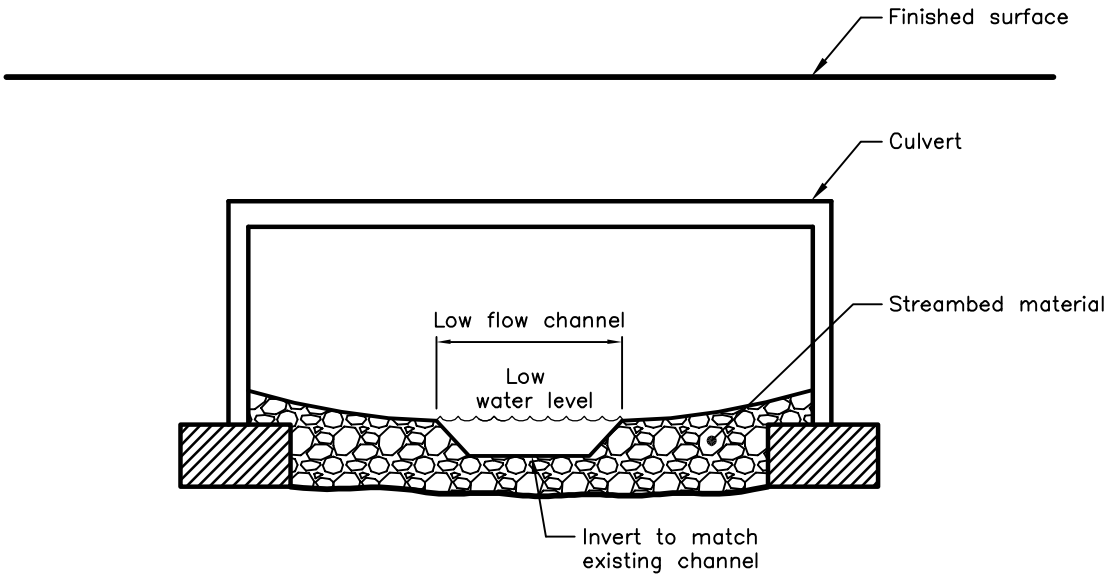


SECTION
HIGH PROFILE OBSTRUCTION

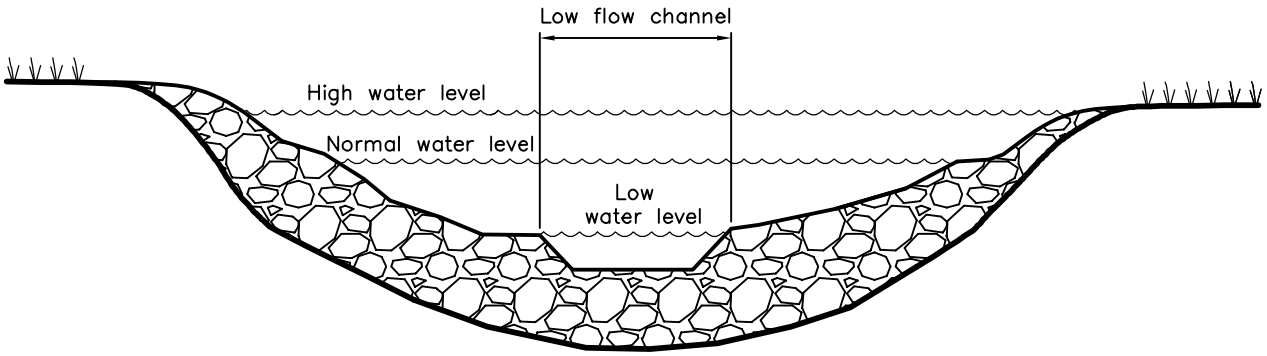
NOTES:

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		

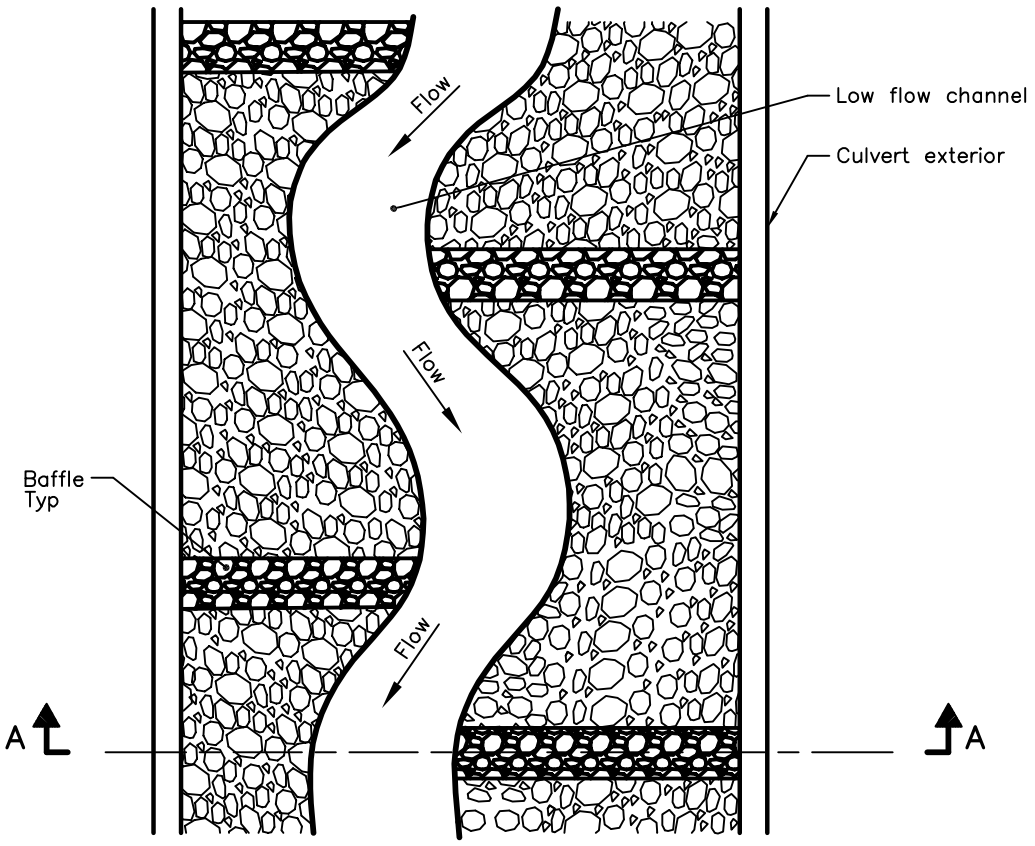


SECTION
LOW FLOW CHANNEL INSIDE OF CULVERT

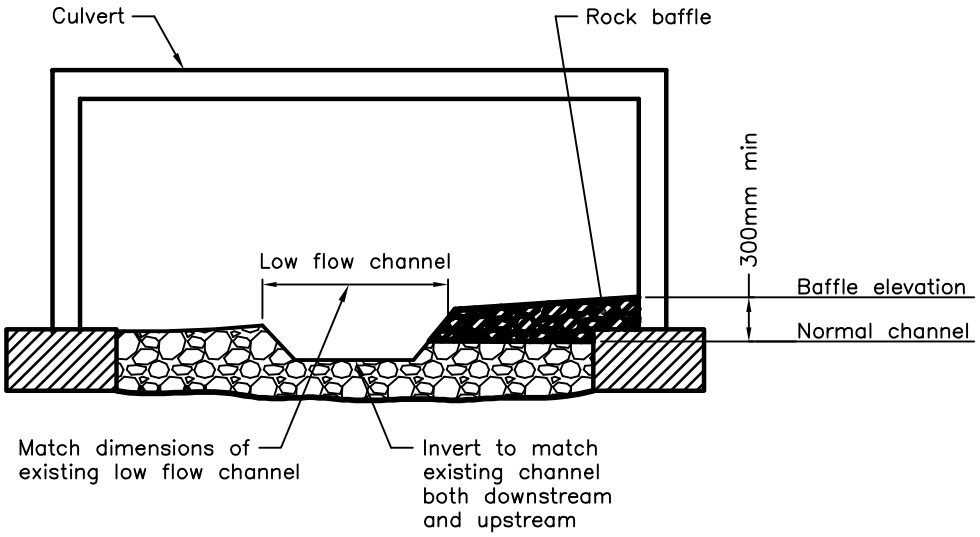


SECTION
LOW FLOW CHANNEL

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



PLAN

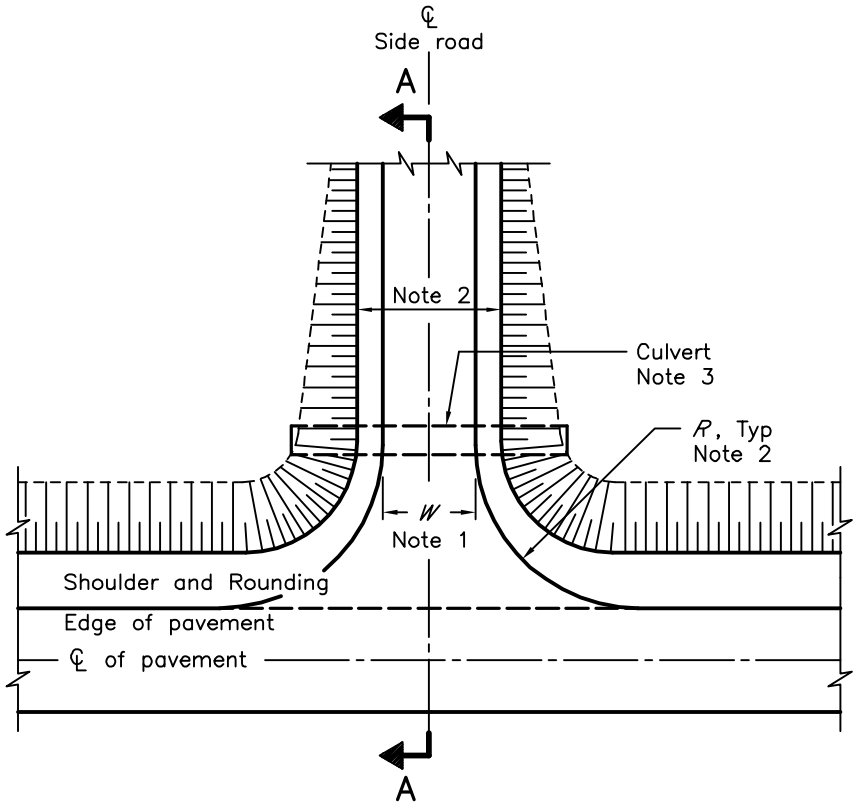


SECTIONAL A–A

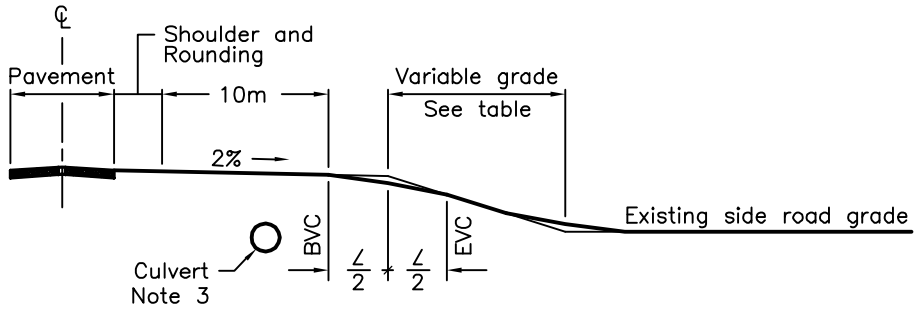
NOTES:

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 %	∠ 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:

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

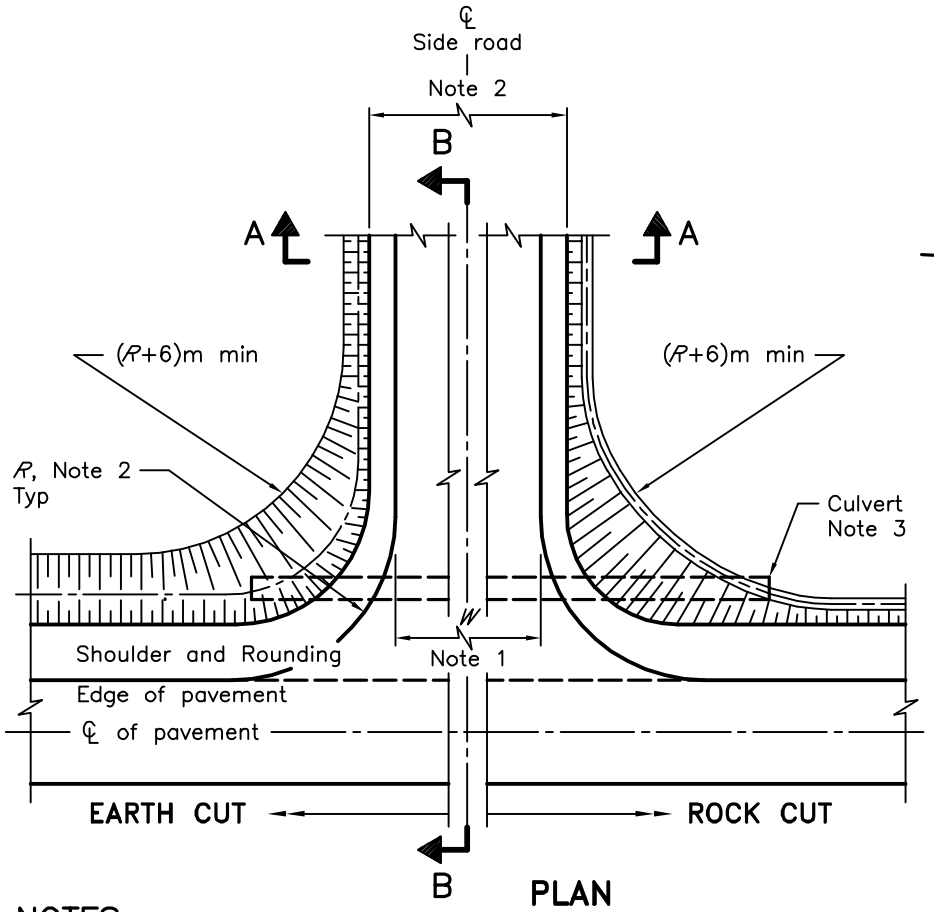
ONTARIO PROVINCIAL STANDARD DRAWING

SIDE ROAD INTERSECTION

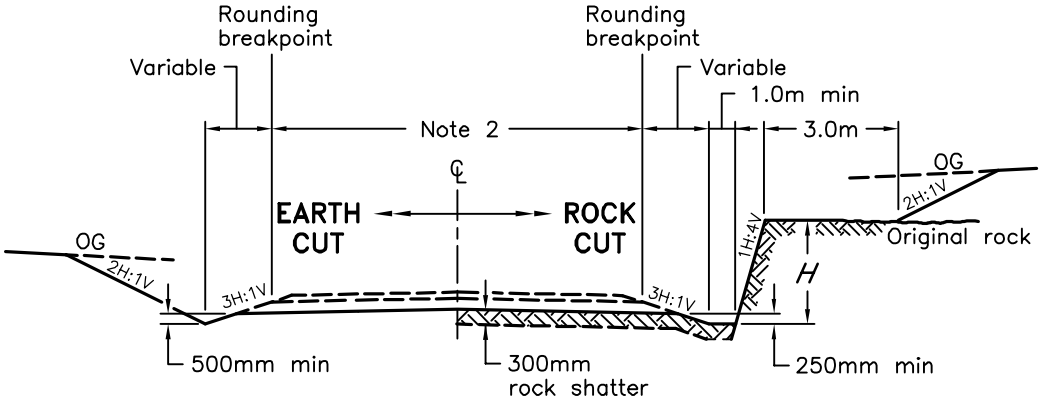
FILL

Nov 2011 | Rev 2

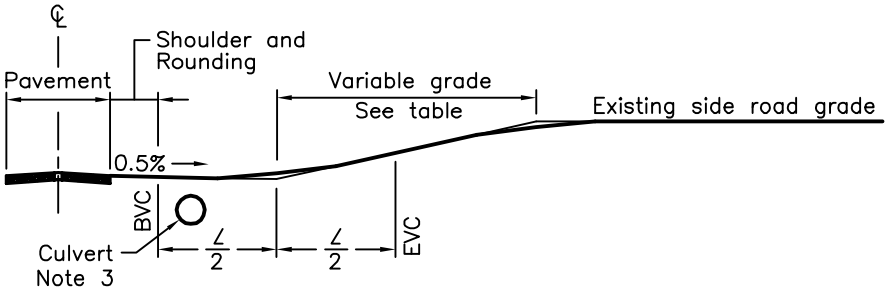
OPSD 300.010



PLAN

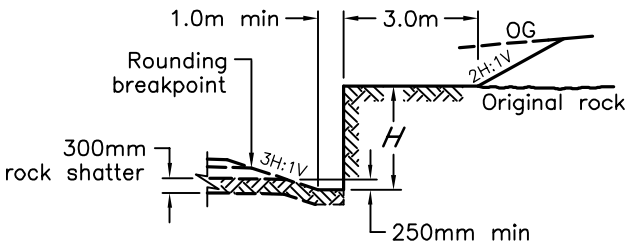


SECTION A–A



SECTION B–B

GRADE TABLE	
Upgrade %	∠ 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
∠ – Length of vertical curve
R – Side road radius
W – Pavement width

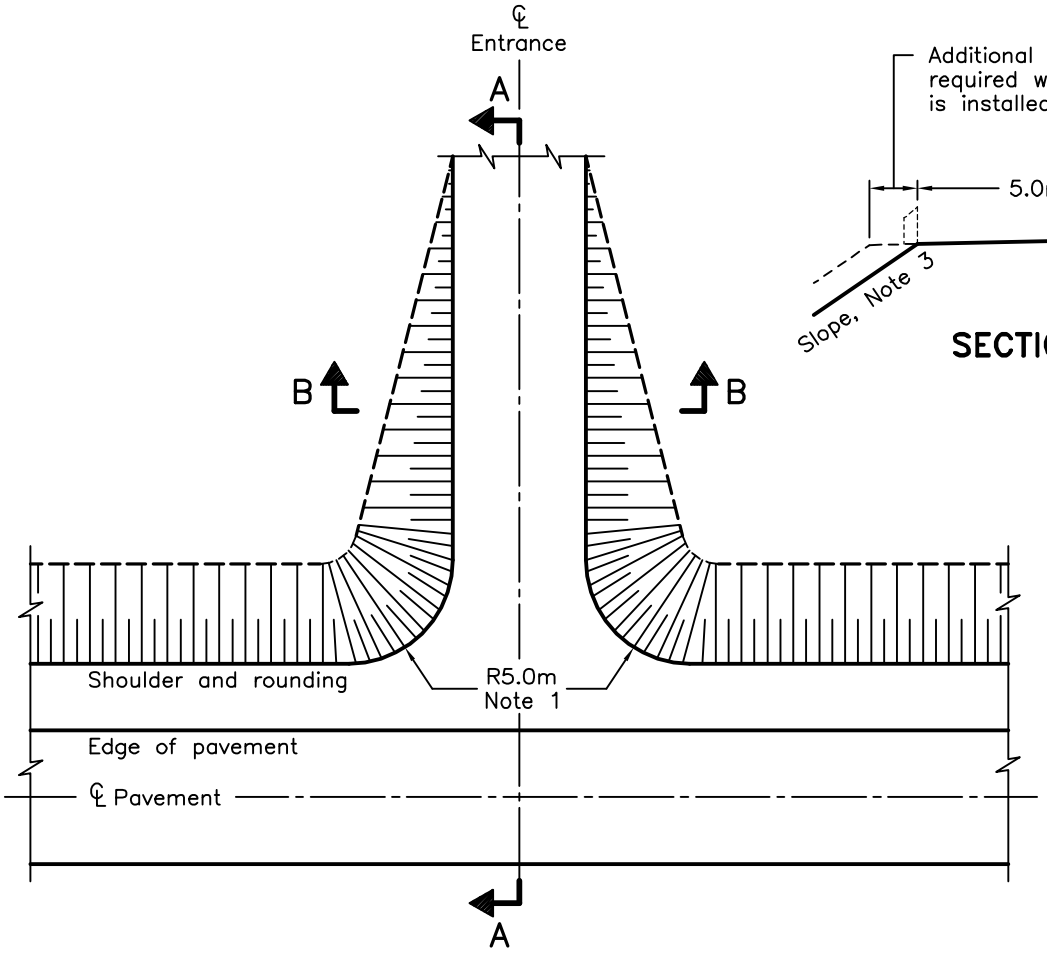
ONTARIO PROVINCIAL STANDARD DRAWING

SIDE ROAD INTERSECTION

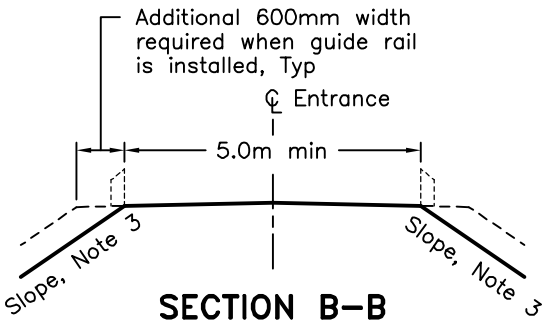
CUT

Nov 2011 | Rev 2

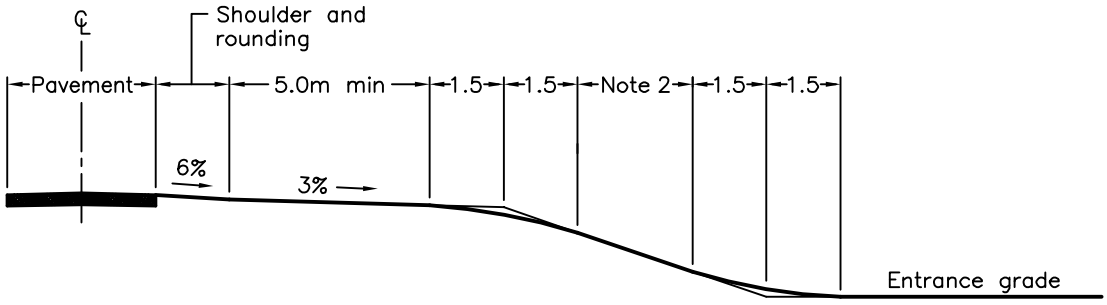
OPSD 300.020



PLAN



SECTION B–B



SECTION A–A

NOTES:

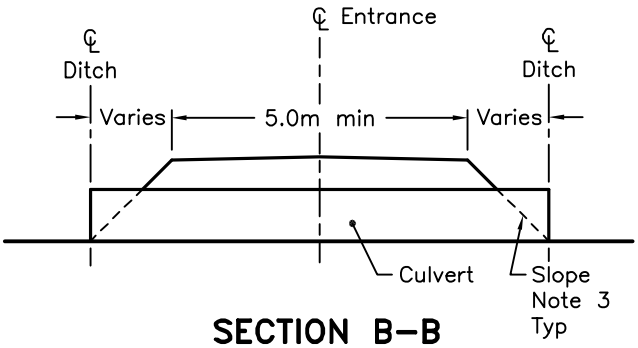
1 Radius shall be 8.0m when entrance is used for farm equipment.

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

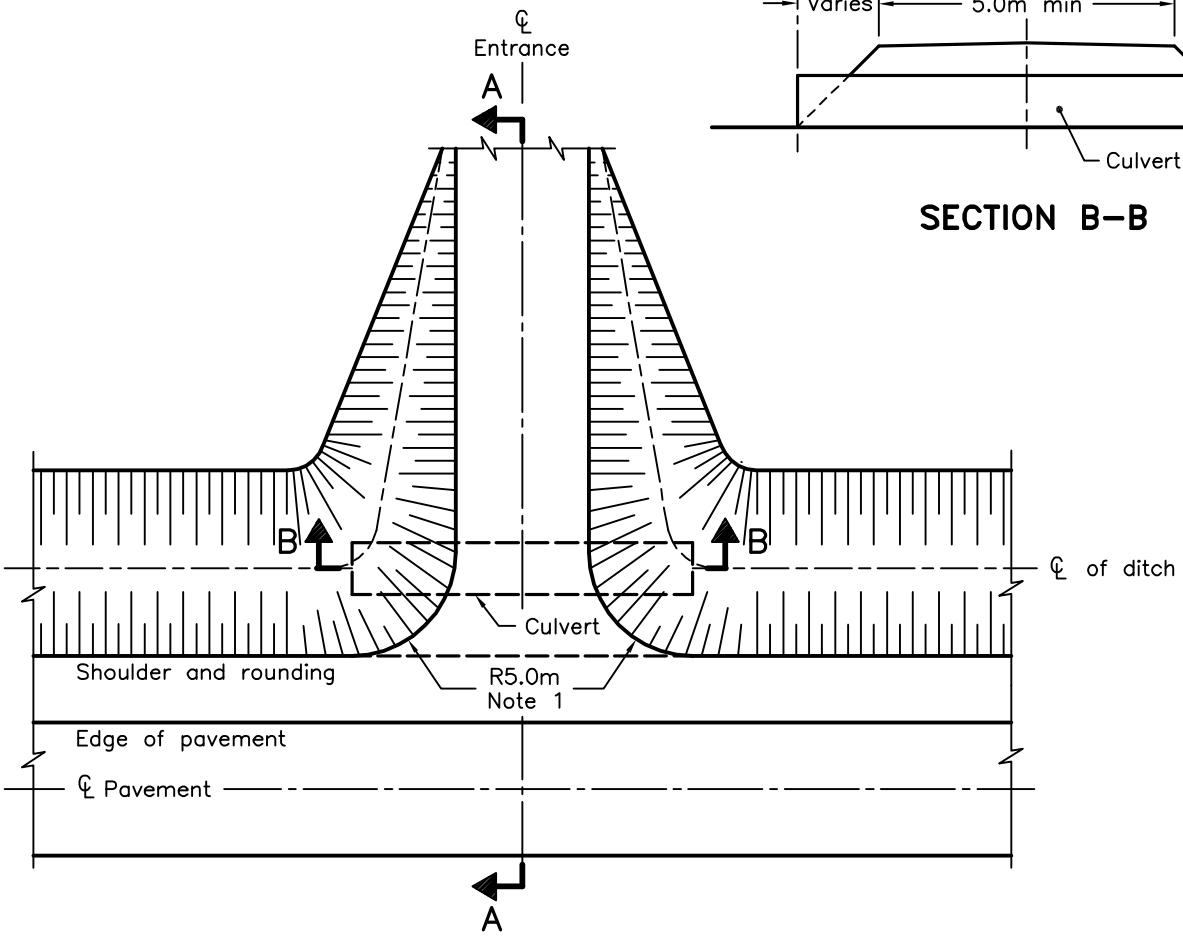
3 Slope shall be 3H:1V or flatter when specified.

A All dimensions are in metres unless otherwise shown.

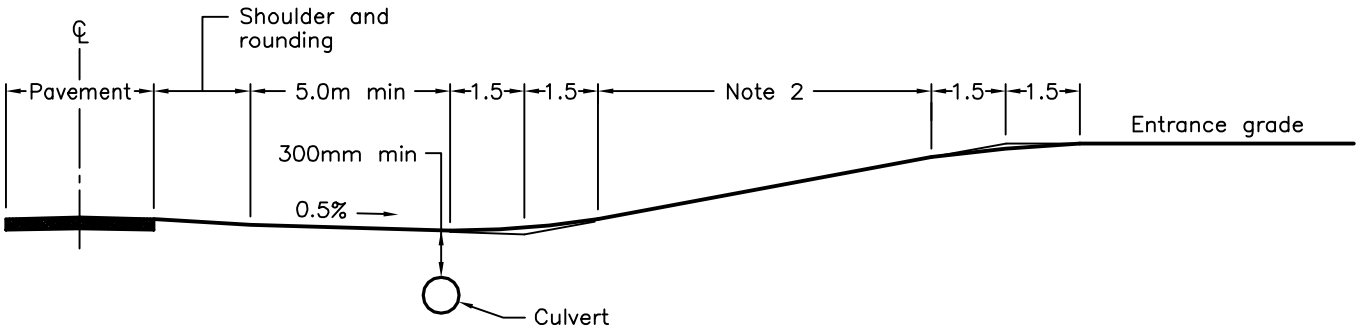
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	2
RURAL ENTRANCES TO ROADS ON FILL			
	OPSD 301.010		



SECTION B–B



PLAN

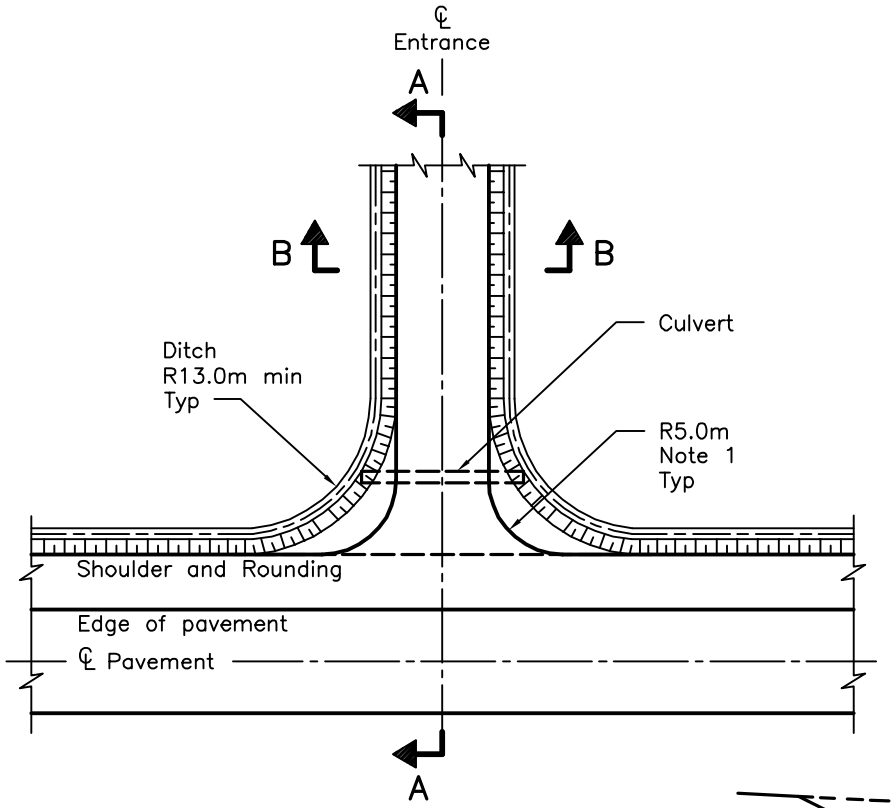


SECTION A–A

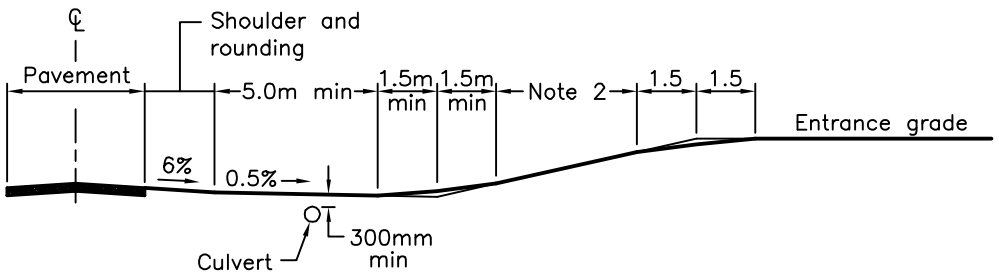
NOTES:

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.

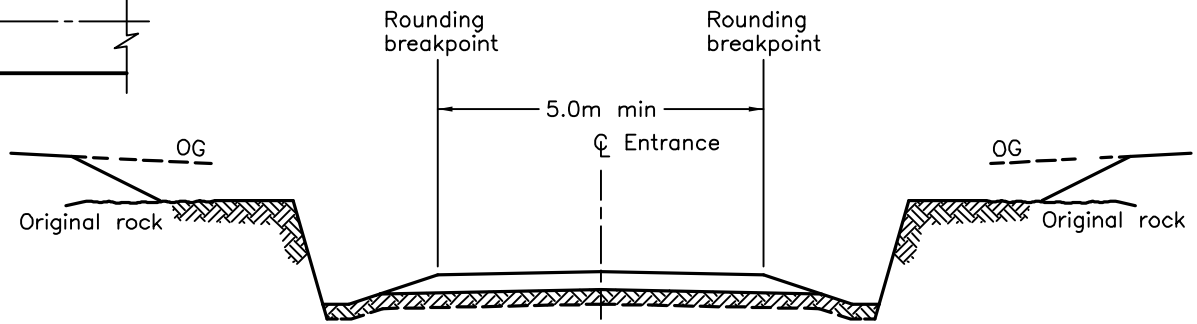
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	2
RURAL ENTRANCES TO ROADS IN EARTH CUT			
			OPSD 301.020



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.

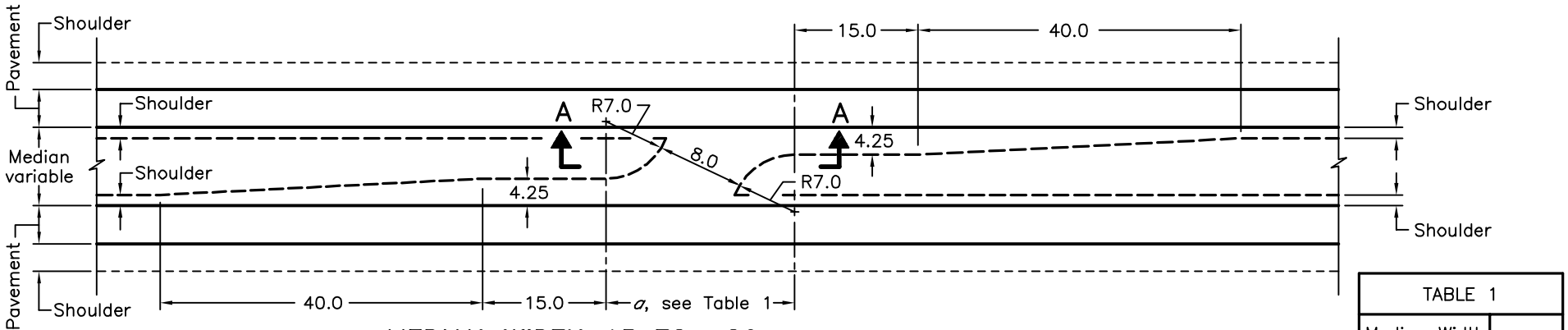
A All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

RURAL ENTRANCE
ROCK CUT

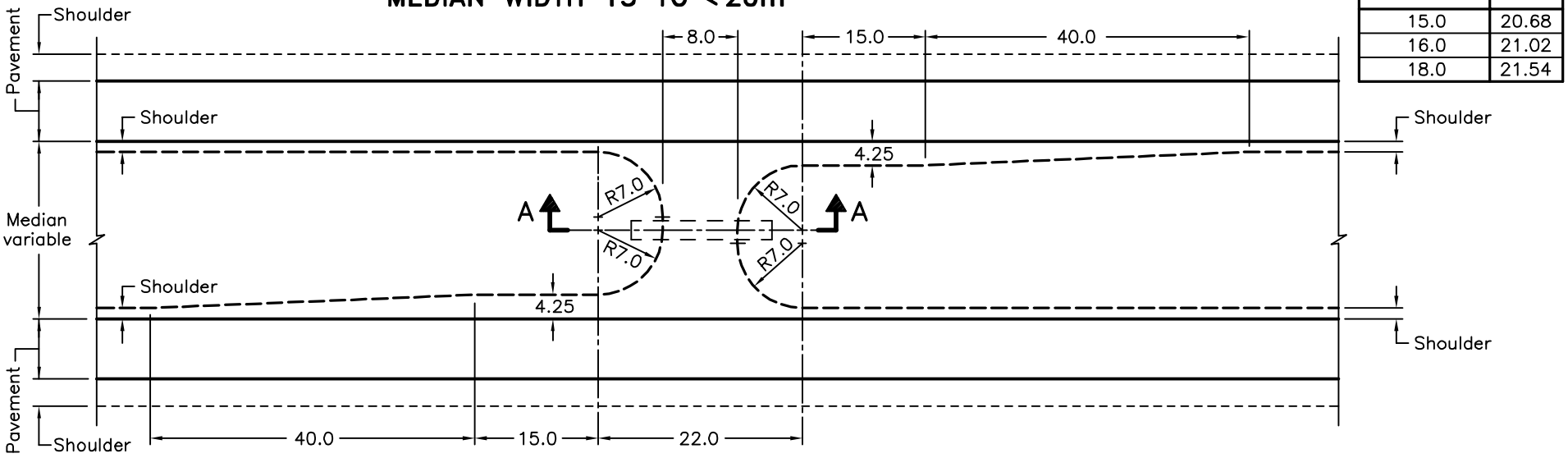
Nov 2010 | Rev 2

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



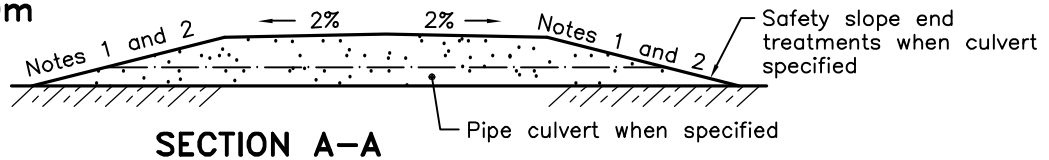
MEDIAN WIDTH ≥ 20m

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

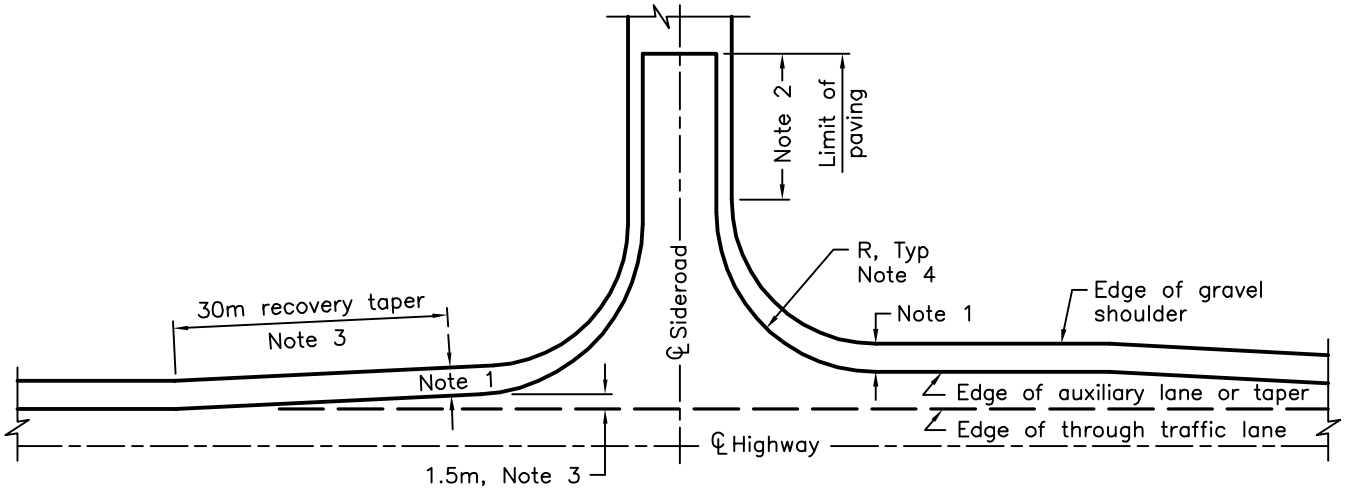
MEDIAN CROSSOVERS

FOR SERVICE AND EMERGENCY VEHICLES

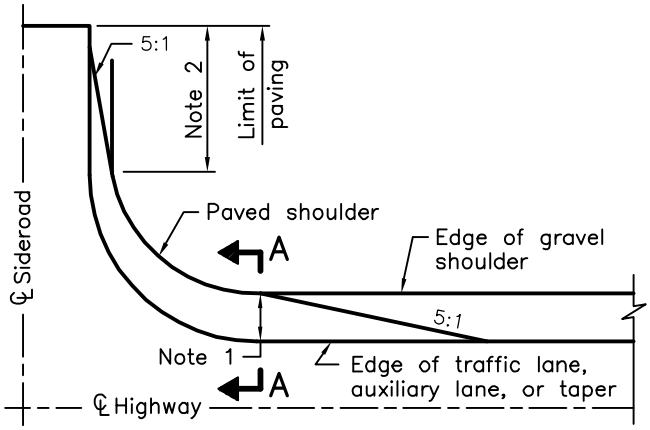
Nov 2015 | Rev 2

ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

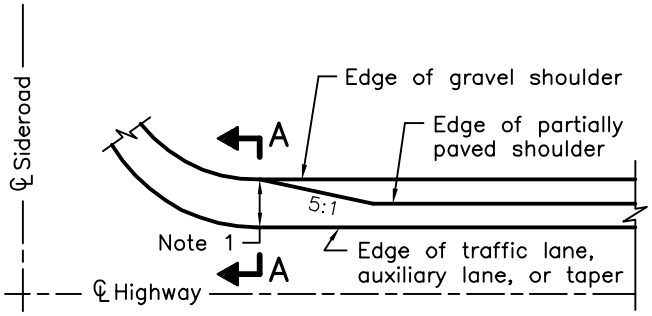
OPSD 302.010



PLAN A, AUXILIARY LANE OR TAPER – GRAVEL SHOULDER

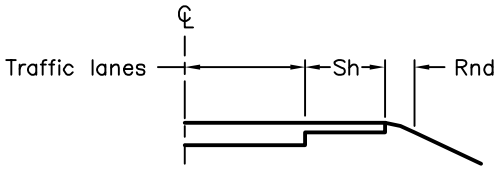


PAVED SHOULDER RADIUS WITH GRAVEL SHOULDER ON HIGHWAY

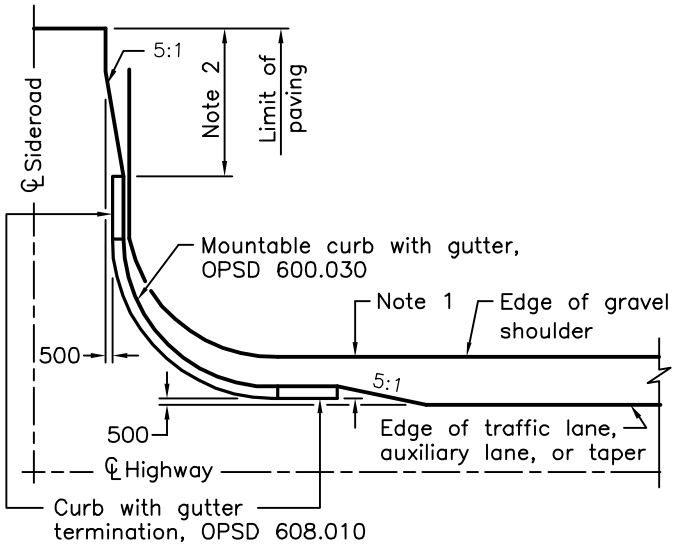


PAVED SHOULDER RADIUS WITH PARTIALLY PAVED SHOULDER ON HIGHWAY

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.

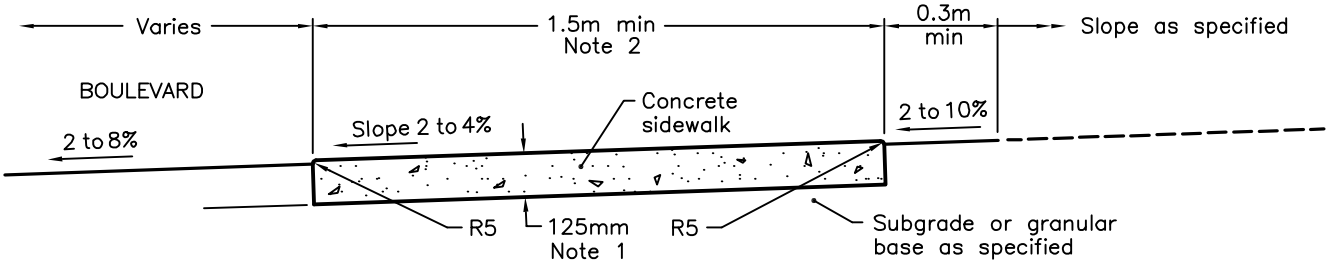
2 For gravel sideroad, distance shall be 15.0m.

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

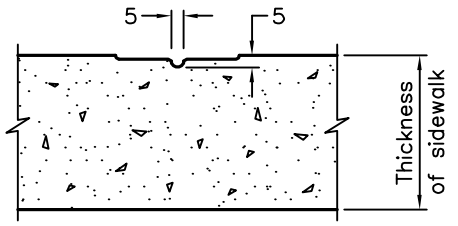
4 Sideroad radii as specified.

A All dimensions are in millimetres unless otherwise shown.

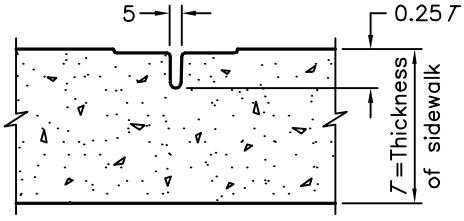
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev	1
# SHOULDER TREATMENT SIDEROAD INTERSECTIONS			
			OPSD 304.010



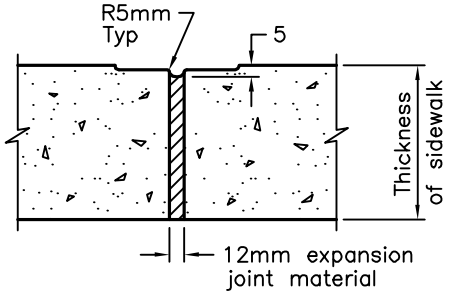
TYPICAL SECTION



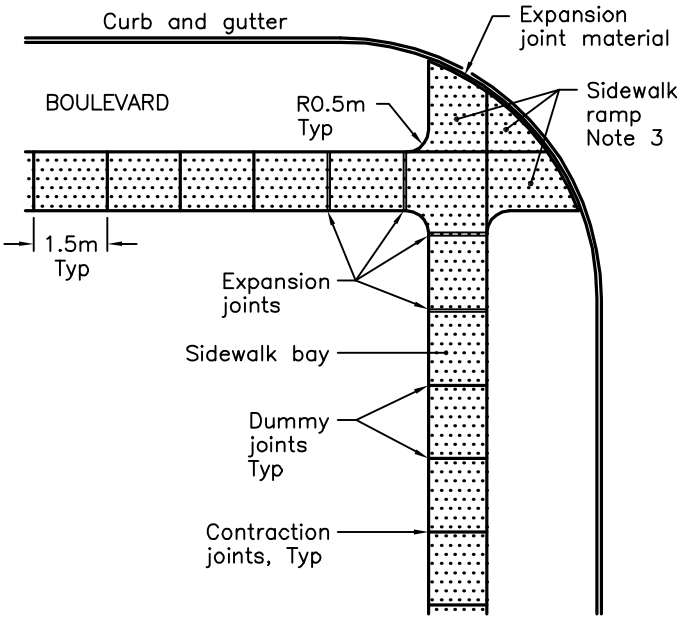
DUMMY JOINT (OPTIONAL)



CONTRACTION JOINT



EXPANSION JOINT



JOINT LAYOUT

NOTES:

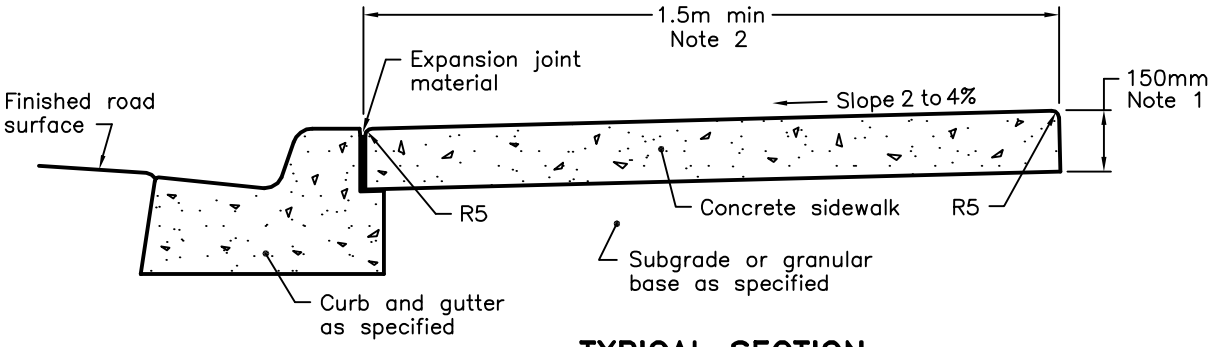
1 Sidewalk thickness at residential driveways and adjacent to curb shall be 150mm. At commercial and industrial driveways, the thickness shall be 200mm.

2 Sidewalk width shall be wider when specified.

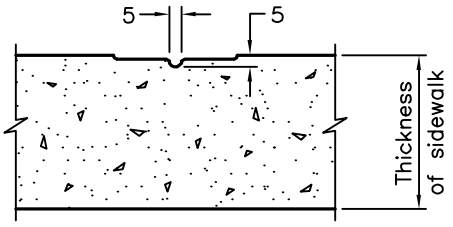
3 This OPSD shall be read in conjunction with OPSD 310.030, 310.031, 310.032, 310.033 and 310.039.

A All dimensions are in millimetres unless otherwise shown.

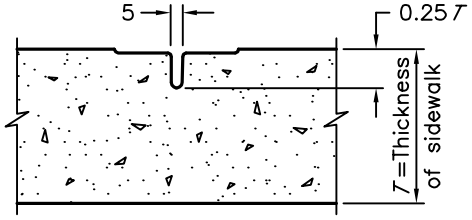
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
CONCRETE SIDEWALK			
	OPSD 310.010		



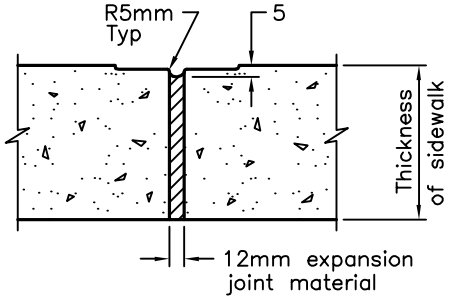
TYPICAL SECTION



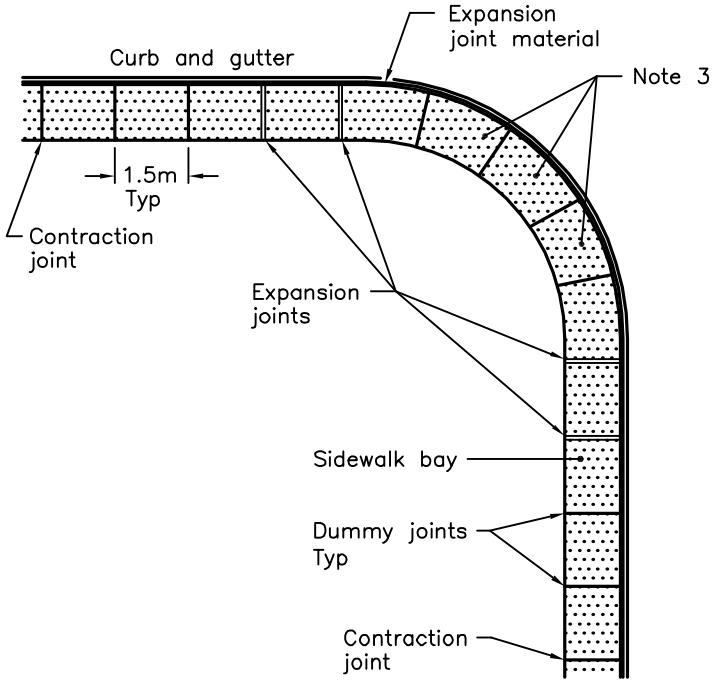
DUMMY JOINT



CONTRACTION JOINT



EXPANSION JOINT



JOINT LAYOUT

NOTES:

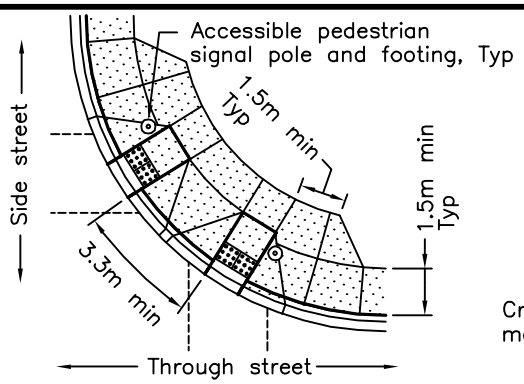
1 At commercial and industrial driveways, the thickness shall be 200mm.

2 Sidewalk width shall be wider when specified.

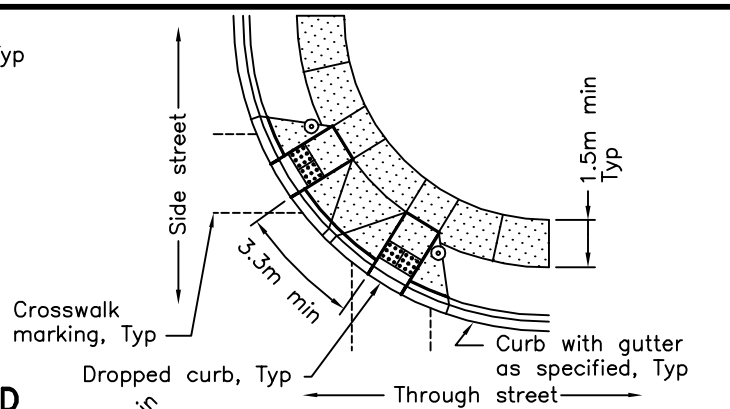
3 This OPSD shall be read in conjunction with OPSD 310.030, 310.031, 310.032, 310.033 and 310.039.

A All dimensions are in millimetres unless otherwise shown.

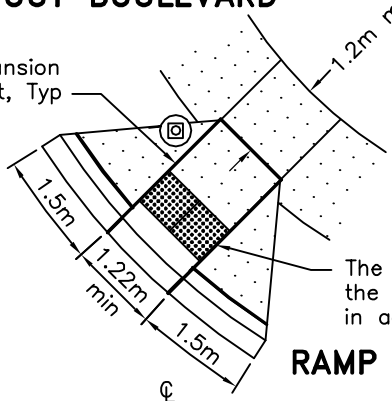
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
CONCRETE SIDEWALK ADJACENT TO CURB AND GUTTER			
			OPSD 310.020



DOUBLE RAMP WITHOUT BOULEVARD

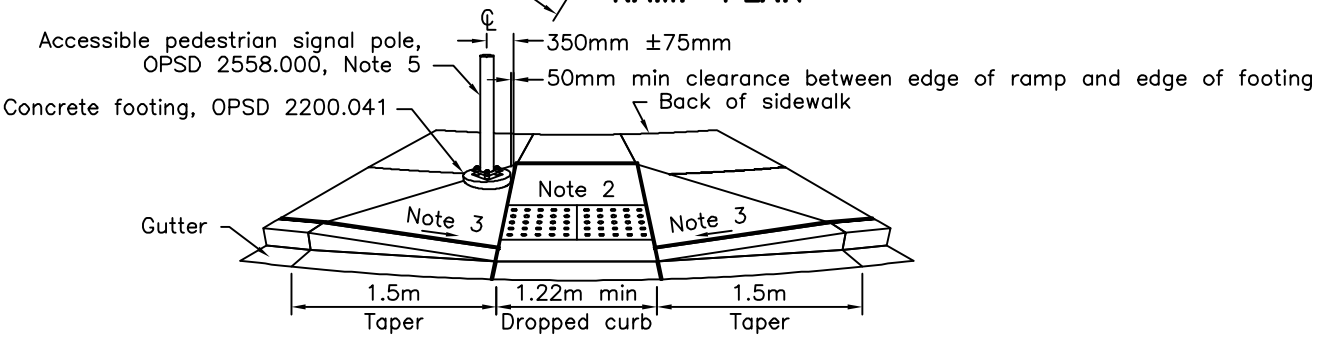


DOUBLE RAMP WITH BOULEVARD

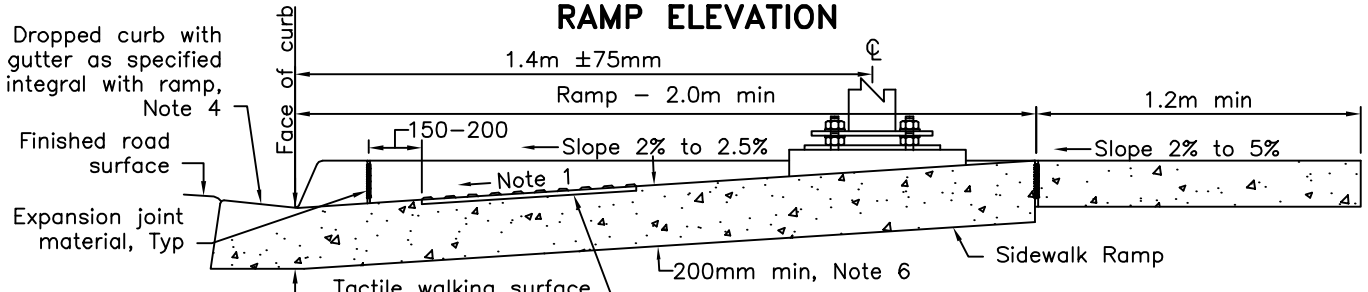


The plates shall extend the entire width of the sidewalk ramp at a minimum length of 610mm, in accordance with OPSD 310.039

RAMP PLAN



RAMP ELEVATION



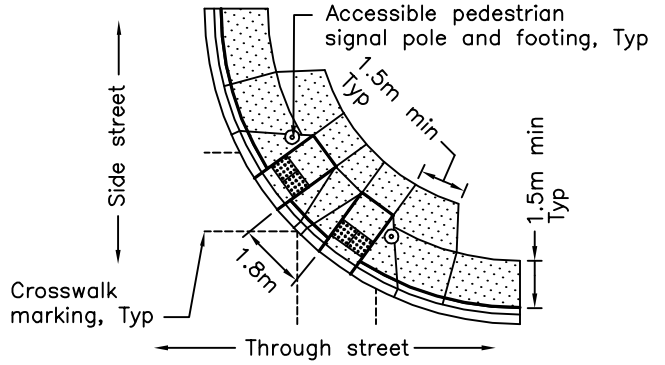
RAMP SECTION

NOTES:

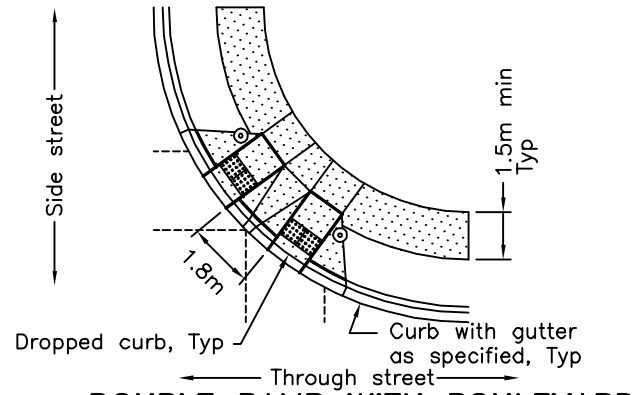
1 Slope of ramp shall not exceed 8%.
2 Cross slope of ramp shall not exceed 2% in either direction.
3 Cross slope of flared side of ramp shall not exceed 8%.
4 Dropped curb at ramp shall be modified to eliminate 30 mm step at gutter.
5 Accessible pedestrian signal to have tactile arrow that aligns with 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.

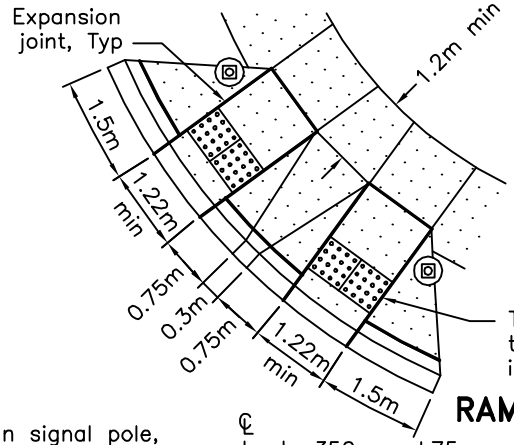
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	1
# CONCRETE SIDEWALK RAMPS AT SIGNALIZED INTERSECTIONS			
	OPSD 310.030		



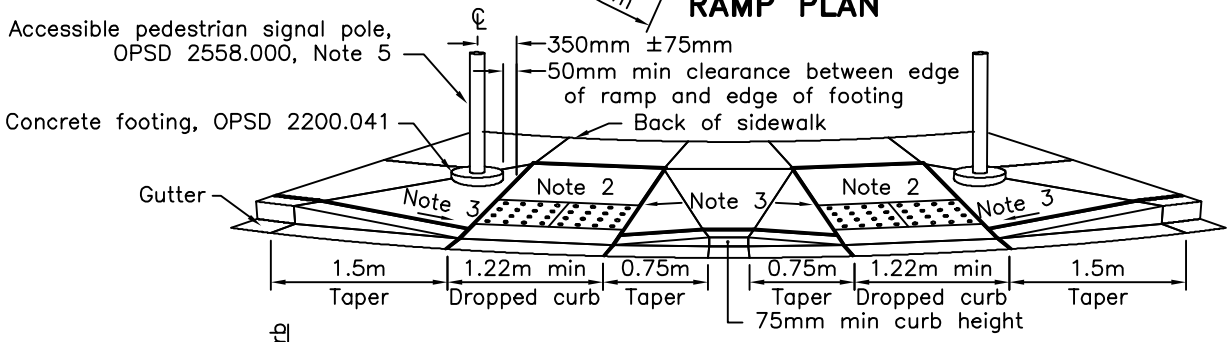
DOUBLE RAMP WITHOUT BOULEVARD



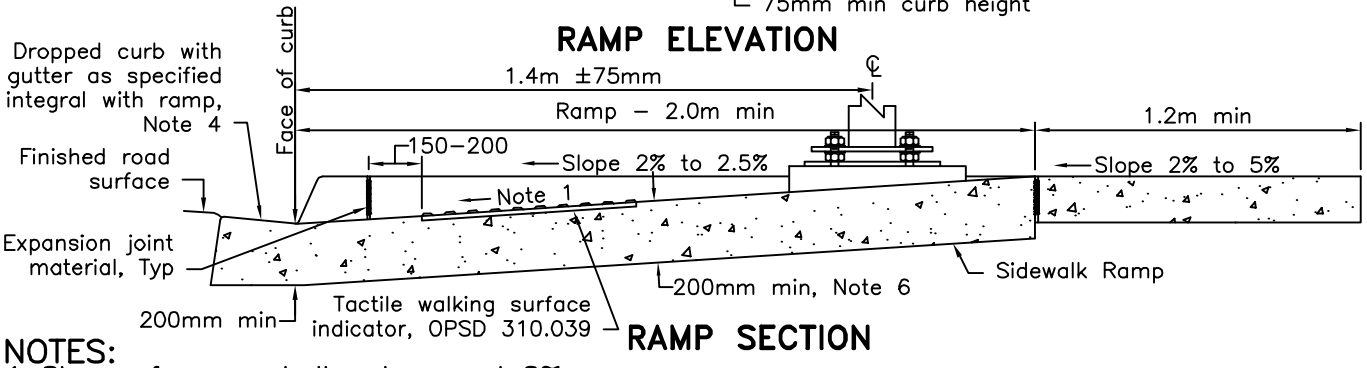
DOUBLE RAMP WITH BOULEVARD



RAMP PLAN



RAMP ELEVATION



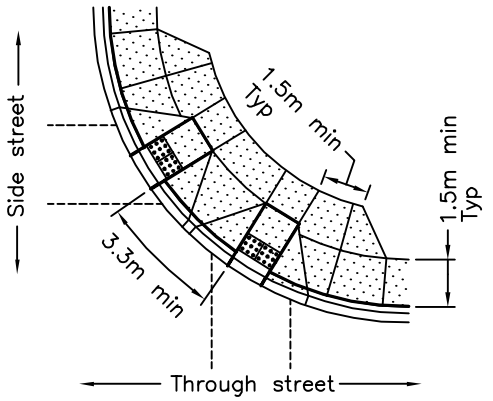
RAMP SECTION

NOTES:

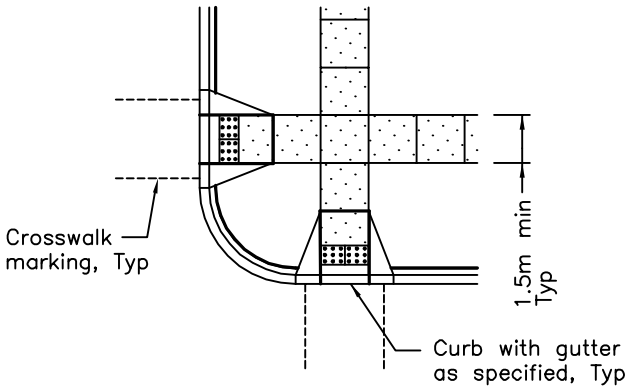
1 Slope of ramp shall not exceed 8%.
2 Cross slope of ramp shall not exceed 2% in either direction.
3 Cross slope of flared side of ramp shall not exceed 8%.
4 Dropped curb at ramp shall be modified to eliminate 30 mm step at gutter line.
5 Accessible pedestrian signal to have tactile arrow that aligns 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.

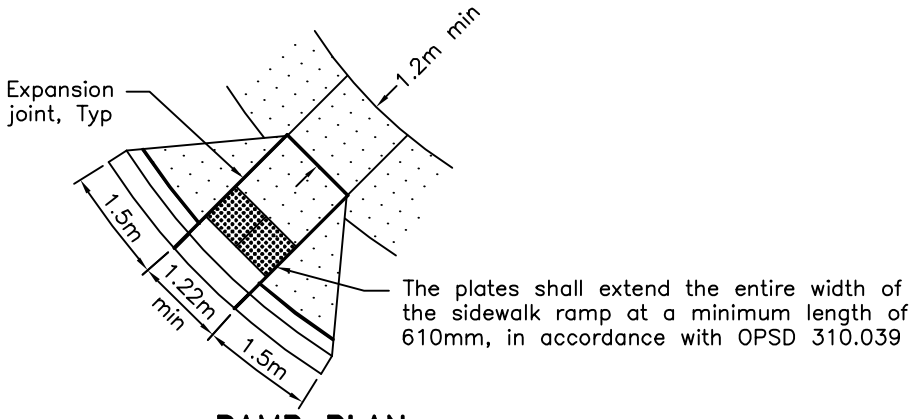
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	0
# CONCRETE SIDEWALK RAMPS AT SIGNALIZED INTERSECTIONS WITH INTERSECTING CROSSWALKS			
	OPSD 310.031		



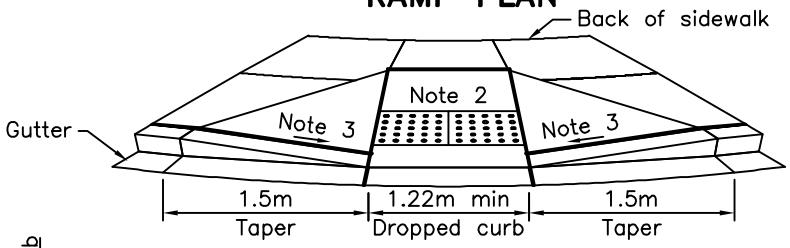
DOUBLE RAMP WITHOUT BOULEVARD



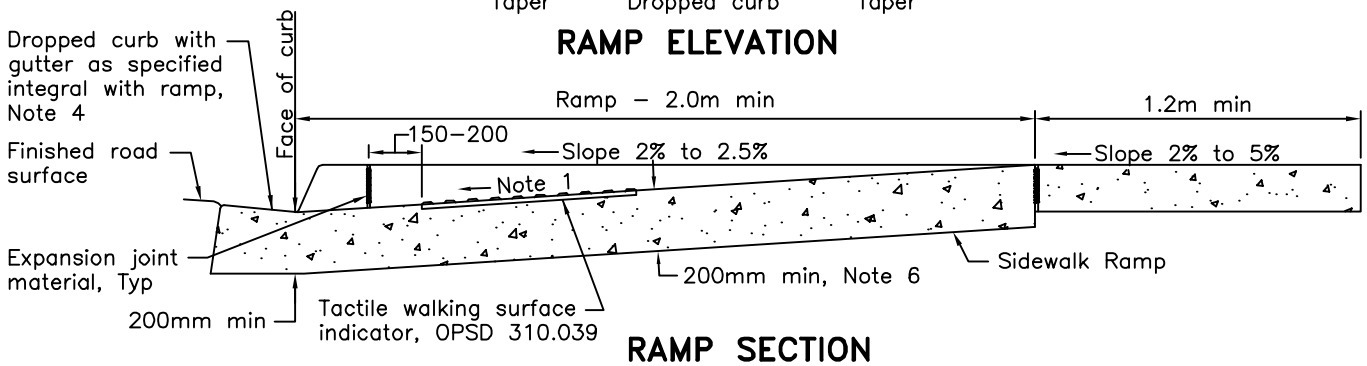
RAMPS WITH BOULEVARD



RAMP PLAN



RAMP ELEVATION

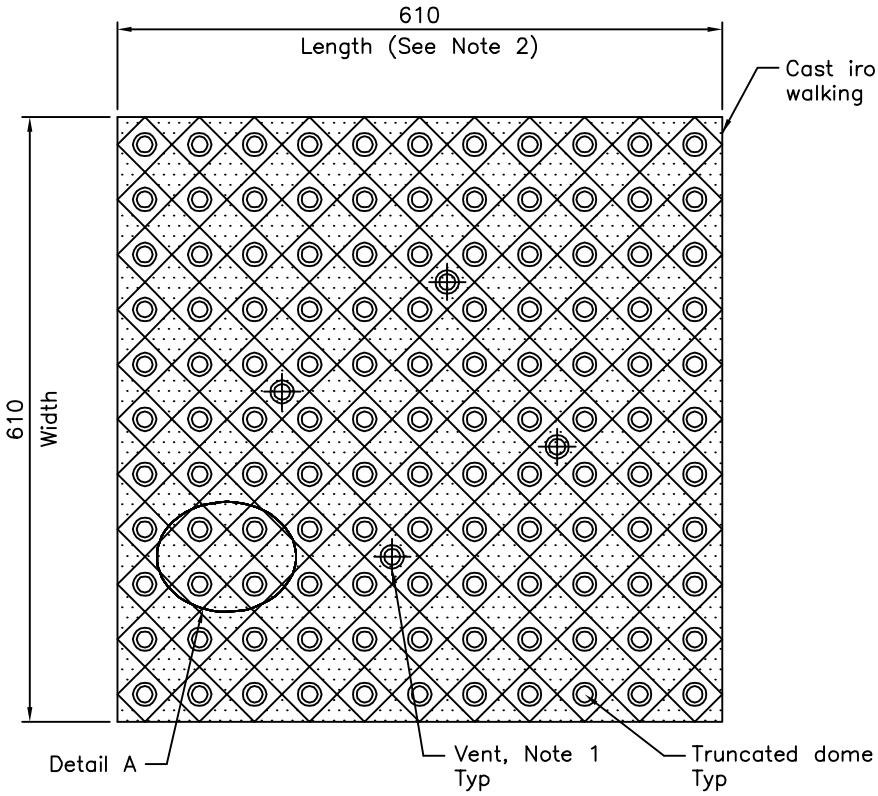


RAMP SECTION

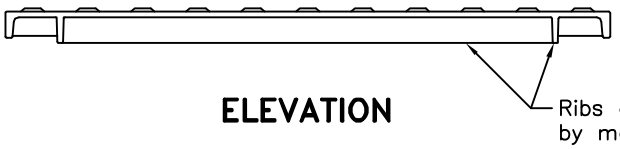
NOTES:

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.

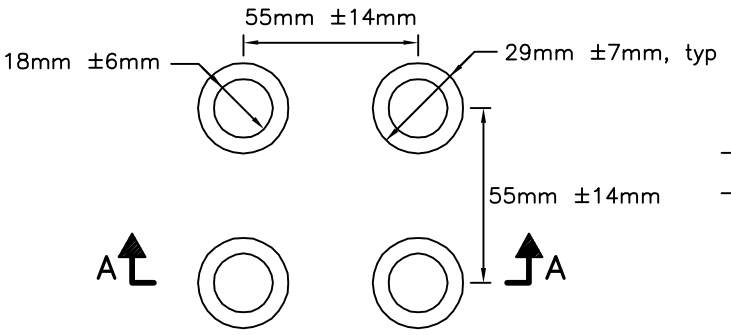
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	0
CONCRETE SIDEWALK RAMPS AT UNSIGNALIZED INTERSECTIONS			
	OPSD 310.033		



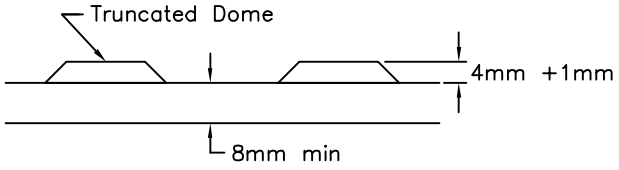
PLAN



ELEVATION



DETAIL A
TRUNCATED DOMES PLAN

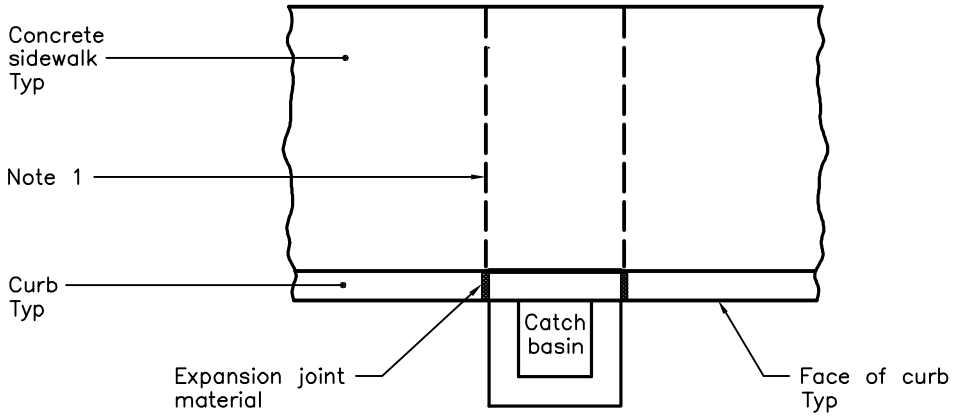


SECTION A–A

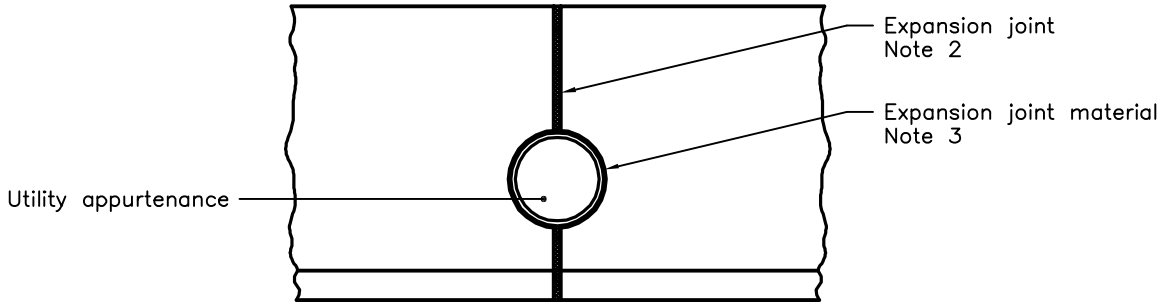
NOTES:

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.

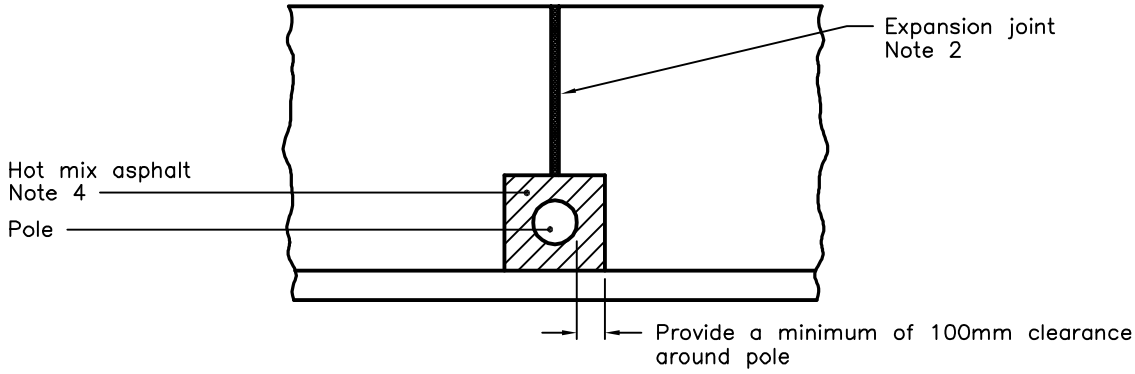
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	0
CONCRETE SIDEWALK RAMPS TACTILE WALKING SURFACE INDICATORS COMPONENT			
	OPSD 310.039		



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.

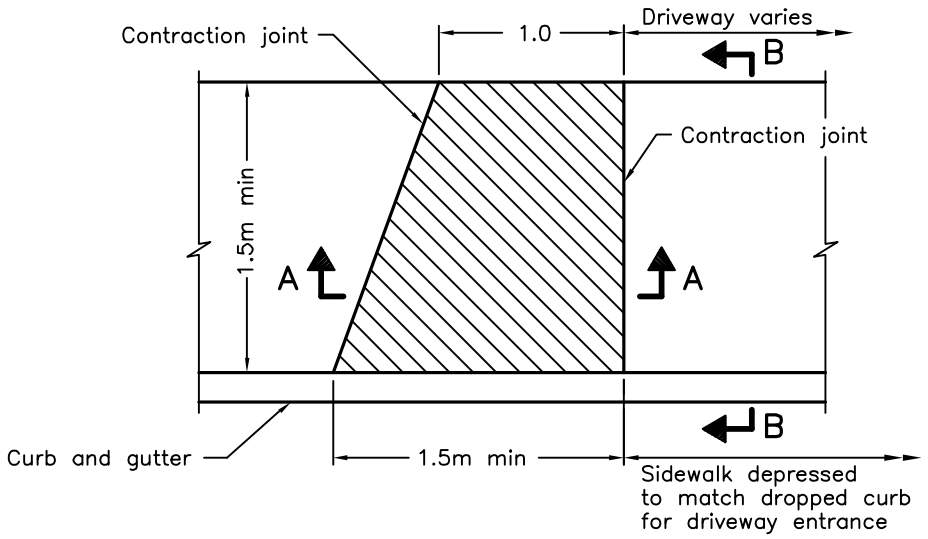
3 Expansion joint material shall be placed around Utility appurtenance flush with concrete surface.

4 For concrete alternative use expansion joint material around boxout.

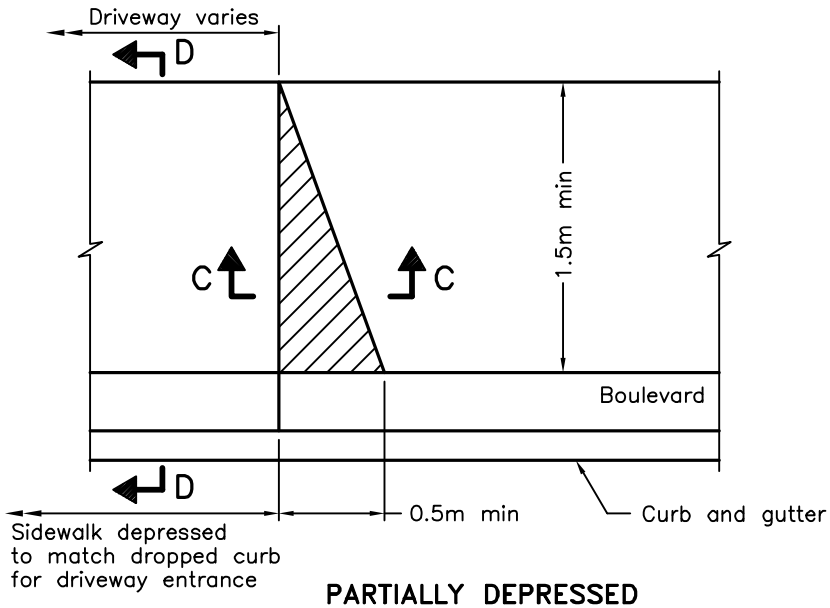
A For expansion joint detail, see OPSD 310.010.

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		

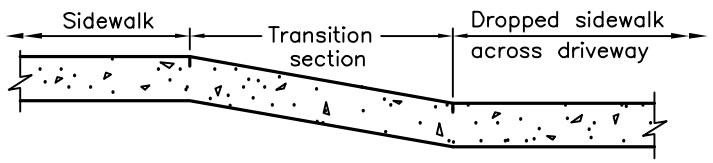


FULLY DEPRESSED

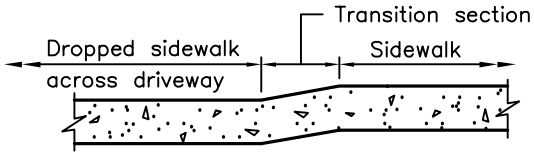


PARTIALLY DEPRESSED

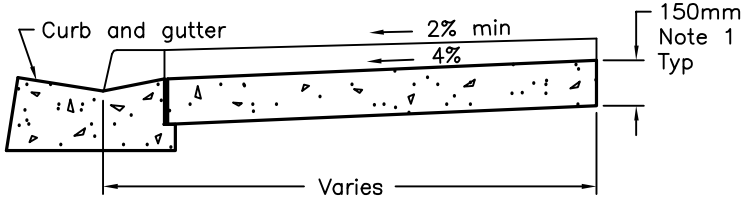
PLAN



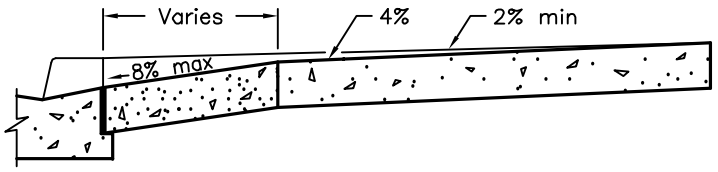
SIDEWALK WITHOUT BOULEVARD
SECTION A–A



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.

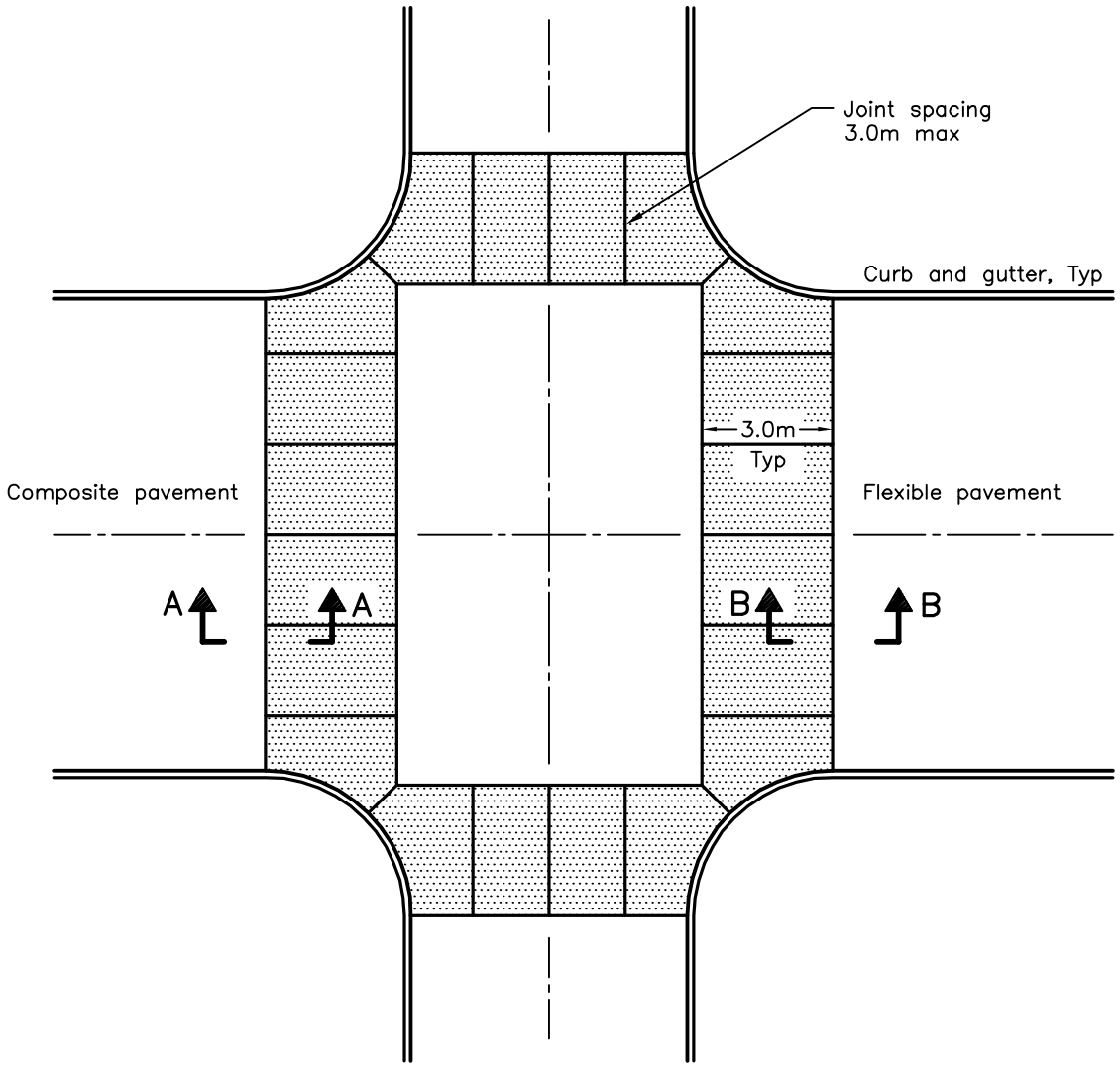
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

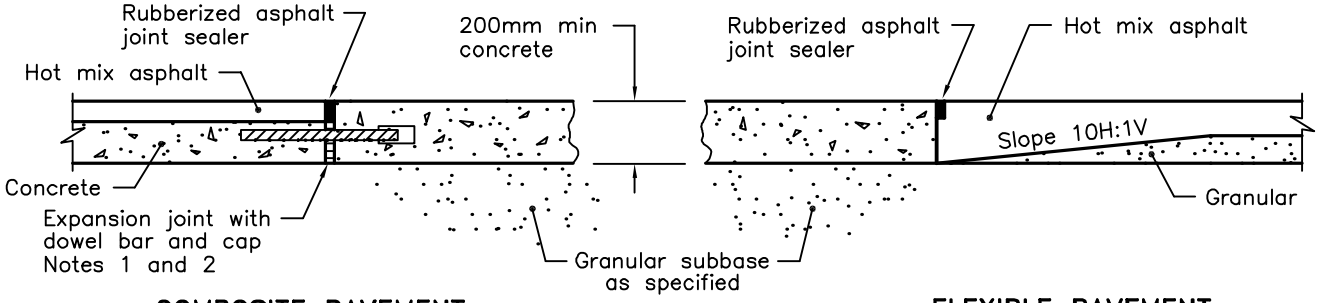
CONCRETE SIDEWALK DRIVEWAY ENTRANCE DETAILS

Nov 2015 | Rev 2

OPSD 310.050



PLAN



COMPOSITE PAVEMENT
SECTION A–A

FLEXIBLE PAVEMENT
SECTION B–B

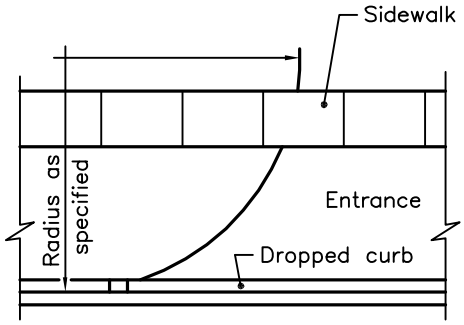
NOTES:

1 For expansion joint detail, see OPSD 552.020.

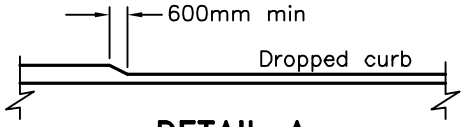
2 Dowel bar with cap shall be installed at 300mm centres.

A All dimensions are in millimetres unless otherwise shown.

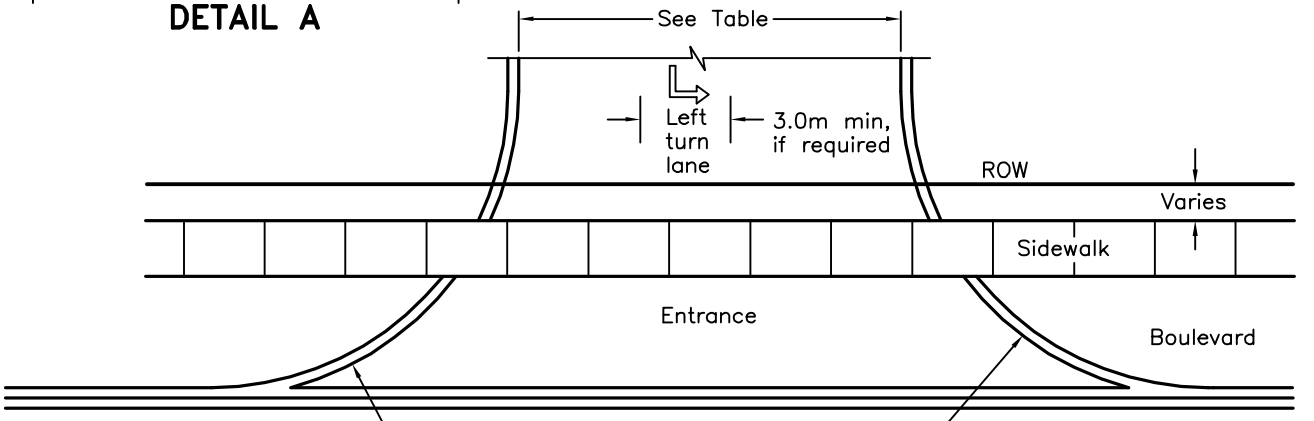
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
JOINT DETAIL FOR CONCRETE PEDESTRIAN CROSSWALK AT SIGNALIZED AND ALL–WAY STOP CONTROLLED INTERSECTIONS			
	OPSD 310.060		



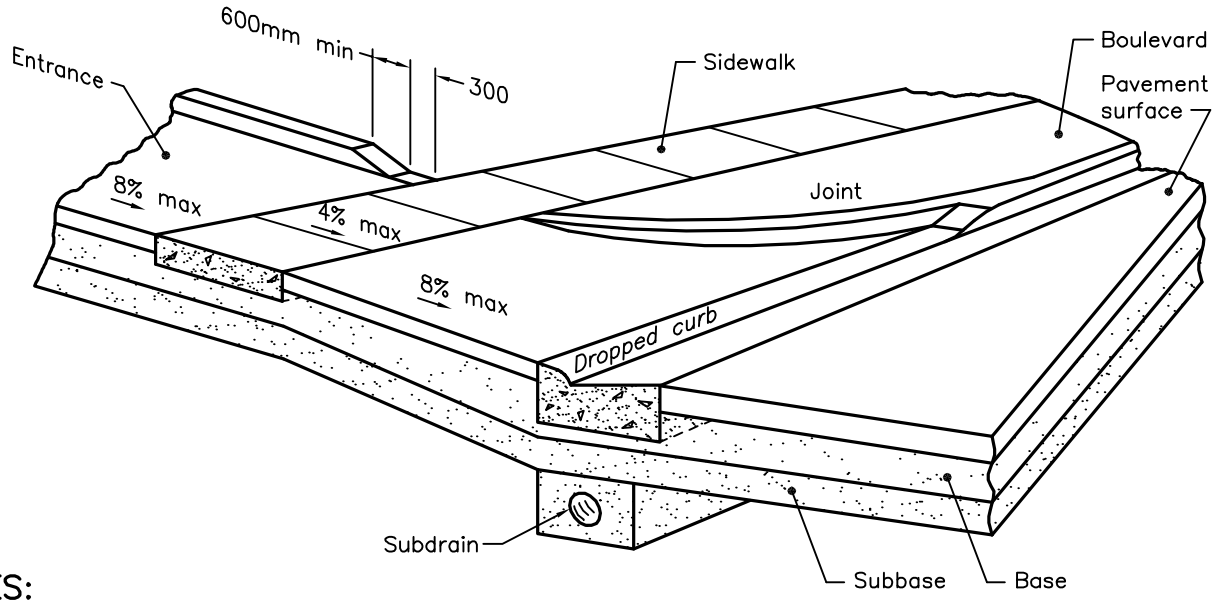
DRIVEWAY DIMENSIONS						
LAND USE	WIDTH m				RADIUS m	
	One–Way		Two–Way			
	min	max	min	max	min	max
Light Industrial, Commercial, and Apartment	4.5	7.5	7.2	12.0	4.5	12.0
Heavy Industrial	5.0	9.0	9.0	15.0	9.0	15.0



DETAIL A



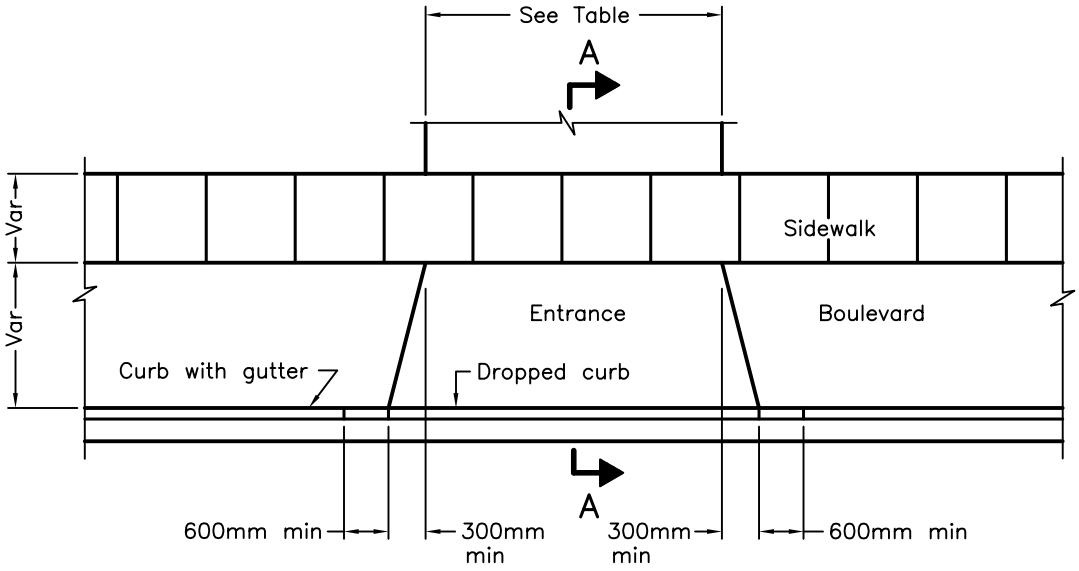
PLAN



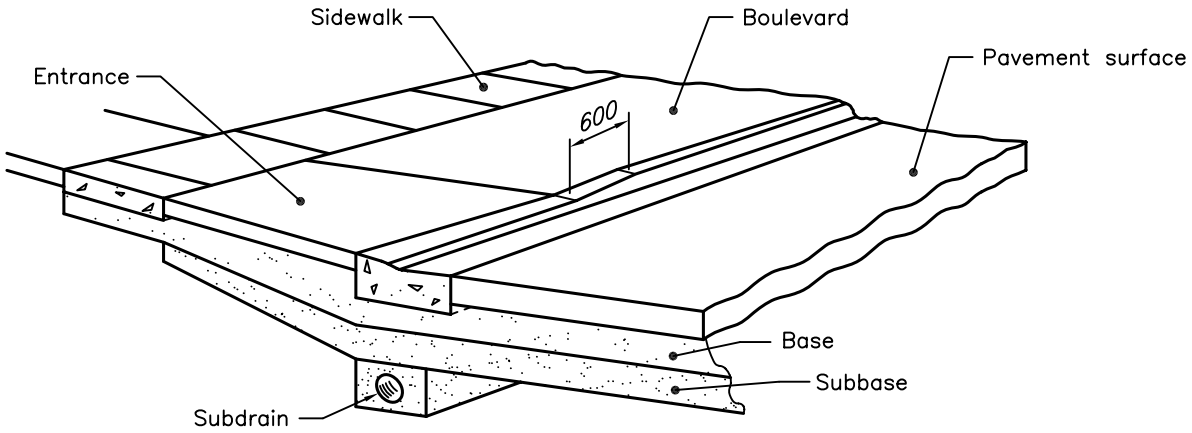
NOTES:

A All dimensions are in millimetres unless otherwise shown.

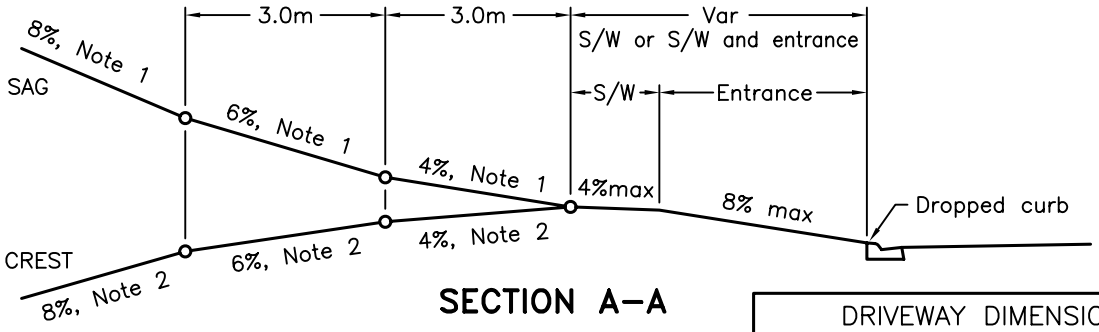
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev	1
URBAN INDUSTRIAL, COMMERCIAL, AND APARTMENT ENTRANCES			
	OPSD 350.010		



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

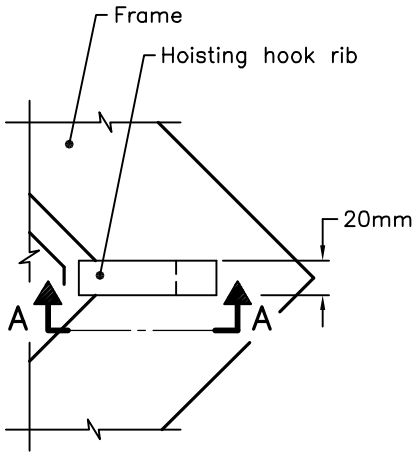
NOTES:

1 Maximum upgrade shall be 10%.

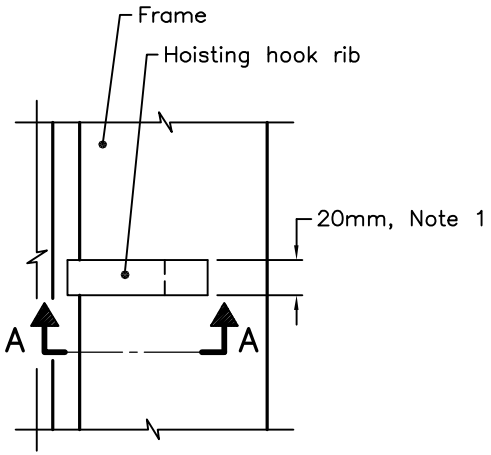
2 Maximum downgrade shall be 8%.

A All dimensions are in millimetres unless otherwise shown.

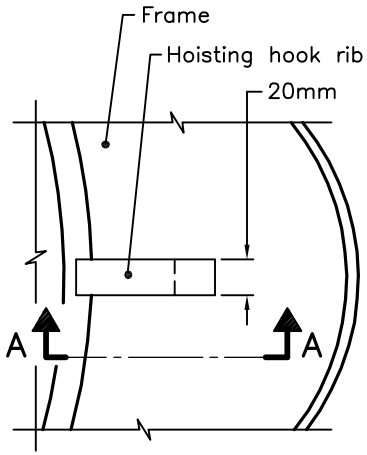
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev	1
URBAN RESIDENTIAL ENTRANCE			
	OPSD 351.010		



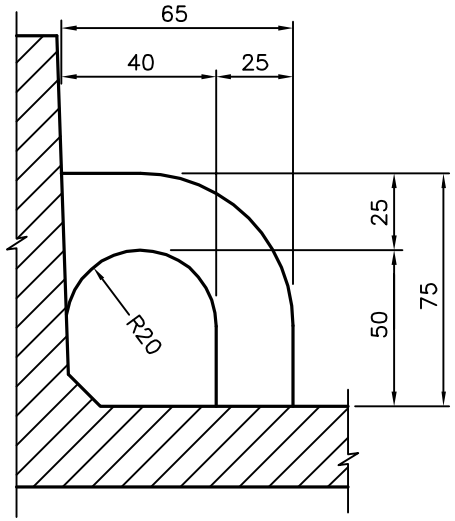
SQUARE FRAME PLAN
SQUARE CORNER



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.

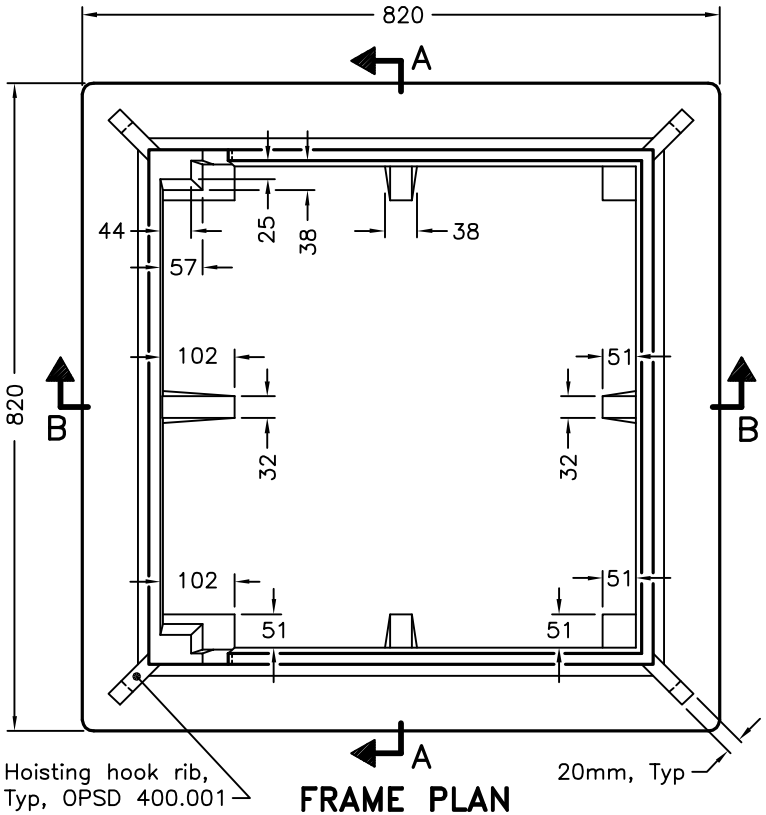
ONTARIO PROVINCIAL STANDARD DRAWING

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

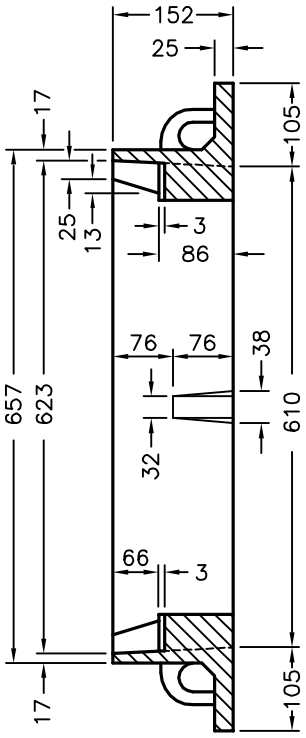
Nov 2013	Rev	1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

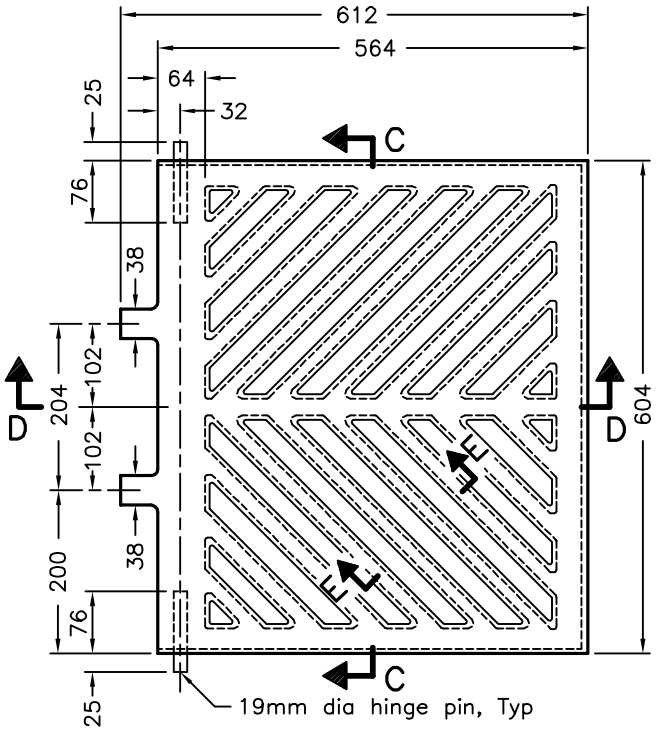
OPSD 400.001



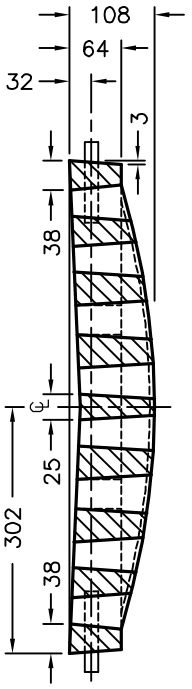
FRAME PLAN



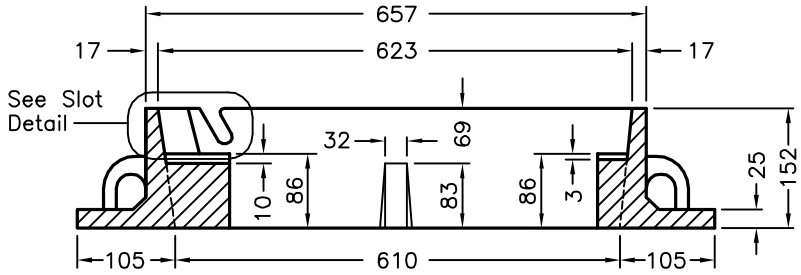
SECTION A–A



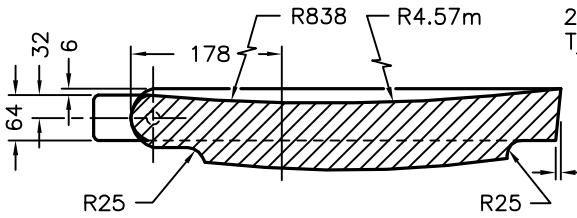
GRATE PLAN



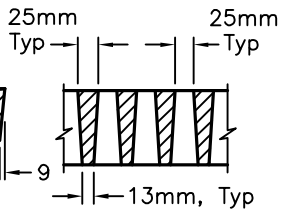
SECTION C–C



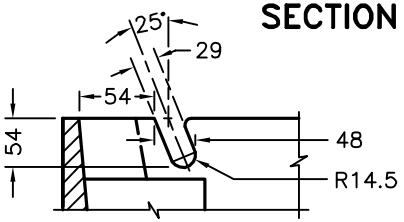
SECTION B–B



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.

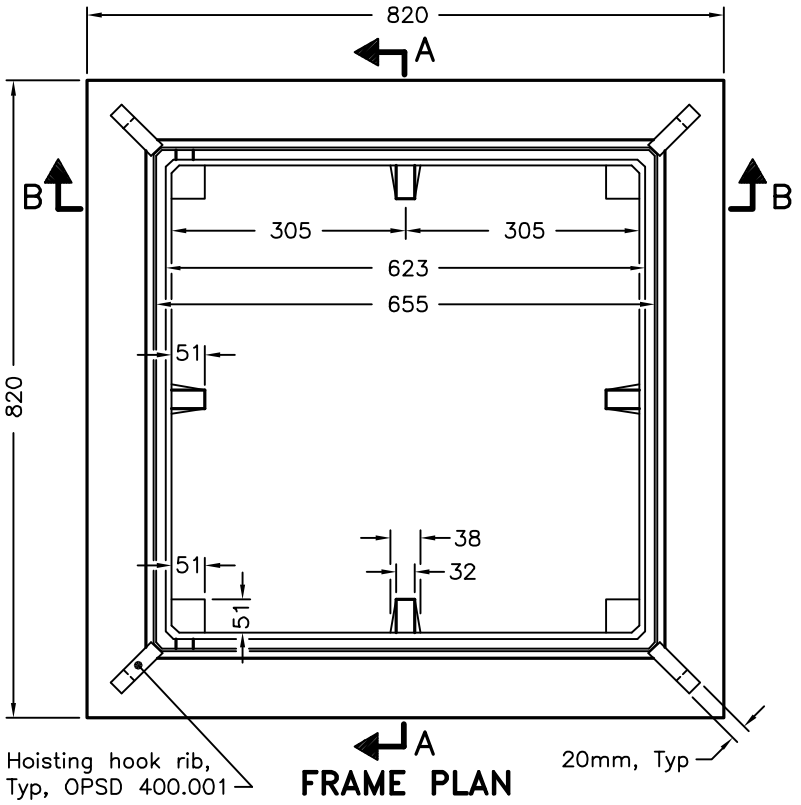
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 | Rev 2

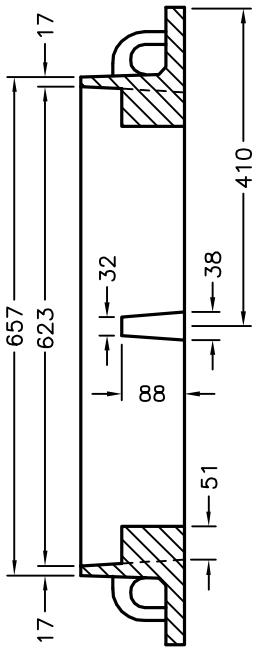
CAST IRON, SQUARE FRAME WITH SQUARE OVERFLOW TYPE DISHED GRATE FOR CATCH BASINS, HERRING BONE OPENINGS

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

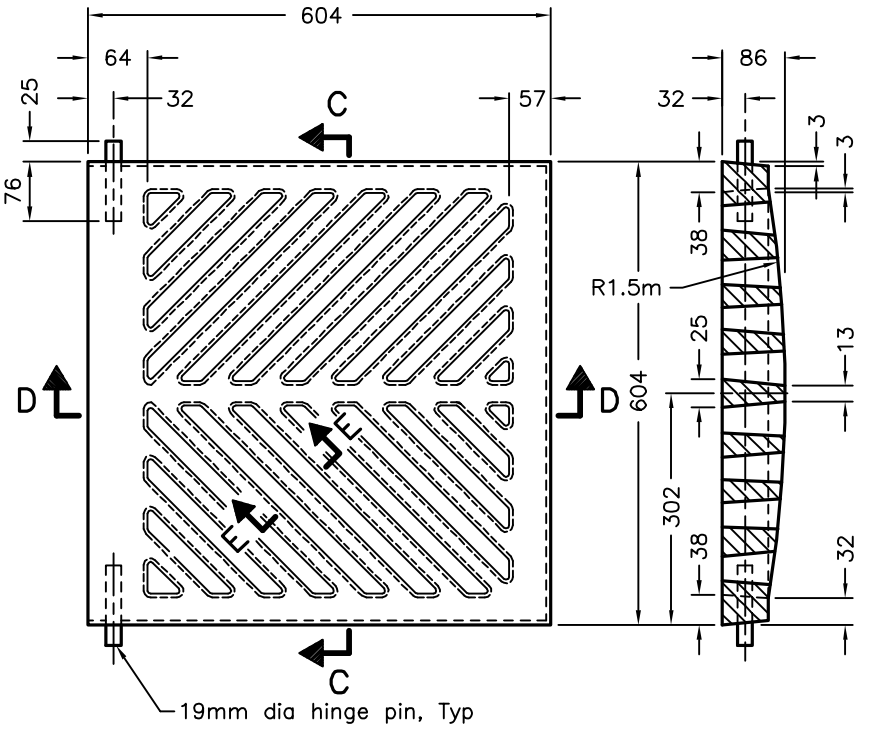
OPSD 400.010



FRAME PLAN

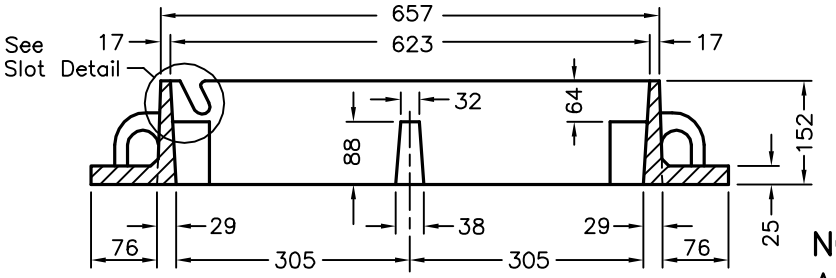


SECTION A–A

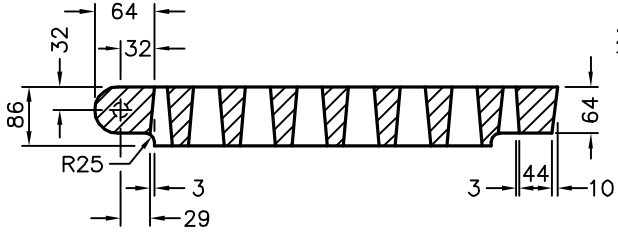


GRATE PLAN

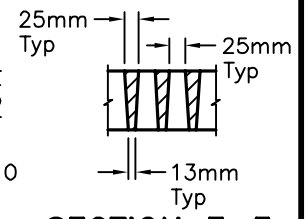
SECTION C–C



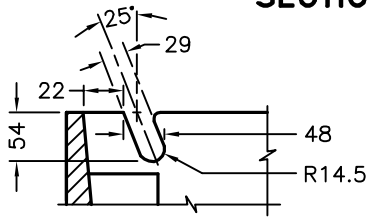
SECTION B–B



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.

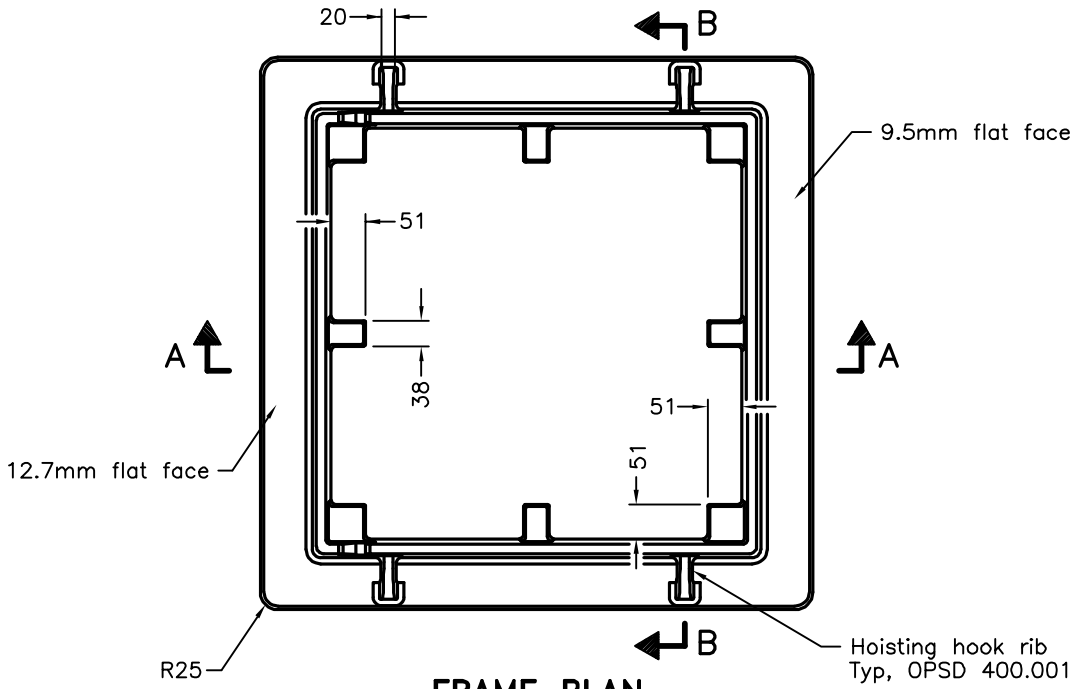
ONTARIO PROVINCIAL STANDARD DRAWING

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

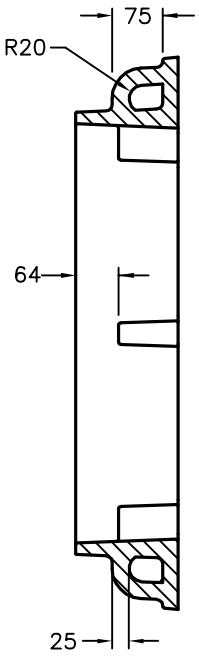
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · STANDARD

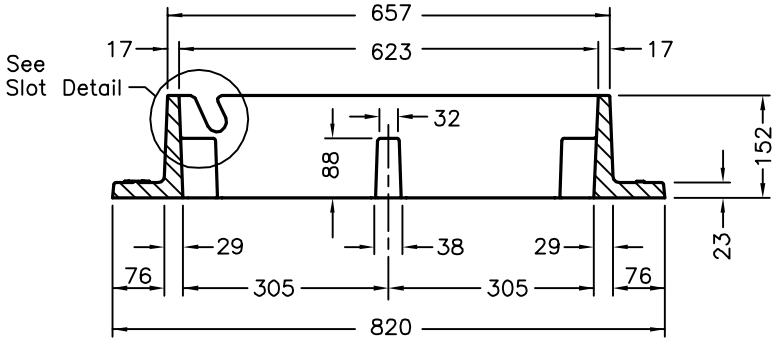
OPSD 400.020



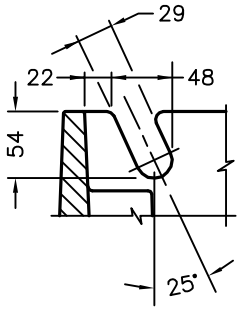
FRAME PLAN



SECTION B–B



SECTION A–A



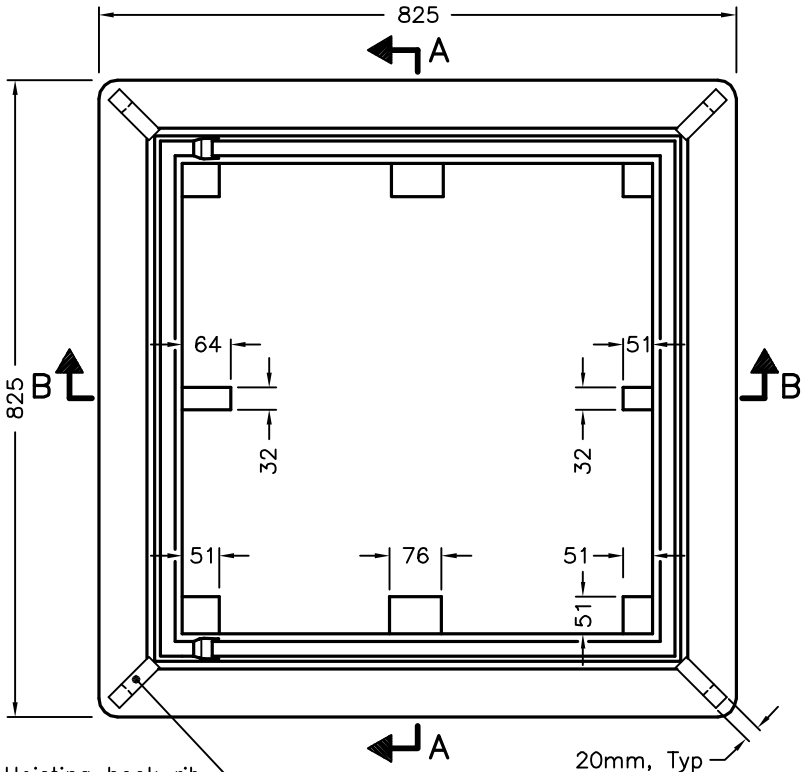
SLOT DETAIL

NOTES:

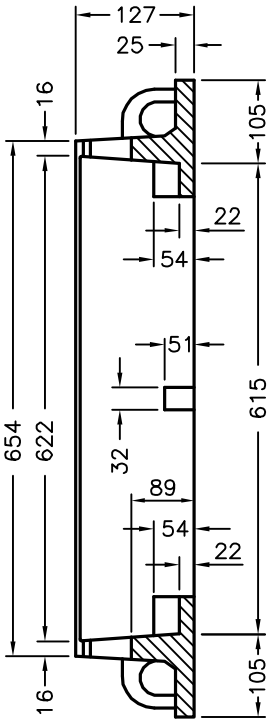
A This OPSD shall be read in conjunction with OPSD 400.090.

B All dimensions are in millimetres unless otherwise shown.

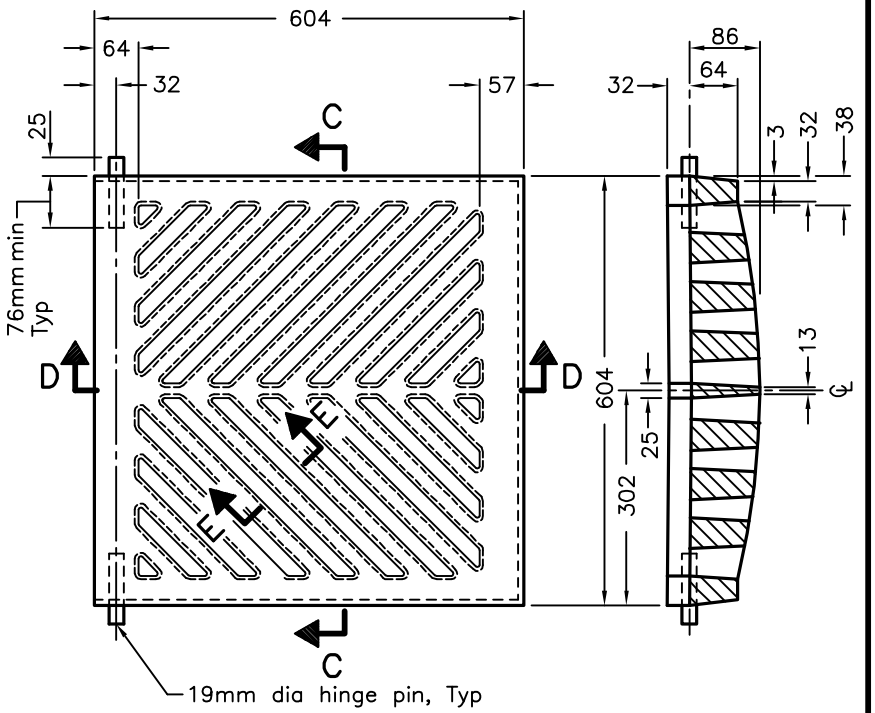
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	0
CAST IRON, SQUARE FRAME FOR CURB INLET OVERFLOW			
	OPSD 400.021		



FRAME PLAN

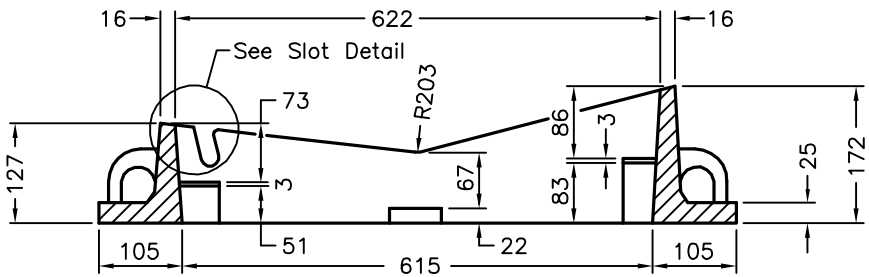


SECTION A–A

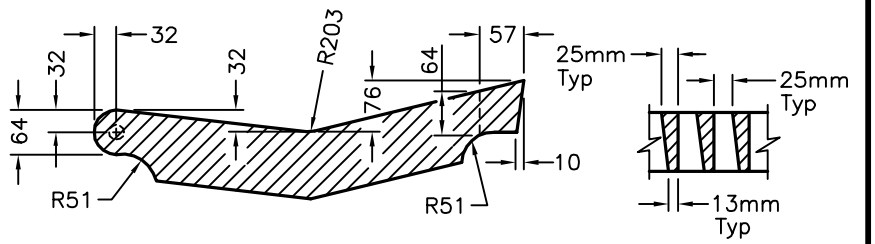


GRATE PLAN

SECTION C–C

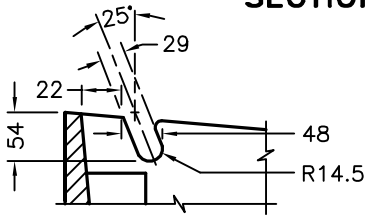


SECTION B–B



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.

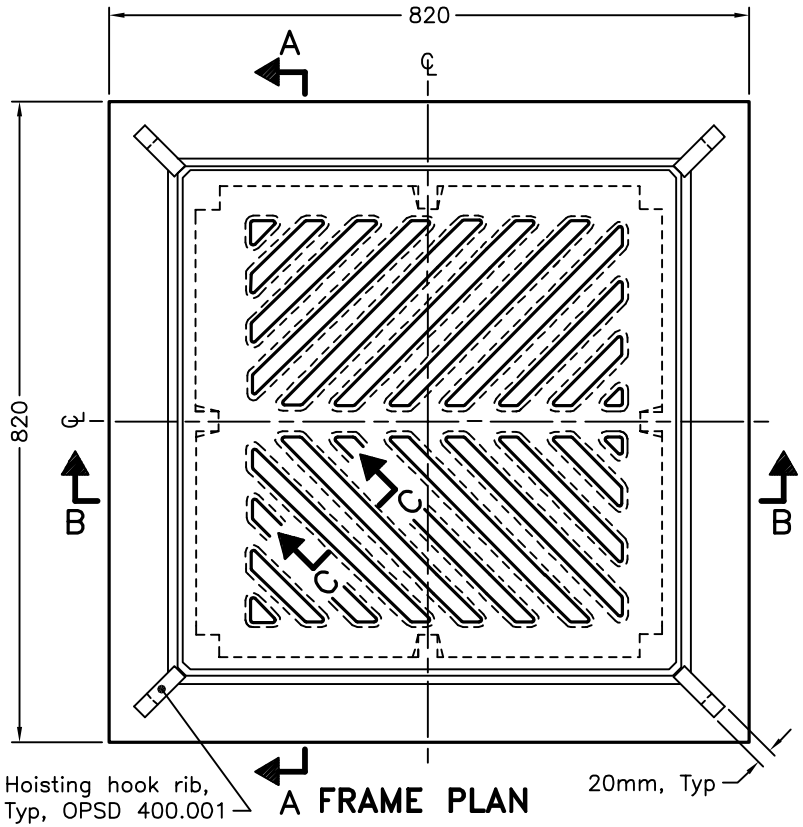
ONTARIO PROVINCIAL STANDARD DRAWING

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

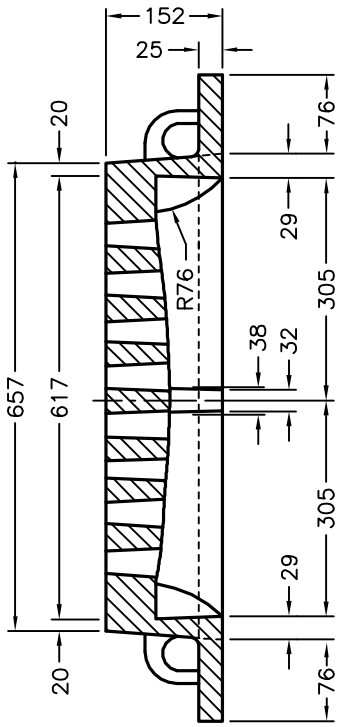
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSD

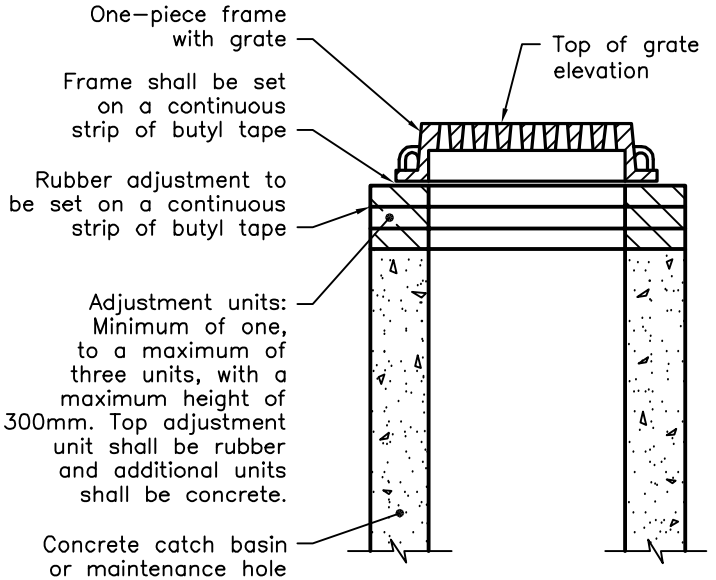
OPSD 400.030



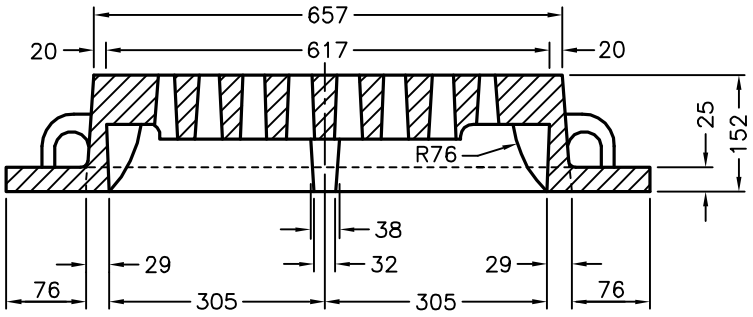
A FRAME PLAN



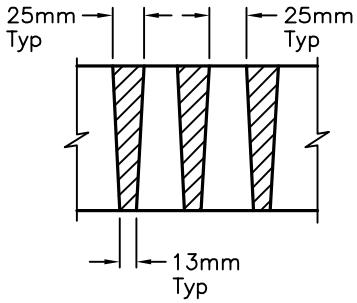
SECTION A–A



INSTALLATION



SECTION B–B



SECTION C–C

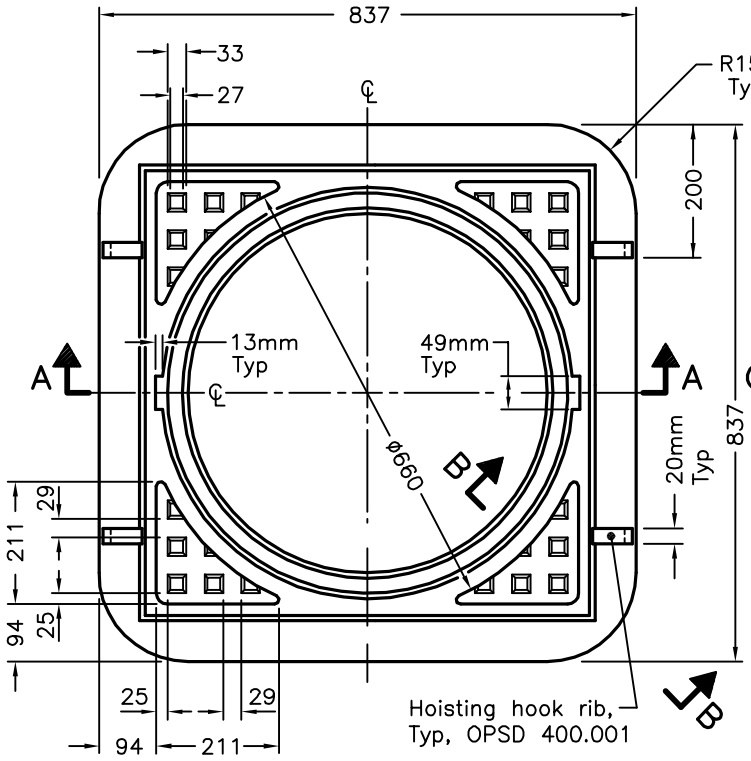
NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

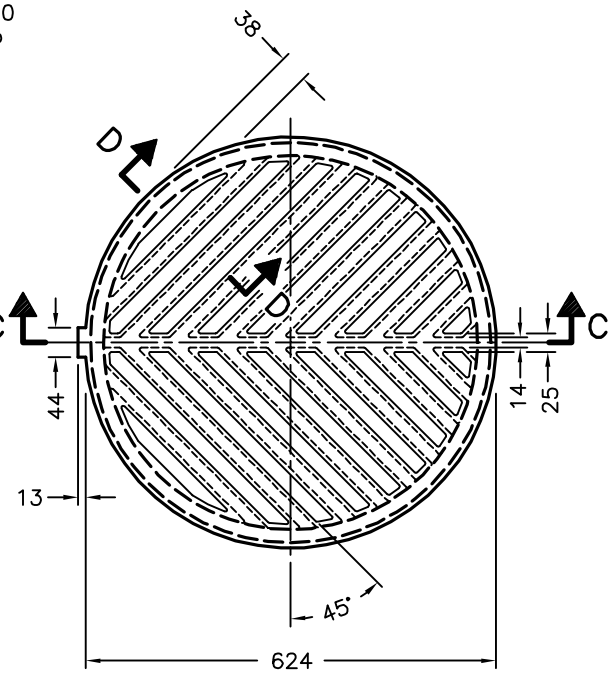
CAST IRON, ONE–PIECE FRAME AND FLAT SQUARE GRATE FOR TEMPORARY INSTALLATION, HERRING BONE OPENINGS

Nov 2013 | Rev 2

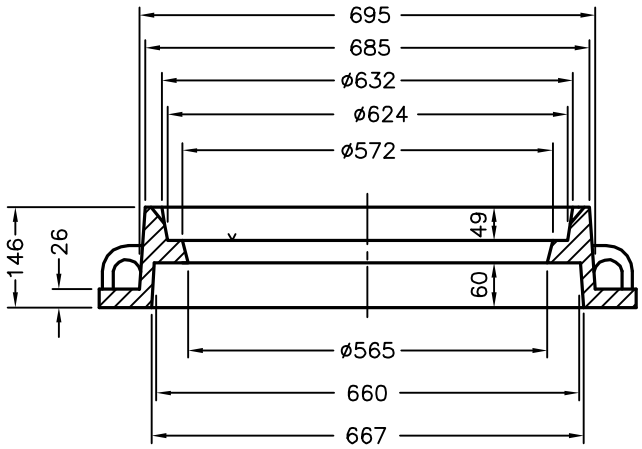
OPSD 400.040



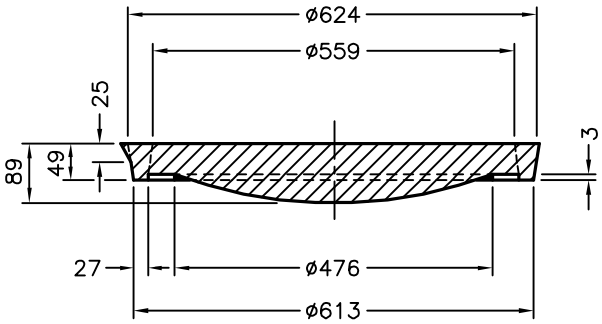
FRAME PLAN



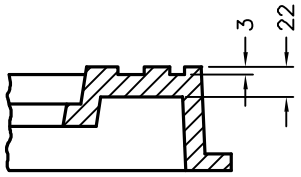
GRATE PLAN



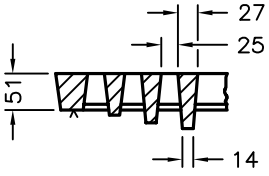
SECTION A–A



SECTION C–C



SECTION B–B

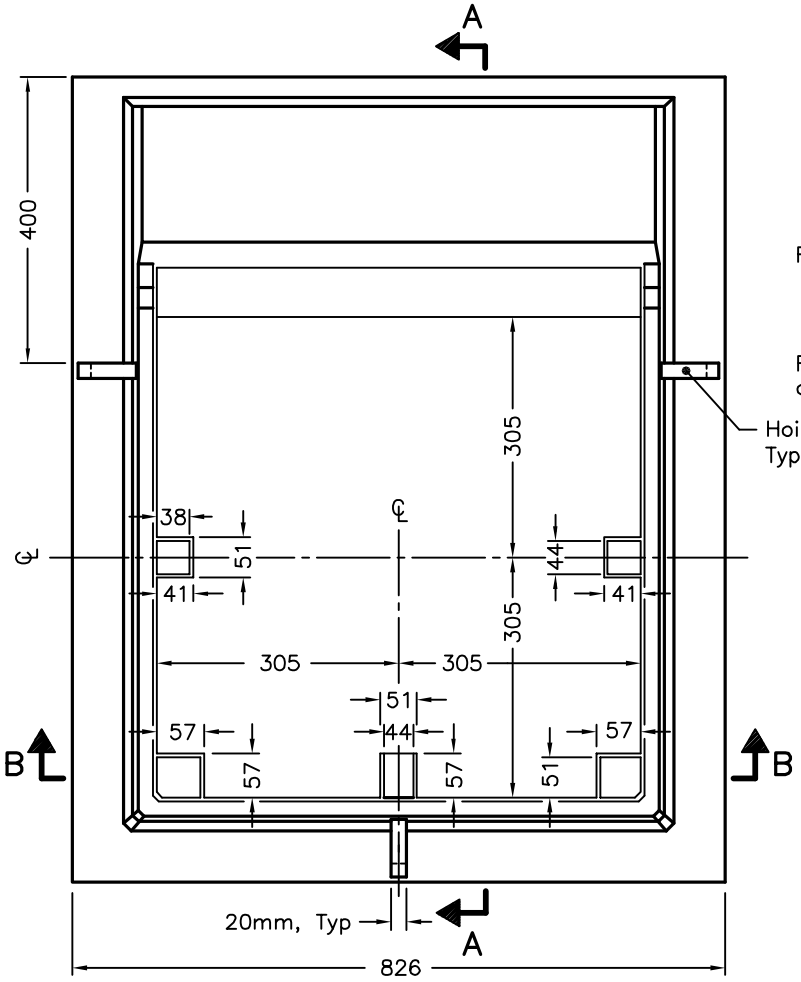


SECTION D–D

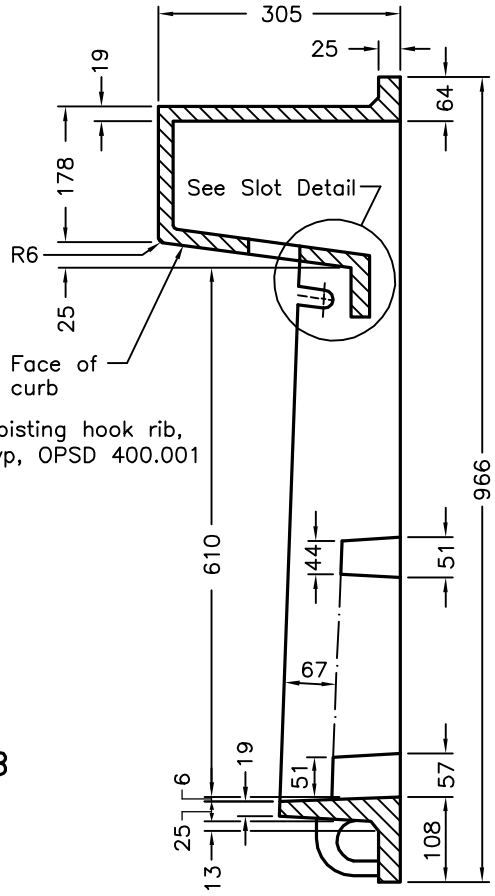
NOTES:

A All dimensions are in millimetres unless otherwise shown.

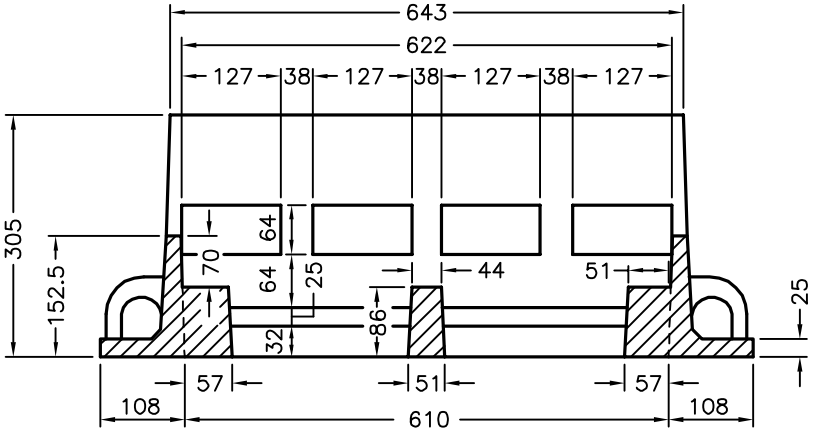
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	5
CAST IRON, RAISED SQUARE FRAME WITH CIRCULAR FLAT GRATE FOR CATCH BASINS, HERRING BONE OPENINGS			
	OPSD 400.070		



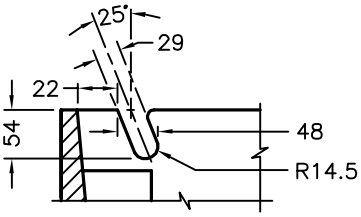
FRAME PLAN



SECTION A–A



SECTION B–B



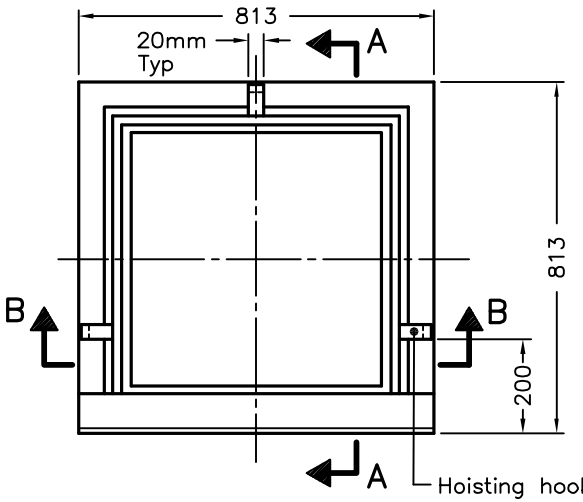
SLOT DETAIL

NOTES:

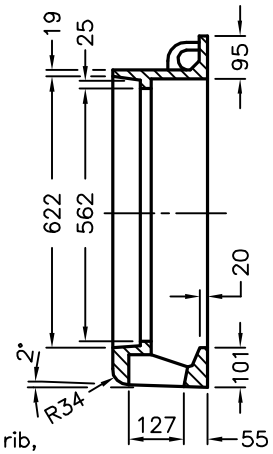
A For grate see OPSD 400.020 or 400.100.

B All dimensions are in millimetres unless otherwise shown.

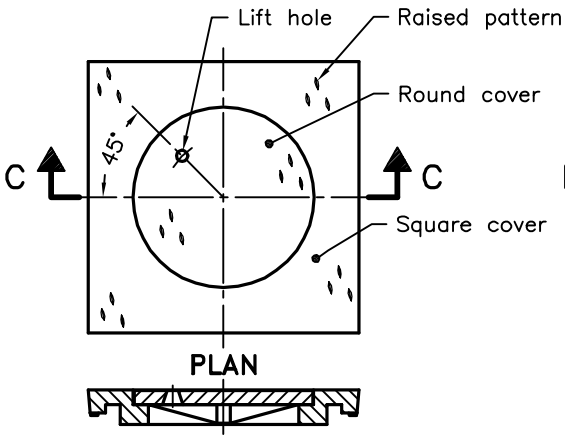
ONTARIO PROVINCIAL STANDARD DRAWING	Apr 2016	Rev 3
CAST IRON, SIDE INLET FOR CATCH BASINS		
		OPSD 400.080



PLAN



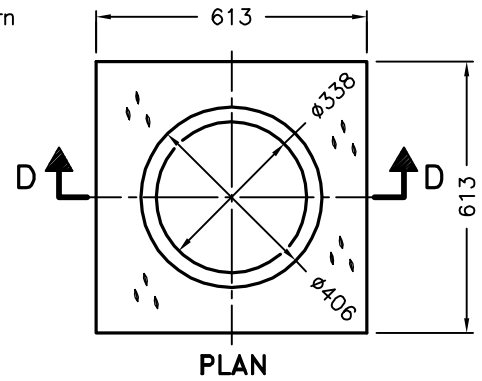
SECTION A–A



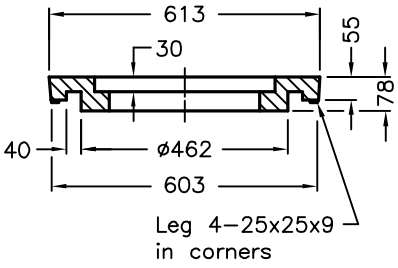
PLAN

SECTION C–C

COVER

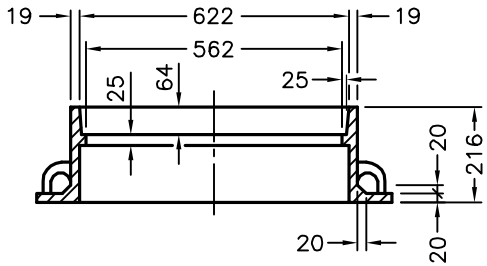


PLAN

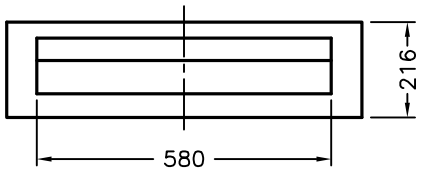


SECTION D–D

SQUARE COVER

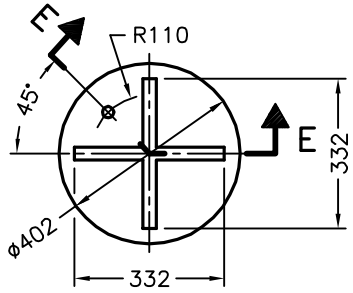


SECTION B–B

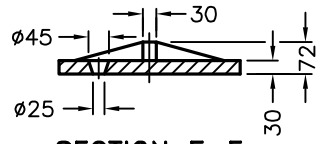


CURB ELEVATION

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.

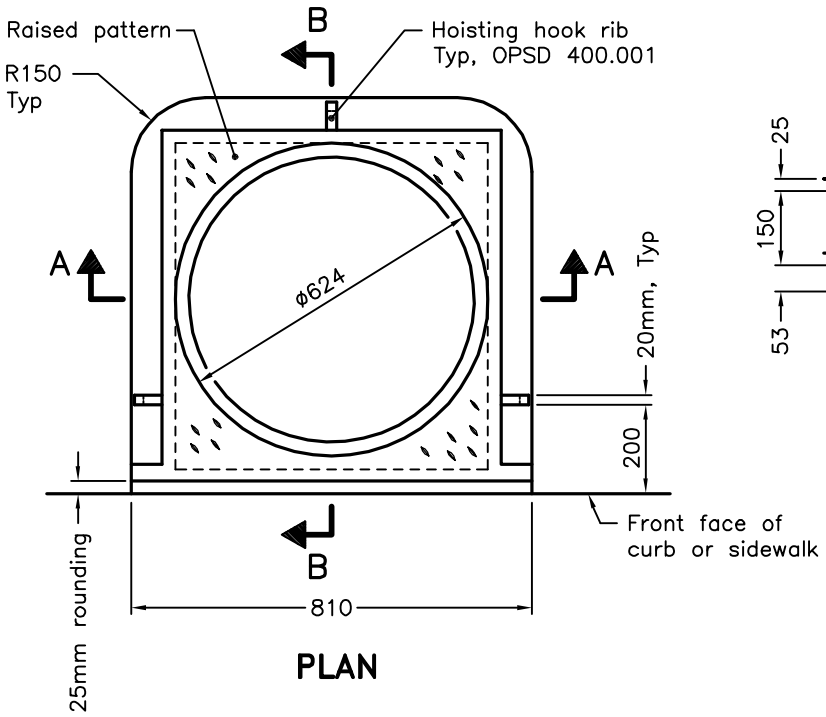
ONTARIO PROVINCIAL STANDARD DRAWING

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

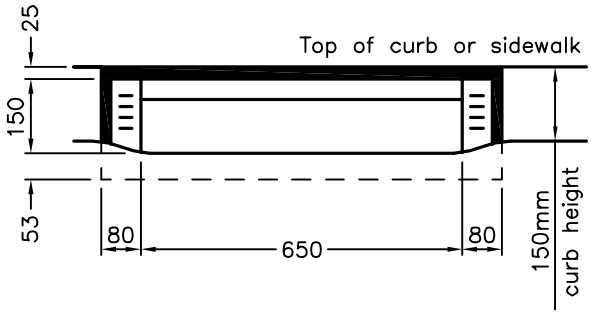
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSD

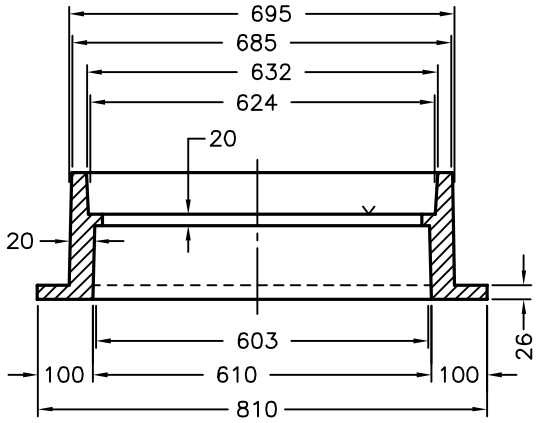
OPSD 400.081



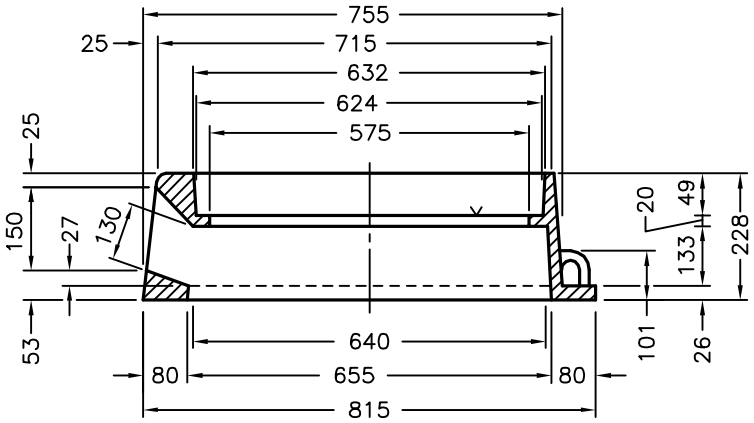
PLAN



CURB ELEVATION



SECTION A–A

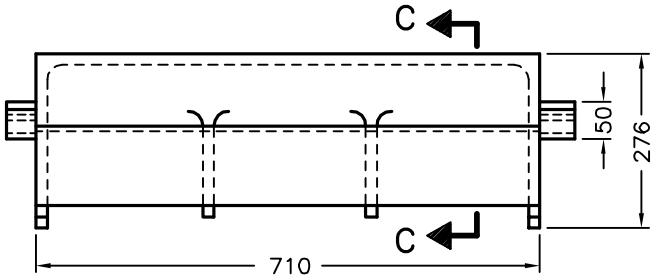


SECTION B–B

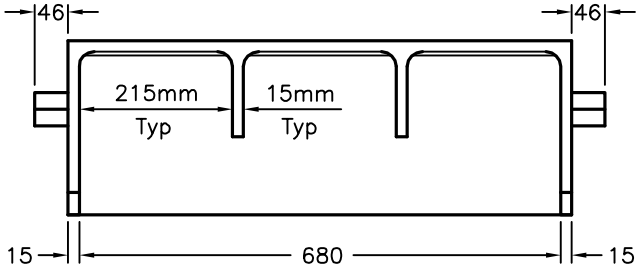
NOTES:

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.

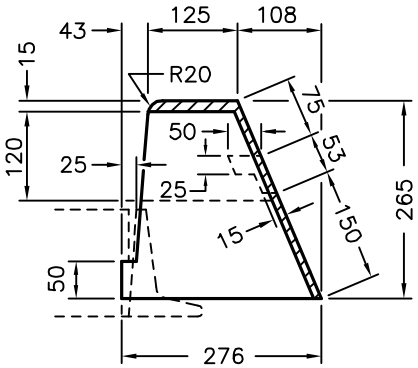
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	4
CAST IRON, RAISED CURB INLET FRAME WITH COVER FOR CATCH BASINS OUT OF ROADWAY			
	OPSD 400.082		



TOP VIEW

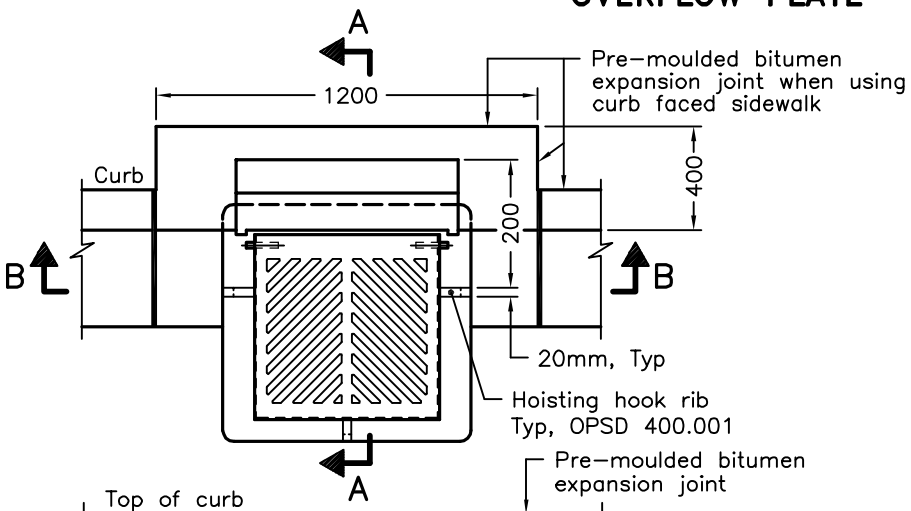


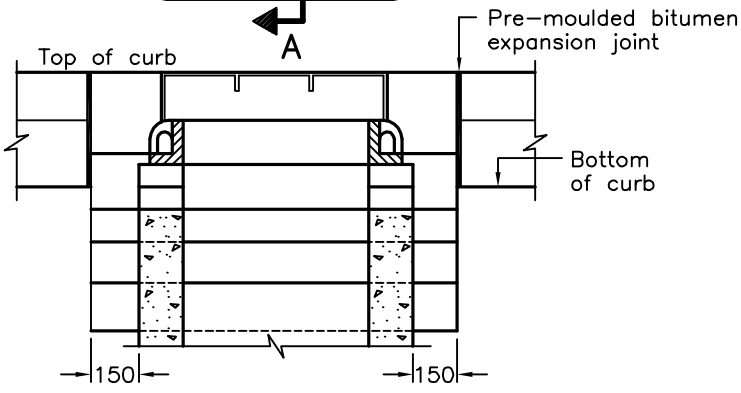
FRONT VIEW



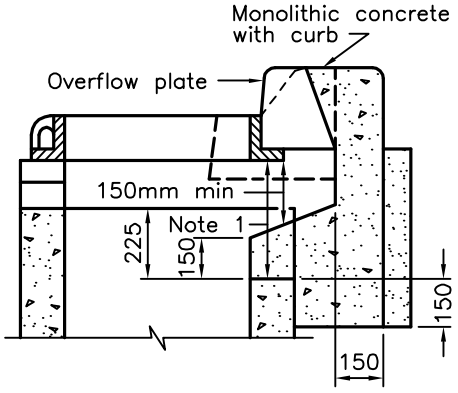
SECTION C–C

OVERFLOW PLATE





SECTION B–B



SECTION A–A

INSTALLATION DETAIL

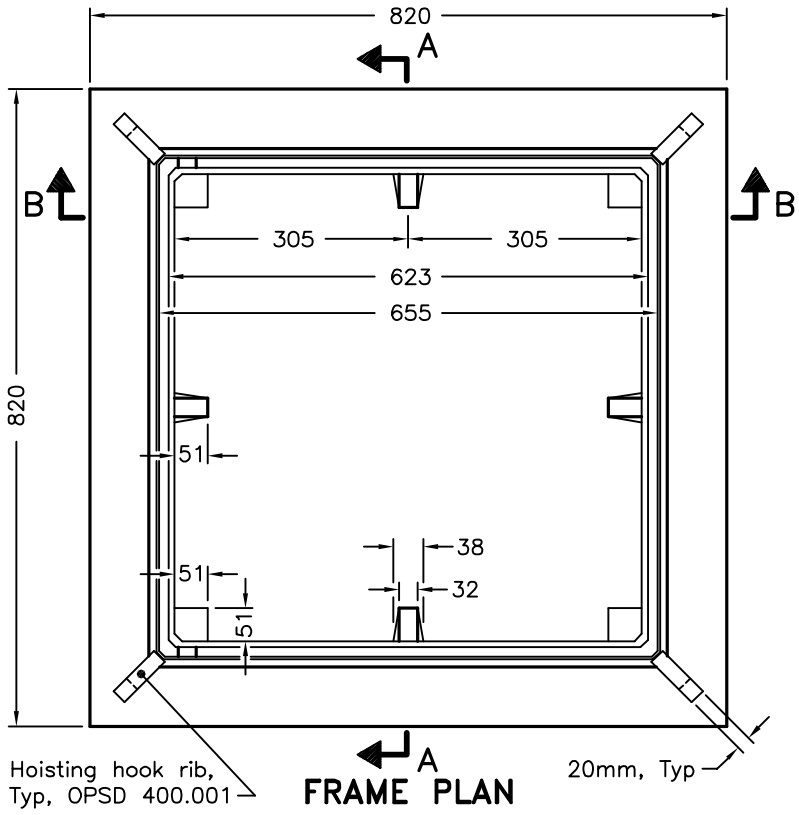
NOTES:

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

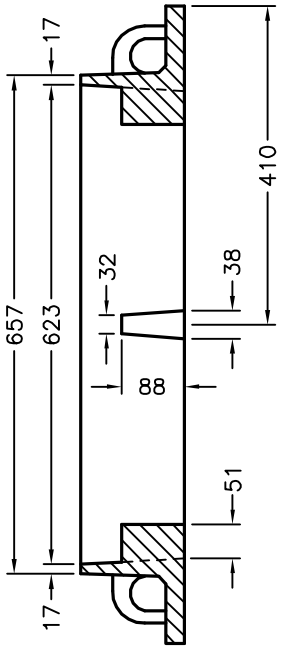
A Catch basin shall have 250mm diameter minimum lead.

B All dimensions are in millimetres unless otherwise shown.

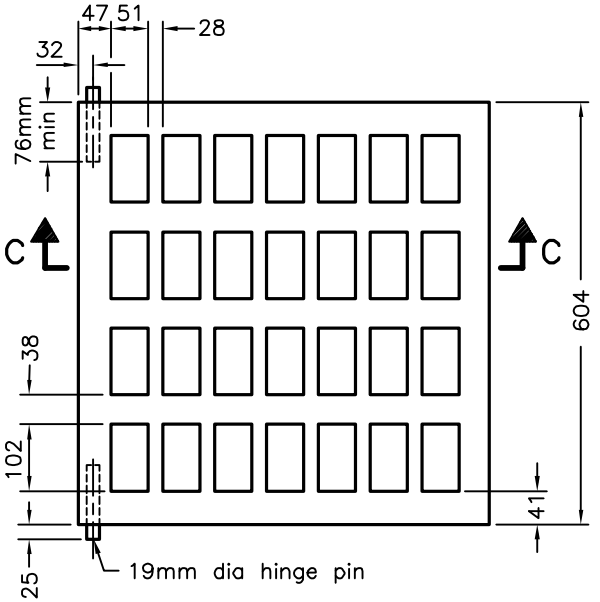
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	2
CAST IRON CURB INLET OVERFLOW FOR CATCH BASINS			
	OPSD 400.090		



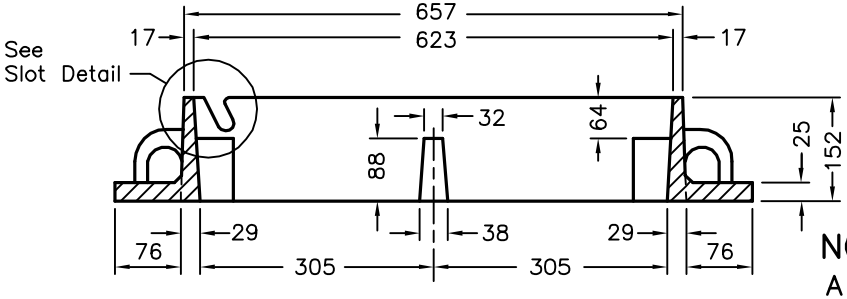
FRAME PLAN



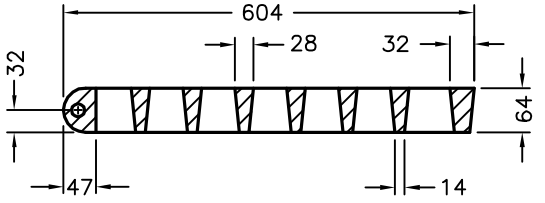
SECTION A–A



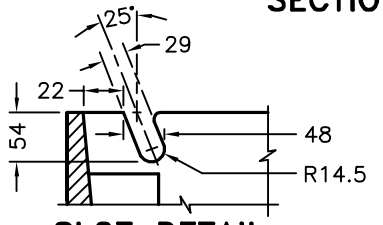
GRATE PLAN



SECTION B–B



SECTION C–C



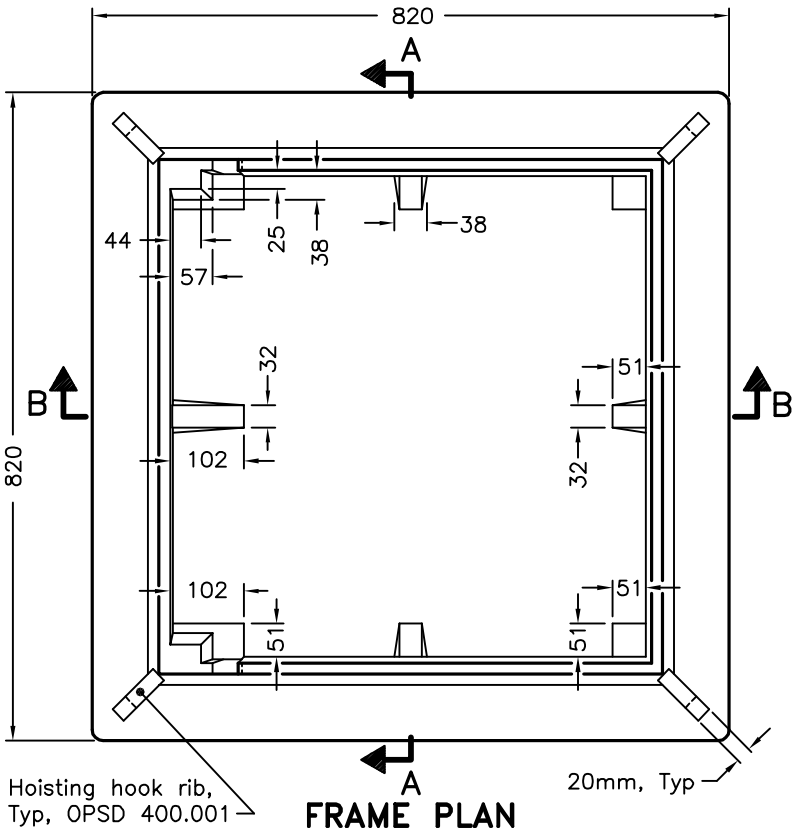
SLOT DETAIL

NOTE:

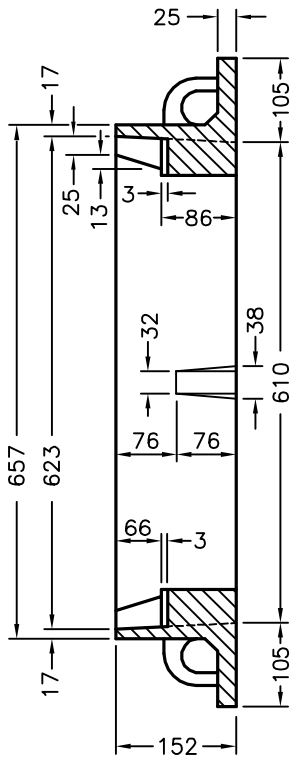
A This OPSD shall be read in conjunction with OPSD 610.010 and 610.020.

B All dimensions are in millimetres unless otherwise shown.

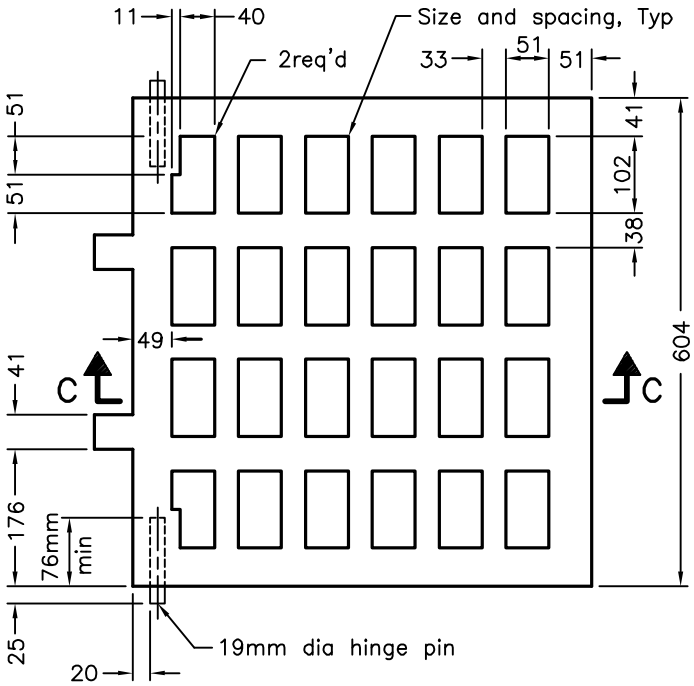
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	2
CAST IRON, SQUARE FRAME WITH SQUARE FLAT GRATE FOR CATCH BASINS, PERFORATED OPENINGS			
	OPSD 400.100		



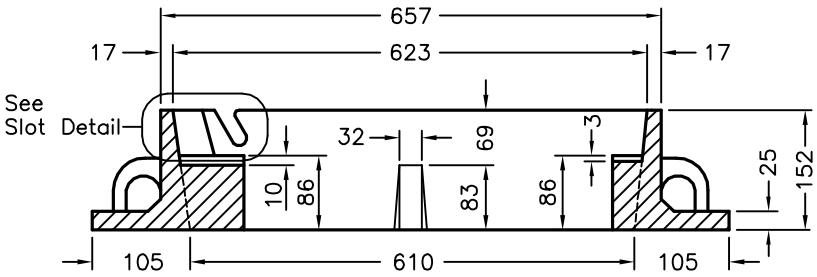
FRAME PLAN



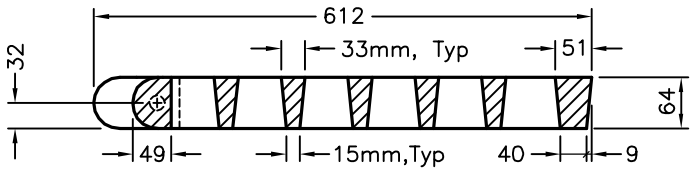
SECTION A–A



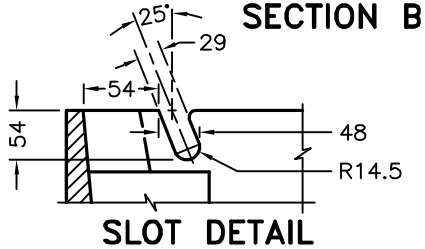
GRATE PLAN



SECTION B–B



SECTION C–C



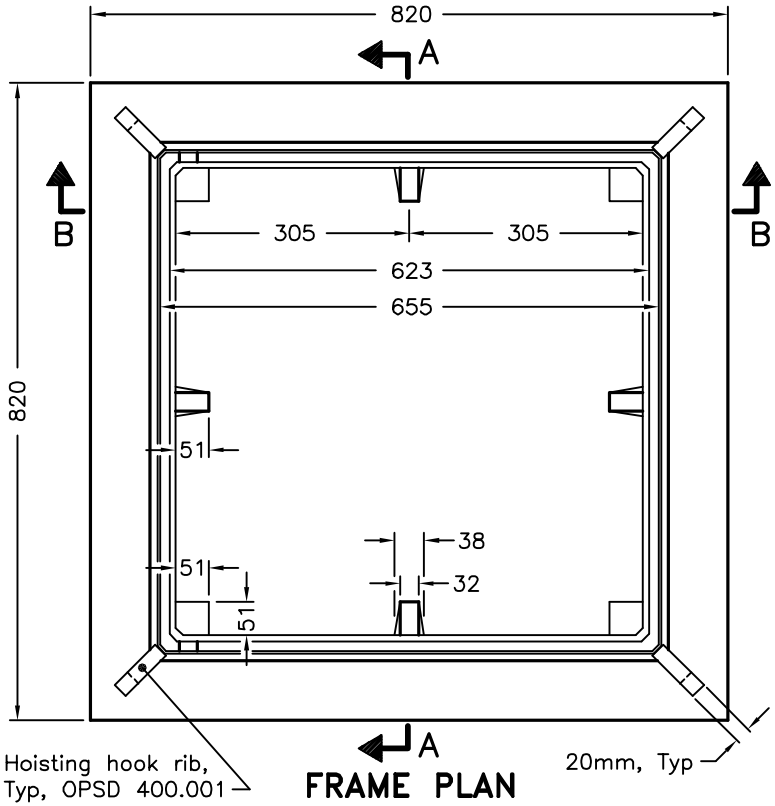
SLOT DETAIL

NOTES:

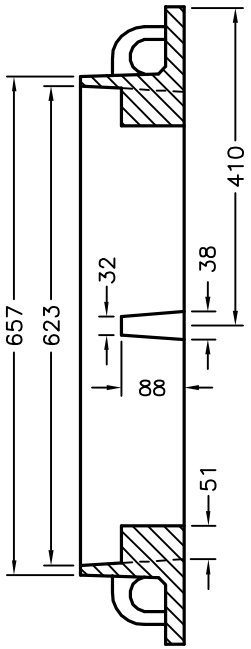
A This OPSD shall be read in conjunction with OPSD 610.010 and 610.020.

B All dimensions are in millimetres unless otherwise shown.

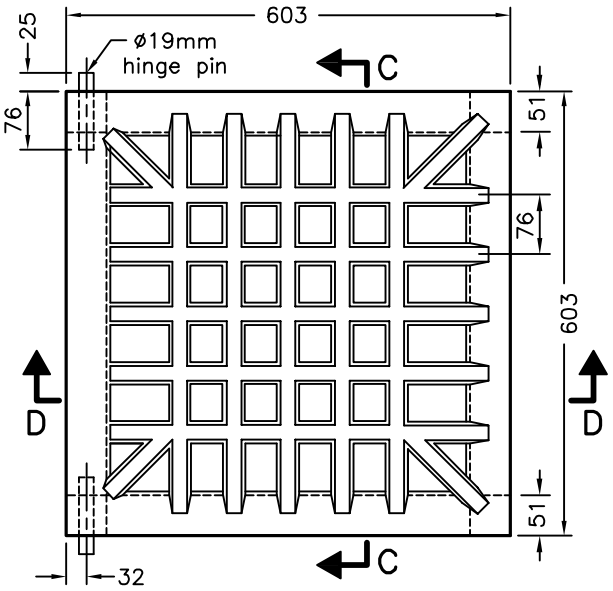
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	2
CAST IRON, SQUARE FRAME WITH SQUARE OVERFLOW TYPE FLAT GRATE FOR CATCH BASINS, PERFORATED OPENINGS			
			OPSD 400.110



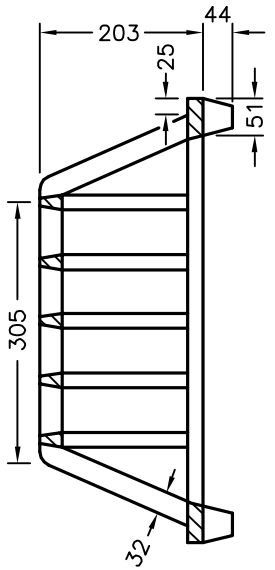
FRAME PLAN



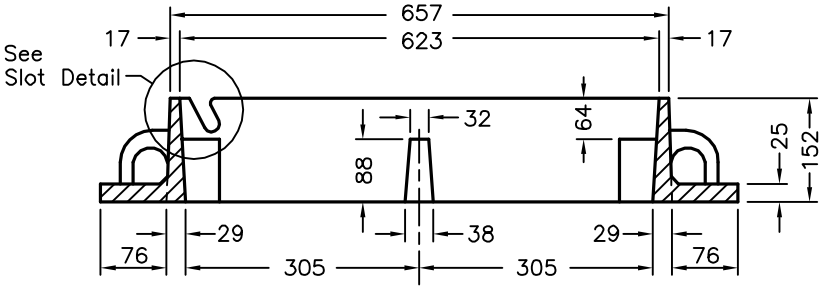
SECTION A–A



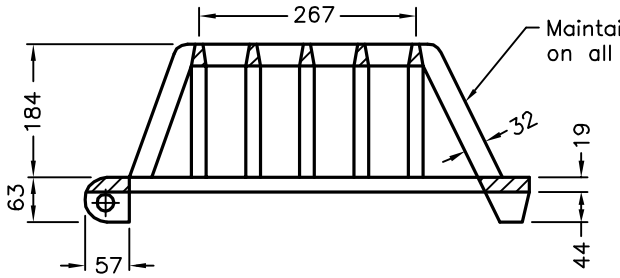
GRATE PLAN



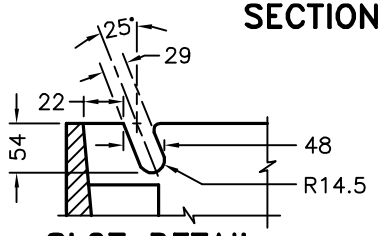
SECTION C–C



SECTION B–B



SECTION D–D



SLOT DETAIL

NOTES:

A All dimensions are in millimetres unless otherwise shown.

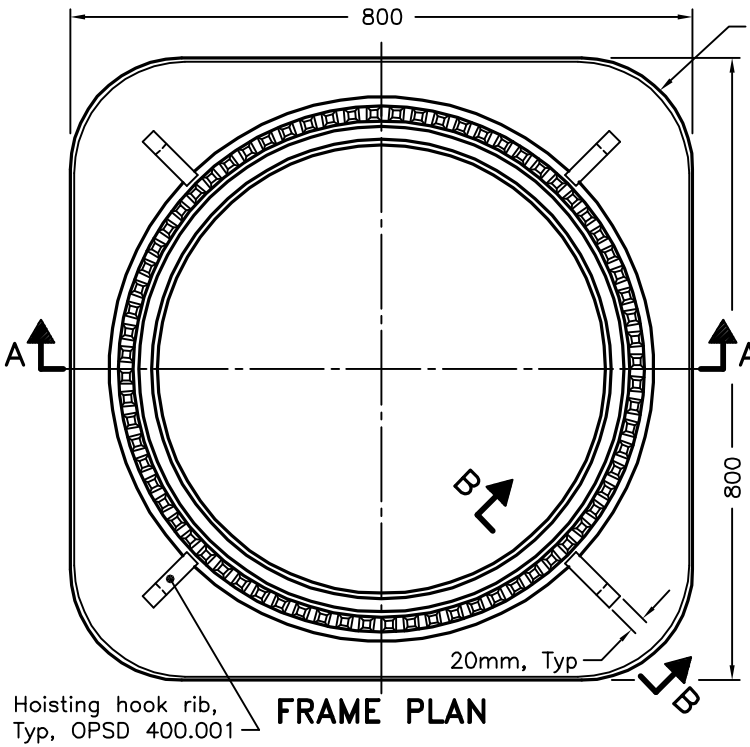
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 | Rev 2

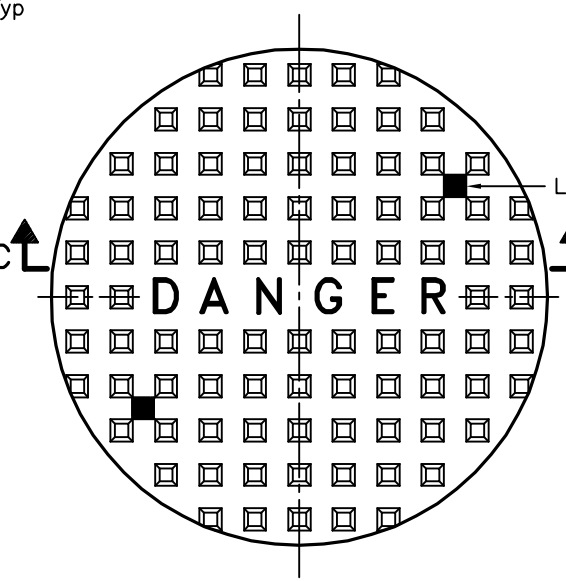
CAST IRON, SQUARE FRAME WITH BIRDCAGE GRATE FOR CATCH BASINS

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

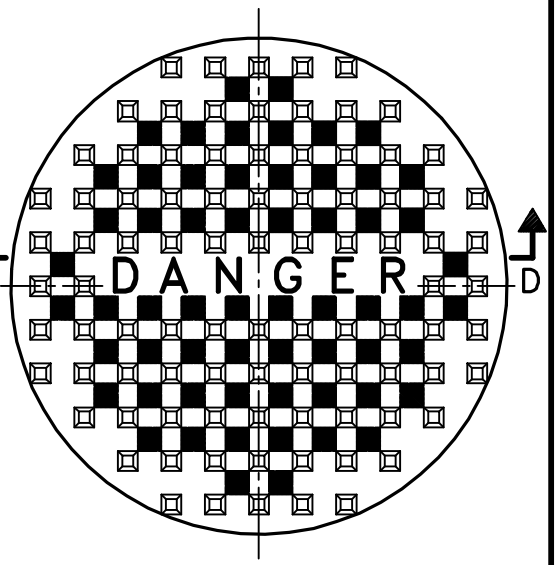
OPSD 400.120



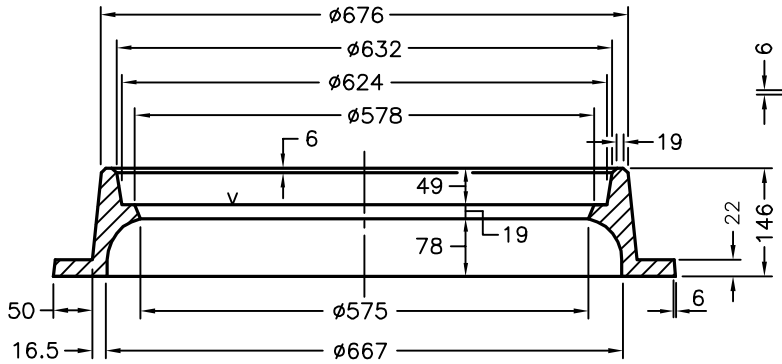
FRAME PLAN



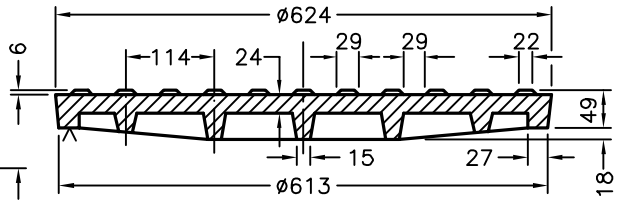
TYPE A
CLOSED COVER



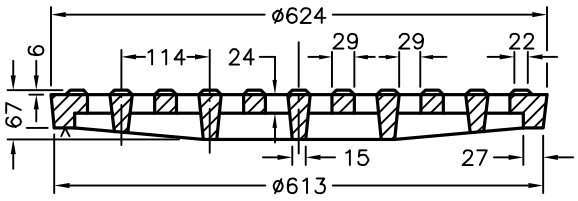
TYPE B
OPEN COVER



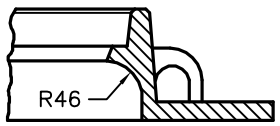
SECTION A–A



SECTION C–C



SECTION D–D



SECTION B–B

NOTES:

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

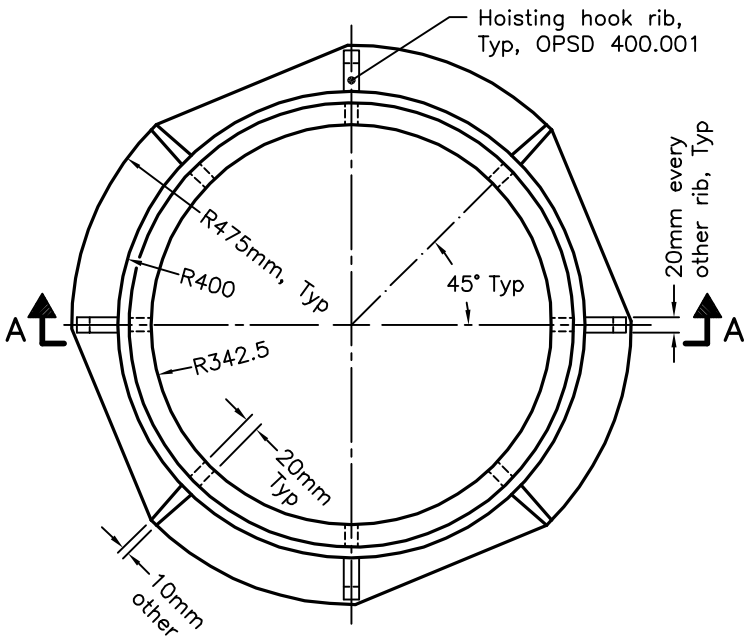
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

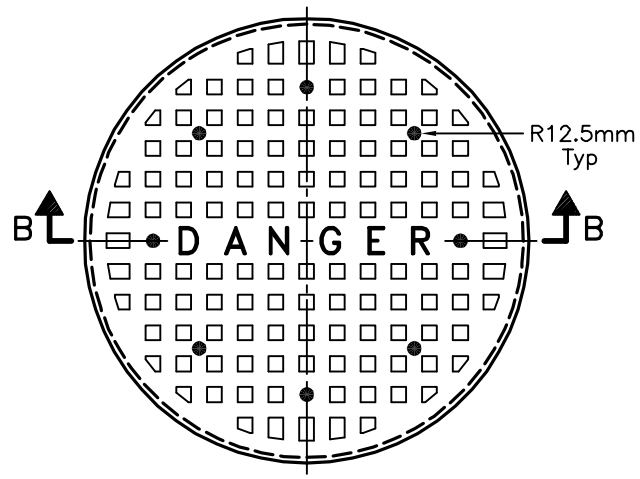
Nov 2013 | Rev 3

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

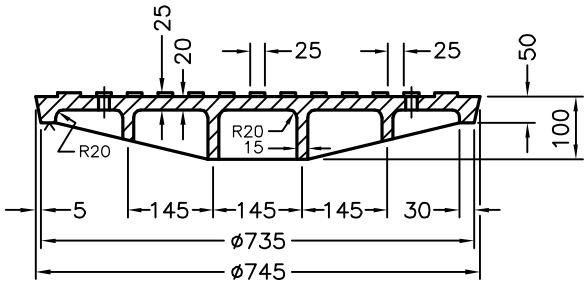
OPSD 401.010



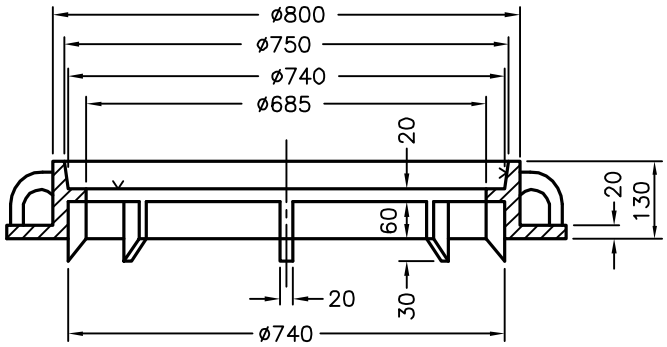
FRAME PLAN
NOTE 1



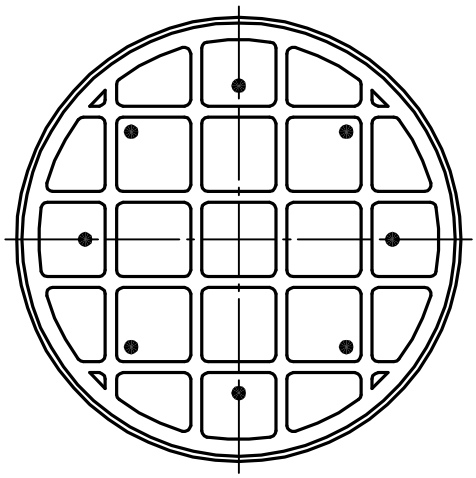
COVER PLAN



SECTION B–B



SECTION A–A



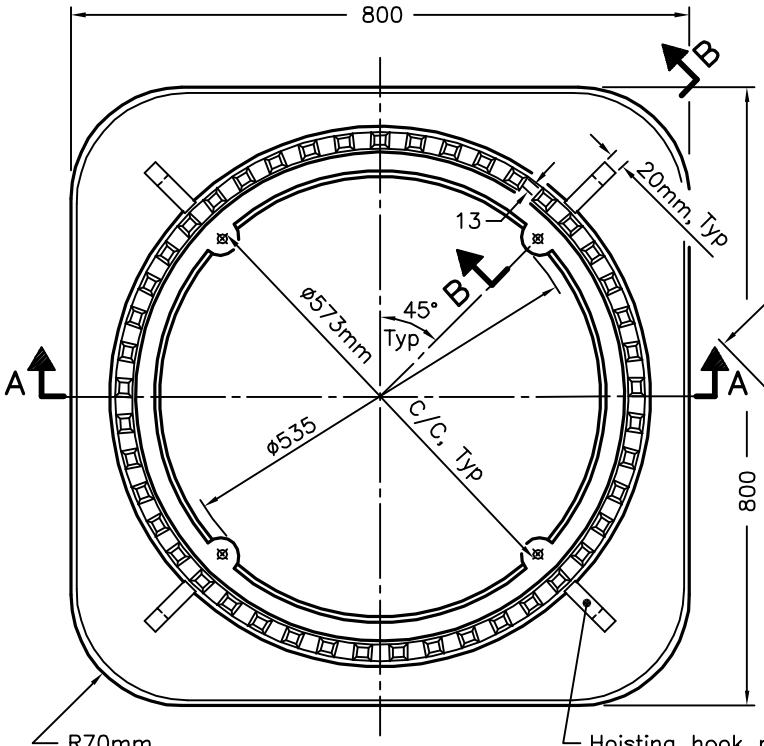
COVER BOTTOM VIEW

NOTE:

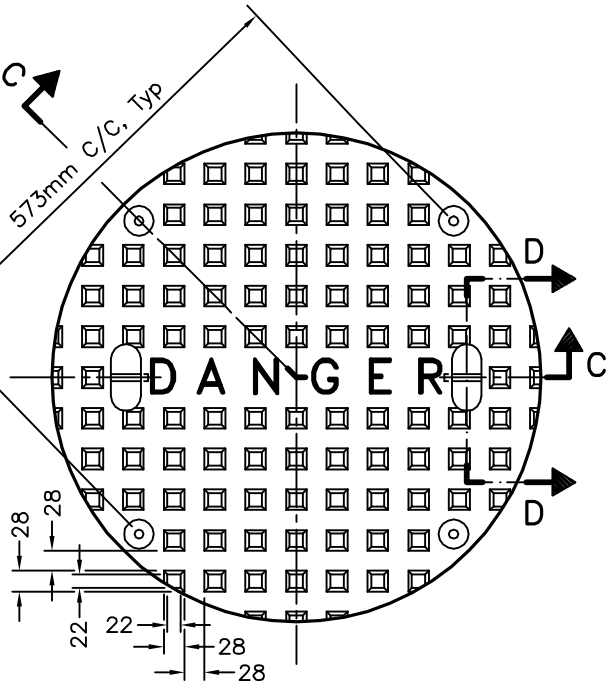
1 As an option, frame may be completely round.

A All dimensions are in millimetres unless otherwise shown.

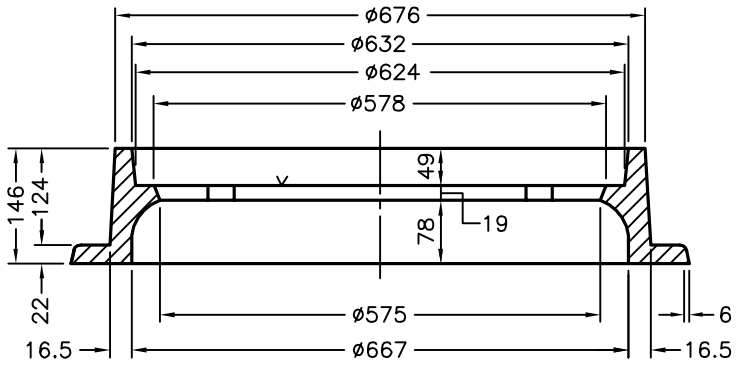
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	3
CAST IRON, CIRCULAR FRAME WITH CIRCULAR 745mm COVER FOR MAINTENANCE HOLES			
	OPSD 401.020		



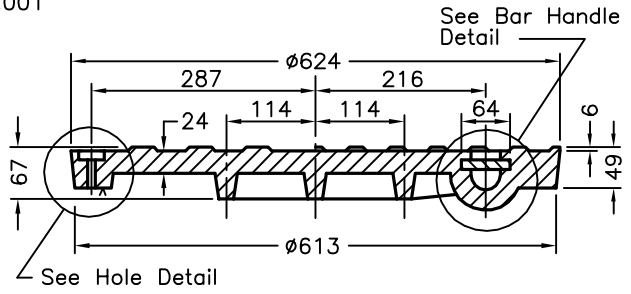
FRAME PLAN



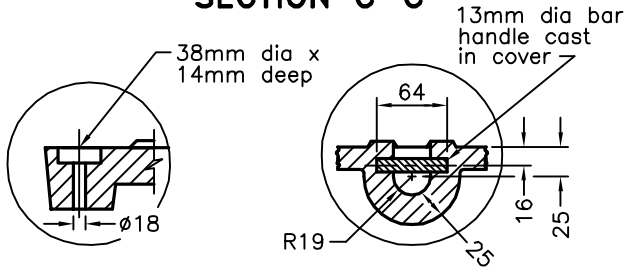
COVER PLAN



SECTION A–A

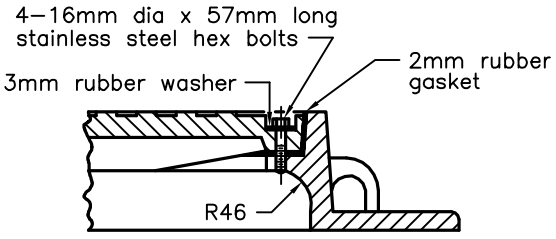


SECTION C–C

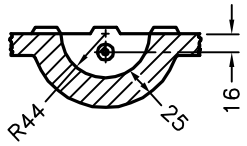


HOLE DETAIL

BAR HANDLE DETAIL



SECTION B–B

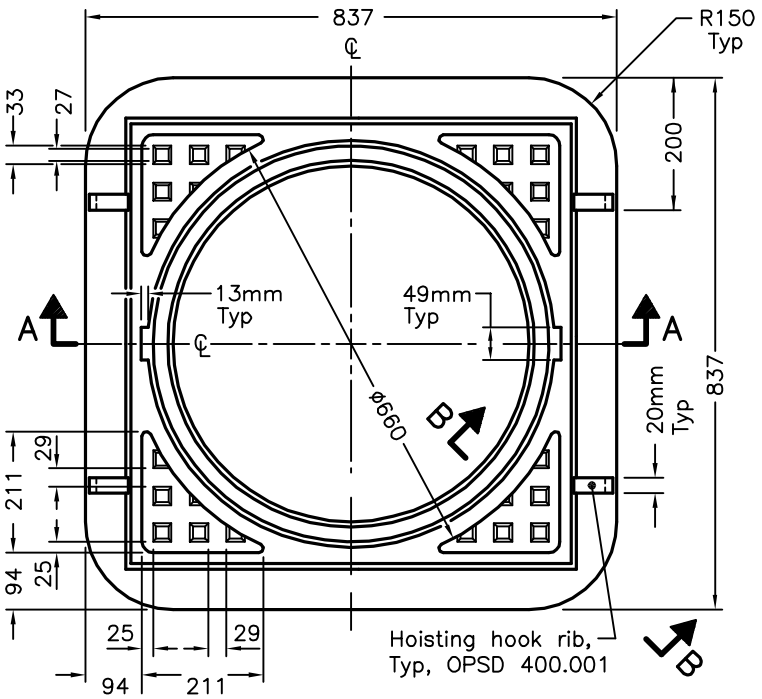


SECTION D–D

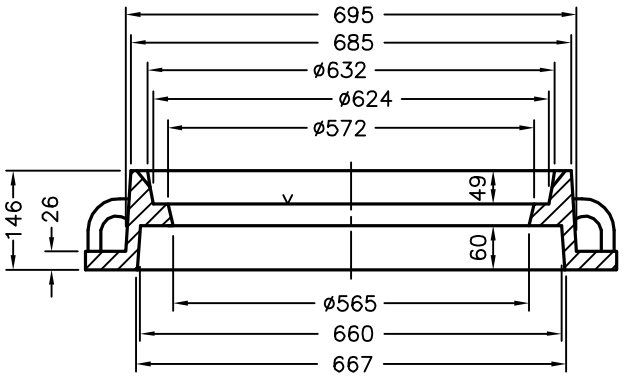
NOTE:

A All dimensions are in millimetres unless otherwise shown.

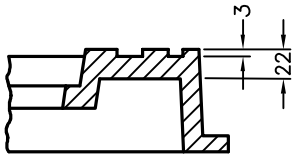
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	3
CAST IRON, SQUARE FRAME WITH CIRCULAR WATERTIGHT COVER FOR MAINTENANCE HOLES			
	OPSD 401.030		



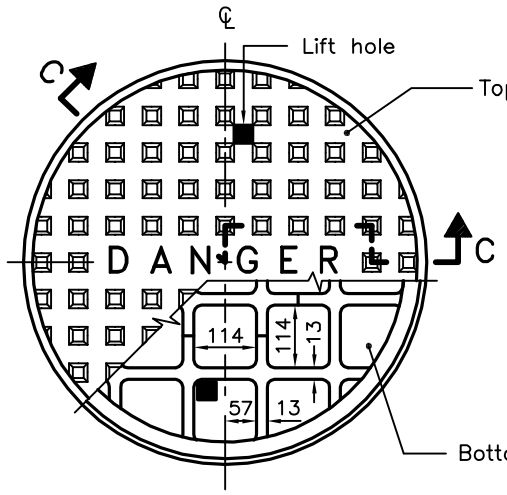
FRAME PLAN



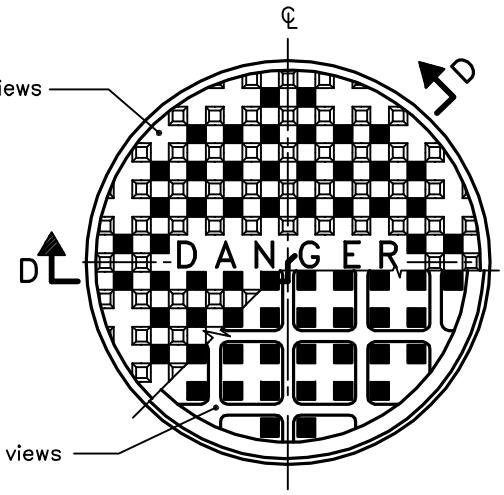
SECTION A–A



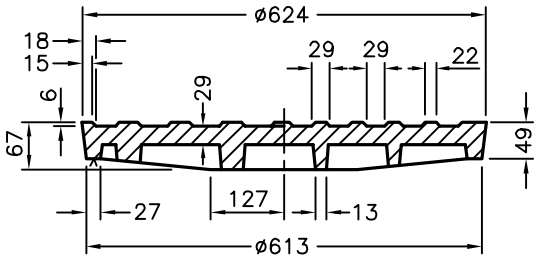
SECTION B–B



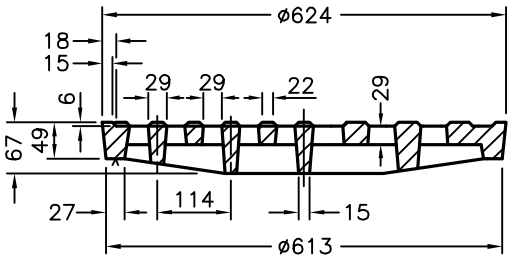
TYPE A
CLOSED COVER



TYPE B
OPEN COVER



SECTION C–C



SECTION D–D

NOTES:

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

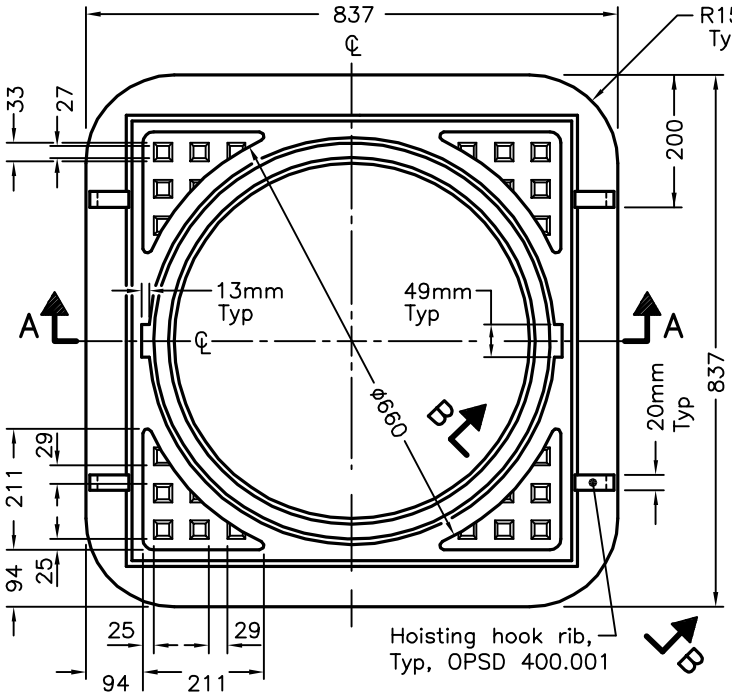
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

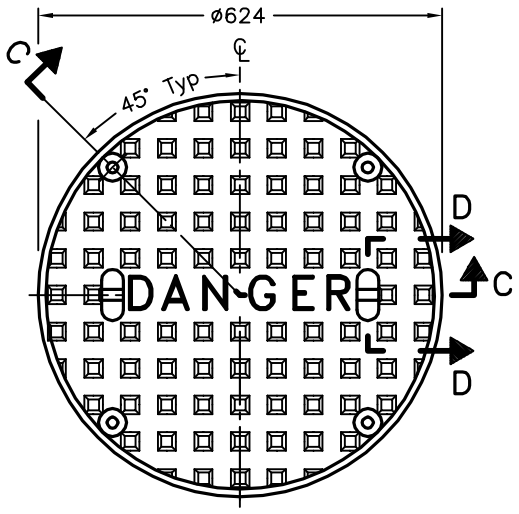
Apr 2015 | Rev 4

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

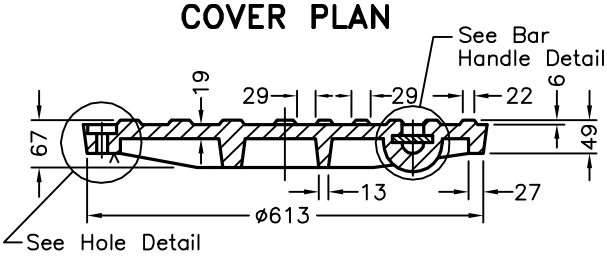
OPSD 401.040



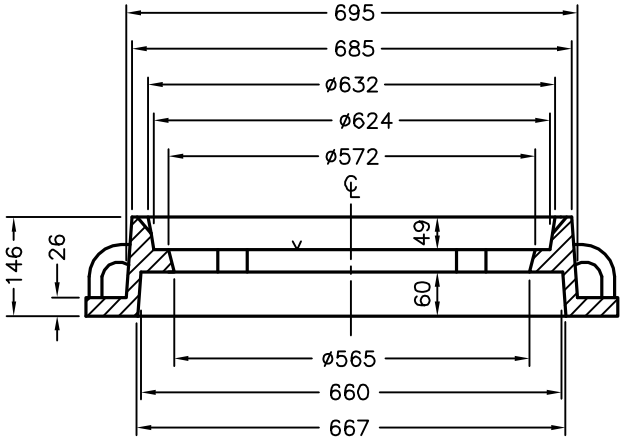
FRAME PLAN



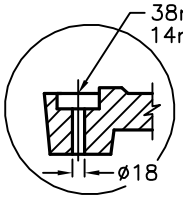
COVER PLAN



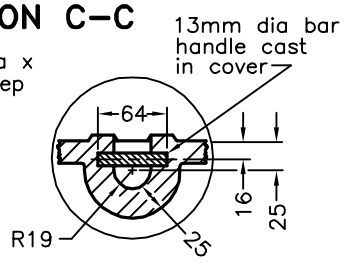
SECTION C–C



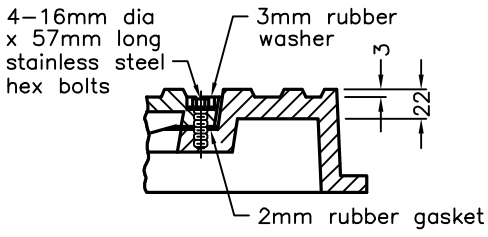
SECTION A–A



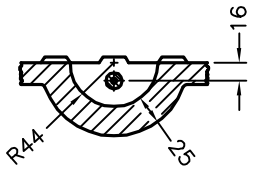
HOLE DETAIL



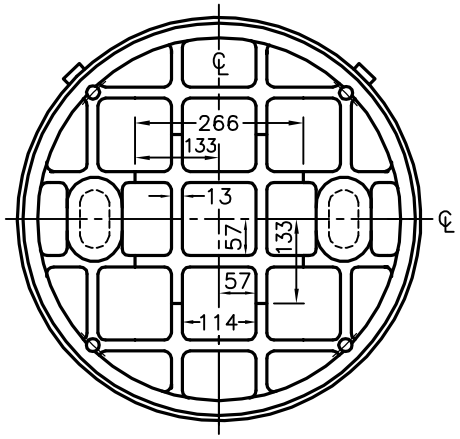
BAR HANDLE DETAIL



SECTION B–B
SHOWN WITH COVER IN PLACE



SECTION D–D

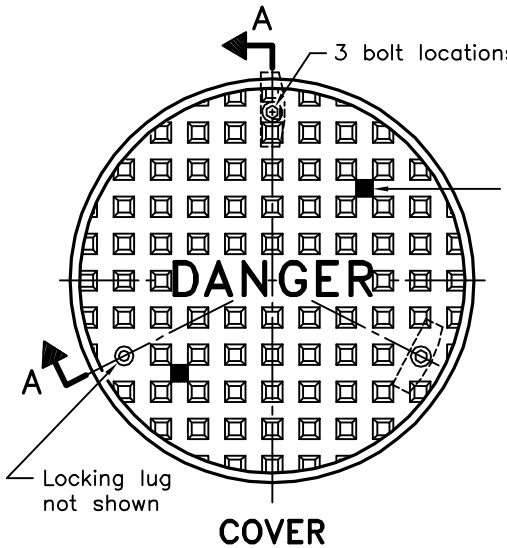


BOTTOM VIEW

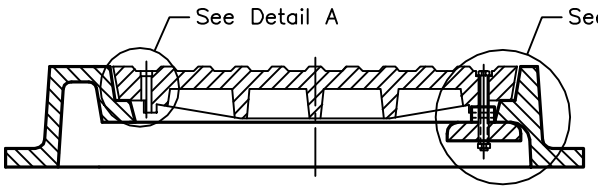
NOTES:

A All dimensions are in millimetres unless otherwise shown.

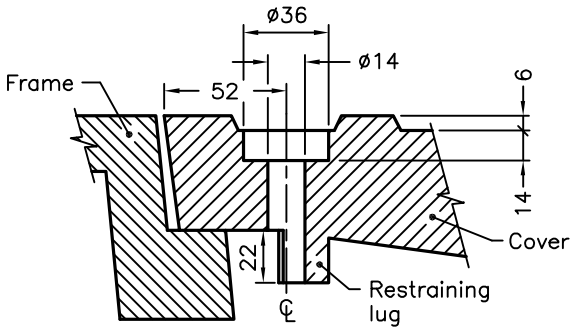
ONTARIO PROVINCIAL STANDARD DRAWING	Apr 2015	Rev	4
CAST IRON, RAISED SQUARE FRAME WITH CIRCULAR WATERTIGHT COVER FOR MAINTENANCE HOLES			
	OPSD 401.050		

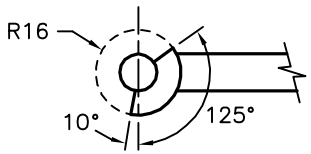


COVER

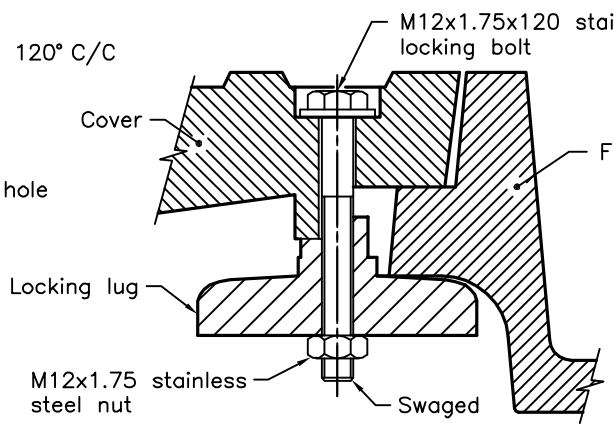


SECTION A–A
FRAME WITH COVER SHOWN

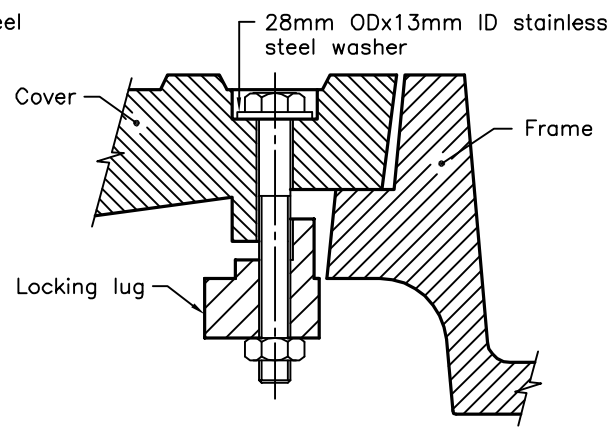




DETAIL A

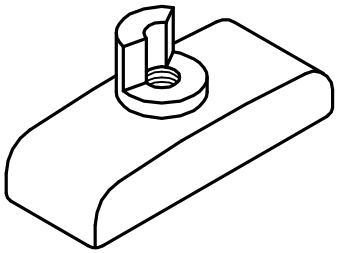


LOCKED POSITION

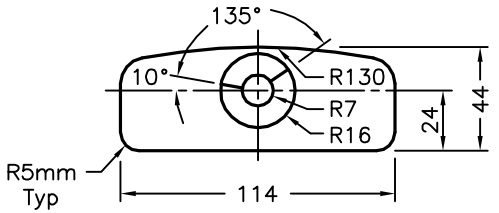


OPEN POSITION

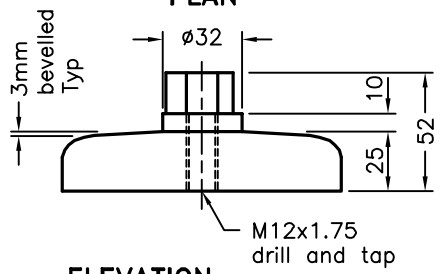
DETAIL B



ISOMETRIC VIEW



PLAN



ELEVATION

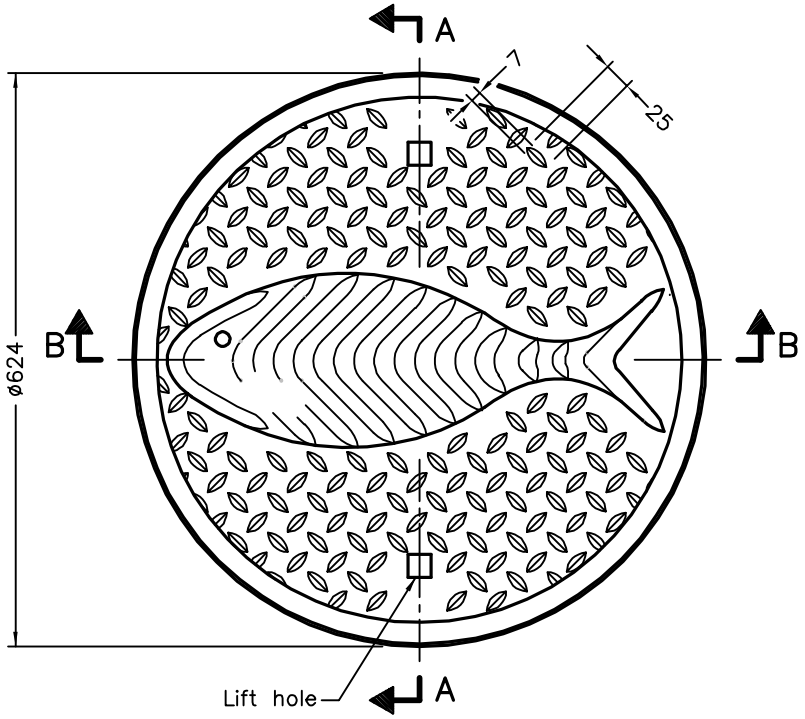
LOCKING LUG

NOTES:

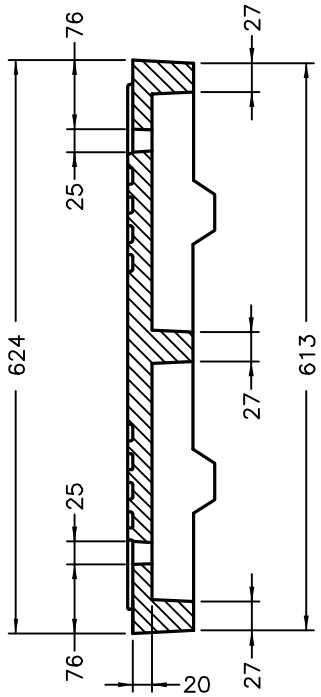
A Locking bolt shall be securely tightened.

B All dimensions are in millimetres unless otherwise shown.

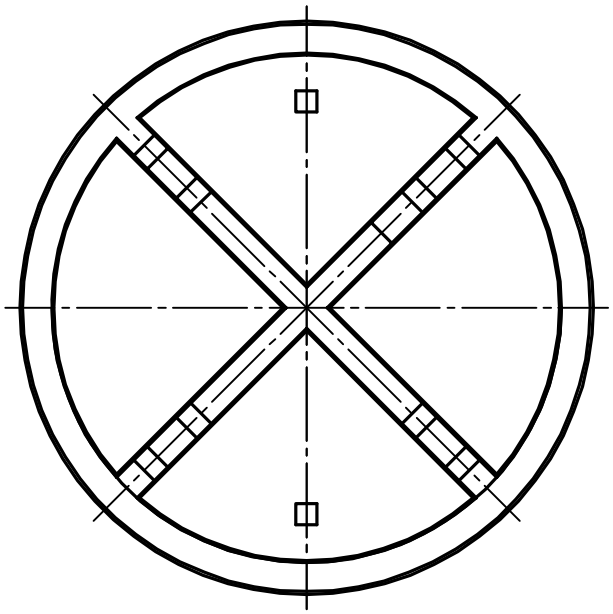
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	3
CAST IRON **CIRCULAR LOCKING COVER** FOR MAINTENANCE HOLES			
	OPSD 401.060		



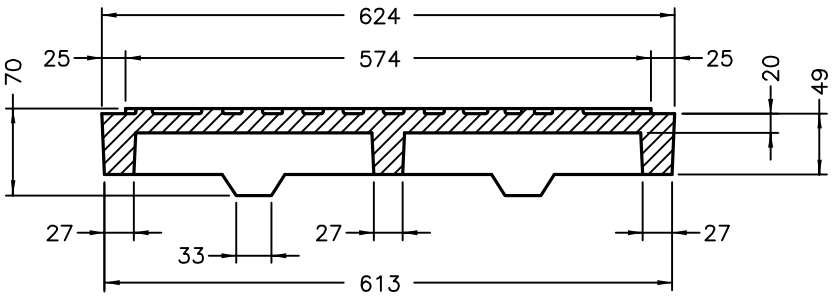
PLAN



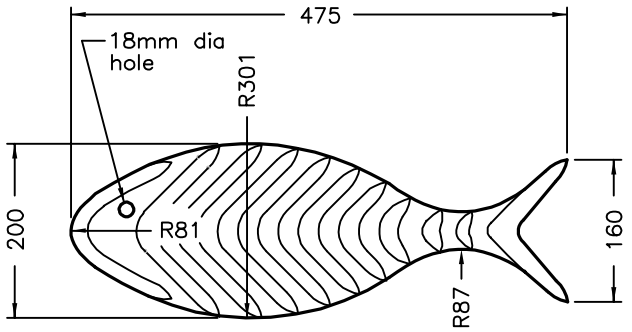
SECTION A–A



BOTTOM VIEW



SECTION B–B



FISH DETAIL

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

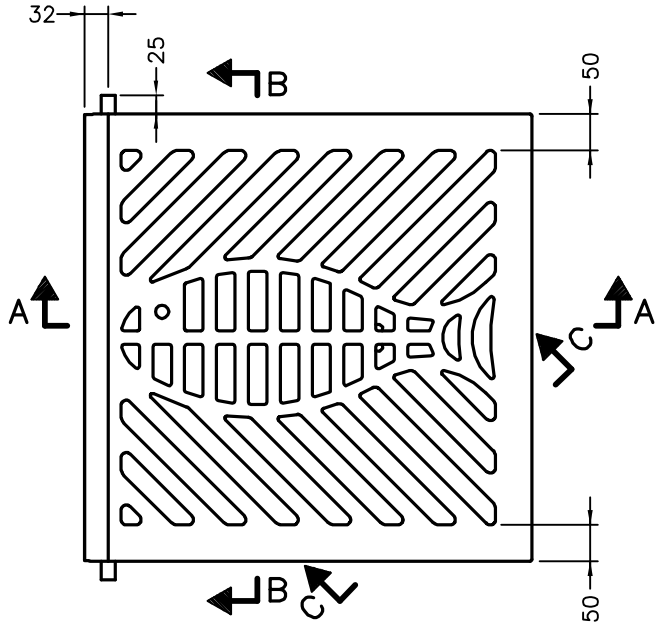
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 | Rev 0

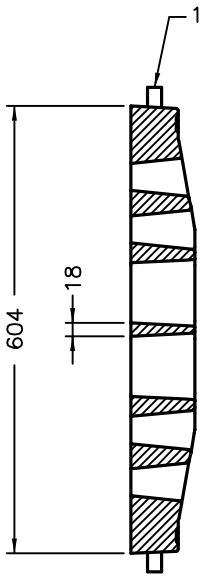
CAST IRON, CURB INLET
FISH TYPE COVER FOR CATCH BASINS
OUT OF ROADWAY

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

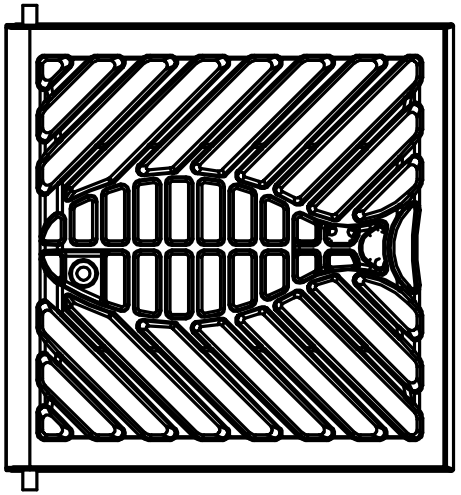
OPSD 401.080



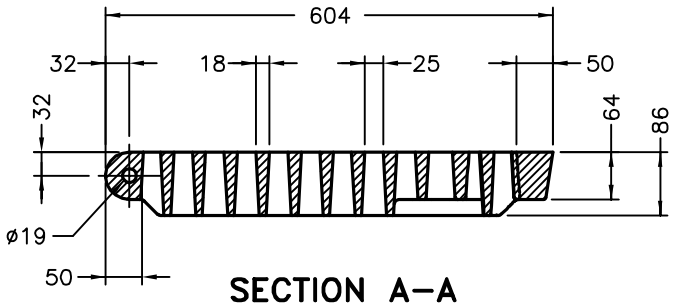
PLAN



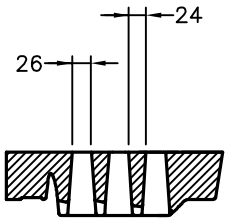
SECTION B–B



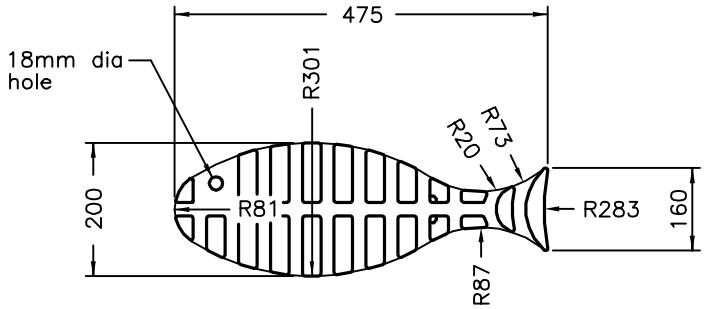
BOTTOM VIEW



SECTION A–A



SECTION C–C



FISH DETAIL

NOTE:

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

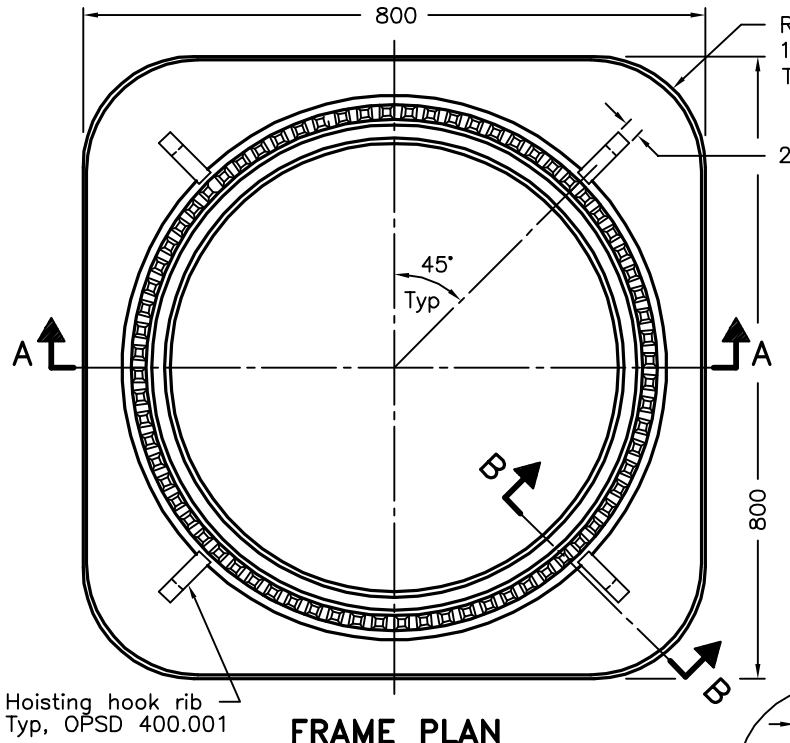
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

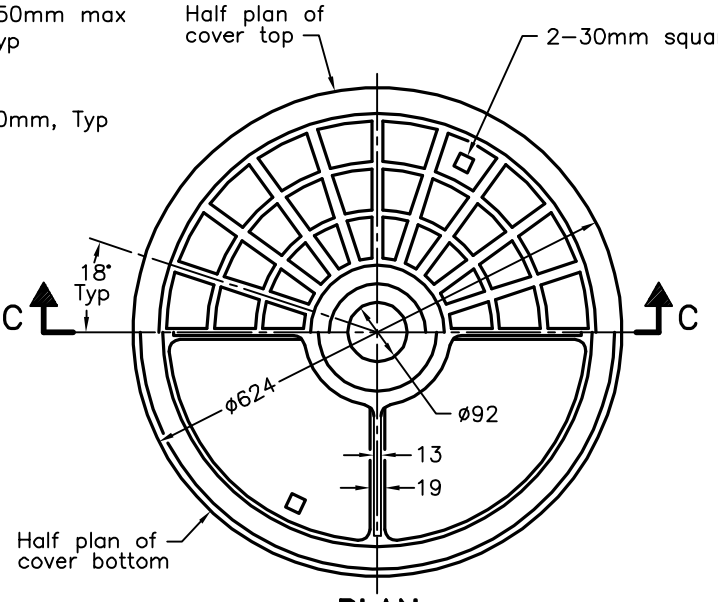
CAST IRON, SQUARE FRAME FISH TYPE COVER

Nov 2015 | Rev 1

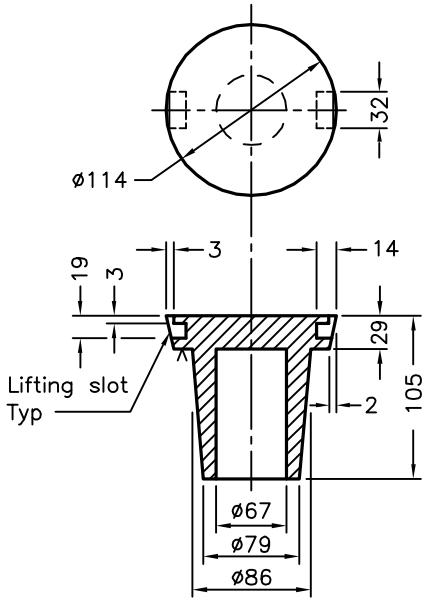
OPSD 401.081



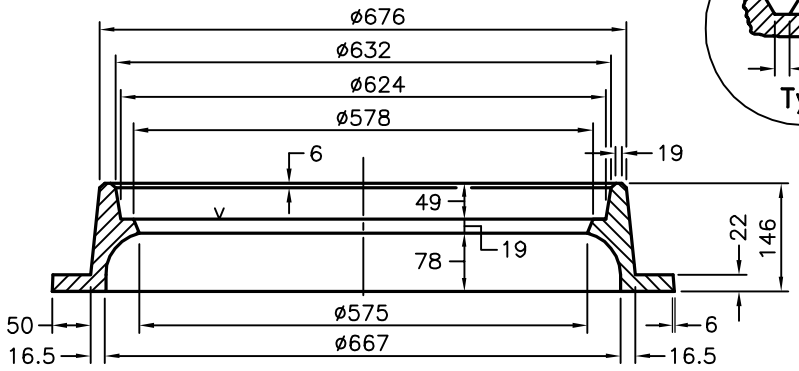
FRAME PLAN



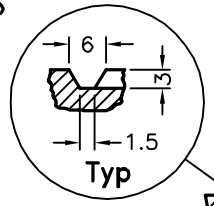
PLAN

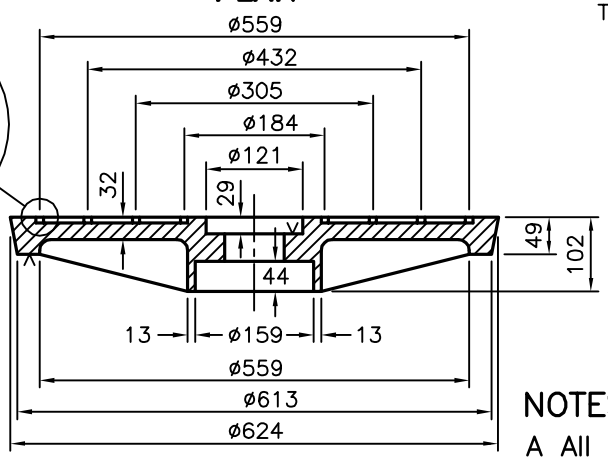


PLUG DETAIL



SECTION A–A

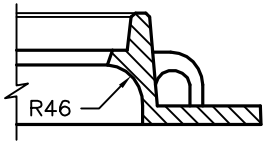




SECTION C–C

NOTES:

A All dimensions are in millimetres unless otherwise shown.



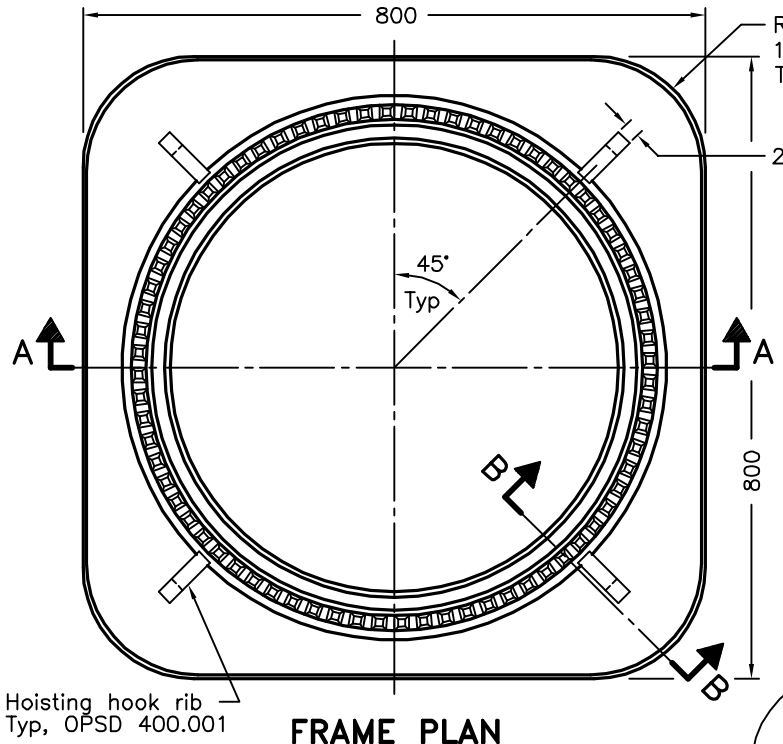
SECTION B–B

ONTARIO PROVINCIAL STANDARD DRAWING

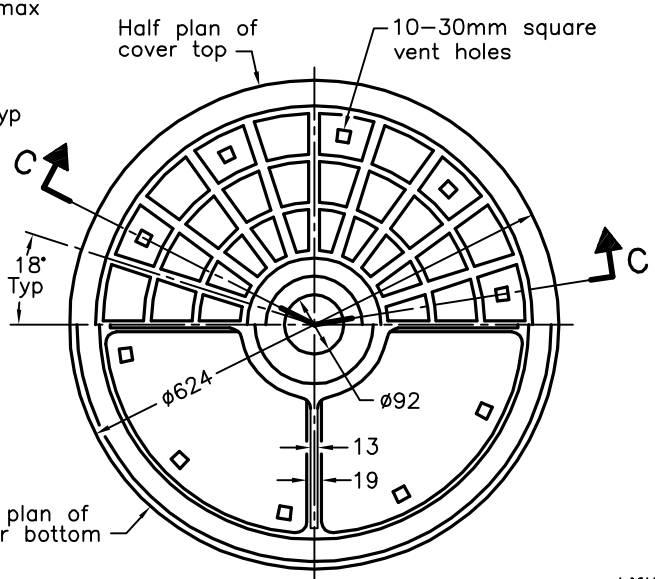
CAST IRON, SQUARE FRAME WITH CIRCULAR COVER AND PLUG FOR VALVE CHAMBERS

Nov 2014 | Rev 3

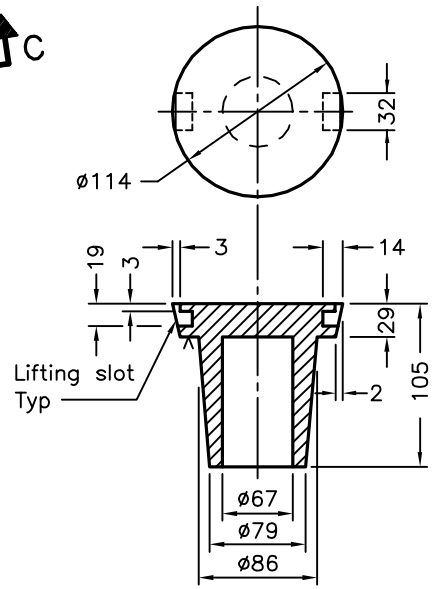
OPSD 402.010



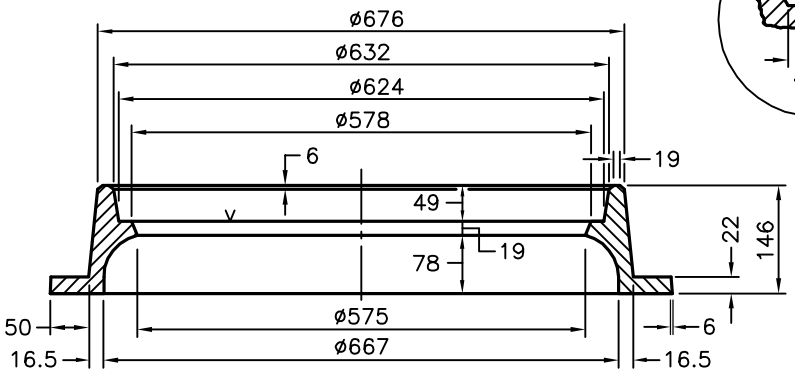
FRAME PLAN



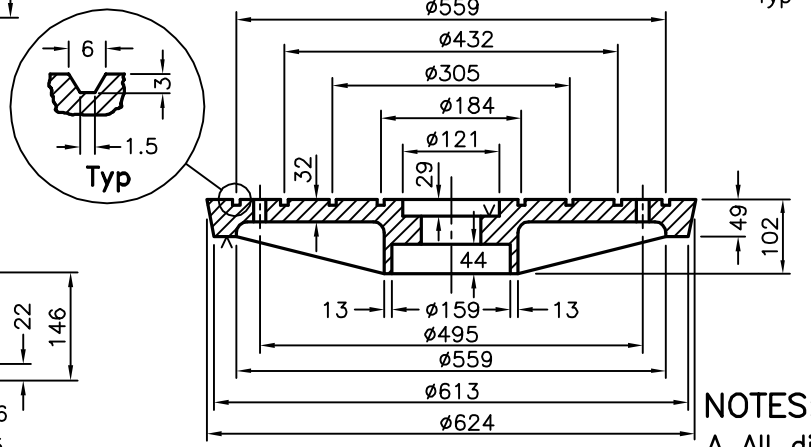
PLAN



PLUG DETAIL



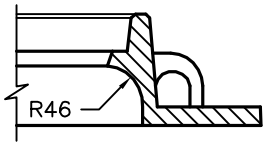
SECTION A–A



SECTION C–C

NOTES:

A All dimensions are in millimetres unless otherwise shown.



SECTION B–B

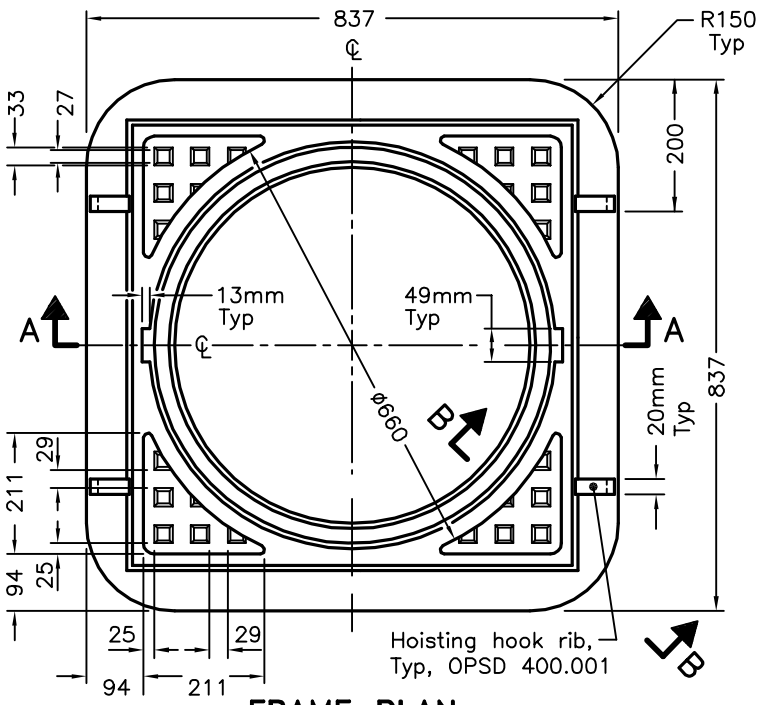
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 | Rev 3

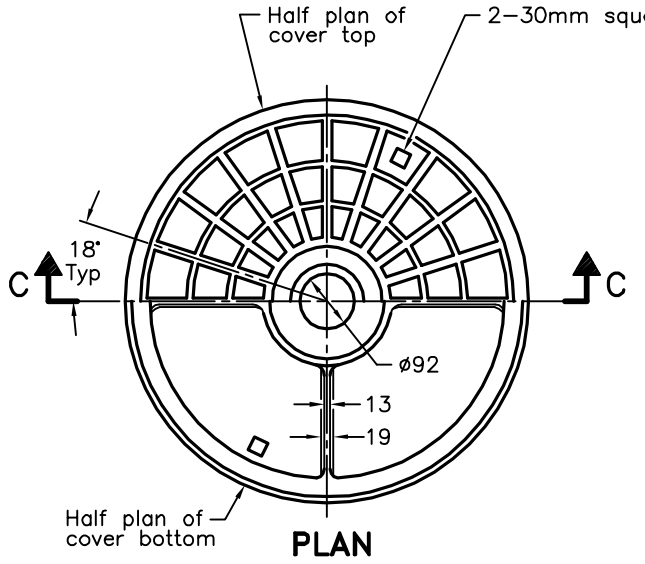
CAST IRON, SQUARE FRAME WITH VENTED CIRCULAR COVER AND PLUG FOR VALVE CHAMBERS

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

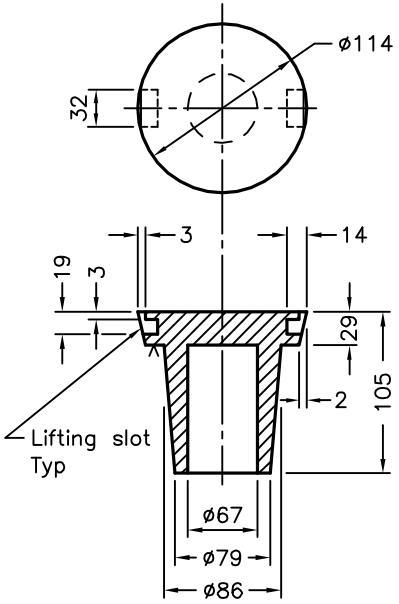
OPSD 402.011



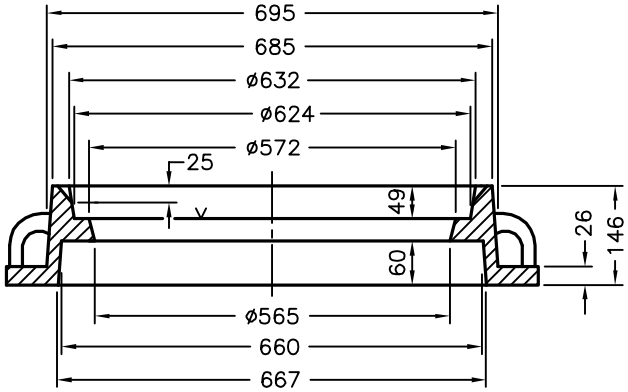
FRAME PLAN



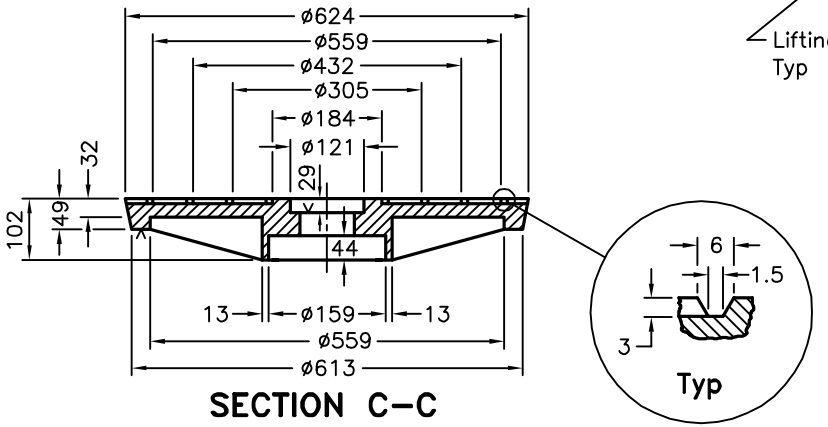
PLAN



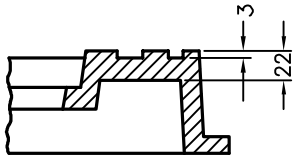
PLUG DETAIL



SECTION A–A



SECTION C–C



SECTION B–B

NOTES:

A All dimensions are in millimetres unless otherwise shown.

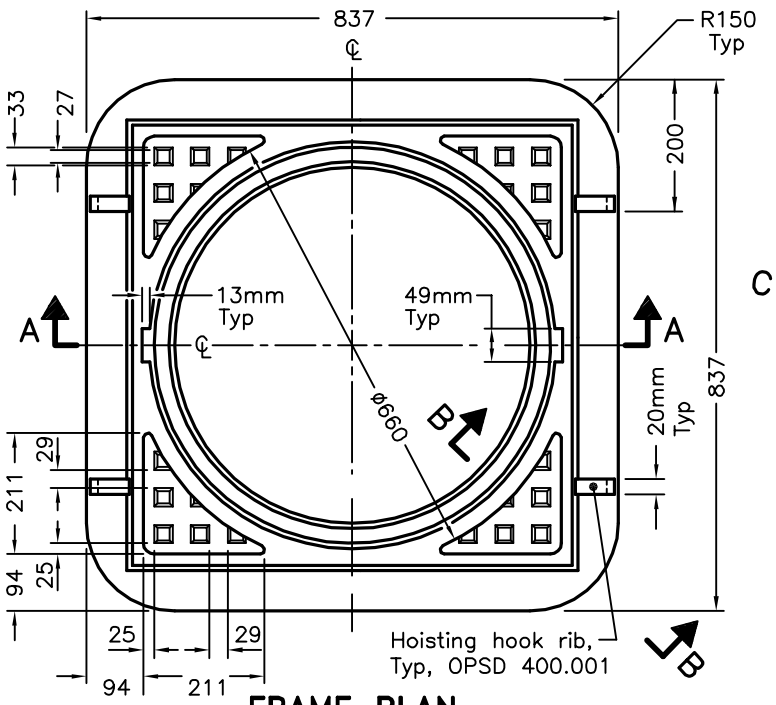
ONTARIO PROVINCIAL STANDARD DRAWING

Apr 2015 | Rev 4

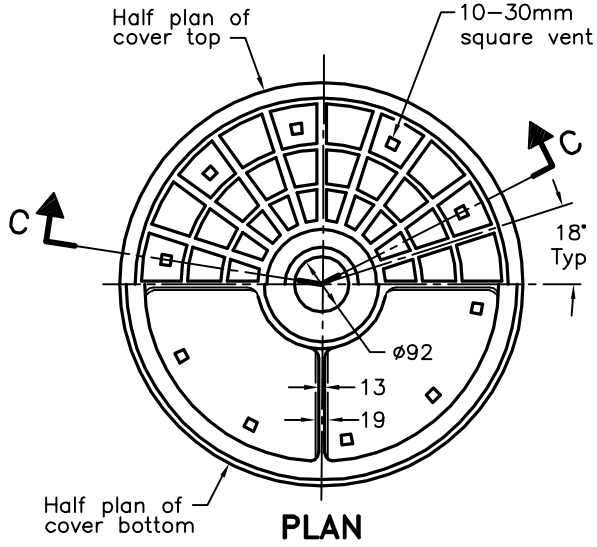
CAST IRON, RAISED SQUARE FRAME WITH CIRCULAR COVER AND PLUG FOR VALVE CHAMBERS

ONTARIO STANDARD · MUNICIPAL–PROVINCIAL · O P S

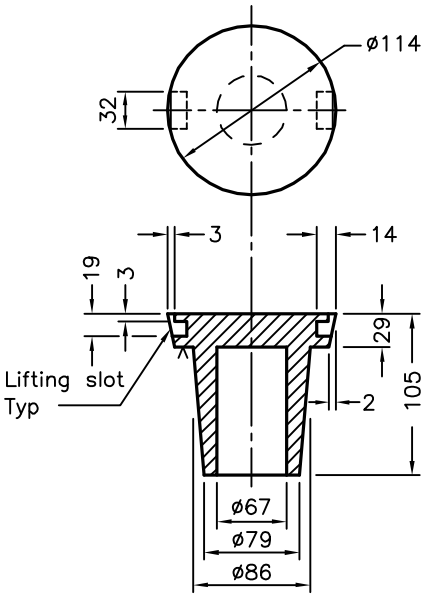
OPSD 402.020



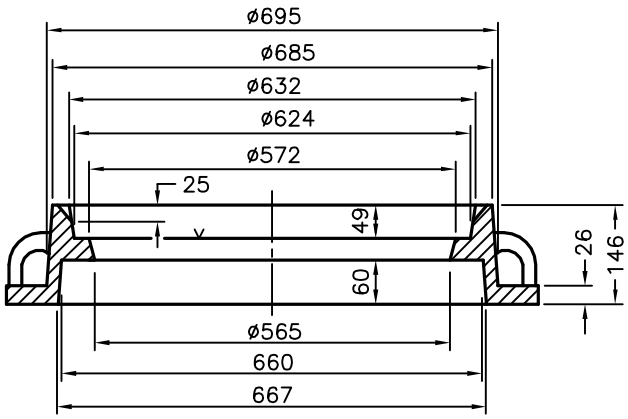
FRAME PLAN



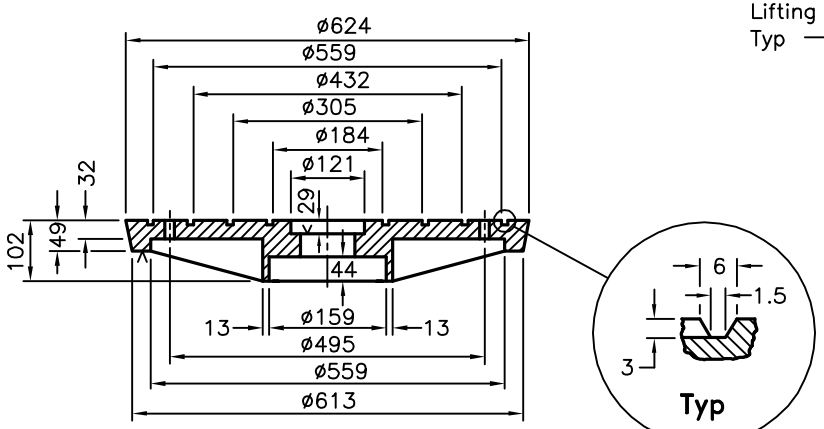
PLAN



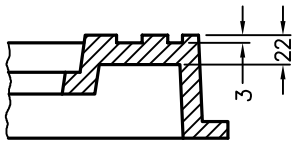
PLUG DETAIL



SECTION A–A



SECTION C–C



SECTION B–B

NOTES:

A All dimensions are in millimetres unless otherwise shown.

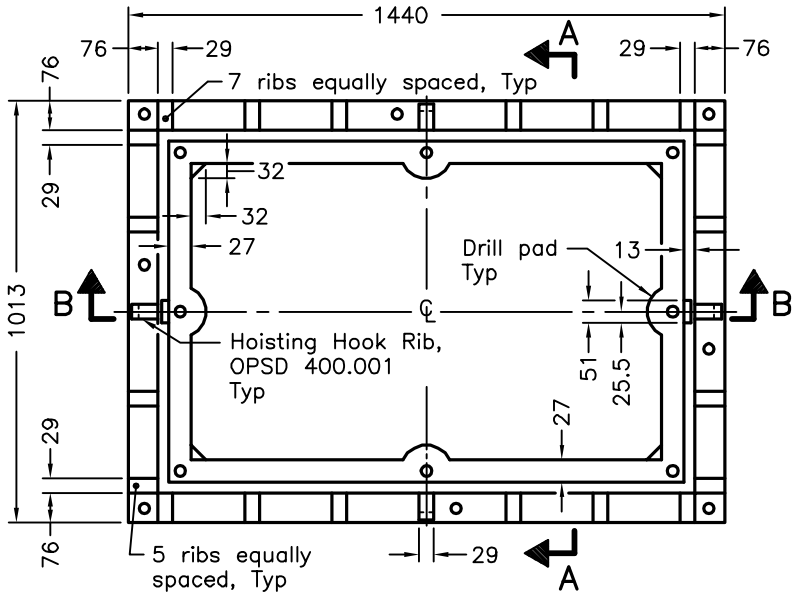
ONTARIO PROVINCIAL STANDARD DRAWING

Apr 2015 | Rev 3

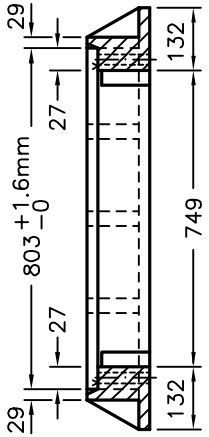
CAST IRON, RAISED SQUARE FRAME WITH VENTED CIRCULAR COVER AND PLUG FOR VALVE CHAMBERS

ONTARIO STANDARDS · MUNICIPAL–PROVINCIAL · OPS

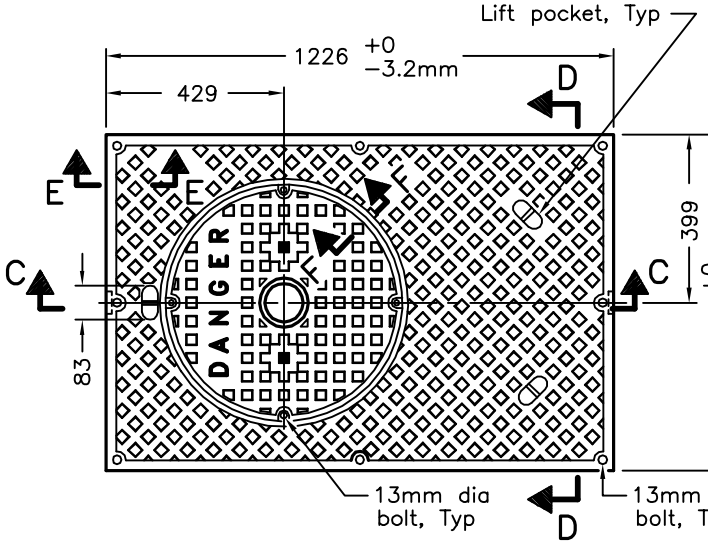
OPSD 402.021



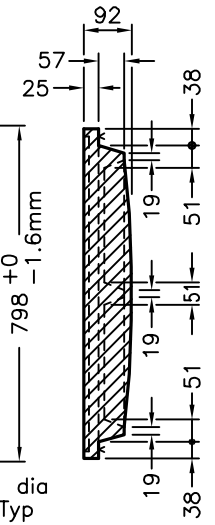
FRAME PLAN



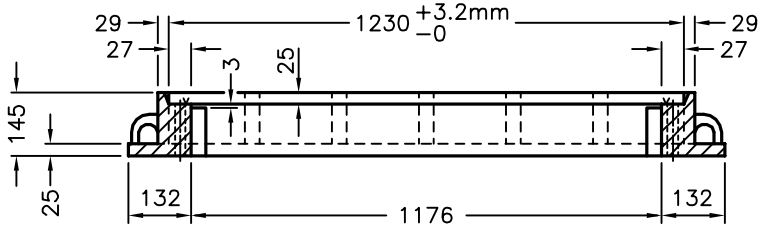
SECTION A–A



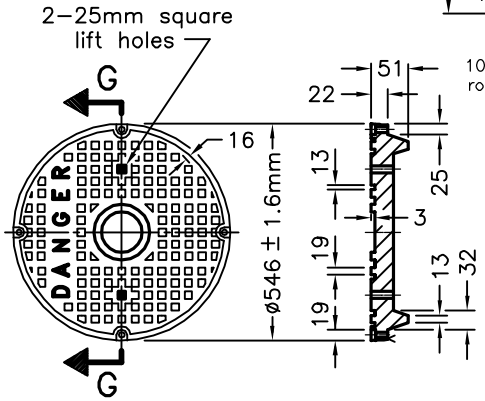
LARGE COVER PLAN



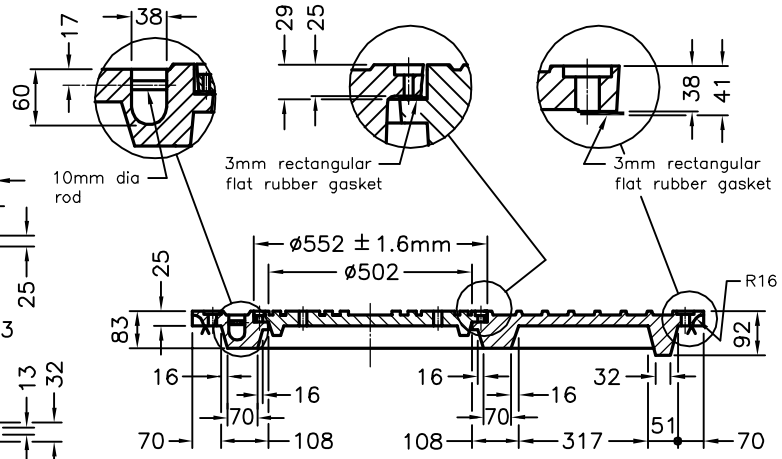
SECTION D–D



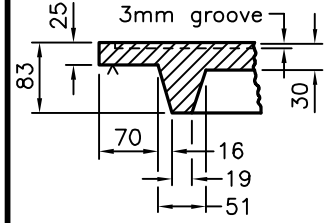
SECTION B–B



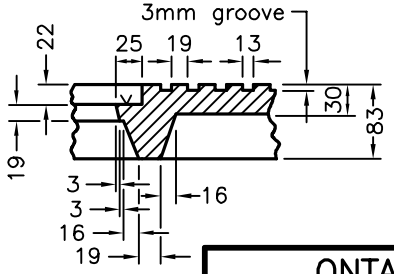
CIRCULAR COVER SECTION G–G



SECTION C–C



SECTION E–E



SECTION F–F

NOTE:
All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

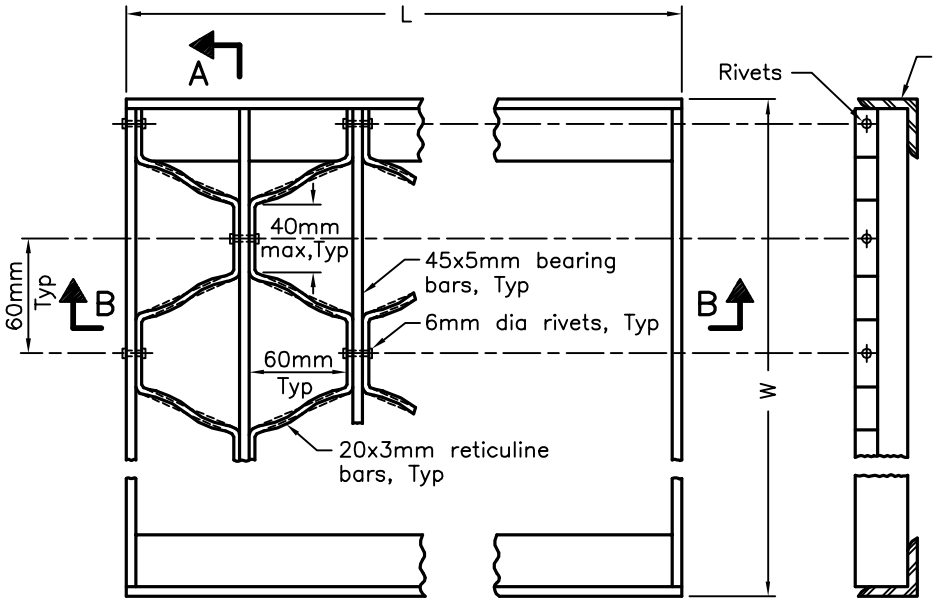
CAST IRON, RECTANGULAR FRAME WITH TWO PIECE COVER

FOR METER AND VALVE CHAMBERS

Nov 2014 | Rev 4

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 402.030

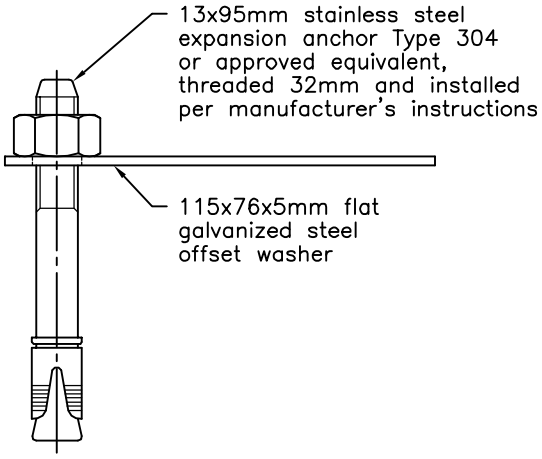


Grating Type	Grating Size	
	Length L	Width W
A	762	768
B	1338	768
C	1465	768

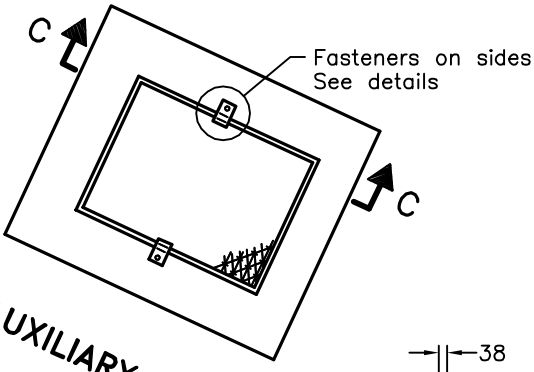
PLAN OF GRATE

SECTION A–A

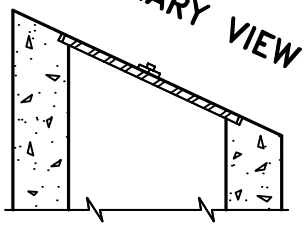
SECTION B–B



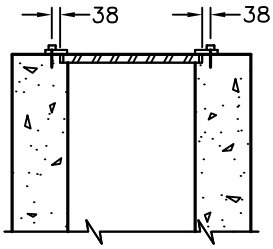
FASTENER DETAIL



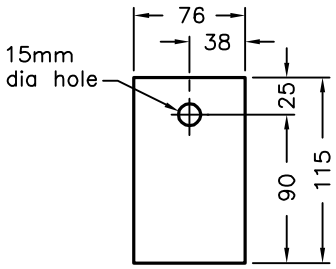
AUXILIARY VIEW



SECTION C–C



FASTENER EMBEDMENT DETAIL



OFFSET WASHER DETAIL

NOTES:

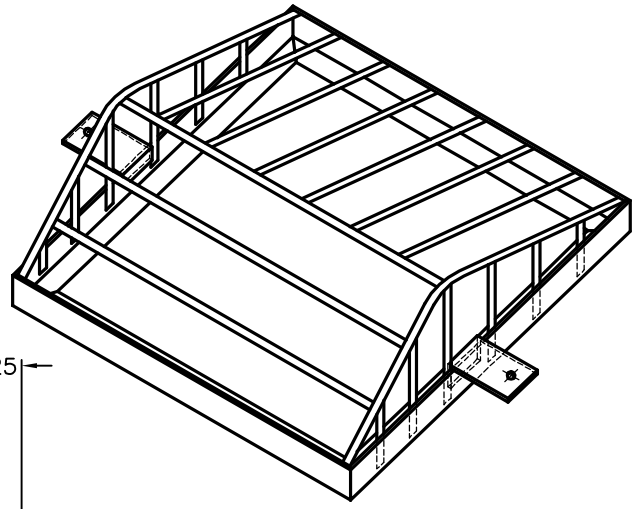
A Fastener shall be inserted to maintain minimum concrete cover requirements.

B All steel components and rivets shall be galvanized.

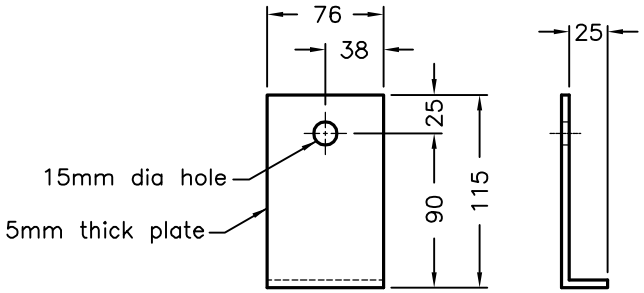
C All dimensions are in millimetres unless otherwise shown.

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

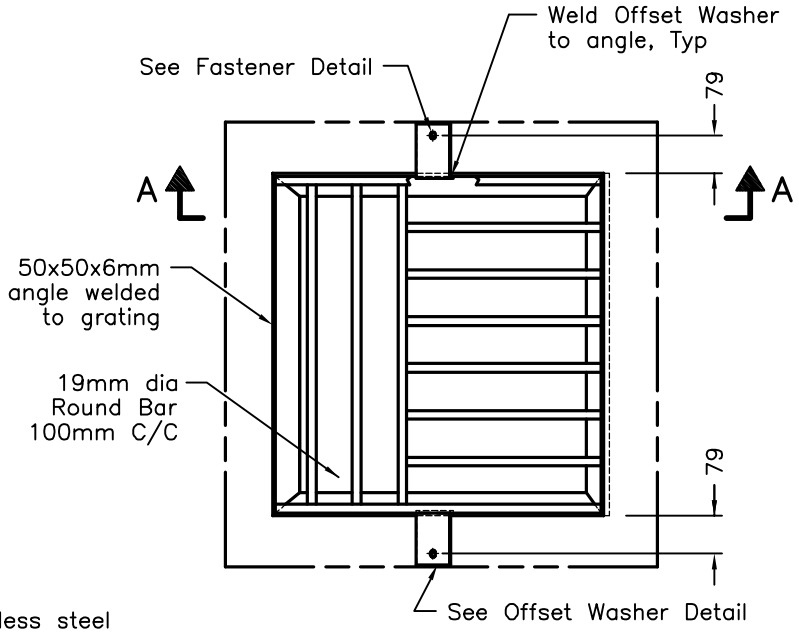
Slope of Grating	Dimension a
2H:1V	343
3H:1V	243
4H:1V	186



GRATE ISOMETRIC VIEW



OFFSET WASHER DETAIL



PLAN OF GRATE

NOTES:

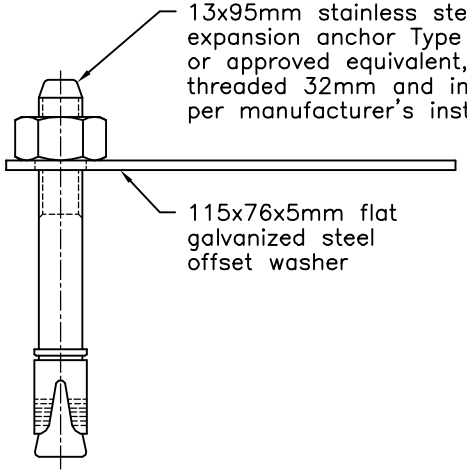
A Grate dimensions shall be according to OPSD 705.030.

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

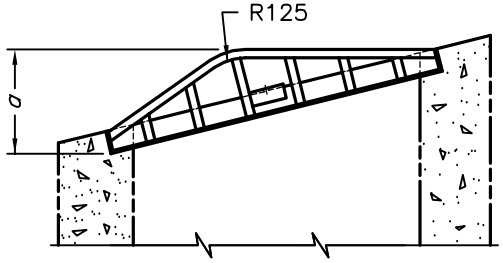
C When specified, all surfaces shall be painted in the shop with one coat of asphalt or tar base black paint having a minimum softening point of 71° C.
All joints and crevices shall be thoroughly coated.

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



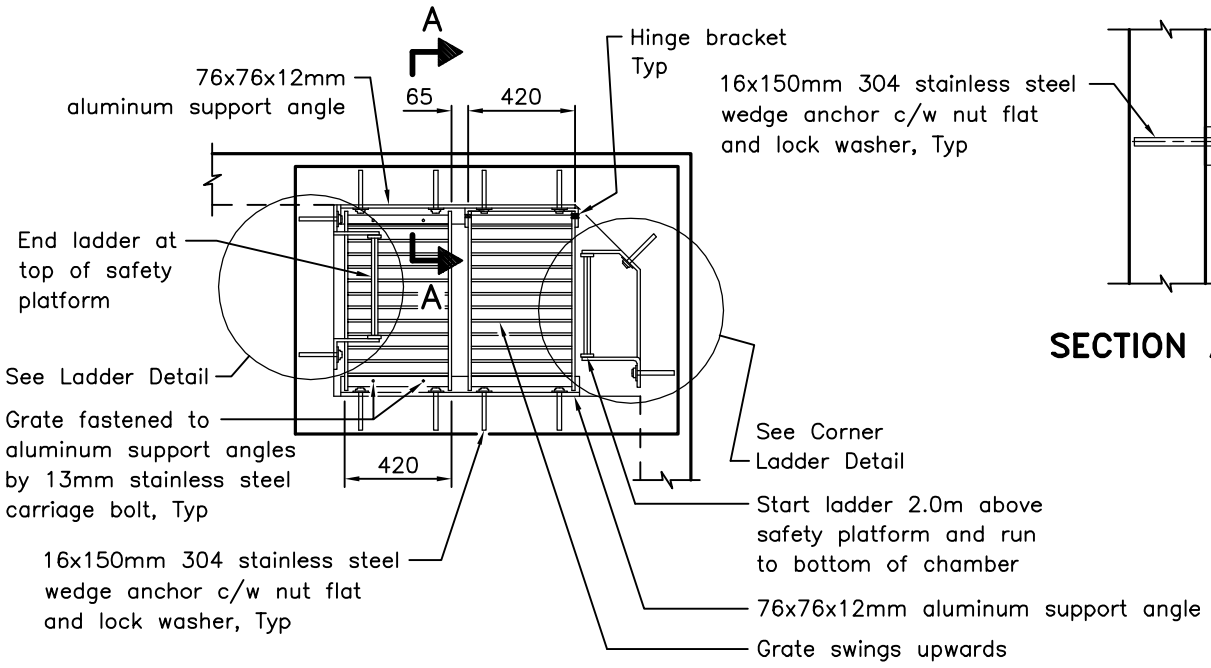
SECTION A–A

ONTARIO PROVINCIAL STANDARD DRAWING

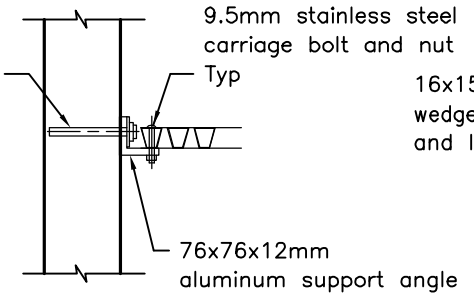
Nov 2012 | Rev 0

RAISED BAR GRATE FOR DITCH INLET 600 x 600mm

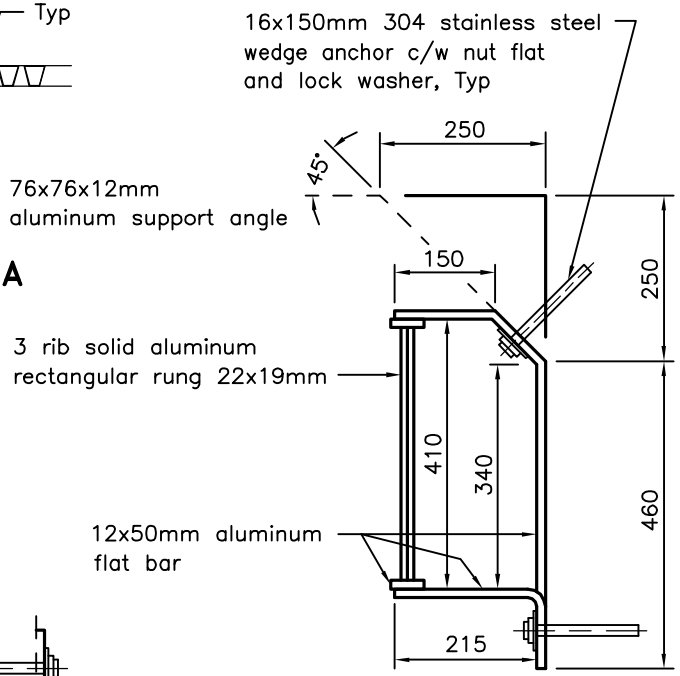
OPSD 403.011



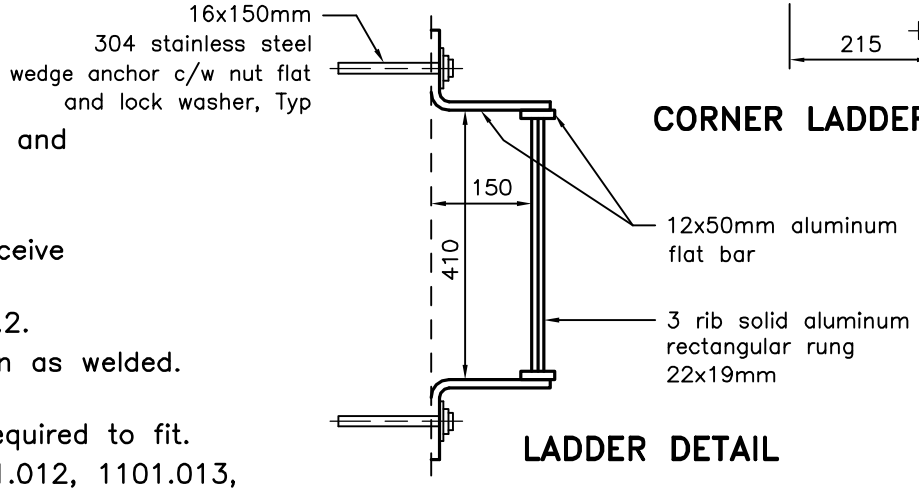
SAFETY PLATFORM IN CHIMNEY



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.

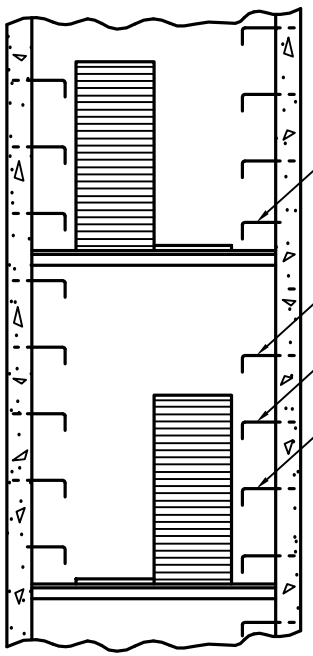
ONTARIO PROVINCIAL STANDARD DRAWING

ALUMINUM SAFETY PLATFORM AND LADDER FOR RECTANGULAR PRECAST CONCRETE VALVE CHAMBERS

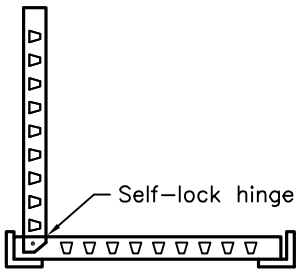
Nov 2012 | Rev 1

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

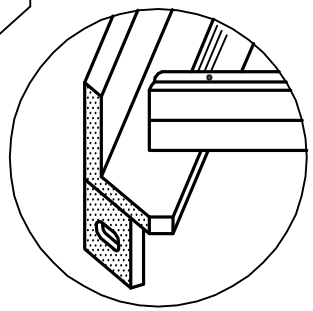
OPSD 404.010



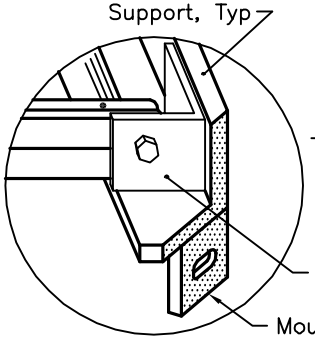
GRATING OPEN
SECTION A–A



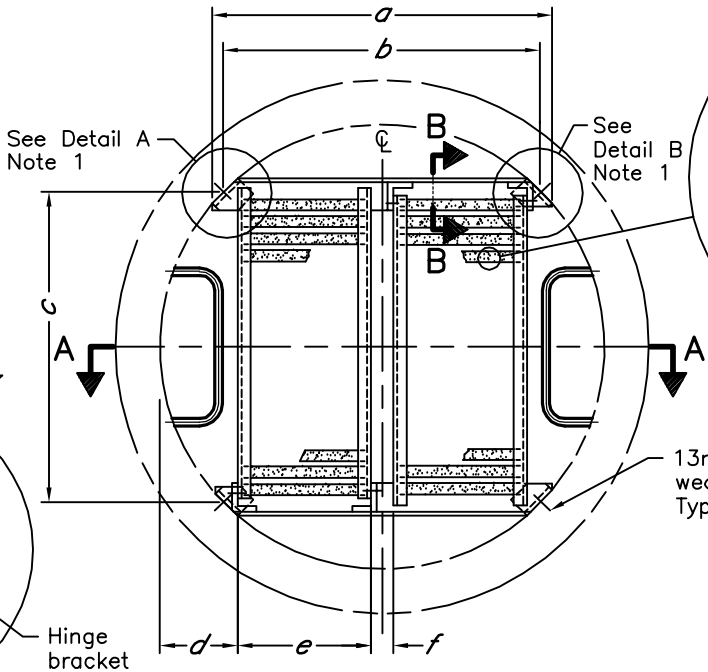
OPEN POSITION
SIDE VIEW



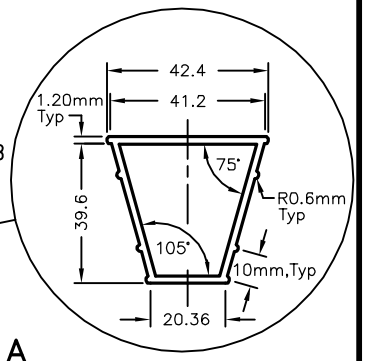
DETAIL A



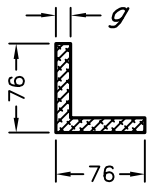
DETAIL B



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

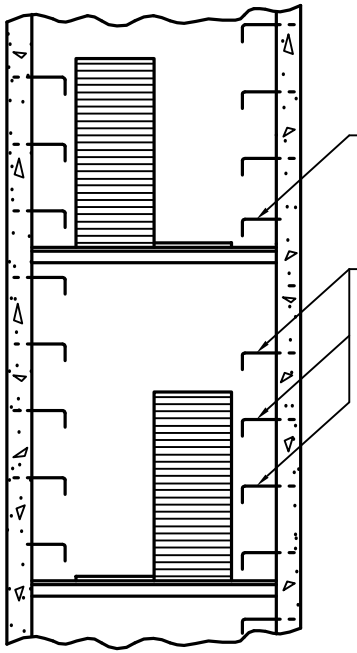
ONTARIO PROVINCIAL STANDARD DRAWING

ALUMINUM SAFETY PLATFORM FOR CIRCULAR MAINTENANCE HOLES

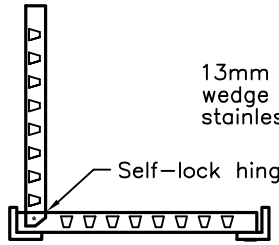
Nov 2013 | Rev 3

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

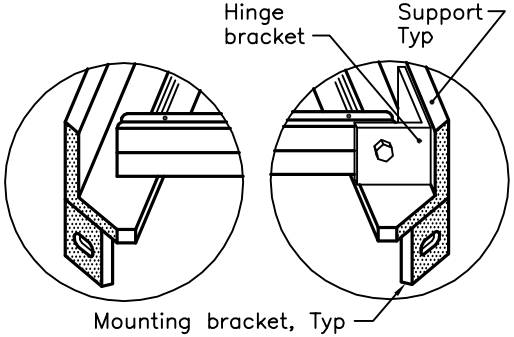
OPSD 404.020



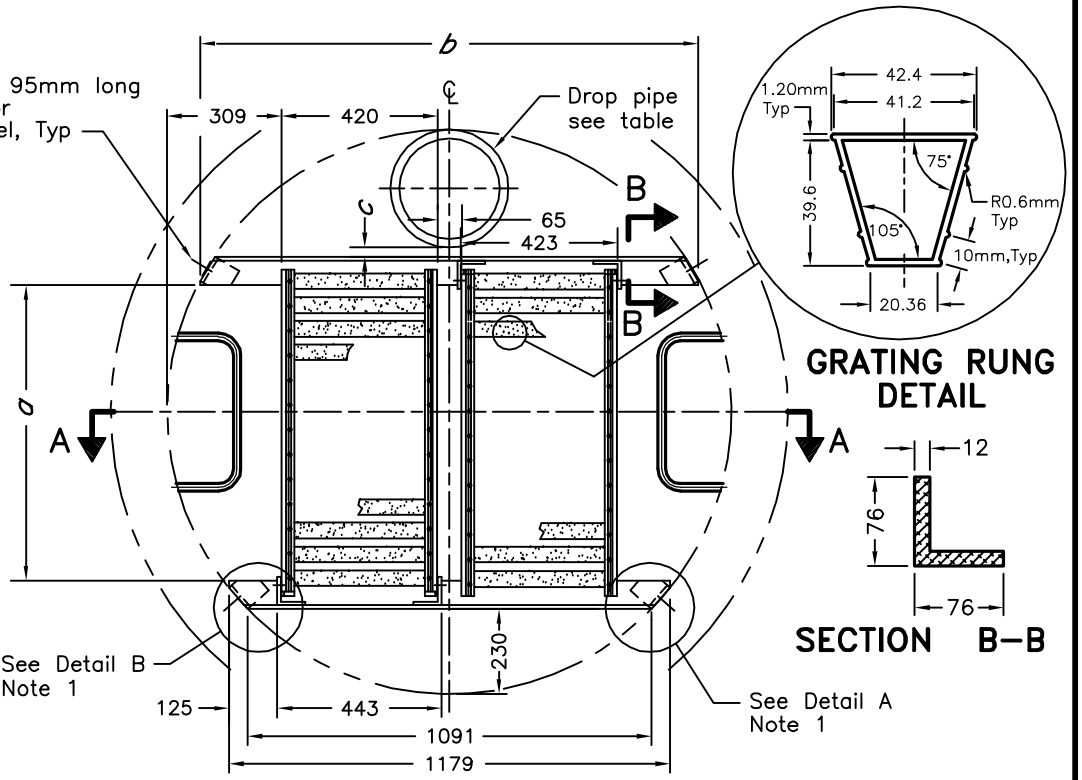
GRATING OPEN
SECTION A–A



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

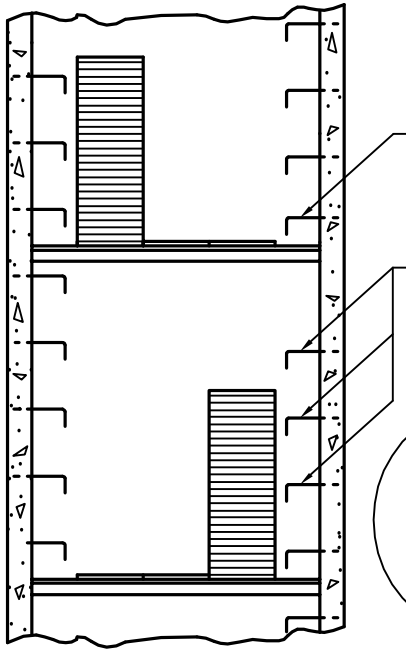
ONTARIO PROVINCIAL STANDARD DRAWING

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

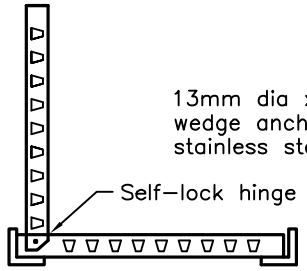
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

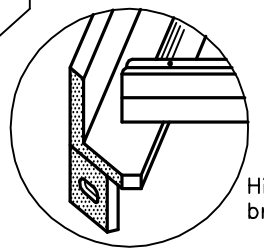
OPSD 404.021



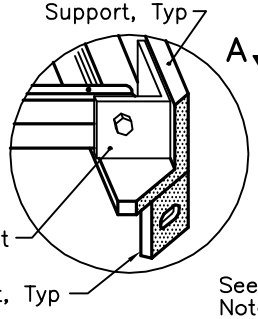
GRATING OPEN
SECTION A–A



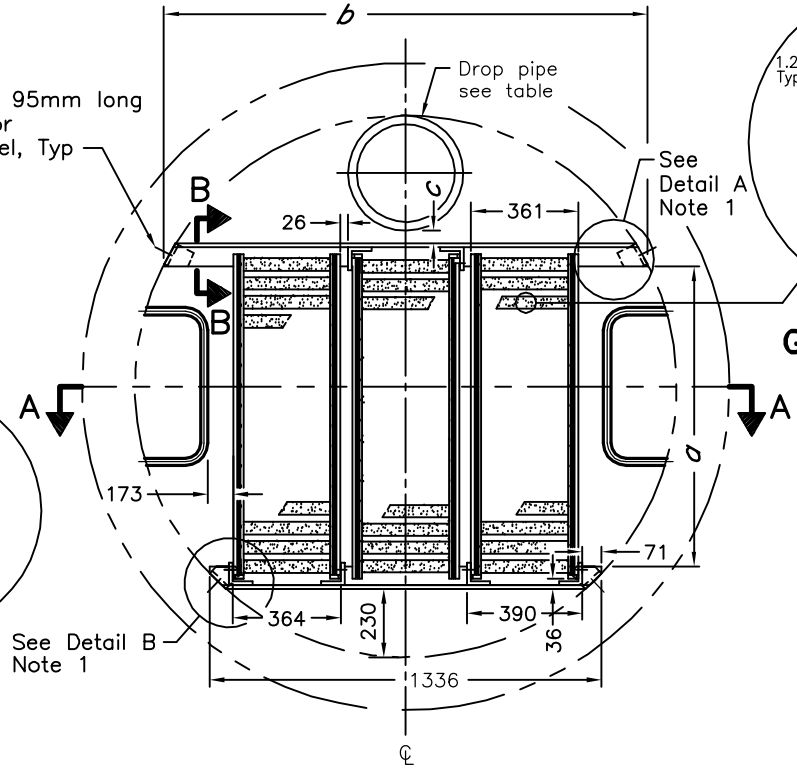
OPEN POSITION
SIDE VIEW



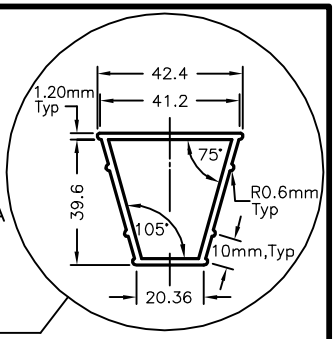
DETAIL A



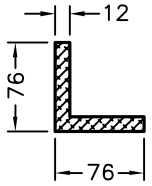
DETAIL B



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

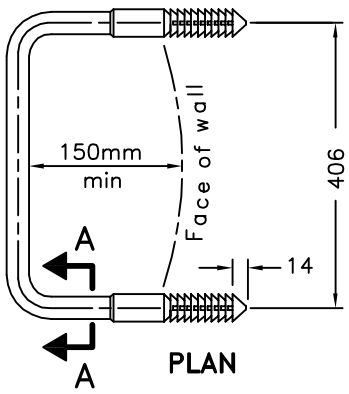
ONTARIO PROVINCIAL STANDARD DRAWING

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

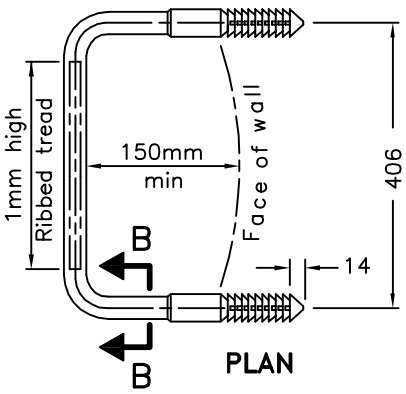
Nov 2013 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

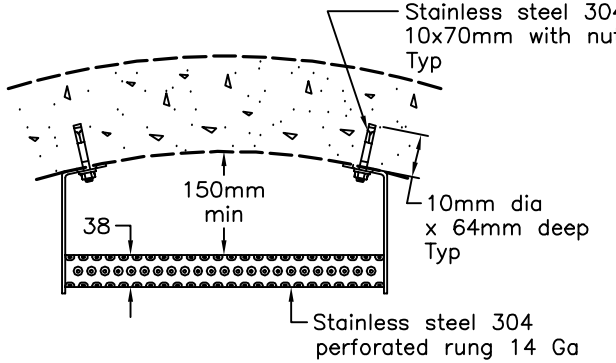
OPSD 404.022



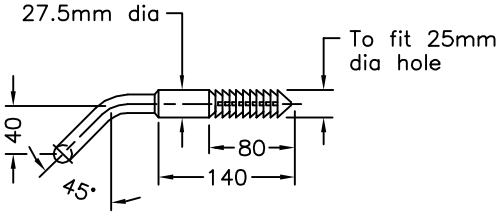
PLAN



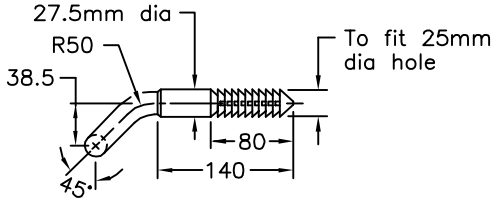
PLAN



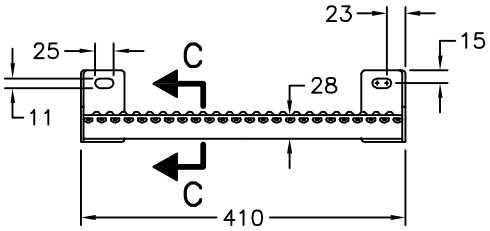
PLAN



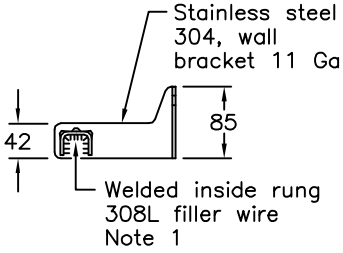
SIDE VIEW



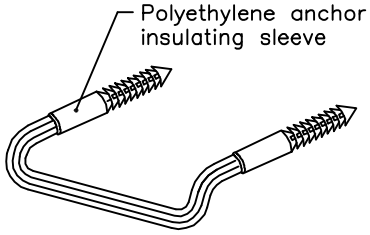
SIDE VIEW



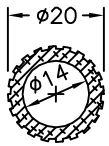
FRONT VIEW



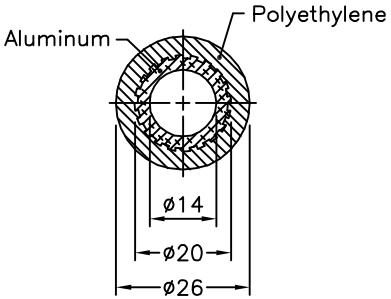
SECTION C–C



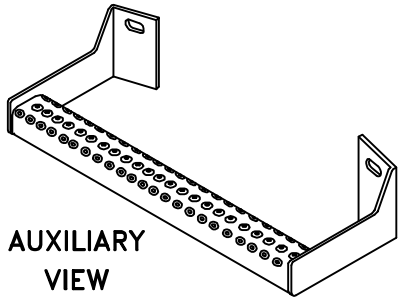
AUXILIARY
VIEW



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.

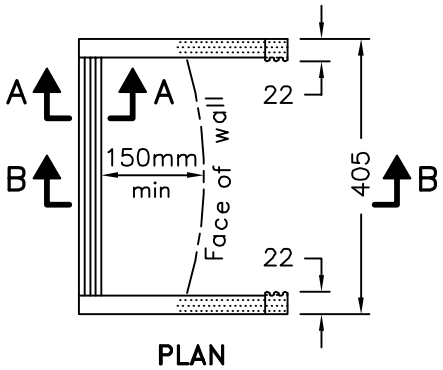
ONTARIO PROVINCIAL STANDARD DRAWING

MAINTENANCE HOLE STEPS

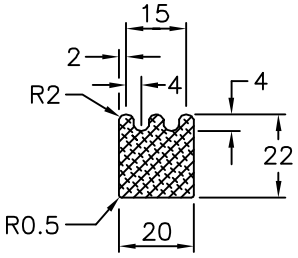
HOLLOW

Nov 2013 | Rev 3

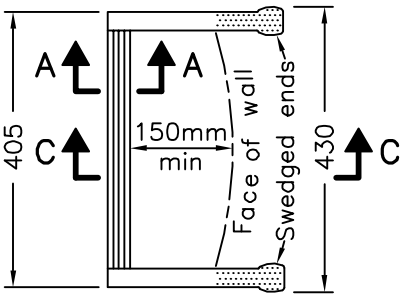
OPSD 405.010



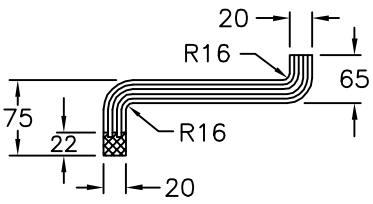
PLAN



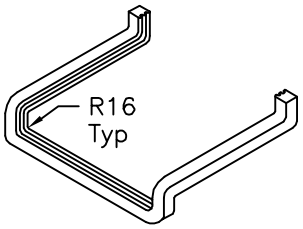
SECTION A–A



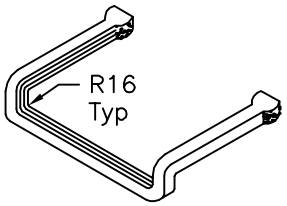
PLAN



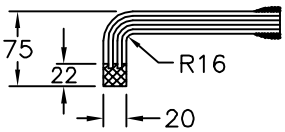
SECTION B–B



AUXILIARY VIEW



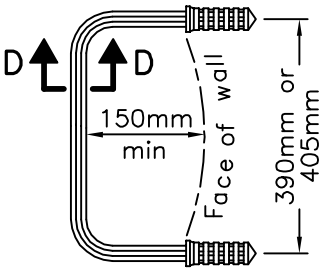
AUXILIARY VIEW



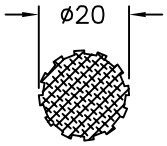
SECTION C–C

TYPE A **TYPE B**

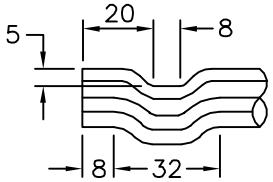
RECTANGULAR ALUMINUM



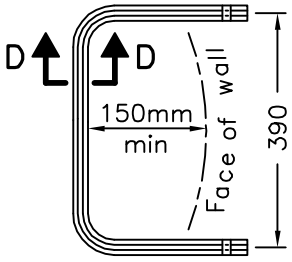
PLAN



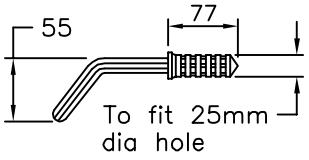
SECTION D–D



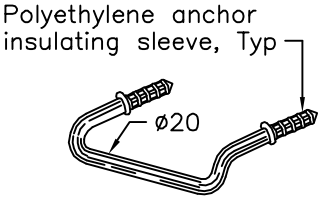
FORMED ANCHOR LOCK DETAIL



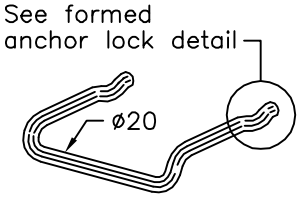
PLAN



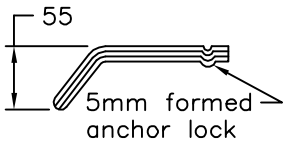
SIDE VIEW



AUXILIARY VIEW



AUXILIARY VIEW



SIDE VIEW

TYPE A **TYPE B**

CIRCULAR ALUMINUM

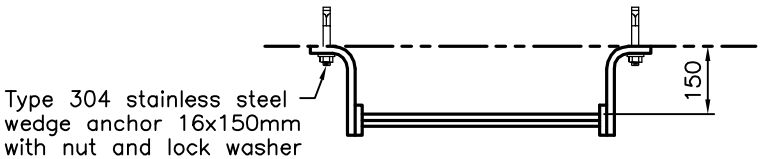
NOTES:

A All aluminum components shall be 6000 series structural aluminum.

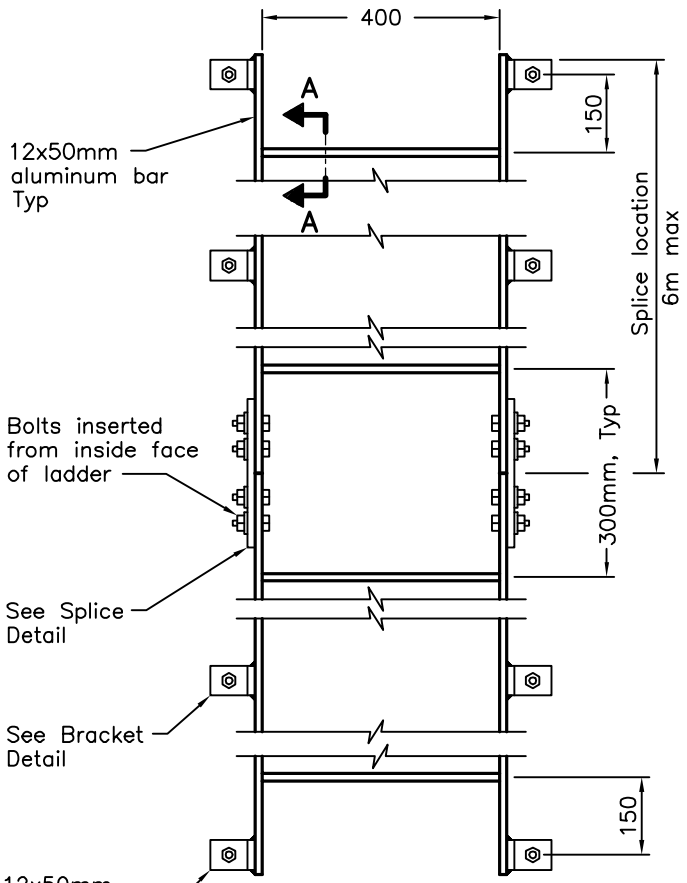
B All aluminum in contact with concrete shall be thoroughly coated with asphalt paint.

C All dimensions are in millimetres unless otherwise shown.

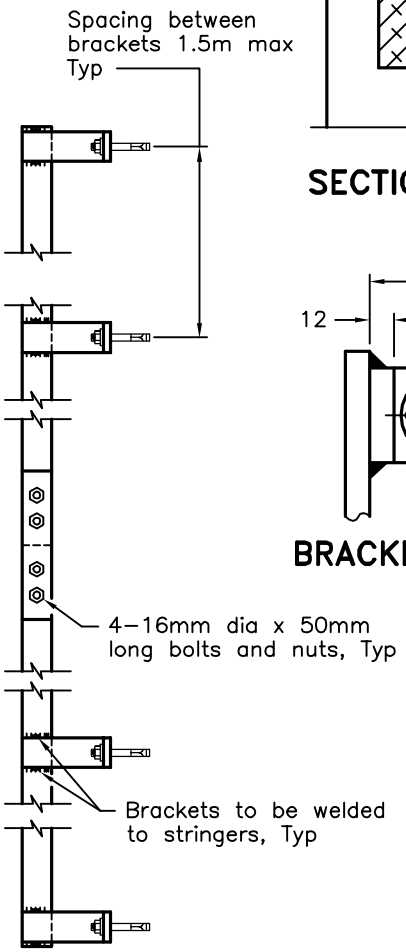
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	3
MAINTENANCE HOLE STEPS SOLID			
	OPSD 405.020		



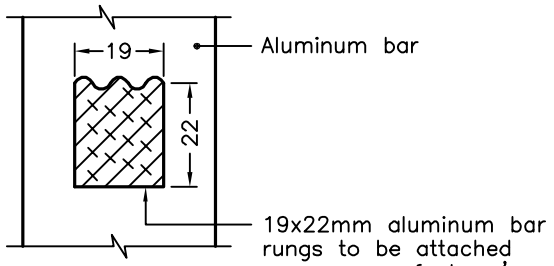
PLAN



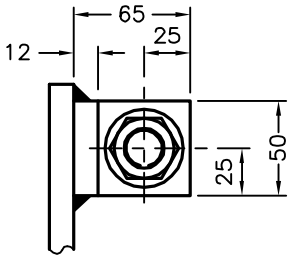
ELEVATION



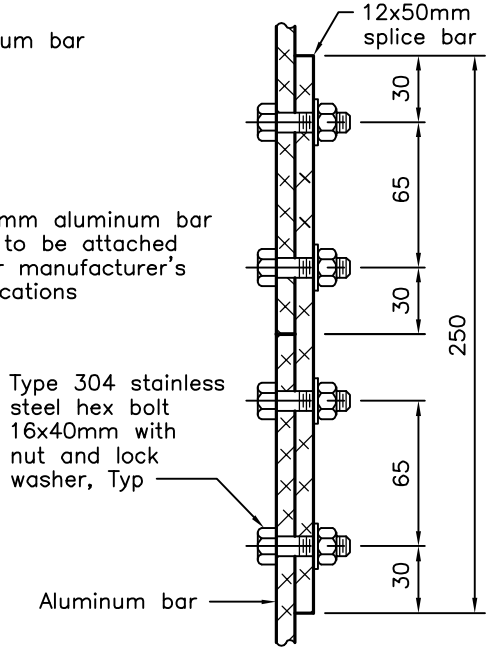
SIDE VIEW



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.

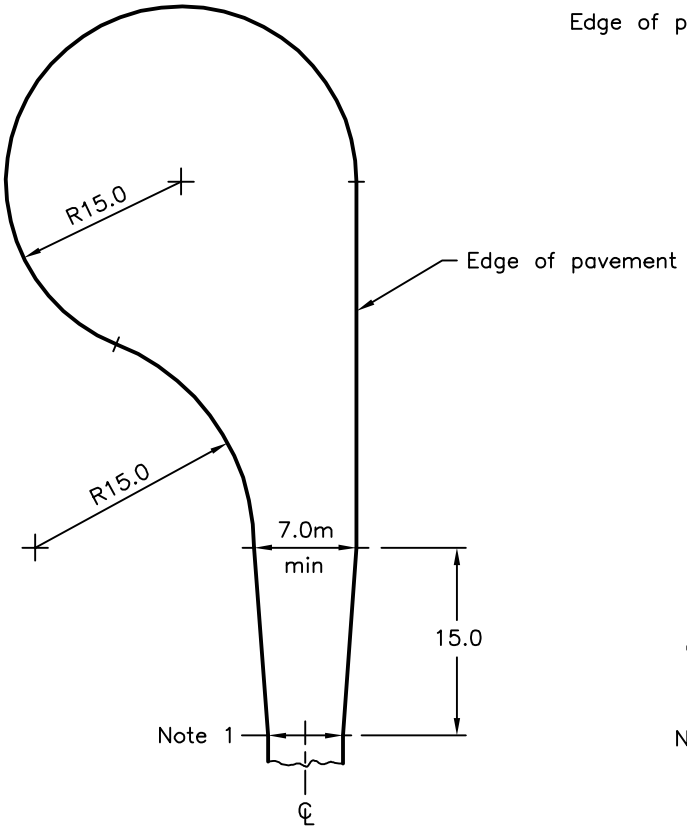
ONTARIO PROVINCIAL STANDARD DRAWING

ALUMINUM LADDER

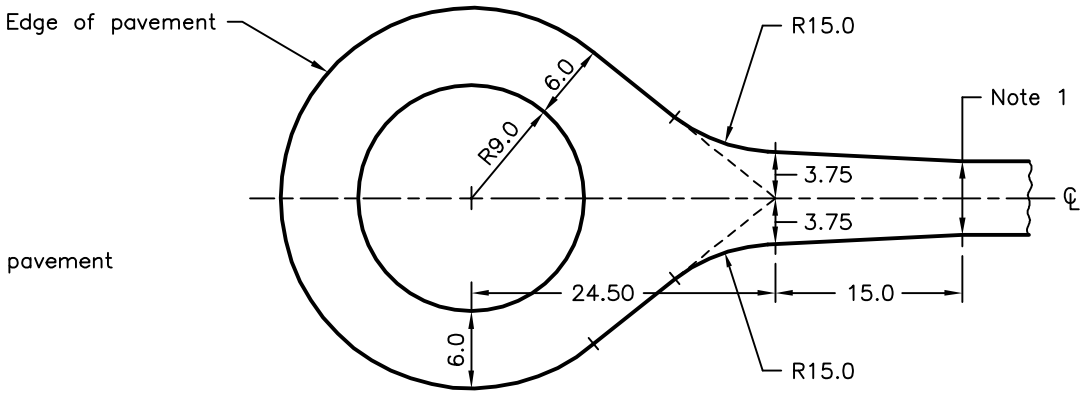
FOR MAINTENANCE HOLES

Nov 2013 | Rev 2

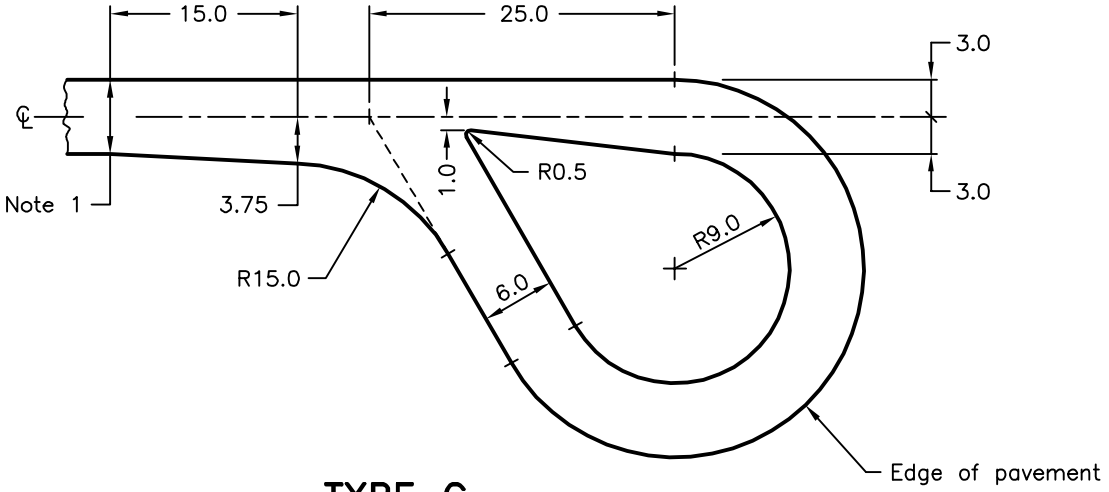
OPSD 406.010



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.

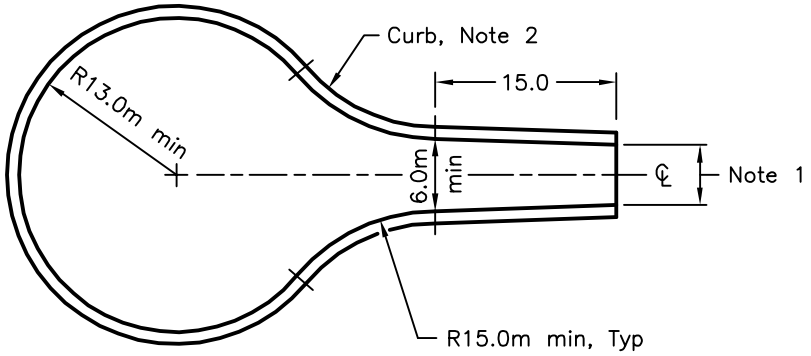
ONTARIO PROVINCIAL STANDARD DRAWING

TURNING BASINS FOR TERMINATED RURAL ROADWAYS

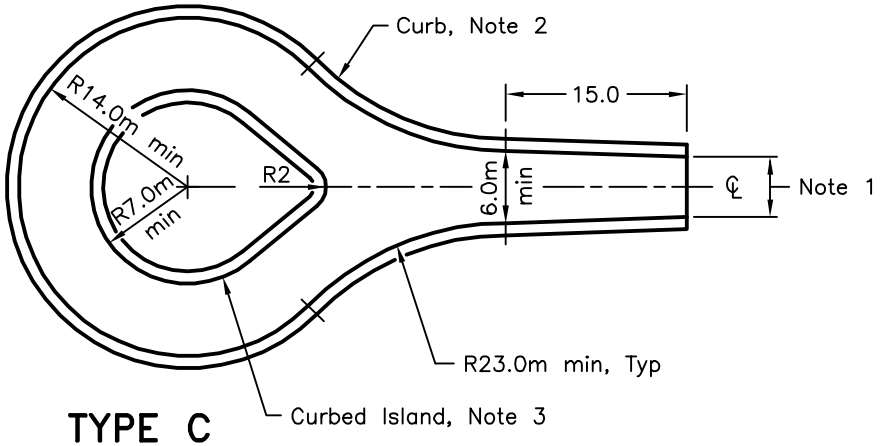
Nov 2009 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

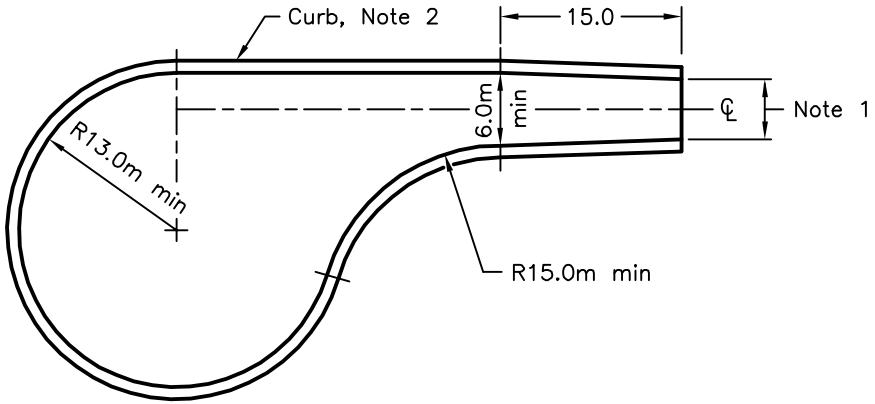
OPSD 500.010



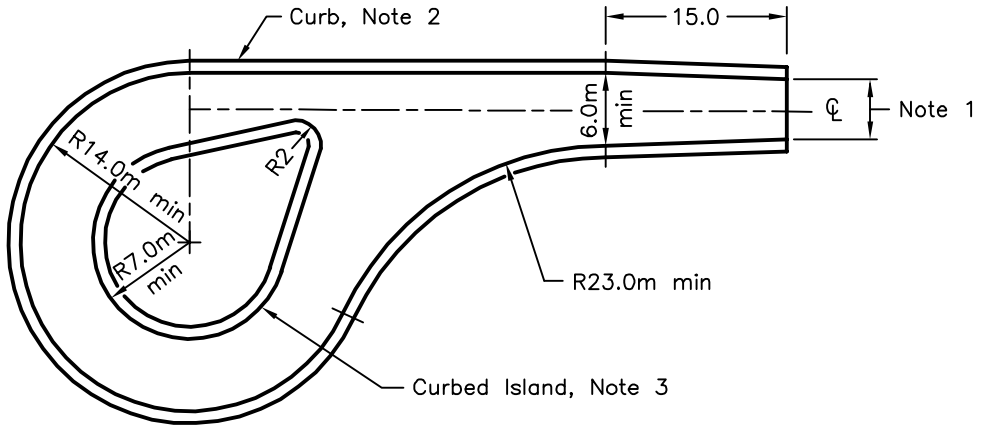
TYPE A



TYPE C



TYPE B



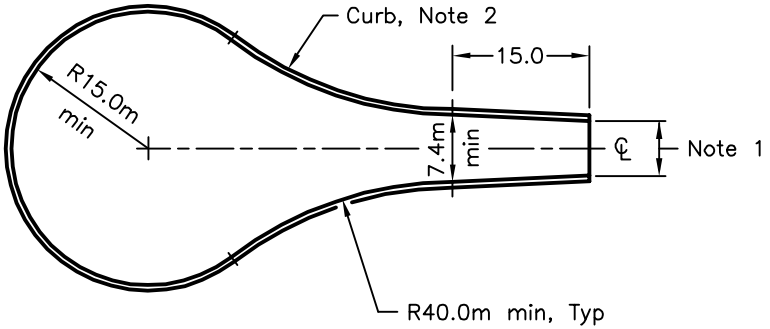
TYPE D

NOTES:

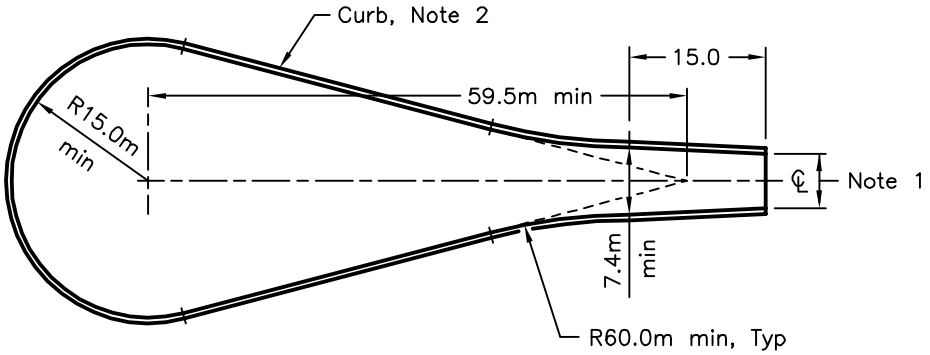
1 Width of pavement to match terminated roadway.
2 Type of curb to match terminated roadway.
3 Island curb shall be according to OPSD 600.090.

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

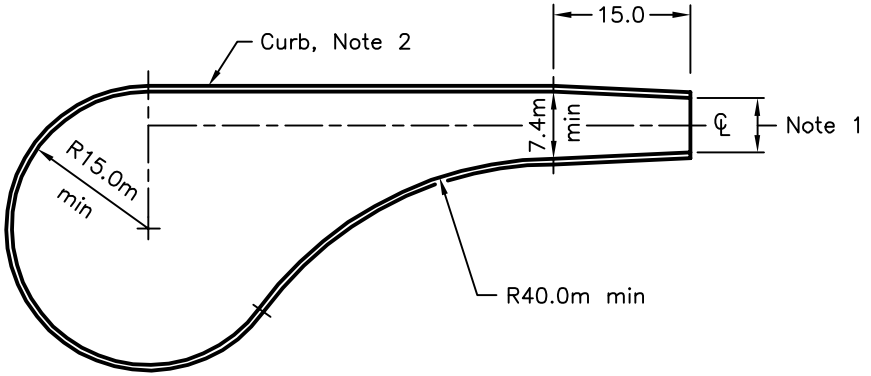
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev	0
TURNING BASINS FOR TERMINATED URBAN ROADWAYS RESIDENTIAL			
	OPSD 500.020		



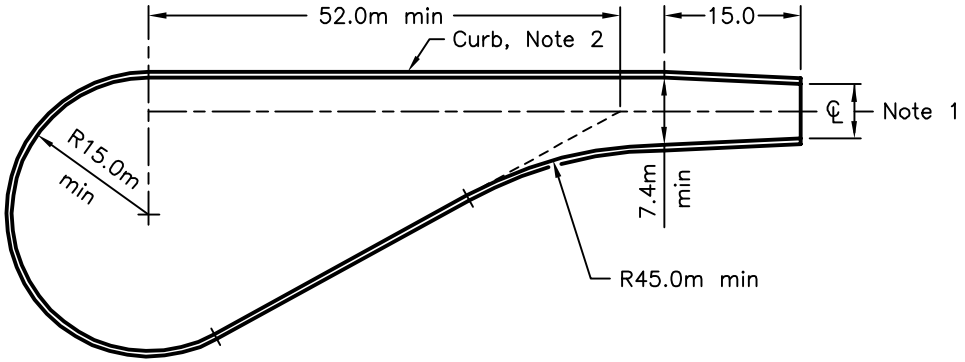
TYPE A



TYPE C



TYPE B



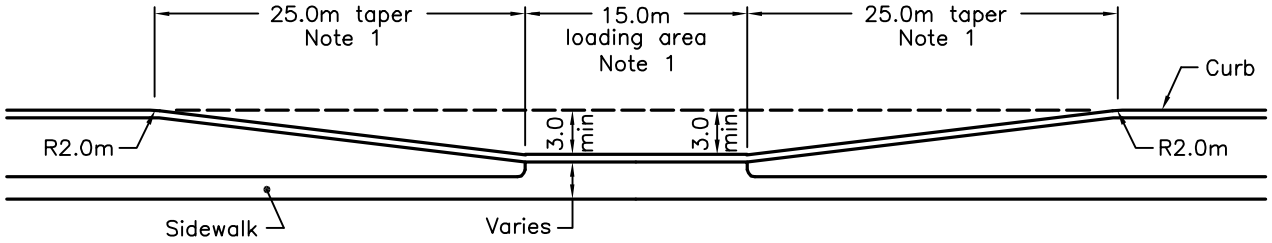
TYPE D

NOTES:

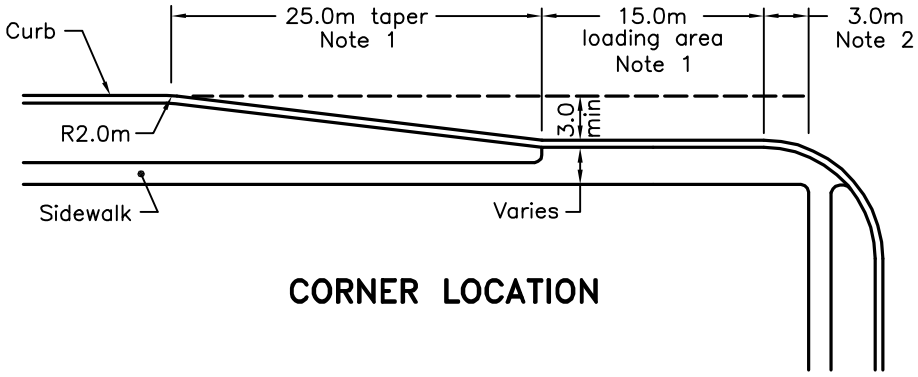
1 Width of pavement to match terminated roadway.
2 Type of curb to match terminated roadway.

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

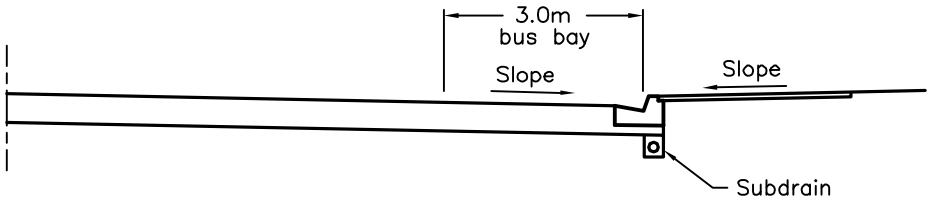
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev	0
TURNING BASINS FOR TERMINATED URBAN ROADWAYS INDUSTRIAL AND COMMERCIAL			
	OPSD 500.030		



BETWEEN INTERSECTIONS



CORNER LOCATION



TYPICAL CROSS SECTION

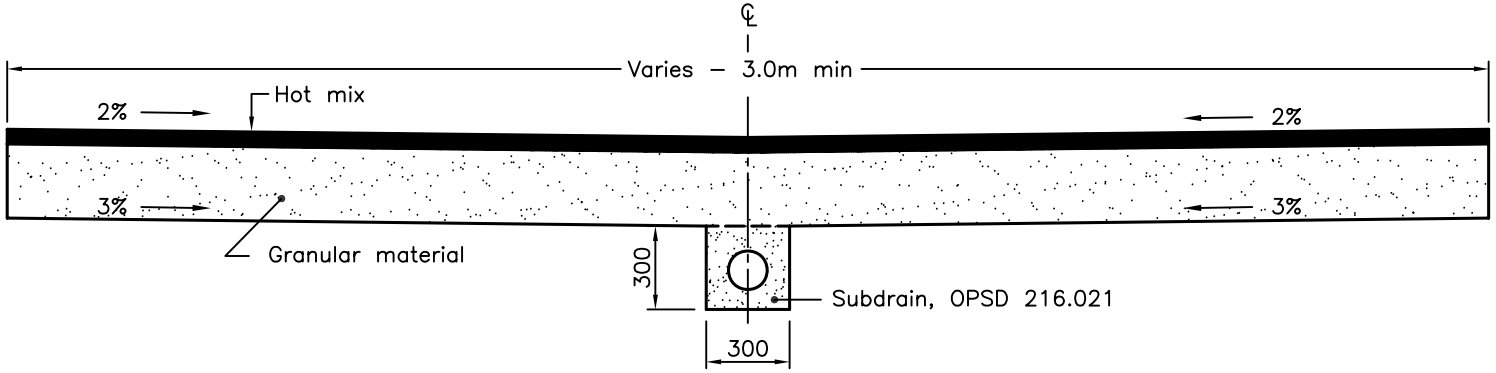
NOTES:

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.

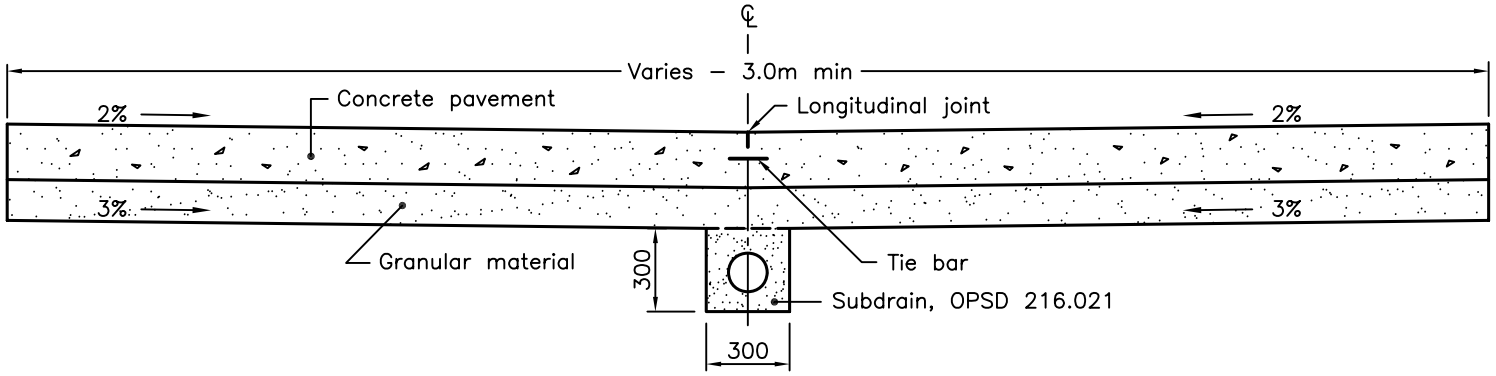
2 When the bus bay surface is concrete on an asphalt road, it shall be extended by 3.0m.

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.

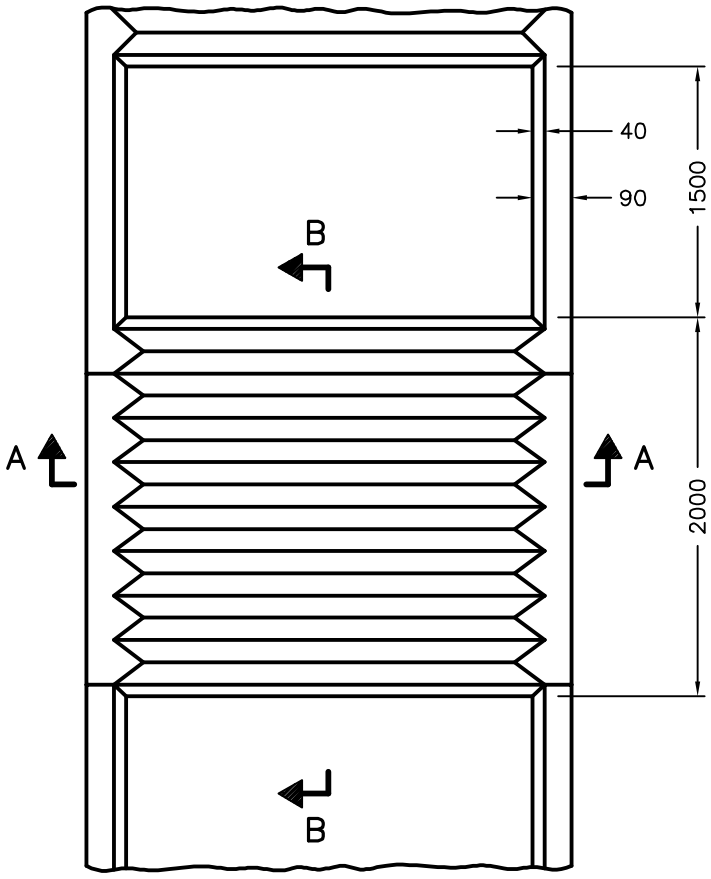
ONTARIO PROVINCIAL STANDARD DRAWING

ACCESS LANES

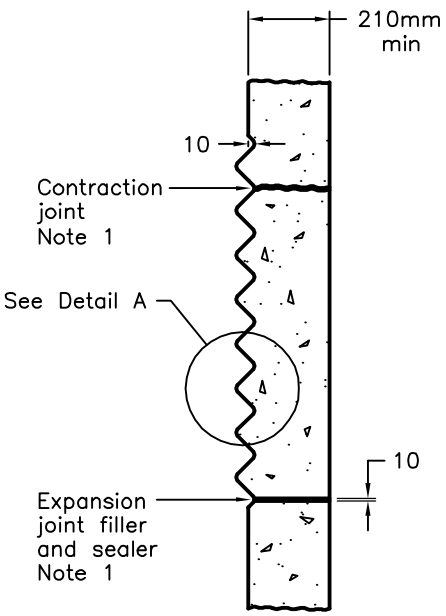
FOR REAR LOTS

Nov 2009 | Rev 1

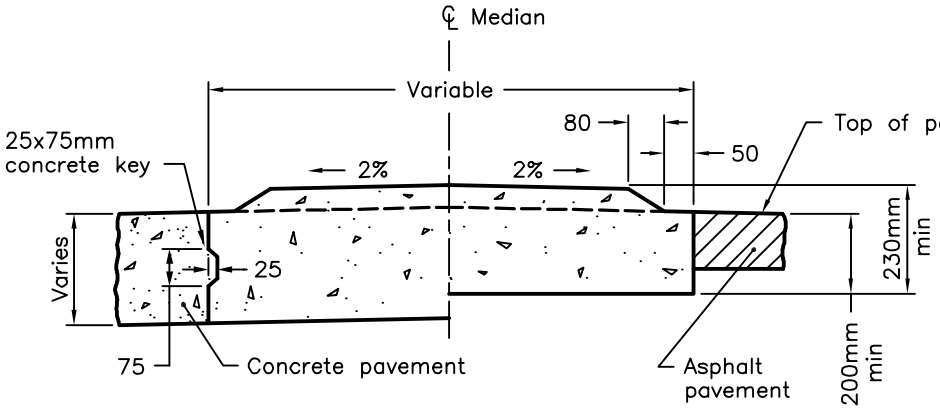
OPSD 502.010



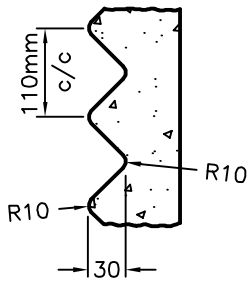
PLAN



SECTION B–B



SECTION A–A



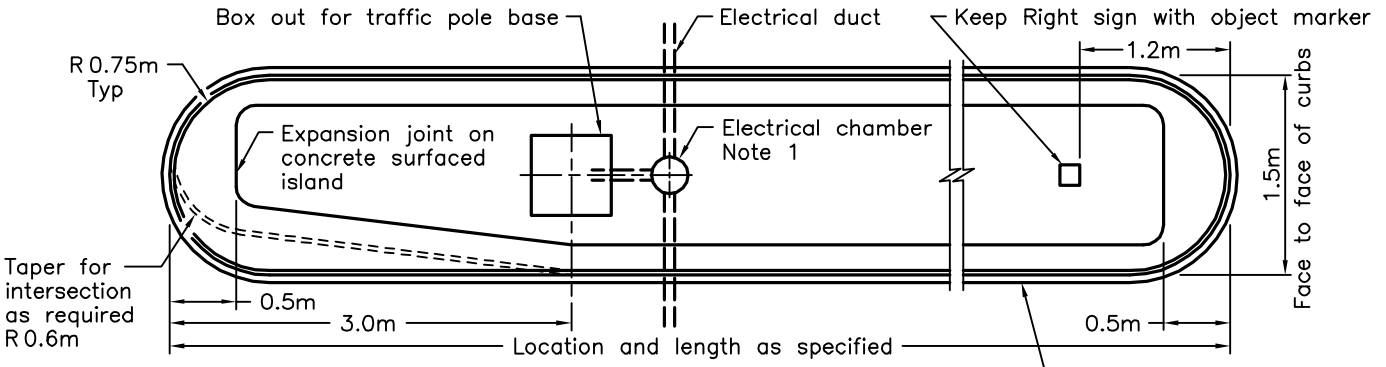
DETAIL A

NOTES:

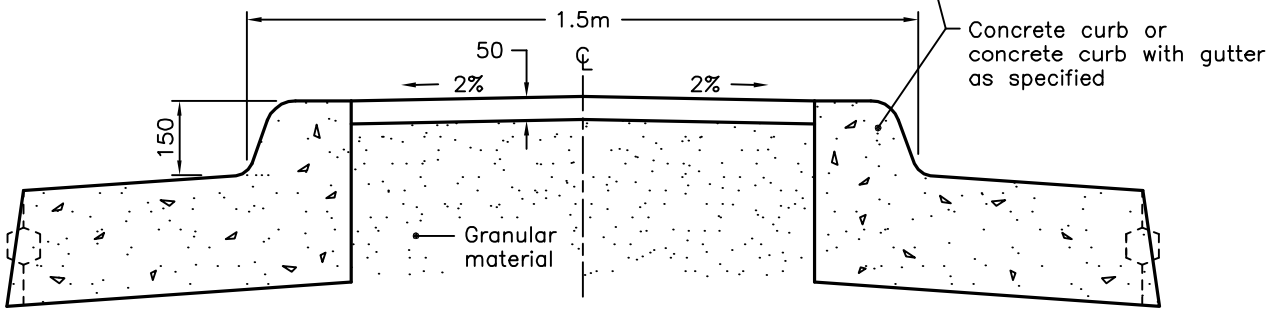
1 Expansion and contraction joint spacing shall coincide with adjacent concrete pavement or where adjacent to asphalt pavement joint spacing shall not exceed 4.0m.

A All dimensions are in millimetres unless otherwise shown.

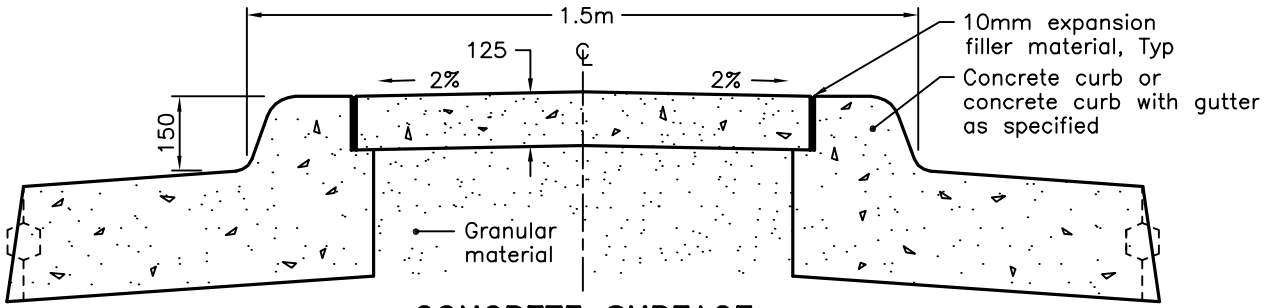
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2011	Rev	1
CONCRETE RIPPLE STRIP			
	OPSD 503.010		



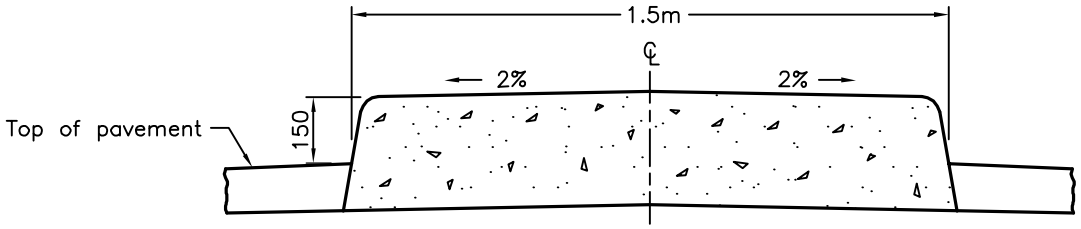
PLAN



ASPHALT SURFACE



CONCRETE SURFACE
Note 2



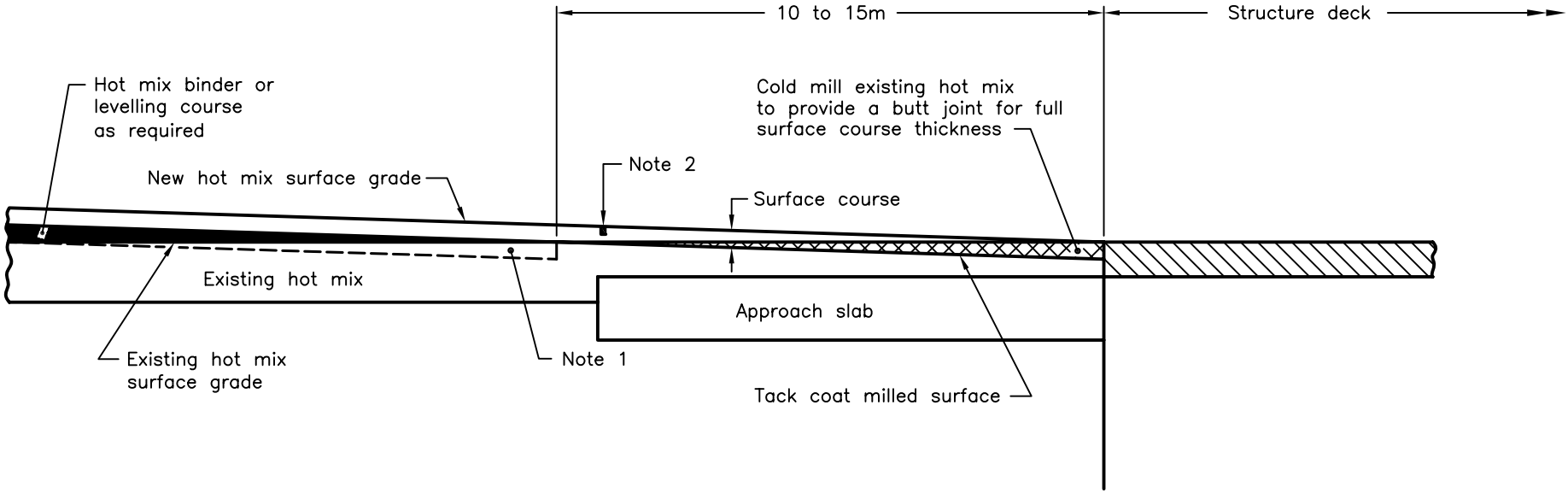
CONCRETE SLAB
Note 3

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		



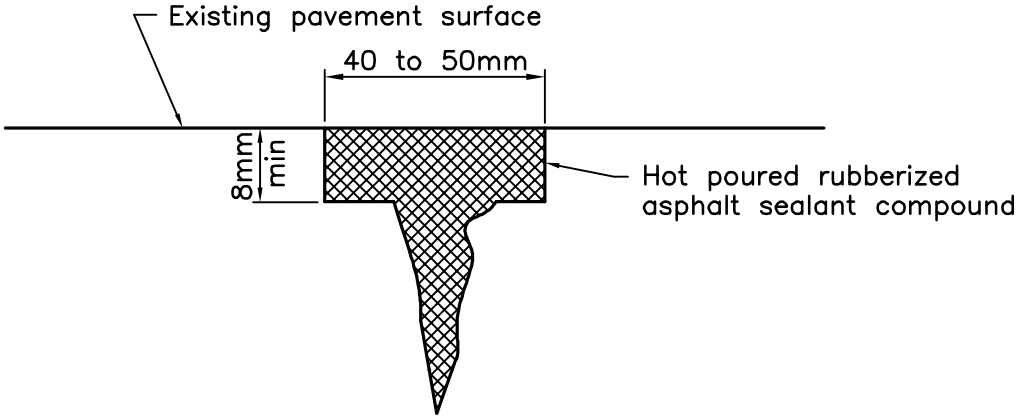
NOTES:

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

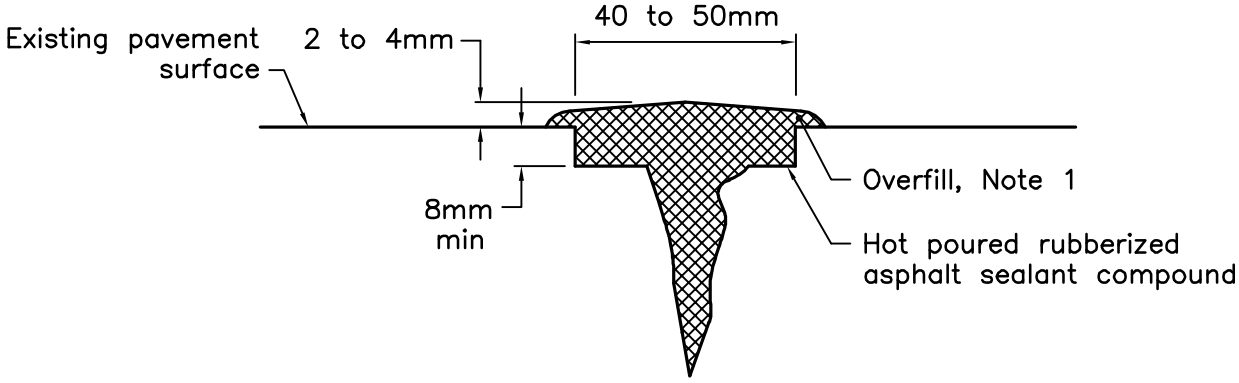
2 For integral and semi–integral abutments provide for a 25 x 25mm sawn joint filled with hot poured rubberized asphalt joint sealing compound in the hot mix over the end of the approach slab.

A All dimensions are in metres unless otherwise shown.

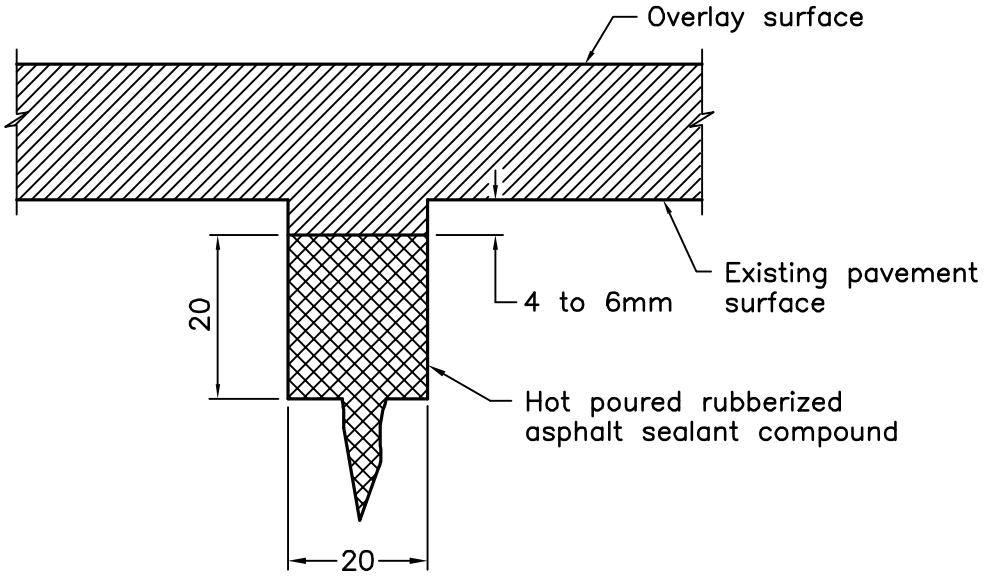
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev	1
HOT MIX RESURFACING TREATMENT AT STRUCTURE APPROACHES			
	OPSD 506.010		



FLUSH FILL OF CRACKS WITHOUT OVERLAY



OVERFILL OF CRACKS WITHOUT OVERLAY



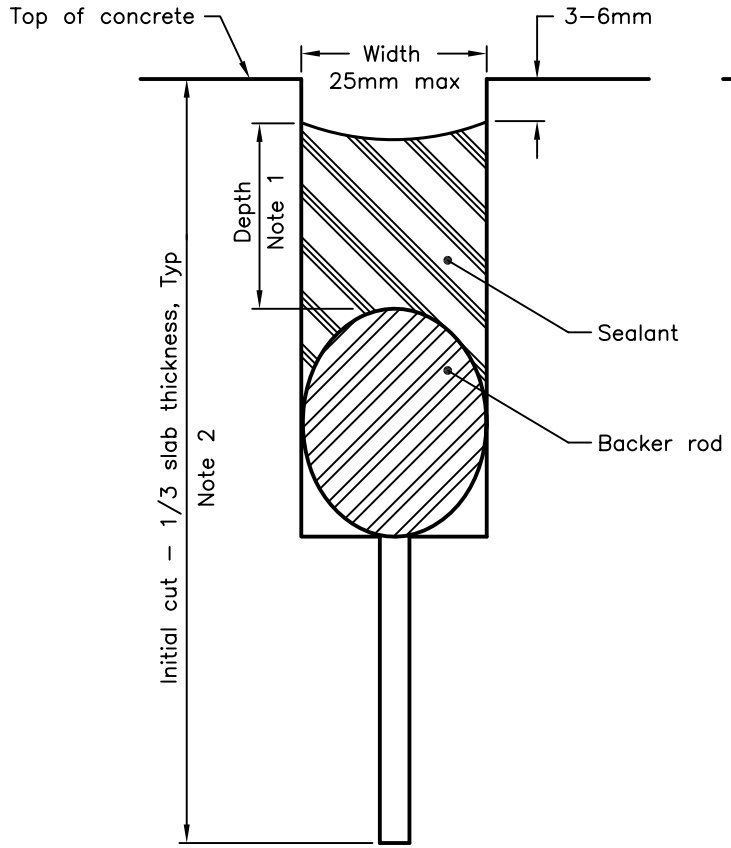
CRACKS WITH ASPHALT OVERLAY

NOTE:

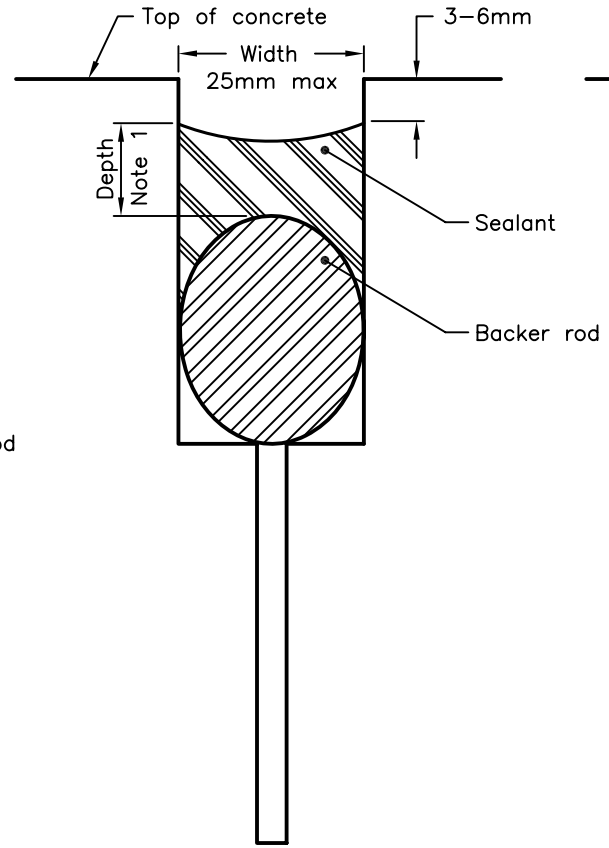
1 Final overfill geometry after cooling of sealant material.

A All dimensions are in millimetres unless otherwise shown.

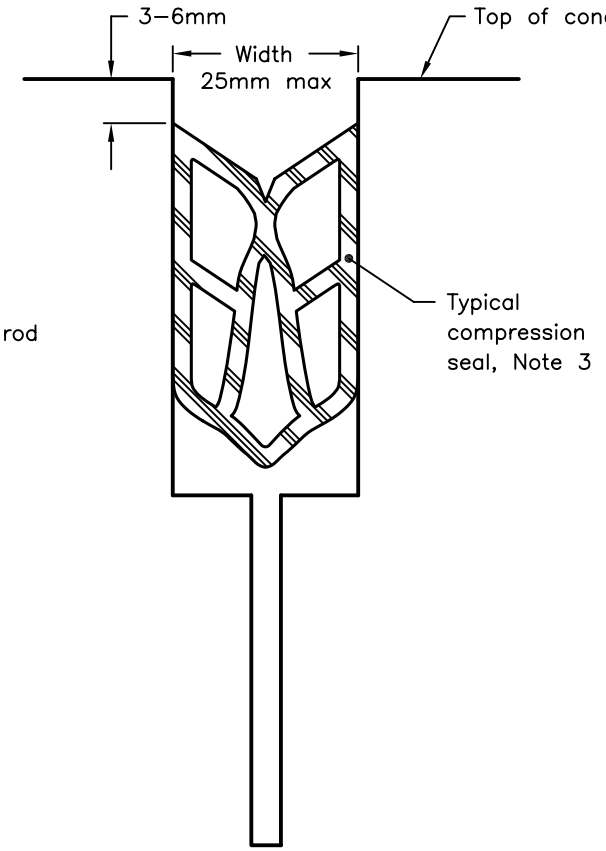
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
ROUTING AND SEALING CRACKS UP TO 20mm IN WIDTH IN ASPHALT PAVEMENT			
	OPSD 508.010		



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.

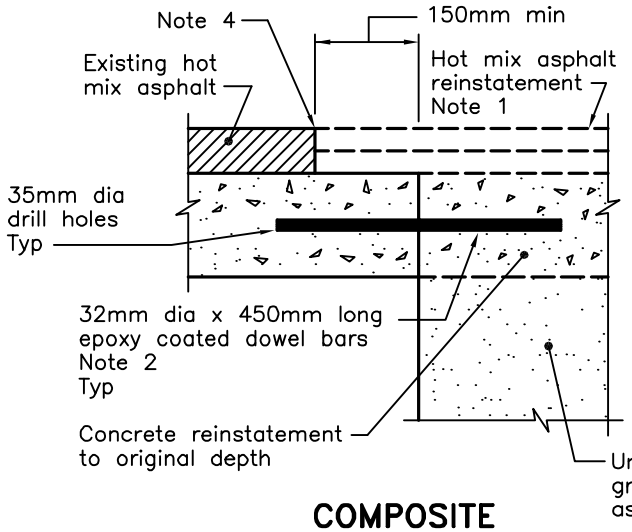
ONTARIO PROVINCIAL STANDARD DRAWING

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

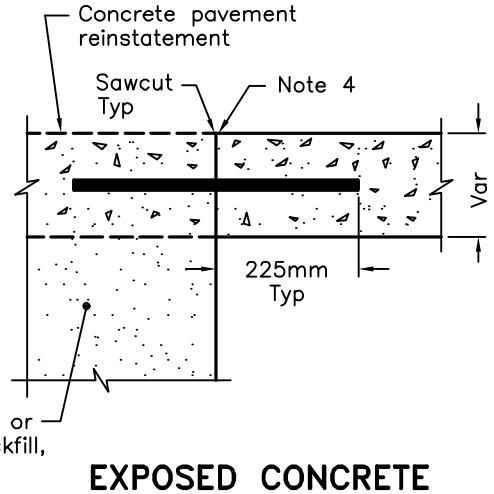
Nov 2008 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

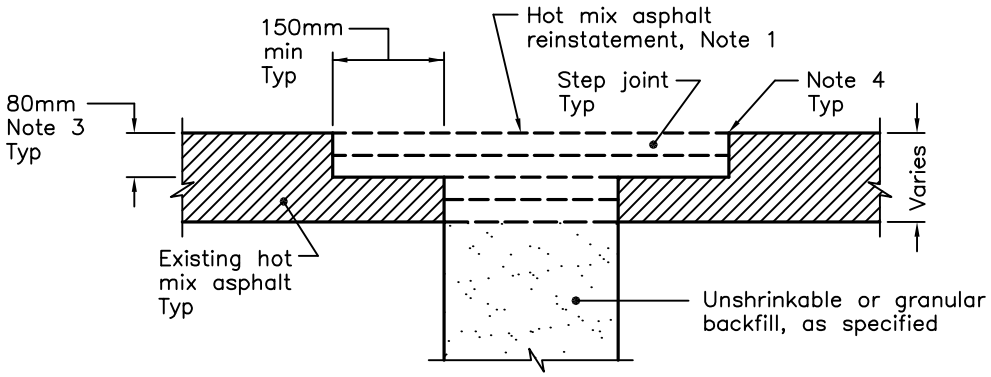
OPSD 508.020



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.

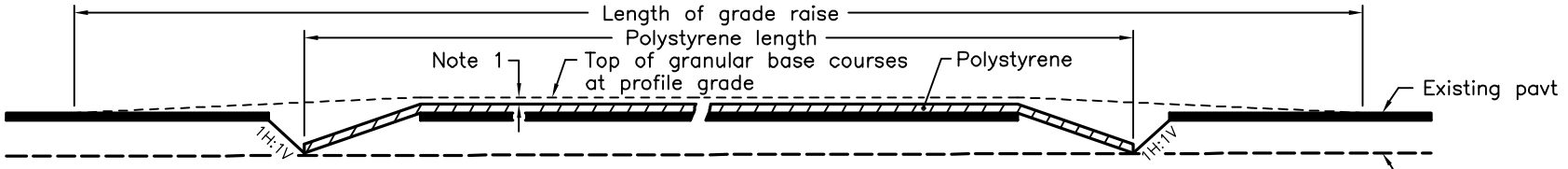
   All dowels and tie bars shall be set with epoxy grout.

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.

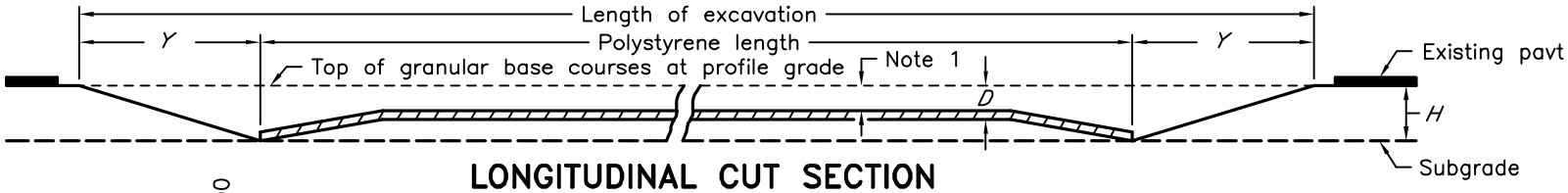
4 Joint treatment as specified.

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



LONGITUDINAL GRADE RAISE SECTION



LONGITUDINAL CUT SECTION

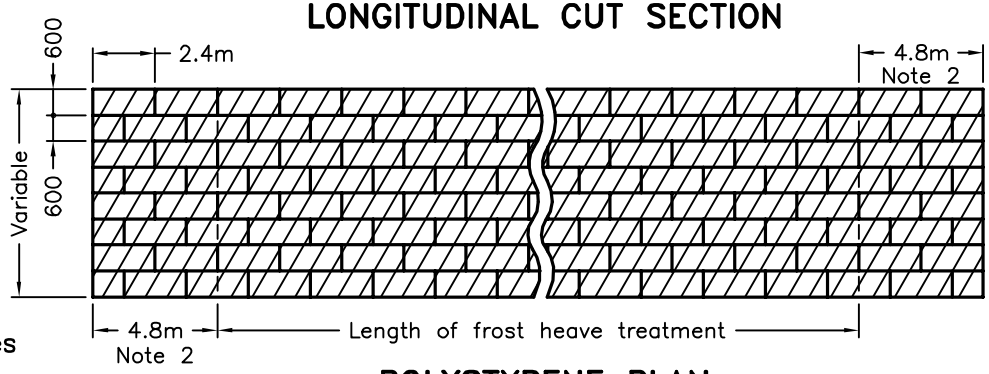
NOTES:

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

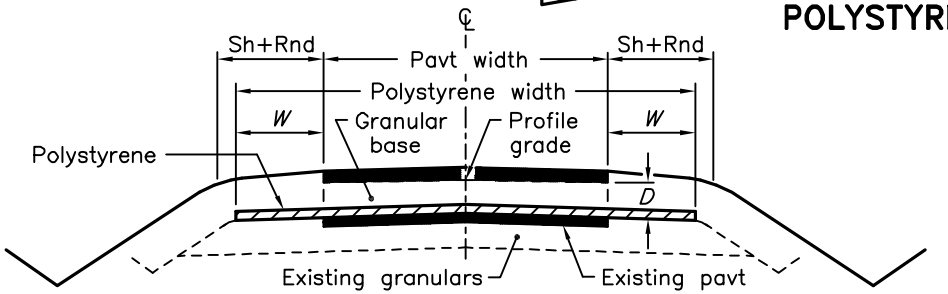
D = Depth to bottom of polystyrene below profile grade

H = Depth of existing granular courses

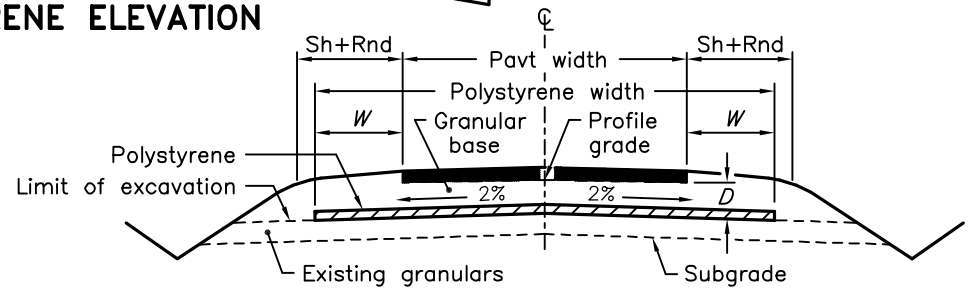
W = Shoulder width or 1.8m whichever is the lesser

Y = Length of excavation taper = *4H*

POLYSTYRENE ELEVATION

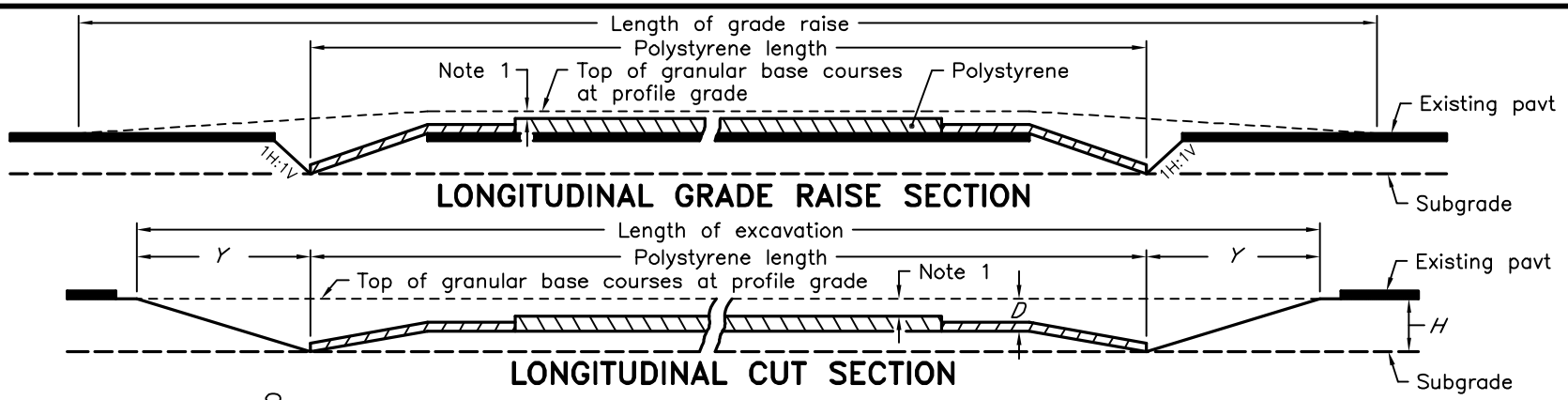


TRANSVERSE GRADE RAISE SECTION



TRANSVERSE CUT SECTION

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
EXTRUDED EXPANDED POLYSTYRENE FROST HEAVE TREATMENT 25mm THICKNESS			
	OPSD 514.010		



LONGITUDINAL GRADE RAISE SECTION

LONGITUDINAL CUT SECTION

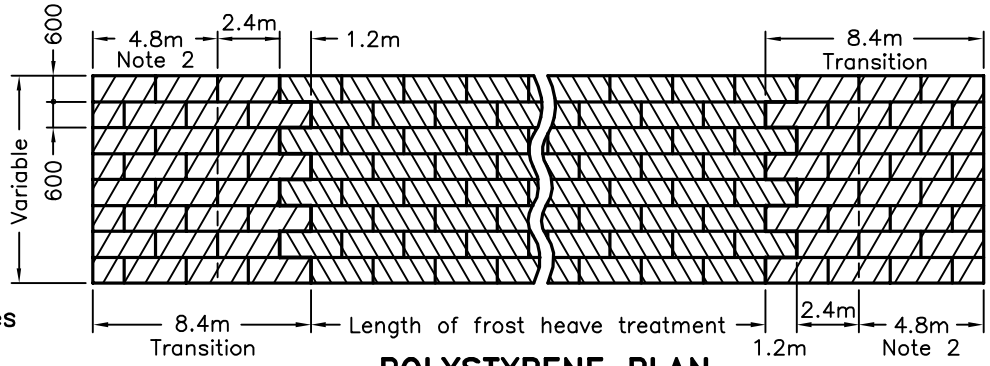
NOTES:

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

LEGEND:

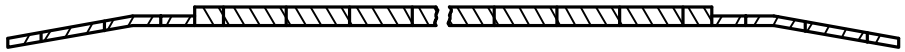
- 25mm polystyrene thickness
- 40mm polystyrene thickness

D = Depth to bottom of polystyrene below profile grade

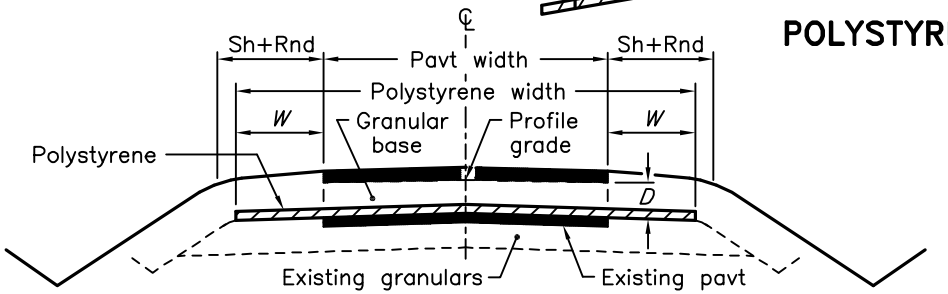
H = Depth of existing granular courses

W = Shoulder width or 1.8m whichever is the lesser

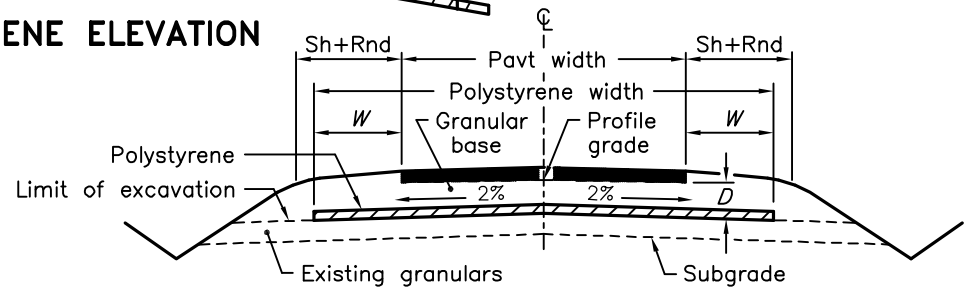
Y = Length of excavation taper = *4H*



POLYSTYRENE ELEVATION



TRANSVERSE GRADE RAISE SECTION



TRANSVERSE CUT SECTION

ONTARIO PROVINCIAL STANDARD DRAWING

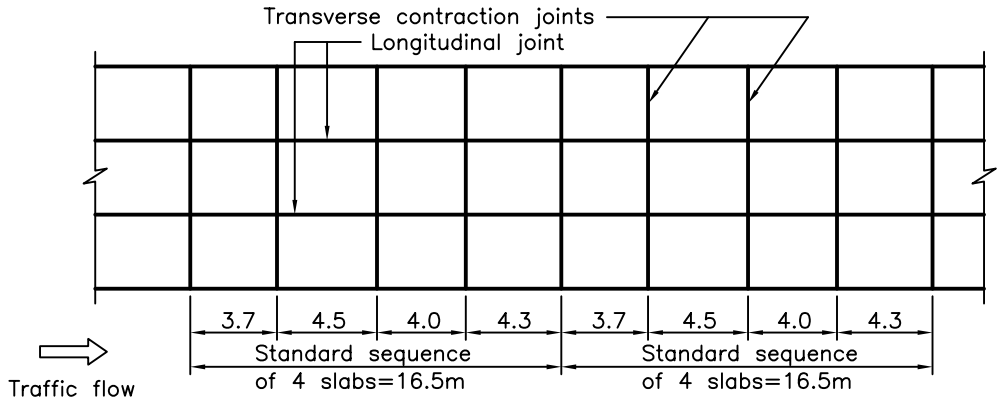
Nov 2010 | Rev 1

EXTRUDED EXPANDED POLYSTYRENE FROST HEAVE TREATMENT

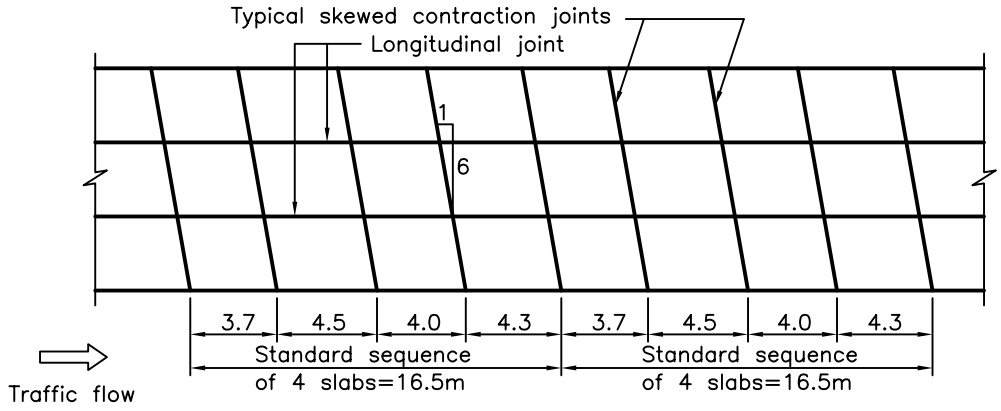
40mm THICKNESS

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

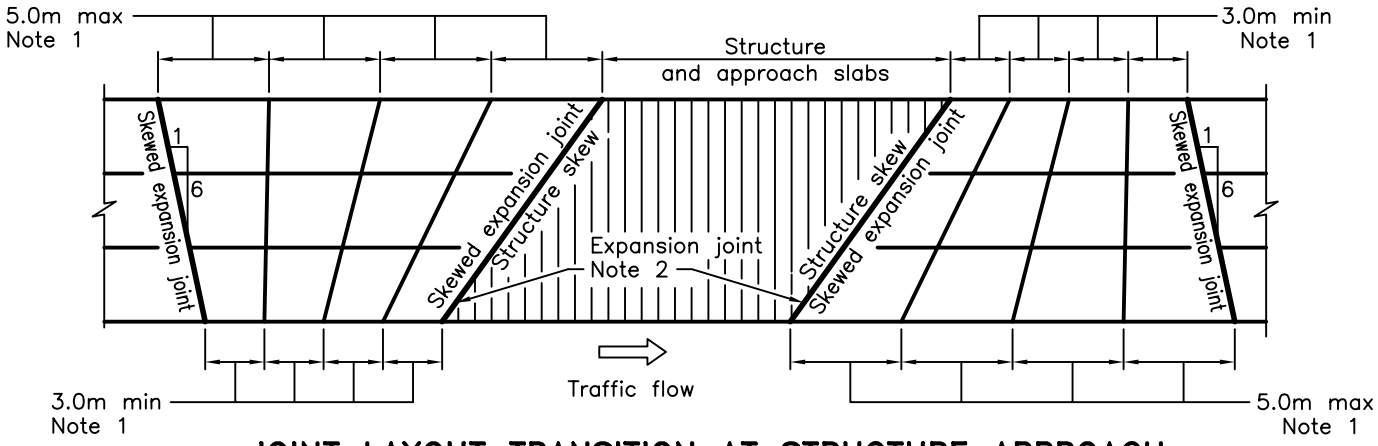
OPSD 514.020



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.

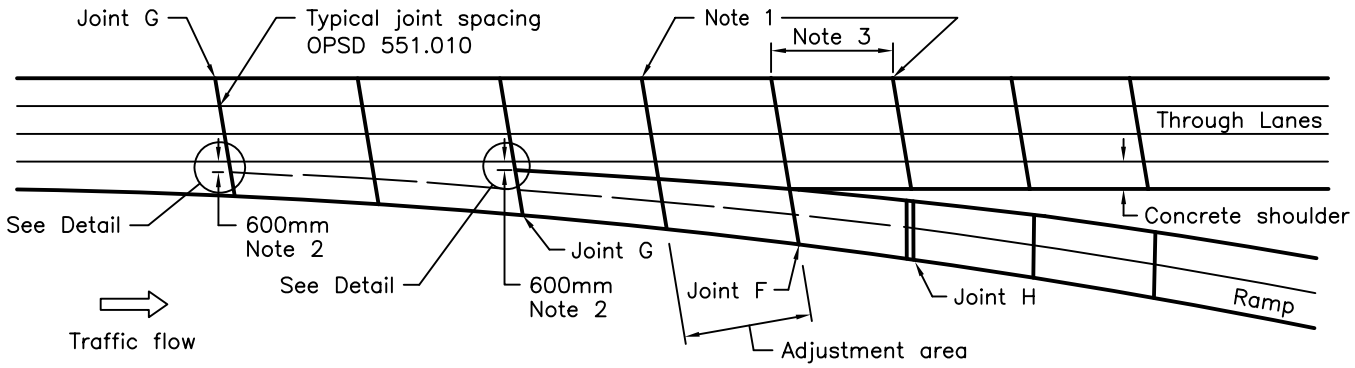
A All joints shall be according to OPSD 552.010 or OPSD 552.020.

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

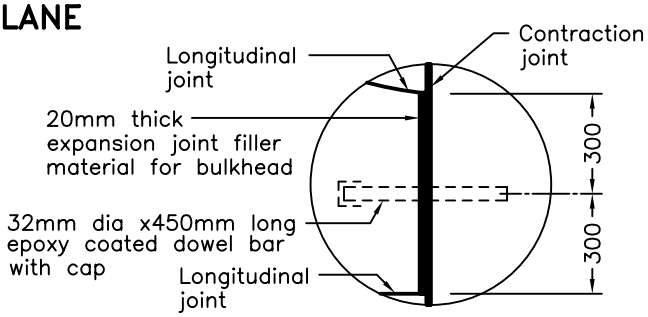
C Transverse joints shall be extended to include the full width of the concrete shoulders and curb with gutter.

D All dimensions are in metres unless otherwise shown.

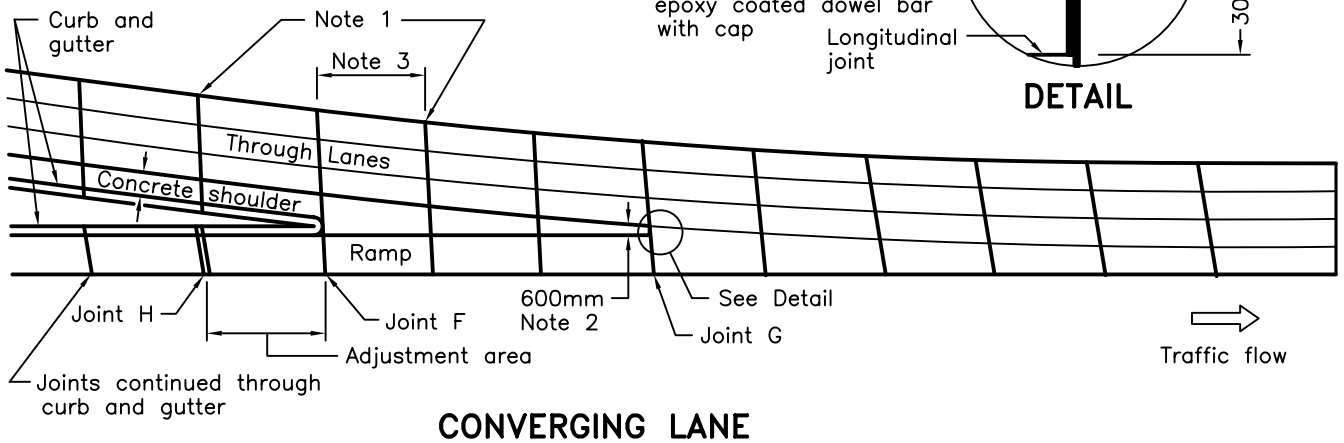
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2008	Rev	1
CONCRETE AND COMPOSITE PAVEMENT JOINT SPACING			
	OPSD 551.010		



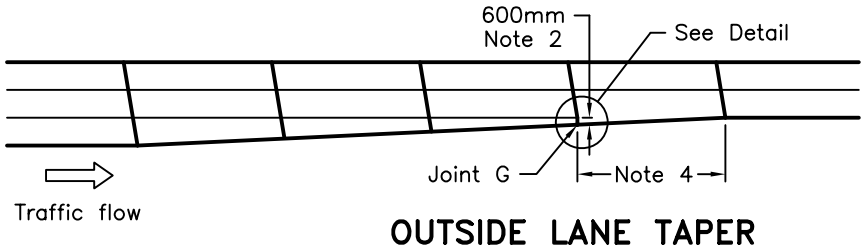
DIVERGING LANE



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.

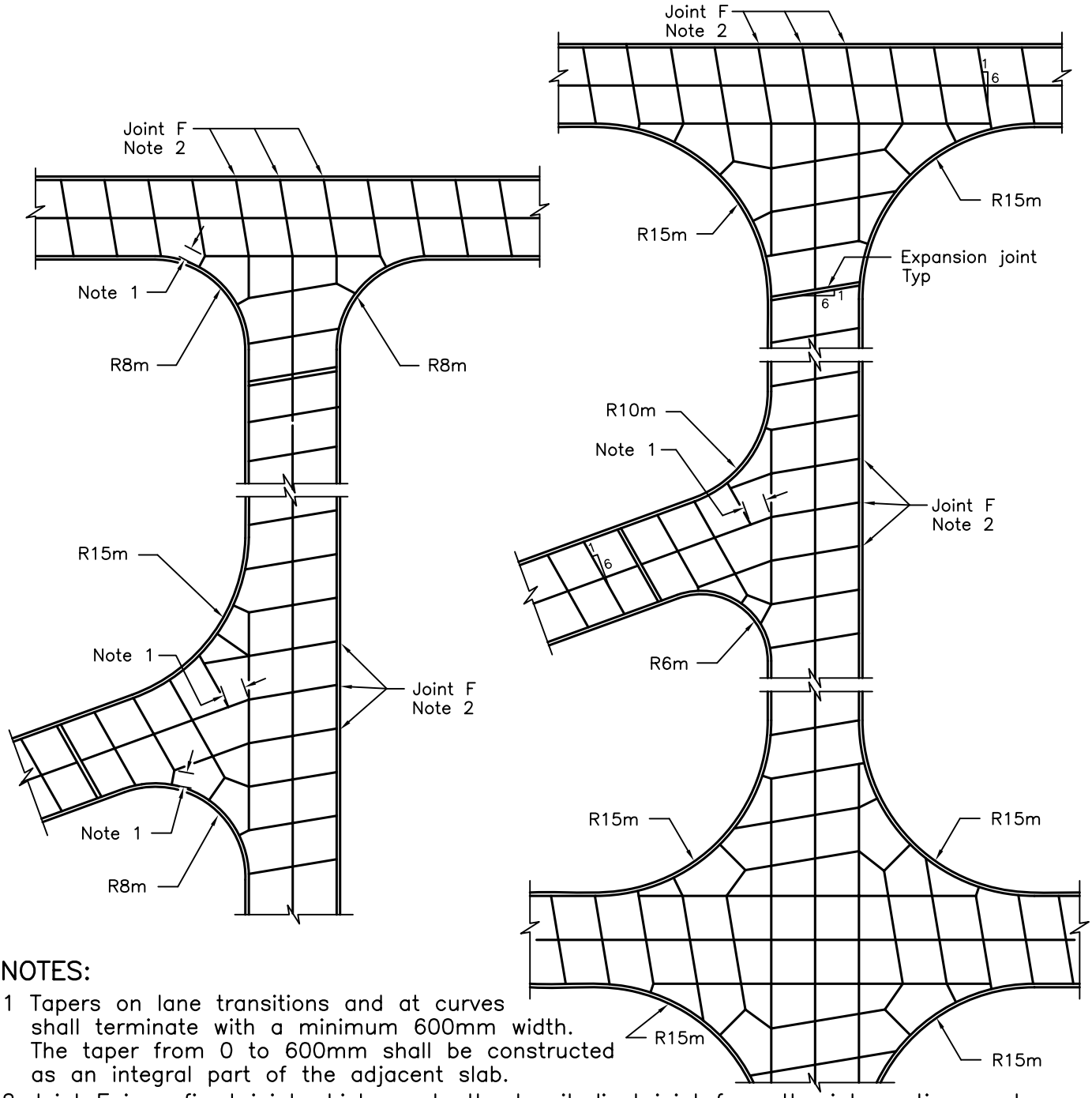
3 When paving in the opposite direction, this area shall be the adjustment area.

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.

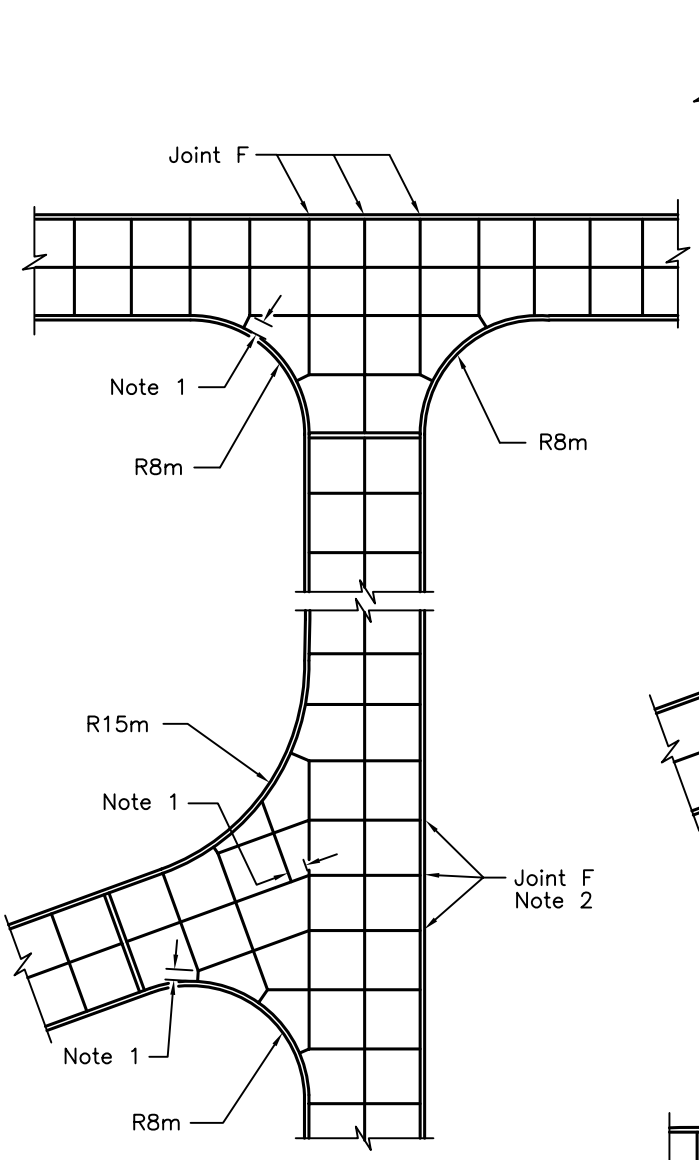
D Standard maximum joint spacing is 4.5m.

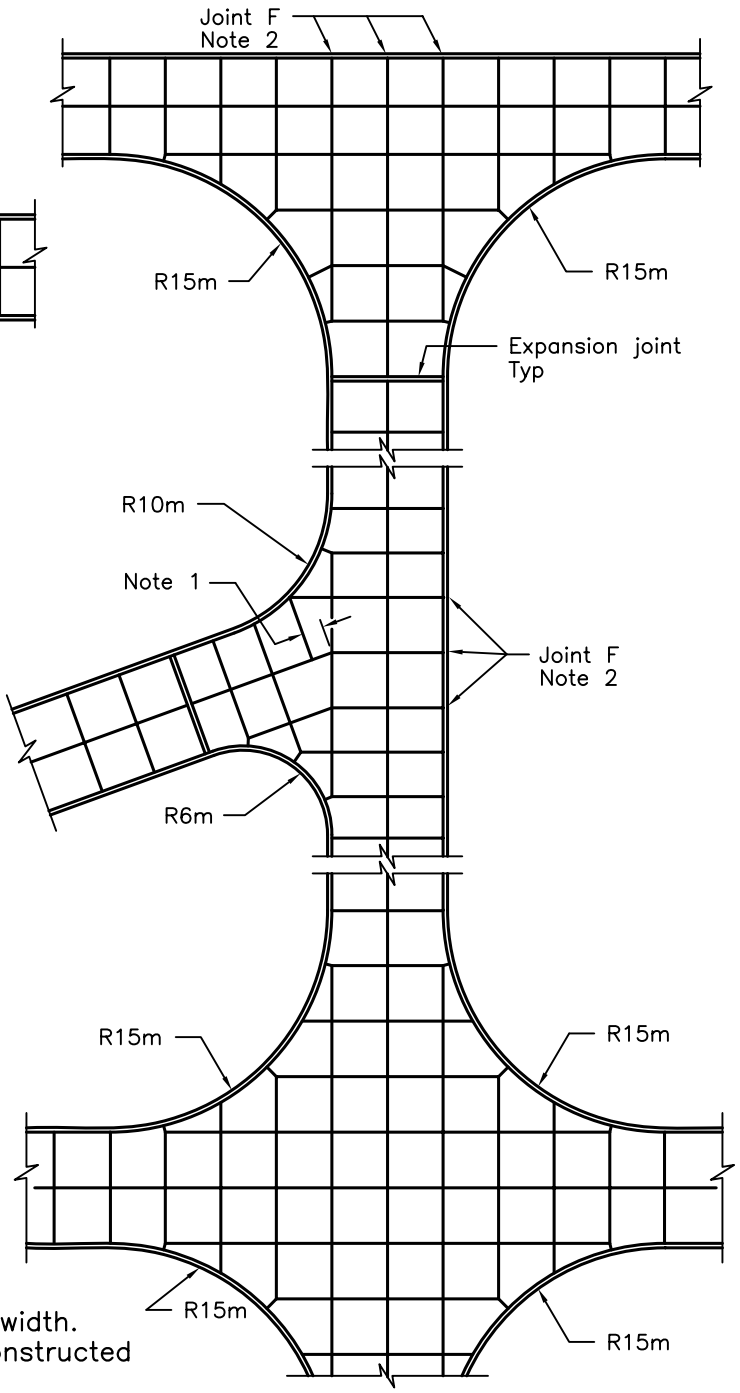
E Pavement joints shall be sawn through curb and gutter.

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 SKEWED JOINT LAYOUT 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.

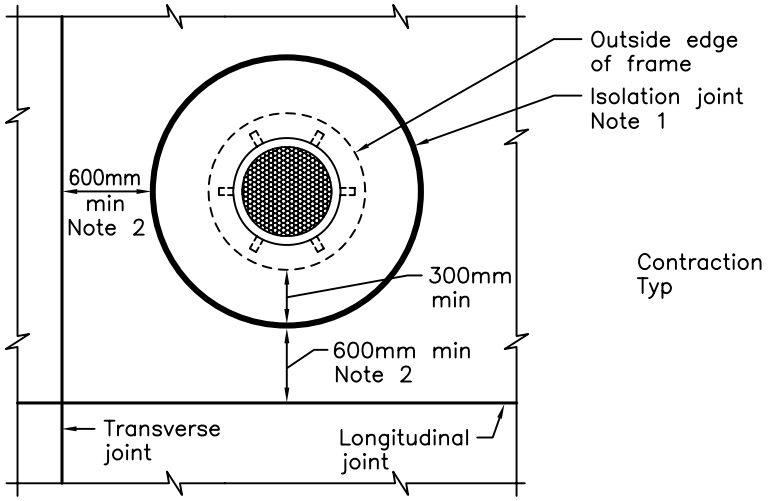
D Standard maximum joint spacing is 4.5m.

E Pavement joints shall be sawn through curb and gutter.

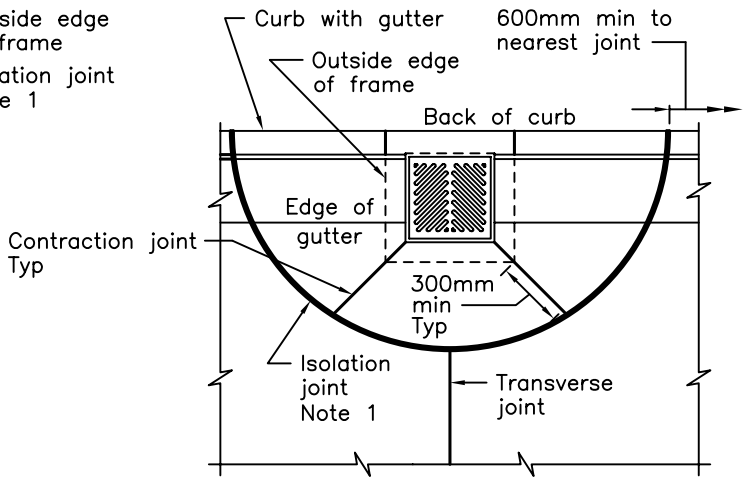
F Angles less than 60° between joints shall be avoided.

G All dimensions are in millimetres unless otherwise shown.

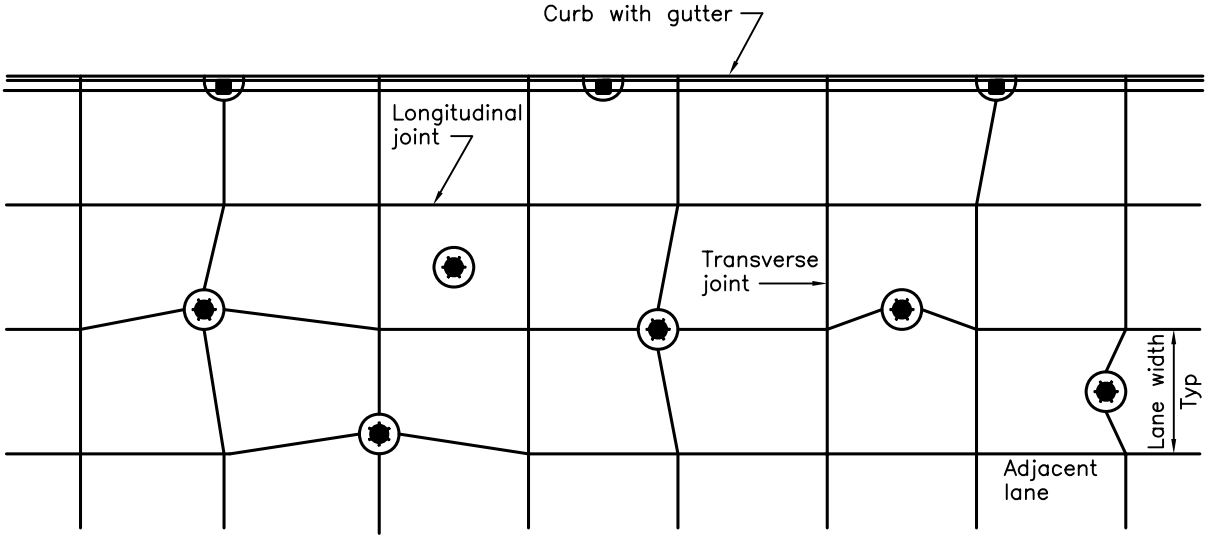
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2008	Rev	2
CONCRETE AND COMPOSITE PAVEMENT RIGHT ANGLE JOINT LAYOUT AT INTERSECTIONS	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _		
	OPSD 551.031		



ISOLATION WITHIN A SLAB



ISOLATION ADJACENT TO CURB



TYPICAL ADJUSTMENTS OF JOINTING AT UTILITY ISOLATION
NOTE 2

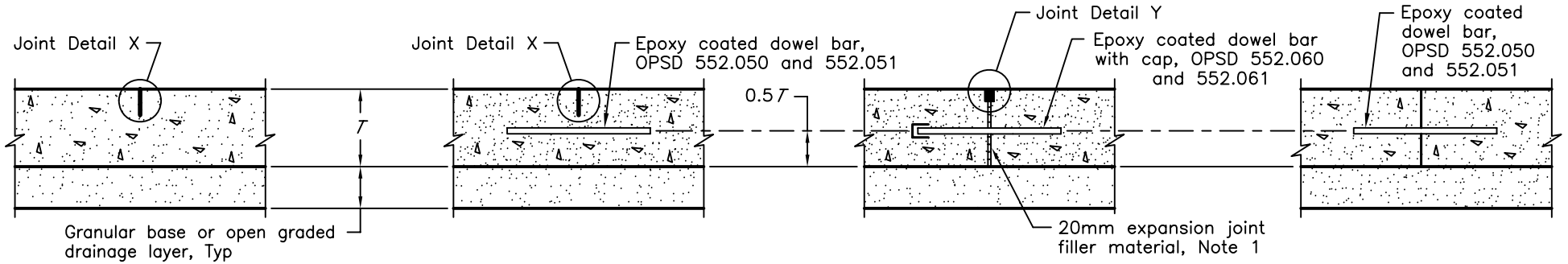
NOTES:

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		

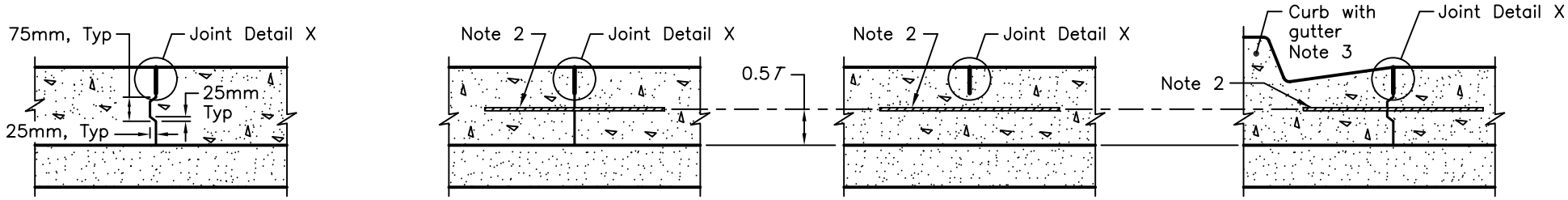


CONTRACTION JOINT
WITHOUT DOWEL BAR

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*.

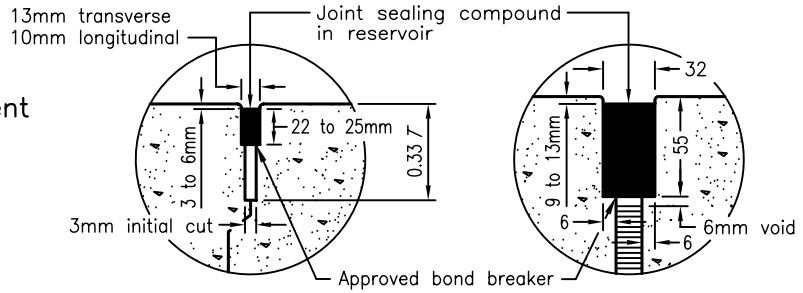
3 Depth of curb with gutter to be extended to coincide with bottom of concrete slab.

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**

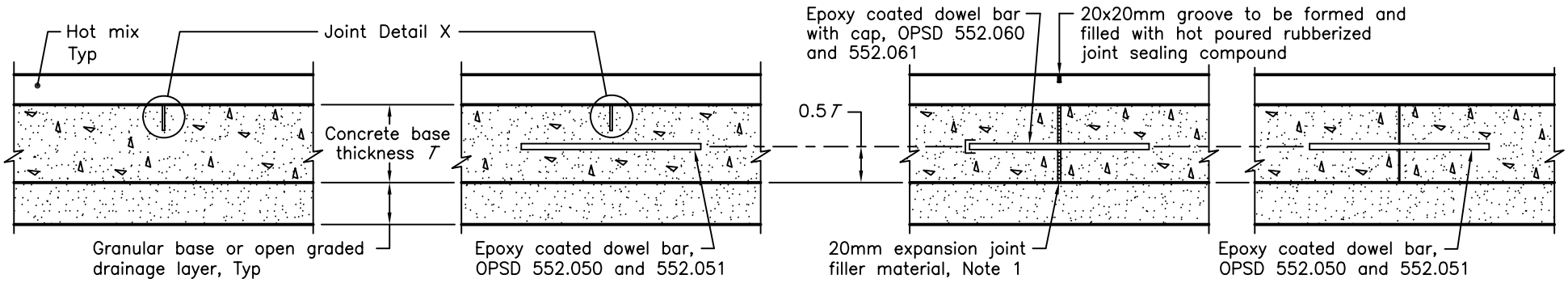
JOINT DETAILS
RESERVOIR CUT TYPE

ONTARIO PROVINCIAL STANDARD DRAWING

CONCRETE PAVEMENT JOINT DETAILS

Nov 2008 | Rev 1

OPSD 552.010

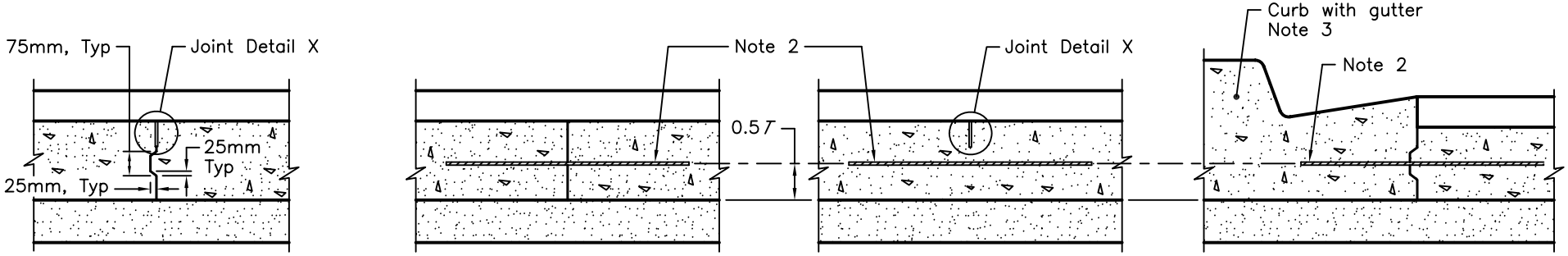


CONTRACTION JOINT
WITHOUT DOWEL BAR

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*.

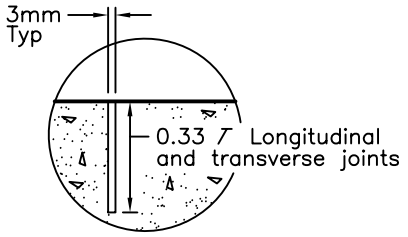
3 Depth of curb with gutter to be extended to coincide with bottom of concrete slab.

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



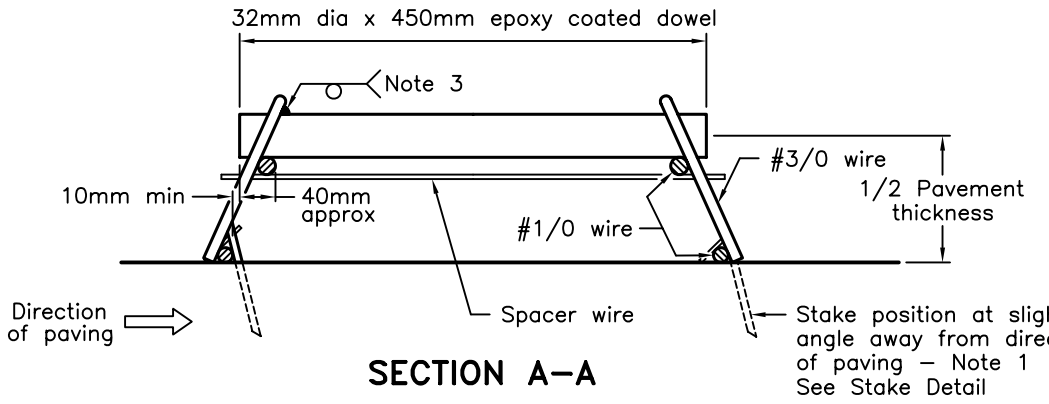
JOINT DETAIL X

ONTARIO PROVINCIAL STANDARD DRAWING

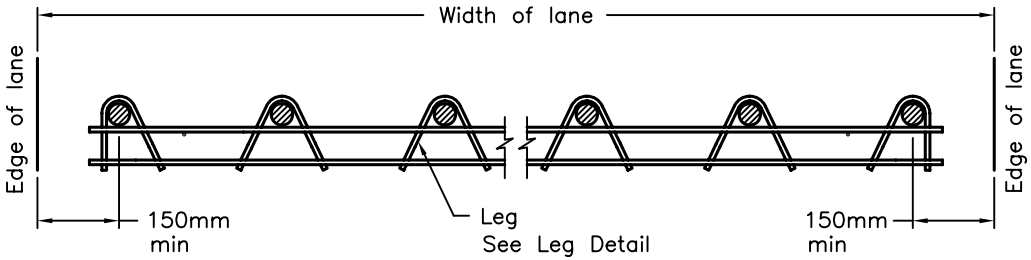
COMPOSITE PAVEMENT JOINT DETAILS

Nov 2008 | Rev 1

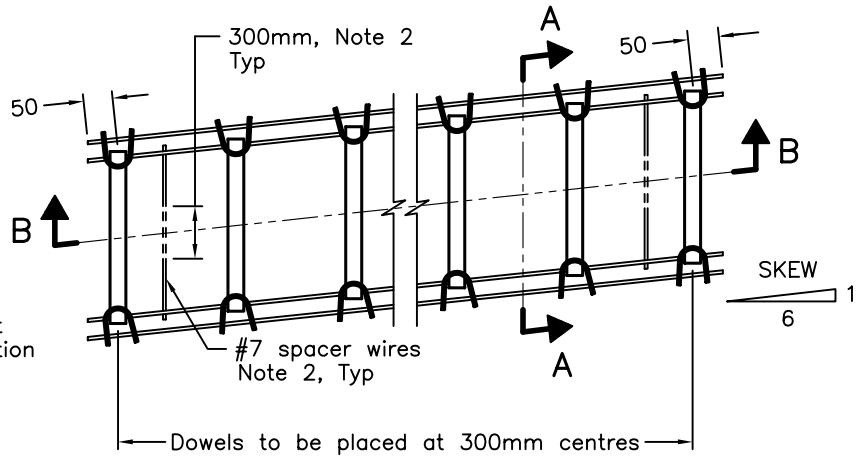
OPSD 552.020



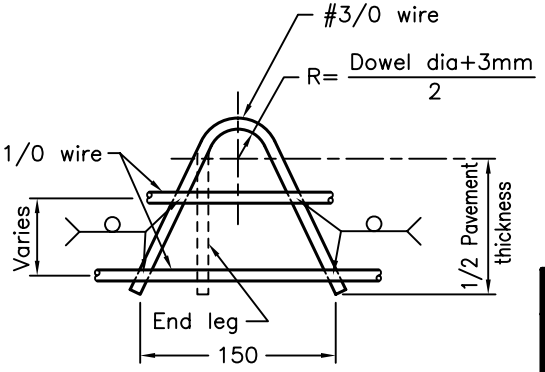
SECTION A–A



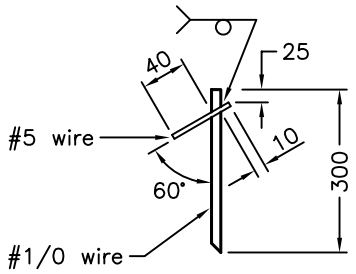
SECTION B–B



PLAN



LEG DETAIL



STAKE DETAIL

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.

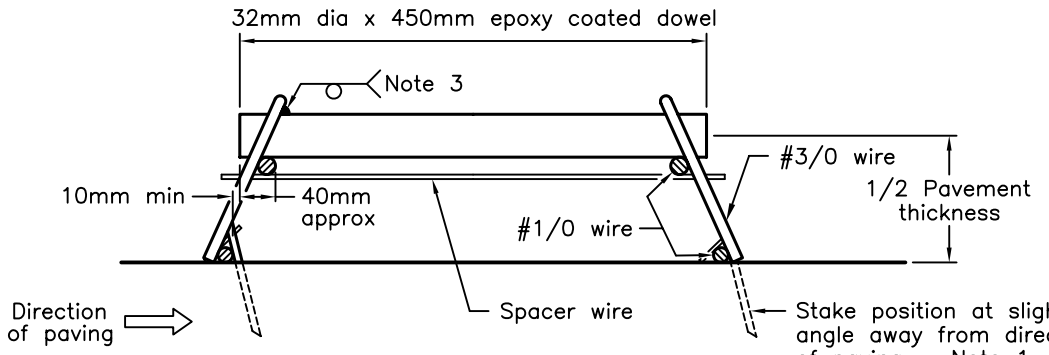
ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev 2

LOAD TRANSFER DEVICE SKEWED CONTRACTION JOINT

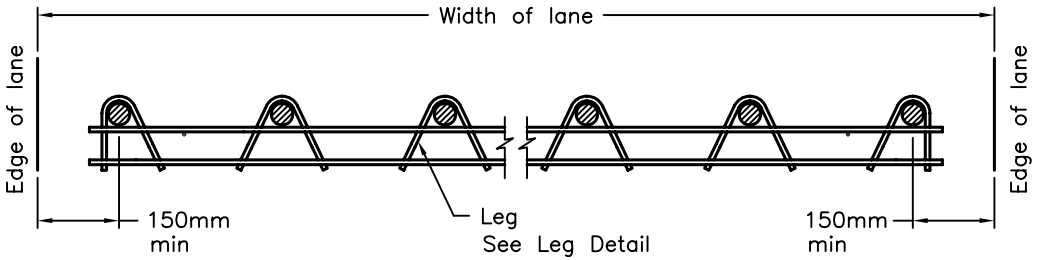
CONCRETE OR COMPOSITE PAVEMENT

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

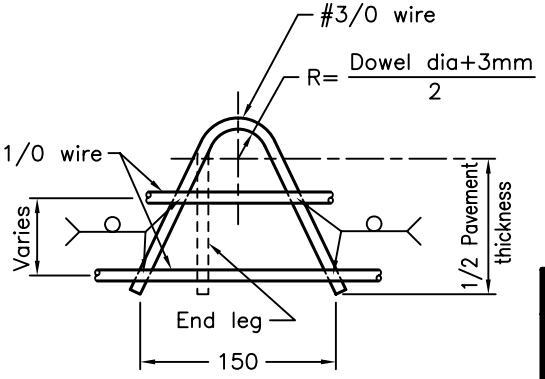
OPSD 552.050



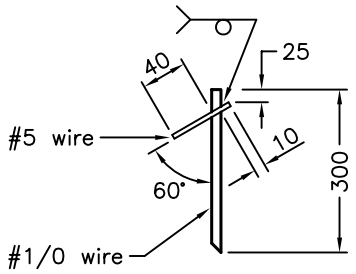
SECTION A–A



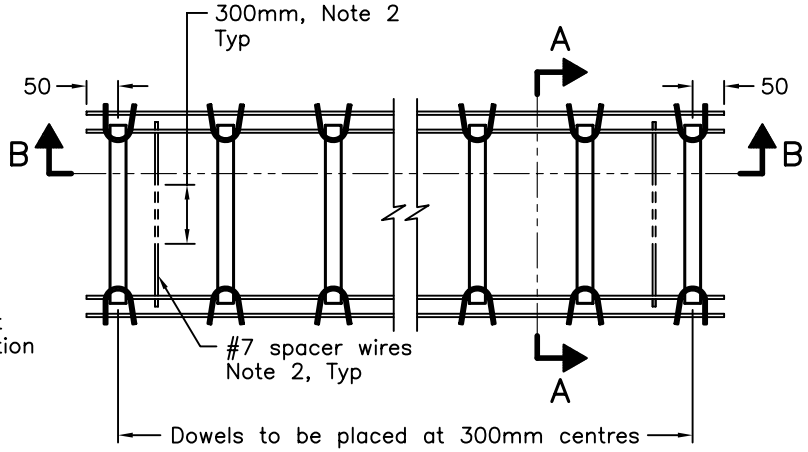
SECTION B–B



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.

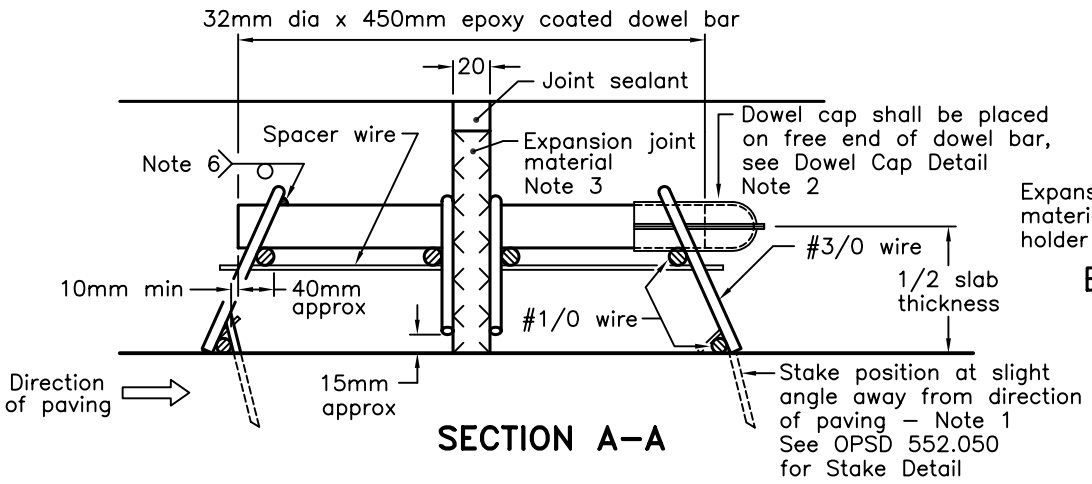
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev 2

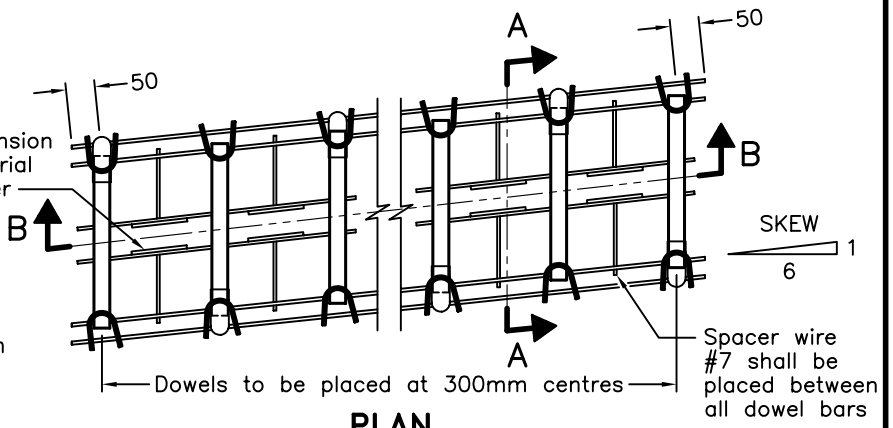
LOAD TRANSFER DEVICE
RIGHT ANGLE CONTRACTION JOINT
CONCRETE OR COMPOSITE PAVEMENT

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

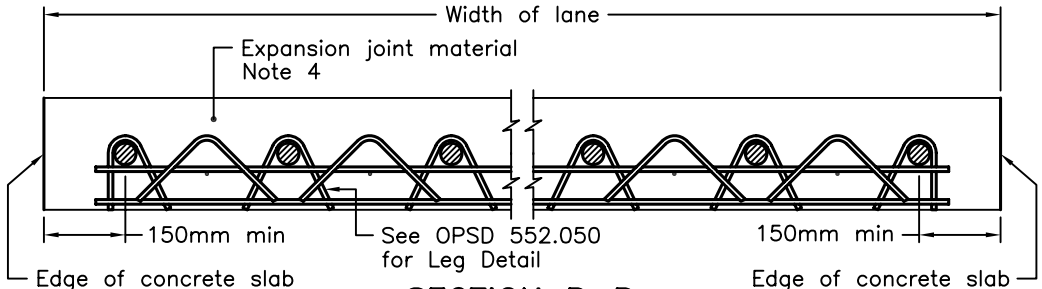
OPSD 552.051



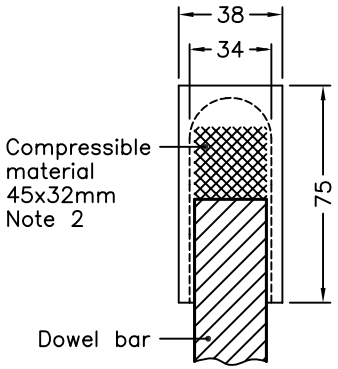
SECTION A–A



PLAN



SECTION B–B



DOWEL CAP DETAIL

NOTES:

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

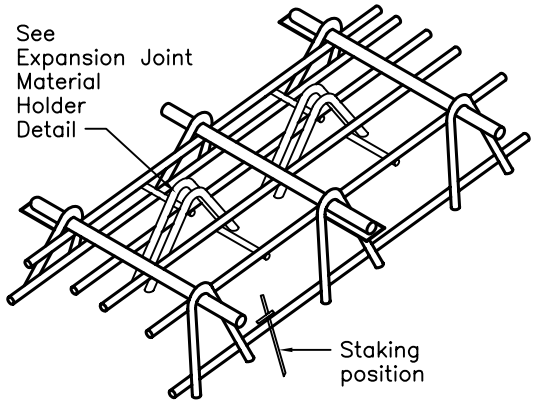
2 The compressible cap material shall be a non–absorptive, closed cell polyethylene foam.

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

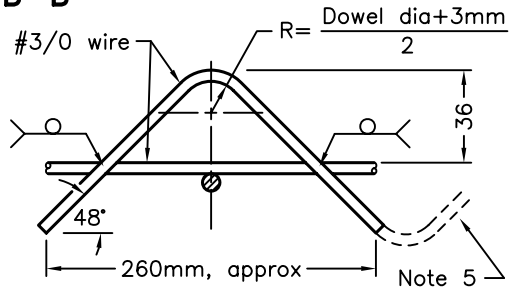
4 Expansion joint material to extend for the full width of the concrete slab.

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.

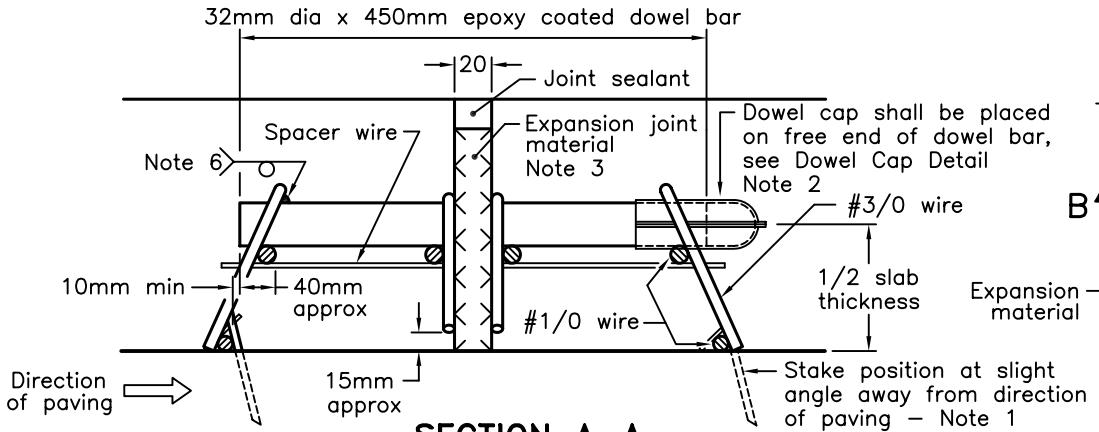
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2008 | Rev 2

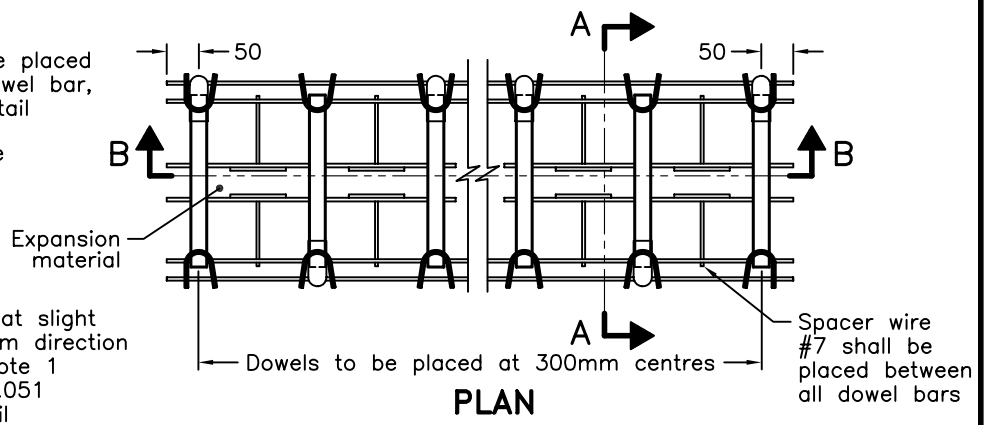
LOAD TRANSFER DEVICE
SKEWED EXPANSION JOINT
CONCRETE OR COMPOSITE PAVEMENT

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

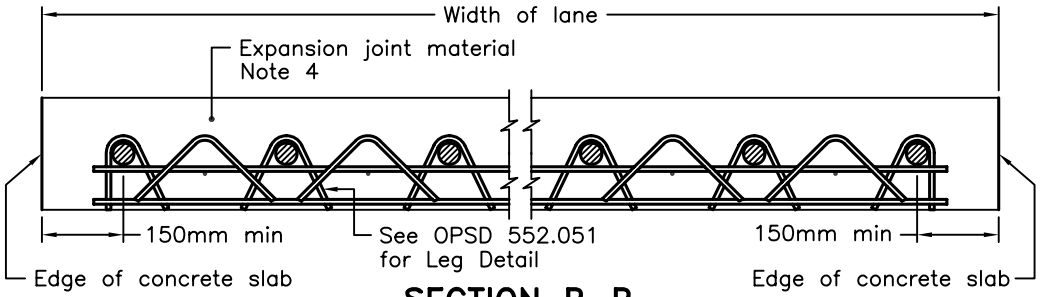
OPSD 552.060



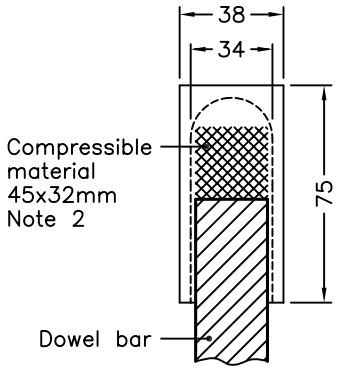
SECTION A–A



PLAN



SECTION B–B



DOWEL CAP DETAIL

NOTES:

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

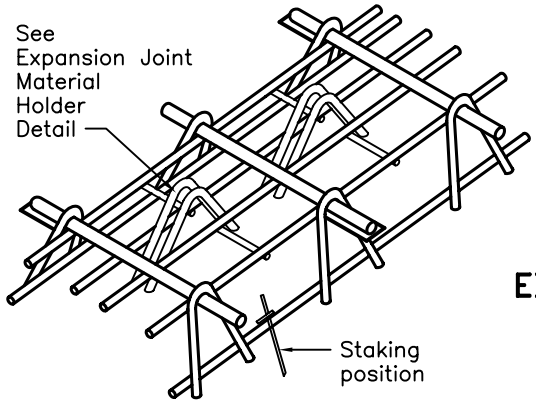
2 The compressible cap material shall be a non–absorptive, closed cell polyethylene foam.

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

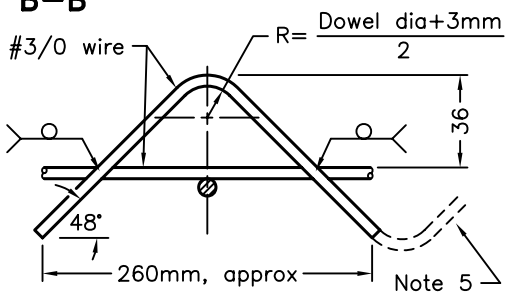
4 Expansion joint material to extend for the full width of the concrete slab.

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.

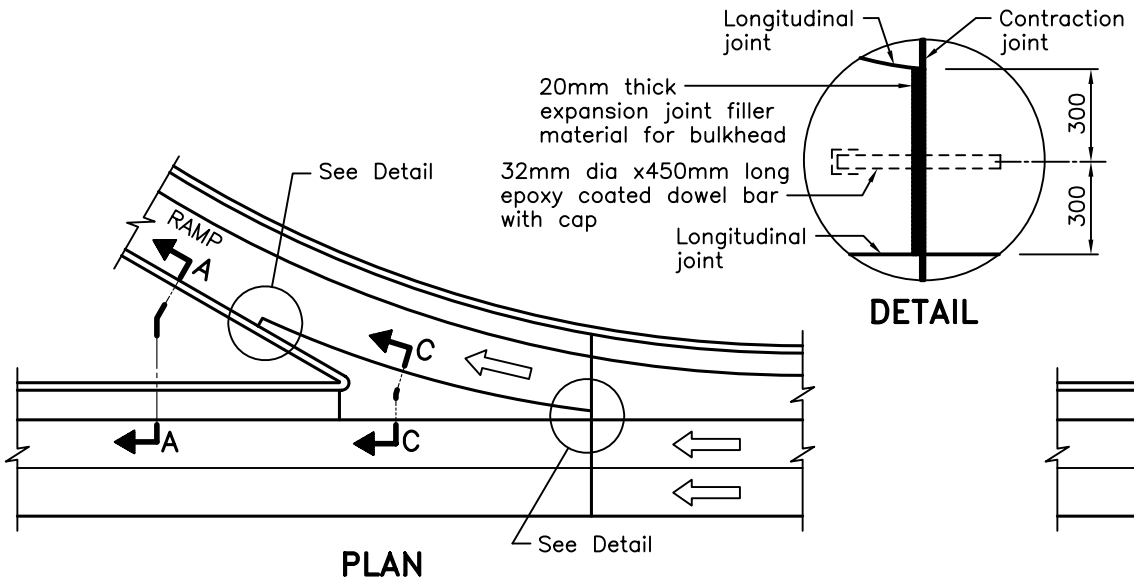
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2008 | Rev 2

LOAD TRANSFER DEVICE
RIGHT ANGLE EXPANSION JOINT
CONCRETE OR COMPOSITE PAVEMENT

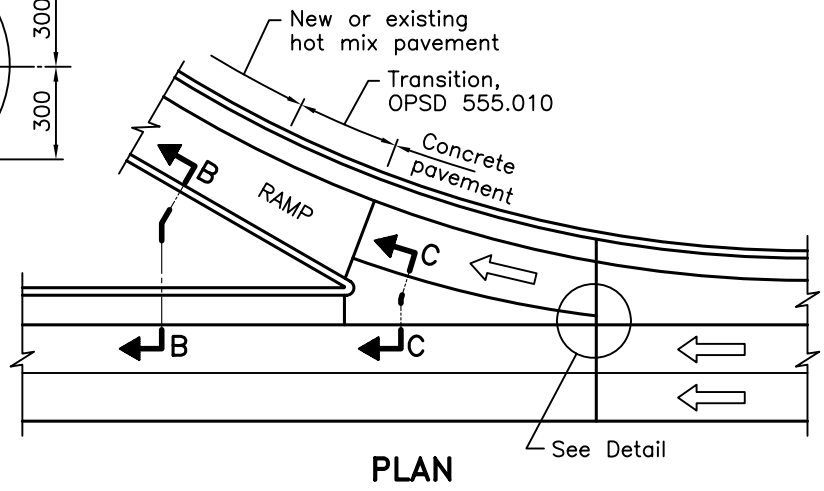
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 552.061

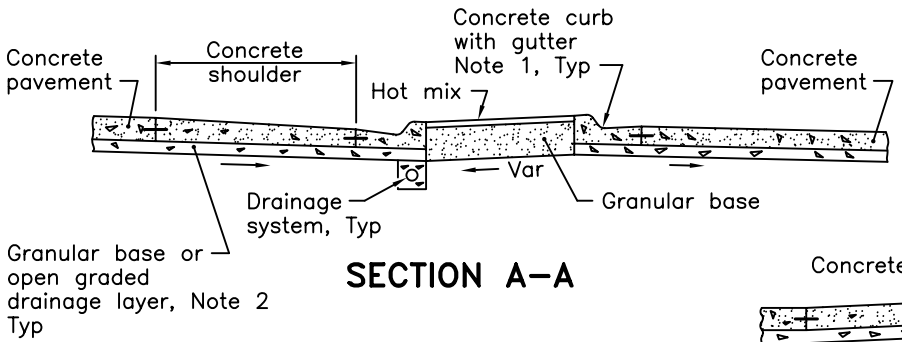


DETAIL

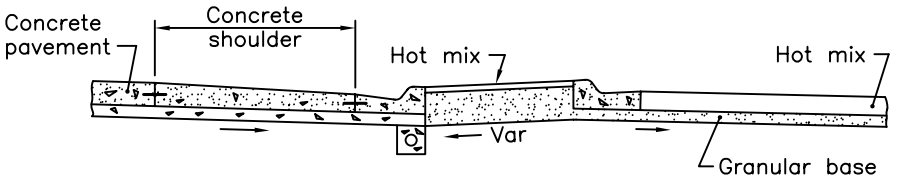
PLAN



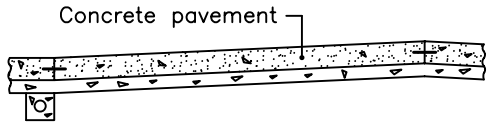
PLAN



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.

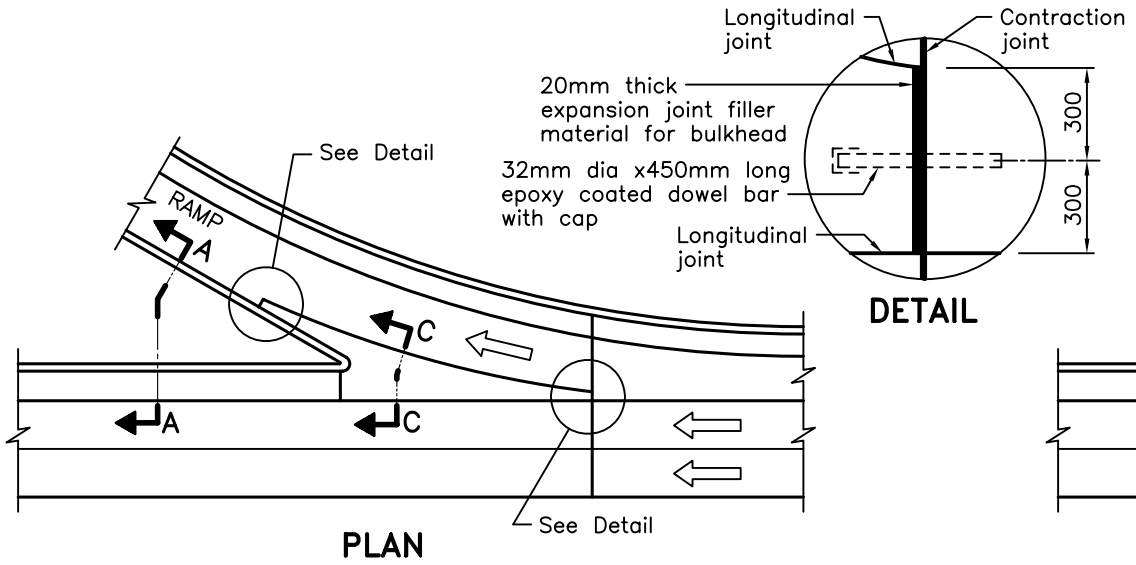
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

CONCRETE PAVEMENT IN GORE AREAS

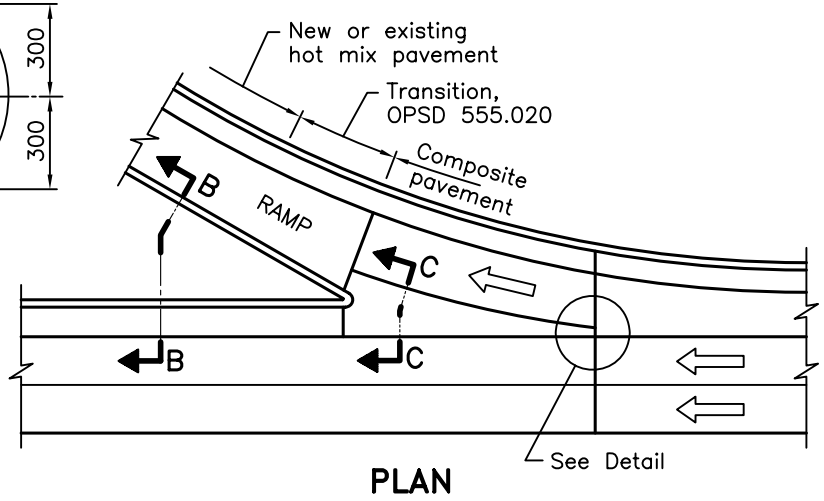
Nov 2008 | Rev 1

OPSD 553.010

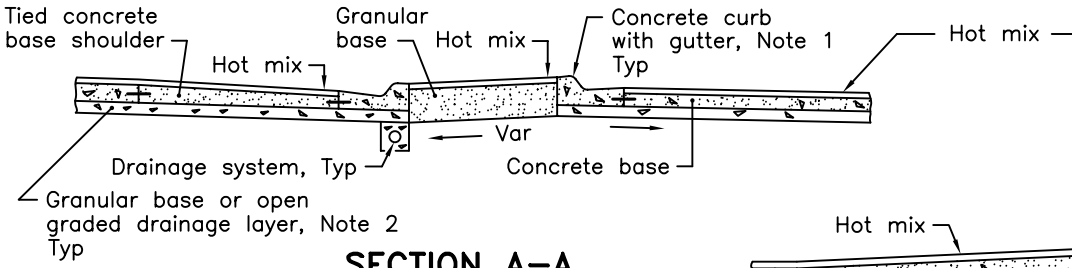


PLAN

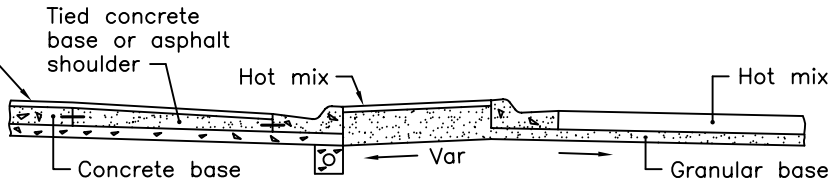
DETAIL



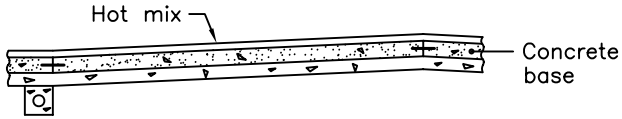
PLAN



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.

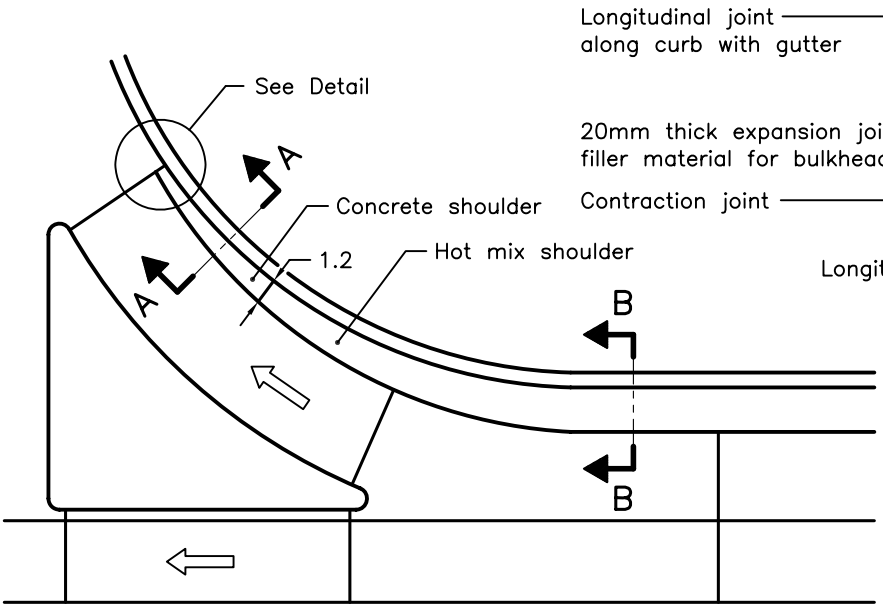
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

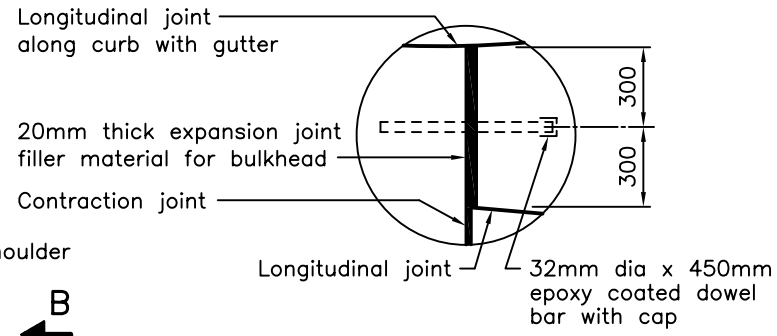
COMPOSITE PAVEMENT IN GORE AREAS

Nov 2008 | Rev 1

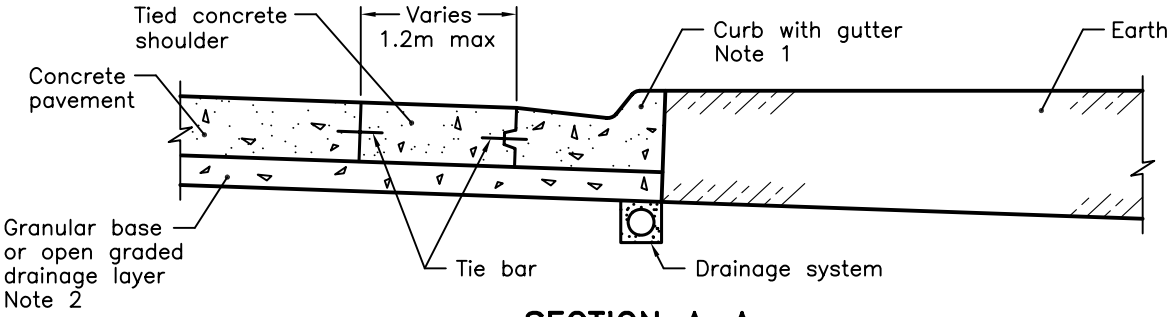
OPSD 553.020



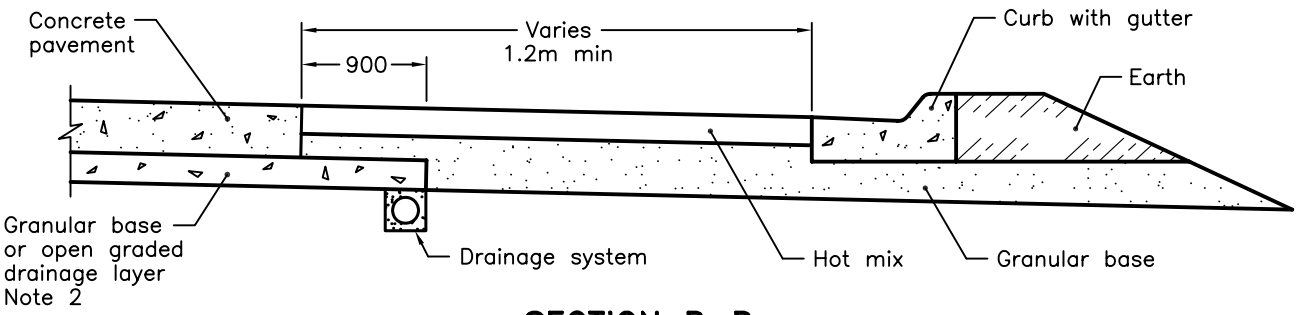
PLAN



DETAIL



SECTION A–A



SECTION B–B

NOTES:

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

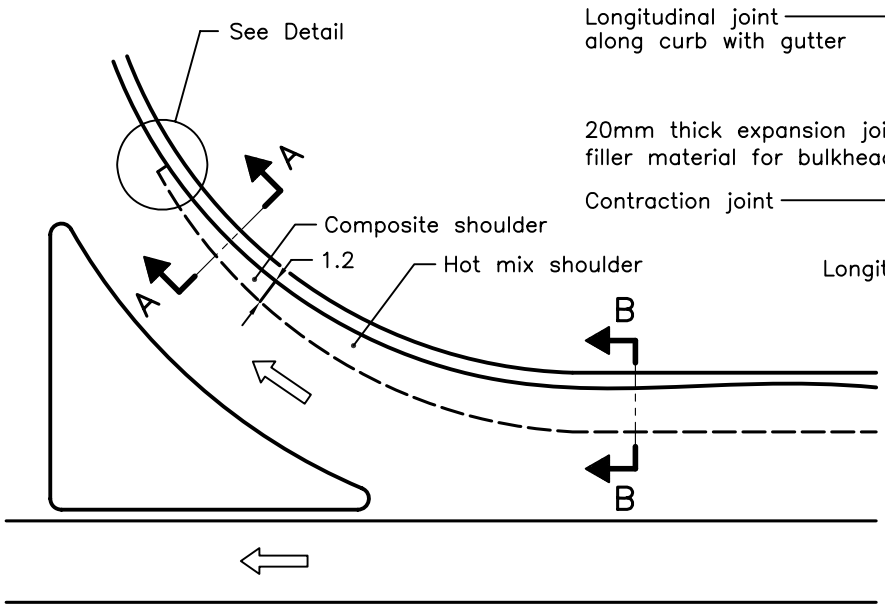
2 When base is open graded drainage layer, a minimum 100mm of Granular A material is required beneath the base.

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

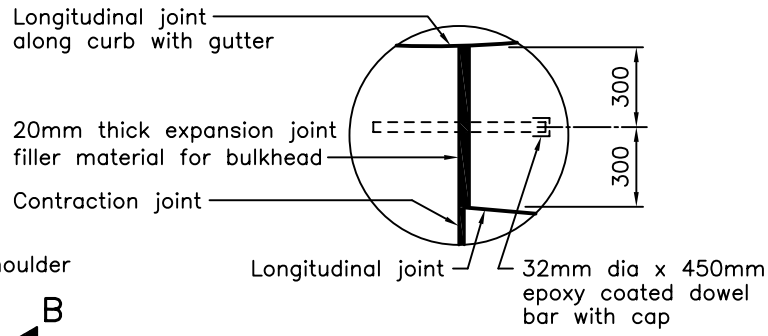
B All joints shall be according to OPSD 551.010 and 552.010.

C All dimensions are in millimetres unless otherwise shown.

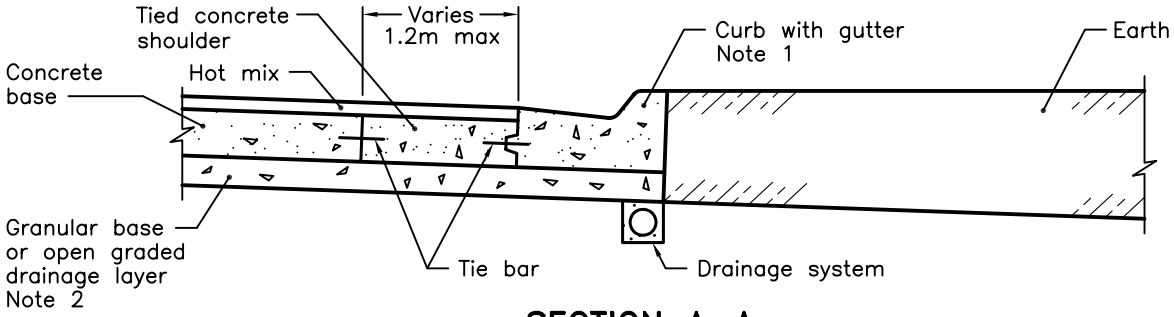
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2008	Rev	1
CONCRETE PAVEMENT SHOULDER TERMINAL			
	OPSD 554.010		



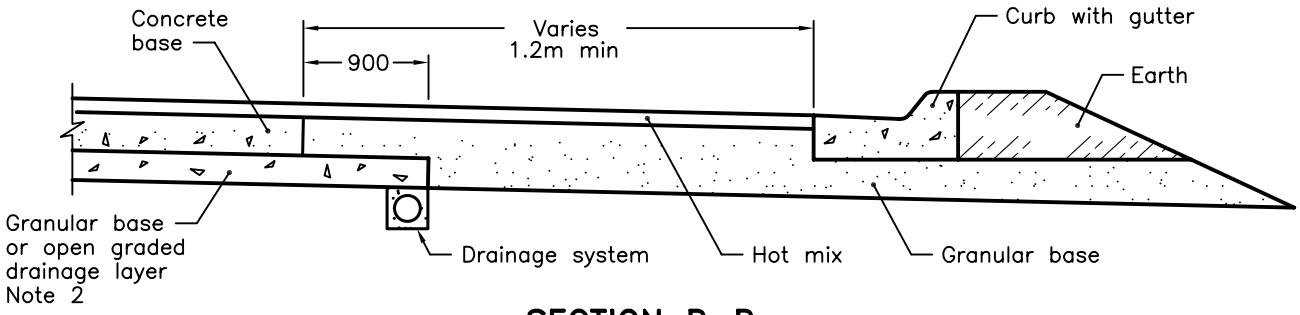
PLAN



DETAIL



SECTION A–A



SECTION B–B

NOTES:

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

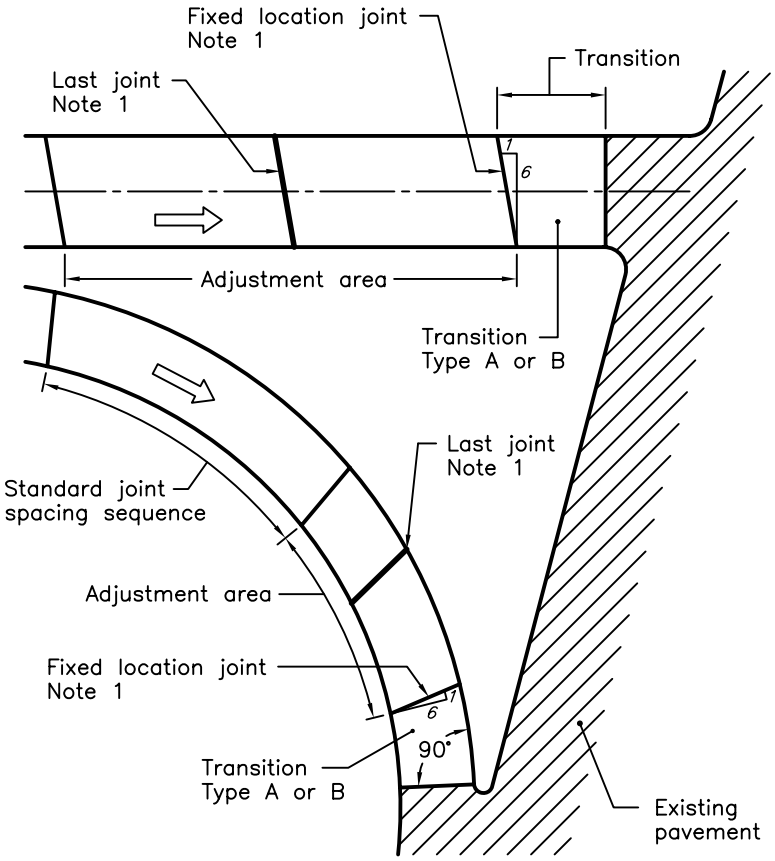
2 When base is open graded drainage layer, a minimum of 100mm of Granular A material is required beneath the base.

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

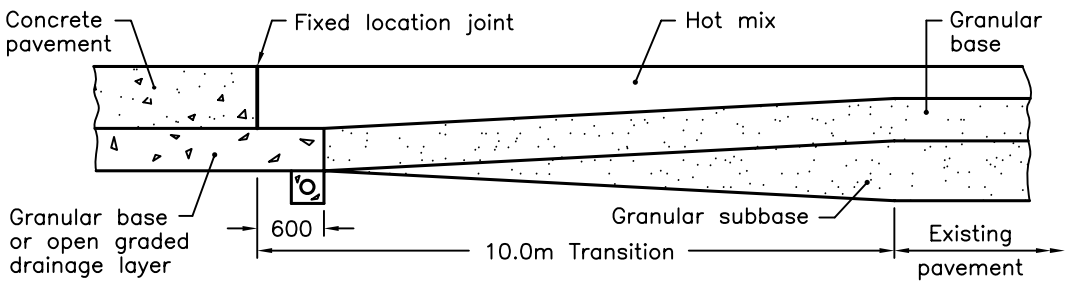
B All joints shall be according to OPSD 551.010 and 552.020.

C All dimensions are in millimetres unless otherwise shown.

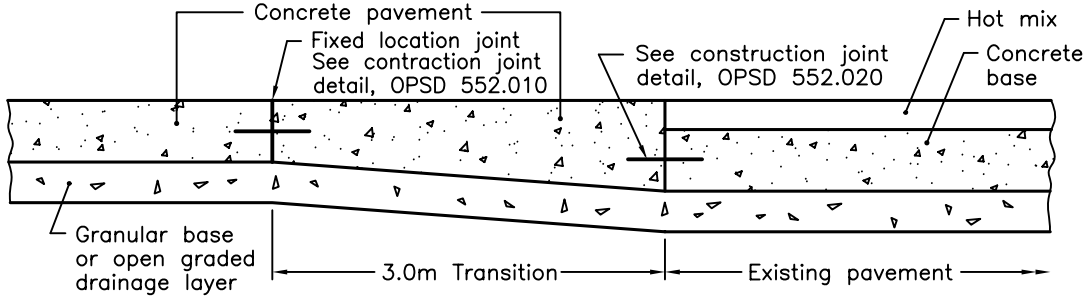
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2008	Rev	1
COMPOSITE PAVEMENT SHOULDER TERMINAL			
			OPSD 554.020



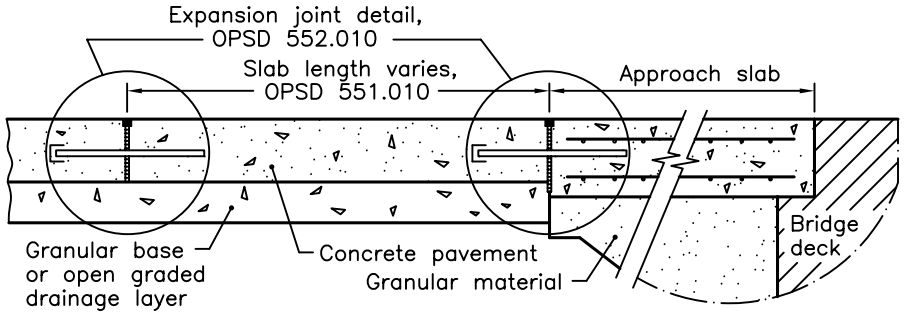
PLAN



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.

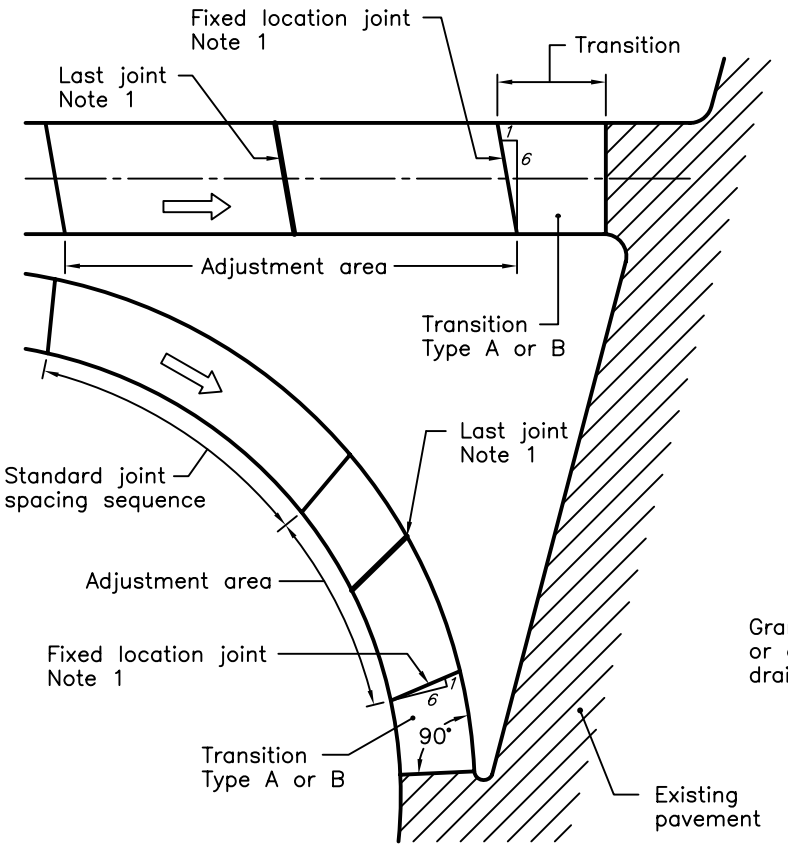
ONTARIO PROVINCIAL STANDARD DRAWING

CONCRETE PAVEMENT
APPROACH TREATMENT TO HOT MIX AND COMPOSITE PAVEMENTS AND STRUCTURE APPROACHES

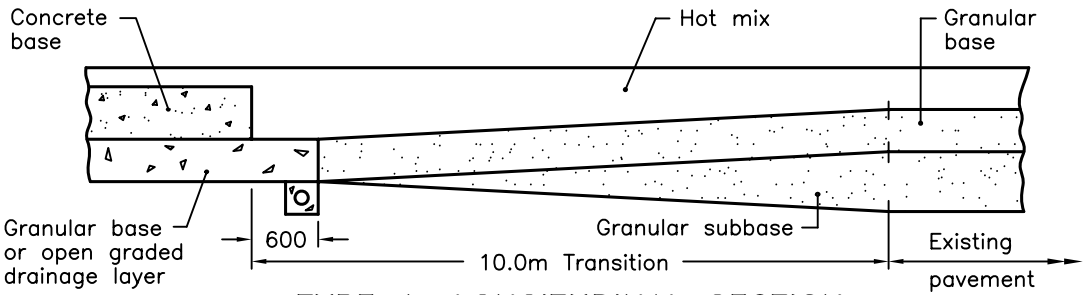
Nov 2008 | Rev 1

ONTARIO STANDARDS MUNICIPAL – PROVINCIAL

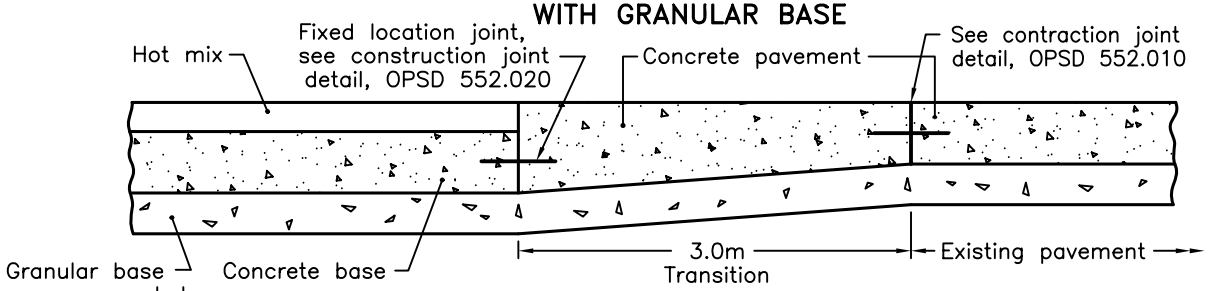
OPSD 555.010



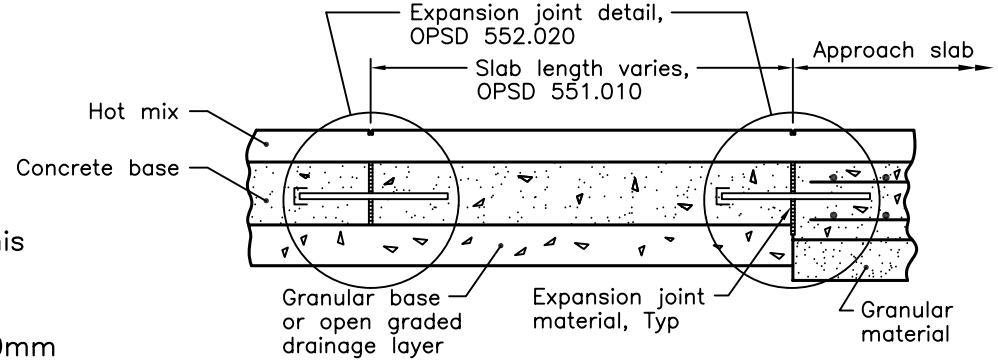
PLAN



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.

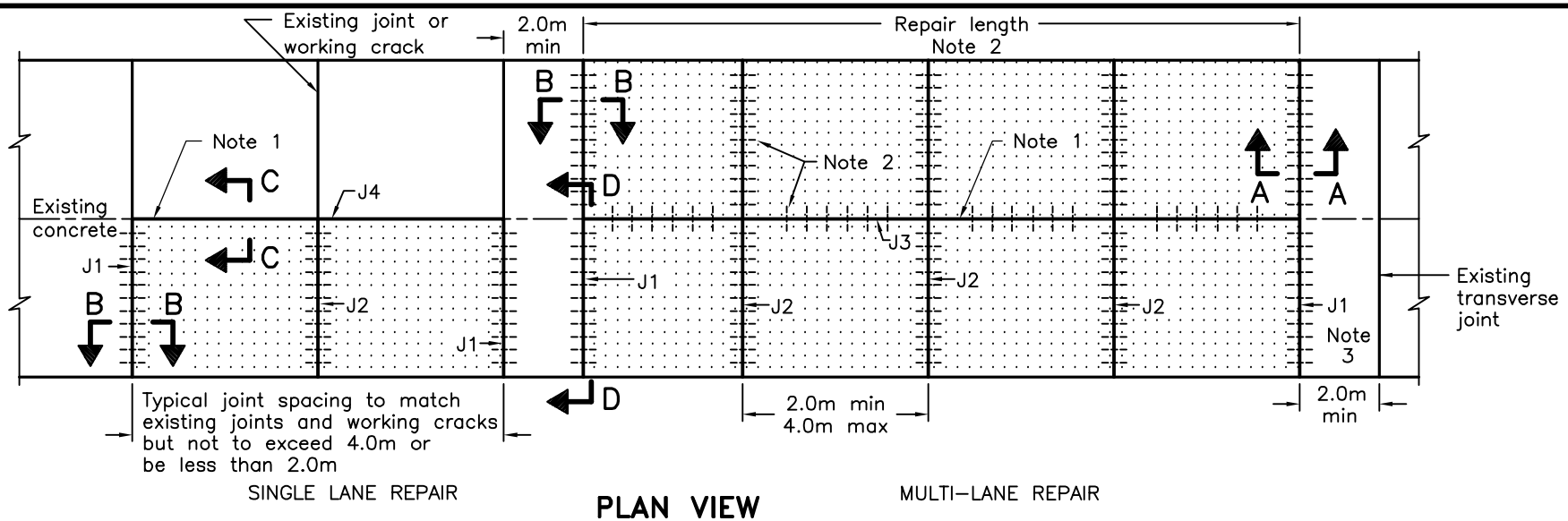
ONTARIO PROVINCIAL STANDARD DRAWING

COMPOSITE PAVEMENT
APPROACH TREATMENT TO HOT MIX AND CONCRETE PAVEMENTS AND STRUCTURE APPROACHES

Nov 2008 | Rev 1

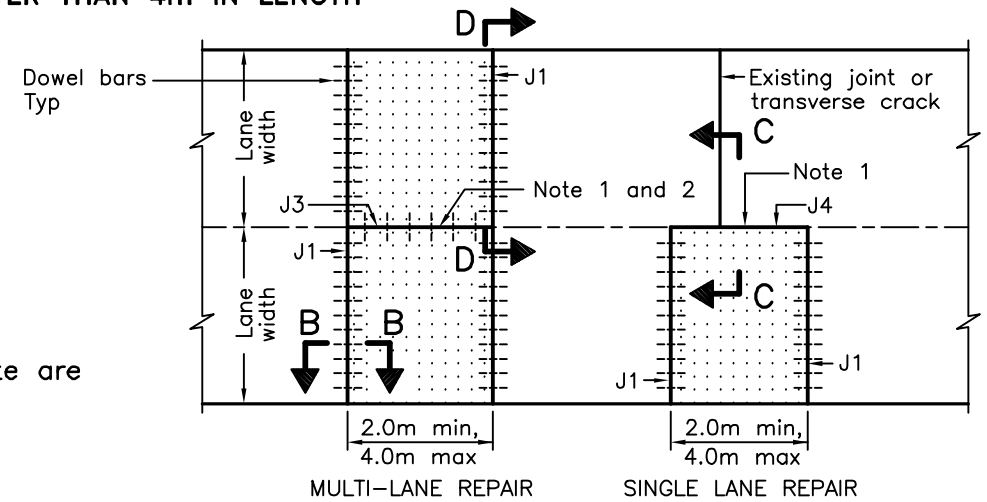
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

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:

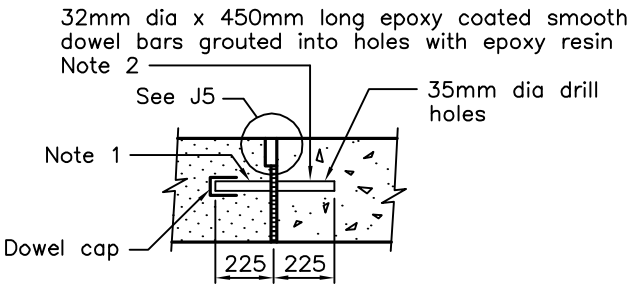
New concrete

ONTARIO PROVINCIAL STANDARD DRAWING

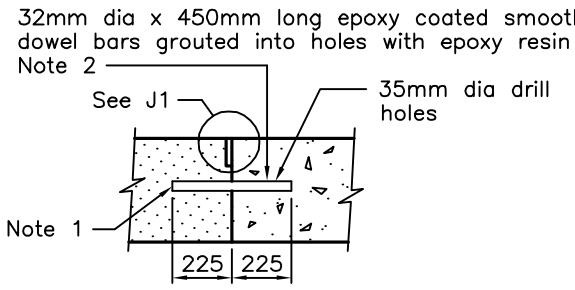
Nov 2010 | Rev 5

COMPOSITE OR EXPOSED CONCRETE PAVEMENTS
FULL DEPTH CONCRETE SLAB REPAIR LAYOUT

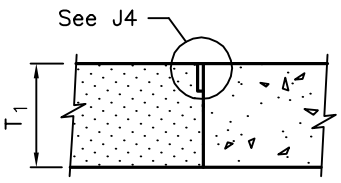
OPSD 560.010



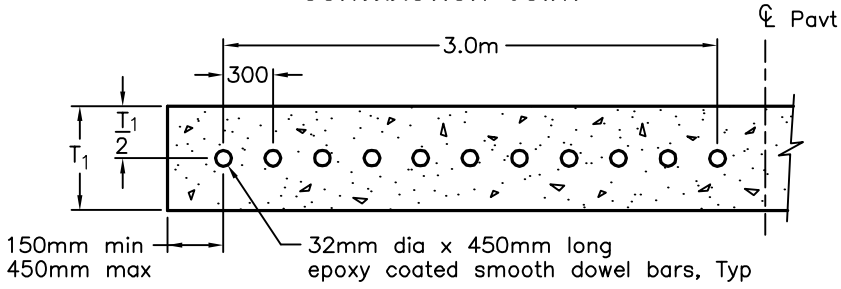
SECTION A–A
EXPANSION JOINT



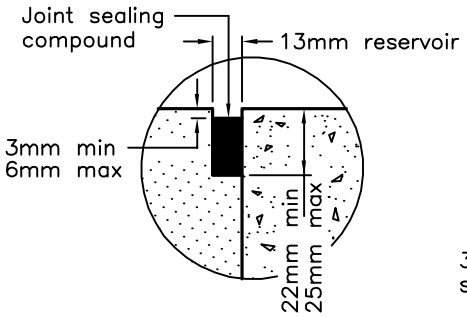
SECTION B–B
CONTRACTION JOINT



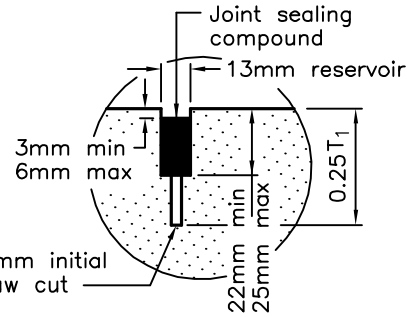
SECTION C–C
LONGITUDINAL JOINT



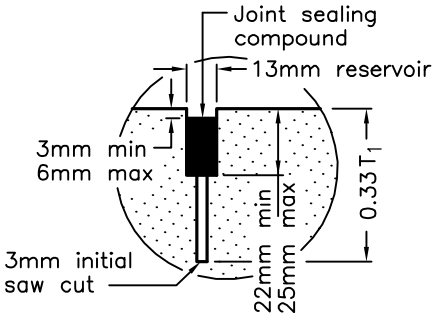
SECTION D–D



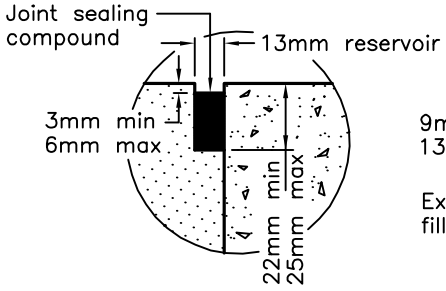
J1, CONTRACTION JOINT



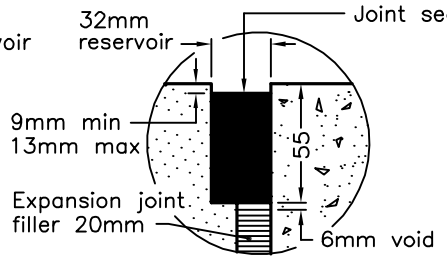
J2, CONTRACTION JOINT



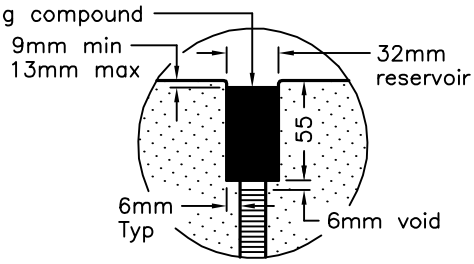
J3, LONGITUDINAL JOINT



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.

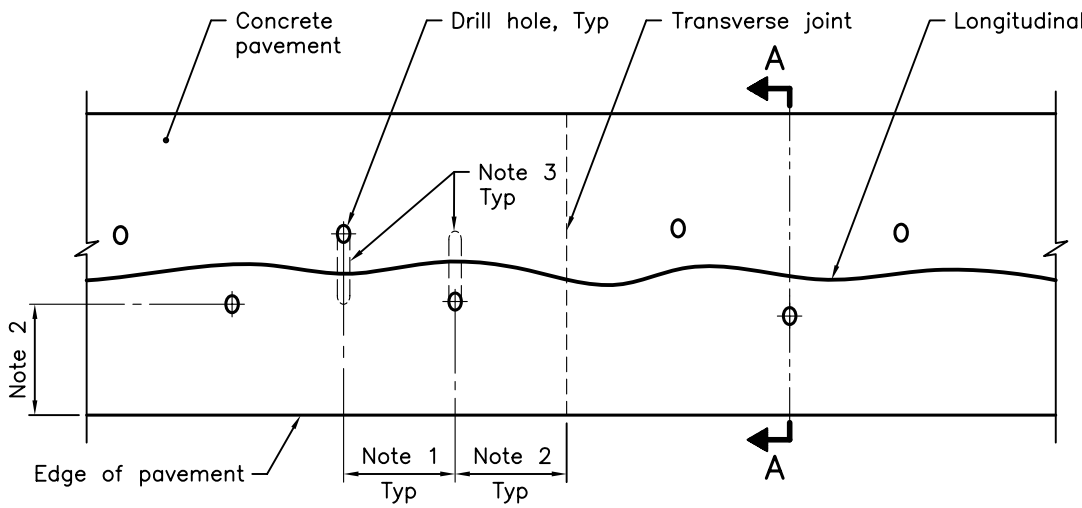
D All dimensions are in millimetres unless otherwise shown.

LEGEND:

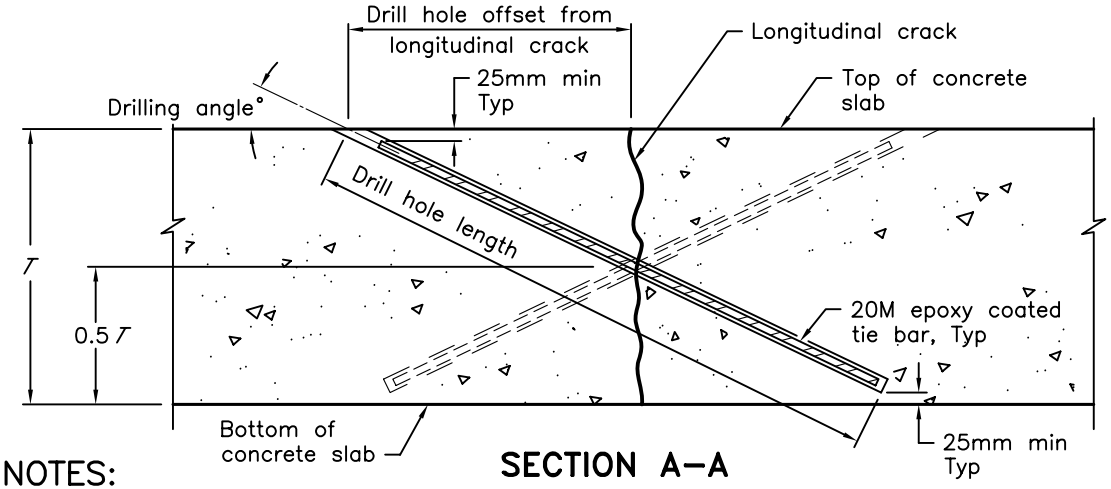
New concrete

T_1 = Thickness of concrete

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	2
EXPOSED CONCRETE PAVEMENT FULL DEPTH CONCRETE SLAB REPAIR JOINT DETAILS	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _		
	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:

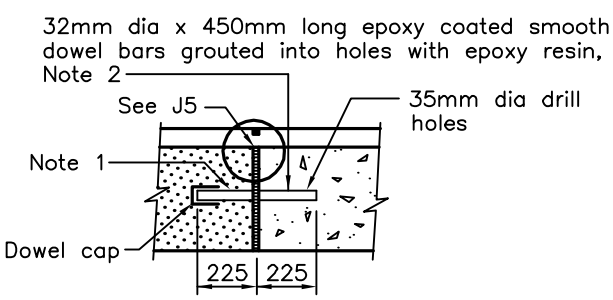
T – Concrete pavement thickness

ONTARIO PROVINCIAL STANDARD DRAWING

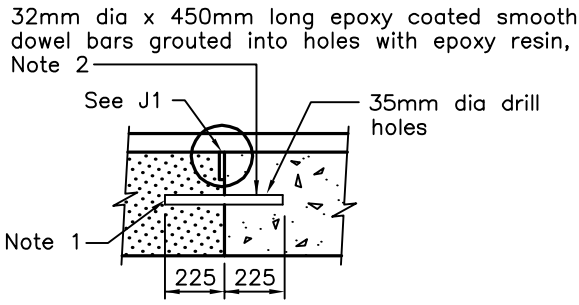
Nov 2008 | Rev 0

CONCRETE PAVEMENT AND CONCRETE BASE CROSS–STITCHING LONGITUDINAL CRACKS

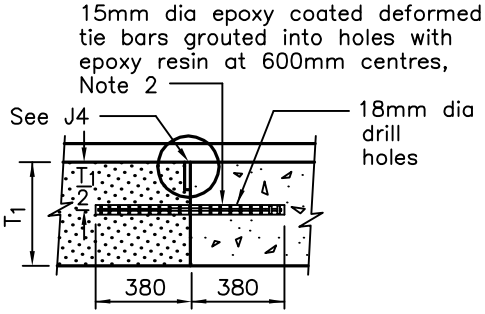
OPSD 560.025



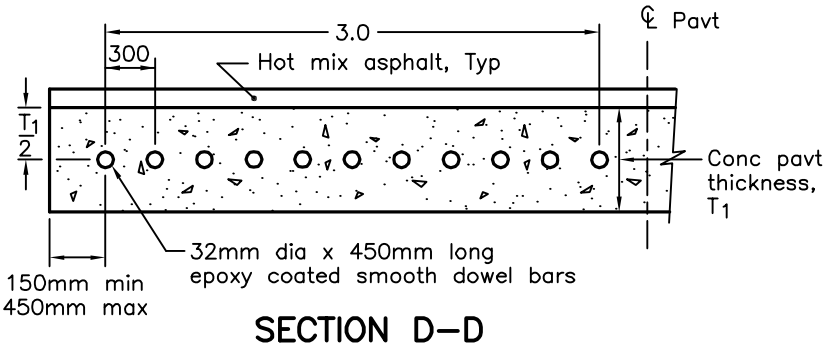
SECTION A–A
EXPANSION JOINT



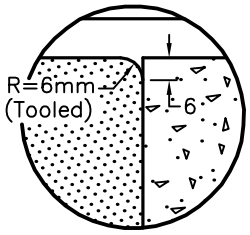
SECTION B–B
CONTRACTION JOINT



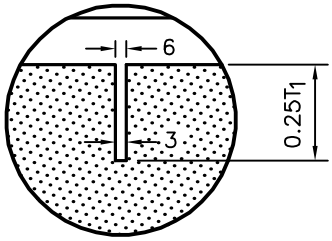
SECTION C–C
LONGITUDINAL JOINT



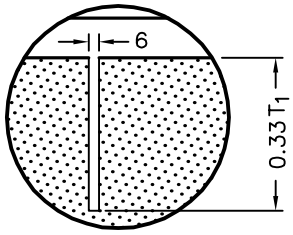
SECTION D–D



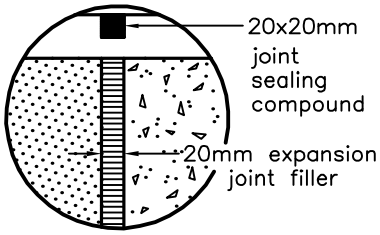
J1, CONTRACTION JOINT
J4, LONGITUDINAL JOINT



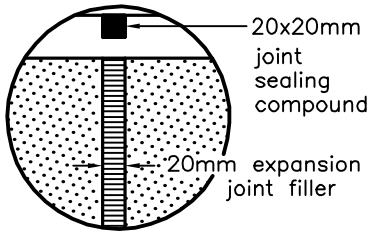
J2, CONTRACTION JOINT



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.

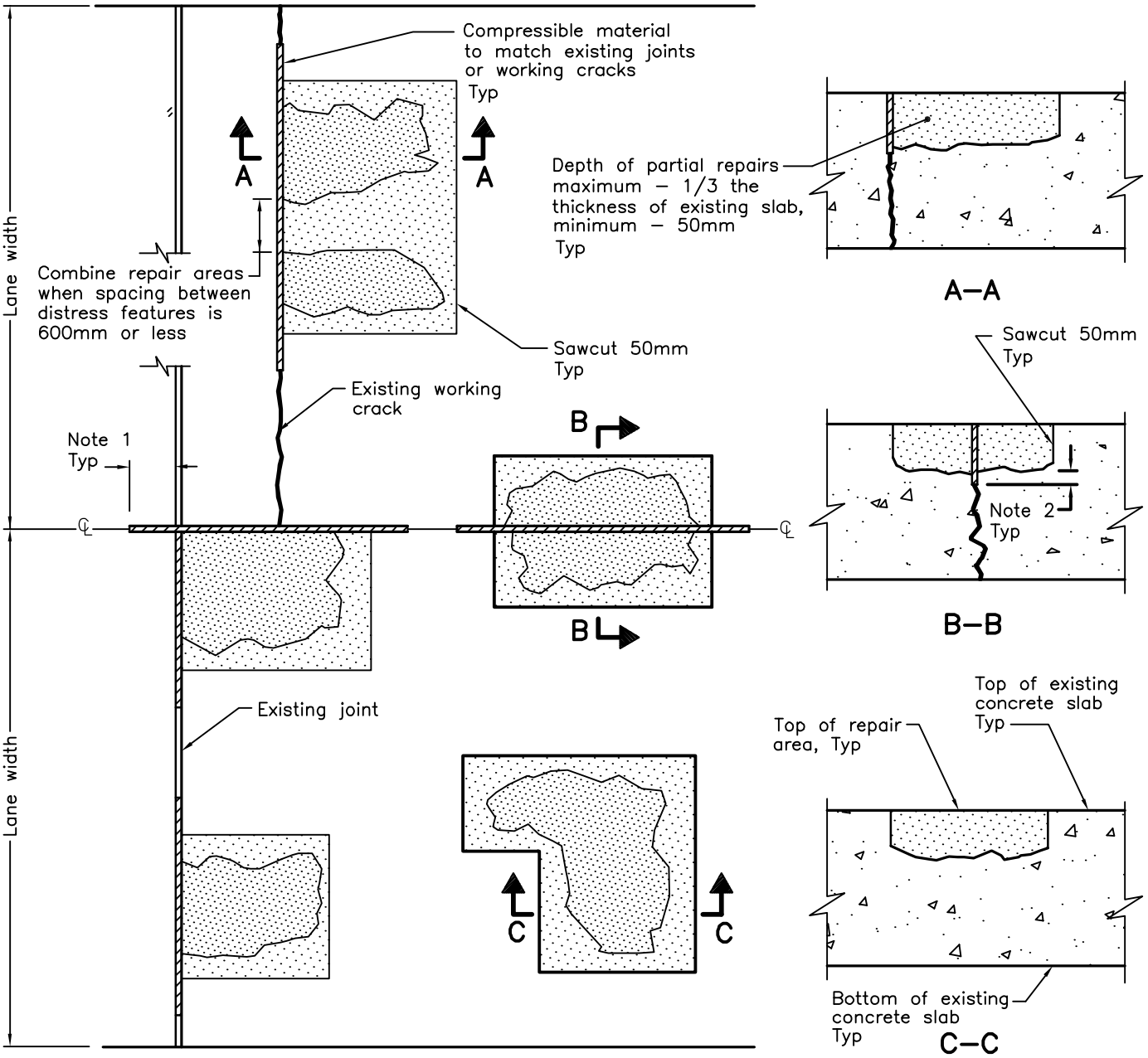
C All dimensions are in millimetres or metres unless otherwise shown.

LEGEND:

New concrete

T_1 = Thickness of concrete

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
COMPOSITE PAVEMENT FULL DEPTH CONCRETE SLAB REPAIR 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.

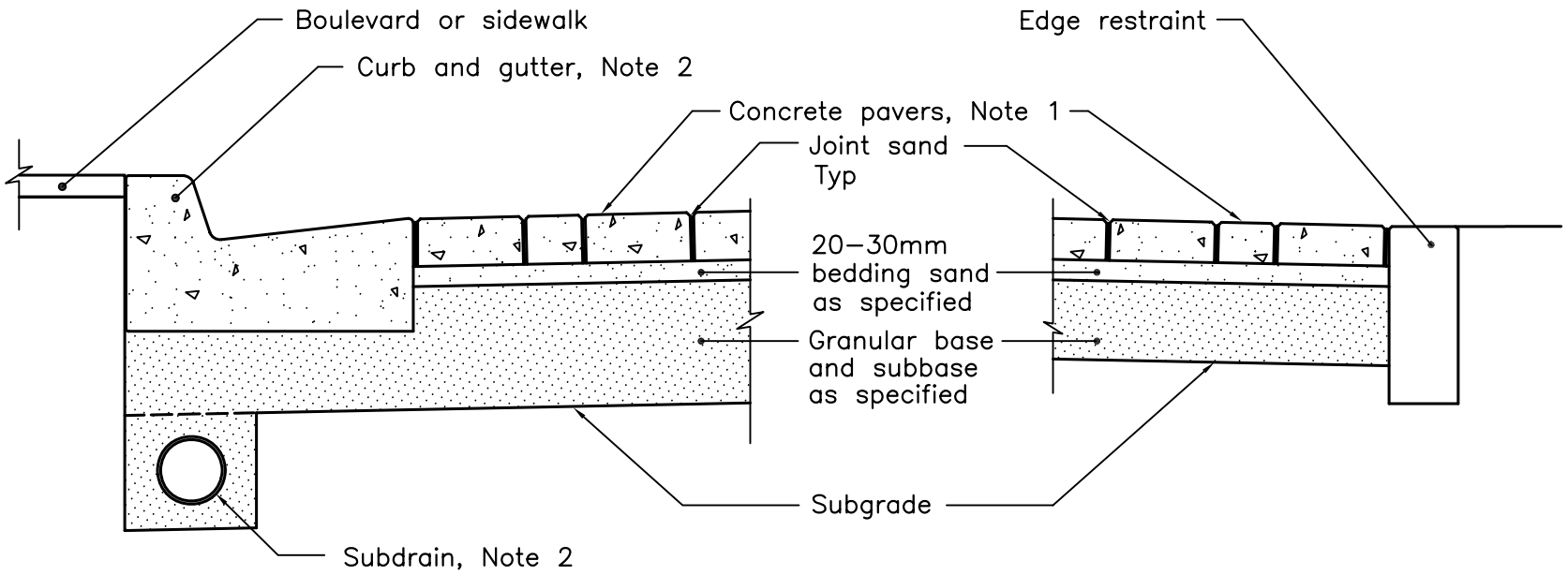
B All dimensions are in millimetres unless otherwise shown.

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**

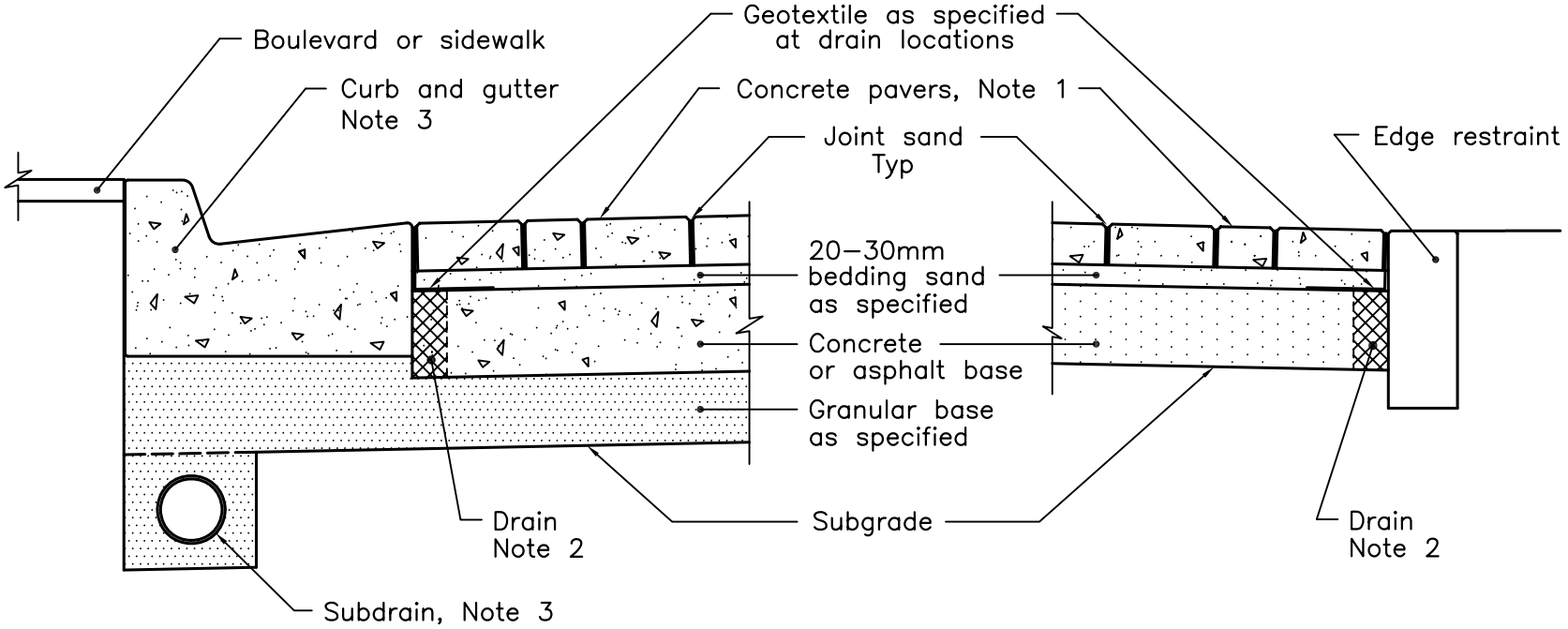
NOTES:

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.

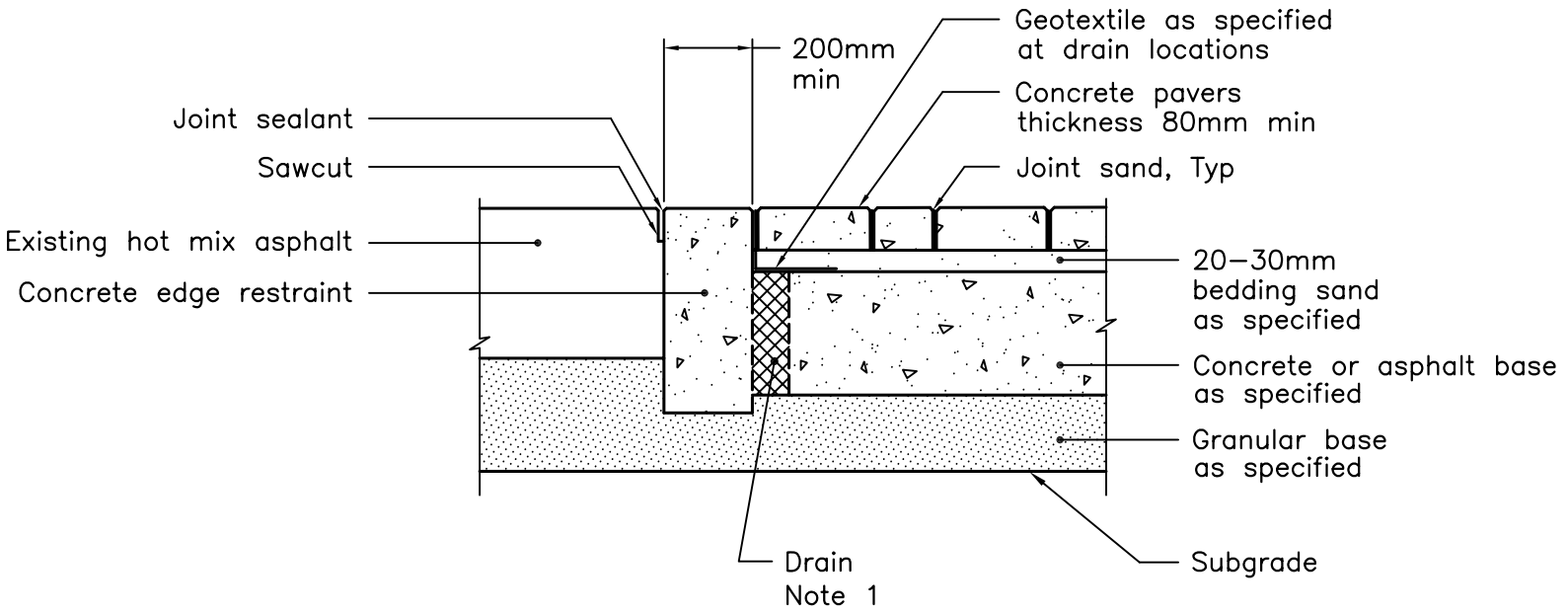
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

INTERLOCKING CONCRETE PAVERS ON CONCRETE OR ASPHALT BASE

Nov 2006 | Rev 1

OPSD 561.020

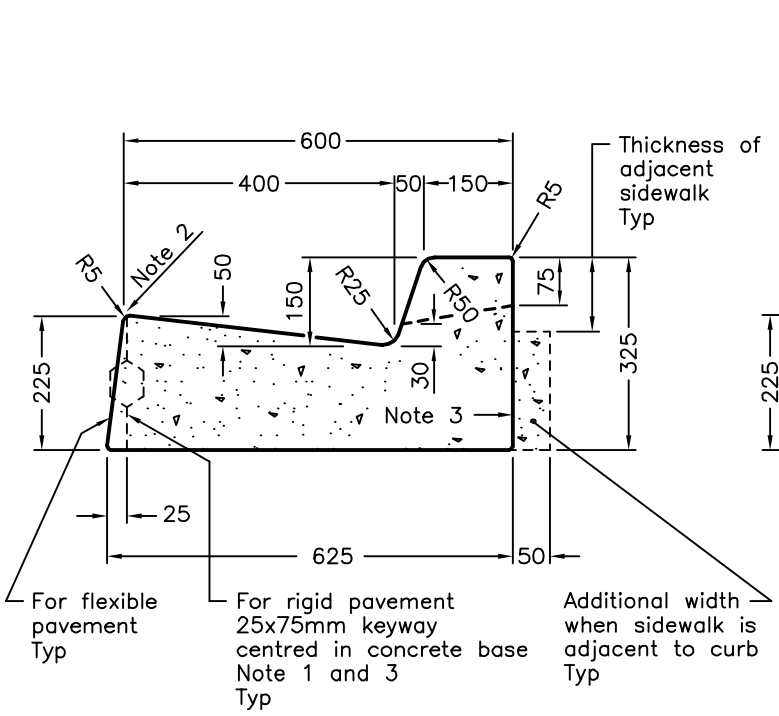


NOTES:

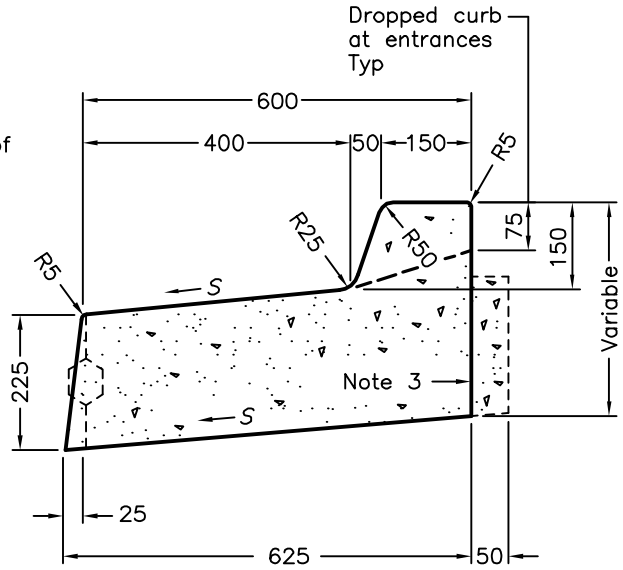
1 Drains to be installed at low points and selected intervals through concrete or asphalt base to suit subgrade conditions.

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.

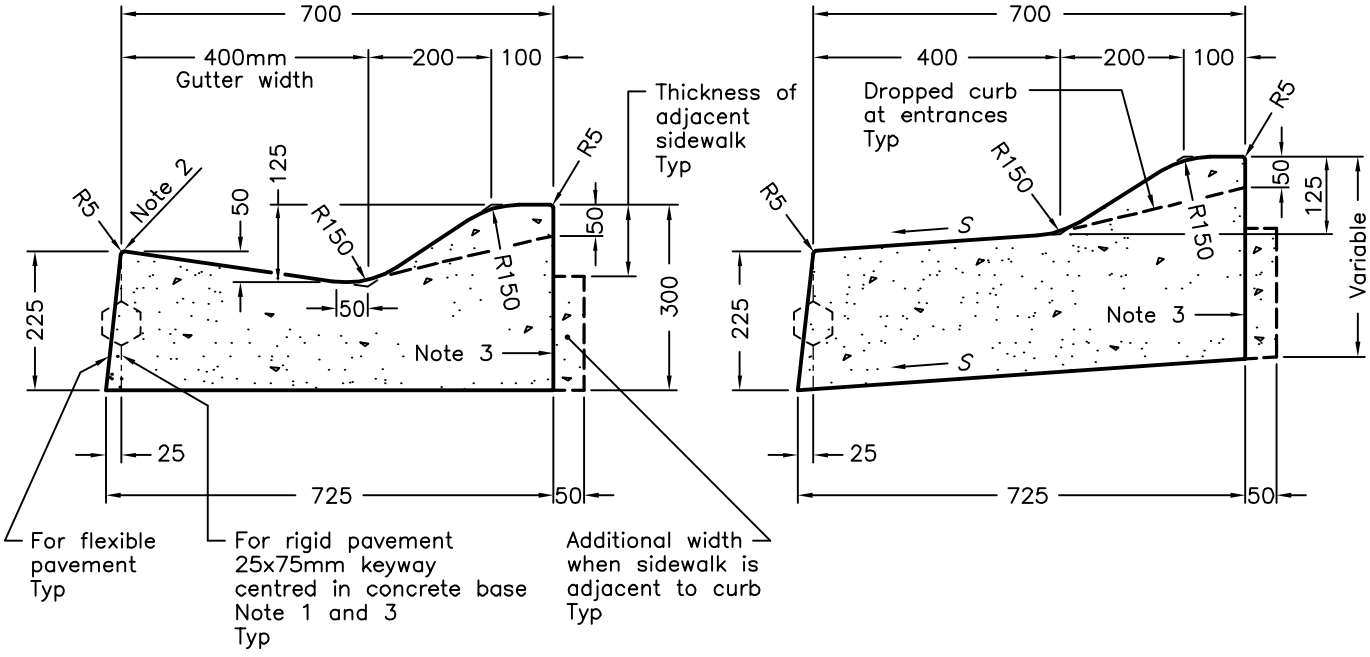
A Treatment at entrances shall be according to OPSD 351.010.

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.

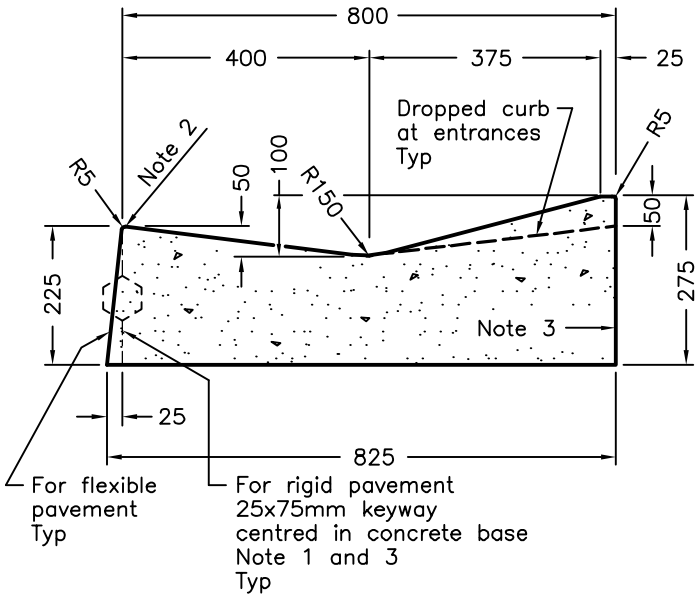
A Treatment at entrances shall be according to OPSD 351.010.

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

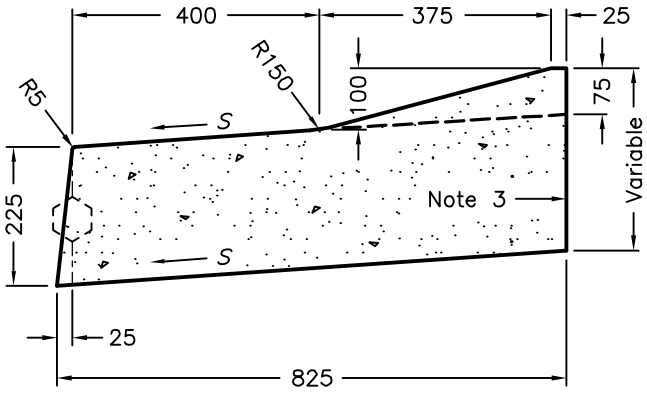
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.

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.

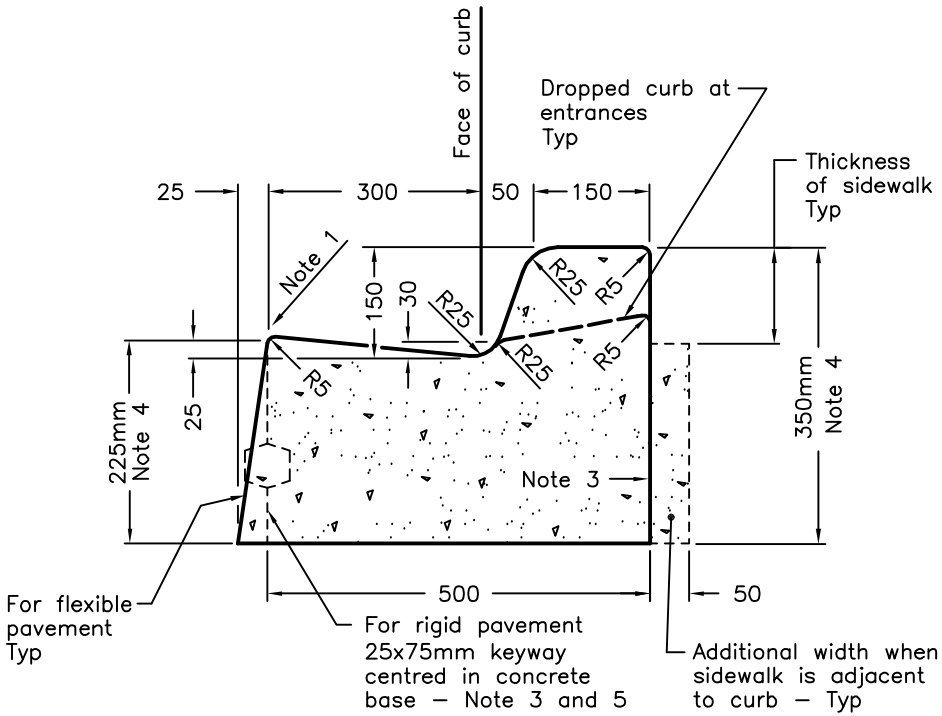
A Treatment at entrances shall be according to OPSD 351.010.

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

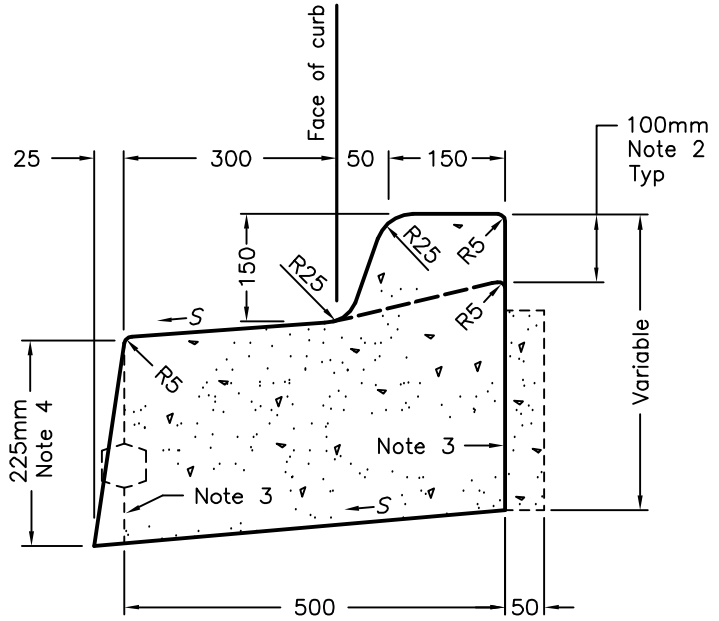
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.

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.

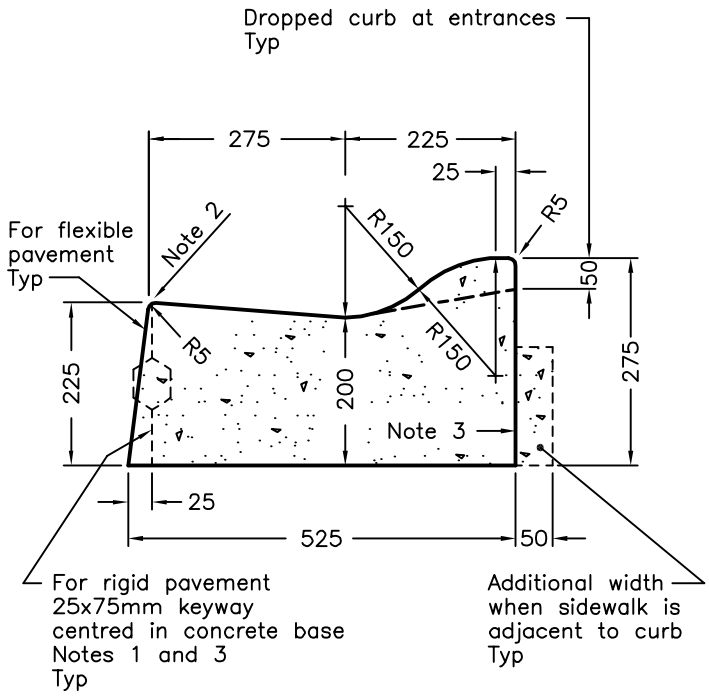
A Treatment at entrances shall be according to OPSD 351.010.
B Outlet treatment shall be according to the OPSD 610 Series.
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
D All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

ONTARIO PROVINCIAL STANDARD DRAWING

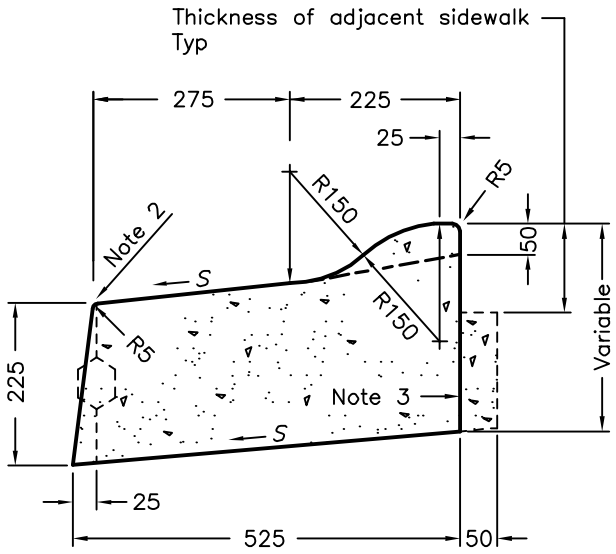
CONCRETE BARRIER CURB WITH STANDARD GUTTER

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.

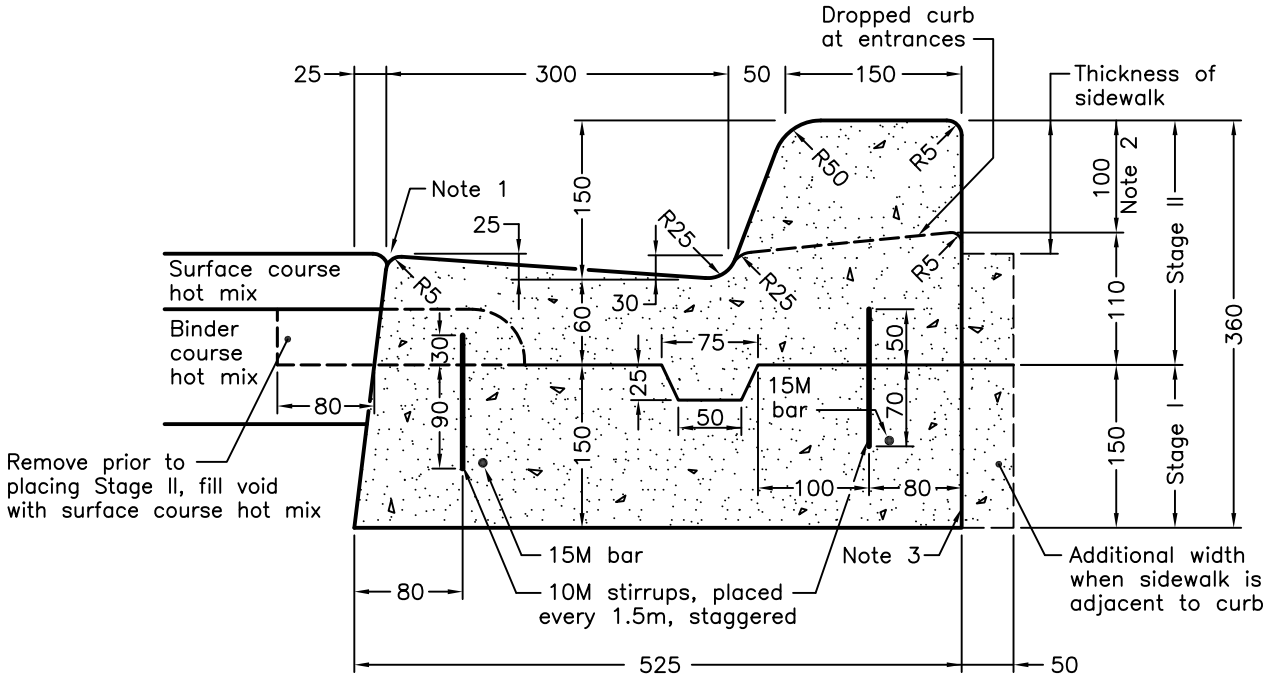
A Treatment at entrances shall be according to OPSD 351.010.

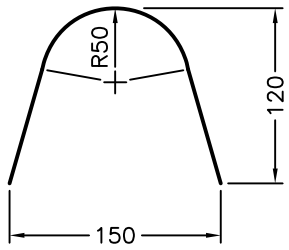
B Outlet treatment shall be according to the OPSD 610 Series.

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.

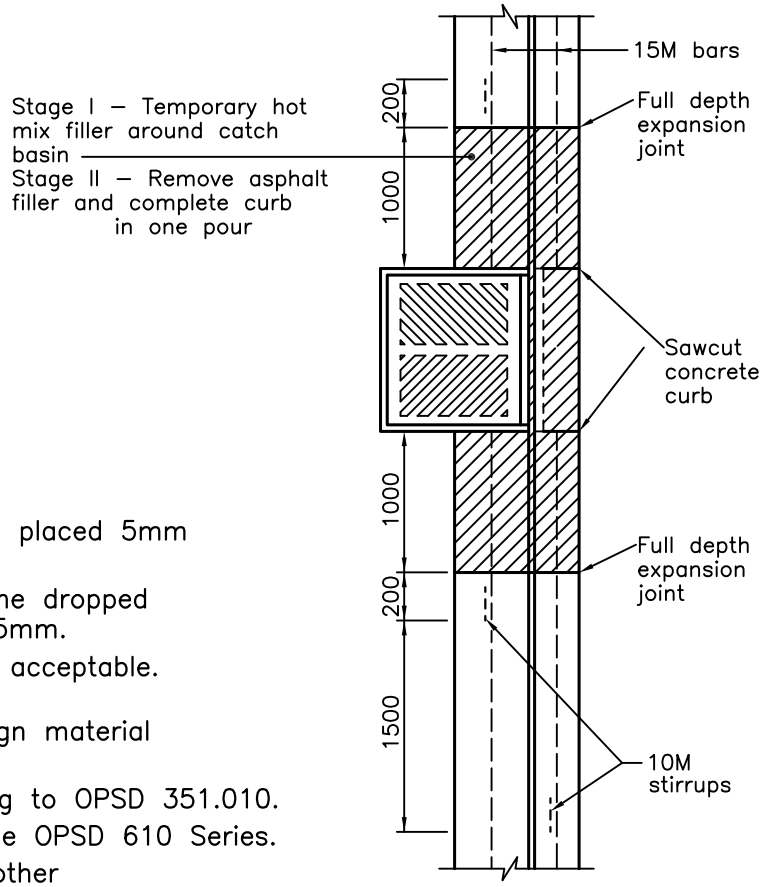
D All dimensions are in millimetres unless otherwise shown.

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.

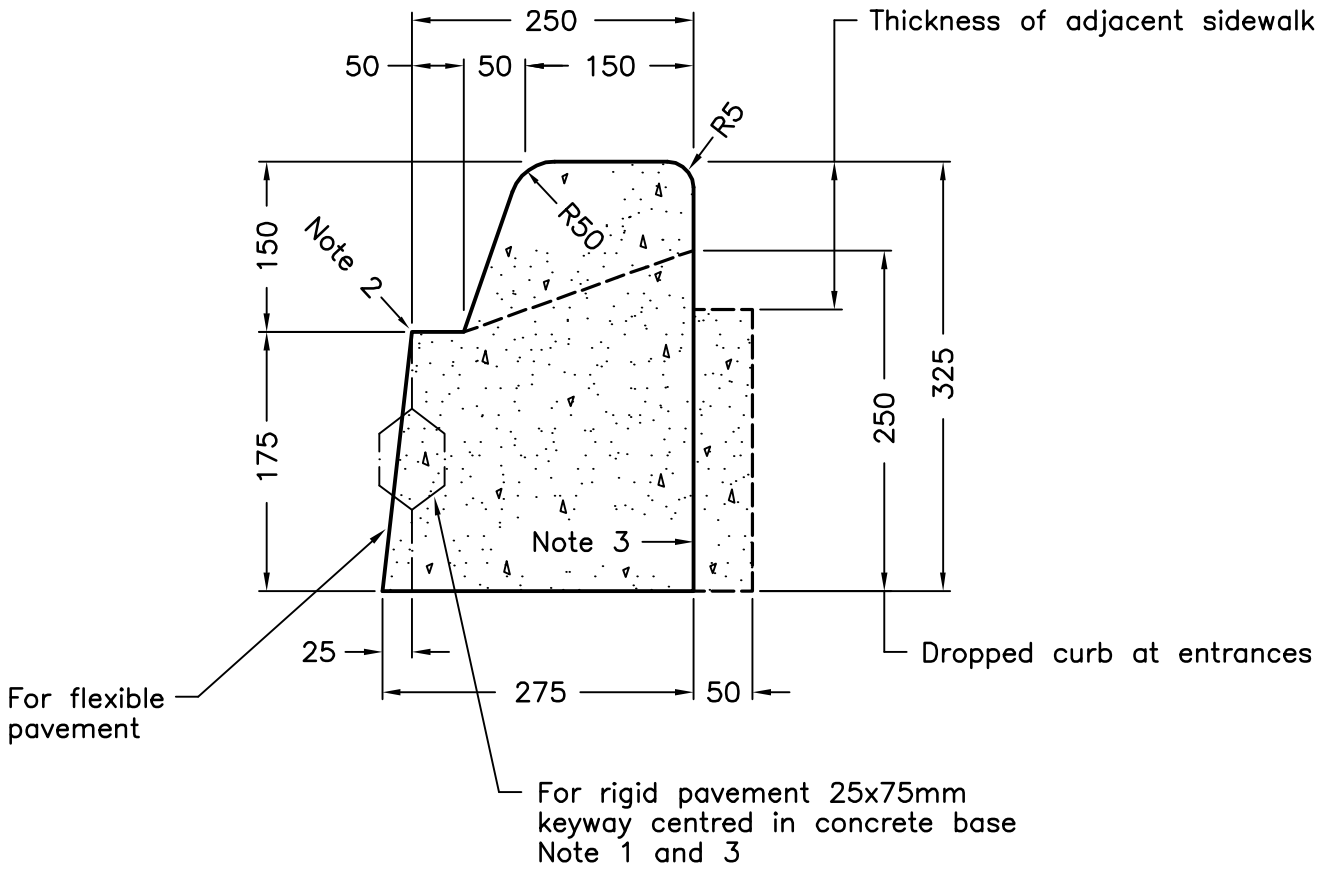
B Treatment at entrances shall be according to OPSD 351.010.

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 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.

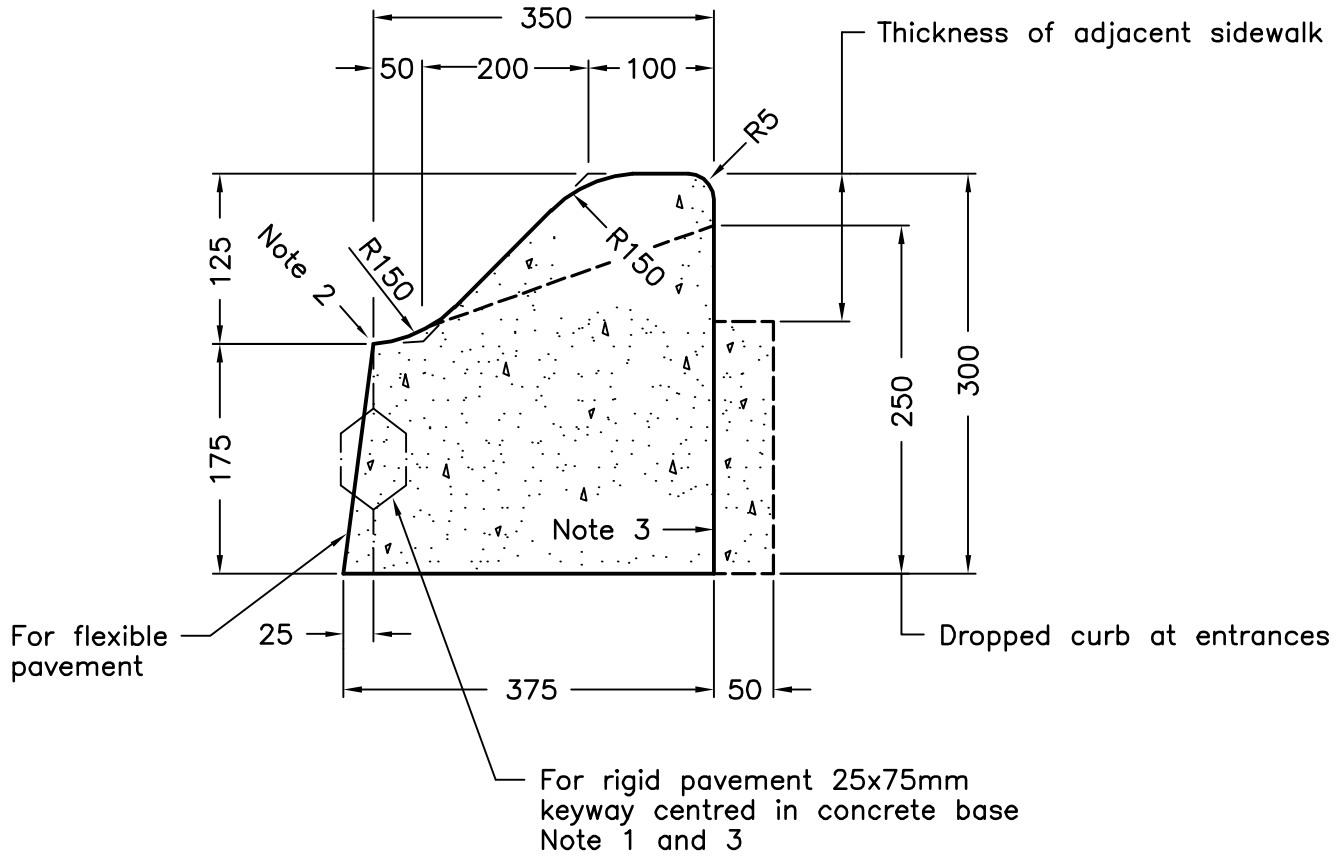
A Treatment at entrances shall be according to OPSD 351.010.

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.

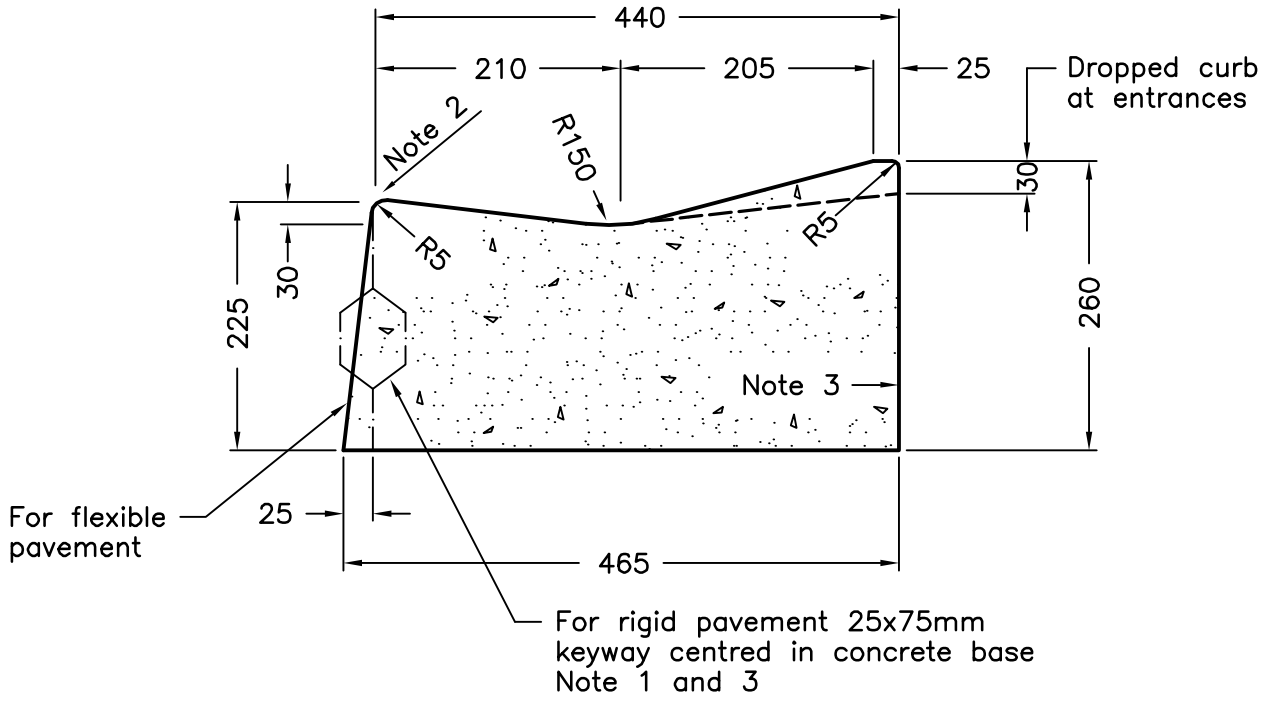
A Treatment at entrances shall be according to OPSD 351.010.

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.

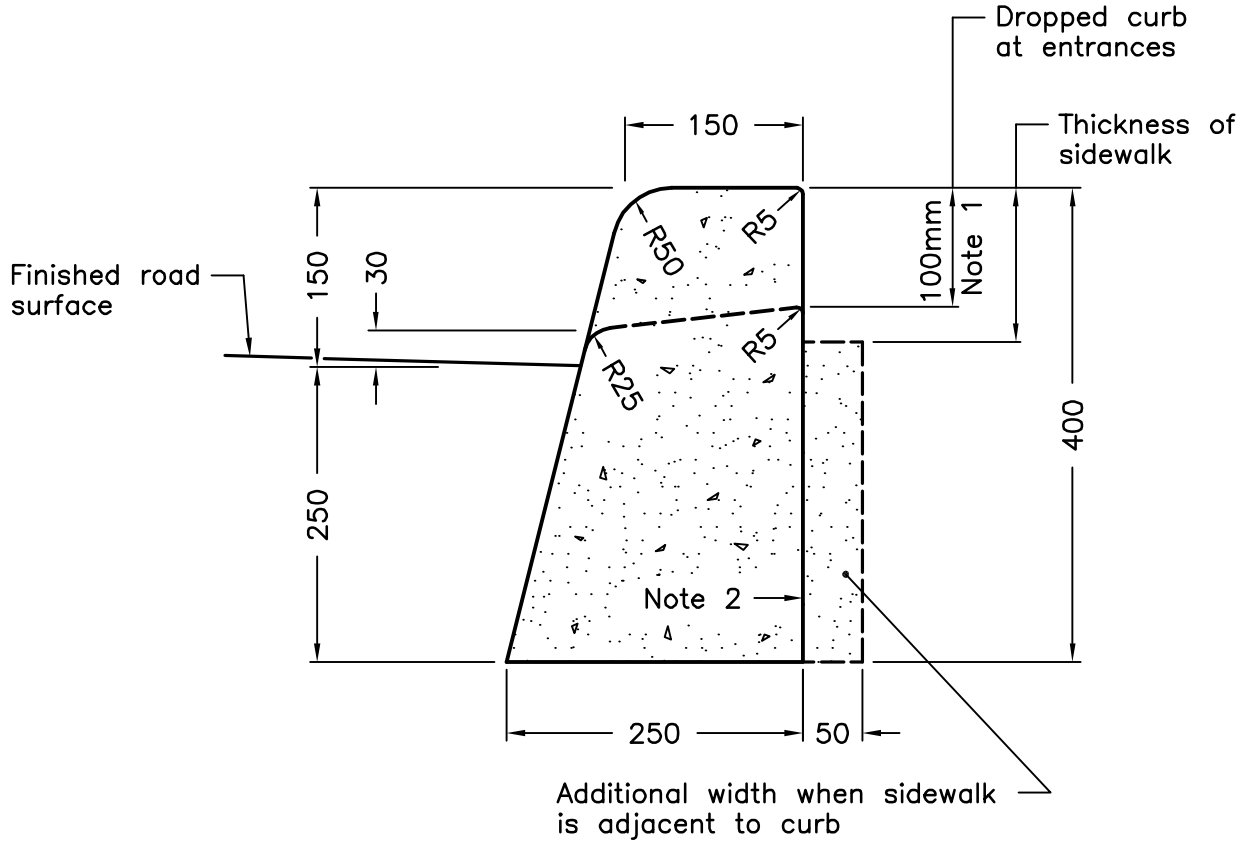
A Treatment at entrances shall be according to OPSD 351.010.

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.

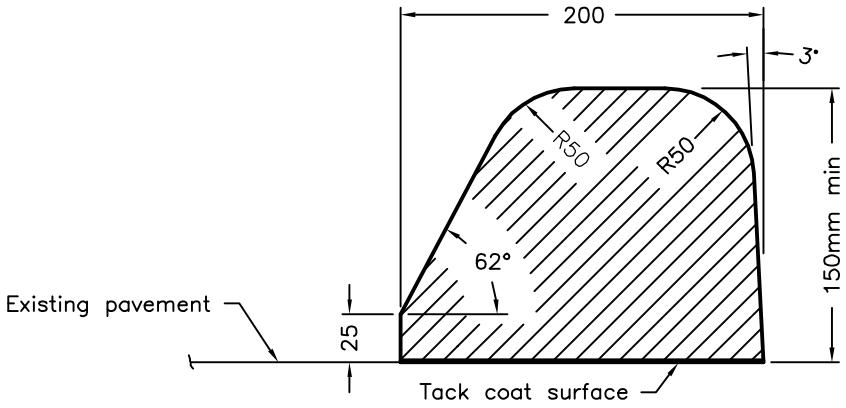
A Treatment at entrances shall be according to OPSD 351.010.

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

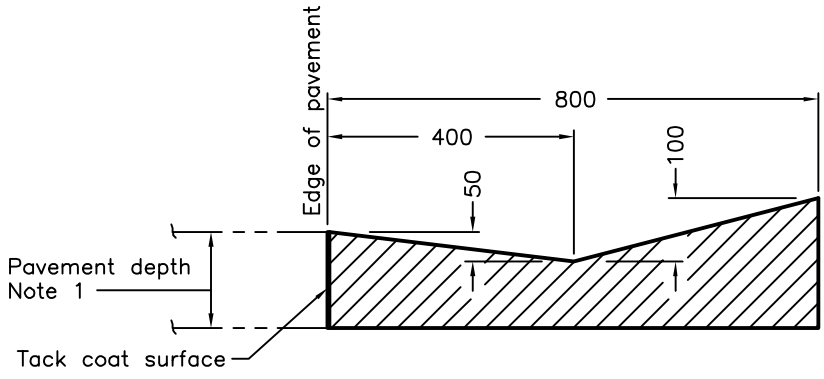
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.

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)



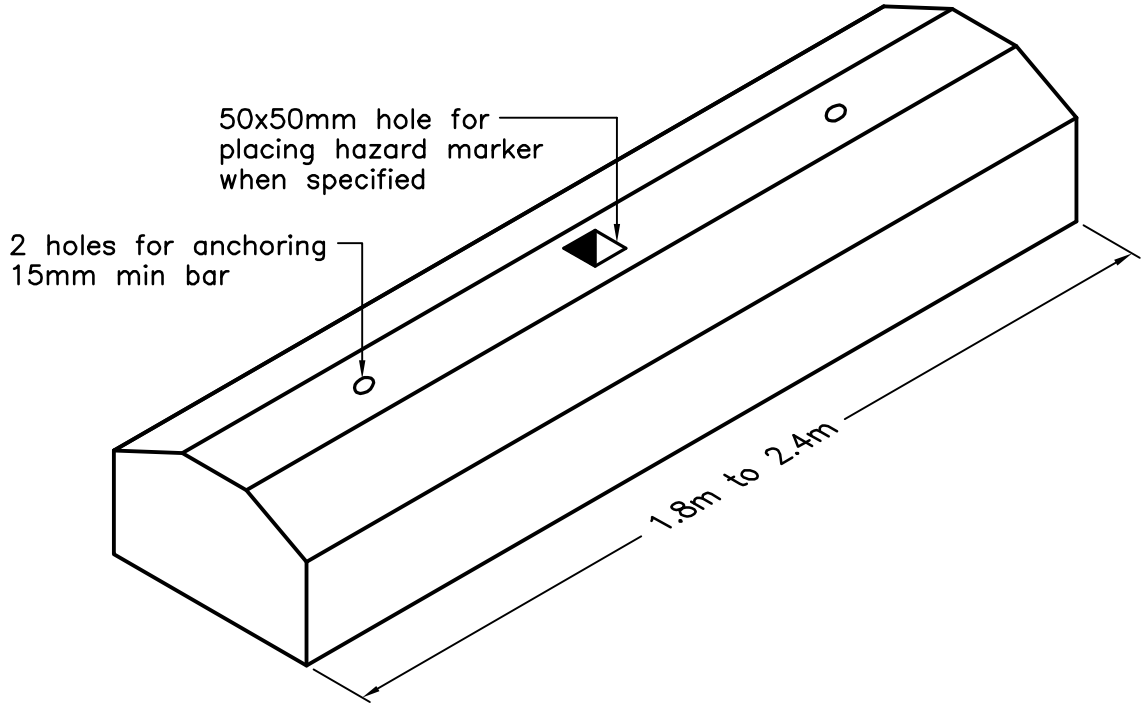
ASPHALT MOUNTABLE CURB WITH WIDE GUTTER

NOTES:

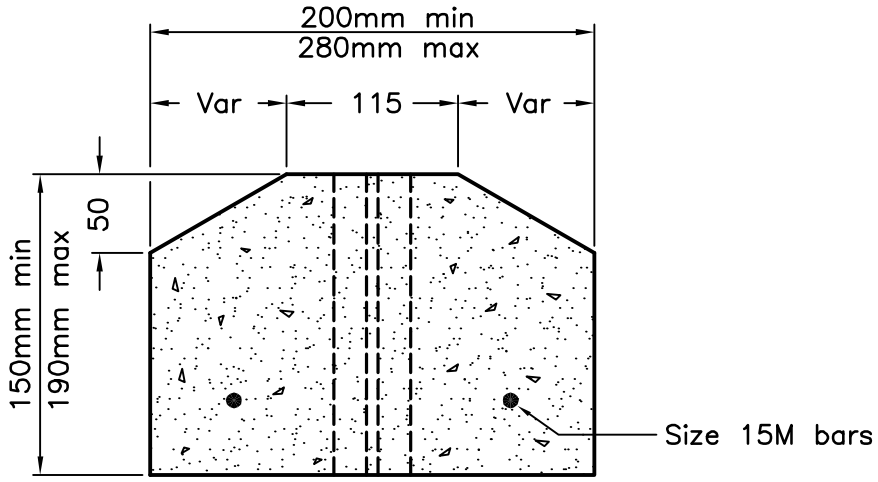
1 Depth of asphalt curb with gutter at pavement edge shall equal depth of new pavement, but in no case less than 130mm.

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



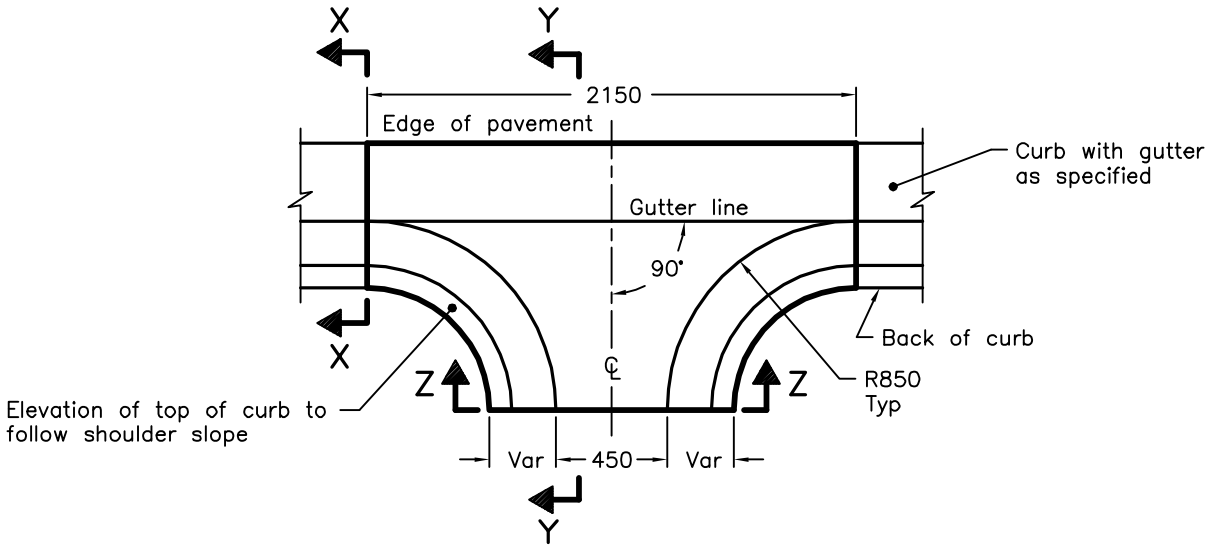
SECTION

NOTES:

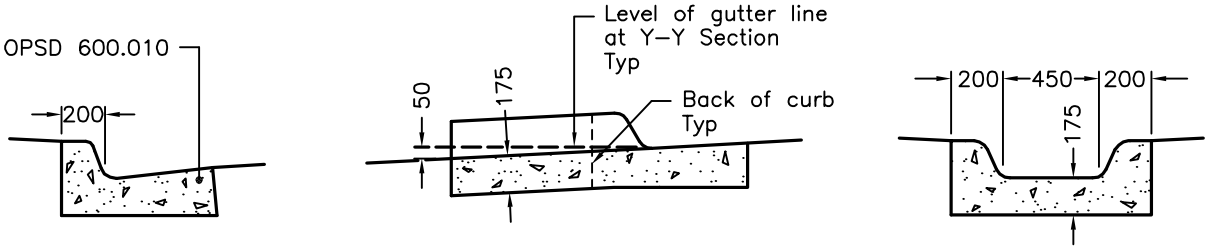
A Class of concrete shall be C2 according to CSA A23.1.

B All dimensions are in millimetres unless otherwise shown.

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

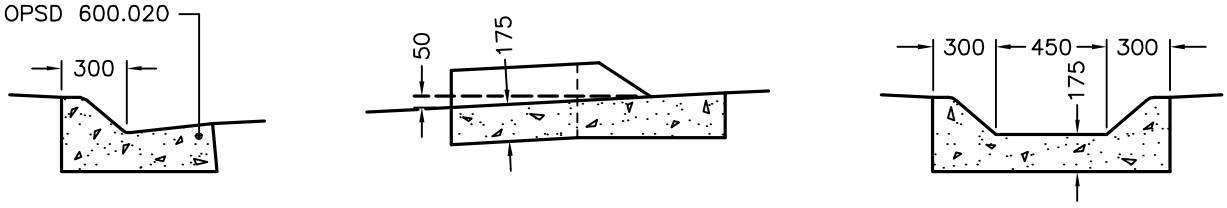


TYPICAL PLAN VIEW



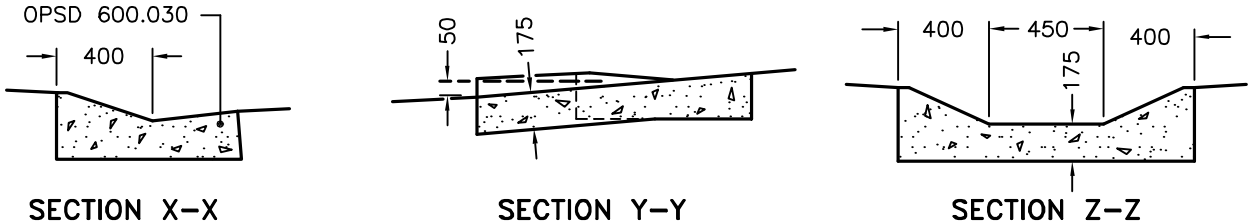
SECTION X–X **SECTION Y–Y** **SECTION Z–Z**

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**

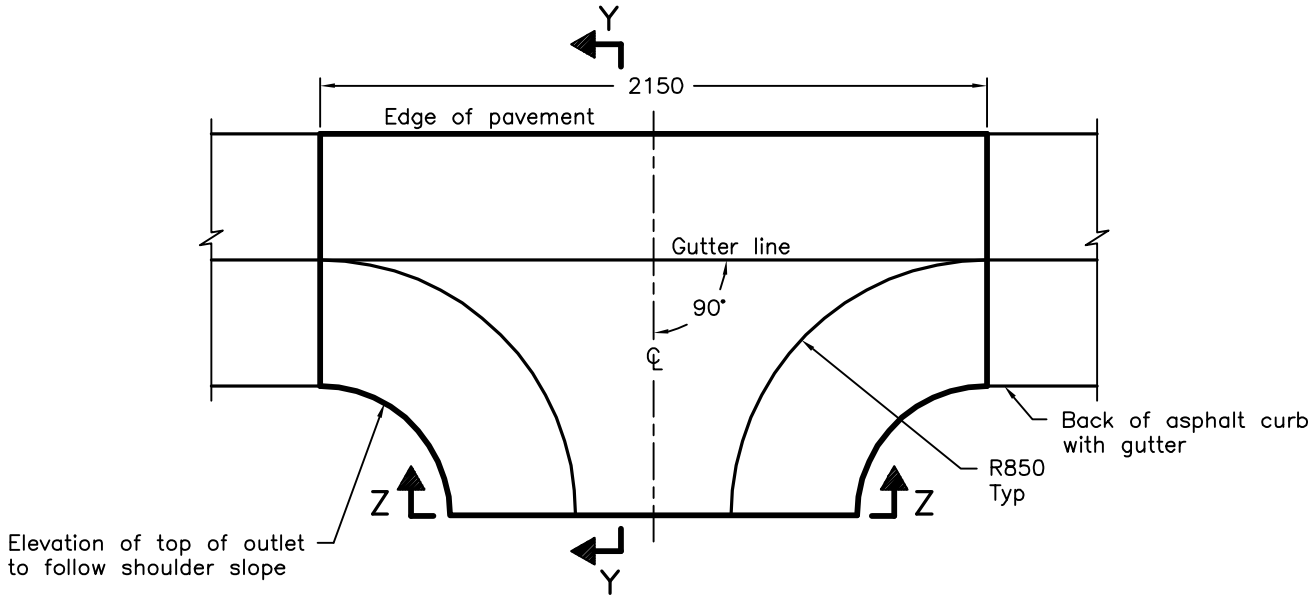
MOUNTABLE CURB with GUTTER

NOTES:

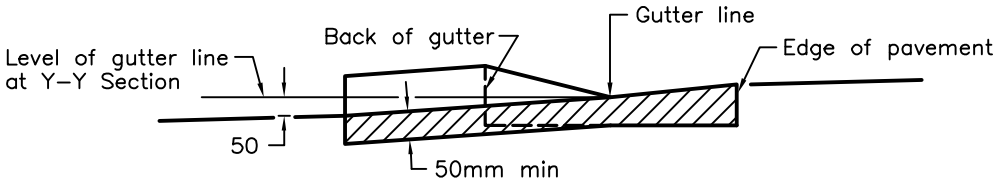
A For asphalt spillway details refer to OPSD 605.040.

B All dimensions are in millimetres unless otherwise shown.

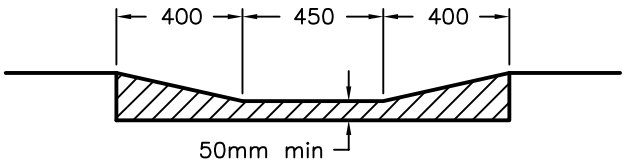
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
90° CONCRETE OUTLET FOR CONCRETE CURB WITH GUTTER			
	OPSD 604.010		



PLAN



SECTION Y–Y



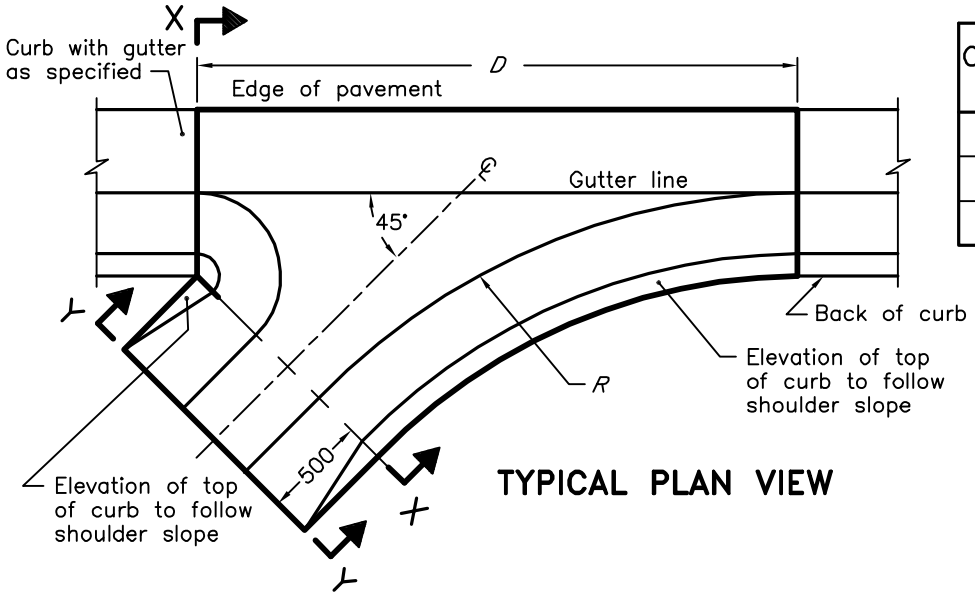
SECTION Z–Z

NOTES:

A For asphalt spillway details refer to OPSD 605.040.

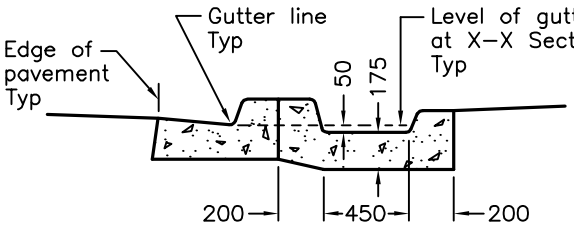
B All dimensions are in millimetres unless otherwise shown.

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

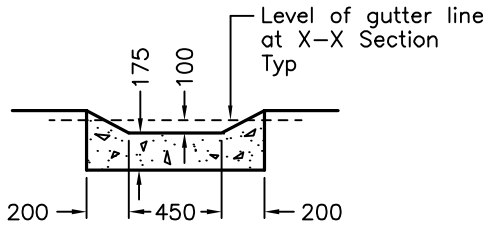


TYPICAL PLAN VIEW

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

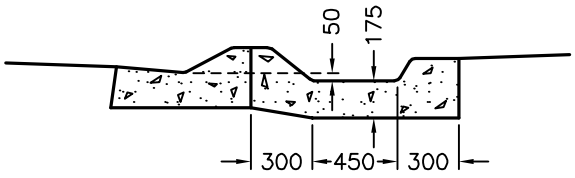


SECTION X–X

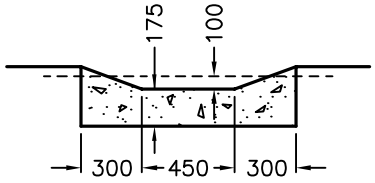


SECTION Y–Y

BARRIER CURB with GUTTER

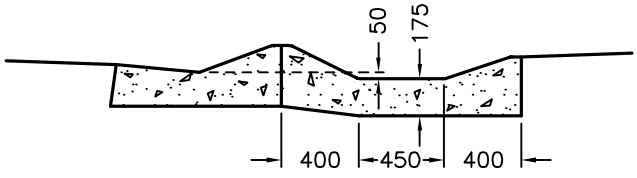


SECTION X–X

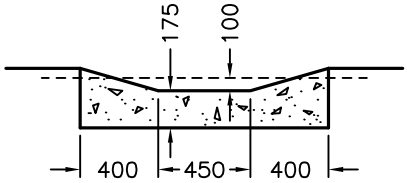


SECTION Y–Y

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.

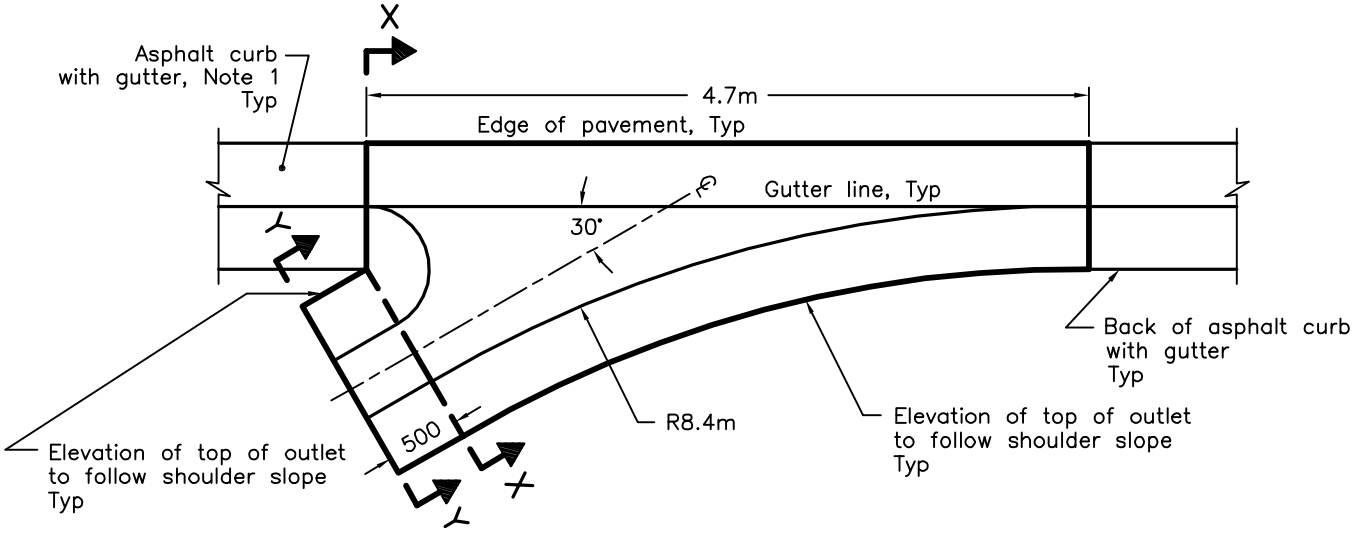
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2

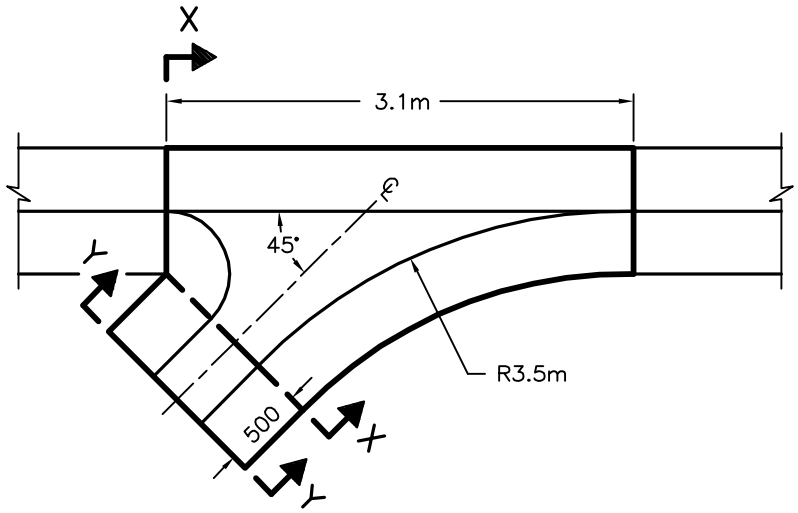
45° CONCRETE OUTLET

FOR CONCRETE CURB WITH GUTTER

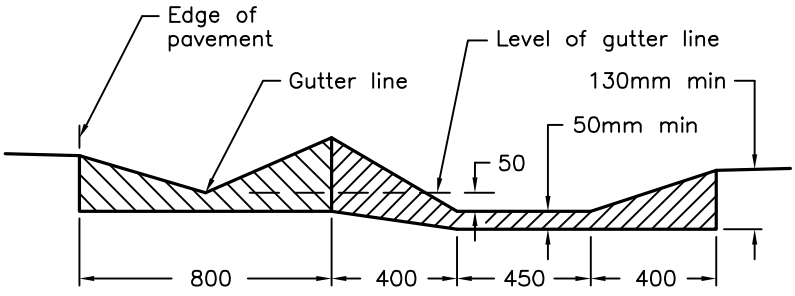
OPSD 605.010



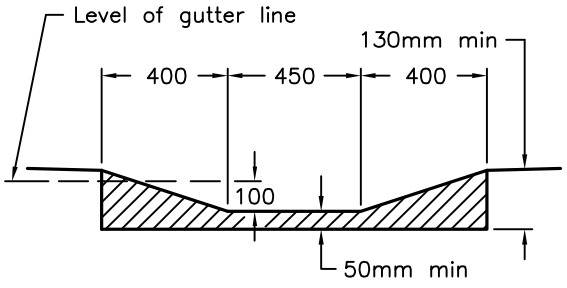
30° ASPHALT OUTLET



45° ASPHALT OUTLET



SECTION X–X, Typ



SECTION Y–Y, Typ

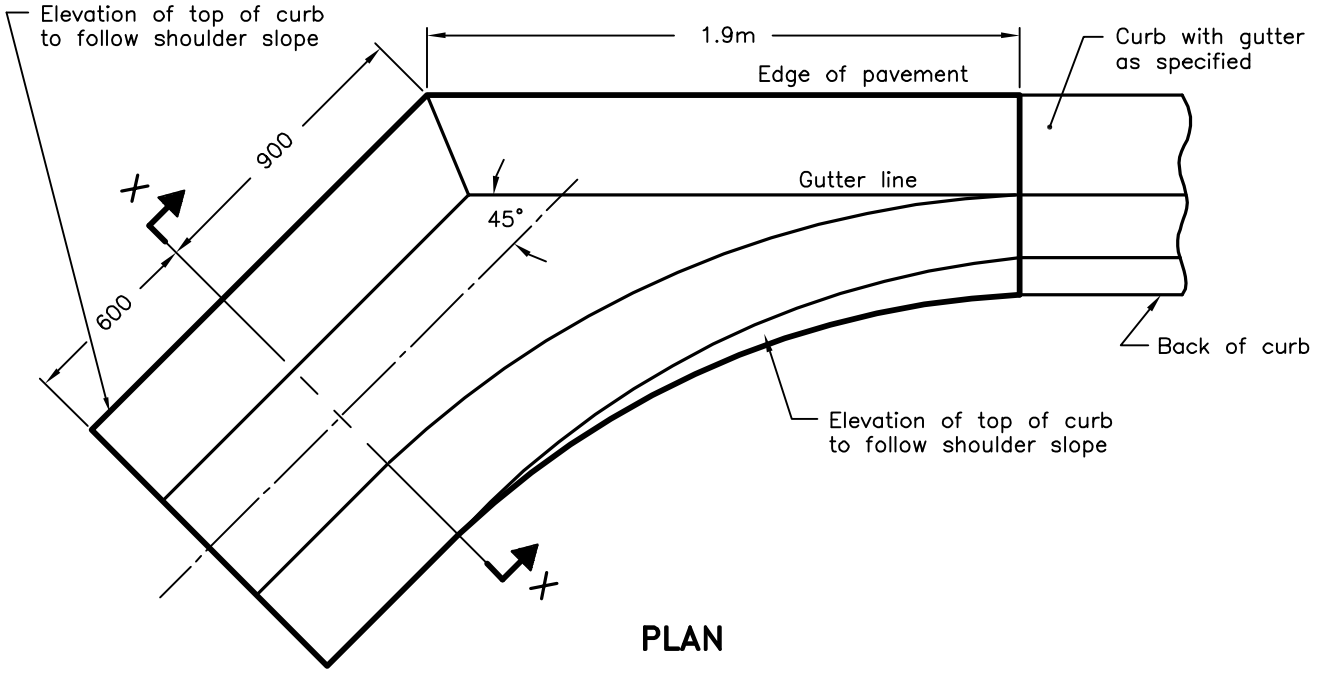
NOTES:

1 For asphalt curb with gutter refer to OPSD 601.010.

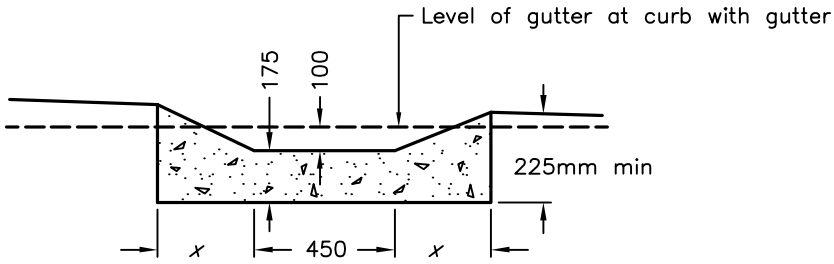
A For asphalt spillway details refer to OPSD 605.040.

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



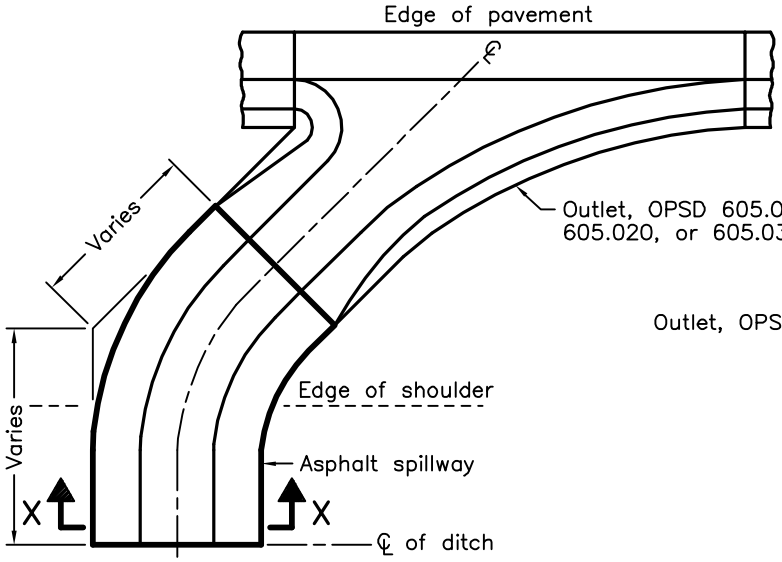
SECTION X–X

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

NOTES:

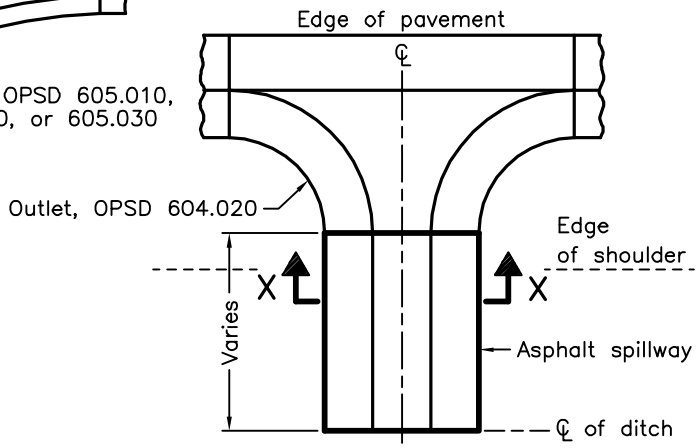
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
45° CONCRETE OUTLET FOR CONCRETE CURB WITH GUTTER AT END OF RUN			
	OPSD 605.030		



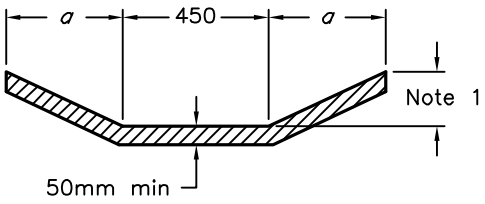
PLAN

WITH 30° or 45° ASPHALT OR CONCRETE OUTLET



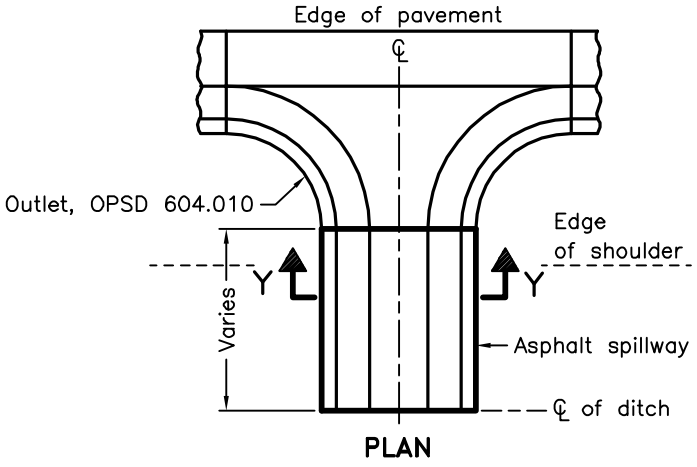
PLAN

WITH 90° ASPHALT OUTLET



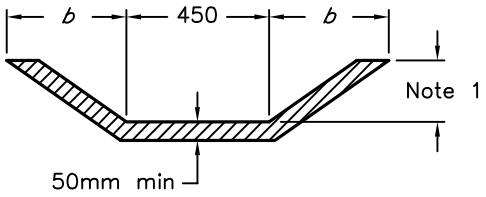
SECTION X–X

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



PLAN

WITH 90° CONCRETE OUTLET



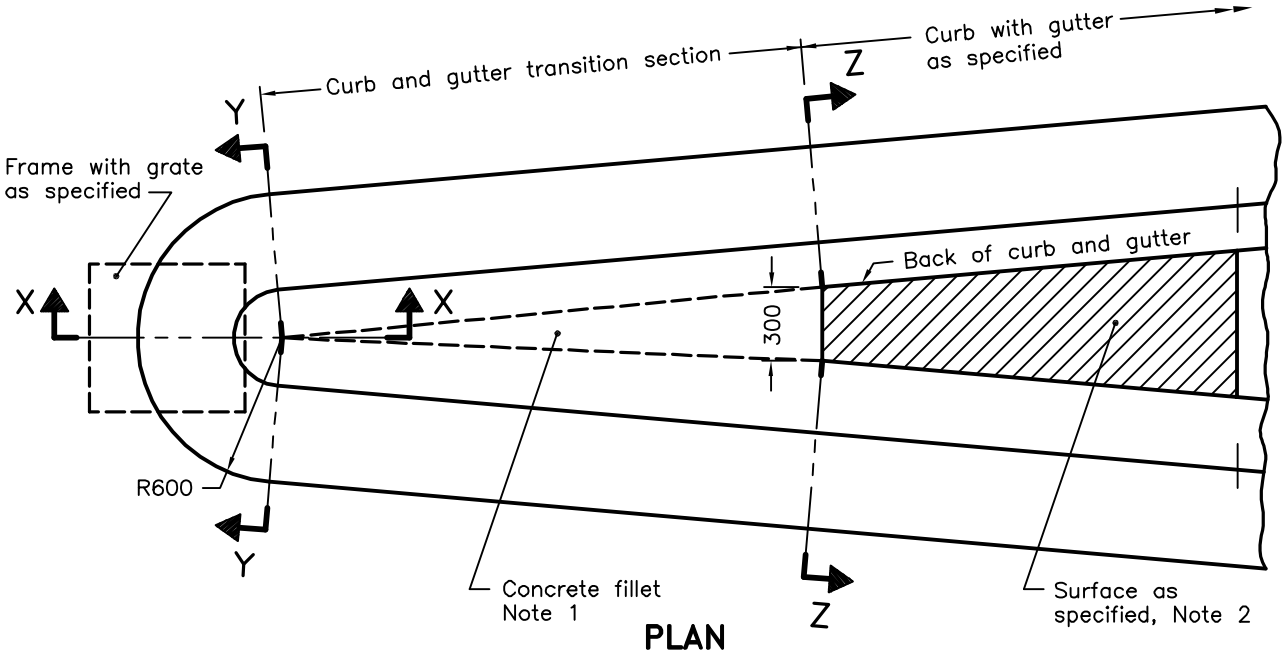
SECTION Y–Y

NOTES:

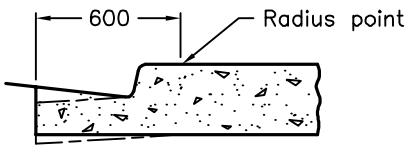
1 Depression of spillway shall coincide with outlet end of gutter outlet.

2 All dimensions are in millimetres unless otherwise shown.

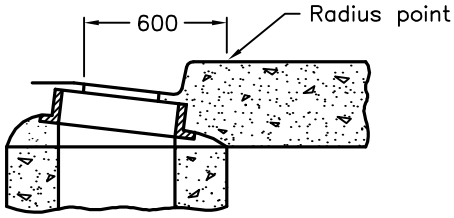
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	2
ASPHALT SPILLWAYS			
		OPSD 605.040	



PLAN

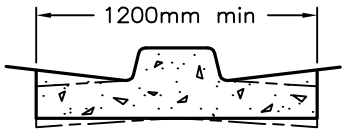


WITHOUT CATCH BASIN

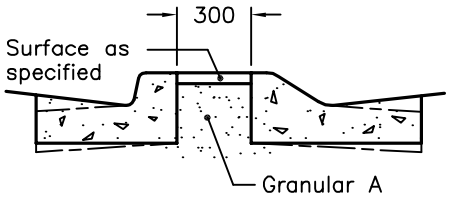


WITH CATCH BASIN

SECTION X–X



SECTION Y–Y



SECTION Z–Z

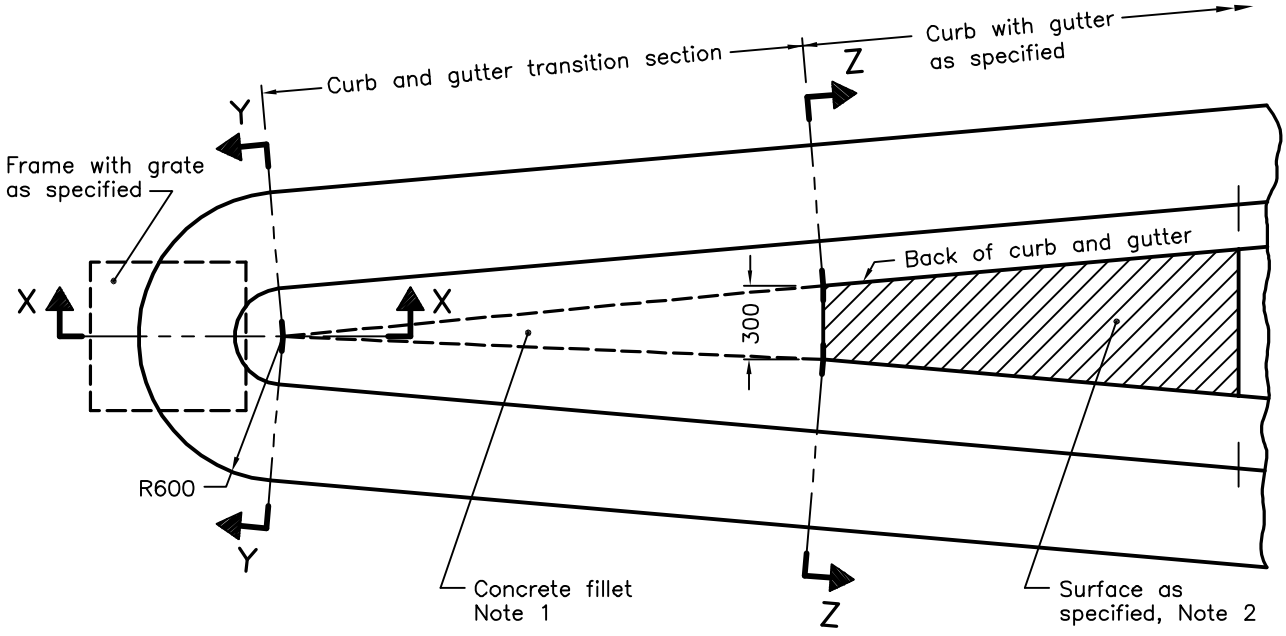
NOTES:

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.

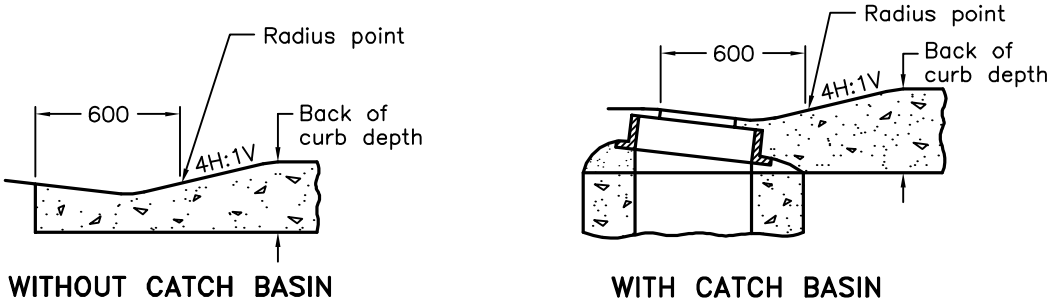
2 Surface between backs of curbs shall extend from end of fillet to point where back to back of curb width is 2.0m or as specified.

A All dimensions are in millimetres unless otherwise specified.

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

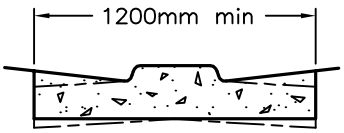


PLAN

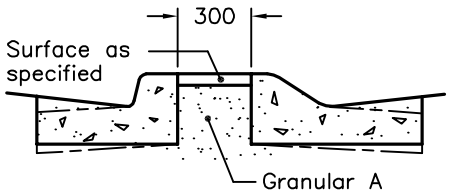


WITHOUT CATCH BASIN **WITH CATCH BASIN**

SECTION X–X



SECTION Y–Y



SECTION Z–Z

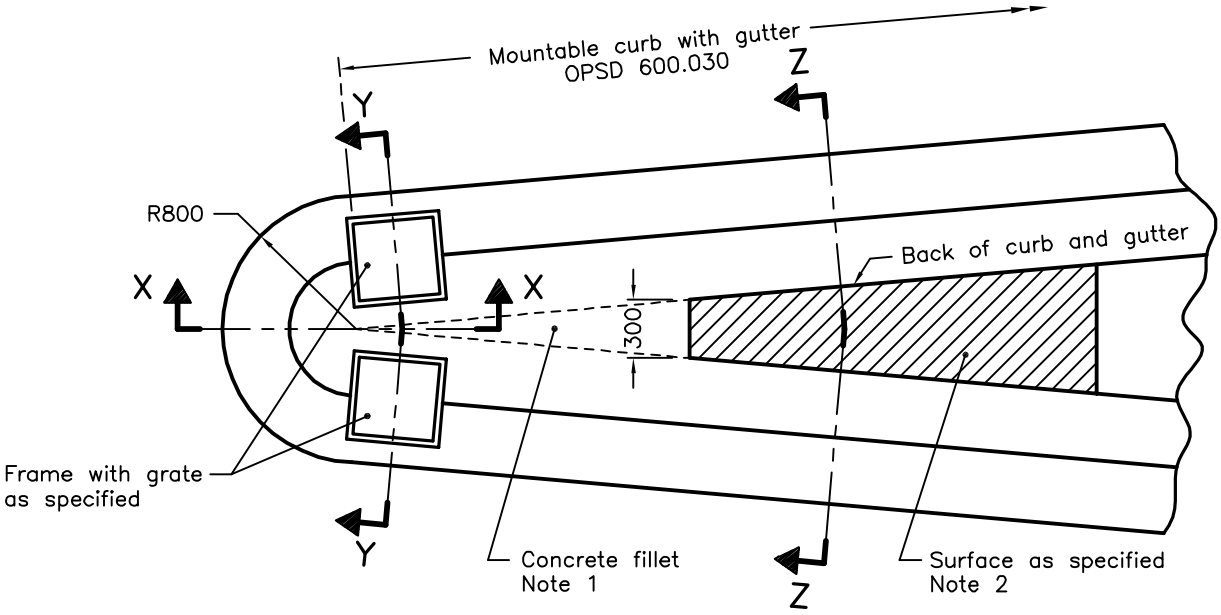
NOTES:

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.

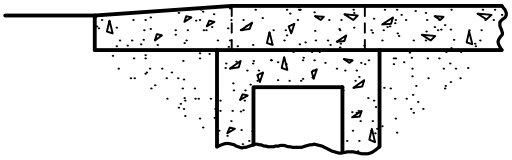
2 Surface between backs of curbs shall extend from end of fillet to point where back to back of curb width is 2.0m or as specified.

A All dimensions are in millimetres unless otherwise specified.

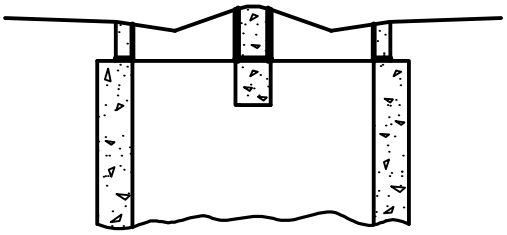
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
600mm RADIUS MOUNTABLE BULLNOSE			
	OPSD 606.020		



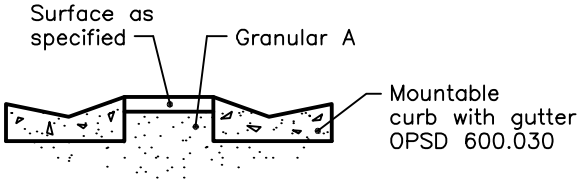
PLAN



SECTION X–X



SECTION Y–Y



SECTION Z–Z

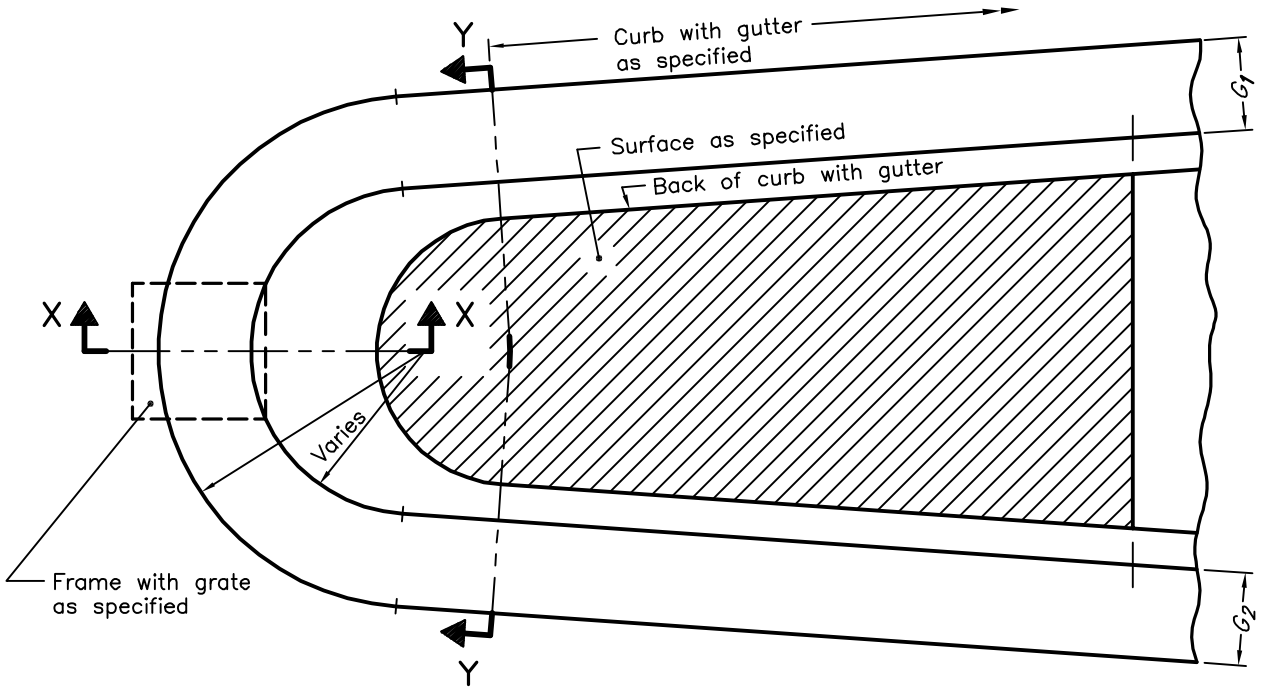
NOTES:

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.

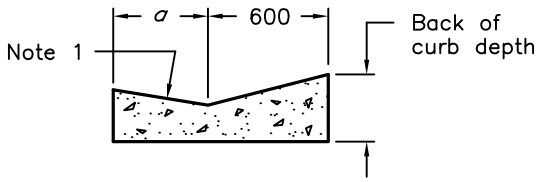
2 Surface between backs of curbs shall extend from end of fillet to point where back to back of curb width is 2.0m or as specified.

A All dimensions are in millimetres unless otherwise shown.

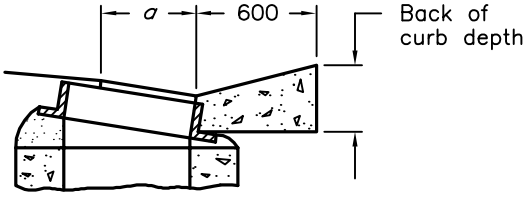
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
800mm RADIUS MOUNTABLE BULLNOSE CURB WITH GUTTER TWIN INLET			
	OPSD 606.030		



PLAN

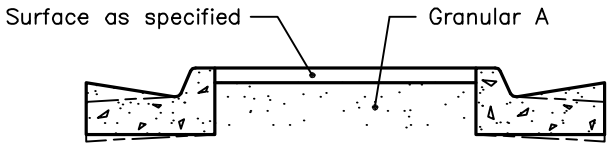


WITHOUT CATCH BASIN



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.

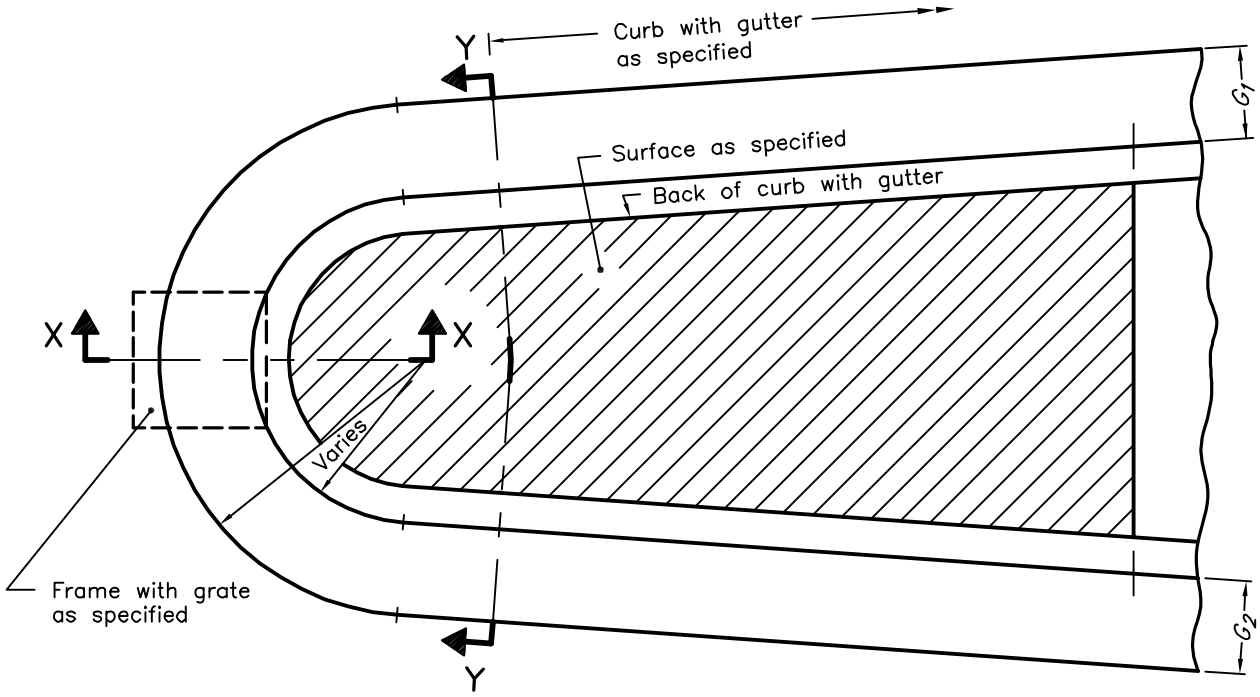
A All dimensions are in millimetres unless otherwise specified.

LEGEND:

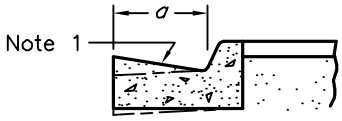
G – Gutter width or offset distance.

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

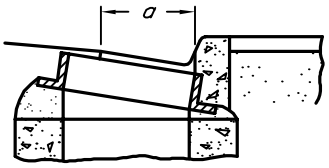
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
OVER 600mm RADIUS MOUNTABLE BULLNOSE			
	OPSD 607.010		



PLAN

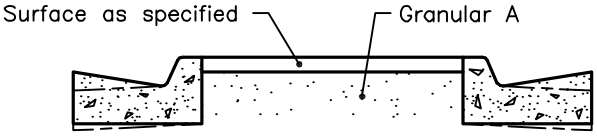


WITHOUT CATCH BASIN



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.

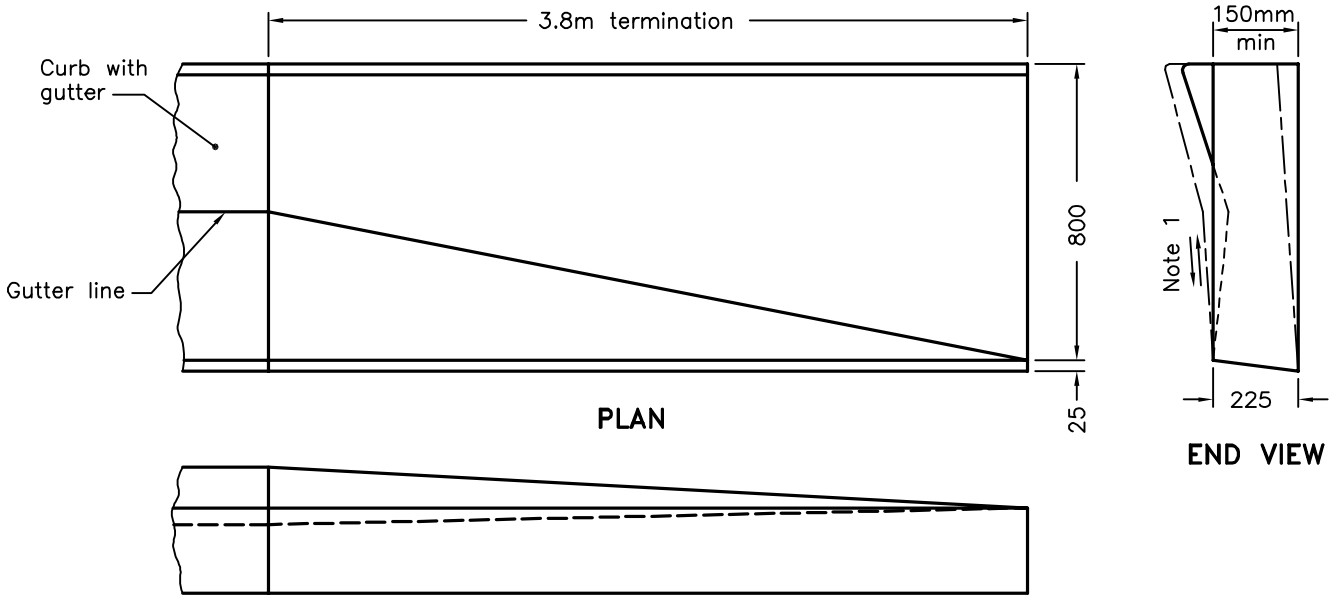
A All dimensions are in millimetres unless otherwise specified.

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		

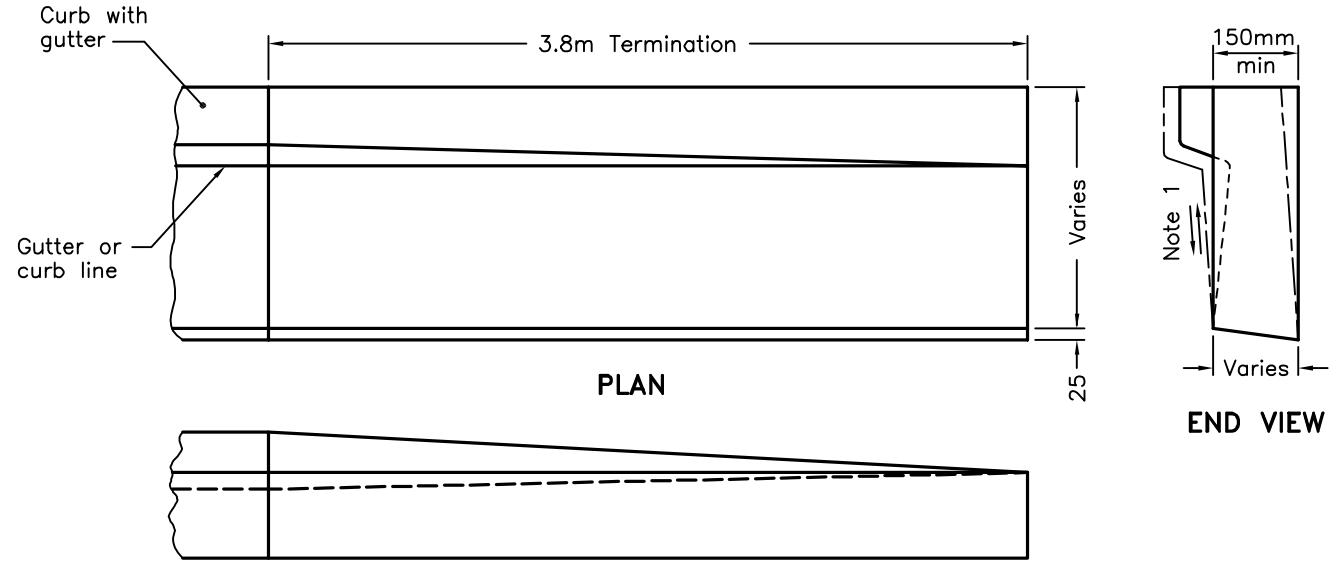


PLAN

END VIEW

ELEVATION

MOUNTABLE CURB WITH GUTTER



PLAN

END VIEW

ELEVATION

BARRIER AND SEMI-MOUNTABLE CURB WITH GUTTER

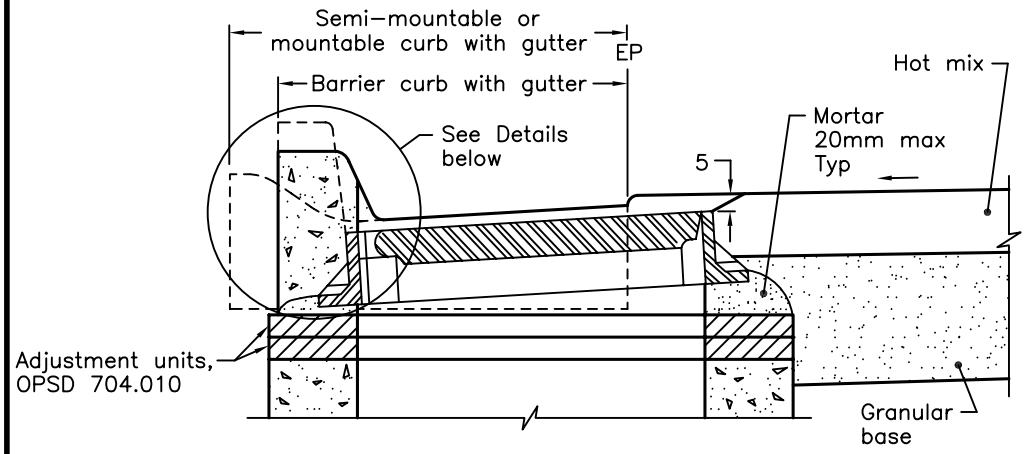
NOTES:

1 Slope shall match existing shoulder.

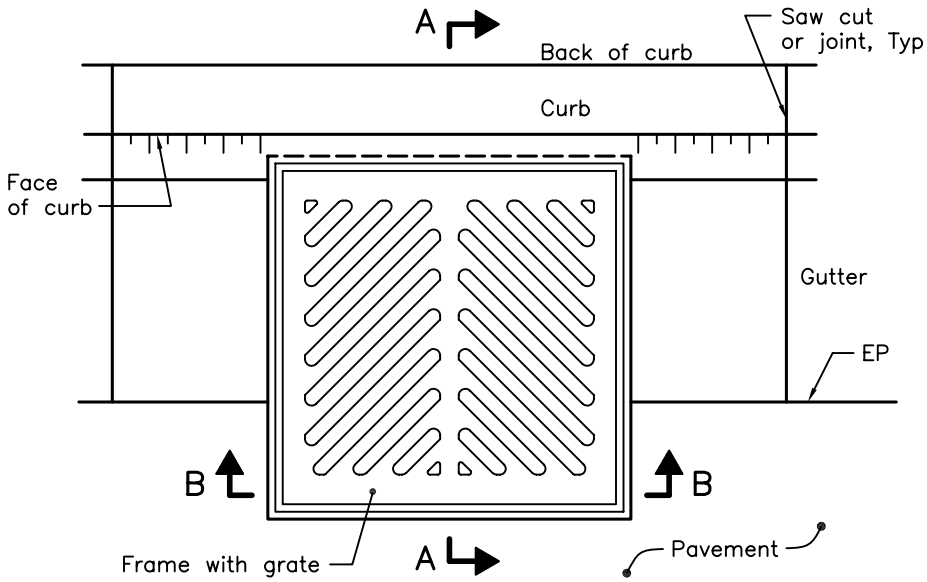
A This drawing shall be read in conjunction with OPSD 600 series curb with gutter drawings.

B All dimensions are in millimetres unless otherwise shown.

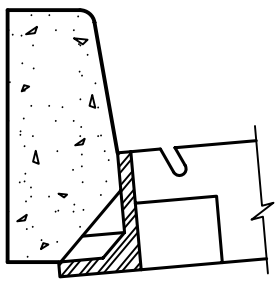
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
METHOD OF TERMINATION FOR CONCRETE CURB WITH GUTTER			
	OPSD 608.010		



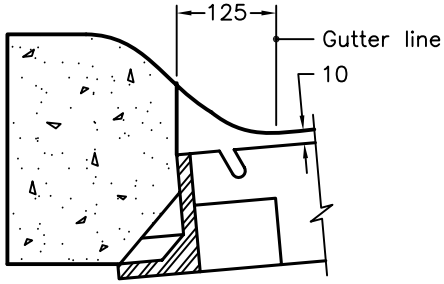
SECTION A–A



PLAN

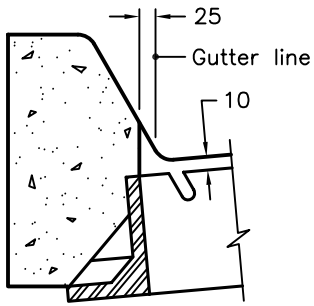


BARRIER CURB

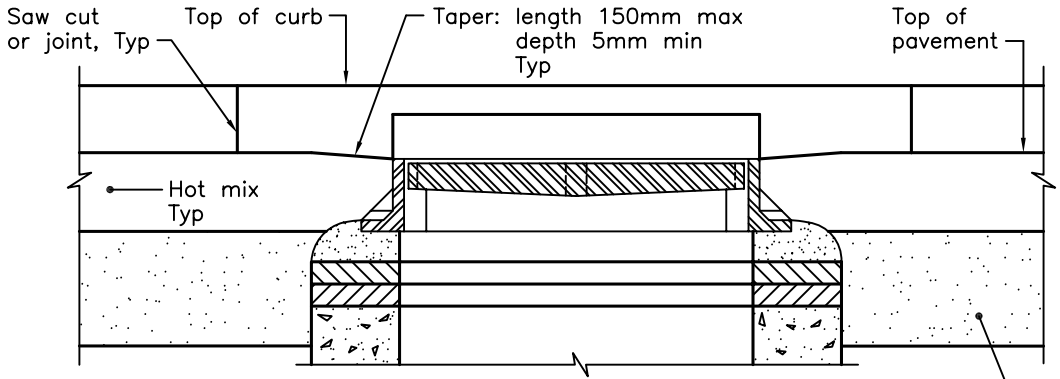


SEMI–MOUNTABLE or MOUNTABLE
CURB WITH GUTTER

DETAILS



BARRIER
CURB WITH GUTTER

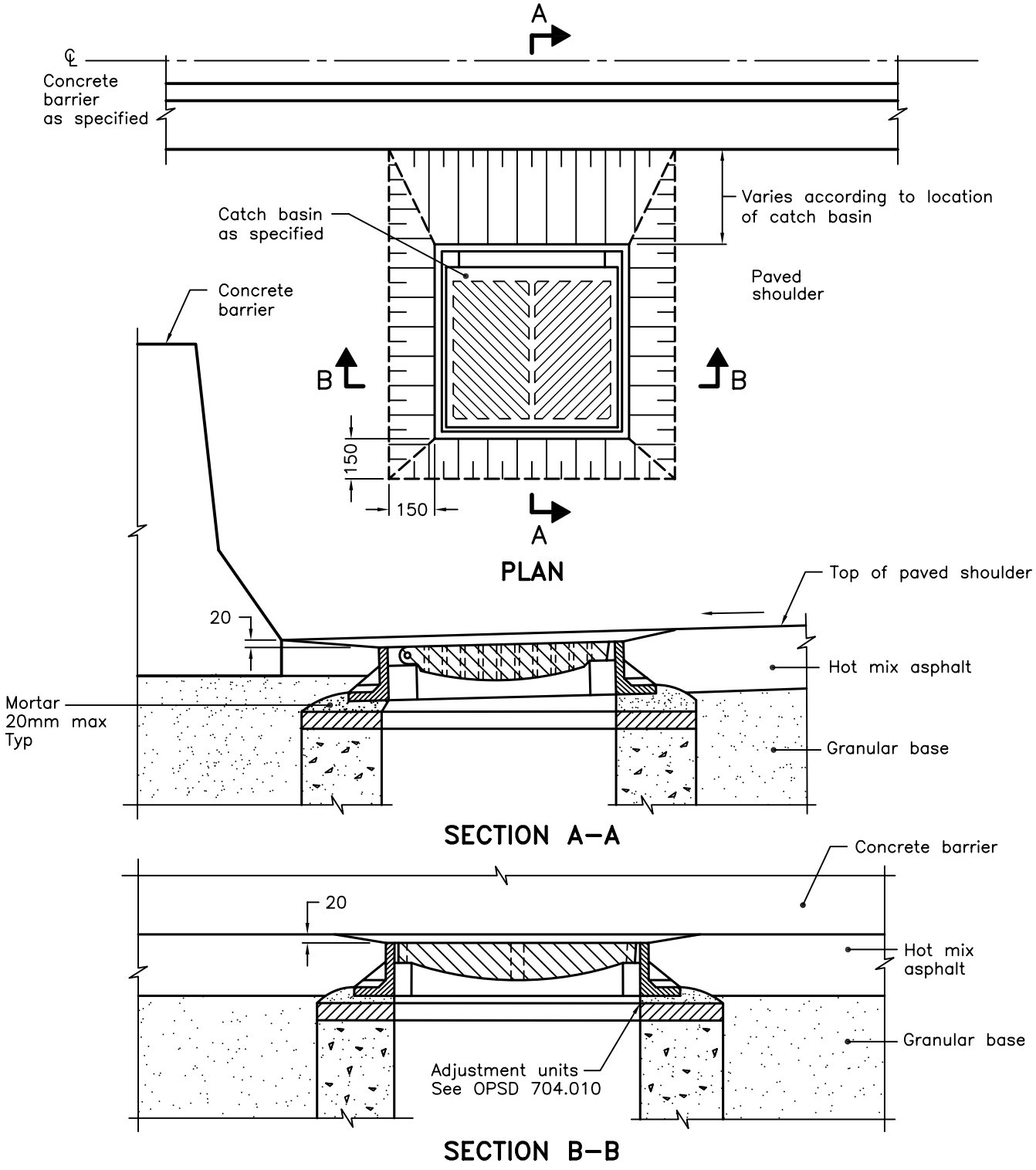


SECTION B–B

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

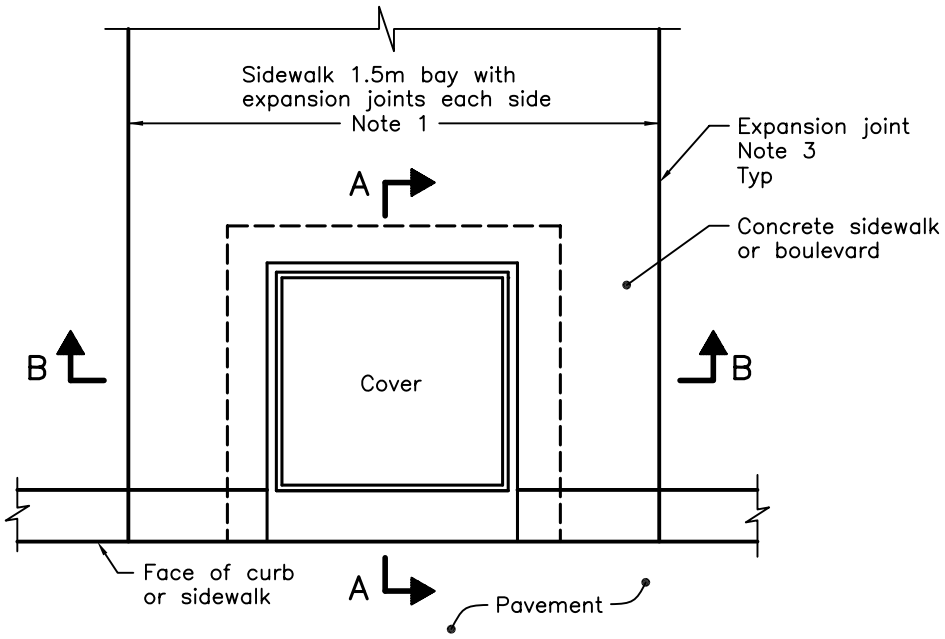


NOTES:

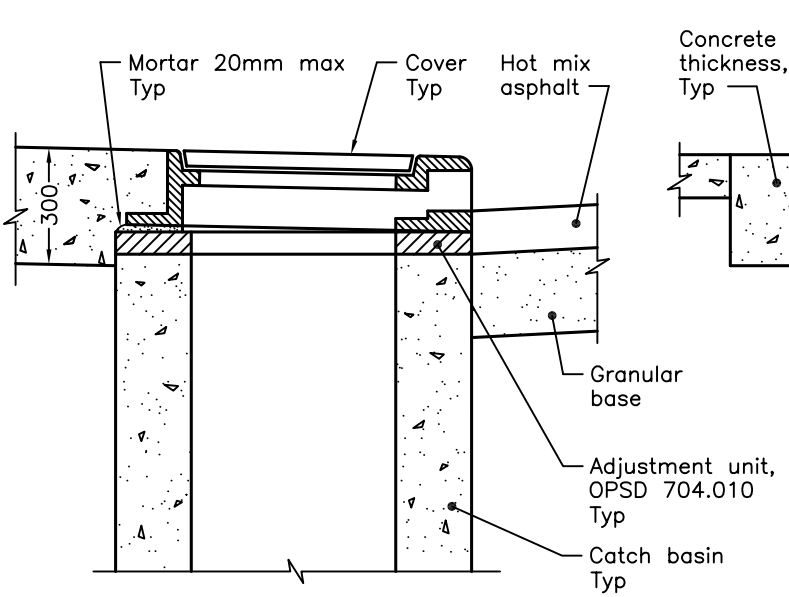
A When catch basins are placed back to back on both sides of the concrete barrier, backfill shall be unshrinkable backfill to the limits of the excavation and within 150mm of top of concrete catch basin structure. Where catch basins are not placed back to back they shall be staggered with a minimum spacing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

B All dimensions are in millimetres unless otherwise shown.

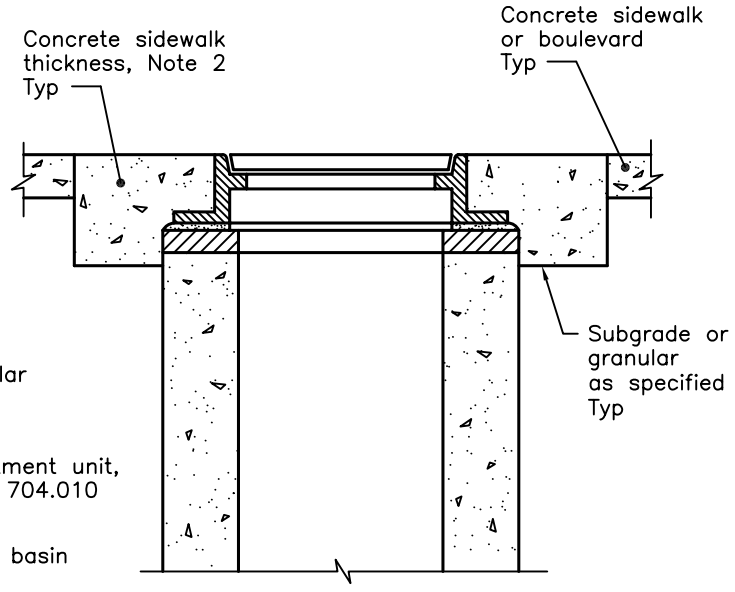
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev	2
CATCH BASIN FRAME WITH GRATE SHOULDER INSTALLATION AT CONCRETE BARRIER			
	OPSD 610.020		



PLAN



SECTION A–A



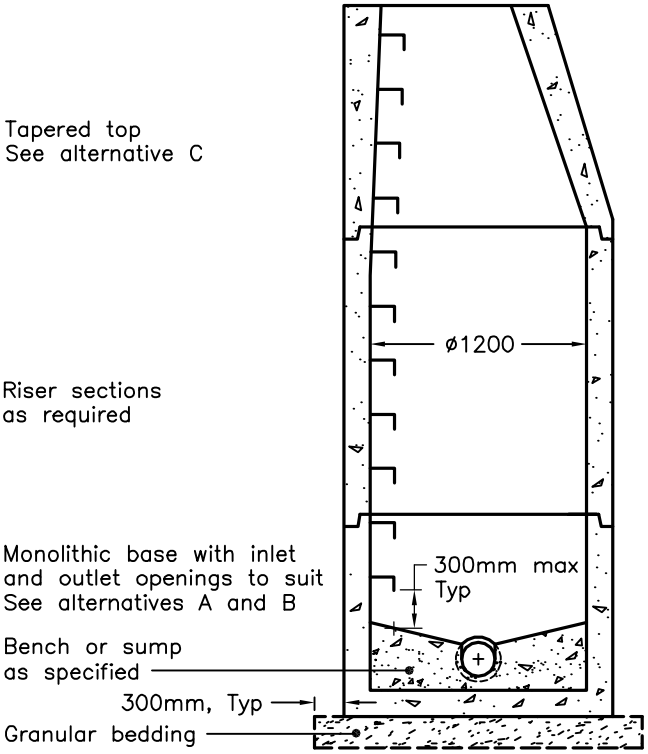
SECTION B–B

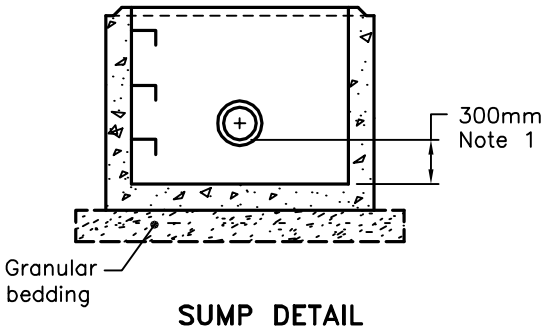
NOTES:

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.

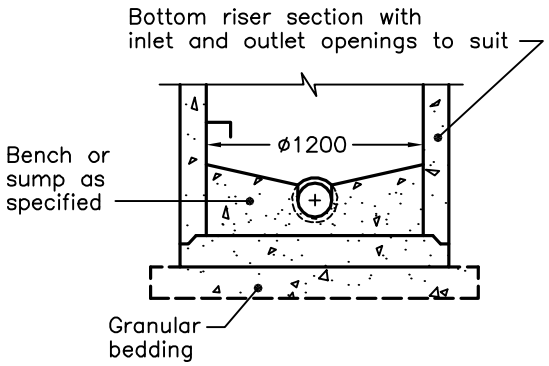
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev	1
FRAME WITH COVER INSTALLATION FOR INLET TYPE CATCH BASINS			
	OPSD 610.030		



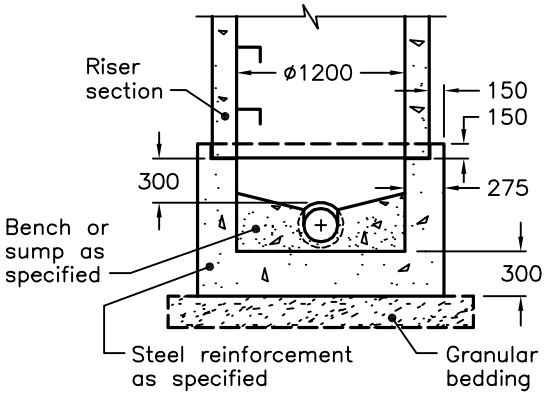


SUMP DETAIL

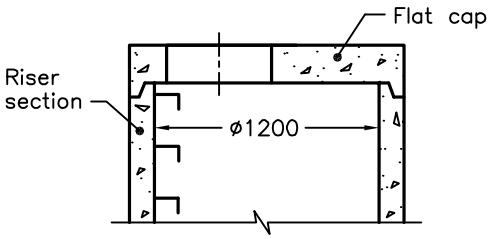
ALTERNATIVES



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.

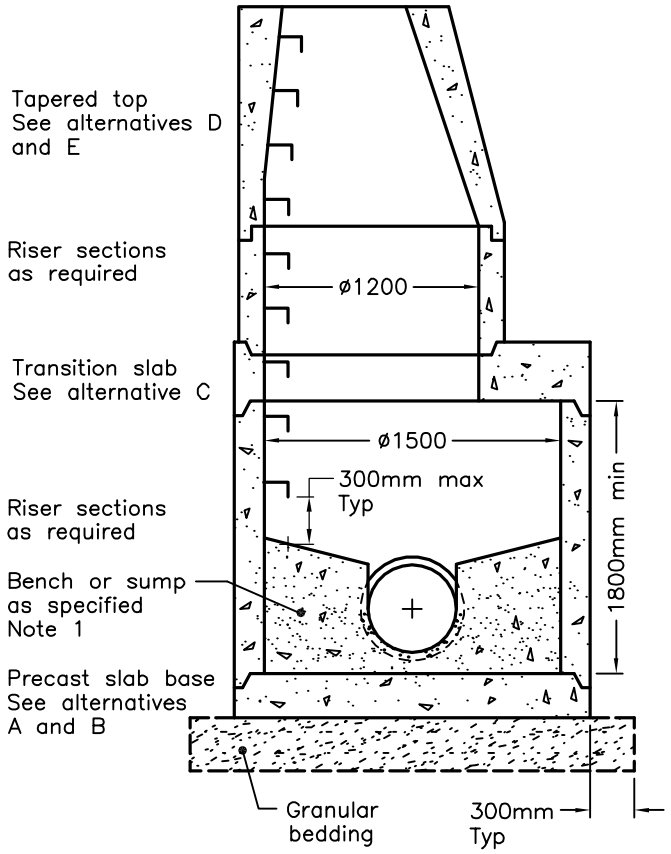
E For benching and pipe opening details, see OPSD 701.021.

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.

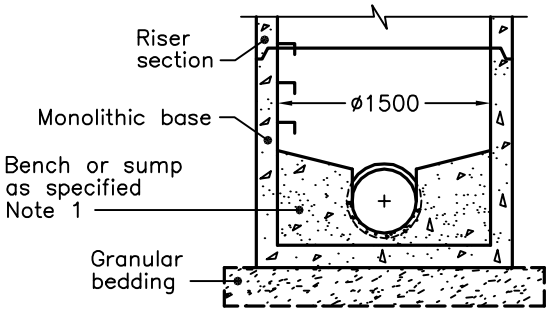
E For benching and pipe opening details, see OPSD 701.021.

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

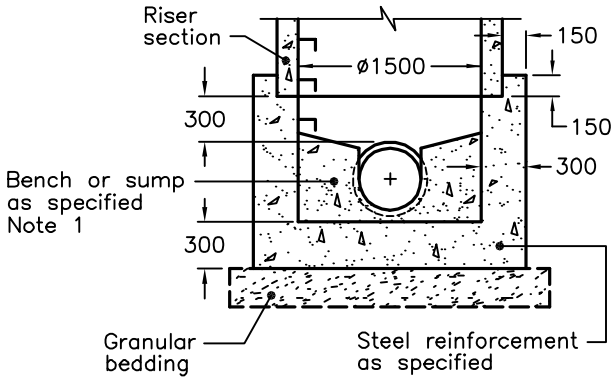
G All dimensions are nominal.

H All dimensions are in millimetres unless otherwise shown.

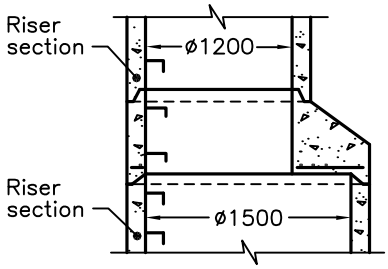
ALTERNATIVES



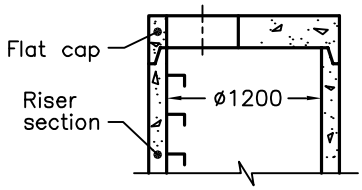
A PRECAST MONOLITHIC BASE



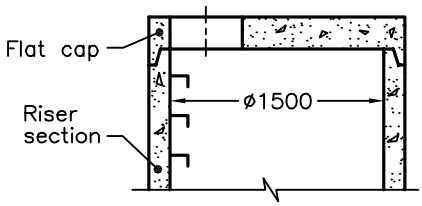
B CAST–IN–PLACE BASE



C TAPERED TRANSITION SLAB



D 1200mm PRECAST FLAT CAP



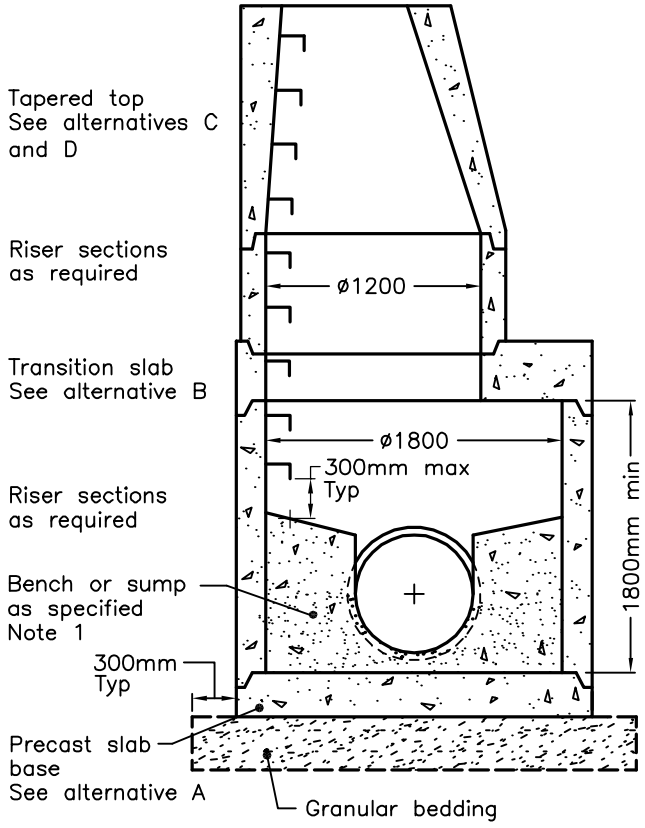
E 1500mm PRECAST FLAT CAP

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 5

PRECAST CONCRETE MAINTENANCE HOLE

1500mm DIAMETER

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.

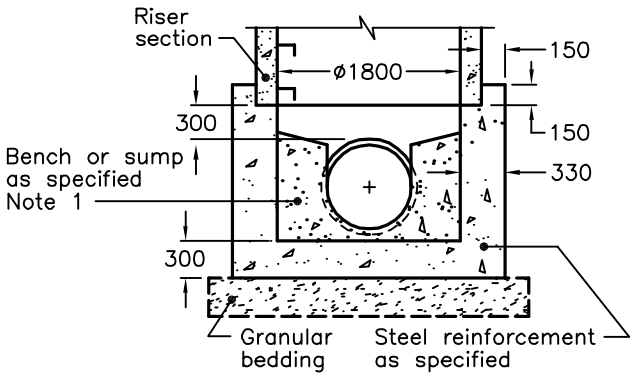
E For benching and pipe opening details, see OPSD 701.021.

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

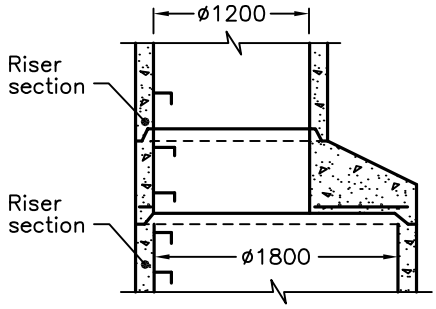
G All dimensions are nominal.

H All dimensions are in millimetres unless otherwise shown.

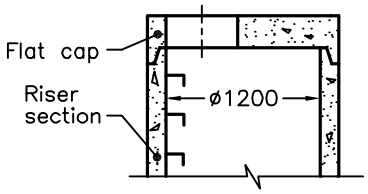
ALTERNATIVES



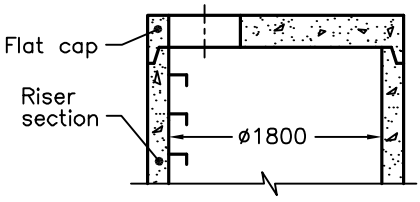
A CAST-IN-PLACE BASE



B TAPERED TRANSITION SLAB

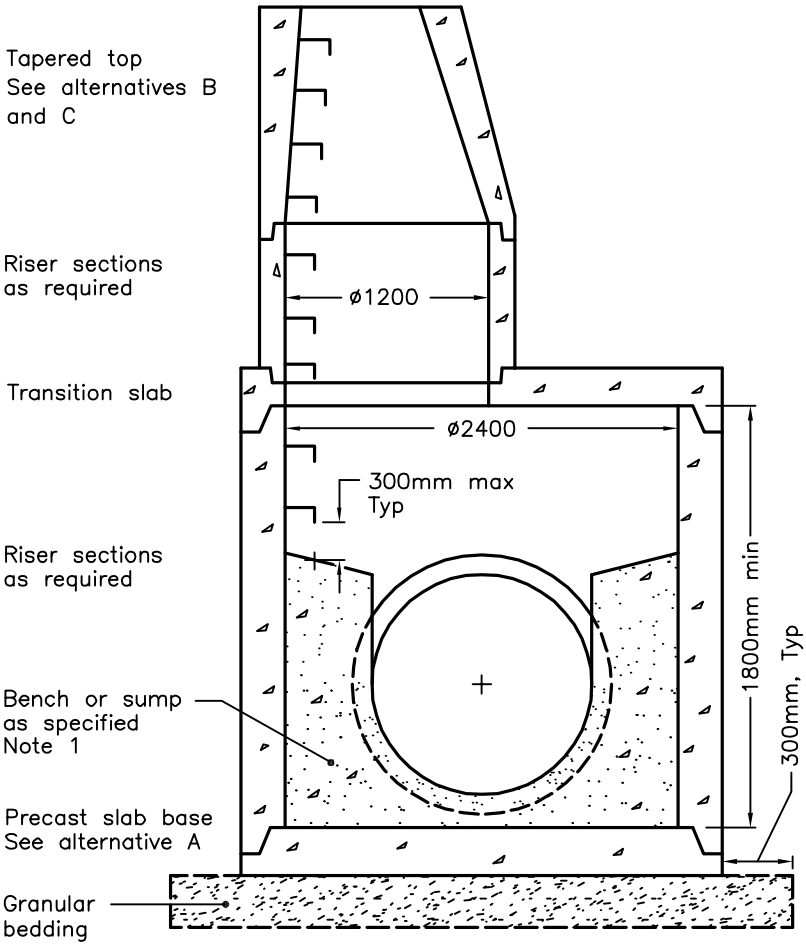


C 1200mm PRECAST FLAT CAP

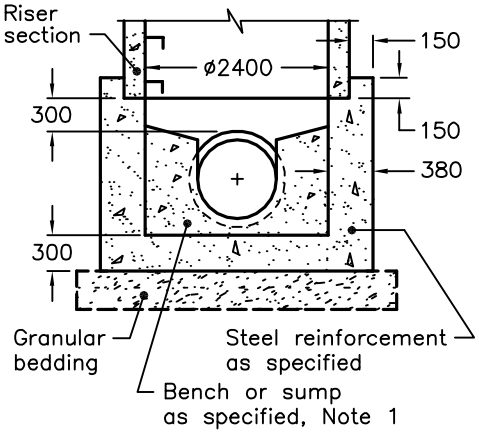


D 1800mm PRECAST FLAT CAP

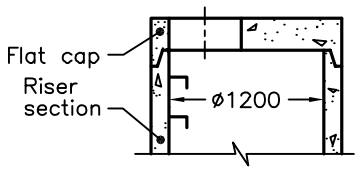
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	5
PRECAST CONCRETE MAINTENANCE HOLE 1800mm DIAMETER			
			OPSD 701.012



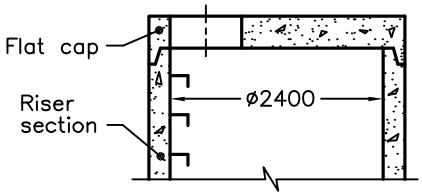
ALTERNATIVES



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.

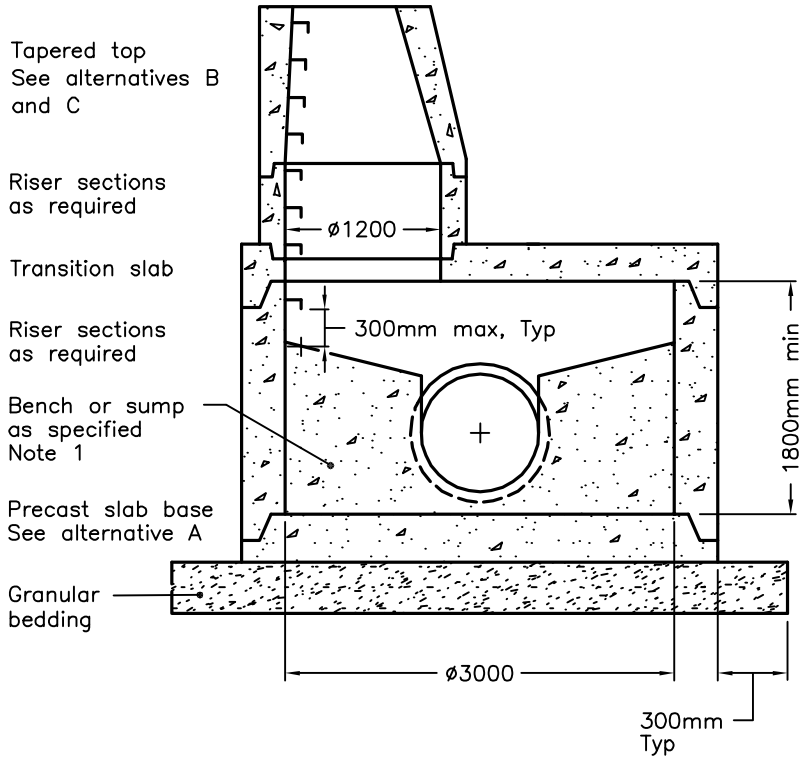
E For benching and pipe opening details, see OPSD 701.021.

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

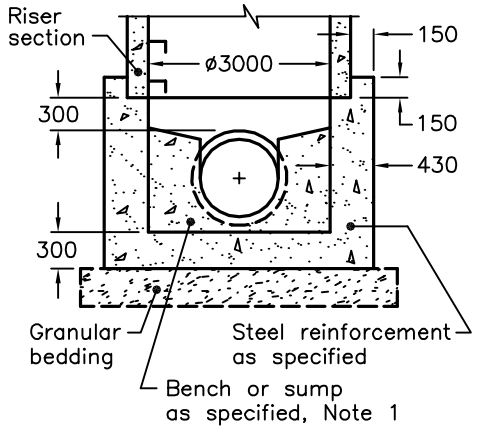
G All dimensions are nominal.

H All dimensions are in millimetres unless otherwise shown.

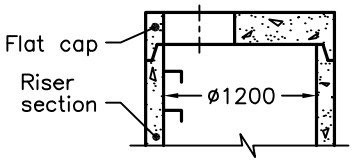
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	5
PRECAST CONCRETE MAINTENANCE HOLE 2400mm DIAMETER			
	OPSD 701.013		



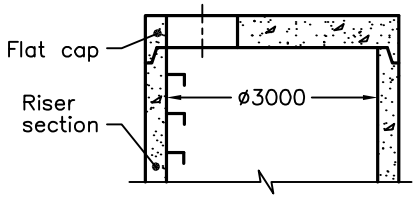
ALTERNATIVES



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.

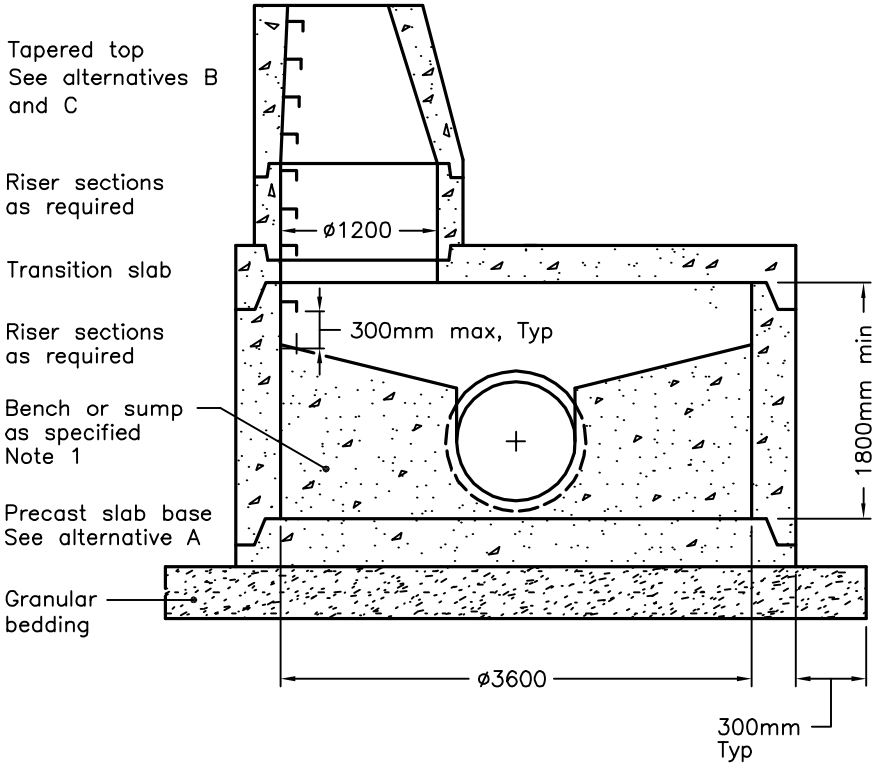
E For benching and pipe opening details, see OPSD 701.021.

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

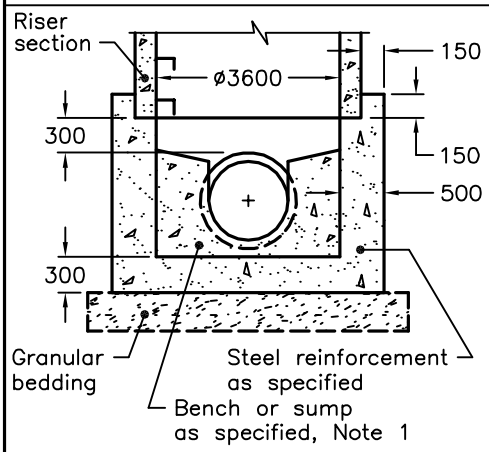
G All dimensions are nominal.

H All dimensions are in millimetres unless otherwise shown.

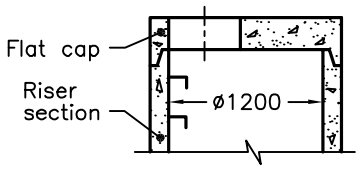
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 4
PRECAST CONCRETE MAINTENANCE HOLE 3000mm DIAMETER		
		OPSD 701.014



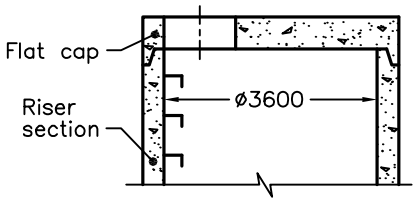
ALTERNATIVES



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.

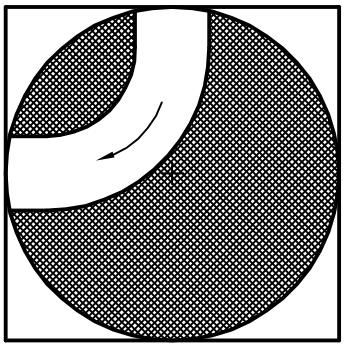
E For benching and pipe opening details, see OPSD 701.021.

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

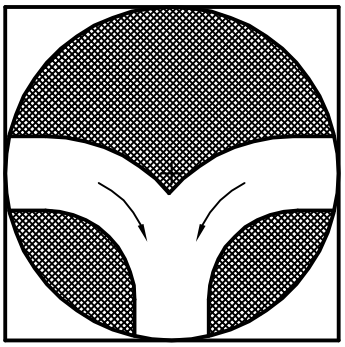
G All dimensions are nominal.

H All dimensions are in millimetres unless otherwise shown.

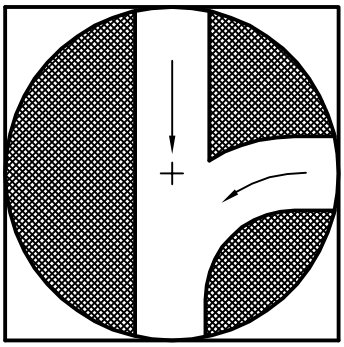
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	4
PRECAST CONCRETE MAINTENANCE HOLE 3600mm DIAMETER			
			OPSD 701.015



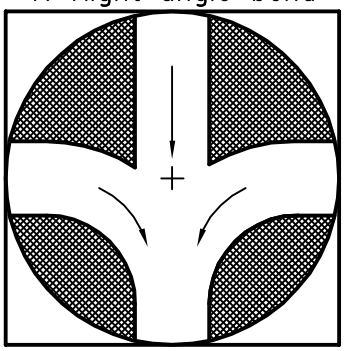
1. Right angle bend



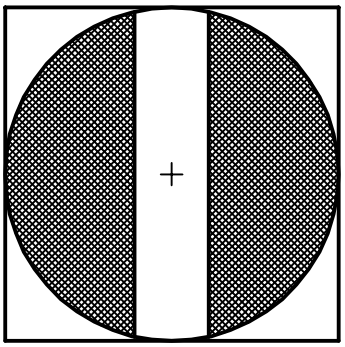
2. Tee connection



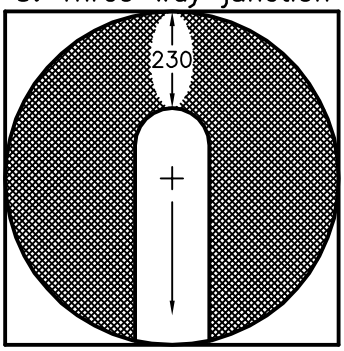
3. Three way junction



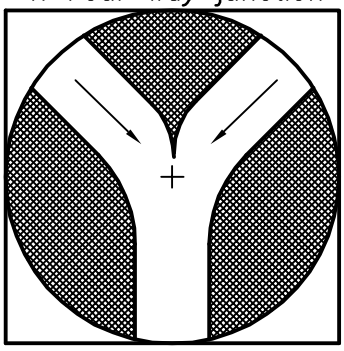
4. Four way junction



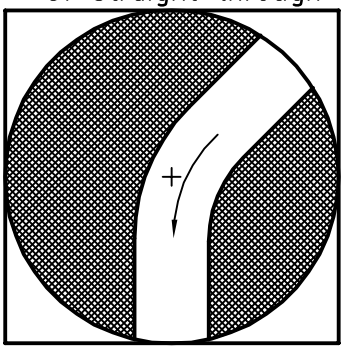
5. Straight through



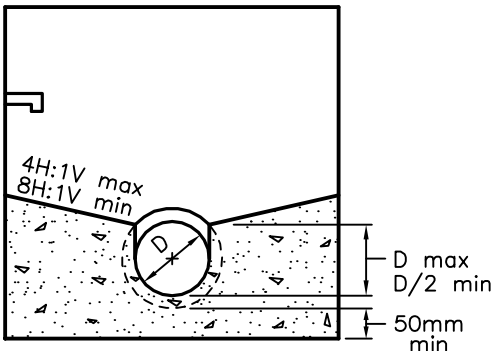
6. Dead end



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.

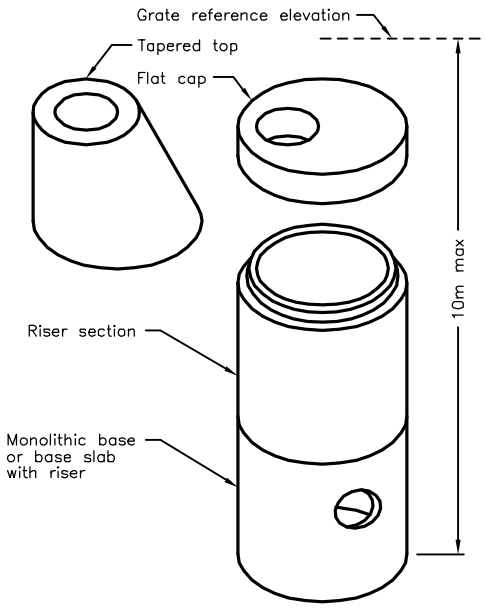
E All dimensions are nominal.

F All dimensions are in millimetres unless otherwise shown.

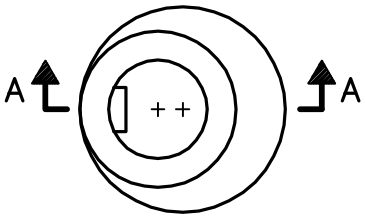
ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 4

MAINTENANCE HOLE BENCHING AND PIPE OPENING ALTERNATIVES

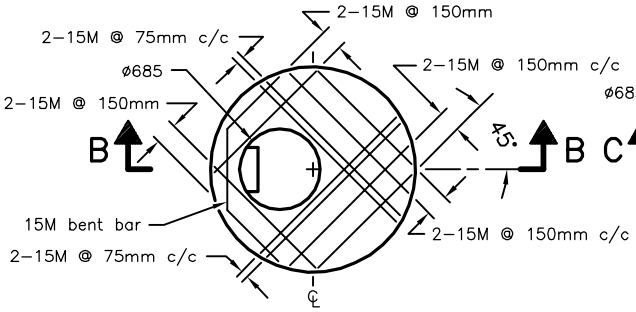
OPSD 701.021



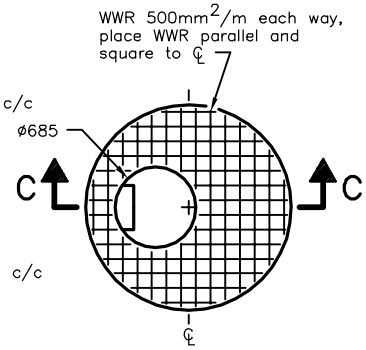
1200mm DIAMETER MAINTENANCE HOLE



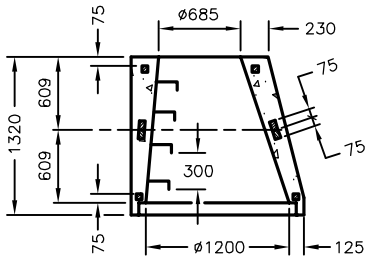
PLAN OF TAPERED TOP



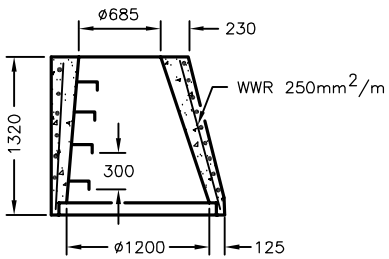
PLAN OF FLAT CAP WITH REINFORCING STEEL BARS



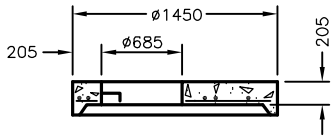
PLAN OF FLAT CAP WITH WWR



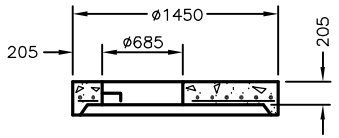
SECTION A–A TAPERED TOP WITH HOOP STEEL



SECTION A–A TAPERED TOP WITH WWR



SECTION B–B

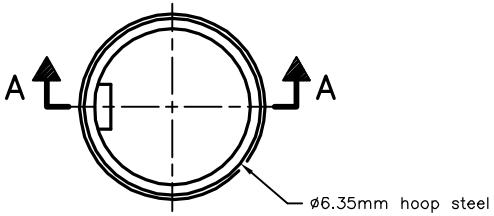


SECTION C–C

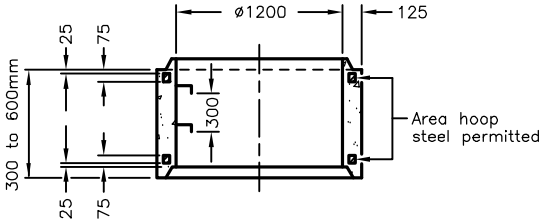
NOTES:

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.

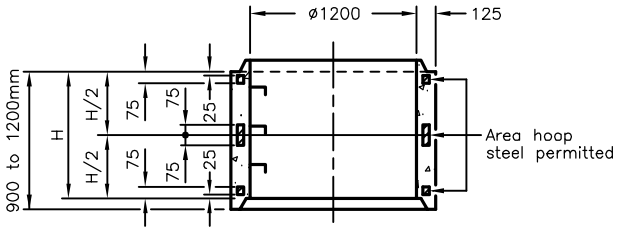
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	4
PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS 1200mm DIAMETER TAPERED TOP AND FLAT CAP			
	OPSD 701.030		



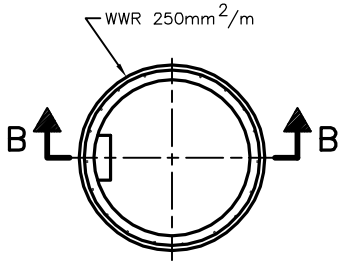
PLAN OF RISER
WITH HOOP STEEL



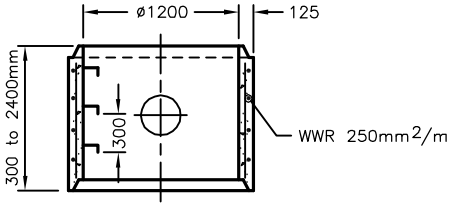
SECTION A–A
RISERS < 900mm HIGH



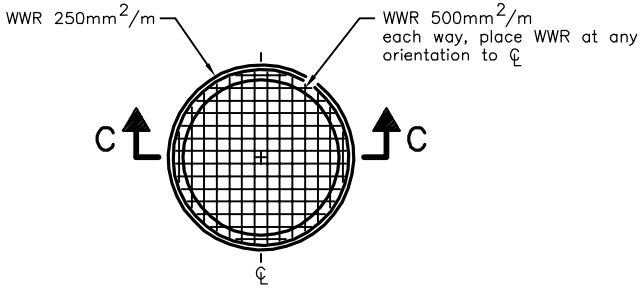
SECTION A–A
RISERS ≥ 900mm



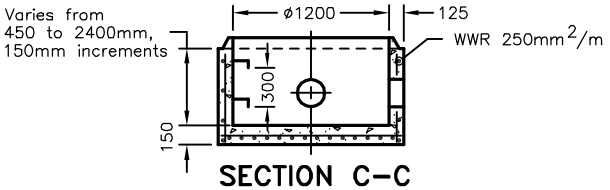
PLAN OF RISER
WITH WWR



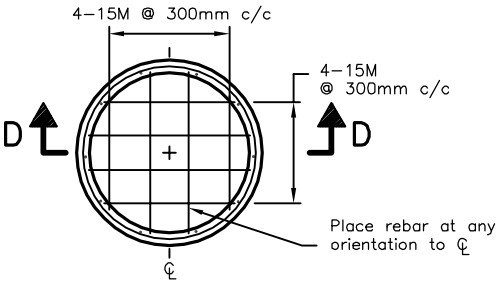
SECTION B–B



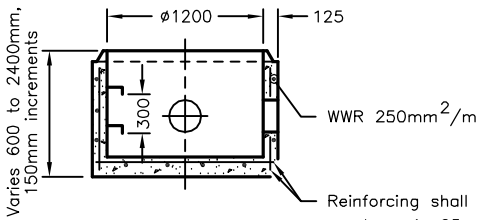
PLAN OF MONOLITHIC BASE WITH WWR



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

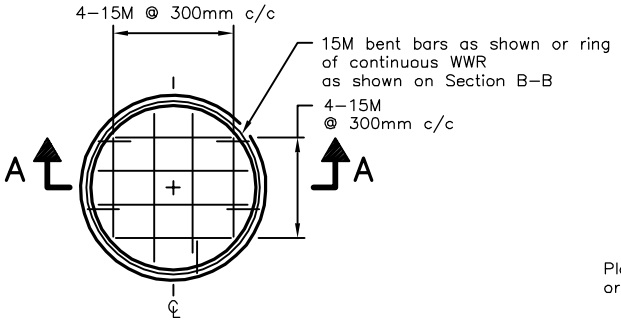
PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

1200mm DIAMETER RISER AND MONOLITHIC BASE

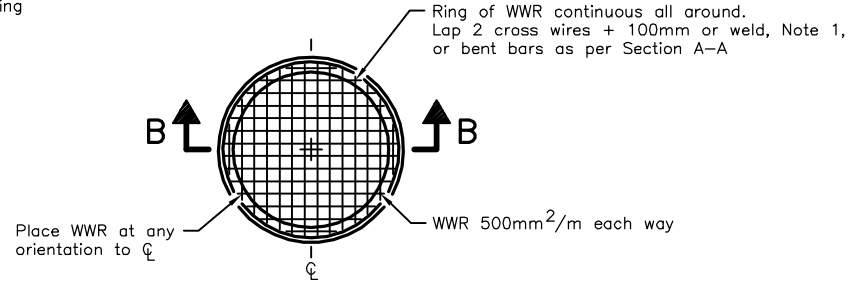
Nov 2014 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

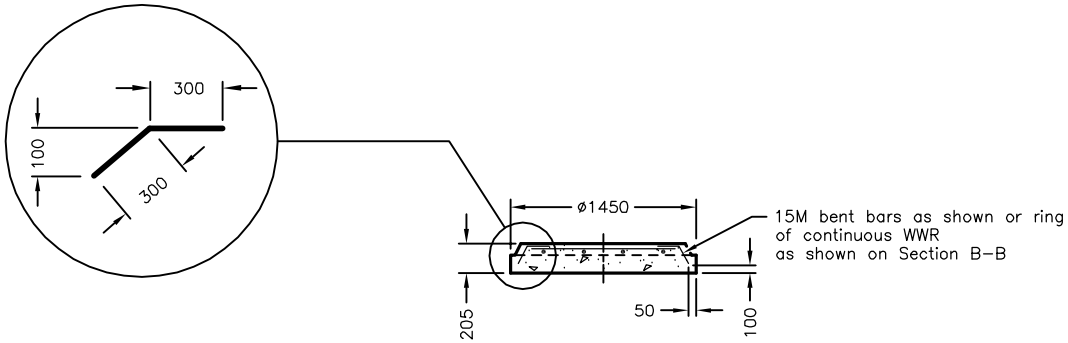
OPSD 701.031



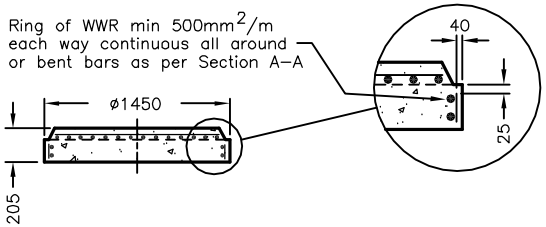
PLAN OF BASE SLAB
WITH REINFORCING STEEL BARS



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

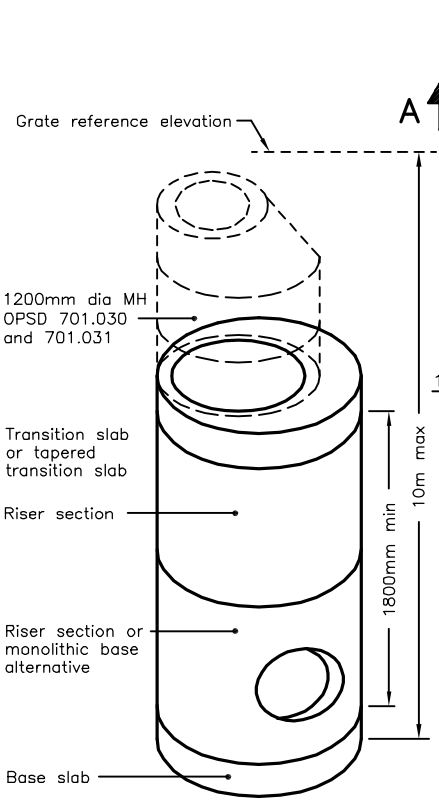
1200mm DIAMETER

BASE SLAB

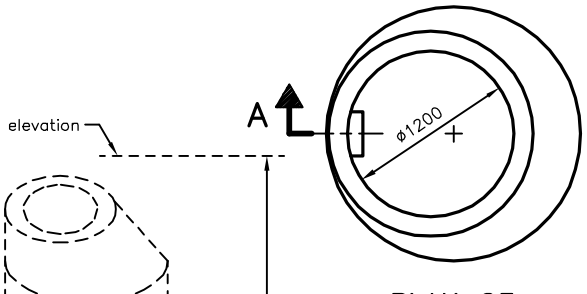
Nov 2014 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

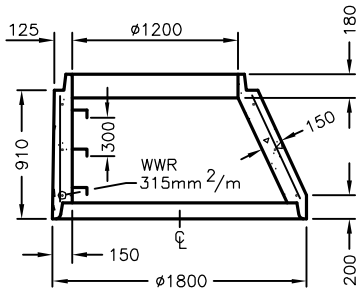
OPSD 701.032



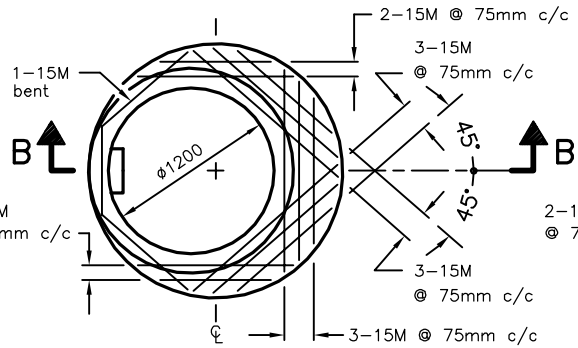
1500 to 1200mm DIAMETER
MAINTENANCE HOLE



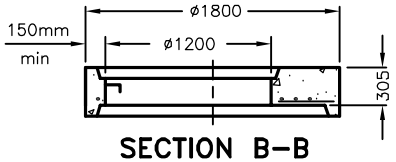
PLAN OF
TRANSITION CONE



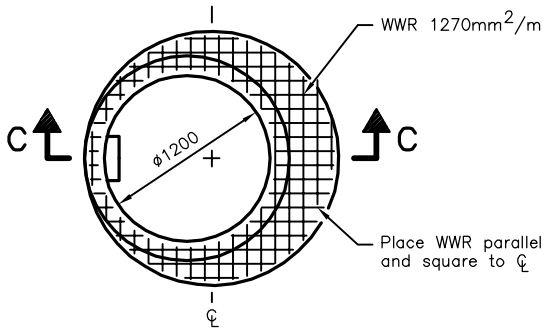
SECTION A–A



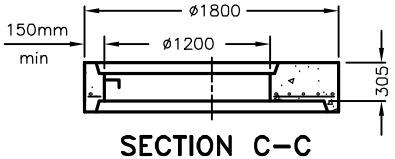
PLAN OF TRANSITION SLAB
WITH REINFORCING STEEL BARS



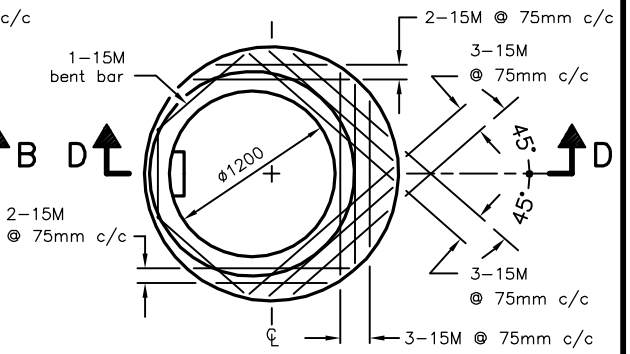
SECTION B–B



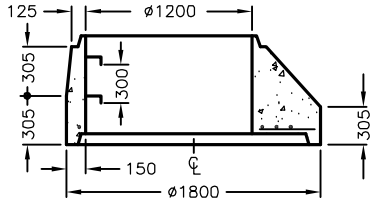
PLAN OF TRANSITION SLAB
WITH WWR



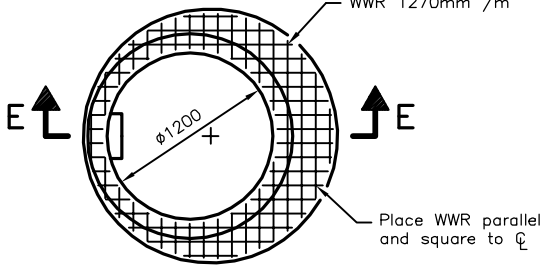
SECTION C–C



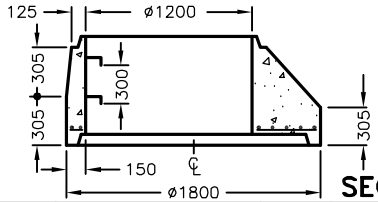
PLAN OF TAPERED TRANSITION SLAB
WITH REINFORCING STEEL BARS



SECTION D–D



PLAN OF TAPERED TRANSITION SLAB WITH WWR



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

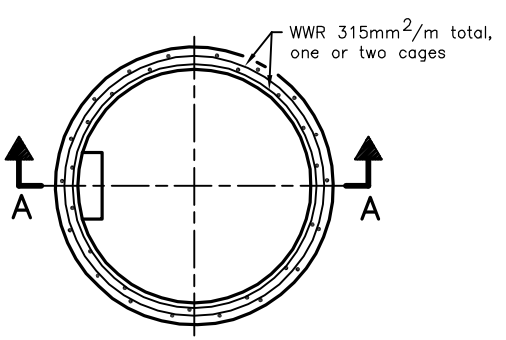
Nov 2014 | Rev 4

PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

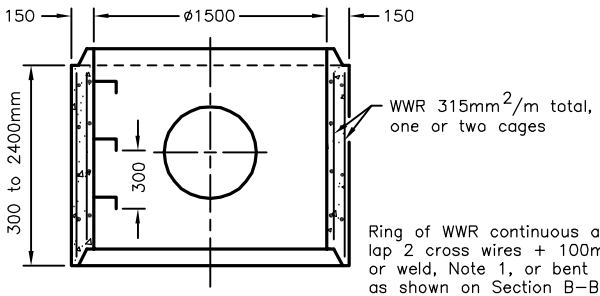
1500mm DIAMETER TRANSITION CONE AND SLABS

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

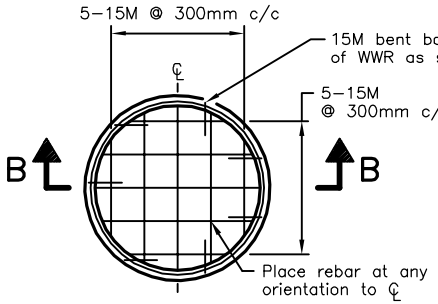
OPSD 701.040



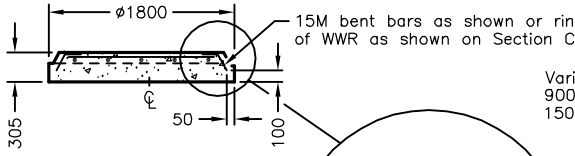
PLAN OF RISER WITH WWR



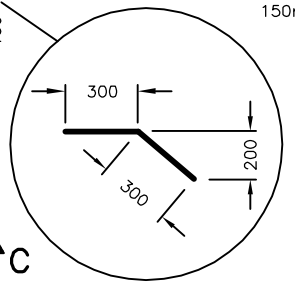
SECTION A–A

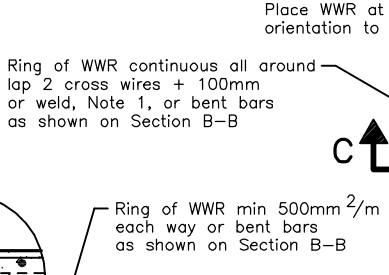


PLAN OF BASE SLAB WITH REINFORCING STEEL BARS

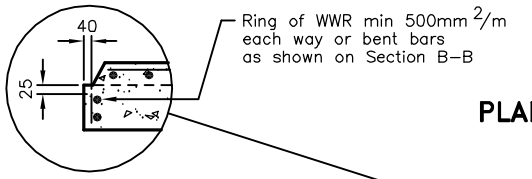


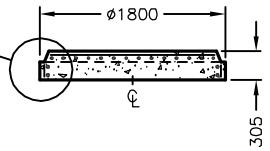
SECTION B–B



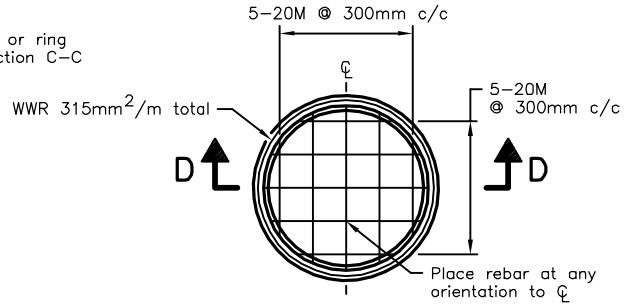


PLAN OF BASE SLAB WITH WWR

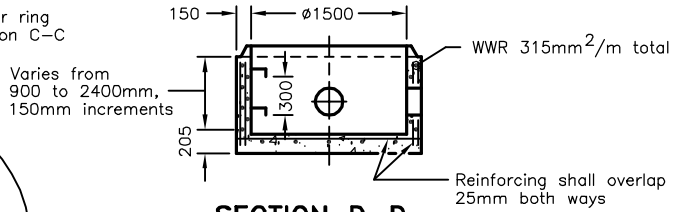




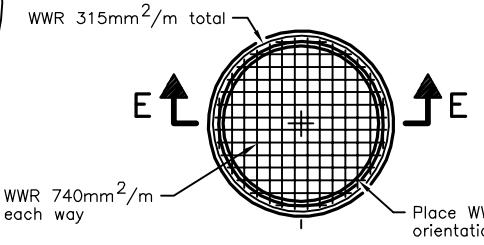
SECTION C–C



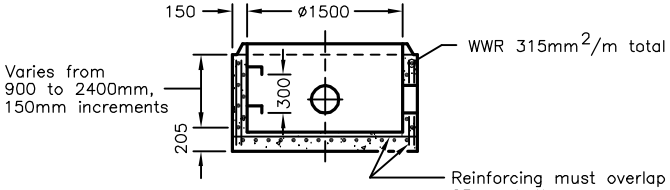
PLAN OF MONOLITHIC BASE WITH REINFORCING STEEL BARS



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

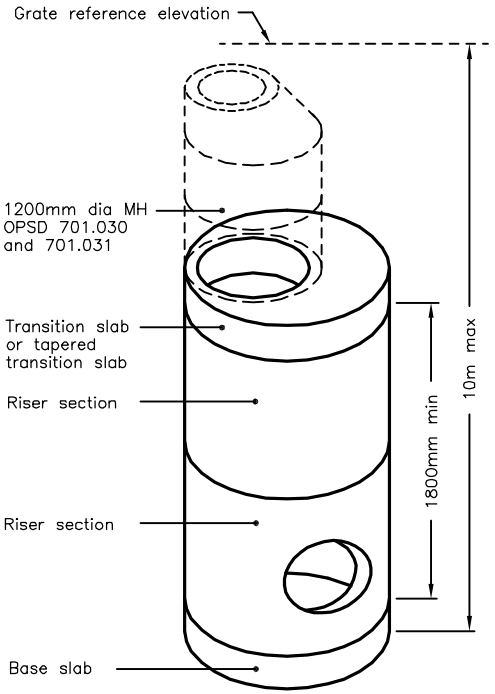
PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

1500mm DIAMETER RISER AND BASES

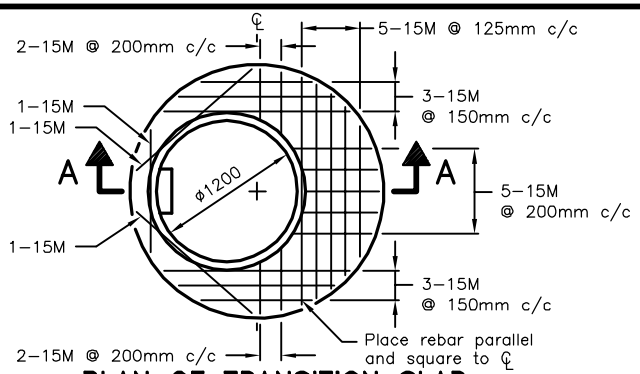
Nov 2014 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

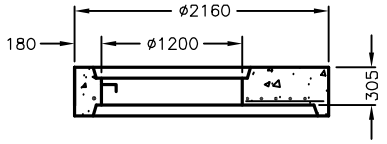
OPSD 701.041



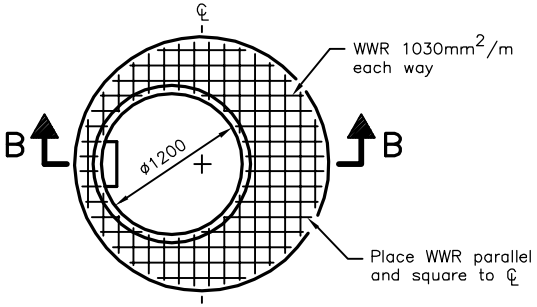
1800 to 1200mm DIAMETER MAINTENANCE HOLE



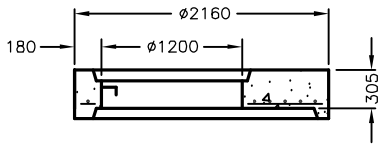
PLAN OF TRANSITION SLAB WITH REINFORCING STEEL BARS



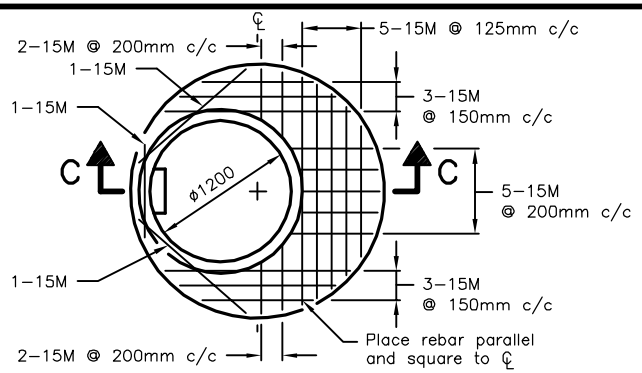
SECTION A–A



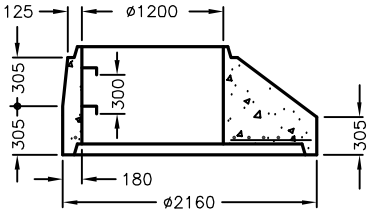
PLAN OF TRANSITION SLAB WITH WWR



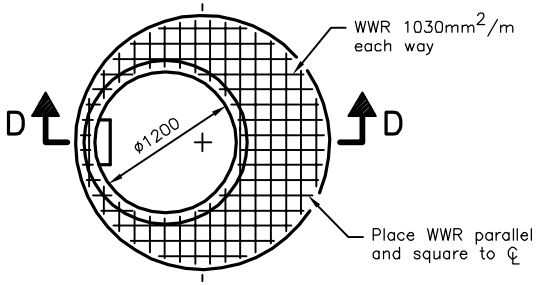
SECTION B–B



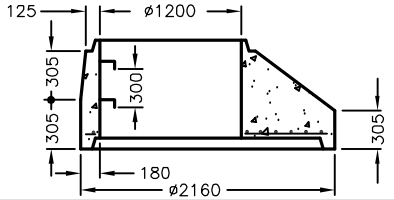
PLAN OF TAPERED TRANSITION SLAB WITH REINFORCING STEEL BARS



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

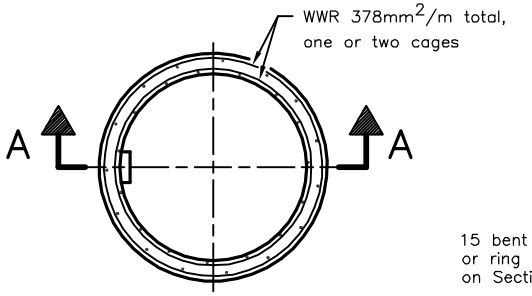
PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

1800mm DIAMETER TRANSITION SLABS

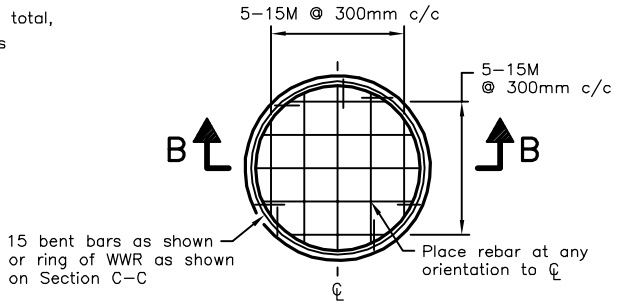
Nov 2014 | Rev 4

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

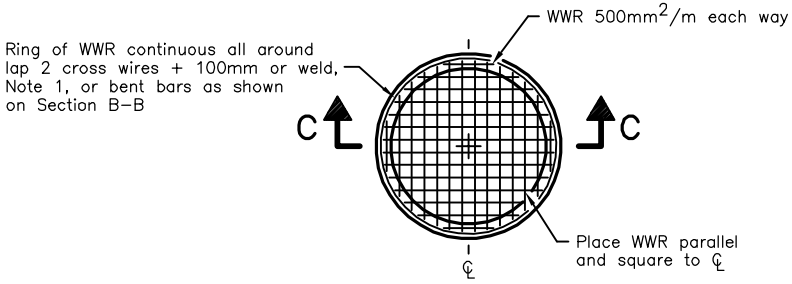
OPSD 701.050



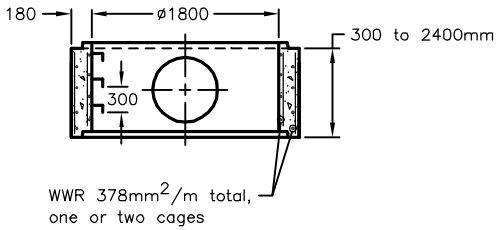
PLAN OF RISER
WITH WWR



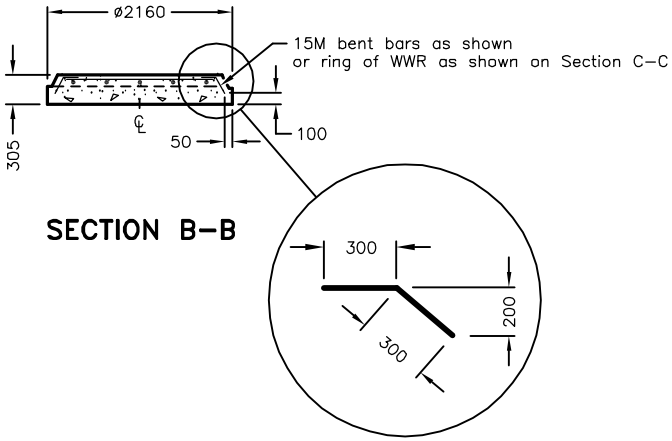
PLAN OF BASE SLAB
WITH REINFORCING STEEL BARS



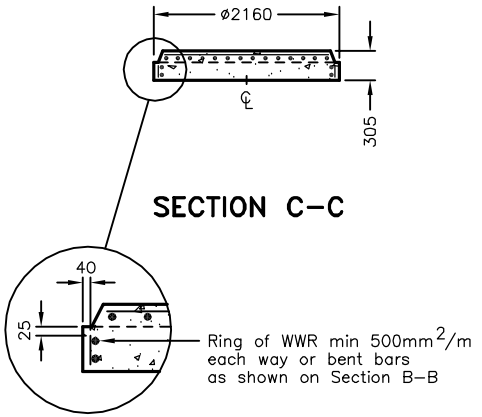
PLAN OF BASE SLAB
WITH WWR



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

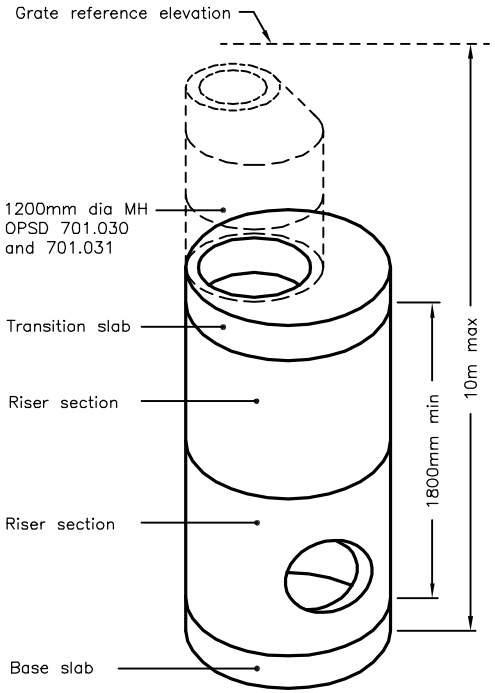
PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

1800mm DIAMETER RISER AND BASE SLAB

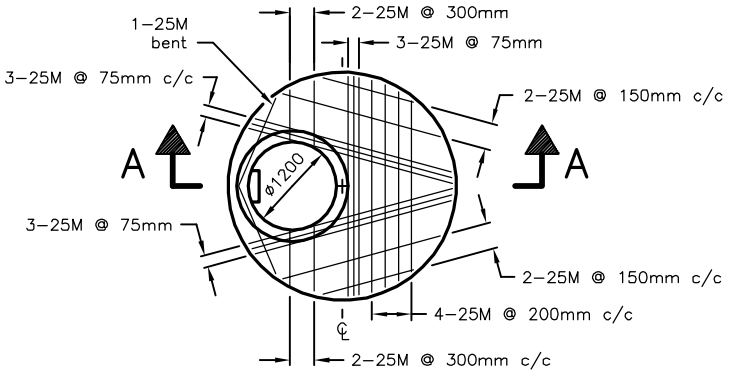
Nov 2014 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

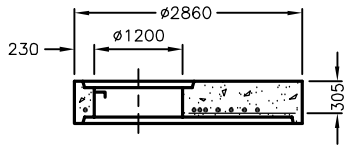
OPSD 701.051



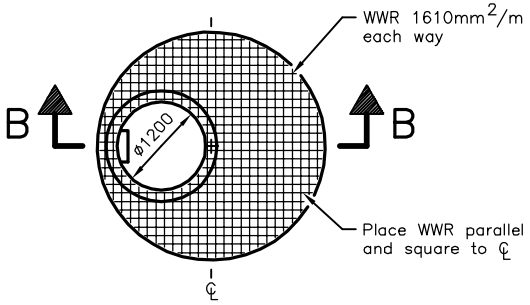
2400 to 1200mm DIAMETER MAINTENANCE HOLE



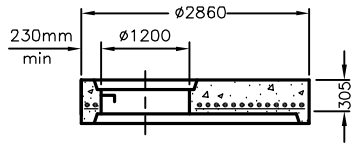
PLAN OF TRANSITION SLAB WITH REINFORCING STEEL BARS



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

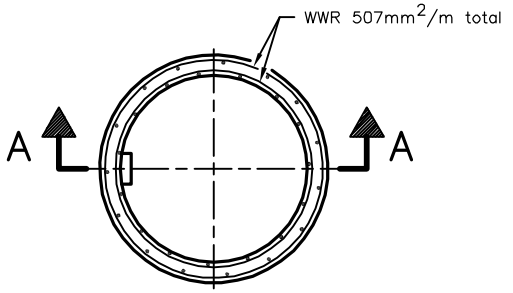
PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

2400mm DIAMETER TRANSITION SLAB

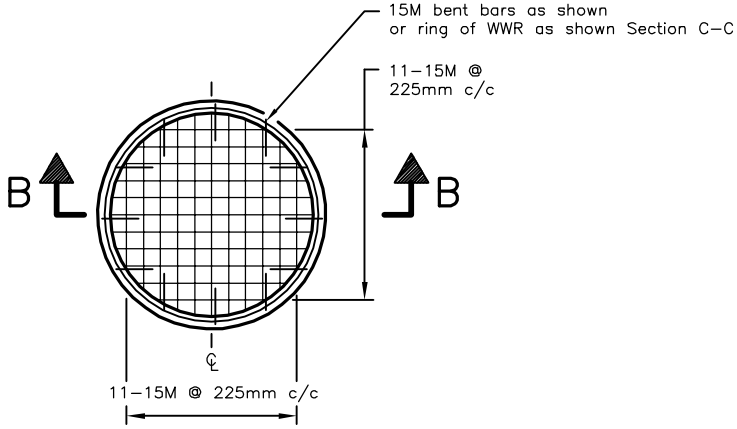
Nov 2014 | Rev 4

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

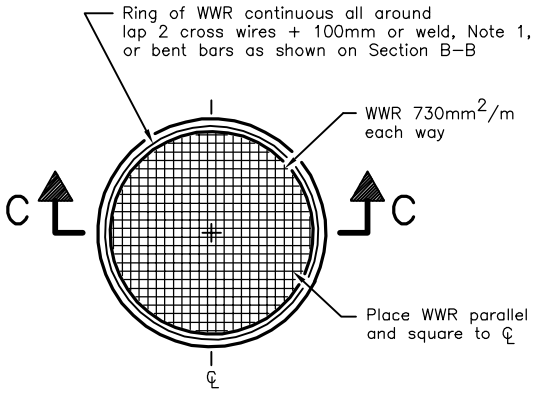
OPSD 701.060



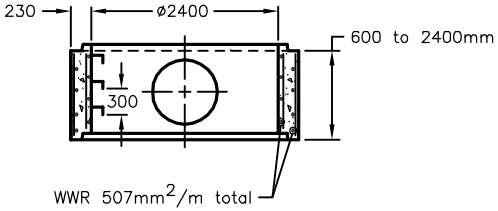
PLAN OF RISER



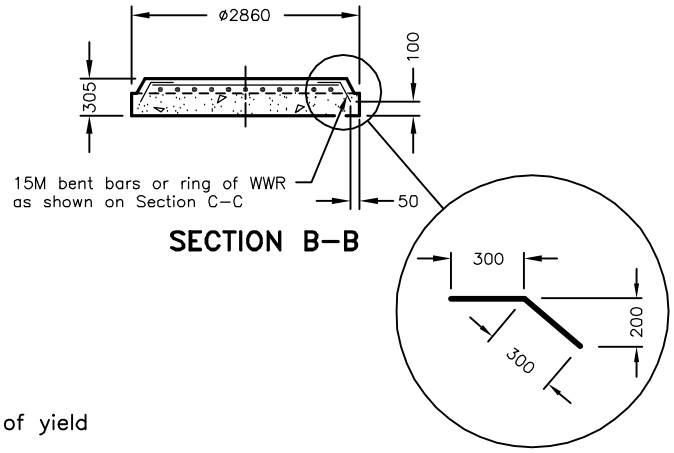
PLAN OF BASE SLAB
WITH REINFORCING STEEL BARS



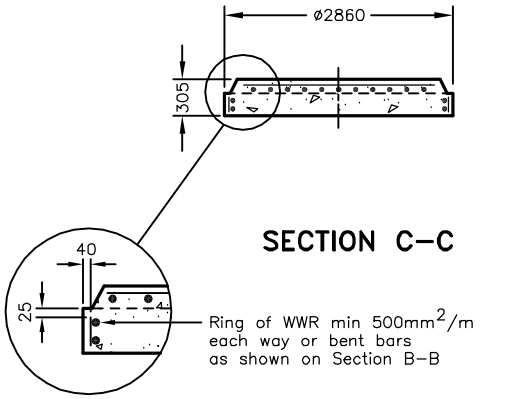
PLAN OF BASE SLAB
WITH WWR



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

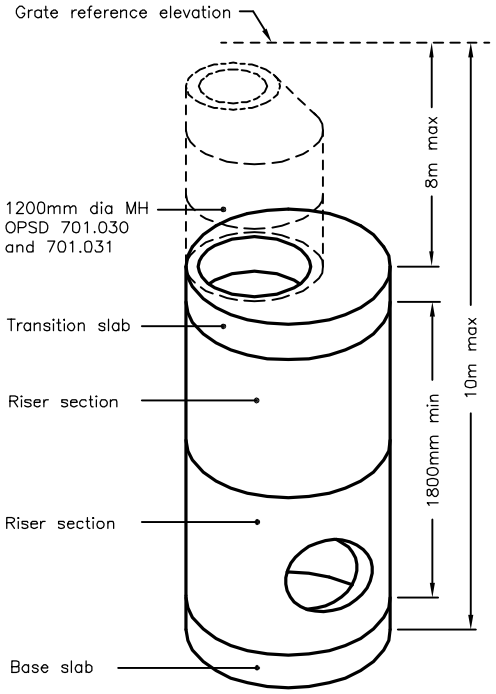
PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

2400mm DIAMETER RISER AND BASE SLAB

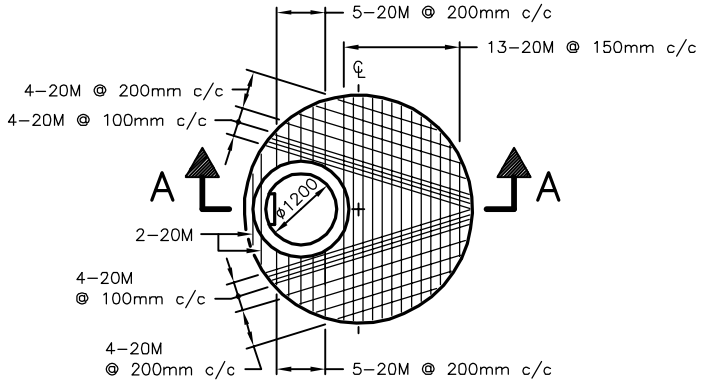
Nov 2014 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

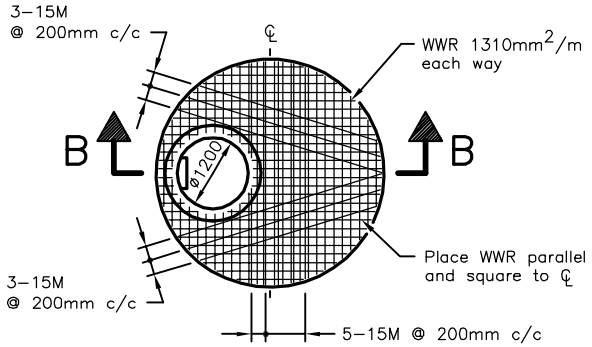
OPSD 701.061



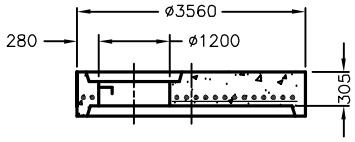
3000 to 1200mm DIAMETER MAINTENANCE HOLE



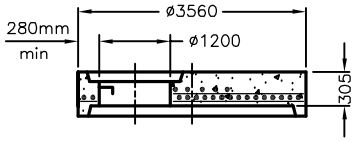
PLAN OF TRANSITION SLAB WITH REINFORCING STEEL BARS



PLAN OF TRANSITION SLAB WITH WWR AND REINFORCING STEEL BARS



SECTION A–A



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

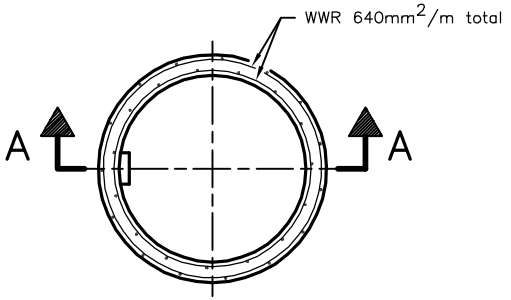
PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

3000mm DIAMETER TRANSITION SLAB

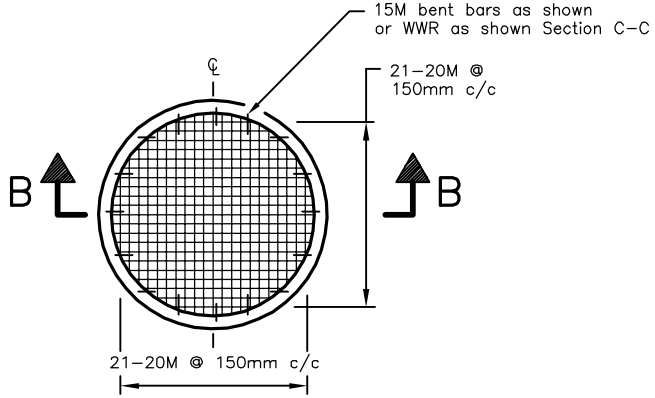
Nov 2014 | Rev 3

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

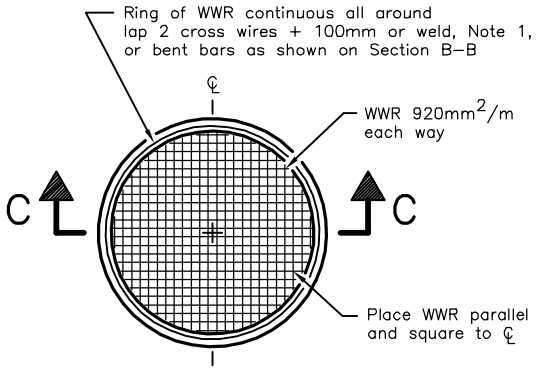
OPSD 701.070



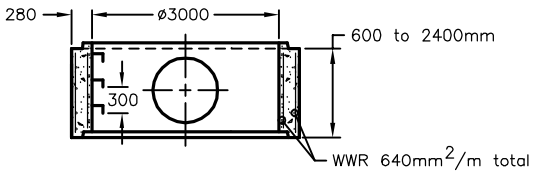
PLAN OF RISER



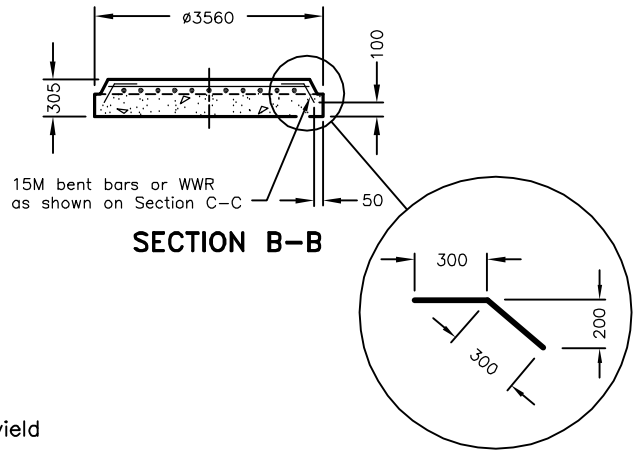
PLAN OF BASE SLAB
WITH REINFORCING STEEL BARS



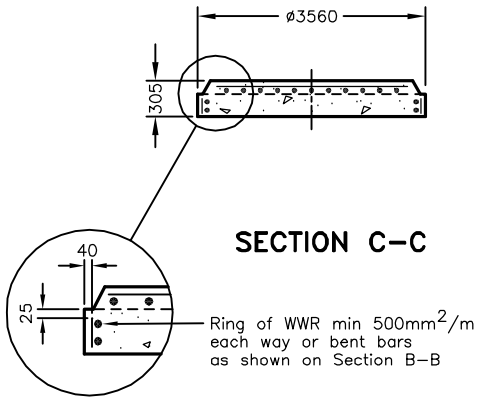
PLAN OF BASE SLAB
WITH WWR



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

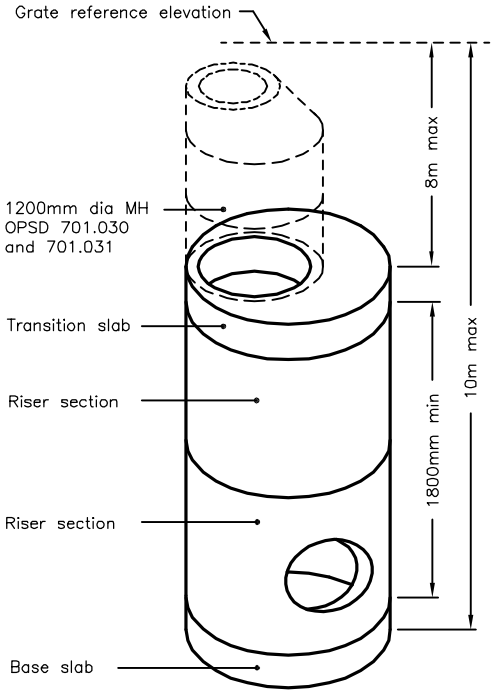
PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

3000mm DIAMETER RISER AND BASE SLAB

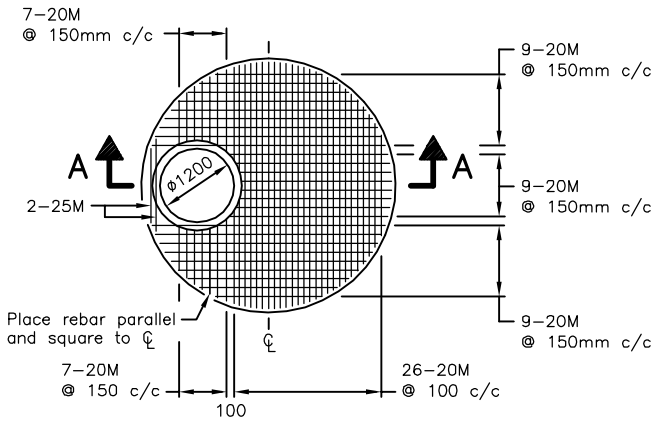
Nov 2014 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

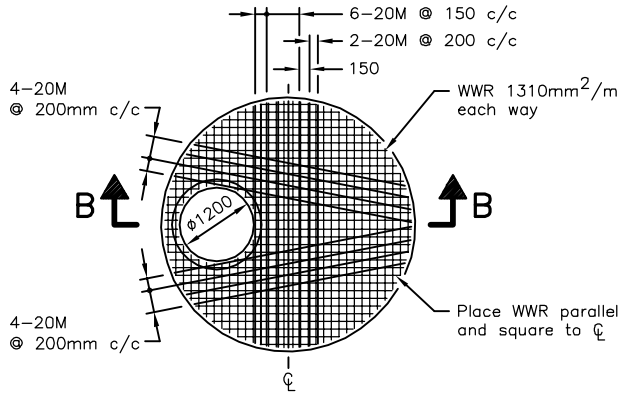
OPSD 701.071



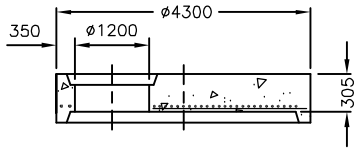
3600 to 1200mm DIAMETER MAINTENANCE HOLE



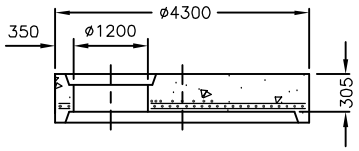
PLAN OF TRANSITION SLAB WITH REINFORCING STEEL BARS



PLAN OF TRANSITION SLAB WITH REINFORCING STEEL BARS AND WWR



SECTION A–A

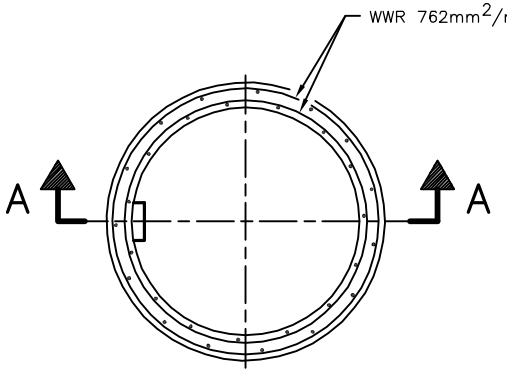


SECTION B–B

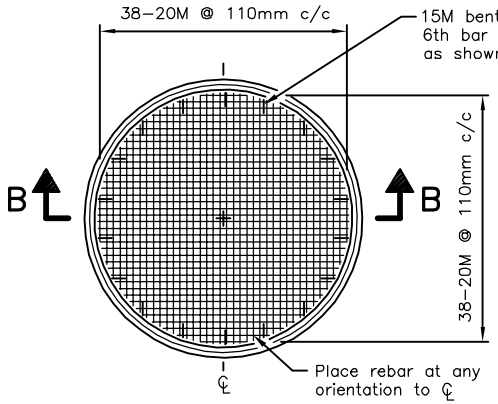
NOTES:

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.

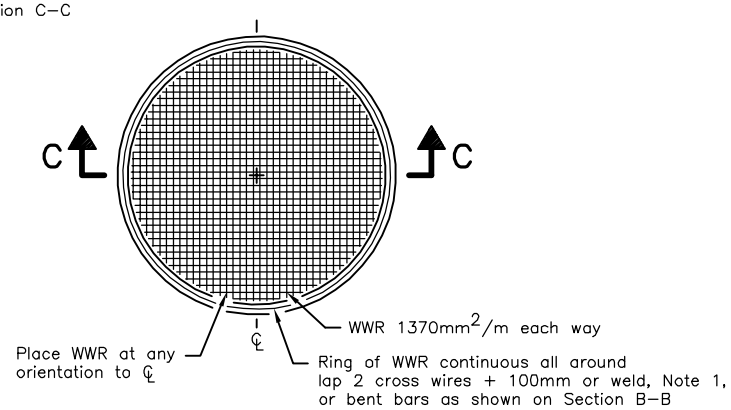
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	3
PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS 3600mm DIAMETER TRANSITION SLAB			
	OPSD 701.080		



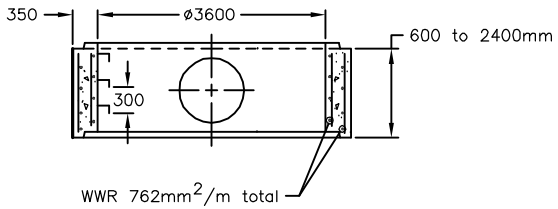
PLAN OF RISER



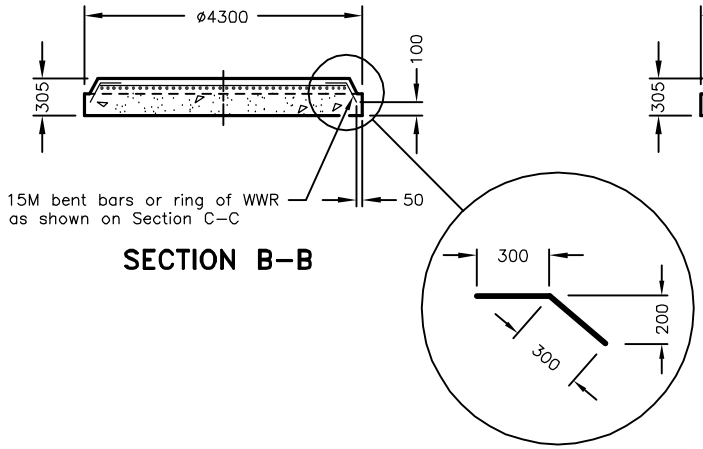
PLAN OF BASE SLAB
WITH REINFORCING STEEL BARS



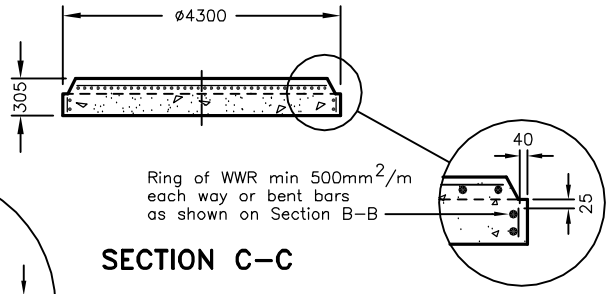
PLAN OF BASE SLAB
WITH WWR



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

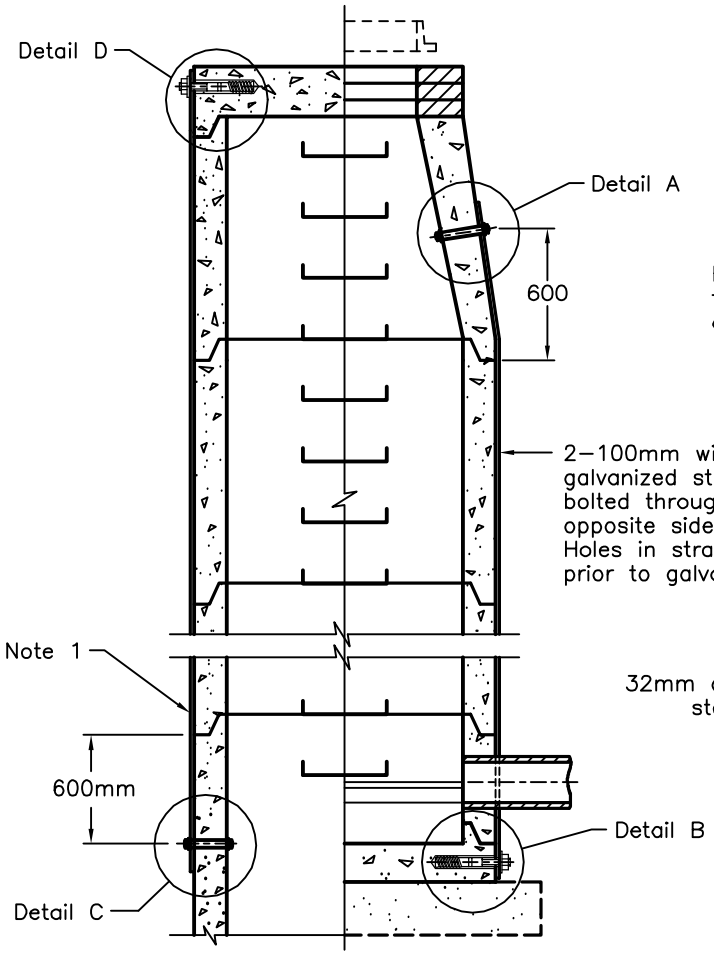
PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

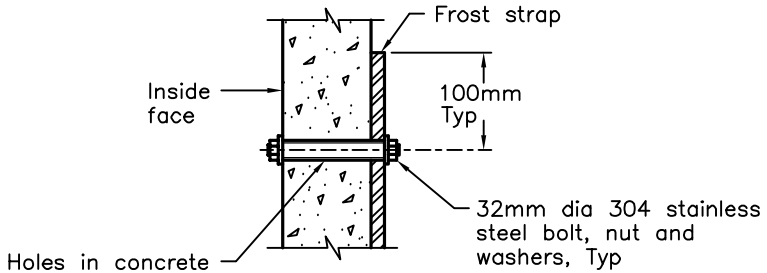
3600mm DIAMETER RISER AND BASE SLAB

Nov 2014 | Rev 2

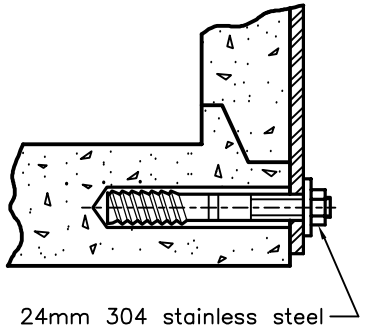
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

OPSD 701.081

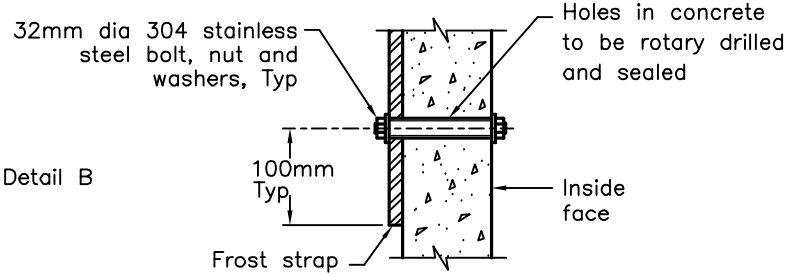




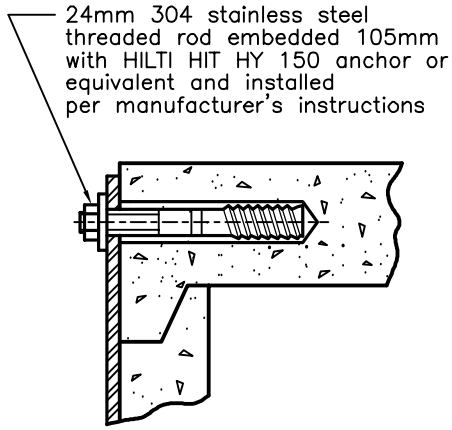
DETAIL A



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.

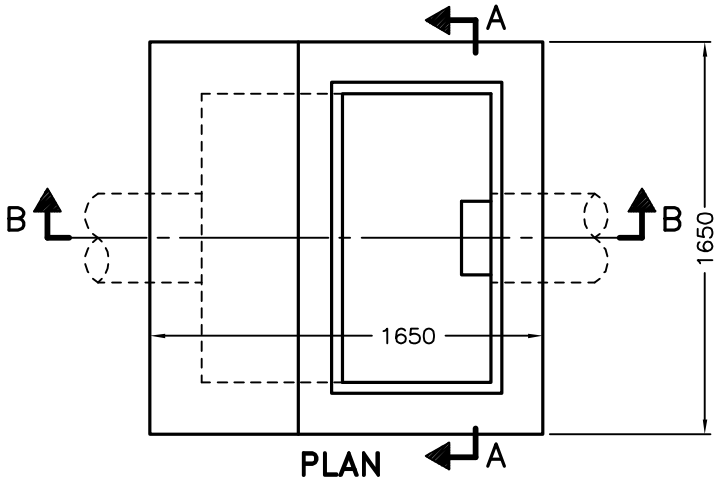
ONTARIO PROVINCIAL STANDARD DRAWING

FROST STRAP INSTALLATION

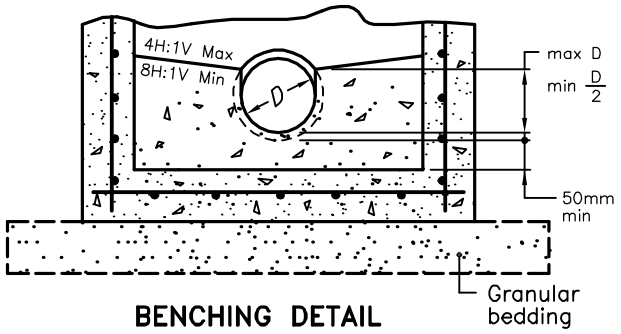
Nov 2010 | Rev 2

ONTARIO STANDARDS – MUNICIPAL – PROVINCIAL

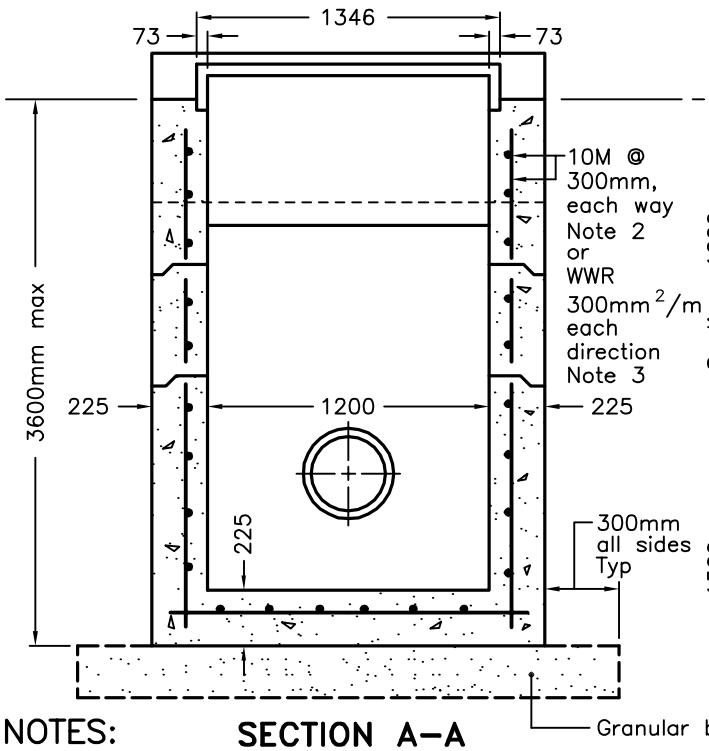
OPSD 701.100



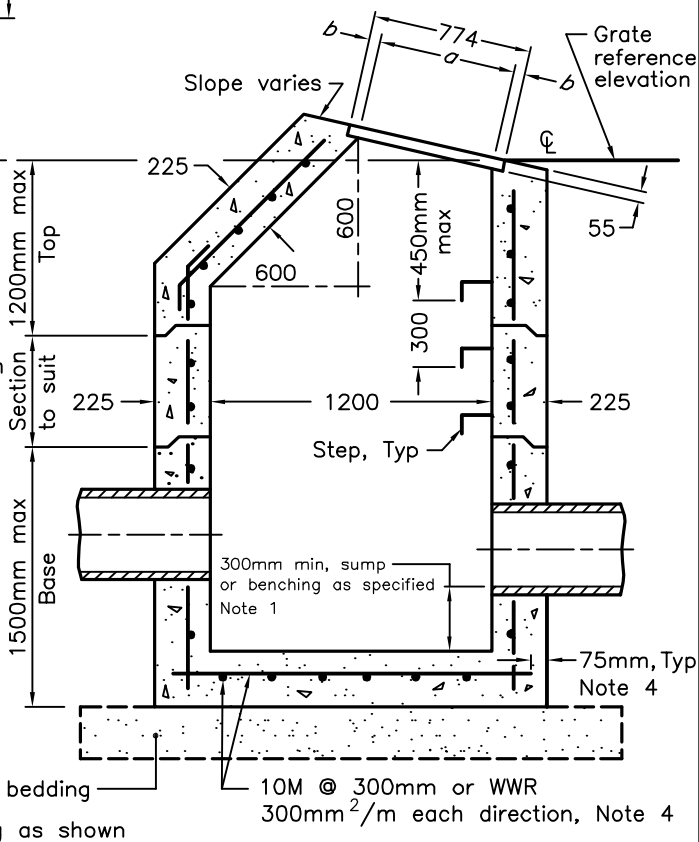
PLAN



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.

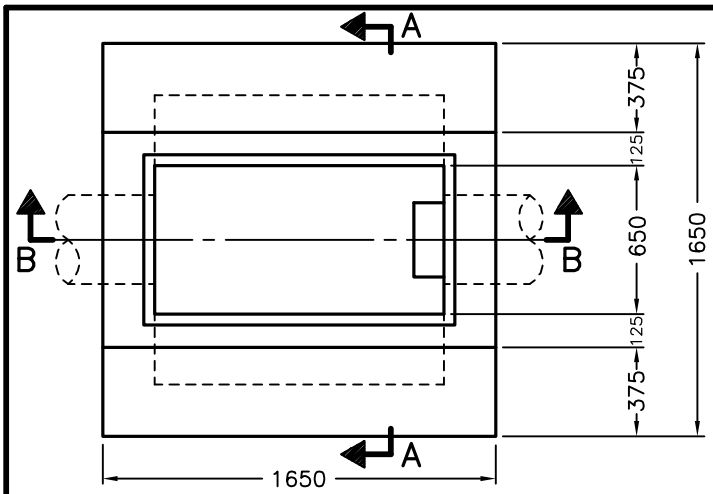
Opening Dimensions			
Grate		a	b
Type	Slope		
B	2H:1V	670	52
	3H:1V	632	71
	4H:1V	618	78
	6H:1V	608	83
	HOR	600	87

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 3

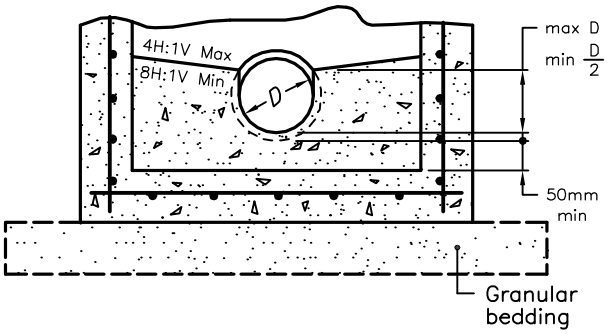
PRECAST CONCRETE DITCH INLET MAINTENANCE HOLE – TYPE A

1200 x 1200mm

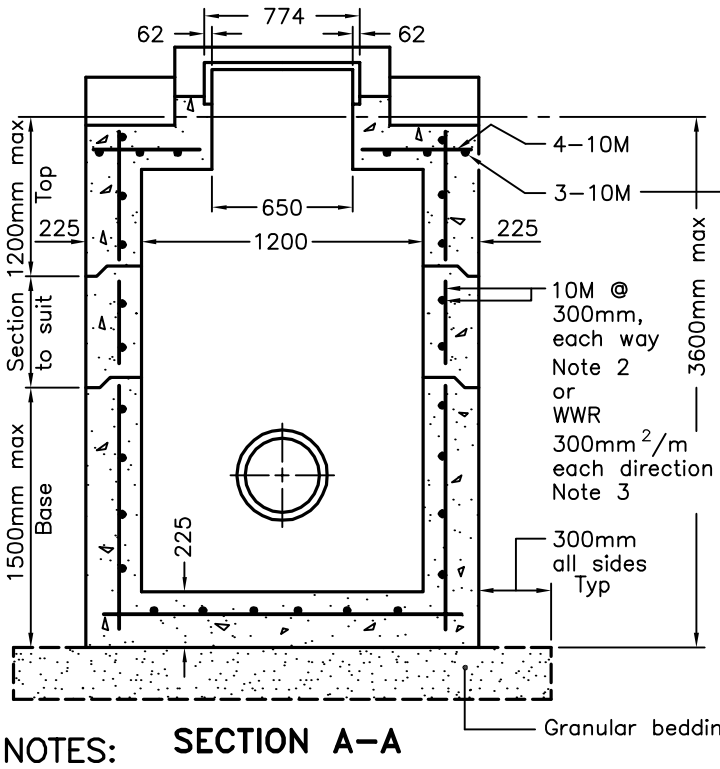
OPSD 702.040



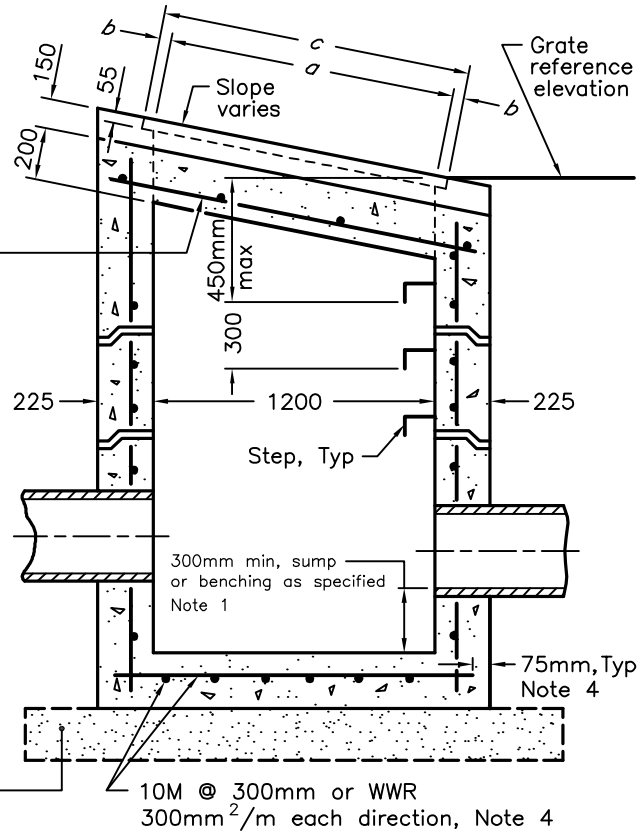
PLAN



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

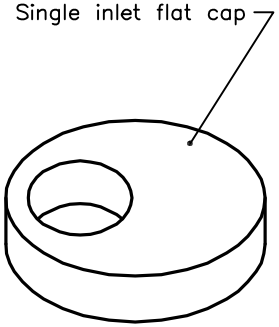
Nov 2014 | Rev 3

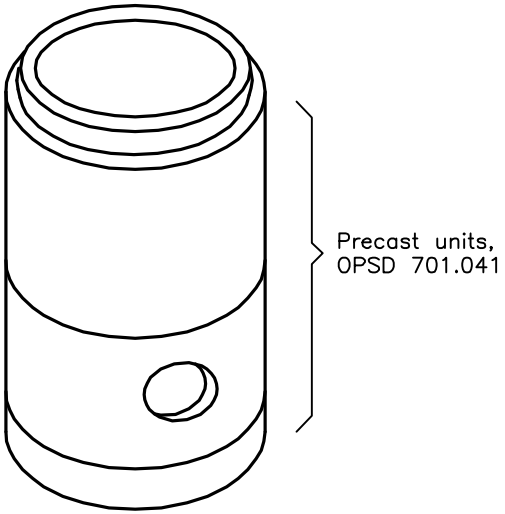
PRECAST CONCRETE DITCH INLET MAINTENANCE HOLE – TYPE B

1200 x 1200mm

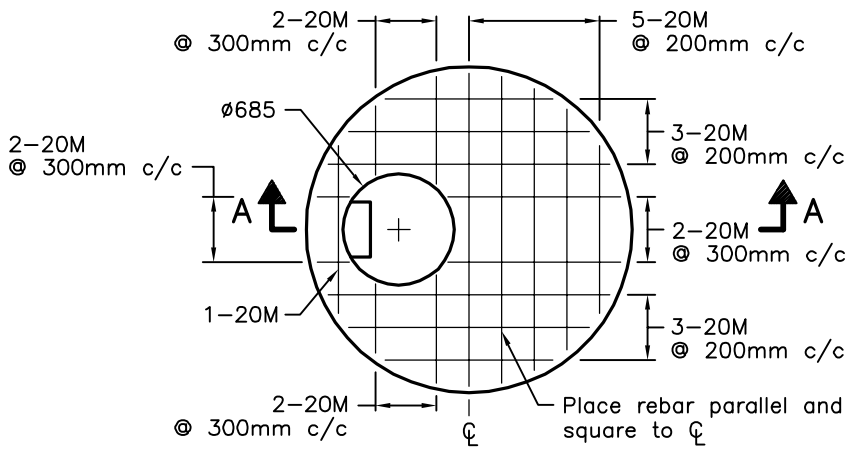
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 702.050

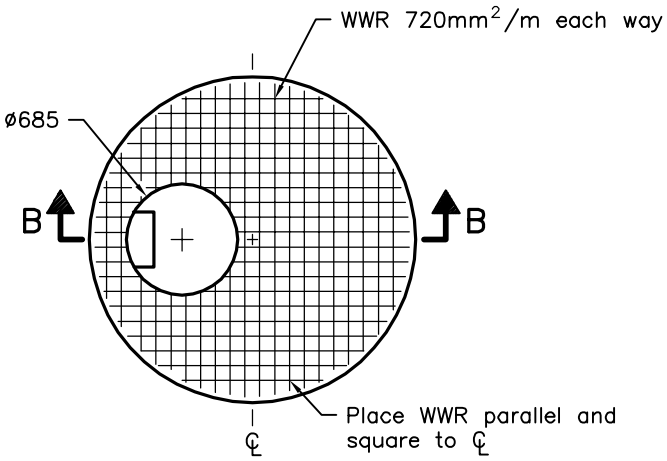




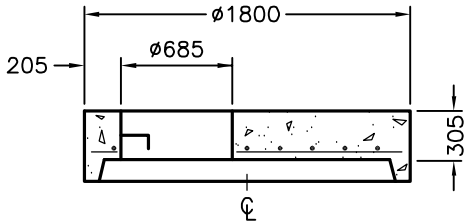
1500mm DIAMETER MAINTENANCE HOLE



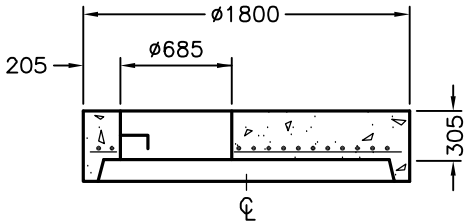
PLAN OF FLAT CAP WITH REINFORCING STEEL BARS



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.

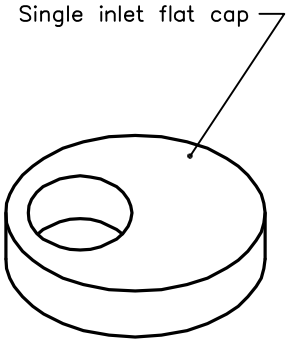
ONTARIO PROVINCIAL STANDARD DRAWING

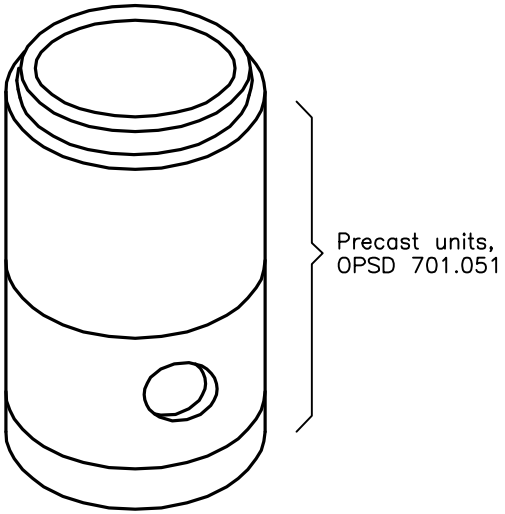
PRECAST CONCRETE SINGLE INLET FLAT CAP

1500mm DIAMETER

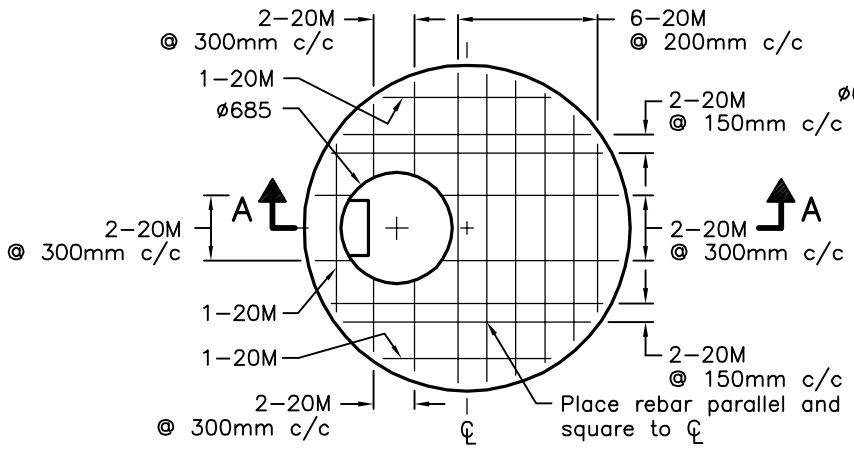
Nov 2014	Rev	2

OPSD 703.011

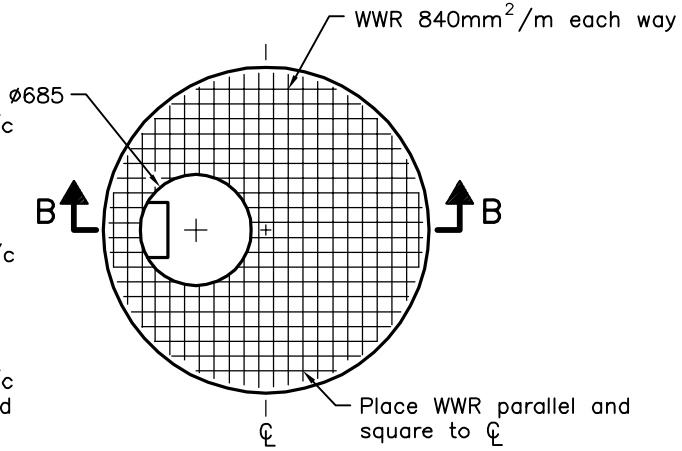




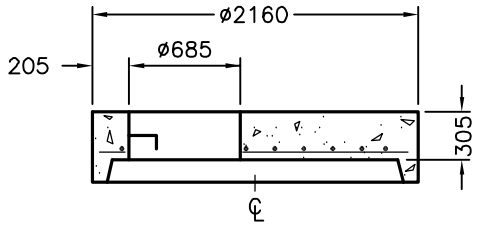
1800mm DIAMETER MAINTENANCE HOLE



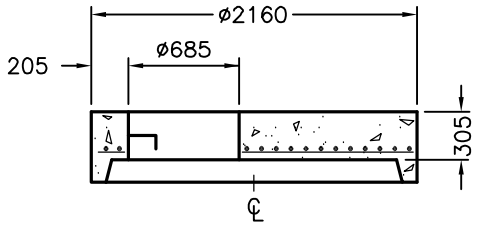
PLAN OF FLAT CAP WITH REINFORCING STEEL BARS



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.

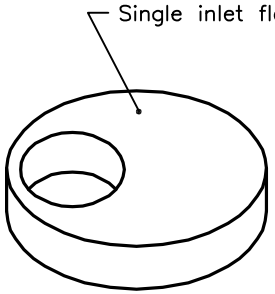
ONTARIO PROVINCIAL STANDARD DRAWING

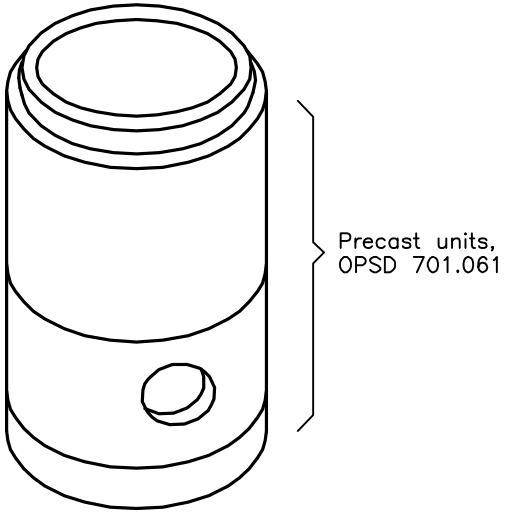
PRECAST CONCRETE SINGLE INLET FLAT CAP

1800mm DIAMETER

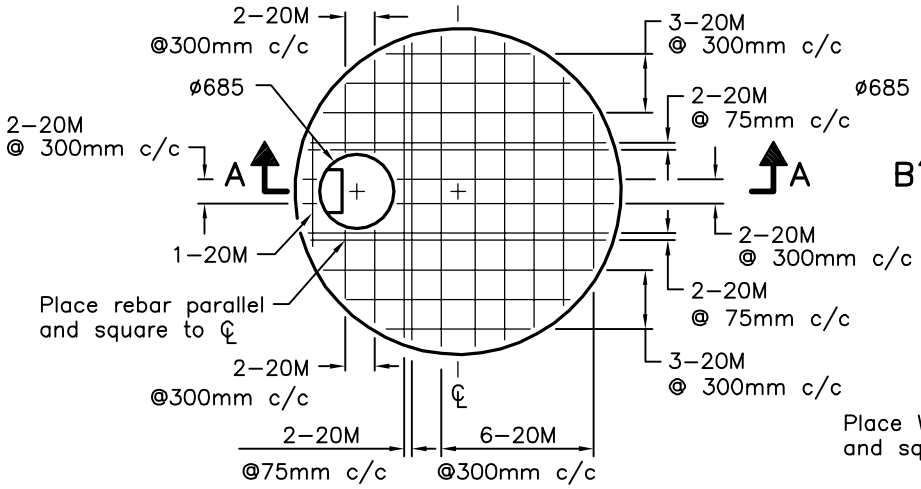
Nov 2014	Rev	2

OPSD 703.012

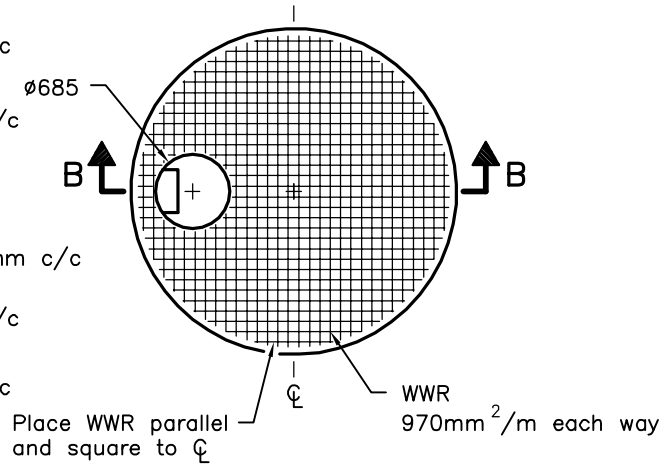




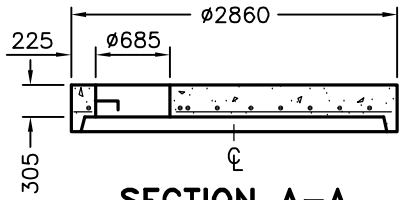
2400mm DIAMETER MAINTENANCE HOLE



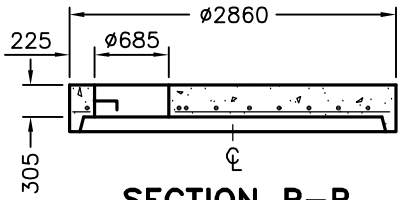
PLAN OF FLAT CAP WITH REINFORCING STEEL BARS



PLAN OF FLAT CAP WITH WWR



SECTION A–A



SECTION B–B

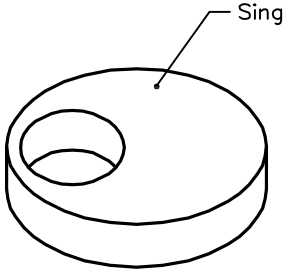
NOTES:

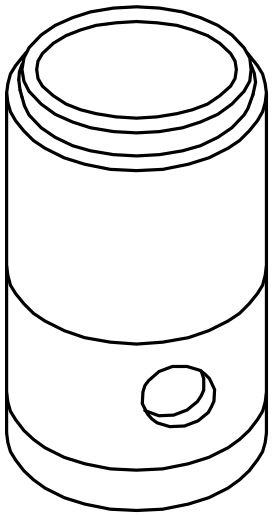
A All reinforcing steel shall have 25mm minimum cover.

B All dimensions are nominal.

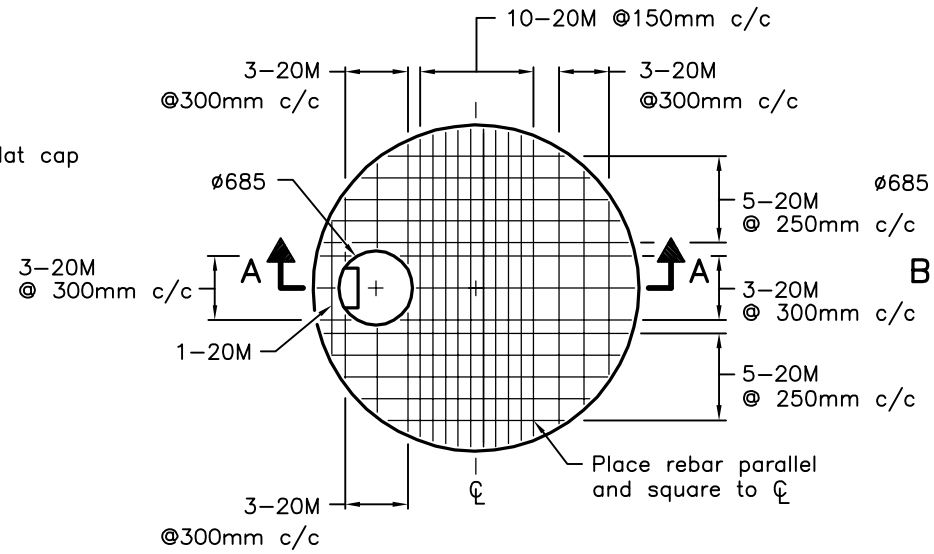
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	2
PRECAST CONCRETE SINGLE INLET FLAT CAP 2400mm DIAMETER			
	OPSD 703.013		

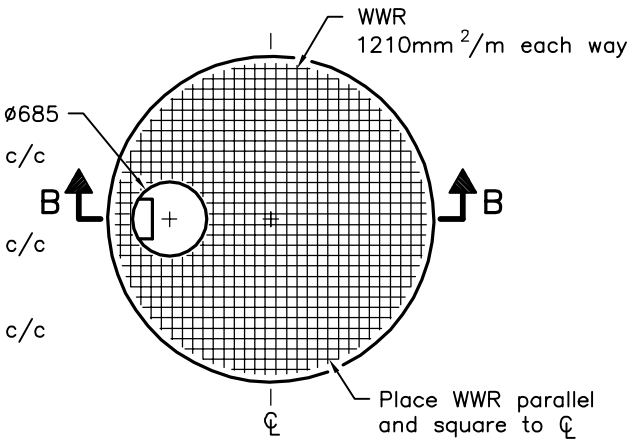




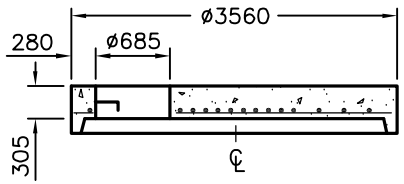
3000mm DIAMETER MAINTENANCE HOLE



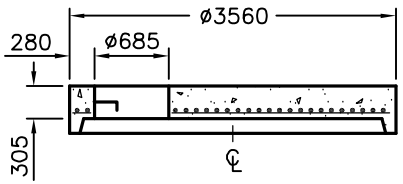
PLAN OF FLAT CAP WITH REINFORCING STEEL BARS



PLAN OF FLAT CAP WITH WWR



SECTION A–A



SECTION B–B

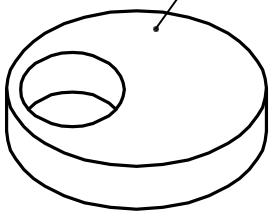
NOTES:

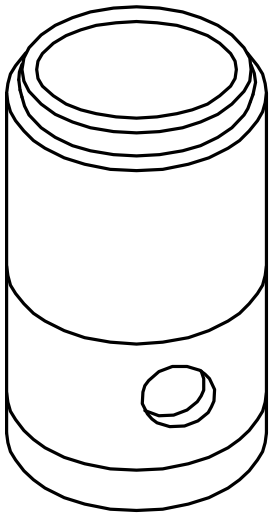
A All reinforcing steel shall have 25mm minimum cover.

B All dimensions are nominal.

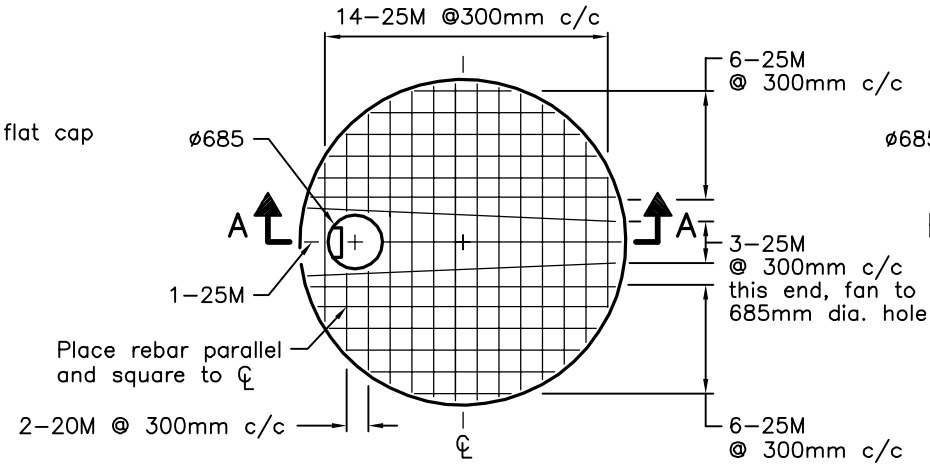
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	2
PRECAST CONCRETE SINGLE INLET FLAT CAP 3000mm DIAMETER			
	OPSD 703.014		

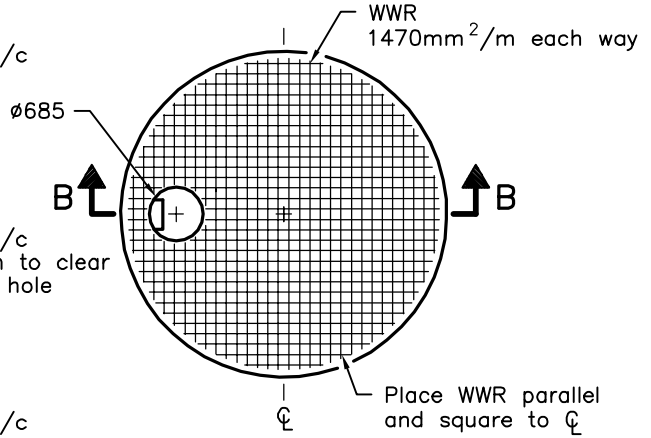




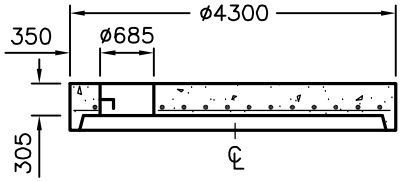
3600mm DIAMETER MAINTENANCE HOLE



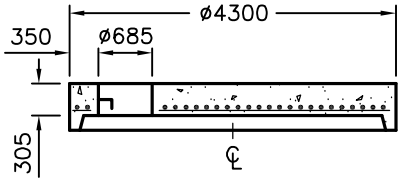
PLAN OF FLAT CAP WITH REINFORCING STEEL BARS



PLAN OF FLAT CAP WITH WWR



SECTION A–A

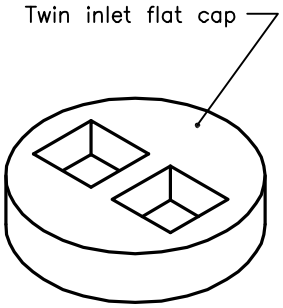


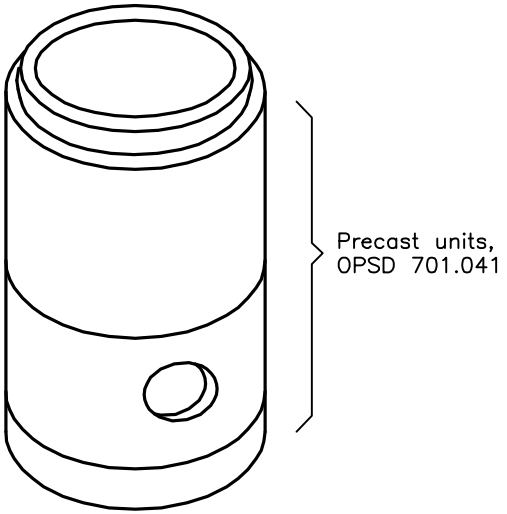
SECTION B–B

NOTES:

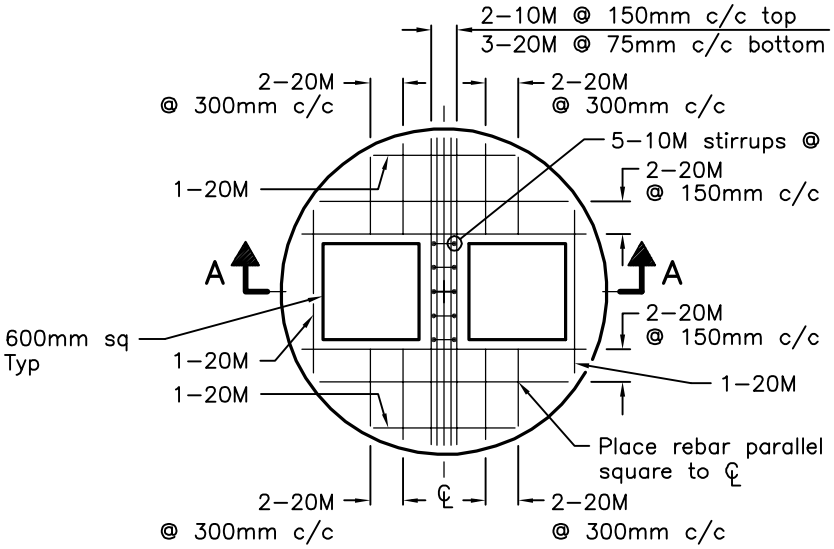
A All reinforcing steel shall have 25mm minimum cover.
B All dimensions are nominal.
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	2
PRECAST CONCRETE SINGLE INLET FLAT CAP 3600mm DIAMETER			
	OPSD 703.015		

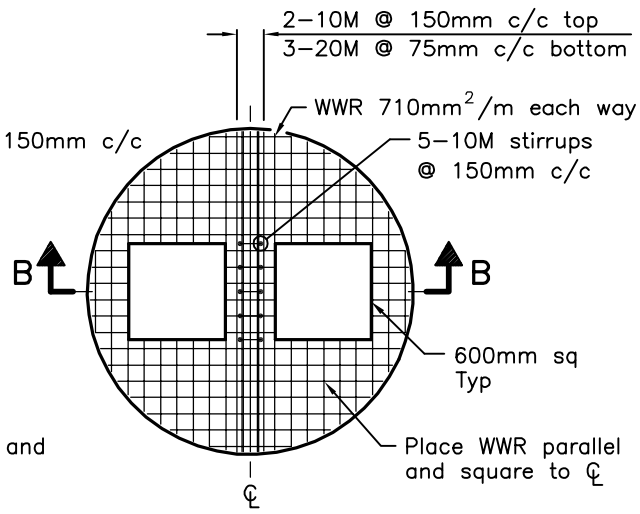




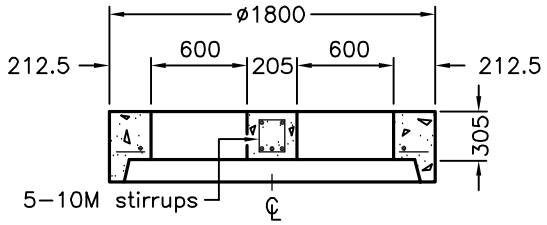
1500mm DIAMETER MAINTENANCE HOLE



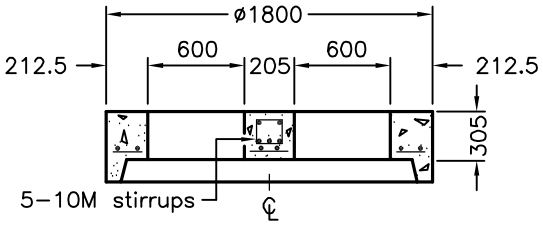
PLAN OF TWIN INLET FLAT CAP WITH REINFORCING STEEL BARS



PLAN OF TWIN INLET FLAT CAP WITH WWR



SECTION A–A

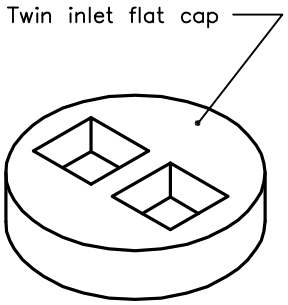


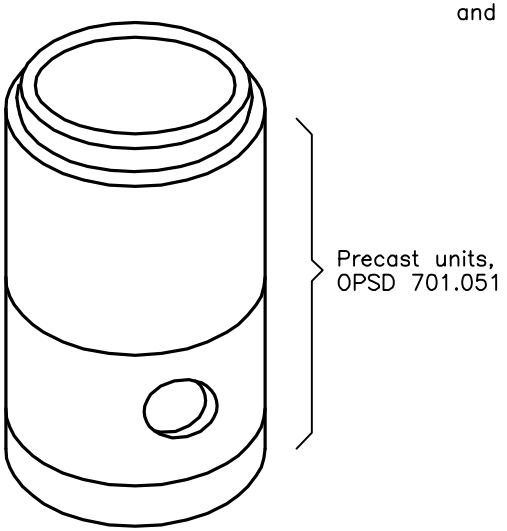
SECTION B–B

NOTES:

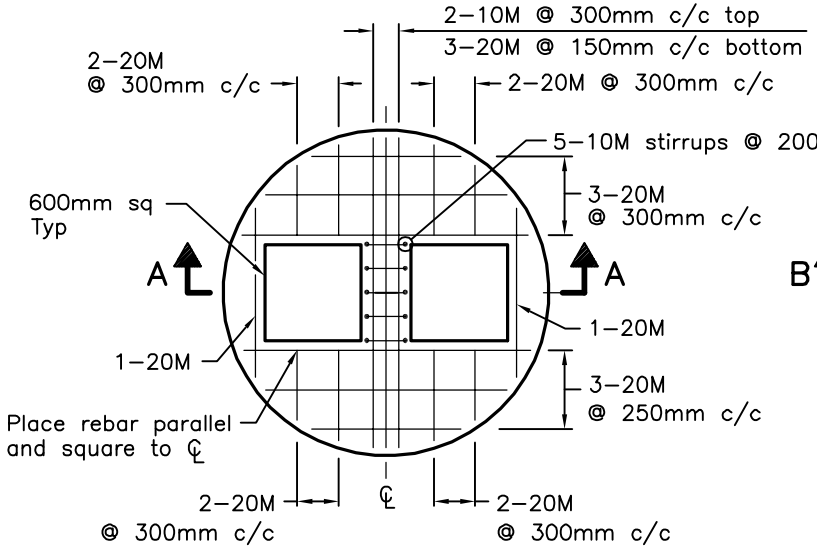
A All reinforcing steel shall have 25mm minimum cover.
B All dimensions are nominal.
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	2
PRECAST CONCRETE TWIN INLET FLAT CAP 1500mm DIAMETER			
	OPSD 703.021		

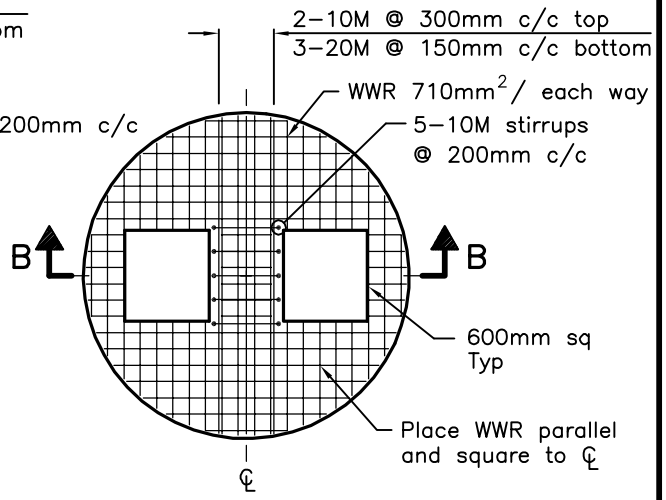




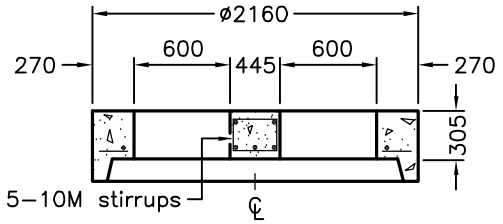
1800mm DIAMETER MAINTENANCE HOLE



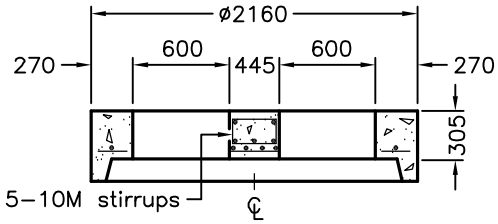
PLAN OF TWIN INLET FLAT CAP WITH REINFORCING STEEL BARS



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

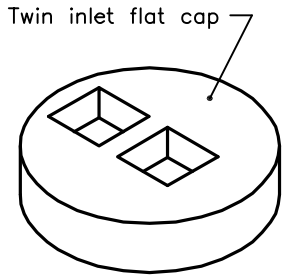
PRECAST CONCRETE TWIN INLET FLAT CAP

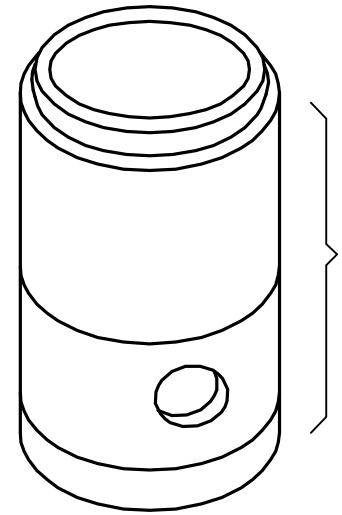
1800mm DIAMETER

Nov 2014	Rev	2

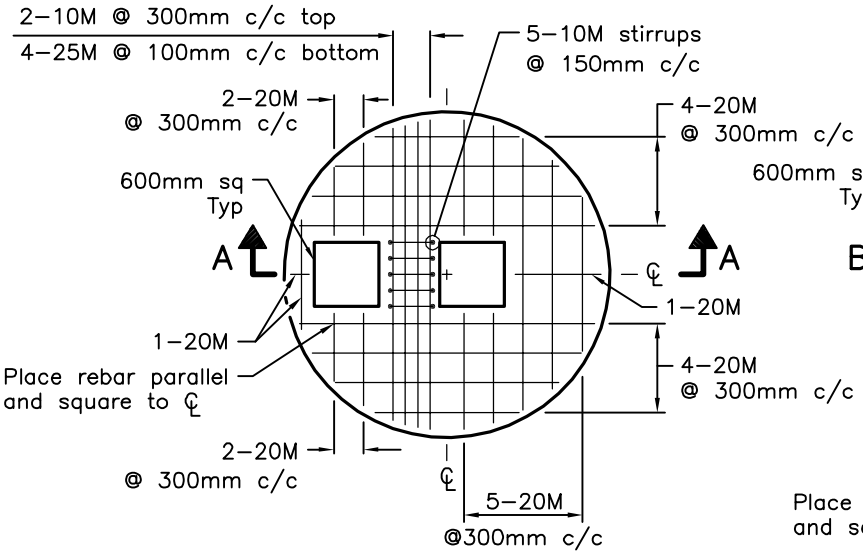
ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 703.022

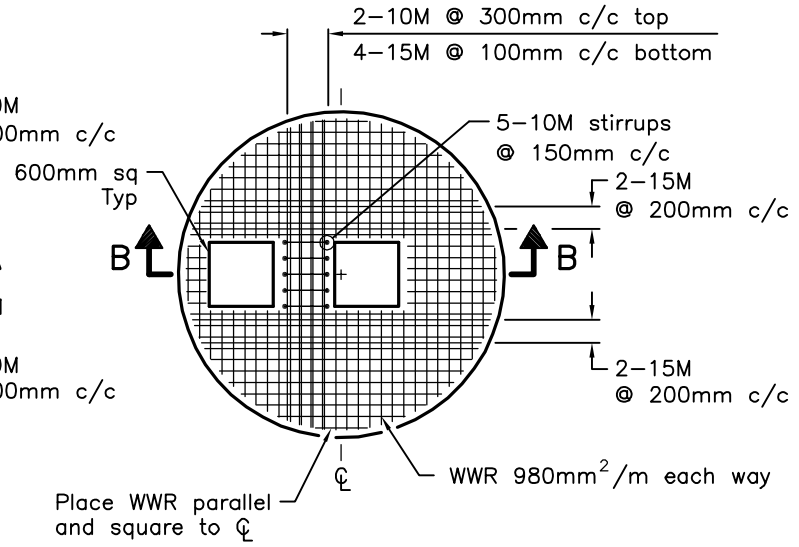




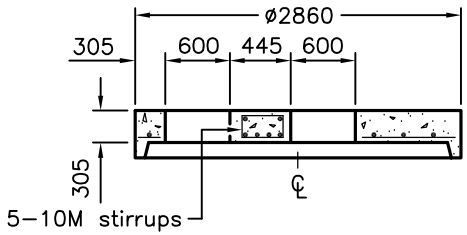
2400mm DIAMETER MAINTENANCE HOLE



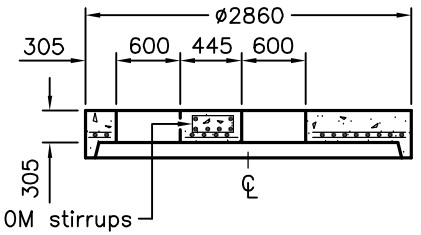
PLAN OF TWIN INLET FLAT CAP WITH REINFORCING STEEL BARS



PLAN OF TWIN INLET FLAT CAP WITH WWR



SECTION A–A

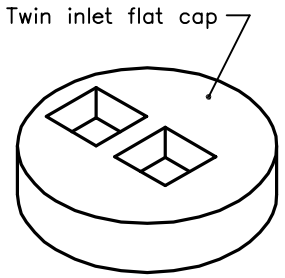


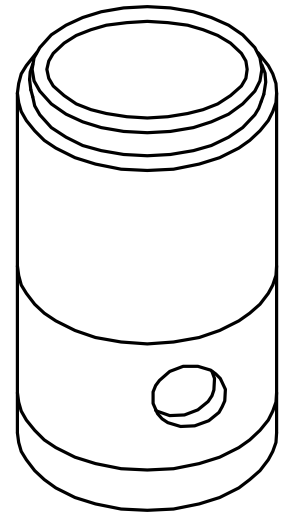
SECTION B–B

NOTES:

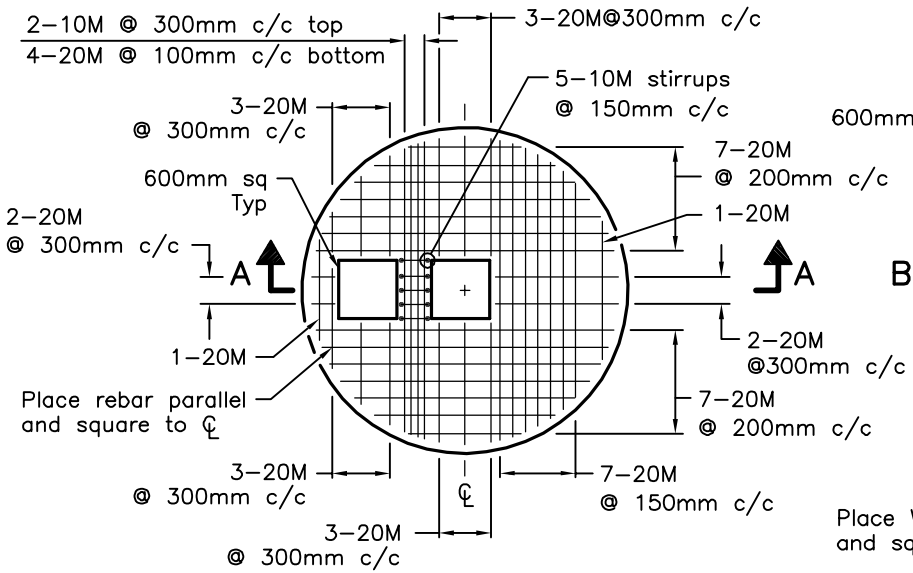
A All reinforcing steel shall have 25mm minimum cover.
B All dimensions are nominal.
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	2
PRECAST CONCRETE TWIN INLET FLAT CAP 2400mm DIAMETER			
			OPSD 703.023

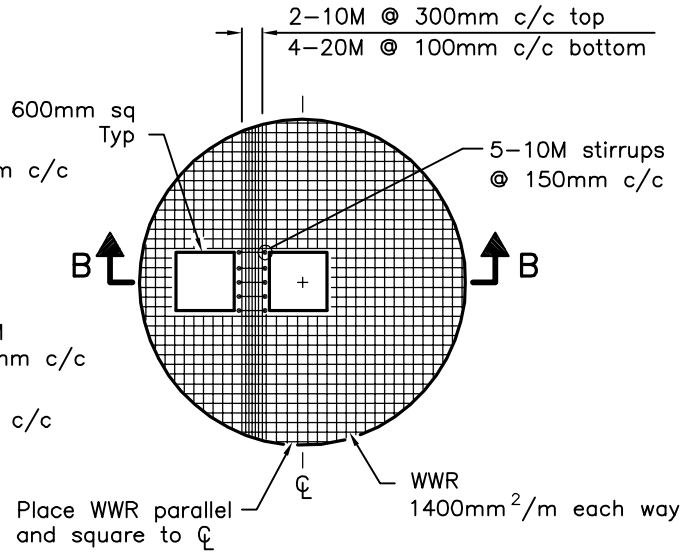




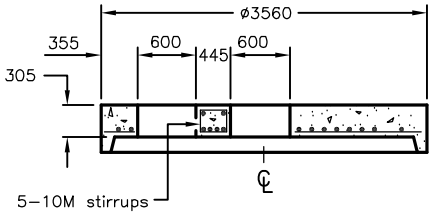
3000mm DIAMETER MAINTENANCE HOLE



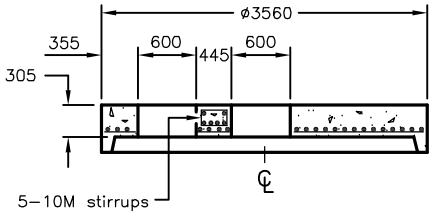
PLAN OF TWIN INLET FLAT CAP WITH REINFORCING STEEL BARS



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

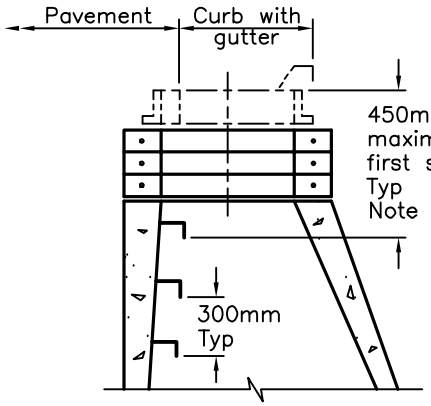
PRECAST CONCRETE TWIN INLET FLAT CAP

3000mm DIAMETER

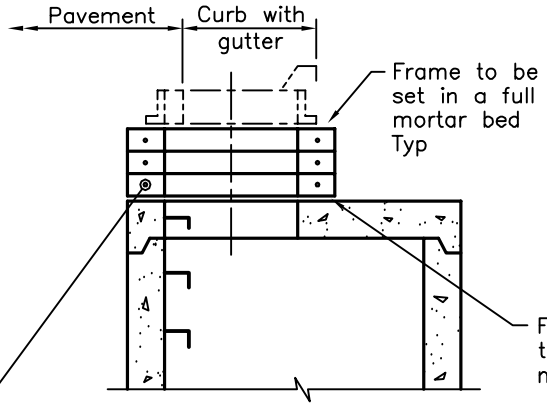
Nov 2014 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

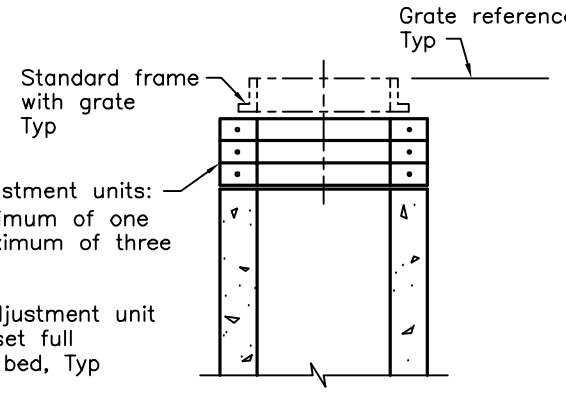
OPSD 703.024



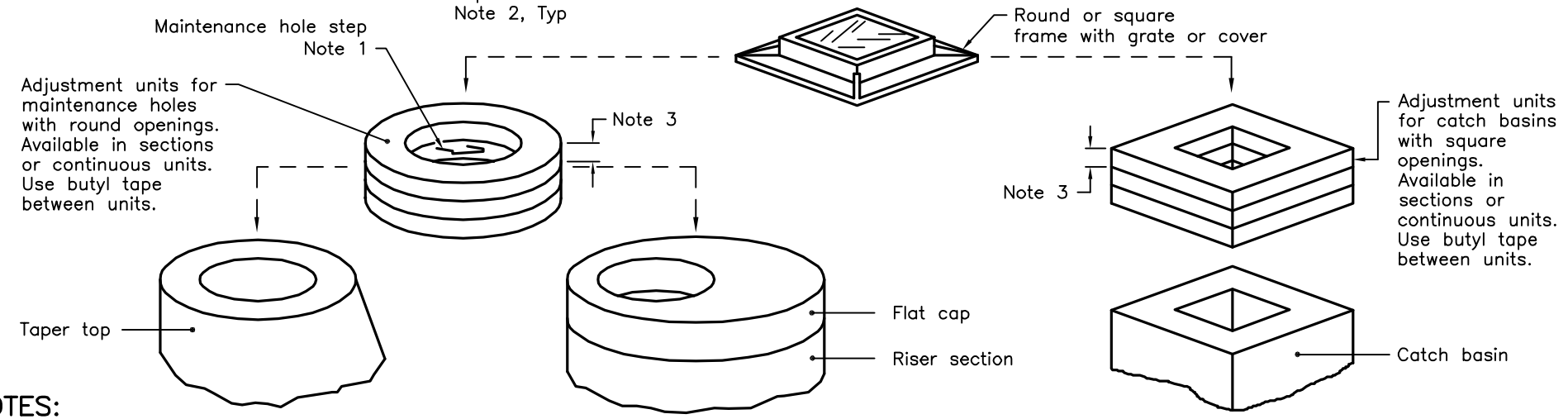
SECTION THROUGH TAPER TOP



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.

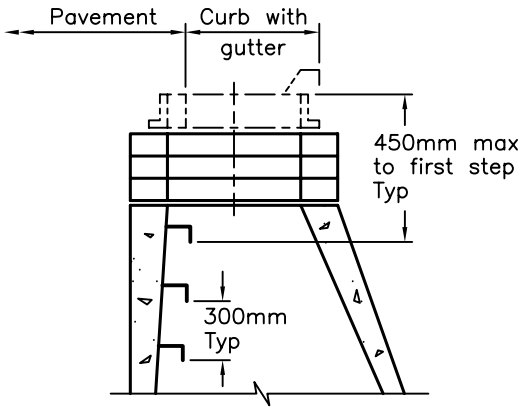
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

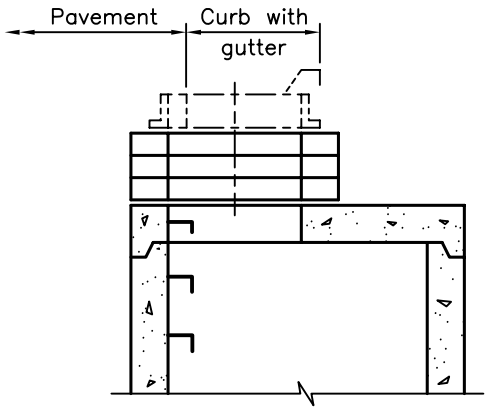
PRECAST CONCRETE ADJUSTMENT UNITS FOR MAINTENANCE HOLES, CATCH BASINS, AND VALVE CHAMBERS

Nov 2014 | Rev 3

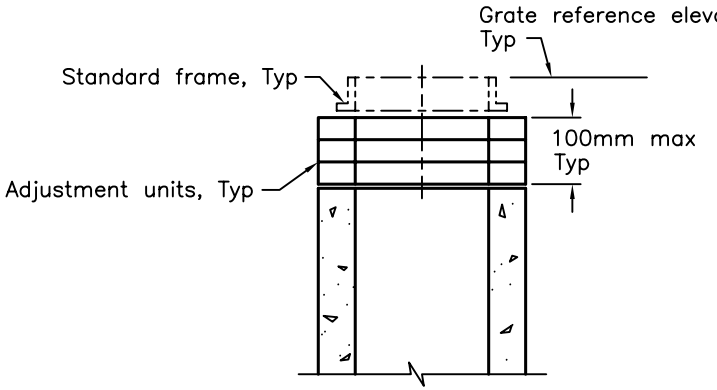
OPSD 704.010



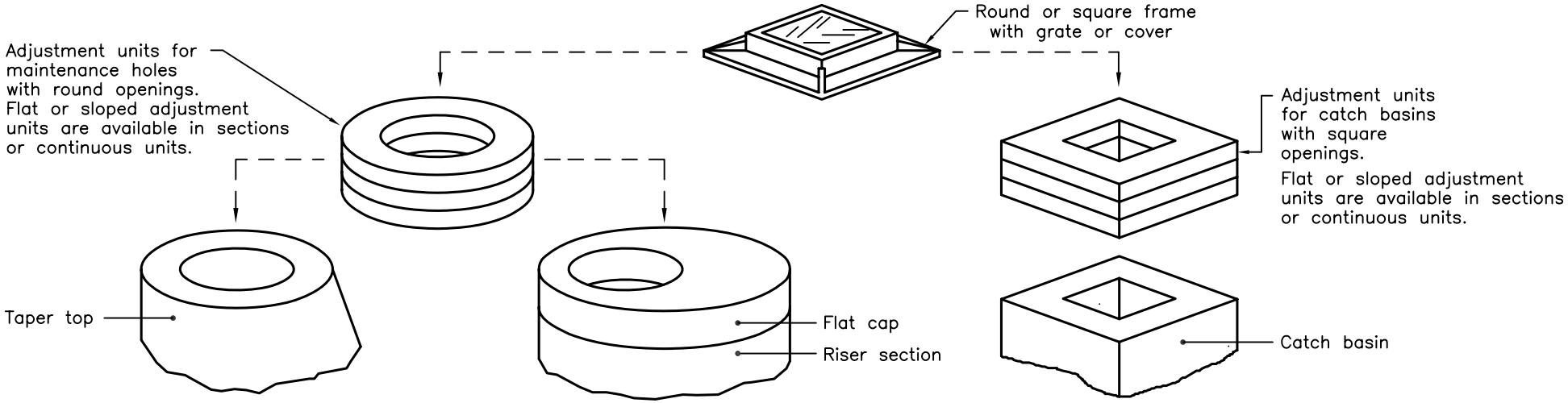
SECTION THROUGH TAPER TOP



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.

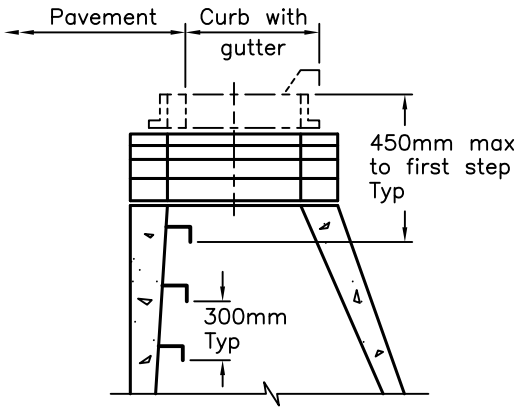
ONTARIO PROVINCIAL STANDARD DRAWING

HIGH DENSITY POLYETHYLENE ADJUSTMENT UNITS FOR MAINTENANCE HOLES, CATCH BASINS, AND VALVE CHAMBERS

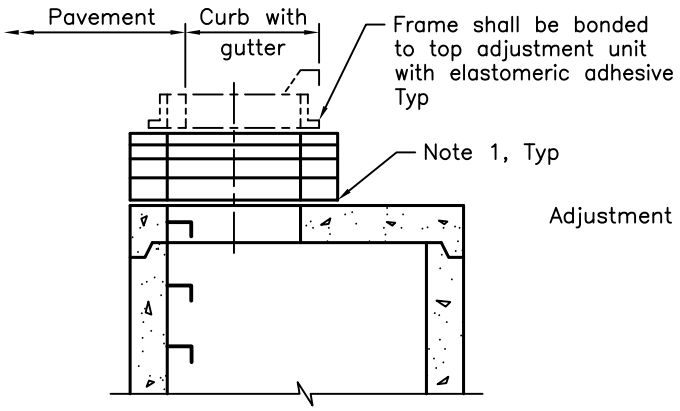
Nov 2008 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

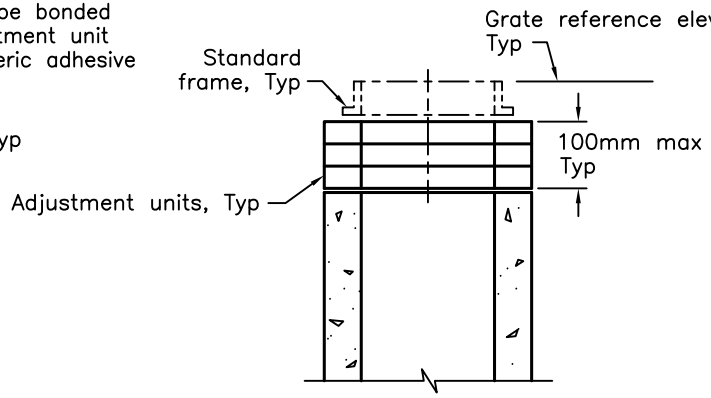
OPSD 704.011



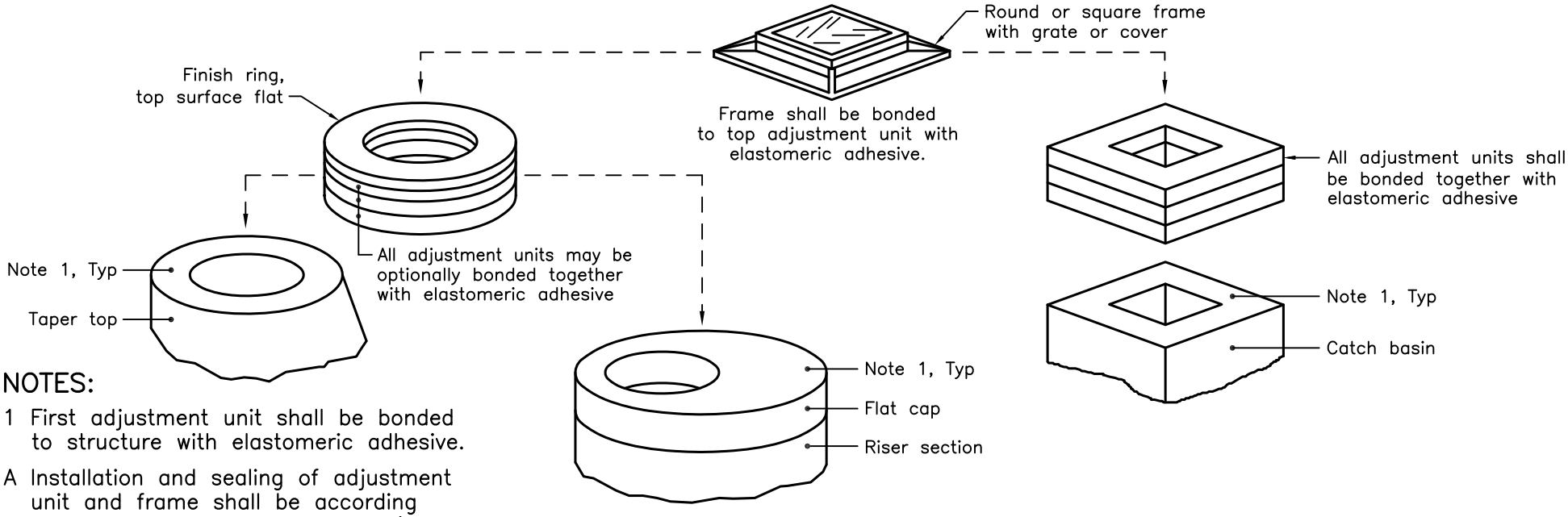
SECTION THROUGH TAPER TOP



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.

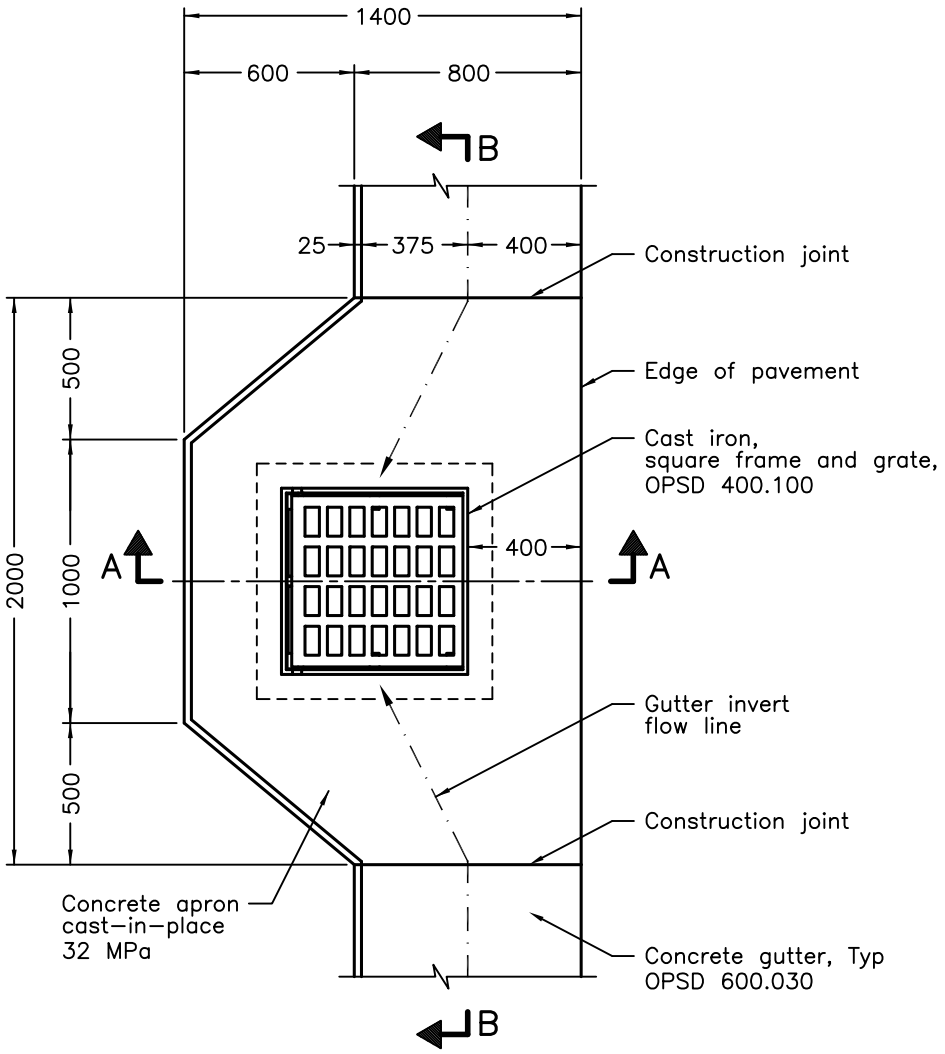
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

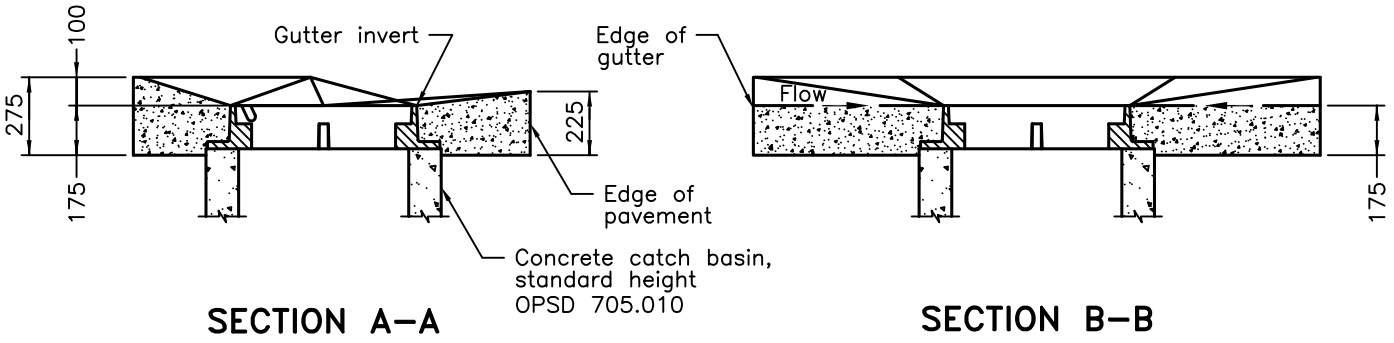
EXPANDED POLYSTYRENE (EPS) ADJUSTMENT UNITS FOR MAINTENANCE HOLES, CATCH BASINS, AND VALVE CHAMBERS

April 2013 | Rev 0

OPSD 704.012



PLAN



SECTION A–A

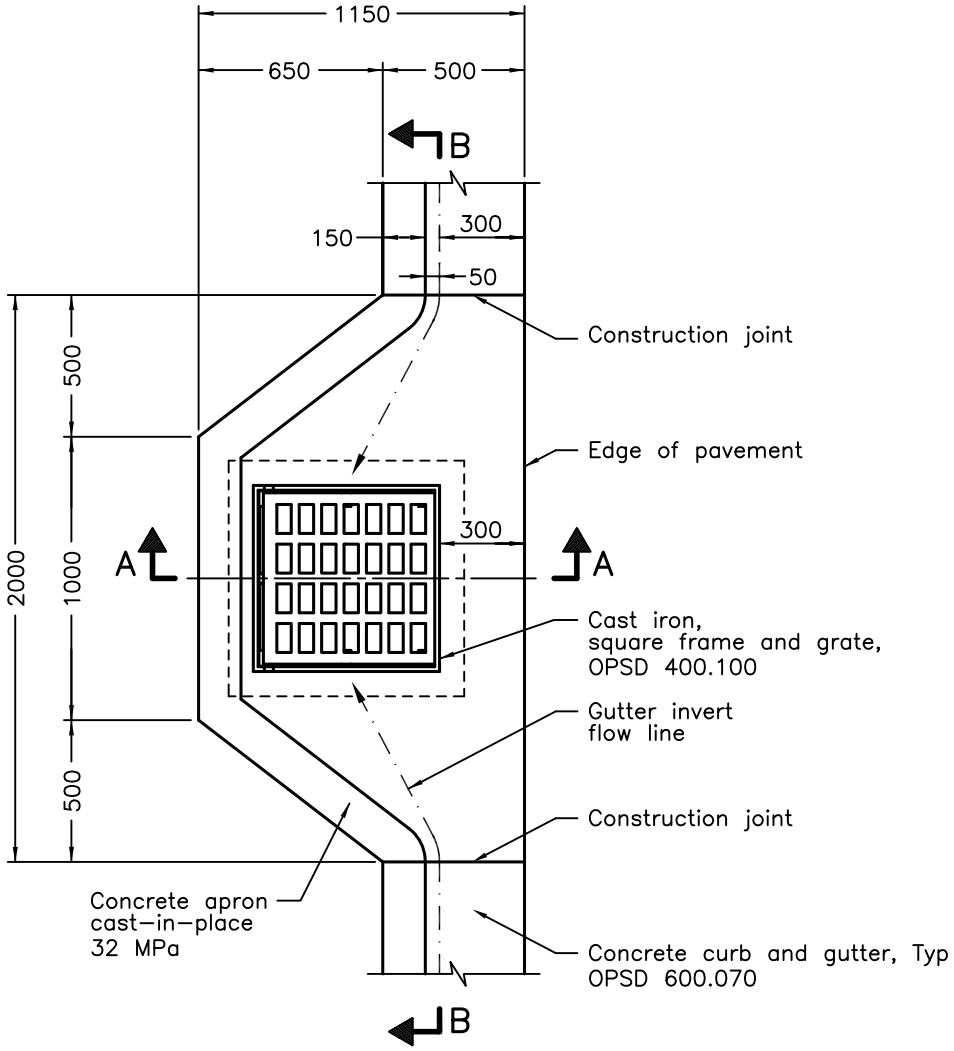
SECTION B–B

NOTES:

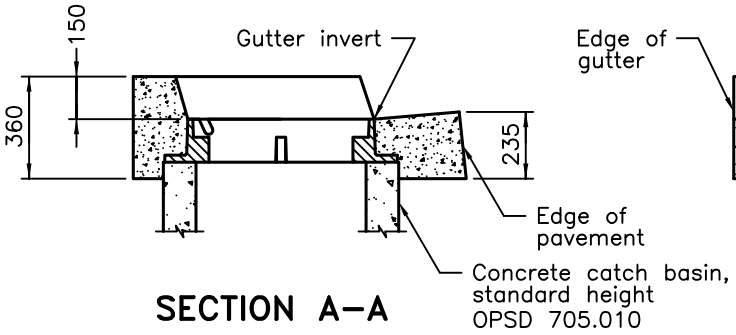
1 All construction joints shall be filled with fibre board or hot–poured rubberized asphalt joint sealing compound and joint filler.

A All dimensions are in millimetres unless otherwise shown.

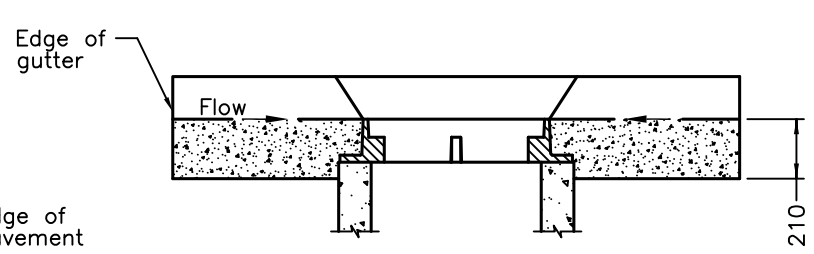
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	0
CONCRETE CATCH BASIN APRON MOUNTABLE CURB WITH WIDE GUTTER			
	OPSD 705.001		



PLAN



SECTION A–A



SECTION B–B

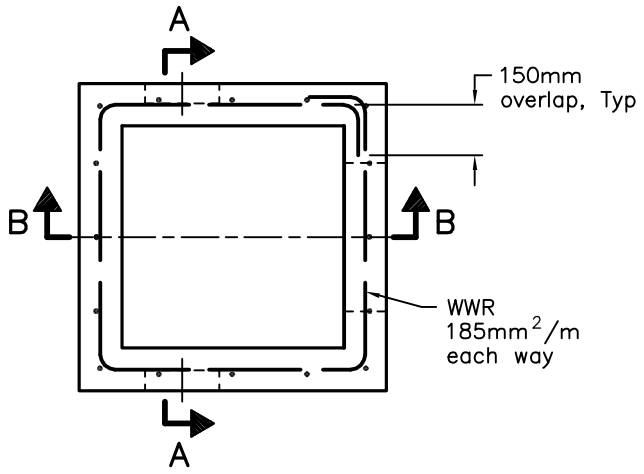
NOTES:

1 All construction joints shall be filled with fibre board or hot–poured rubberized asphalt joint sealing compound and joint filler.

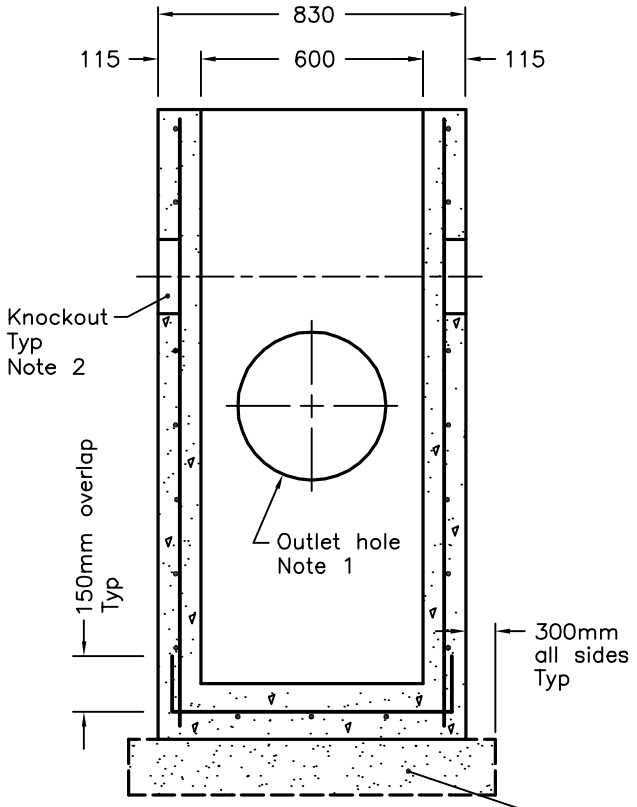
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	0
CONCRETE CATCH BASIN APRON BARRIER CURB WITH STANDARD GUTTER			
	OPSD 705.002		

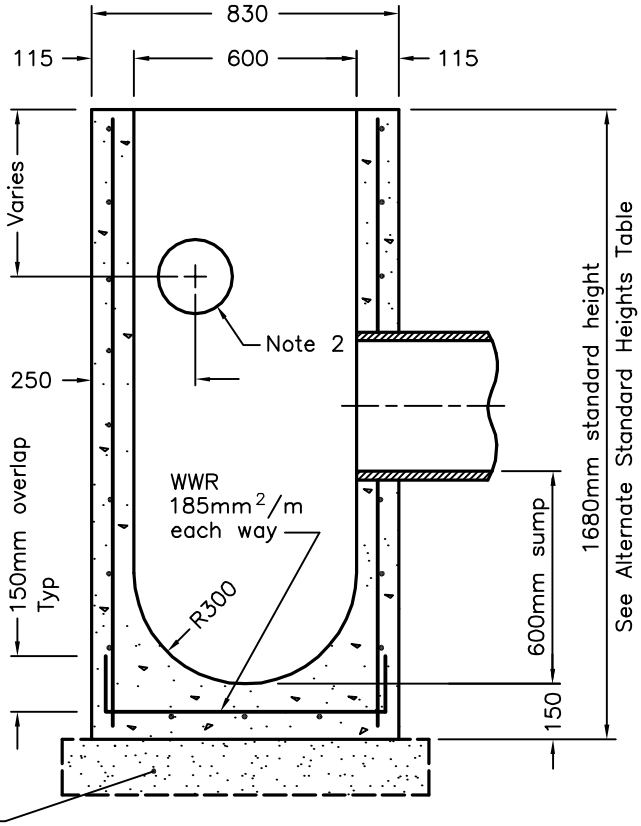
ALTERNATE STANDARD HEIGHTS	
ALTERNATIVE	DIMENSION
A	1980
B	1830
C	1520
D	1380



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.

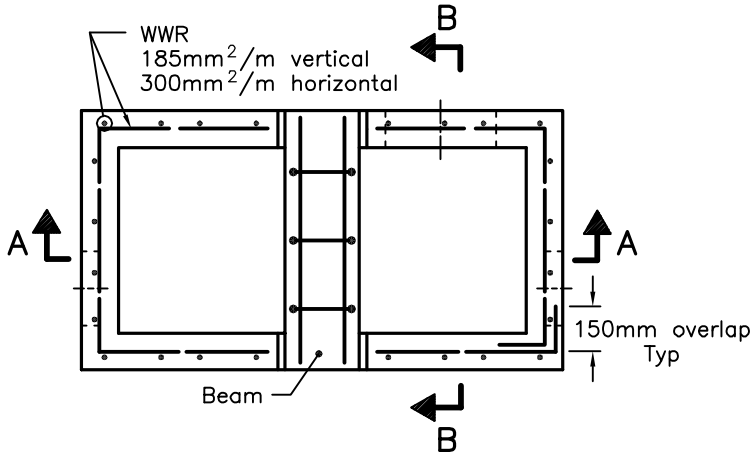
F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 3

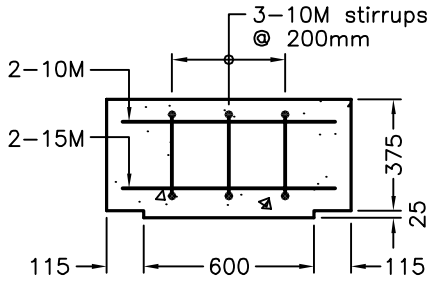
PRECAST CONCRETE CATCH BASIN

600x600mm

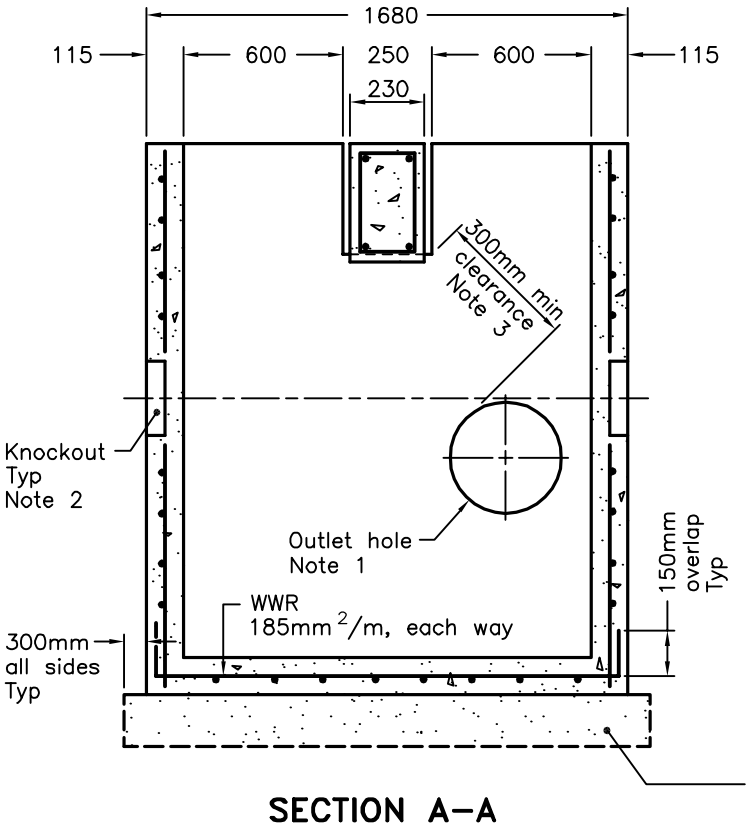
OPSD 705.010



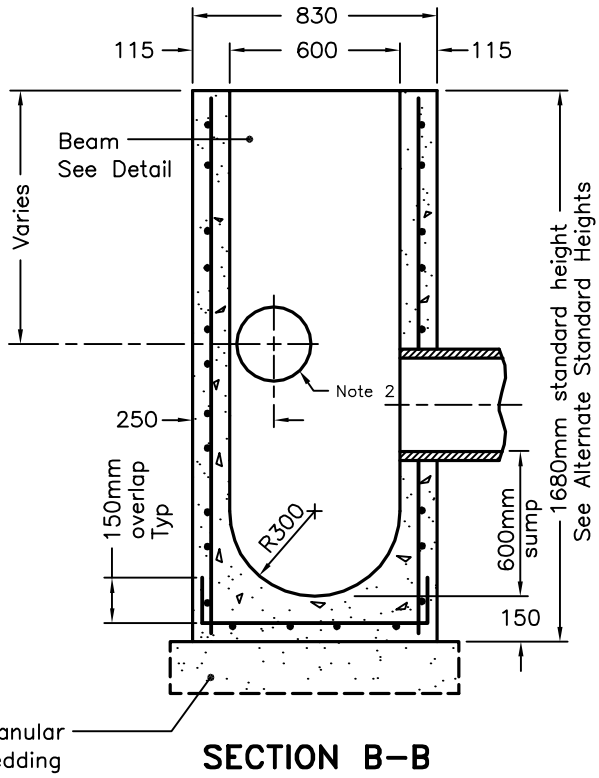
PLAN



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

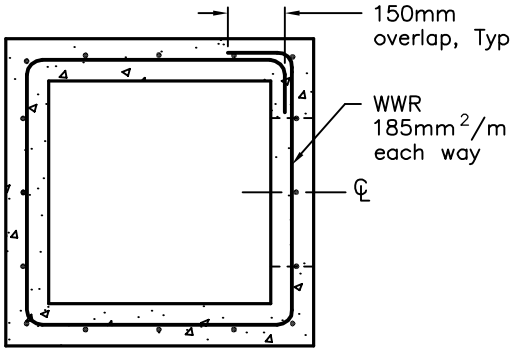
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 | Rev 3

PRECAST CONCRETE
TWIN INLET CATCH BASIN
600 x 1450mm

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

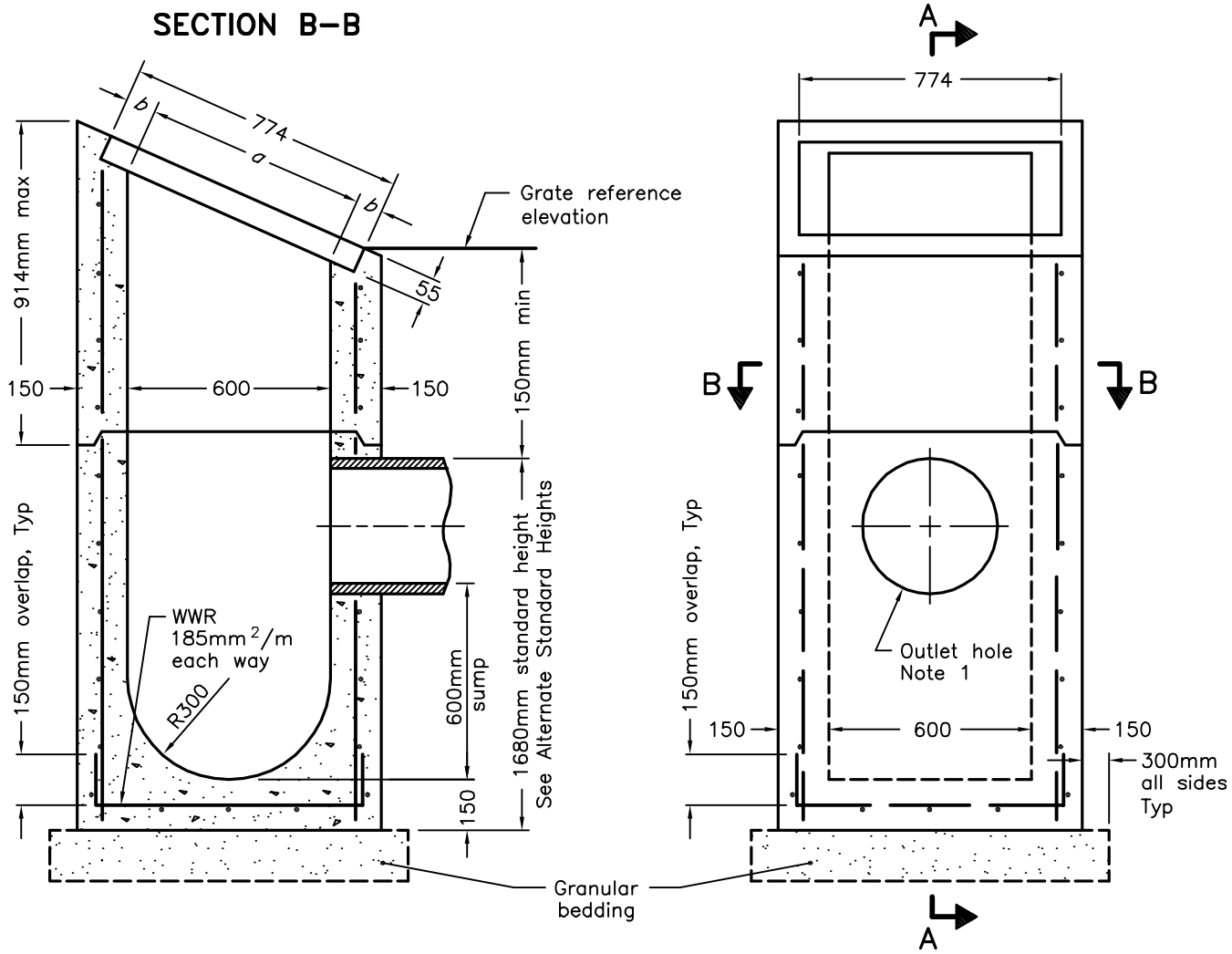
OPSD 705.020



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.

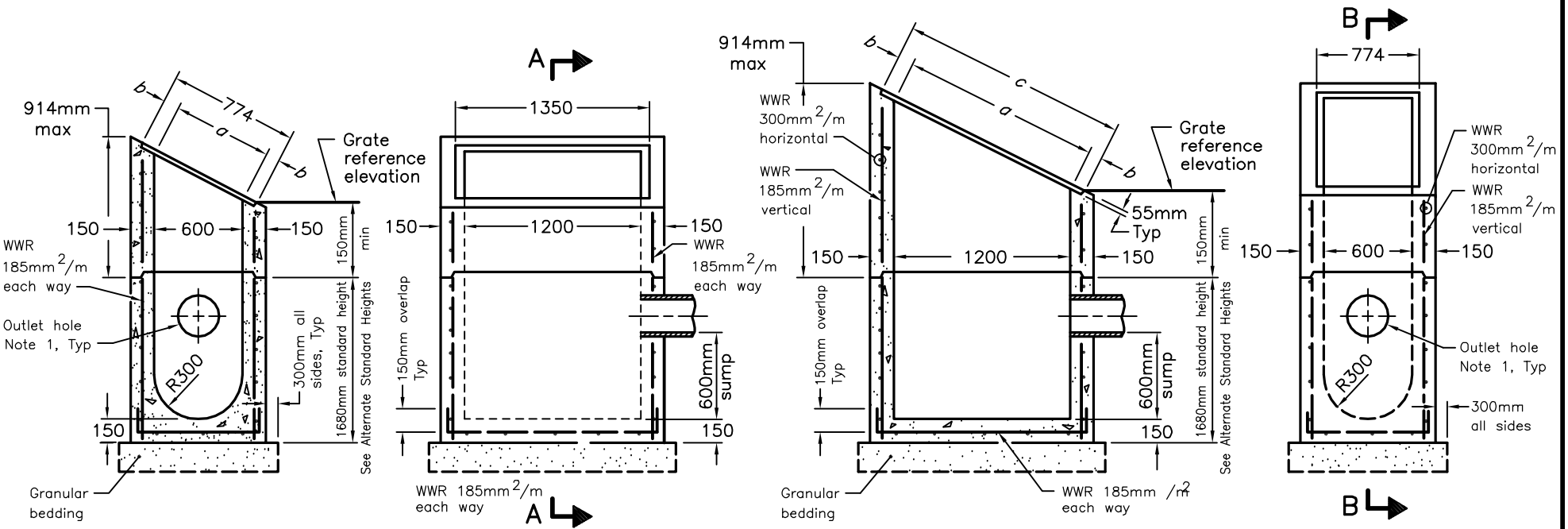
G All dimensions are in millimetres unless otherwise shown.

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.

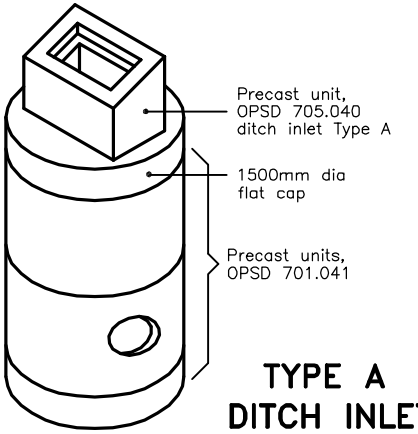
ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE DITCH INLETS

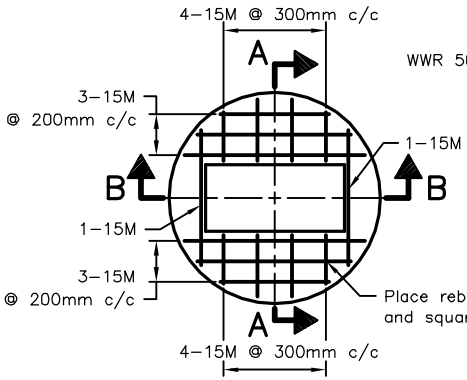
600 x 1200mm

Nov 2014 | Rev 3

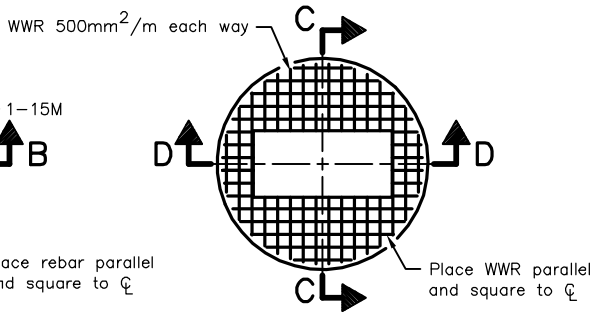
OPSD 705.040



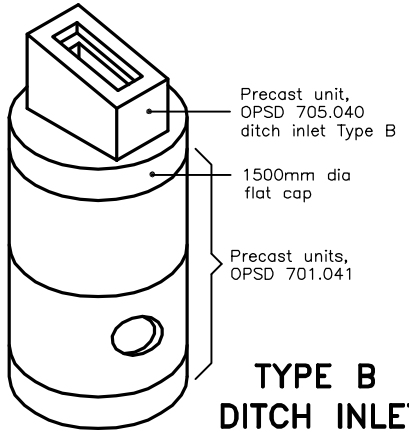
TYPE A DITCH INLET



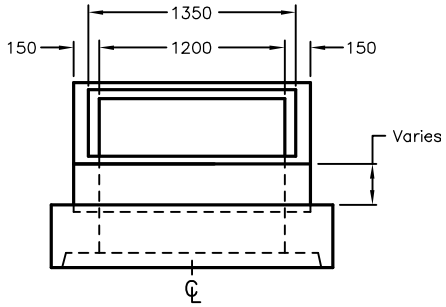
PLAN OF FLAT CAP WITH REINFORCING STEEL BARS



PLAN OF FLAT CAP WITH WWR



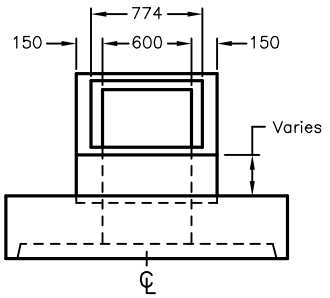
TYPE B DITCH INLET



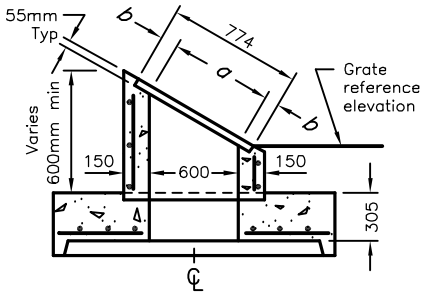
FRONT VIEW

Opening Dimensions			
Grate		*a*	*b*
Type	Slope		
B	2H:1V	670	52
	3H:1V	632	71
	4H:1V	618	78
	Horizontal	600	87

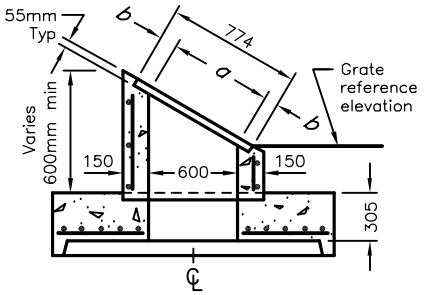
Opening Dimensions				
Grate		*a*	*b*	*c*
Type	Slope			
C	2H:1V	1341	66	1473
	3H:1V	1265	104	1473
	4H:1V	1237	118	1473
B	6H:1V	1216	65	1346
	Horizontal	1200	73	1346



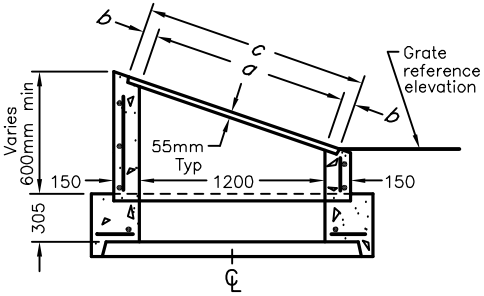
FRONT VIEW



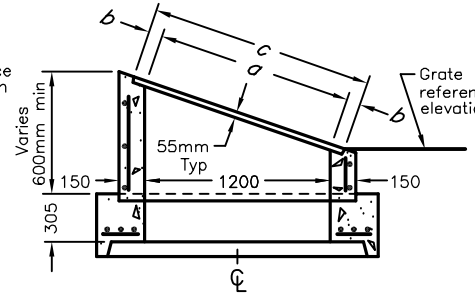
SECTION A–A



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.

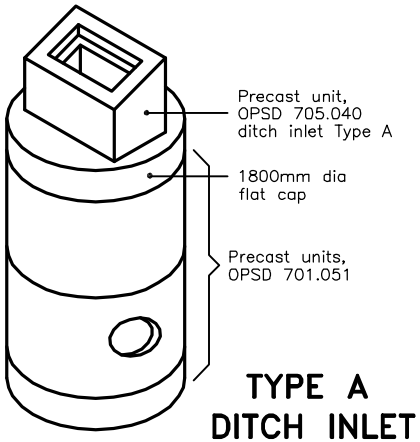
ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE DITCH INLETS 600x1200mm WITH 1500mm DIAMETER FLAT CAP

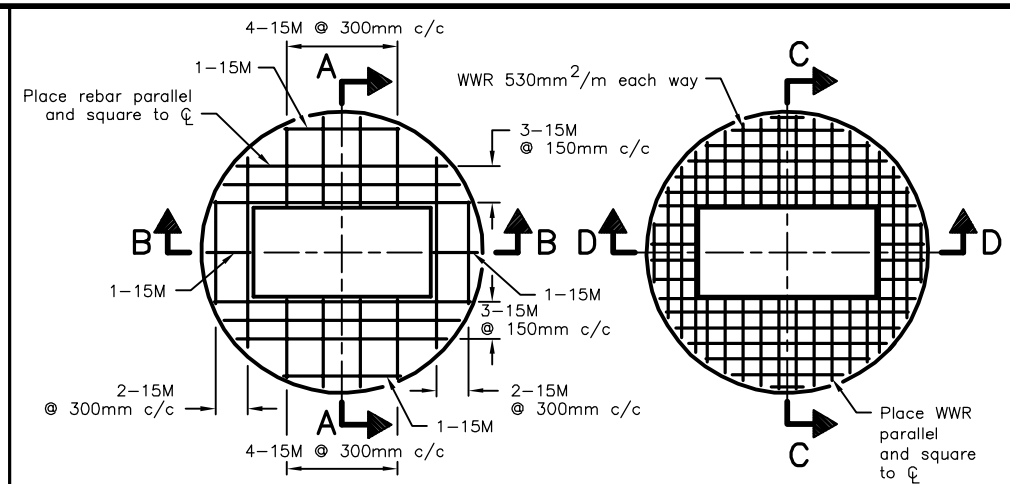
Nov 2014 | Rev 3

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 706.010

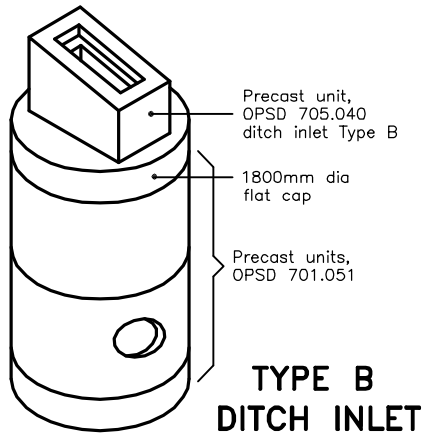


TYPE A DITCH INLET

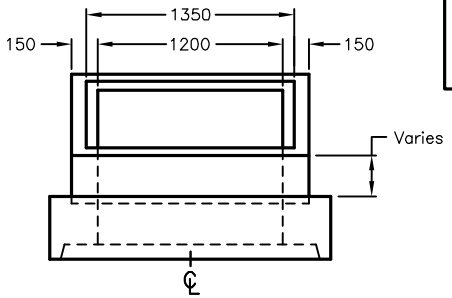


PLAN OF FLAT CAP WITH REINFORCING STEEL BARS

PLAN OF FLAT CAP WITH WWR



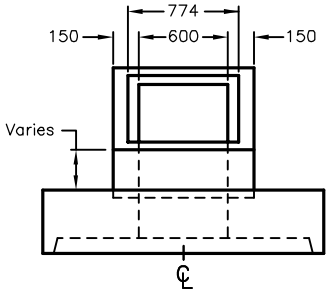
TYPE B DITCH INLET



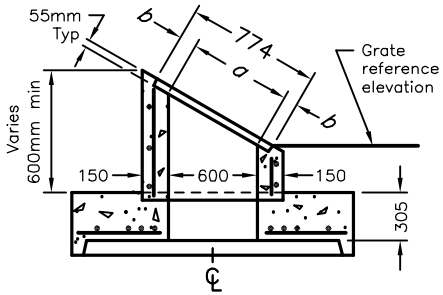
FRONT VIEW

Opening Dimensions			
Grate		*a*	*b*
Type	Slope		
B	2H:1V	670	52
	3H:1V	632	72
	4H:1V	618	79
	Horizontal	600	87

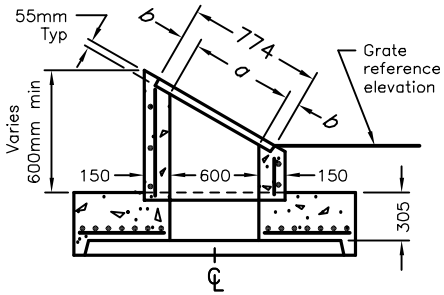
Opening Dimensions				
Grate		*a*	*b*	*c*
Type	Slope			
C	2H:1V	1341	66	1473
	3H:1V	1265	104	1473
	4H:1V	1237	118	1473
B	6H:1V	1216	65	1346
	Horizontal	1200	73	1346



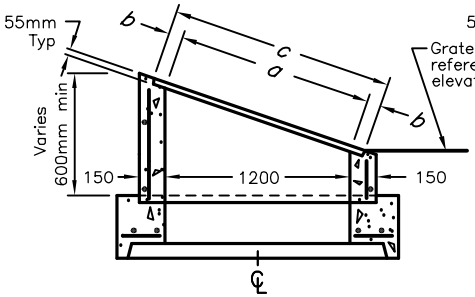
FRONT VIEW



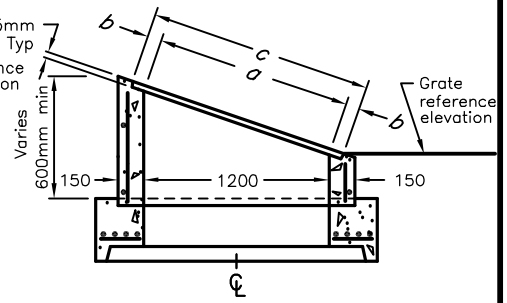
SECTION A–A



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.

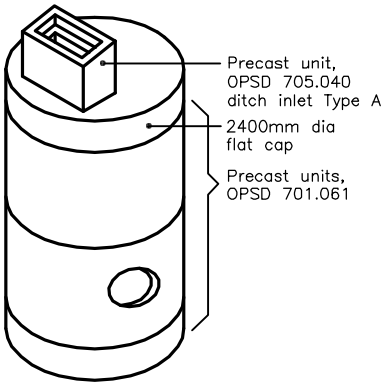
ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE DITCH INLETS 600x1200mm WITH 1800mm DIAMETER FLAT CAP

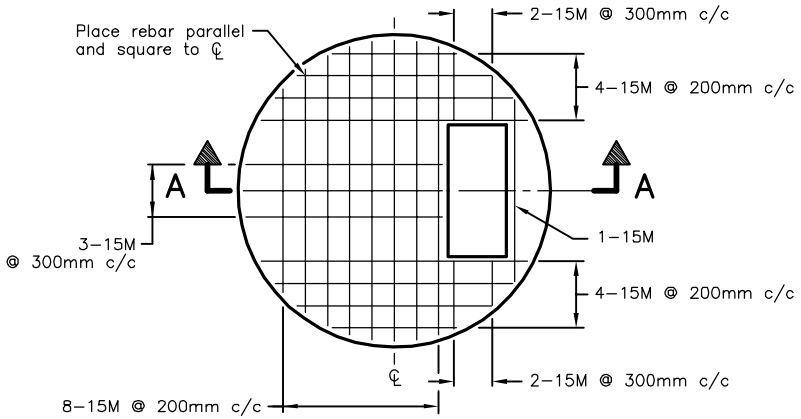
Nov 2014 | Rev 3

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

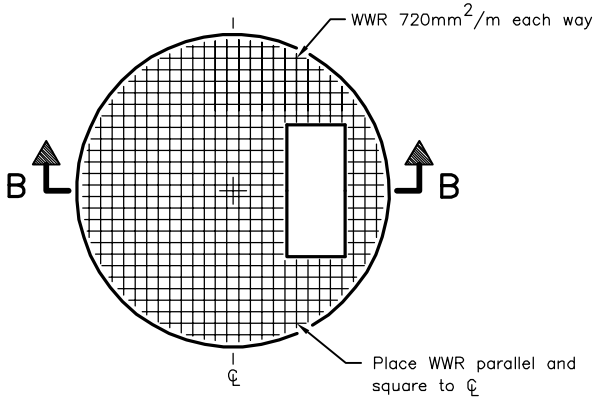
OPSD 706.020



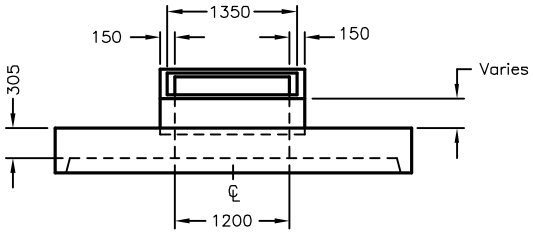
TYPE A DITCH INLET



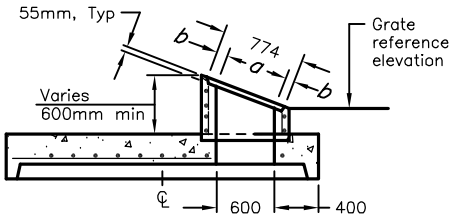
PLAN OF FLAT CAP WITH REINFORCING STEEL BARS



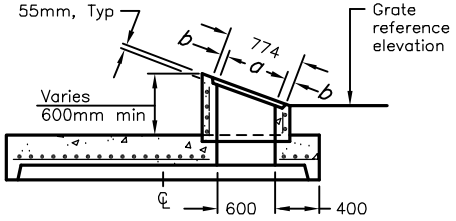
PLAN OF FLAT CAP WITH WWR



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.

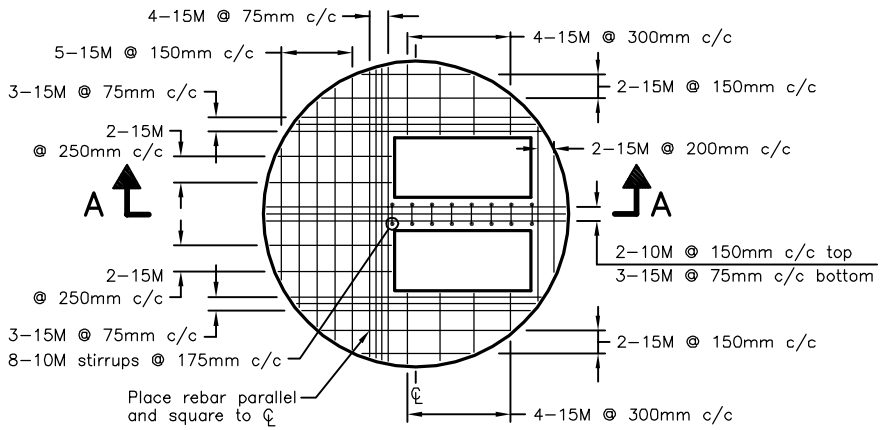
ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE DITCH INLET – TYPE A 600x1200mm WITH 2400mm DIAMETER FLAT CAP

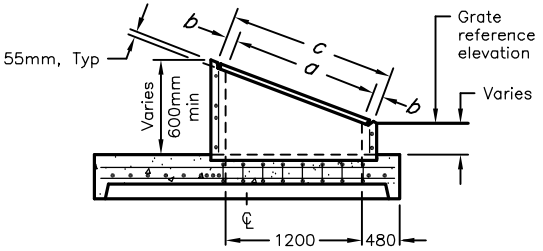
Nov 2014 | Rev 3

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSD

OPSD 706.030

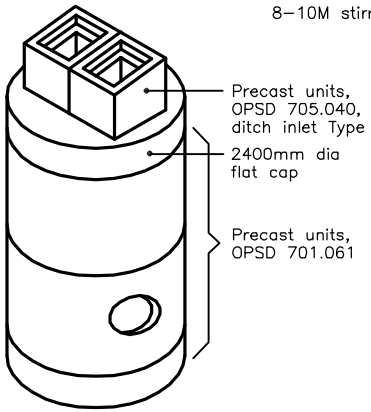


PLAN OF FLAT CAP WITH REINFORCING STEEL BARS

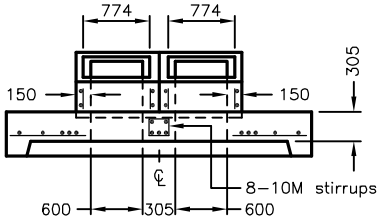


SECTION A–A

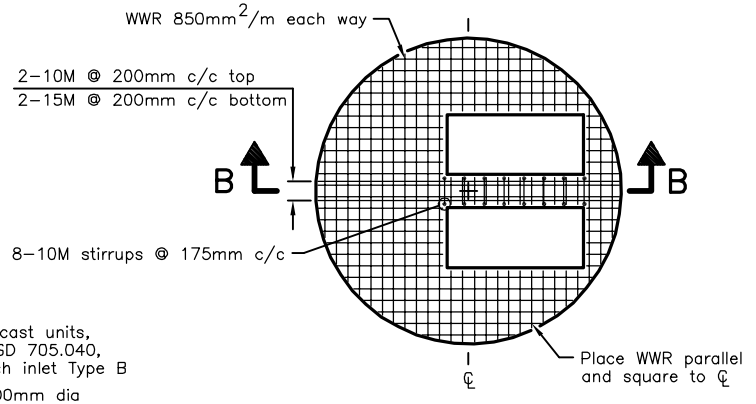
Opening Dimensions				
Grate		*a*	*b*	*c*
Type	Slope			
C	2H:1V	1341	66	1473
	3H:1V	1265	104	1473
	4H:1V	1237	118	1473
B	6H:1V	1216	65	1346
	Horizontal	1200	73	1346



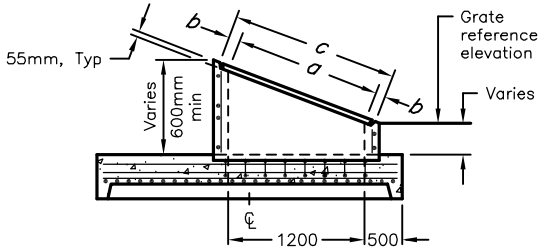
TYPE B DITCH INLET



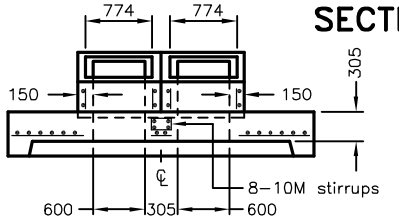
FRONT VIEW OF FLAT CAP WITH REINFORCING STEEL BARS



PLAN OF FLAT CAP WITH WWR AND REINFORCING STEEL BARS



SECTION B–B



FRONT VIEW OF FLAT CAP WITH WWR

NOTES:

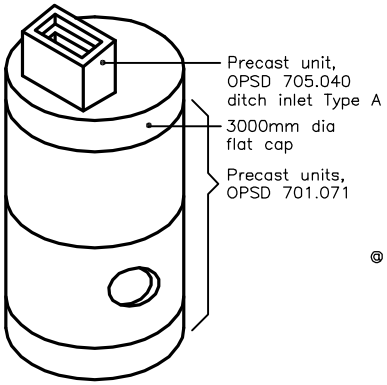
A Where inlet is placed across ditch and is accessible to vehicular traffic, grating slope shall be 6H:1V or flatter.
B All reinforcing steel shall have 25mm minimum cover.
C Grating shall be according to OPSD 403.010.
D All dimensions are nominal.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

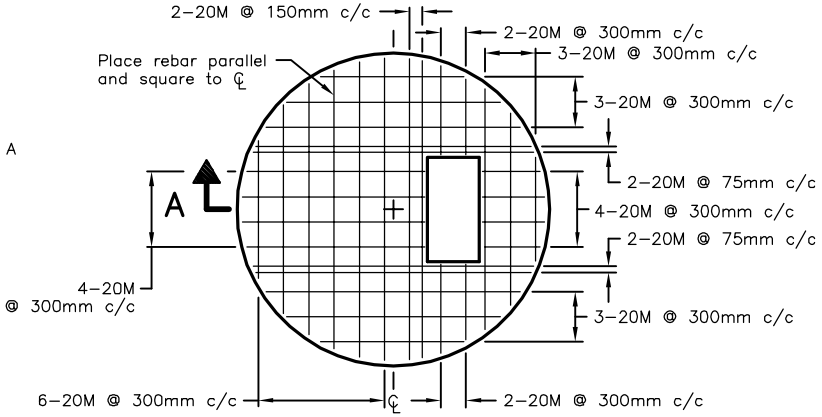
PRECAST CONCRETE DITCH INLET – TYPE B 600x1200mm WITH 2400mm DIAMETER FLAT CAP

Nov 2014 | Rev 2

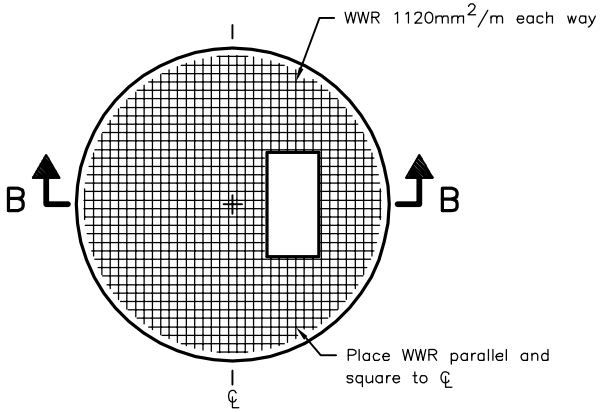
OPSD 706.031



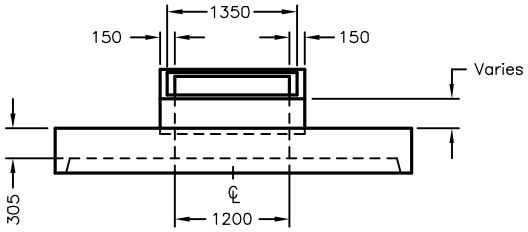
TYPE A
DITCH INLET



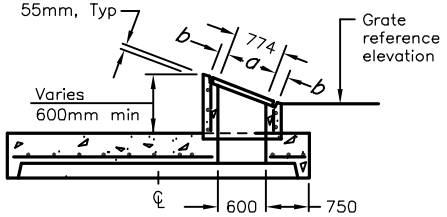
PLAN OF FLAT CAP
WITH REINFORCING STEEL BARS



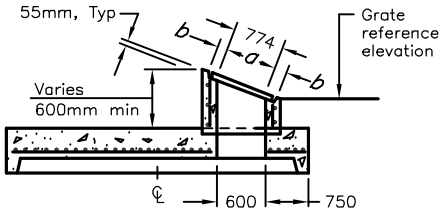
PLAN OF FLAT CAP
WITH WWR



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.

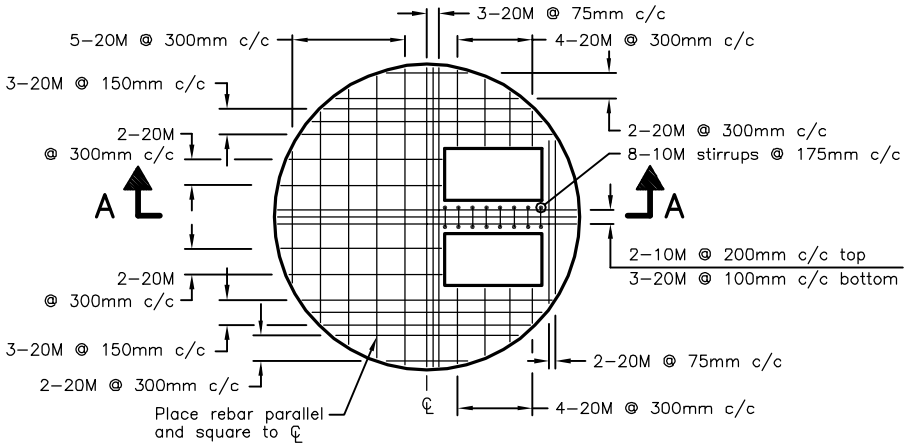
ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE DITCH INLET – TYPE A
600x1200mm
WITH 3000mm DIAMETER FLAT CAP

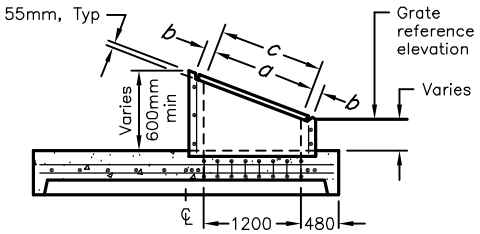
Nov 2014 | Rev 3

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

OPSD 706.040

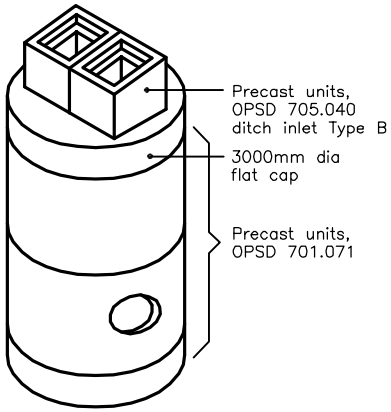


PLAN OF FLAT CAP WITH REINFORCING STEEL BARS

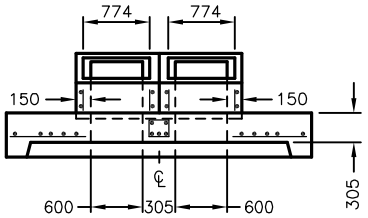


SECTION A–A

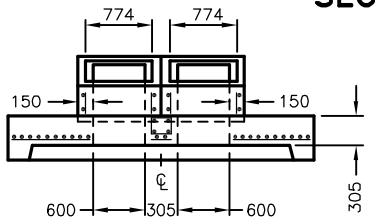
Opening Dimensions				
Grate		*a*	*b*	*c*
Type	Slope			
C	2H:1V	1341	66	1473
	3H:1V	1265	104	1473
	4H:1V	1237	118	1473
B	6H:1V	1216	65	1346
	Horizontal	1200	73	1346



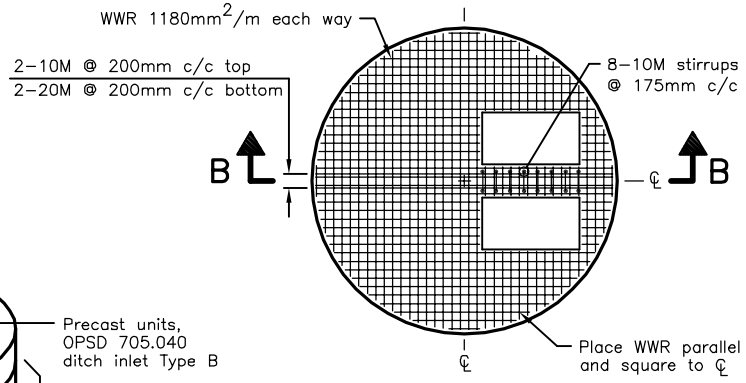
TYPE B DITCH INLET



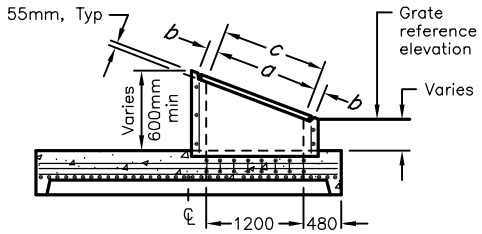
FRONT VIEW WITH REINFORCING STEEL BARS



FRONT VIEW WITH WWF



PLAN OF FLAT CAP WITH WWR



SECTION B–B

NOTES:

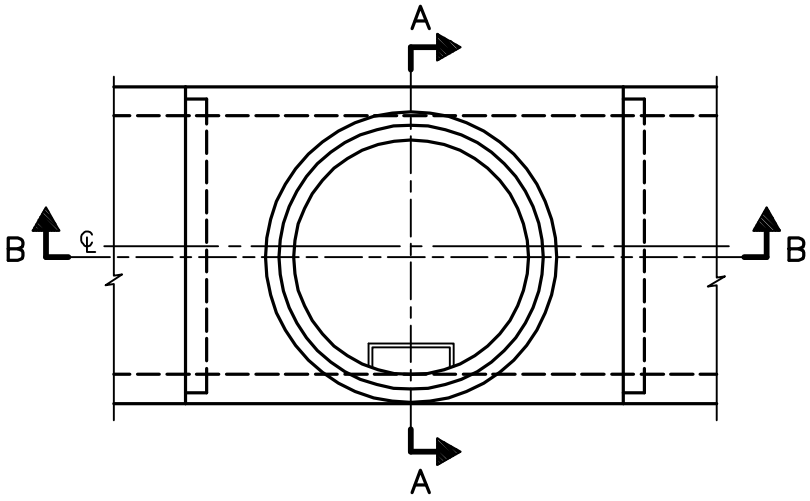
A Where inlet is placed across ditch and is accessible to vehicular traffic, grating slope shall be 6H:1V or flatter.
B All reinforcing steel shall have 25mm minimum cover.
C Grating shall be according to OPSD 403.010.
D All dimensions are nominal.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

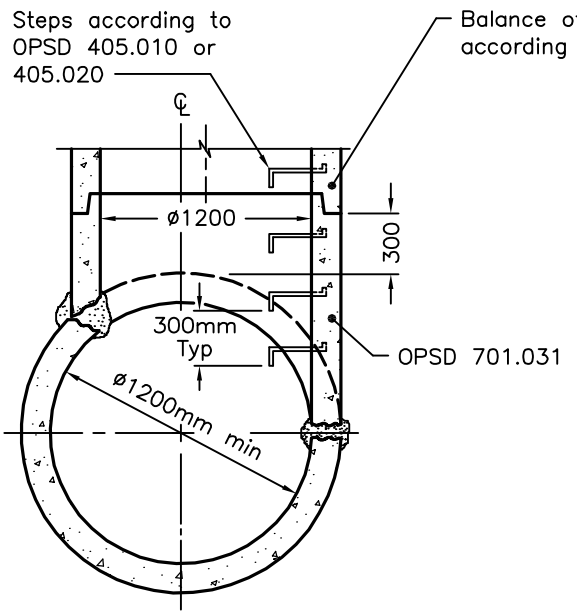
PRECAST CONCRETE DITCH INLET – TYPE B 600x1200mm WITH 3000mm DIAMETER FLAT CAP

Nov 2014 | Rev 2

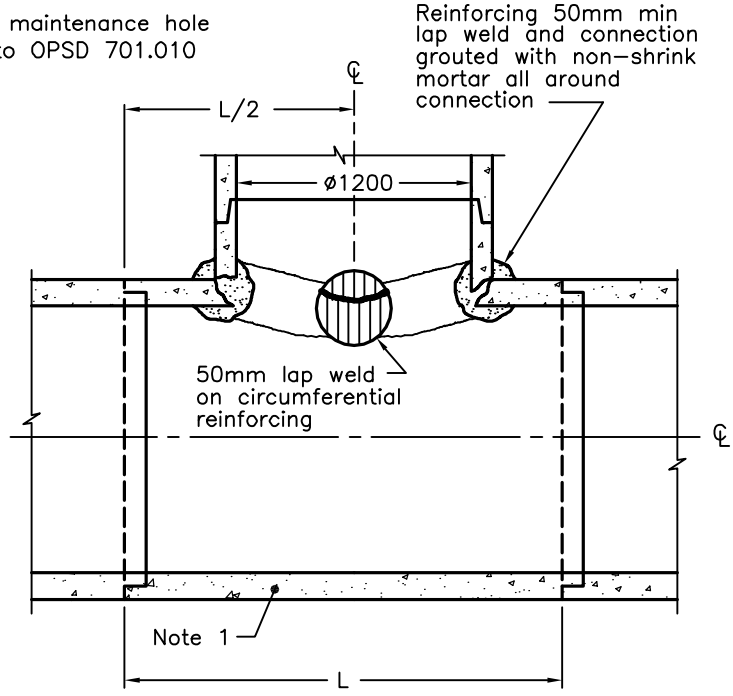
OPSD 706.041



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.

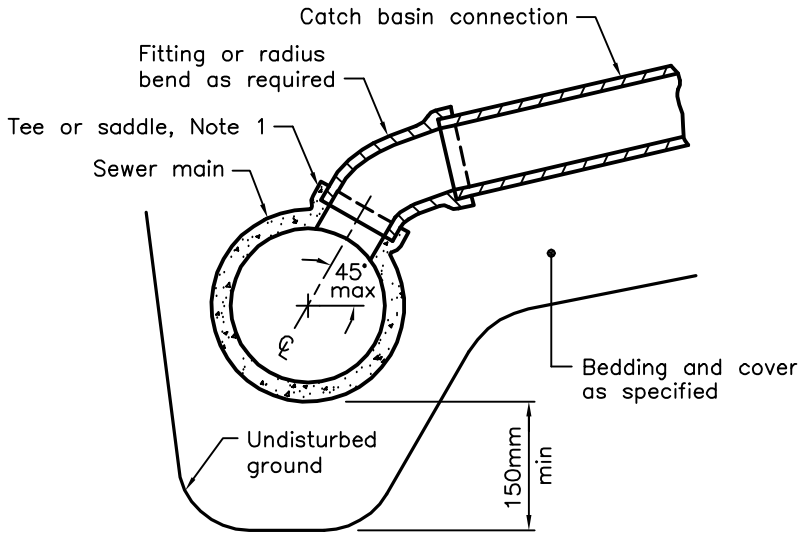
E All dimensions are nominal.

F All dimensions are in millimetres unless otherwise shown.

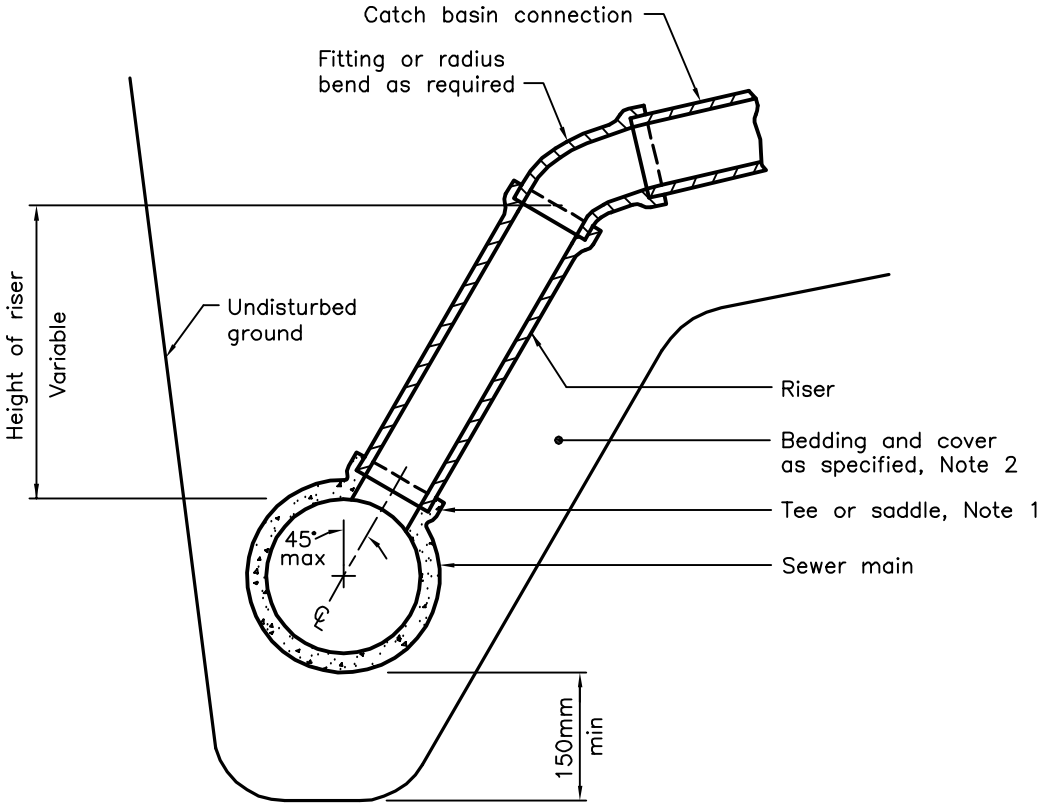
LEGEND:

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.

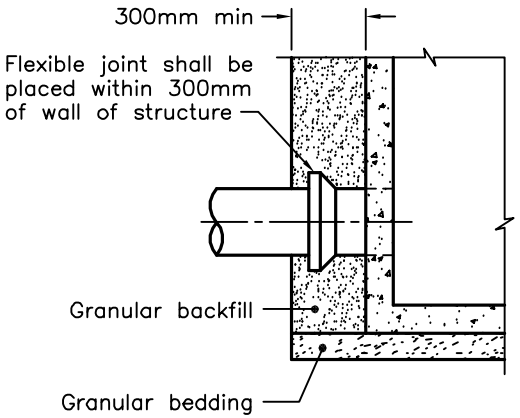
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

CATCH BASIN CONNECTION FOR RIGID MAIN PIPE SEWER

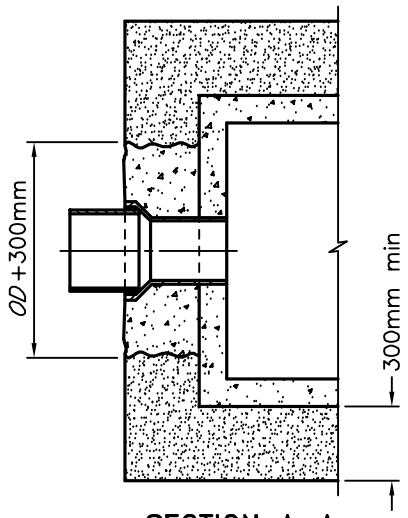
Nov 2011 | Rev 2

OPSD 708.010

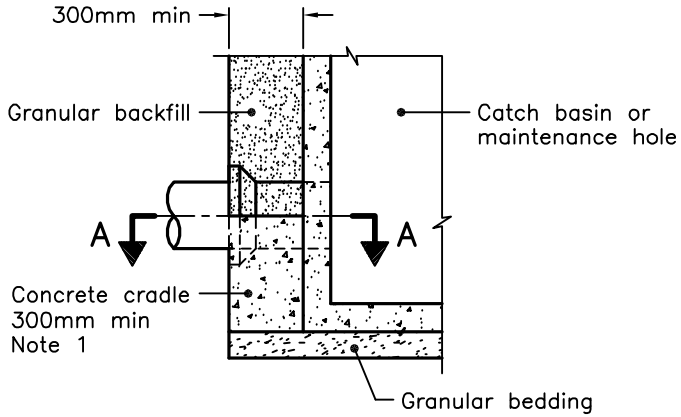


ELEVATION

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.

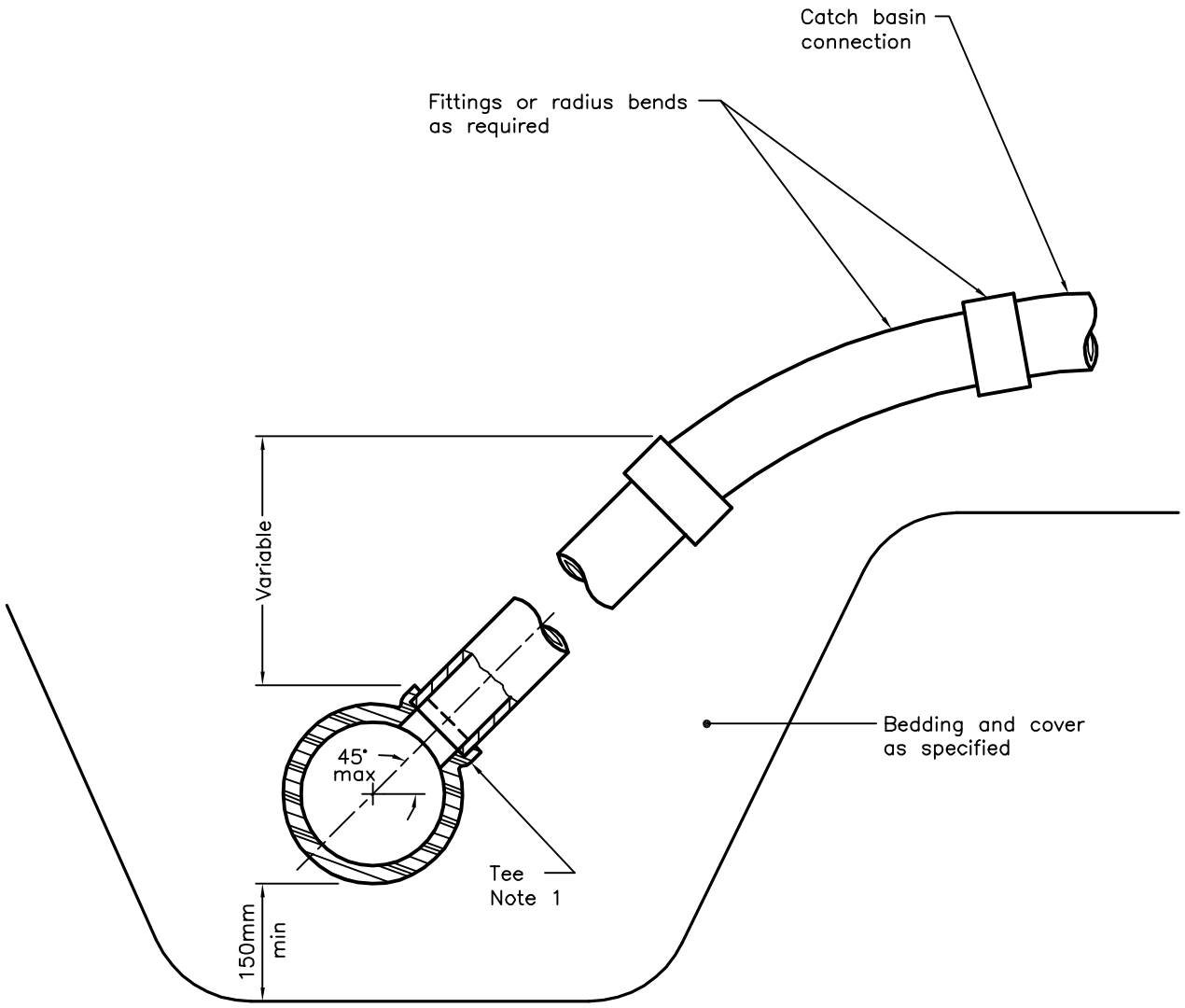
FLEXIBLE, WATERTIGHT CONNECTOR
RIGID AND FLEXIBLE PIPE

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	Nov 2011	Rev	3
SUPPORT FOR PIPE AT CATCH BASIN OR MAINTENANCE HOLE			
	OPSD 708.020		



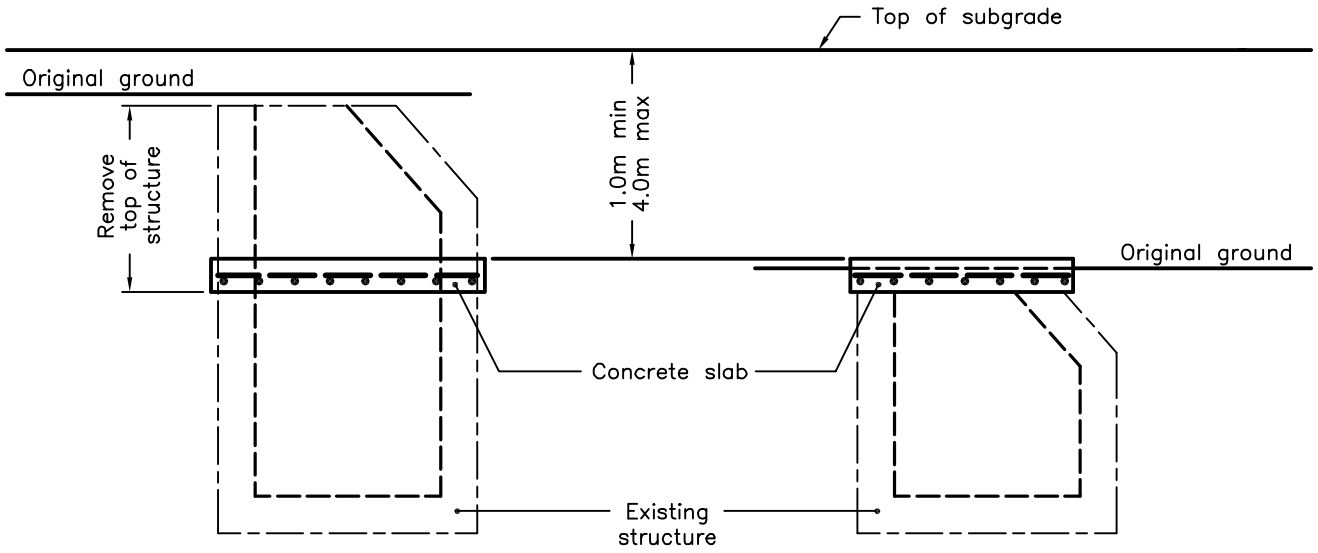
NOTES:

1 For catch basin connections 300mm in diameter or less, factory made tees shall be used.

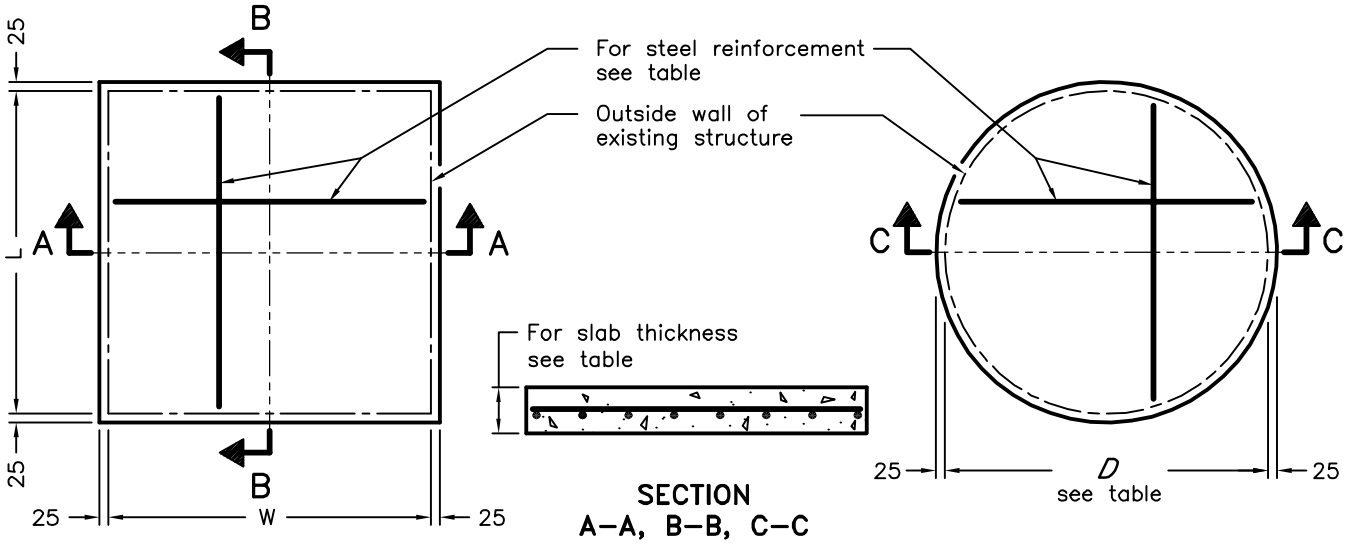
A For catch basin connections greater than 300mm, maintenance holes shall be used at the main sewer.

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

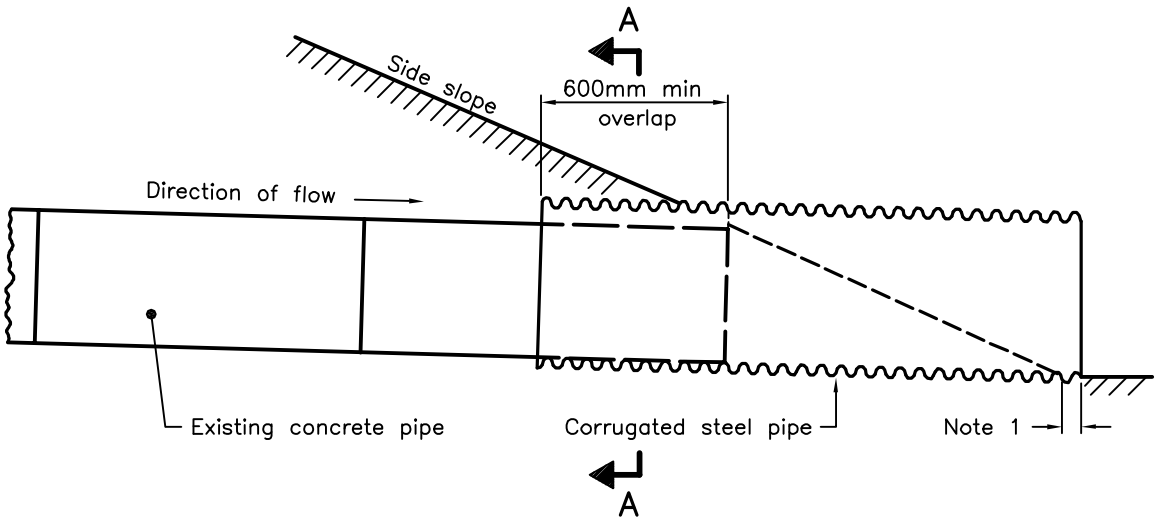
NOTES:

A Class of concrete: 30MPa at 28 Days.

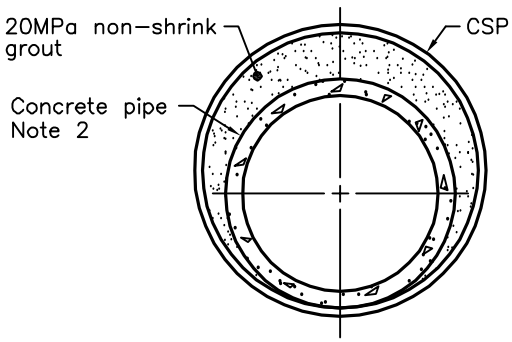
B Clear cover for steel reinforcement: 60mm±20mm.

C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	3
CAPPING EXISTING STRUCTURES 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:

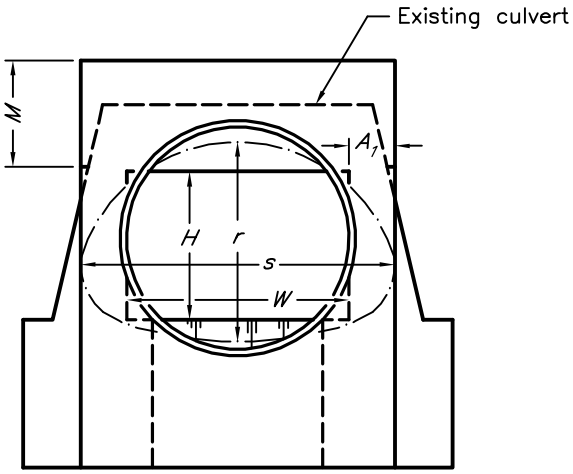
1 Extend pipe beyond the toe of slope as specified.

2 Outside surface of concrete pipe shall be thoroughly scrubbed to ensure proper bond.

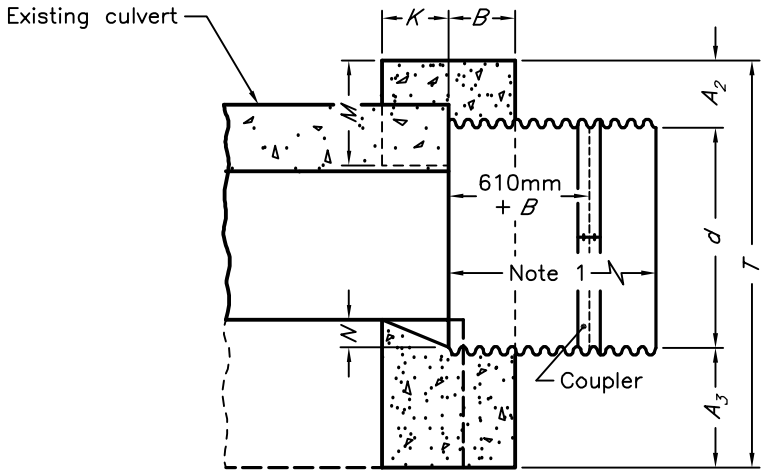
A Bedding and backfill as specified.

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 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

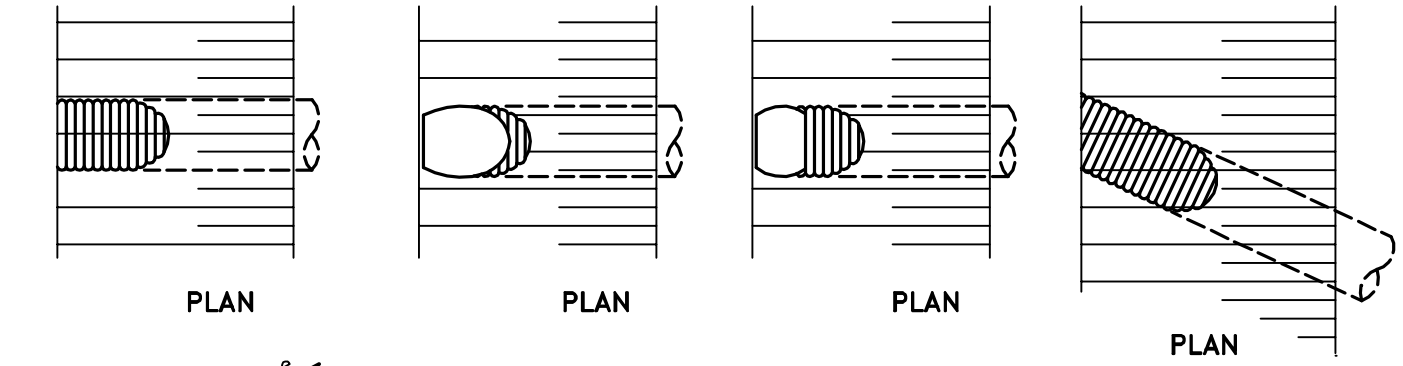
CONCRETE RIGID FRAME BOX AND OPEN CULVERT EXTENSIONS USING CORRUGATED STEEL PIPE

TEMPORARY CONDITIONS

Nov 2012 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

OPSD 800.011



SQUARE END END FINISH

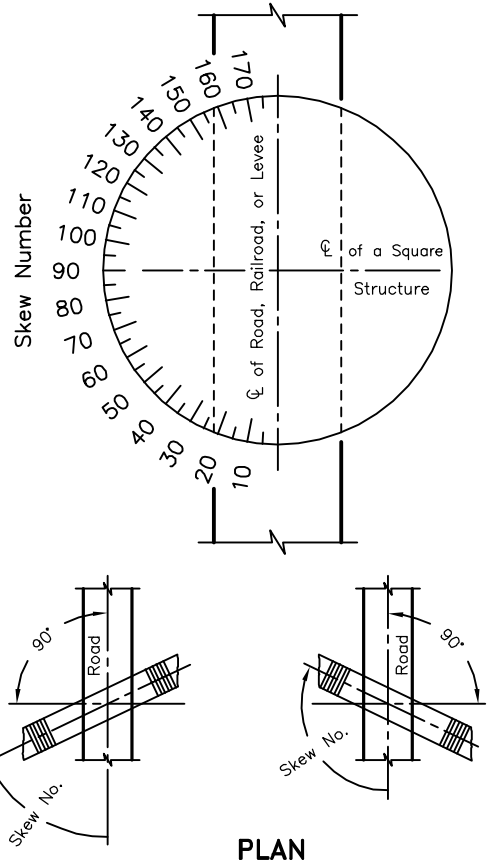
ALL TYPES CORRUGATED STEEL PIPE

PARTIAL BEVEL NOTE 1

STEP–BEVEL NOTE 1

SKEW END

END FINISH
STRUCTURAL PLATE CORRUGATED STEEL PIPE



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.

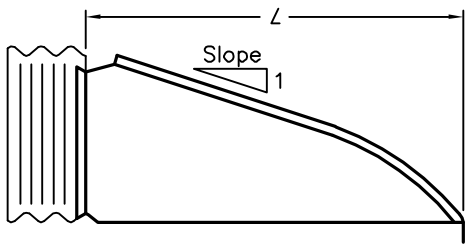
ONTARIO PROVINCIAL STANDARD DRAWING

CUT END FINISH
CIRCULAR PIPE AND PIPE–ARCH
CORRUGATED STEEL PIPE

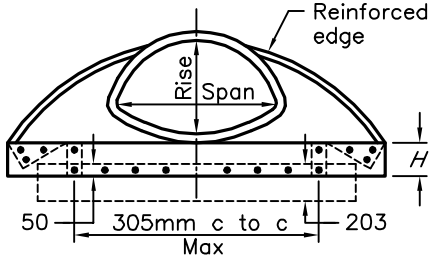
Nov 2012 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

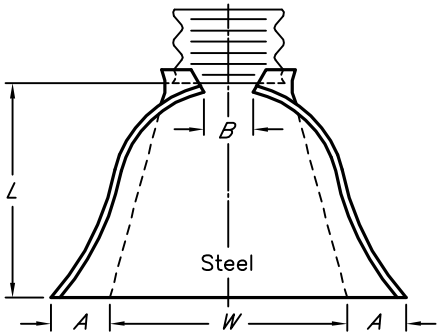
OPSD 801.010



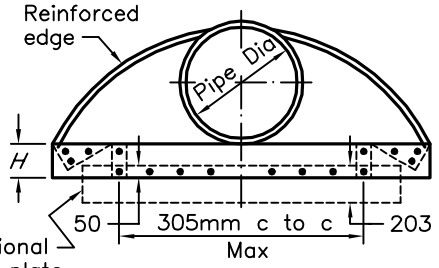
SIDE ELEVATION



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

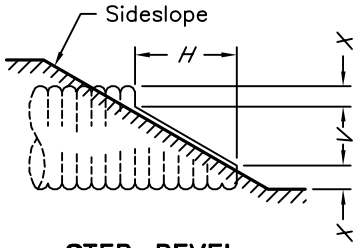
Nov 2012 | Rev 1

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

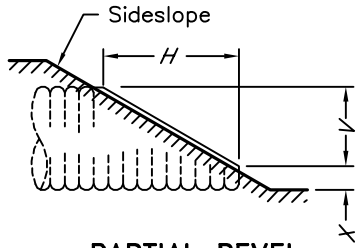
TABLE 2 – Partial Bevel and Step–Bevel for Pipe–Arch Structural Plate Pipe									
Span	Rise	*X*	*H* for bevels of			*V*	*Y* for bevels of		
			1.5H:1V	2H:1V	3H:1V		1.5H:1V	2H:1V	3H:1V
2060	1520	660	1290	1720	2580	860	—	—	—
2240	1630	660	1450	1940	2910	970	—	—	—
2440	1750	710	1560	2080	3050	1040	—	—	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.

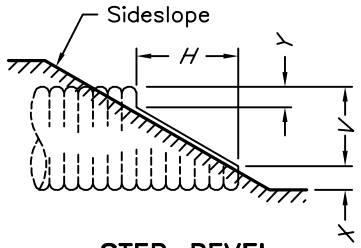


STEP–BEVEL

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 | Nov 2012 | Rev 2

BEVEL DETAILS
CIRCULAR AND PIPE–ARCH
STRUCTURAL PLATE CORRUGATED STEEL PIPE

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.

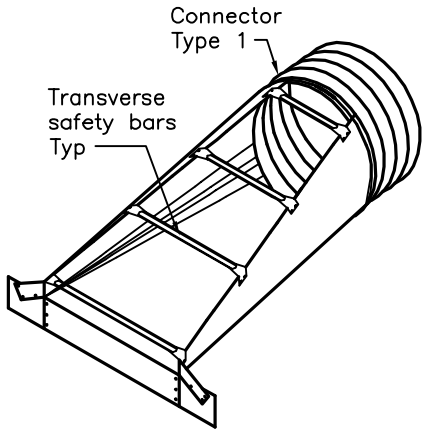
ONTARIO PROVINCIAL STANDARD DRAWING

CULVERT AND SEWER
SAFETY SLOPE END TREATMENT
NOTES AND TABLES

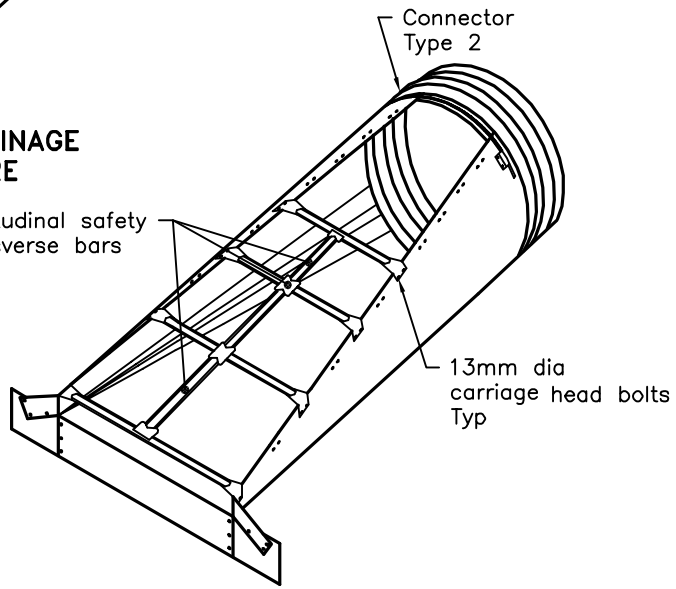
Nov 2012 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 801.040

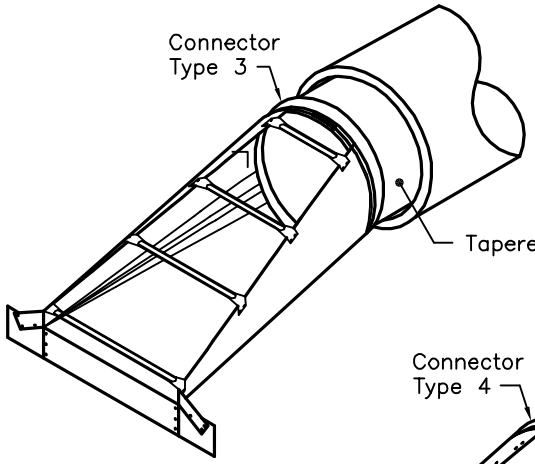


PARALLEL DRAINAGE STRUCTURE

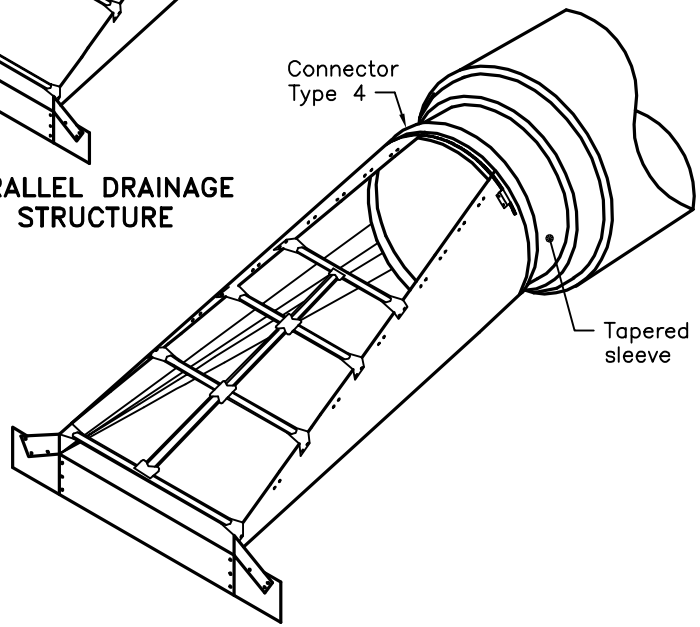


CROSS DRAINAGE STRUCTURE

CIRCULAR AND ARCHED CORRUGATED PIPES



PARALLEL DRAINAGE STRUCTURE



CROSS DRAINAGE STRUCTURE

CIRCULAR SMOOTH WALLED AND ELLIPTICAL PIPES

Concrete Pipe Shown

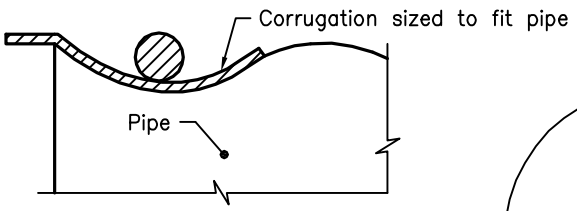
NOTES:

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.

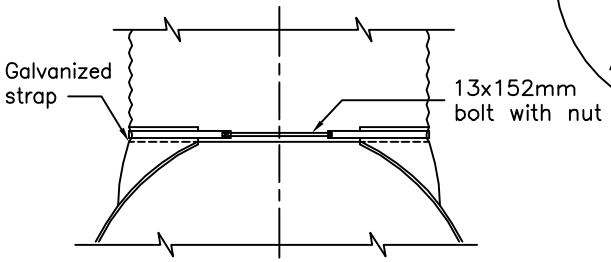
A This OPSD shall be read in conjunction with OPSD 801.040, 801.042, and 801.043.

B All dimensions are in millimetres unless otherwise shown.

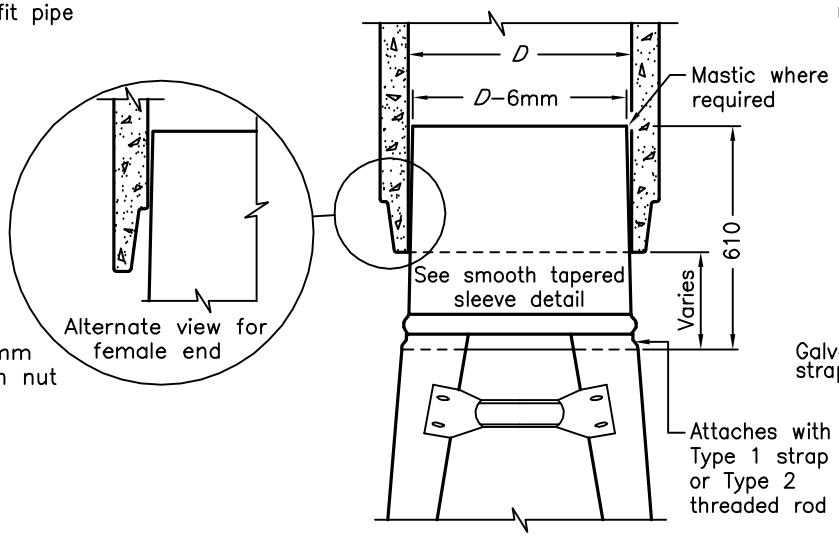
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
CULVERT AND SEWER SAFETY SLOPE END TREATMENT ASSEMBLY DETAILS			
	OPSD 801.041		



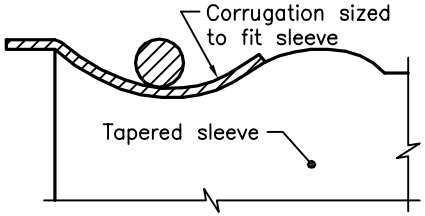
SECTION A–A



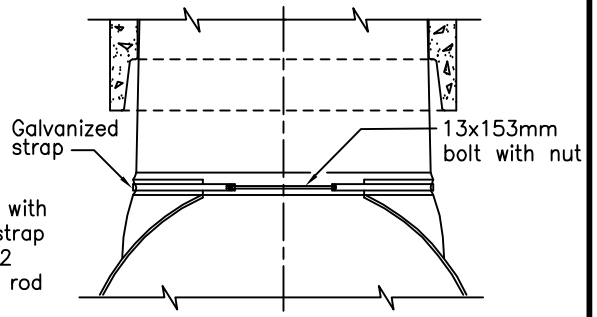
TYPE 1–CONNECTOR DETAIL



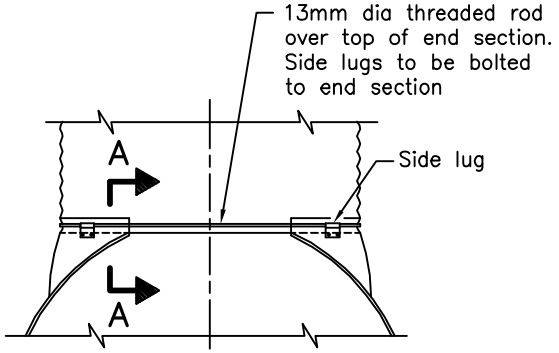
TAPERED SLEEVE FOR ATTACHING
STEEL END SECTIONS TO SMOOTH WALLED PIPE
Concrete Pipe Shown



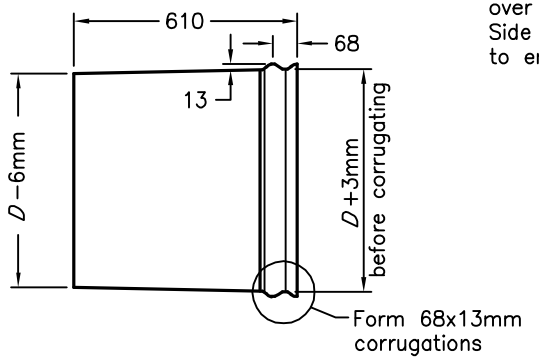
SECTION B–B



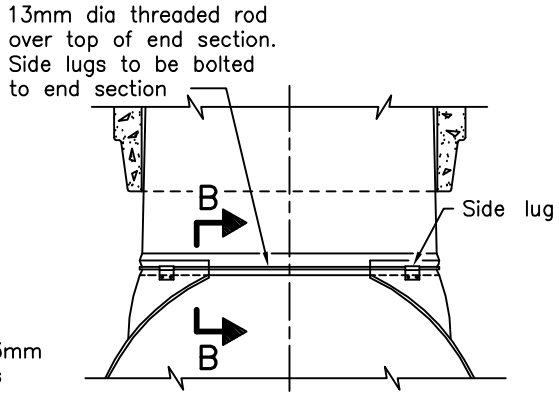
TYPE 3–CONNECTOR DETAIL



TYPE 2–CONNECTOR DETAIL



SMOOTH TAPERED SLEEVE DETAIL



TYPE 4–CONNECTOR DETAIL

CIRCULAR AND ARCHED CORRUGATED PIPES

CIRCULAR SMOOTH WALLED AND ELLIPTICAL PIPES

NOTES:

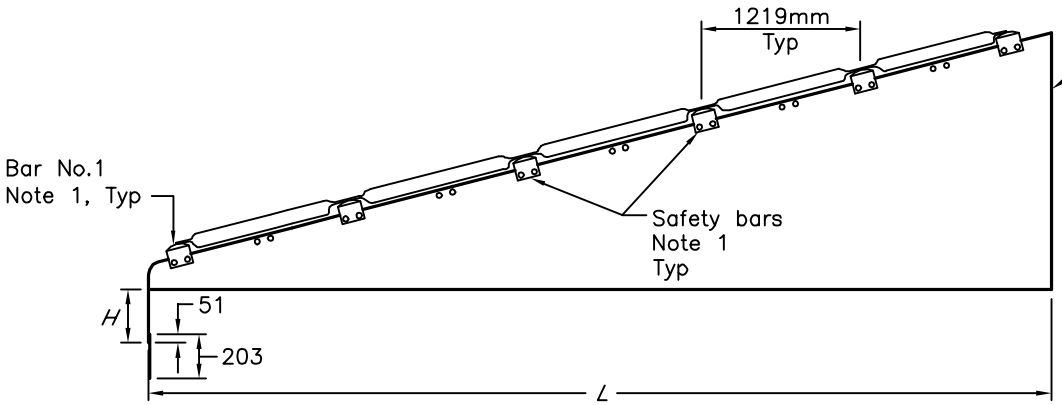
A This OPSD shall be read in conjunction with OPSD 801.040, 801.041, and 801.043.

B All dimensions are in millimetres unless otherwise shown.

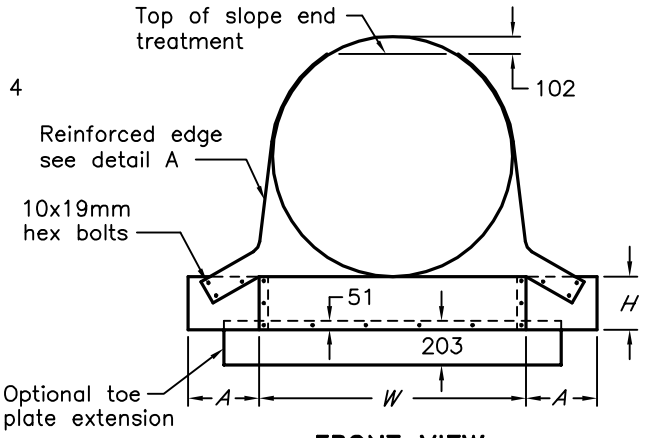
LEGEND:

D – Nominal pipe diameter

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
CULVERT AND SEWER SAFETY SLOPE END TREATMENT CONNECTION DETAILS			
			OPSD 801.042

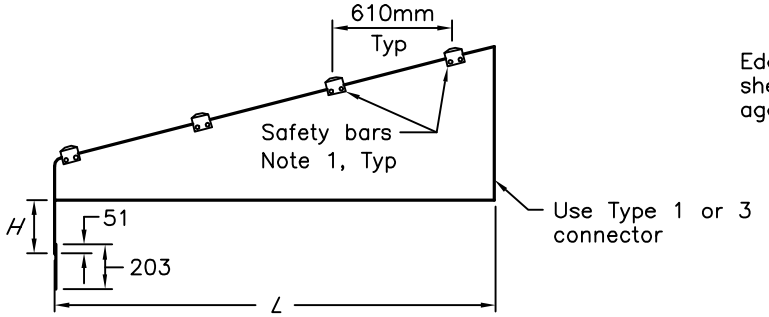


SIDE ELEVATION FOR CROSS DRAINAGE STRUCTURE

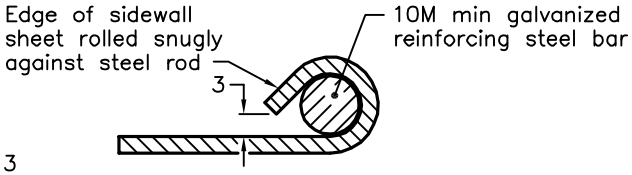


FRONT VIEW

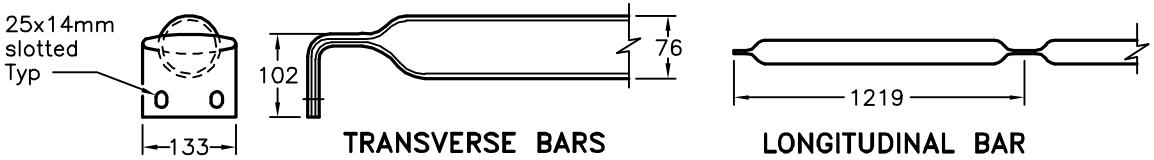
CIRCULAR SMOOTH WALLED PIPE



SIDE ELEVATION OF PARALLEL DRAINAGE STRUCTURE



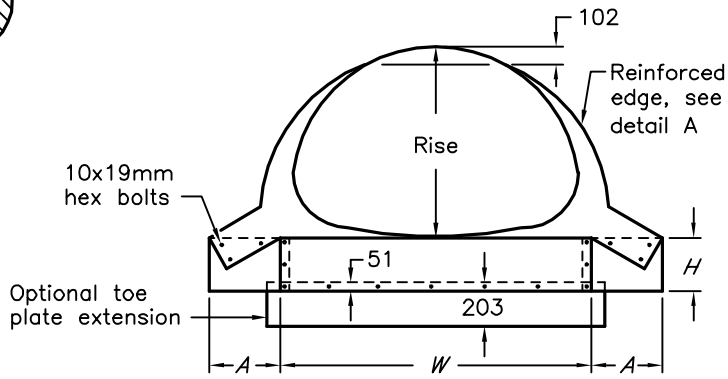
DETAIL A



TRANSVERSE BARS

LONGITUDINAL BAR

DETAIL OF SAFETY BARS



FRONT VIEW

ARCHED PIPE

NOTES:

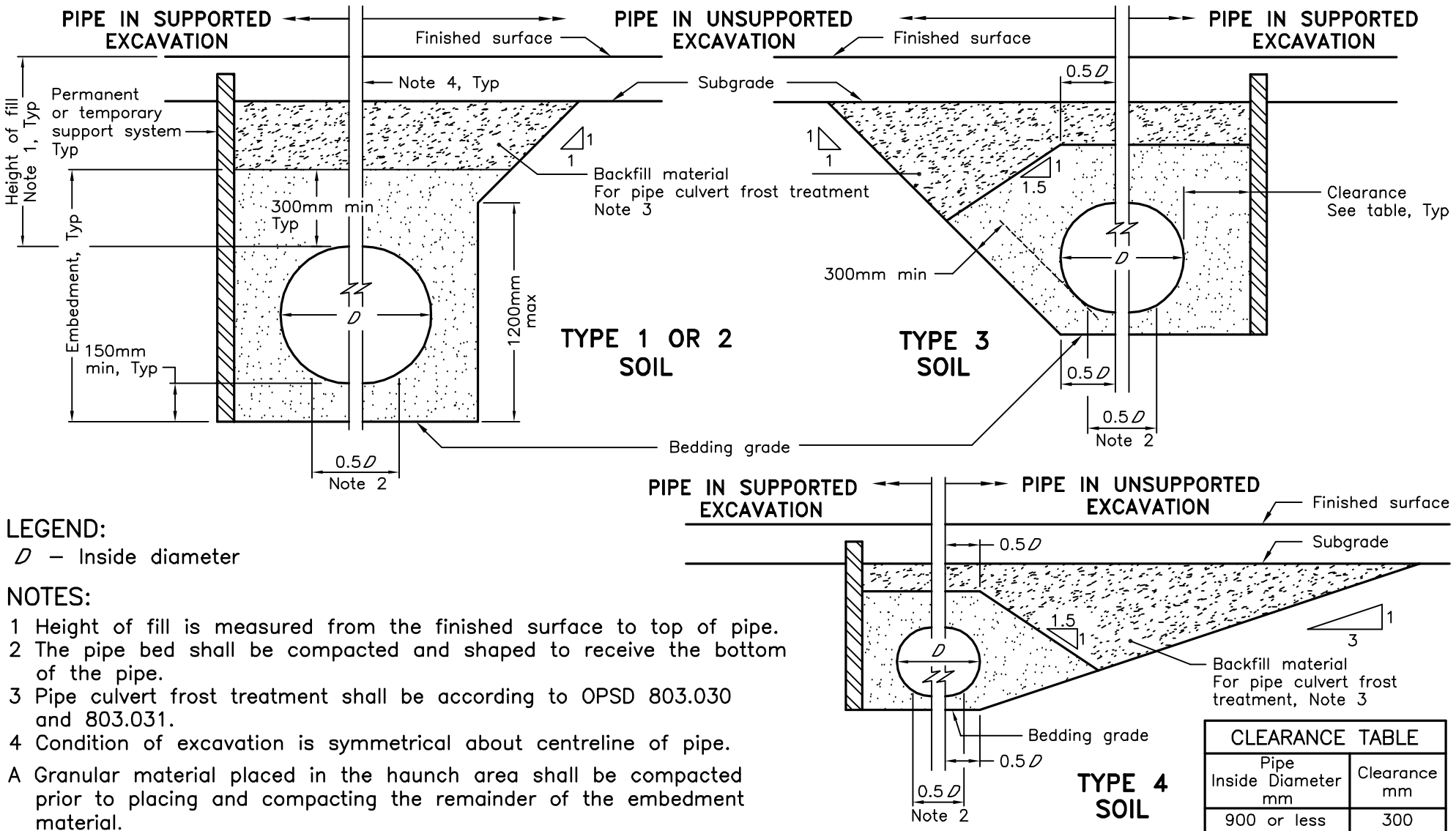
1 Number of bars required will vary depending on the length of the end section. Bar No.1 shall be located 150mm above flow line.

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 SAFETY SLOPE END TREATMENT 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.

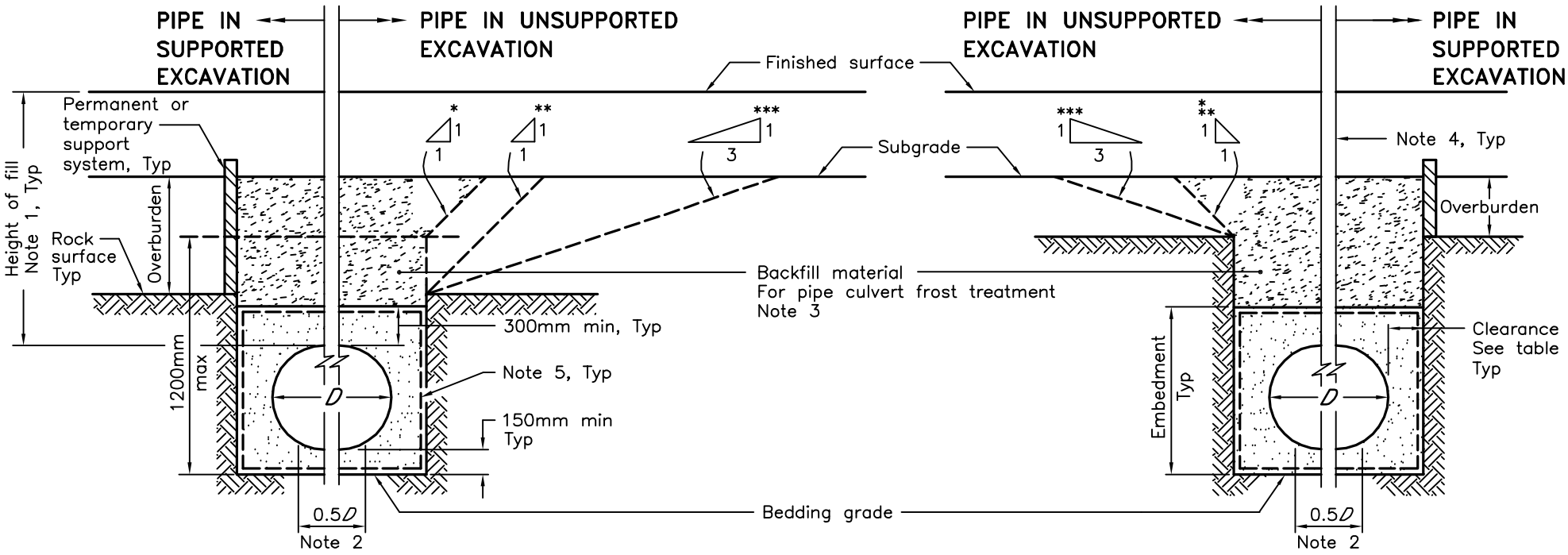
CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

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

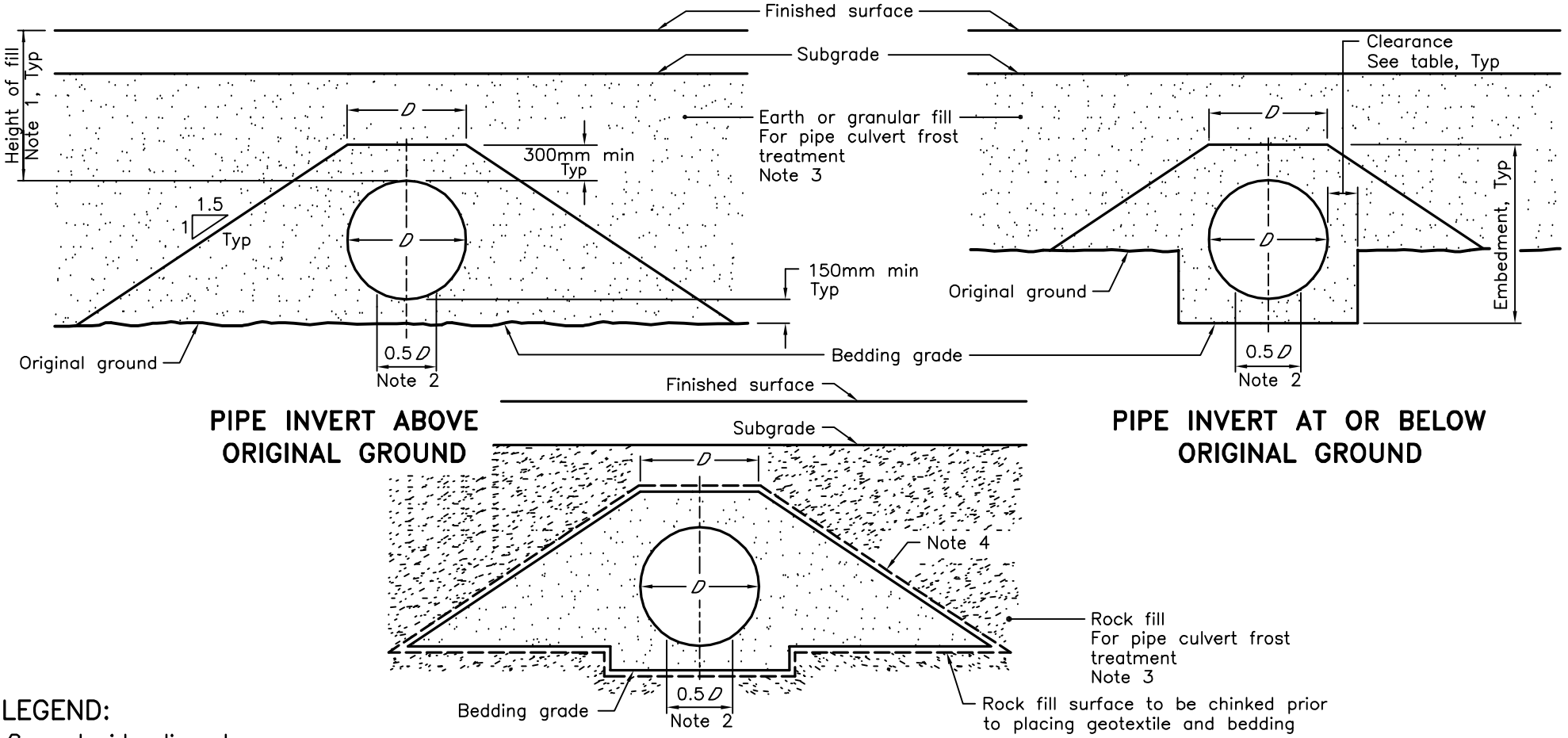
ONTARIO PROVINCIAL STANDARD DRAWING

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.

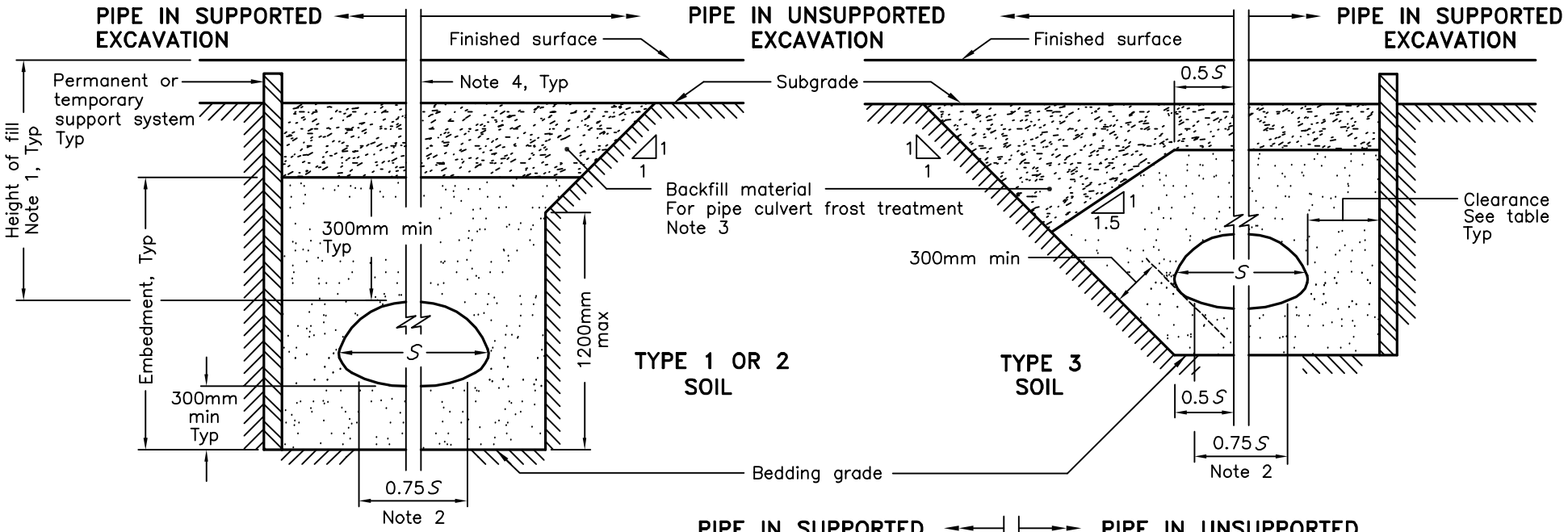
ONTARIO PROVINCIAL STANDARD DRAWING

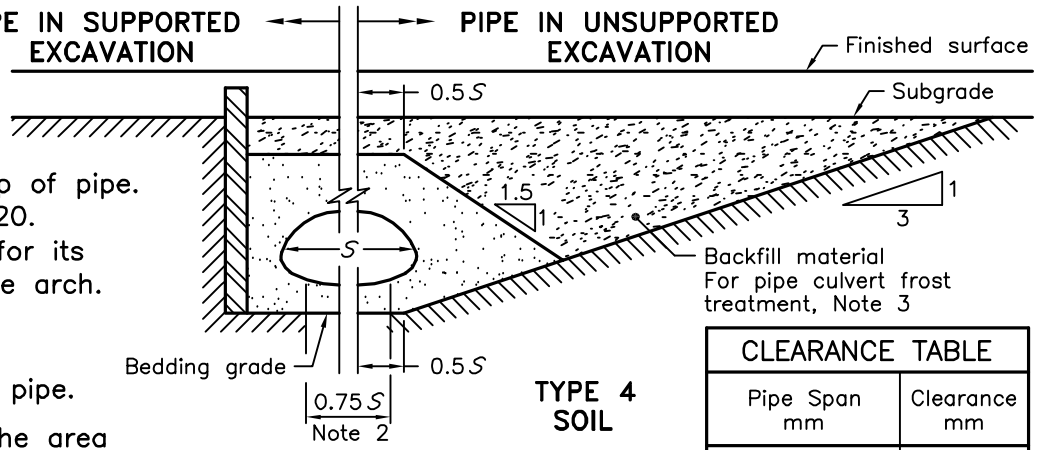
FLEXIBLE PIPE EMBEDMENT IN EMBANKMENT ORIGINAL GROUND: EARTH OR ROCK

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 0.75S, 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

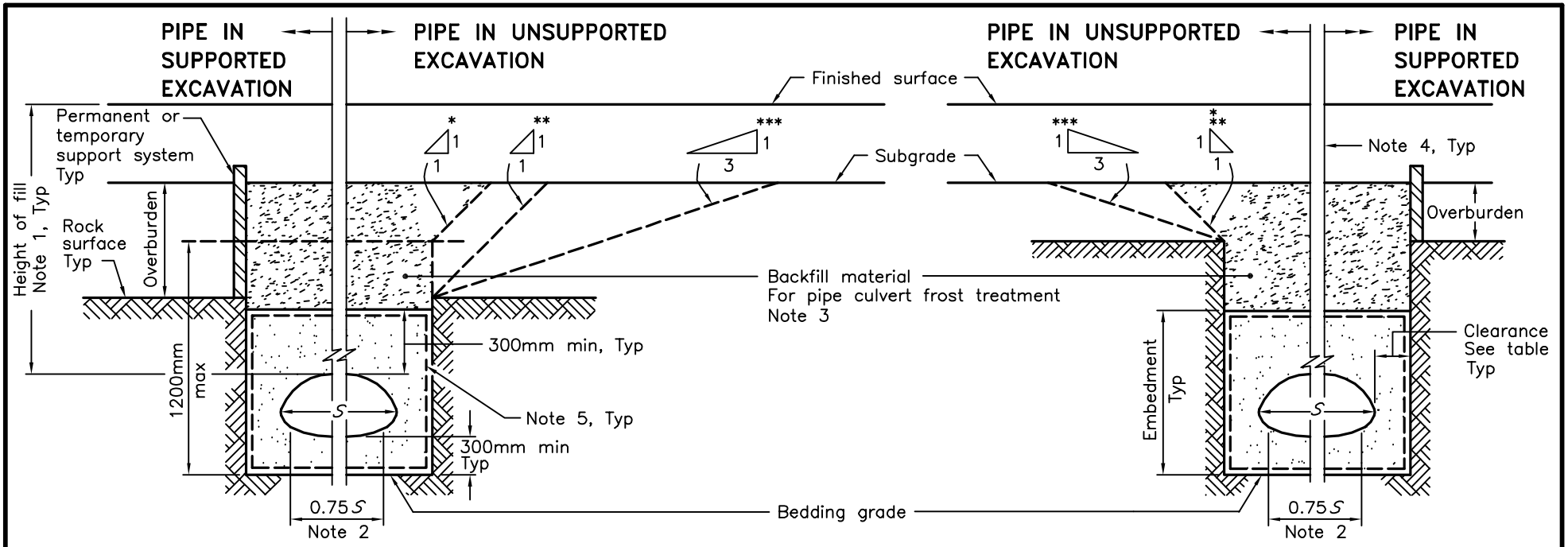
ONTARIO PROVINCIAL STANDARD DRAWING

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

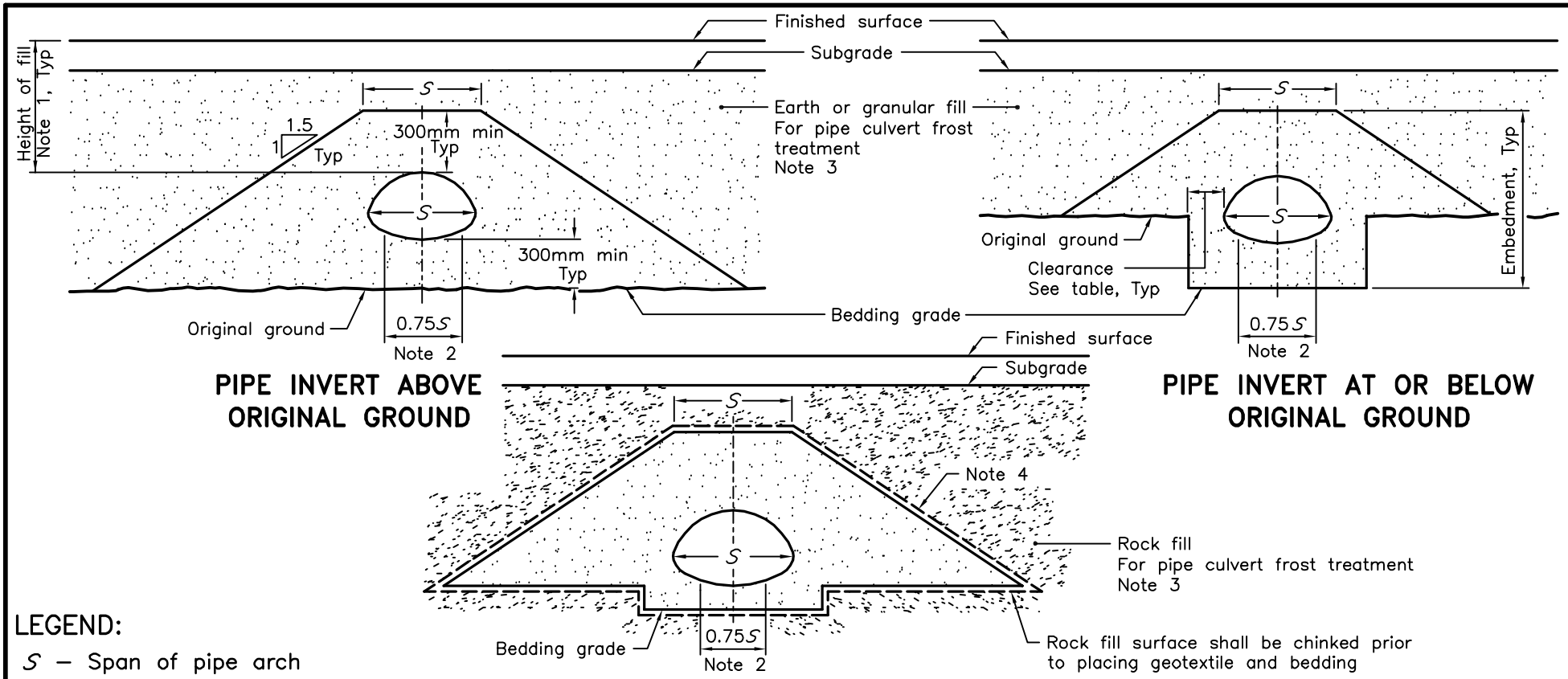
CLEARANCE TABLE	
Pipe Span mm	Clearance mm
900 or less	300
Over 900	500

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 0.75S, 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

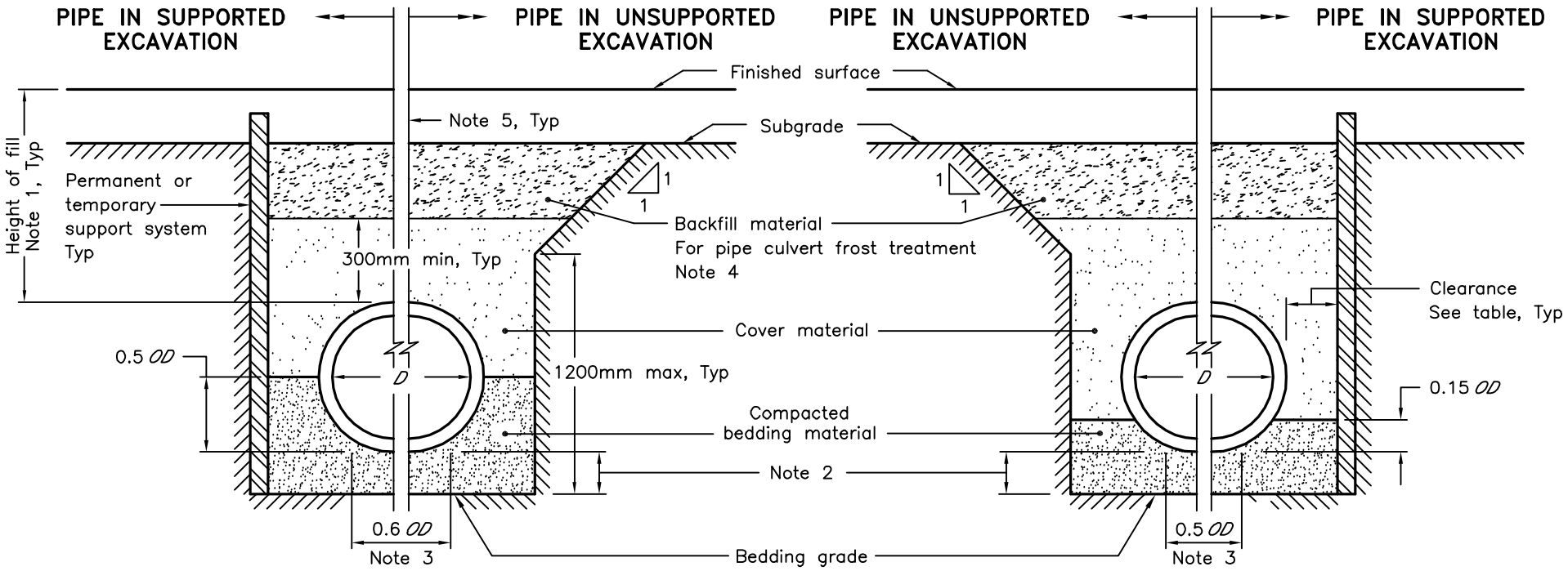
ONTARIO PROVINCIAL STANDARD DRAWING

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

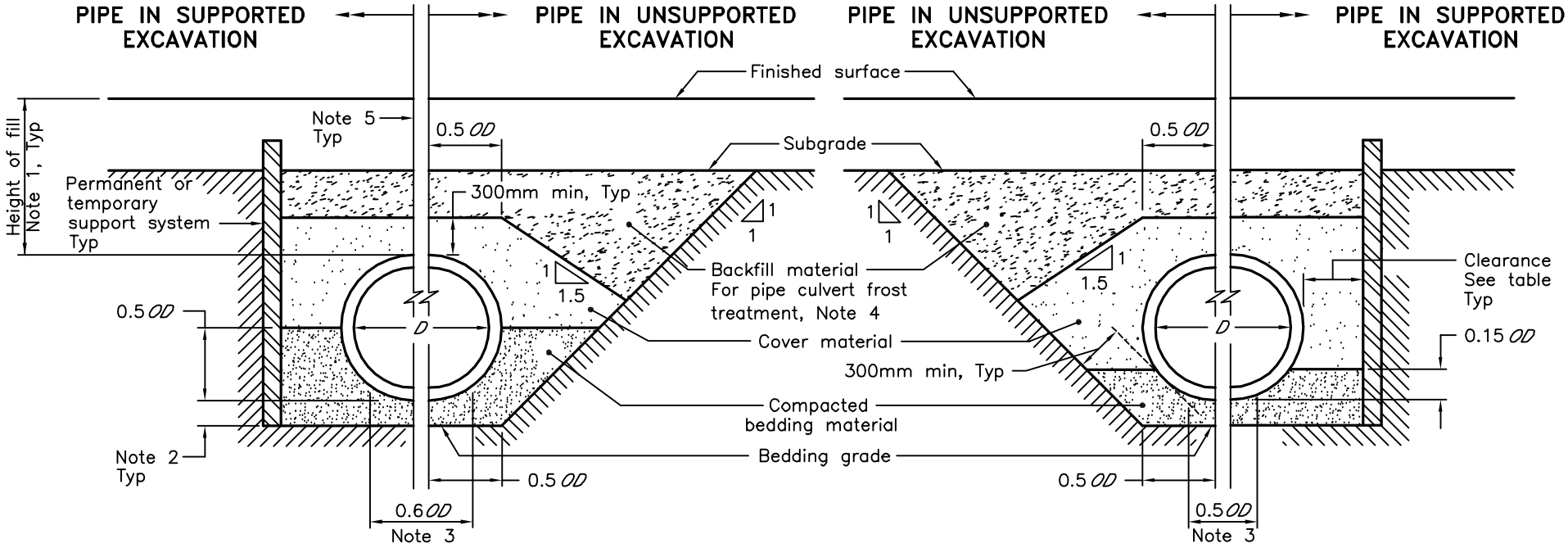
ONTARIO PROVINCIAL STANDARD DRAWING

RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 1 OR 2 SOIL – EARTH EXCAVATION

Nov 2015 | Rev 3

ONTARIO STANDARDS MUNICIPAL – PROVINCIAL

OPSD 802.030



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

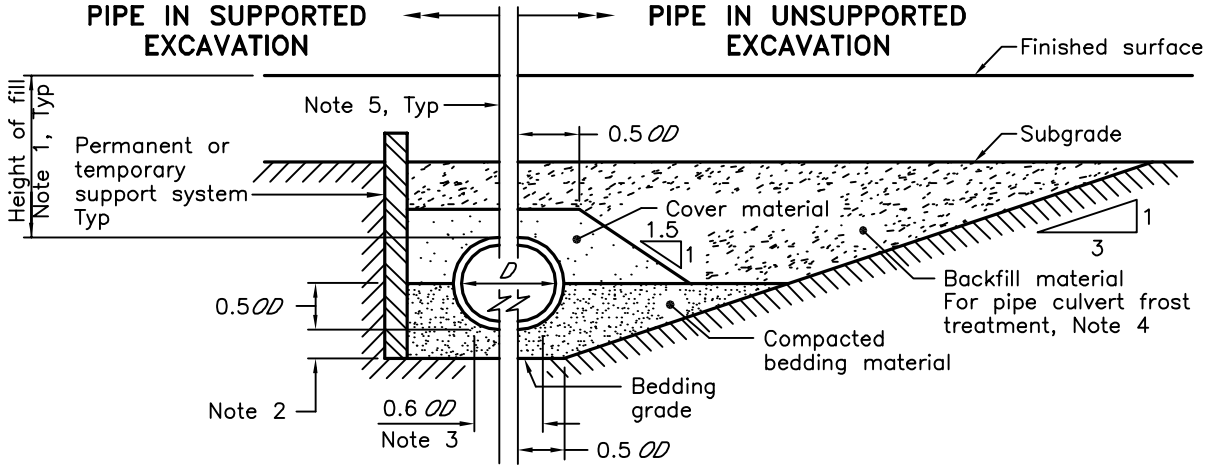
ONTARIO PROVINCIAL STANDARD DRAWING

RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 3 SOIL – EARTH EXCAVATION

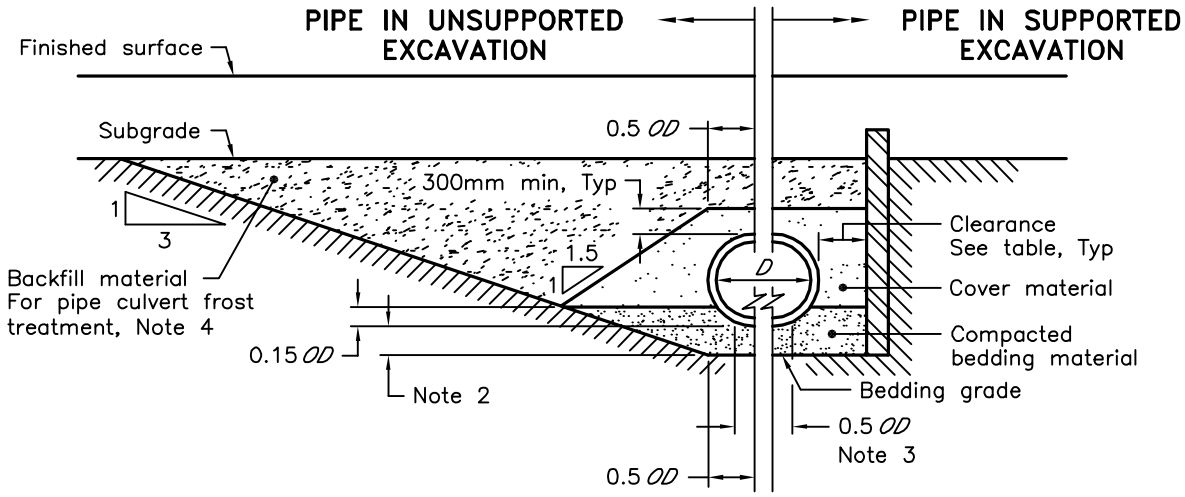
Nov 2015 | Rev 3

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.

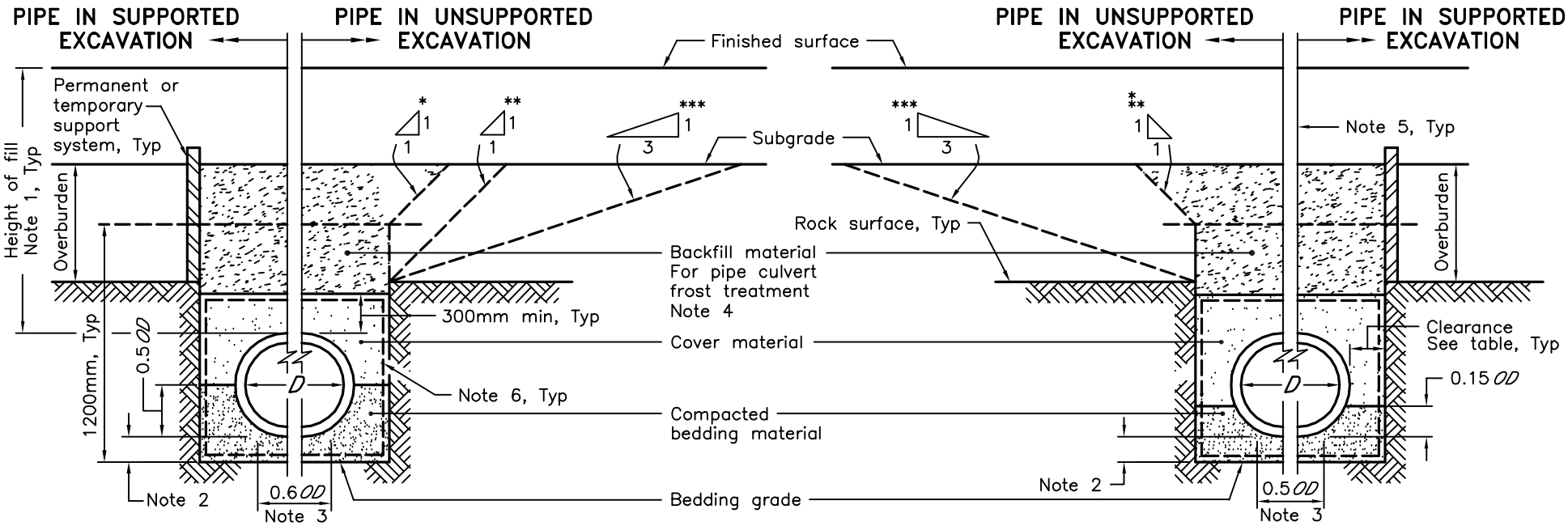
4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.

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

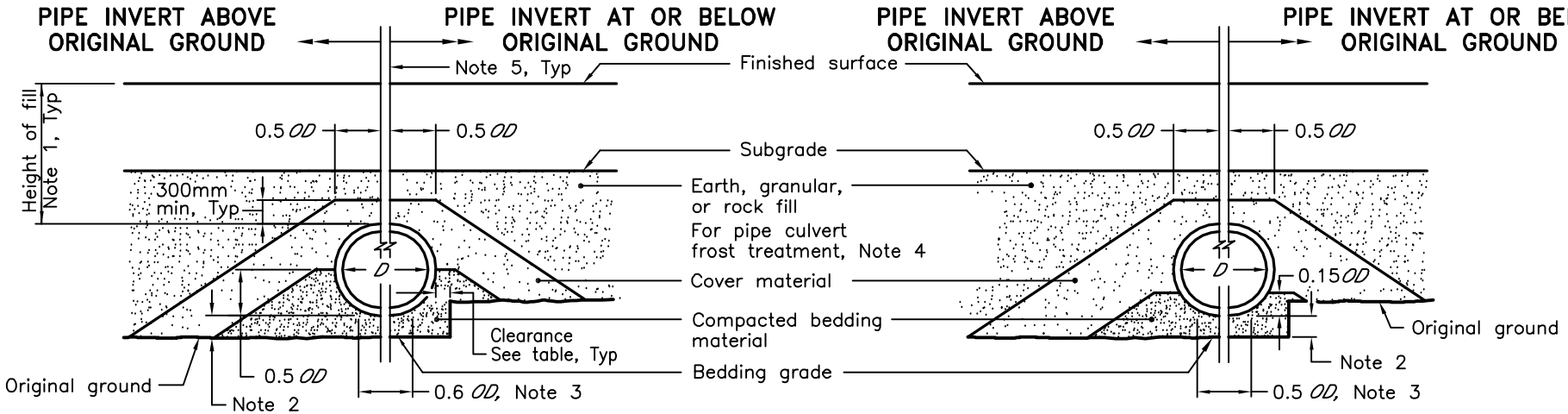
CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING

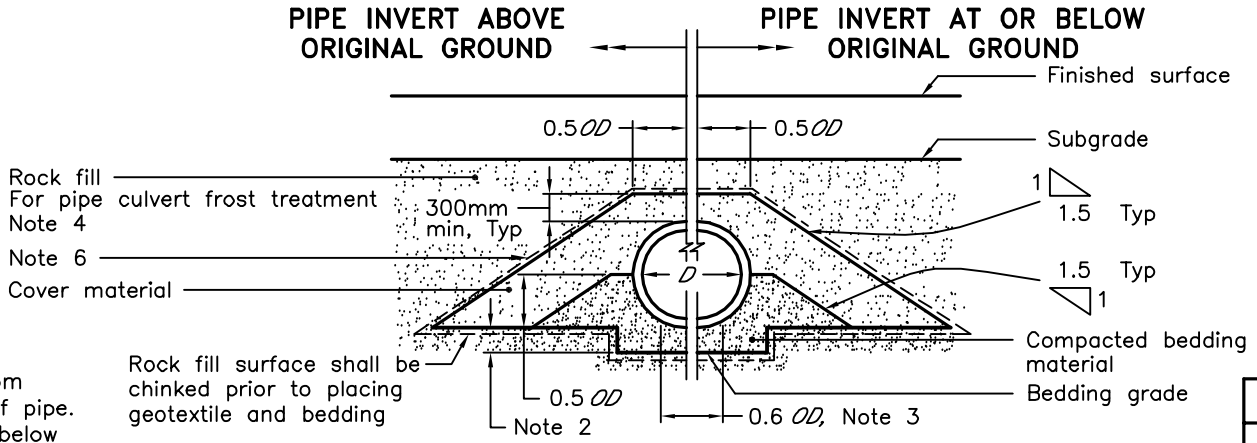
RIGID PIPE BEDDING, COVER, AND BACKFILL ROCK EXCAVATION

Nov 2015 | Rev 3

OPSD 802.033



EARTH AND ROCK EXCAVATION



PIPE BEDDING AND COVER WITH ROCK FILL UNDER AND OVER THE PIPE

LEGEND:

D – Inside diameter

OD – Outside diameter

CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

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.

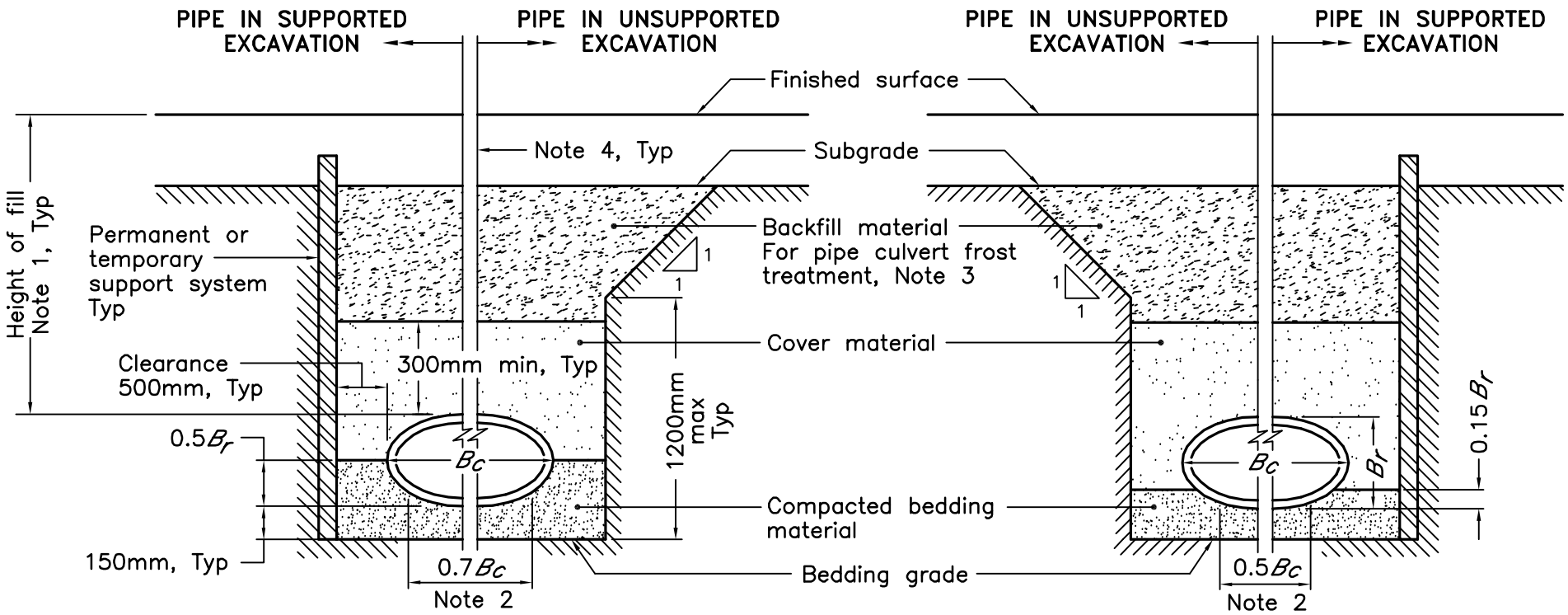
ONTARIO PROVINCIAL STANDARD DRAWING

RIGID PIPE BEDDING AND COVER IN EMBANKMENT ORIGINAL GROUND: EARTH OR ROCK

Nov 2015 | Rev 3

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

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.

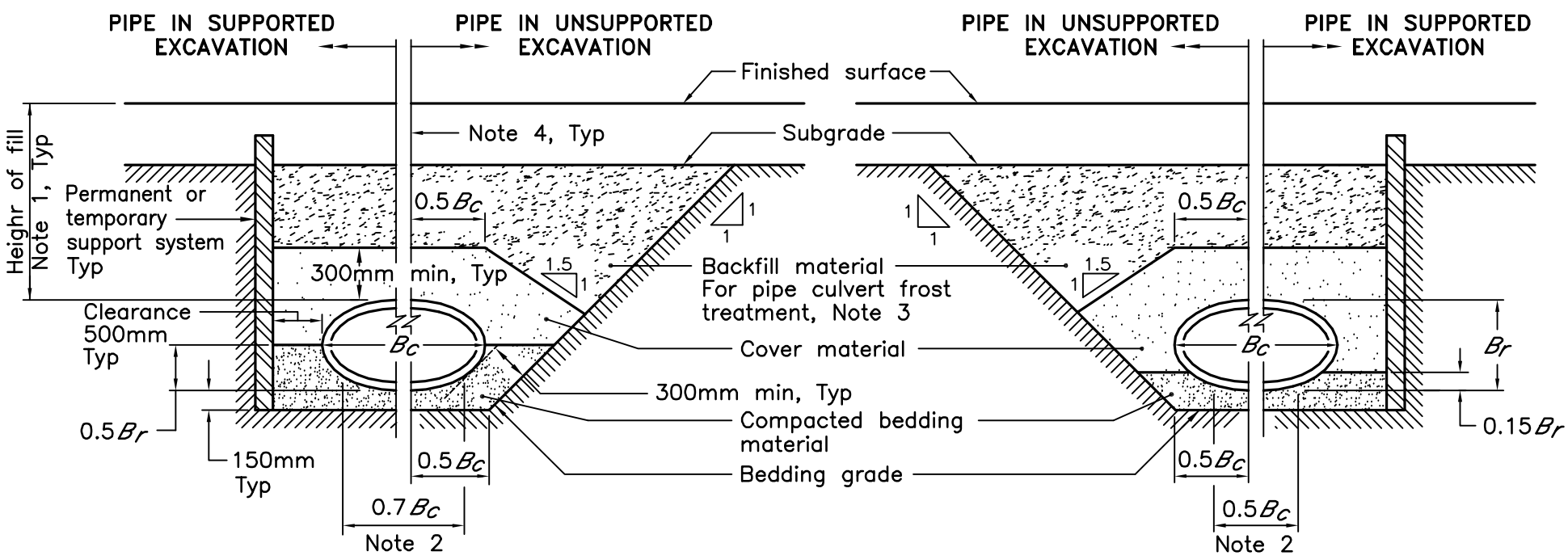
A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

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.

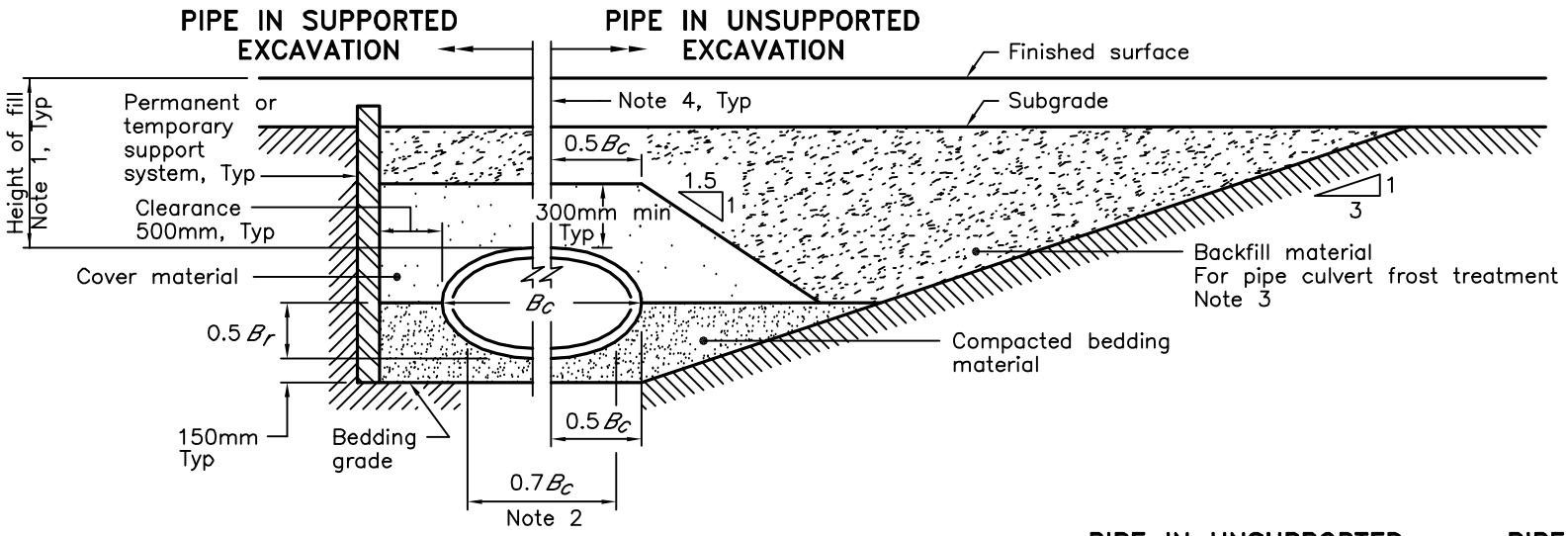
A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

B All dimensions are in metres unless otherwise shown.

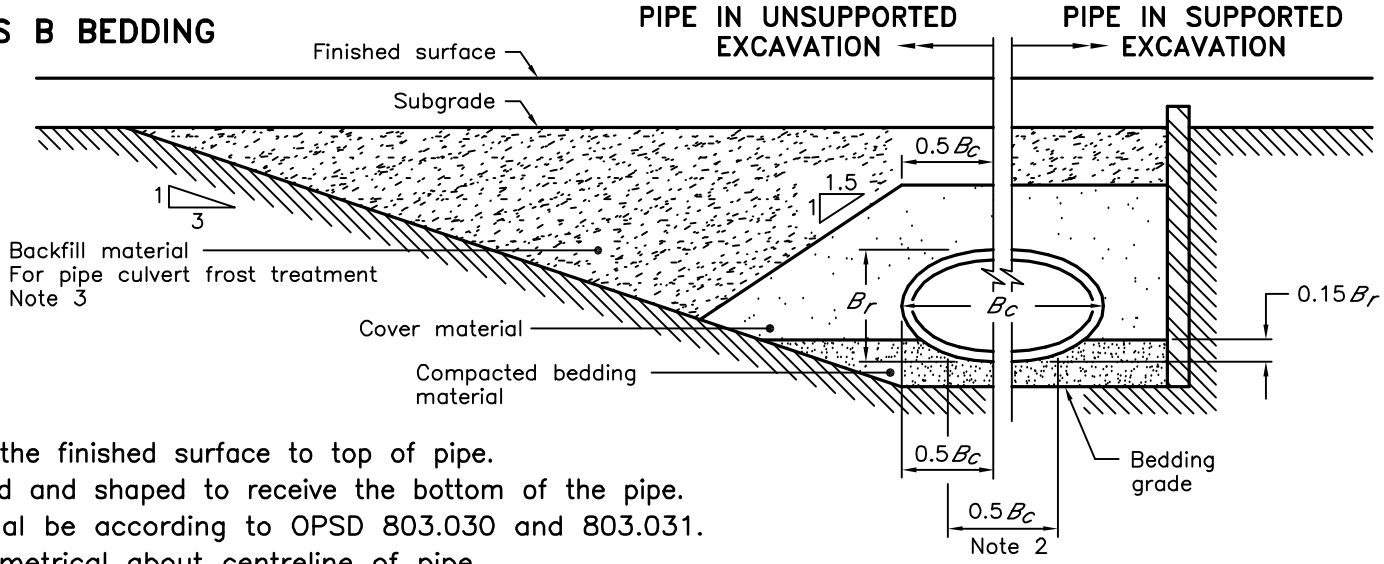
LEGEND:

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.

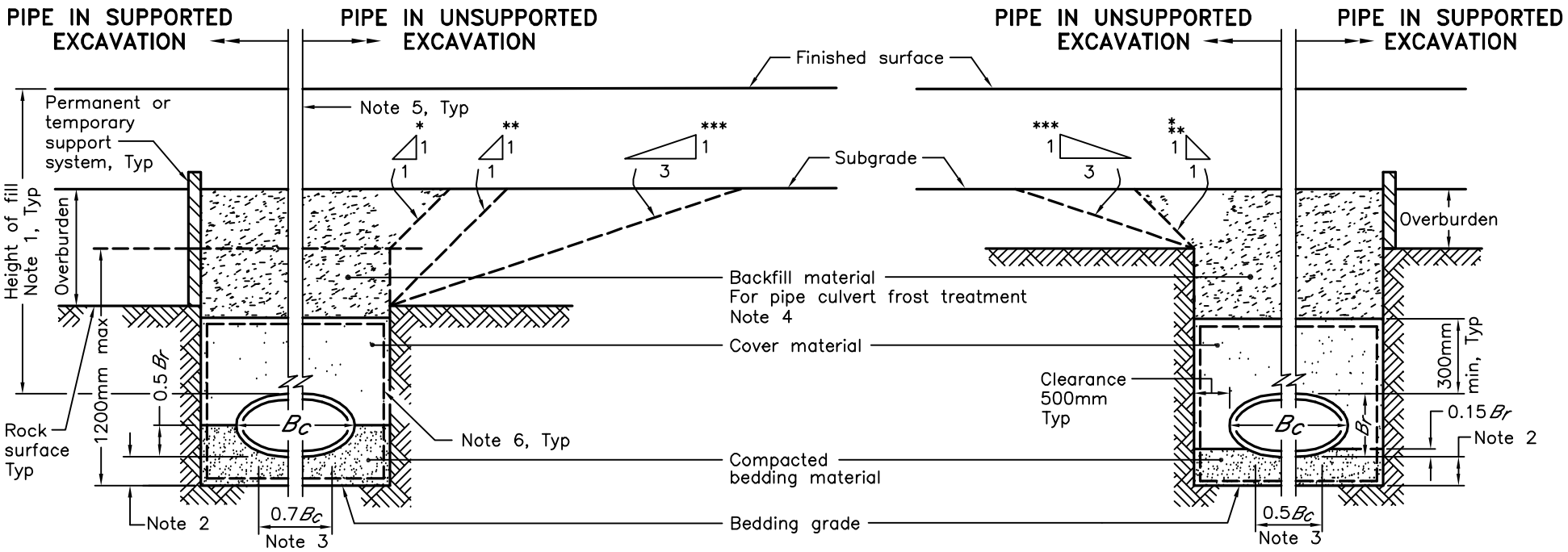
ONTARIO PROVINCIAL STANDARD DRAWING

HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 4 SOIL – EARTH EXCAVATION

Nov 2015 | Rev 3

ONTARIO STANDARDS MUNICIPAL – PROVINCIAL

OPSD 802.052



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 $0.25B_c$. 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.

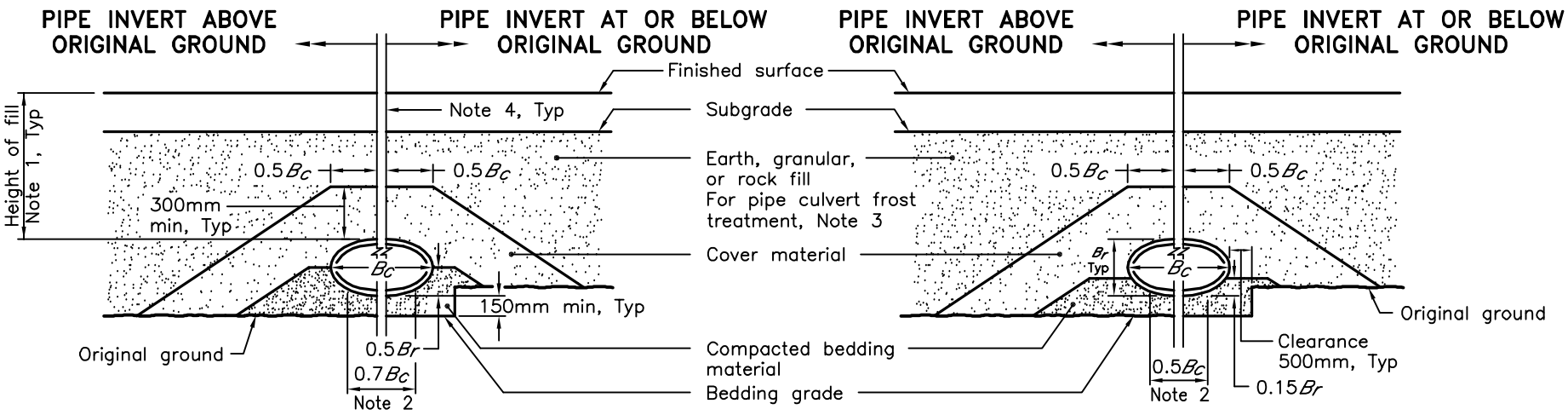
LEGEND:

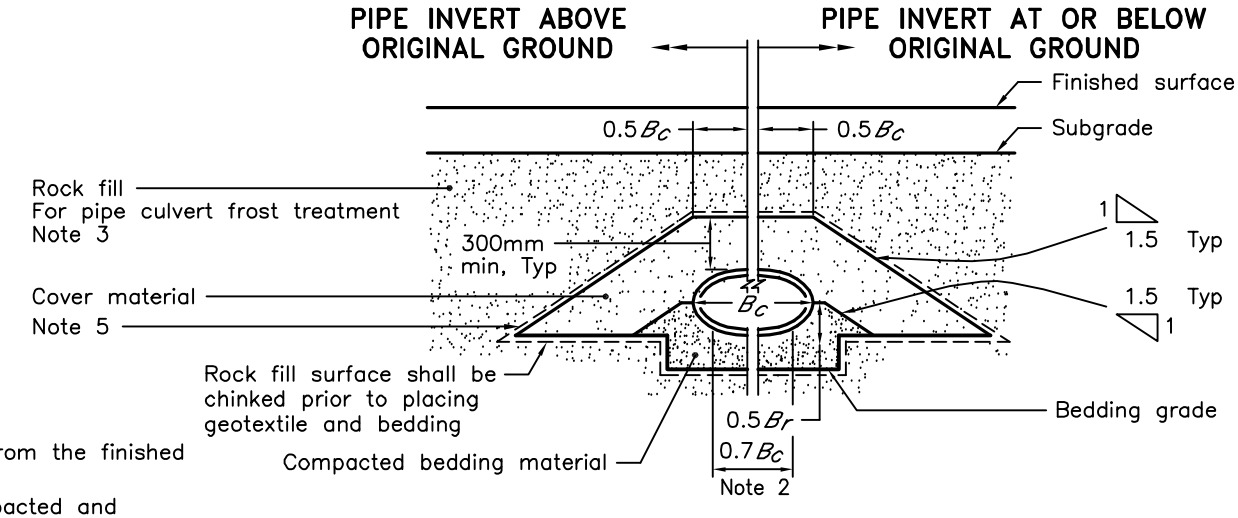
B_c = Outside horizontal span
B_r = Outside vertical rise
* – Type 1 or 2 soil
** – Type 3 soil
*** – Type 4 soil

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev 3

HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING, COVER, AND BACKFILL ROCK EXCAVATION

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.

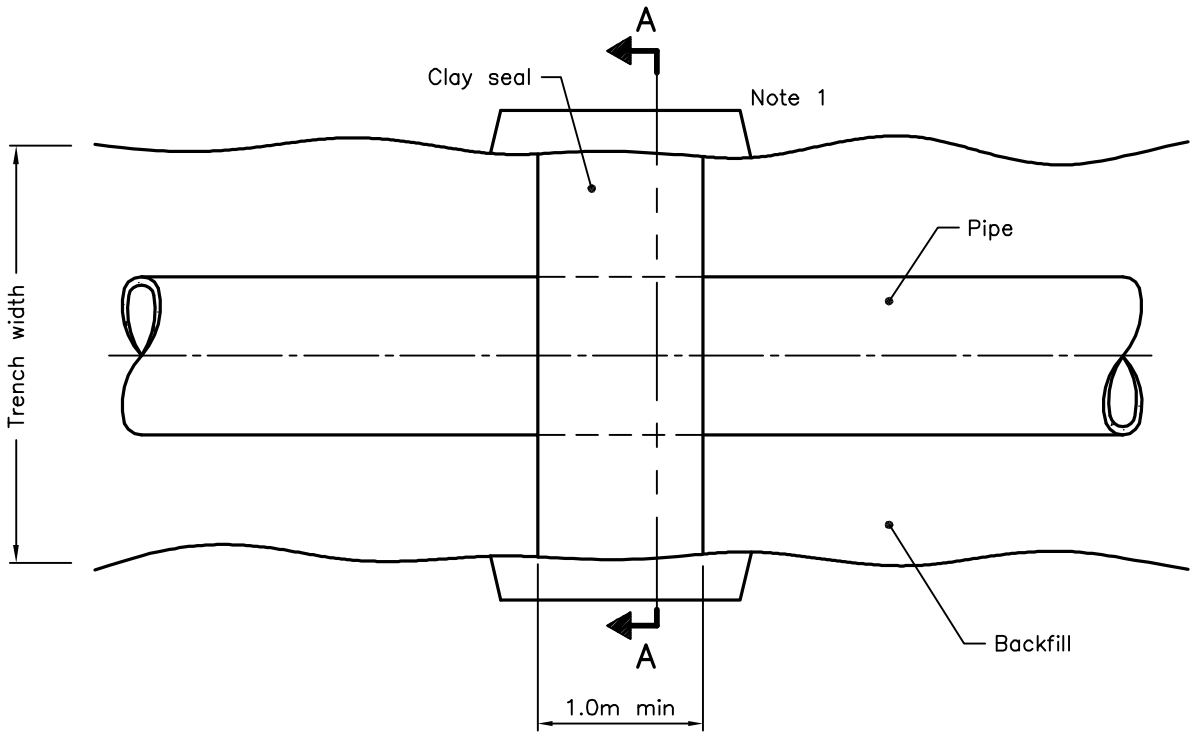
ONTARIO PROVINCIAL STANDARD DRAWING

HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING AND COVER IN EMBANKMENT ORIGINAL GROUND: EARTH OR ROCK

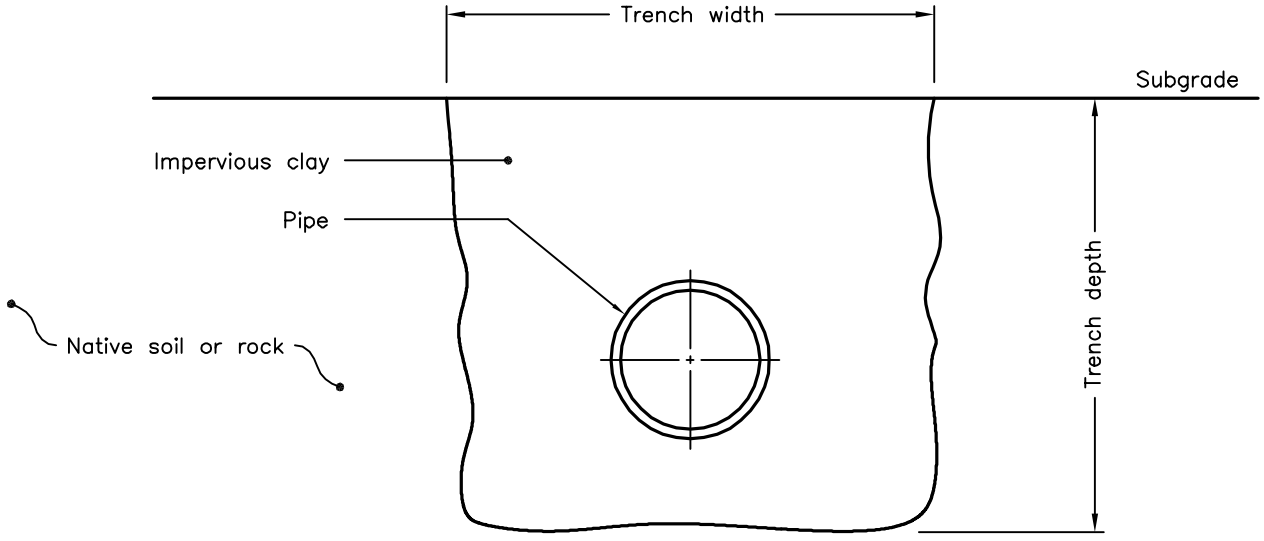
Nov 2015 | Rev 3

ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

OPSD 802.054



PLAN



SECTION A–A

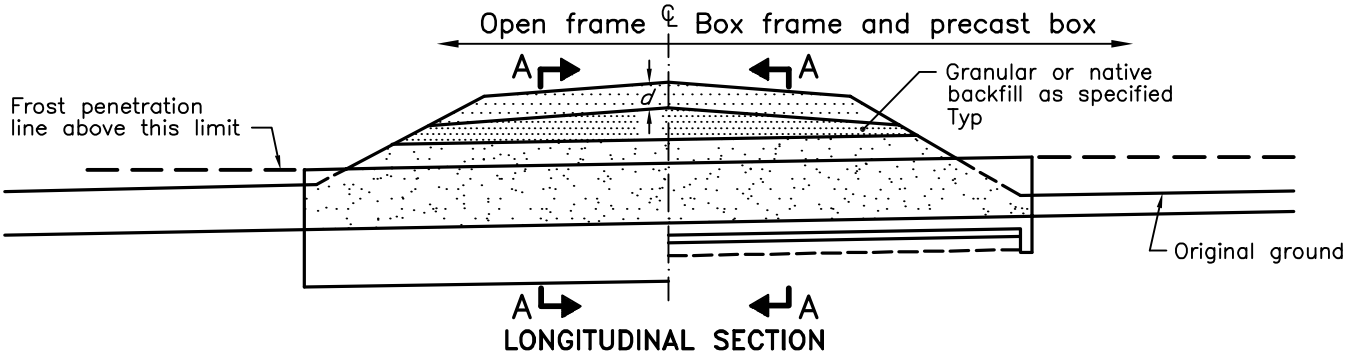
NOTES:

1. Key into undisturbed trench soil.

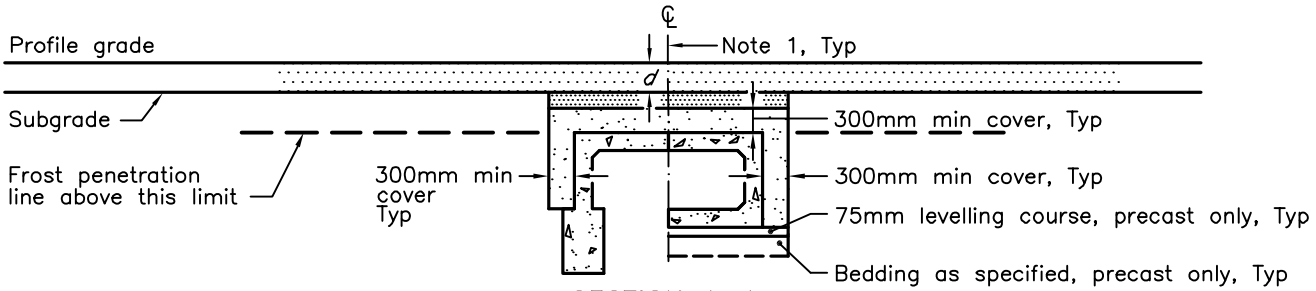
A Clay seal shall extend from bottom of trench excavation to the subgrade.
B Clay seal shall be located so that no pipe joints are within the clay seal material.
C All dimensions are in metres unless otherwise shown.

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

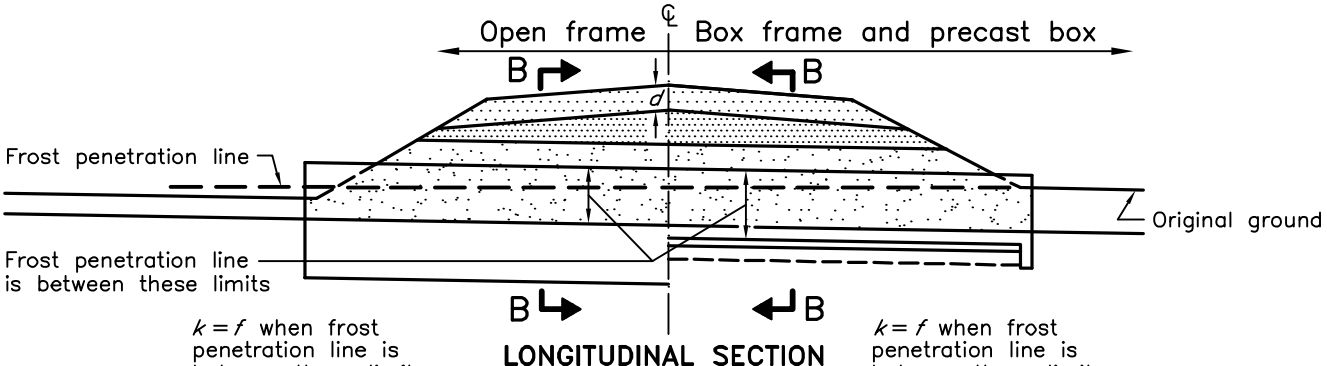


LONGITUDINAL SECTION

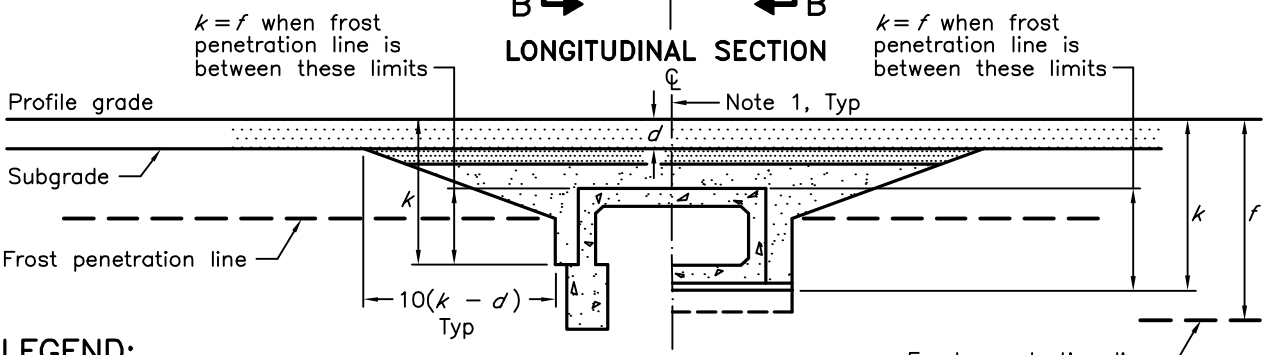


SECTION A–A

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.

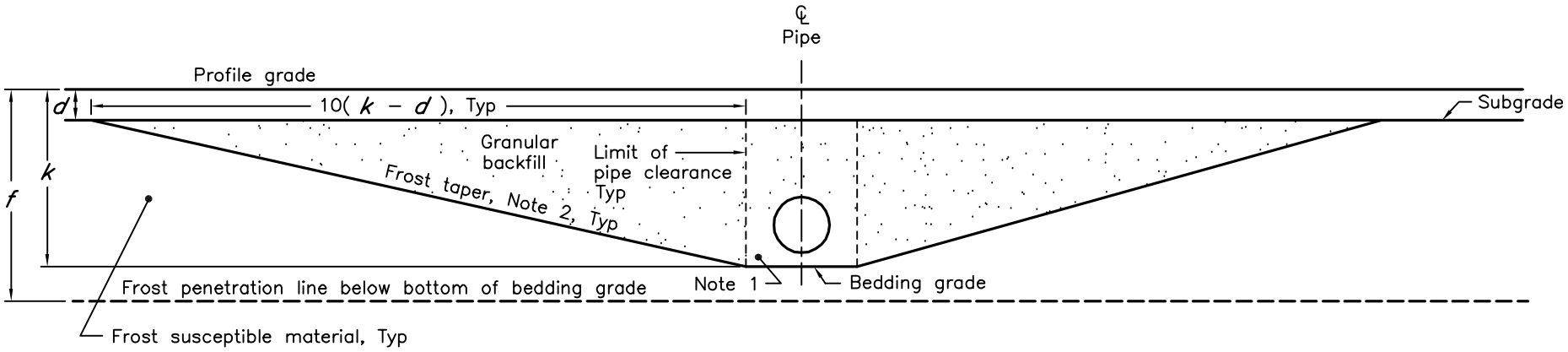
A Bedding, levelling, and cover material shall be granular as specified.

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

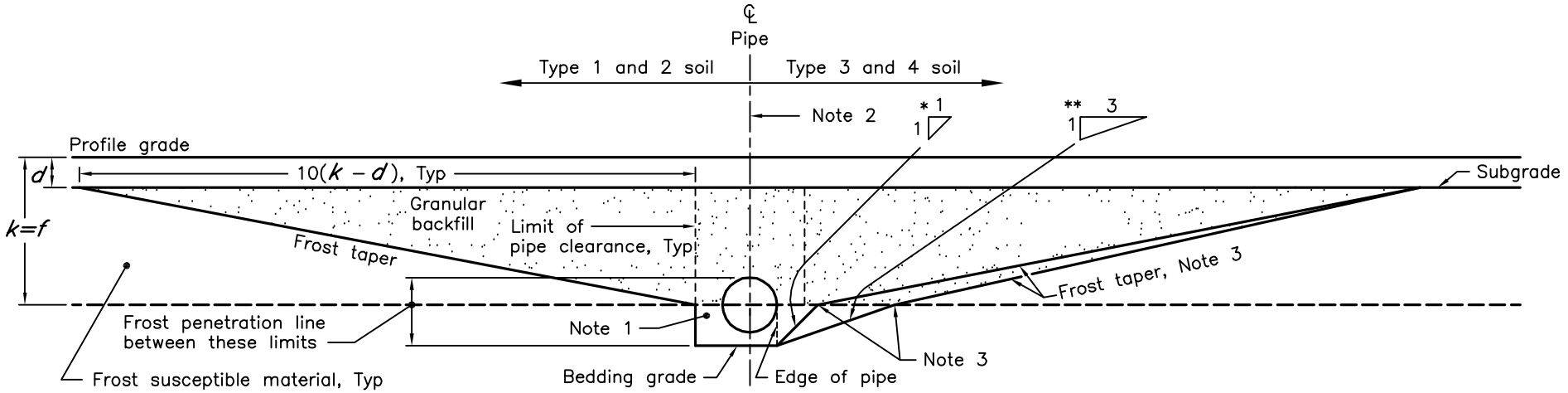
NOTES:

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 FROST PENETRATION LINE BELOW 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.

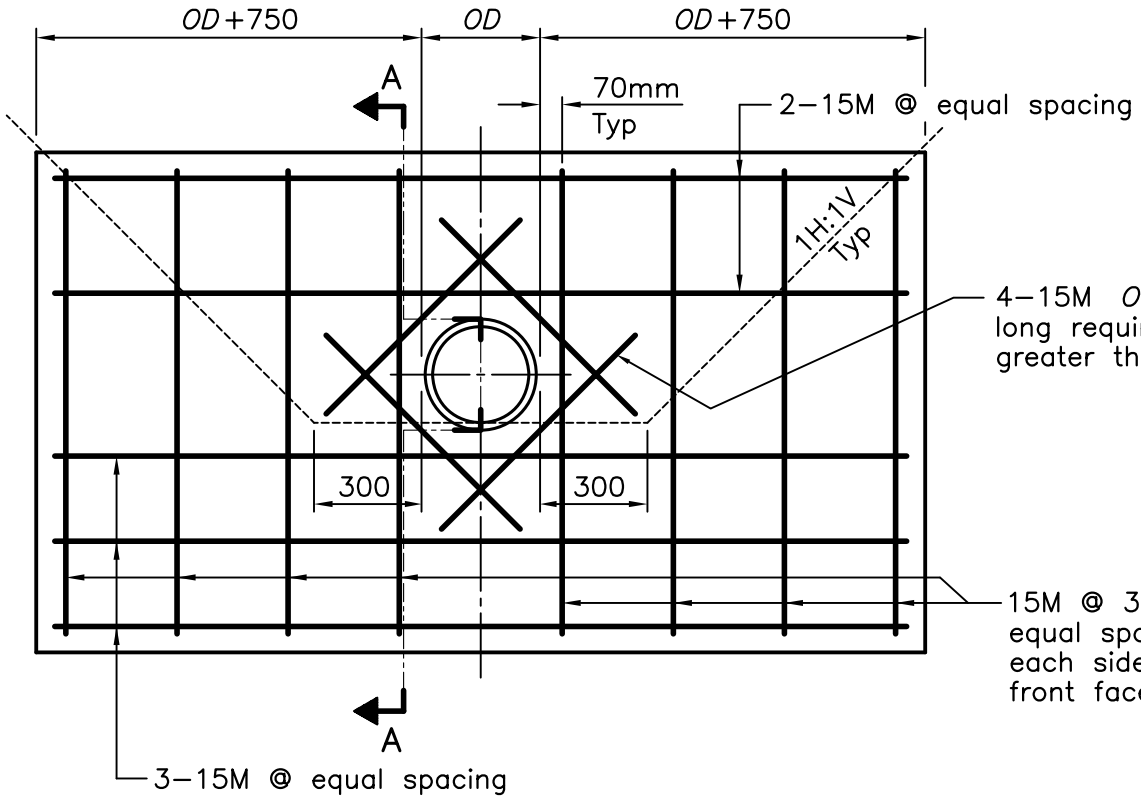
3 Frost tapers shall start at the intersection of the 1H:1V or 3H:1V slope and the frost penetration line.

A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

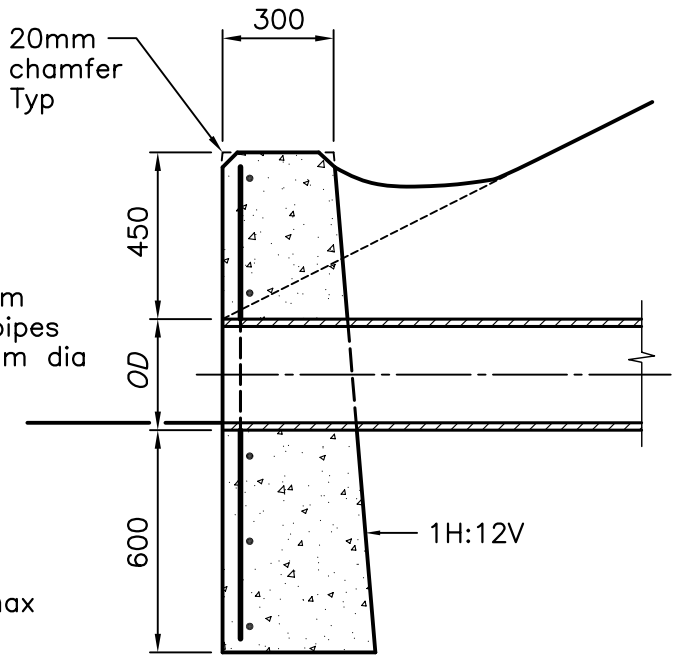
LEGEND:

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 FROST PENETRATION LINE BETWEEN 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.

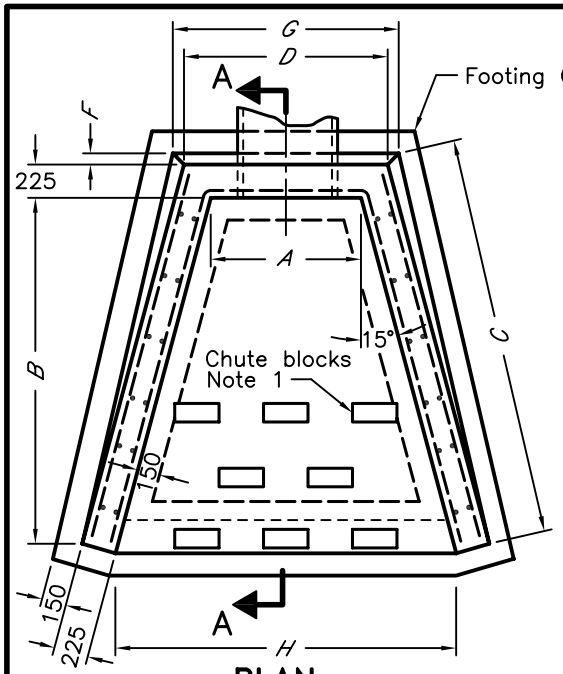
ONTARIO PROVINCIAL STANDARD DRAWING

CONCRETE HEADWALL

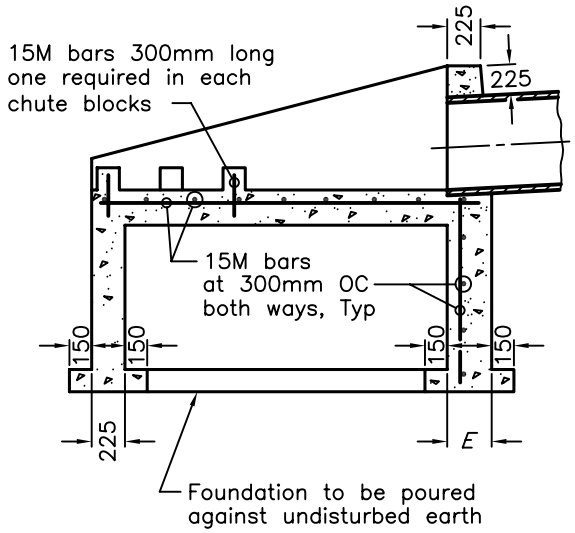
FOR PIPE LESS THAN 900mm DIAMETER

Nov 2006 | Rev 1

OPSD 804.030

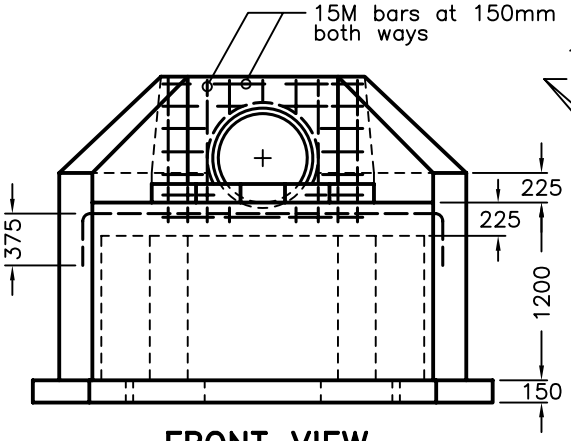


PLAN

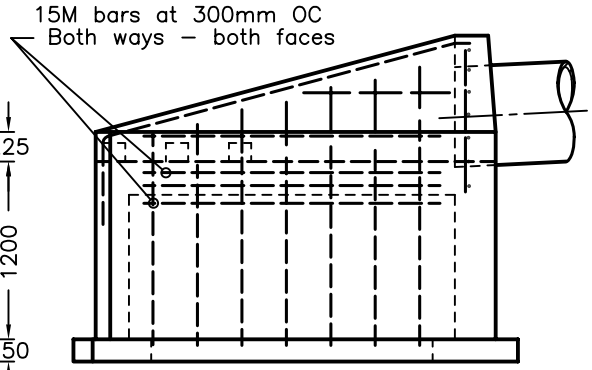


SECTION A–A

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

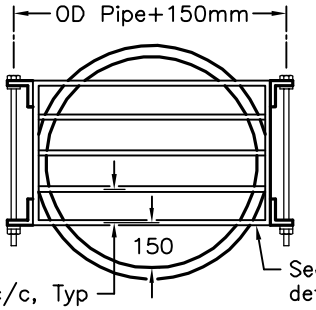
Nov 2006 | Rev 0

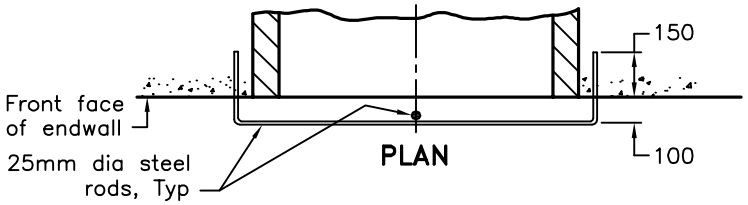
CONCRETE HEADWALL

FOR SEWER OR CULVERT PIPE OUTLET

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

OPSD 804.040





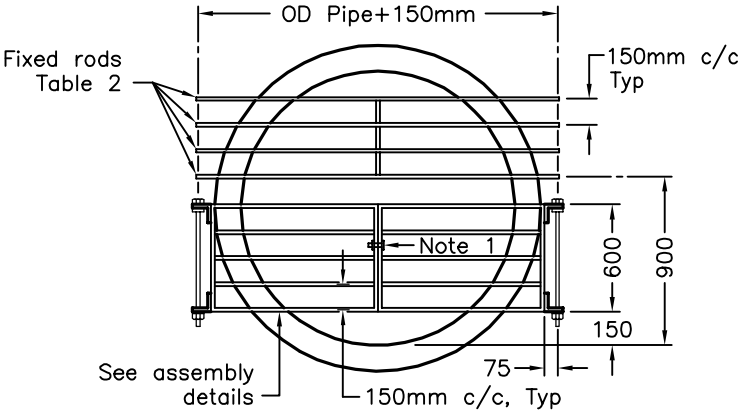
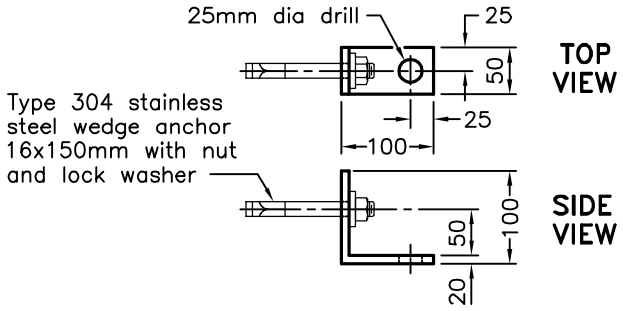


TABLE 1 – NUMBER OF RODS IN FRAME	
PIPE DIA	No of RODS
450	1
525	1
600	2
675	3
750	3
825	4
900	4
975	5
1050	6
1200	7

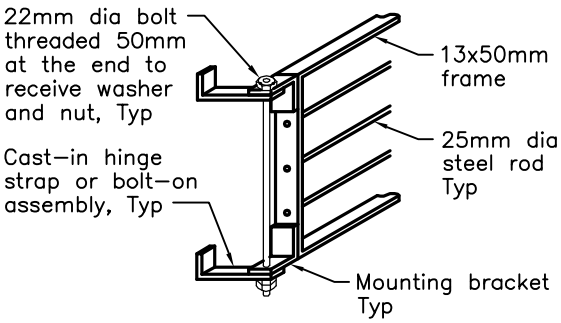
PIPE DIA up to 1200mm

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

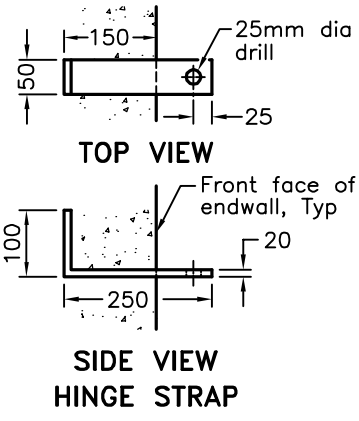
PIPE DIA 1350 to 2400mm

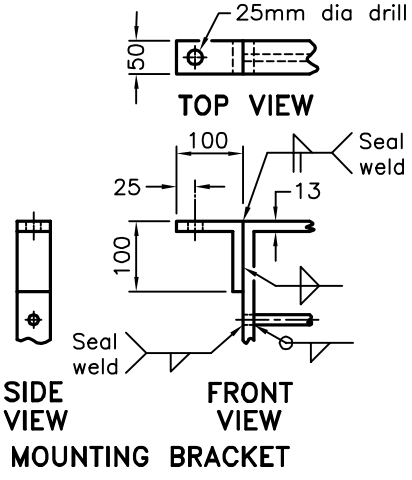


BOLT–ON ASSEMBLY DETAIL



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

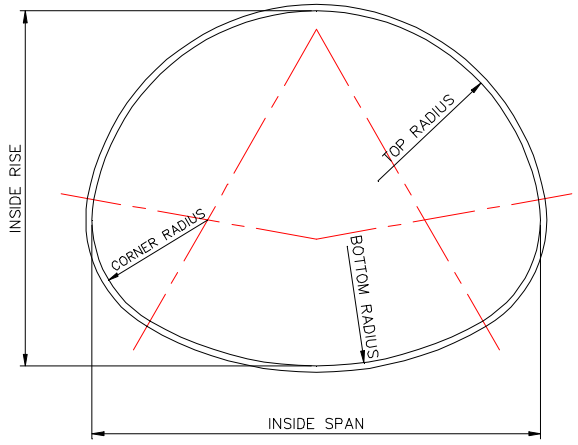
HEIGHT OF FILL TABLE

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 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.

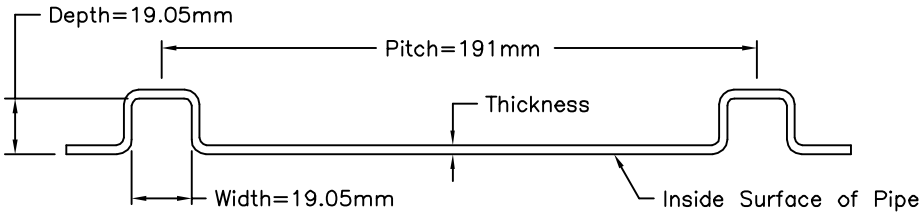
B This OPSD shall be read in conjunction with OPSD 802.020, 802.023, and 802.024.

C Sizes greater than 3000mm are available subject to design by Canadian Highway Bridge Design Code (CHBDC CSA S6).

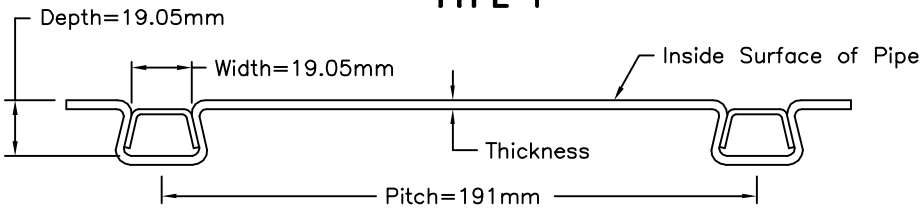
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	2
HEIGHT OF FILL TABLE CORRUGATED STEEL PIPE–ARCH AND 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



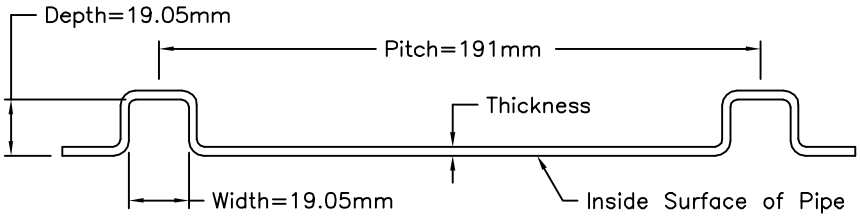
SPIRAL RIB STEEL PIPE PROFILE
TYPE II

NOTES:

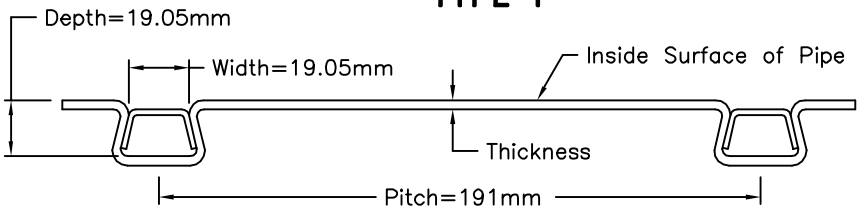
1 Installation shall be in trench–like conditions as shown for Type 1 and 2 soil in OPSD 802.010 or as shown in OPSD 802.013, provided the rock trench has a minimum depth of 0.75 times the diameter of the pipe.
2 Compaction of embedment material shall be obtained by hand, walk behind equipment, or by 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.

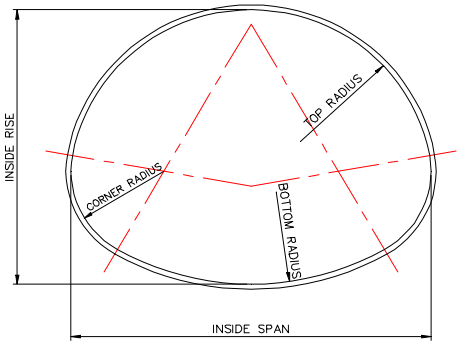
Span	Rise	Equivalent Diameter	Area m^2	Minimum Height of Fill	Metal Thickness		
					1.6	2.0	2.8
					Maximum Height of Fill Over Pipe m Corner Bearing Pressure Limited to 200 kPa (Note 3)		
500	410	450	0.15	300	4.0		
580	490	525	0.21	300	5.2		
680	540	600	0.27	300	5.2		
830	660	750	0.43	300	5.2		
1010	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 DUAL WALL CORRUGATED POLYETHYLENE GRAVITY SEWER PIPE RSC 100 AND RSC 160	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _		
	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 Kμ=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 CLASS 3 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 Kμ=0.130, p=0.7, and r_{sd} =0.7.

F For positive projecting embankment Kμ=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

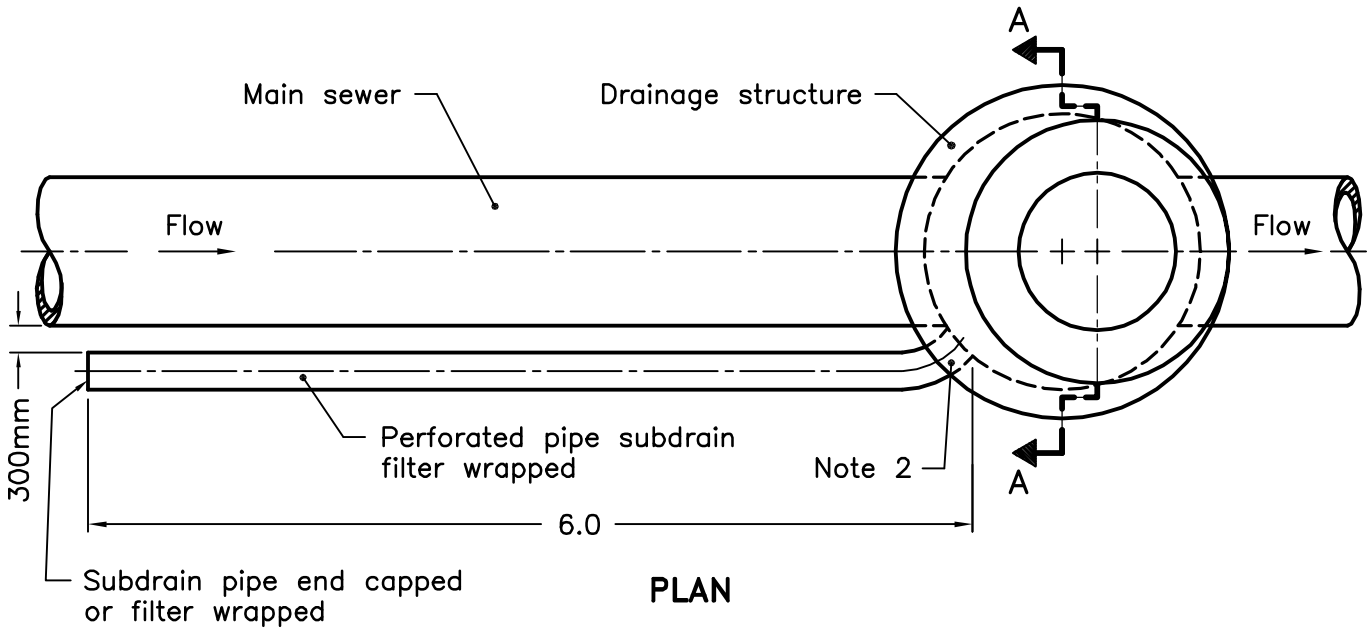
HEIGHT OF FILL TABLE

HORIZONTAL ELLIPTICAL CONCRETE PIPE

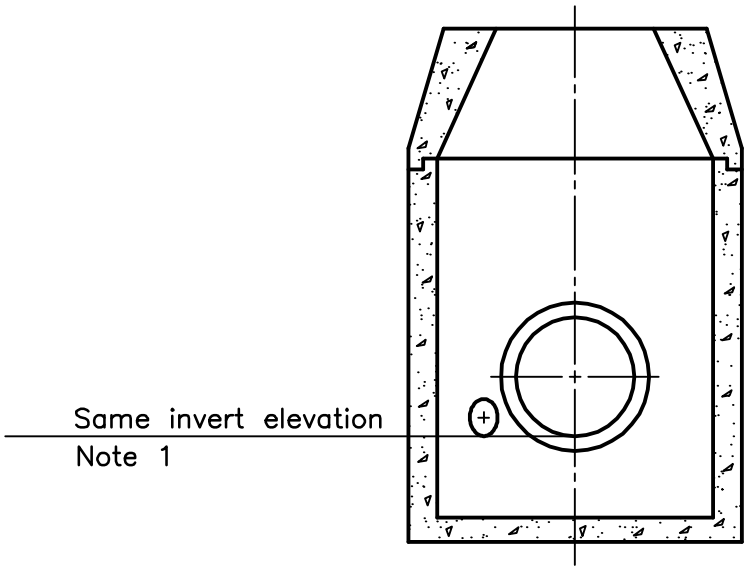
CLASS HE-A, HE-I, HE-II, HE-III, and HE-IV

ONTARIO STANDARDS · MUNICIPAL - PROVINCIAL · O P S

OPSD 807.050



PLAN



SECTION A–A

NOTES:

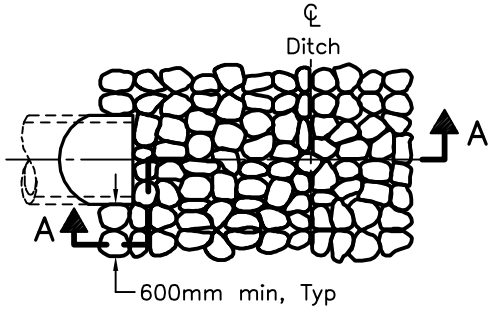
1 Where concrete bedding is used for the main sewer, the pipe subdrain shall be placed 150mm above the top of such bedding.

2 Subdrain pipe shall be cored into maintenance hole.

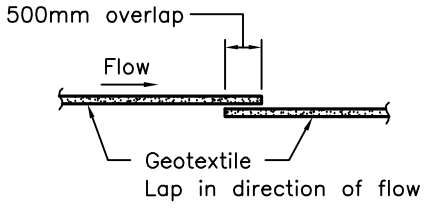
A Maintenance hole benching shall accommodate pipe subdrain, as required.

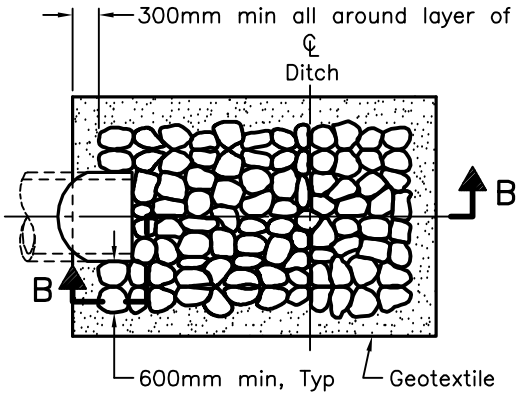
B All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	3
PERFORATED PIPE SUBDRAIN IN GRANULAR TRENCH MAIN STORM SEWER CONNECTION TO DRAINAGE STRUCTURE			
	OPSD 809.010		

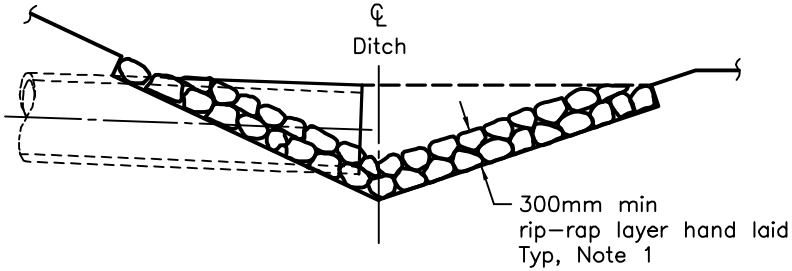


PLAN
CUT OR FILL

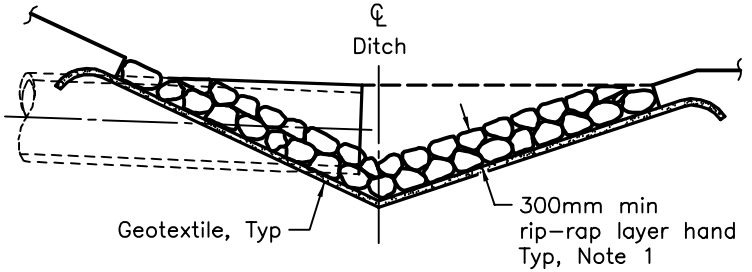




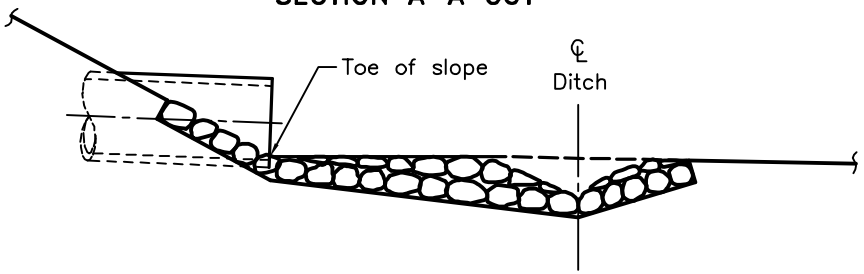
PLAN
CUT OR FILL



SECTION A–A CUT

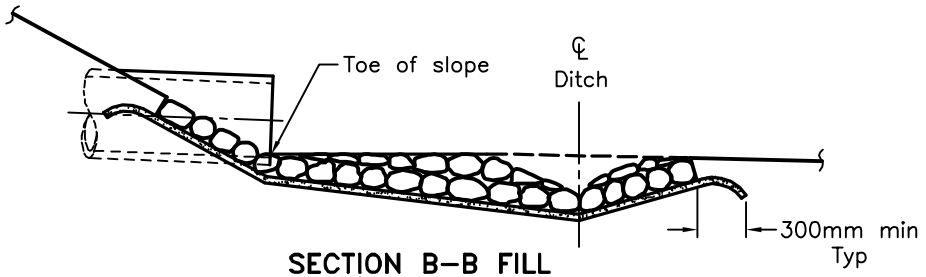


SECTION B–B CUT



SECTION A–A FILL

TYPE A – WITHOUT GEOTEXTILE



SECTION B–B FILL

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.

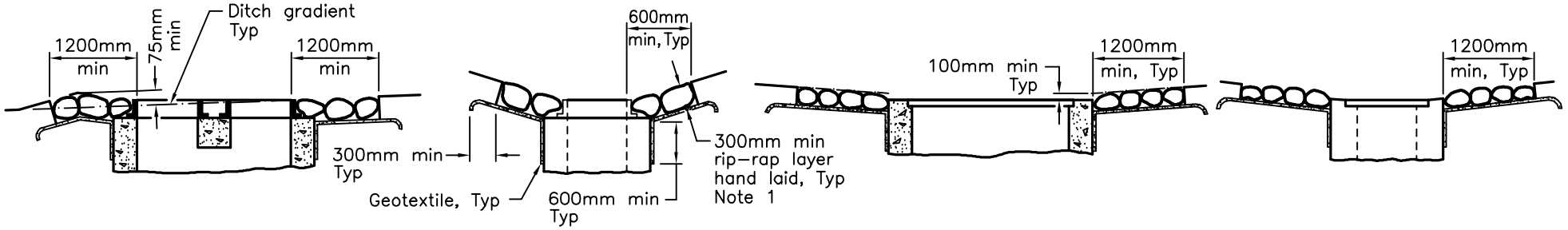
ONTARIO PROVINCIAL STANDARD DRAWING

GENERAL RIP–RAP LAYOUT FOR SEWER AND CULVERT OUTLETS

Nov 2013	Rev	2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 810.010

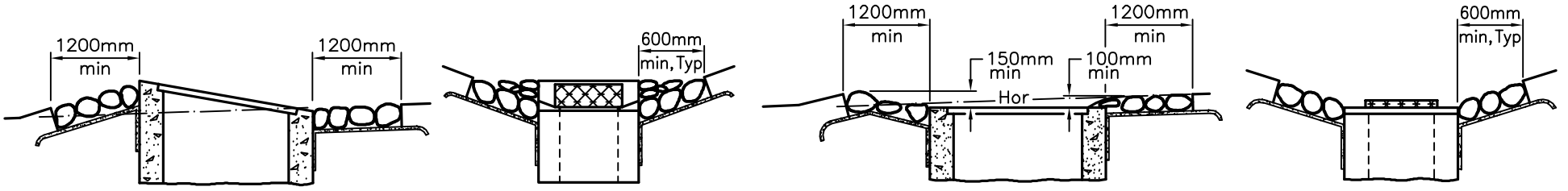


Ditch Longitudinal Section — Ditch Cross–Section

TWIN INLET–INTERMEDIATE

Ditch Longitudinal Section — Ditch Cross–Section

SINGLE INLET–SUMP

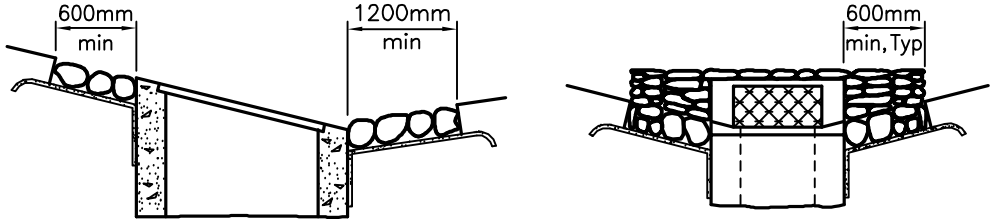


Ditch Longitudinal Section — Ditch Cross–Section

SINGLE INLET–INTERMEDIATE

Ditch Longitudinal Section — Ditch Cross–Section

SINGLE INLET–INTERMEDIATE



Ditch Longitudinal Section — Ditch Cross–Section

SINGLE INLET–END OF DITCH

NOTES:

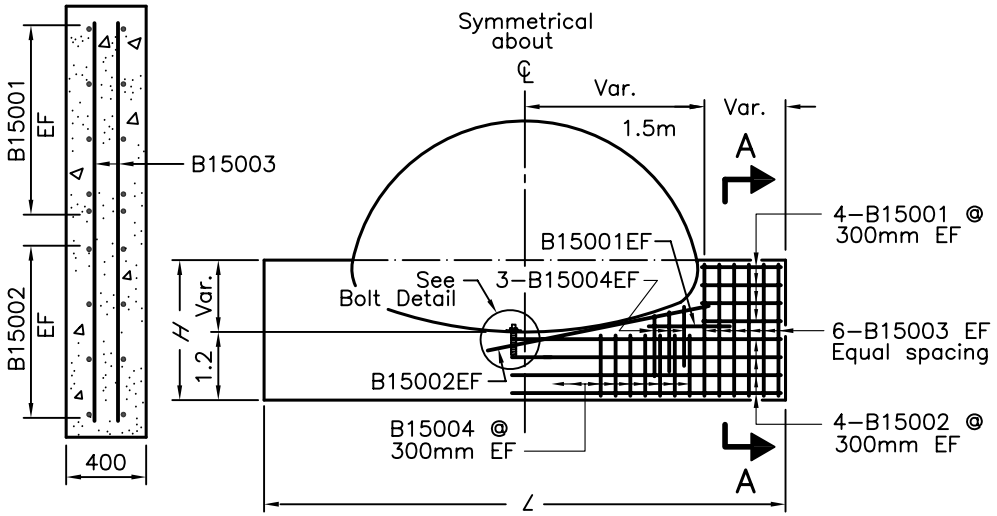
1 The thickness of the rip–rap layer shall be at least 1.5 times the rip–rap mean diameter.

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	2
GENERAL RIP–RAP LAYOUT FOR DITCH INLETS			
	OPSD 810.020		

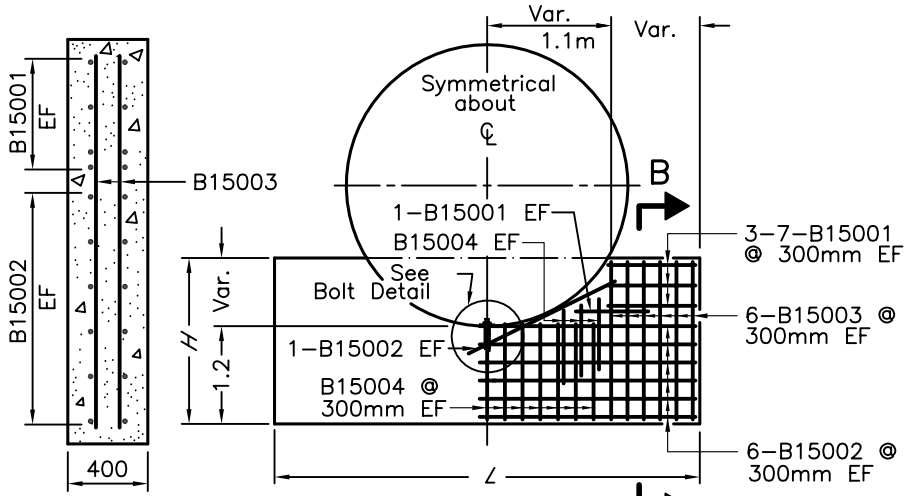
PIPE		B15001		B15002		B15003		B15004		ℓ	H
Span	Rise	No	Length m	No	Length m	No	Length m	No	Length m	m	m
3730	2290	20	1.06	20	3.20	24	2.13	36	1.06	6.17	2.28
3890	2690	20	1.06	20	3.27	24	2.13	36	1.06	6.32	2.28
4370	2870	20	1.37	20	3.86	24	2.28	40	1.06	7.46	2.43
4720	3070	20	1.37	20	4.01	24	2.28	42	1.06	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



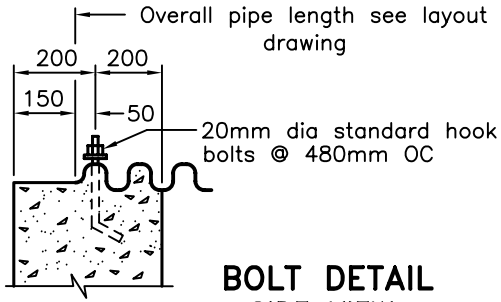
SECTION A–A

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.

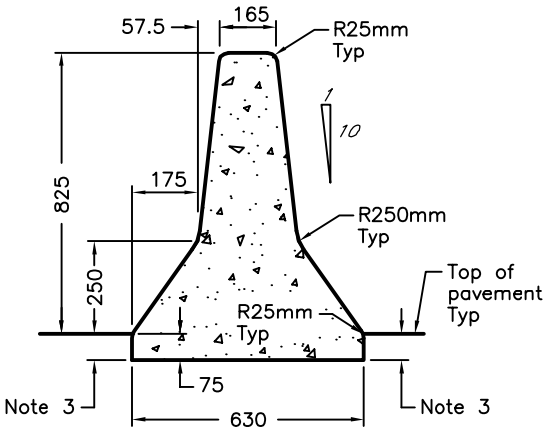
ONTARIO PROVINCIAL STANDARD DRAWING

CUT OFF WALL FOR STRUCTURAL PLATE PIPE ARCH AND CIRCULAR CSP

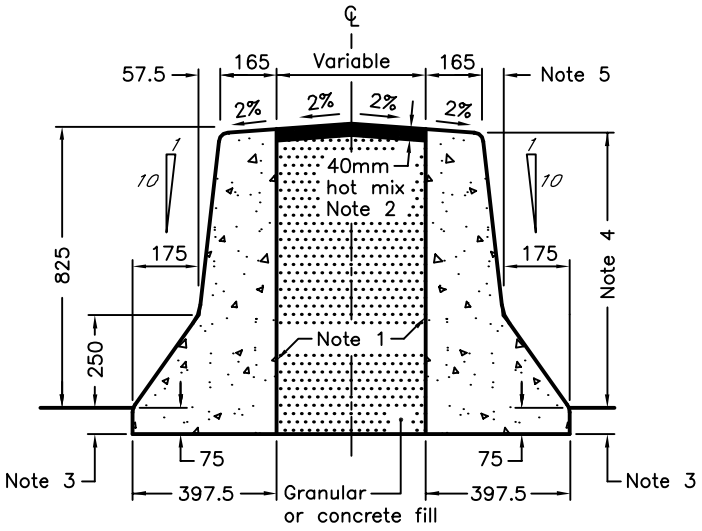
Nov 2006 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

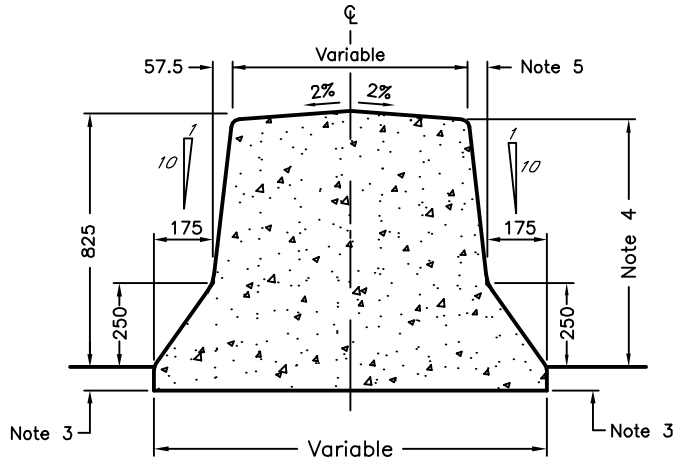
OPSD 812.010



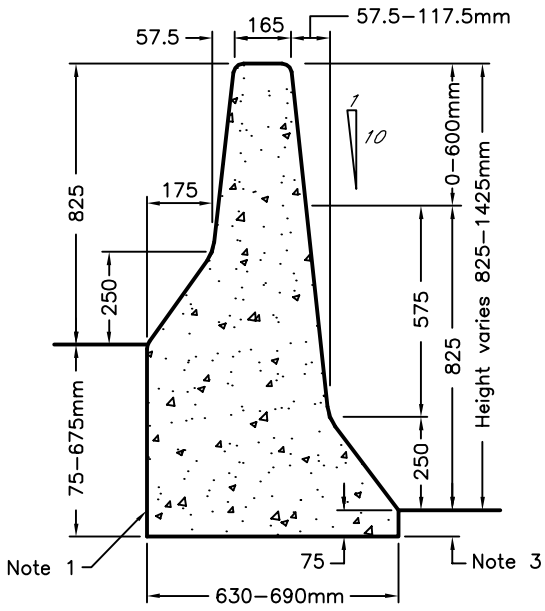
TYPE A



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.

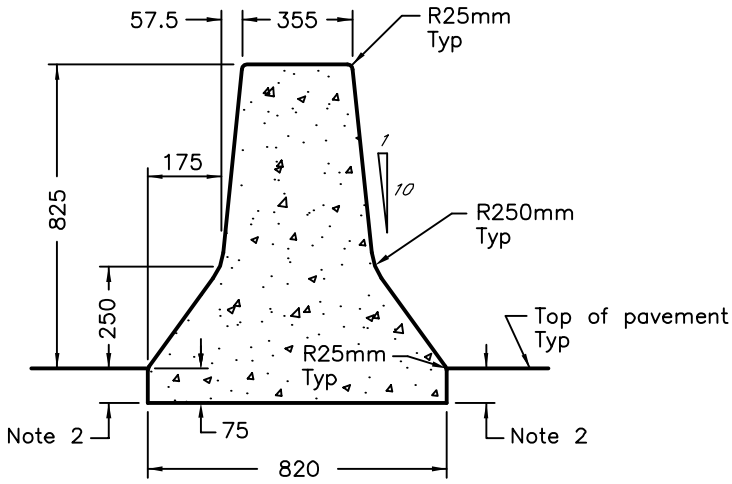
3 Embedment shall be 75mm into adjacent pavement.

4 Height may vary from 825 to 1425mm in an asymmetric cross section.

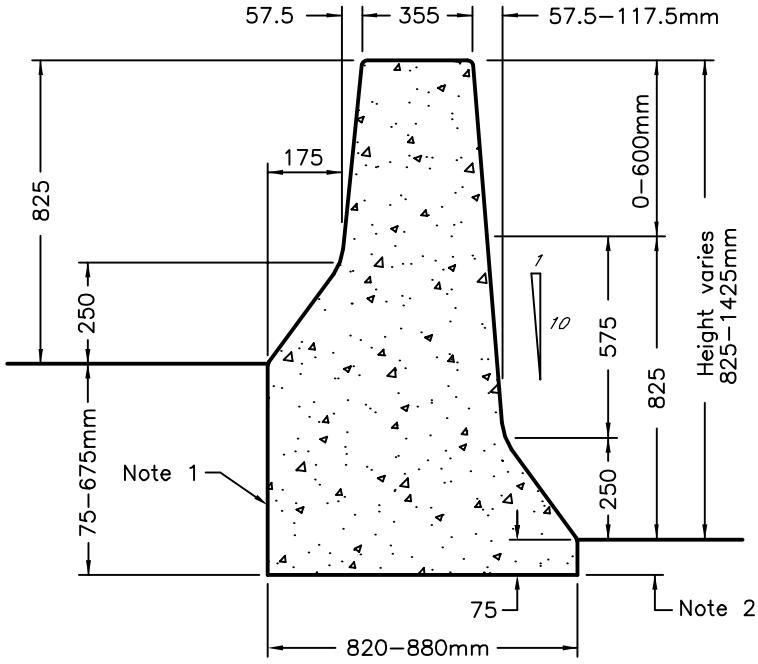
5 Width may vary from 57.5 to 117.5mm in an asymmetric cross section.

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:

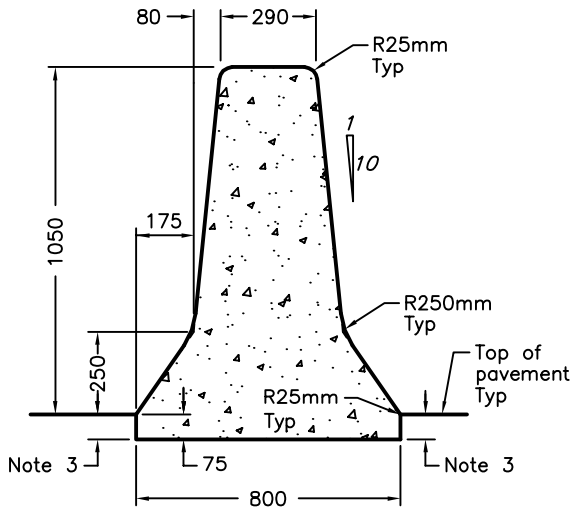
1 For slipforming procedure, a 1H:20V batter is acceptable.

2 Embedment shall be 75mm into adjacent pavement.

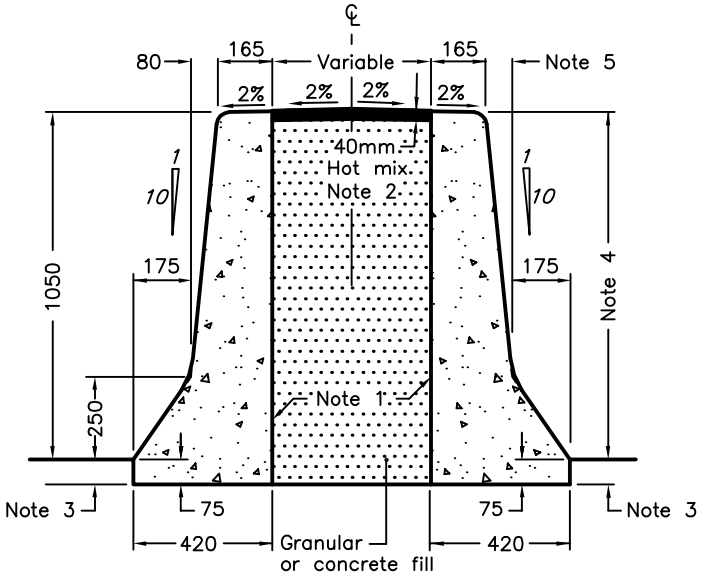
A OPSD 911.130 Type A–2 barrier shall be placed adjacent to bridge piers.

B All dimensions are in millimetres unless otherwise shown.

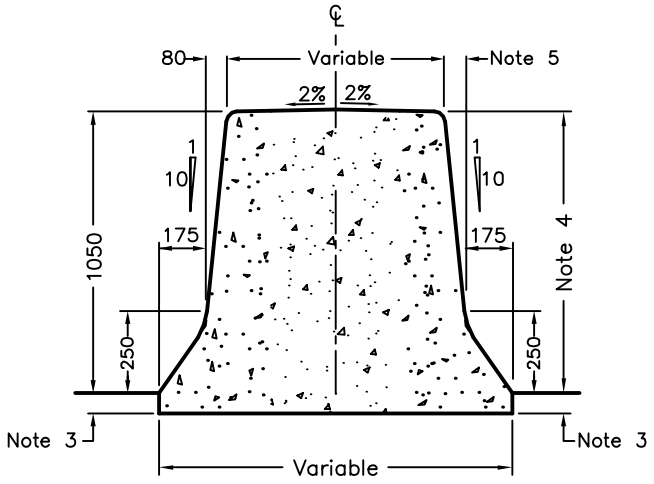
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	1
GUIDE RAIL SYSTEM, CONCRETE BARRIER CAST–IN–PLACE, TYPE C INSTALLATION			
	OPSD 911.131		



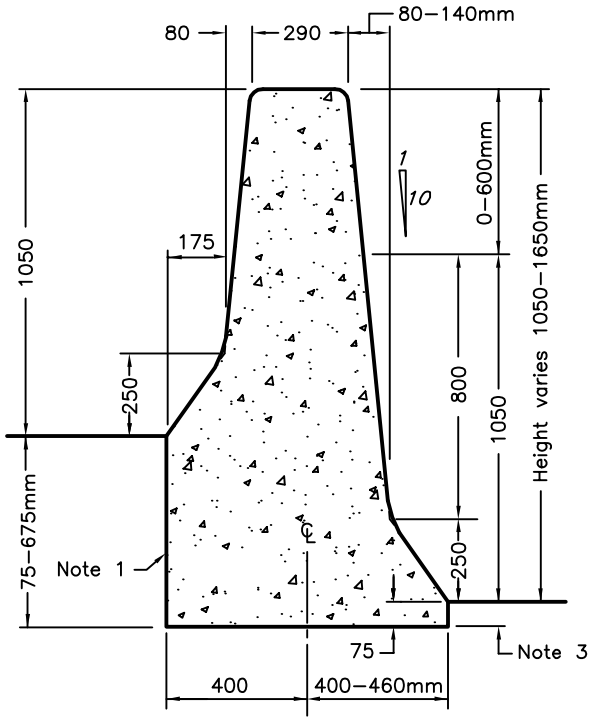
TYPE TW



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.

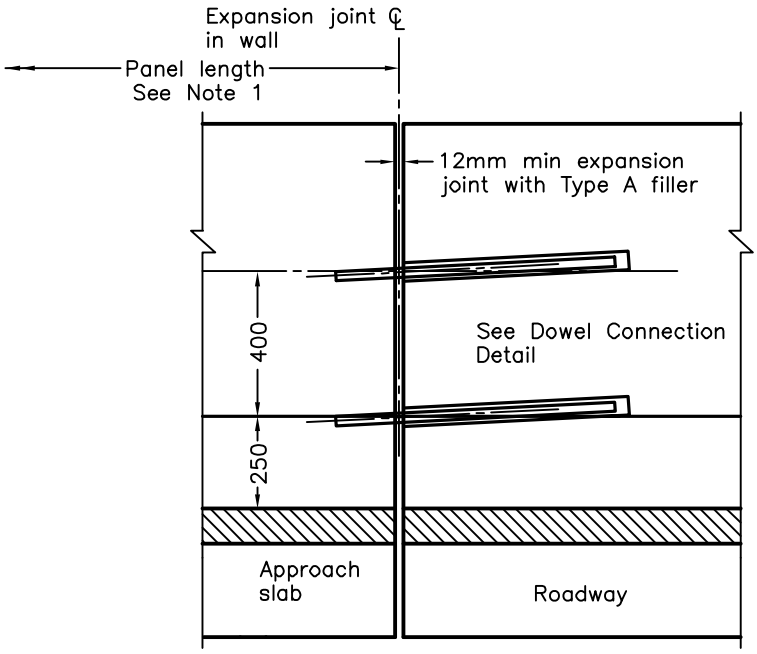
3 Embedment shall be 75mm into adjacent pavement.

4 Height may vary from 1050 to 1650mm in an asymmetric cross section.

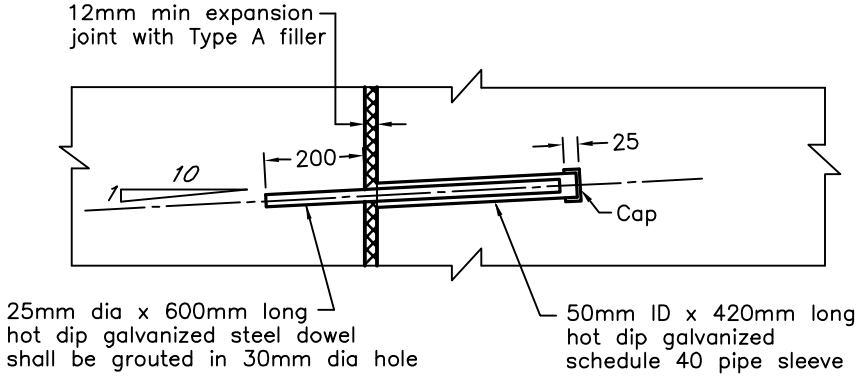
5 Width may vary from 80 to 140mm in an asymmetric cross section.

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.

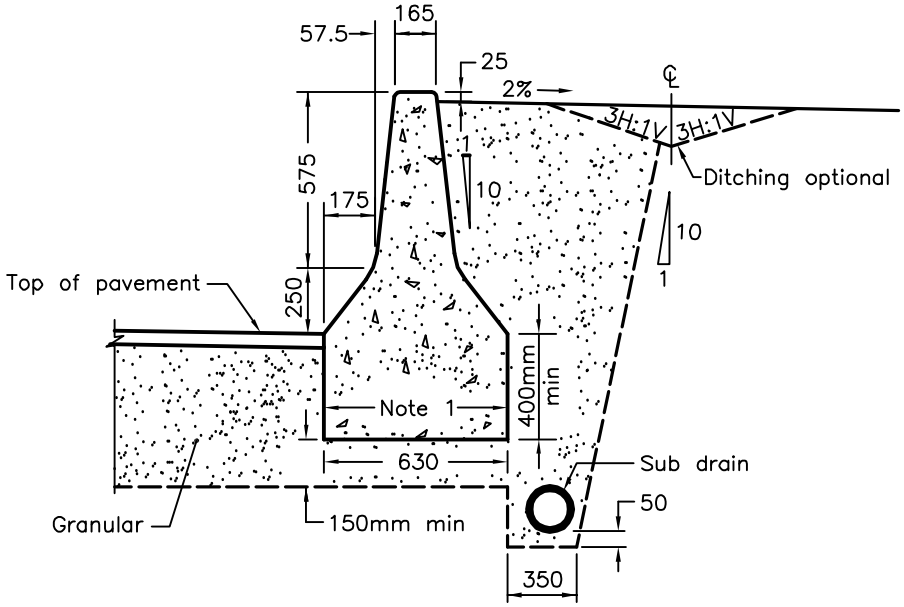
A This OPSD shall be read in conjunction with OPSD 911.130, 911.131, and 911.132.

B All dowels shall be hot dip galvanized according to ASTM A123.

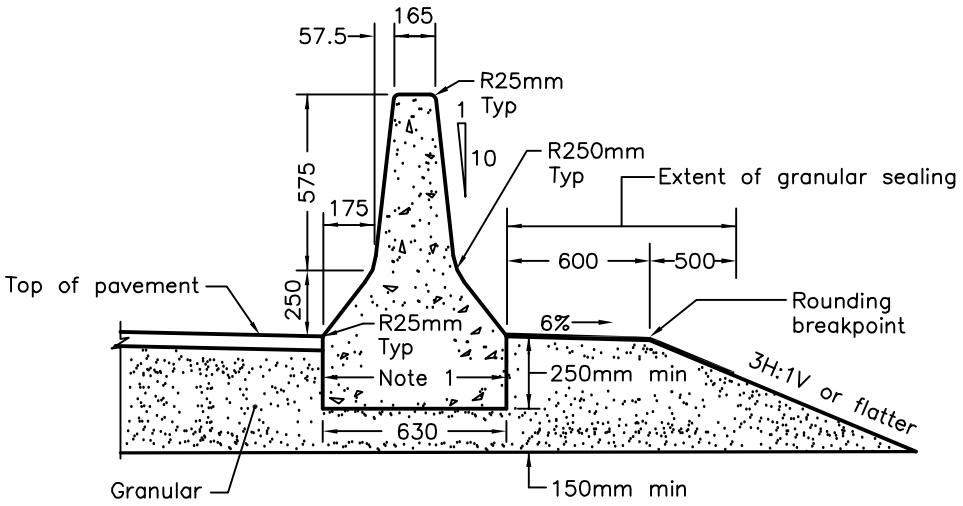
C Cover on reinforcement shall be 70mm ±20mm at all joints.

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	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _		
	OPSD 911.134		



CUT SECTION



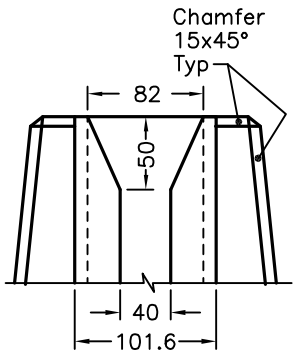
FILL SECTION

NOTES:

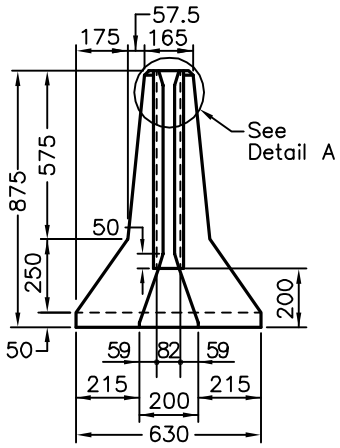
1 For slipforming procedure, a 1H:20V batter is acceptable.

A All dimensions are in millimetres unless otherwise shown.

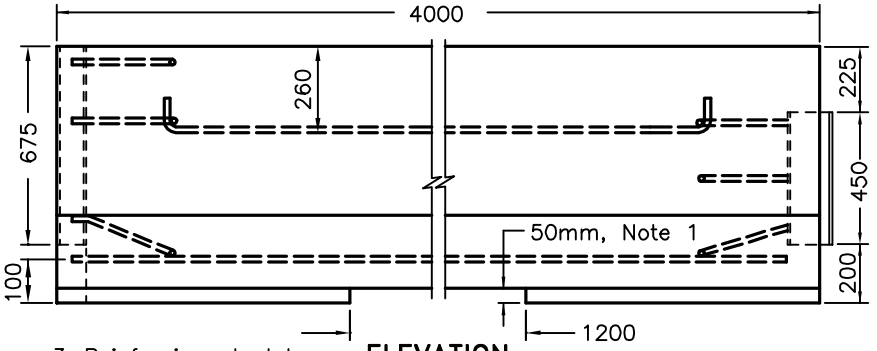
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	0
GUIDE RAIL SYSTEM, CONCRETE ROADSIDE BARRIER CAST–IN–PLACE OR SLIPFORMED INSTALLATION			
	OPSD 911.135		



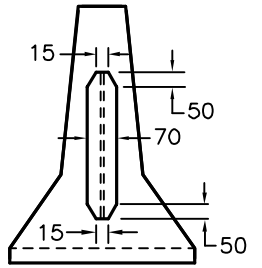
DETAIL A



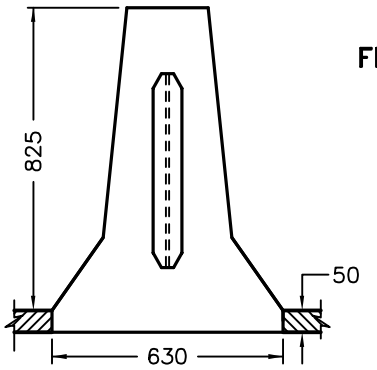
FEMALE END ELEVATION
See Installation
Detail B or C



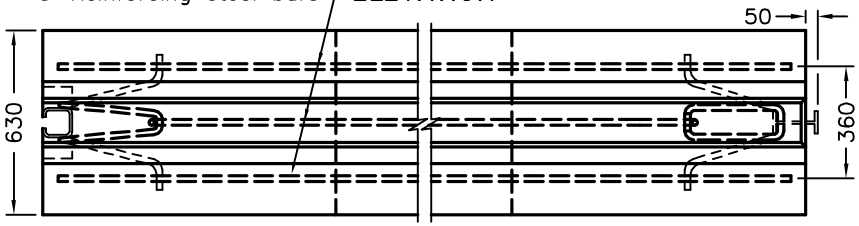
ELEVATION



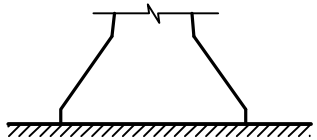
MALE END ELEVATION
See Installation
Detail B or C



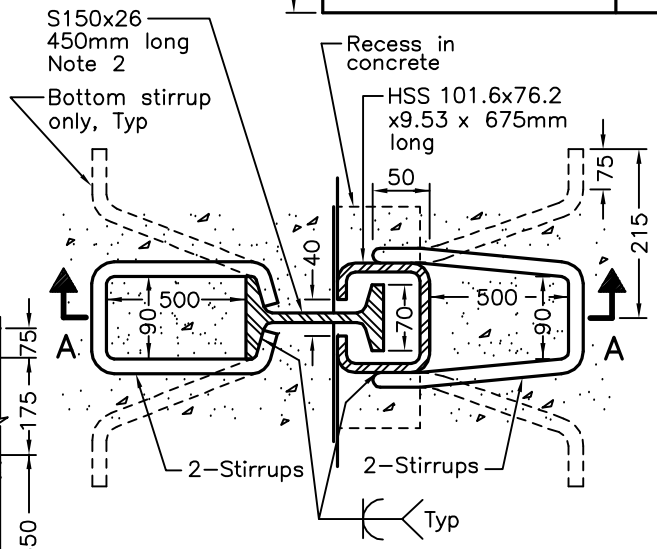
DETAIL B
PERMANENT INSTALLATION



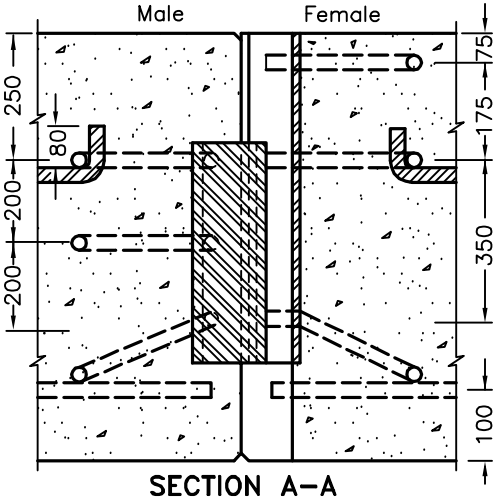
PLAN



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.

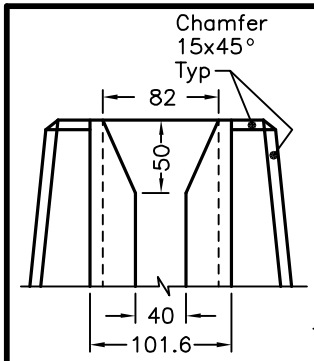
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 | Rev 1

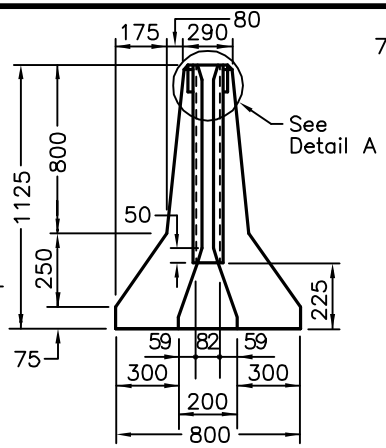
GUIDE RAIL SYSTEM, CONCRETE BARRIER PRECAST I–LOCK CONNECTION INSTALLATION–TEMPORARY AND PERMANENT

ONTARIO STANDARDS · MUNICIPAL–PROVINCIAL · O P S

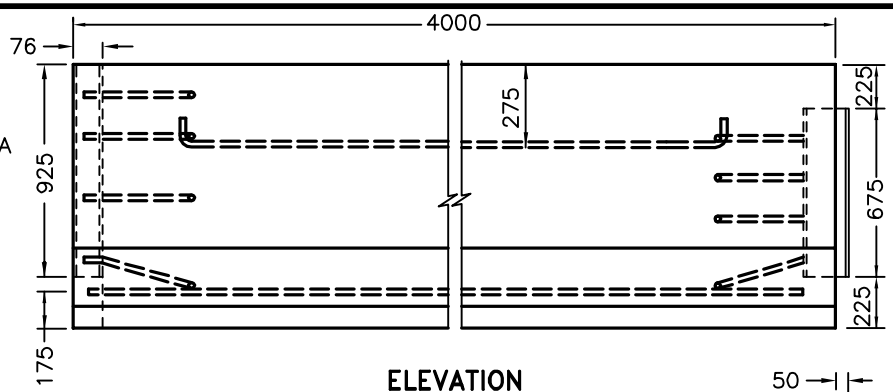
OPSD 911.140



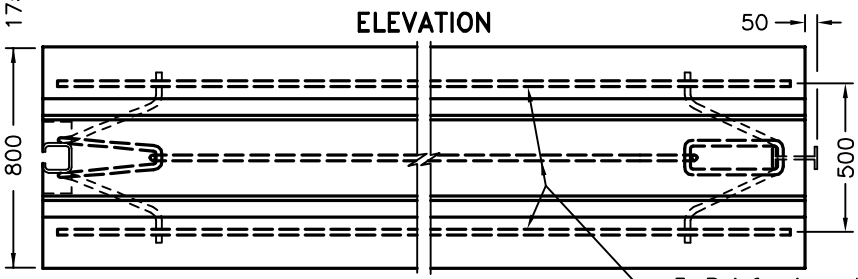
DETAIL A



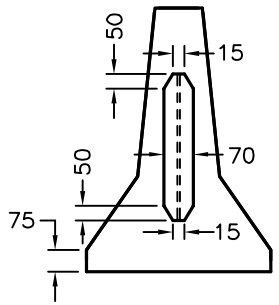
FEMALE END ELEVATION
See Installation Detail B



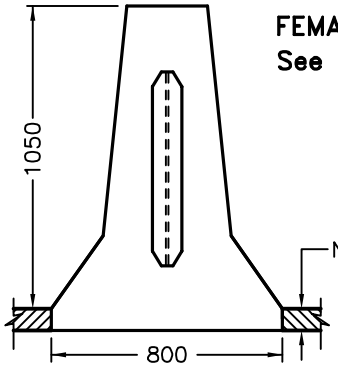
ELEVATION



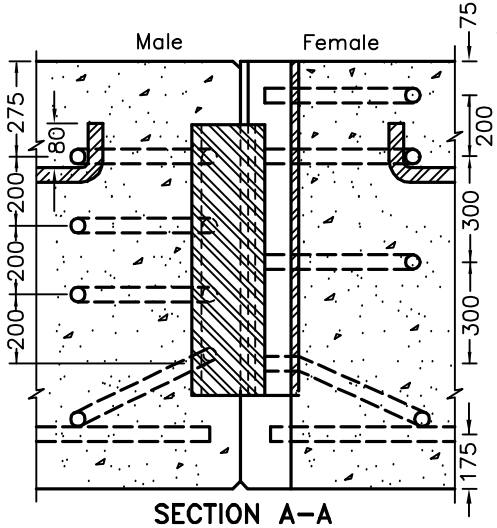
PLAN



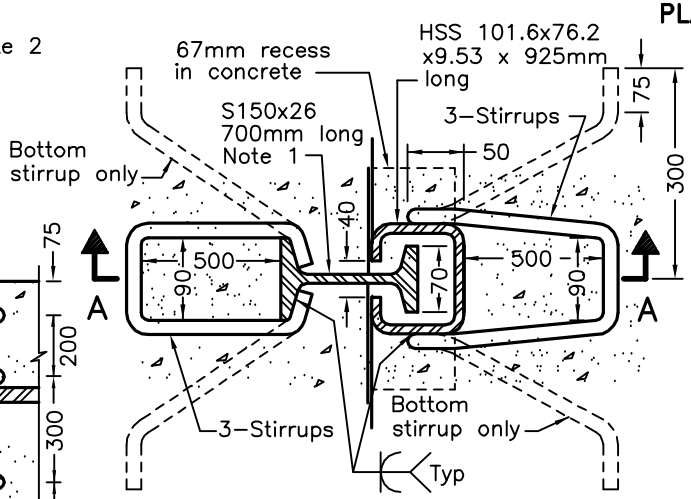
MALE END ELEVATION
See Installation Detail B



DETAIL B



SECTION A–A



CONNECTION ASSEMBLY DETAIL, Note 3

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.

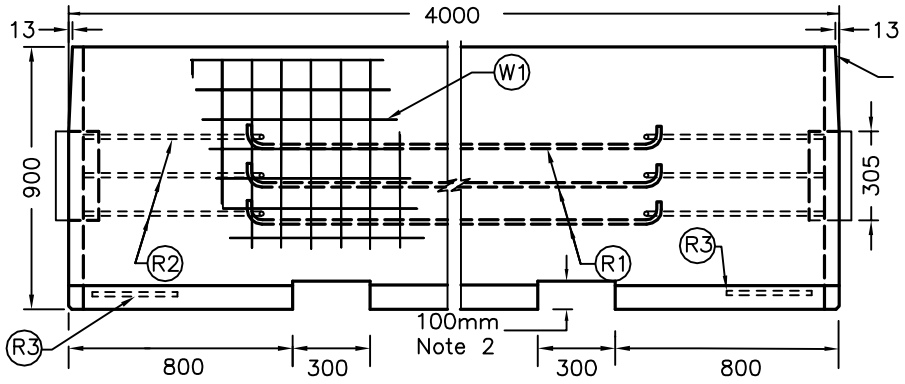
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 | Rev 1

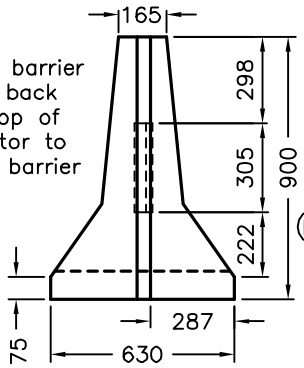
GUIDE RAIL SYSTEM, CONCRETE BARRIER PRECAST I–LOCK CONNECTION, TYPE TW INSTALLATION – PERMANENT

ONTARIO STANDARDS · MUNICIPAL–PROVINCIAL · O P S

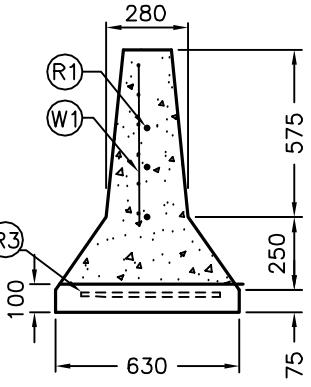
OPSD 911.143



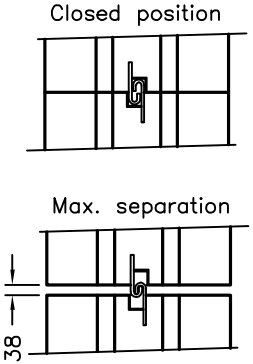
ELEVATION

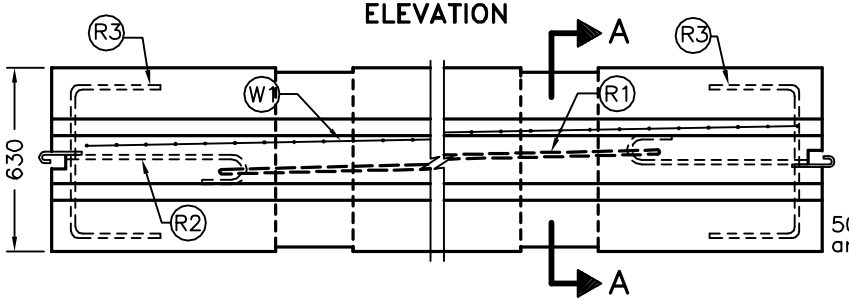


END ELEVATION

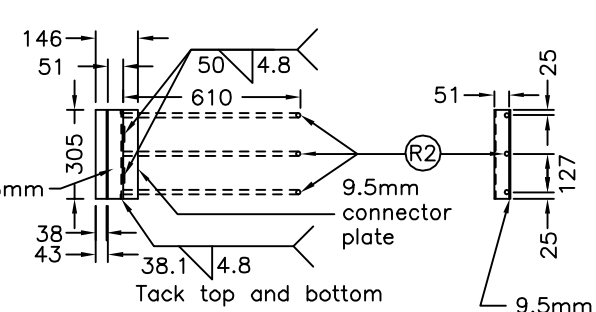


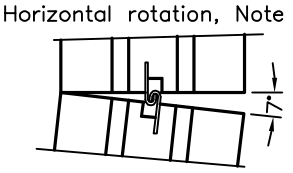
SECTION A–A



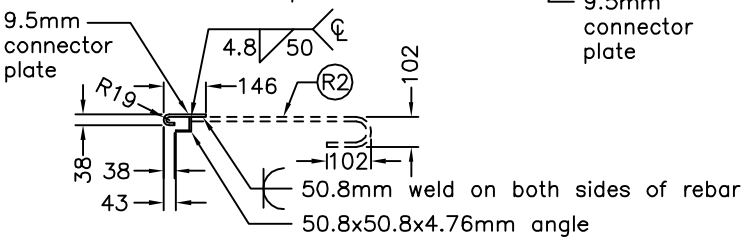


PLAN





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.

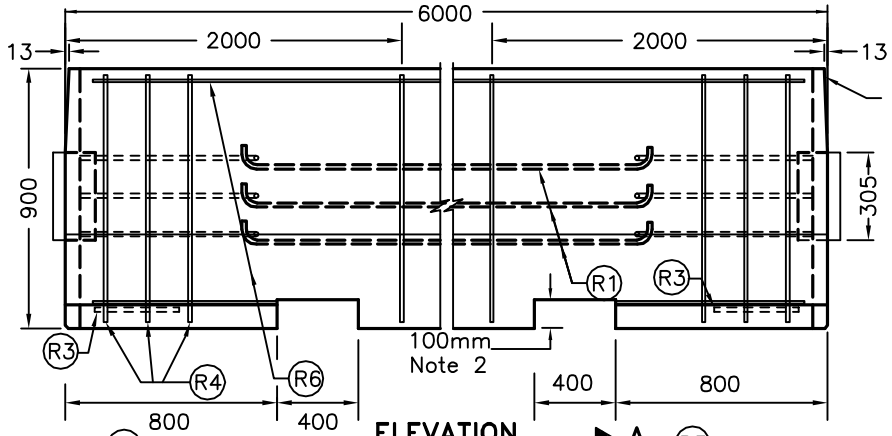
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

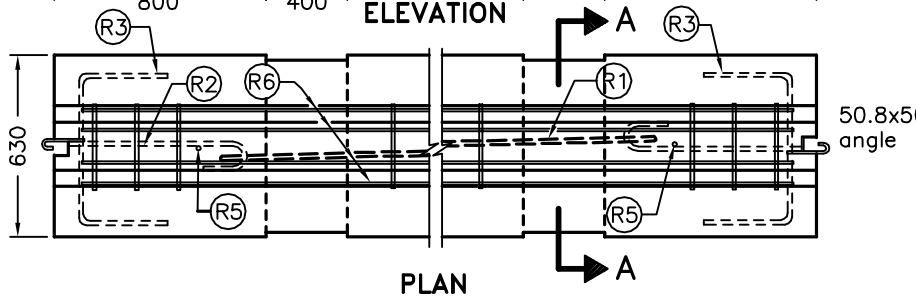
GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE J CONNECTION, 4m LENGTH INSTALLATION–TEMPORARY

Nov 2013 | Rev 0

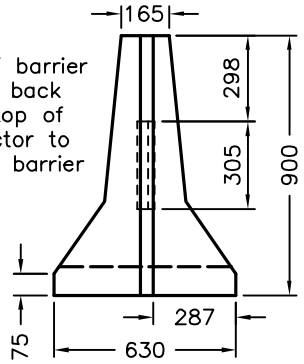
OPSD 911.150



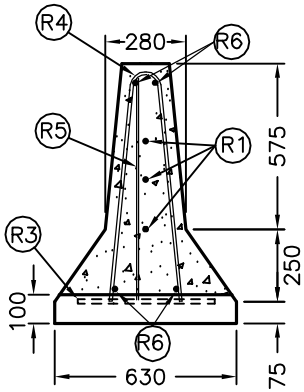
ELEVATION



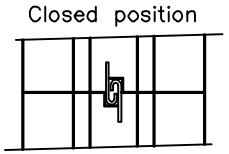
PLAN

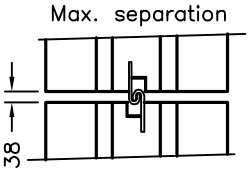


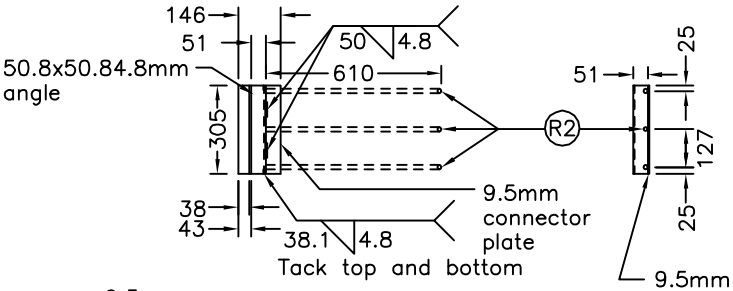
END ELEVATION

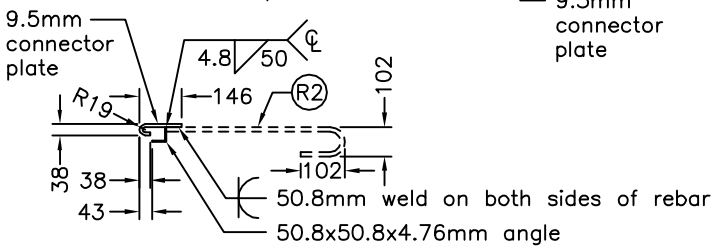


SECTION A–A

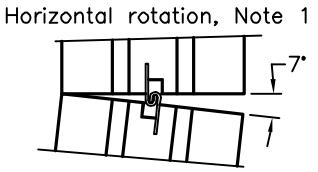








Type J Connection DETAIL, Note 3



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:

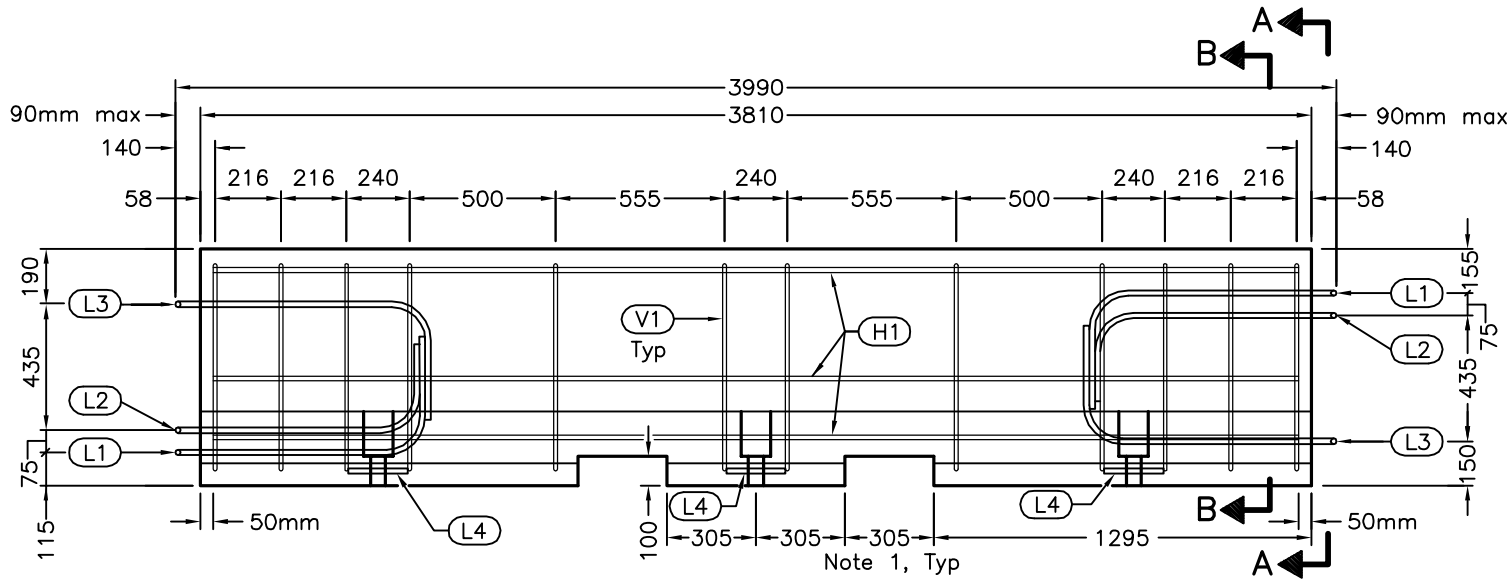
1 Minimum horizontal radius shall be 47m.
2 Drainage openings.
3 JJ Hook Connection is proprietary to Easi–Set Industries Inc.
A System configuration meets NCHRP Report 350 TL–3.
B Concrete cover 50mm minimum.
C All concrete edges shall have 15x45° chamfers.
D Welds shall be according to CSA W59.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

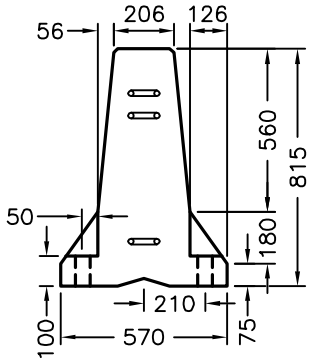
GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE J CONNECTION, 6m LENGTH INSTALLATION–TEMPORARY

Nov 2013 | Rev 0

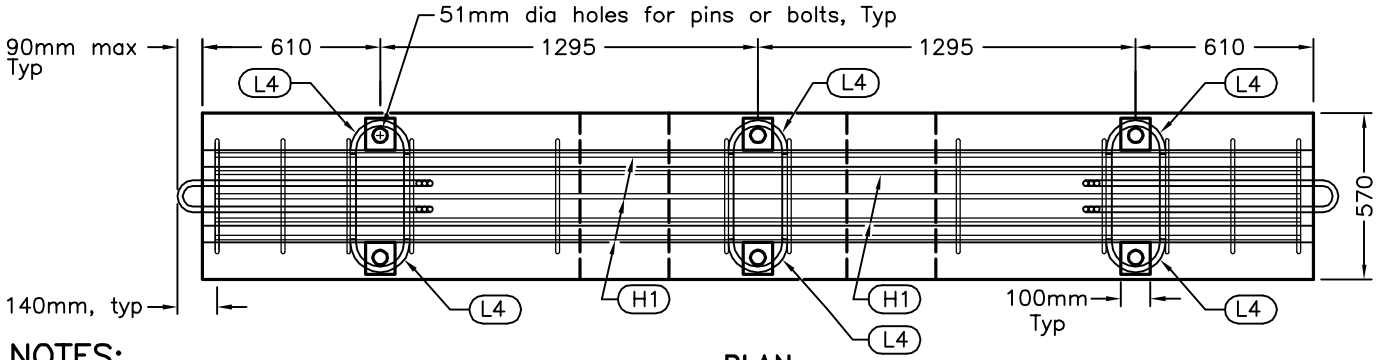
OPSD 911.151



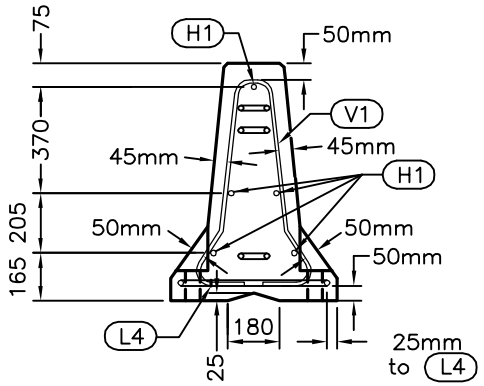
ELEVATION



SECTION A–A



PLAN



SECTION B–B

NOTES:

1 Drainage opening.

A This OPSD shall be read in conjunction with OPSD 911.161.

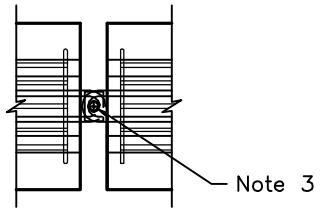
B System configuration meets NCHRP Report 350 TL–3.

C Welding of reinforcement bars shall be according to CSA W186.

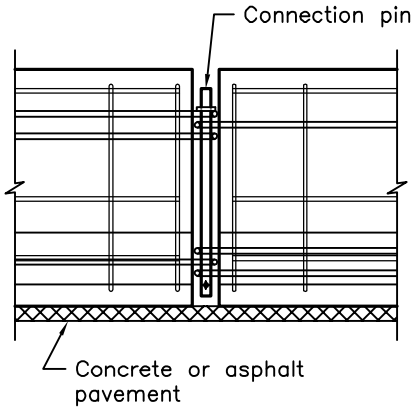
D All concrete edges shall have 15x45° chamfers.

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	0
GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION INSTALLATION–TEMPORARY 1			
	OPSD 911.160		

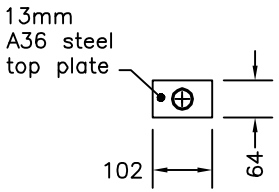


PLAN

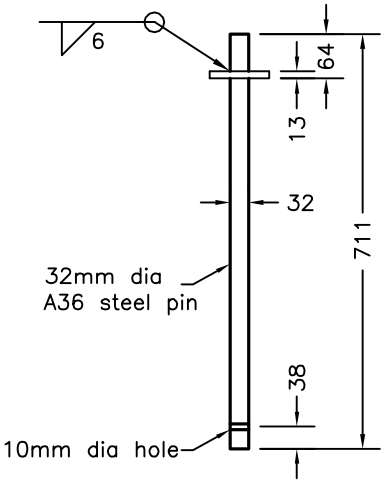


ELEVATION

CONNECTION DETAIL

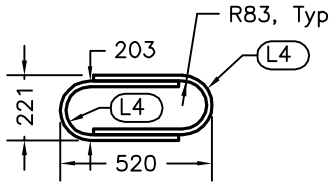


PLAN



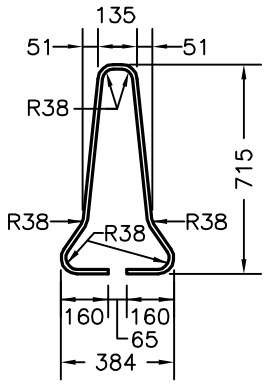
ELEVATION

CONNECTION PIN



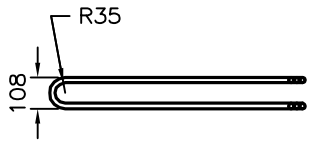
PLAN

HOOP BAR ASSEMBLY

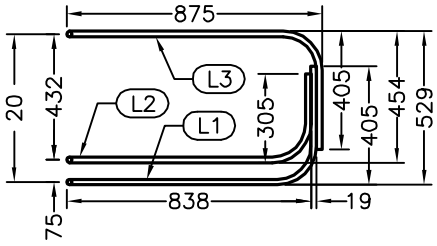


ELEVATION

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.

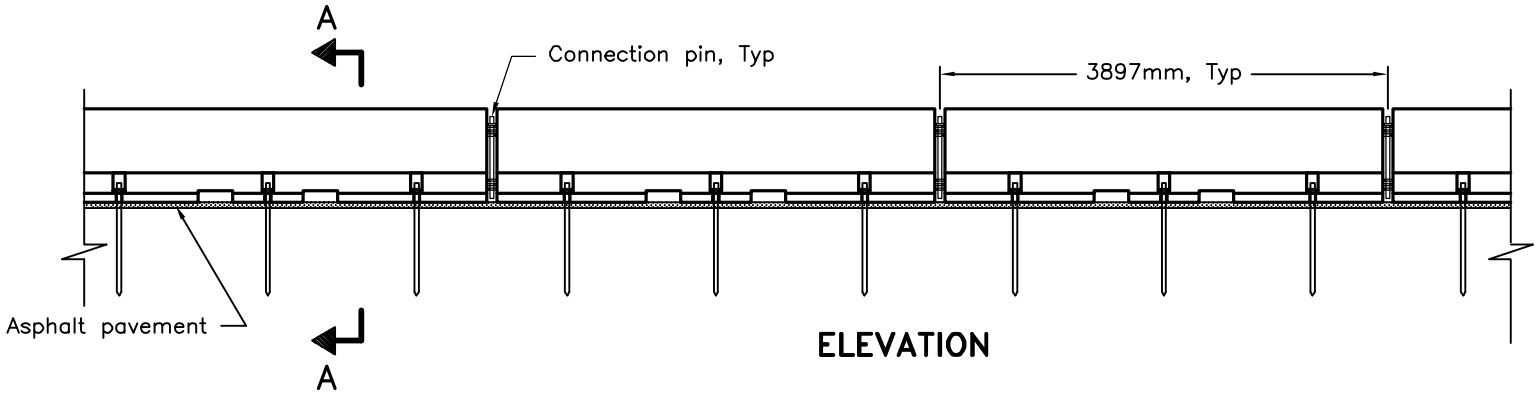
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION INSTALLATION–TEMPORARY 2

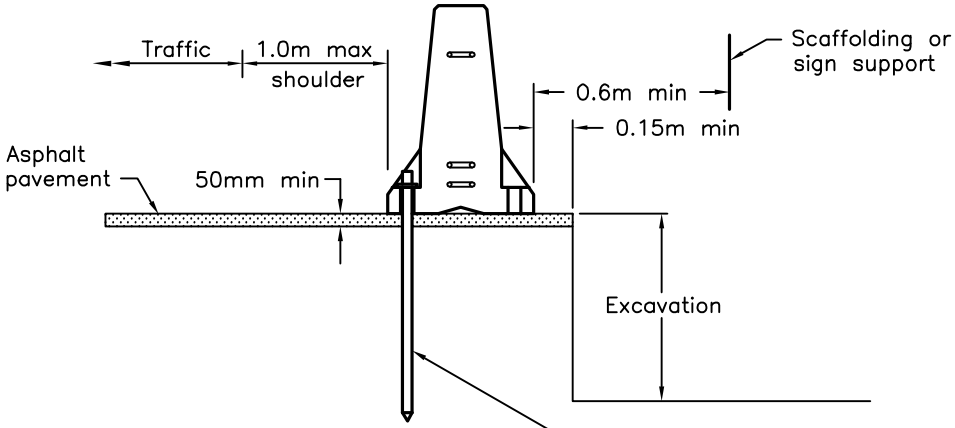
Nov 2013 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · STS

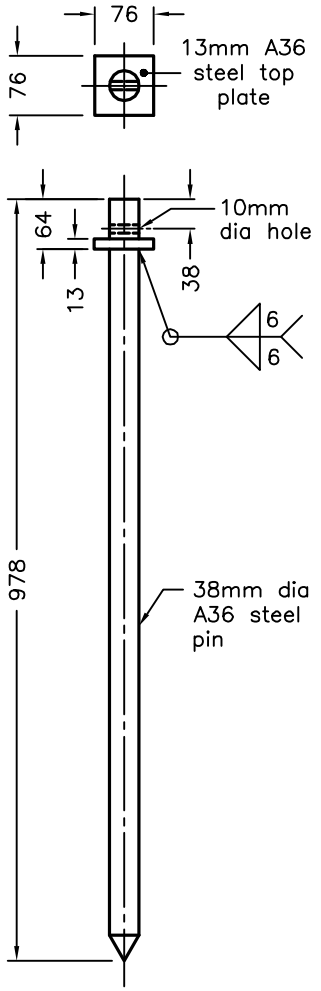
OPSD 911.161



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

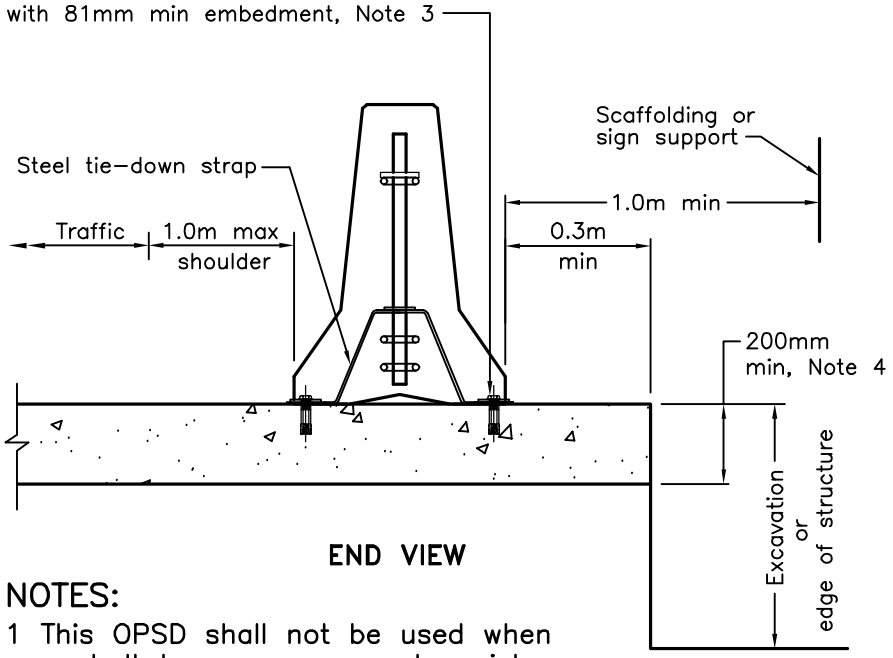
GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION

INSTALLATION – TEMPORARY RESTRAINED SYSTEM PINNED TO ASPHALT PAVEMENT

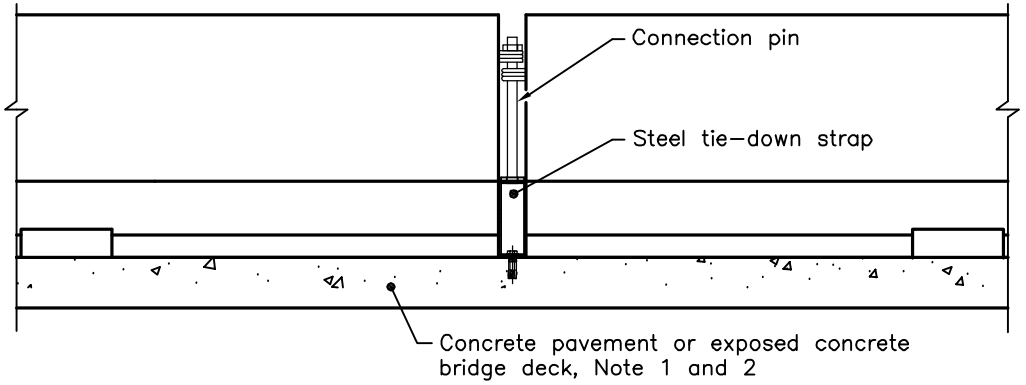
Nov 2013 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

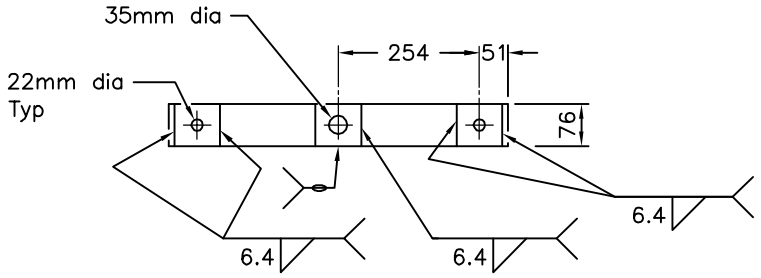
OPSD 911.162



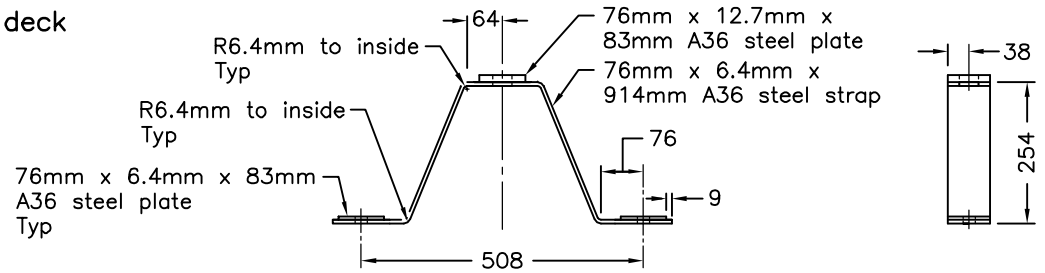
END VIEW



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

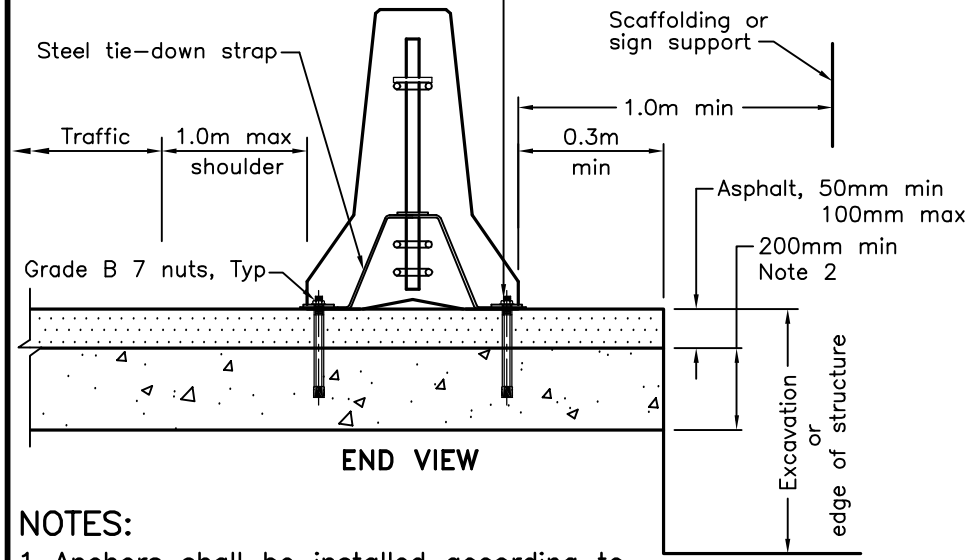
GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION INSTALLATION – TEMPORARY RESTRAINT SYSTEM STRAPPED TO CONCRETE

Nov 2013 | Rev 0

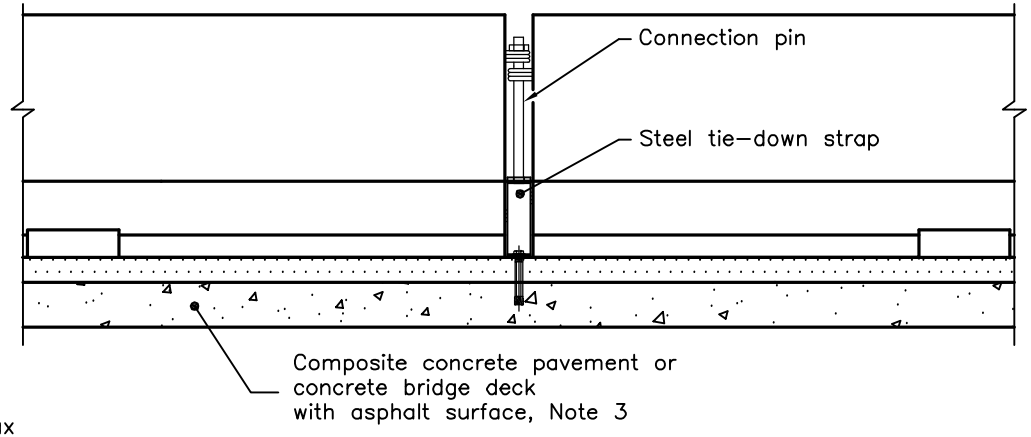
ONTARIO STANDARD MUNICIPAL – PROVINCIAL

OPSD 911.163

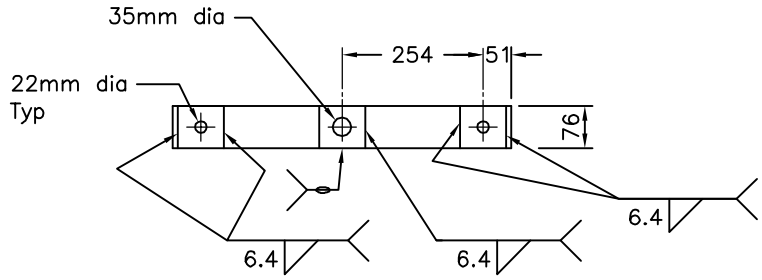
Two 3/4" dia x 4" Hilti HAS Super Rods fully threaded into Hilti 3/4" x 8–1/4" HIS–N inserts and HIT–RE 500 epoxy anchoring system with minimum 120mm embedment into concrete. Top of inserts and epoxy flush with top of pavement. Nuts shall not be torqued until epoxy is cured. Note 1



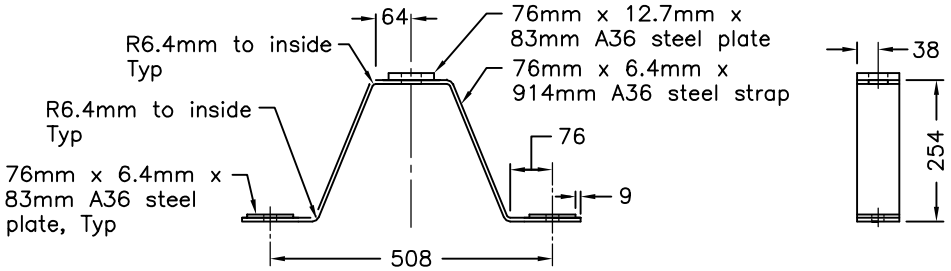
END VIEW



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

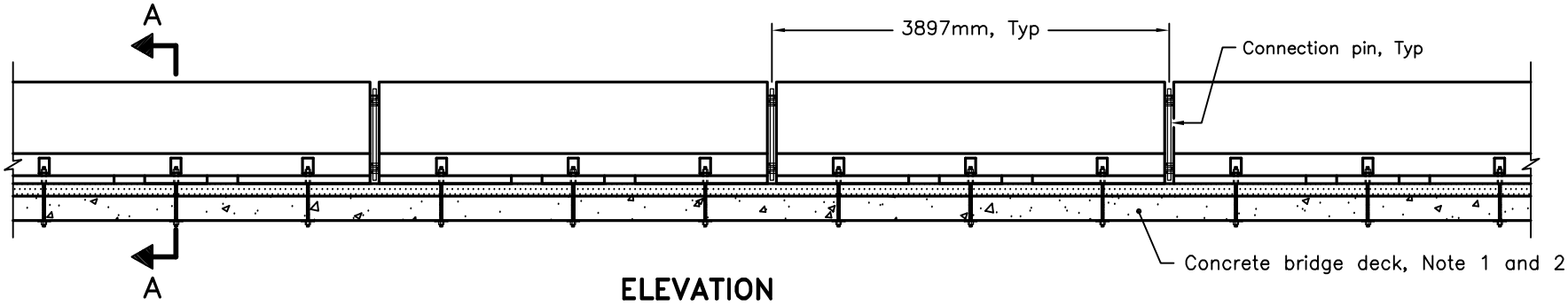
GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION

INSTALLATION – TEMPORARY RESTRAINT SYSTEM STRAPPED TO CONCRETE WITH ASPHALT SURFACE

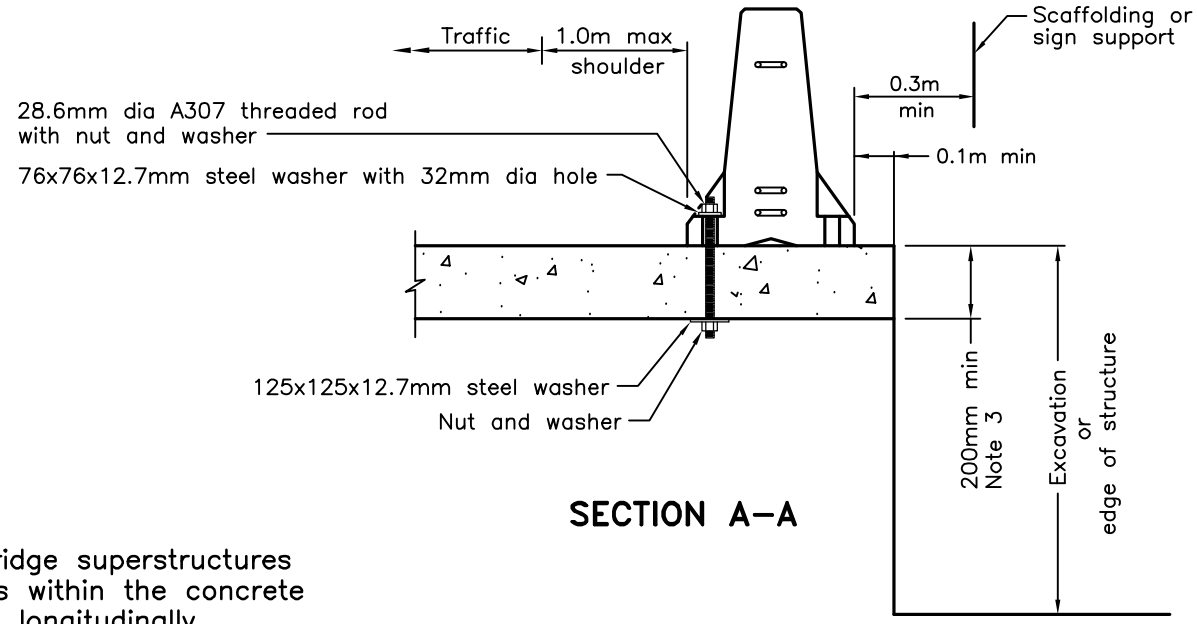
Nov 2013 | Rev 0

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.

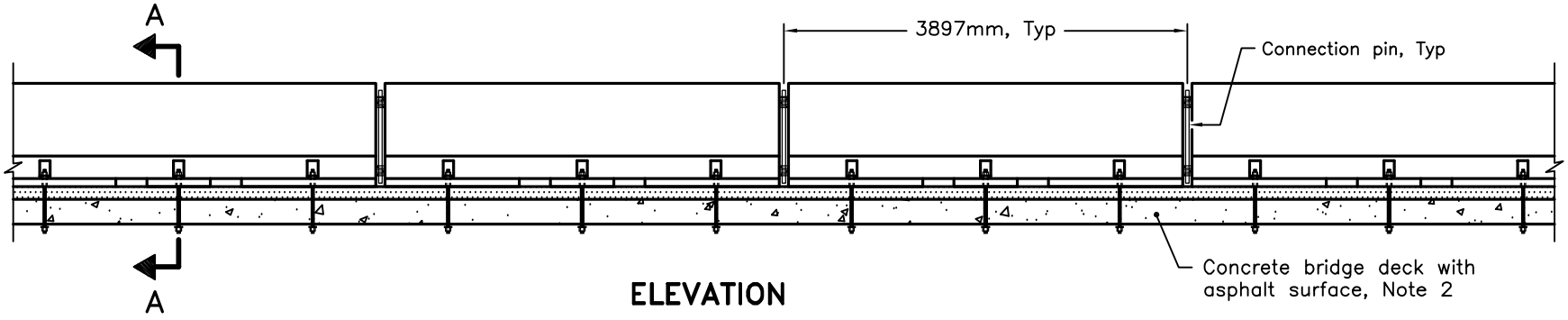
3 Minimum concrete strength shall be 27MPa.

A This OPSD shall be read in conjuction with OPSD 911.160 and 911.172.

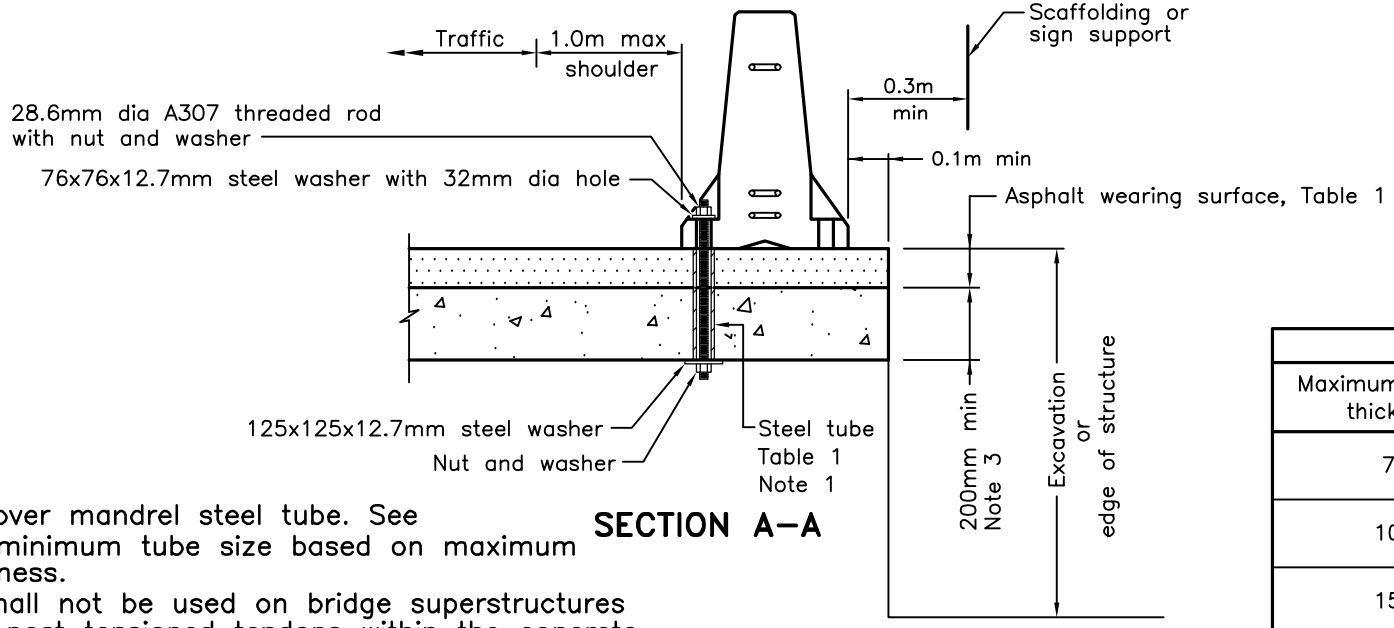
B System configuration meets NCHRP Report 350 TL–3.

C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	0
GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION INSTALLATION – TEMPORARY RESTRAINT SYSTEM BOLTED THROUGH CONCRETE			
	OPSD 911.167		



ELEVATION



SECTION A–A

Table 1	
Maximum asphalt thickness	Steel tube diameter
76	73 OD 41 ID
100	83 OD 51 ID
150	95 OD 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

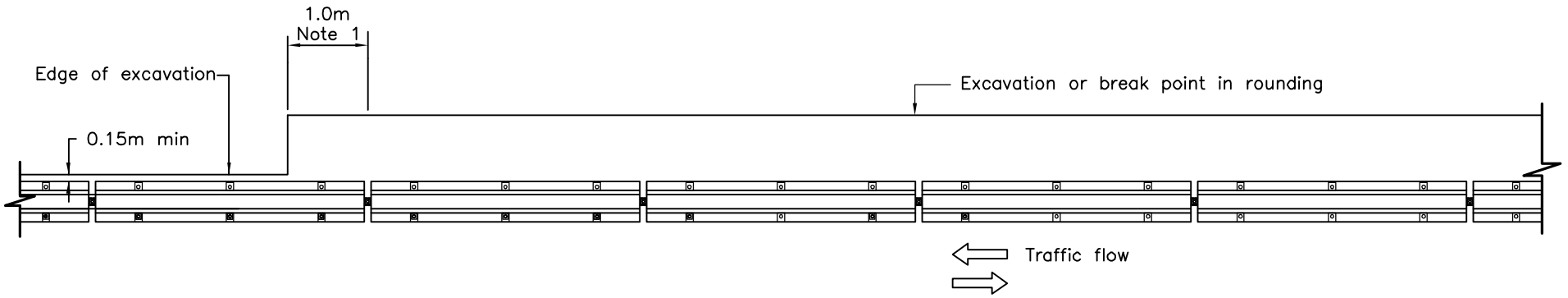
GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION

INSTALLATION – TEMPORARY RESTRAINT SYSTEM BOLTED THROUGH CONCRETE WITH ASPHALT SURFACE

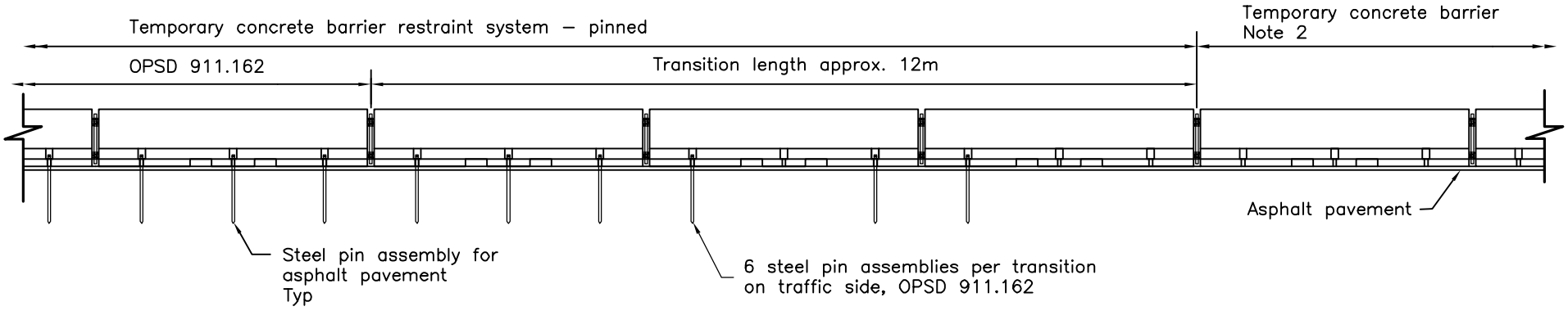
Nov 2013 | Rev 0

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.

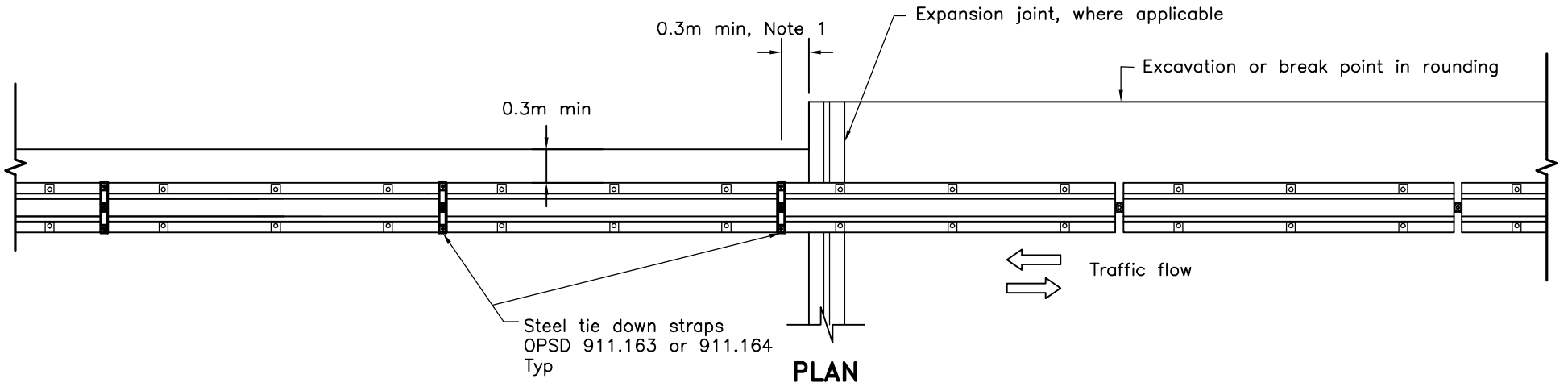
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION
INSTALLATION – TEMPORARY RESTRAINT SYSTEM TRANSITION TO PINNED TCB

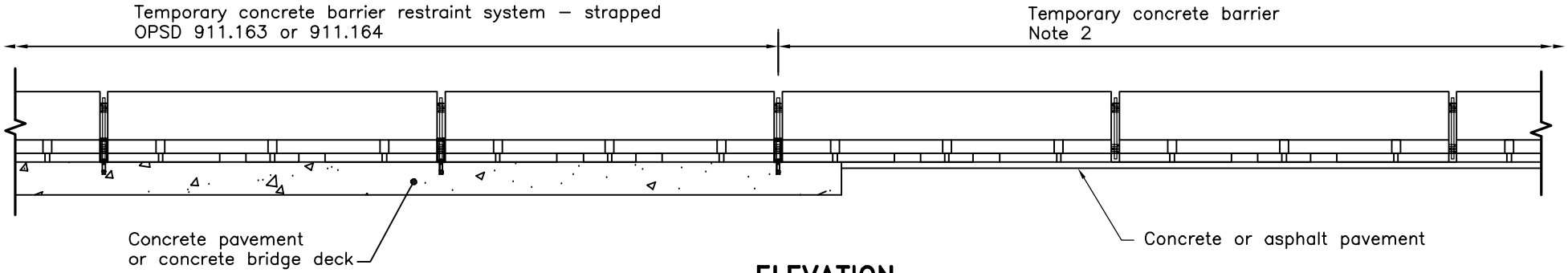
Nov 2014 | Rev 1

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.

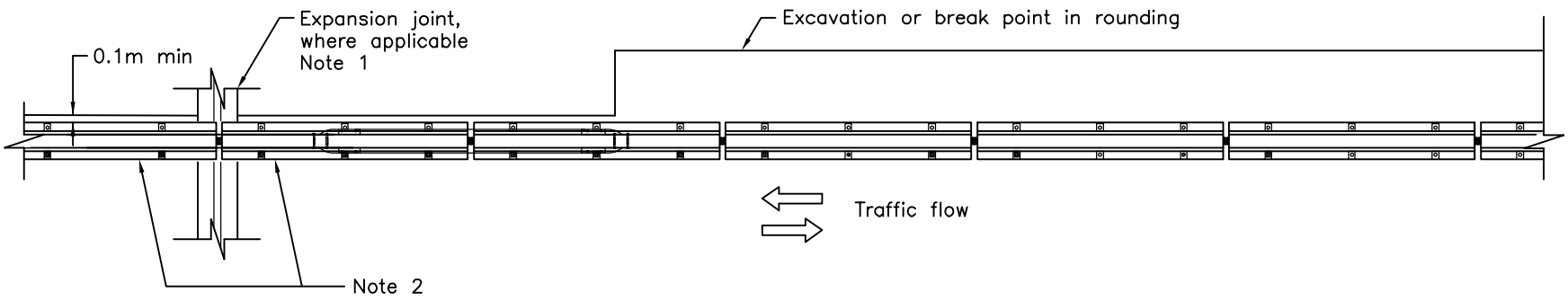
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION
INSTALLATION – TEMPORARY RESTRAINT SYSTEM TRANSITION TO STRAPPED TCB

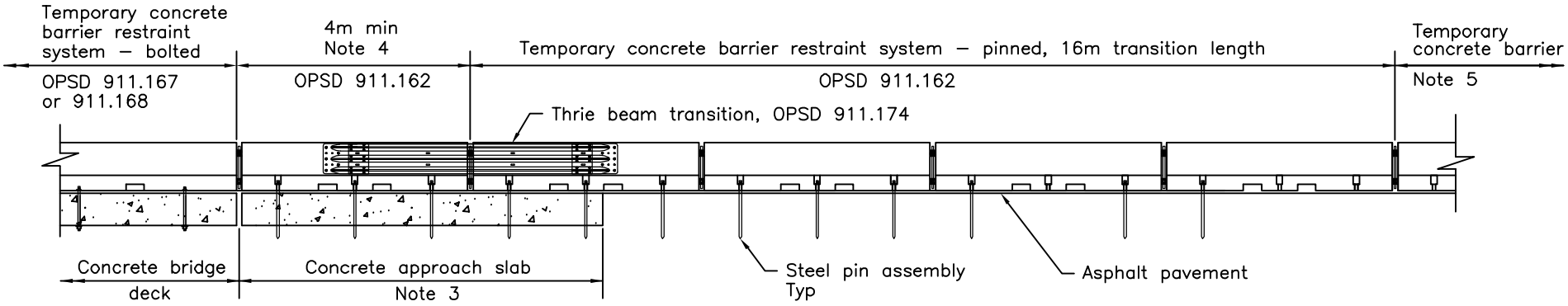
Nov 2014 | Rev 1

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.

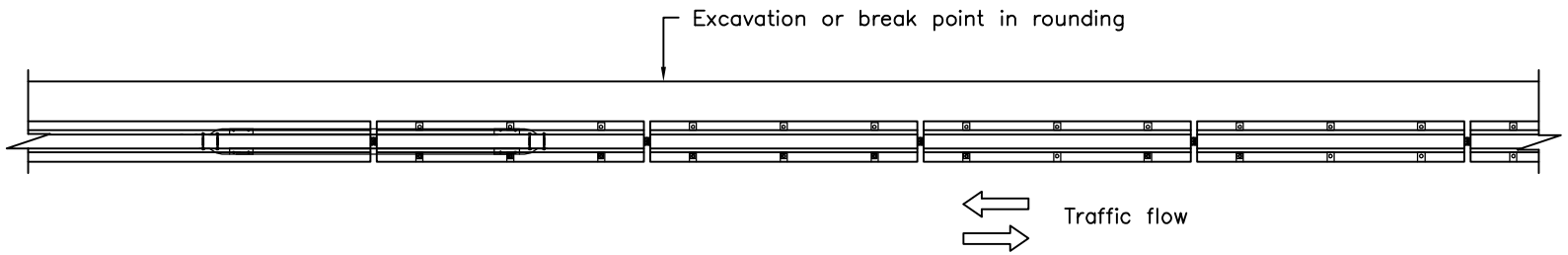
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION
INSTALLATION – TEMPORARY RESTRAINT SYSTEM TRANSITION TO BOLTED TCB

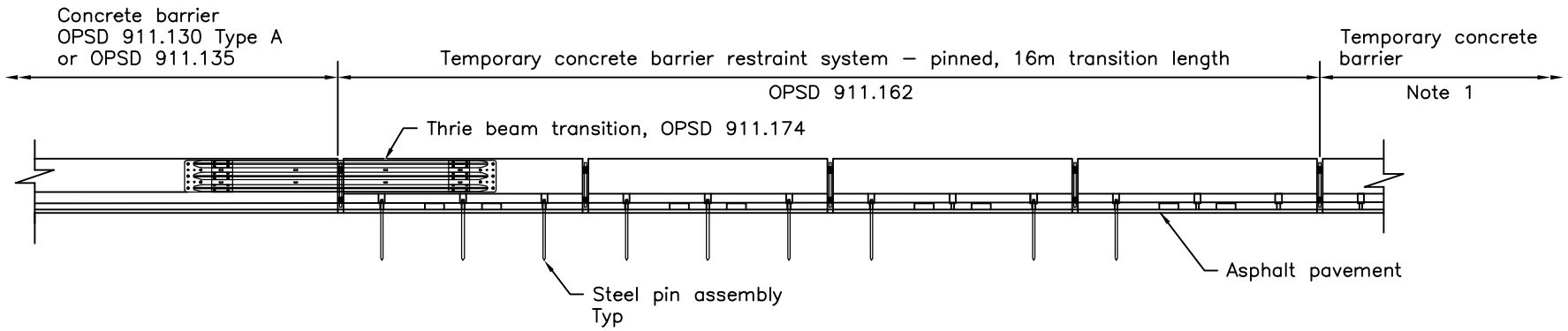
Nov 2014 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

OPSD 911.172



PLAN



ELEVATION

NOTES:

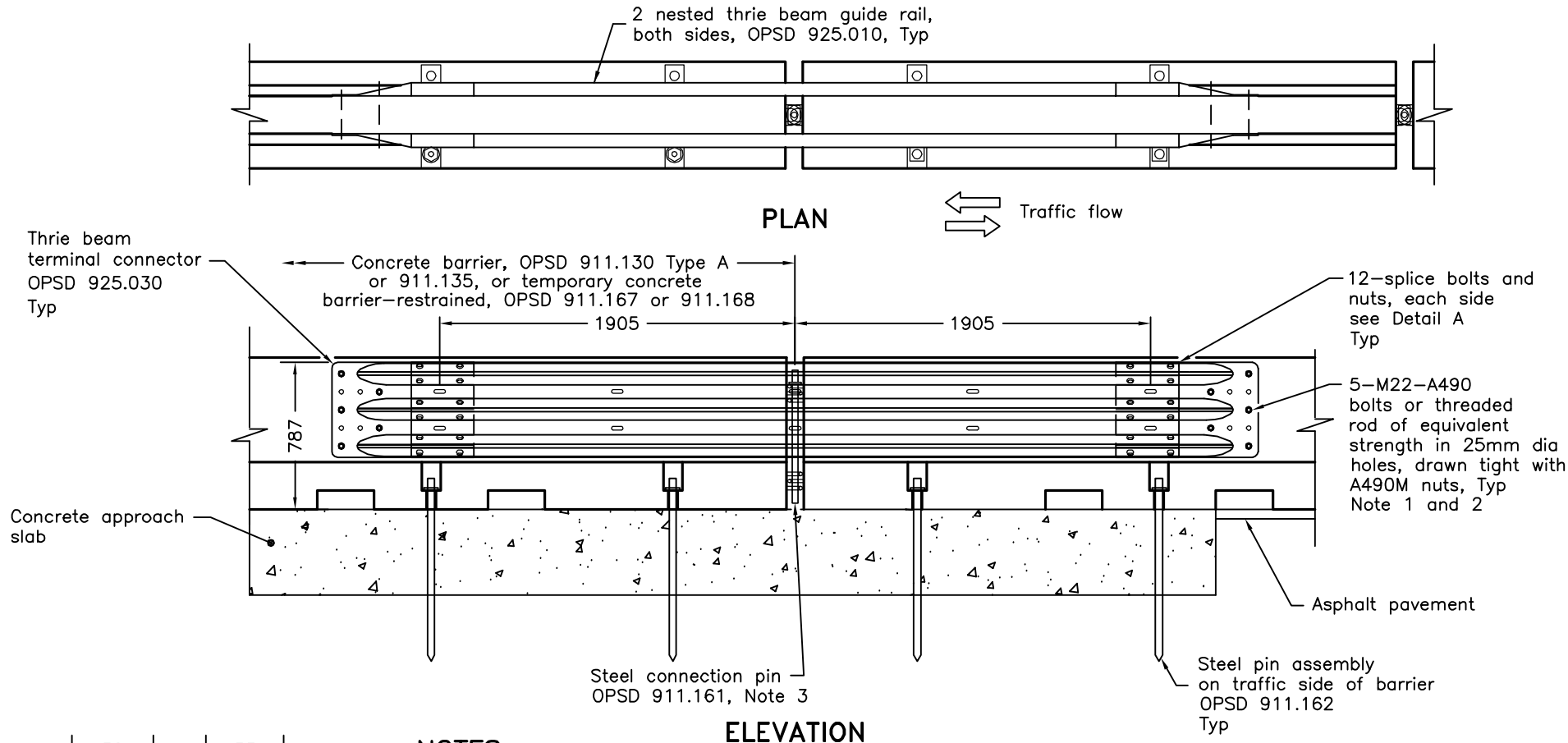
1 Type M temporary concrete barrier shown. Transition to another connection type shall be completed according to OPSD 911.340.

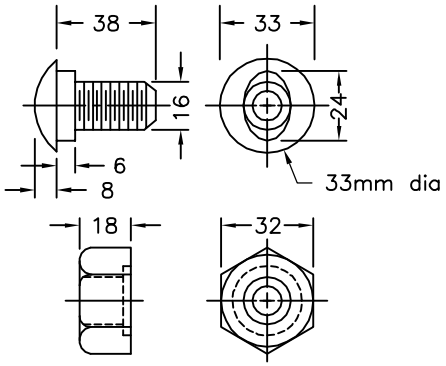
A This OPSD shall be read in conjunction with OPSD 911.160 and 911.162.

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	



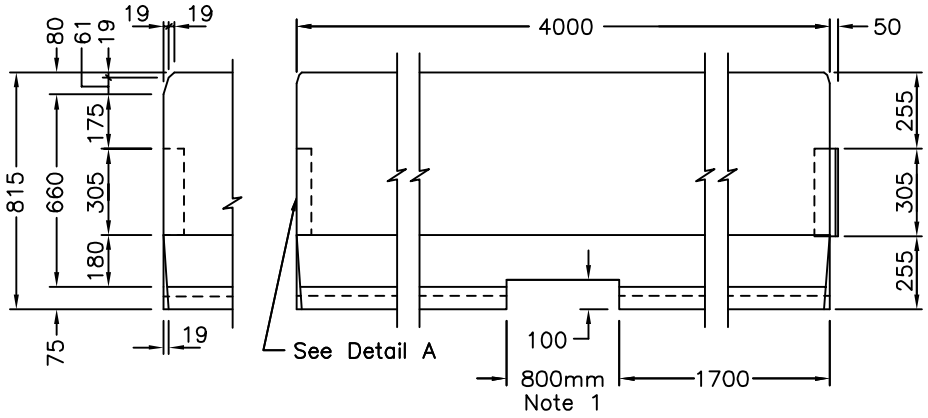


SPLICE BOLT AND NUT
DETAIL A

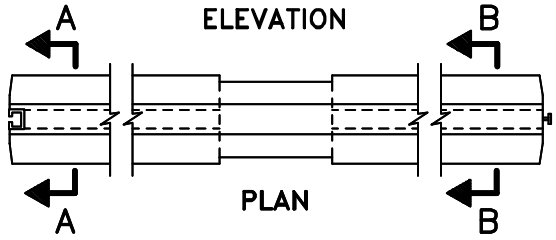
NOTES:

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

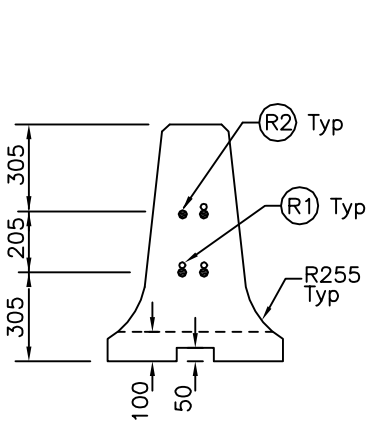


DETAIL A

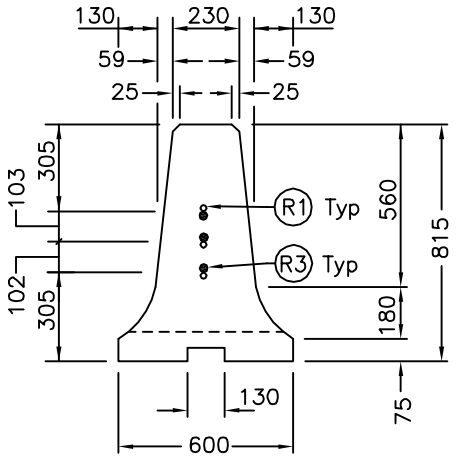


ELEVATION

PLAN

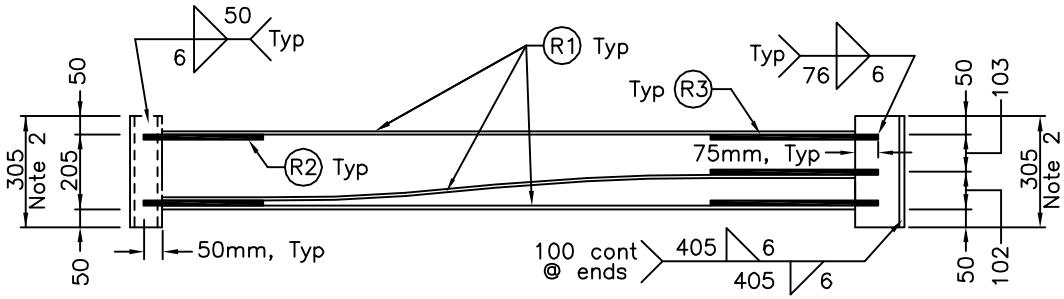


SECTION A–A

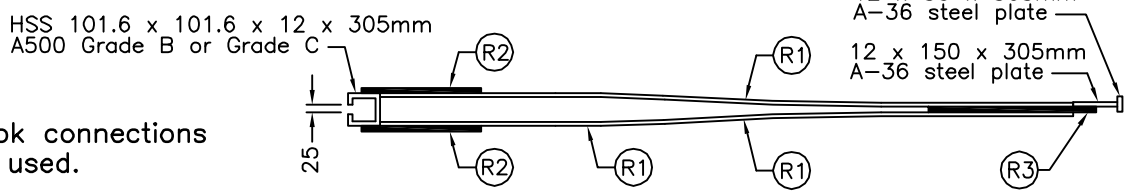


SECTION B–B

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



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 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.

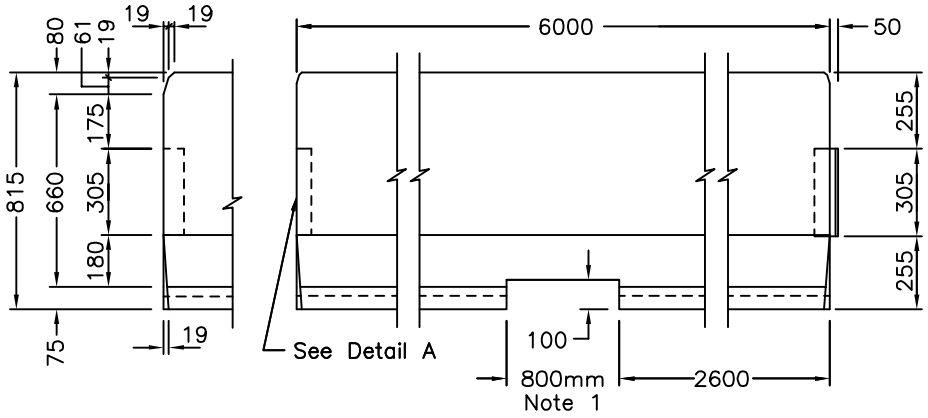
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE T CONNECTION, 4.0m LENGTH INSTALLATION–TEMPORARY

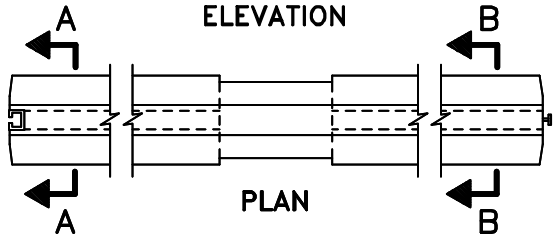
Nov 2013 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

OPSD 911.180

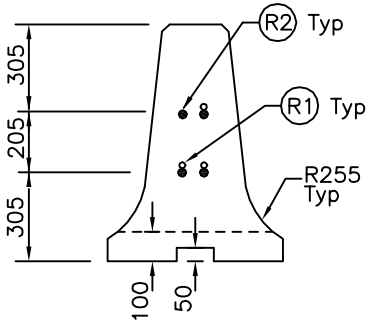


DETAIL A

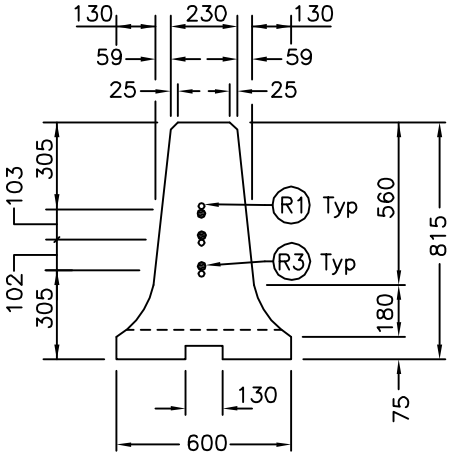


ELEVATION

PLAN

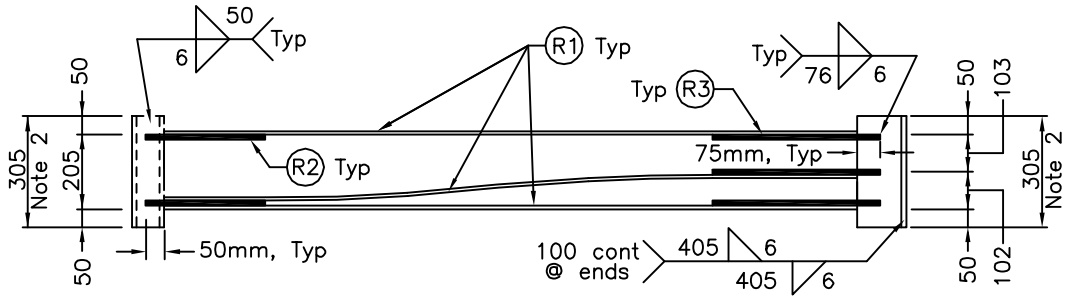


SECTION A–A

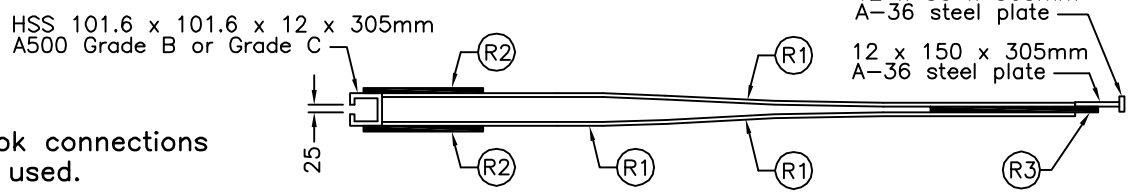


SECTION B–B

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.

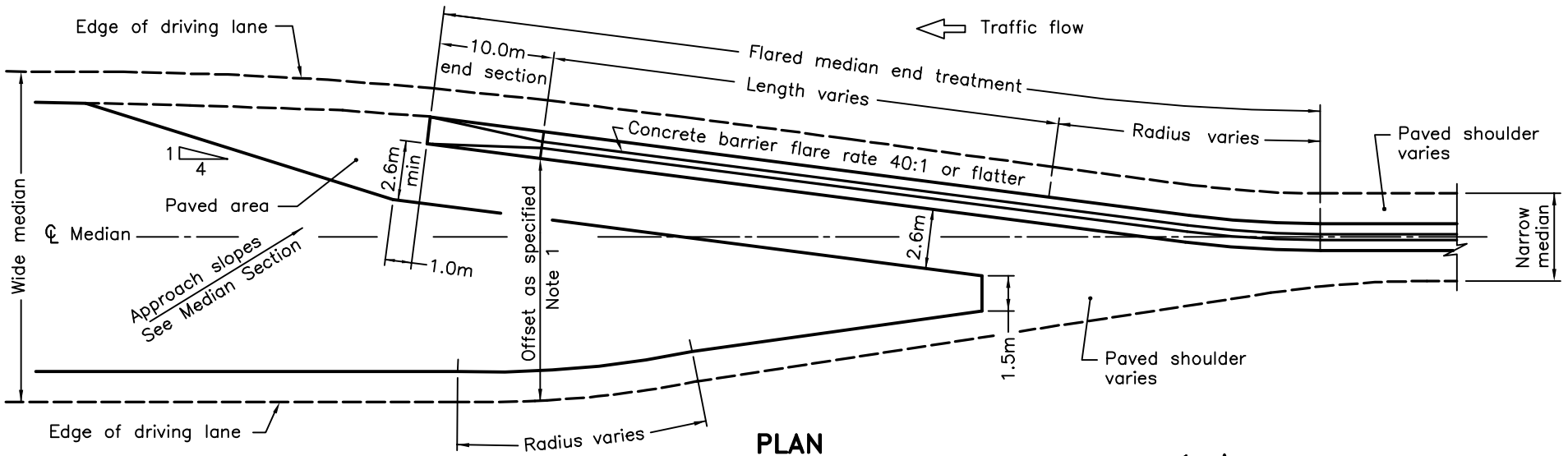
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE T CONNECTION, 6.0m LENGTH INSTALLATION–TEMPORARY

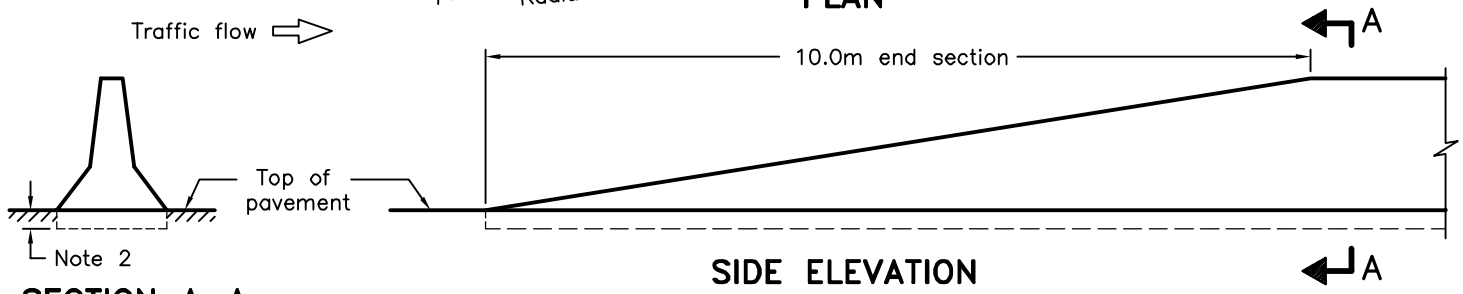
Nov 2013 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · STANDARD

OPSD 911.181

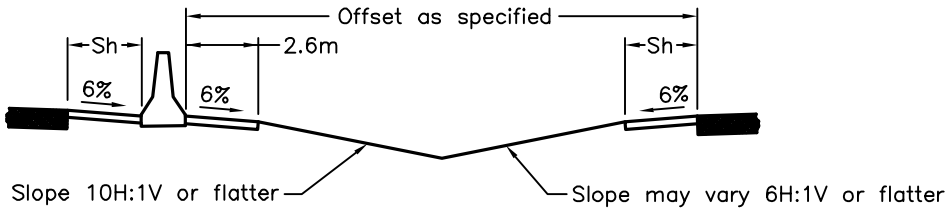


PLAN



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.

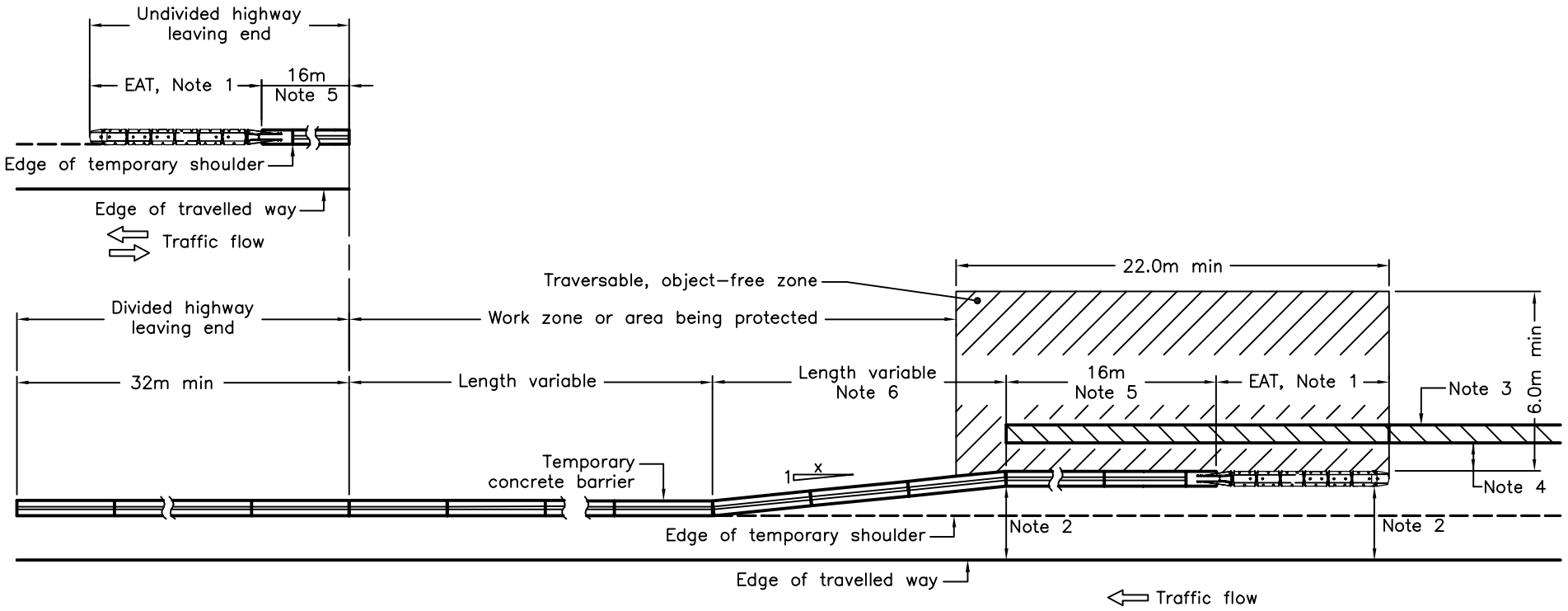
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, CONCRETE BARRIER MEDIAN END TREATMENT INSTALLATION

Nov 2015 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

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

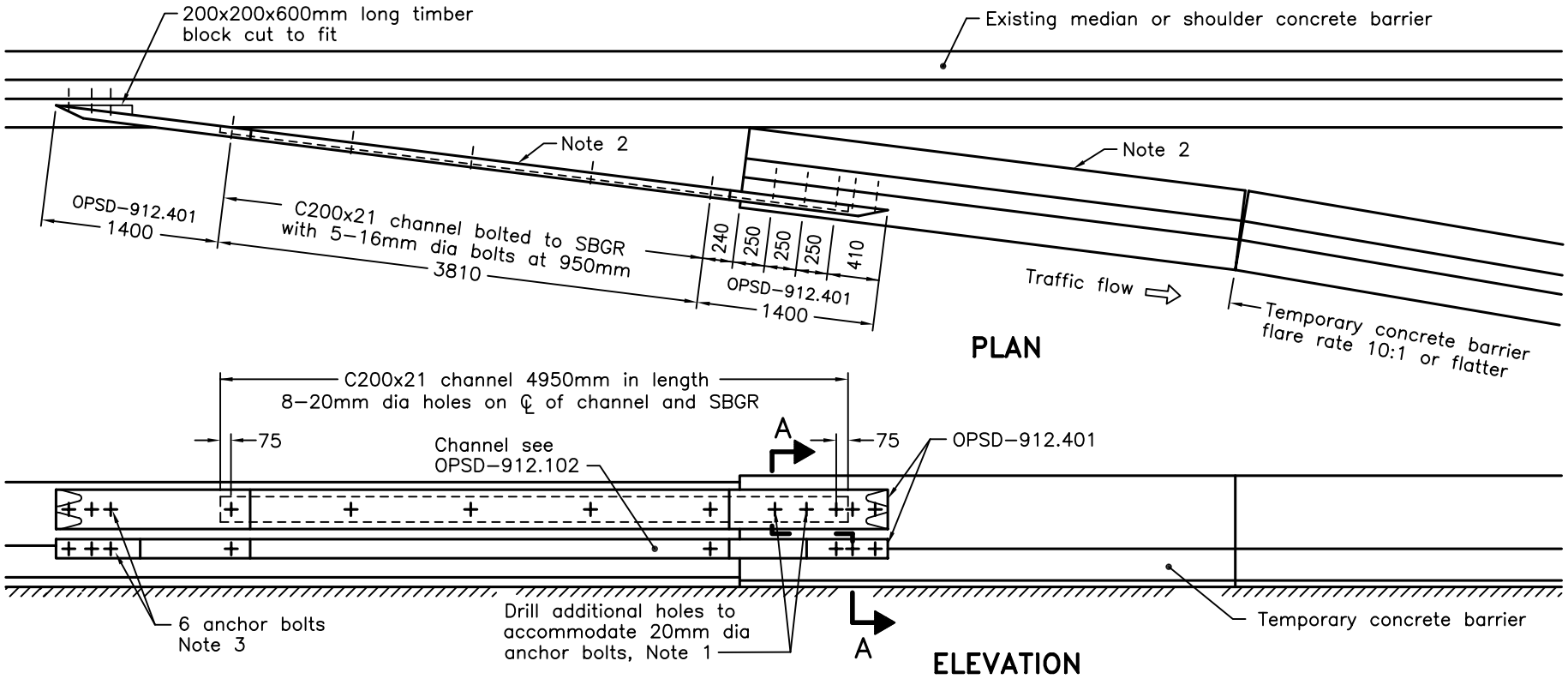
ONTARIO PROVINCIAL STANDARD DRAWING

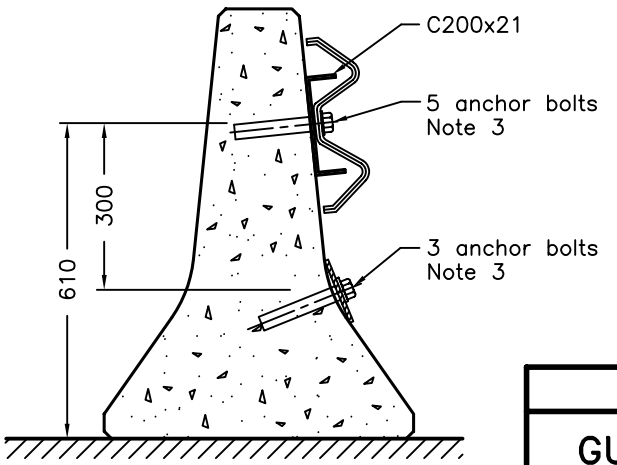
GUIDE RAIL SYSTEM, CONCRETE BARRIER ENERGY ATTENUATOR INSTALLATION – TEMPORARY

Nov 2014 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

OPSD 911.232





SECTION A–A

NOTES:

1 OPSD–912.401 rail connections shall consist of double SBGR panels. Additional holes may be field drilled.

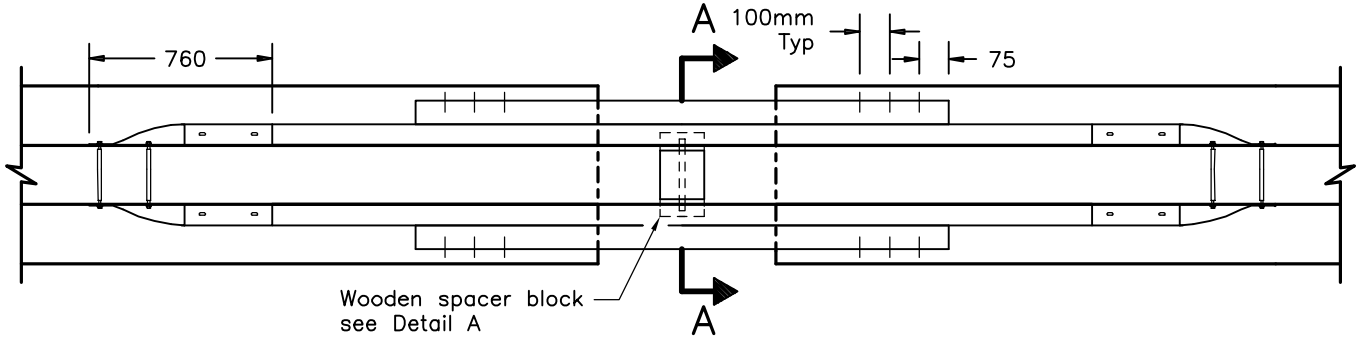
2 Flare rate of temporary transition rail and first temporary concrete barrier unit shall be 12:1 or flatter.

3 20mm dia removable anchor bolts each with an ultimate pullout value of 100kN in 30MPa concrete.

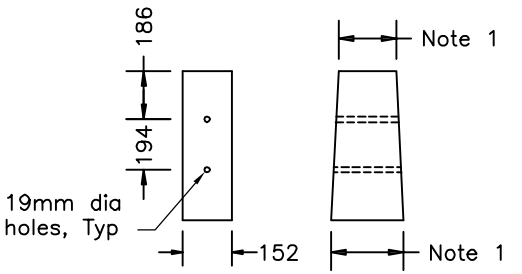
A When transitioning from a curb section onto a lower surface the temporary concrete barrier shall be supported to attain a grade of 10% or flatter.

B All dimensions are in millimetres unless otherwise shown.

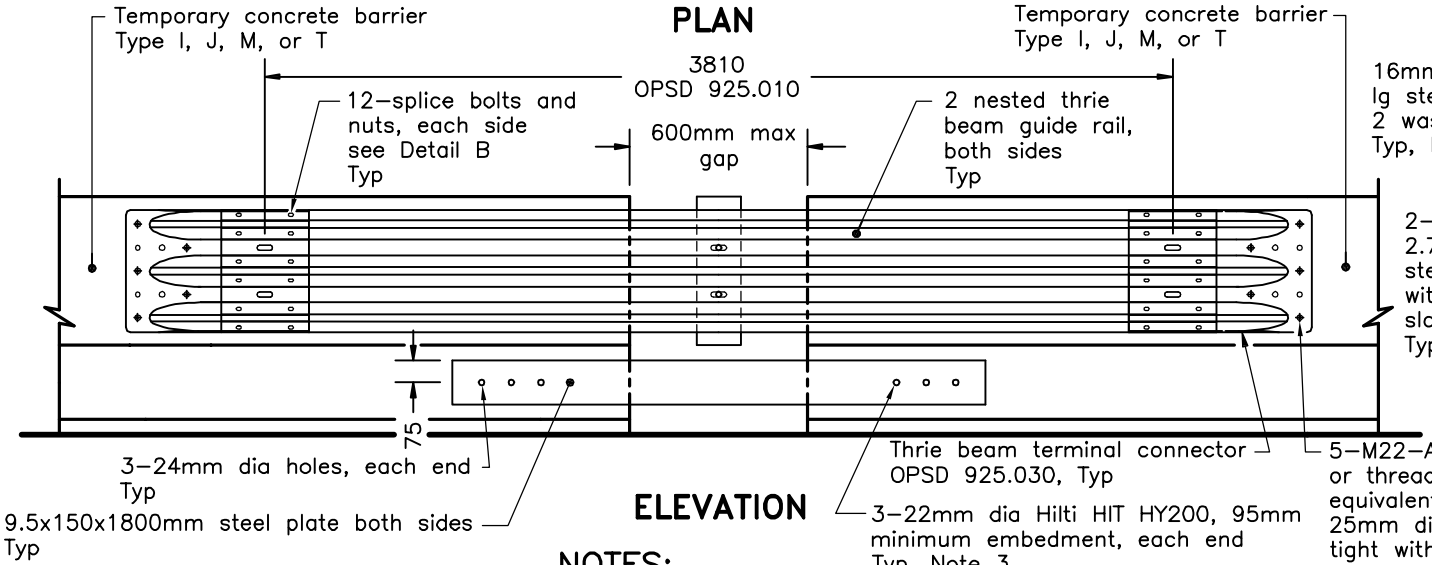
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2001	Rev	0
GUIDE RAIL SYSTEM, CONCRETE BARRIER TEMPORARY TRANSITION INSTALLATION–RAIL METHOD CONCRETE BARRIER TO TEMPORARY CONCRETE BARRIER			
	OPSD – 911.330		



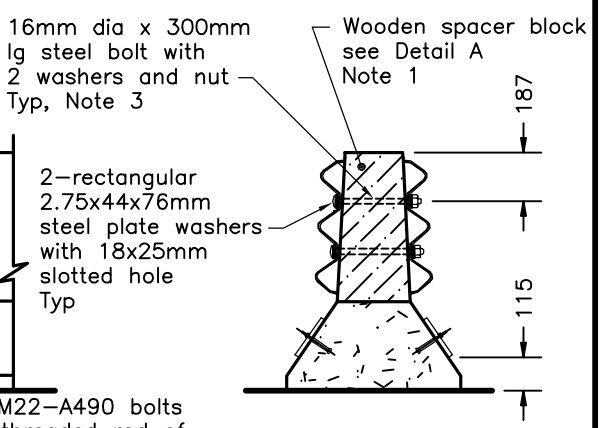
PLAN



WOODEN SPACER BLOCK
DETAIL A



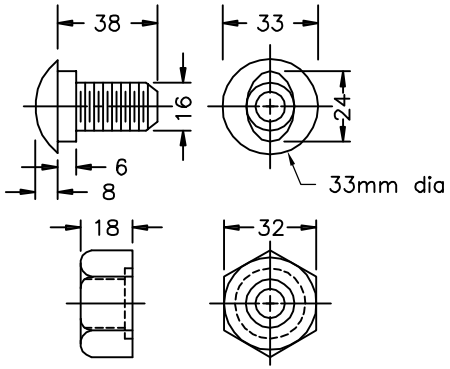
ELEVATION



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.



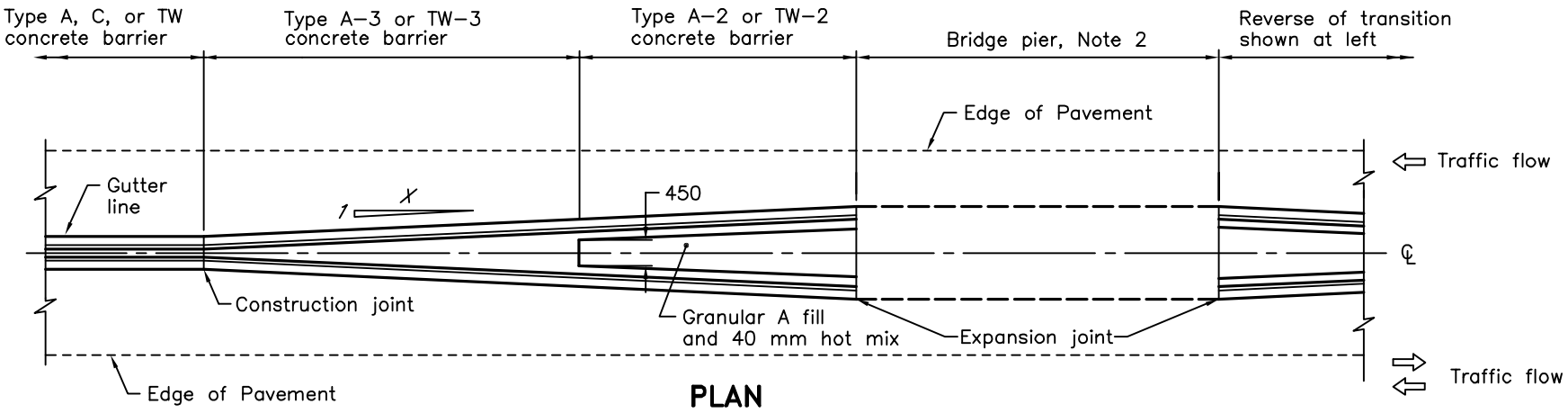
SPLICE BOLT AND NUT
DETAIL B

ONTARIO PROVINCIAL STANDARD DRAWING

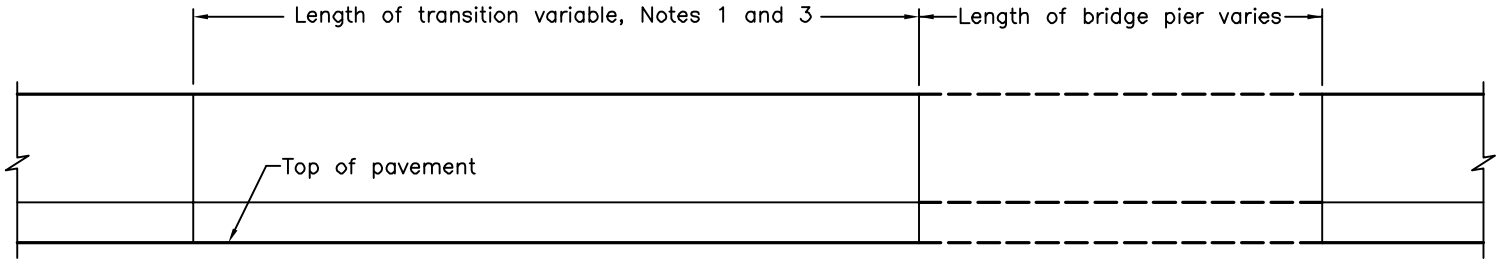
Nov 2013 | Rev 0

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.

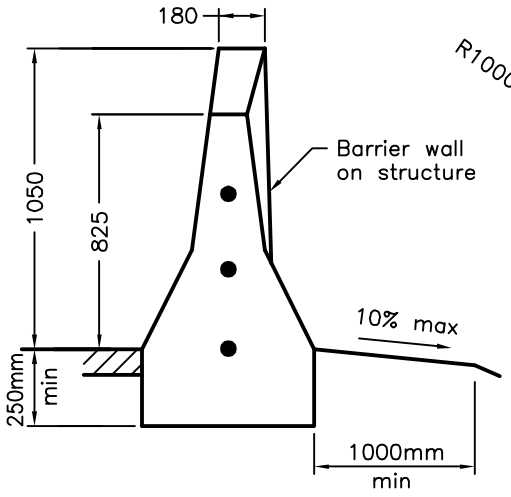
ONTARIO PROVINCIAL STANDARD DRAWING

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

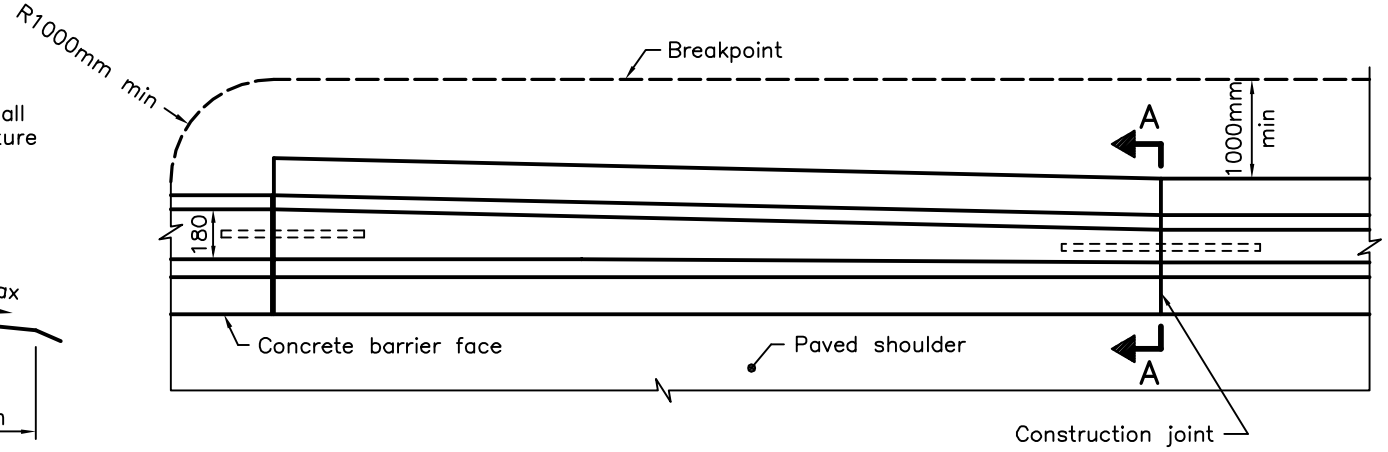
Nov 2015 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

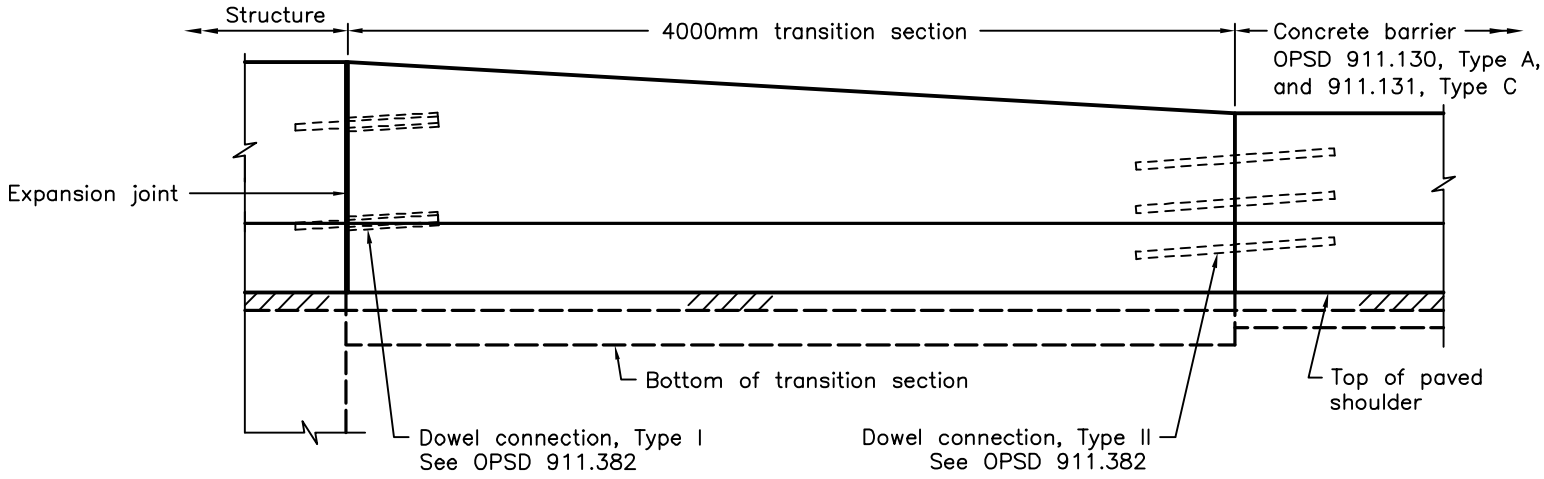
OPSD 911.380



SECTION A–A



PLAN

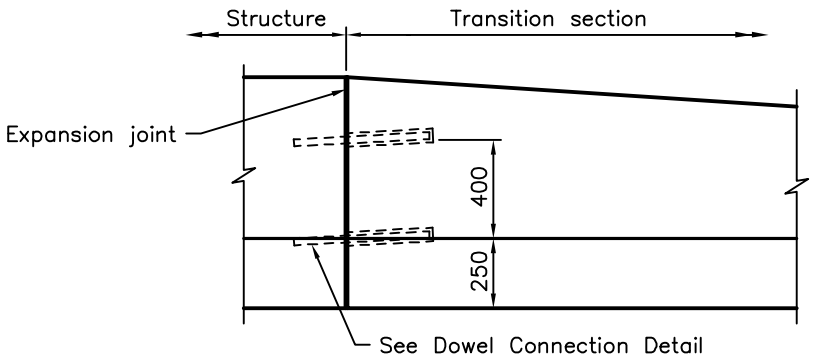


ELEVATION

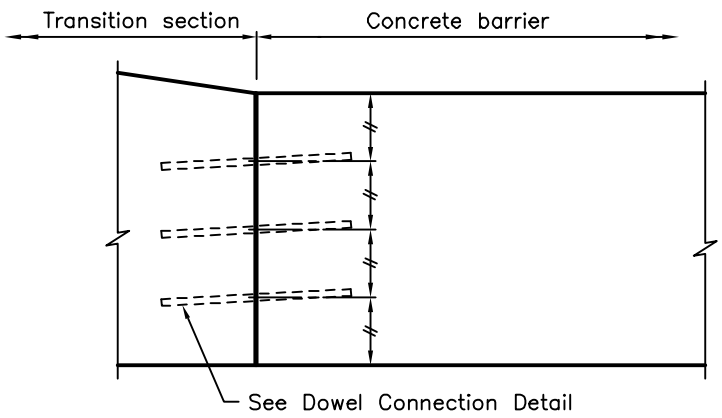
NOTES:

A All dimensions are in millimetres unless otherwise shown.

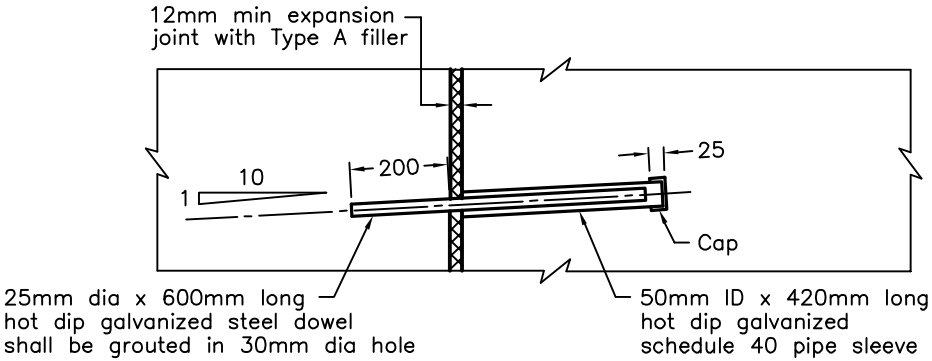
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
GUIDE RAIL SYSTEM, CONCRETE BARRIER PERMANENT TRANSITION INSTALLATION ROADSIDE CONCRETE BARRIER TO STRUCTURE			
	OPSD 911.381		



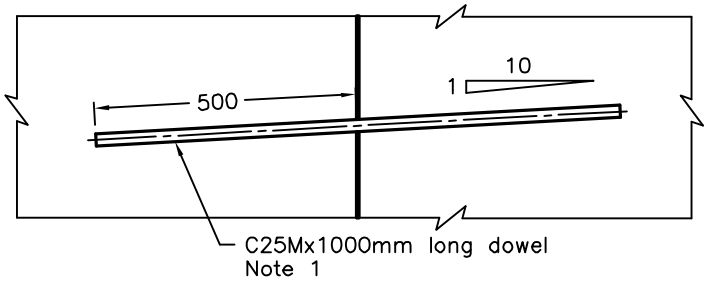
DOWEL CONNECTION WITH EXPANSION JOINT
TYPE I



DOWEL CONNECTION WITHOUT EXPANSION JOINT
TYPE II



DOWEL CONNECTION DETAIL
TYPE I



DOWEL CONNECTION DETAIL
TYPE II

NOTES:

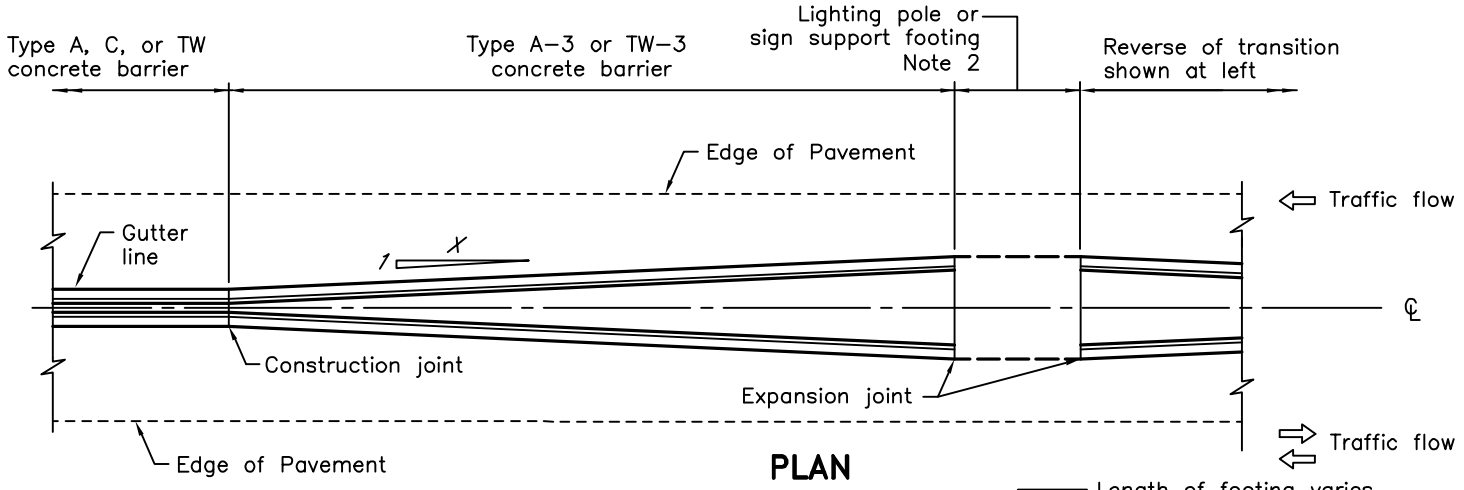
1 Dowel shall be placed along centreline of transition section.

A This OPSD shall be read in conjunction with OPSD 911.381.

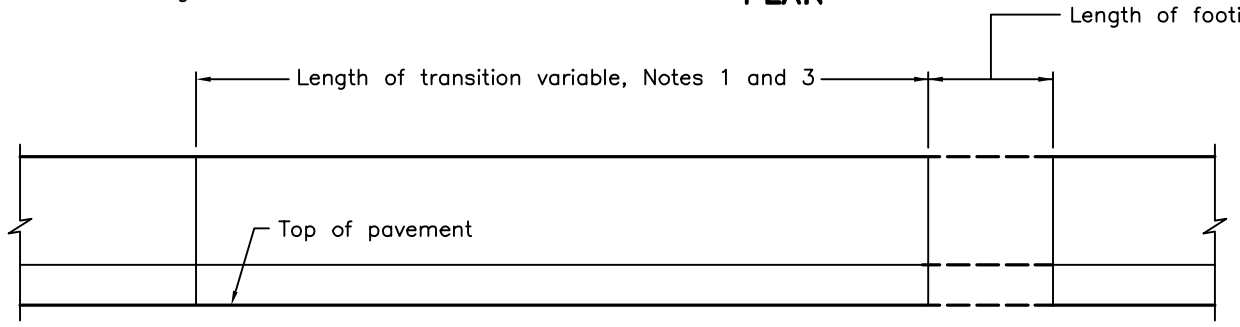
B All dowels shall be hot dip galvanized according to ASTM A123.

C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	1
GUIDE RAIL SYSTEM, CONCRETE BARRIER 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.

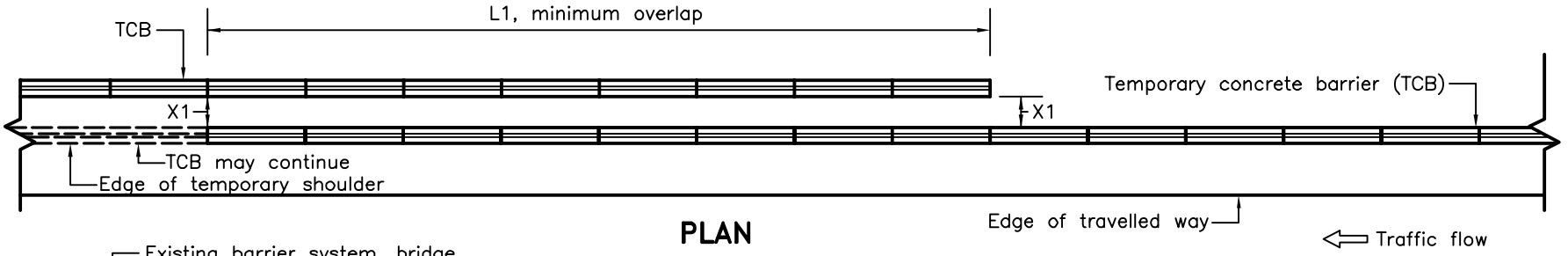
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, CONCRETE BARRIER PERMANENT TRANSITION INSTALLATION AT LIGHTING POLE AND SIGN SUPPORT FOOTINGS

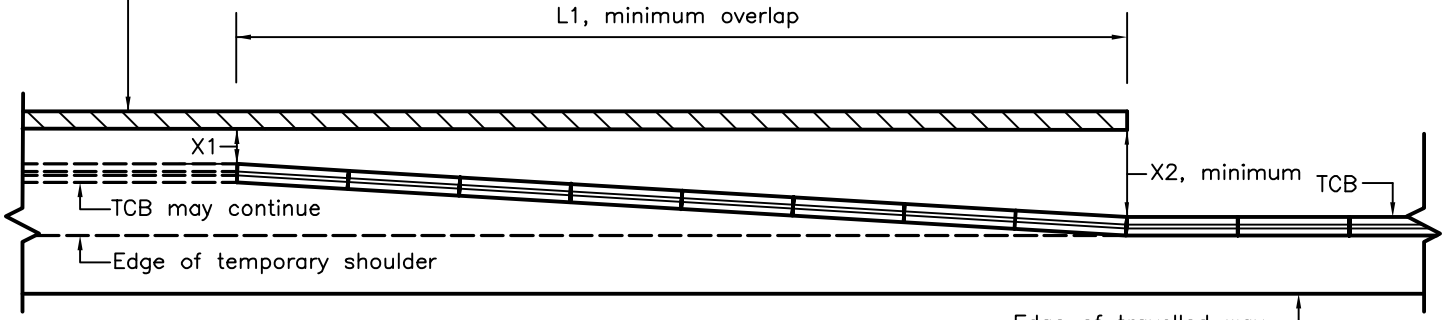
Nov 2015 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 911.383

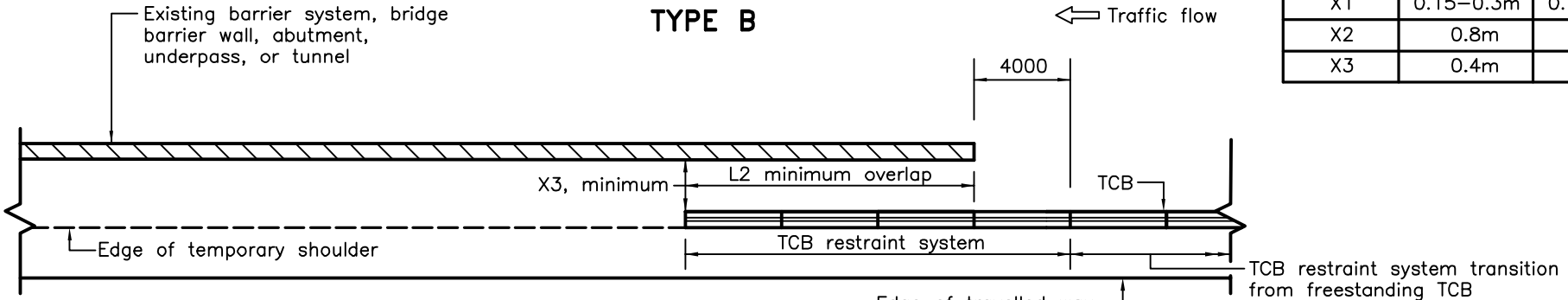


PLAN
TYPE A



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.

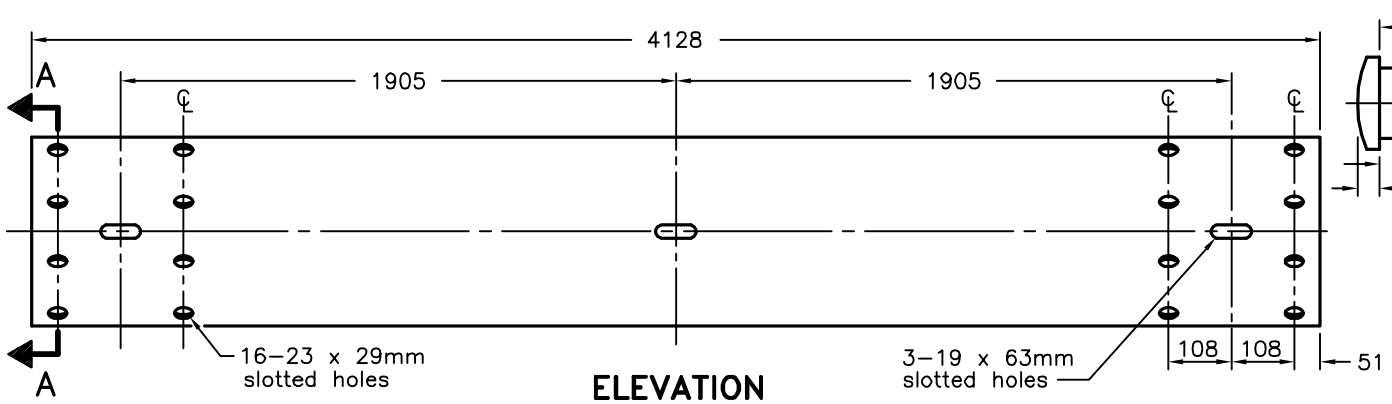
ONTARIO PROVINCIAL STANDARD DRAWING

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

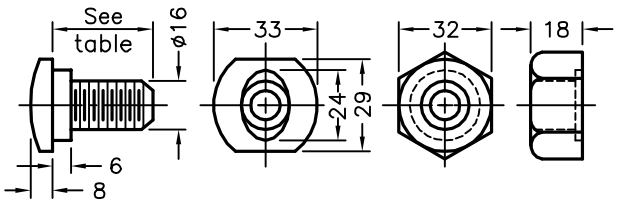
Nov 2015 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

OPSD 911.430

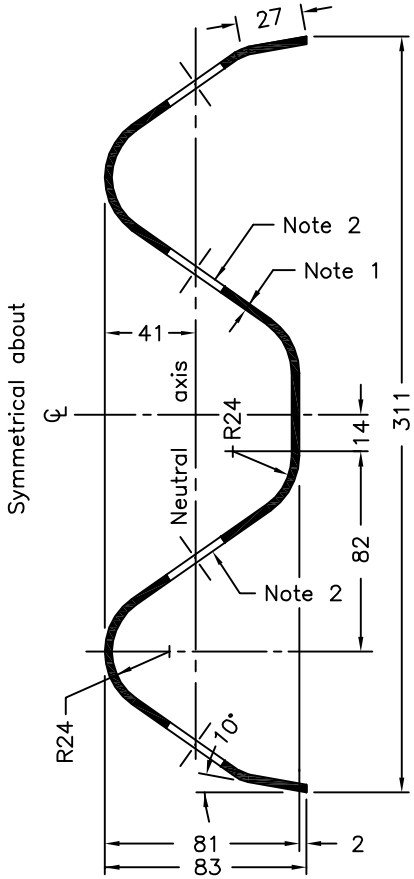


ELEVATION

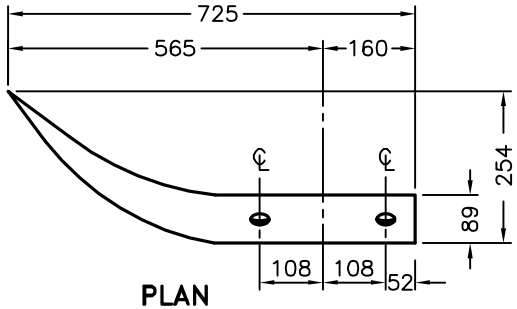


SPLICE BOLT AND NUT

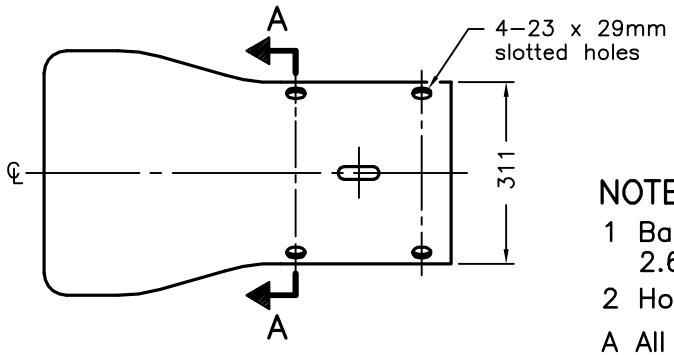
SPLICE BOLT LENGTH	
LOCATION	LENGTH
At posts	32
At structure anchor	38



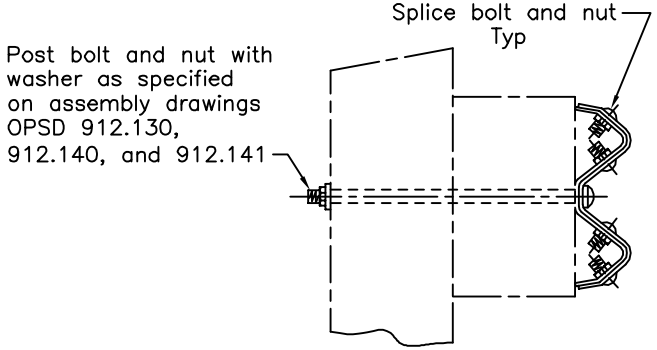
ENLARGED SECTION A–A



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.

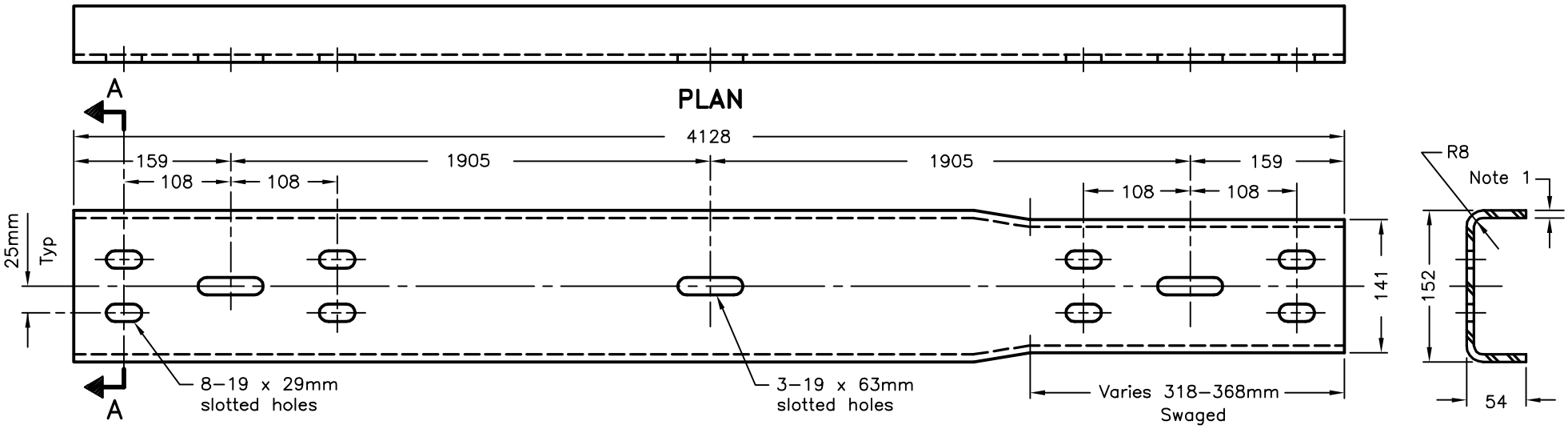
B All dimensions are in millimetres unless otherwise shown.

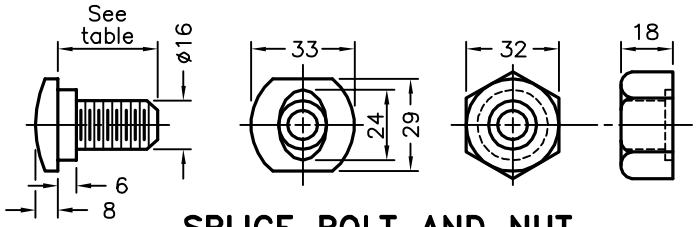
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010 | Rev 2

GUIDE RAIL SYSTEM, STEEL BEAM
RAIL
COMPONENT

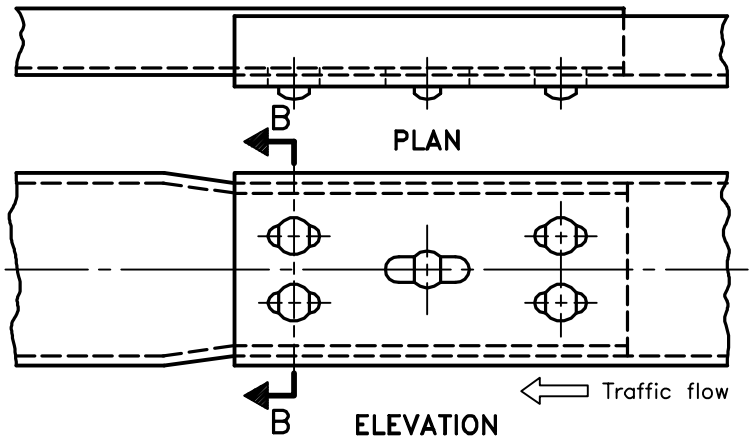
OPSD 912.101



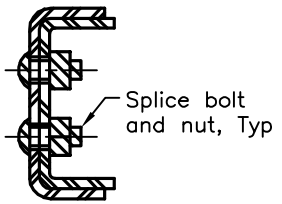


SPLICE BOLT AND NUT

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.

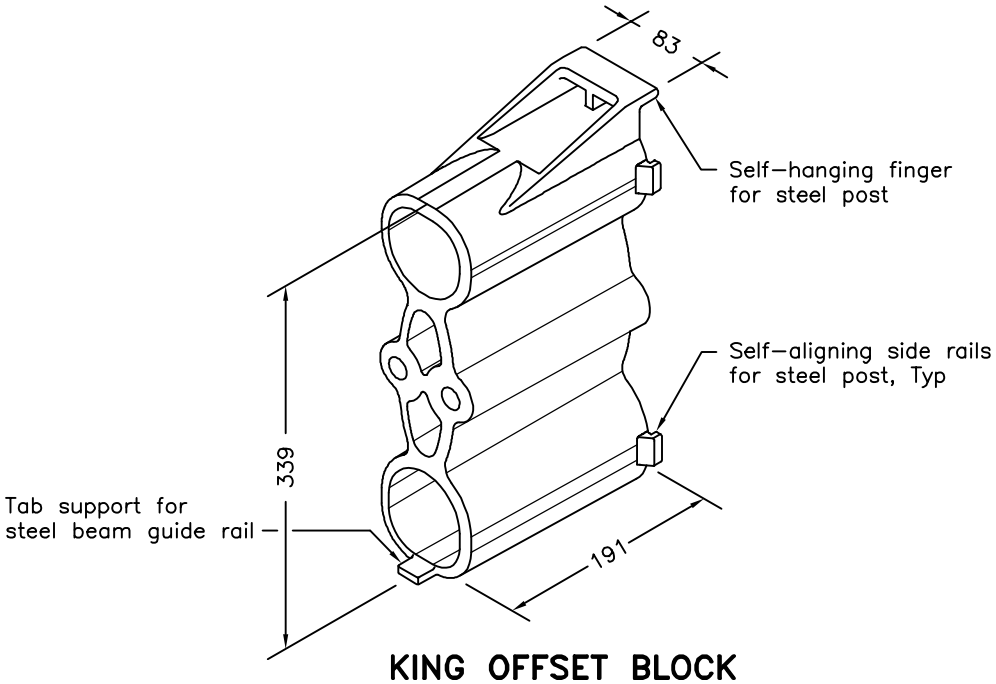
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, STEEL BEAM CHANNEL COMPONENT

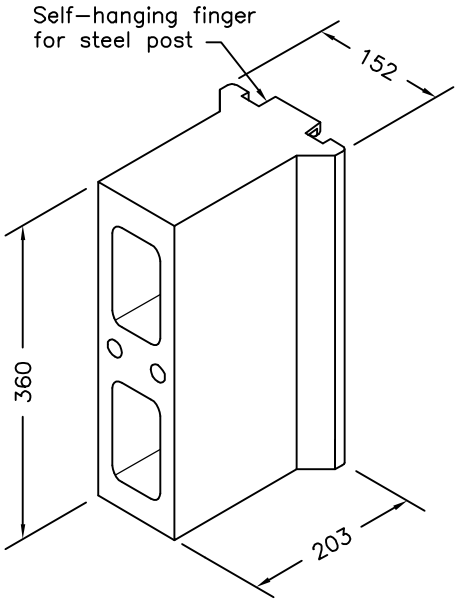
Nov 2010 | Rev 1

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

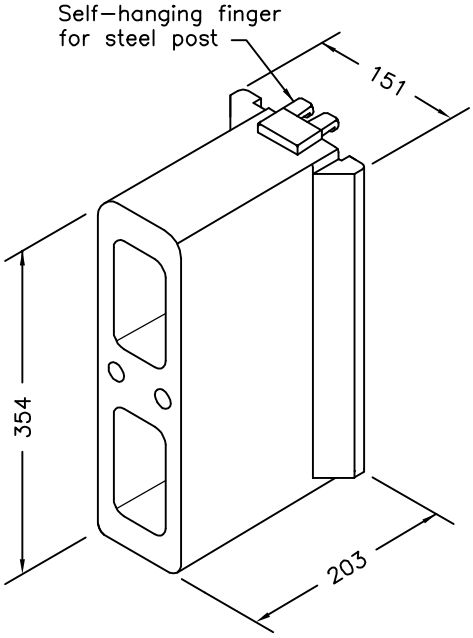
OPSD 912.102



KING OFFSET BLOCK
NOTE 1



MONDO OFFSET BLOCK
NOTE 2



P–BLOCK
NOTE 3

NOTES:

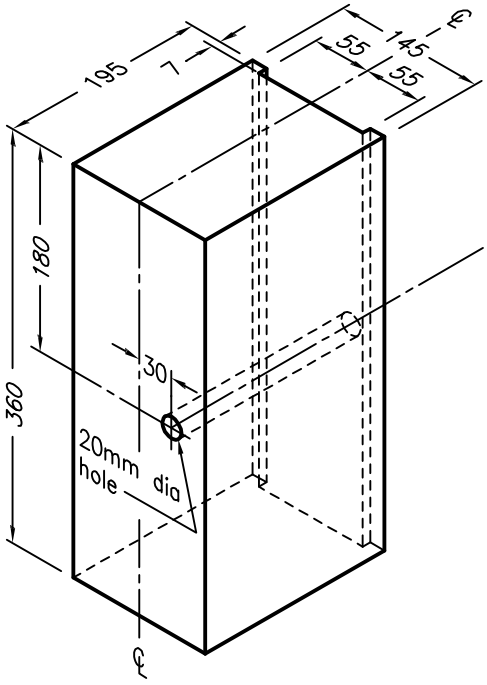
1 The component depicted is proprietary to Trinity Industries, Inc.

2 The component depicted is proprietary to Mondo Polymer Technologies.

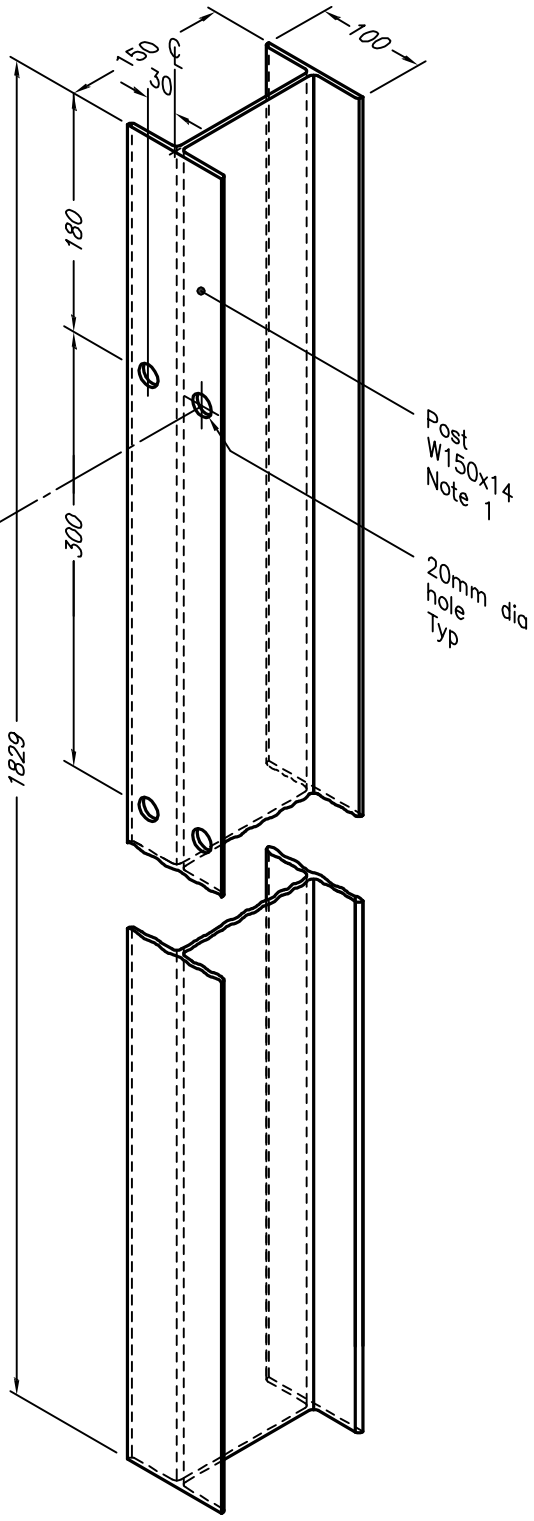
3 The component depicted is proprietary to R.G. Steel Corp.

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
GUIDE RAIL SYSTEM, STEEL BEAM PLASTIC OFFSET BLOCKS COMPONENT	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _		
	OPSD 912.103		



ROUTED WOODEN OFFSET BLOCK



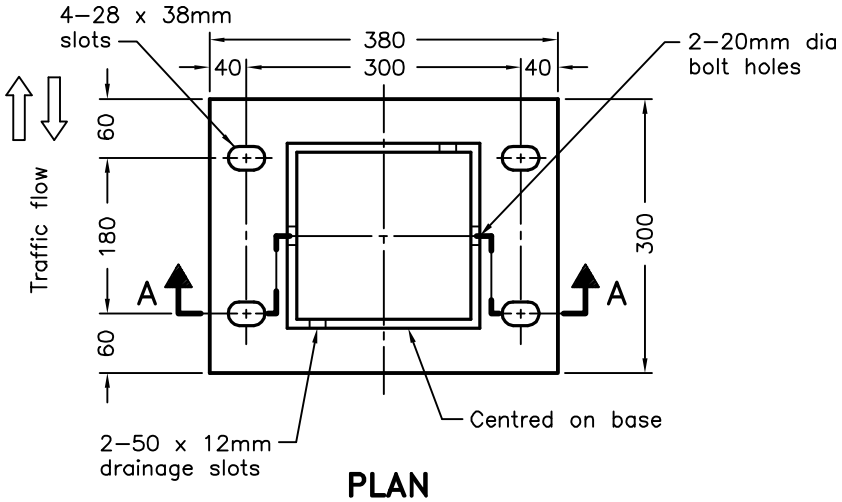
POST DETAIL

NOTES:

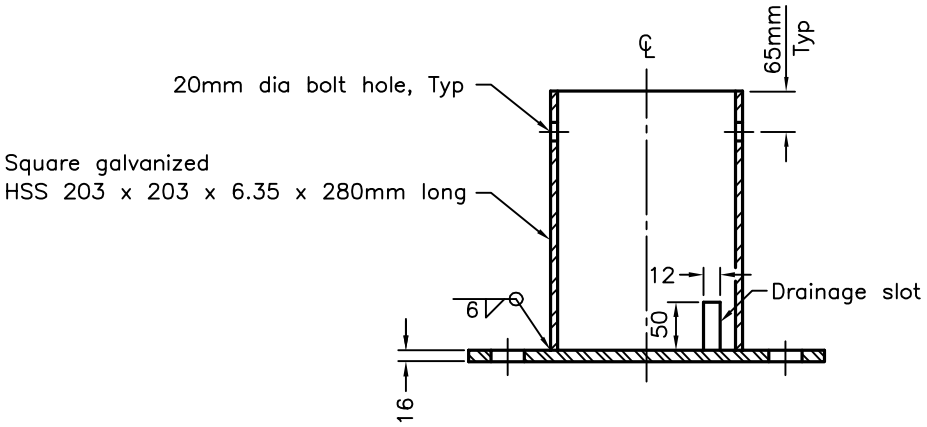
1 Imperial size steel sections W6x9 and W6x8.5 are acceptable.

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	2
GUIDE RAIL SYSTEM, STEEL BEAM STEEL POST WITH WOODEN OFFSET BLOCK COMPONENT			
	OPSD 912.104		



PLAN



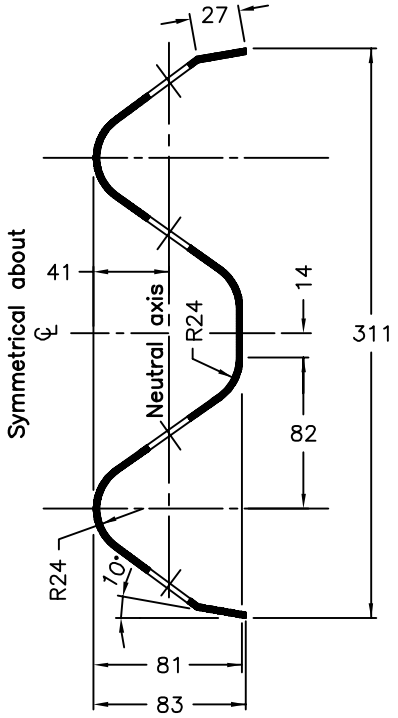
SECTION A–A

FOR SQUARE WOODEN POST FOR STEEL BEAM GUIDE RAIL

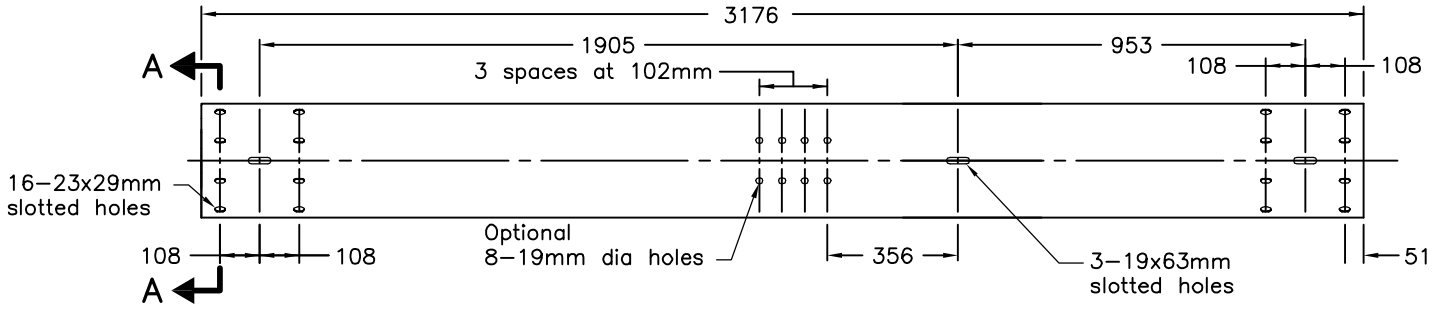
NOTES:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
GUIDE RAIL SYSTEM, STEEL BEAM BASE PLATE COMPONENT			
	OPSD 912.105		



ENLARGED SECTION A–A
NOTE 1



FRONT ELEVATION

NOTES:

1 Base metal thickness of rail shall be 2.67mm nominal and 2.44mm minimum.

A All dimensions subject to manufacturing tolerances unless otherwise indicated.

B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

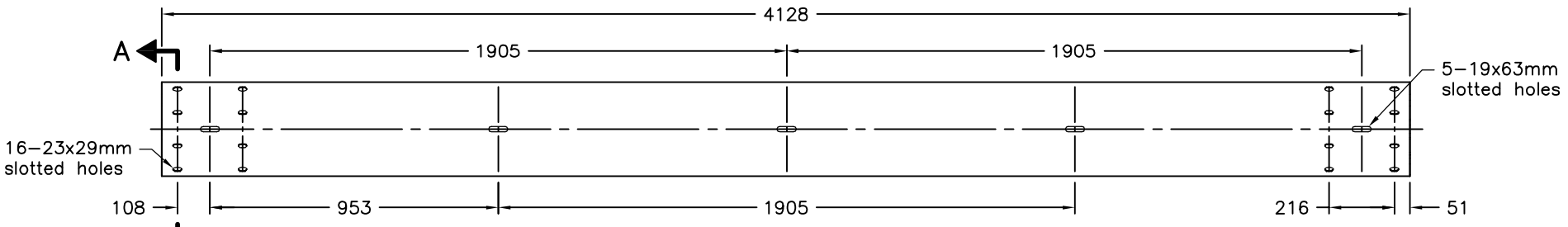
Apr 2016 | Rev | 0

GUIDE RAIL SYSTEM, STEEL BEAM

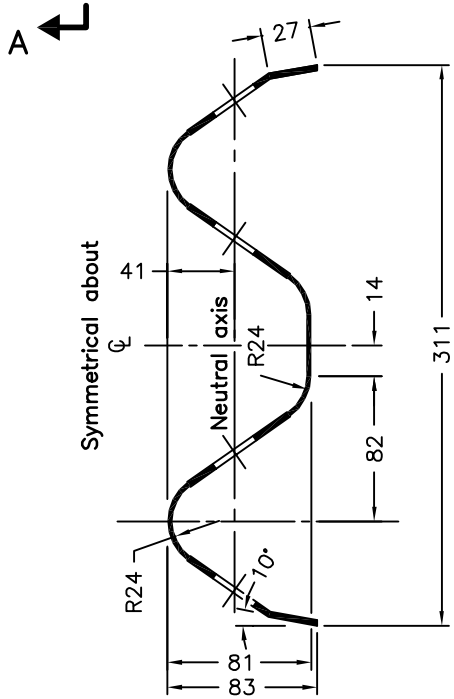
TYPE M TRANSITION RAIL

COMPONENT

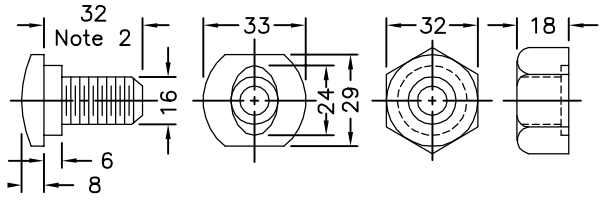
OPSD 912.124



FRONT ELEVATION

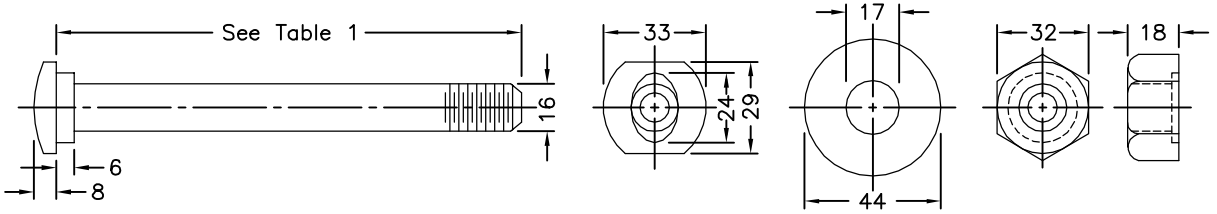


ENLARGED SECTION A–A
NOTE 1



SPLICE BOLT AND NUT
NOTE 2

TABLE 1	
MOUNTING BOLT LENGTH	
SBGR Type	Length mm
M20 Wood Post	460
M20 Steel Post	250
M30 Wood Post	560
M30 Steel Post	360



MOUNTING BOLT, WASHER, AND NUT

NOTES:

1 Base metal thickness of rail shall be 2.67mm nominal and 2.44mm minimum.

2 Splice bolt length shall be 38mm when connecting nested (double) rails.

A All dimensions subject to manufacturing tolerances unless otherwise indicated.

B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

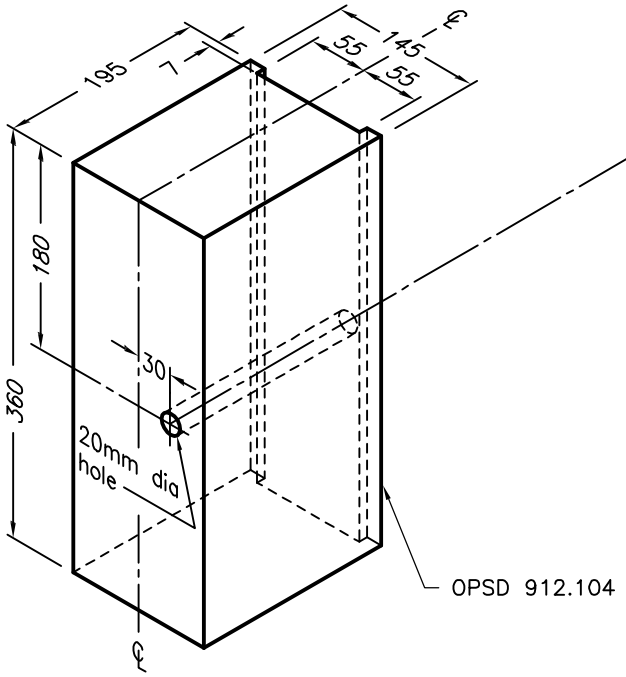
Apr 2016 | Rev 0

GUIDE RAIL SYSTEM, STEEL BEAM

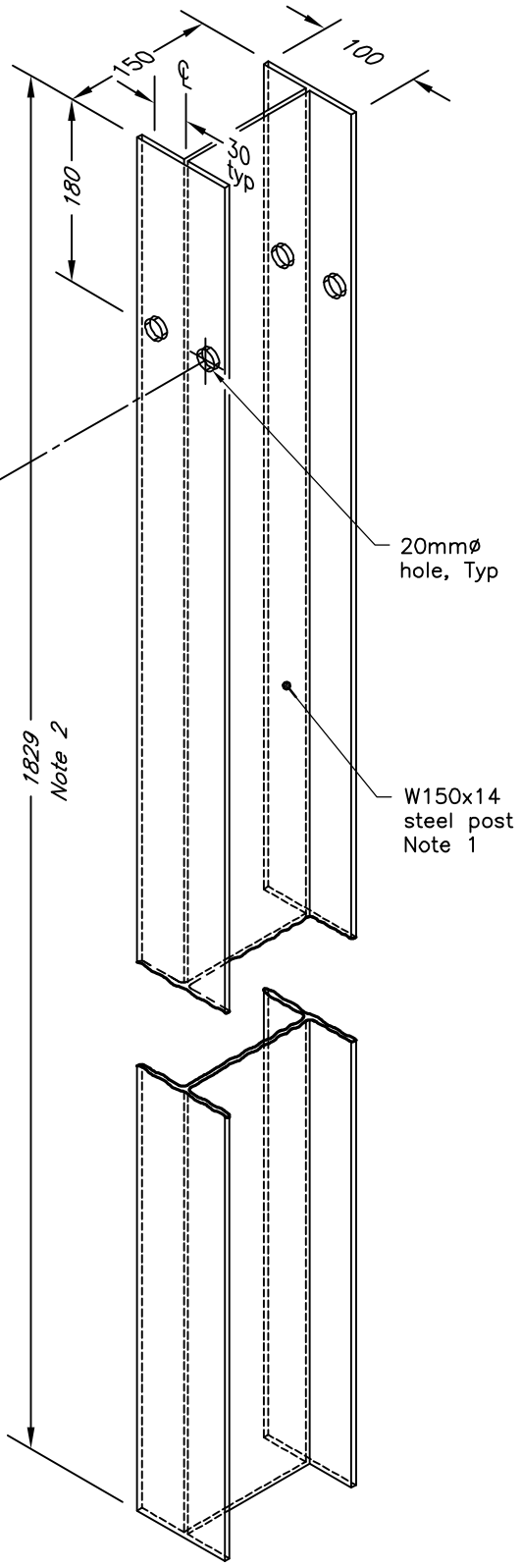
TYPE M RAIL

COMPONENT

OPSD 912.125



ROUTED WOODEN OFFSET BLOCK (SHOWN)
OR
PLASTIC OFFSET BLOCK
ACCORDING TO OPSD 912.103



POST DETAIL

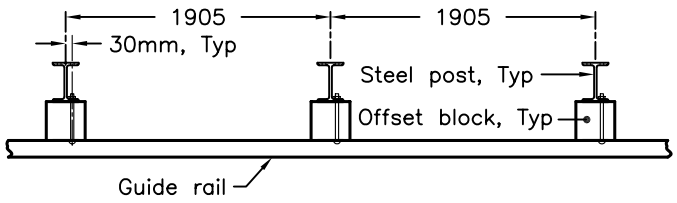
NOTES:

1 Imperial size steel sections W6x9 or W6x8.5 are acceptable.

2 Post length shall be 2438mm when specified and when 2438mm long shall be stamped with a 50mm high number "8" in centre of web 50mm below top of post.

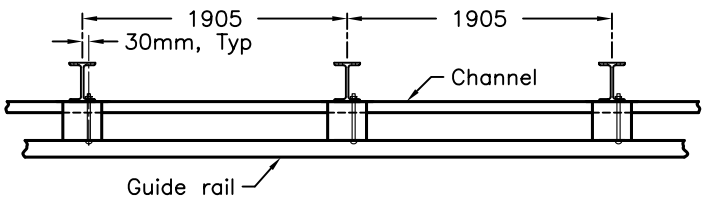
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Apr 2016	Rev	0
GUIDE RAIL SYSTEM, STEEL BEAM **M20 STEEL POST** **WITH OFFSET BLOCK** COMPONENT			
	OPSD 912.127		

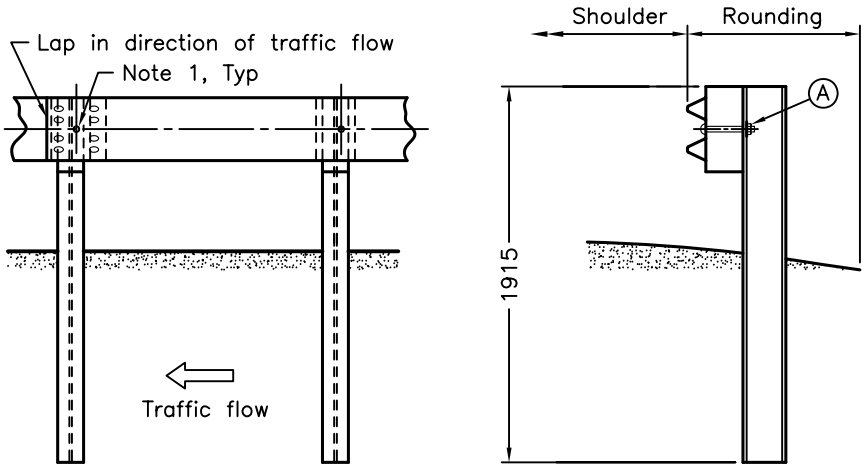


PLAN

POST BOLT		
	Post Bolt Size and Type	Washer @ Nut
(A)	16x250 BH	Plate
(B)	16x100 CaB	Plate

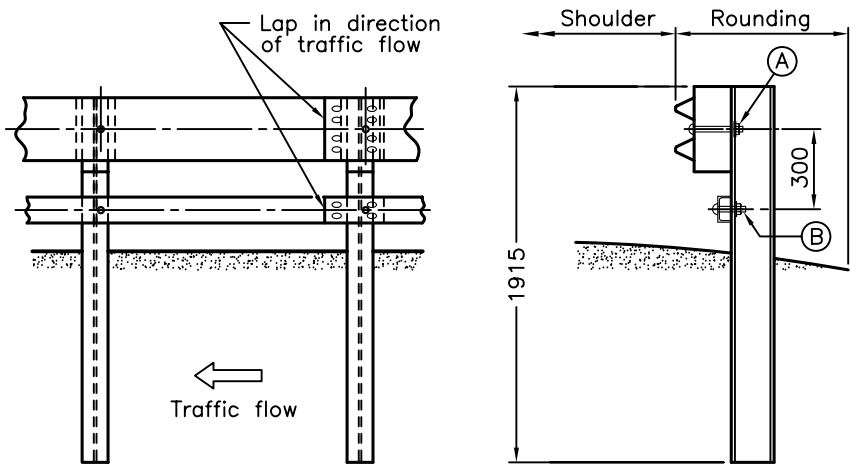


PLAN



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.

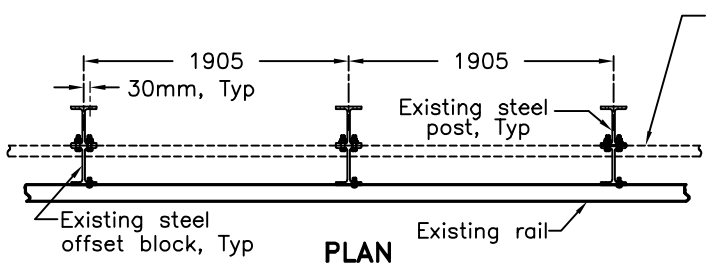
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

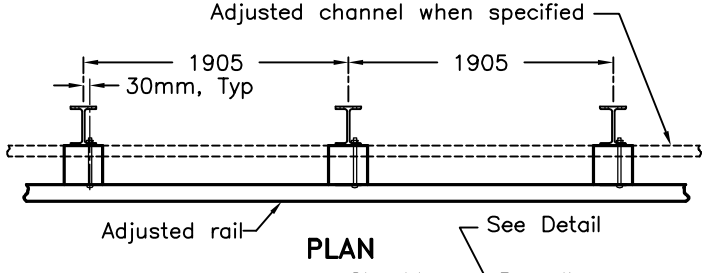
GUIDE RAIL SYSTEM, STEEL BEAM STEEL POST WITH OFFSET BLOCK ASSEMBLY INSTALLATION – SINGLE RAIL

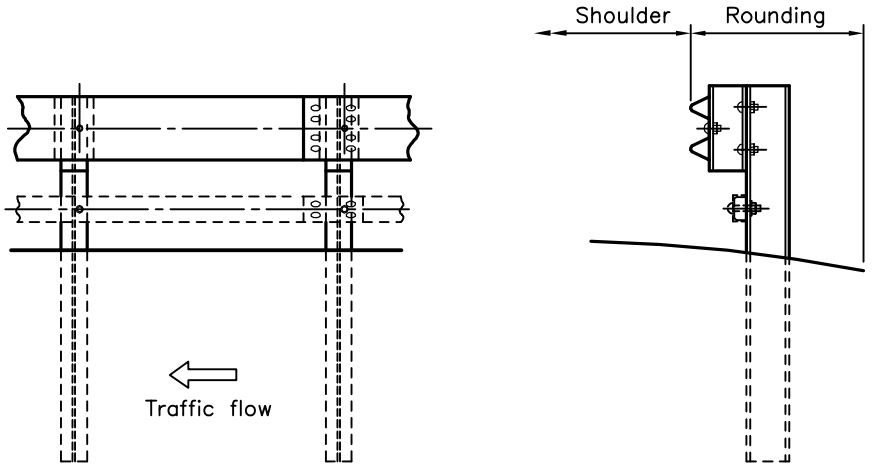
Nov 2008 | Rev 2

OPSD 912.130

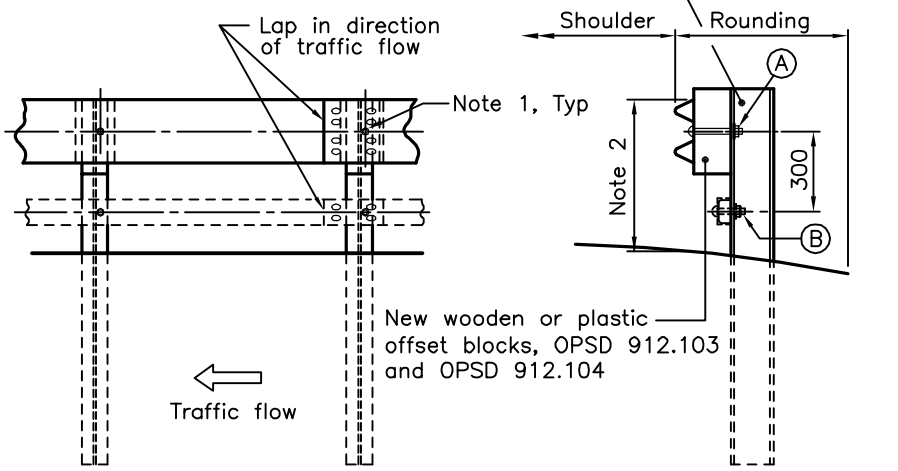


NEW POST BOLTS		
	Post Bolt Size and Type	Washer @ Nut
Ⓐ	16x250 BH	Plate
Ⓑ	16x100 CaB	Plate

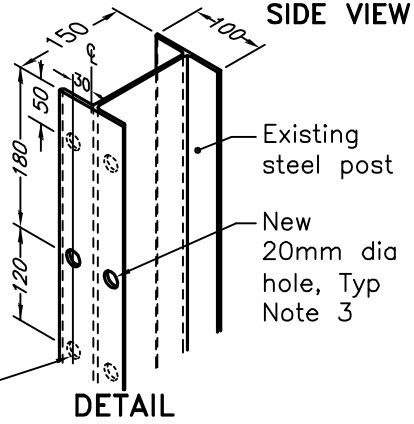




EXISTING SINGLE RAIL WITH STEEL OFFSET BLOCK



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.

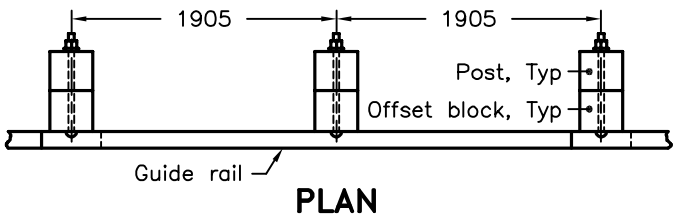
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, STEEL BEAM STEEL POST WITH STEEL OFFSET BLOCK ASSEMBLY ADJUSTMENT – SINGLE RAIL

Nov 2013	Rev	0

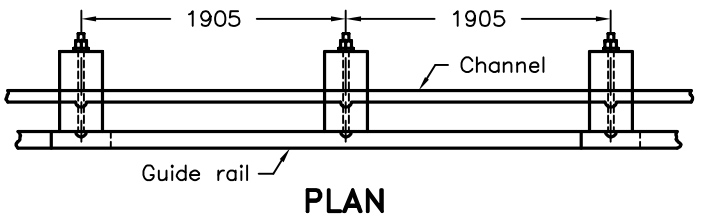
ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

OPSD 912.135

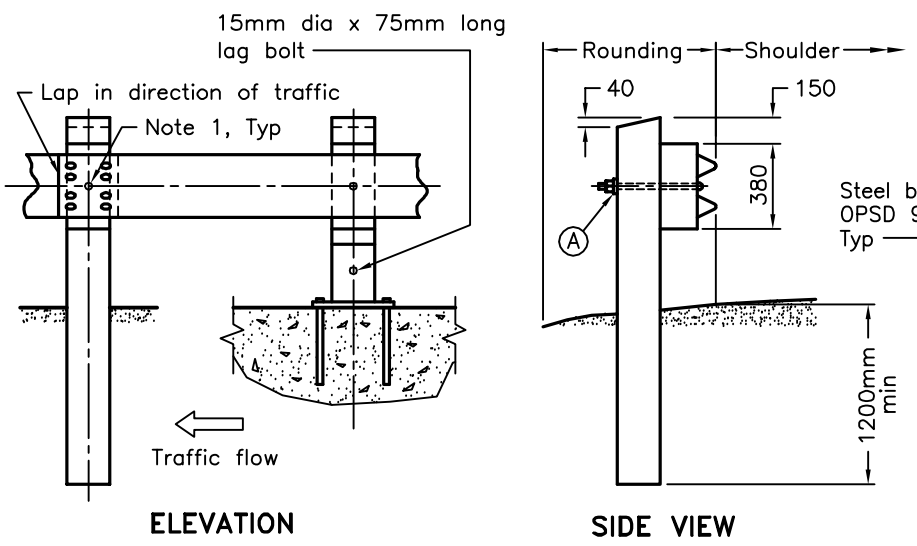


PLAN

	POST BOLT AND HOLE	
	Hole Dia	Post Bolt Size and Type
Ⓐ	18	16x460 BH
Ⓑ	18	16x310 CaB

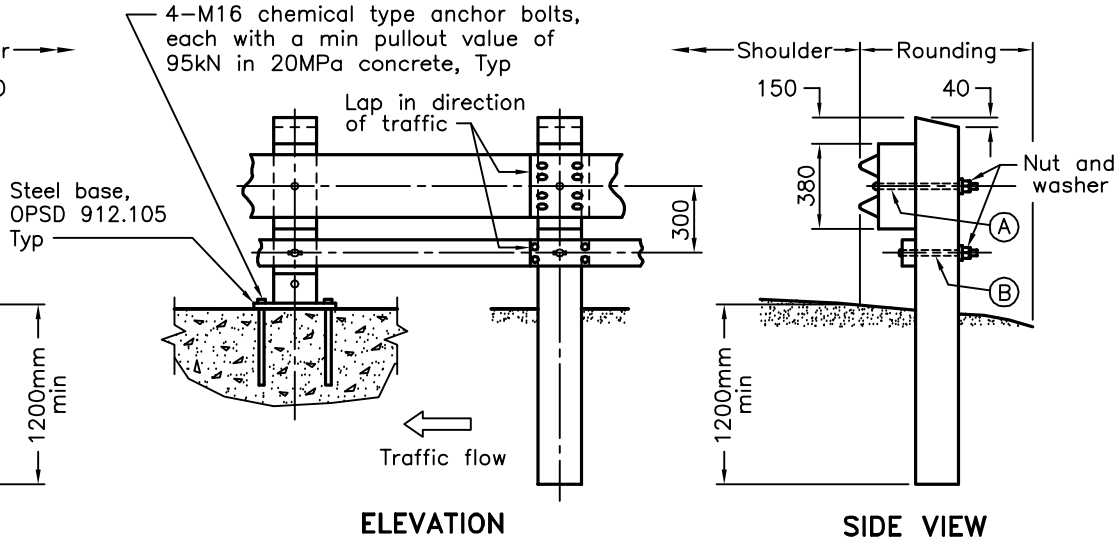


PLAN



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.

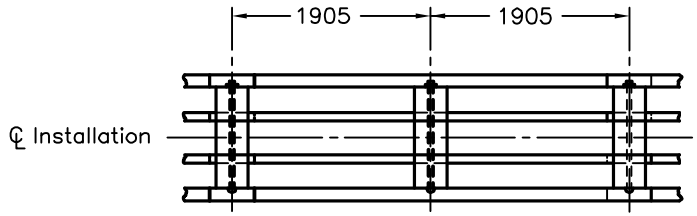
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, STEEL BEAM WOODEN POST ASSEMBLY INSTALLATION – SINGLE RAIL

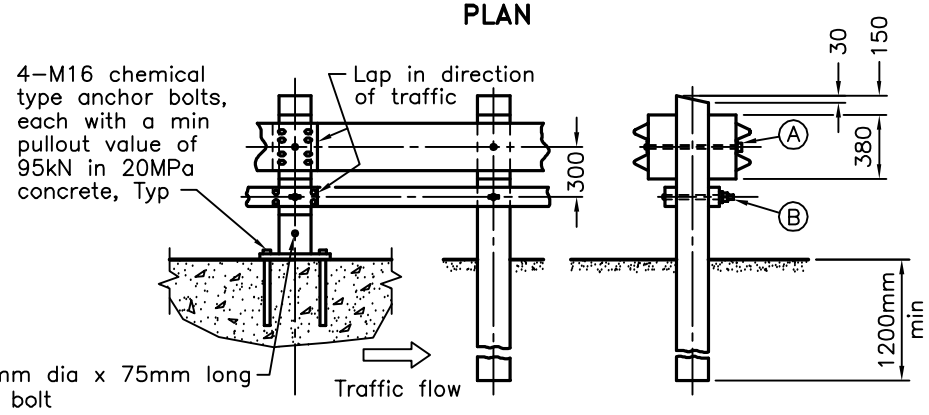
Nov 2010 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

OPSD 912.140

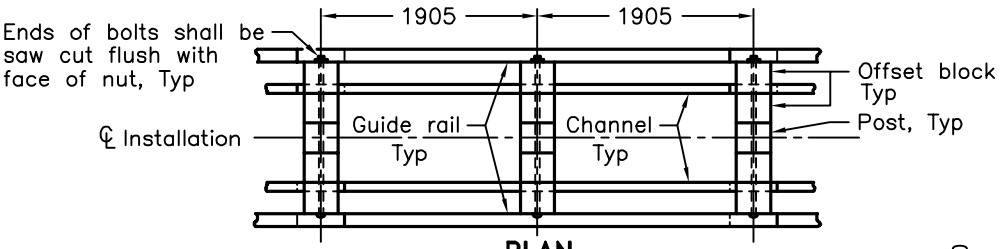


PLAN

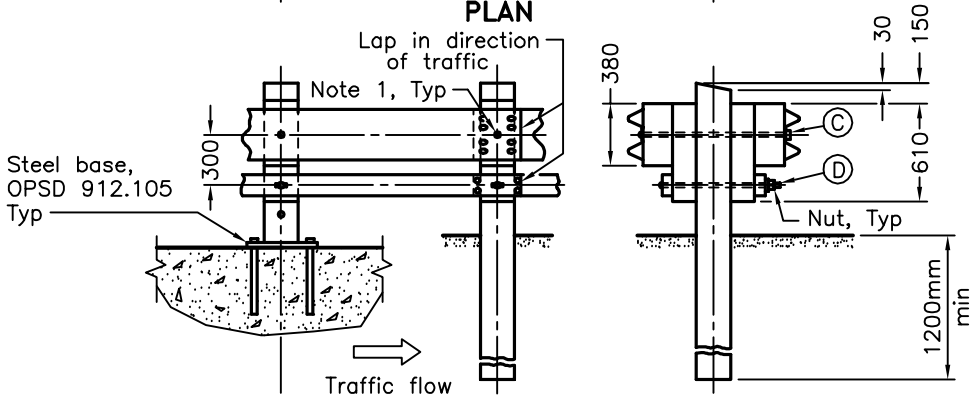


ELEVATION SIDE VIEW

DOUBLE RAIL WITH CHANNEL

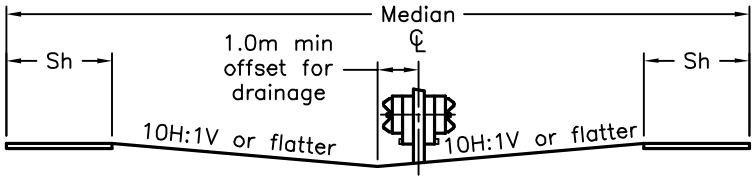


PLAN

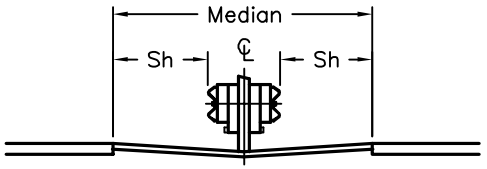


ELEVATION SIDE VIEW

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.

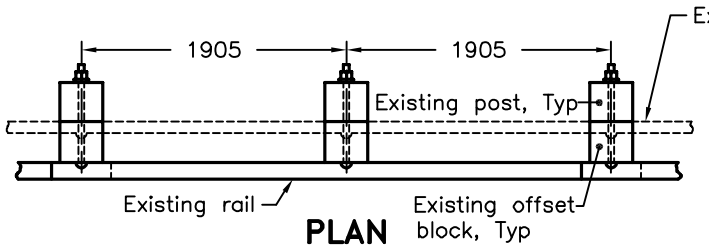
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, STEEL BEAM WOODEN POST ASSEMBLY INSTALLATION – DOUBLE RAIL

Nov 2010 | Rev 2

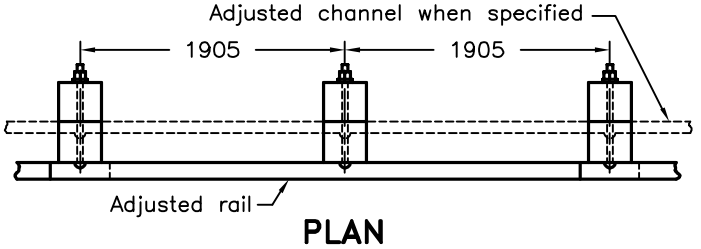
ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 912.141

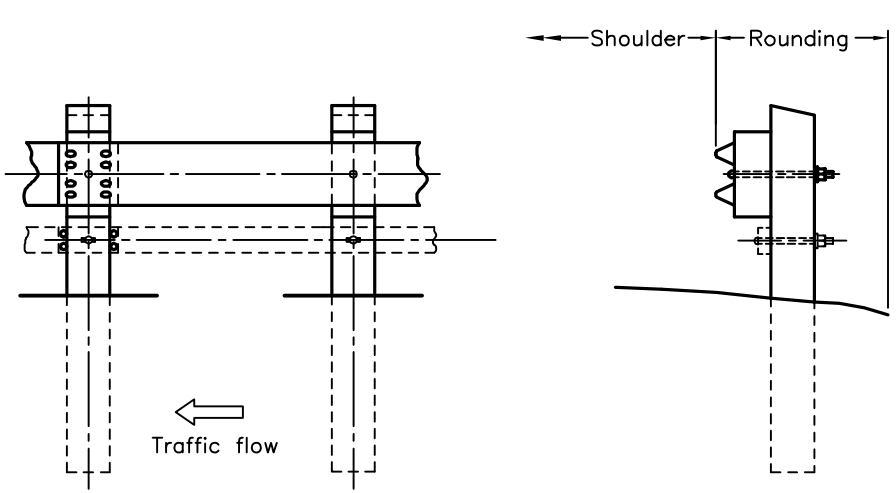


PLAN

	NEW POST BOLT AND HOLE	
	Hole Dia	Post Bolt Size and Type
Ⓐ	18	16x460 BH
Ⓑ	18	16x310 CaB

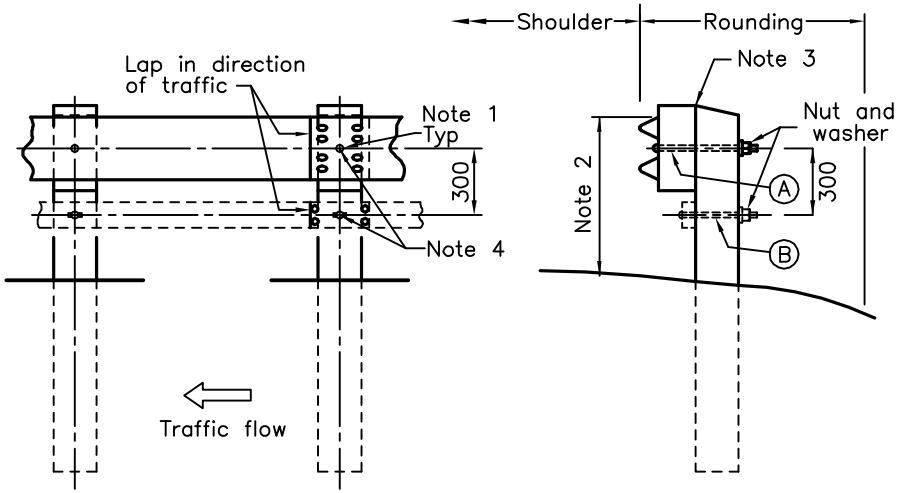


PLAN



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.

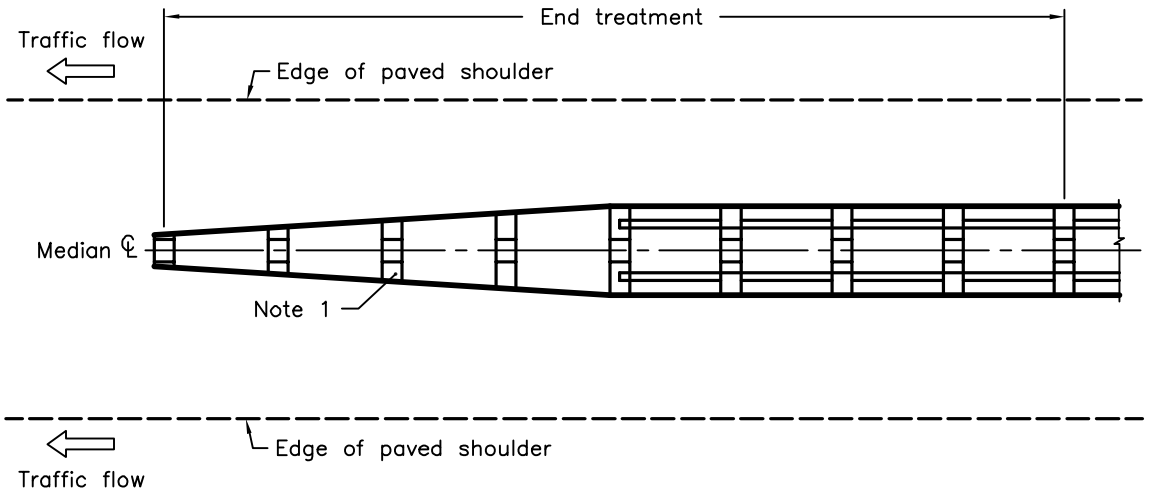
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

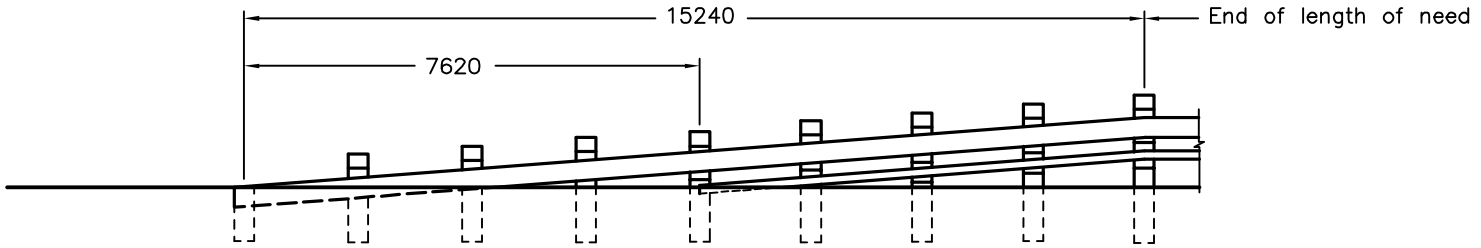
GUIDE RAIL SYSTEM, STEEL BEAM WOODEN POST ASSEMBLY ADJUSTMENT – SINGLE RAIL

Nov 2013 | Rev 0

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.

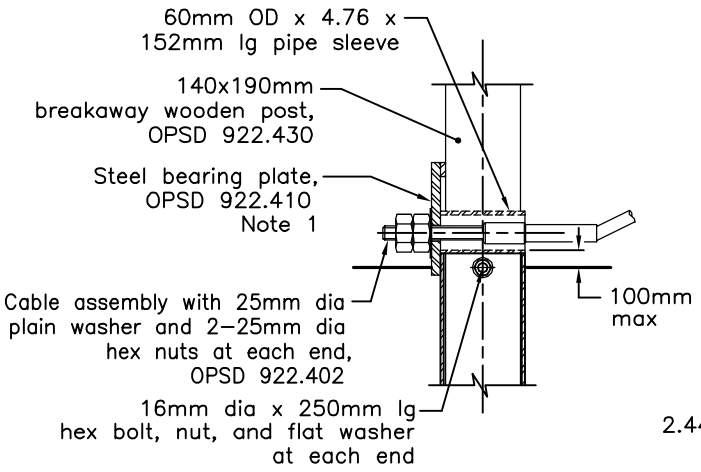
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

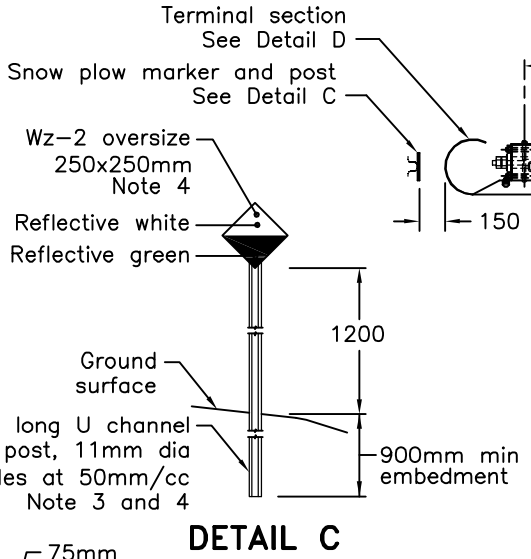
GUIDE RAIL SYSTEM, STEEL BEAM END TREATMENT INSTALLATION – LEAVING END COLLECTOR MEDIAN

Nov 2010 | Rev 1

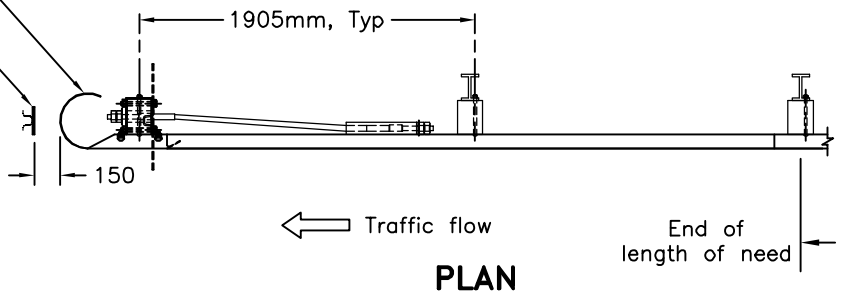
OPSD 912.234



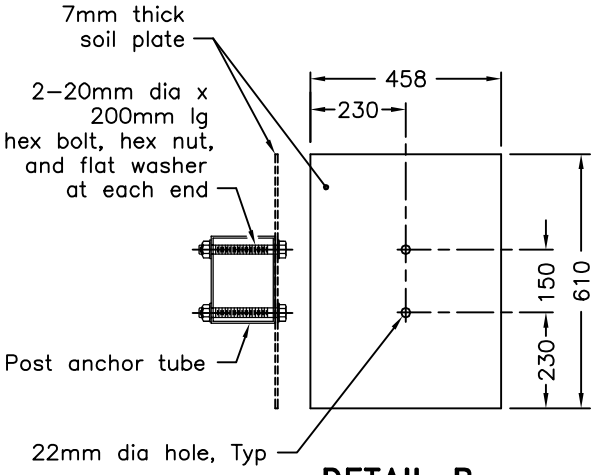
DETAIL A



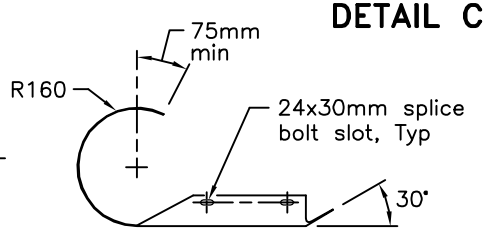
DETAIL C



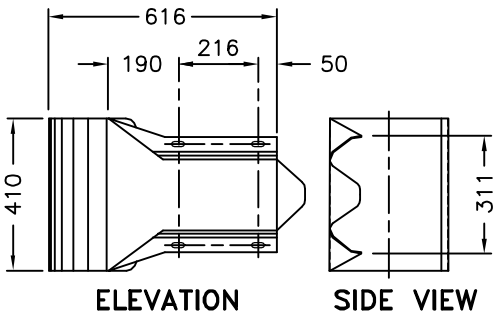
PLAN



DETAIL B

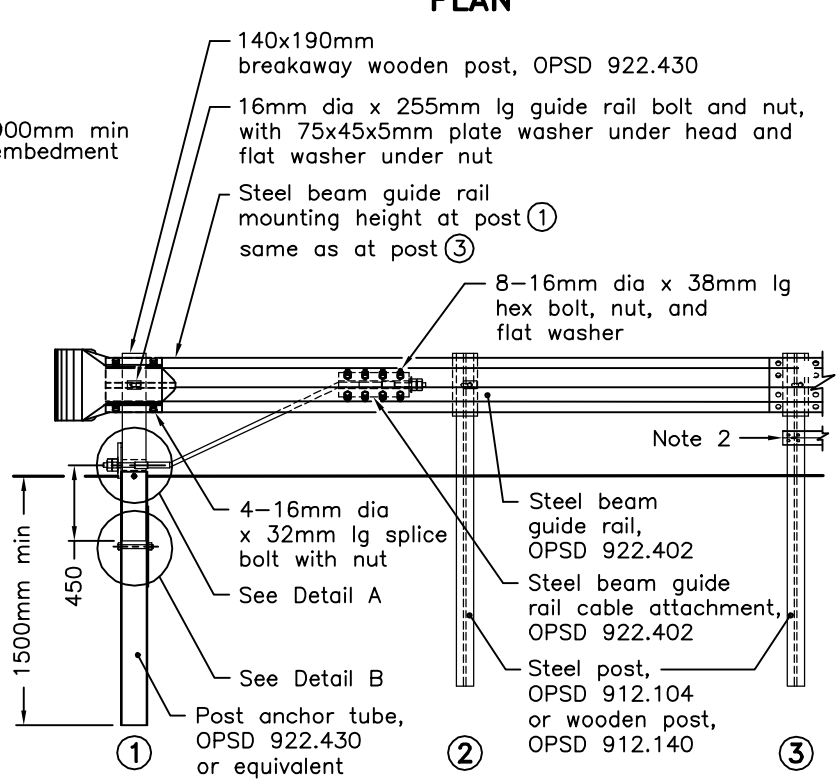


PLAN



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

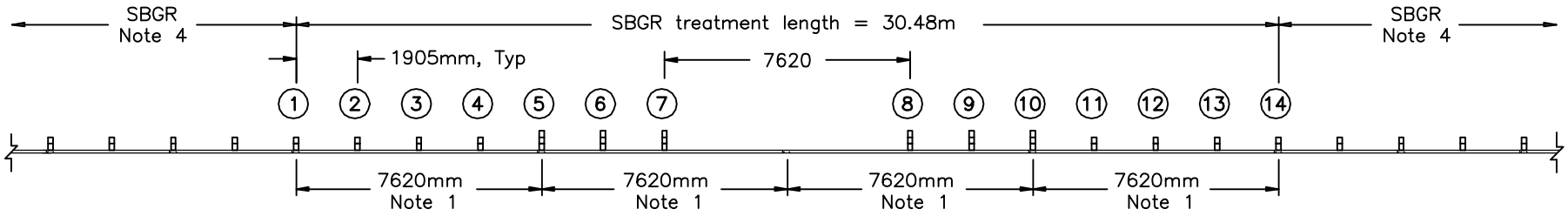
GUIDE RAIL SYSTEM, STEEL BEAM

LEAVING END TREATMENT

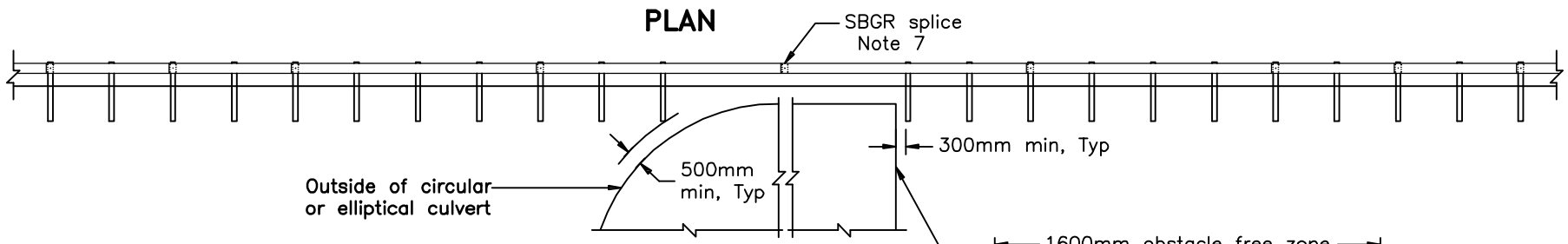
INSTALLATION

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

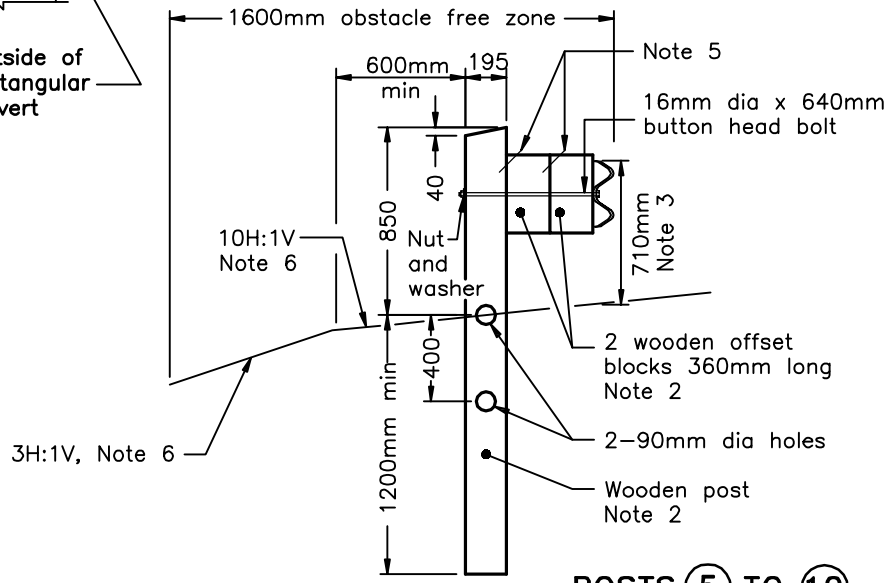
OPSD 912.235



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.

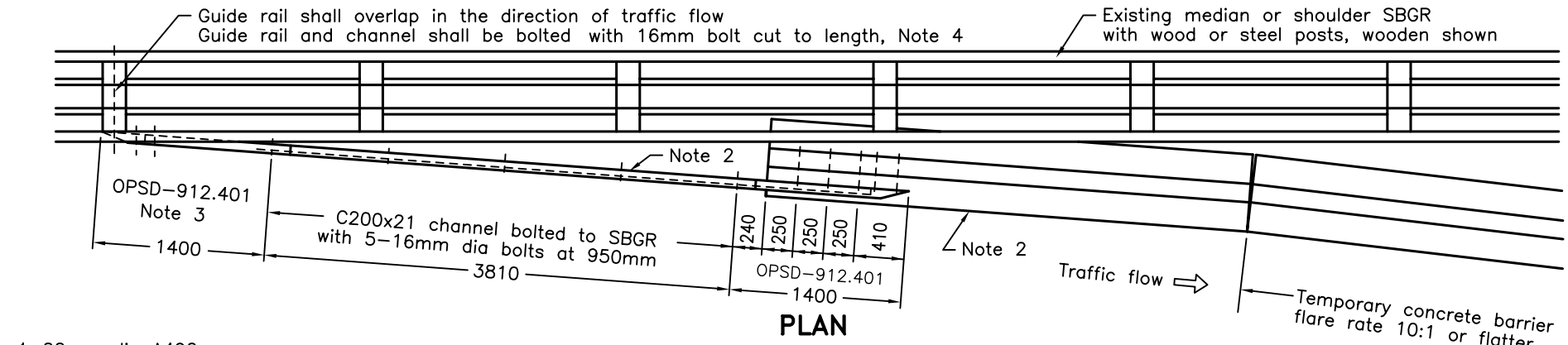
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, STEEL BEAM TREATMENT AT CULVERTS WITH MINIMAL COVER INSTALLATION – SINGLE RAIL

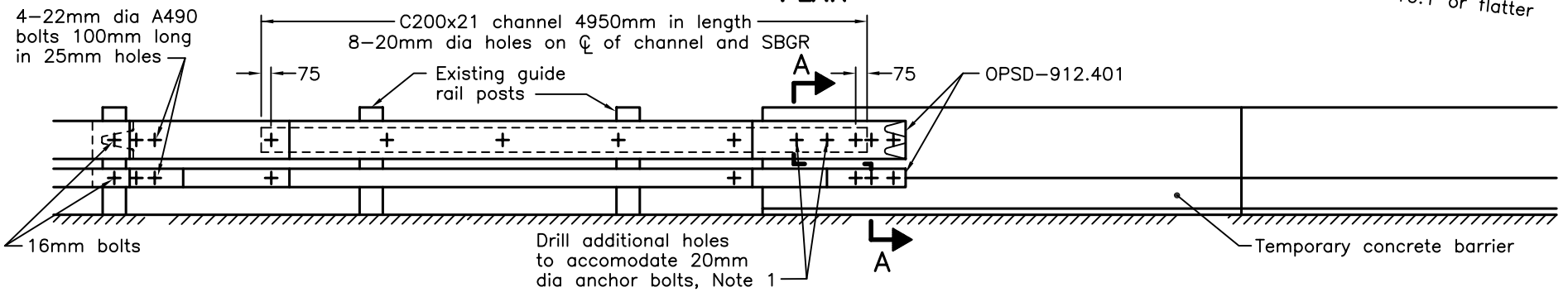
Nov 2010 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

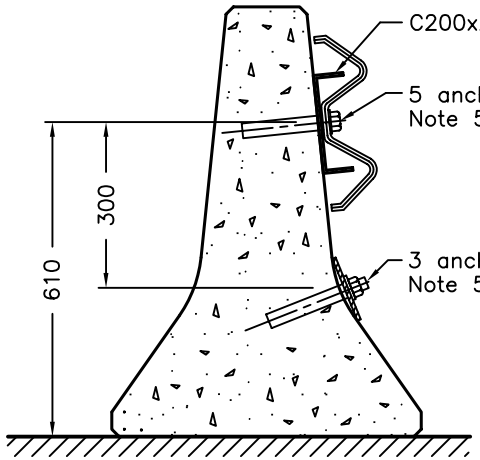
OPSD 912.240



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.

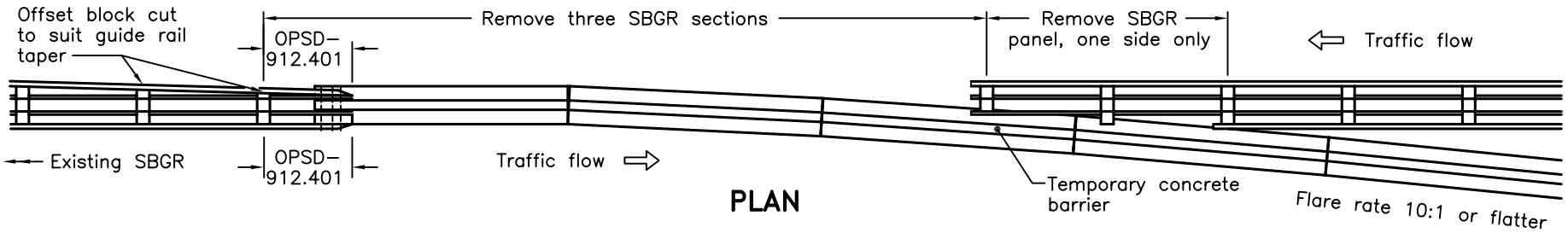
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2002 | Rev 1

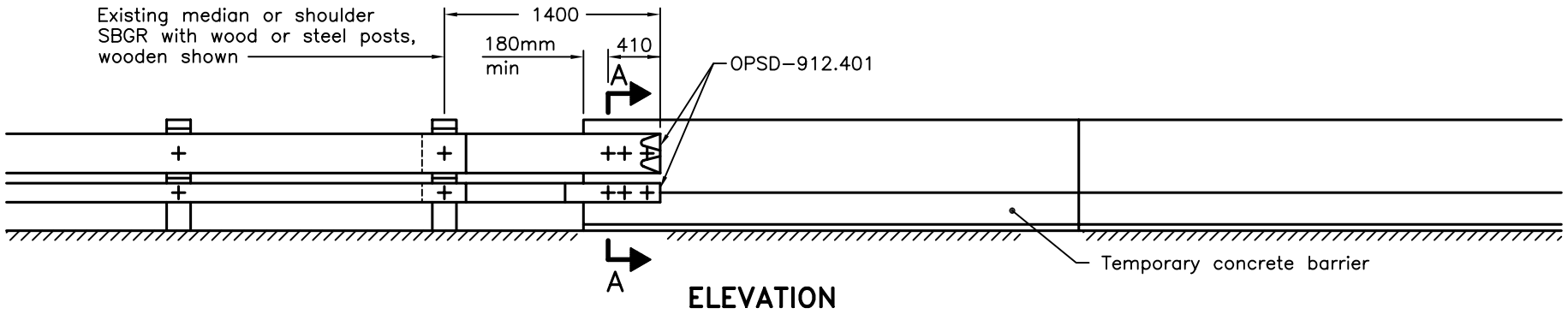
GUIDE RAIL SYSTEM, STEEL BEAM
TEMPORARY TRANSITION INSTALLATION–RAIL METHOD
SINGLE STEEL BEAM TO TEMPORARY CONCRETE BARRIER

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL

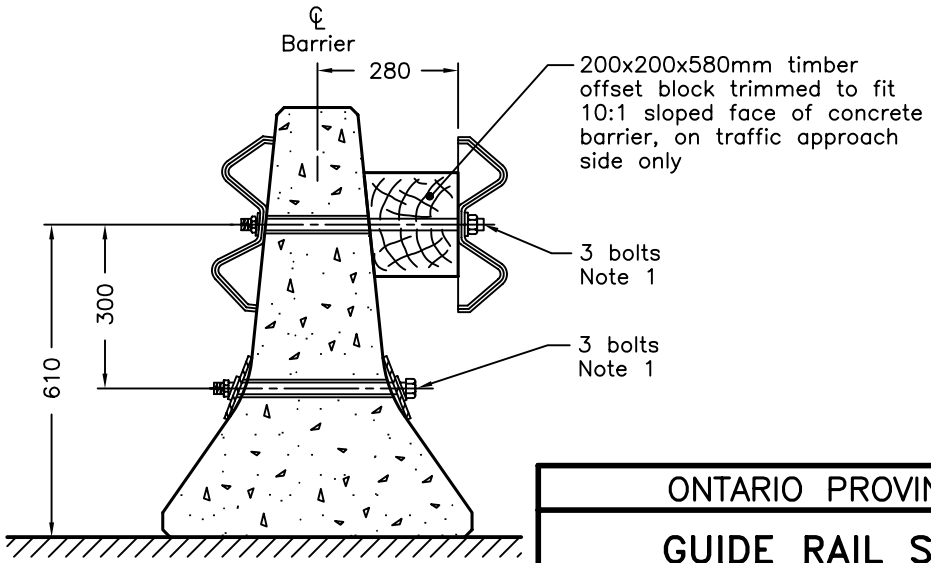
OPSD – 912.330



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

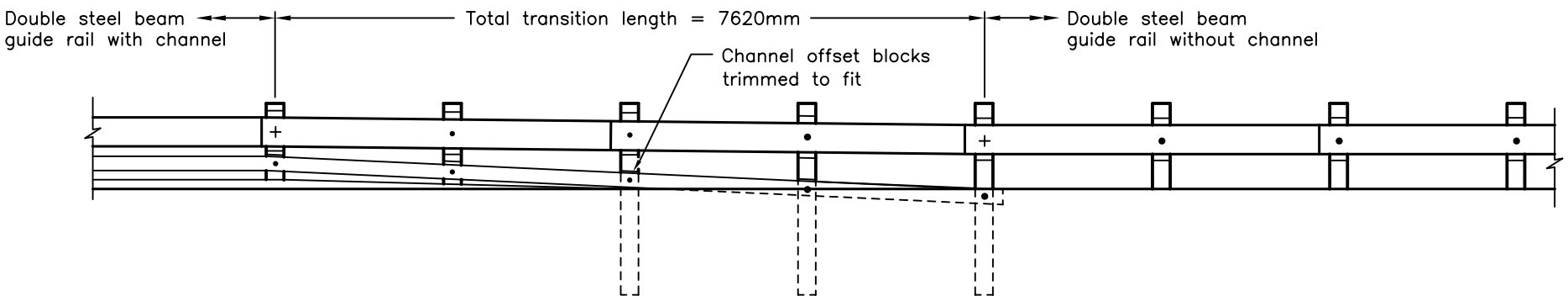
Nov 2002 | Rev 1

GUIDE RAIL SYSTEM, STEEL BEAM TEMPORARY TRANSITION INSTALLATION

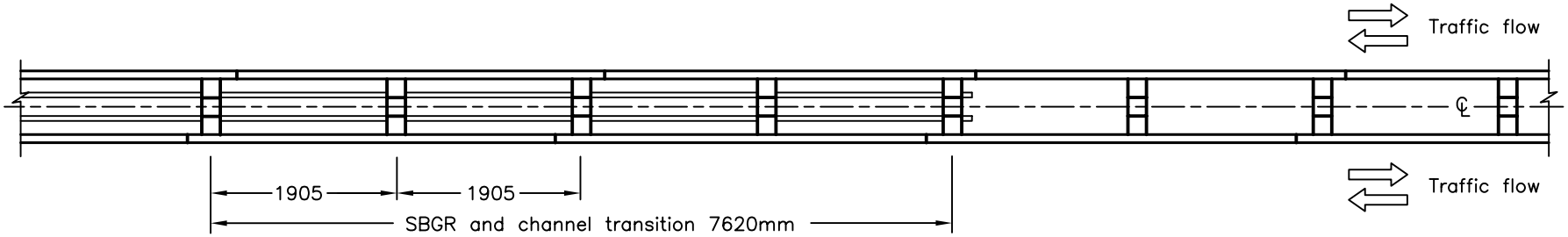
SINGLE STEEL BEAM TO TEMPORARY CONCRETE BARRIER

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSD

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.

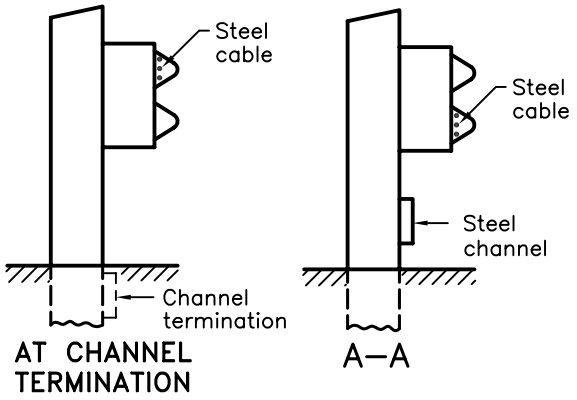
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

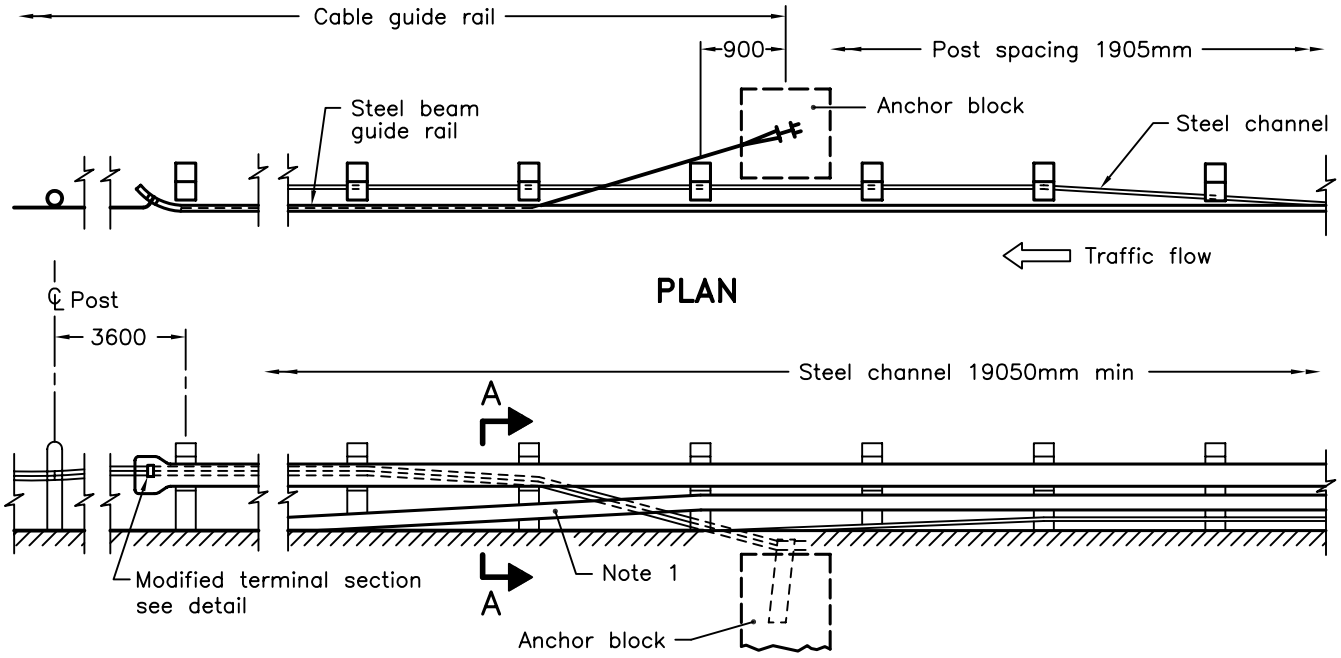
GUIDE RAIL SYSTEM, STEEL BEAM PERMANENT TRANSITION INSTALLATION CHANNEL TERMINATION MEDIAN

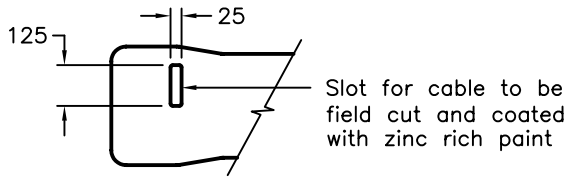
Nov 2008 | Rev 1

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.

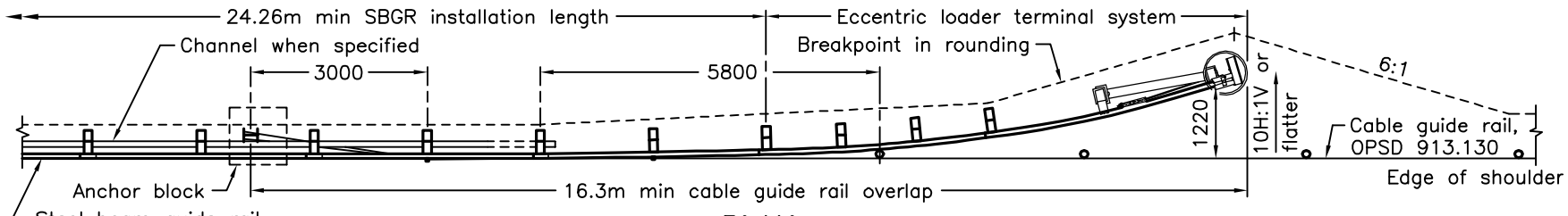
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, STEEL BEAM PERMANENT TRANSITION INSTALLATION SINGLE STEEL BEAM TO 3 CABLE DIVIDED HIGHWAY

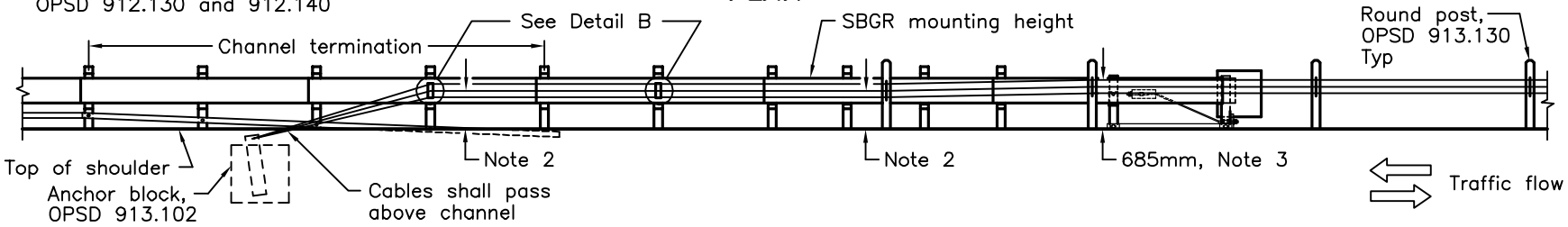
Nov 2002 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

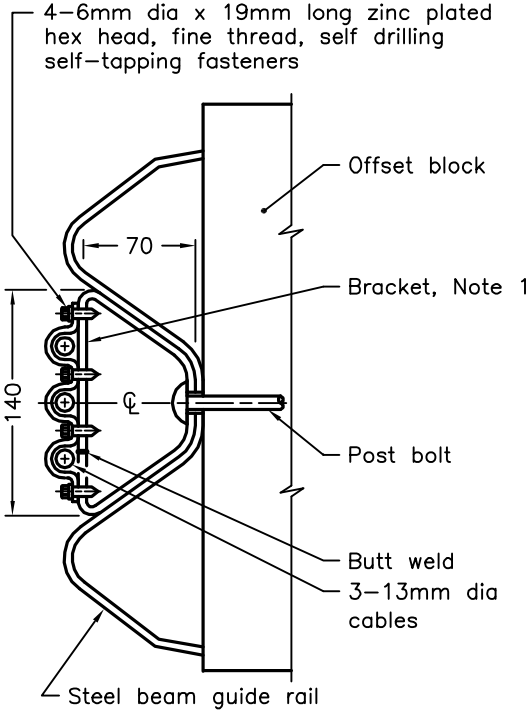
OPSD – 912.381



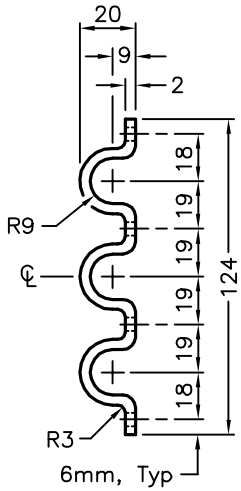
PLAN



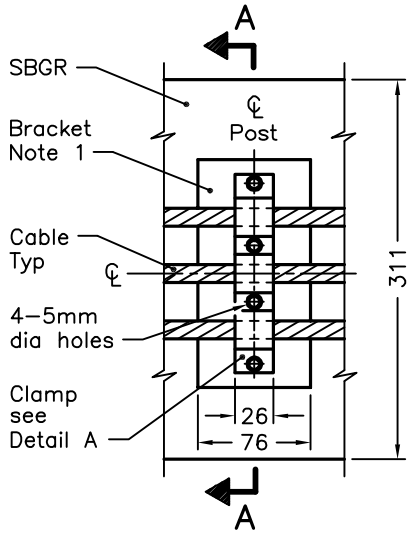
ELEVATION



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.

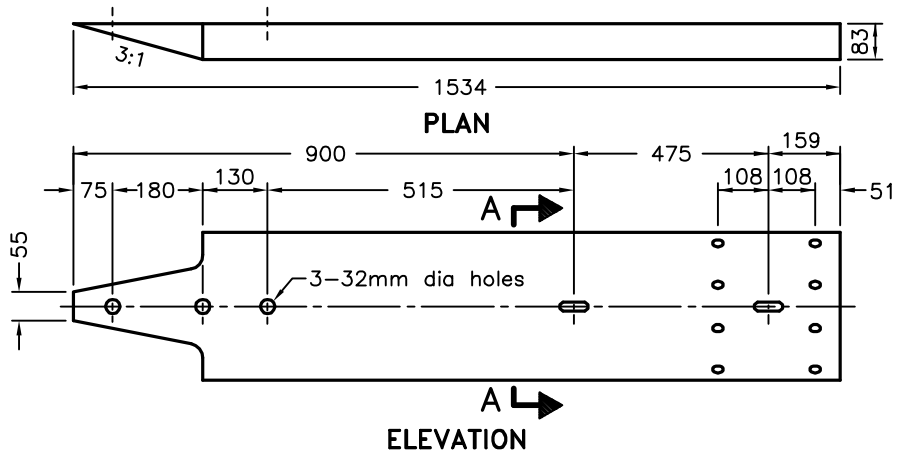
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, STEEL BEAM PERMANENT TRANSITION INSTALLATION STEEL BEAM WITH ECCENTRIC LOADER TO 3 CABLE DIVIDED AND UNDIVIDED HIGHWAY

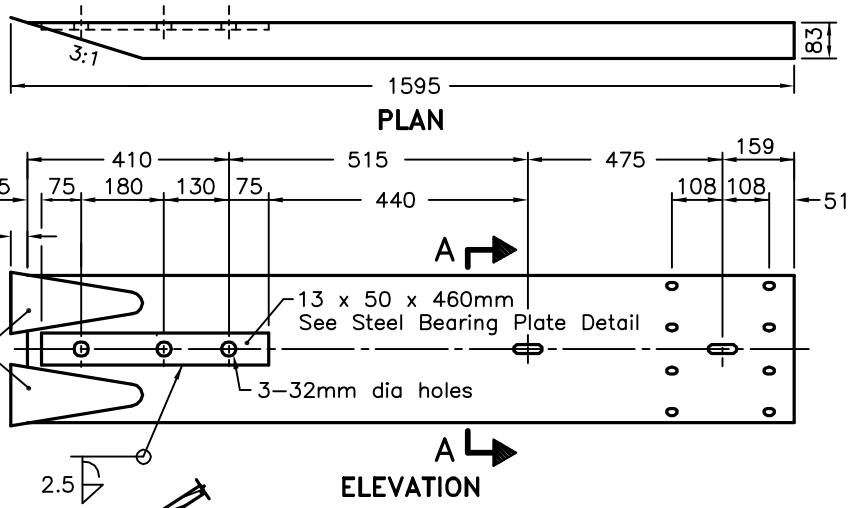
Nov 2009 | Rev 3

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

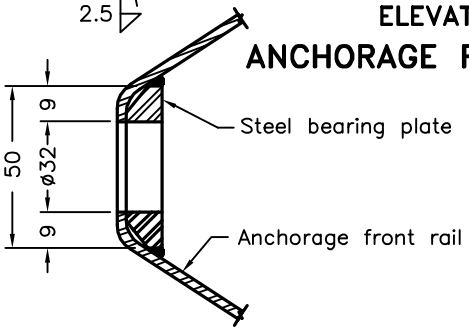
OPSD 912.382



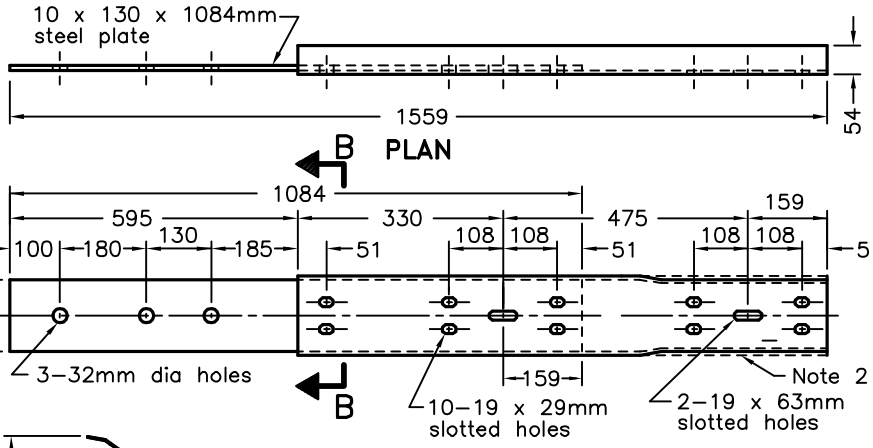
ANCHORAGE BACKUP RAIL



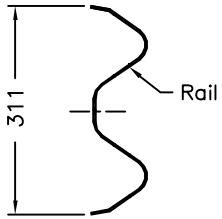
ANCHORAGE FRONT RAIL



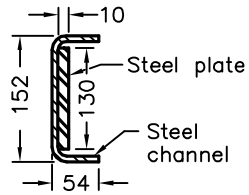
STEEL BEARING PLATE DETAIL



CHANNEL



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.

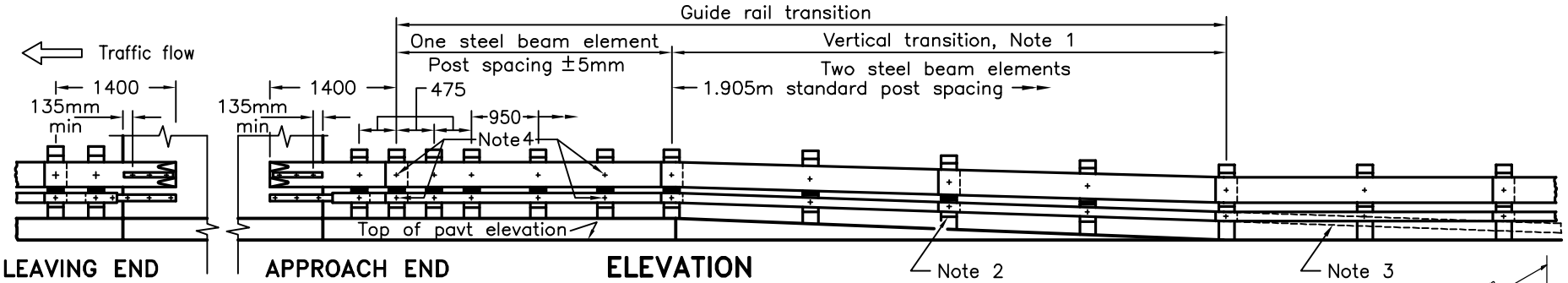
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010 | Rev 1

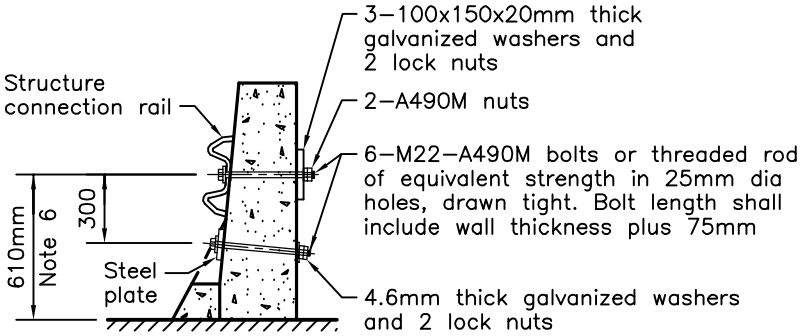
GUIDE RAIL SYSTEM, STEEL BEAM STRUCTURE CONNECTION COMPONENT – RAIL AND CHANNEL

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

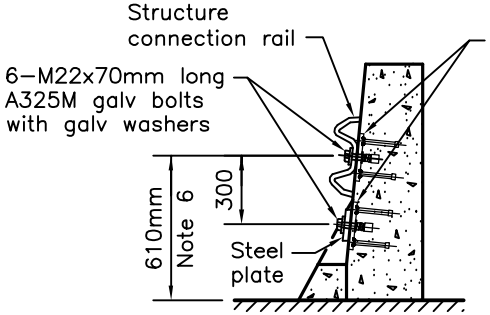
OPSD 912.401



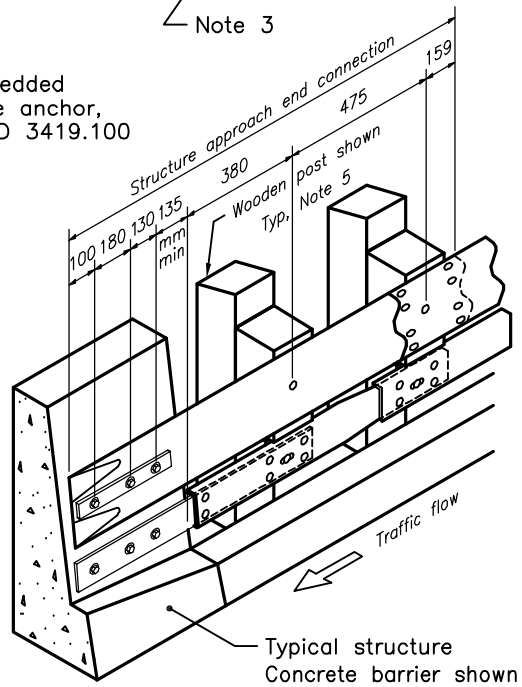
LEAVING END APPROACH END ELEVATION

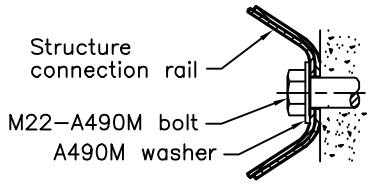


EXISTING CONCRETE BARRIER



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.

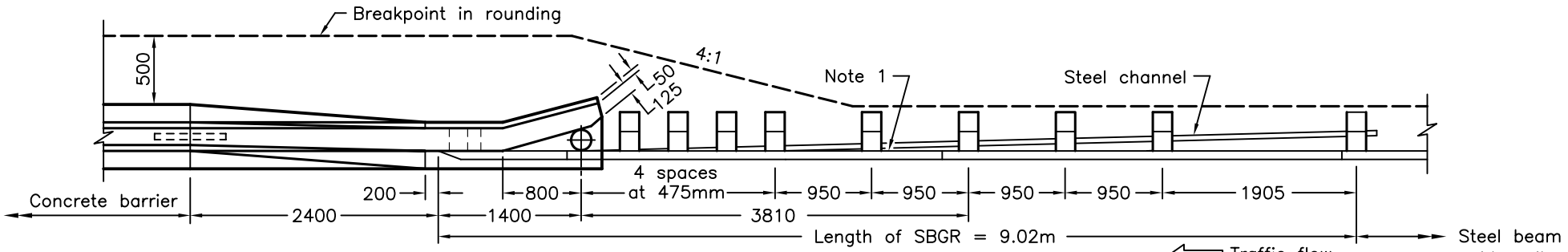
A This OPSD to be read in conjunction with OPSD 912.130, 912.140, 912.401, and 912.530.

B All dimensions are in millimetres unless otherwise shown.

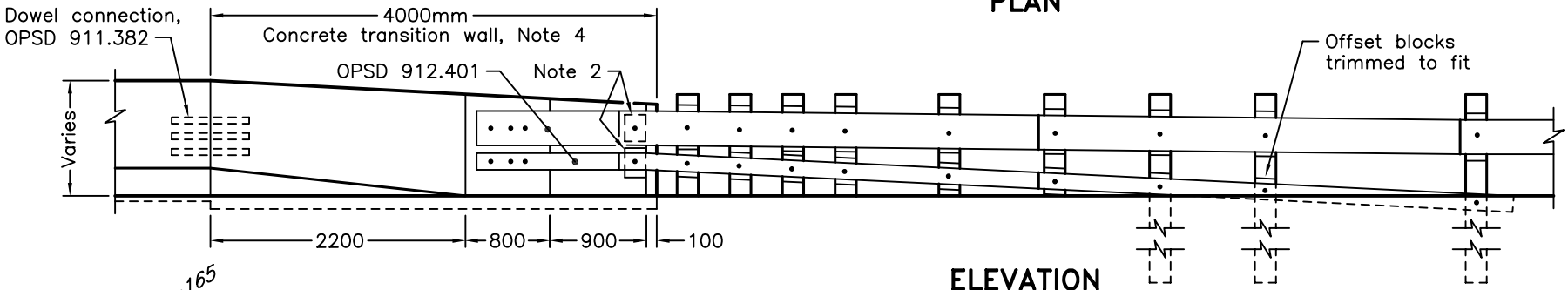
ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev 3

GUIDE RAIL SYSTEM, STEEL BEAM STRUCTURE CONNECTION

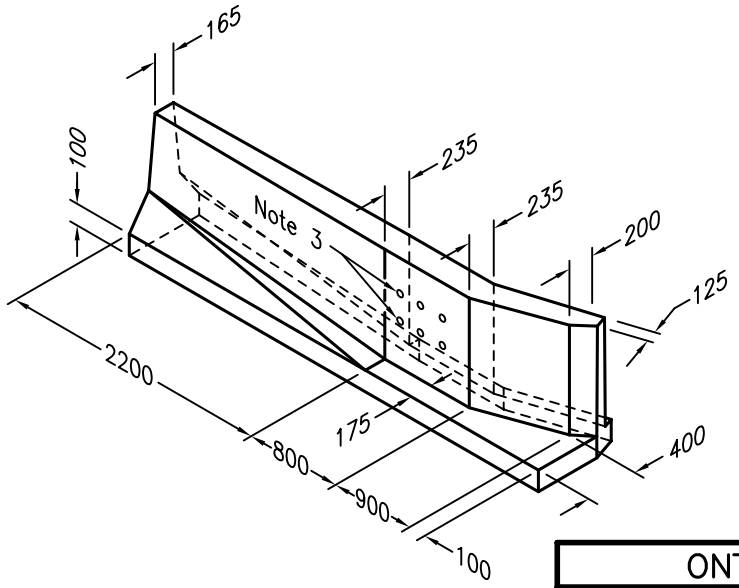
OPSD 912.430



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.

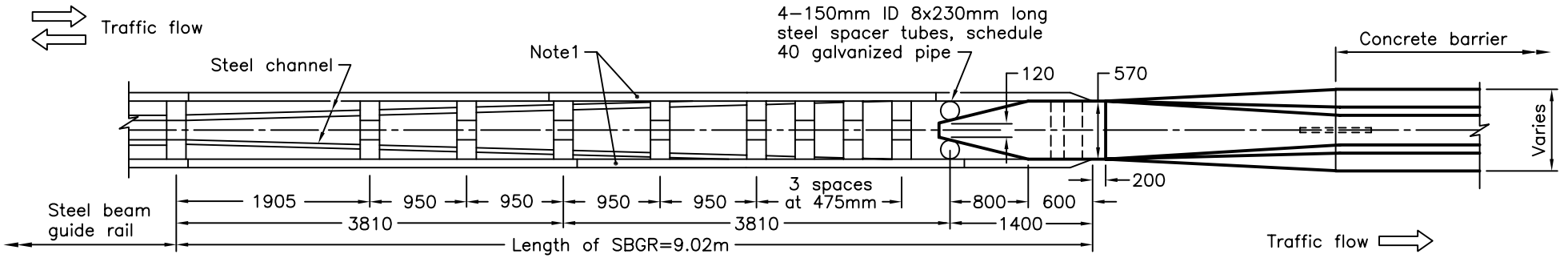
4 Vertical transition required for connection to tall wall barrier or bridge wingwalls greater than 825mm high.

A Steel beam guide rail mounting heights shall be as specified.

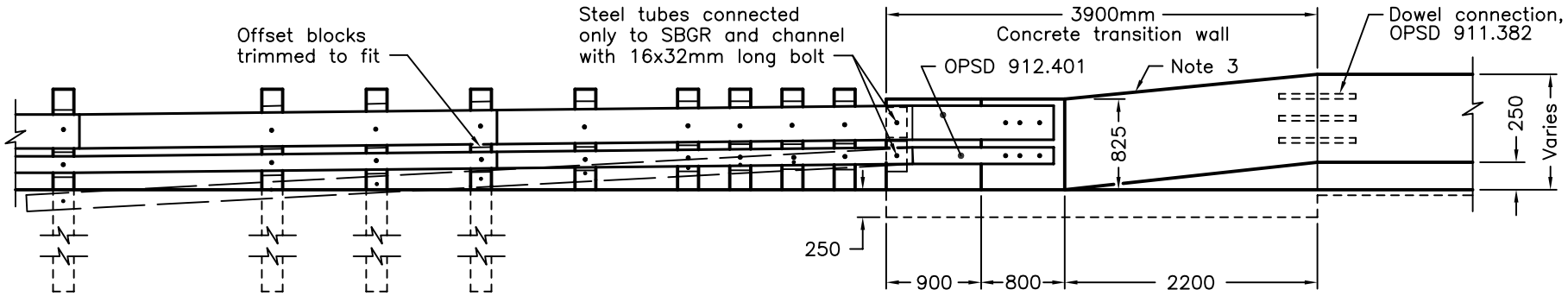
B This OPSD to be read in conjunction with OPSD 912.130 and 912.140.

C All dimensions are in millimetres unless otherwise shown.

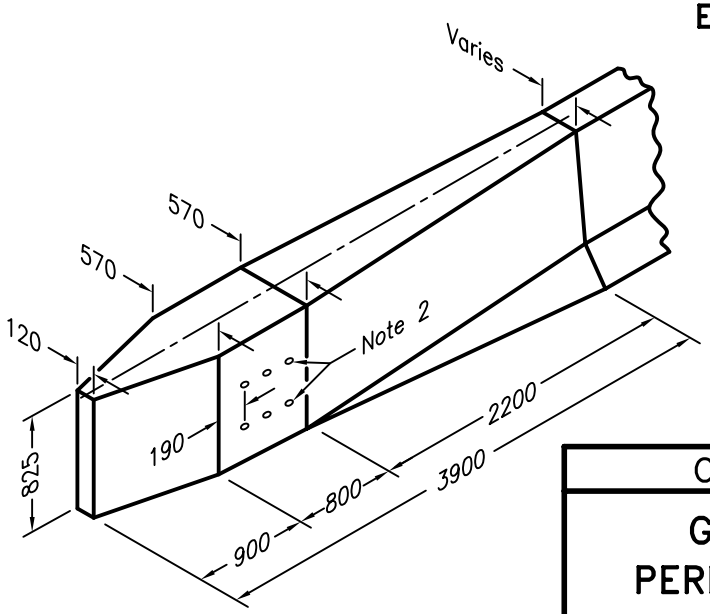
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2008	Rev	2
GUIDE RAIL SYSTEM, STEEL BEAM PERMANENT CONNECTION INSTALLATION SINGLE STEEL BEAM TO CONCRETE BARRIER			
			OPSD 912.480



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.

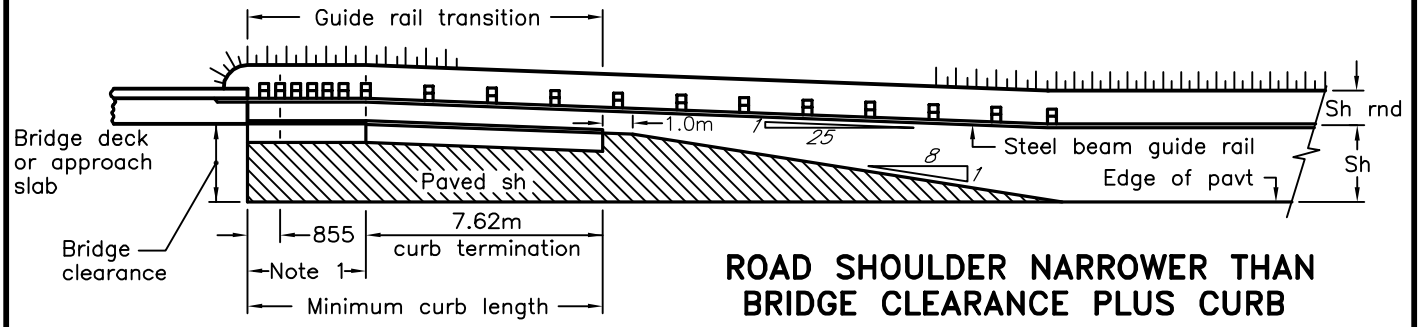
3 Vertical transition required for connection to tall wall barrier or bridge wingwalls greater than 825mm high.

A Steel beam guide rail mounting heights shall be as specified.

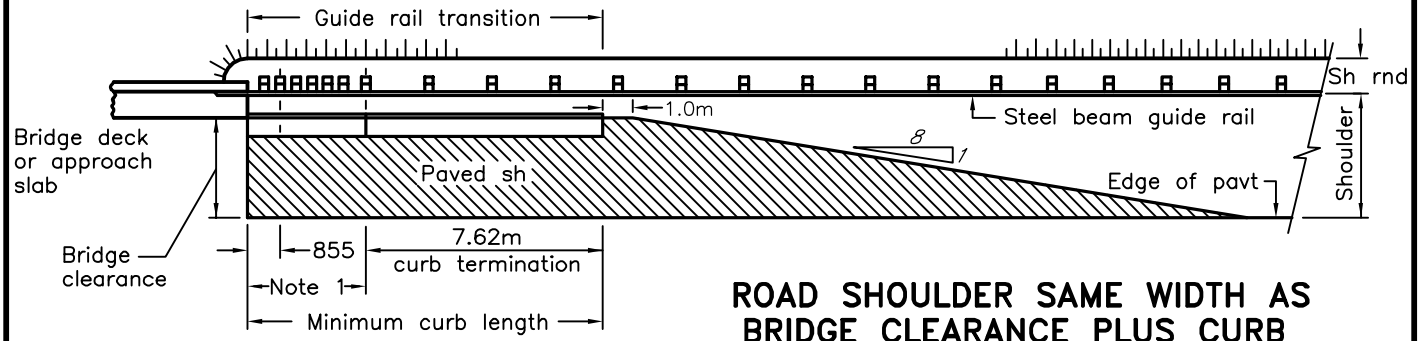
B This OPSD to be read in conjunction with OPSD 912.141.

C All dimensions are in millimetres unless otherwise shown.

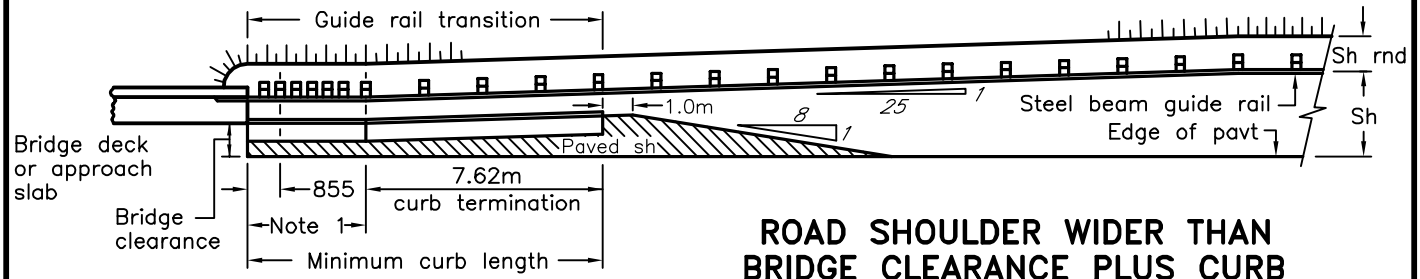
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2008	Rev	2
GUIDE RAIL SYSTEM, STEEL BEAM PERMANENT CONNECTION INSTALLATION DOUBLE STEEL BEAM TO CONCRETE BARRIER			
			OPSD 912.481



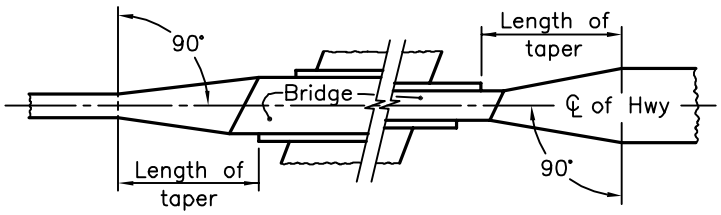
ROAD SHOULDER NARROWER THAN BRIDGE CLEARANCE PLUS CURB



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.

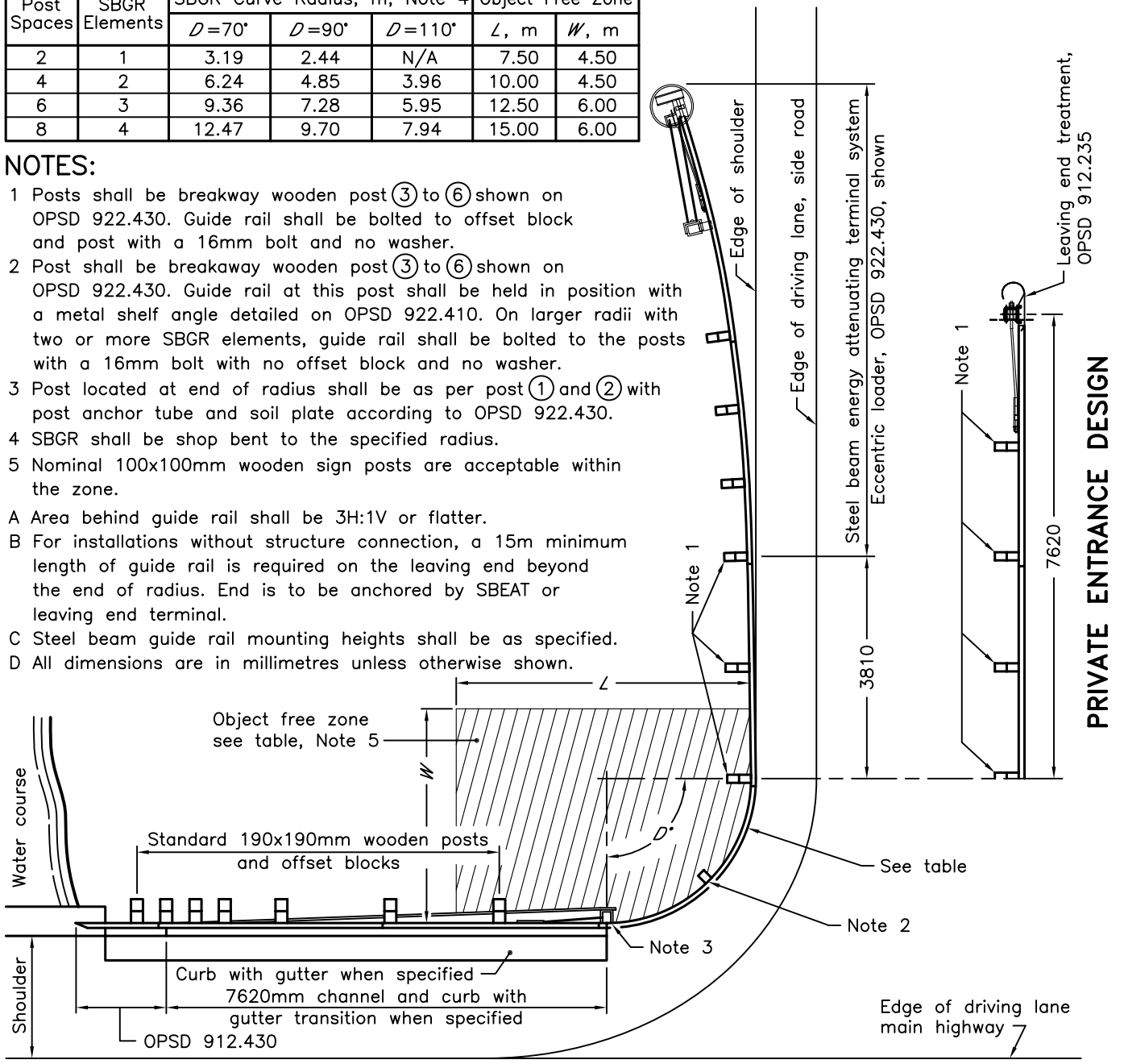
5 Nominal 100x100mm wooden sign posts are acceptable within the zone.

A Area behind guide rail shall be 3H:1V or flatter.

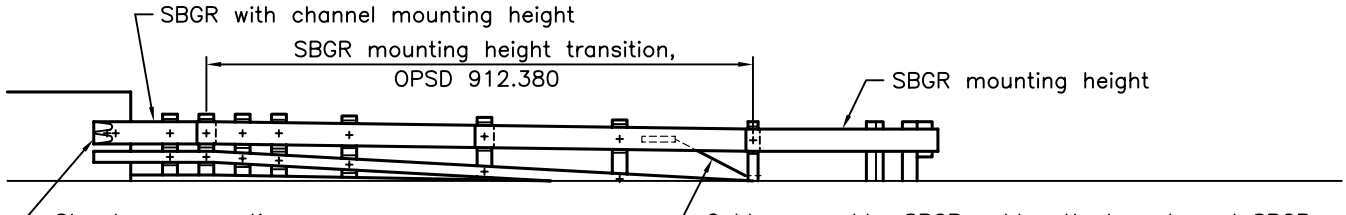
B For installations without structure connection, a 15m minimum length of guide rail is required on the leaving end beyond the end of radius. End is to be anchored by SBEAT or leaving end terminal.

C Steel beam guide rail mounting heights shall be as specified.

D All dimensions are in millimetres unless otherwise shown.



PLAN



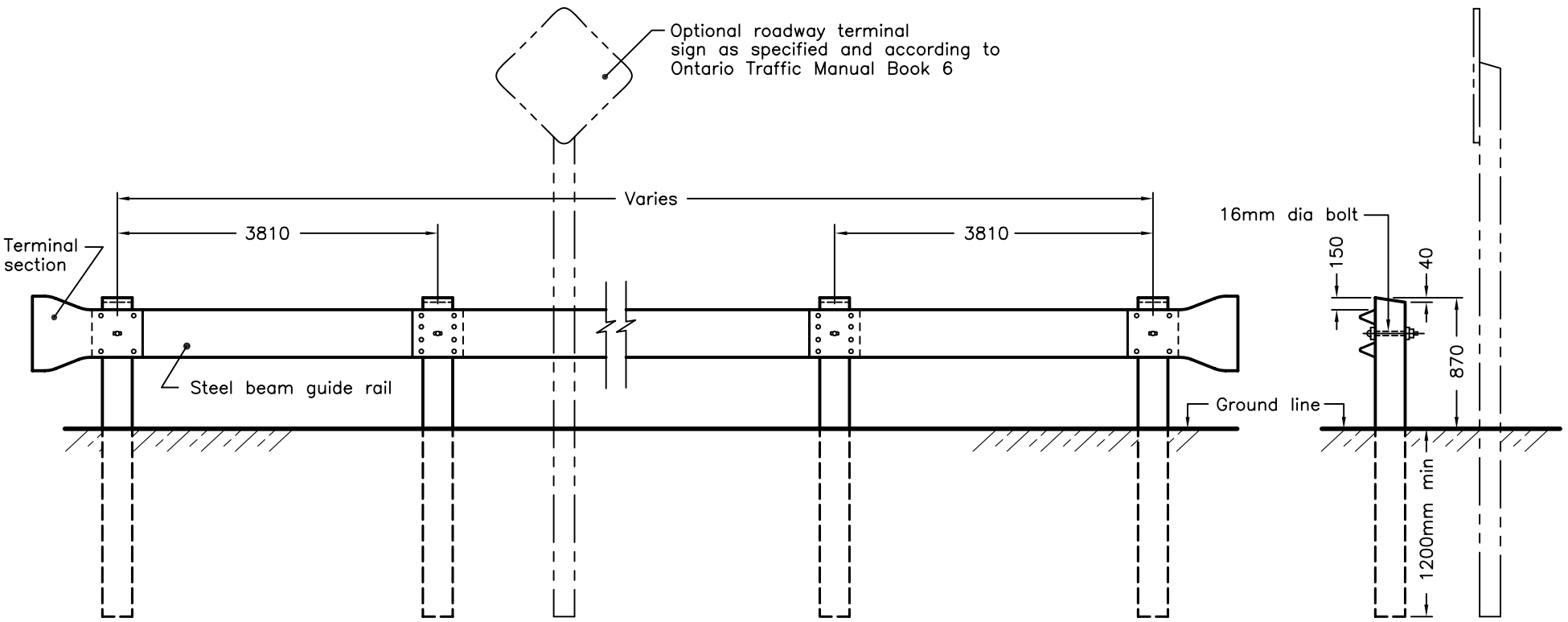
ELEVATION

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2008 | Rev 2

GUIDE RAIL SYSTEM, STEEL BEAM INSTALLATION – ENTRANCES AND INTERSECTING ROADWAYS

OPSD 912.531

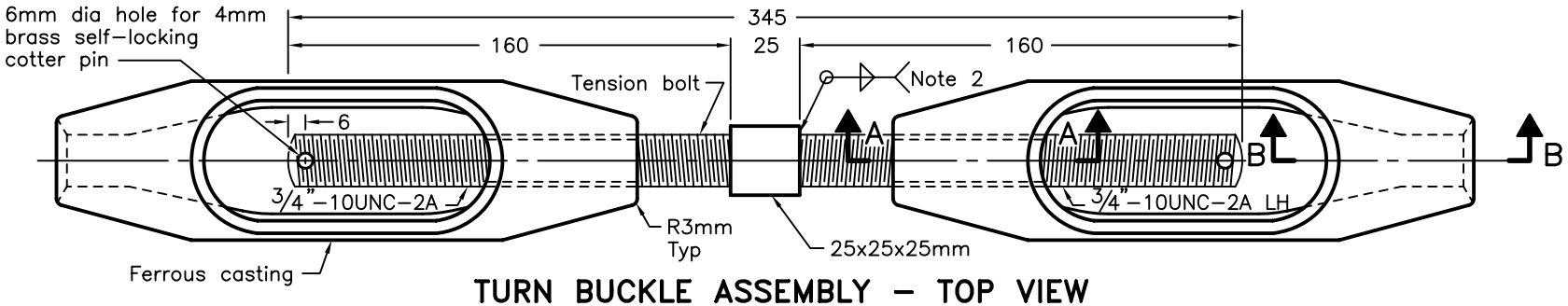


ELEVATION **SIDE**

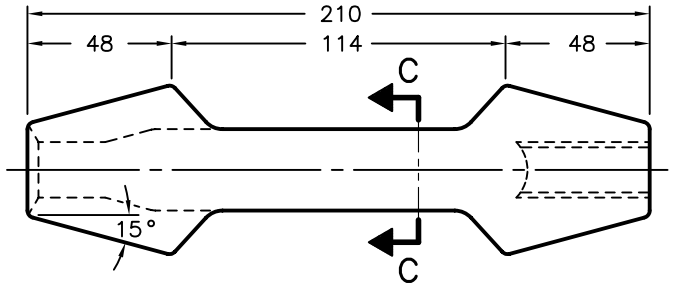
NOTES:

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.

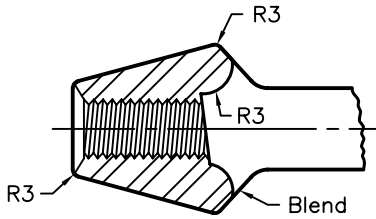
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2008	Rev	1
GUIDE RAIL SYSTEM, STEEL BEAM BARRICADE INSTALLATION			
	OPSD 912.532		



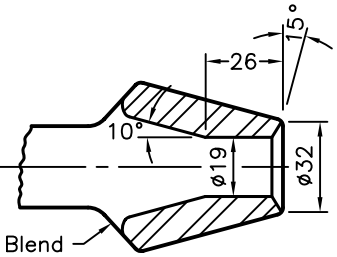
TURN BUCKLE ASSEMBLY – TOP VIEW



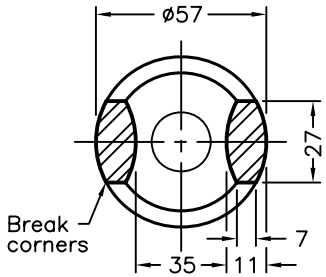
END FITTING – SIDE VIEW



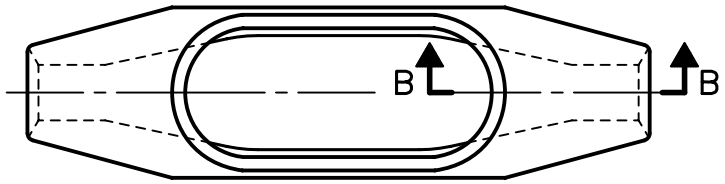
SECTION A–A



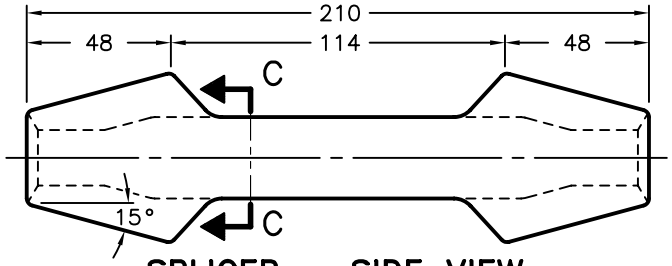
SECTION B–B



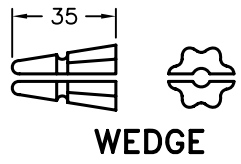
SECTION C–C



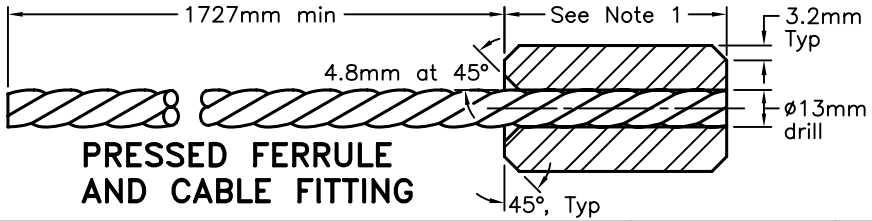
SPLICER – TOP VIEW



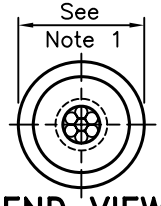
SPLICER – SIDE VIEW



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.

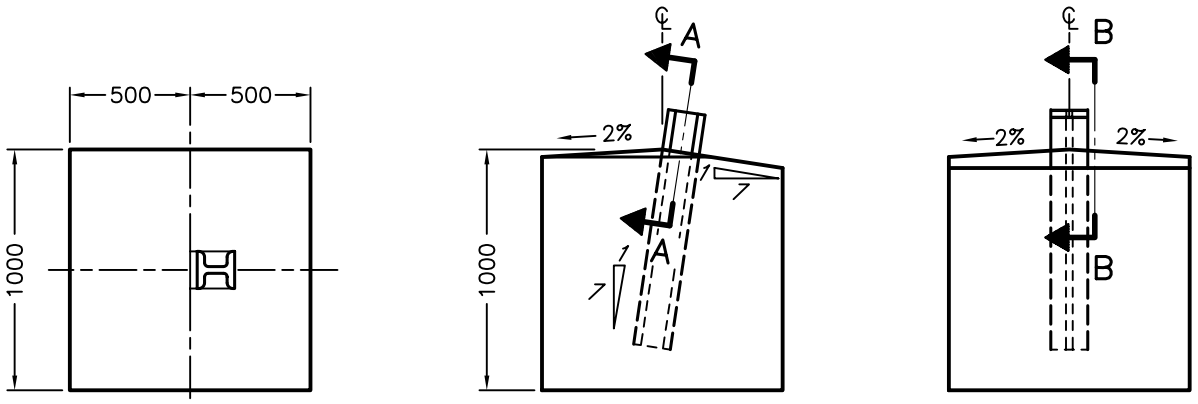
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

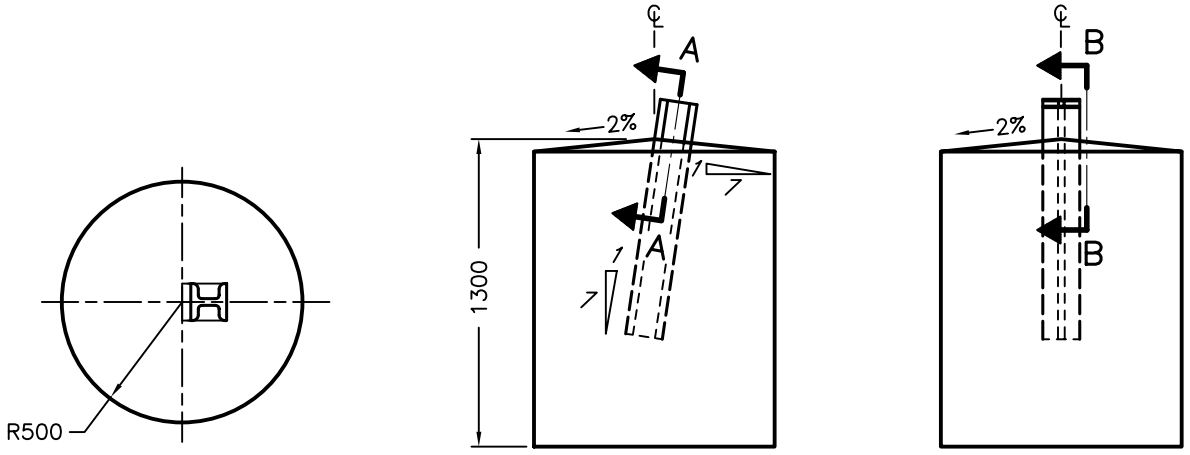
Nov 2008 | Rev 1

GUIDE RAIL SYSTEM, CABLE COMPONENT – CABLE FITTINGS

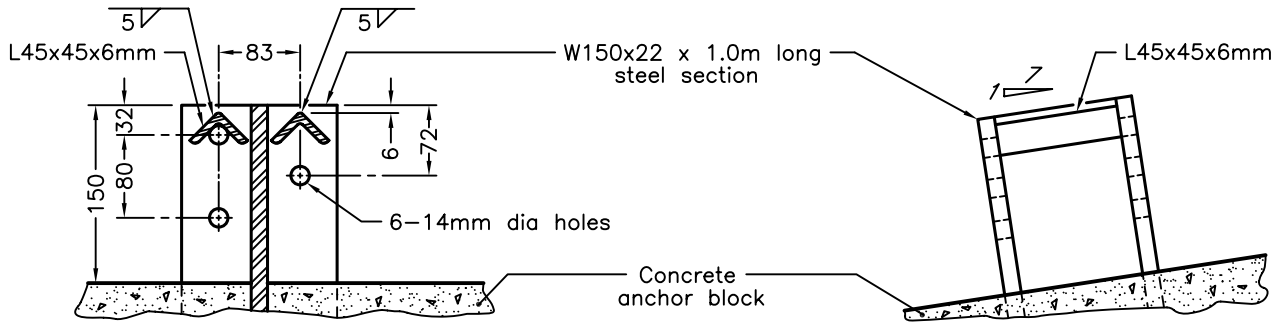
OPSD 913.101



CUBICAL ANCHOR BLOCK



CYLINDRICAL ANCHOR BLOCK



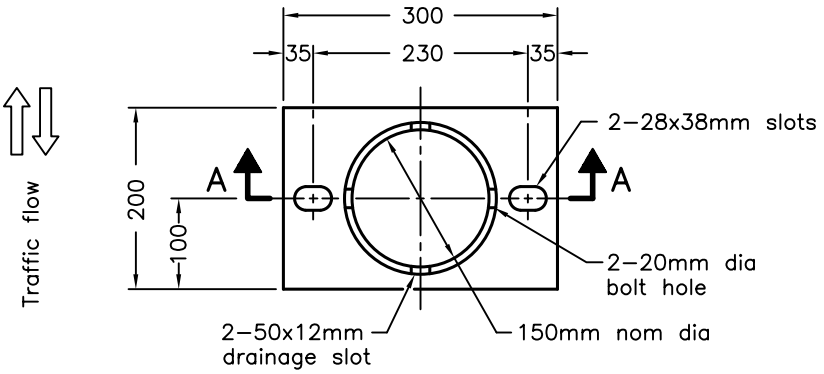
SECTION A–A

SECTION B–B

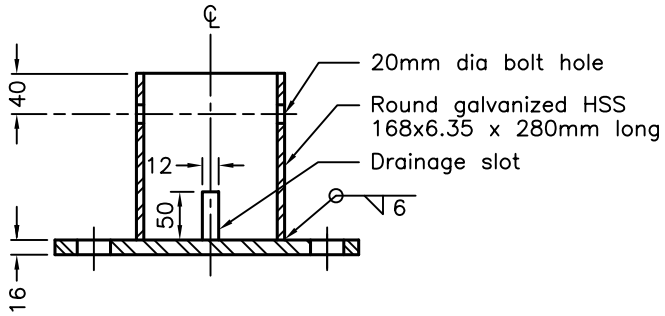
NOTES:

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

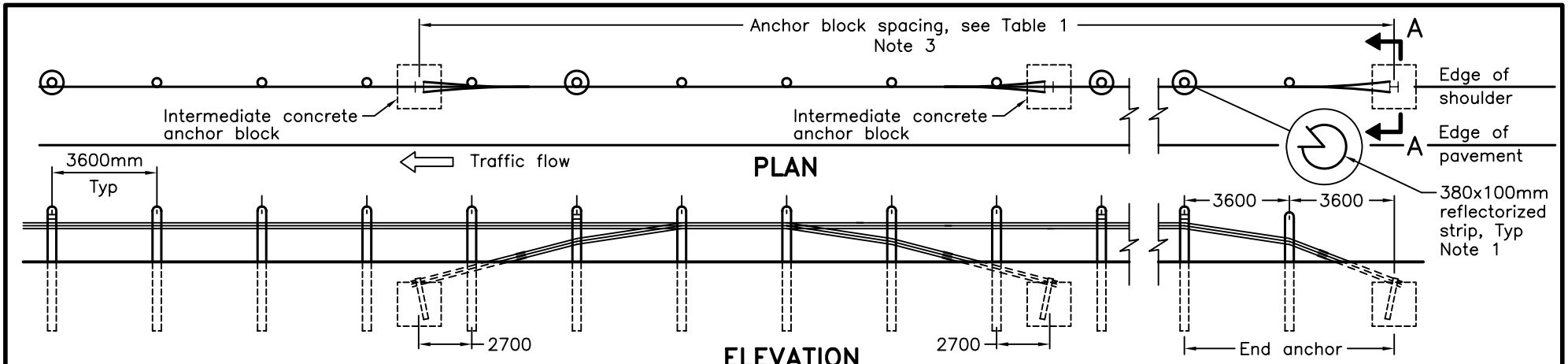


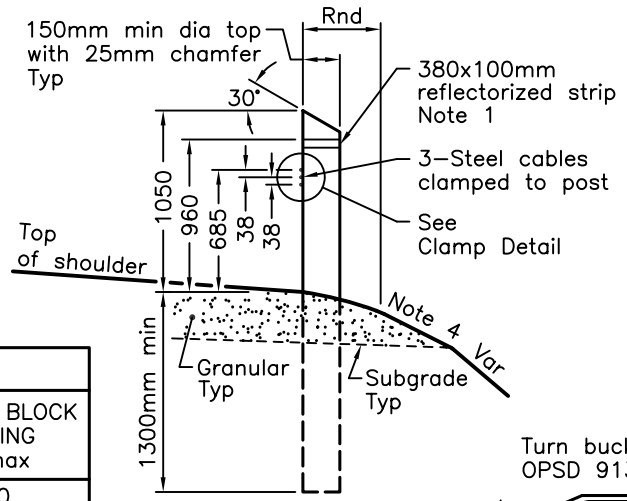
SECTION A–A

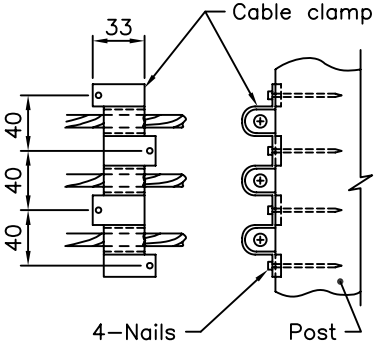
NOTES:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2008	Rev	1
GUIDE RAIL SYSTEM, CABLE COMPONENT – WOODEN POST BASE PLATE			
	OPSD 913.103		







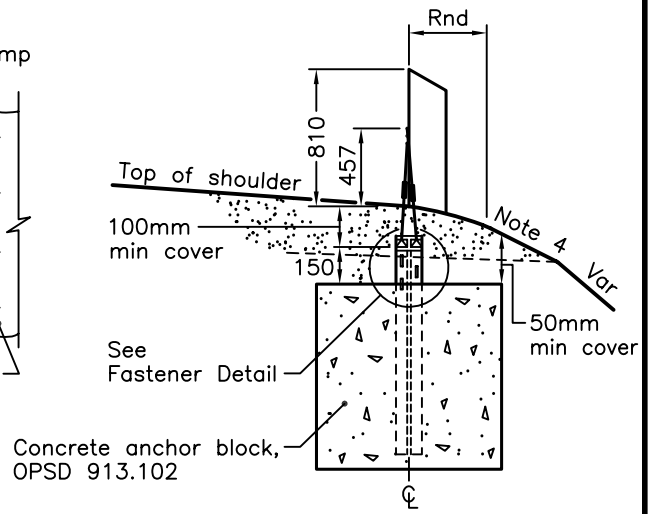
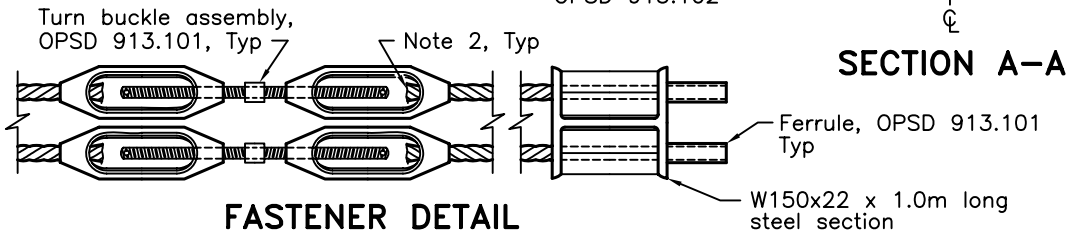


TABLE 1	
RADIUS OF CURVATURE m	ANCHOR BLOCK SPACING m max
Over 600	300
250 to 600	100



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.

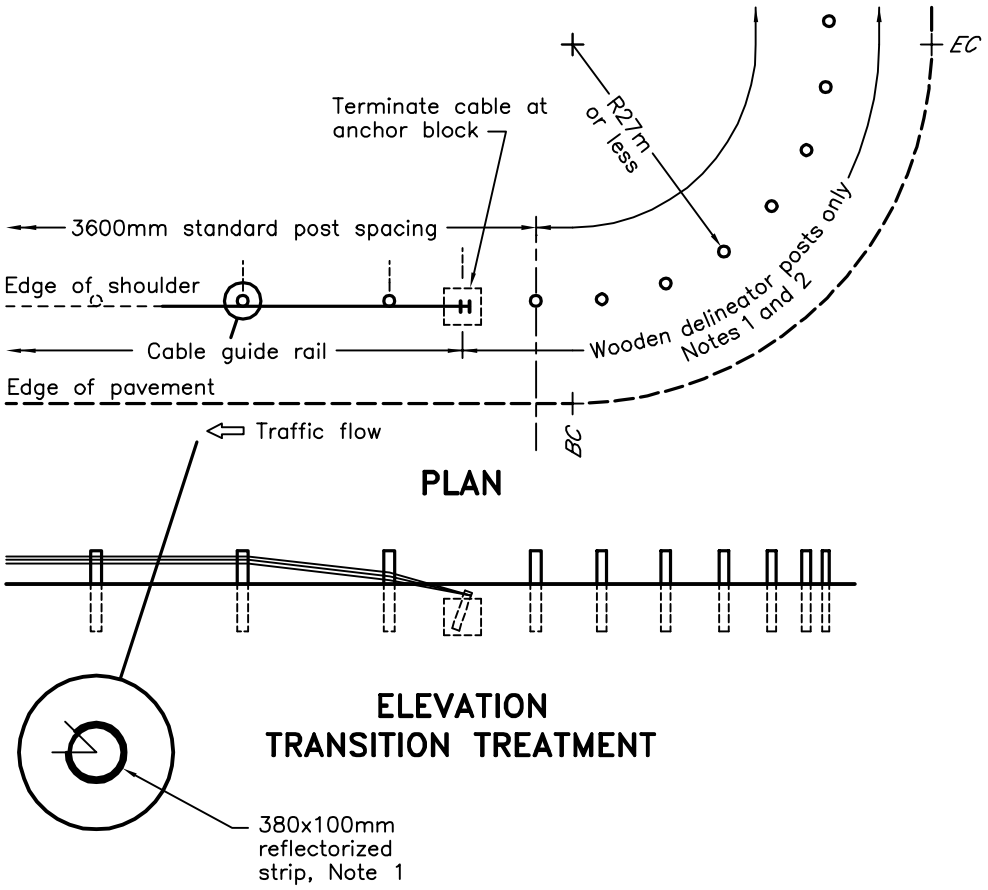
ONTARIO PROVINCIAL STANDARD DRAWING

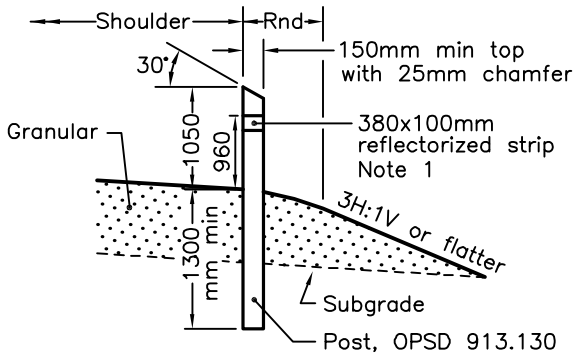
GUIDE RAIL SYSTEM, CABLE INSTALLATION – SHOULDER

Nov 2008 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 913.130





WOODEN DELINEATOR POST

NOTES:

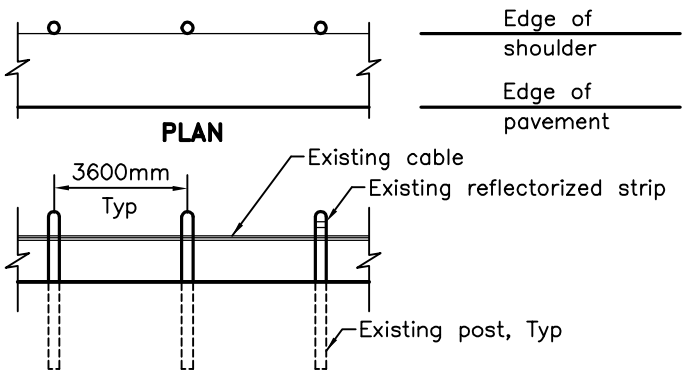
1 All posts shall be fitted with a reflectorized strip on 0.5mm aluminum, fastened with two 50mm aluminum nails.
Reflectors shall be according to Ontario Traffic Manual Book 11.

2 Post spacing shall be 1.8m.

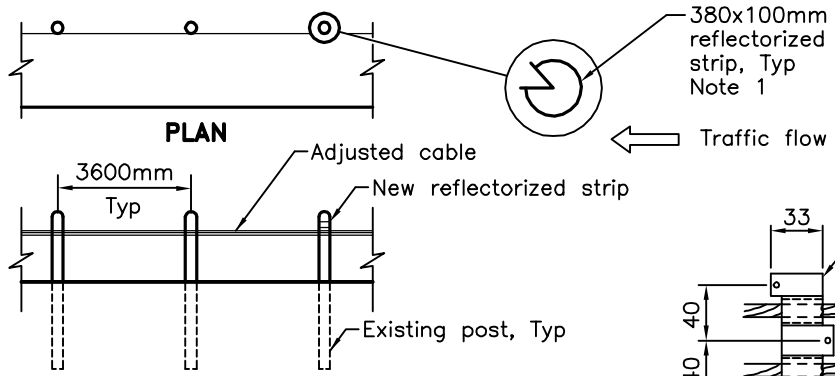
A This OPSD shall be read in conjunction with OPSD 913.130.

B All dimensions are in millimetres unless otherwise shown.

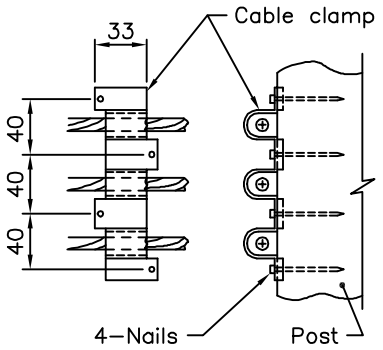
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	0
GUIDE RAIL SYSTEM, CABLE INSTALLATION ENTRANCES AND INTERSECTING ROADWAYS			
	OPSD 913.131		



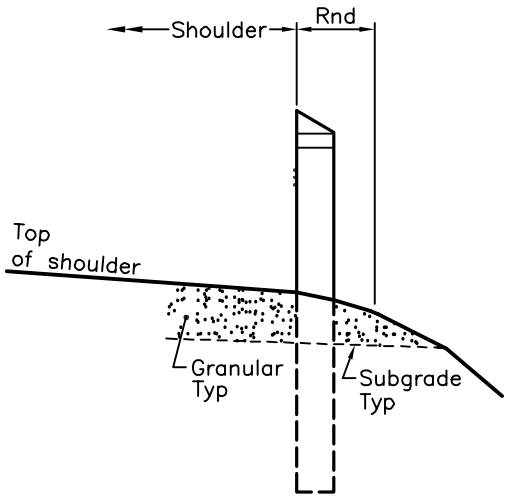
EXISTING CABLE GUIDE RAIL



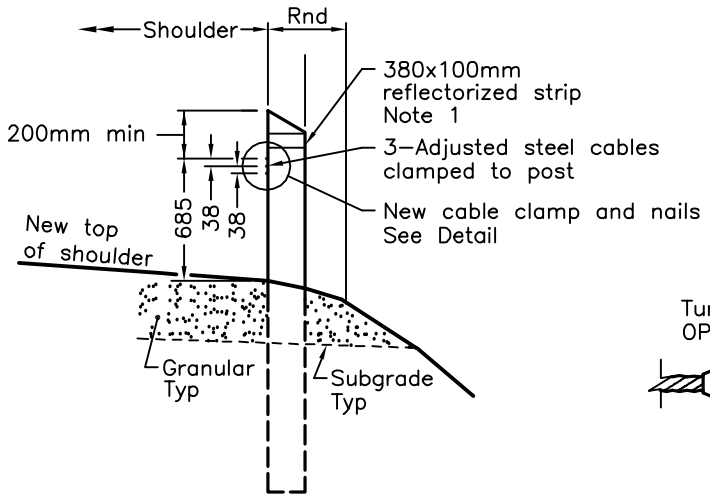
ADJUSTED CABLE GUIDE RAIL



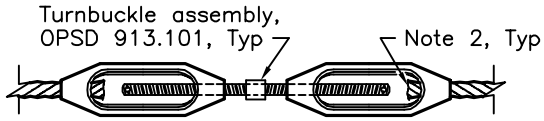
CLAMP DETAIL



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.

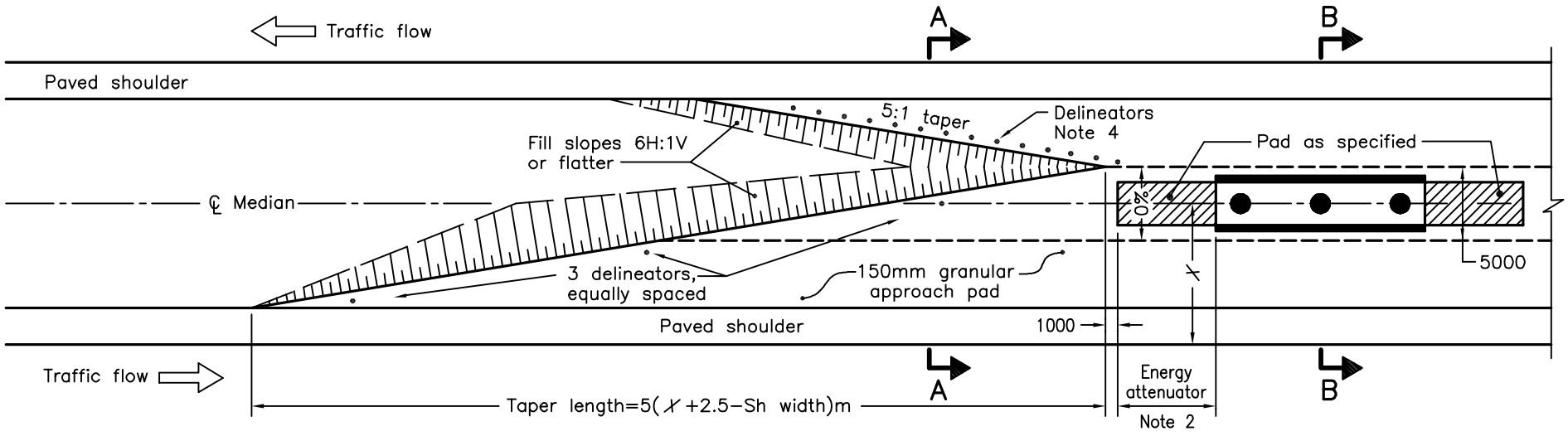
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

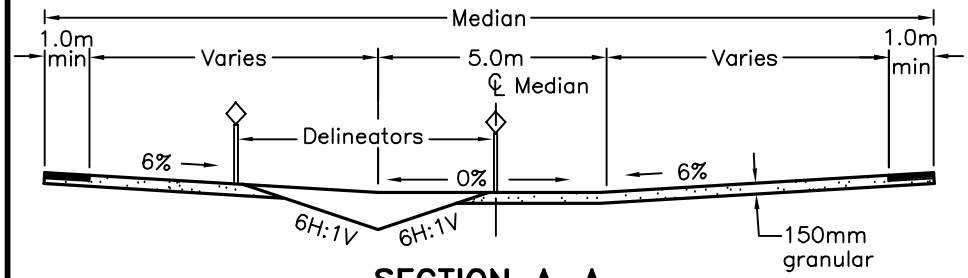
GUIDE RAIL SYSTEM, CABLE ADJUSTMENT – SHOULDER

Nov 2013	Rev	0

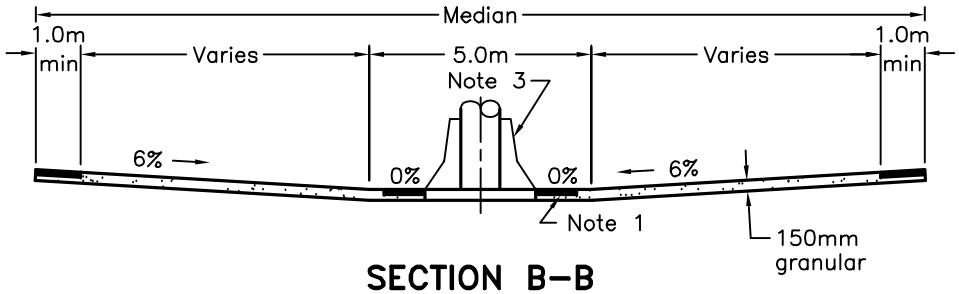
OPSD 913.135



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.

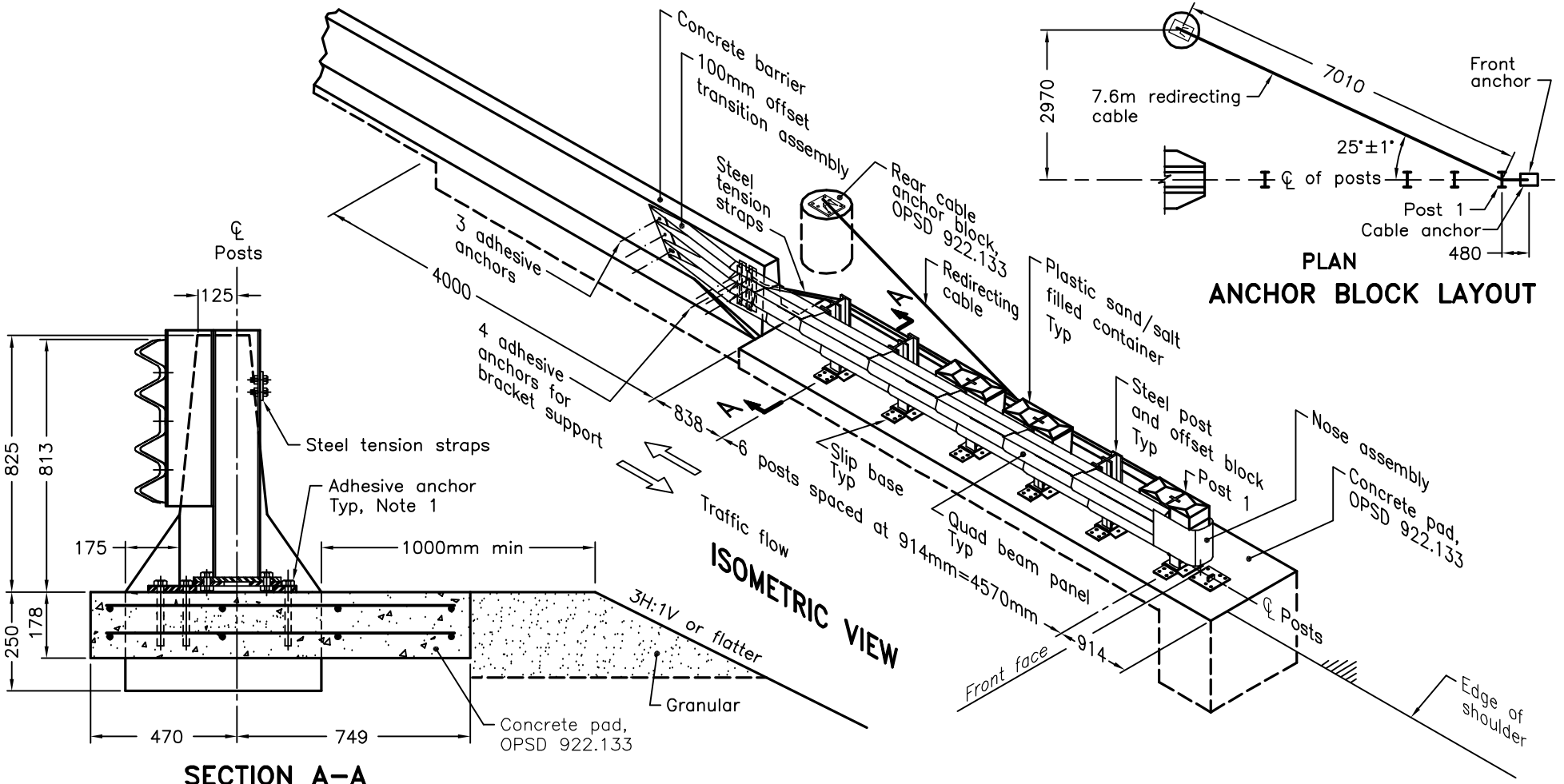
B Drainage as required.

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.

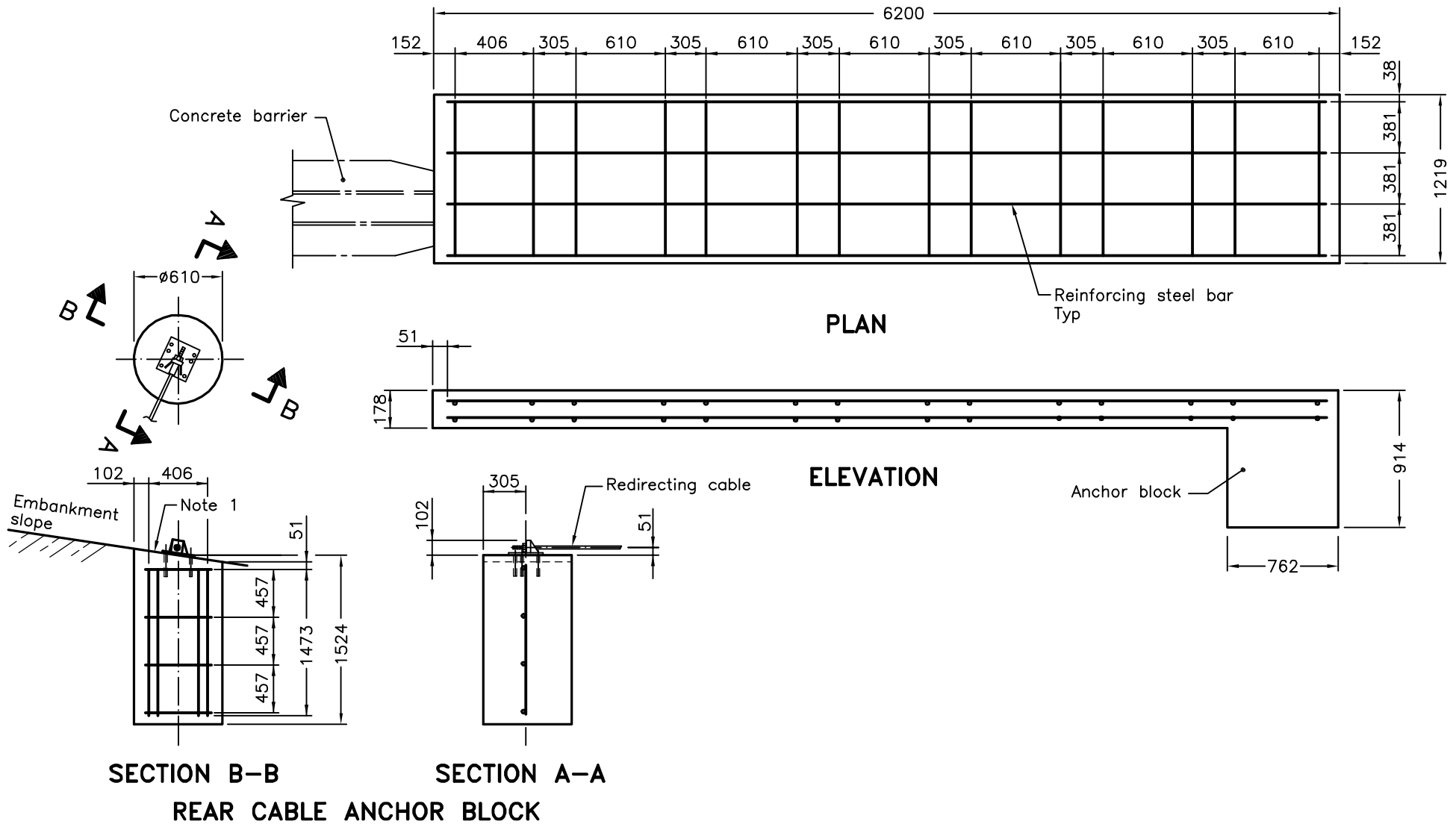
ONTARIO PROVINCIAL STANDARD DRAWING

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.

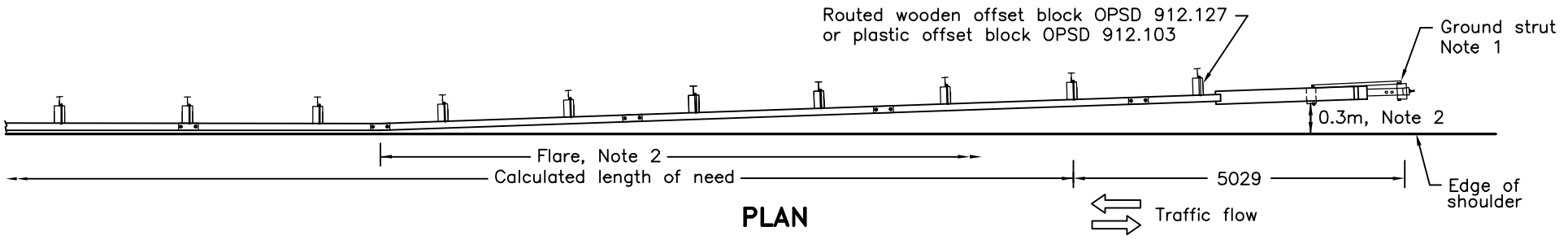
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

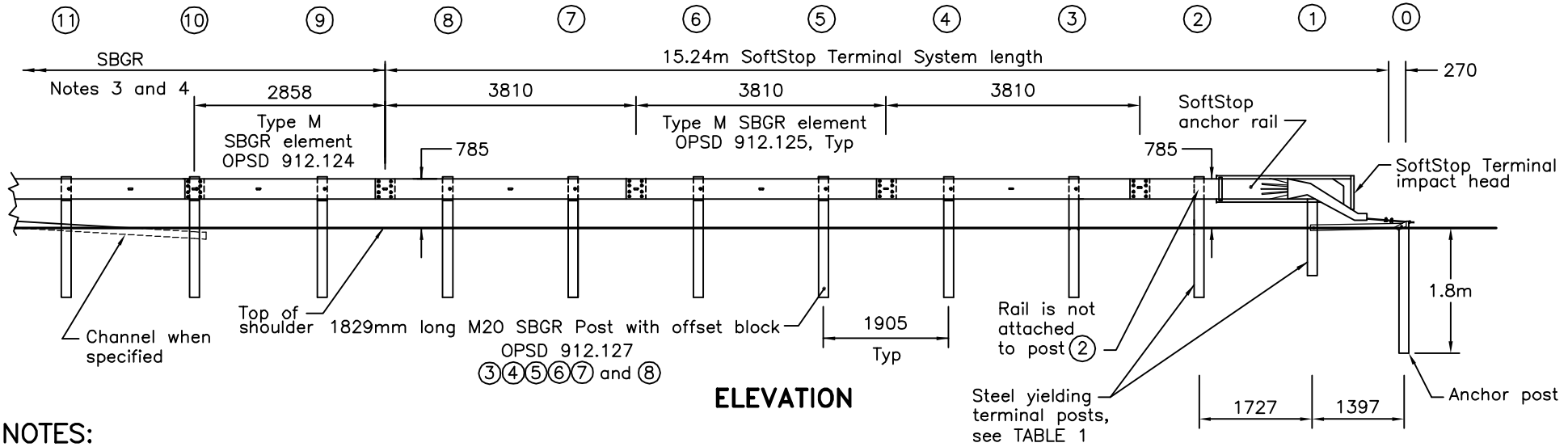
ENERGY ATTENUATOR, CRASH CUSHION QUADTREND SYSTEM INSTALLATION – CONCRETE PAD AND REAR CABLE ANCHOR BLOCK

Nov 2011 | Rev 2

OPSD 922.133



PLAN



ELEVATION

NOTES:

1 This OPSD shows right shoulder installation. The SoftStop Terminal shall be inverted for left shoulder installation.

2 The system length shall be installed in a straight line at a 50:1 flare rate or parallel to roadway when specified.

3 SBGR or SBGR with channel when specified.

4 SBGR transition in height shall occur beyond terminal between post (10) and post (13).

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 AASHTO MASH TL–3.

D This OPSD shall be read in conjunction with OPSD 202.031 or 202.032 as specified.

E All dimensions are in millimetres unless otherwise shown.

TABLE 1	
Steel Yielding Terminal Post	
Post	Length m
1	1.46
2	1.83

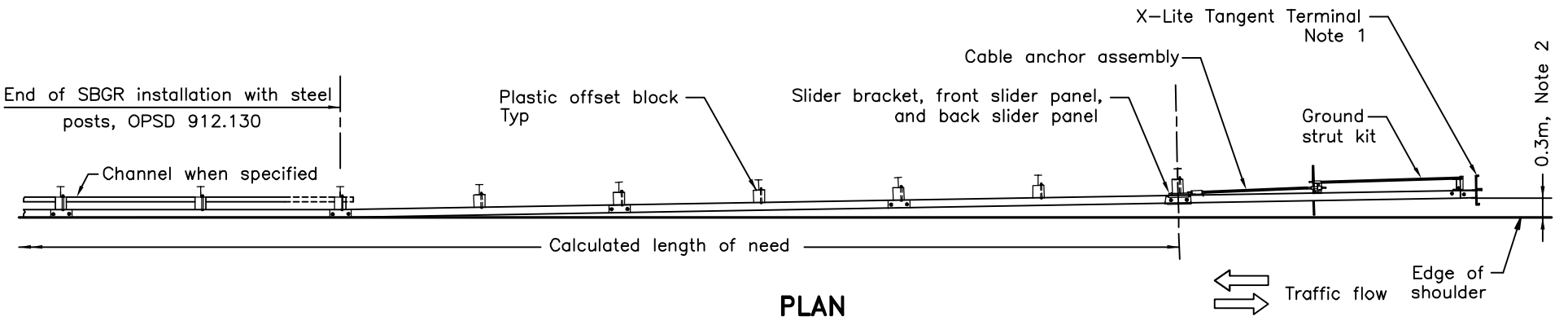
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, END TREATMENT STEEL BEAM ENERGY ATTENUATING TERMINAL SOFTSTOP TERMINAL SYSTEM INSTALLATION

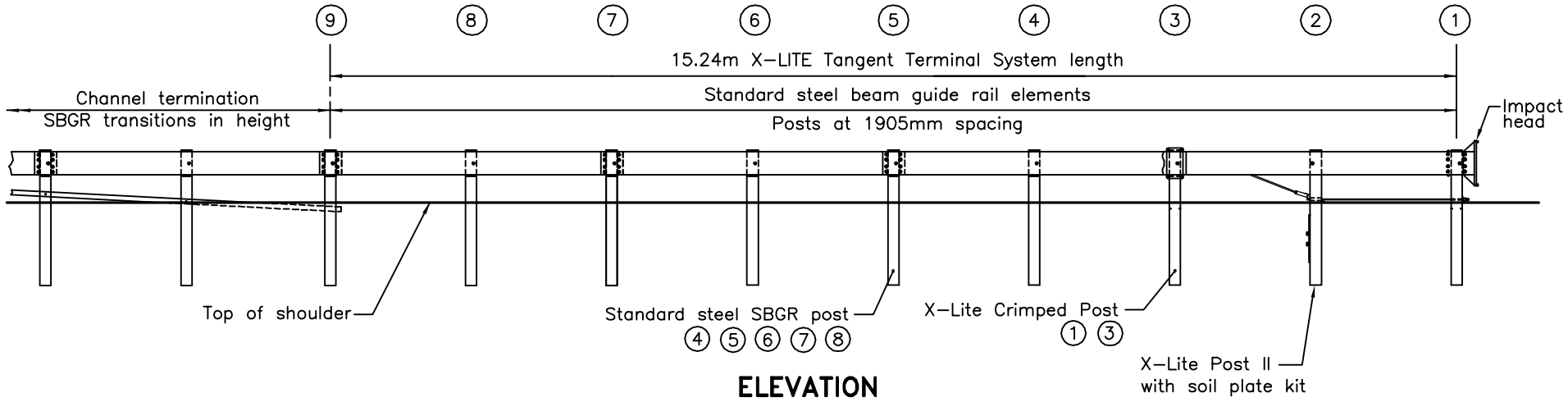
Apr 2016 | Rev 0

ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

OPSD 922.161



PLAN



ELEVATION

NOTES:

1 This OPSD shows right shoulder installation. The X–Lite Tangent Terminal shall be inverted for left shoulder installation.

2 The system length shall be installed in a straight line parallel to the roadway, at a 50:1 flare rate or parallel to roadway when 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 shall be read in conjunction with OPSD 202.031 or 202.032 as specified.

E All dimensions are in millimetres unless otherwise shown.

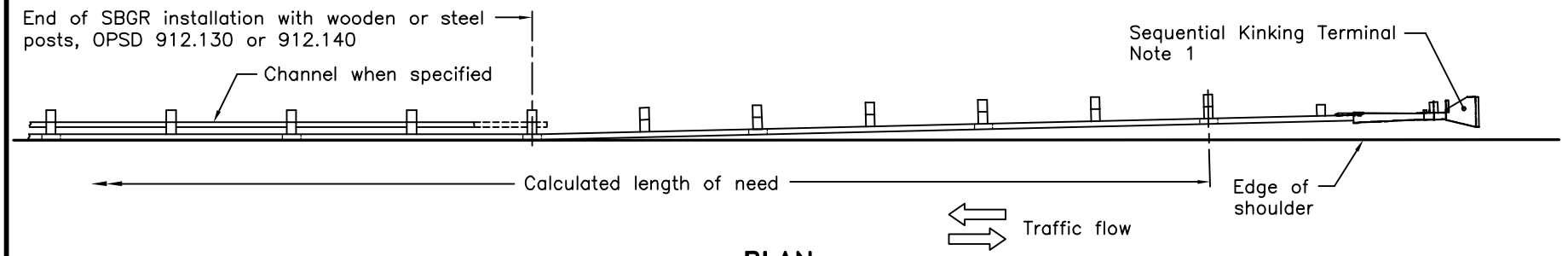
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, END TREATMENT STEEL BEAM ENERGY ATTENUATING TERMINAL X–LITE TANGENT TERMINAL SYSTEM WITH STEEL POSTS, INSTALLATION

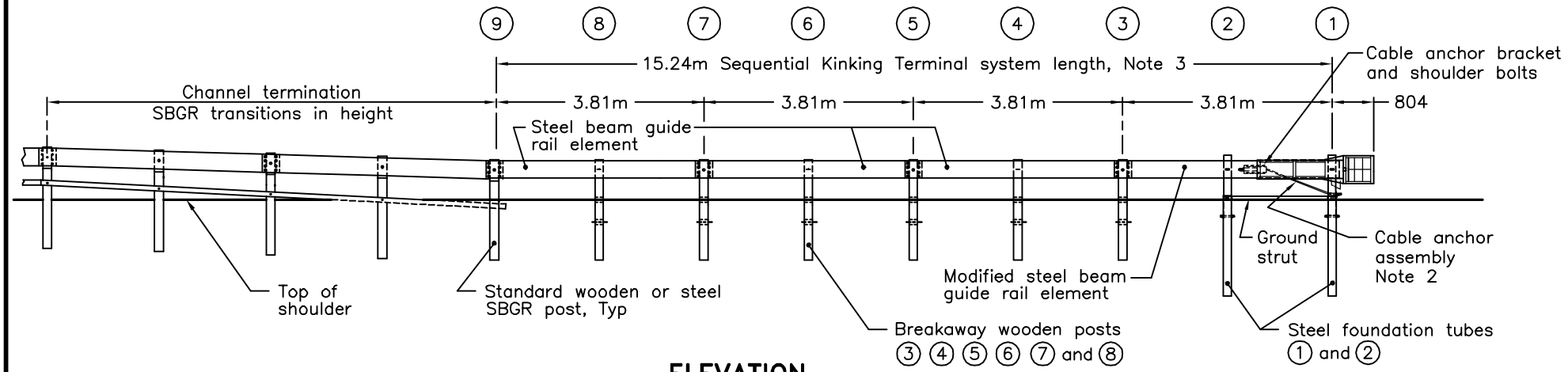
Apr 2016 | Rev 0

ONTARIO STANDARD · MUNICIPAL–PROVINCIAL · O P S

OPSD 922.170



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.

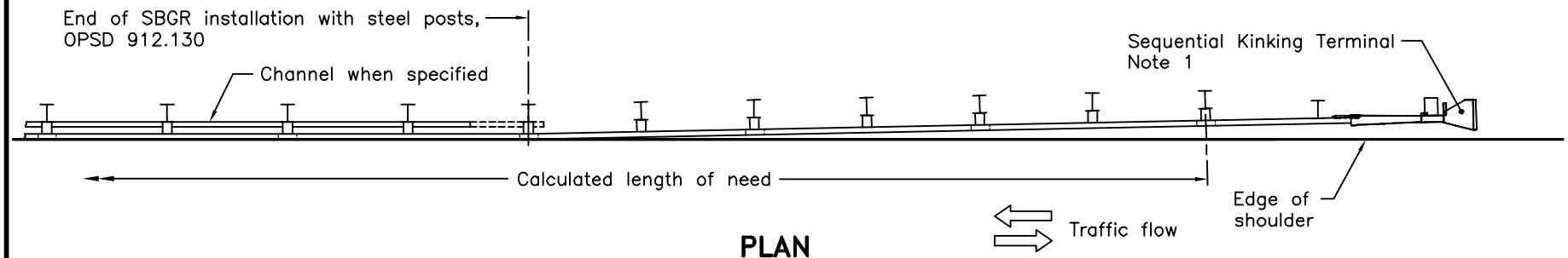
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, END TREATMENT STEEL BEAM ENERGY ATTENUATING TERMINAL SEQUENTIAL KINKING TERMINAL SYSTEM WITH WOODEN POSTS, INSTALLATION

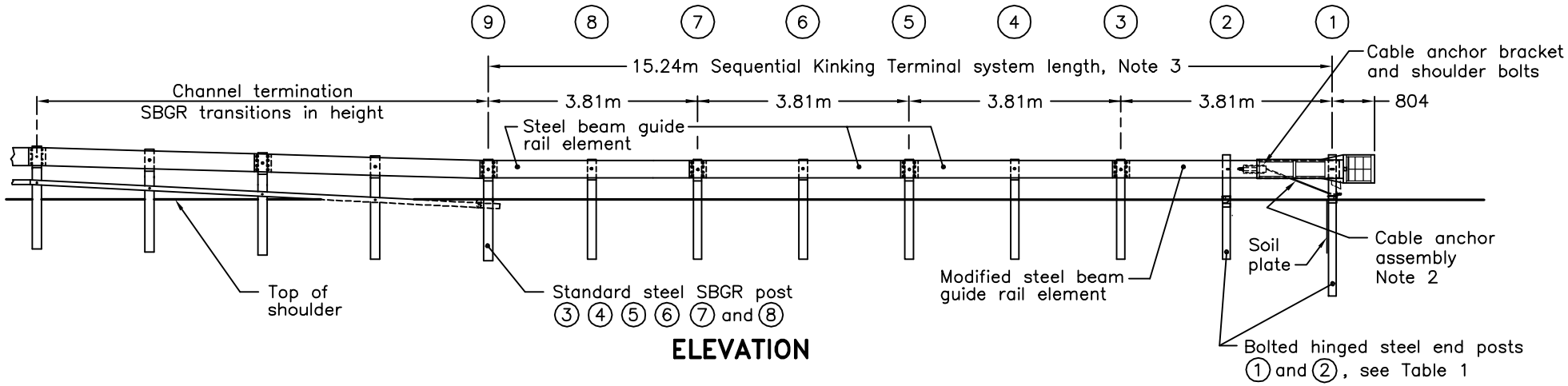
Nov 2010 | Rev 2

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

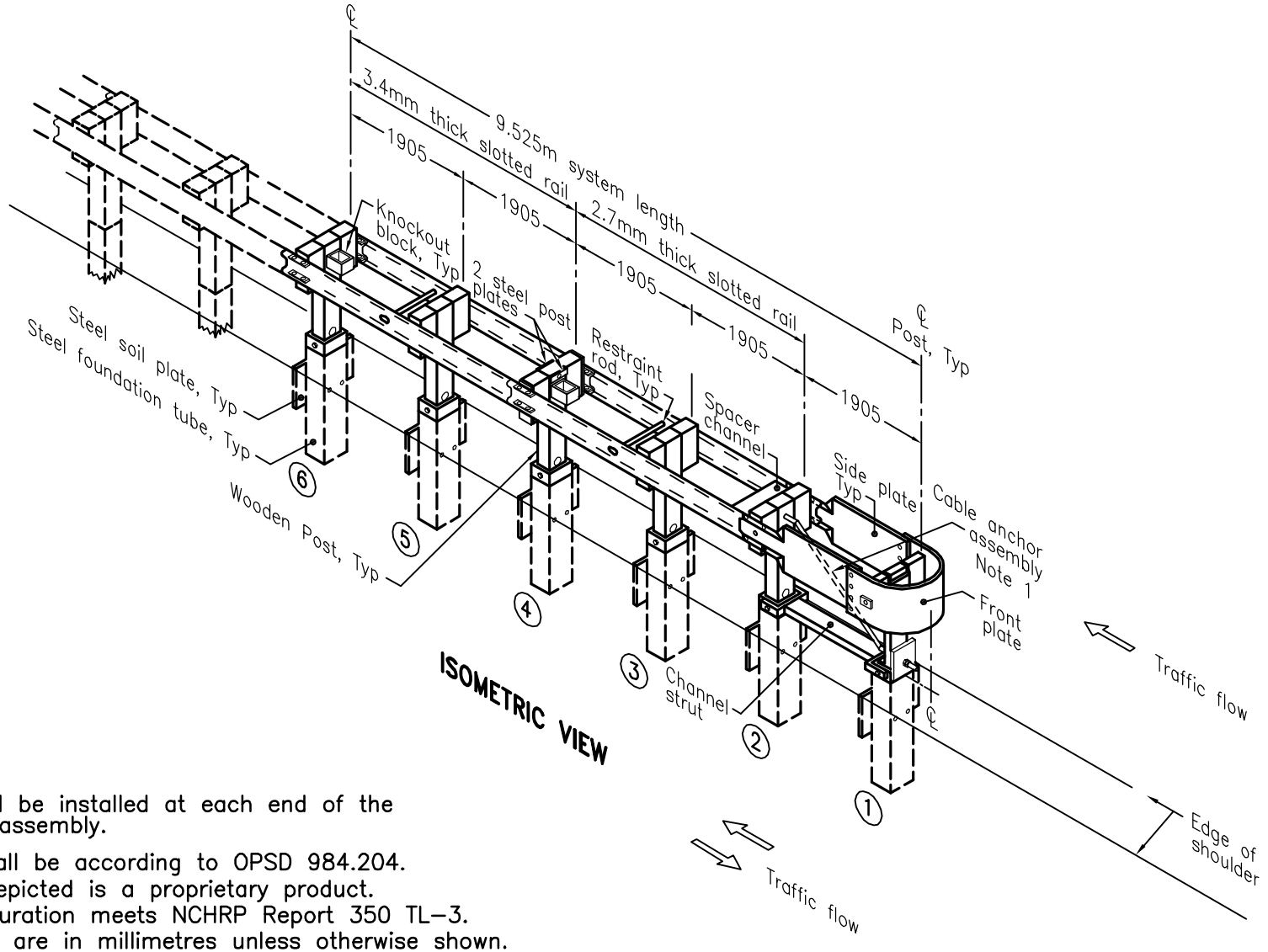
ONTARIO PROVINCIAL STANDARD DRAWING

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



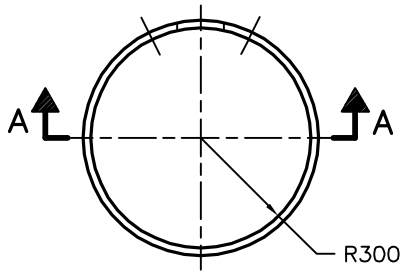
ISOMETRIC VIEW

NOTES:

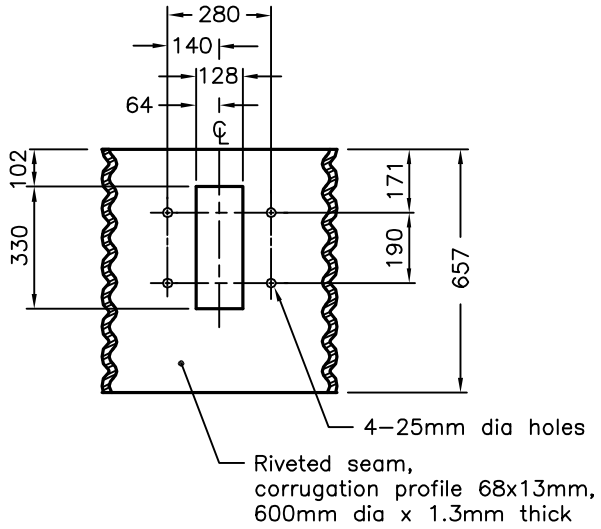
1 Two nuts shall be installed at each end of the cable anchor assembly.

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 CRASH–CUSHION ATTENUATING TERMINAL (CAT–350) SYSTEM ASSEMBLY			
	OPSD 922.330		

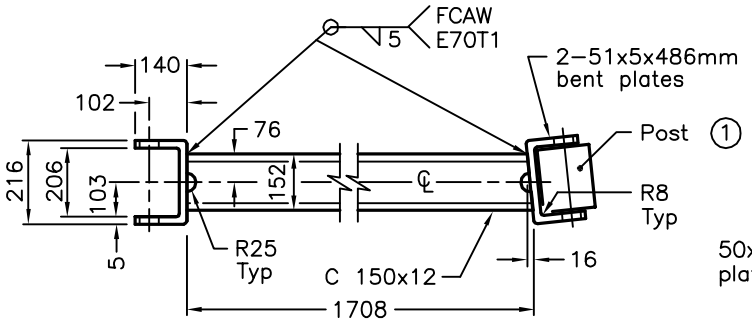


PLAN

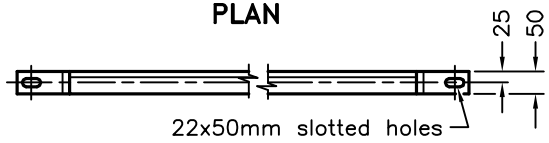


SECTION A–A
Note 1

RIVETED CORRUGATED STEEL PIPE

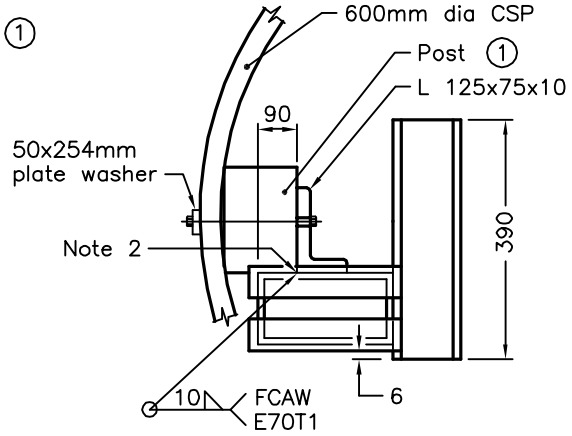


PLAN

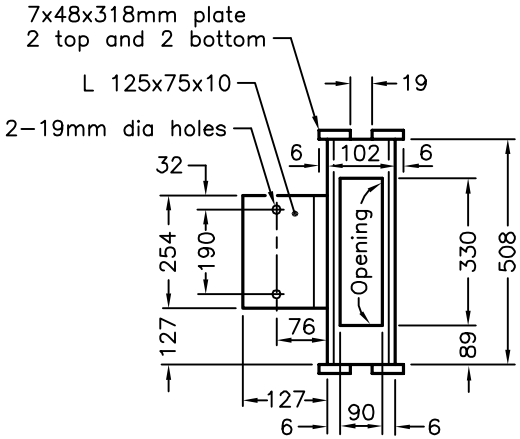


ELEVATION

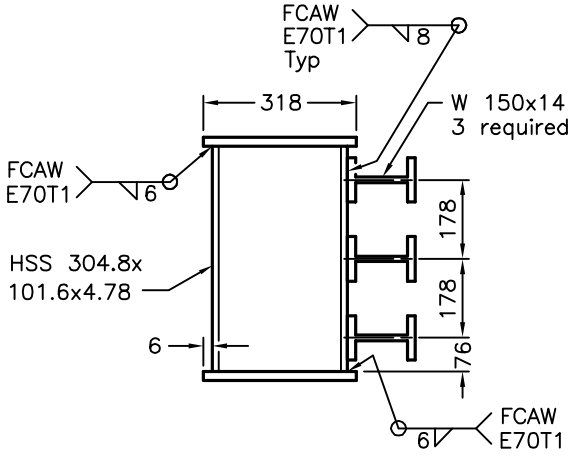
STRUT



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.

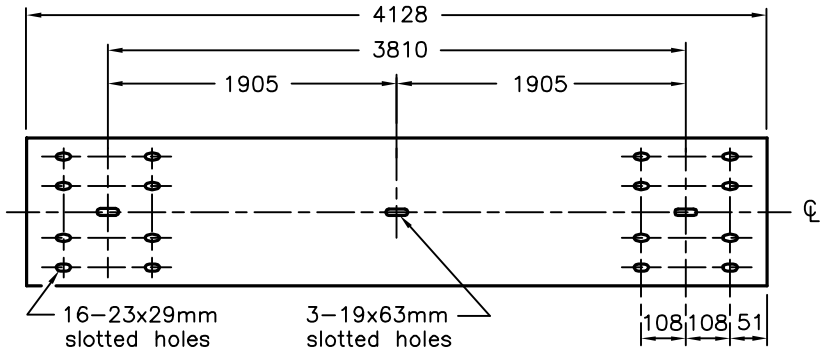
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, END TREATMENT
ECCENTRIC LOADER TERMINAL SYSTEM
COMPONENT – LOADER ASSEMBLY

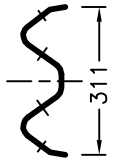
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

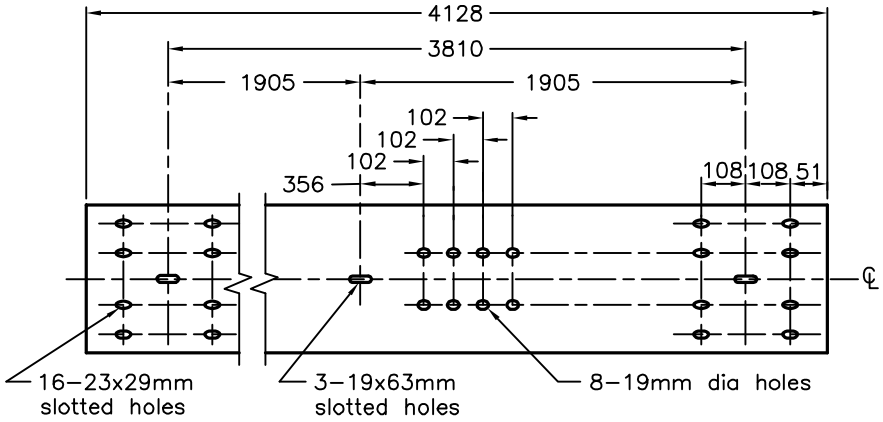
OPSD 922.401



FRONT ELEVATION
FROM POST (3) TO (6)

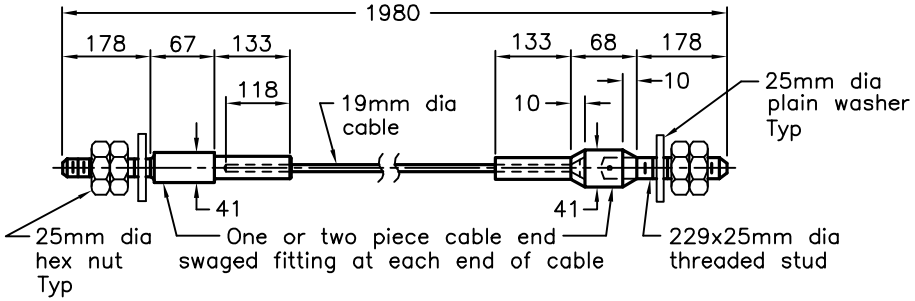


SIDE VIEW



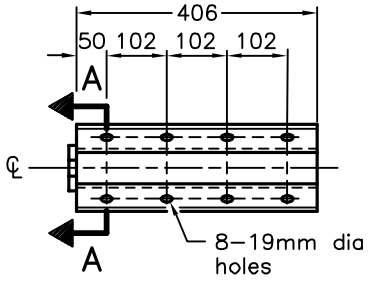
FRONT ELEVATION
FROM POST (1) TO (3)

STEEL BEAM GUIDE RAIL

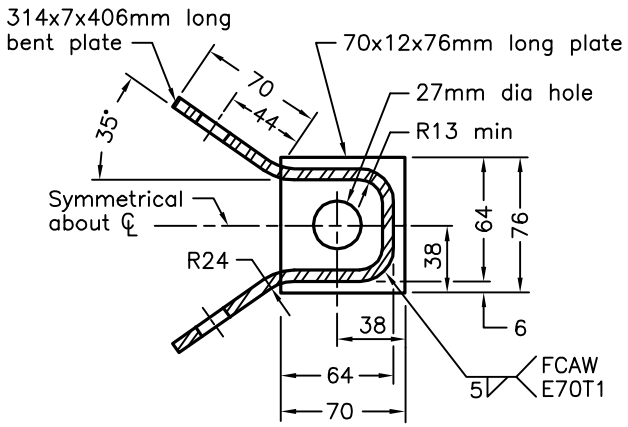


ONE PIECE CABLE END TWO PIECE CABLE END

CABLE ASSEMBLY



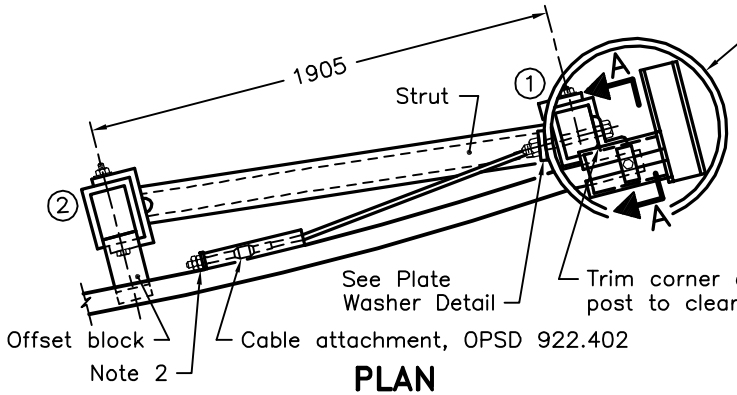
STEEL BEAM GUIDE RAIL
CABLE ATTACHMENT



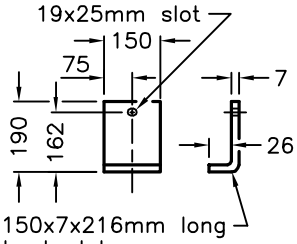
SECTION A–A

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

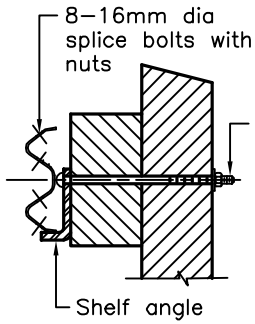
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	2
ENERGY ATTENUATOR, END TREATMENT ECCENTRIC LOADER TERMINAL SYSTEM COMPONENT – RAIL AND CABLE ATTACHMENT			
	OPSD 922.402		



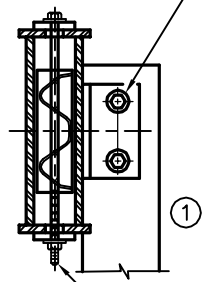
PLAN



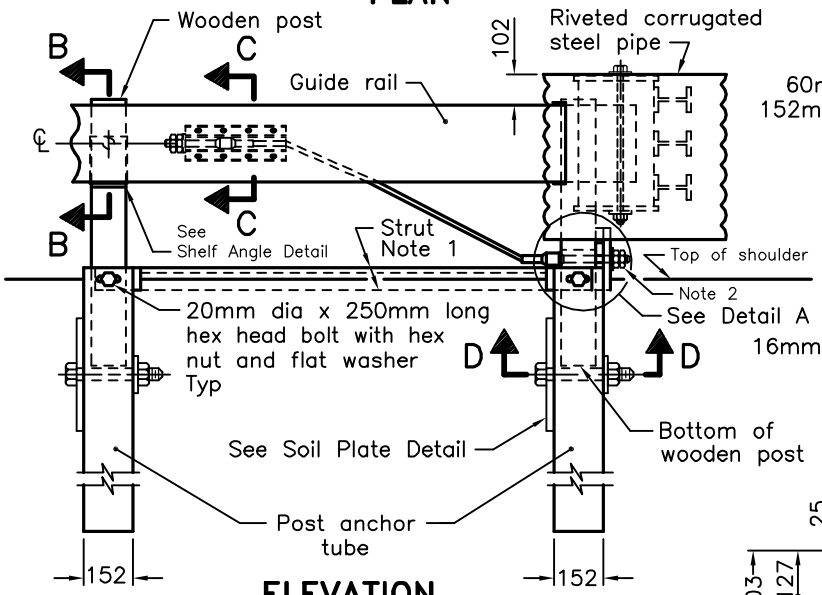
SHELF ANGLE DETAIL



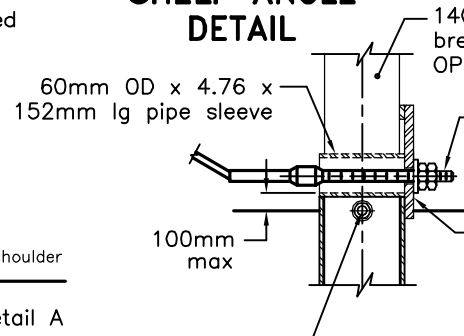
SECTION B–B



SECTION A–A



ELEVATION



DETAIL A

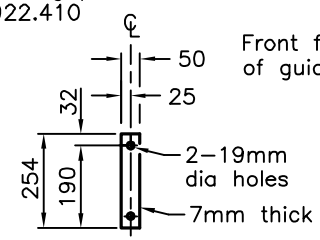
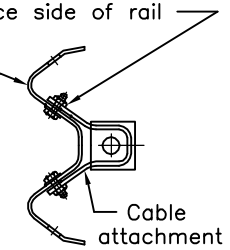
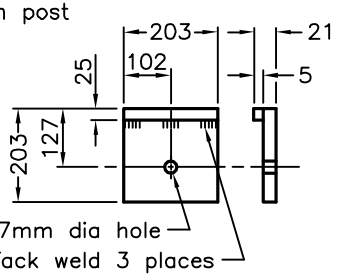


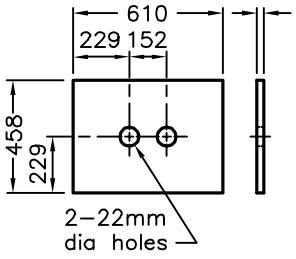
PLATE WASHER DETAIL



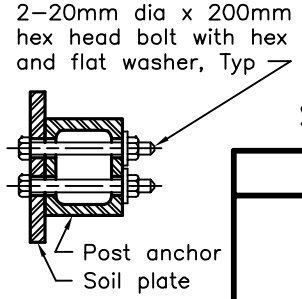
SECTION C–C



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.

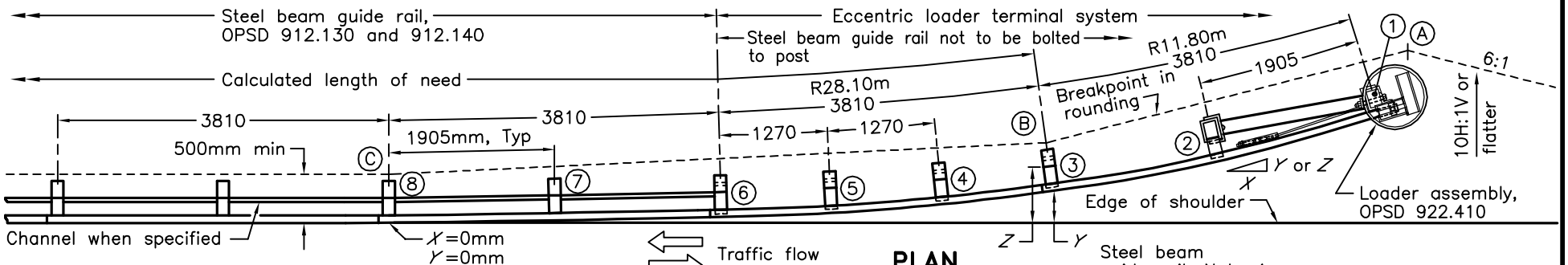
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 | Rev 2

ENERGY ATTENUATOR, END TREATMENT
ECCENTRIC LOADER TERMINAL SYSTEM
ASSEMBLY – LOADER DETAIL

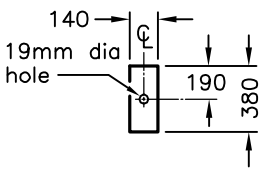
ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

OPSD 922.410

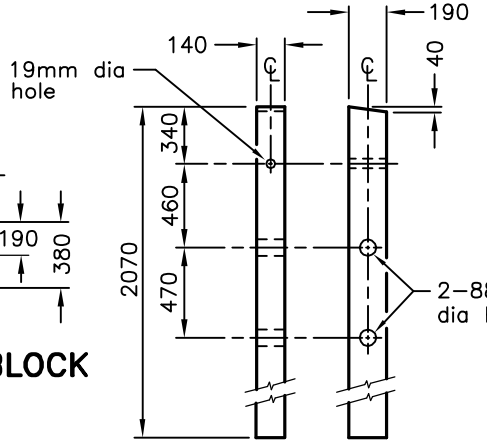


BREAKPOINT IN ROUNDING MINIMUM OFFSET		
FLARE POINT	X	Y
C	0	500
B	7500	850
A	12000	2000

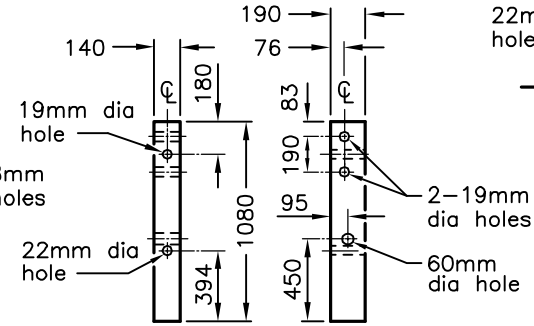
RAIL AND POST OFFSET			
		SHOULDER TO FACE OF	
		RAIL	POST
POSTS	X	Y	Z
8	0	0	270
7	1905	25	295
6	3810	65	345
5	5075	105	385
4	6335	202	482
3	7595	355	635
2	9475	630	910
1	11345	1220	1310



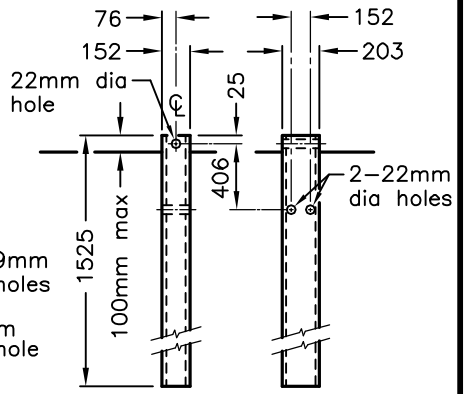
OFFSET BLOCK



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.

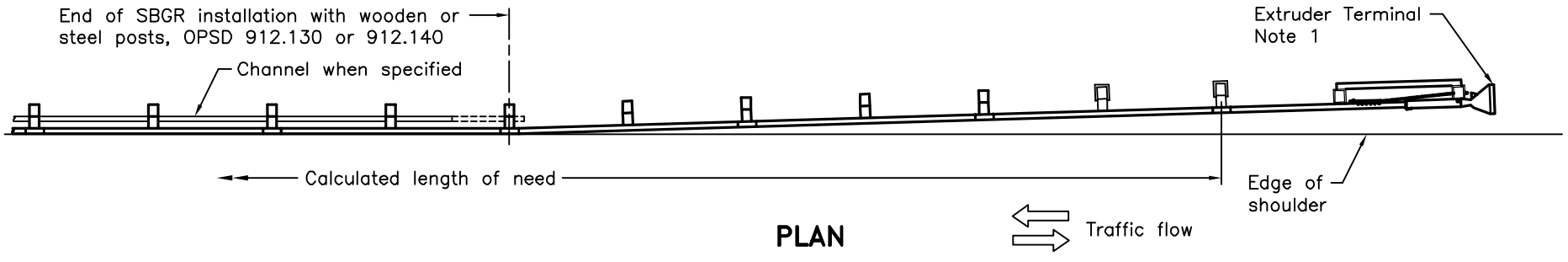
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, END TREATMENT ECCENTRIC LOADER TERMINAL SYSTEM INSTALLATION – LAYOUT AND POST

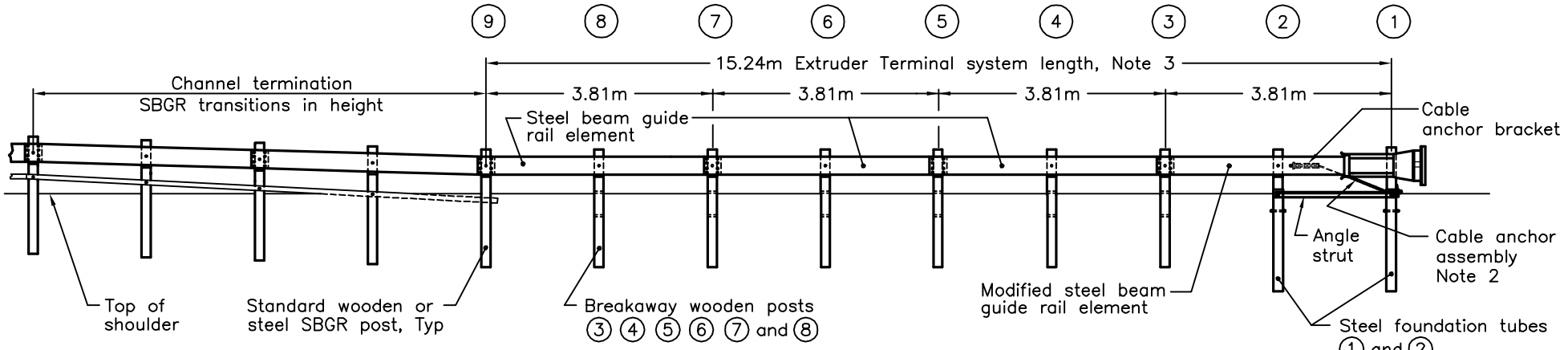
Nov 2013 | Rev 7

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

OPSD 922.430



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.

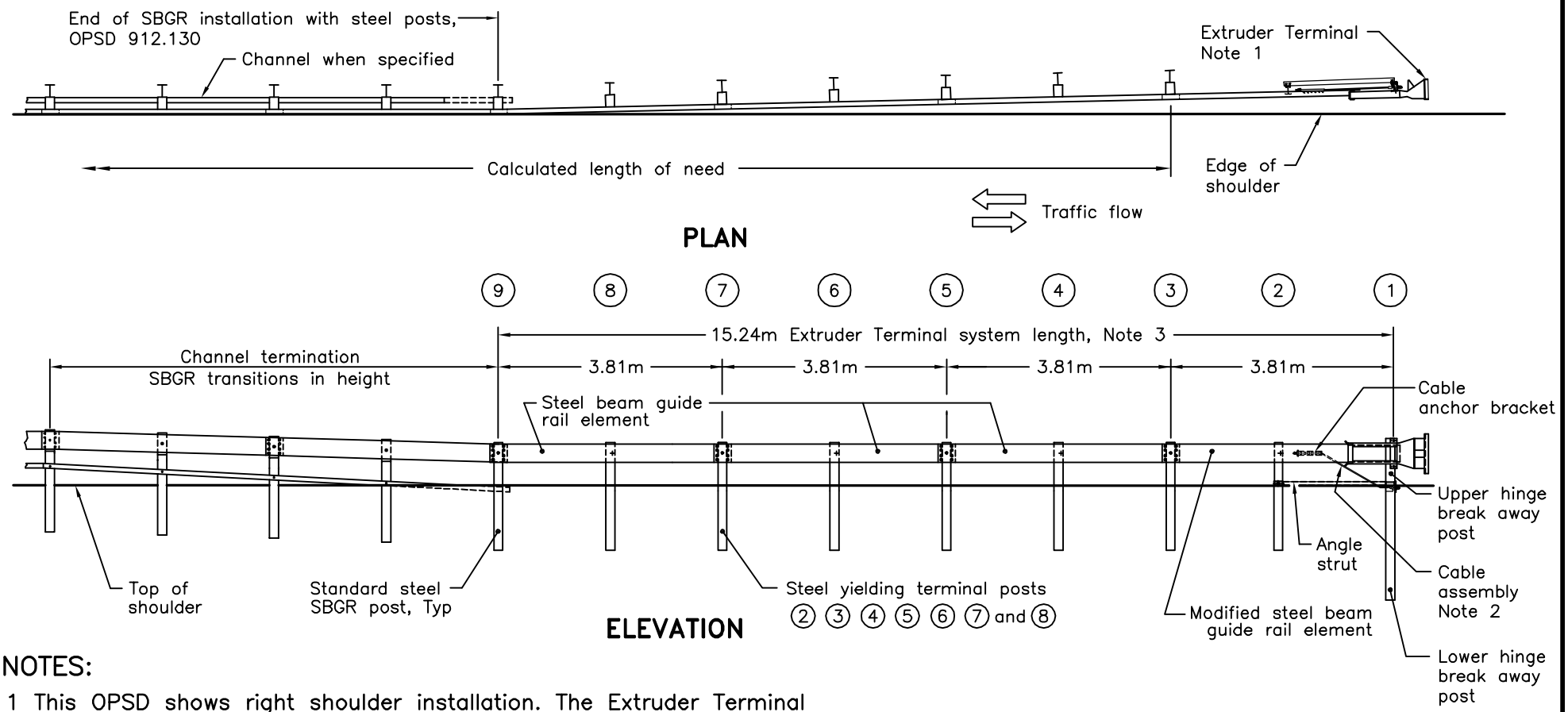
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, END TREATMENT
STEEL BEAM ENERGY ATTENUATING TERMINAL
EXTRUDER TERMINAL SYSTEM
WITH WOODEN POSTS, INSTALLATION

Nov 2010 | Rev 5

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 922.530



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.

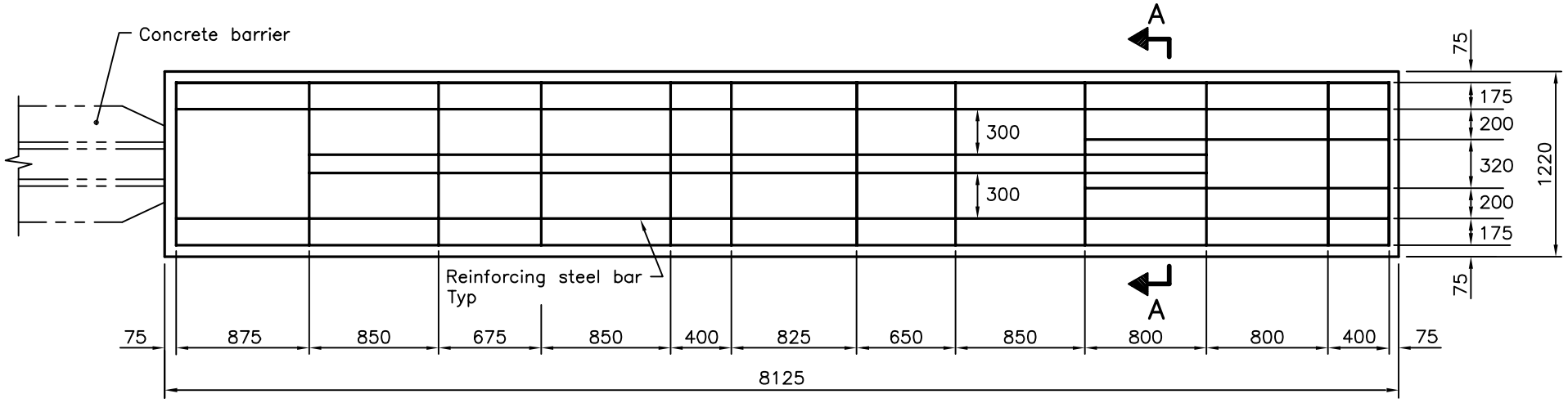
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, END TREATMENT STEEL BEAM ENERGY ATTENUATING TERMINAL EXTRUDER TERMINAL SYSTEM WITH STEEL POSTS, INSTALLATION

Nov 2010 | Rev 2

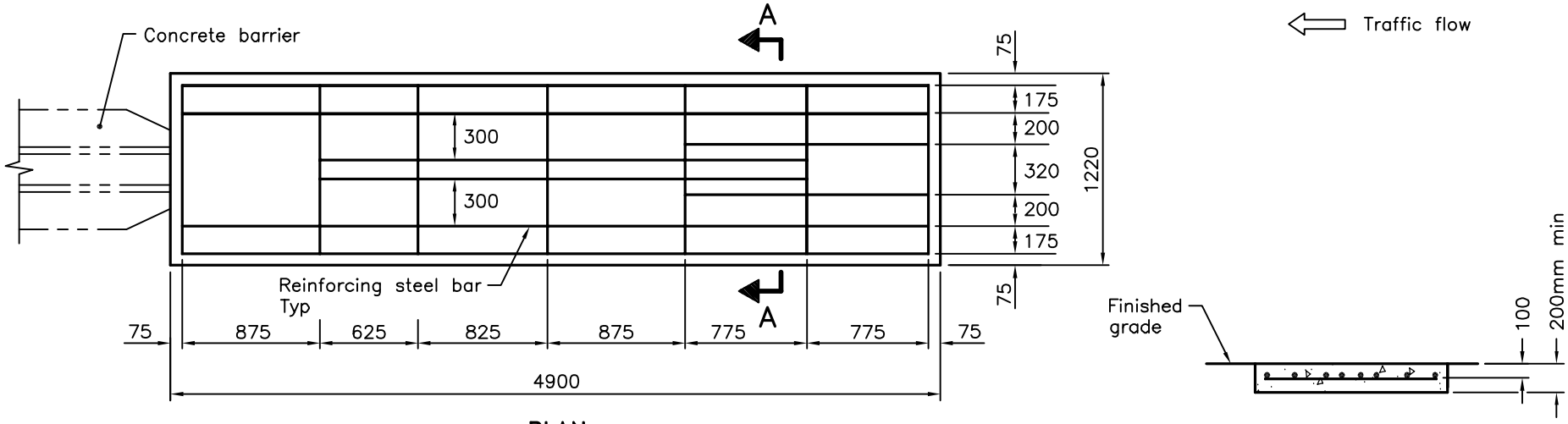
ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 922.532



PLAN

CONCRETE PAD FOR TL-3 SYSTEM CONFIGURATION



PLAN

CONCRETE PAD FOR TL-2 SYSTEM CONFIGURATION

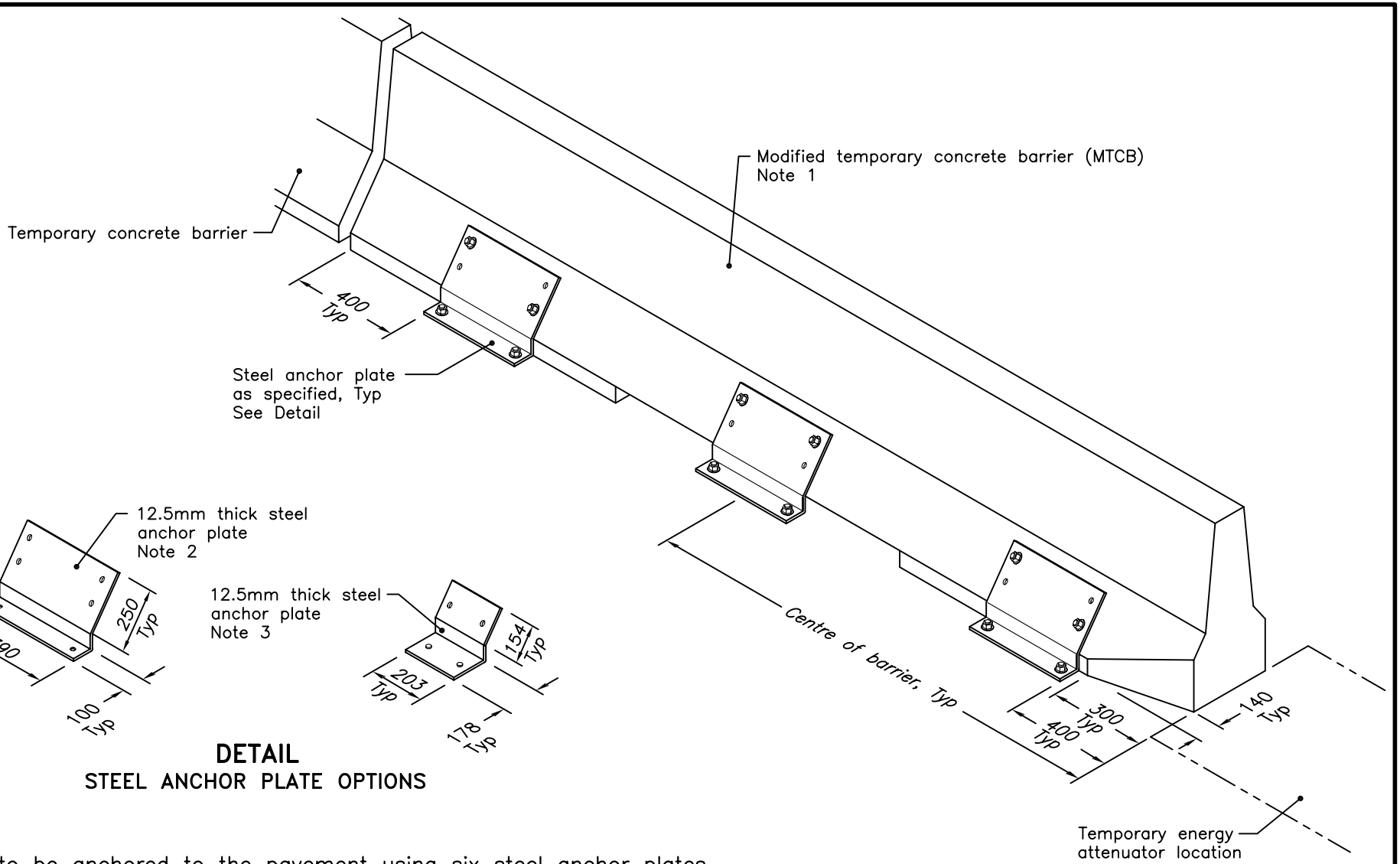
SECTION A-A

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 NARROW SYSTEMS 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.

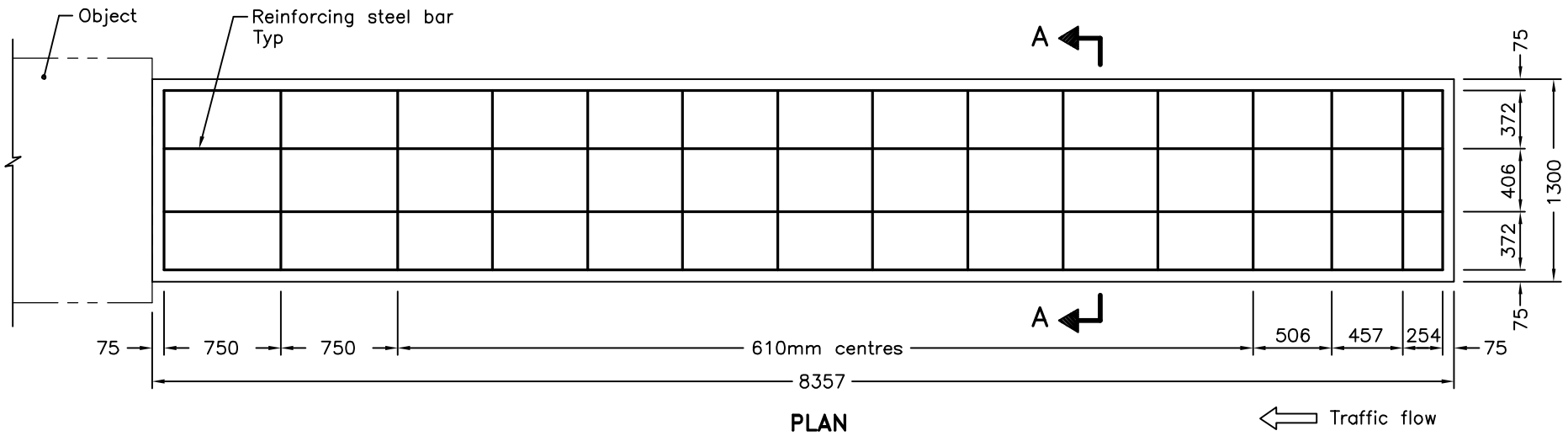
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION COMPONENT–ANCHOR ASSEMBLY

Nov 2005 | Rev 0

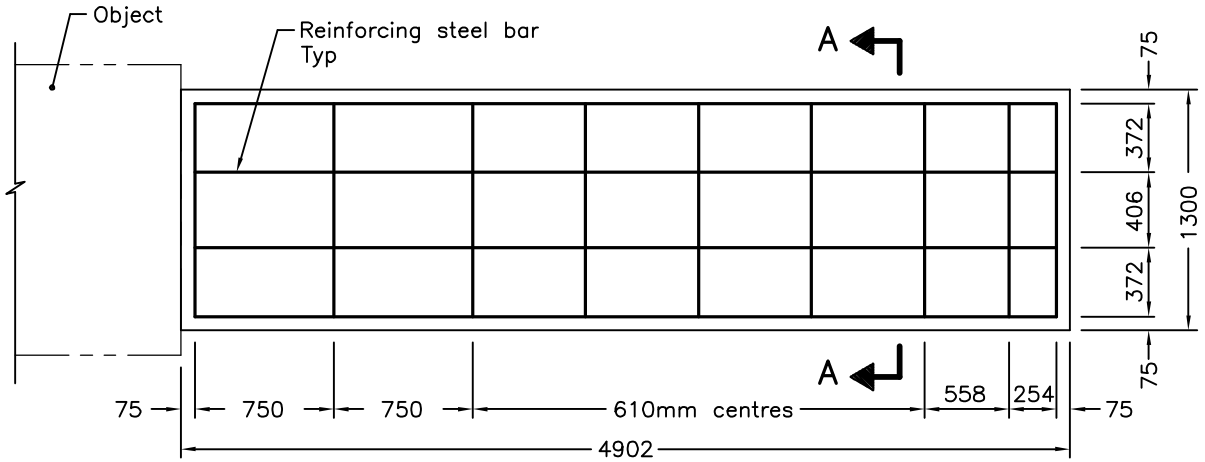
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

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.

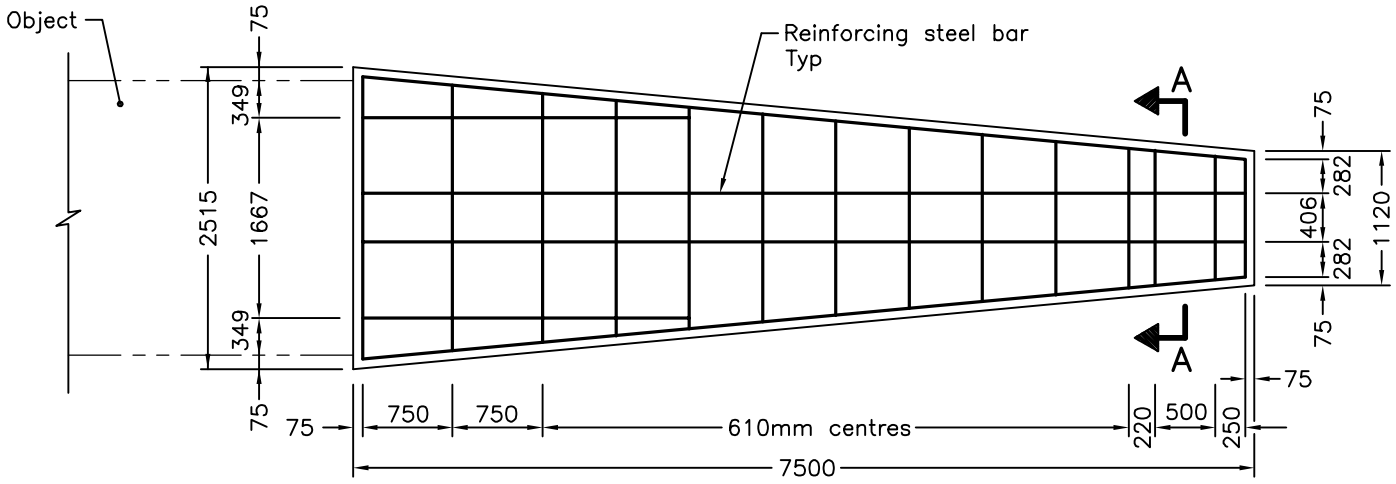
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION WIDE SYSTEMS COMPONENT – REINFORCED CONCRETE PAD

Nov 2011 | Rev 0

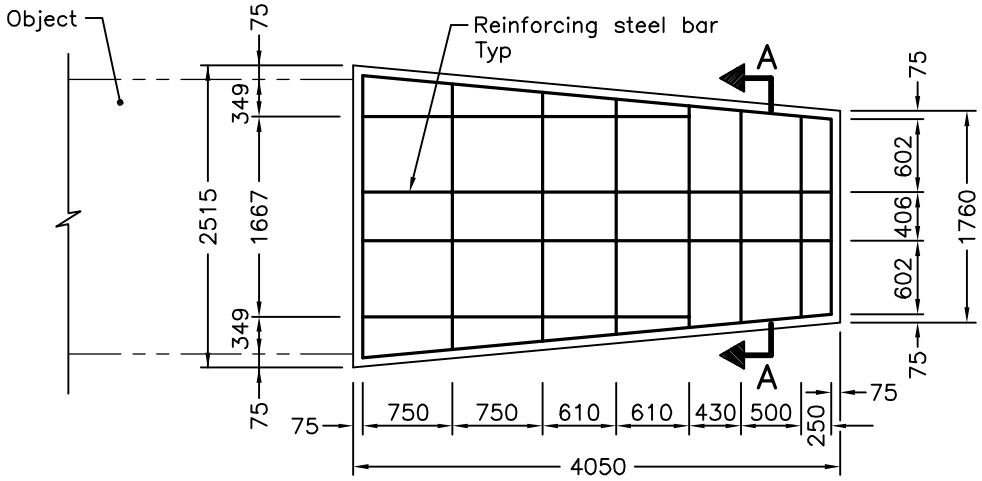
OPSD 923.004



PLAN

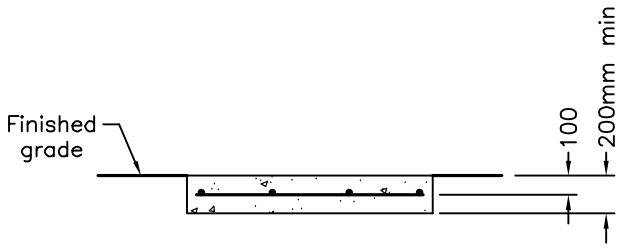
Traffic flow

CONCRETE PAD FOR TL–3 SYSTEM CONFIGURATION



PLAN

CONCRETE PAD FOR TL–2 SYSTEM CONFIGURATION



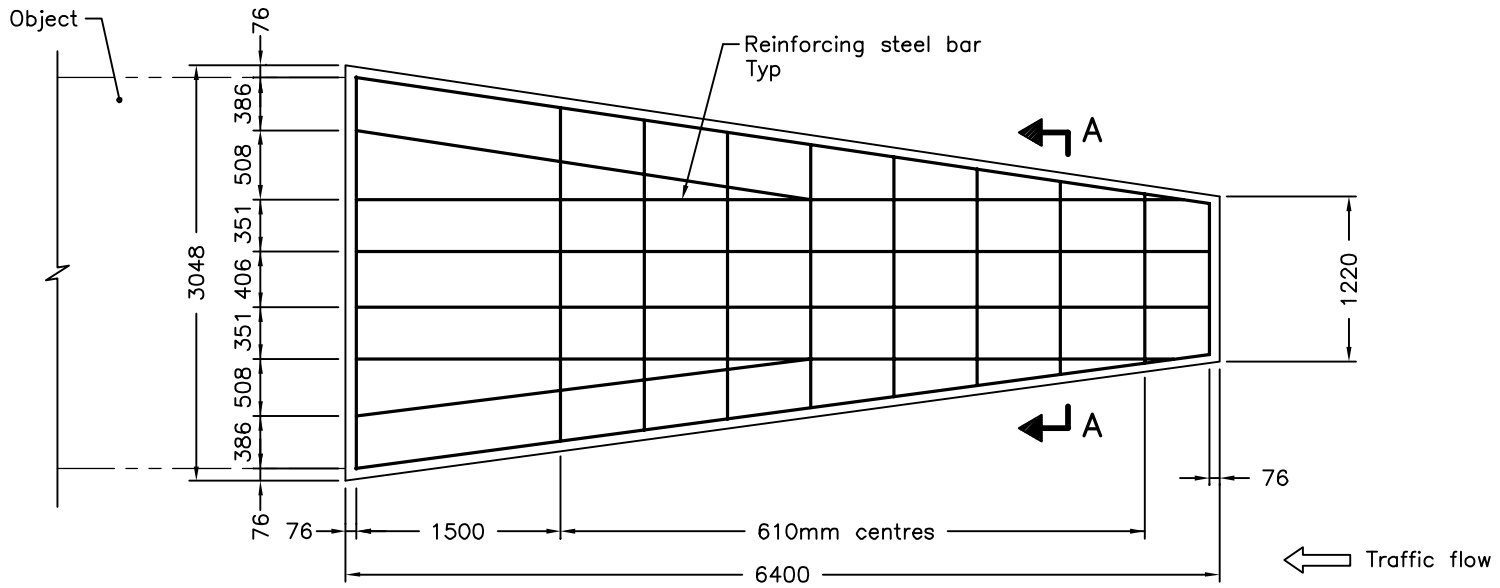
SECTION A–A

NOTES:

A All reinforcing shall be 15M reinforcing steel bars.

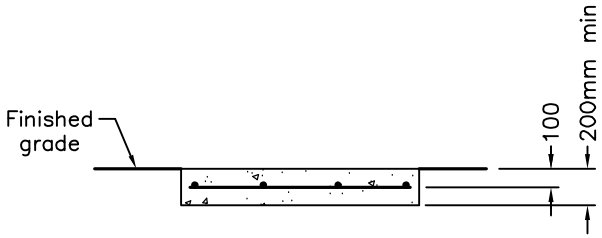
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2011	Rev	0
ENERGY ATTENUATOR, CRASH CUSHION EXTRA WIDE SYSTEMS COMPONENT – REINFORCED CONCRETE PAD			
	OPSD 923.005		



PLAN

CONCRETE PAD FOR TL–3 SYSTEM CONFIGURATION



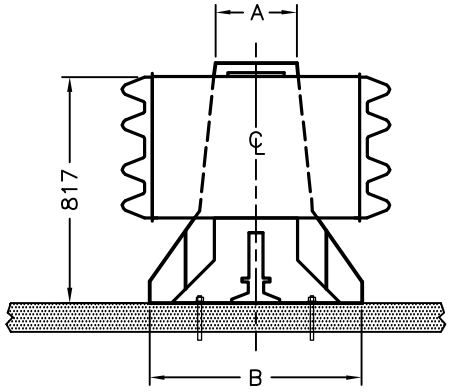
SECTION A–A

NOTES:

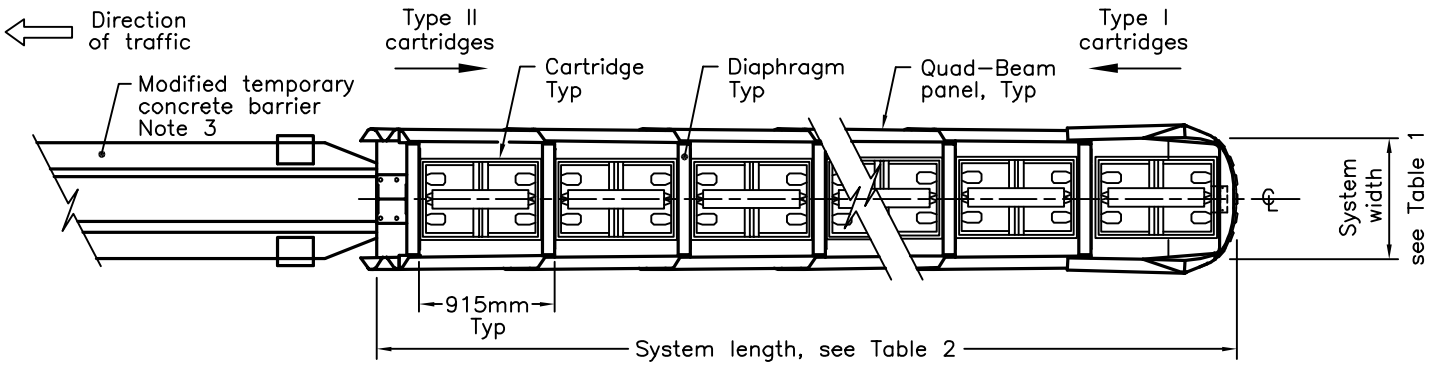
A All reinforcing shall be 15M reinforcing steel bars.

B All dimensions are in millimetres unless otherwise shown.

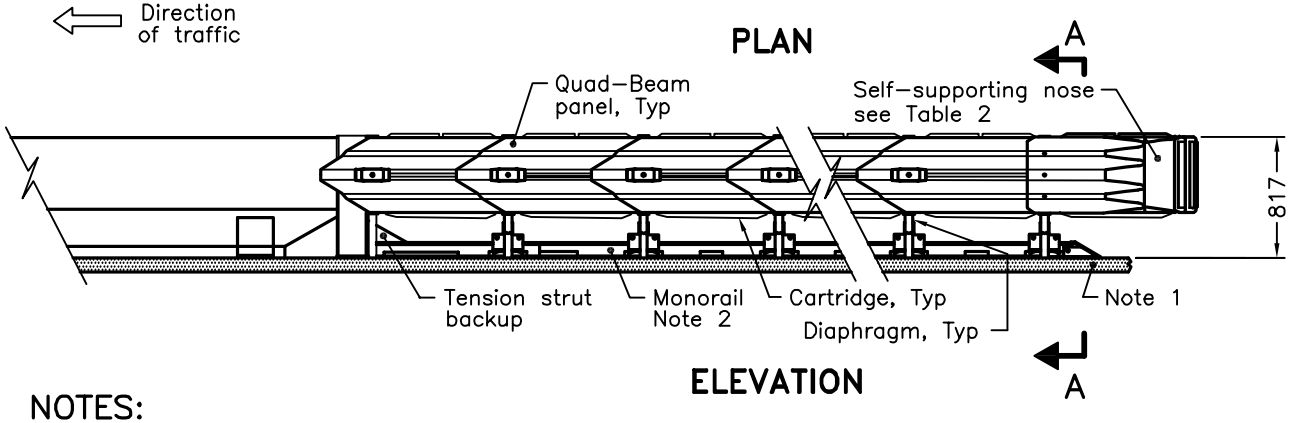
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	0
ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SUPER WIDE SYSTEM COMPONENT – REINFORCED CONCRETE PAD			
	OPSD 923.006		



SECTION A–A



PLAN



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 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.

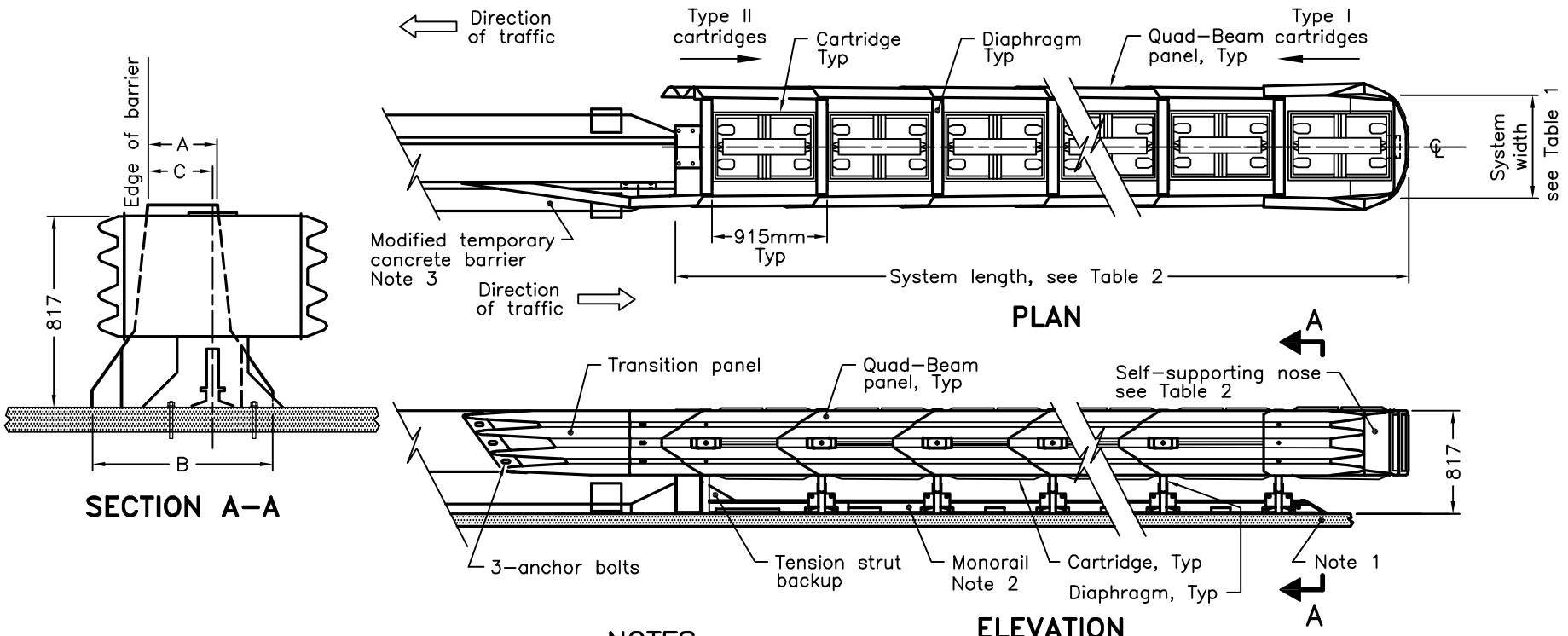
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SYSTEM INSTALLATION – TEMPORARY UNIDIRECTIONAL

Nov 2011 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

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

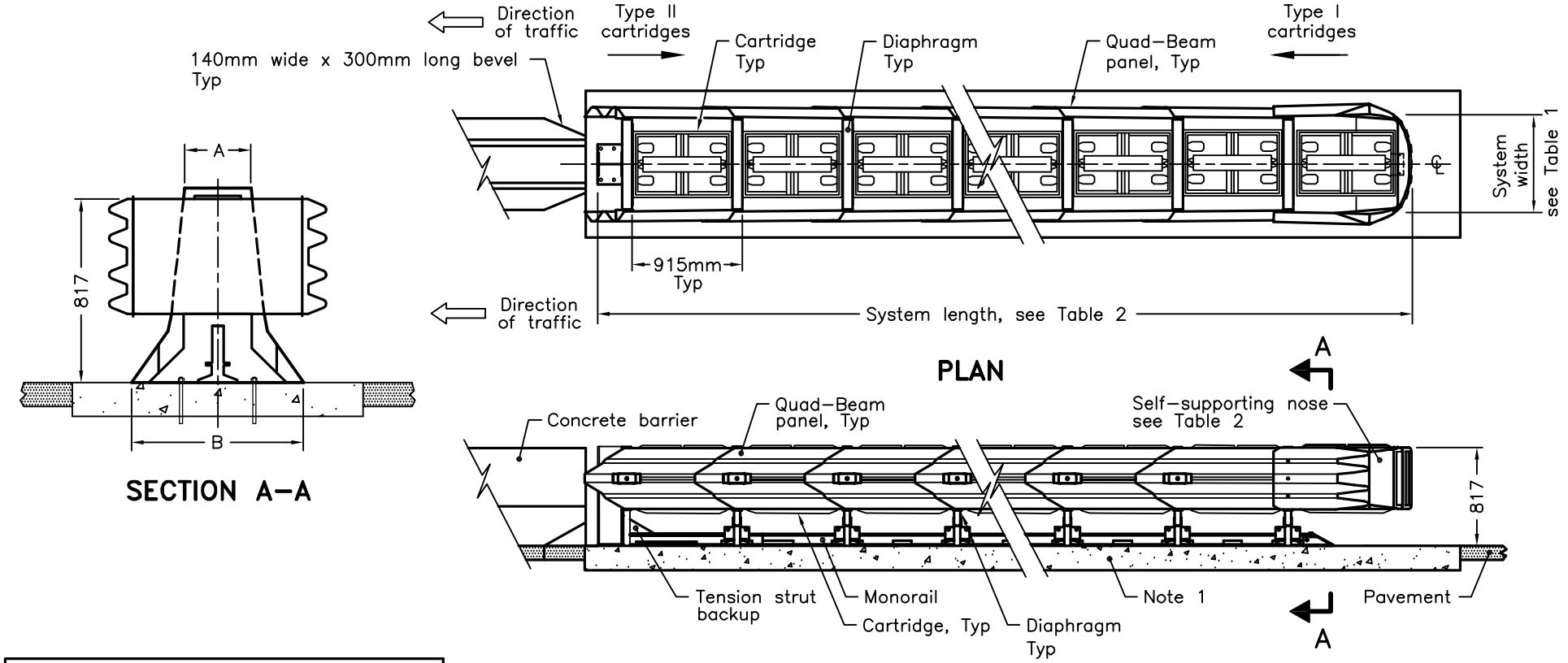


TABLE 1		
SYSTEM WIDTH	A TOP OF CONCRETE BARRIER OR HAZARD WIDTH	B BOTTOM OF CONCRETE BARRIER OR HAZARD WIDTH
610	≤ 406	≤ 864
760	≤ 559	≤ 1016
915	≤ 711	≤ 1168

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

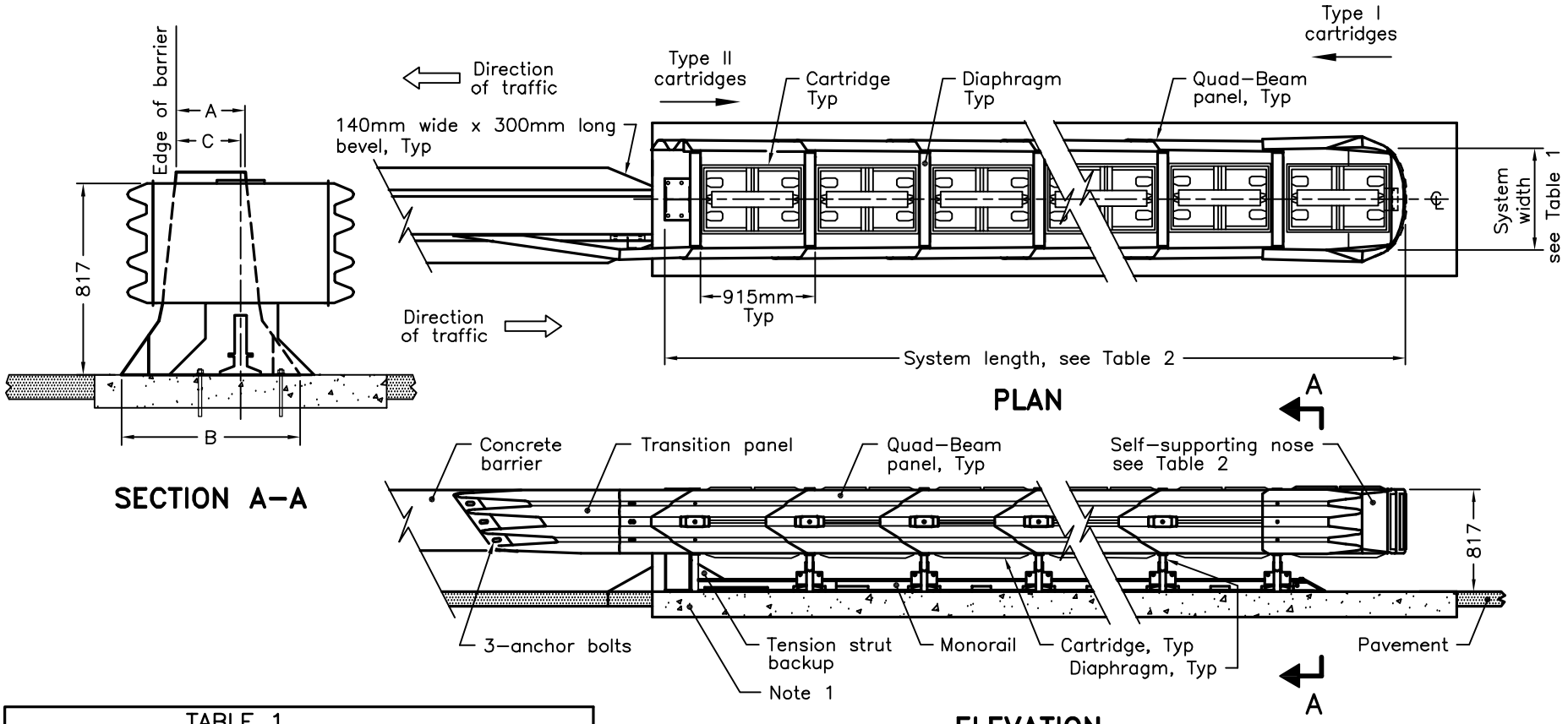


TABLE 1			
SYSTEM WIDTH	A TOP OF CONCRETE BARRIER OR HAZARD WIDTH	B BOTTOM OF CONCRETE BARRIER OR HAZARD WIDTH	C ℄ OFFSET
610	≤ 406	≤ 864	205
760	≤ 559	≤ 1016	280
915	≤ 711	≤ 1168	355

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.

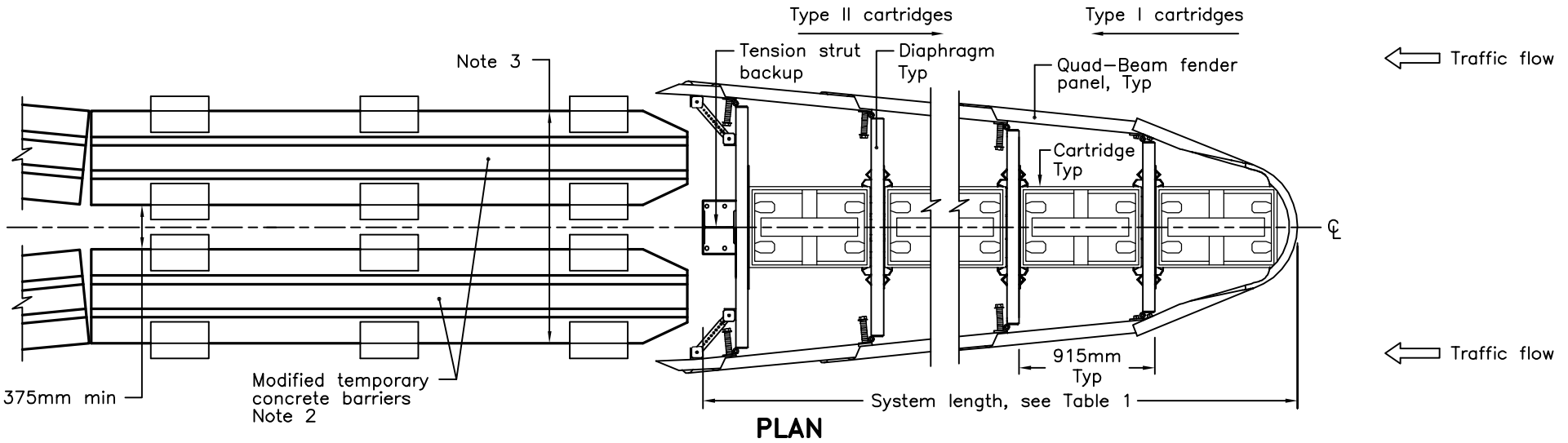
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

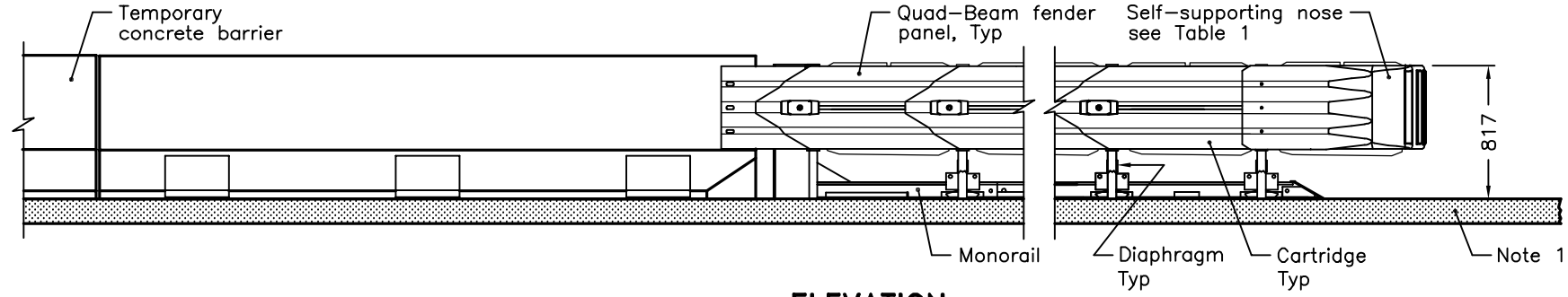
Nov 2011 | Rev 1

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

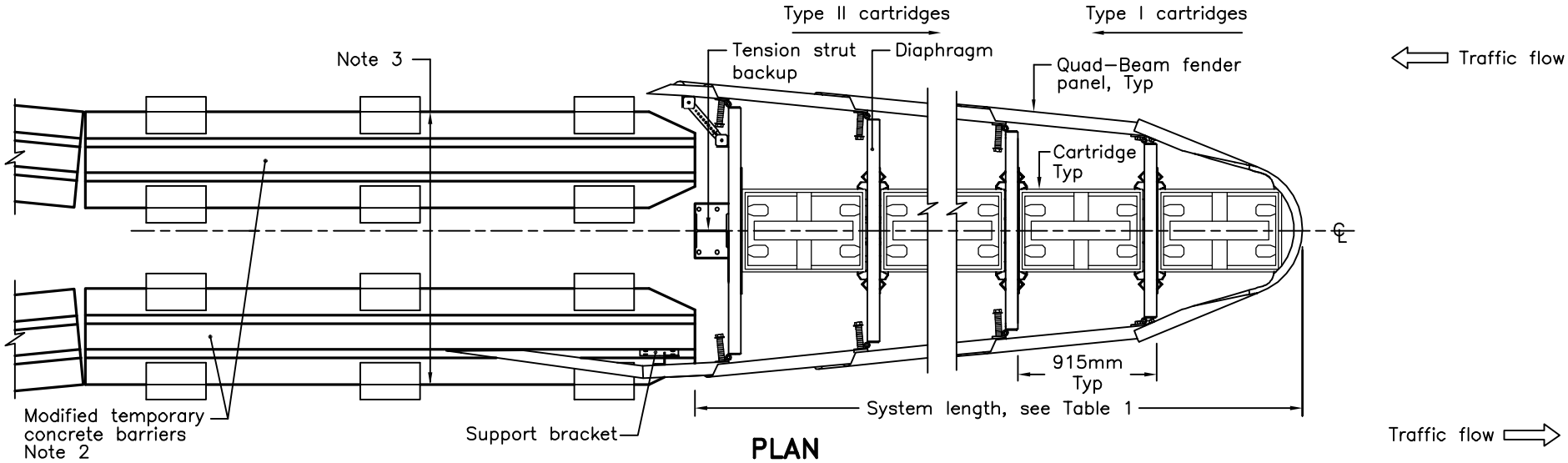
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD WIDE SYSTEM INSTALLATION – TEMPORARY UNIDIRECTIONAL

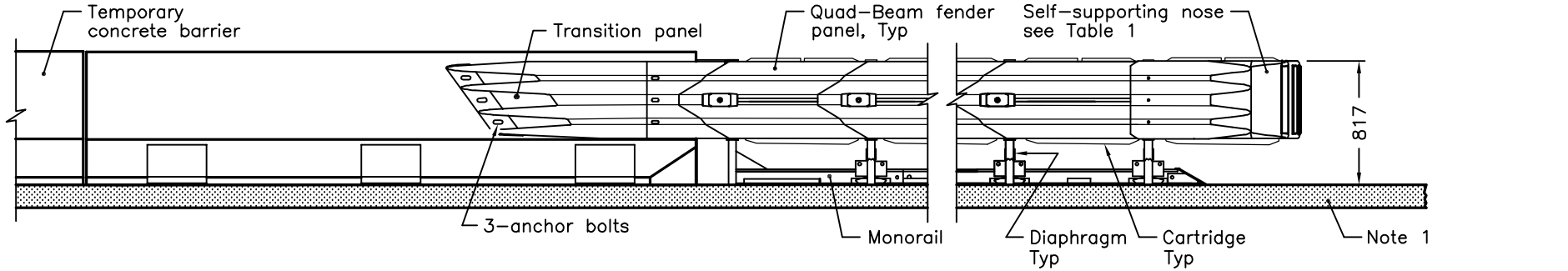
Nov 2011 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

OPSD 923.184



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.

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

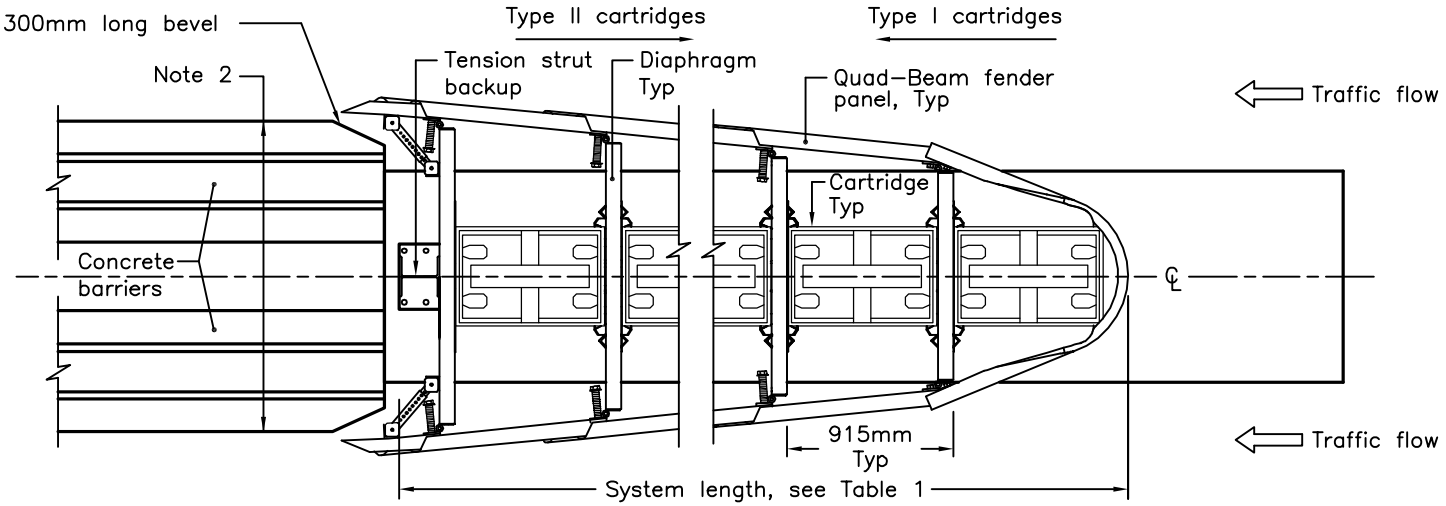
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD WIDE SYSTEM INSTALLATION – TEMPORARY BIDIRECTIONAL

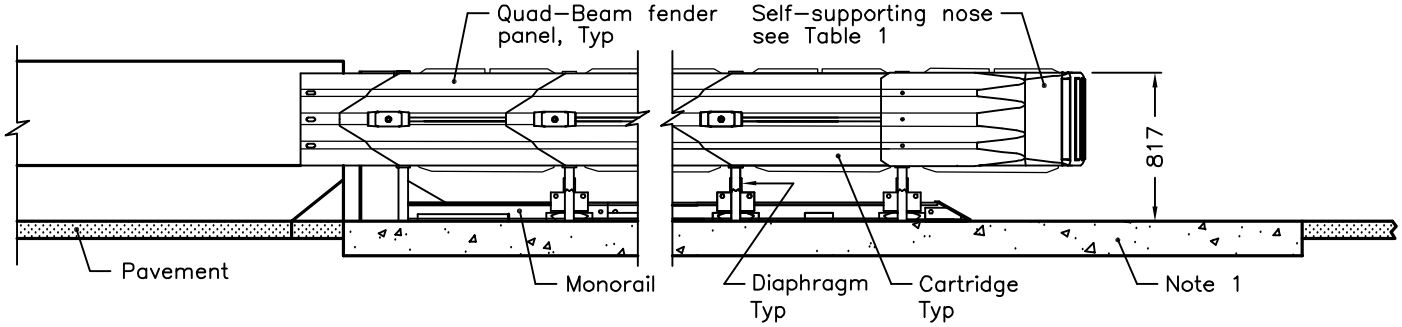
Nov 2011 | Rev 0

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

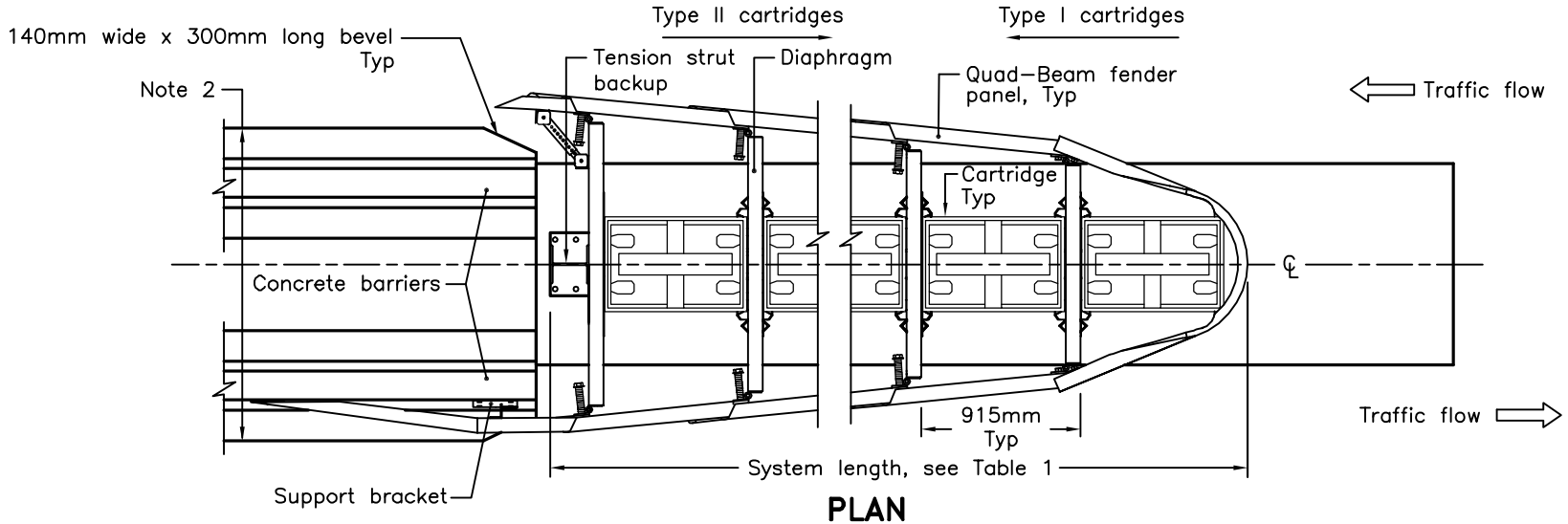
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD WIDE SYSTEM INSTALLATION – PERMANENT UNIDIRECTIONAL

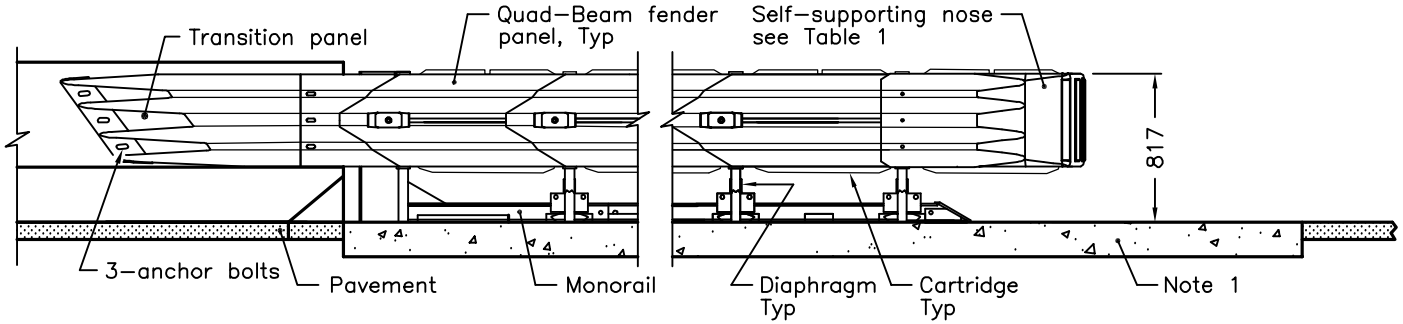
Nov 2011 | Rev 0

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

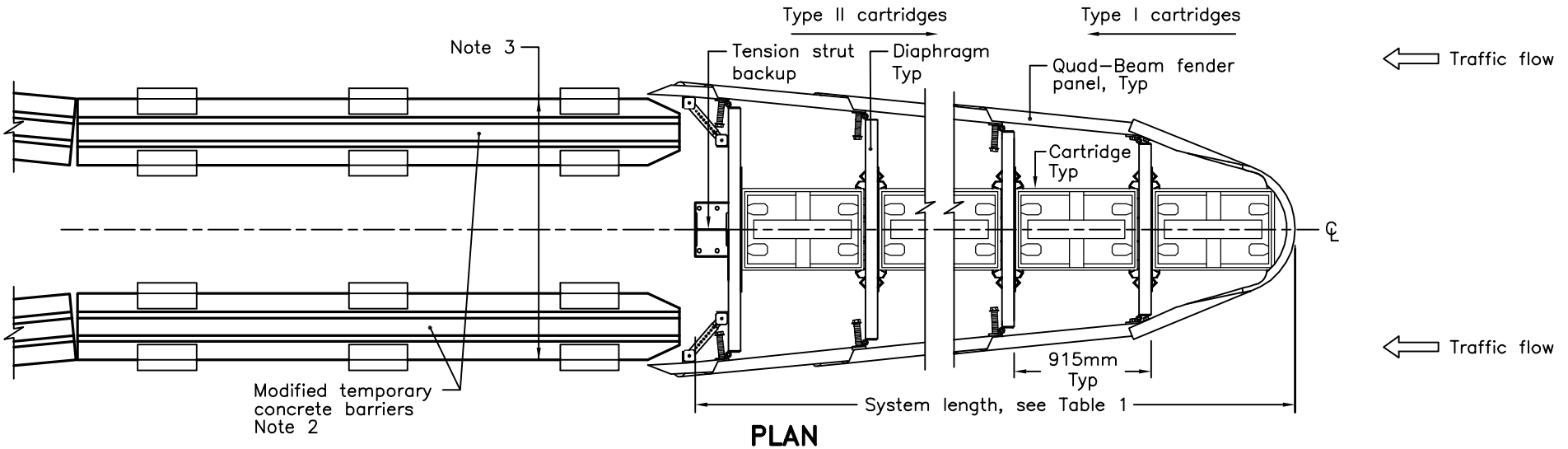
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD WIDE SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

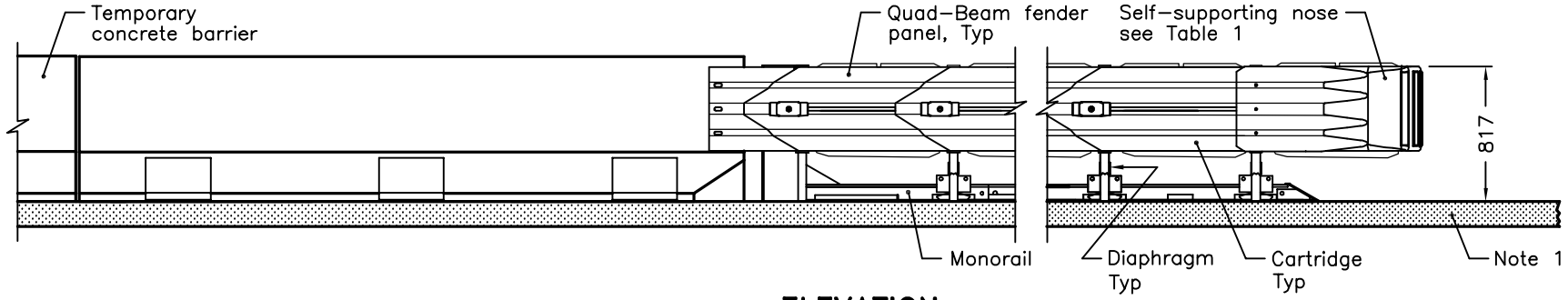
Nov 2011 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

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

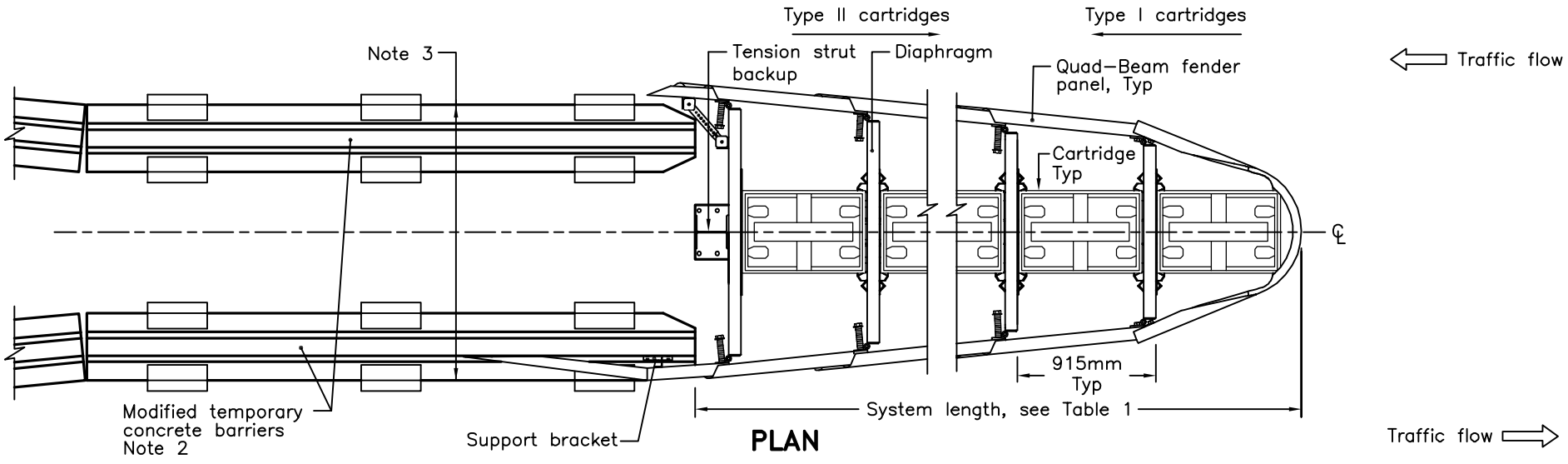
ONTARIO PROVINCIAL STANDARD DRAWING

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

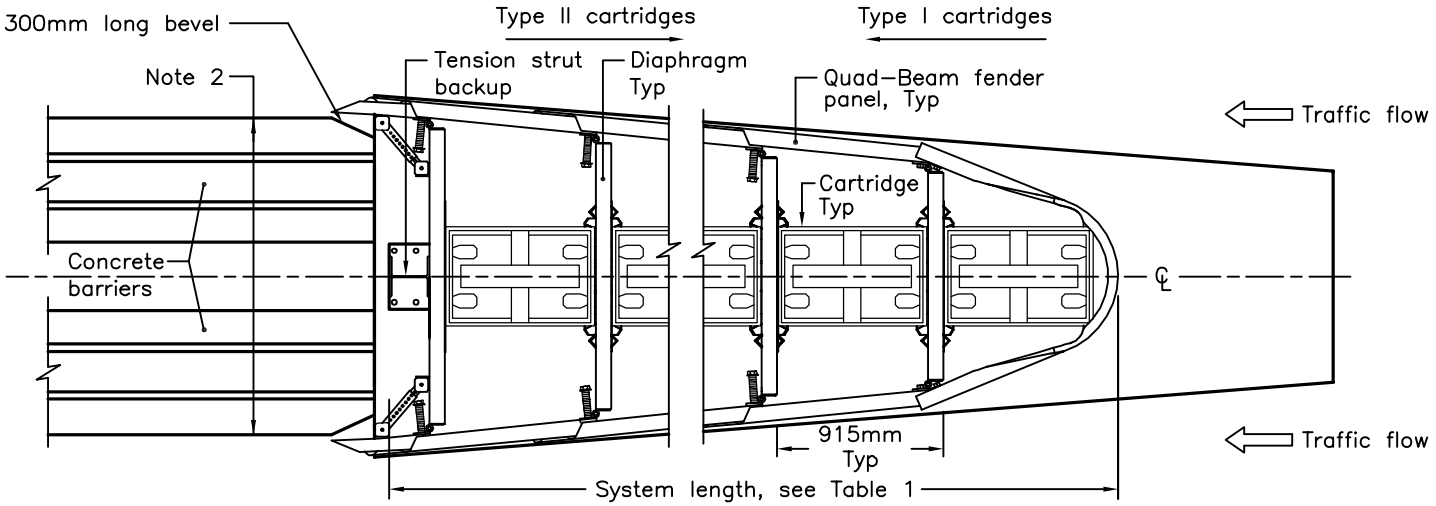
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD EXTRA WIDE SYSTEM INSTALLATION – TEMPORARY BIDIRECTIONAL

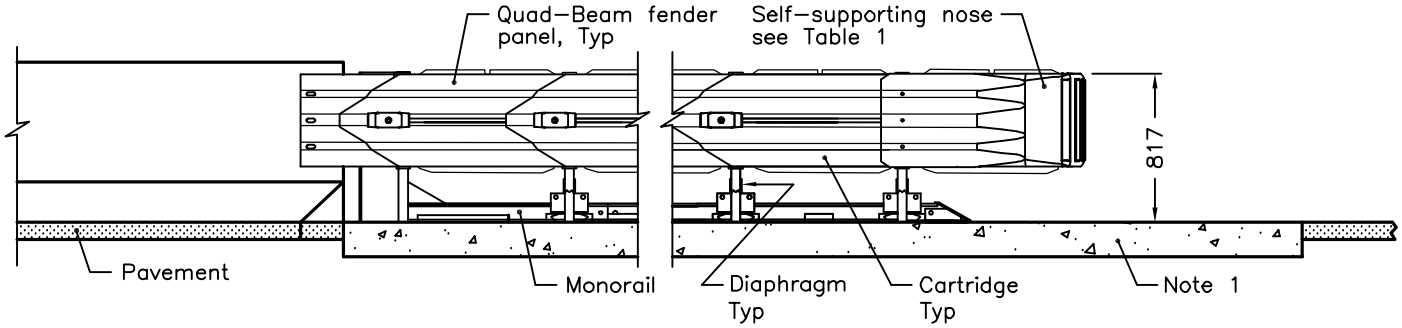
Nov 2011 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

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

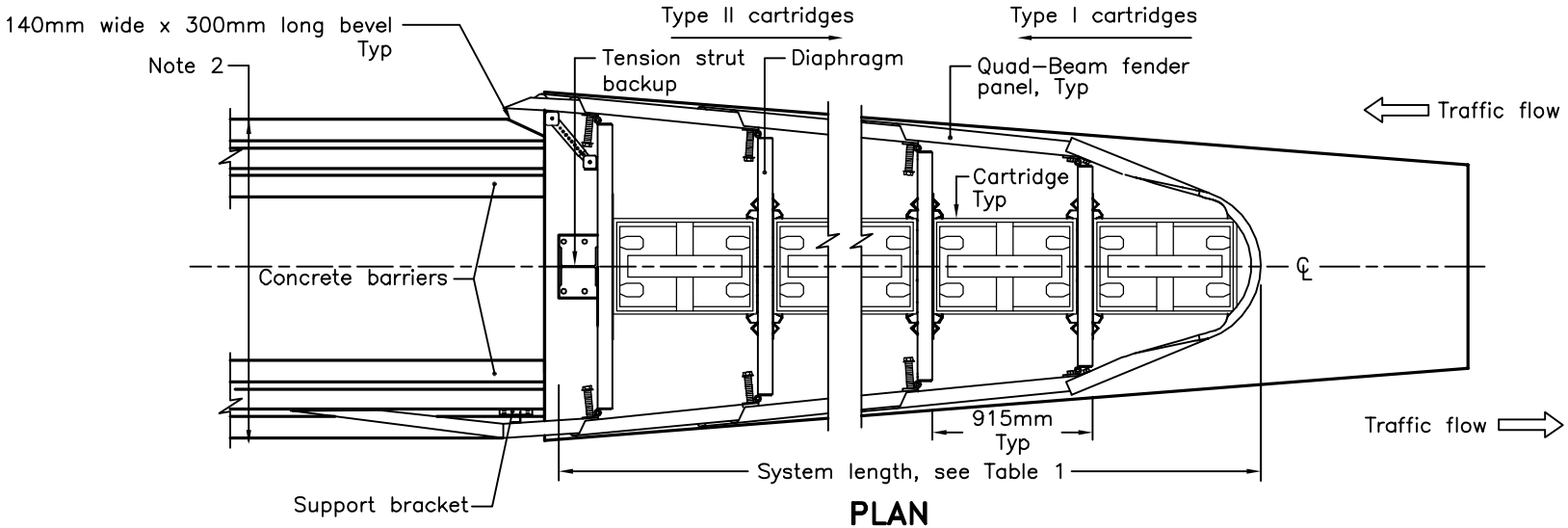
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD EXTRA WIDE SYSTEM INSTALLATION – PERMANENT UNIDIRECTIONAL

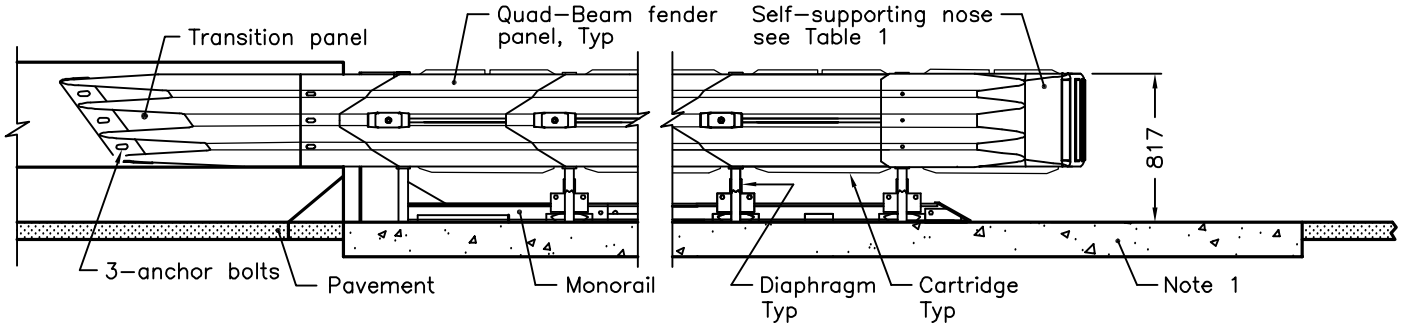
Nov 2011 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

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

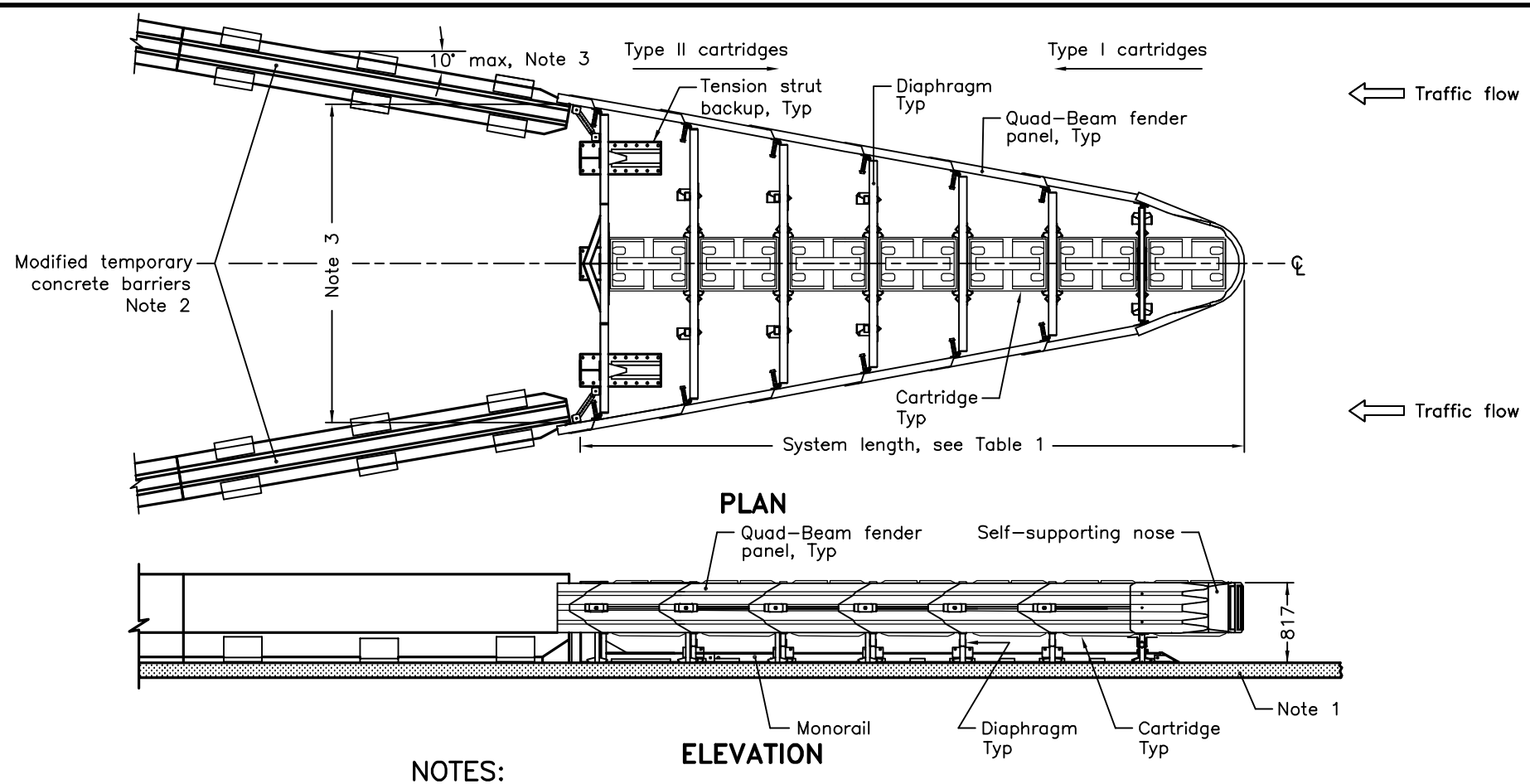
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD EXTRA WIDE SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

Nov 2011 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

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

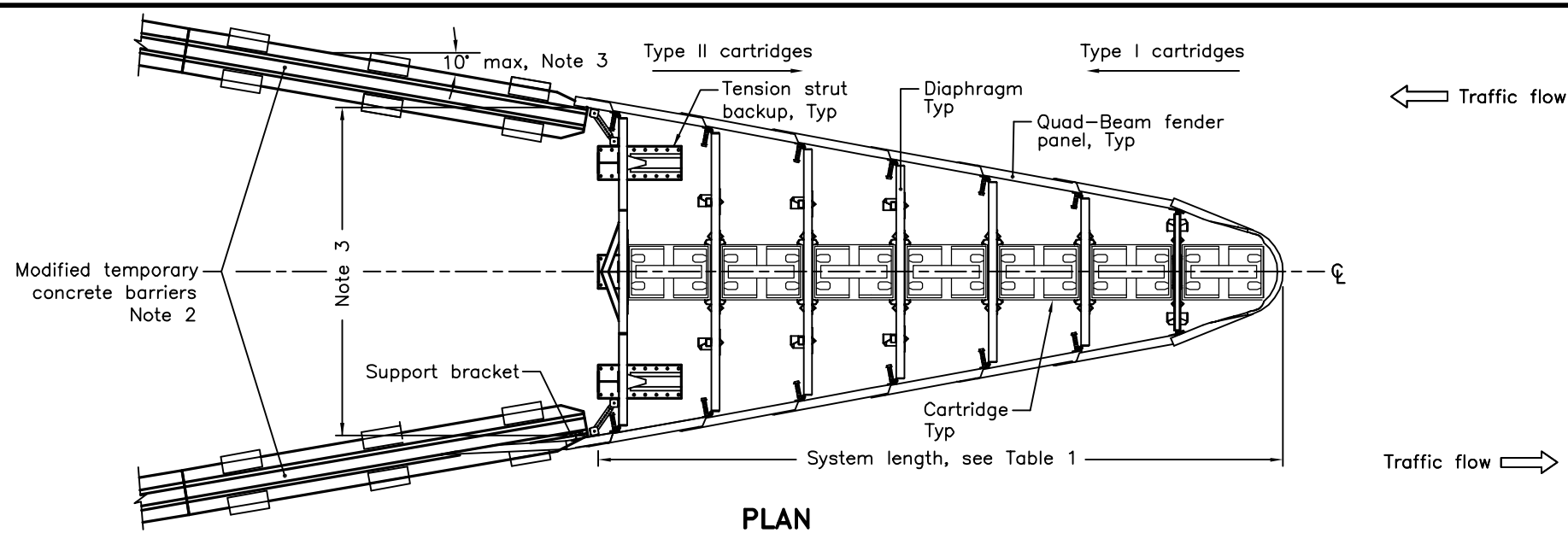
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SUPER WIDE SYSTEM INSTALLATION – TEMPORARY UNIDIRECTIONAL

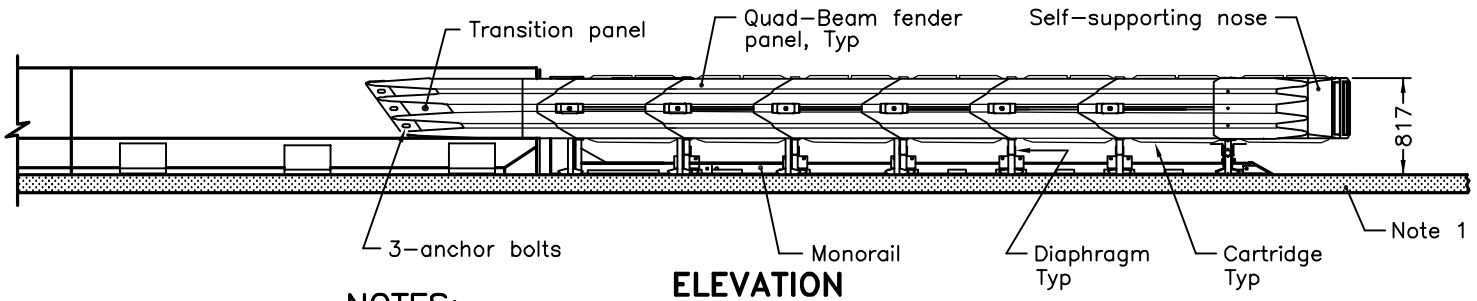
Nov 2015 | Rev 0

ONTARIO STANDARDS · MUNICIPAL–PROVINCIAL · O P S

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

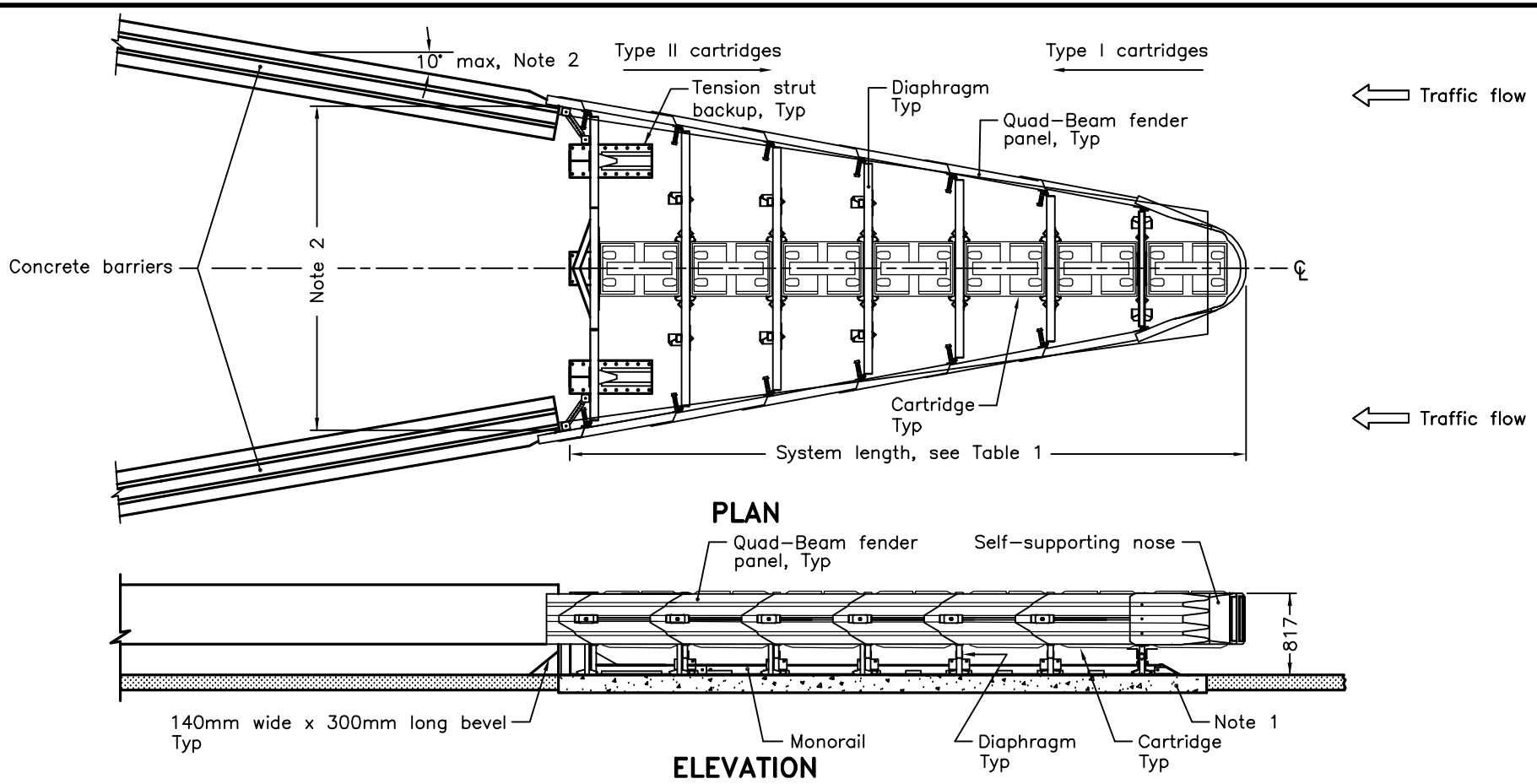
ONTARIO PROVINCIAL STANDARD DRAWING

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

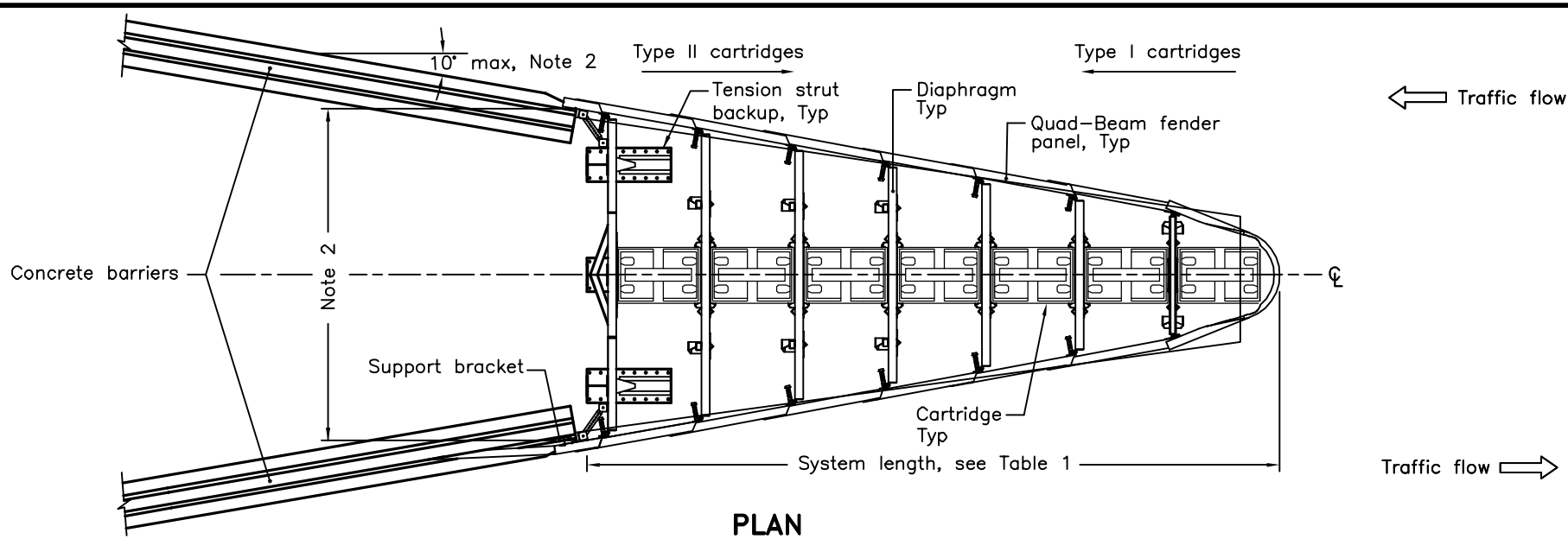
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SUPER WIDE SYSTEM INSTALLATION – PERMANENT UNIDIRECTIONAL

Nov 2015 | Rev | 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

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

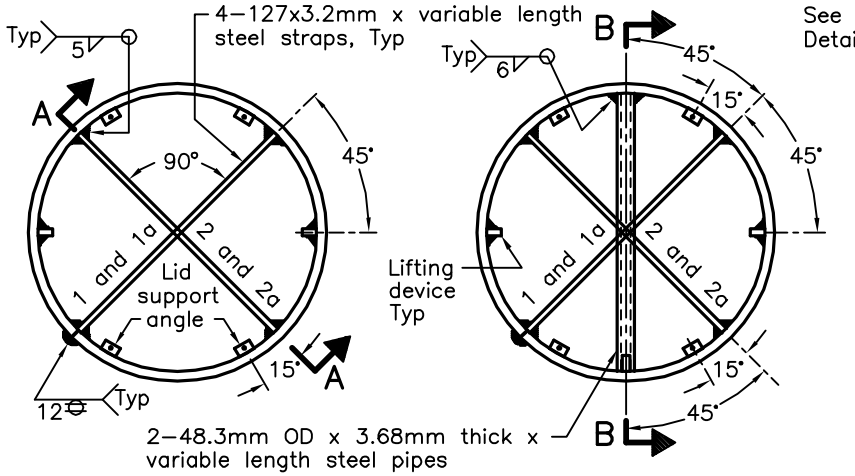
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SUPER WIDE SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

Nov 2015 | Rev 0

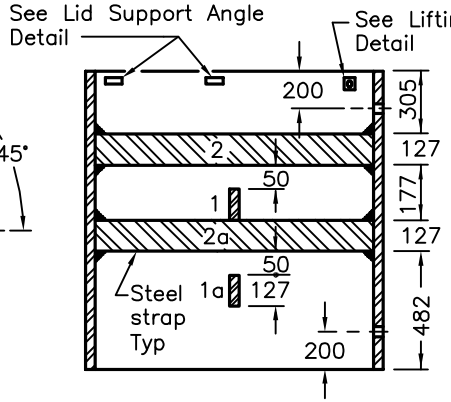
ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

OPSD 923.195

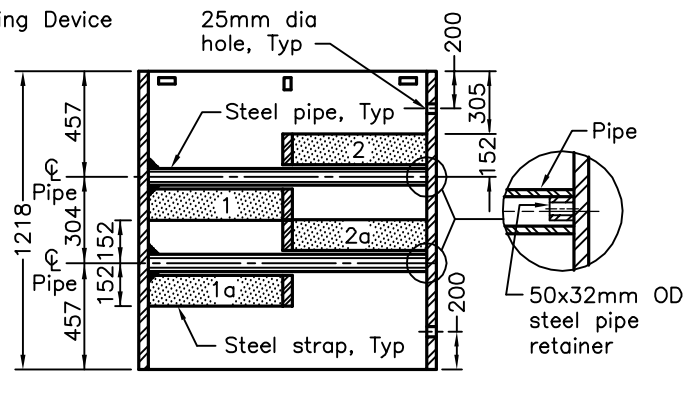


STEEL CYLINDERS: A,B,C STEEL CYLINDERS: D,E,F,G

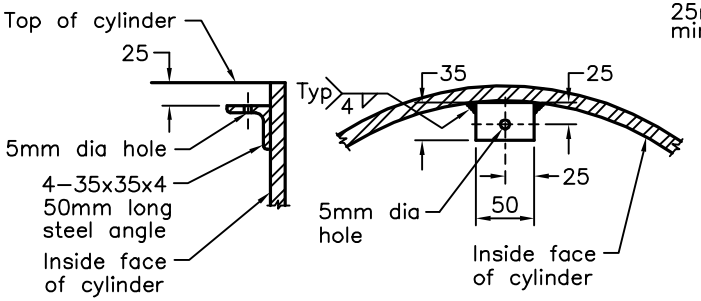
TOP VIEWS



SECTION A–A

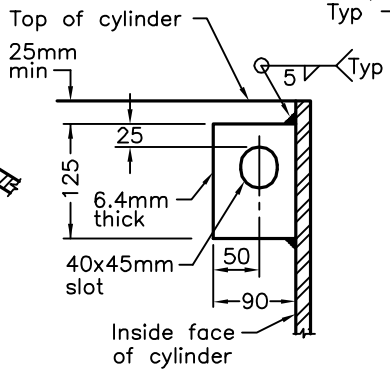


SECTION B–B



SIDE VIEW **TOP VIEW**

LID SUPPORT ANGLE DETAIL

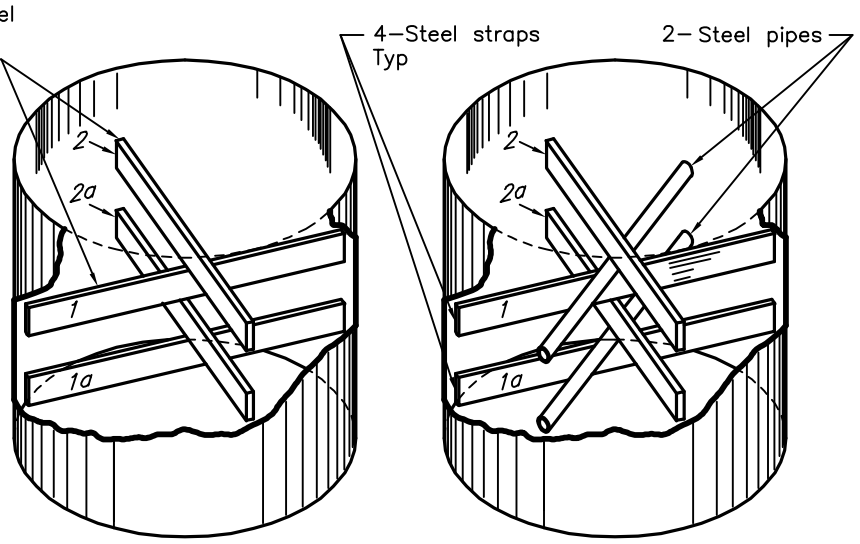


LIFTING DEVICE DETAIL

NOTE:

A No internal reinforcing in cylinder types H to N.

B All dimensions are in millimetres unless otherwise shown.



STEEL CYLINDERS: A,B,C STEEL CYLINDERS: D,E,F,G

ISOMETRIC VIEWS

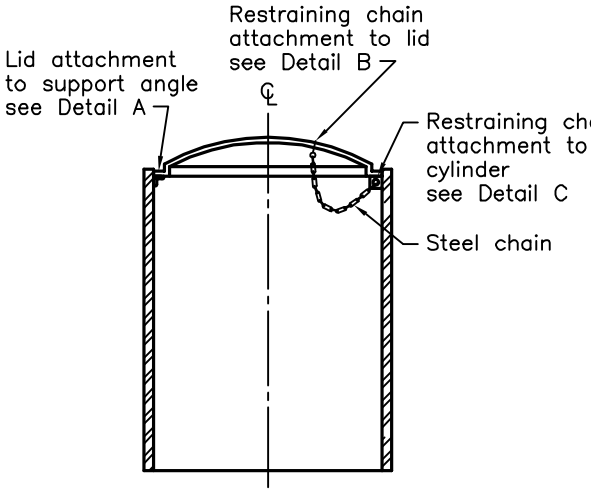
STEEL CYLINDERS			
CYLINDERS	OD	HEIGHT	WALL THICKNESS
A,B,C	1220	1218	6.4
D,E	1220	1218	7.9
F,G,H I,J,K,N	1220	1218	4.8
L,M	914	1218	4.2

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev 2

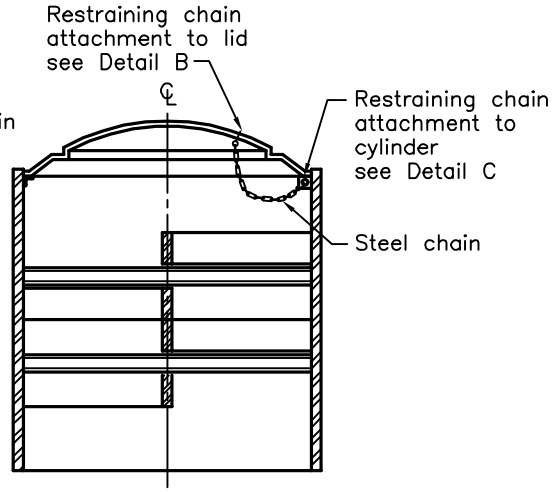
ENERGY ATTENUATOR, CRASH CUSHION CONNECTICUT IMPACT ATTENUATION SYSTEM COMPONENT – STEEL CYLINDER

ONTARIO STANDARDS · MUNICIPAL–PROVINCIAL · OPS

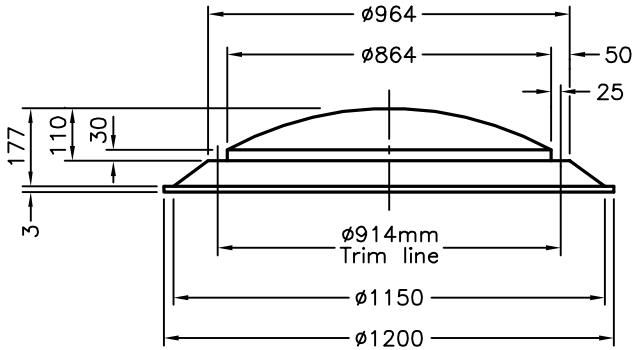
OPSD 923.201



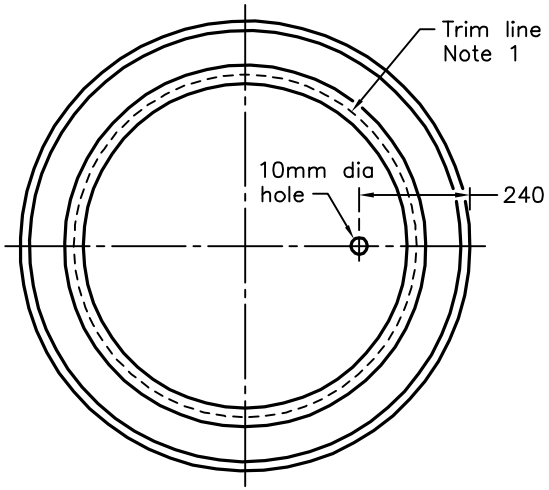
CYLINDERS–914mm DIA



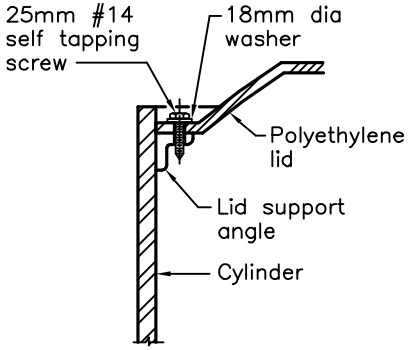
CYLINDERS–1220mm DIA



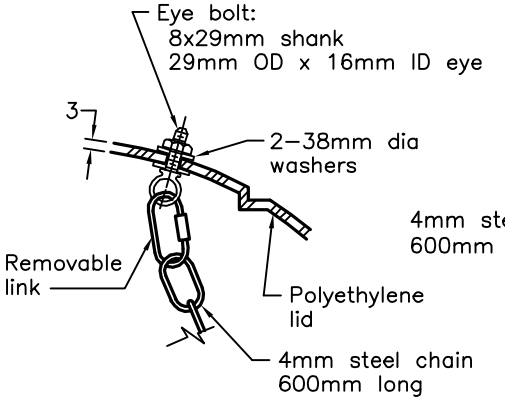
SIDE VIEW



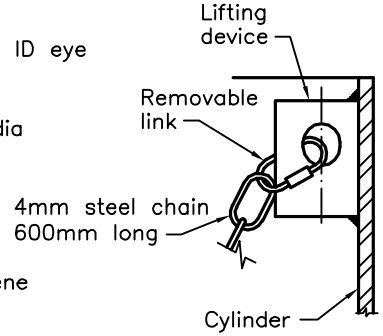
TOP VIEW



DETAIL A



DETAIL B



DETAIL C

POLYETHYLENE LID

NOTES:

1 For 914mm cylinder lid, cut along trim line as shown.

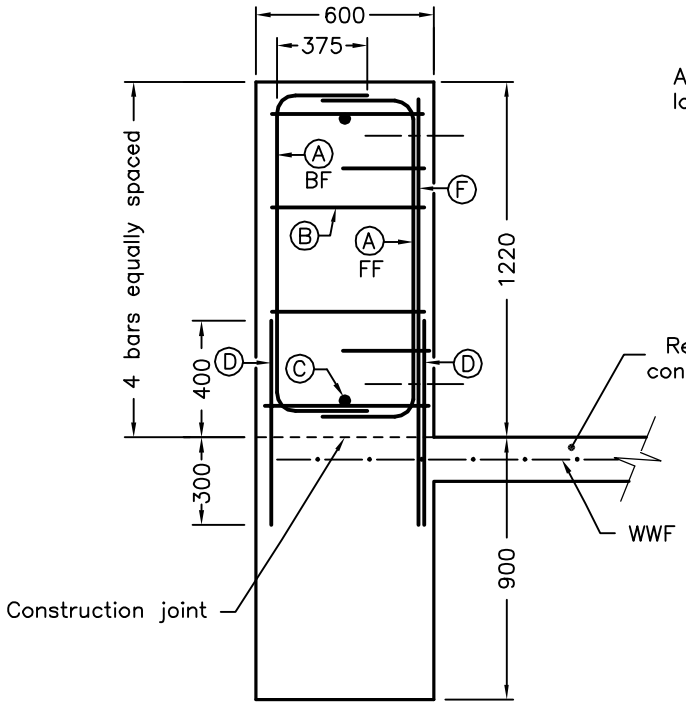
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

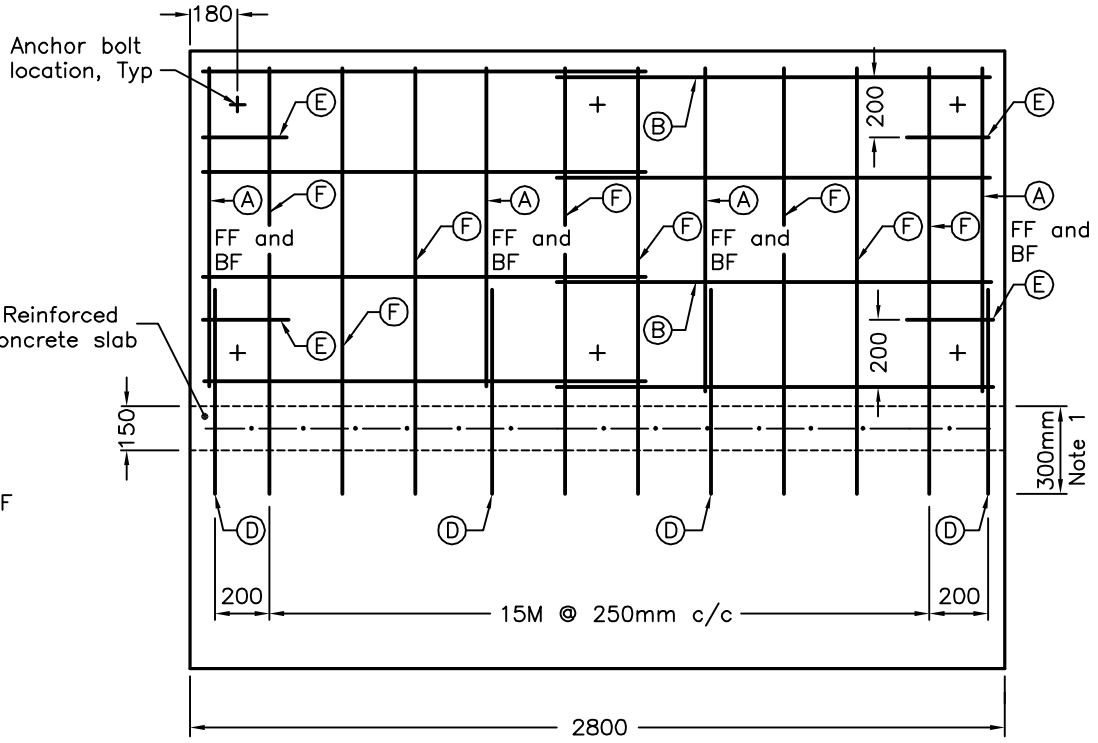
ENERGY ATTENUATOR, CRASH CUSHION CONNECTICUT IMPACT ATTENUATION SYSTEM COMPONENT – POLYETHYLENE LID

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

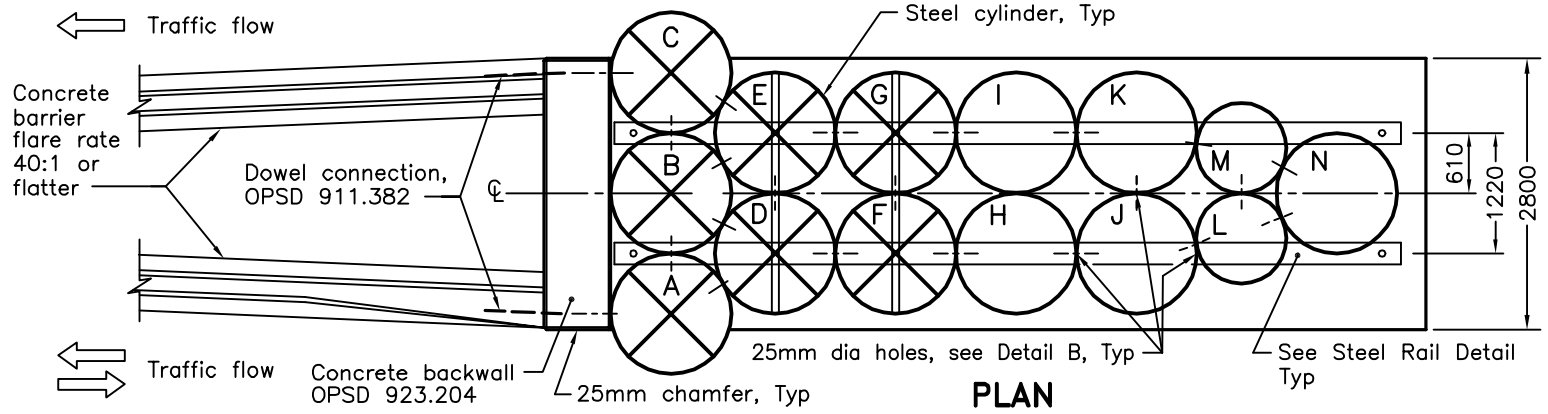
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 | Rev 2

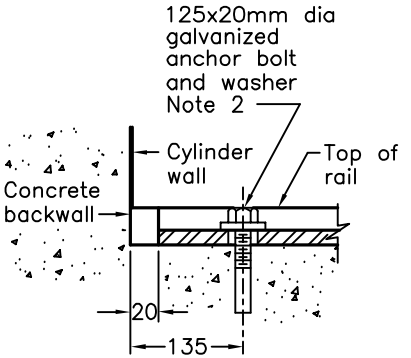
ENERGY ATTENUATOR, CRASH CUSHION CONNECTICUT IMPACT ATTENUATION SYSTEM COMPONENT – CONCRETE BACKWALL

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

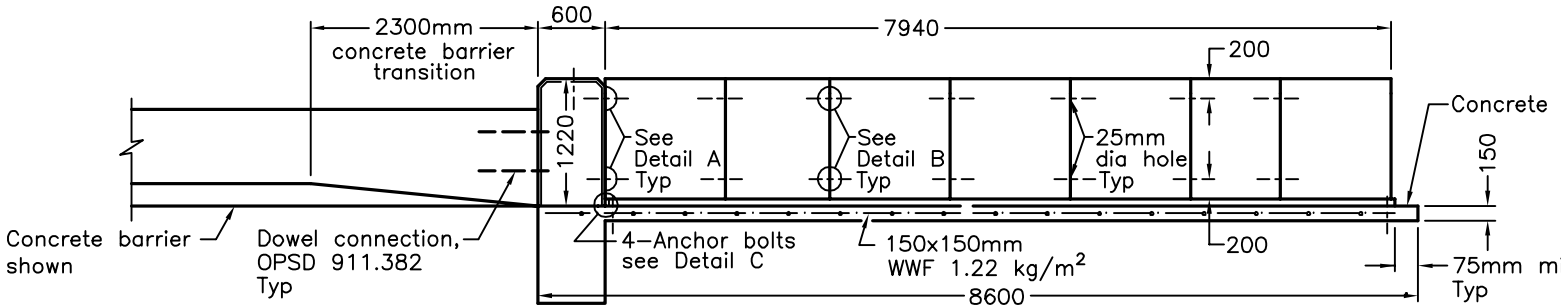
OPSD 923.204



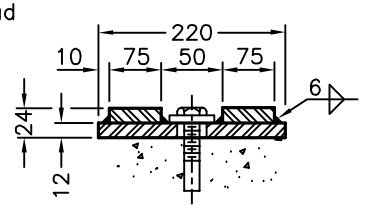
PLAN



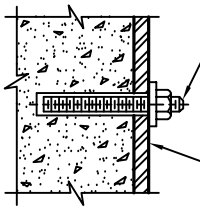
DETAIL C



ELEVATION

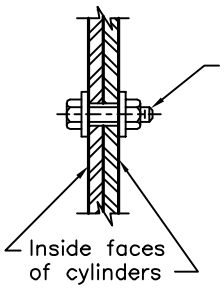


SECTION A–A

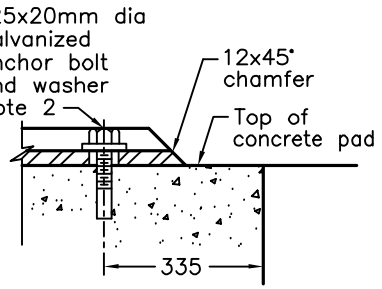


DETAIL A

STEEL RAIL DETAIL



DETAIL B



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.

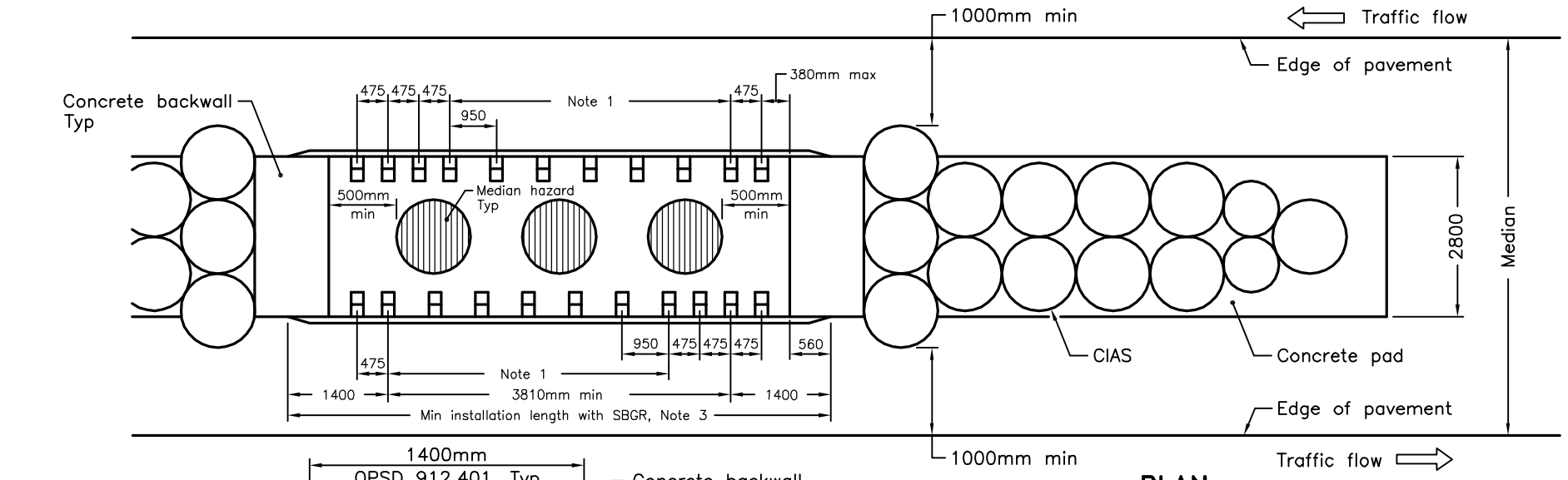
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION CONNECTICUT IMPACT ATTENUATION SYSTEM INSTALLATION

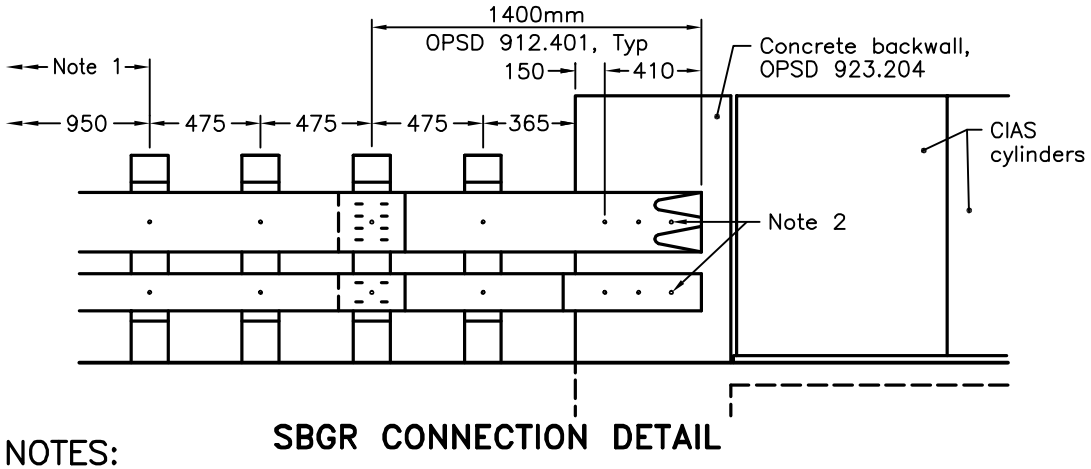
Nov 2013 | Rev 2

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

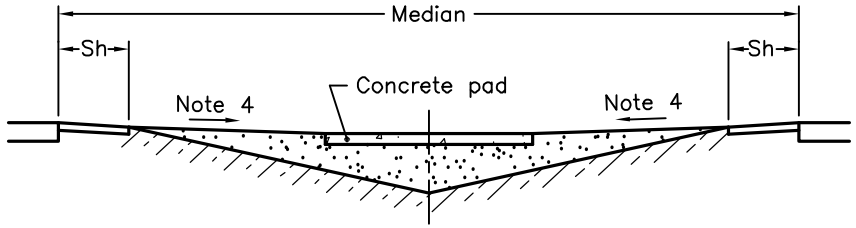
OPSD 923.242



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.

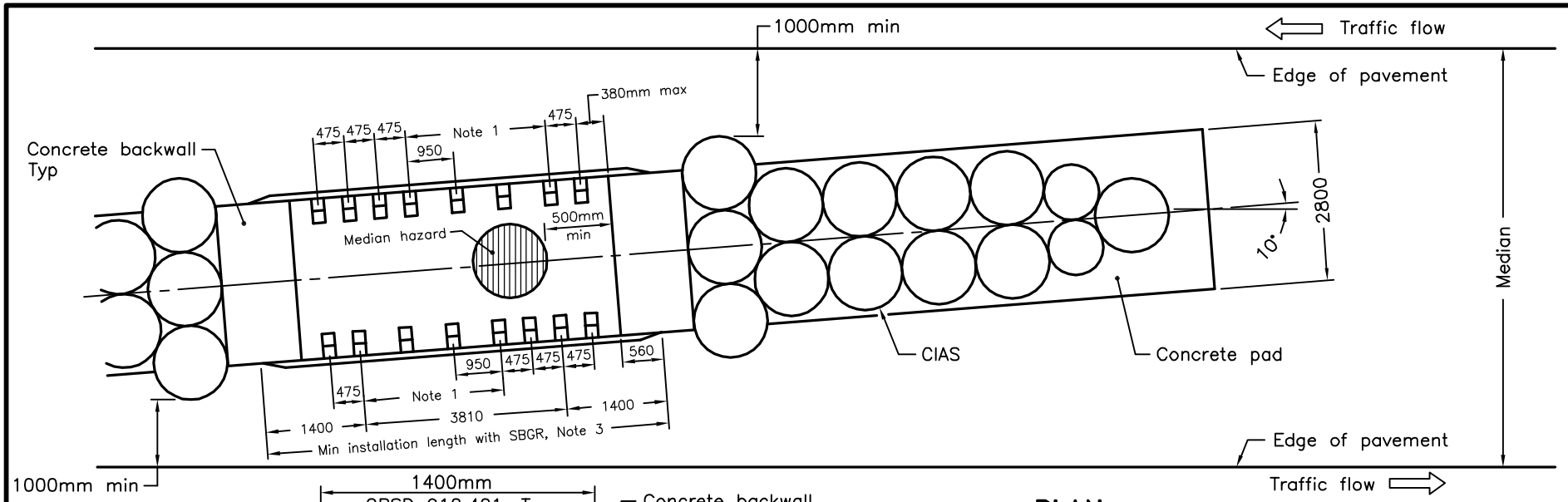
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

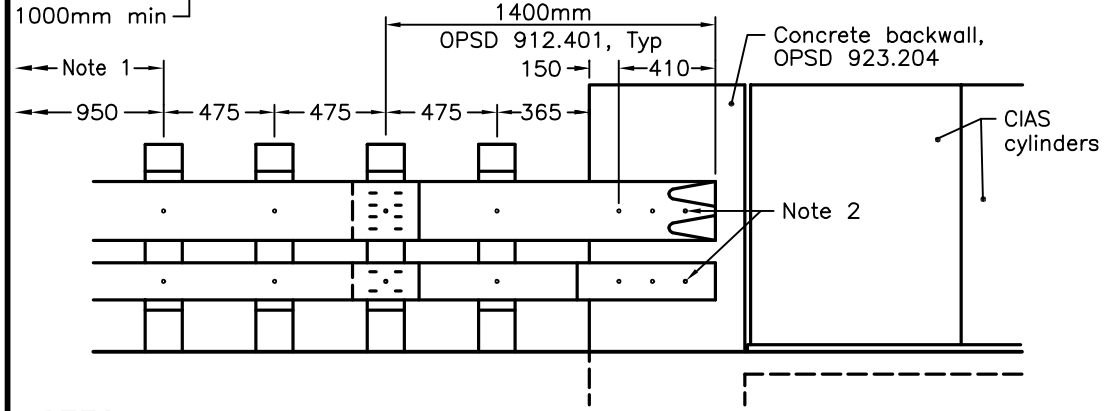
ENERGY ATTENUATOR, CRASH CUSHION CONNECTICUT IMPACT ATTENUATION SYSTEM INSTALLATION – LONG MEDIAN HAZARD

Nov 2013 | Rev 1

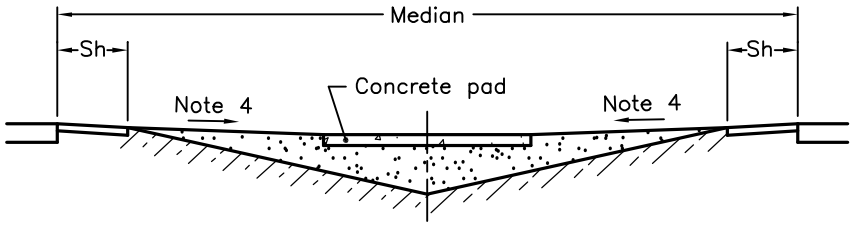
OPSD 923.244



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.

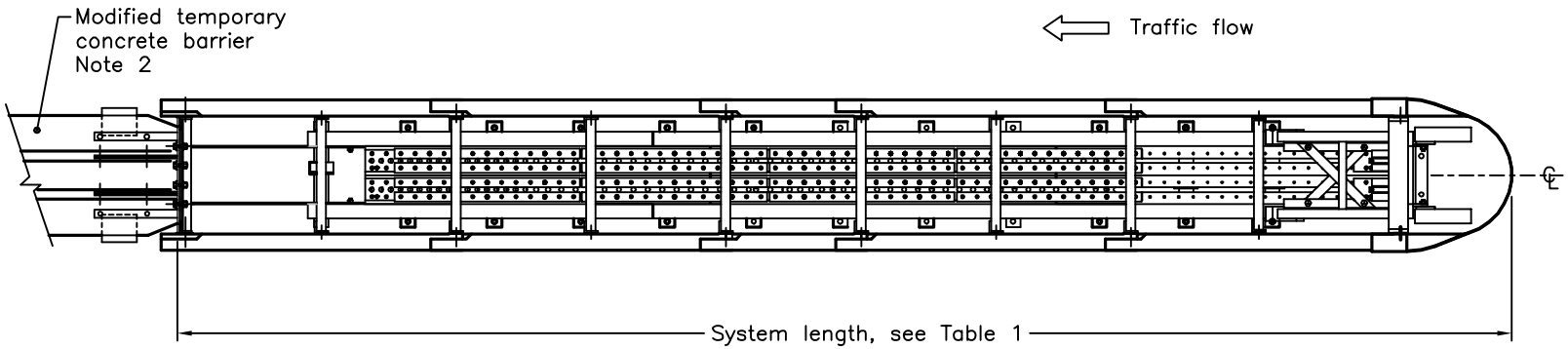
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION CONNECTICUT IMPACT ATTENUATION SYSTEM INSTALLATION – SHORT MEDIAN HAZARD

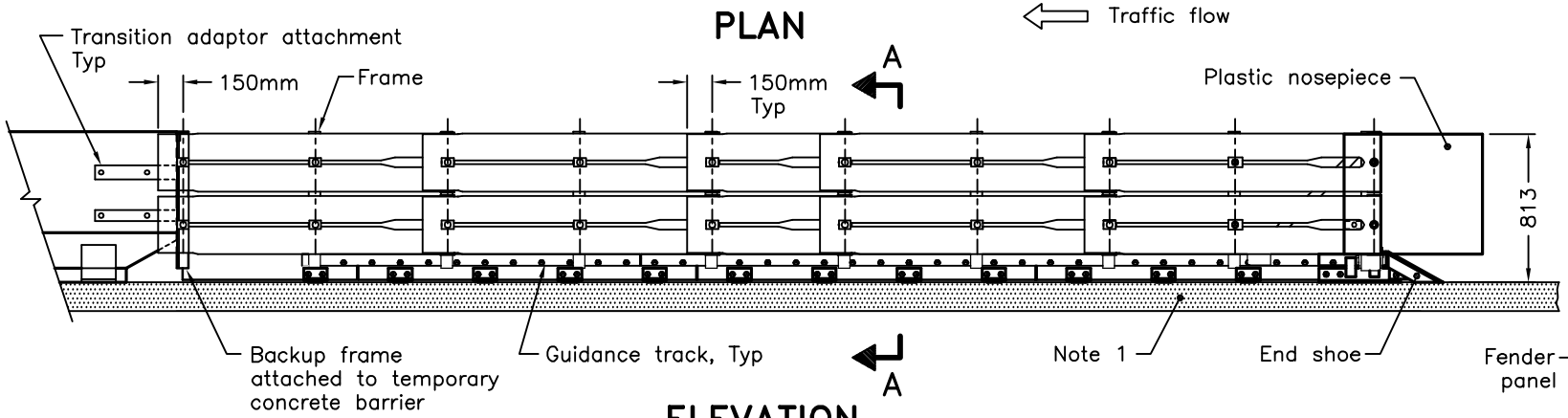
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

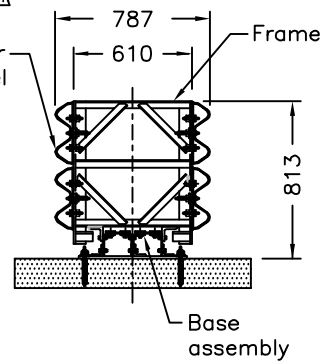
OPSD 923.245



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.

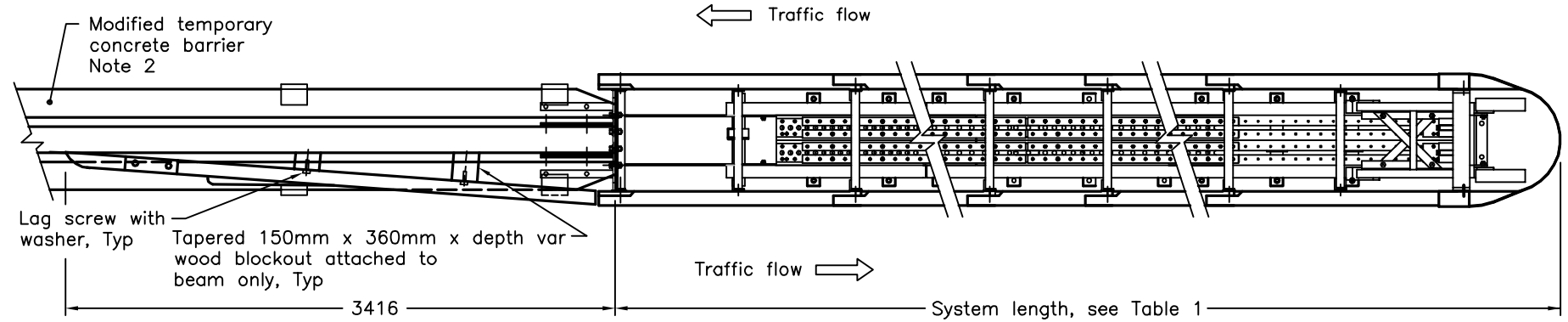
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION TRACC SYSTEM INSTALLATION – TEMPORARY UNIDIRECTIONAL

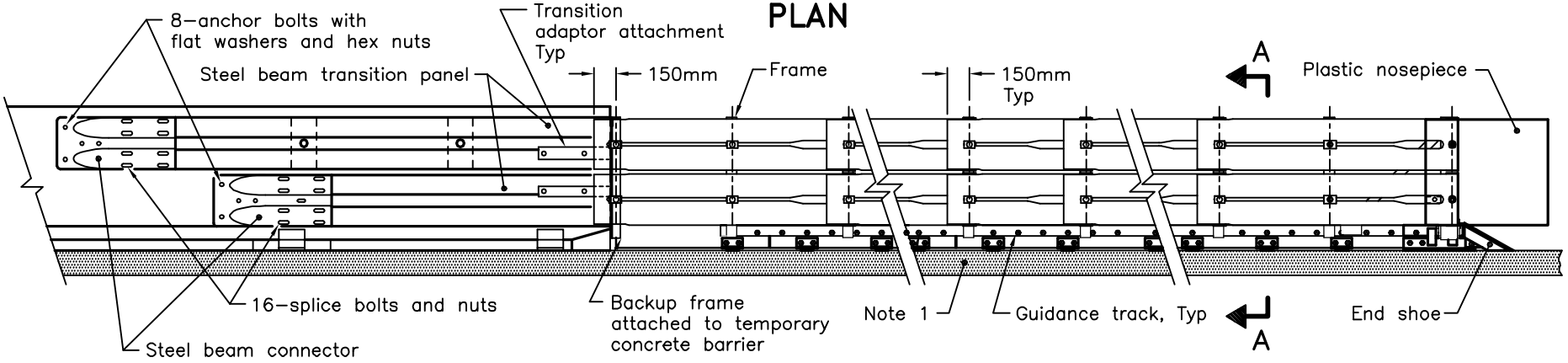
Nov 2011 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

OPSD 923.280

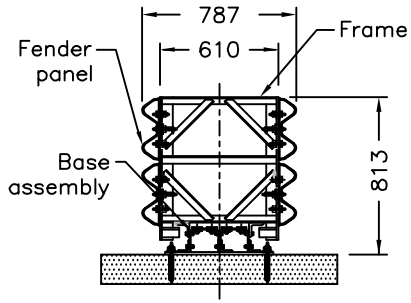


PLAN



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.

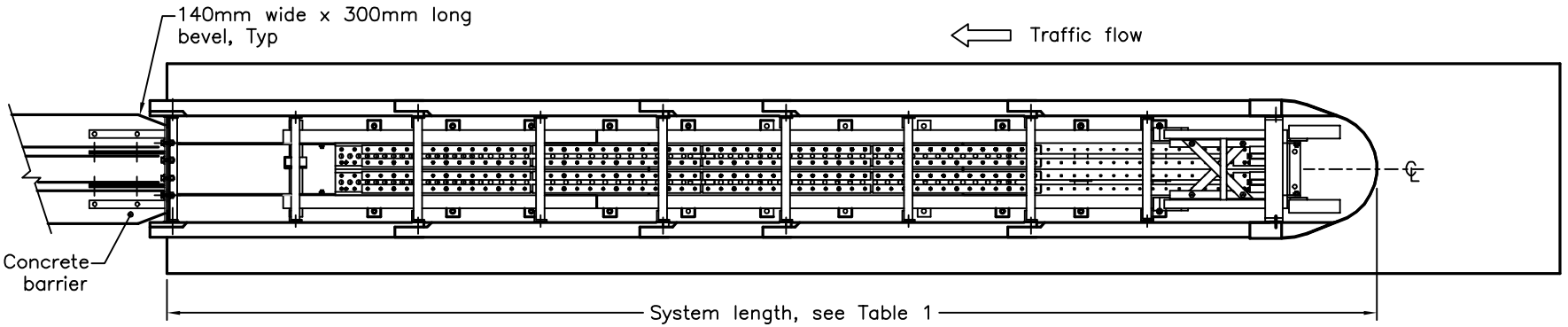
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION TRACC SYSTEM INSTALLATION – TEMPORARY BIDIRECTIONAL

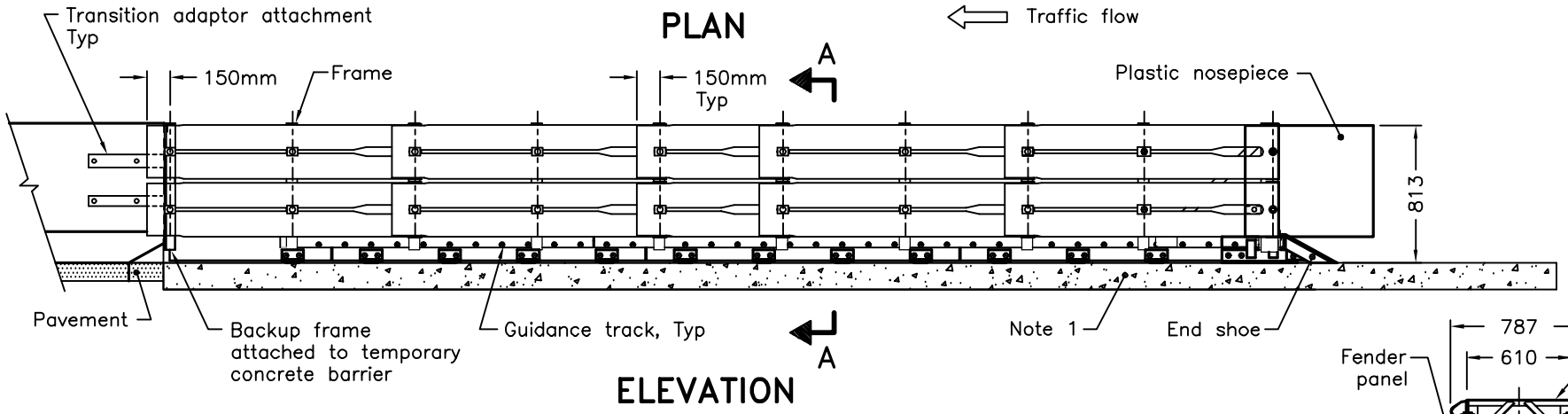
Nov 2011 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

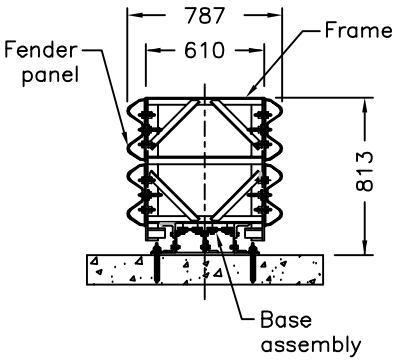
OPSD 923.281



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.

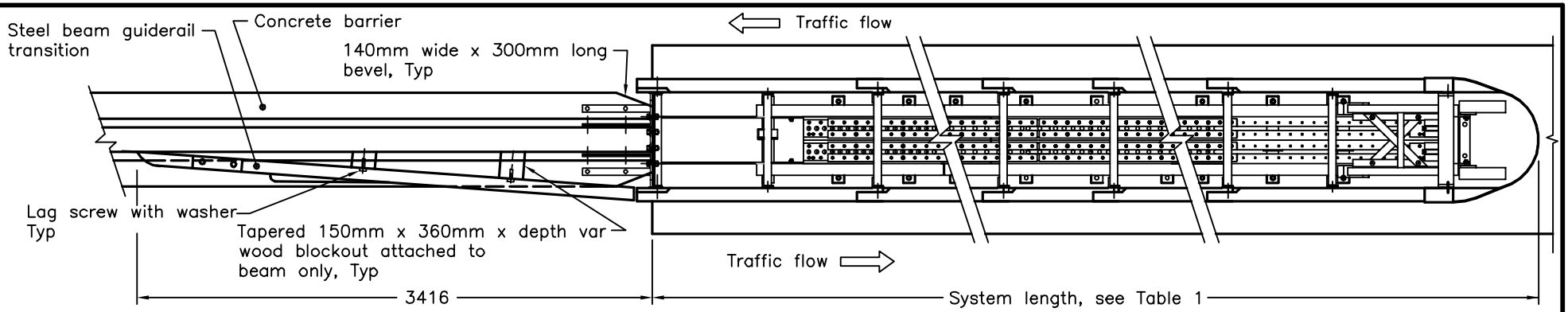
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION TRACC SYSTEM INSTALLATION – PERMANENT UNIDIRECTIONAL

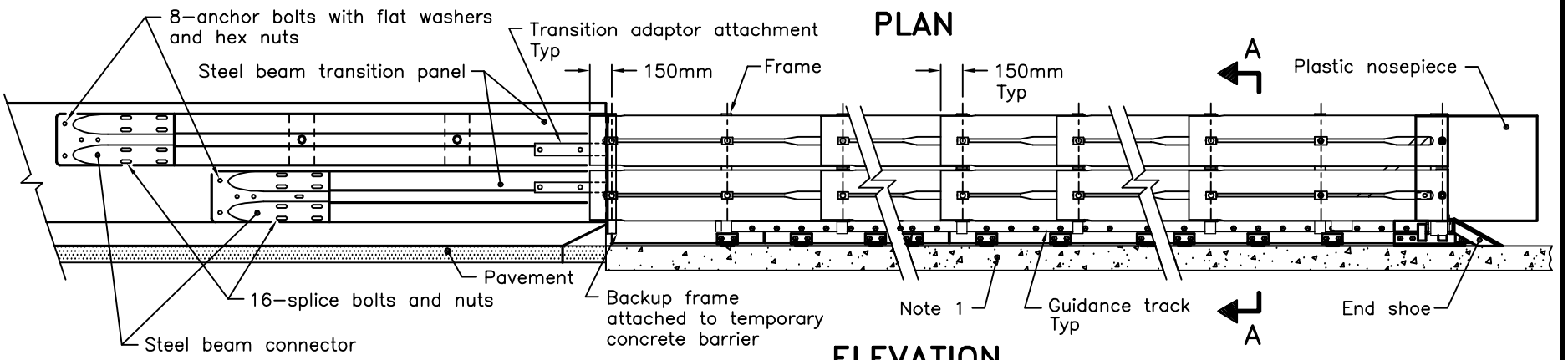
Nov 2011 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

OPSD 923.282

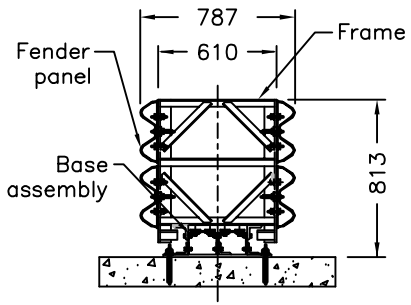


PLAN



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.

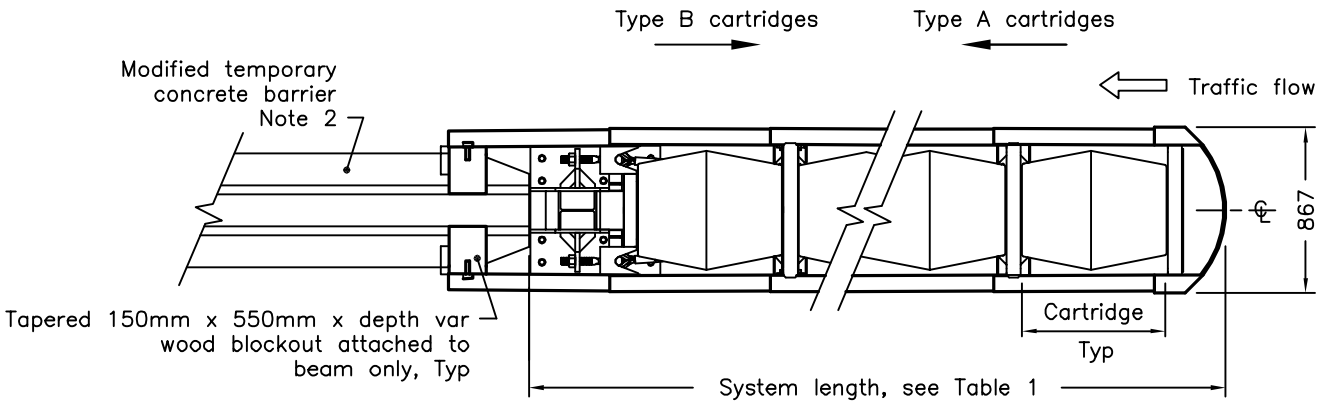
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION TRACC SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

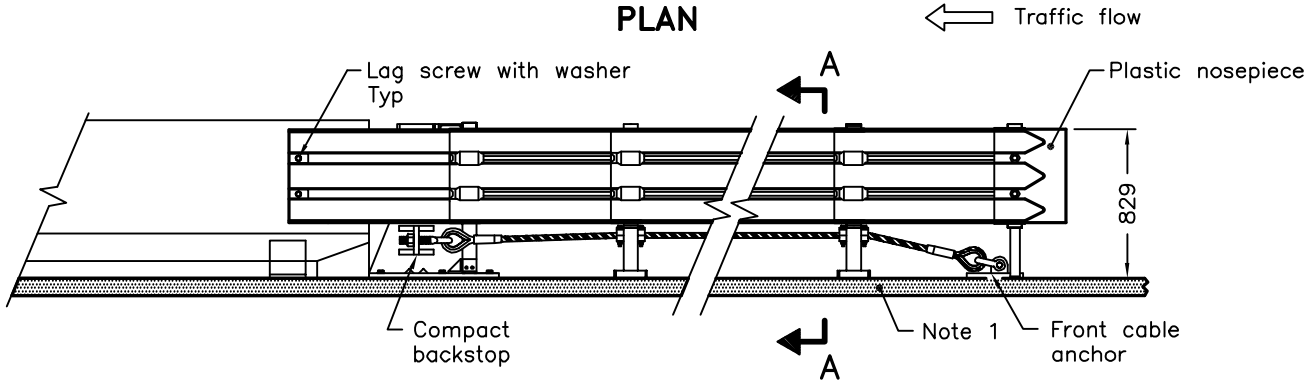
Nov 2011 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

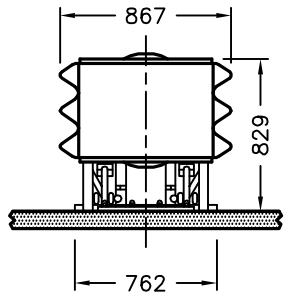
OPSD 923.283



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.

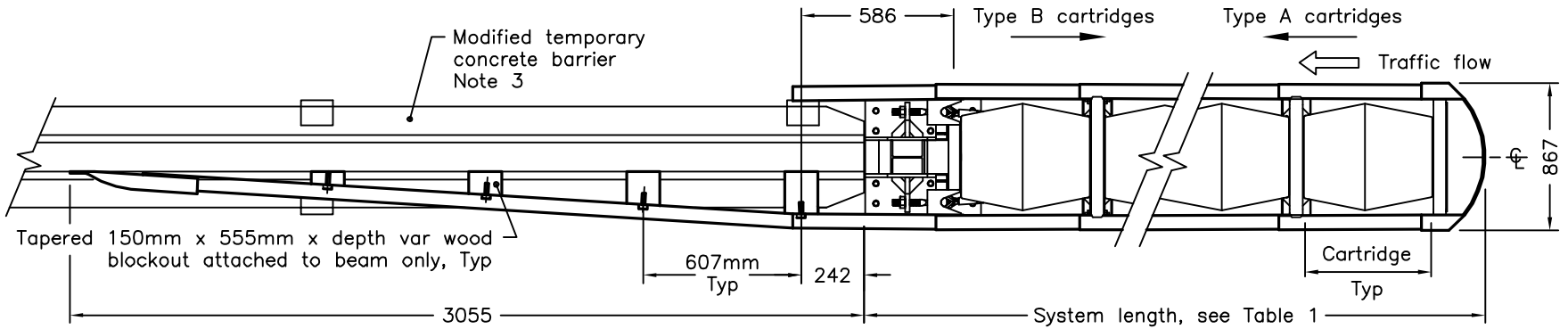
TABLE 1		
SYSTEM CONFIGURATION	TL–2	TL–3
TYPE A CARTRIDGES FRONT REQ'D	1	3
TYPE B CARTRIDGES REAR REQ'D	3	5
SYSTEM LENGTH	3780	7250

ONTARIO PROVINCIAL STANDARD DRAWING

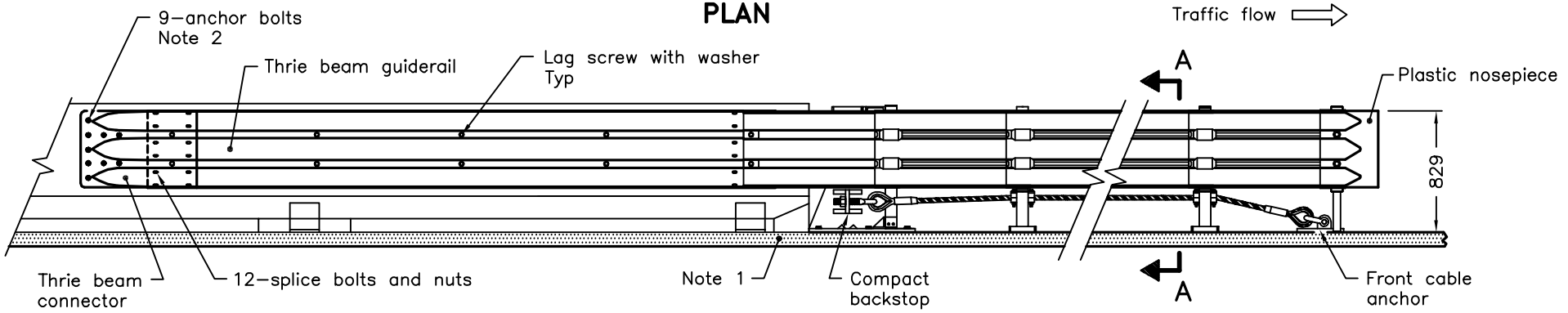
ENERGY ATTENUATOR, CRASH CUSHION TAU–II SYSTEM INSTALLATION – TEMPORARY UNIDIRECTIONAL

Nov 2011 | Rev 1

OPSD 923.380



PLAN



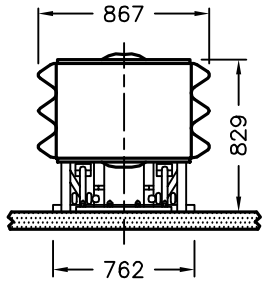
ELEVATION

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



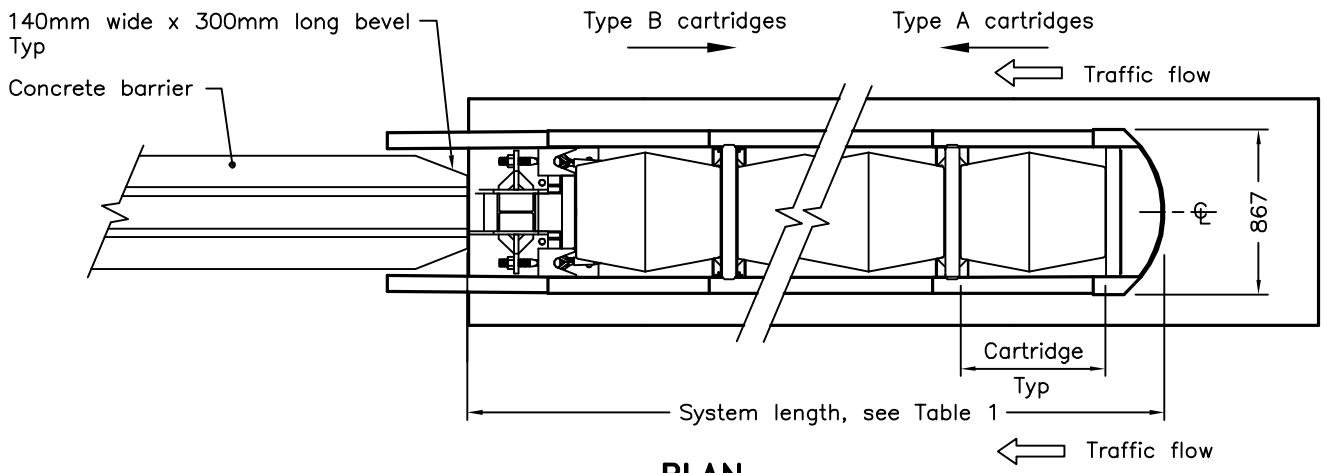
SECTION A–A

ONTARIO PROVINCIAL STANDARD DRAWING

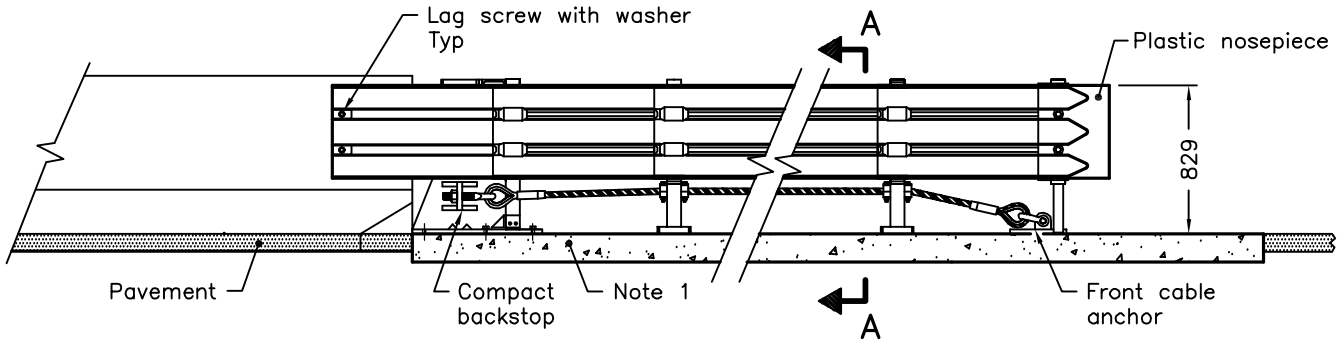
ENERGY ATTENUATOR, CRASH CUSHION TAU–II SYSTEM INSTALLATION – TEMPORARY BIDIRECTIONAL

Nov 2011 | Rev 1

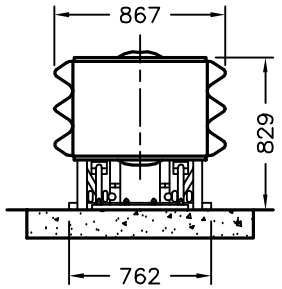
OPSD 923.381



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.

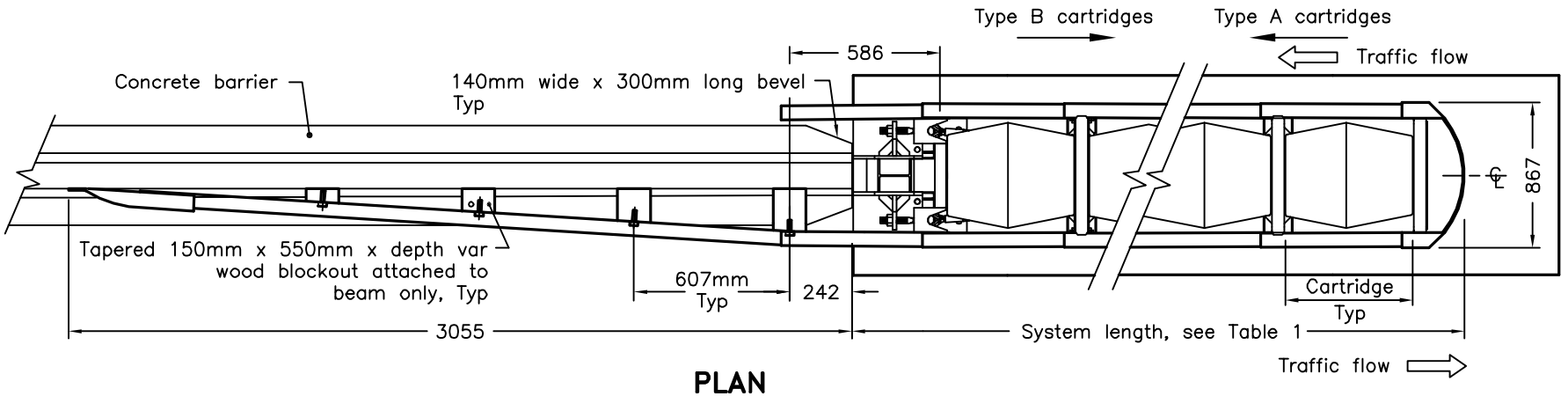
TABLE 1		
SYSTEM CONFIGURATION	TL–2	TL–3
TYPE A CARTRIDGES FRONT REQ'D	1	3
TYPE B CARTRIDGES REAR REQ'D	3	5
SYSTEM LENGTH	3780	7250

ONTARIO PROVINCIAL STANDARD DRAWING

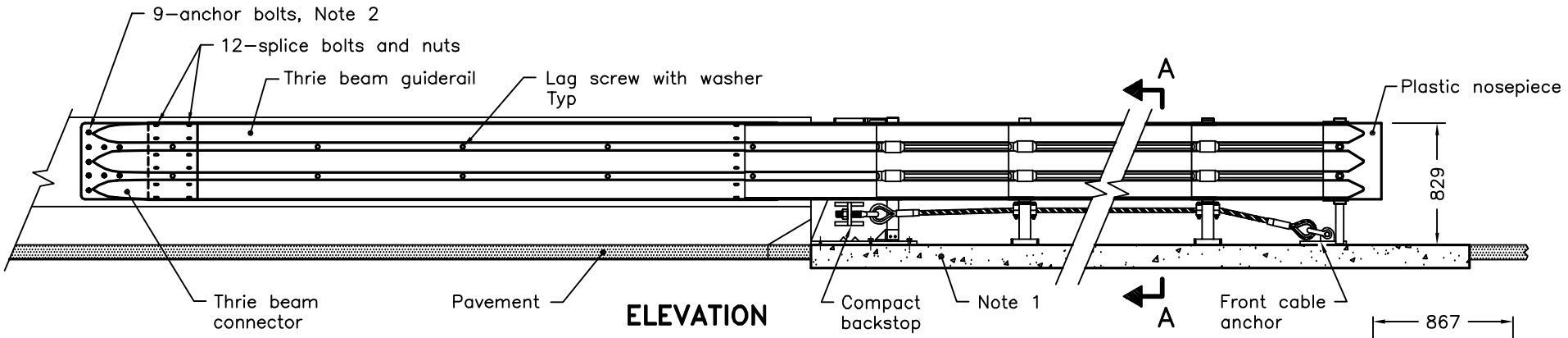
ENERGY ATTENUATOR, CRASH CUSHION TAU–II SYSTEM INSTALLATION – PERMANENT UNIDIRECTIONAL

Nov 2011 | Rev 1

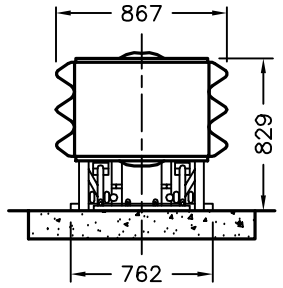
OPSD 923.382



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

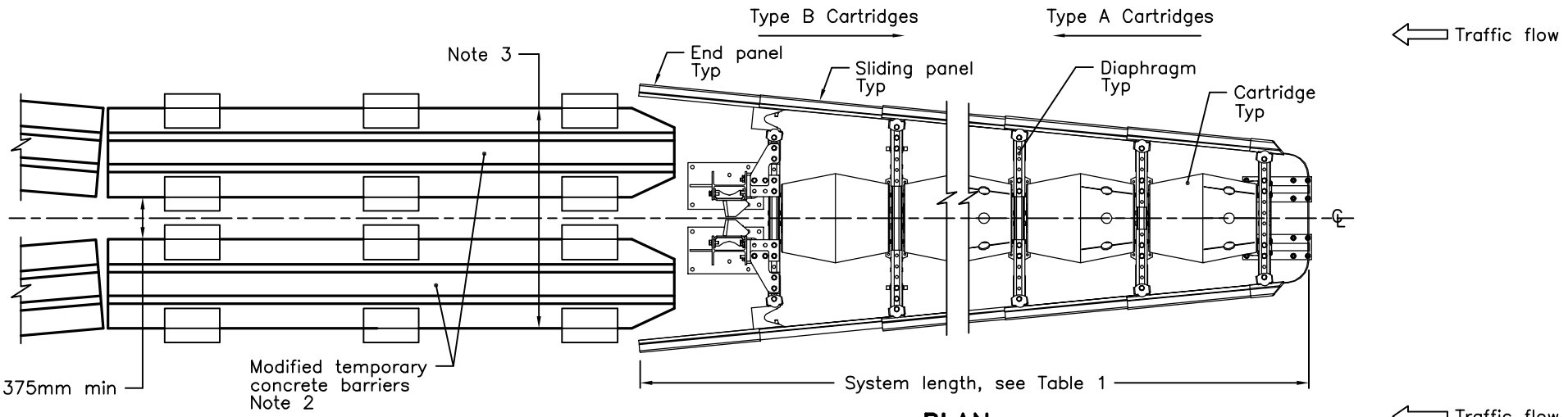
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION TAU–II SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

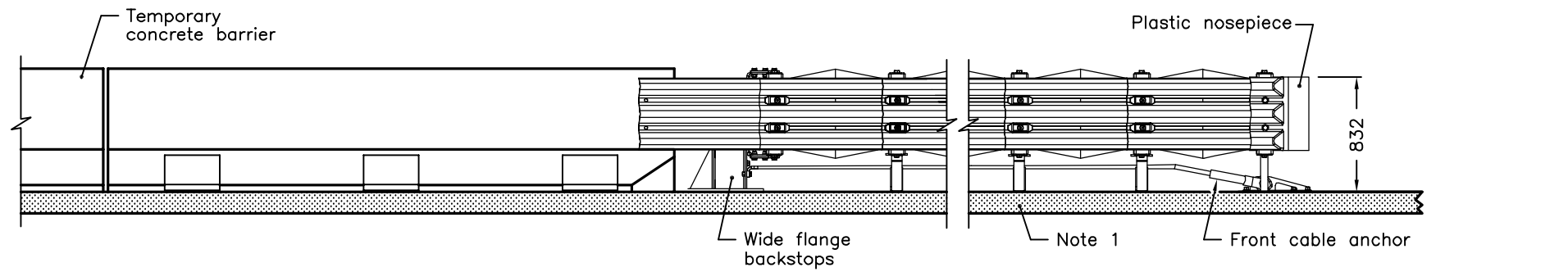
Nov 2011 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

OPSD 923.383



PLAN



ELEVATION

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	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

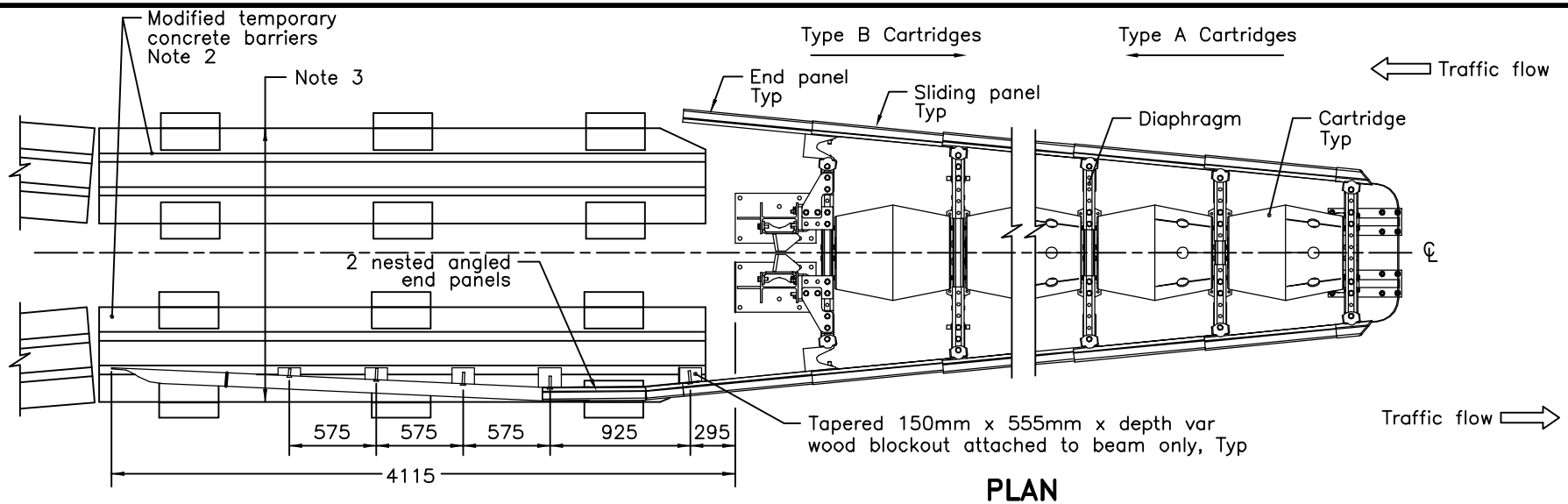
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION TAU–II WIDE SYSTEM INSTALLATION – TEMPORARY UNIDIRECTIONAL

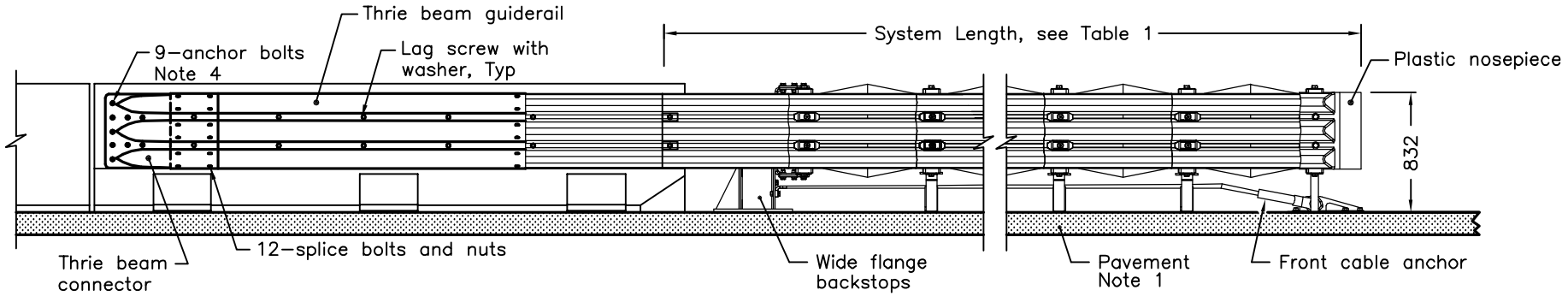
Nov 2011 | Rev 0

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

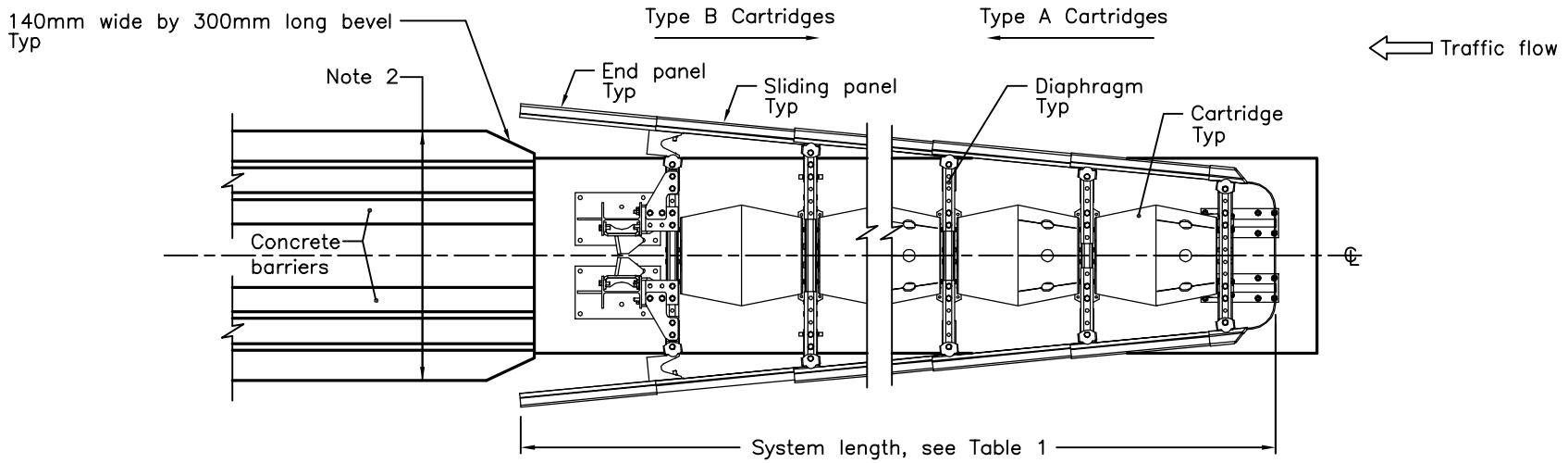
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION TAU–II WIDE SYSTEM INSTALLATION – TEMPORARY BIDIRECTIONAL

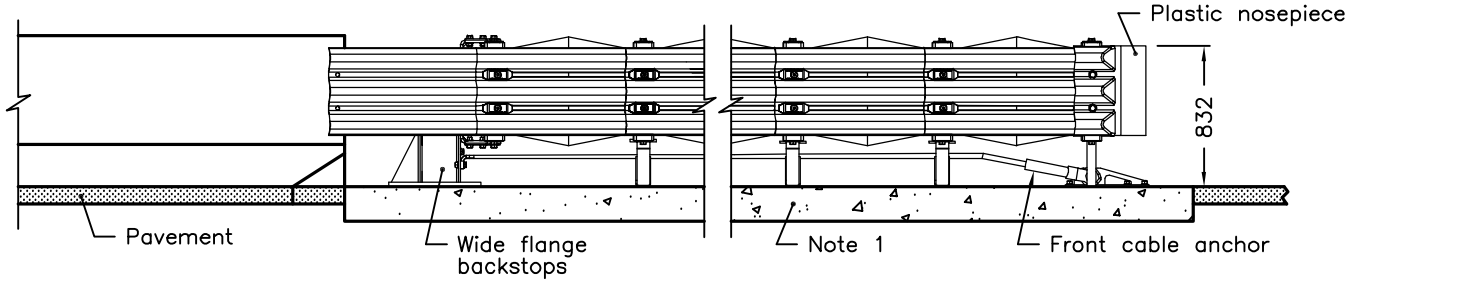
Nov 2011 | Rev 0

ONTARIO STANDARDS · 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.

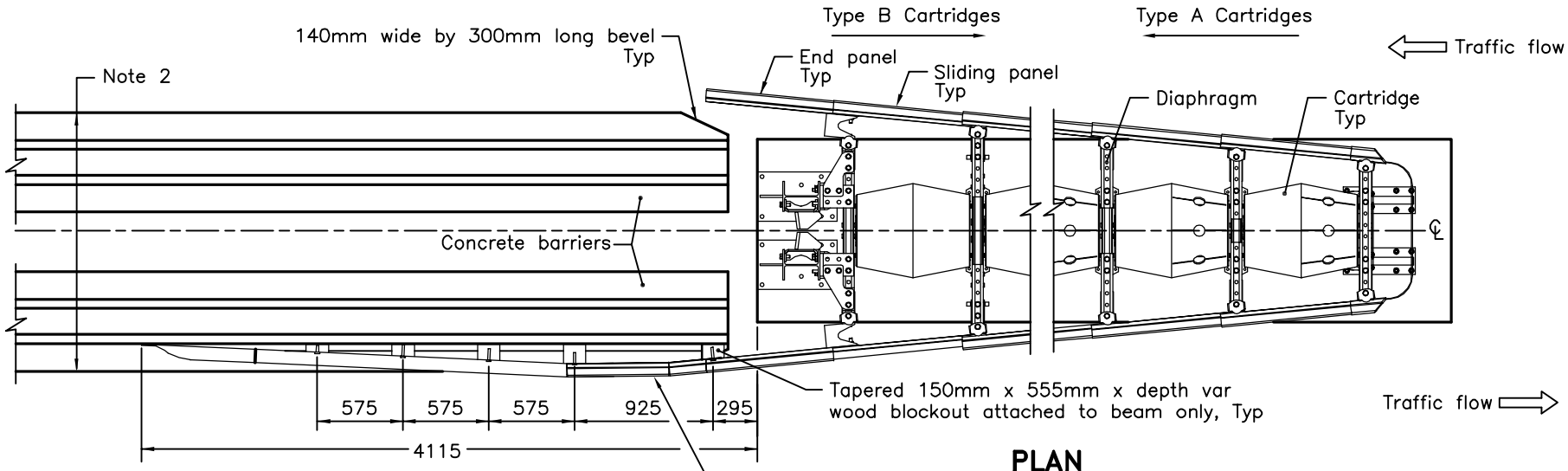
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION TAU–II WIDE SYSTEM INSTALLATION – PERMANENT UNIDIRECTIONAL

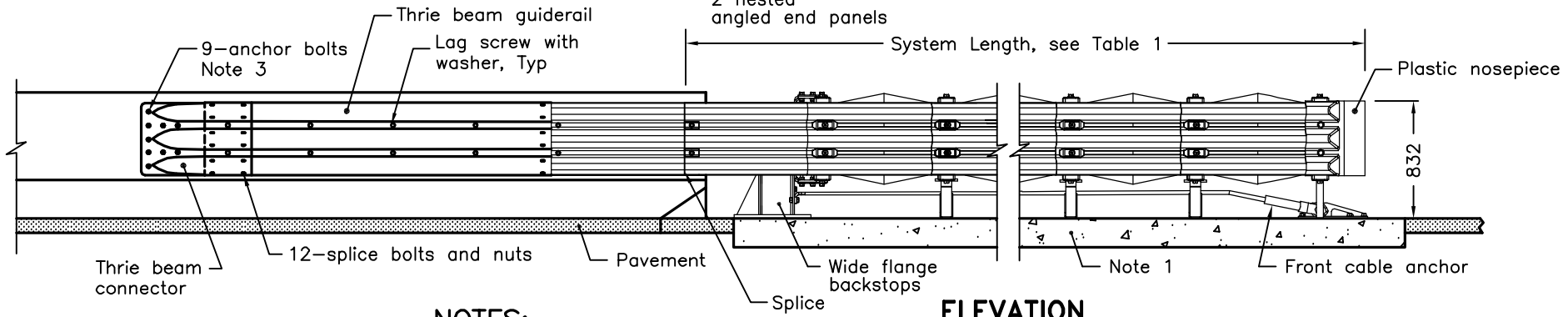
Nov 2011 | Rev 0

ONTARIO STANDARDS · 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

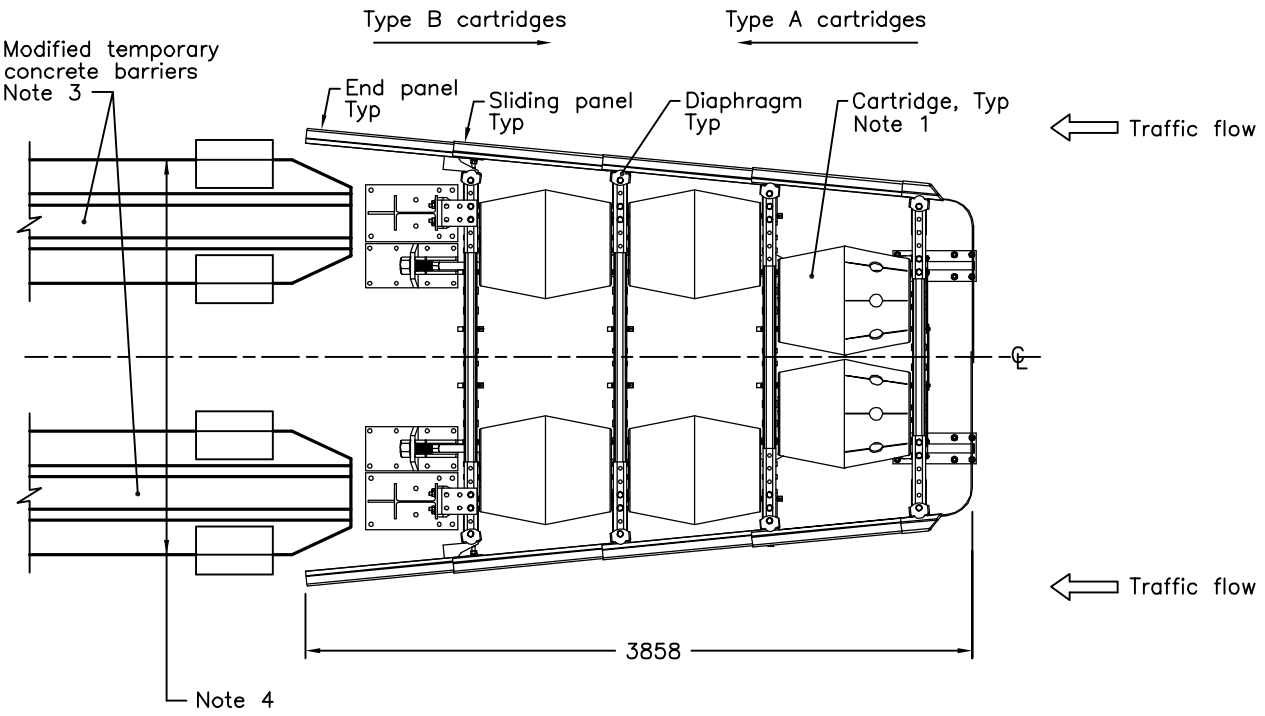
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION TAU–II WIDE SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

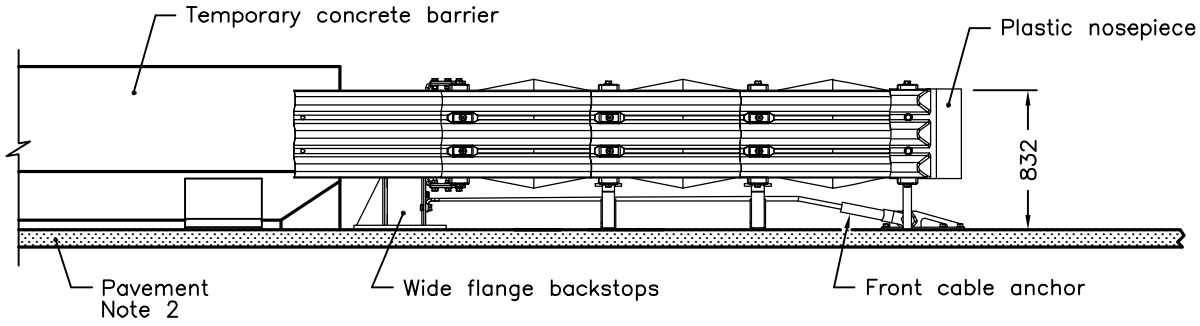
Nov 2011 | Rev 0

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

OPSD 923.387



PLAN



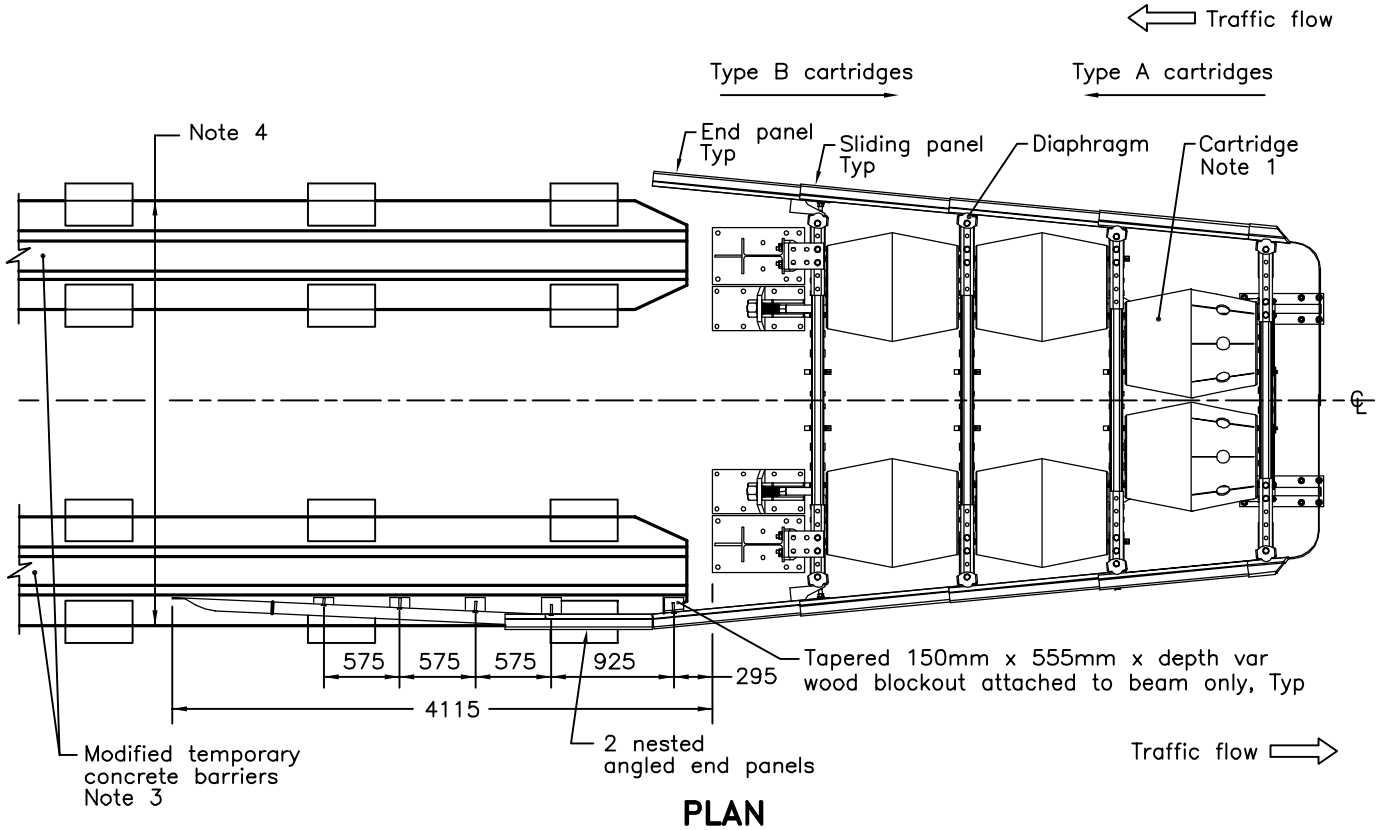
ELEVATION

NOTES:

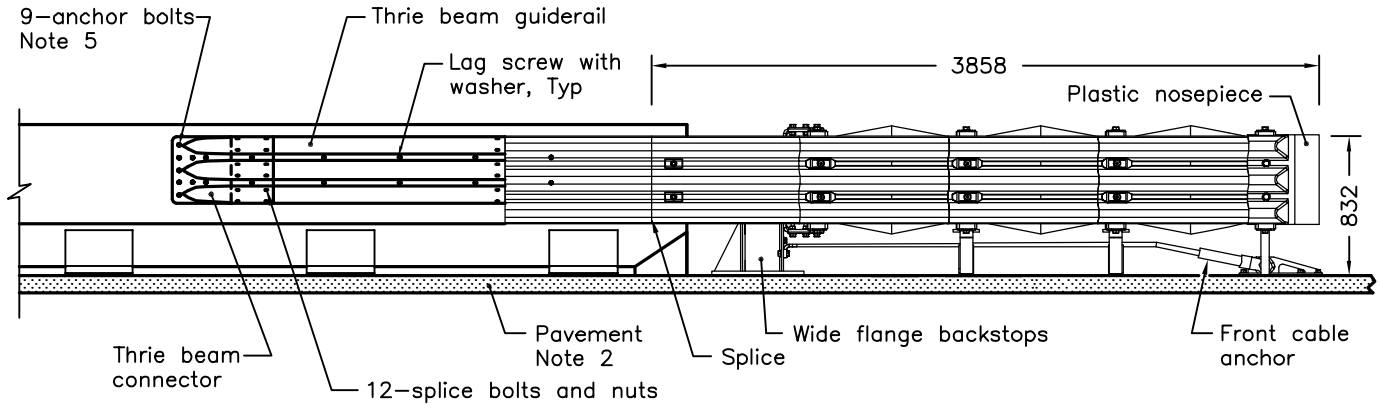
1 2 Type A and 4 Type B cartridges.
2 When system is placed on a concrete pad, the pad shall be according to OPSD 923.005.
3 Adjacent temporary concrete barriers shall be modified and anchored according to OPSD 923.002.
4 Maximum width of object shall be 2200mm for the first 762mm behind the rear fender 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



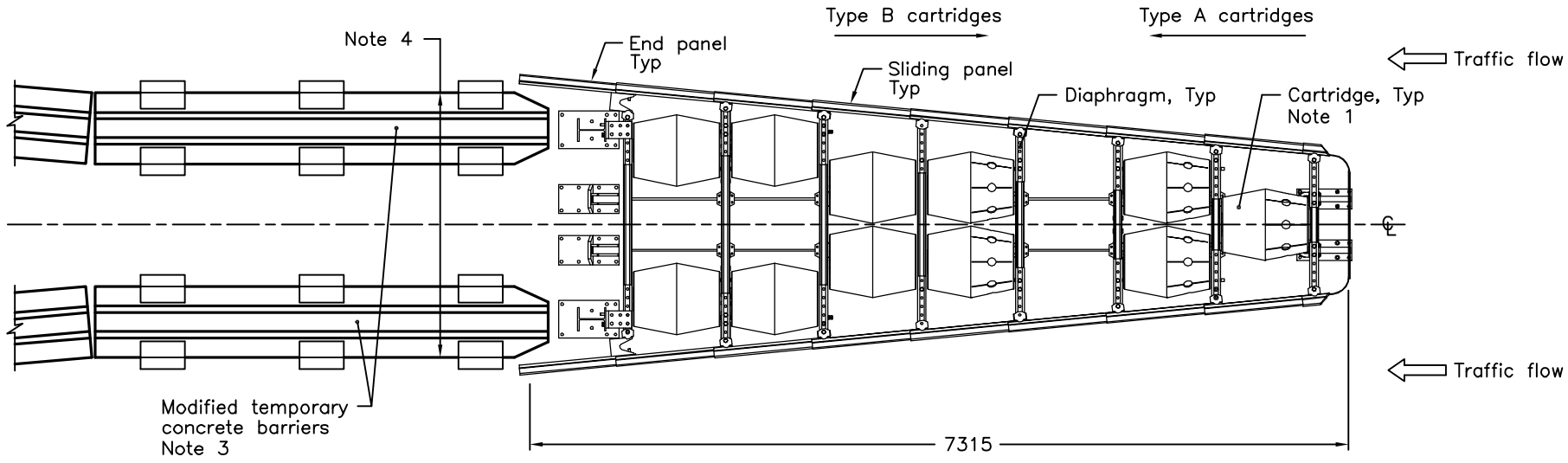
ELEVATION

NOTES:

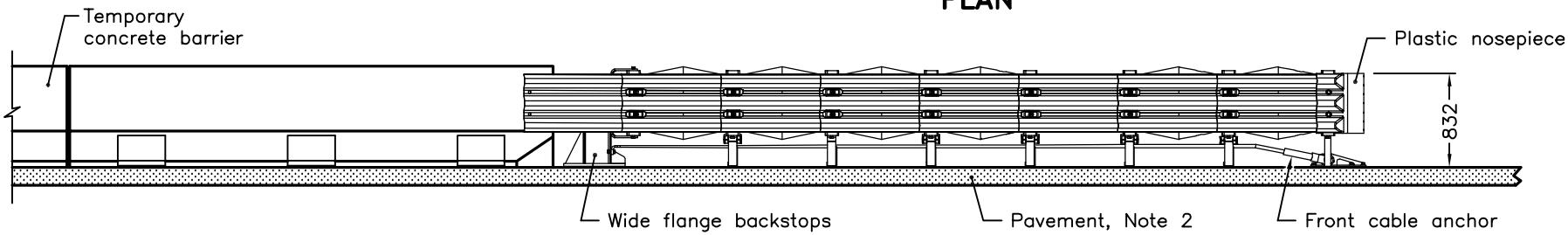
1 2 Type A and 4 Type B cartridges.
2 When the system is placed on a concrete pad, the pad shall be according to OPSD 923.005.
3 Adjacent temporary concrete barrier units shall be modified and anchored according to OPSD 923.002.
4 Maximum width of object shall be 2200mm for the first 762mm behind the 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.

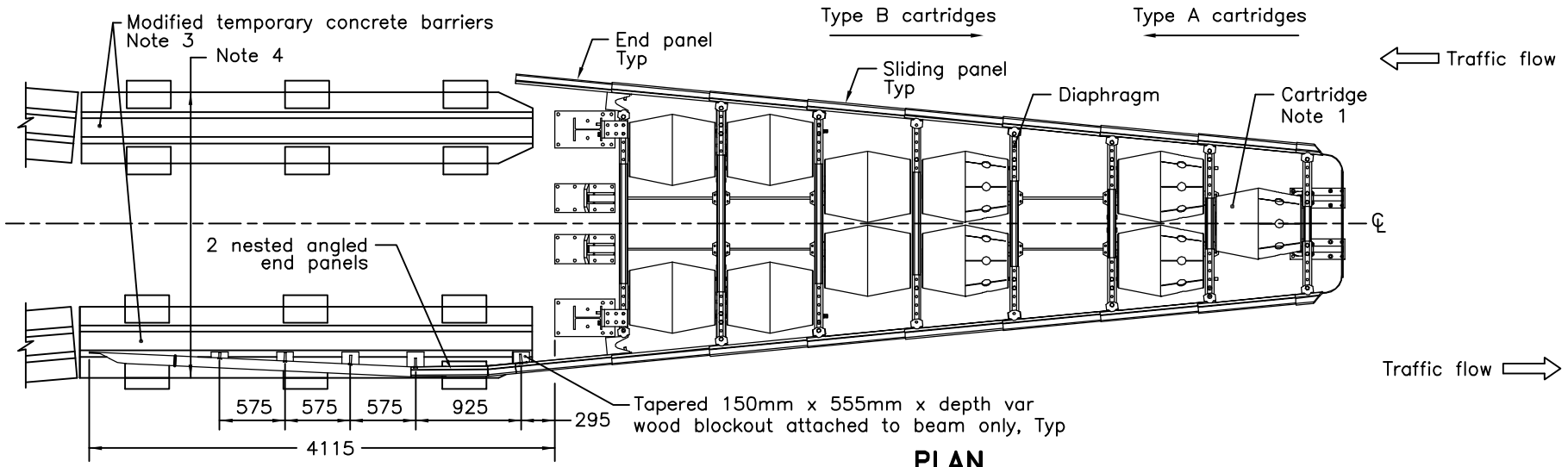
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION TAU–II EXTRA WIDE SYSTEM – TL–3 INSTALLATION – TEMPORARY UNIDIRECTIONAL

Nov 2011 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

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.

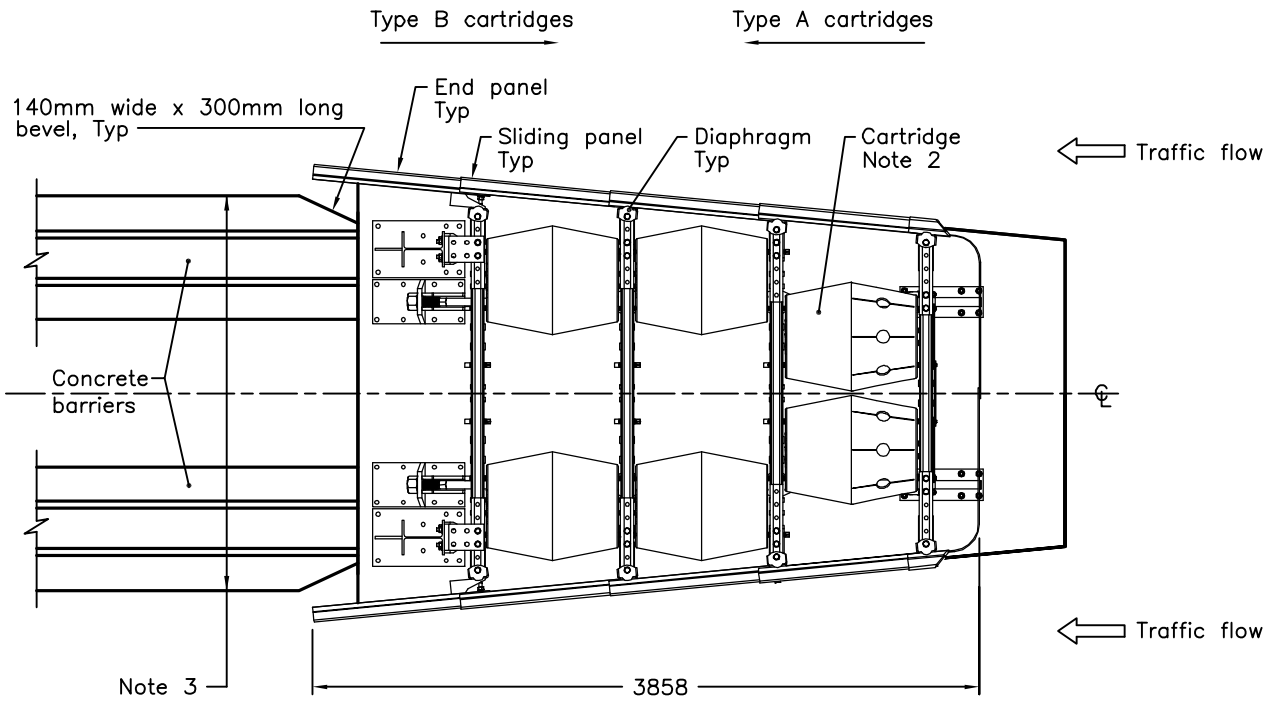
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION TAU–II EXTRA WIDE SYSTEM – TL–3 INSTALLATION – TEMPORARY BIDIRECTIONAL

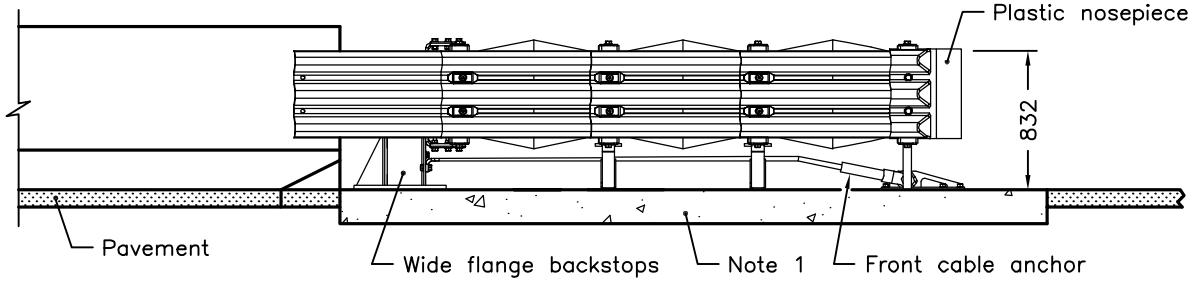
Nov 2011 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 923.391



PLAN



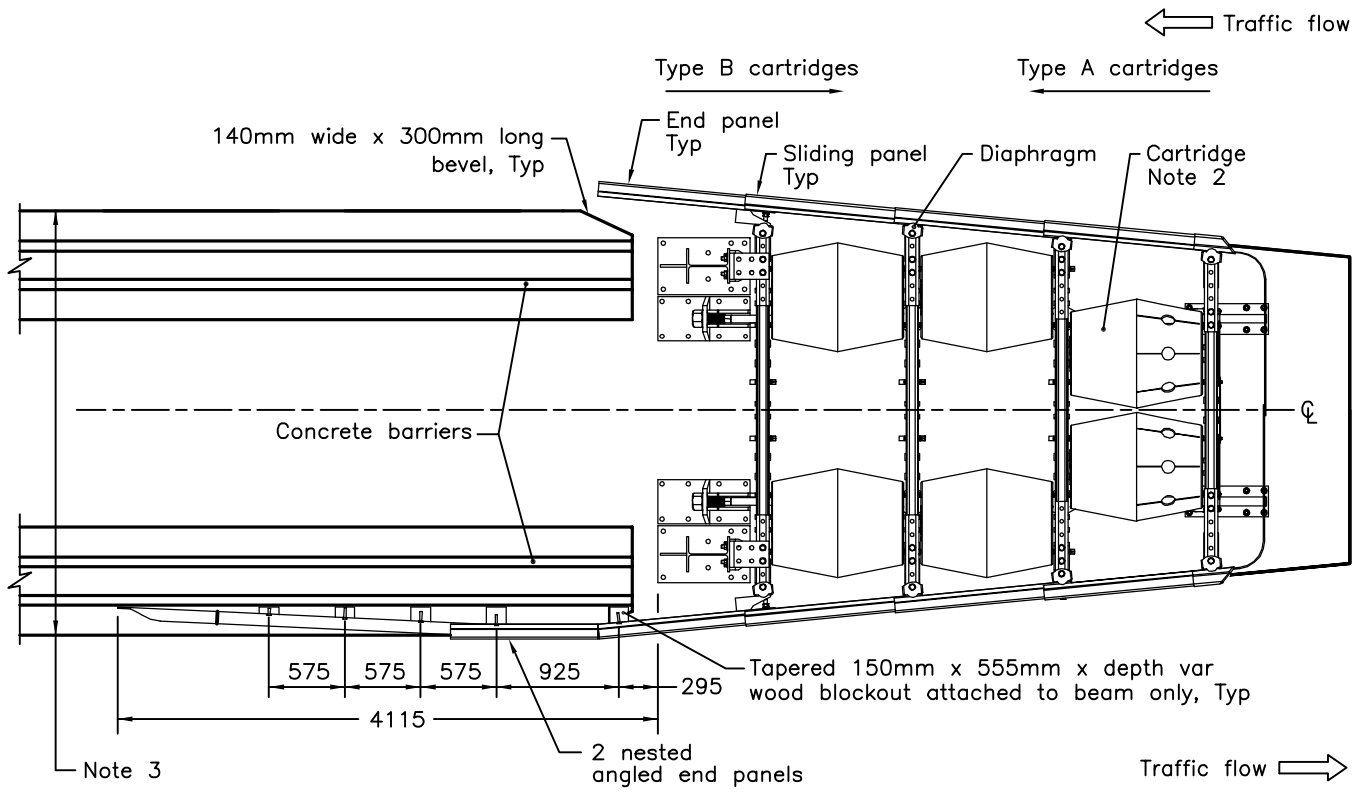
ELEVATION

NOTES:

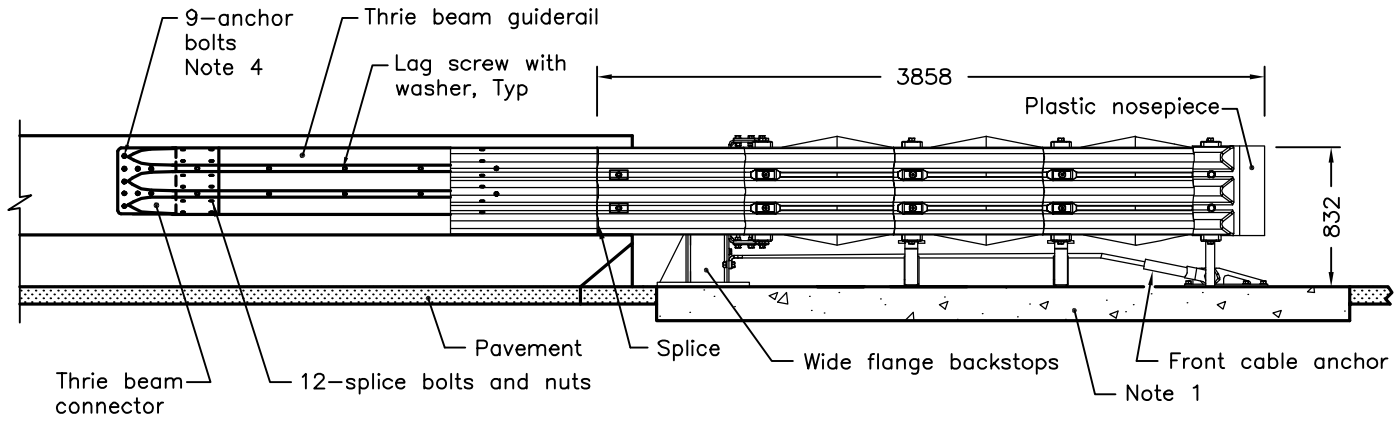
1 The system shall be anchored to concrete pad detailed in OPSD 923.005.
2 2 Type A and 4 Type B cartridges.
3 Maximum width of object shall be 2200mm for the first 762mm behind the rear fender panels.

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



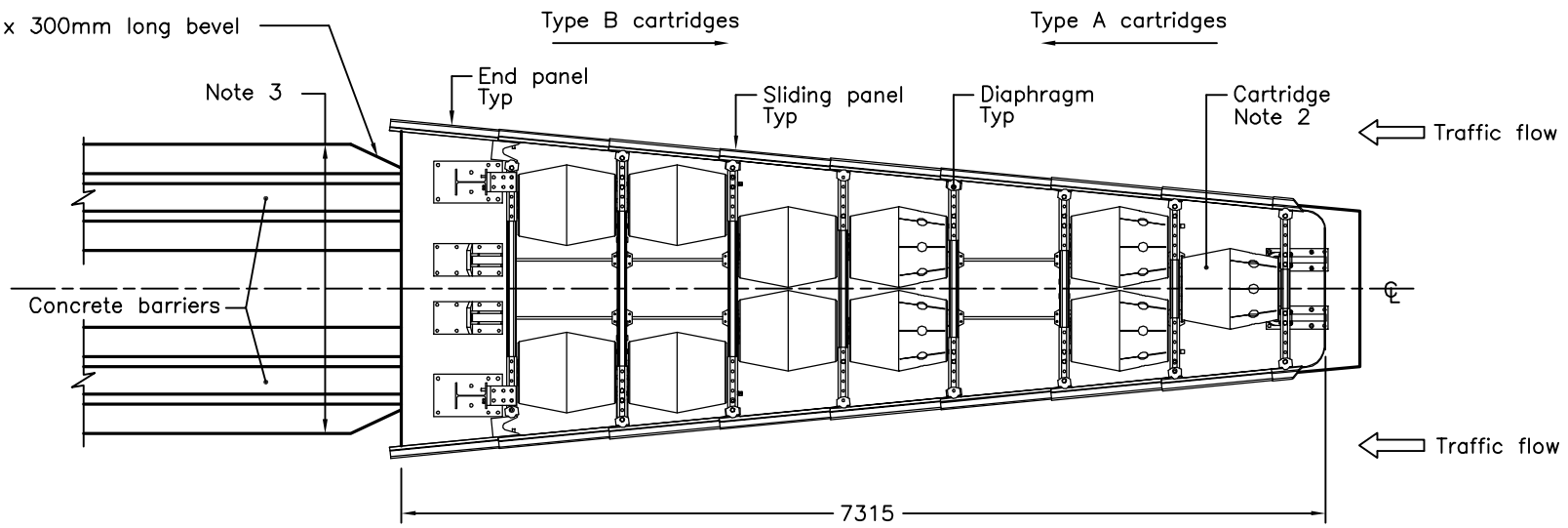
ELEVATION

NOTES:

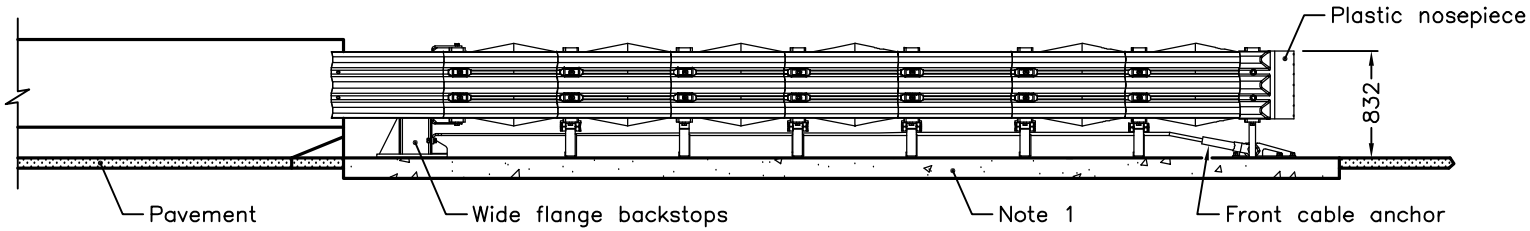
1 The system shall be anchored to concrete pad detailed in OPSD 923.005.
2 2 Type A and 4 Type B cartridges.
3 Maximum width of object shall be 2200mm for the first 762mm behind the rear fender panels.
4 Removable 20mm dia anchor bolts, each with an ultimate pullout strength of 100kN in 30MPa concrete.

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.

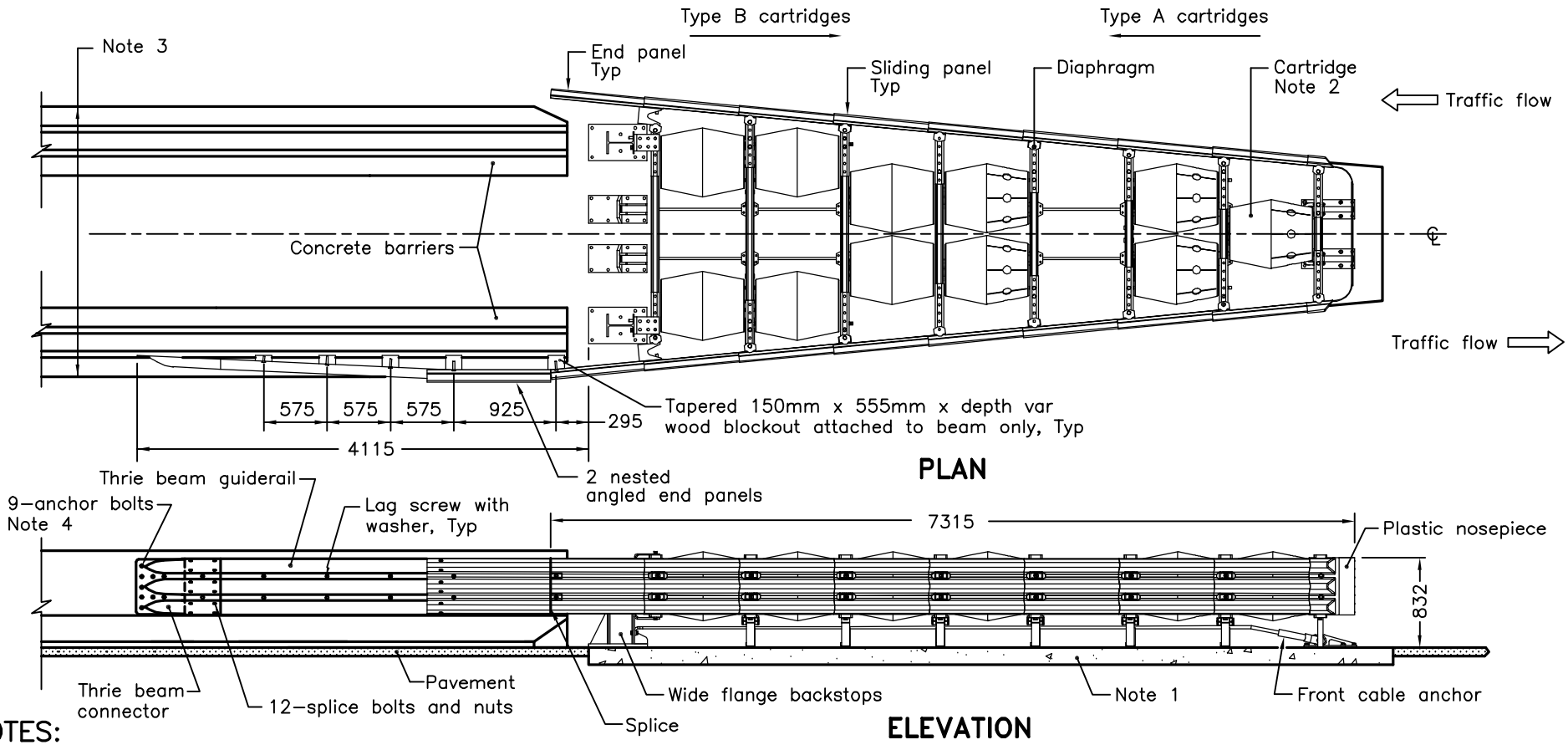
ONTARIO PROVINCIAL STANDARD DRAWING

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.

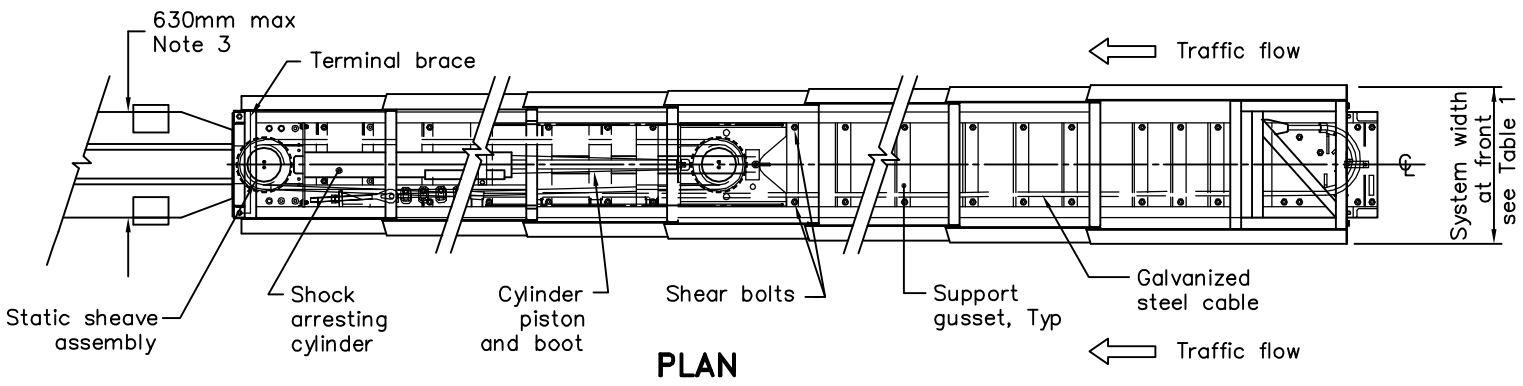
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION TAU–II EXTRA WIDE SYSTEM – TL–3 INSTALLATION – PERMANENT BIDIRECTIONAL

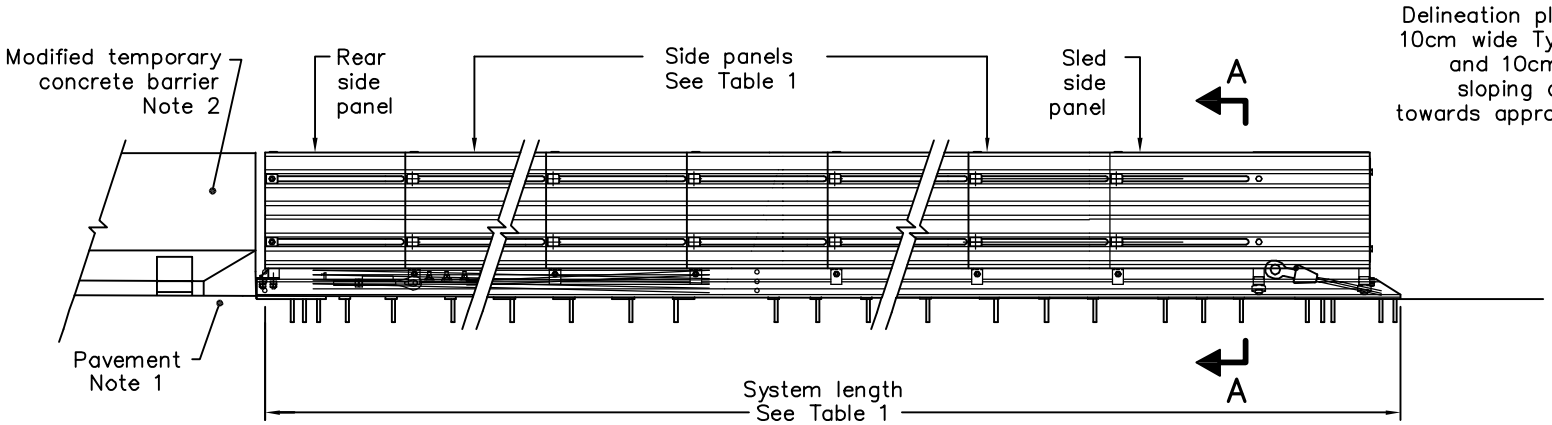
Nov 2011 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

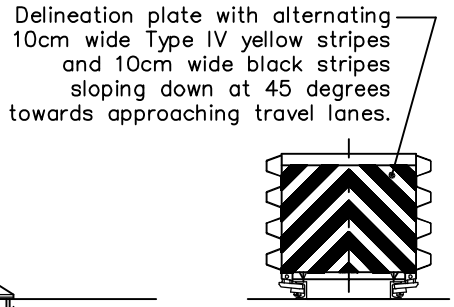
OPSD 923.395



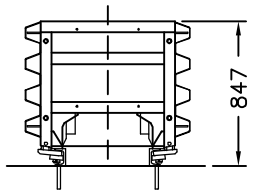
PLAN



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.

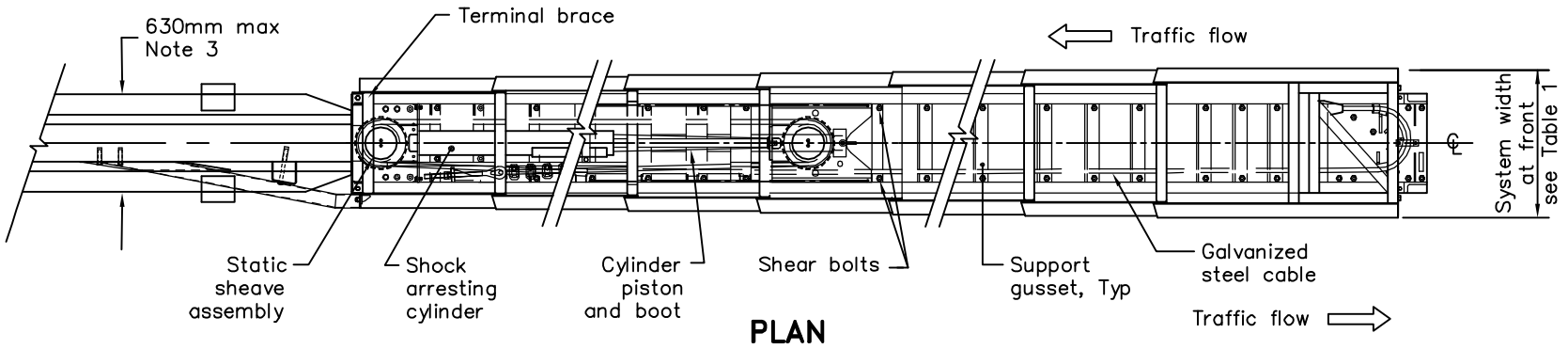
TABLE 1		
SYSTEM CONFIGURATION	TL–2	TL–3
SYSTEM LENGTH	4118	6556
SIDE PANELS PER SIDE	2	5
SYSTEM WIDTH	879	951

ONTARIO PROVINCIAL STANDARD DRAWING

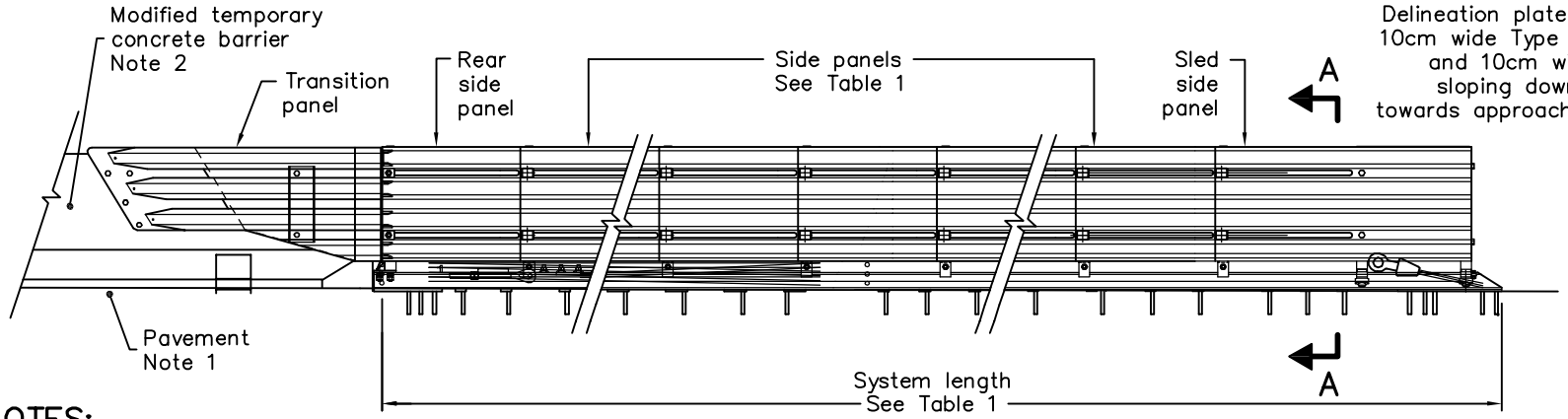
ENERGY ATTENUATOR, CRASH CUSHION SMART SYSTEM INSTALLATION–TEMPORARY UNIDIRECTIONAL

Nov 2010 | Rev | 0

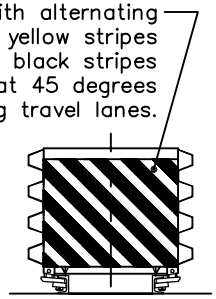
OPSD 923.480



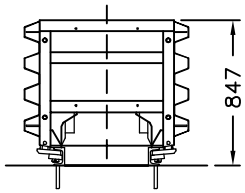
PLAN



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

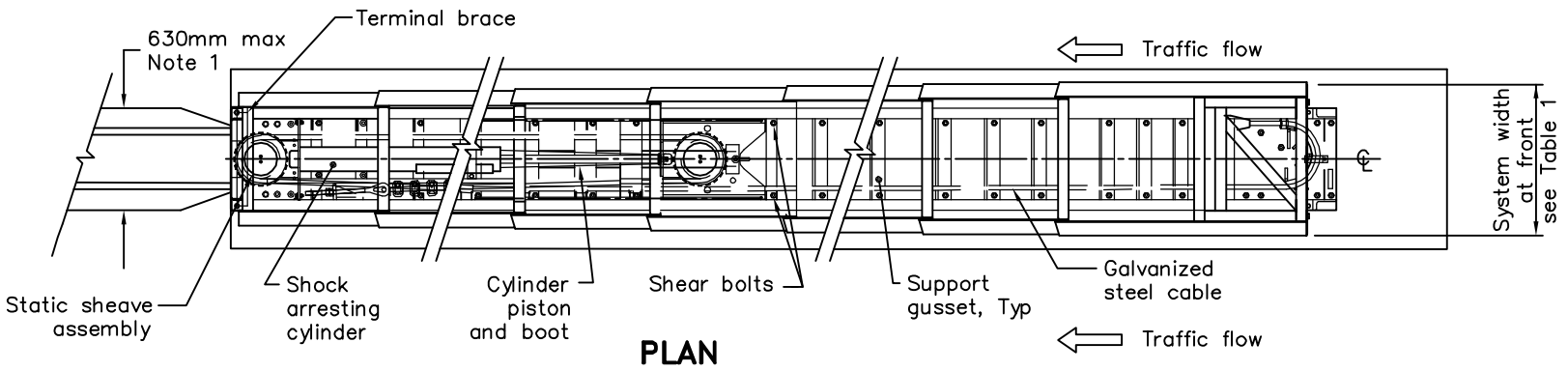
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION SMART SYSTEM INSTALLATION–TEMPORARY BIDIRECTIONAL

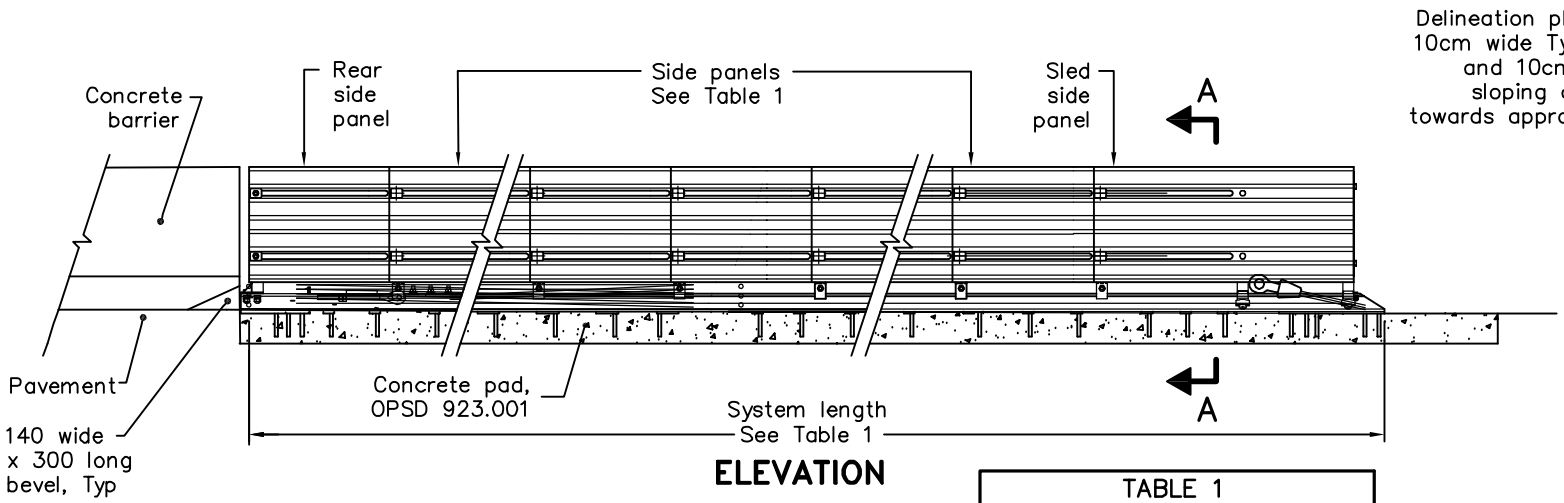
Nov 2010 | Rev | 0

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

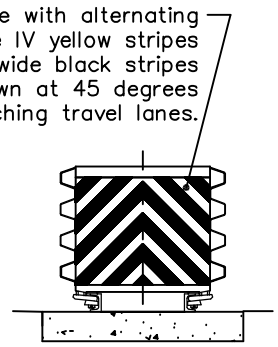
OPSD 923.481



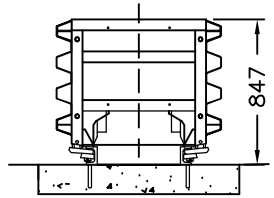
PLAN



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.

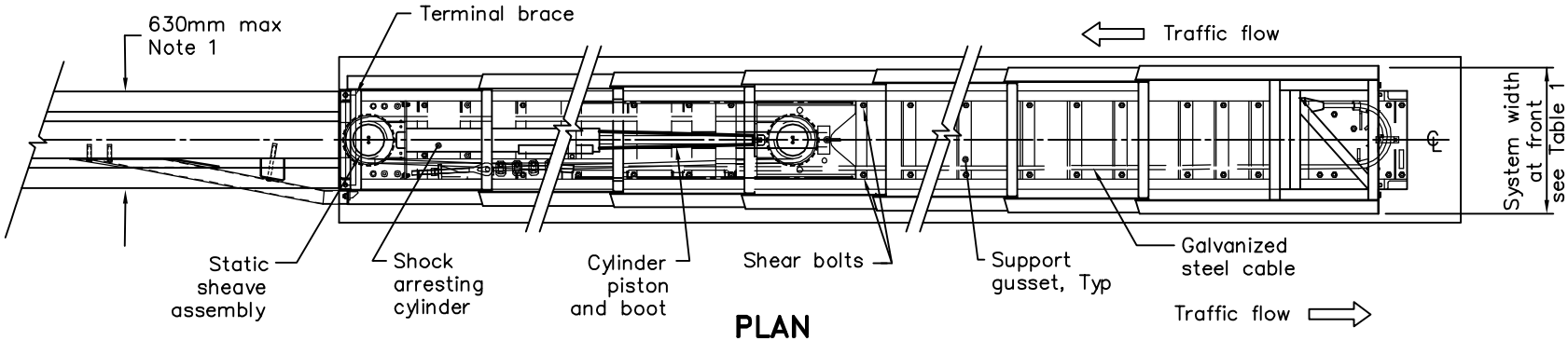
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION SMART SYSTEM INSTALLATION–PERMANENT UNIDIRECTIONAL

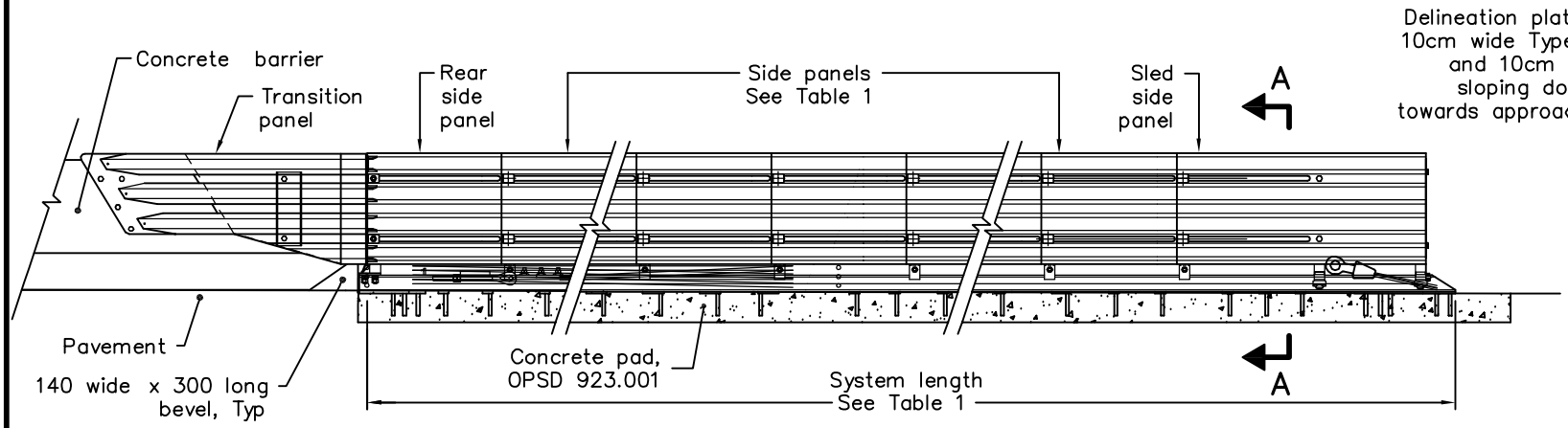
Nov 2010 | Rev | 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

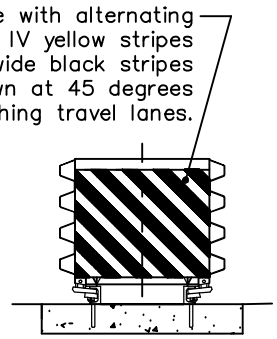
OPSD 923.482



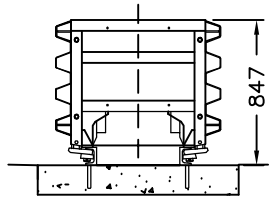
PLAN



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.

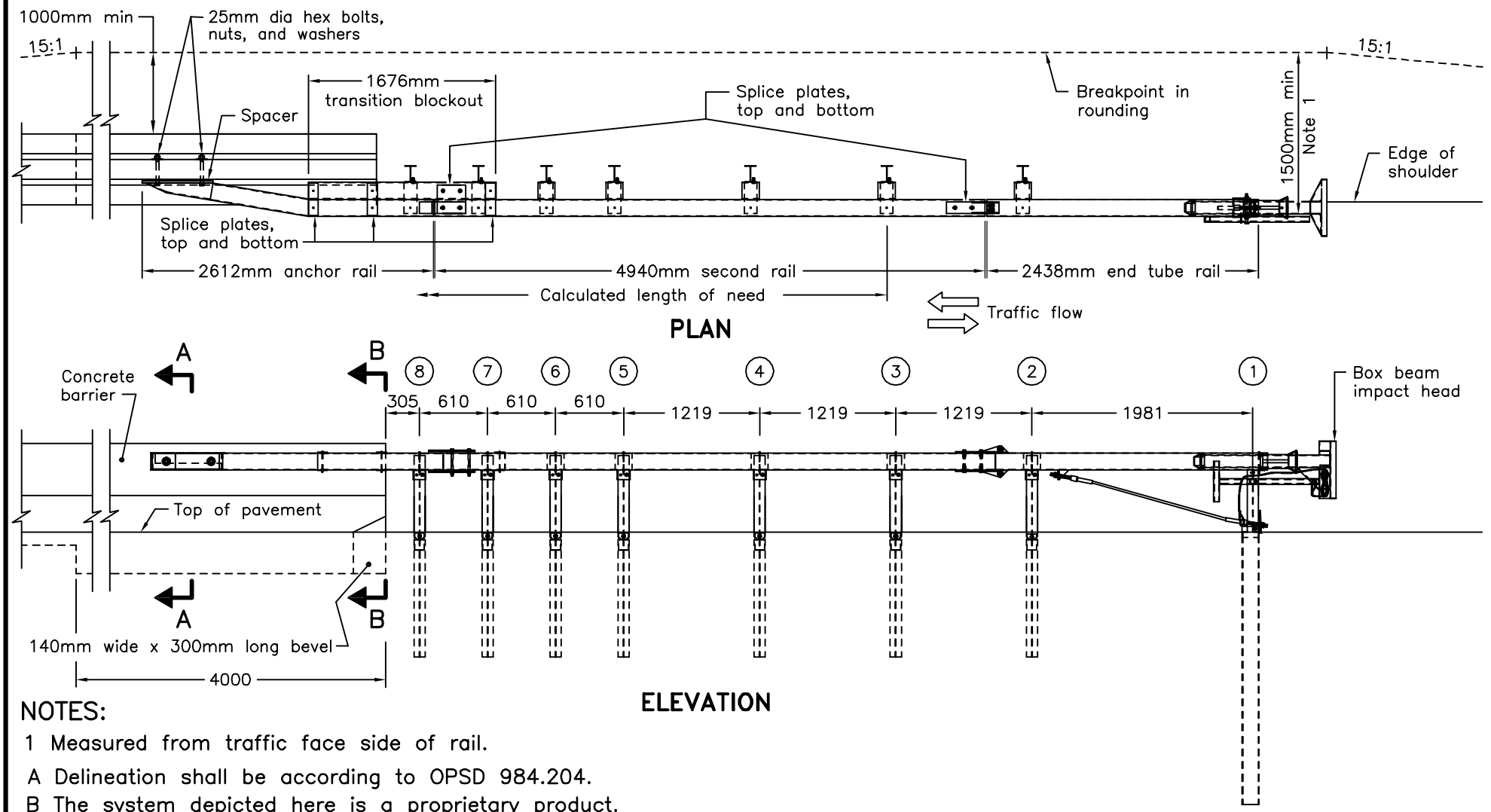
ONTARIO PROVINCIAL STANDARD DRAWING

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.

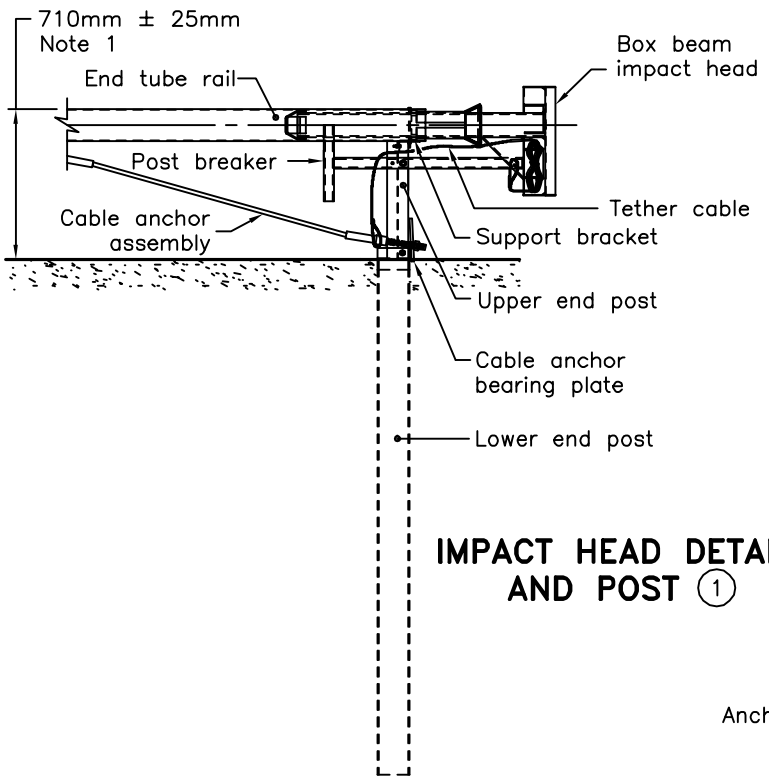
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION BOX BEAM BURSTING ENERGY ABSORBING TERMINAL INSTALLATION – LAYOUT

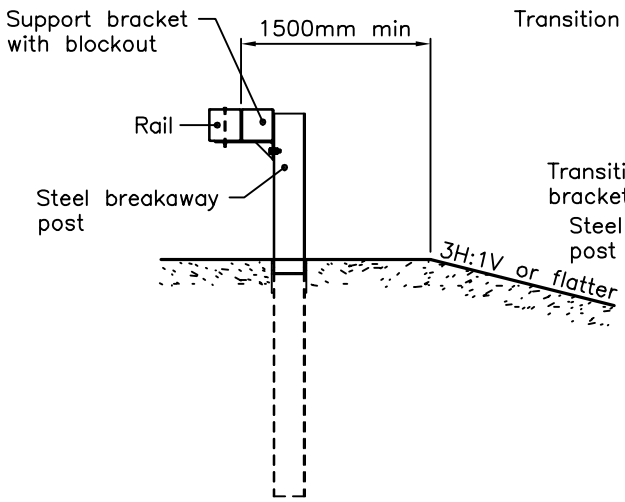
Nov 2011 | Rev 1

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

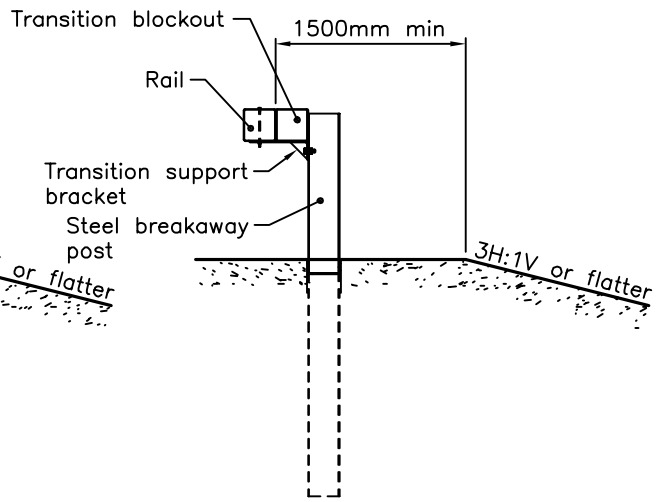
OPSD 923.530



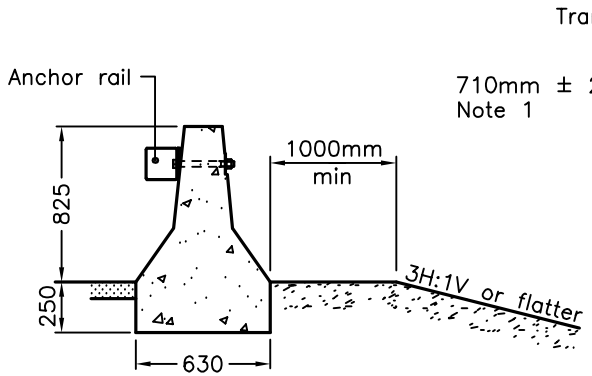
IMPACT HEAD DETAIL AND POST (1)



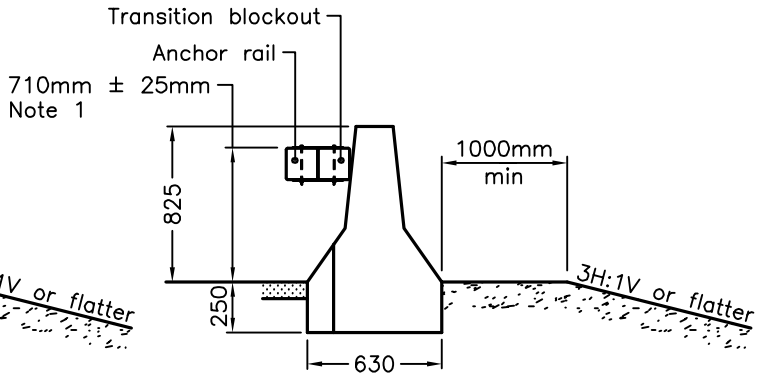
POSTS (2)(3)(4)(5)(6)



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

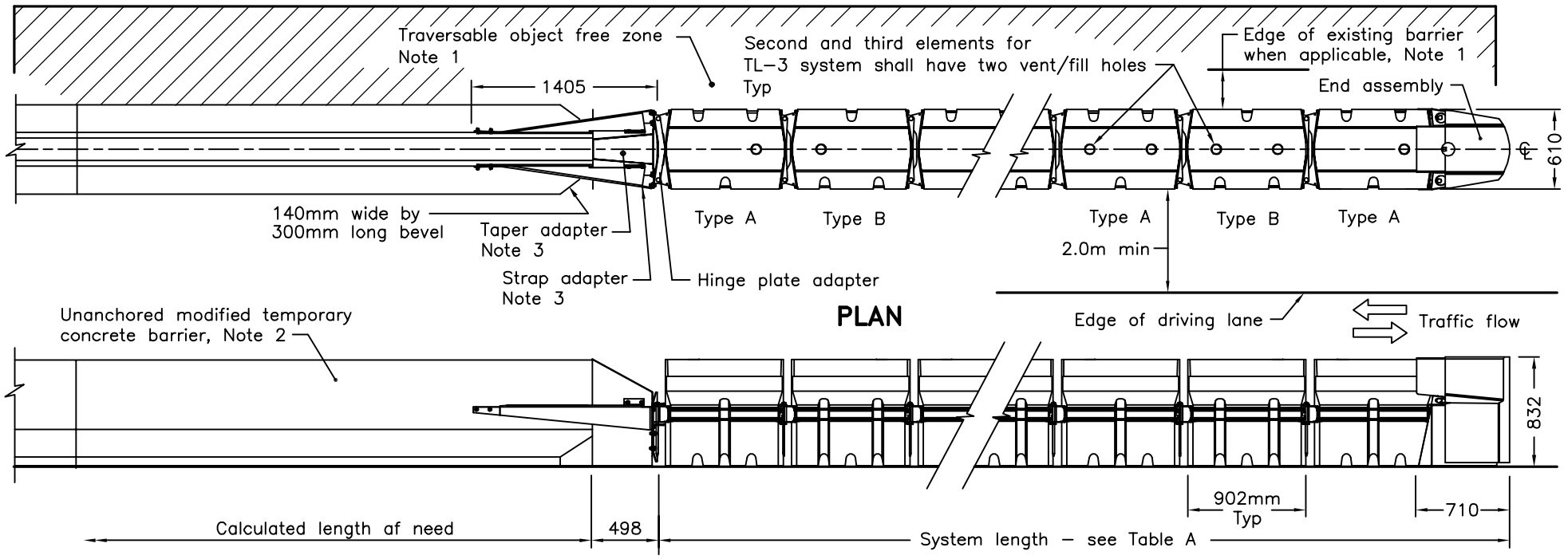
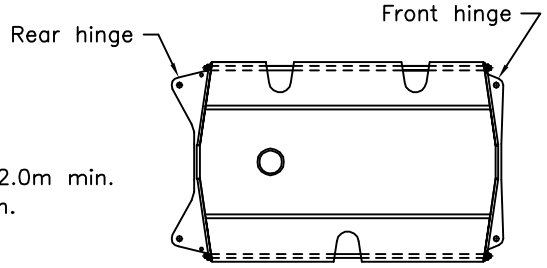
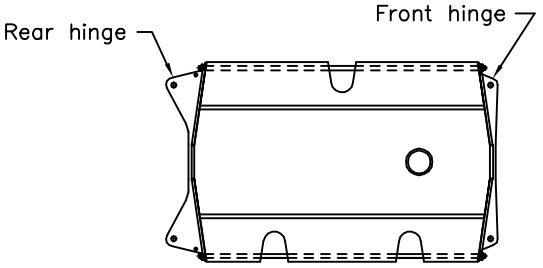


TABLE A		
System Configuration	TL-2	TL-3
Elements	5	9
Configuration	A-B-A-B-A	A-B-A-B-A-B-A-B-A
System Length	4740	9379



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.

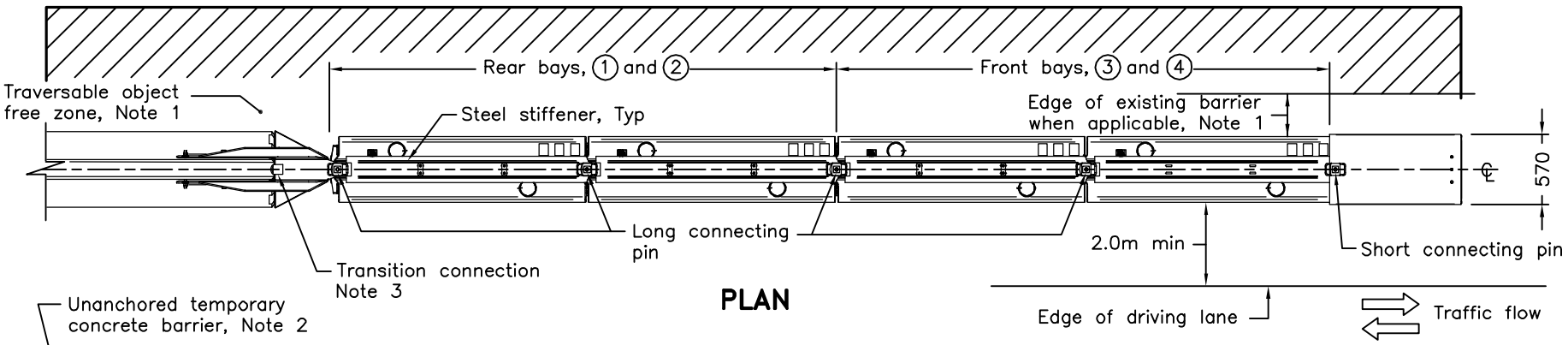
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION ABSORB 350 SYSTEM INSTALLATION–TEMPORARY CONCRETE BARRIER

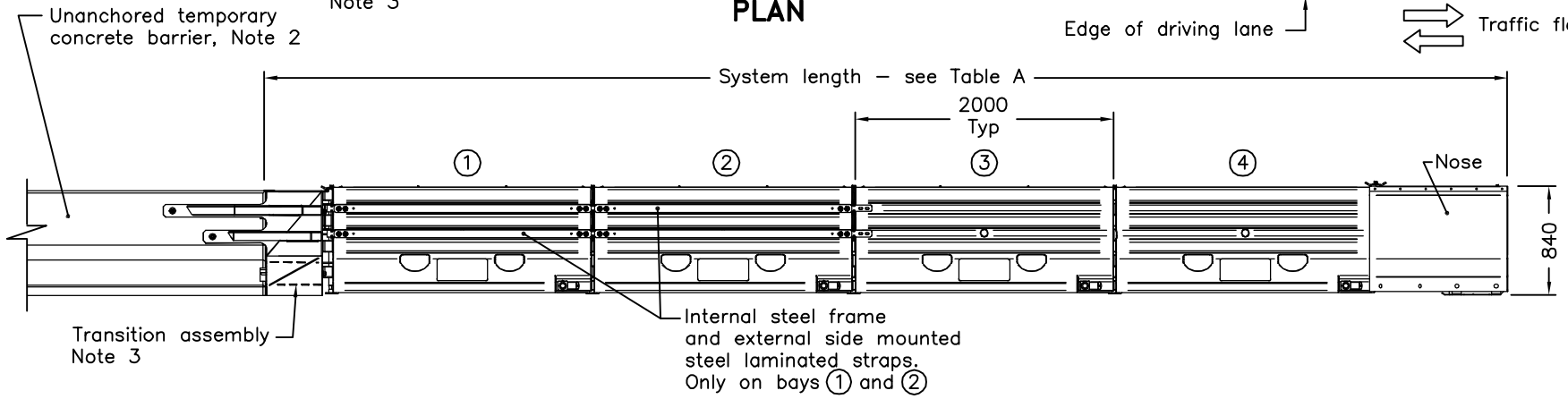
Nov 2011 | Rev 0

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.

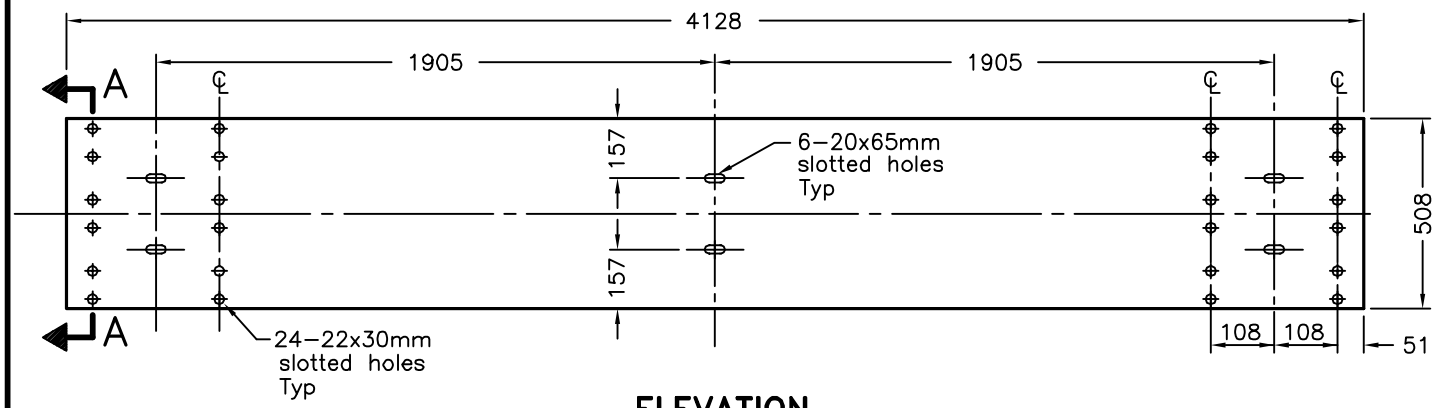
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION ACZ–350 SYSTEM INSTALLATION–TEMPORARY CONCRETE BARRIER

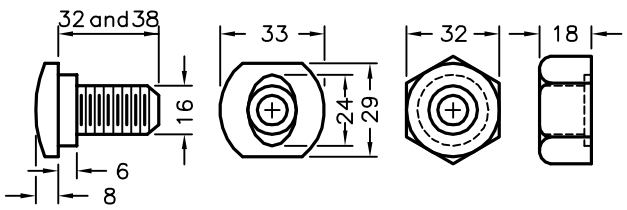
Nov 2015 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

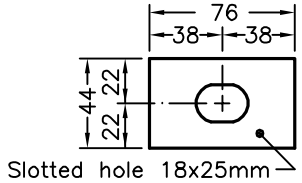
OPSD 924.135



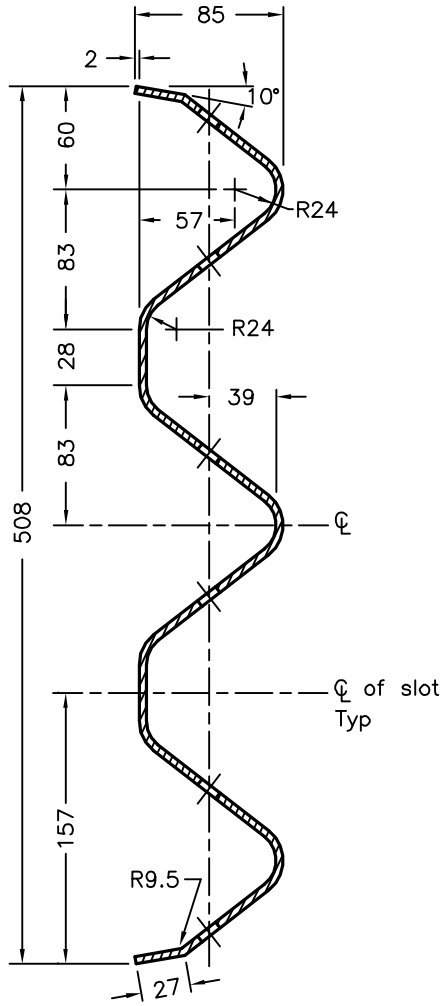
ELEVATION



SPLICE BOLT AND NUT



RECTANGULAR WASHER
Note 1



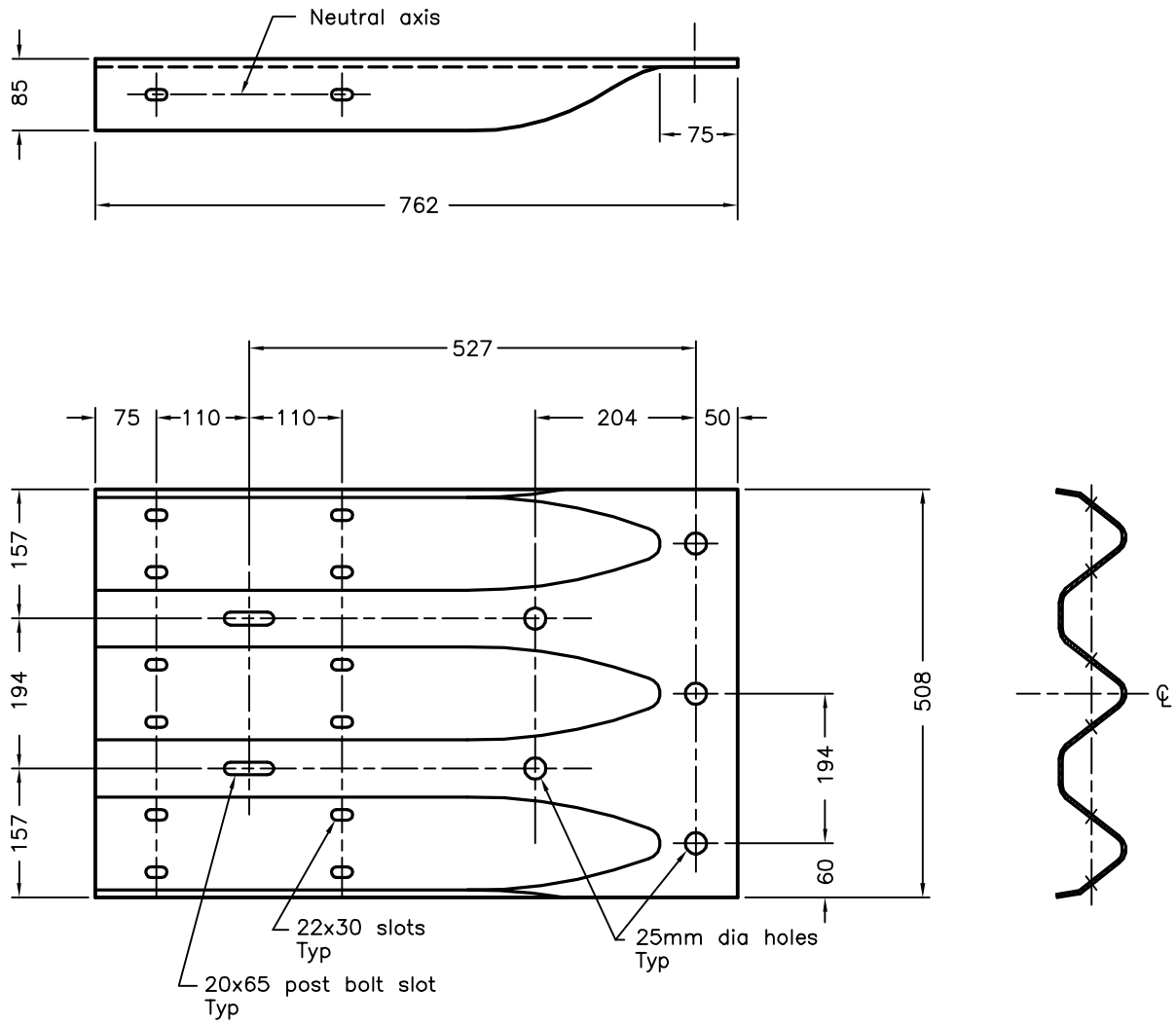
ENLARGED SECTION A–A

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 COMPONENT – RAIL			
	OPSD 925.010		



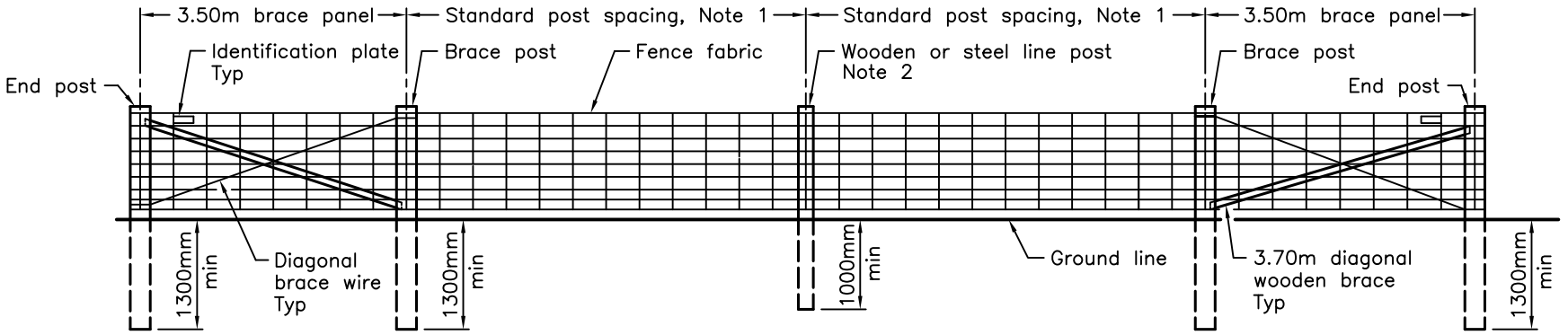
ELEVATION

NOTES:

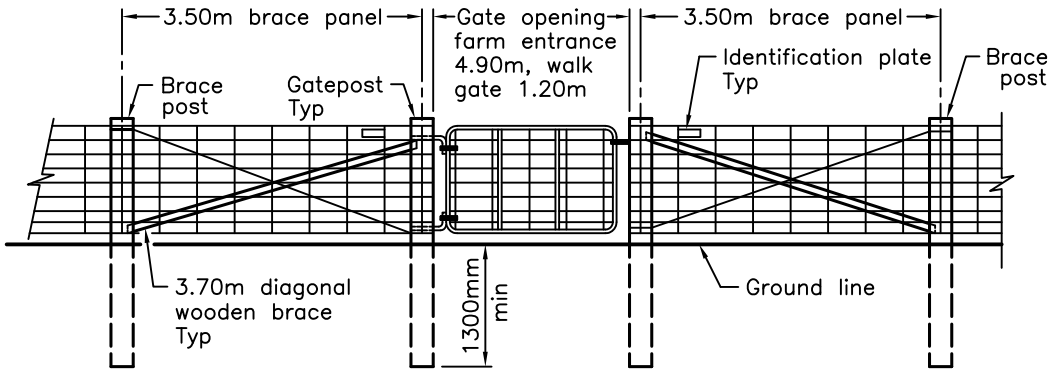
A Base metal thickness of terminal connector shall be 3.43mm nominal and 3.18mm minimum.

B All dimensions are in millimetres unless otherwise shown.

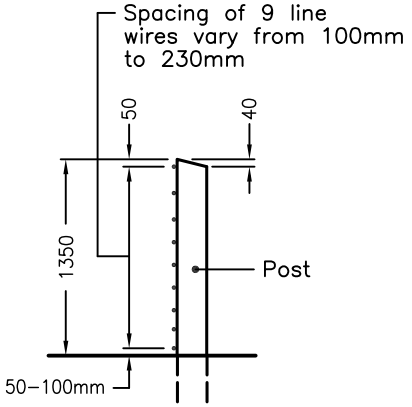
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	0
GUIDE RAIL SYSTEM, THRIE BEAM COMPONENT – TERMINAL CONNECTOR			
	OPSD 925.030		



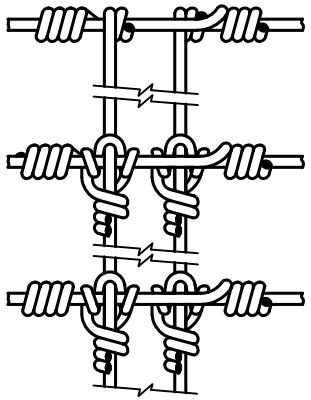
HIGHWAY FENCE
IN EARTH, SHALE, LOOSE ROCK, OR FRIABLE ROCK



GATE DETAIL



WIRE SPACING DETAIL



SPLICING DETAIL

NOTES:

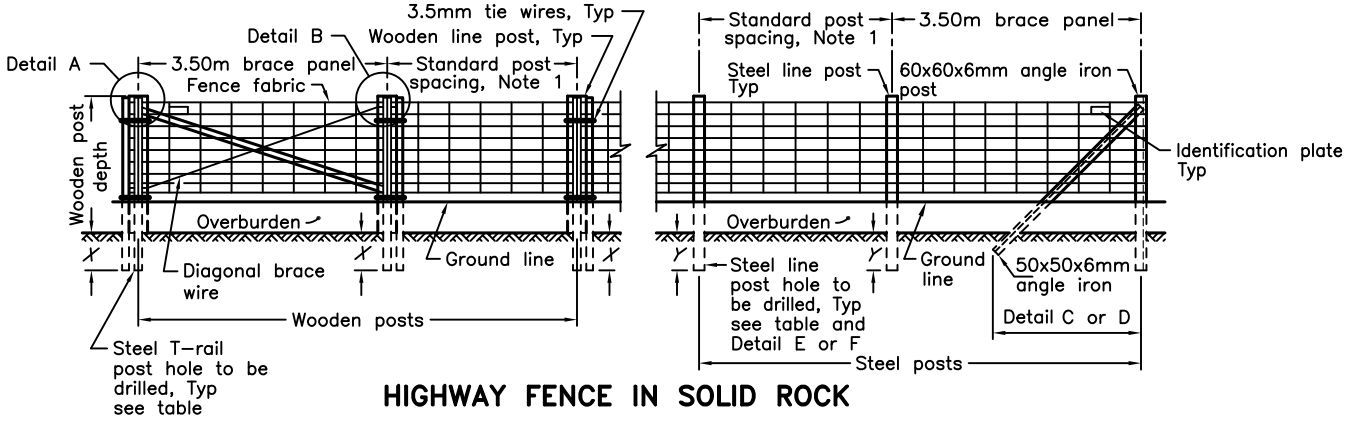
1 Standard post spacing shall be 6.0m for wooden post to wooden post and 5.0m for steel post to steel or wooden post.

2 Ratio of steel posts to wooden posts shall be 3:1.

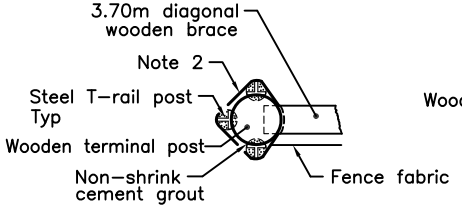
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	3
FENCE, HIGHWAY **IN EARTH, SHALE, LOOSE ROCK, OR FRIABLE ROCK** **INSTALLATION**			
	OPSD 971.101		

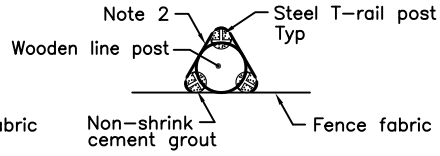
STEEL POST DEPTH IN ROCK		
EARTH OVERBURDEN DEPTH	POST DEPTH Min	
	T–RAIL POST X	LINE POST Y
0–600	380	380
600–1000	230	230
1000–1200	230	0



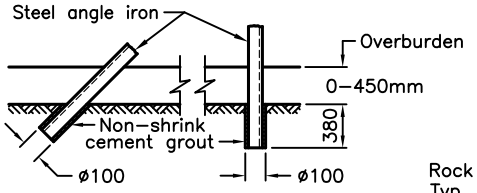
HIGHWAY FENCE IN SOLID ROCK



DETAIL A

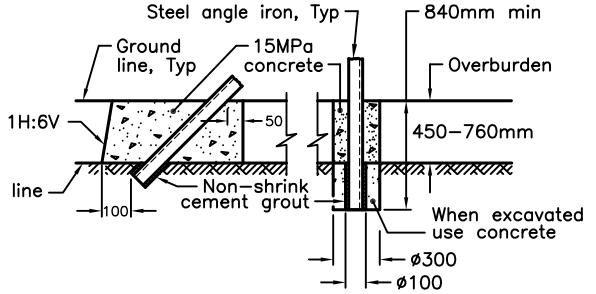


DETAIL B



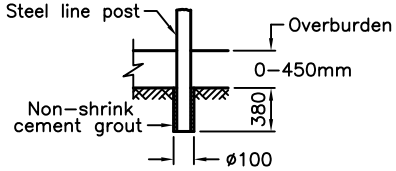
DETAIL C

BRACE PANEL IN OVERBURDEN LESS THAN 450mm



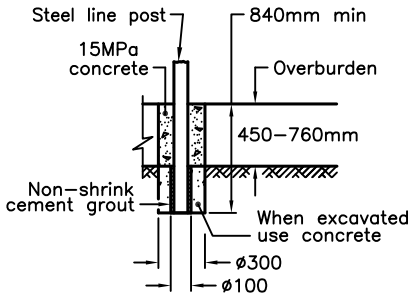
DETAIL D

BRACE PANEL IN OVERBURDEN BETWEEN 450 – 760mm



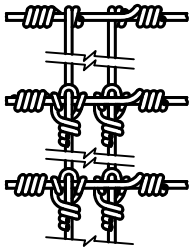
DETAIL E

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.

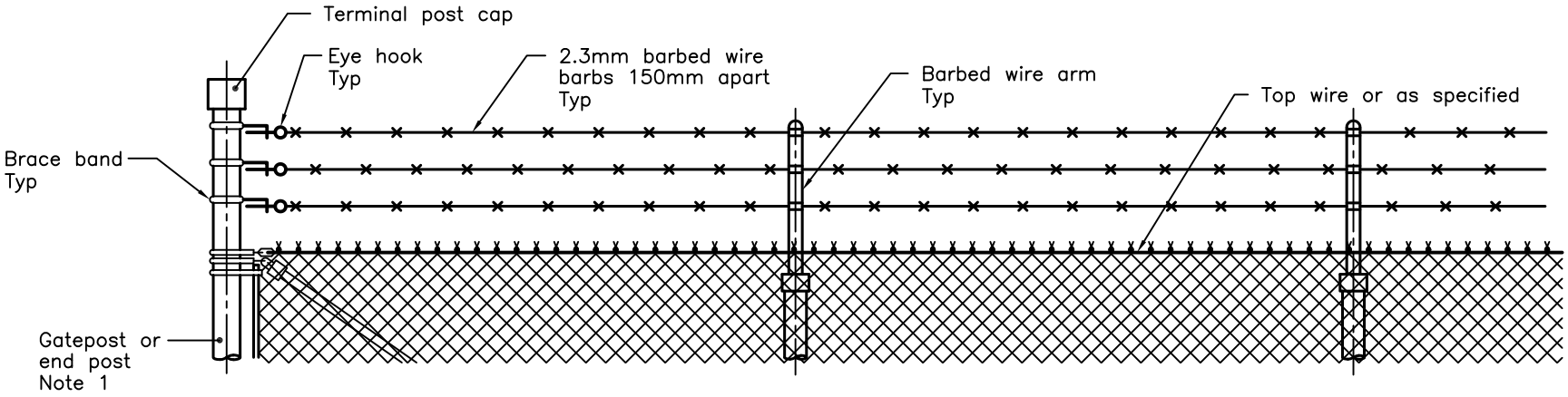
A All dimensions are in millimetres unless otherwise shown.

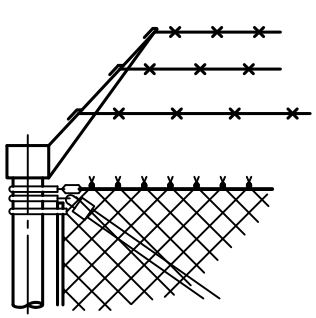
ONTARIO PROVINCIAL STANDARD DRAWING

FENCE, HIGHWAY IN SOLID ROCK INSTALLATION

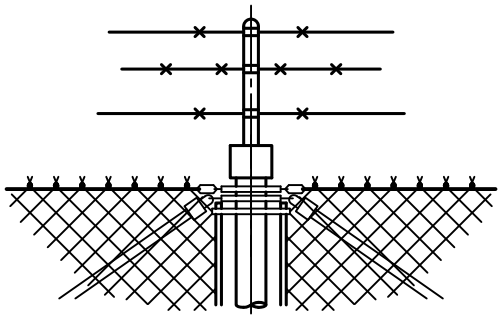
Nov 2012 | Rev 1

OPSD 971.102

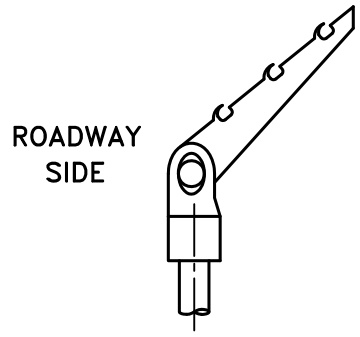




CORNER POST
WITH BARBED WIRE ARM



STRAINING POST
WITH BARBED WIRE ARM



LINE POST WITH
BARBED WIRE ARM

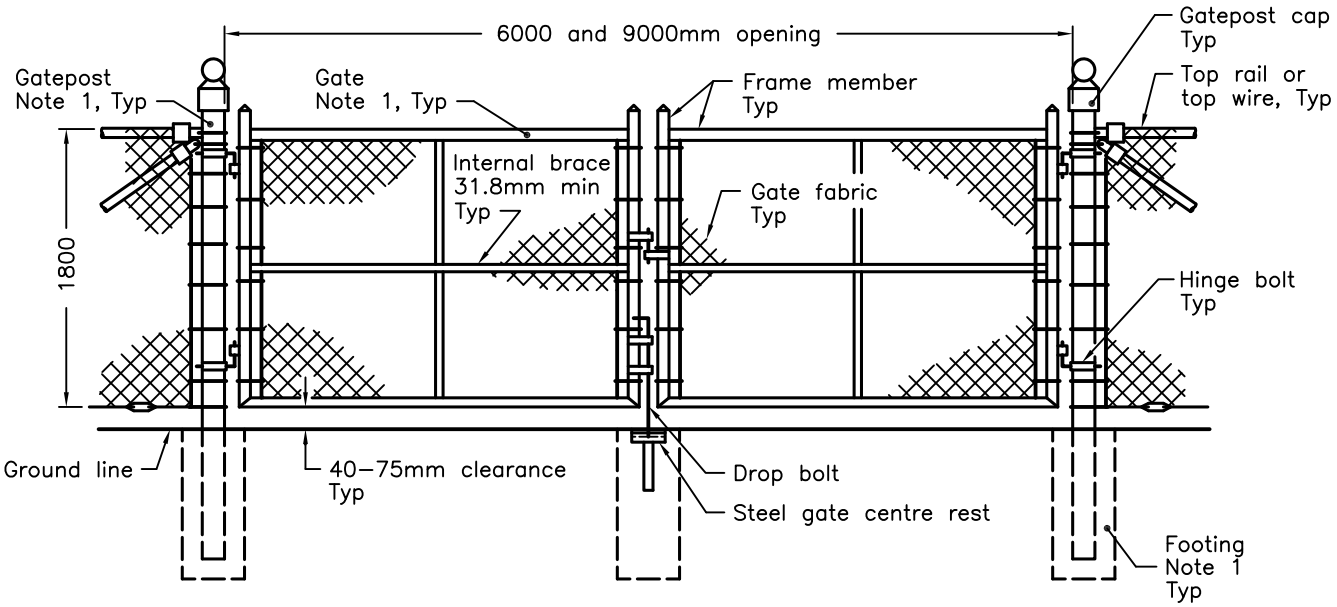
NOTES:

1 Terminal post shall be lengthened when barbed wire is specified, except when barbed wire arms are used.

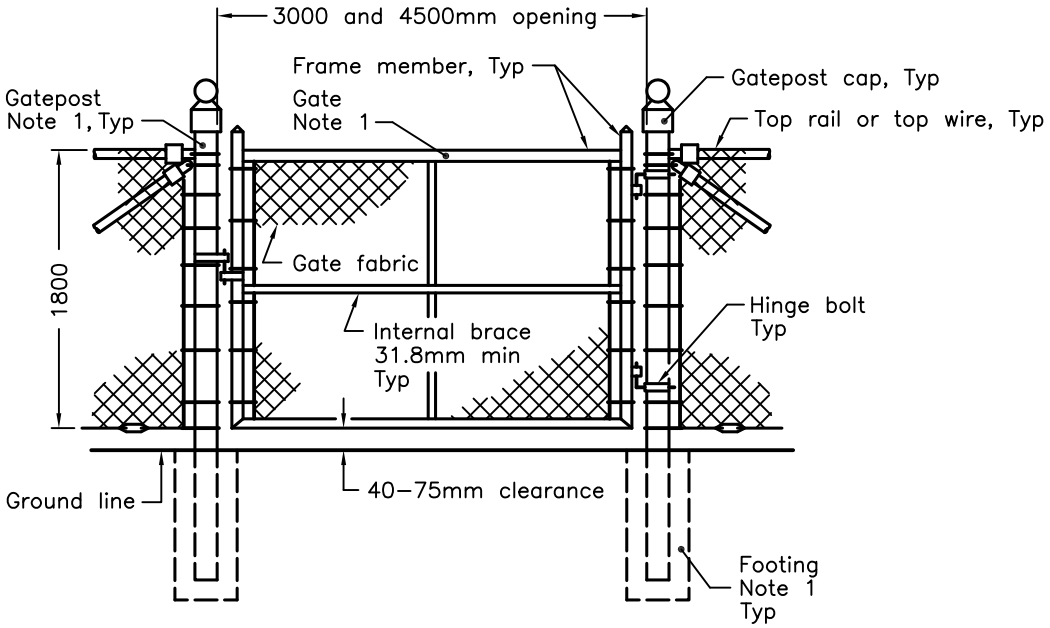
A Installation as viewed from the roadway.

B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
FENCE, CHAIN-LINK COMPONENT – BARBED WIRE			
	OPSD 972.101		



DOUBLE SWING GATE OPENING



SINGLE SWING GATE OPENING

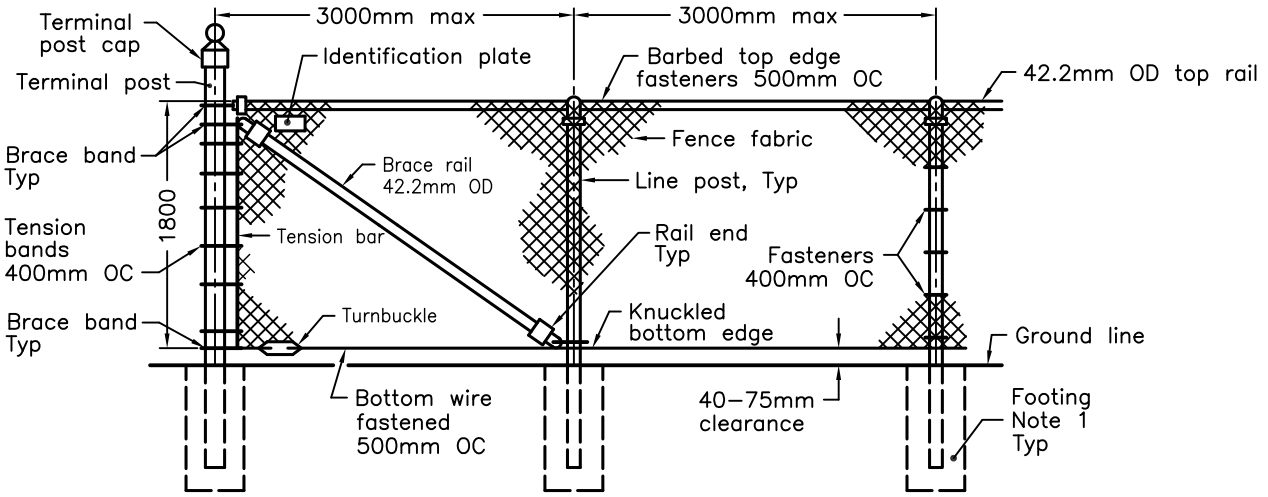
NOTES:

1 For footing details and Gate and Gatepost Details Table refer to OPSD 972.132.

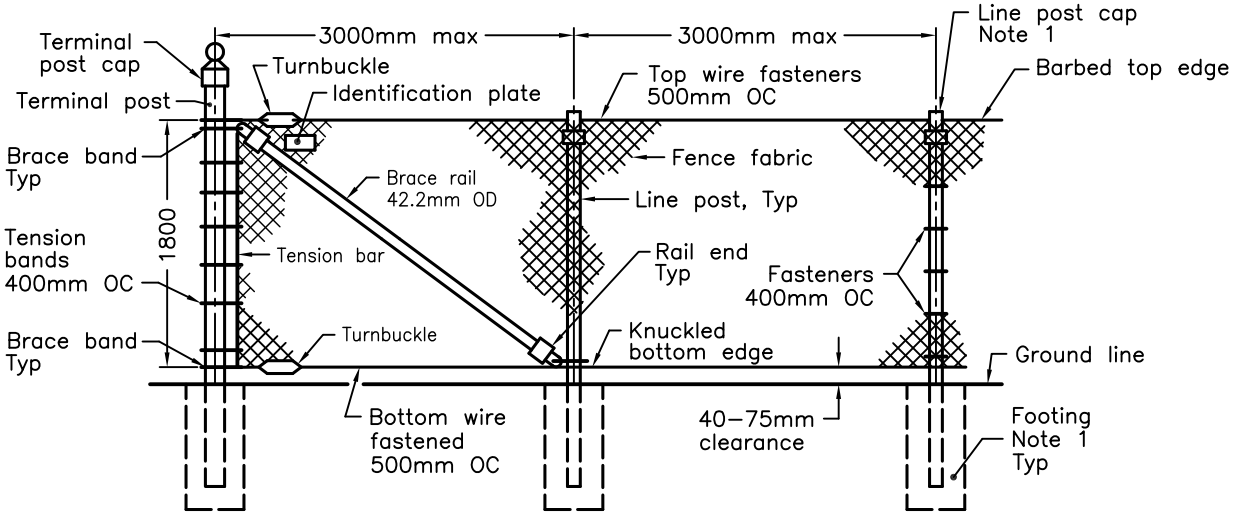
A Gates as viewed from the roadway.

B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
FENCE, CHAIN–LINK 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.

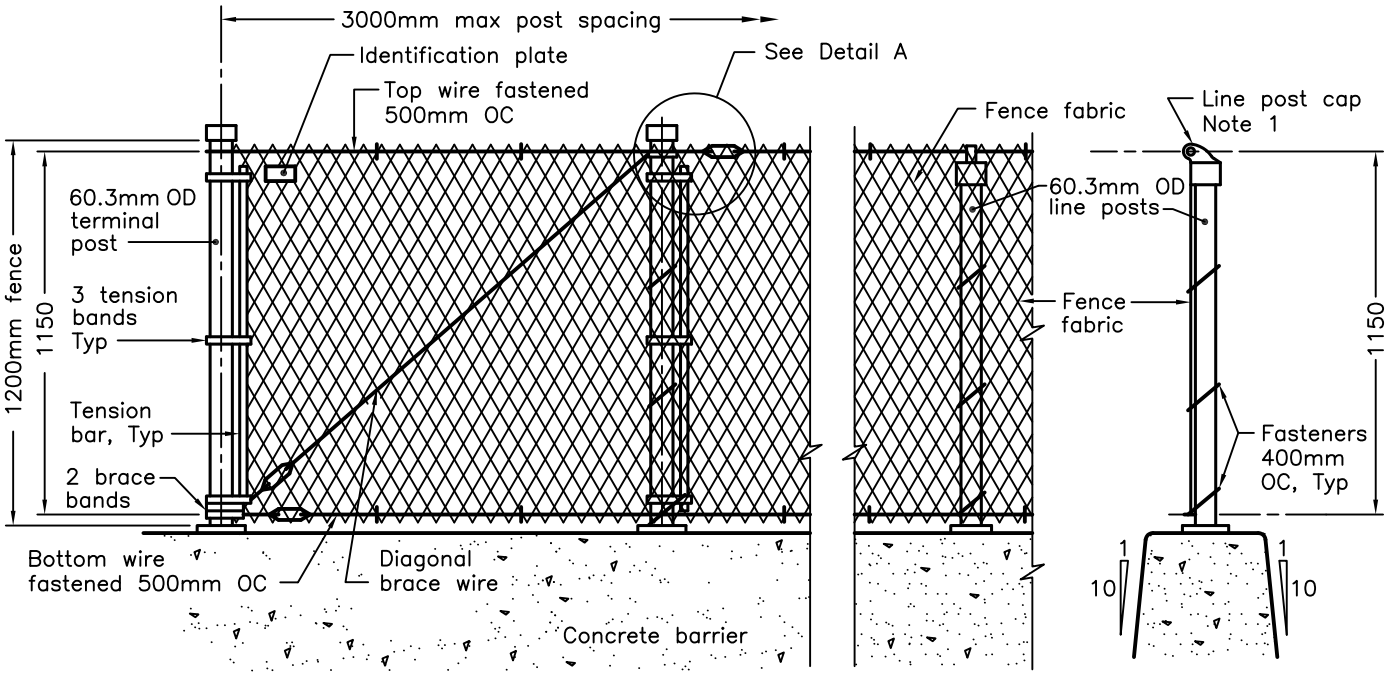
ONTARIO PROVINCIAL STANDARD DRAWING

FENCE, CHAIN–LINK
INSTALLATION – ROADWAY

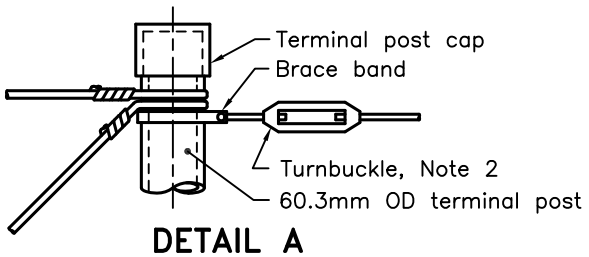
Nov 2012 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

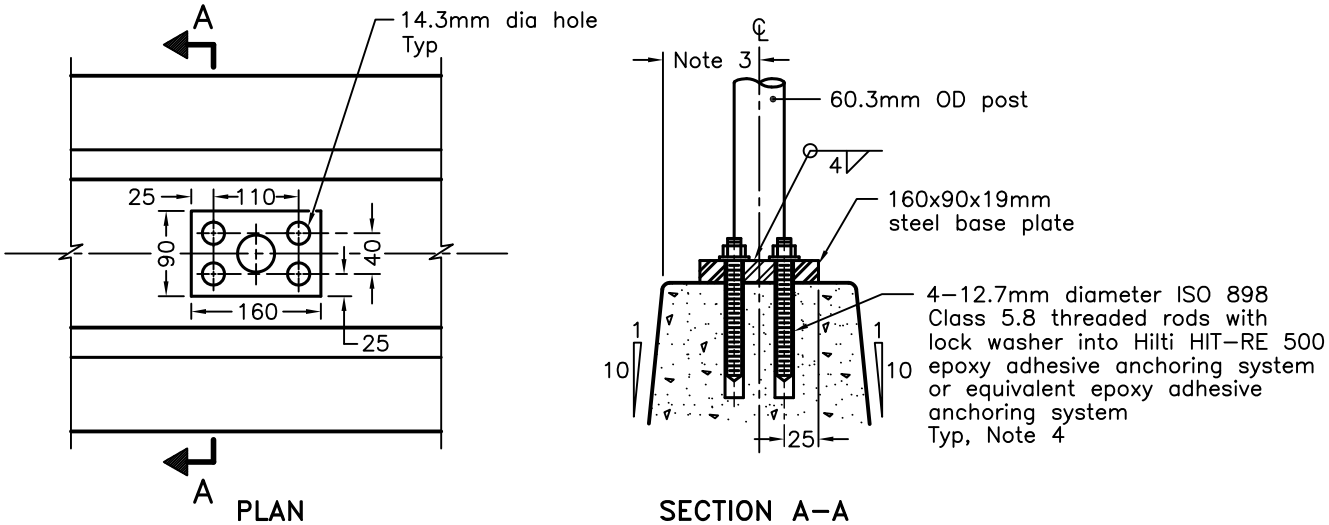
OPSD 972.130



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.

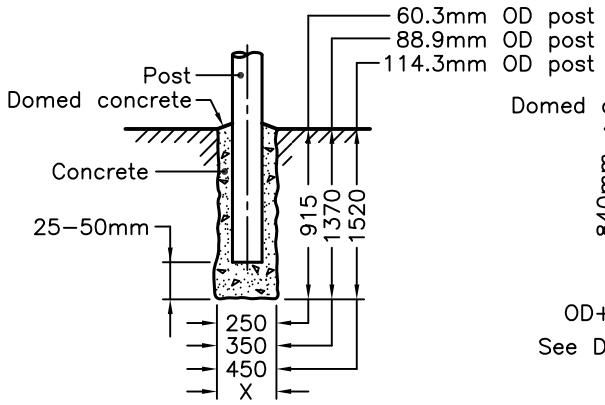
2 Turnbuckles shall be installed on diagonal brace wires and top and bottom wires, at intervals of 150m max and at terminal posts.

3 Chain–link fence posts shall be located on centreline of concrete barrier.

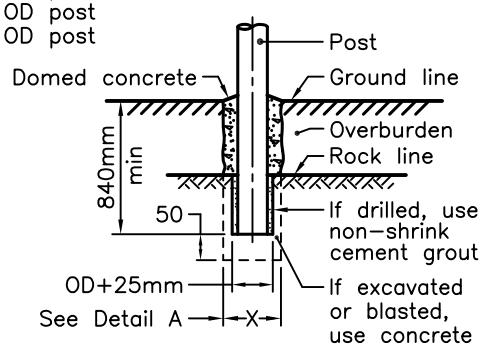
4 Anchors shall be installed according to manufacturer's specifications.

A All dimensions are in millimetres unless otherwise shown.

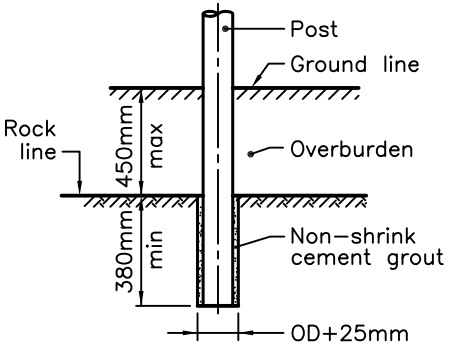
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
FENCE, CHAIN–LINK INSTALLATION – CONCRETE BARRIER			
			OPSD 972.131



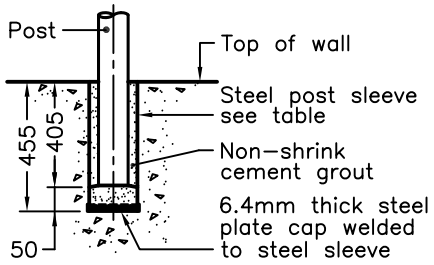
DETAIL A
FOOTING IN EARTH



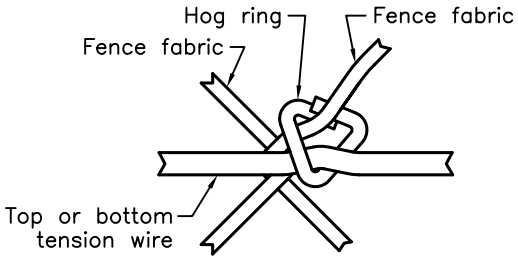
DETAIL B
FOOTING IN SHALE, LOOSE OR FRIABLE ROCK, OR SOLID ROCK WITH MORE THAN 450mm OVERBURDEN



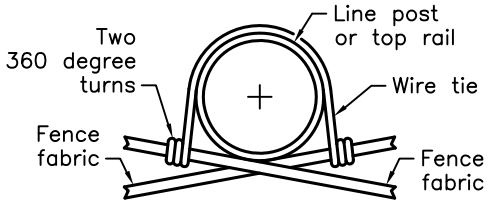
DETAIL C
FOOTING IN SOLID ROCK LESS THAN 450mm OVERBURDEN



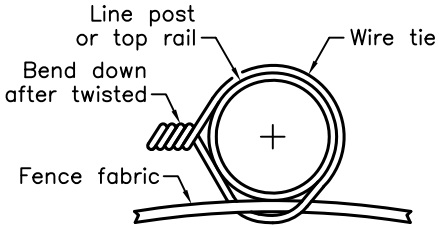
DETAIL D
FOOTING IN RETAINING WALL



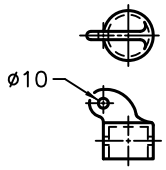
HOG RING TIE DETAIL



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.

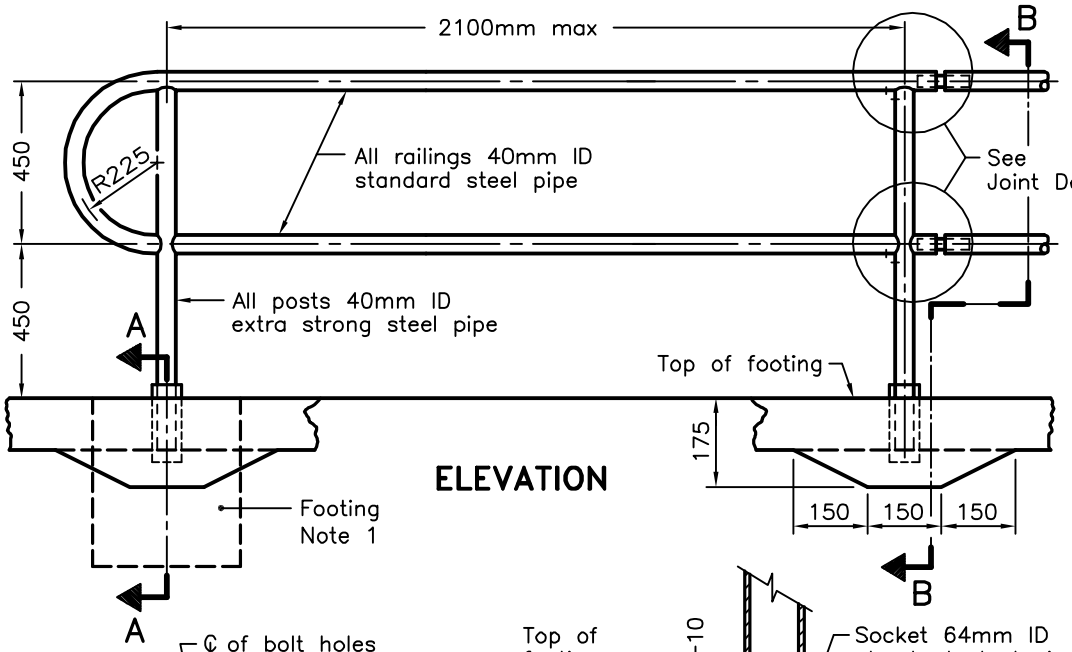
ONTARIO PROVINCIAL STANDARD DRAWING

FENCE, CHAIN–LINK
DETAILS AND TABLE

Nov 2012 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 972.132

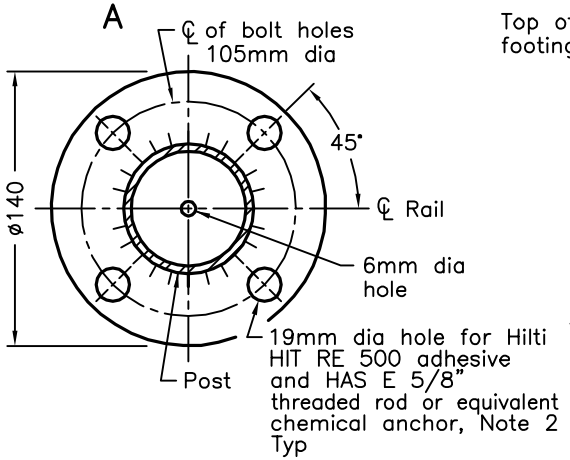


ELEVATION

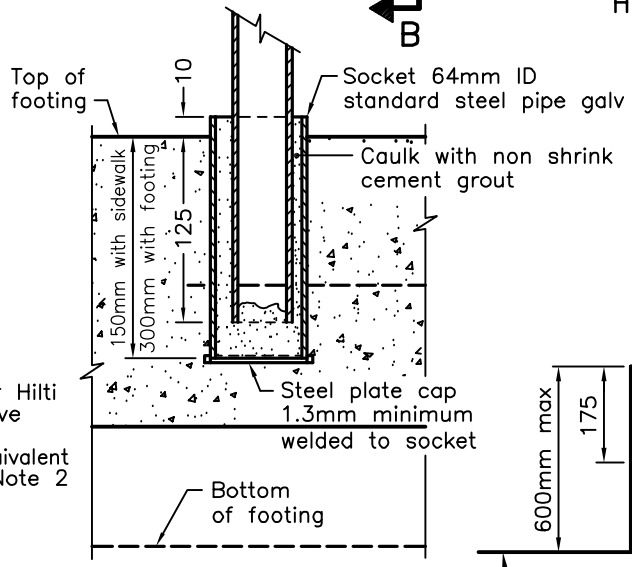
NOTES:

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.

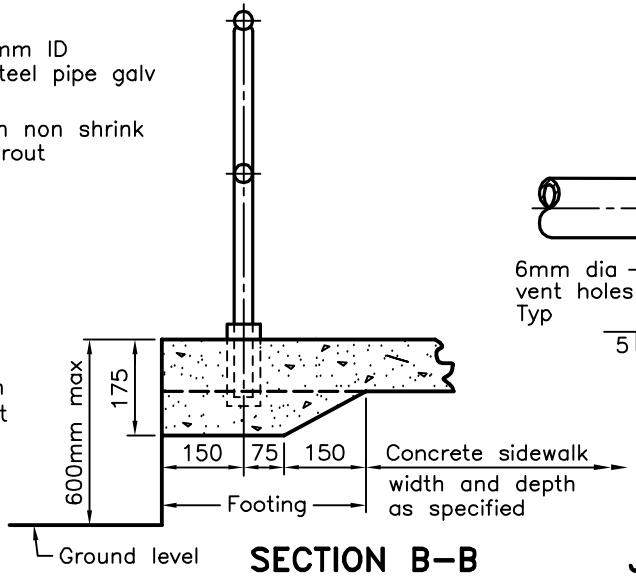
A Concrete shall have a nominal minimum 28–Day compressive strength of 20MPa.
B Posts and railings shall be hot dip galvanized according to CSA G164 after fabrication.
C Posts shall be vertical. All exposed corners shall be ground smooth.
D Welding shall be according to CSA W59.
E All joints shall be 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.



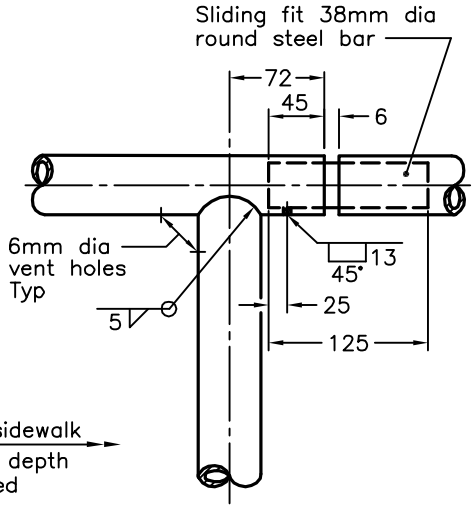
PLAN OF BASE PLATE



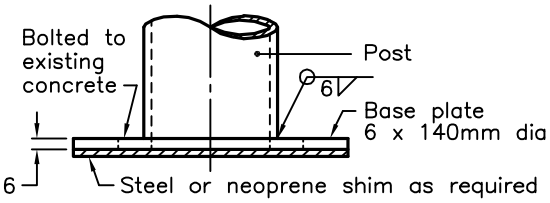
SECTION A–A



SECTION B–B



JOINT DETAIL



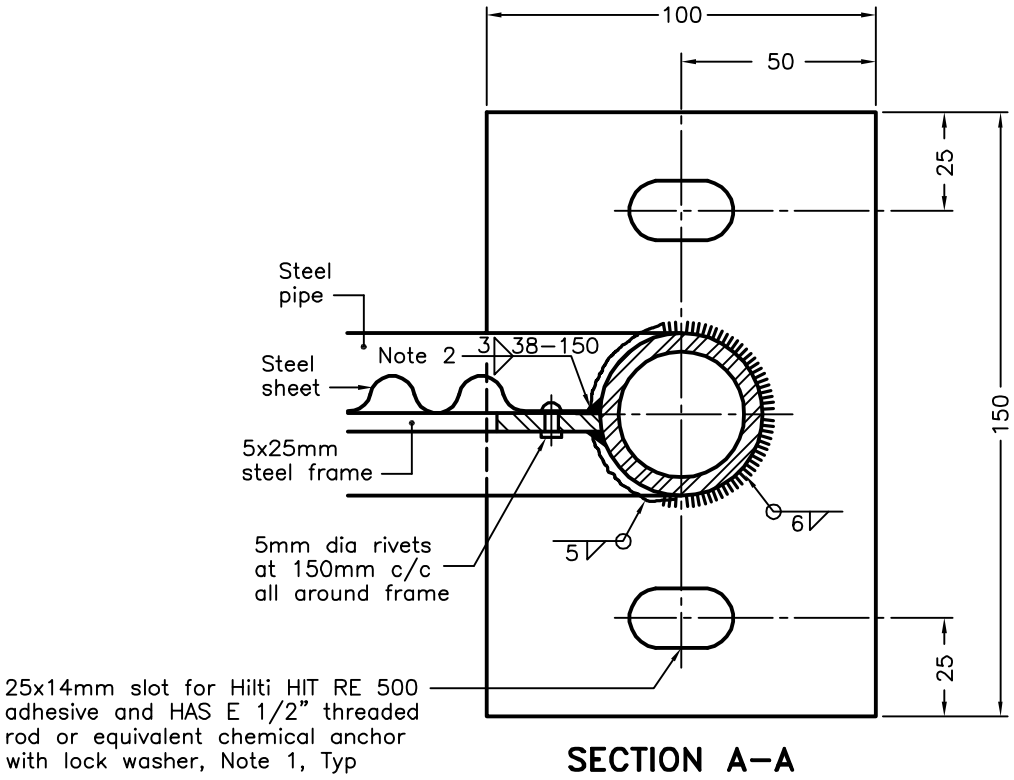
BASE PLATE ELEVATION
INSTALLATION DETAIL ON EXISTING CONCRETE

ONTARIO PROVINCIAL STANDARD DRAWING

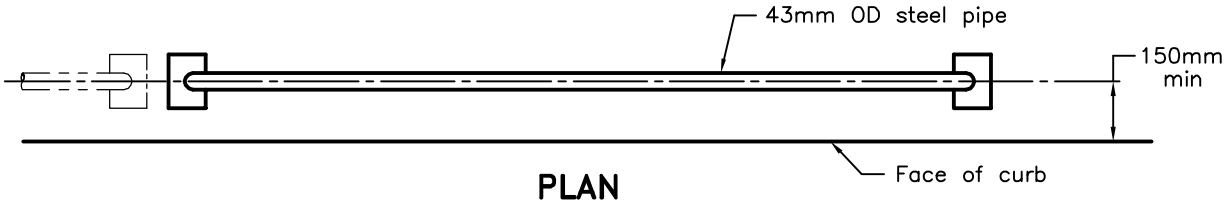
PEDESTRIAN BARRICADE
INSTALLATION

Nov 2009	Rev	2

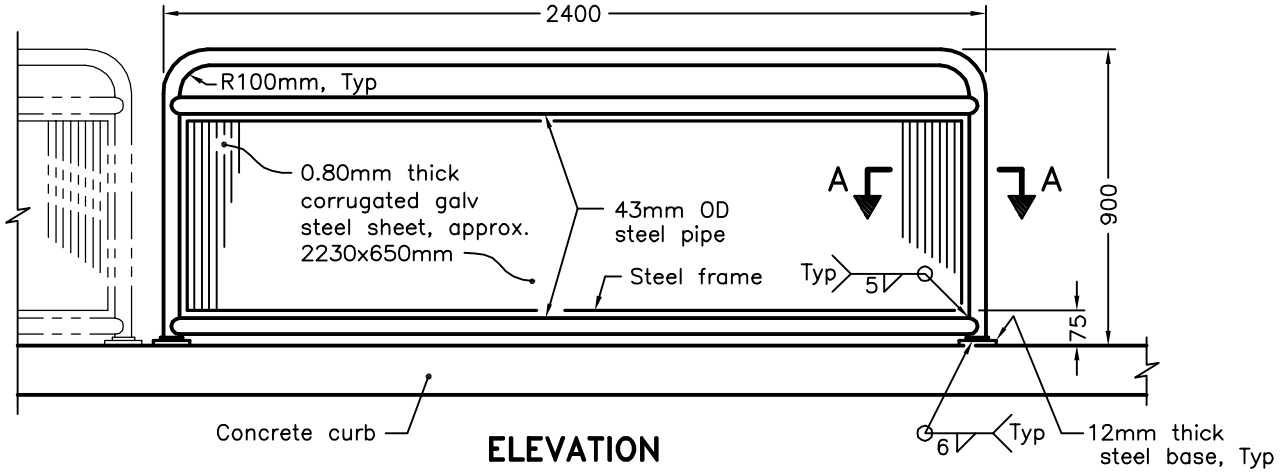
OPSD 980.101



SECTION A–A



PLAN



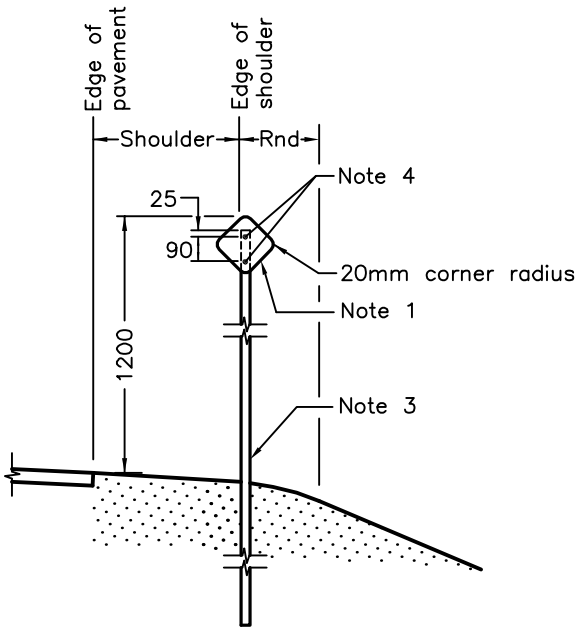
ELEVATION

NOTES:

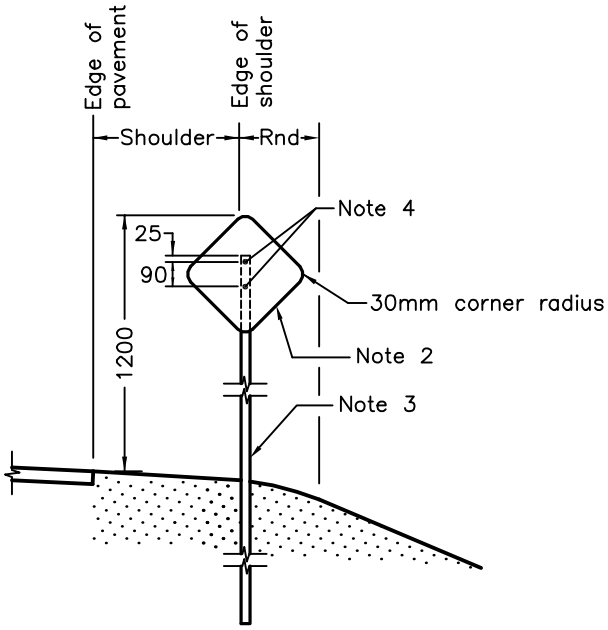
1 Anchors shall be installed according to manufacturer's specifications.
2 Frame shall be welded to the steel pipes all around.

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



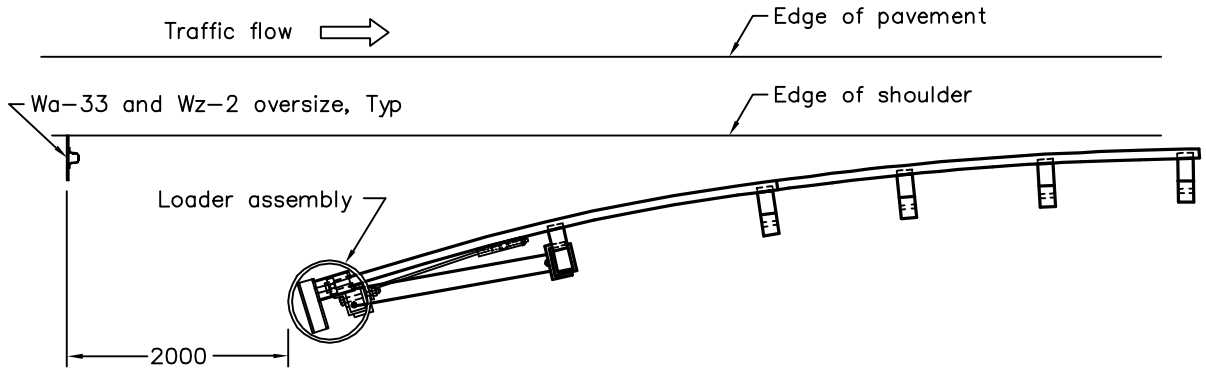
POST MOUNTED DELINEATOR
TYPE B

NOTES:

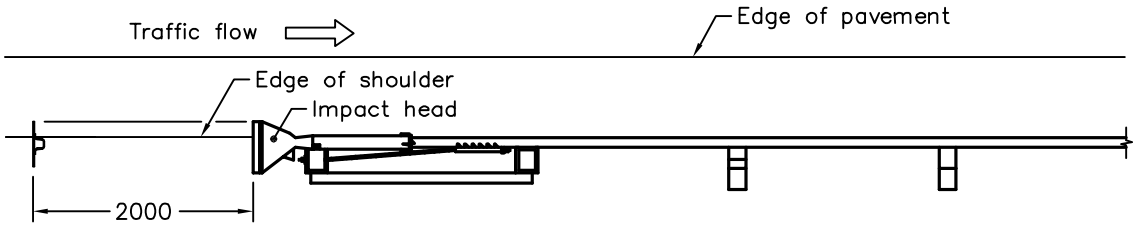
1 Type A delineators shall be 125 x 125mm.
2 Type B delineators shall be 250 x 250mm.
3 Delineator posts shall be 25 x 25mm steel square tube post, 2134mm in length.
4 Prior to galvanizing, four holes shall be drilled or punched, size No. 30, 3.2mm diameter. Delineators shall be fastened with two #10 (3/16") x 3/4" metal drilling screws.

A All dimensions are in millimetres unless otherwise shown.

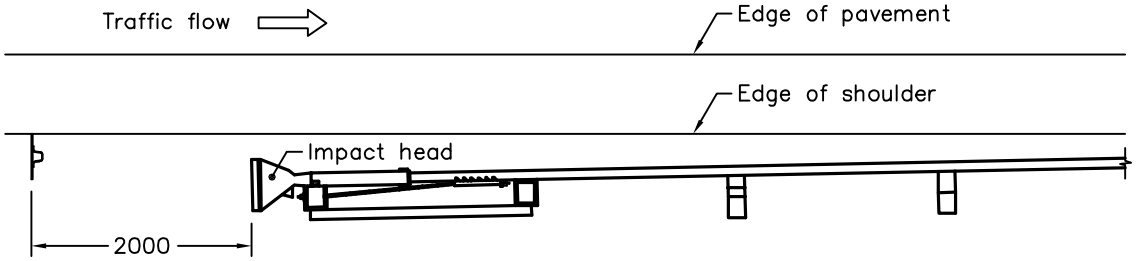
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	1
POST MOUNTED DELINEATOR INSTALLATION			
	OPSD 984.101		



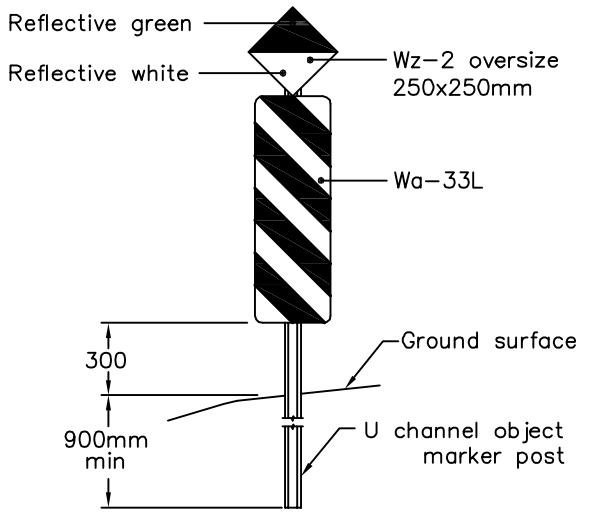
ECCENTRIC LOADER TERMINAL



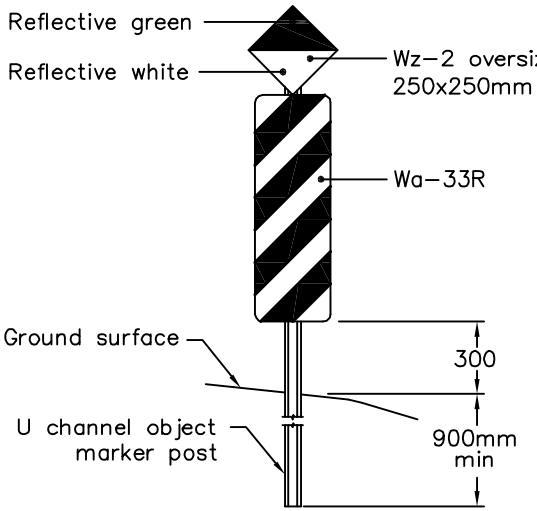
STEEL BEAM ENERGY ATTENUATING TERMINAL – TANGENT



STEEL BEAM ENERGY ATTENUATING TERMINAL – FLARED



APPROACH END – LEFT SHOULDER

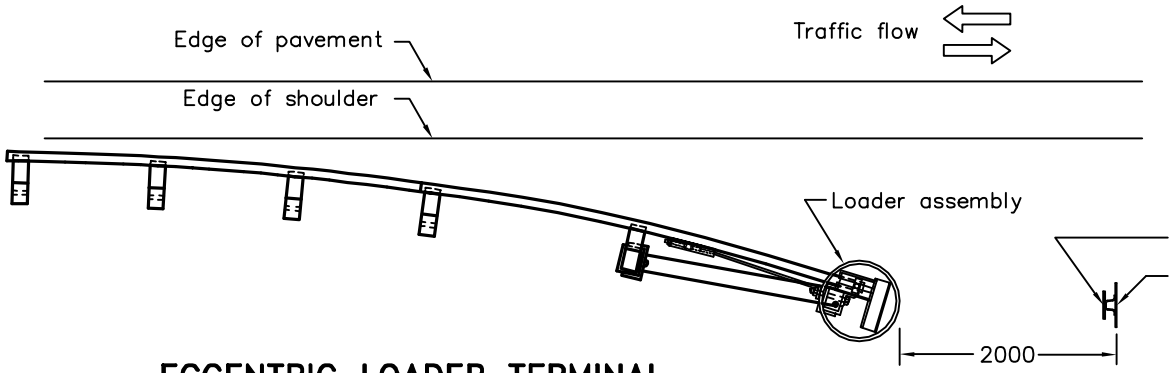


APPROACH END – RIGHT SHOULDER

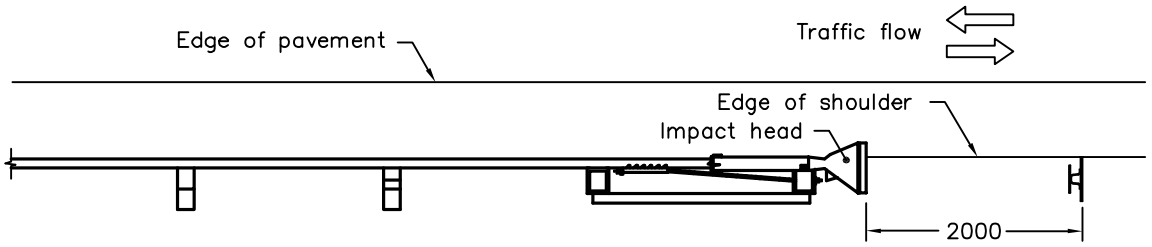
NOTES:

A All dimensions are in millimetres unless otherwise shown.

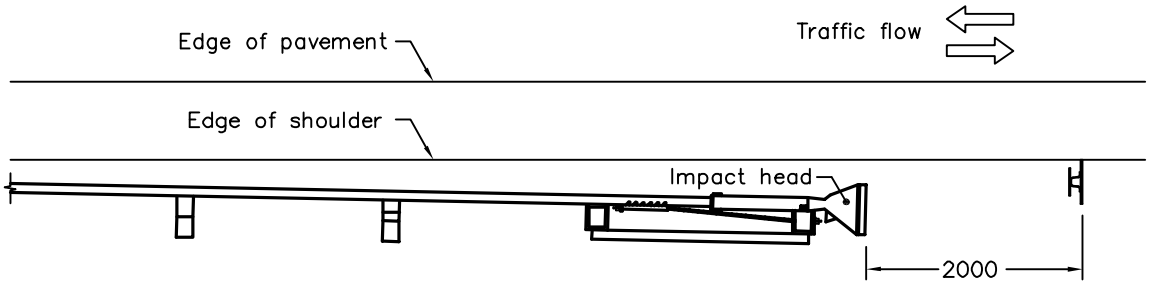
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	0
ENERGY ATTENUATOR, END TREATMENT DELINEATION INSTALLATION – APPROACH END			
	OPSD 984.201		



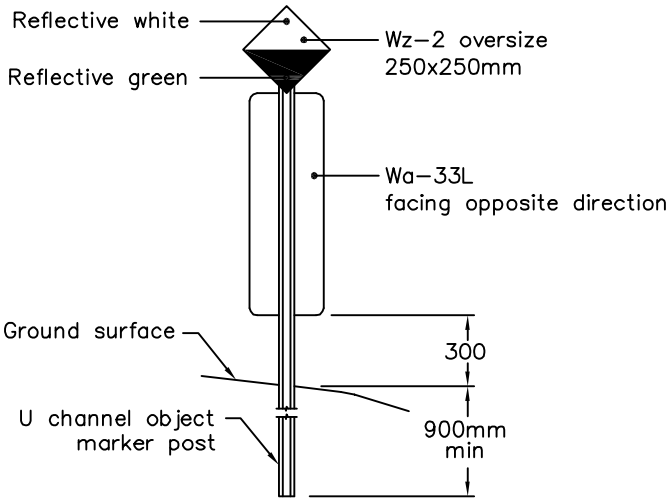
ECCENTRIC LOADER TERMINAL



STEEL BEAM ENERGY ATTENUATING TERMINAL – TANGENT



STEEL BEAM ENERGY ATTENUATING TERMINAL – FLARED

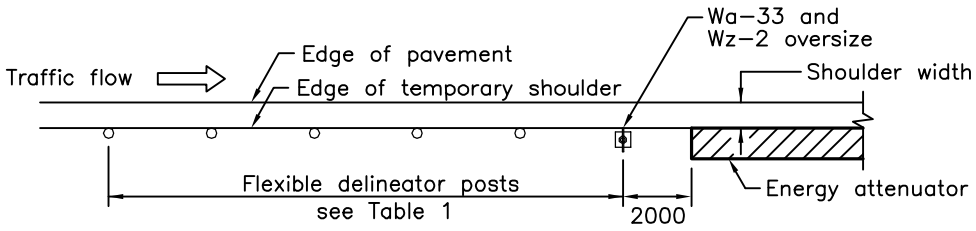


LEAVING END

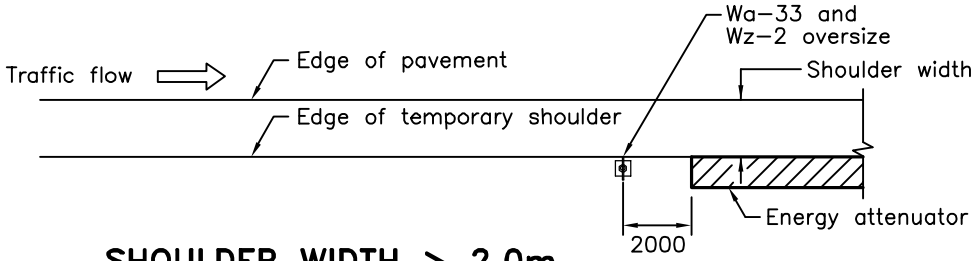
NOTES:

A All dimensions are in millimetres unless otherwise shown.

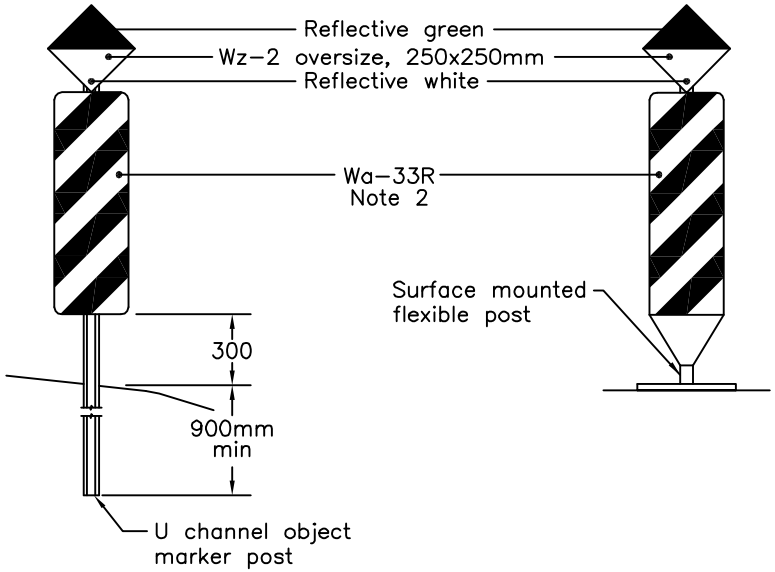
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	0
ENERGY ATTENUATOR, END TREATMENT DELINEATION INSTALLATION – LEAVING END			
	OPSD 984.202		



SHOULDER WIDTH < 2.0m

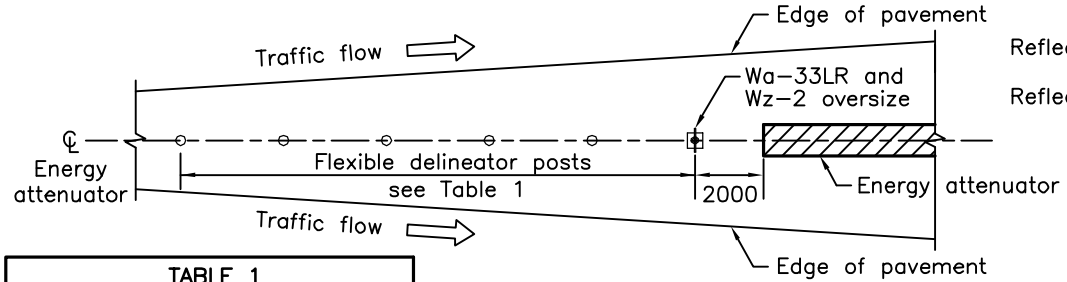


SHOULDER WIDTH ≥ 2.0m



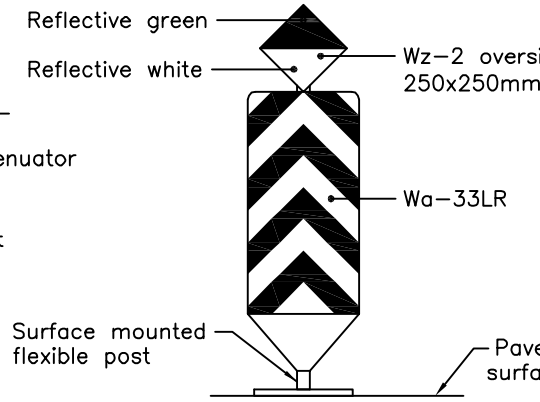
GRANULAR SURFACE **PAVED SURFACE**

SHOULDER

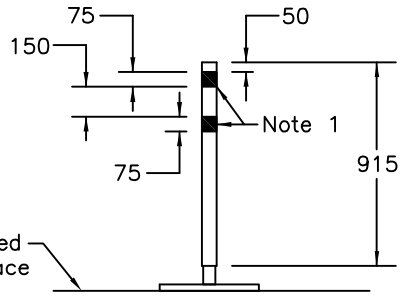


GORE

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.

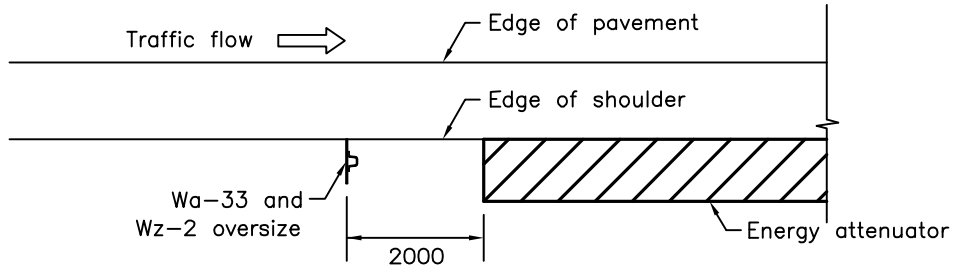
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION DELINEATION INSTALLATION – TEMPORARY

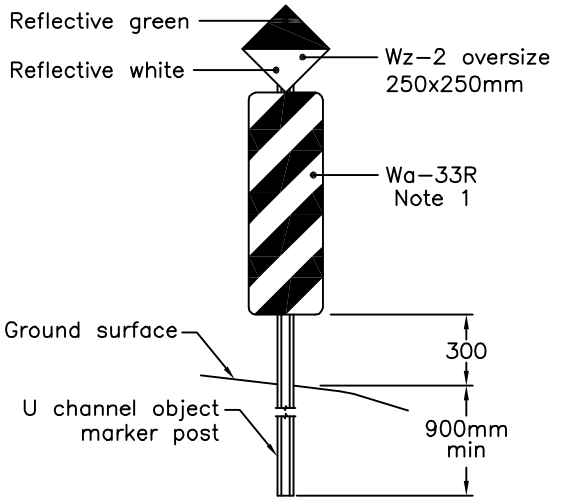
Nov 2010 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

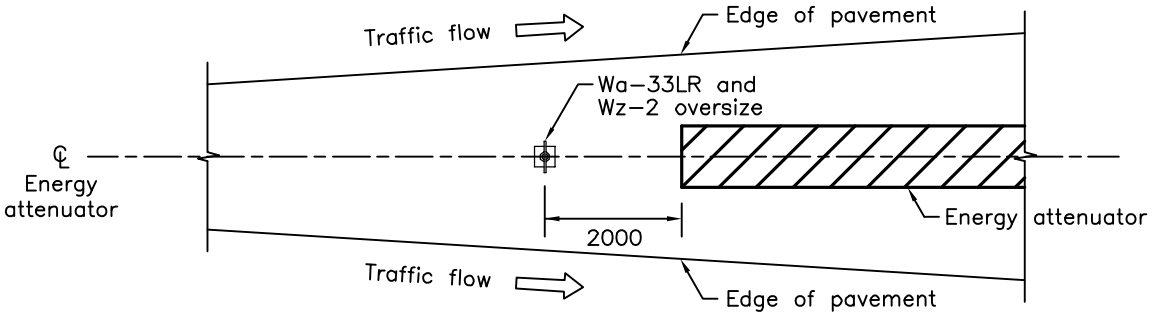
OPSD 984.203



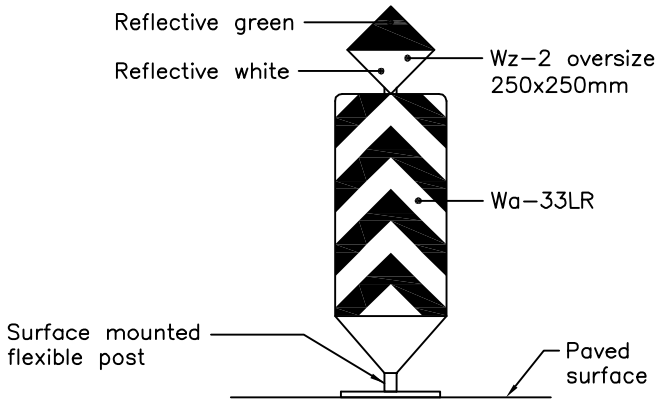
SHOULDER



SHOULDER



GORE



GORE

NOTES:

1 Right shoulder installation shown. For left shoulder installation, use Wa–33L.

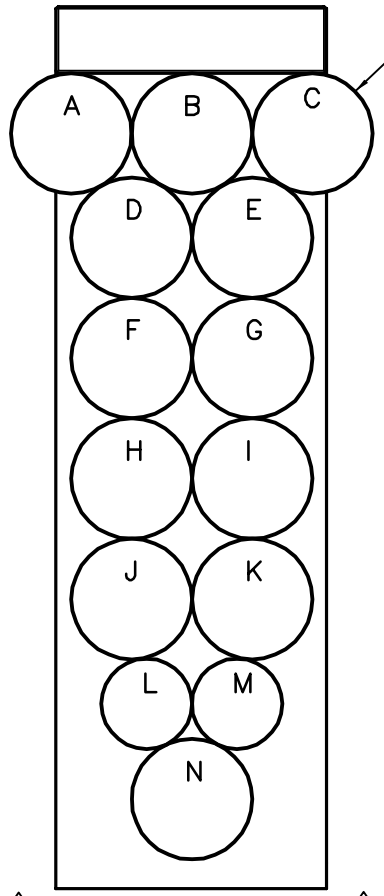
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

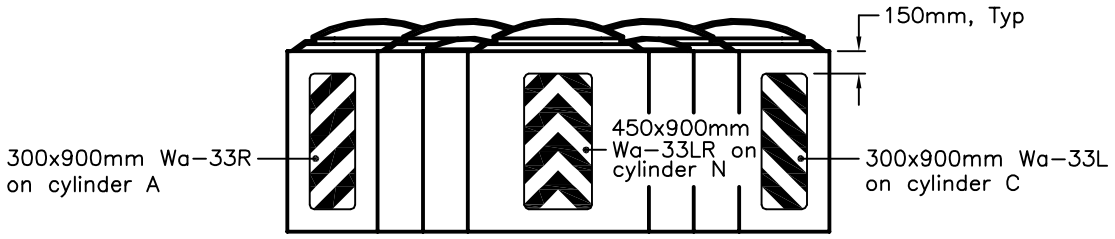
ENERGY ATTENUATOR, CRASH CUSHION DELINEATION INSTALLATION – PERMANENT

Nov 2010 | Rev 0

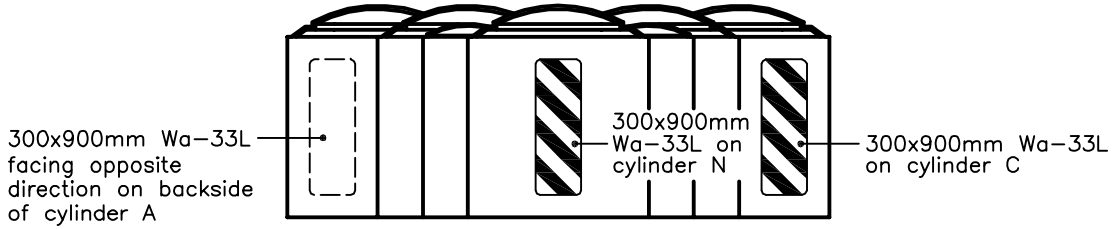
OPSD 984.204



PLAN



UNIDIRECTIONAL CIAS INSTALLATION



BIDIRECTIONAL CIAS INSTALLATION

NOTES:

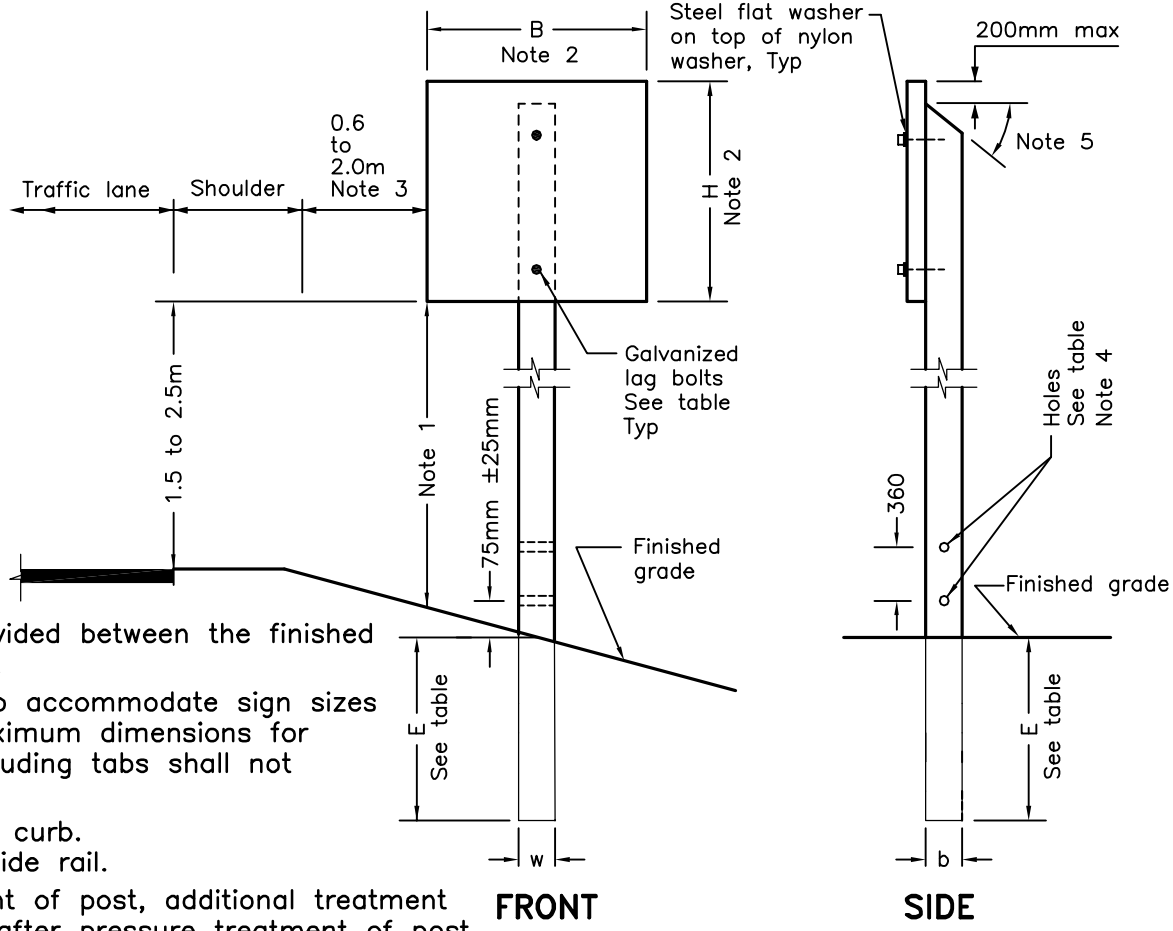
A High intensity retroreflective sheeting shall be applied directly to the CIAS cylinder.
The edges of the applied sheeting shall be vertical and free of bubbles and wrinkles.

B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	0
ENERGY ATTENUATOR, CRASH CUSHION CONNECTICUT IMPACT ATTENUATION SYSTEM DELINEATION 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

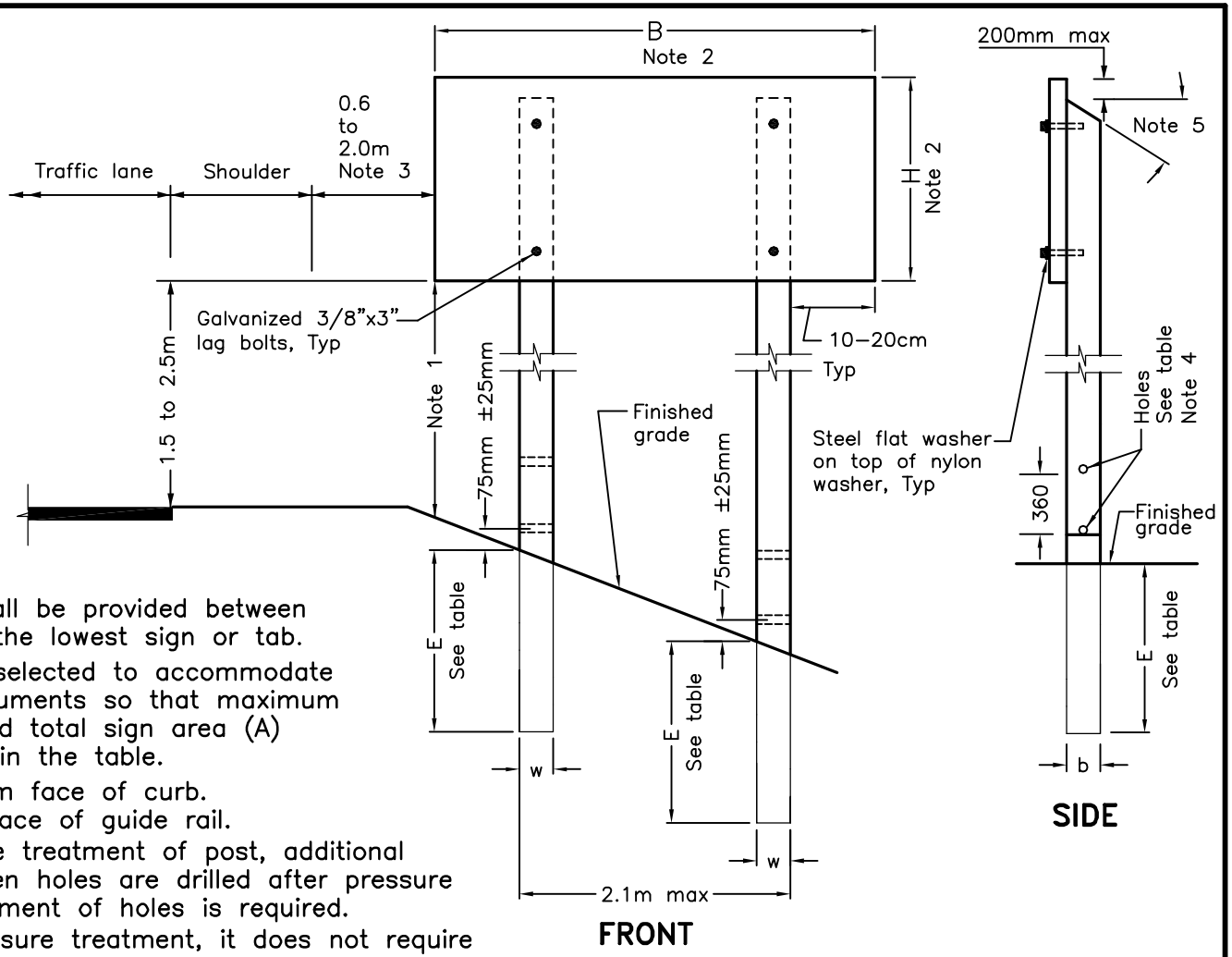
Nov 2013 | Rev 0

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

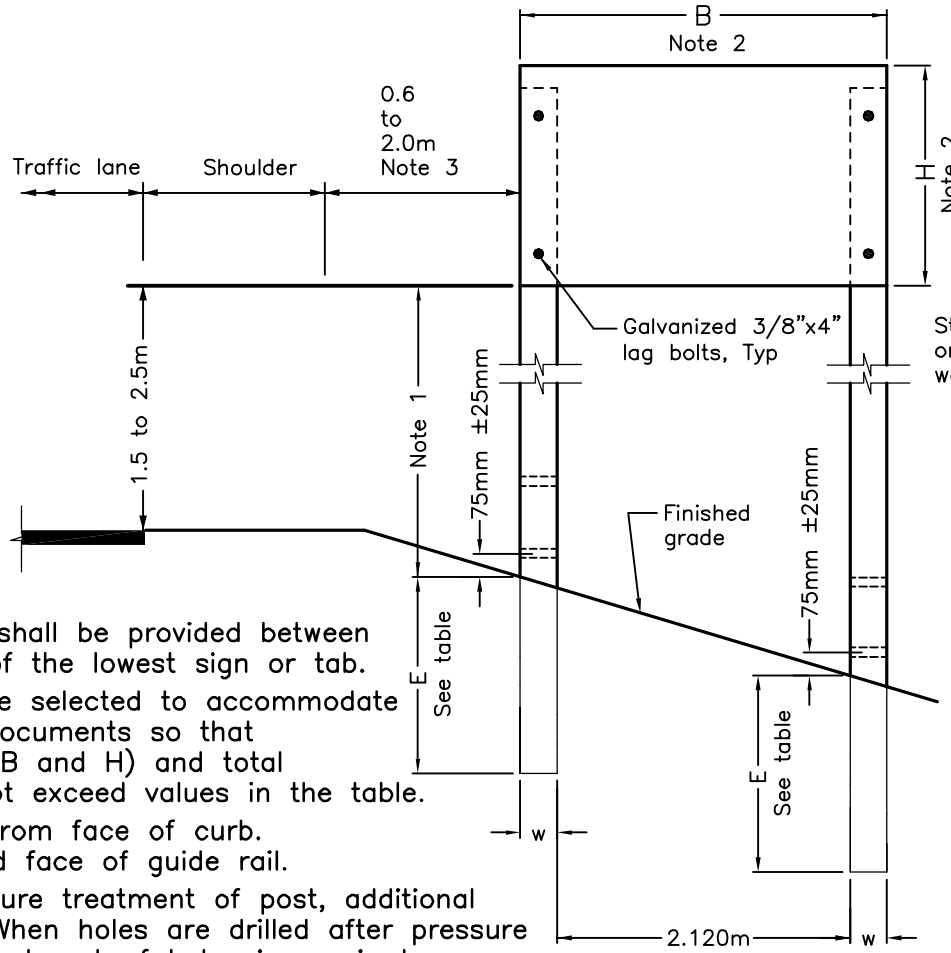
Nov 2013 | Rev 0

ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

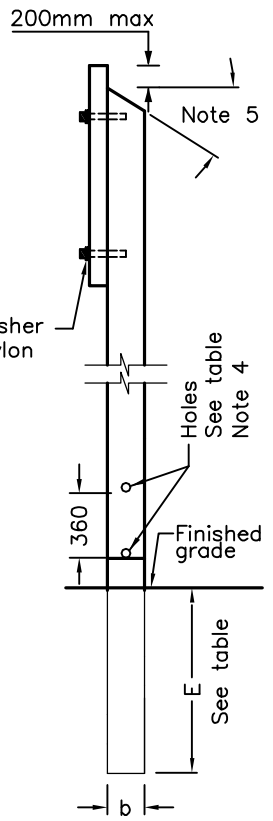
OPSD 985.210

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.

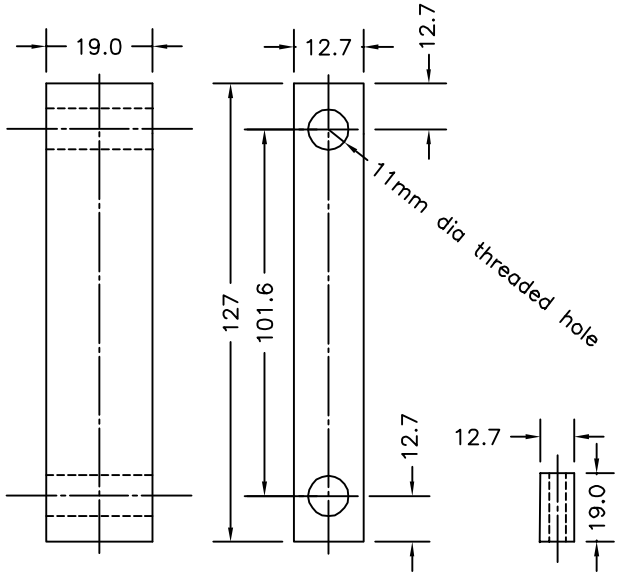
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

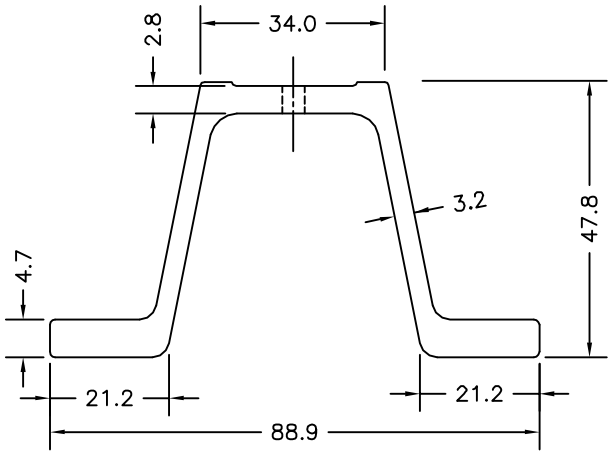
SMALL SIGN SUPPORT SYSTEM DOUBLE BREAKAWAY WOODEN POST 140x140mm AND 140x184mm INSTALLATION–DOUBLE POST ASSEMBLY

Nov 2013 | Rev 0

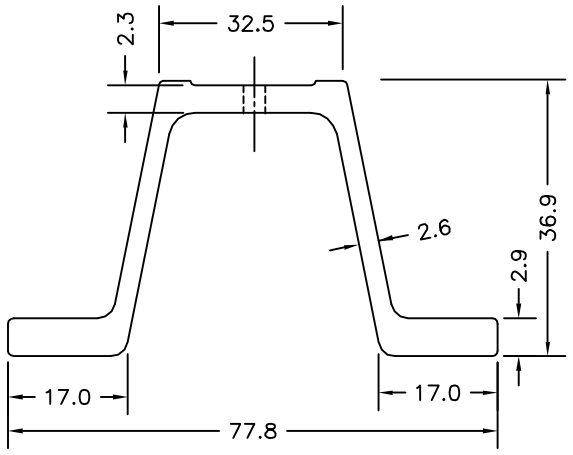
OPSD 985.220



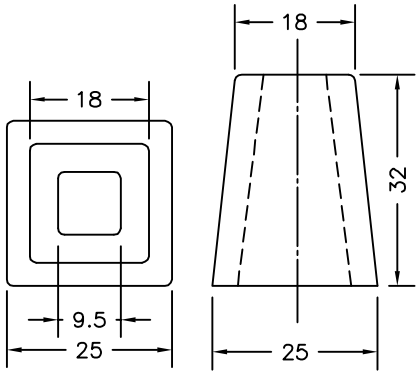
SPACER FOR LAP SPLICE
Gold coloured nickel/steel



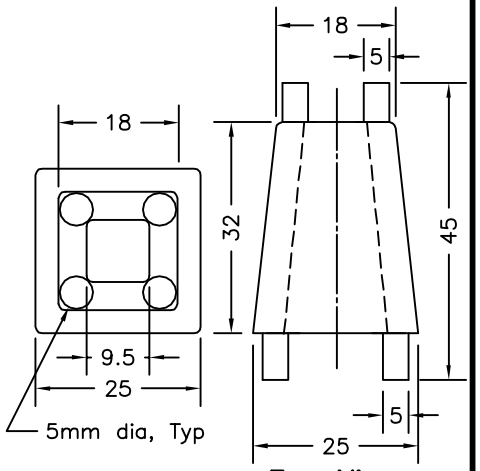
4.46 kg/m RIB–BAK POST



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

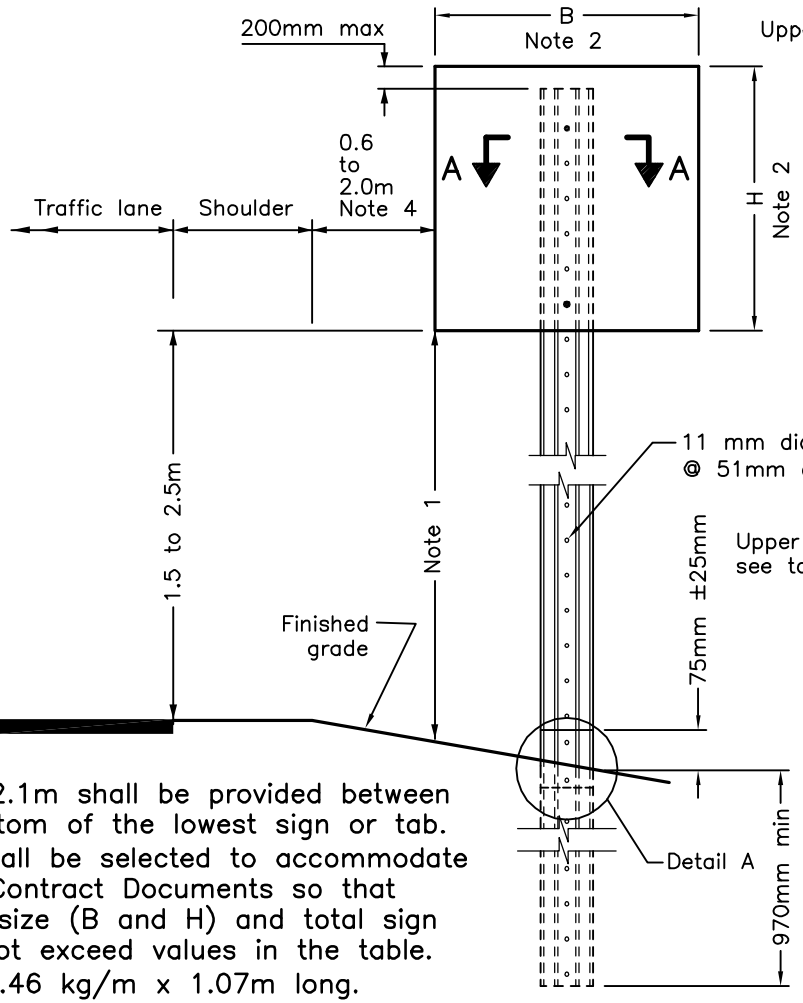
SMALL SIGN SUPPORT SYSTEM
LAP SPLICE RIB–BAK BREAKAWAY SYSTEM COMPONENTS

Nov 2013 | Rev 0

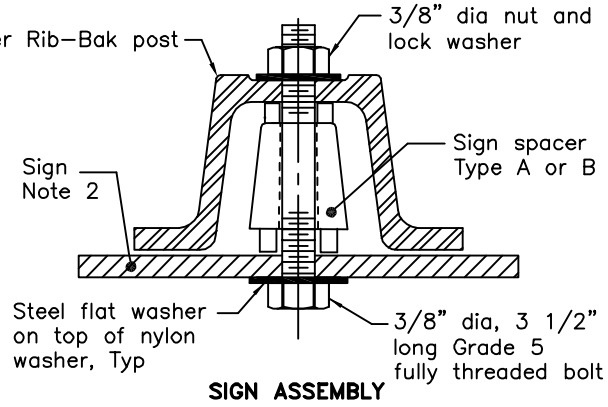
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

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

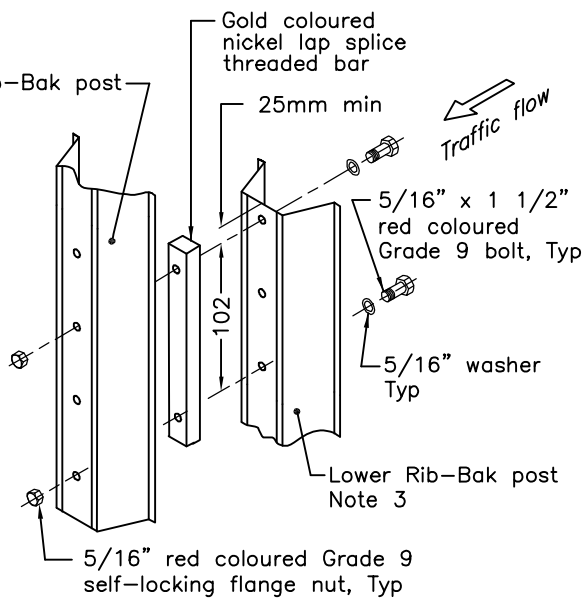


FRONT



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

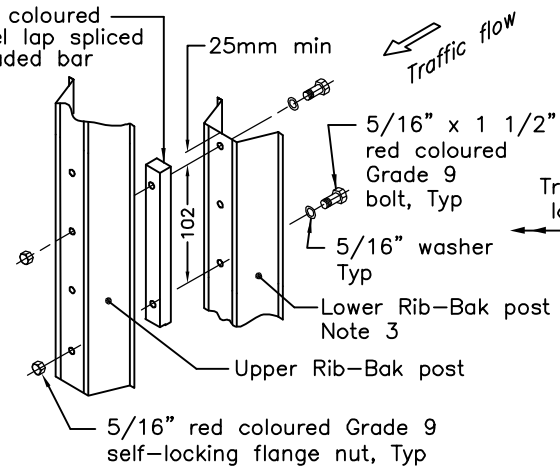
SMALL SIGN SUPPORT SYSTEM
LAP SPLICE RIB–BAK BREAKAWAY SYSTEM
INSTALLATION–SINGLE POST ASSEMBLY

Nov 2013 | Rev 0

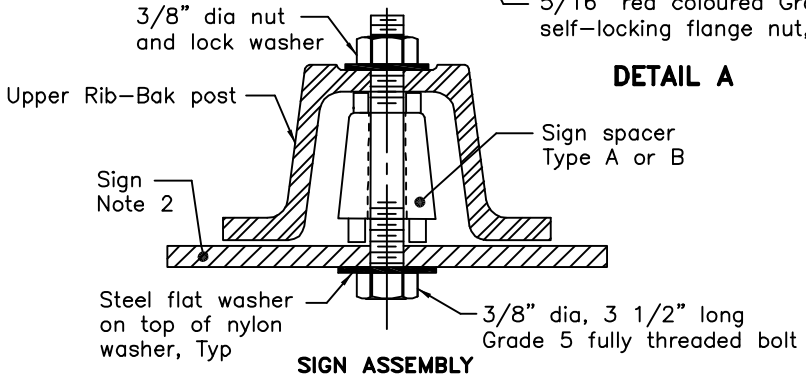
ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

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

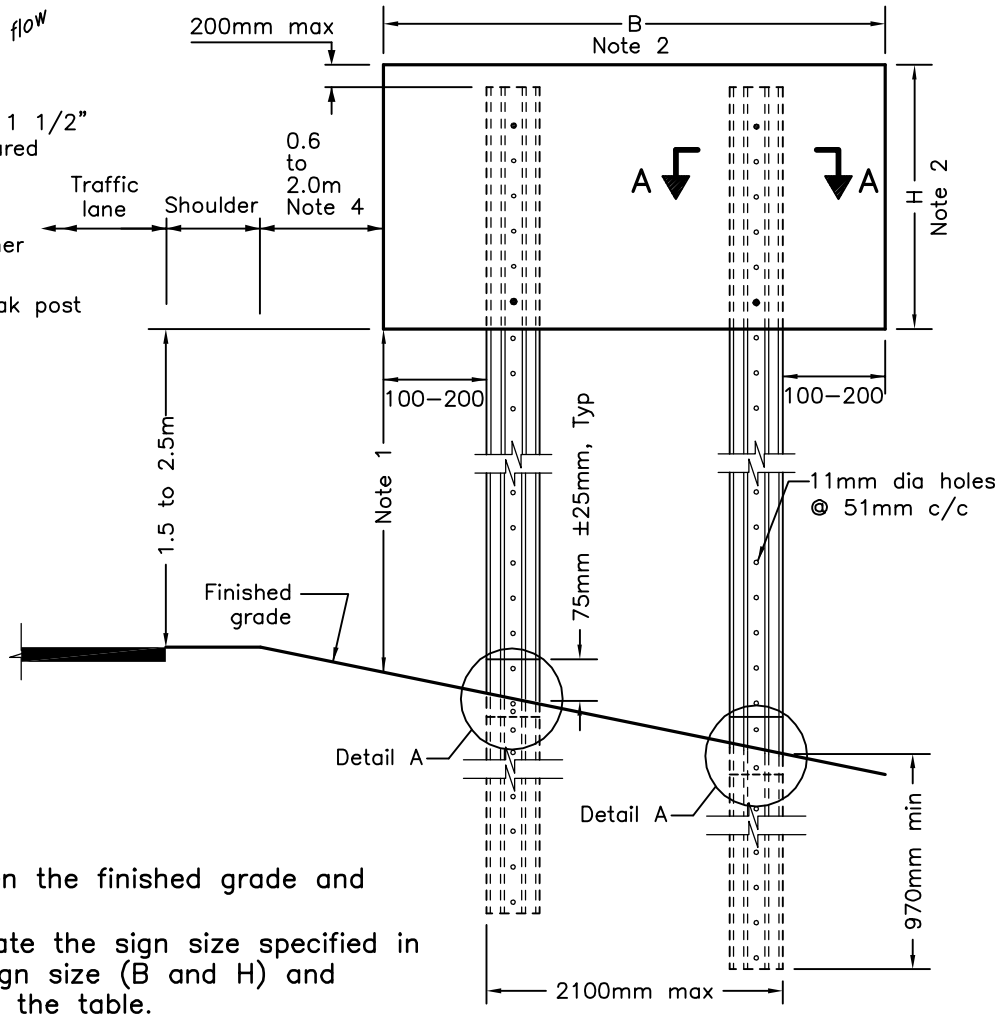


DETAIL A



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

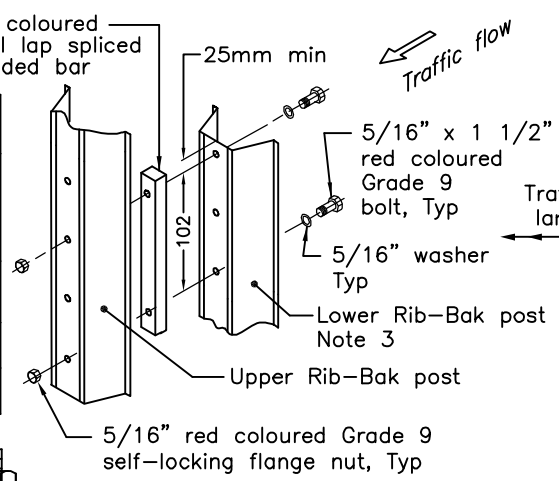
Nov 2013 | Rev 0

SMALL SIGN SUPPORT SYSTEM
LAP SPLICE RIB–BAK BREAKAWAY SYSTEM
INSTALLATION–DOUBLE POST ASSEMBLY

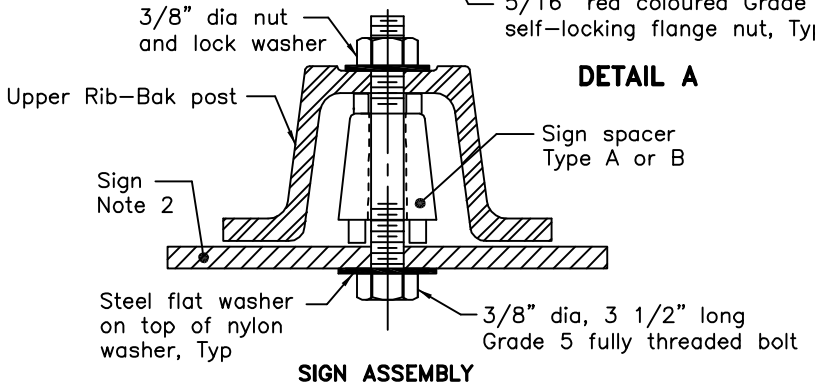
ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

OPSD 987.210

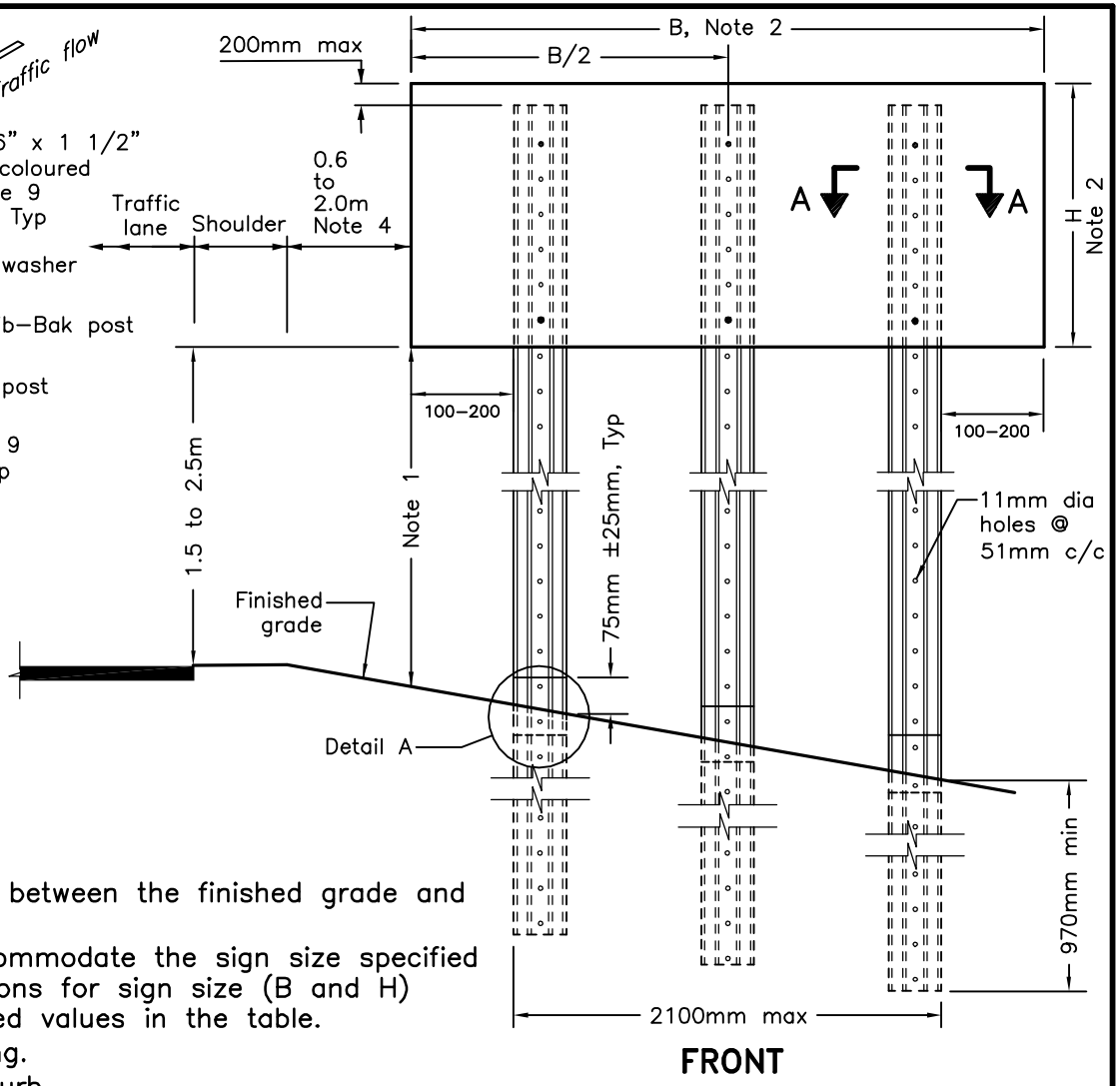
SIGN SUPPORT REQUIREMENTS Note 2			
Max. Sign Dimensions		Max. Sign Area	Upper Post
B cm	H cm	A m^2	kg/m
180 to 240	75	1.58	2.61
	150	2.92	4.46



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.

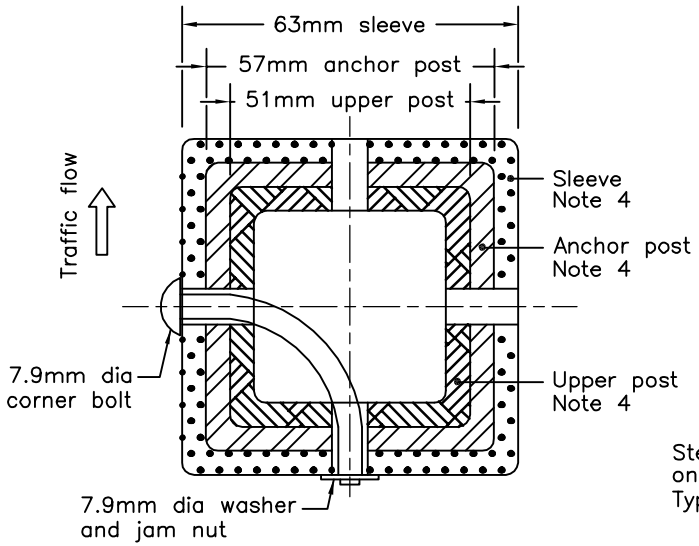
ONTARIO PROVINCIAL STANDARD DRAWING

SMALL SIGN SUPPORT SYSTEM
LAP SPLICE RIB–BAK BREAKAWAY SYSTEM
INSTALLATION–TRIPLE POST ASSEMBLY

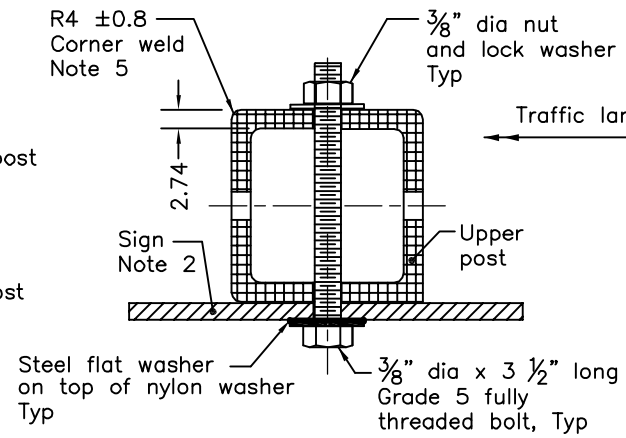
Nov 2013 | Rev 0

ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

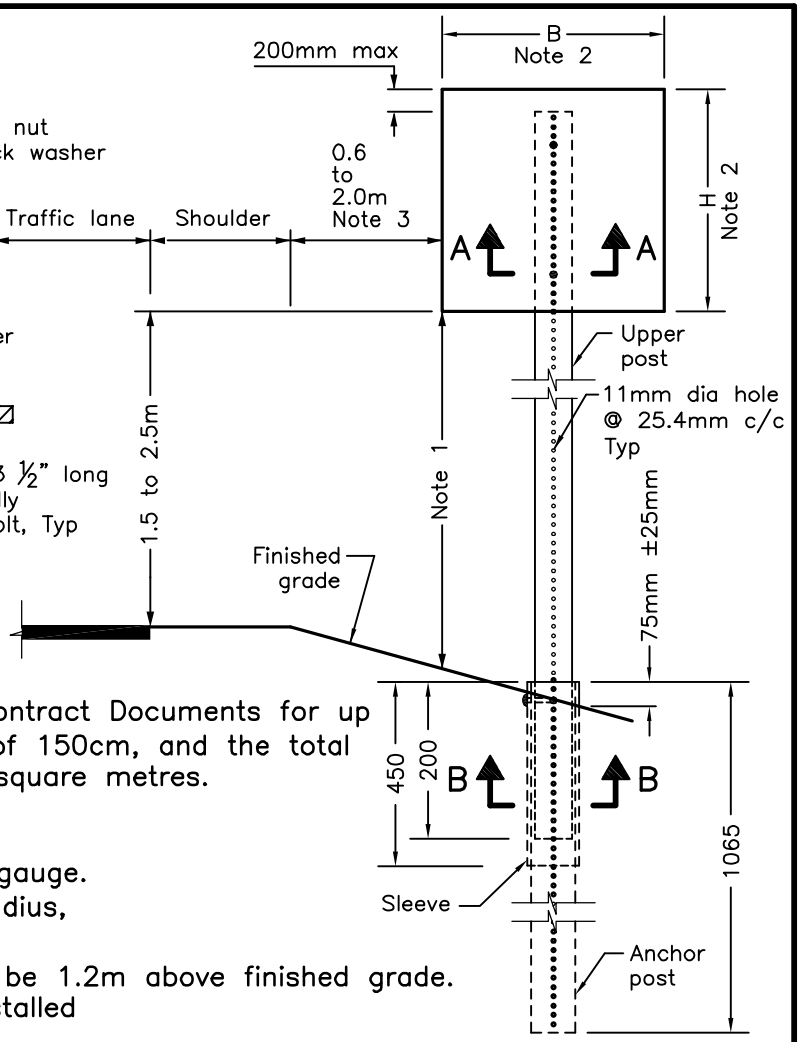
OPSD 987.310



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.

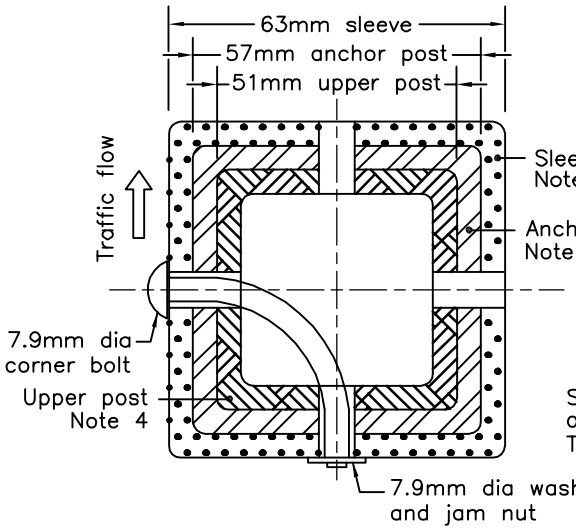
ONTARIO PROVINCIAL STANDARD DRAWING

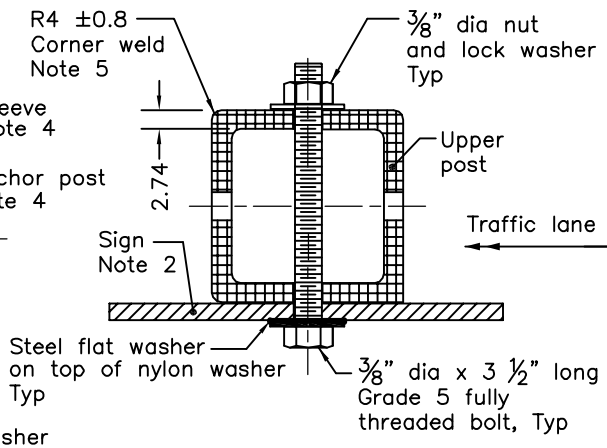
SMALL SIGN SUPPORT SYSTEM SQR–LOC PERFORATED STEEL SQUARE SIGN POST SYSTEM INSTALLATION–SINGLE POST ASSEMBLY

Nov 2013 | Rev 0

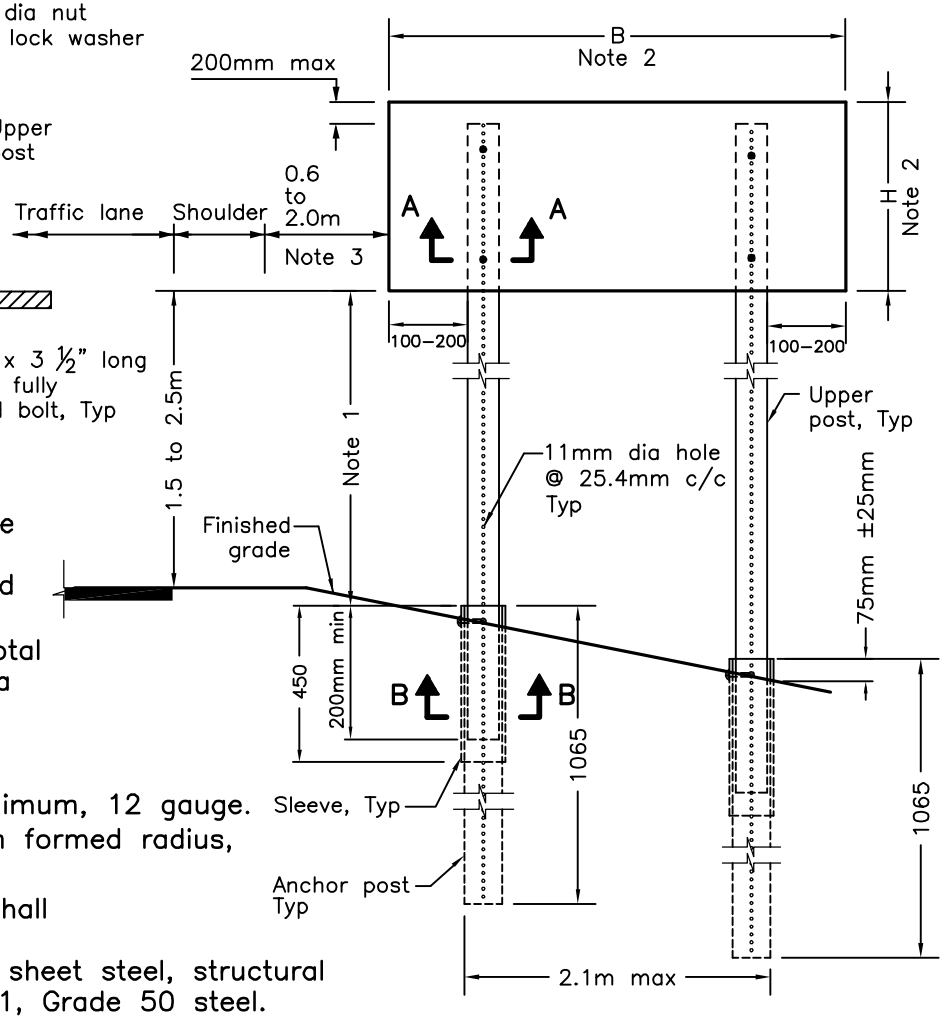
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

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.

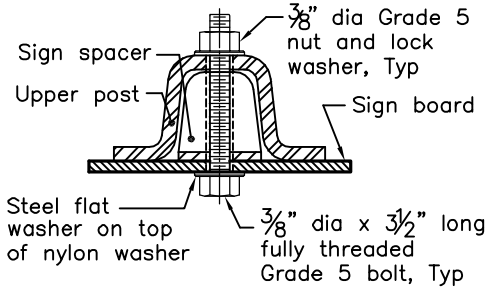
ONTARIO PROVINCIAL STANDARD DRAWING

SMALL SIGN SUPPORT SYSTEM SQR–LOC PERFORATED STEEL SQUARE POST SYSTEM INSTALLATION–DOUBLE POST ASSEMBLY

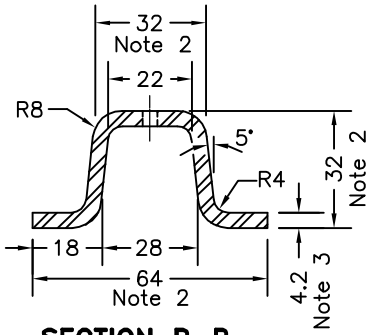
Nov 2013 | Rev 0

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

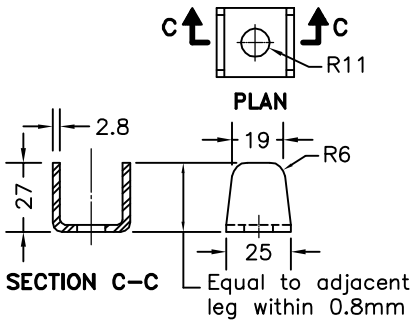
OPSD 989.210



SECTION A–A

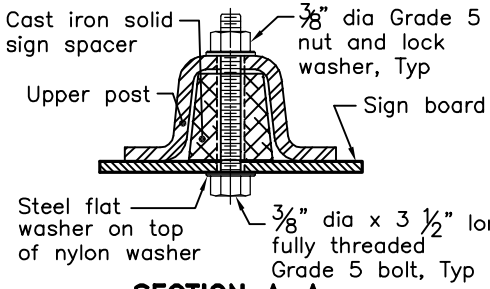


SECTION B–B

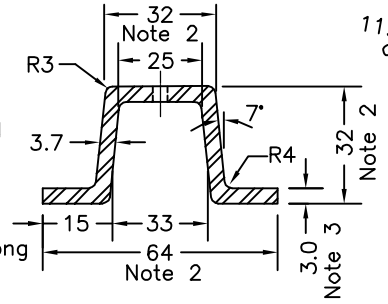


SIGN SPACER

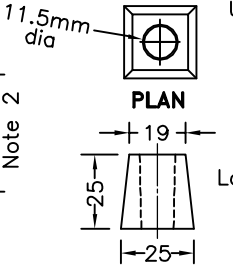
COLD FORMED STEEL POST DETAILS, Note B and C



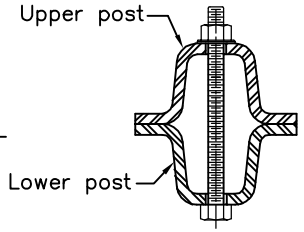
SECTION A–A



SECTION B–B



SIGN SPACER



OVERLAP SECTION

HOT FORMED STEEL POST DETAILS, Note B and D

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.

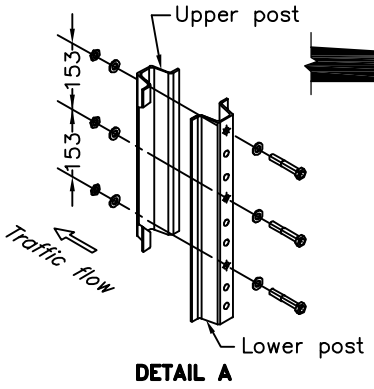
B Posts shall be manufactured from either cold formed steel or hot formed steel.

C Cold formed steel shall have a minimum yield strength of 345 MPa and weigh a minimum of 3.36 kg/m.

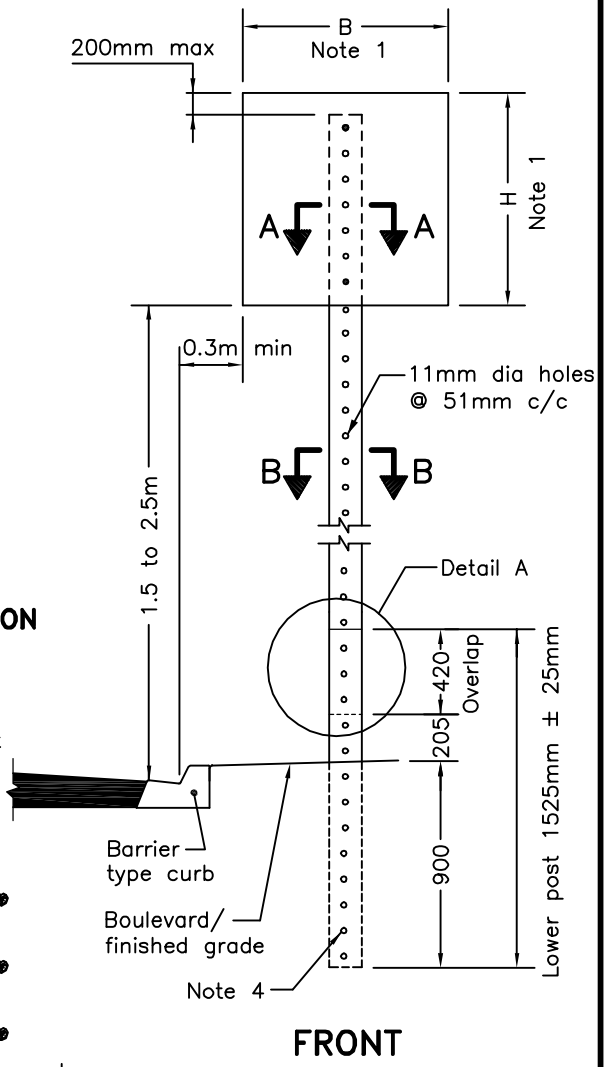
D Hot formed steel shall have a minimum yield strength of 380 MPa and weigh a minimum of 3.02 kg/m.

E Post and hardware shall be hot dip galvanized after fabrication.

F All dimensions are in millimetres unless otherwise shown.

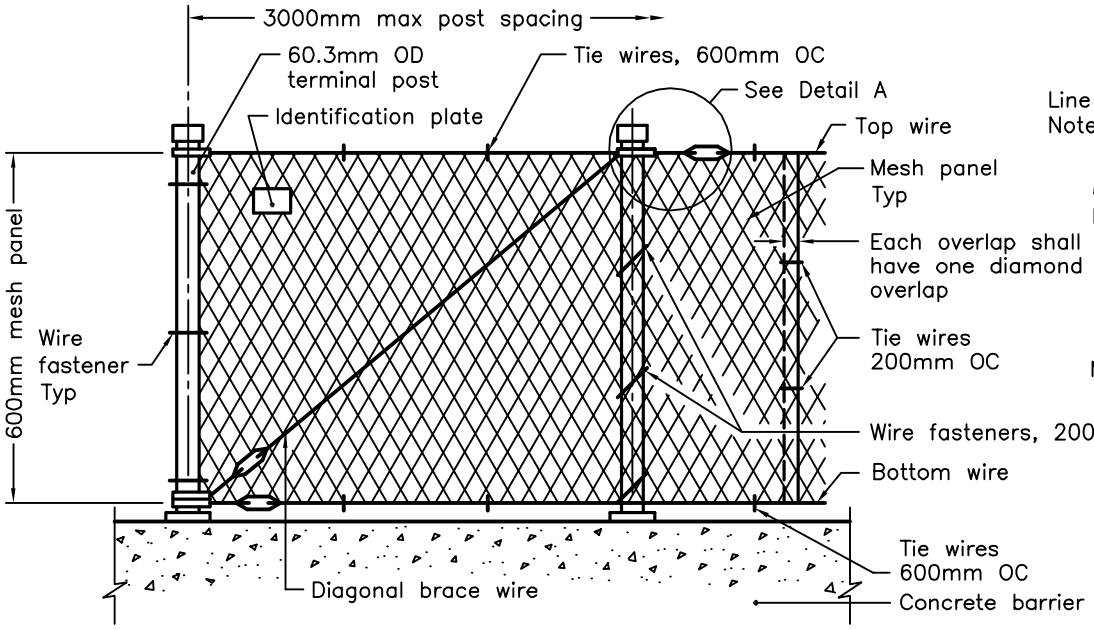


DETAIL A

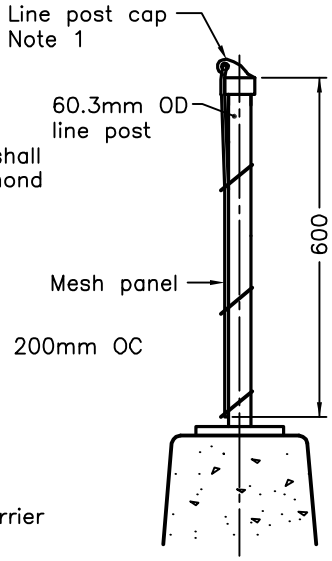


FRONT

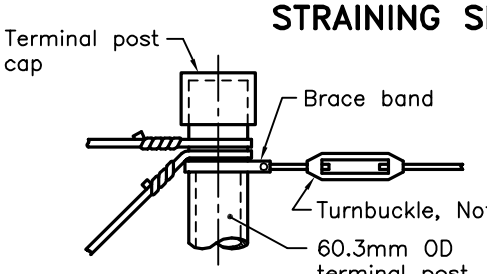
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	1
SMALL SIGN SUPPORT SYSTEM NON–BREAKAWAY U–FLANGE POST SYSTEM INSTALLATION–SINGLE POST ASSEMBLY			
	OPSD 990.110		



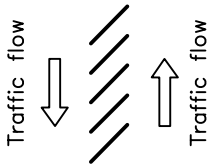
STRAINING SECTION DETAIL



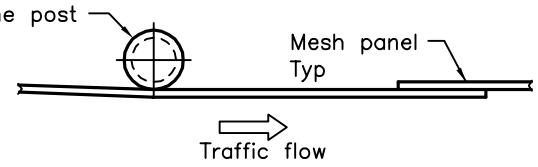
LINE POST DETAIL



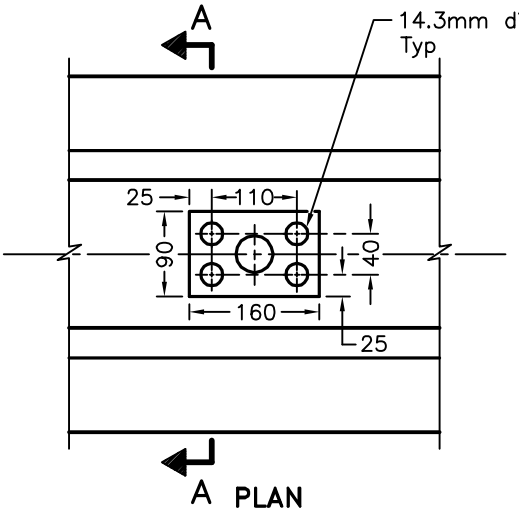
DETAIL A



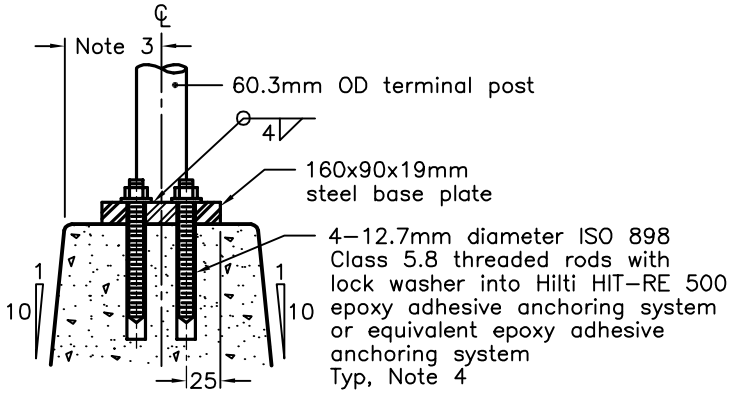
MESH PANEL OPENINGS ORIENTATION



OVERLAP DETAIL



PLAN



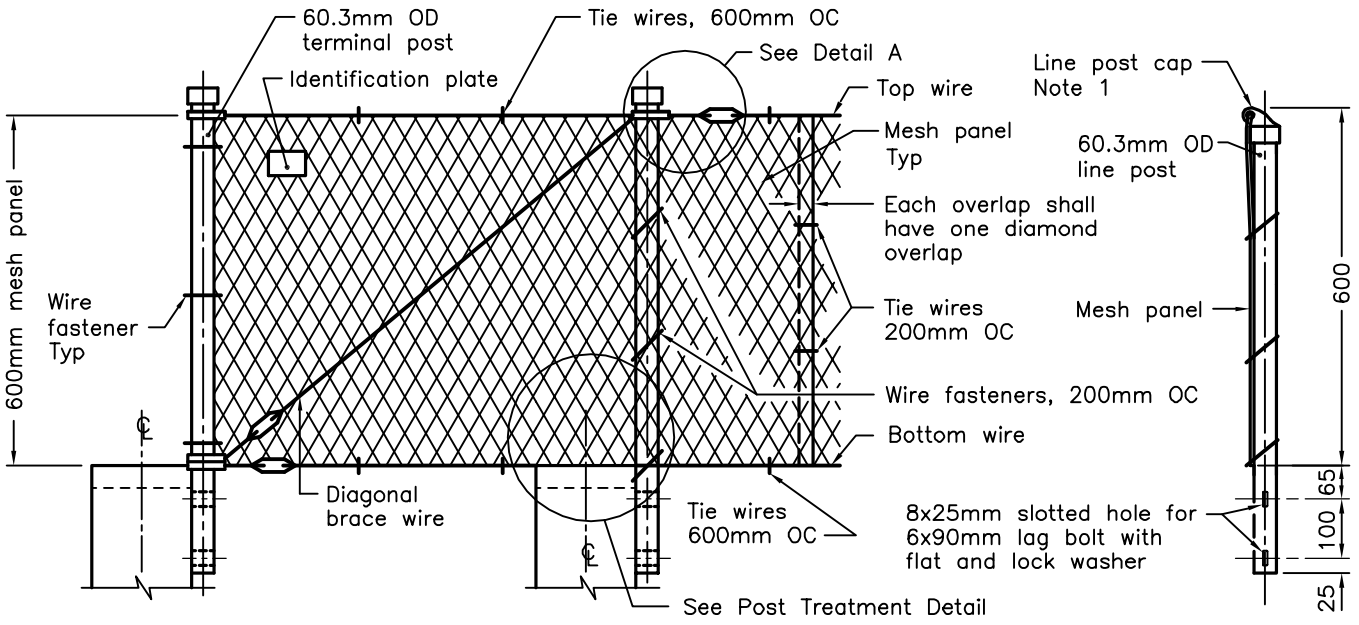
SECTION A–A

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.

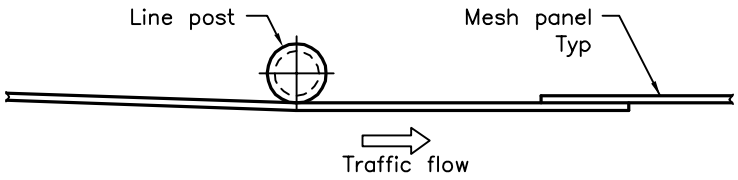
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	3
EXPANDED METAL ANTI–GLARE SCREEN INSTALLATION – CONCRETE BARRIER			
	OPSD 991.130		



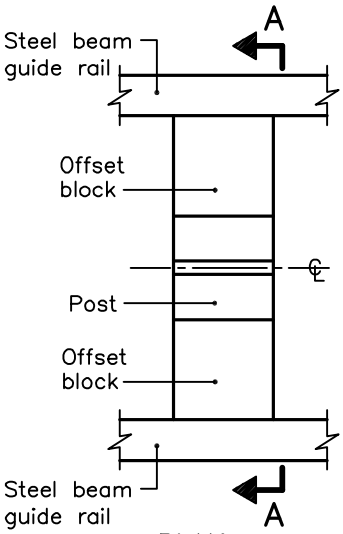
STRAINING SECTION DETAIL

STEEL BEAM GUIDE RAIL NOT SHOWN FOR CLARITY

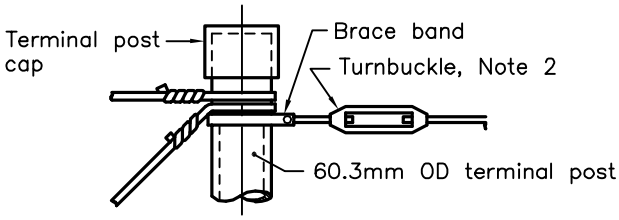
LINE POST DETAIL



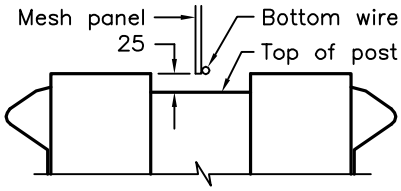
OVERLAP DETAIL



PLAN

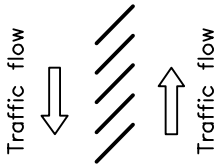


DETAIL A



SECTION A–A

POST TREATMENT DETAIL



MESH PANEL OPENINGS ORIENTATION

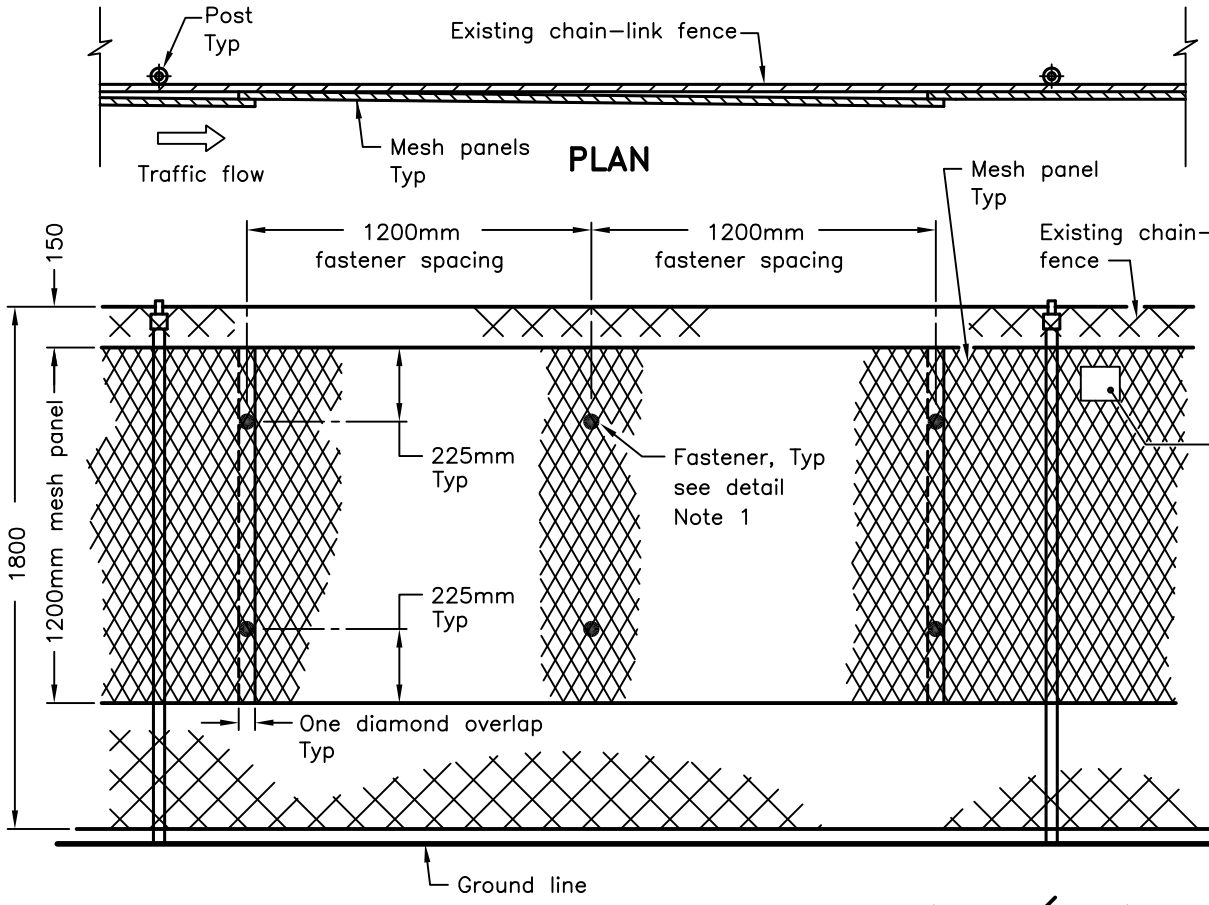
NOTES:

1 For line post cap detail refer to OPSD 972.132.

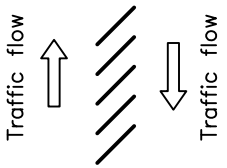
2 Turnbuckles shall be installed on diagonal brace wires and top and bottom wires, at intervals of 150m maximum and at terminal posts.

A All dimensions are in millimetres unless otherwise shown.

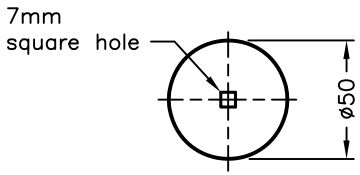
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	3
EXPANDED METAL ANTI–GLARE SCREEN INSTALLATION – STEEL BEAM GUIDE RAIL WITH WOODEN POST			
	OPSD 991.131		



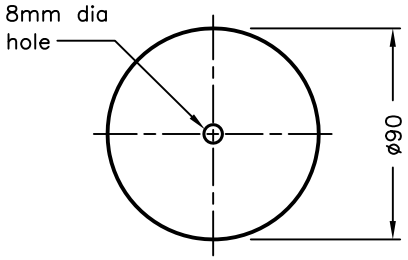
ELEVATION



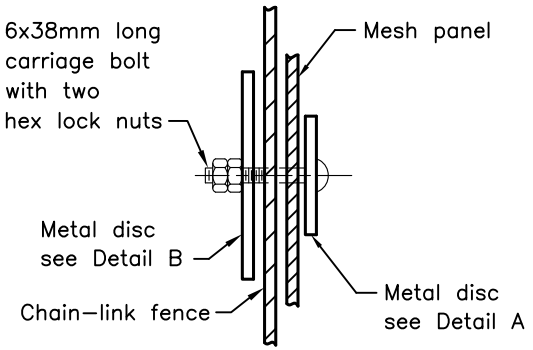
MESH PANEL OPENINGS ORIENTATION



DETAIL A



DETAIL B



FASTENER DETAIL

NOTES:

1 Fasteners shall be installed so that the hex nuts are on the highway side of fence.

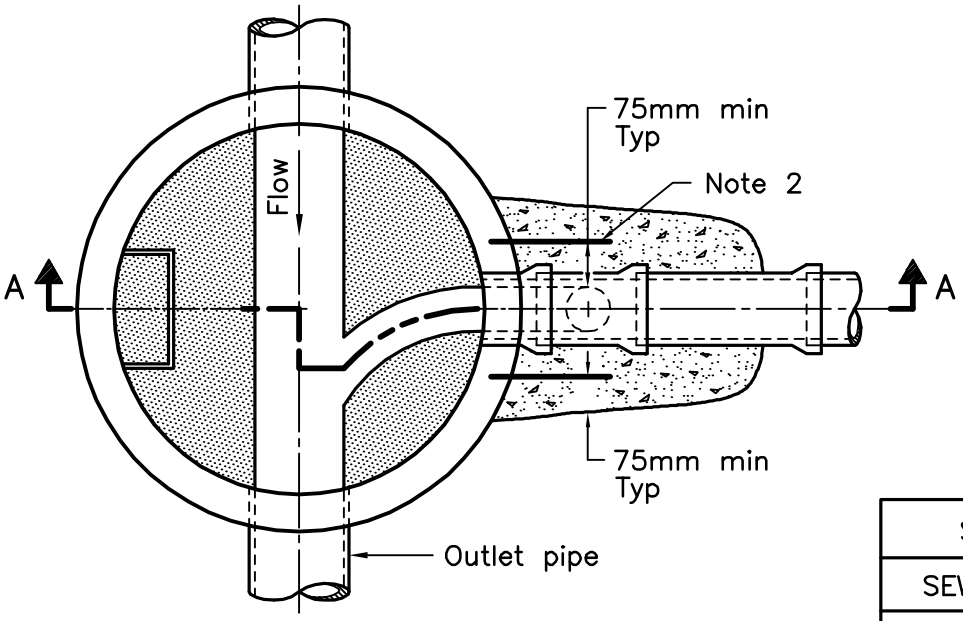
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

EXPANDED METAL ANTI–GLARE SCREEN INSTALLATION – CHAIN–LINK FENCE

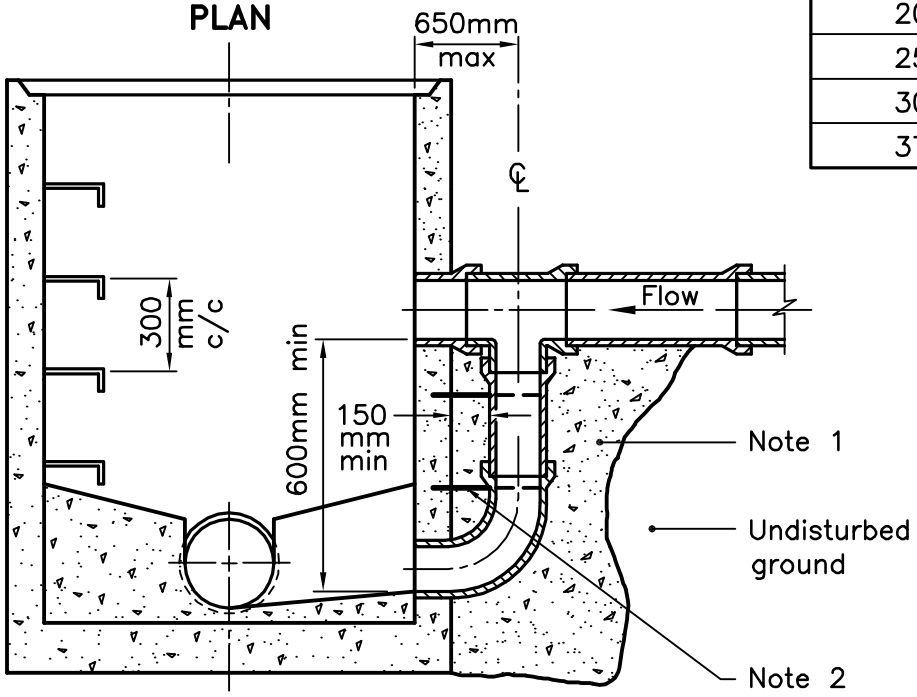
Nov 2012 | Rev 2

OPSD 991.132



PLAN

SIZE OF DROP PIPE	
SEWER ID	DROP PIPE ID
200	200
250	200
300	250
375	300



SECTION A–A

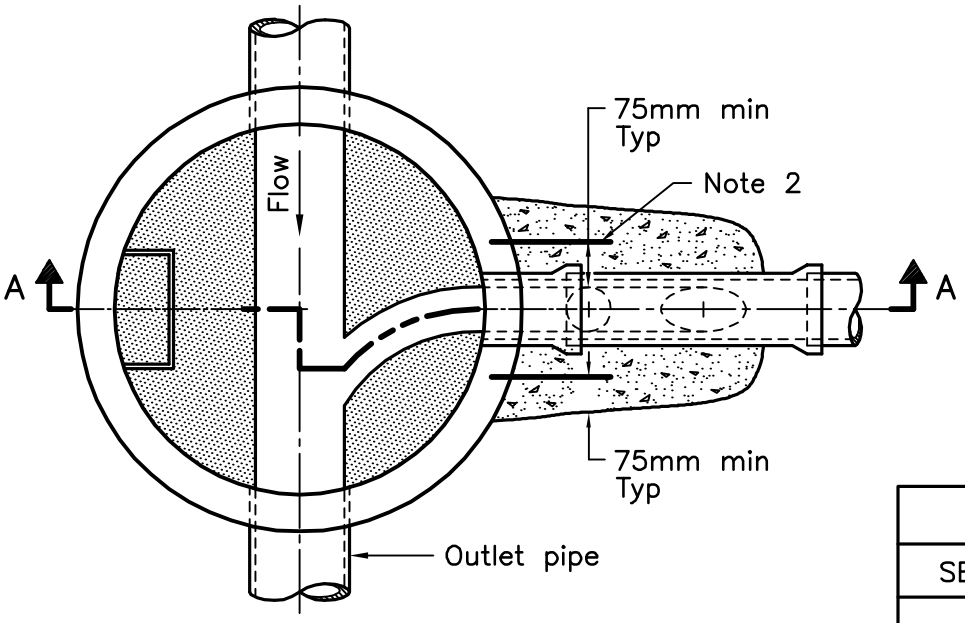
NOTES:

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.

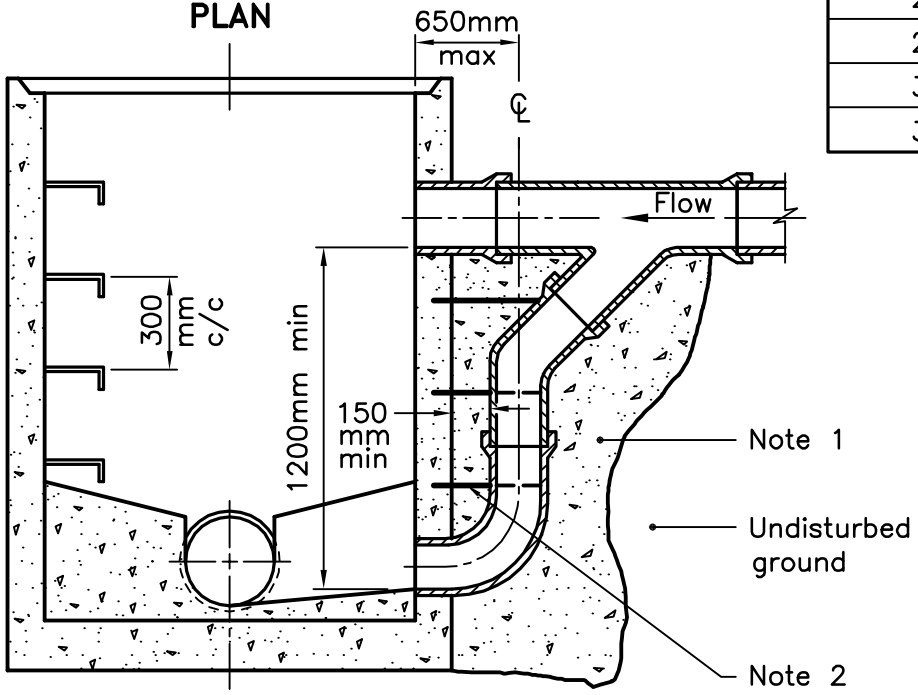
A All dimensions are in millimetres unless otherwise shown.

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

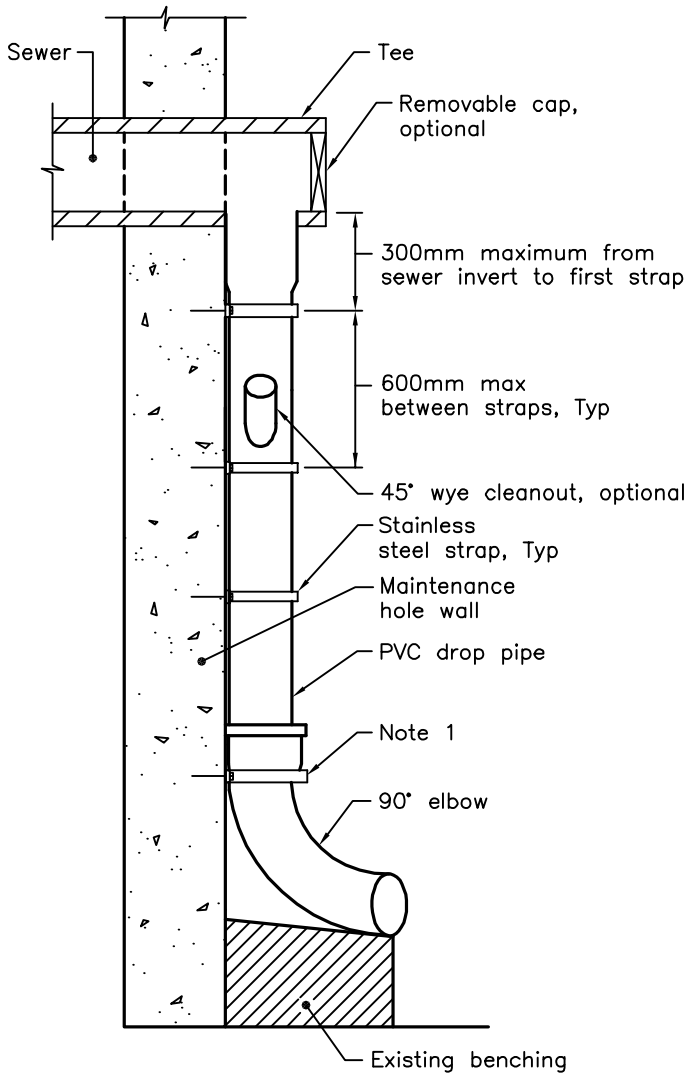
NOTES:

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.

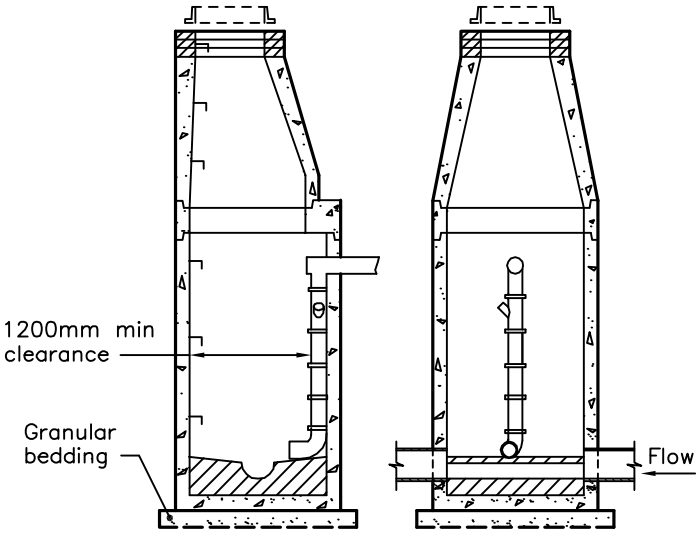
2 Concrete shall be secured to the maintenance hole with 450mm long, 13mm diameter threaded rods and drilled expansion anchors down either side of the drop pipe at 300mm centres.

A All dimensions are in millimetres unless otherwise shown.

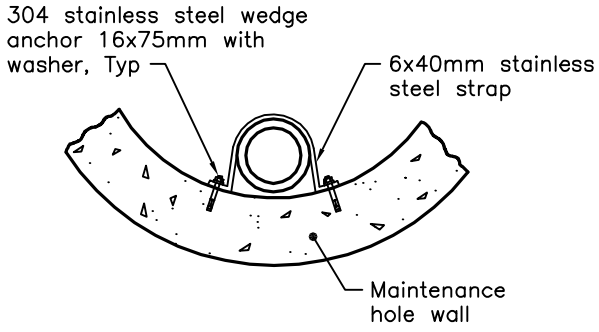
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2011	Rev	2
CAST–IN–PLACE MAINTENANCE HOLE DROP STRUCTURE WYE			
	OPSD 1003.020		



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.

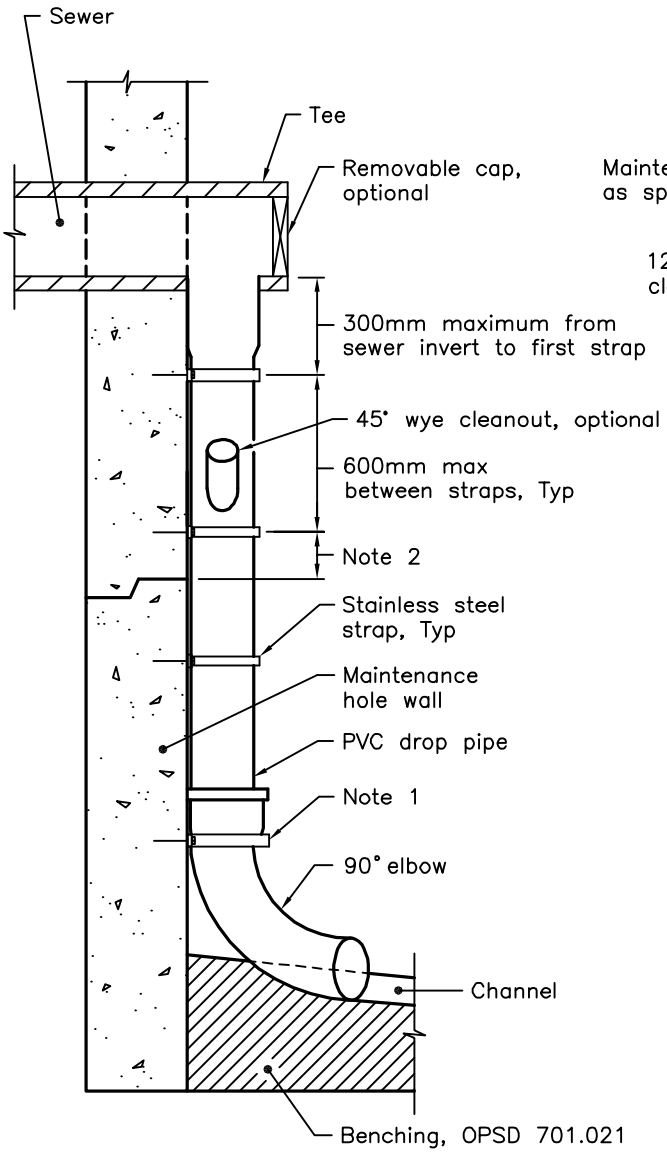
A Internal drop structure shall be used on existing maintenance holes 1500mm diameter and larger with a minimum height of 600mm from the inlet pipe invert to the top of benching. The existing benching shall be modified as required.

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.

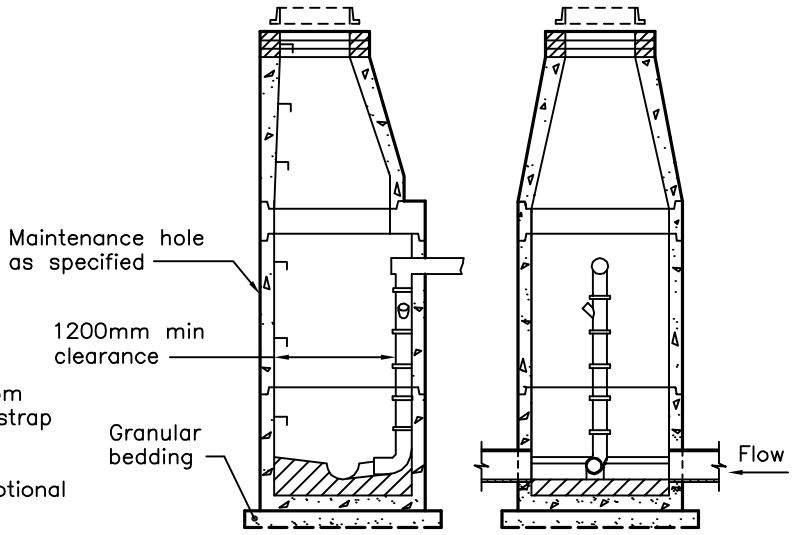
C Straps shall not be placed within 150mm of any maintenance hole section joint.

D All dimensions are in millimetres unless otherwise shown.

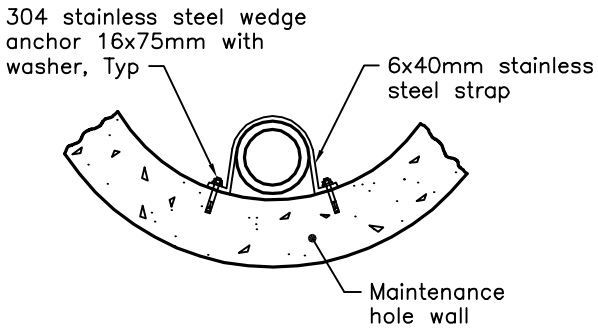
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	3
INTERNAL DROP STRUCTURE FOR EXISTING MAINTENANCE HOLES			
	OPSD 1003.030		



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.

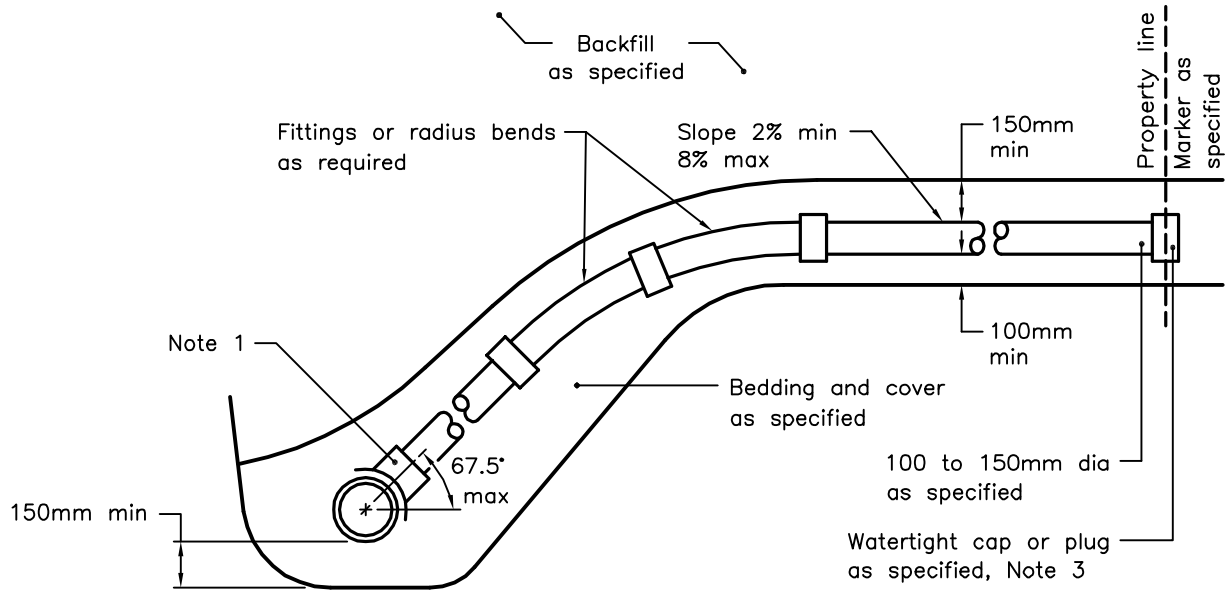
2 Straps shall not be placed within 150mm of any maintenance hole section joint.

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.

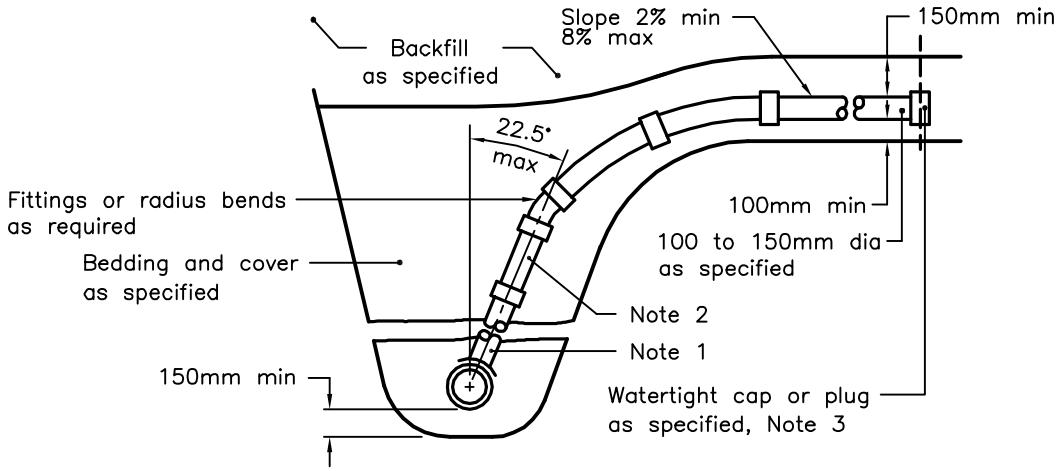
B Drop pipe shall be one size smaller than the incoming sewer with a minimum 150mm diameter and maximum of 375mm diameter. A maximum of 300mm diameter for 1500mm maintenance holes.

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.

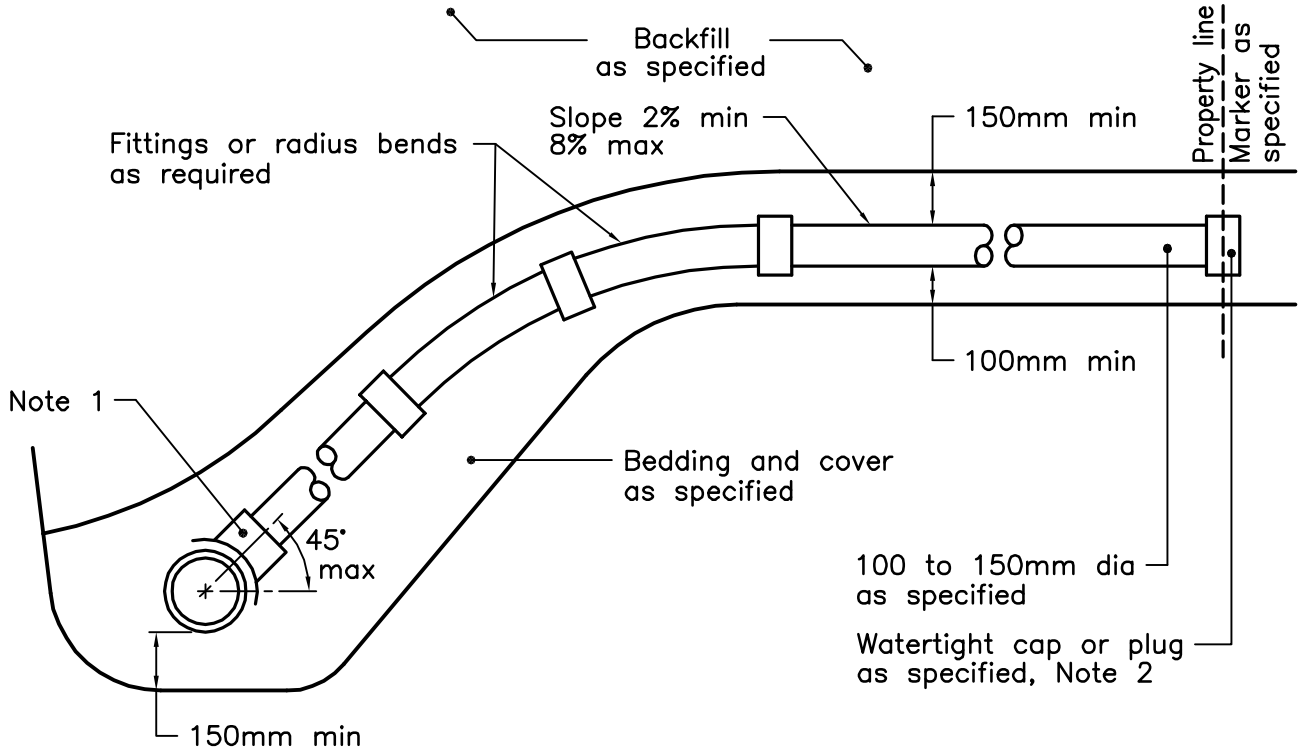
A Maintenance holes shall be used at the main sewer to connect service connections greater than or equal to 200mm.

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.

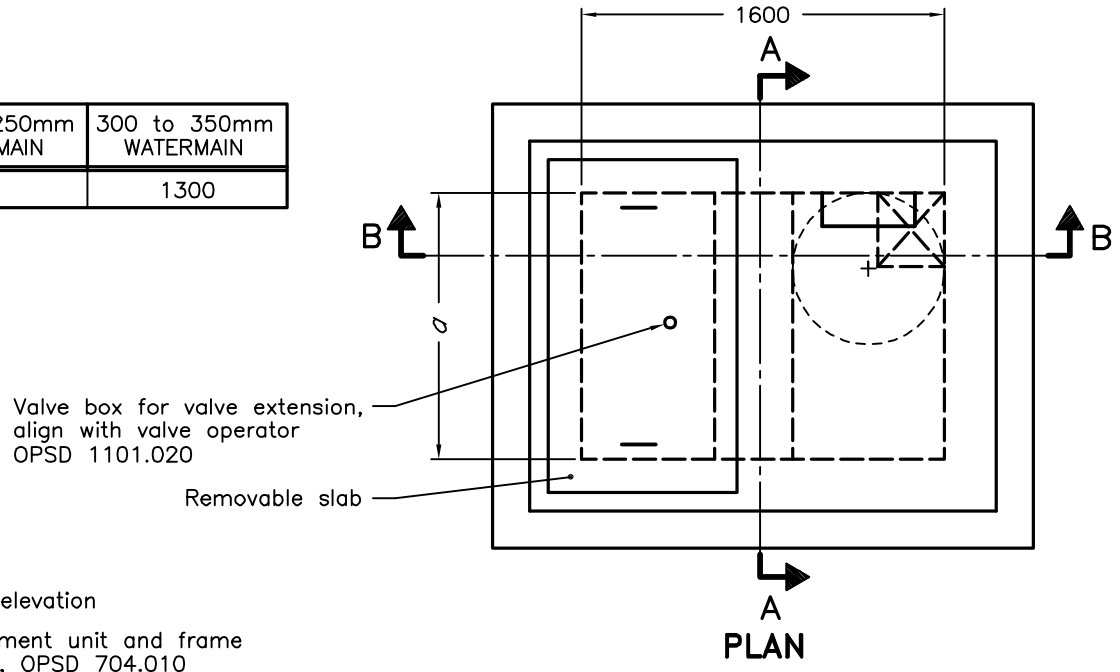
B For new construction, saddles shall be installed on the main pipe before that pipe is laid.

C Approved cut–in tool shall be used for field made connections.

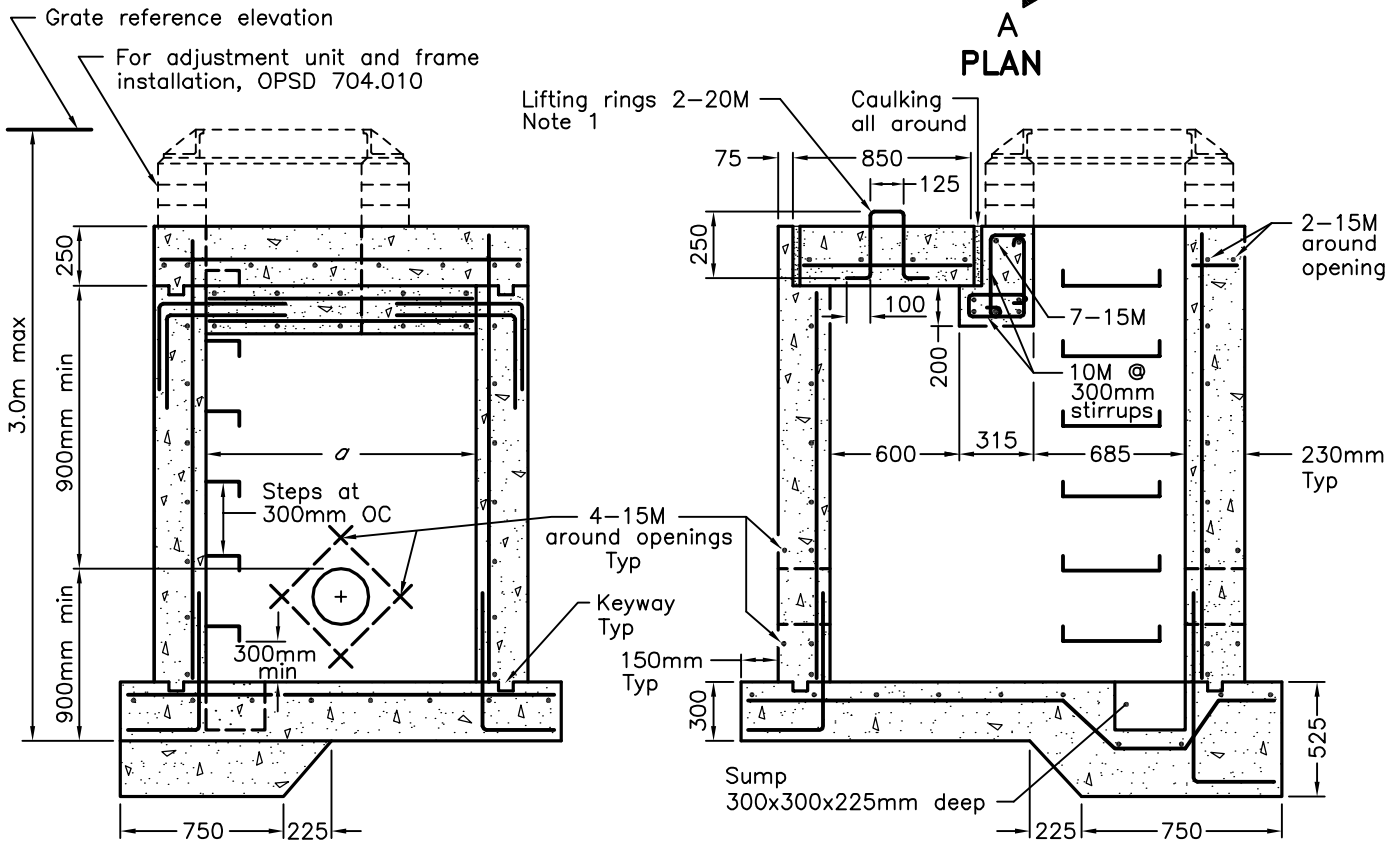
D All dimensions are in millimetres unless otherwise shown.

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.

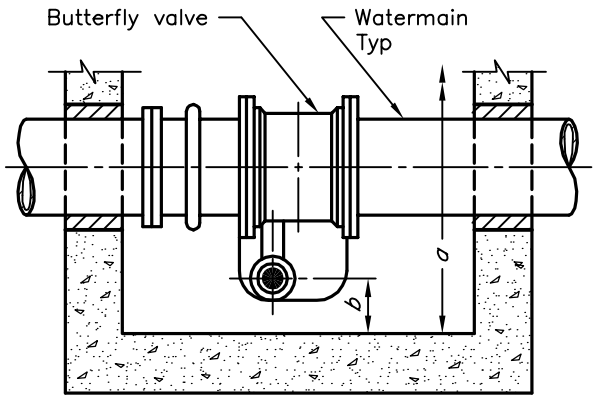
B All steel reinforcement shall be 15M at 300mm unless otherwise shown.

C This OPSD shall be read in conjunction with OPSD 1100.011.

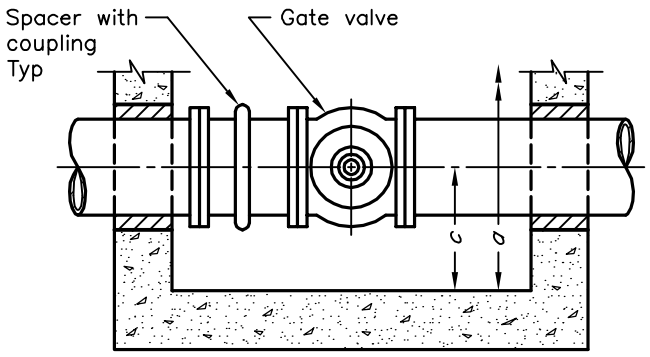
D Joint around removable slab shall be sealed as specified.

E All dimensions are in millimetres unless otherwise shown.

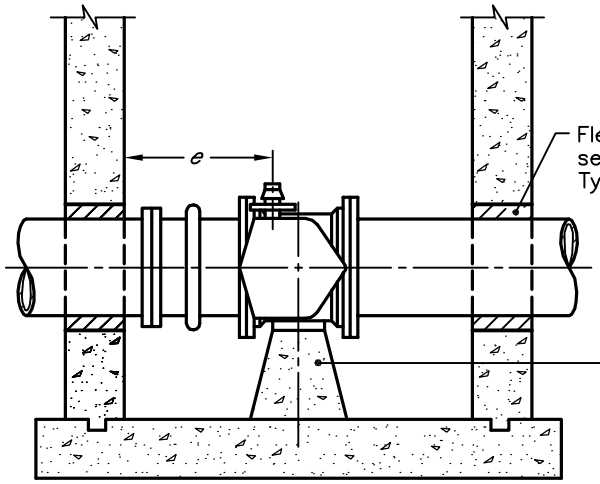
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	3
CAST–IN–PLACE CHAMBER FOR VALVES UP TO 350mm DIAMETER			
			OPSD 1100.010



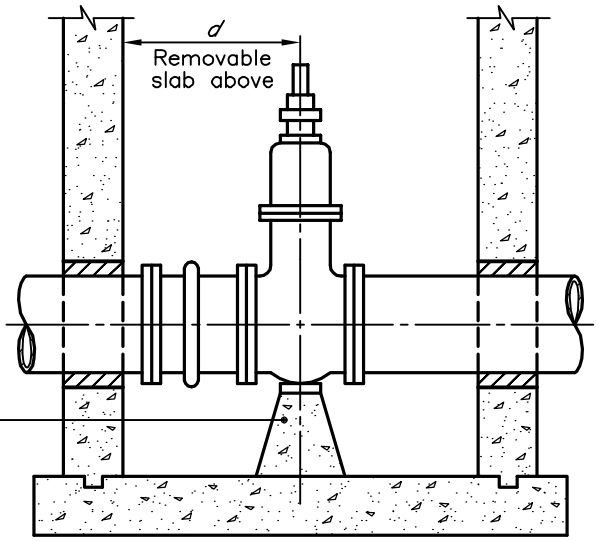
PLAN



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.

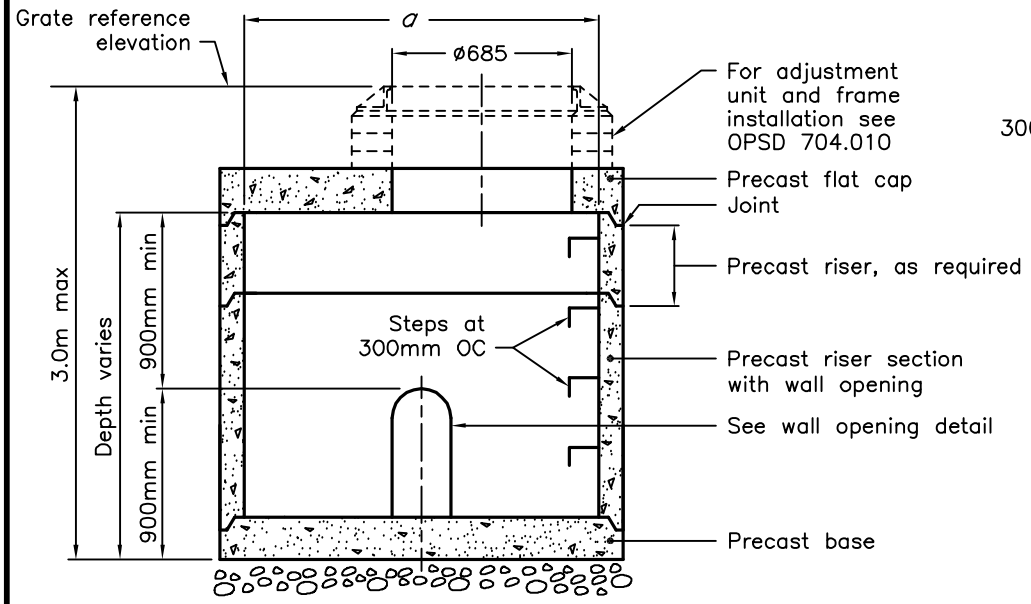
B Concrete support shall be minimum 200mm high.

C This OPSD shall be read in conjunction with OPSD 1100.010.

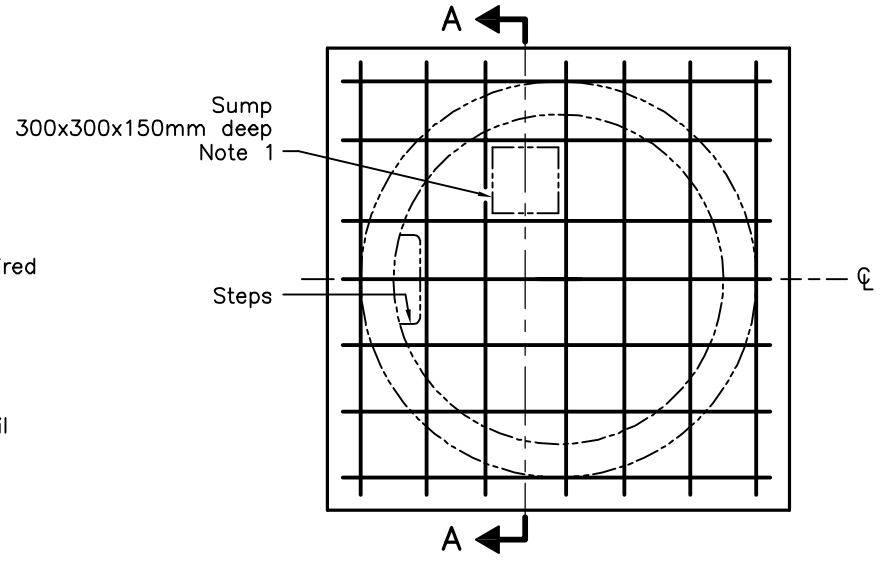
D All joints shall be restrained.

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		

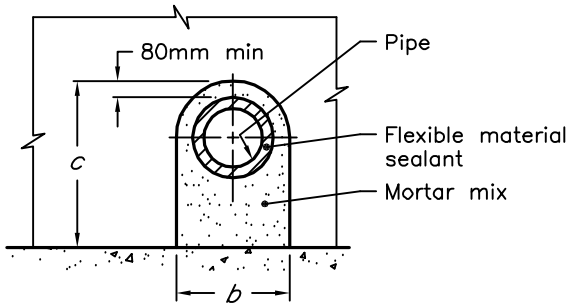


CROSS SECTION

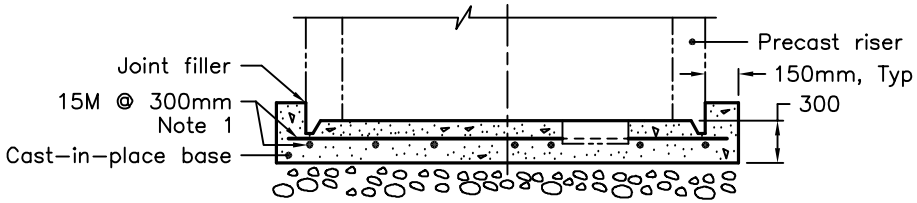


PLAN

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

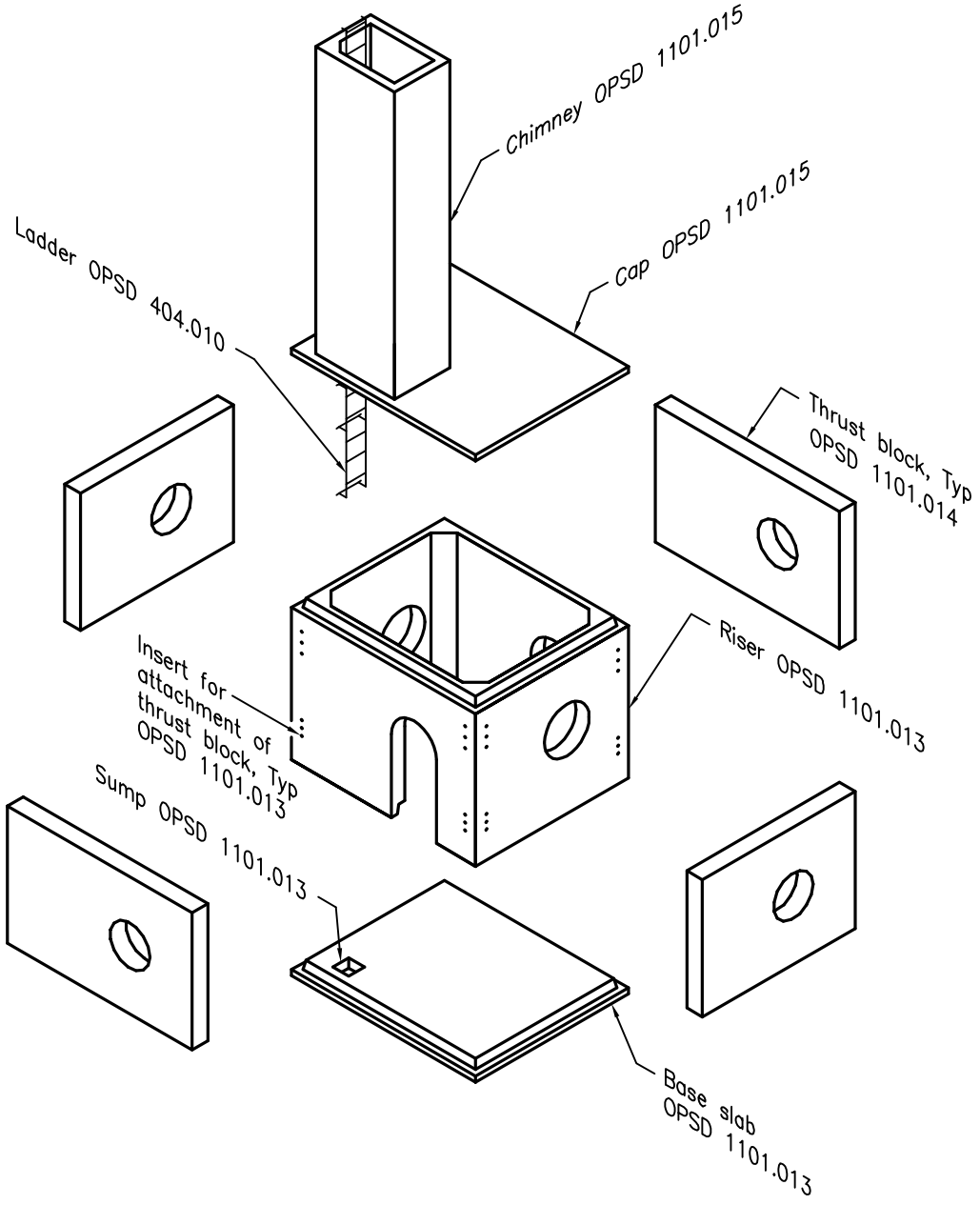
PRECAST VALVE CHAMBER

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.

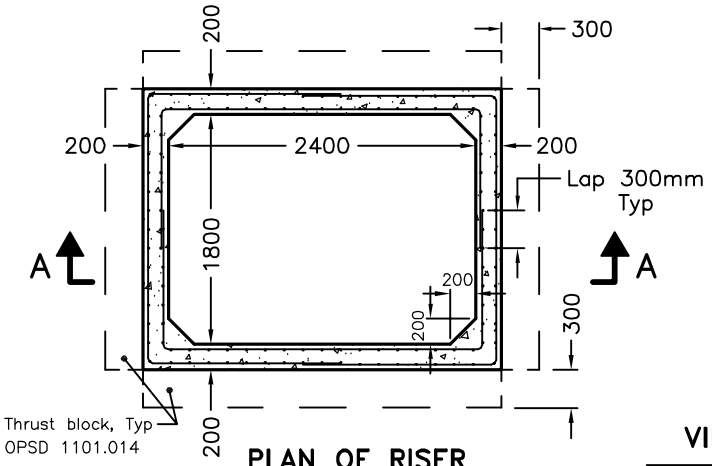
C When the combined height of chamber and chimney is 5.0m or greater, provide safety platform according to OPSD 404.010.

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.

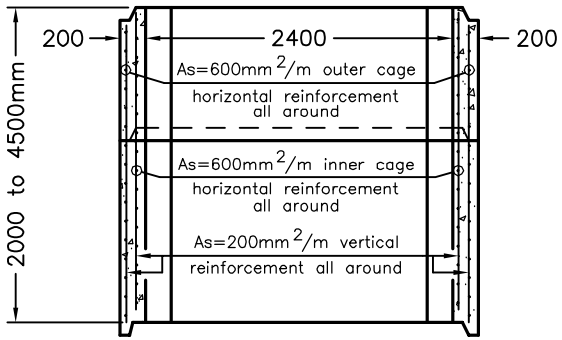
E Thrust blocks designed for a water pressure of 0.86 MPa and a maximum watermain size of 600mm diameter. If thrust blocks are required, they shall be placed on the outside of the chamber on the side or sides as specified.

F All dimensions are in millimetres unless otherwise shown.

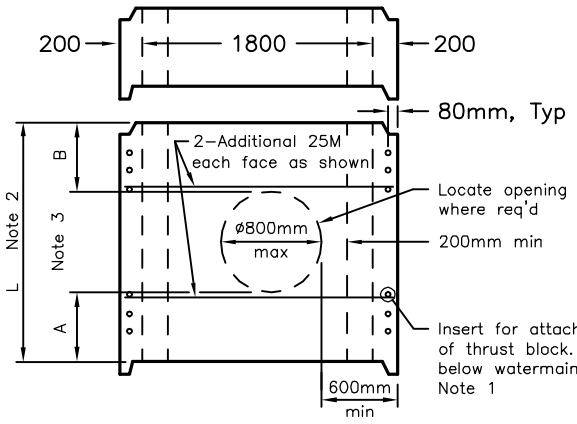
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev 2	ONTARIO STANDARDS MUNICIPAL-PROVINCIAL
PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 1800 x 2400mm COMPONENTS			
			OPSD 1101.012



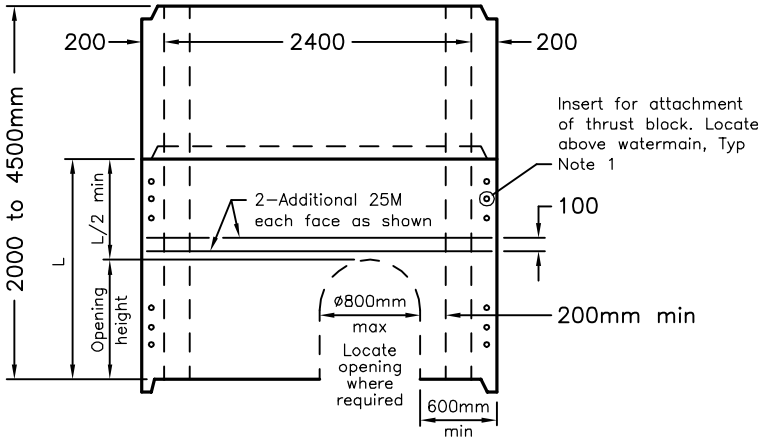
PLAN OF RISER



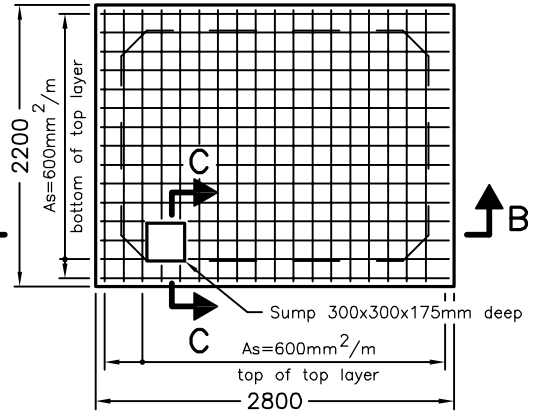
SECTION A–A



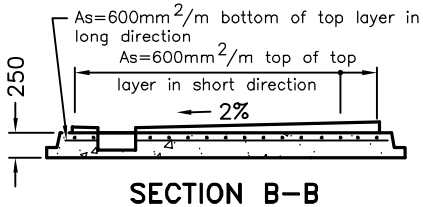
VIEW OF SIDES WITH CIRCULAR OPENING



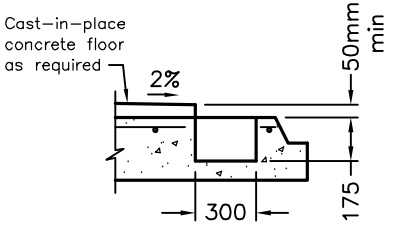
VIEW OF SIDES WITH SLOTTED OPENING



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.

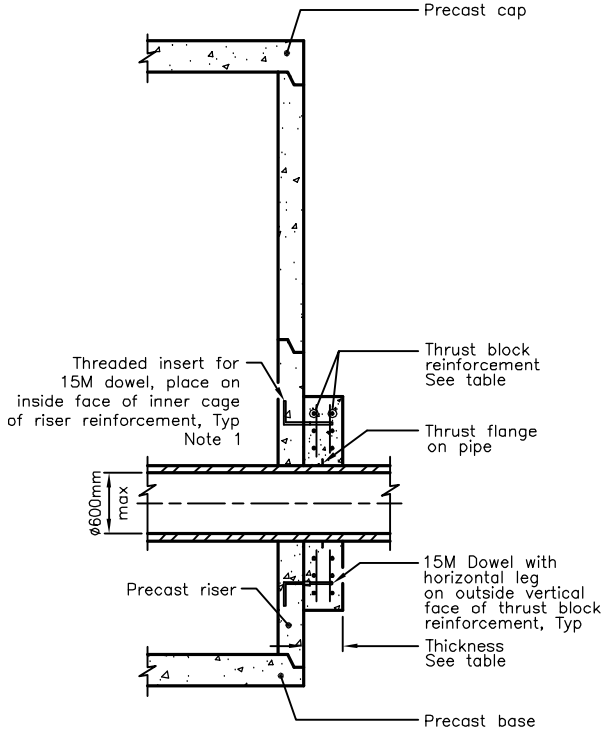
ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 1800 x 2400mm RISER AND BASE

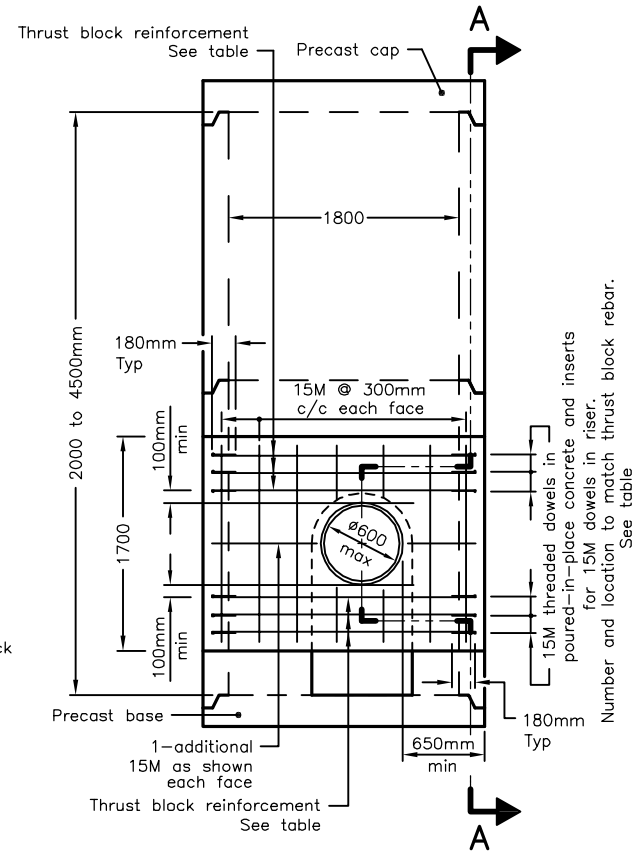
Nov 2013 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

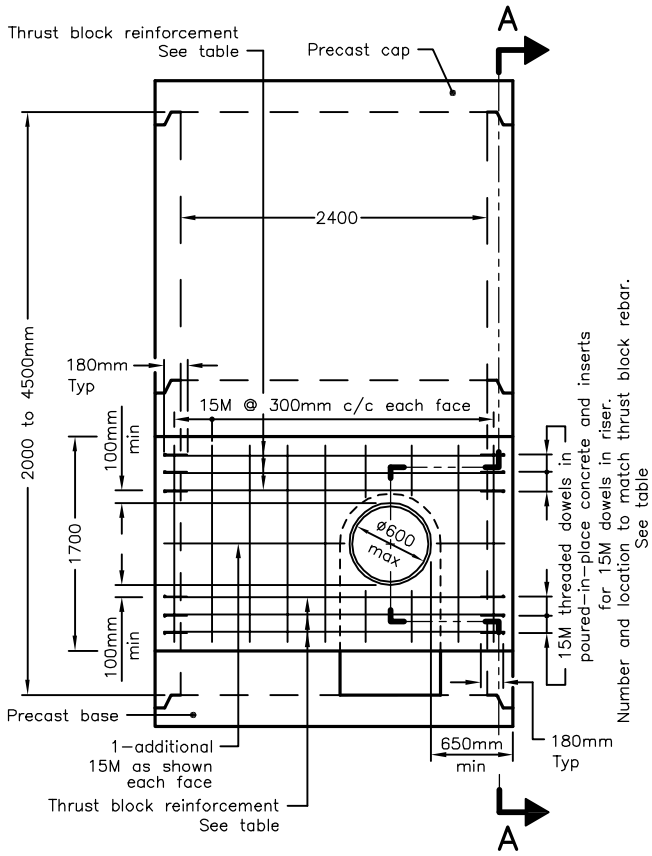
OPSD 1101.013



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

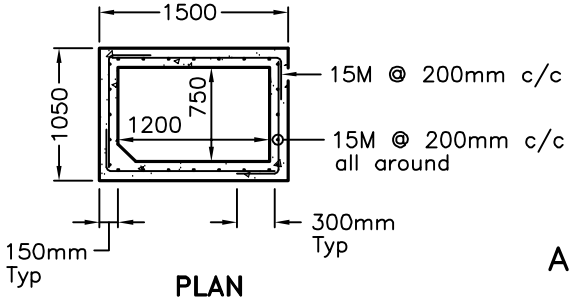
ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 1800 x 2400mm THRUST BLOCKS

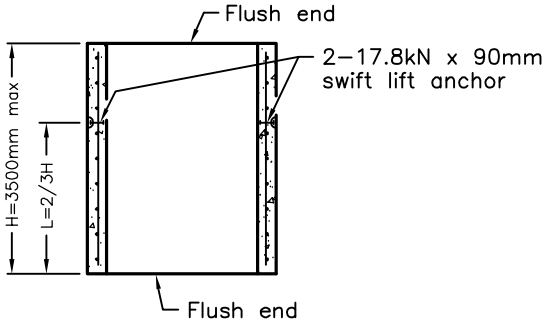
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

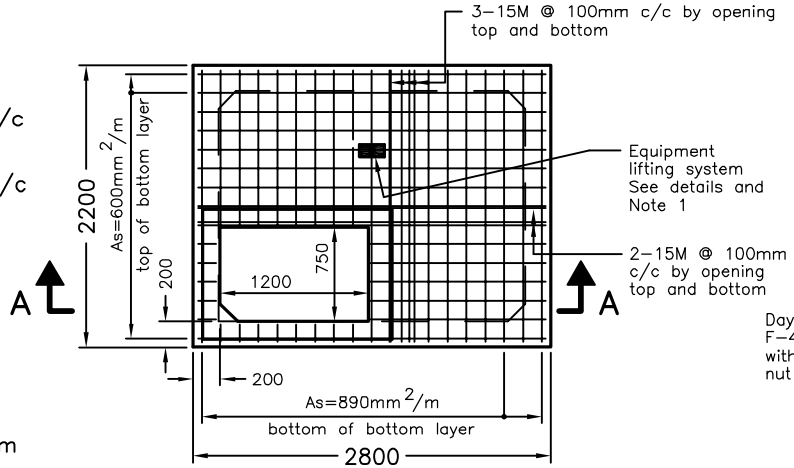
OPSD 1101.014



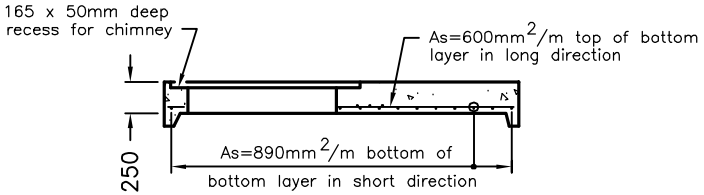
PLAN



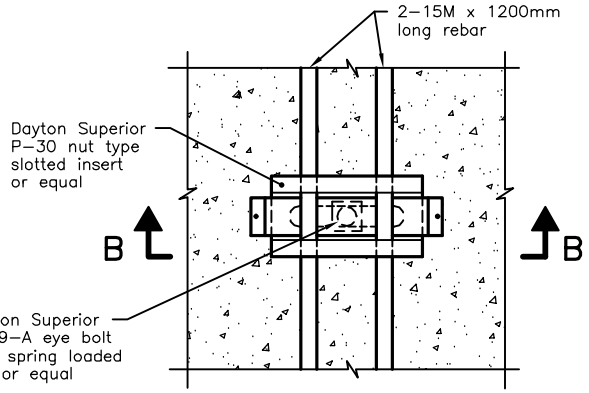
ELEVATION
CHIMNEY



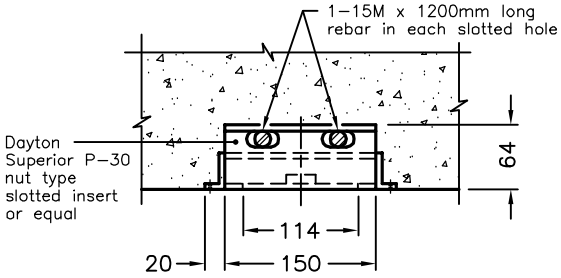
PLAN OF CAP



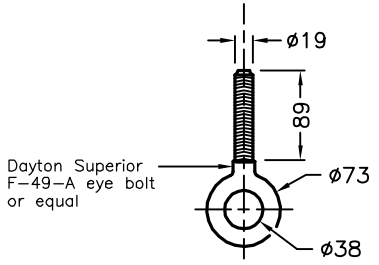
SECTION A–A



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.

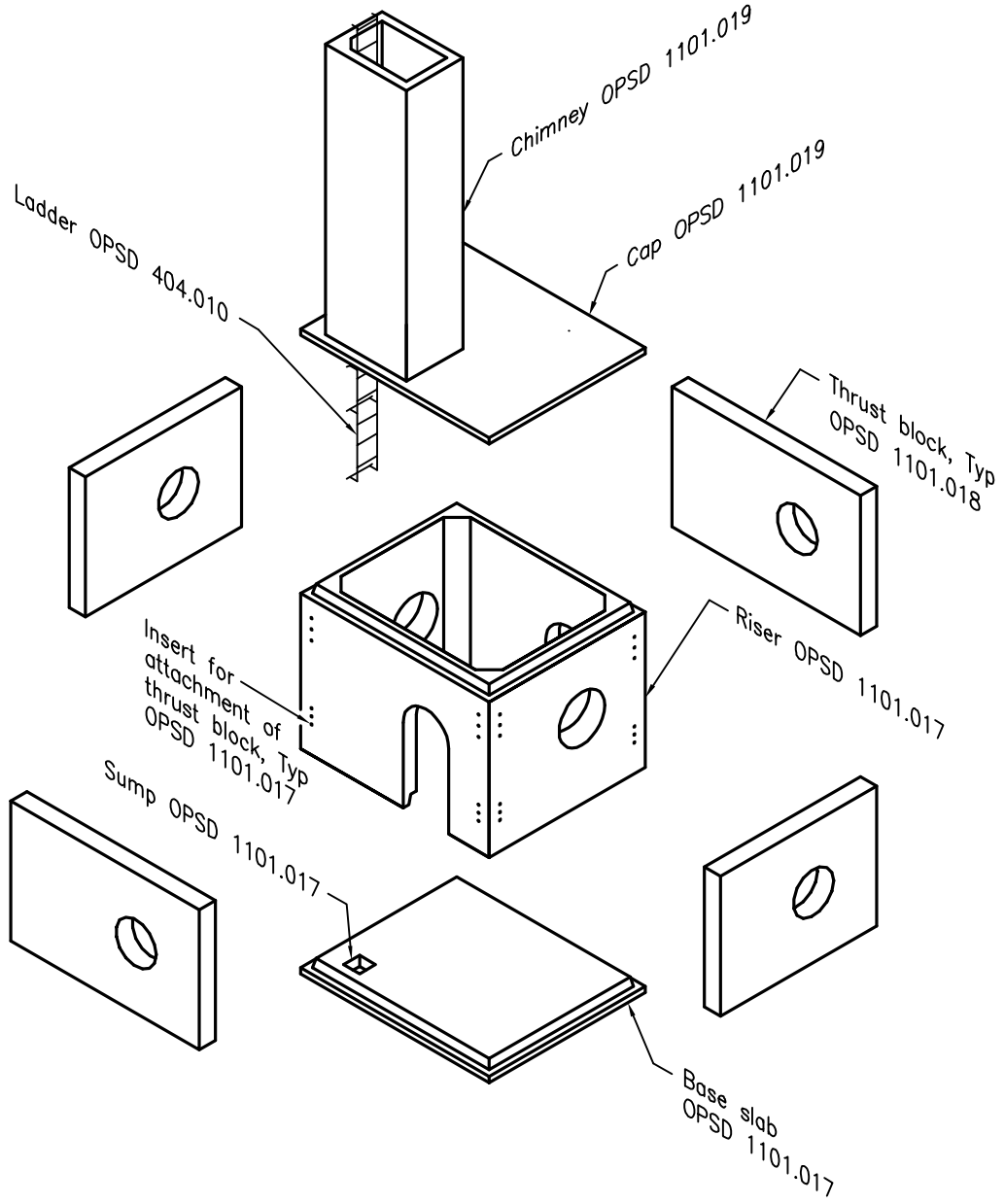
ONTARIO PROVINCIAL STANDARD DRAWING

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.

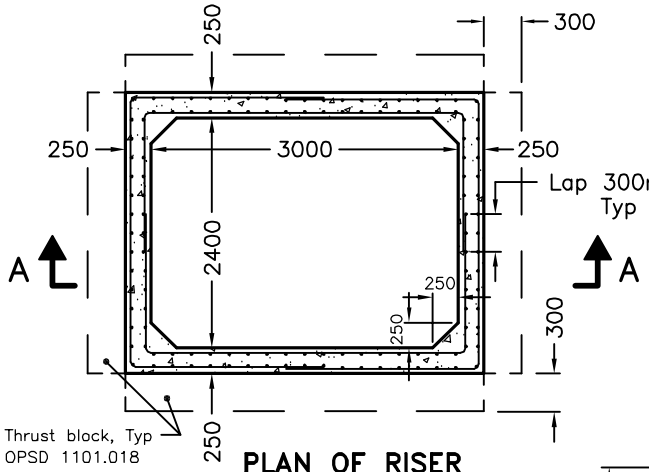
C When the combined height of chamber and chimney is 5.0m or greater, provide safety platform according to OPSD 404.010.

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.

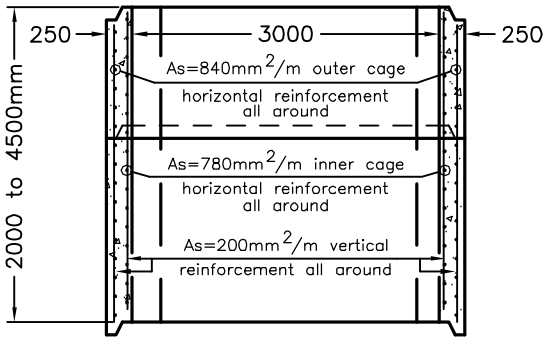
E Thrust blocks designed for a water pressure of 0.86 MPa and a maximum watermain size of 750mm diameter. If thrust blocks are required, they shall be placed on the outside of the chamber on the side or sides as specified.

F All dimensions are in millimetres unless otherwise shown.

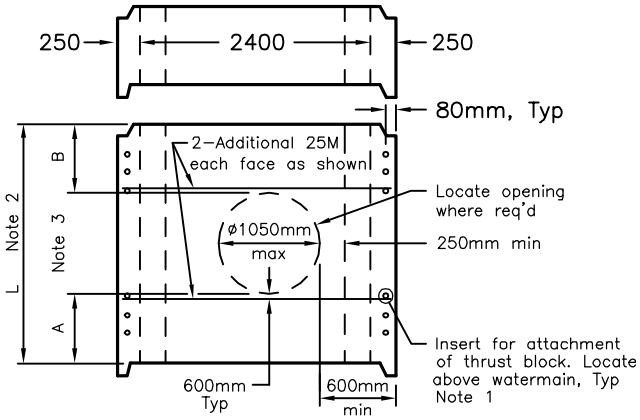
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	2
PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 2400 x 3000mm COMPONENTS			
	OPSD 1101.016		



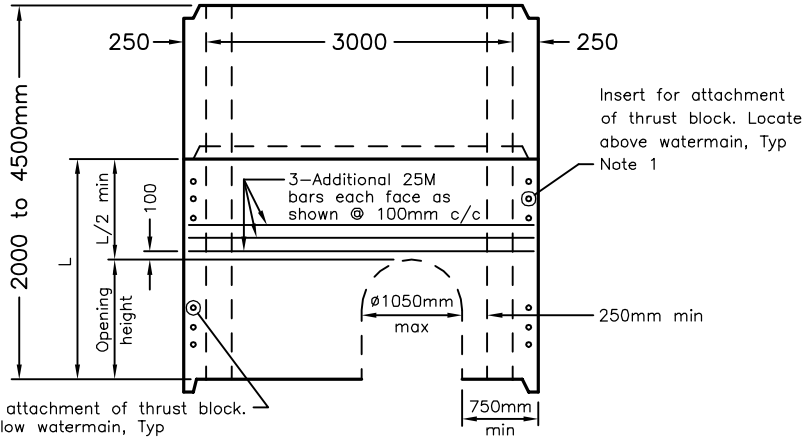
PLAN OF RISER



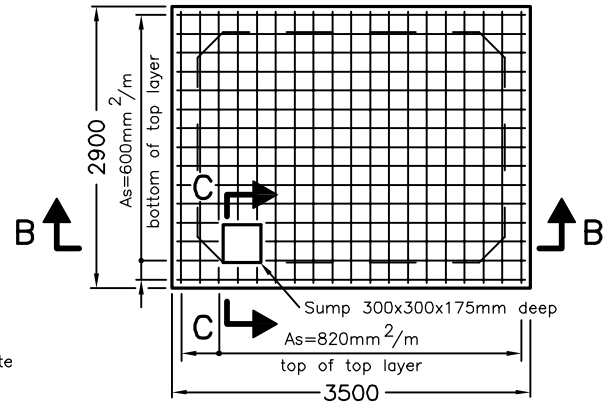
SECTION A–A



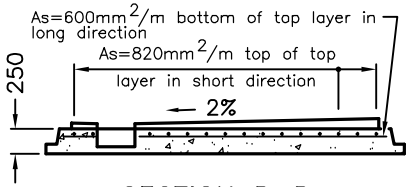
VIEW OF SIDES WITH CIRCULAR OPENING



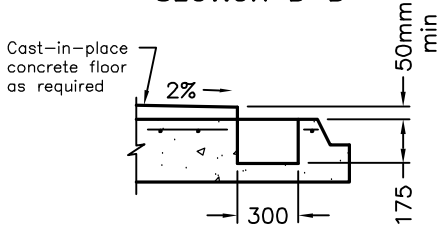
VIEW OF SIDES WITH SLOTTED OPENING



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.

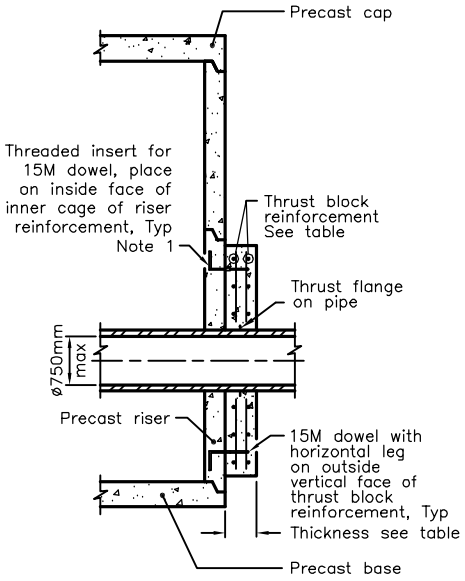
ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 2400 x 3000mm RISER AND BASE

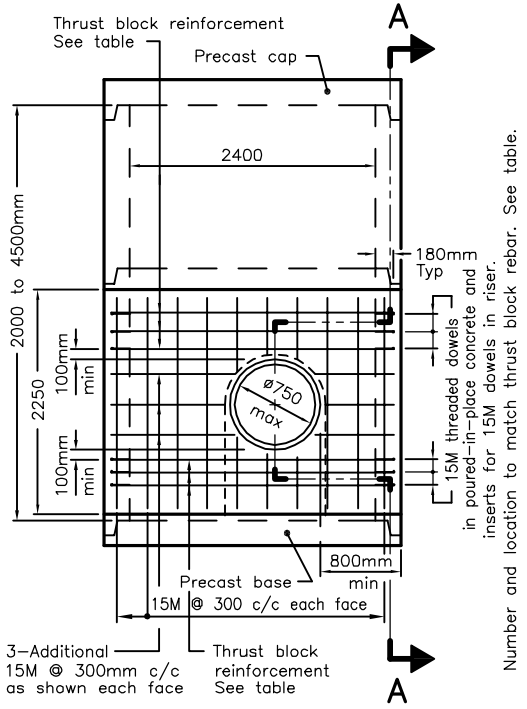
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

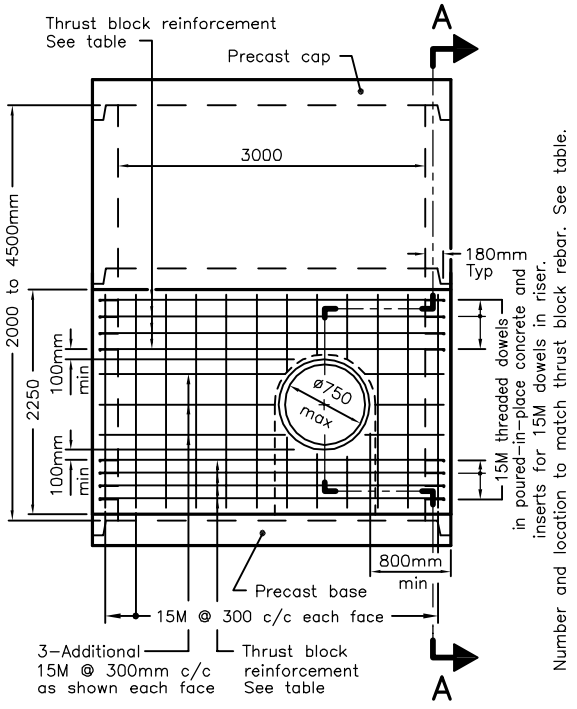
OPSD 1101.017



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

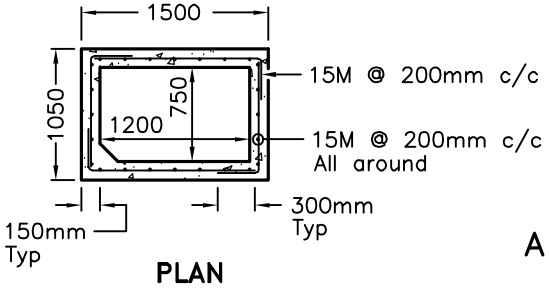
ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 2400 x 3000mm THRUST BLOCKS

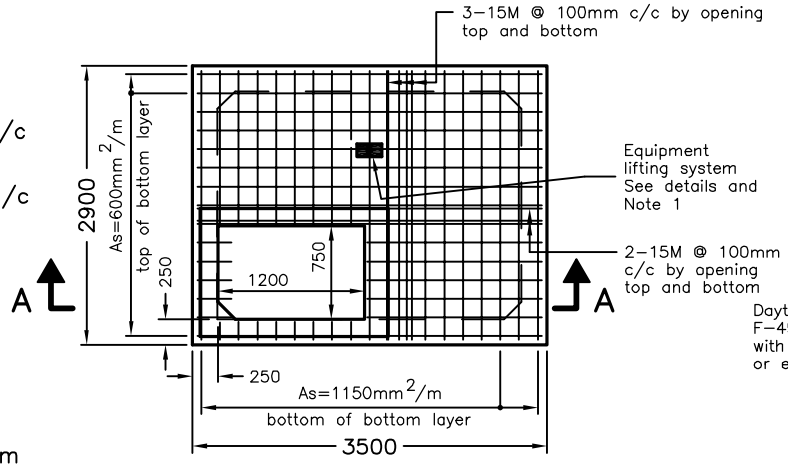
Nov 2013 | Rev 3

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

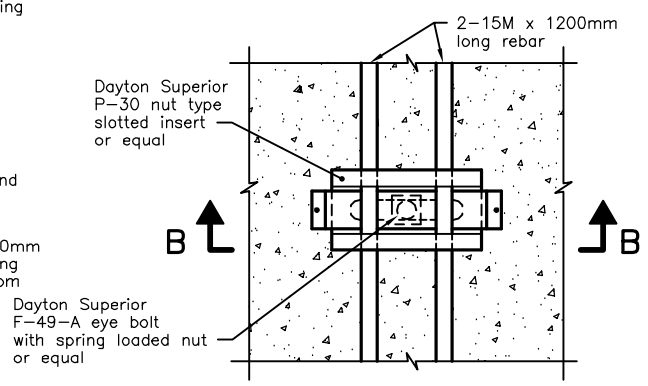
OPSD 1101.018



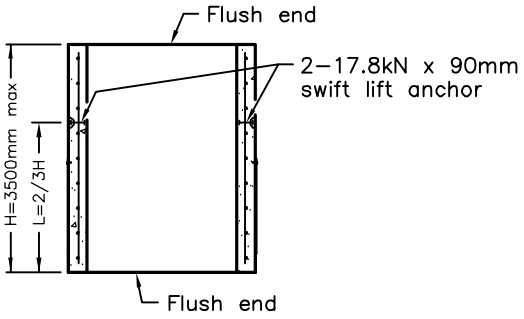
PLAN



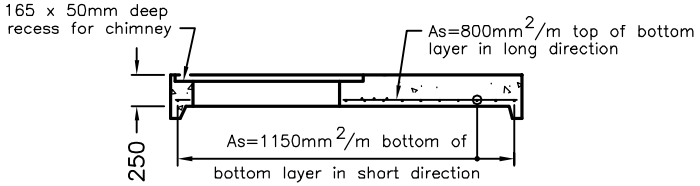
PLAN OF CAP



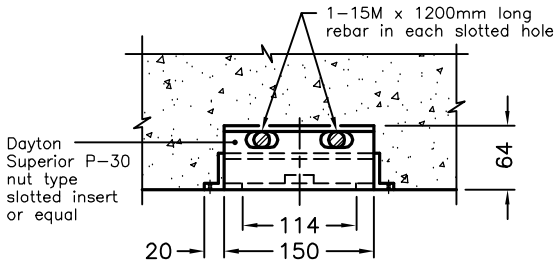
PLAN



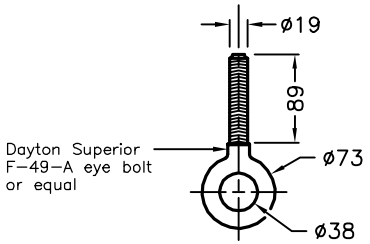
ELEVATION
CHIMNEY



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.

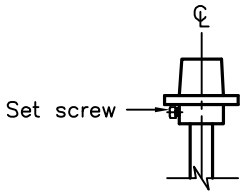
ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 2400 x 3000mm CHIMNEY AND CAP

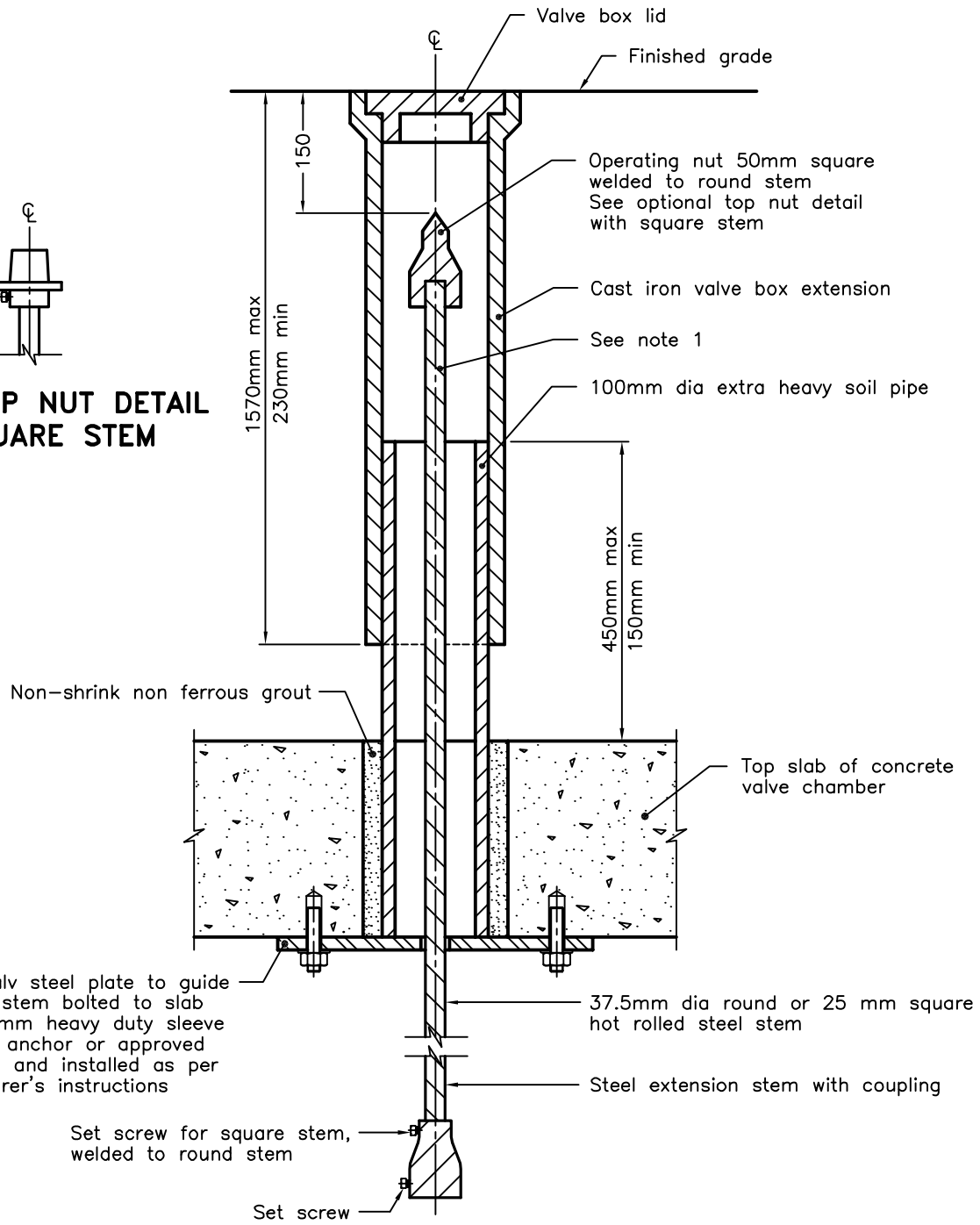
Nov 2013 | Rev 2

ONTARIO STANDARDS MUNICIPAL – PROVINCIAL

OPSD 1101.019



OPTIONAL TOP NUT DETAIL WITH SQUARE STEM



CROSS SECTION

NOTES:

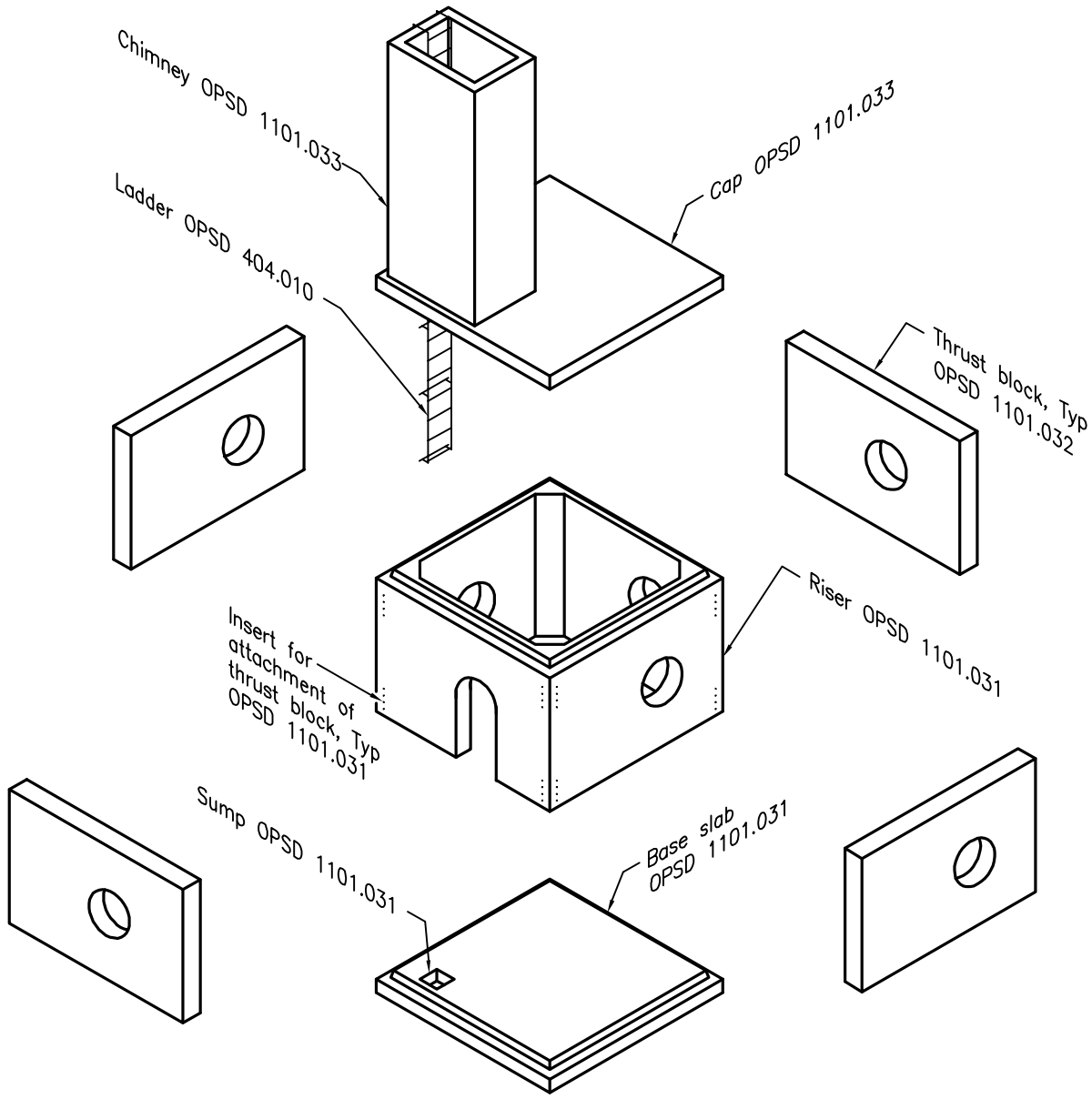
1 Either the square or round stem shall be used with specified connections.

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.

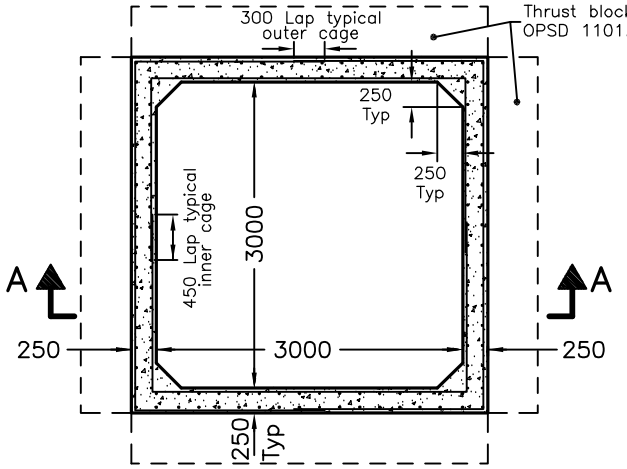
C When the combined height of chamber and chimney is 5.0m or greater, provide safety platform according to OPSD 404.010.

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.

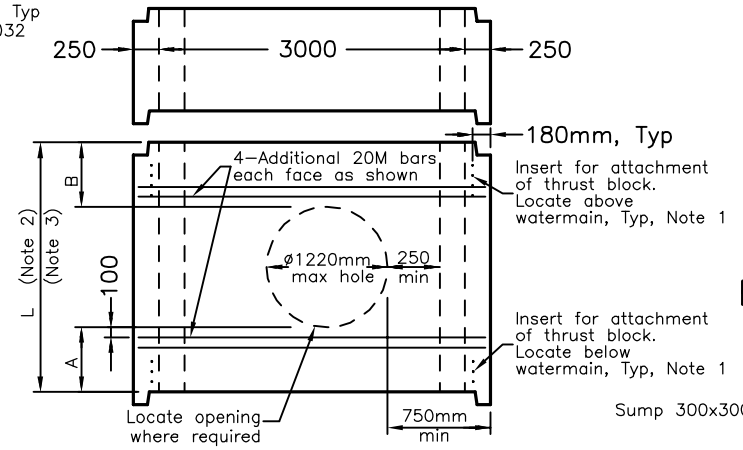
E Thrust blocks designed for a maximum water surge pressure of 1.72 MPa and a maximum opening size of 1220mm diameter. If thrust blocks are required, they shall be placed on the outside of the chamber on the side or sides specified.

F All dimensions are in millimetres unless otherwise shown.

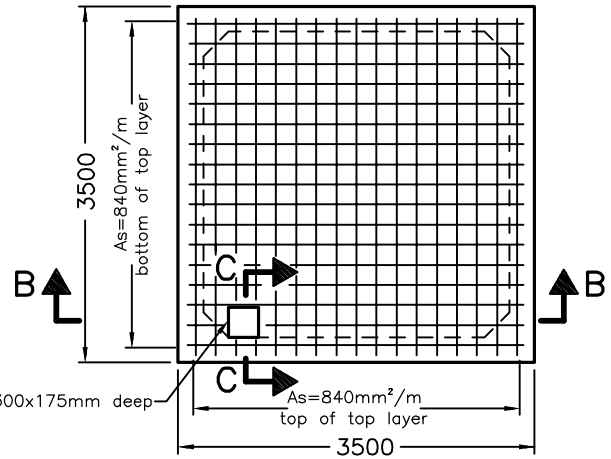
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	0
PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 3000 x 3000mm COMPONENTS			
	OPSD 1101.030		



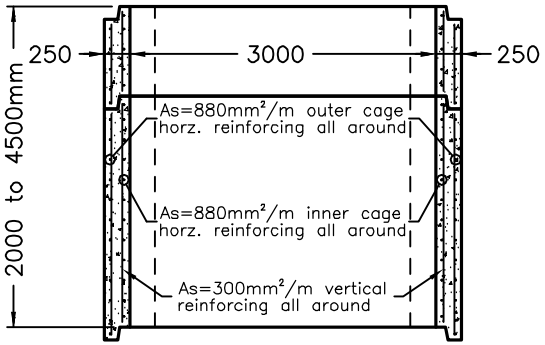
PLAN OF RISER



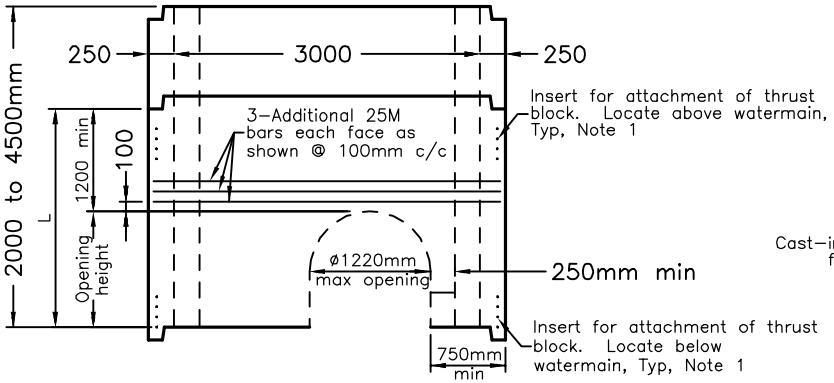
VIEW OF SIDES WITH CIRCULAR OPENING



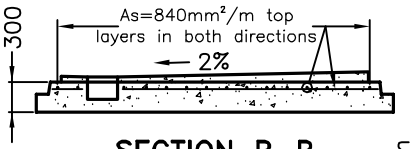
PLAN OF BASE



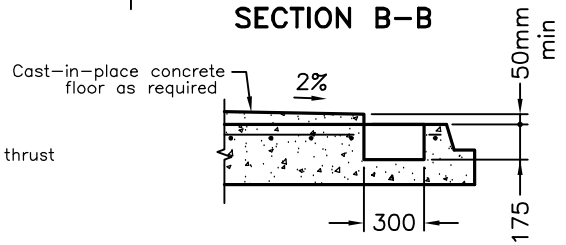
SECTION A–A



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.

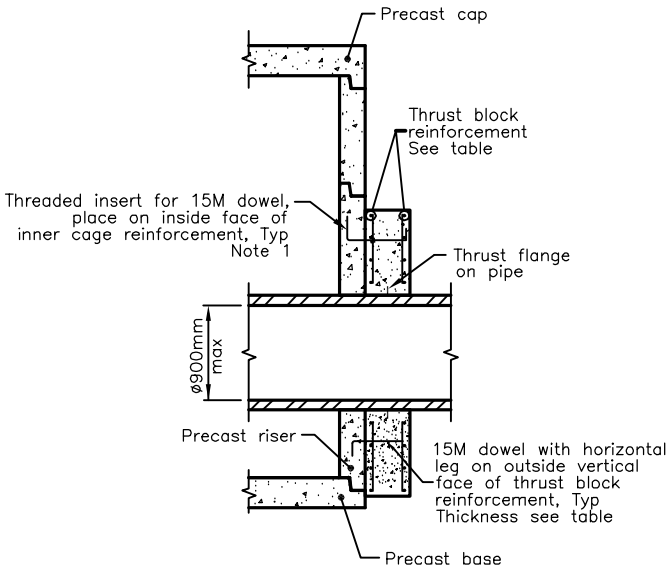
ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 3000 x 3000mm RISER AND BASE

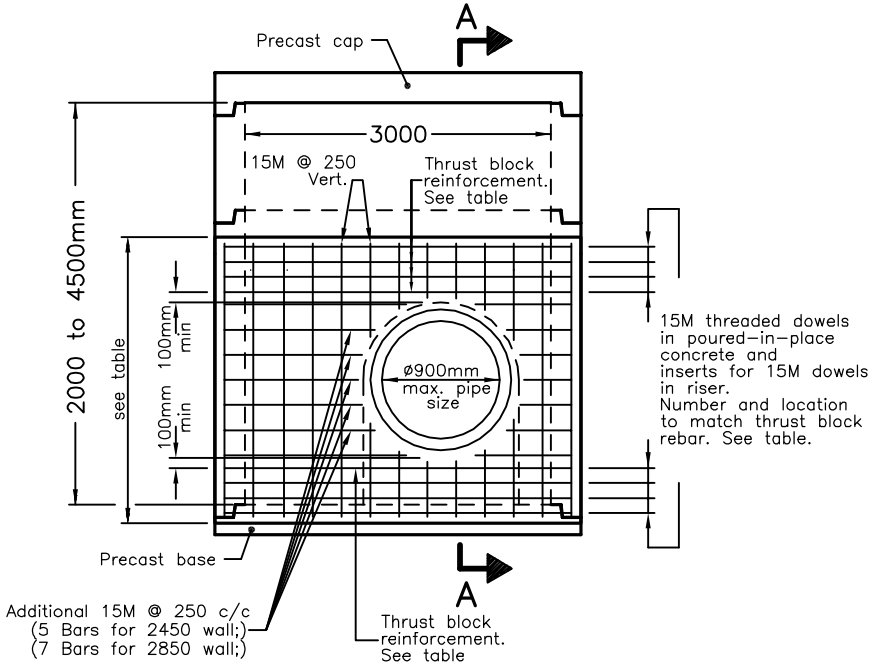
Nov 2013 | Rev 0

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.

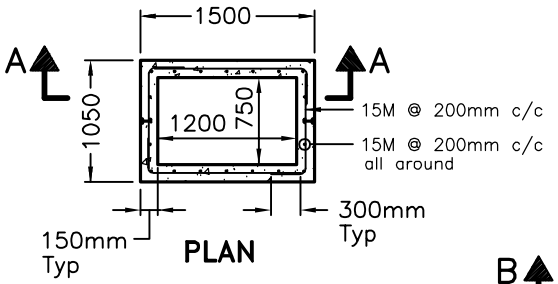
ONTARIO PROVINCIAL STANDARD DRAWING

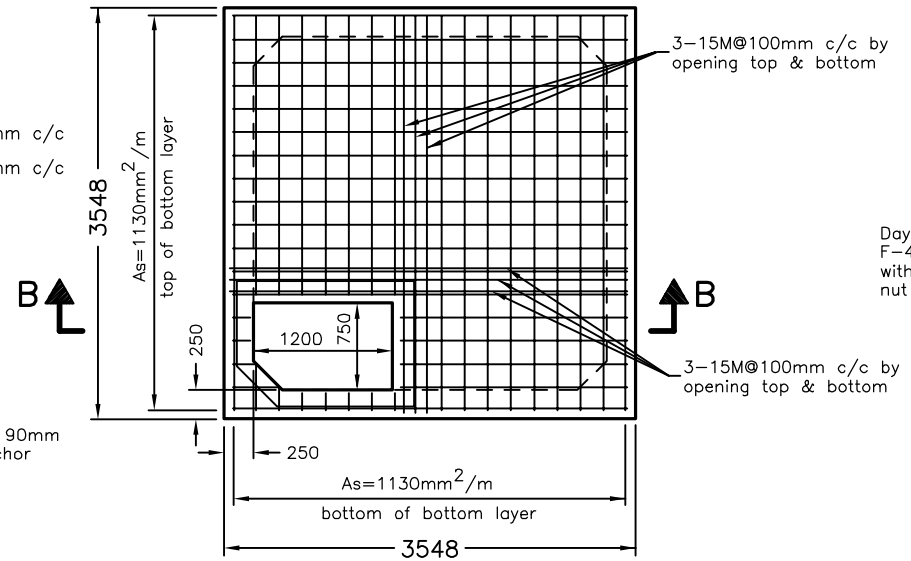
PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 3000 x 3000mm THRUST BLOCKS

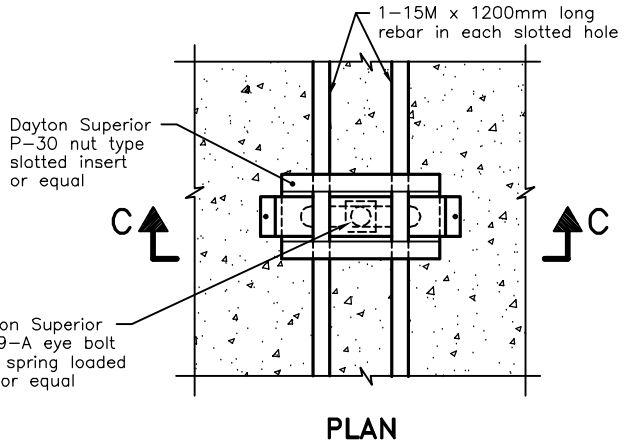
Nov 2013 | Rev 0

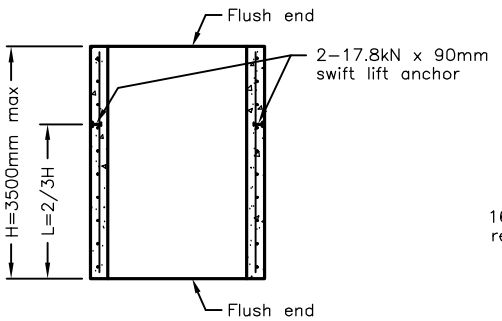
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

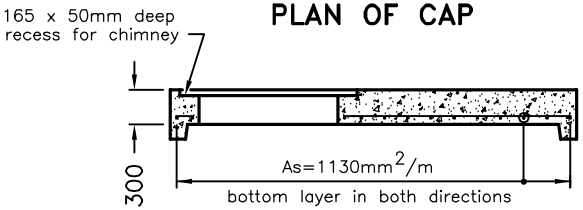
OPSD 1101.032

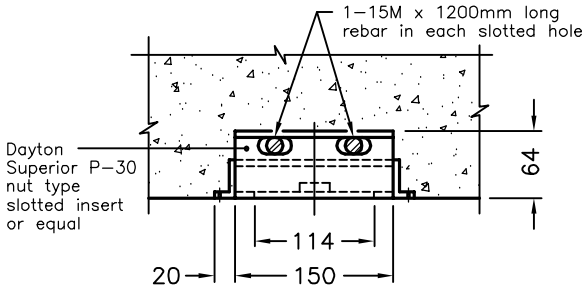


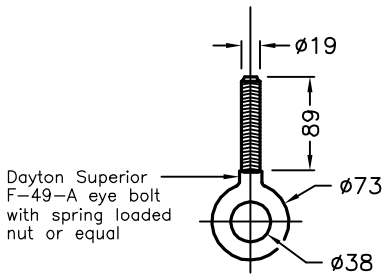












NOTES:

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.

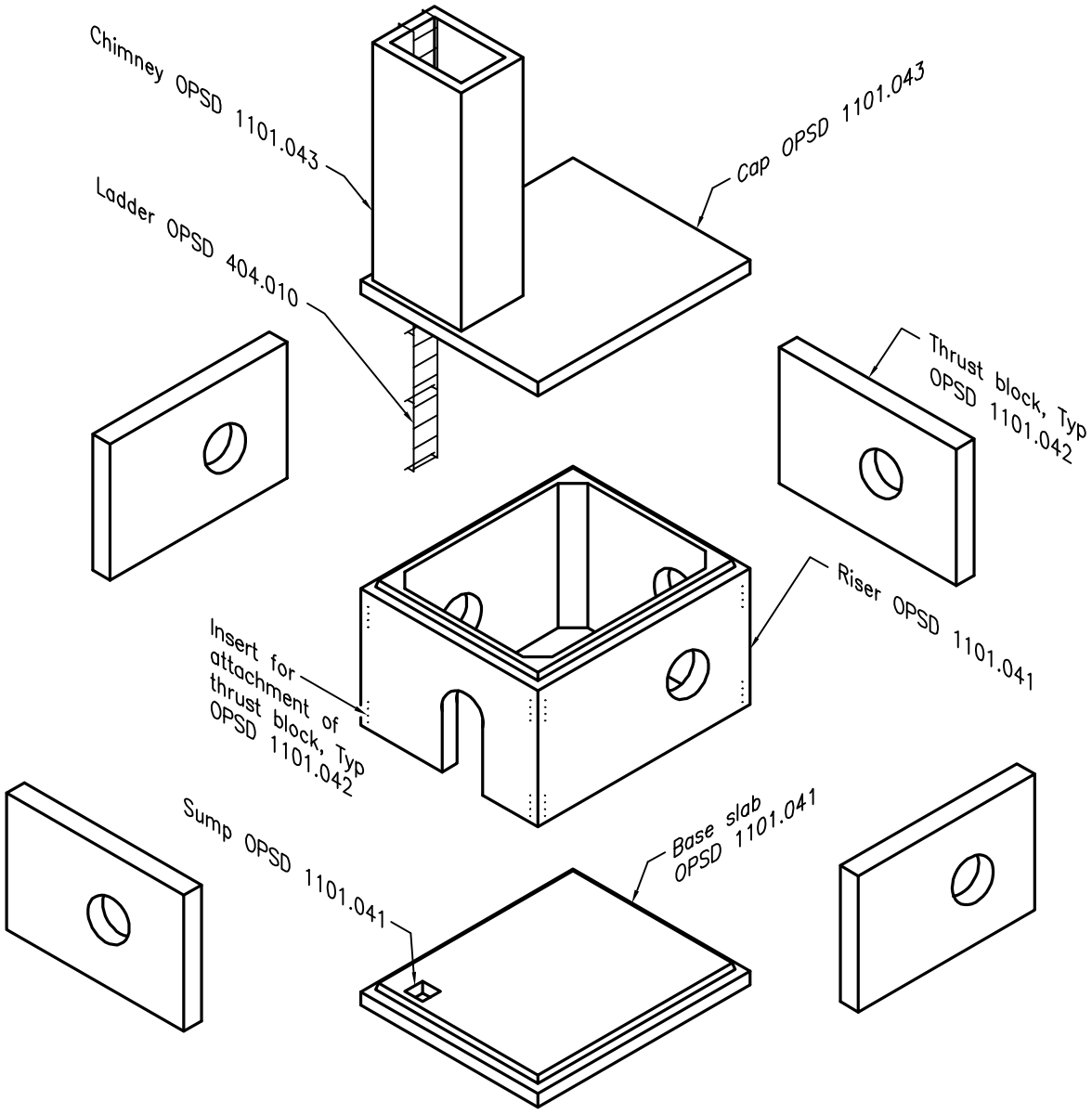
G All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 3000 x 3000mm CHIMNEY AND CAP

Nov 2013 | Rev 0

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.

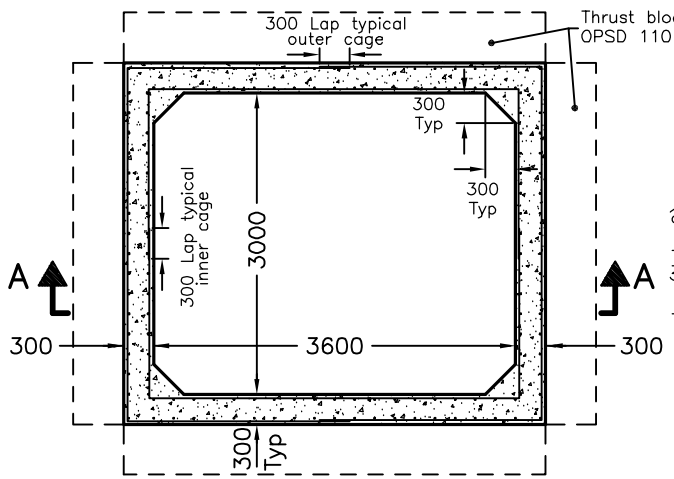
C When the combined height of chamber and chimney is 5.0m or greater, provide safety platform according to OPSD 404.010.

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.

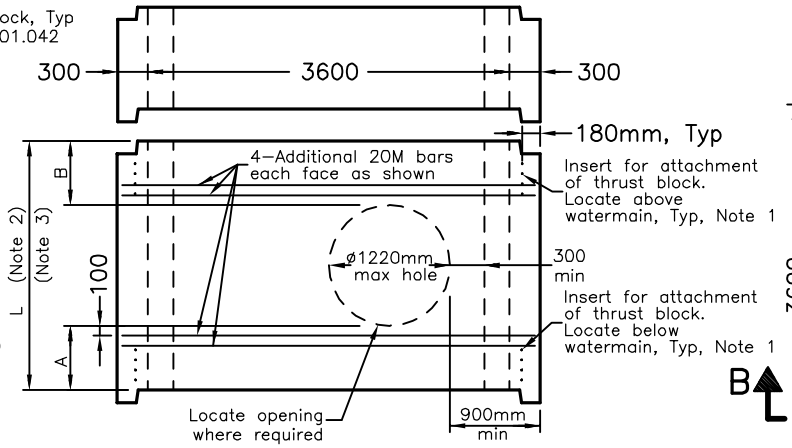
E Thrust blocks designed for a maximum water surge pressure of 1.72 MPa and a maximum opening size of 1220mm diameter. If thrust blocks are required, they shall be placed on the outside of the chamber on the side or sides specified.

F All dimensions are in millimetres unless otherwise shown.

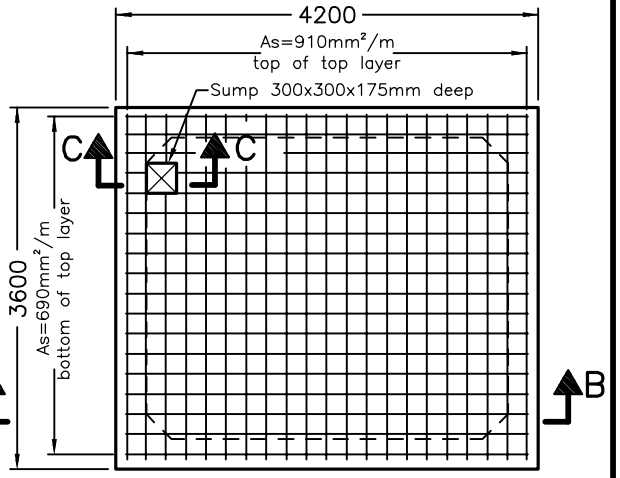
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	0
PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 3600 x 3000mm COMPONENTS			
	OPSD 1101.040		



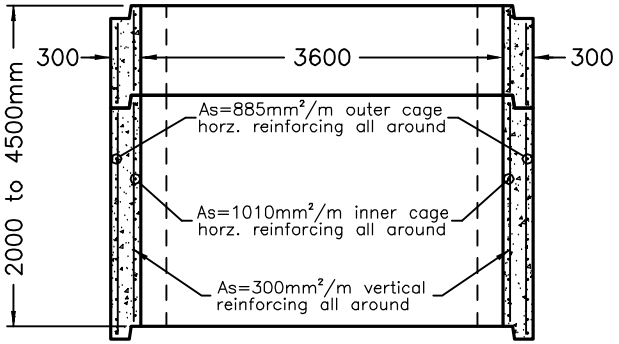
PLAN OF RISER



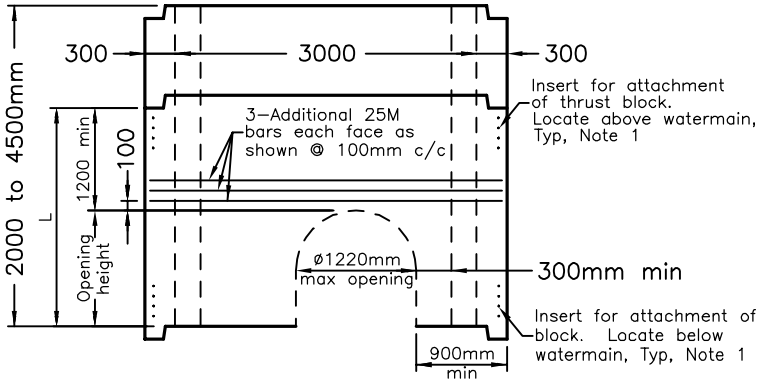
VIEW OF SIDES WITH CIRCULAR OPENING



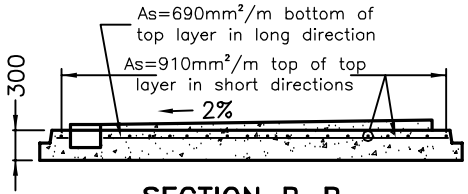
PLAN OF BASE



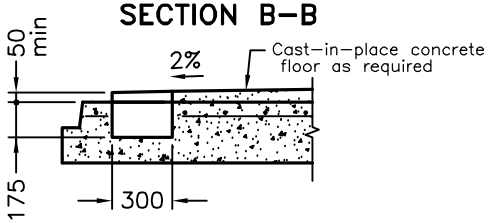
SECTION A–A



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.

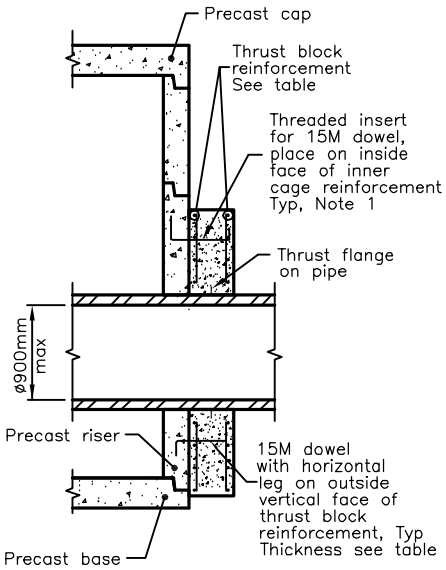
ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 3600 x 3000mm RISER AND BASE

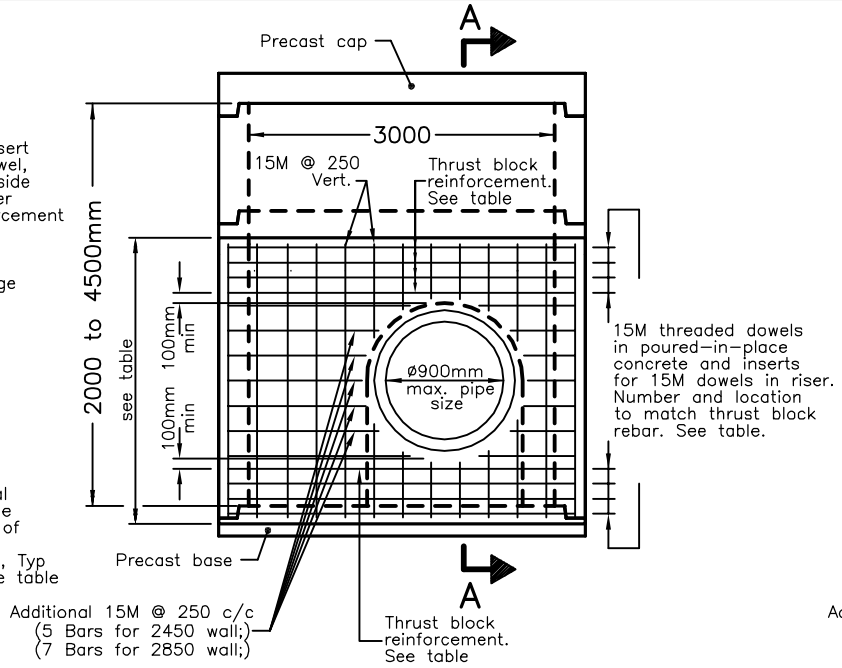
Nov 2013 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

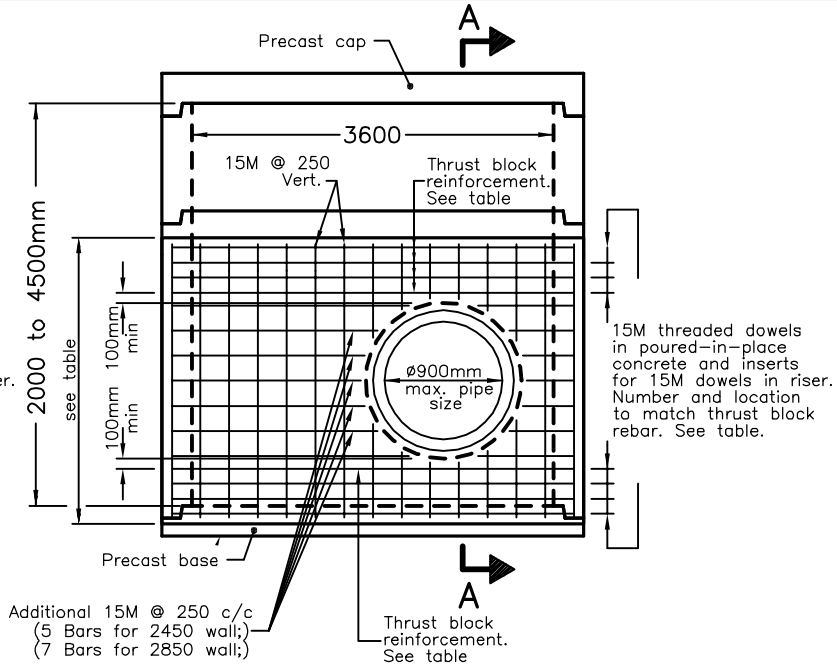
OPSD 1101.041



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.

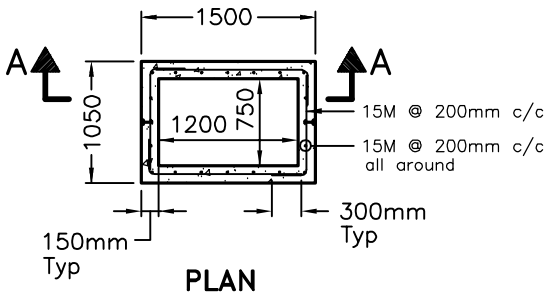
ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 3600 x 3000mm THRUST BLOCKS

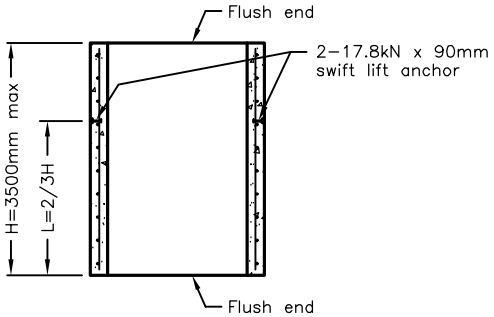
Nov 2013 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

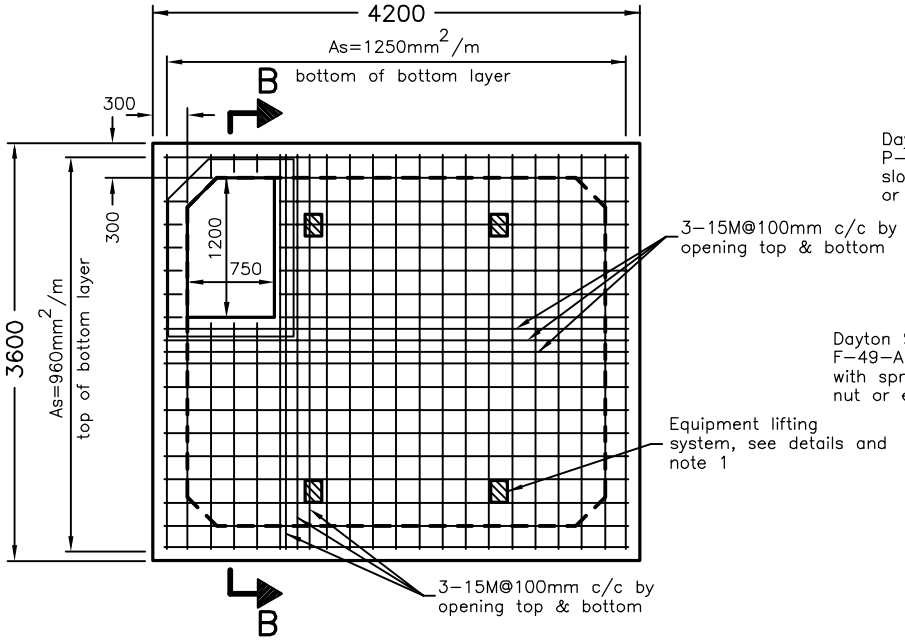
OPSD 1101.042



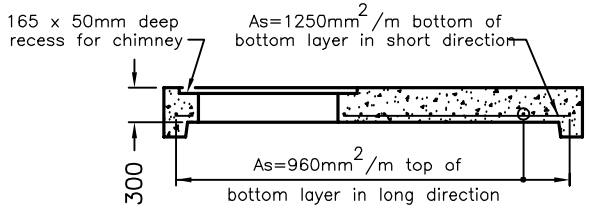
PLAN



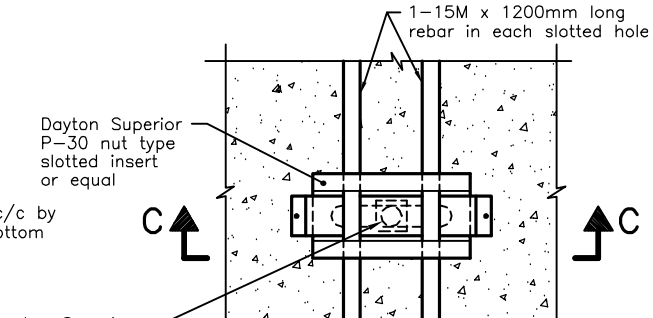
SECTION A–A



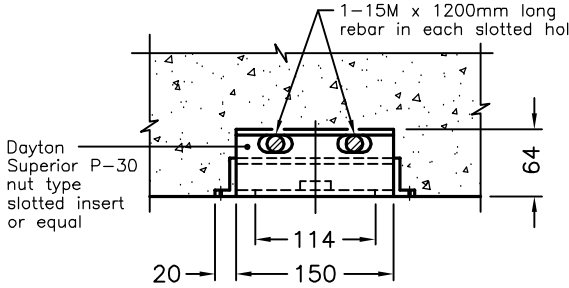
PLAN OF CAP



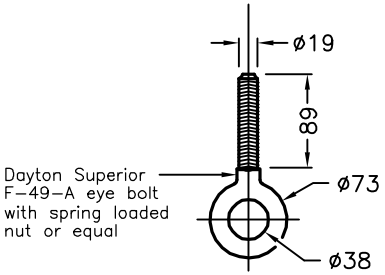
SECTION B–B



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.

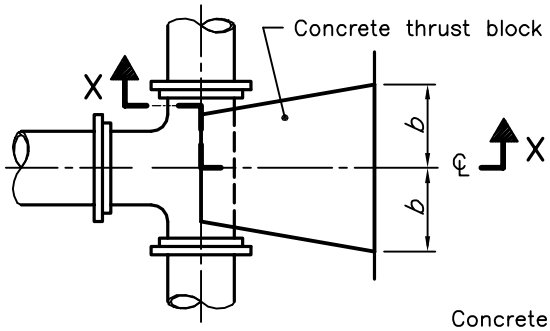
ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 3600 x 3000mm CHIMNEY AND CAP

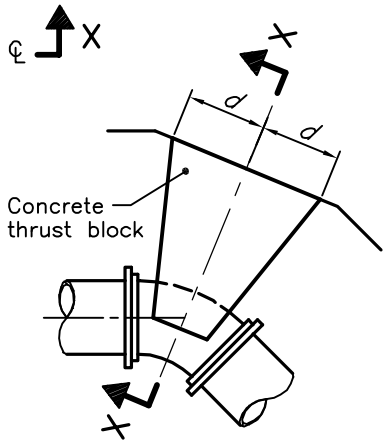
Nov 2013 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

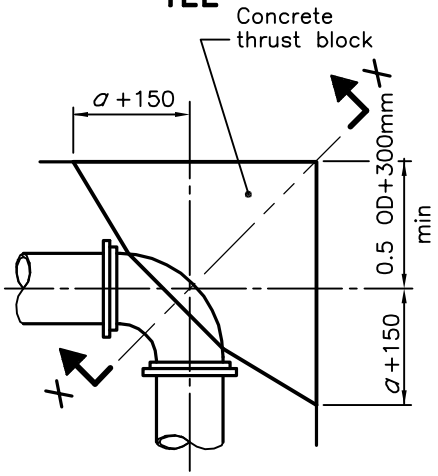
OPSD 1101.043



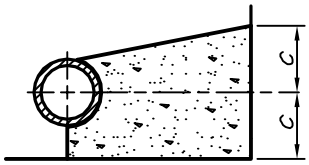
PLAN
TEE



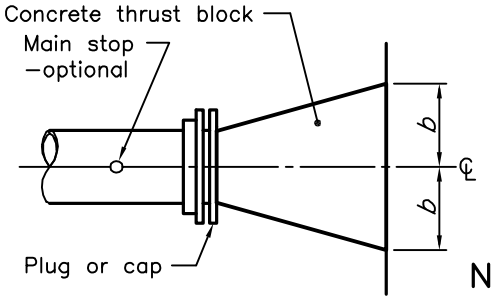
PLAN
TYPICAL BEND



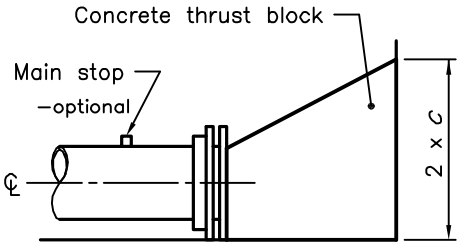
PLAN
90 BEND



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.

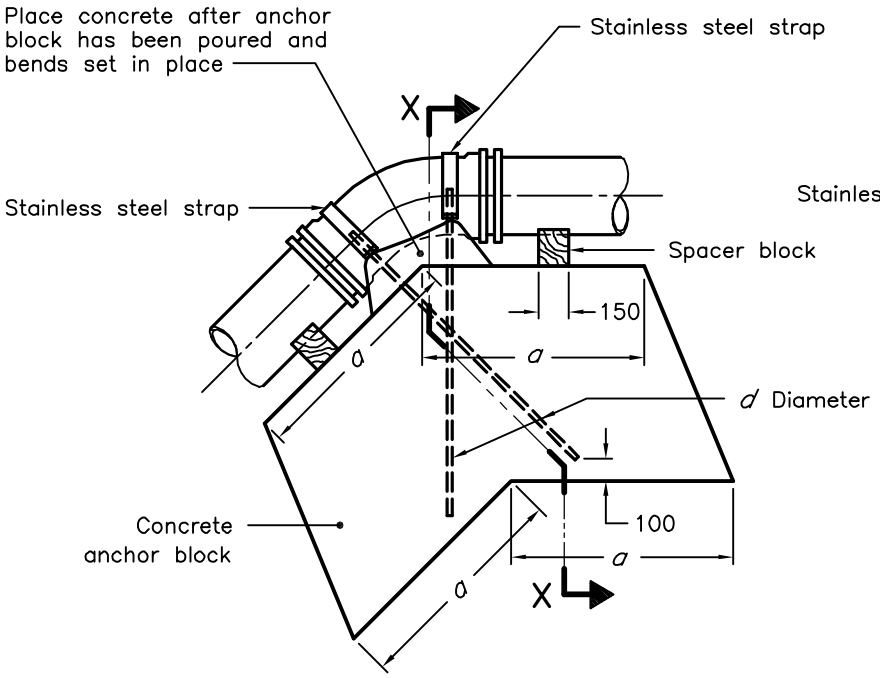
C The above thrust block dimensions meet or exceed the MOE Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit.

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.

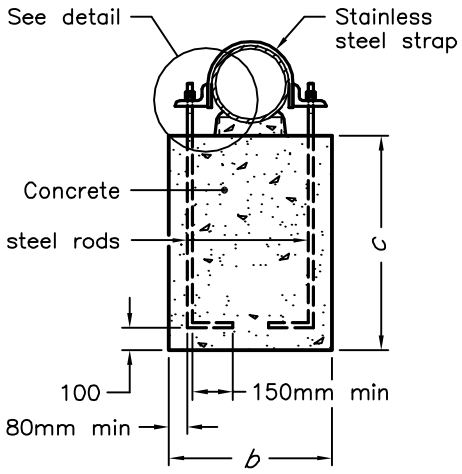
E The tables apply to both ductile iron and PVC pipe. When one length exceeded the other, the longer length was used.

F All dimensions are in millimetres unless otherwise shown.

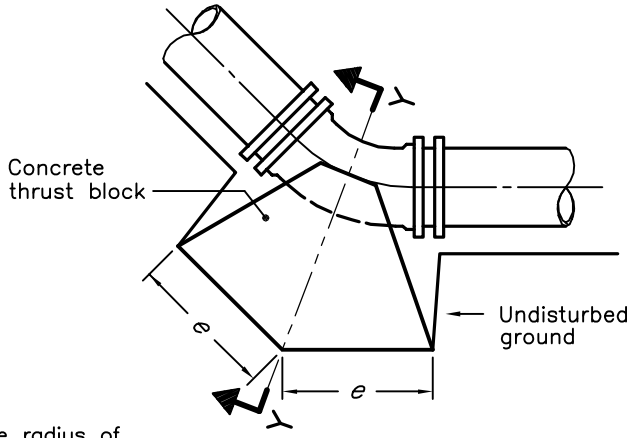
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	2
CONCRETE THRUST BLOCKS FOR TEES, PLUGS, AND HORIZONTAL BENDS	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _		
	OPSD 1103.010		



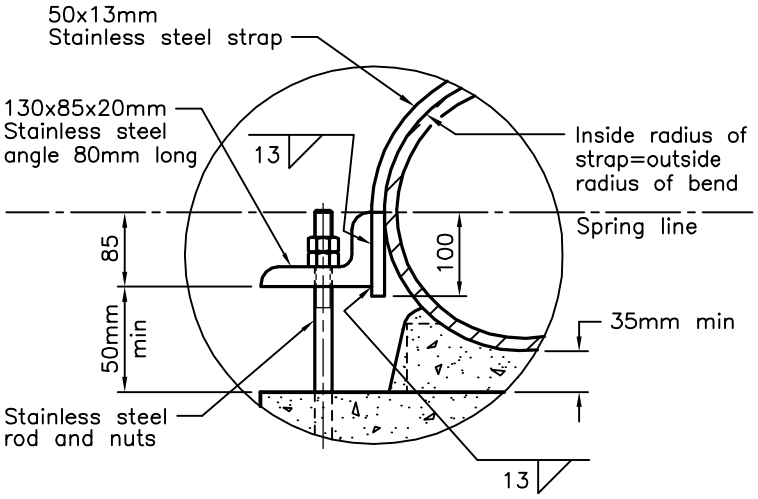
UP–THRUST BLOCK ELEVATION



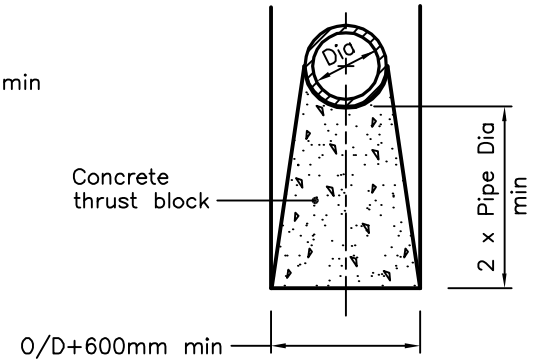
UP–THRUST BLOCK SECTION X–X



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.

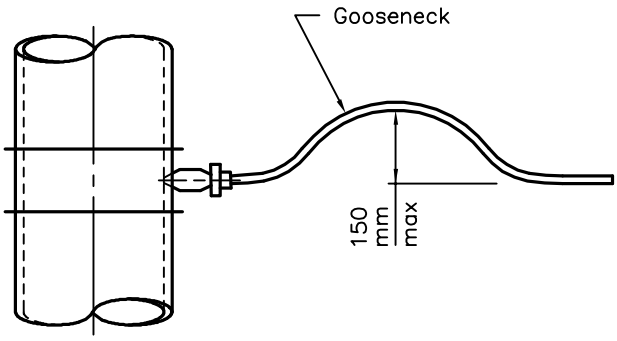
B The assumptions made for the above calculations are as follows:
- Maximum operating pressure of 690 kPa,
- Maximum surge pressure with a flow velocity change of 0.6 m/s of 790 kPa for Class 52 DI pipe and 240 kPa for PVC pipe.

C The tables apply to both ductile iron and PVC pipe. When one length exceeded the other, the longer length was used.

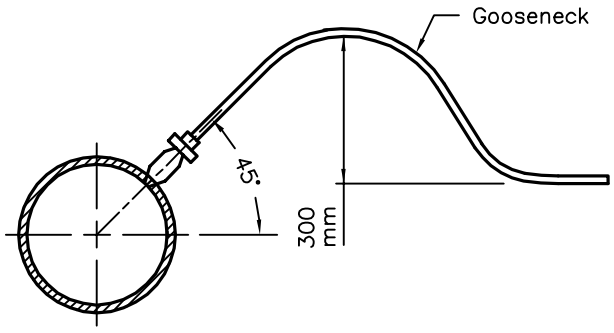
D This OPSD shall be read in conjunction with OPSD 1103.020.

E All dimensions are in millimetres unless otherwise shown.

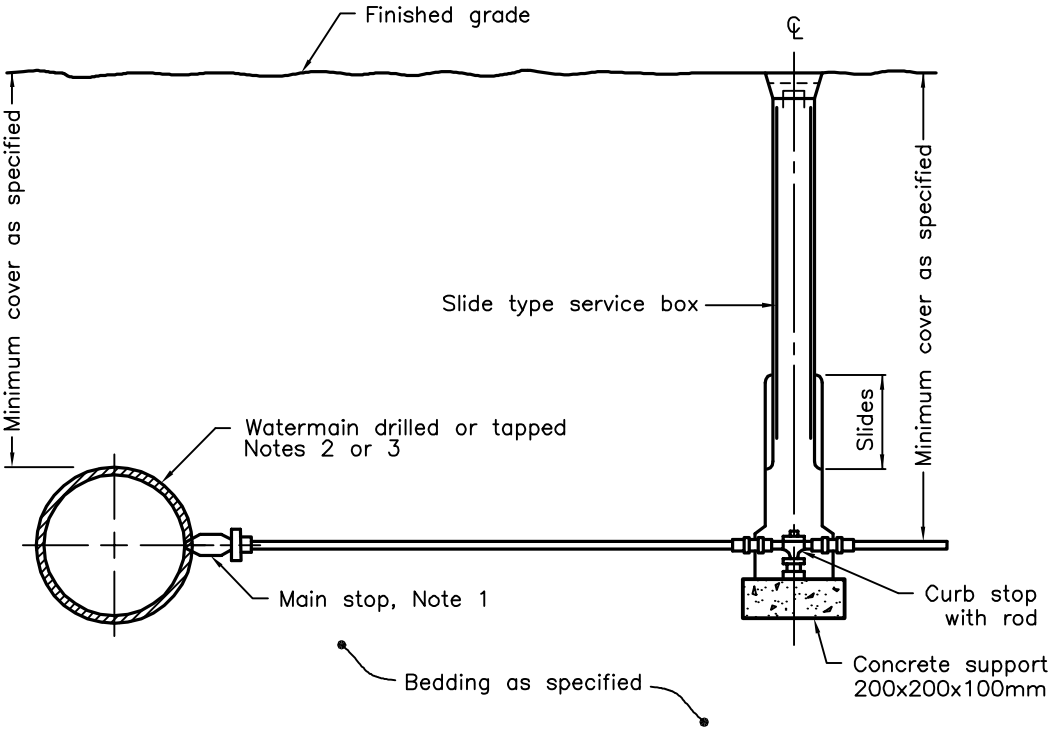
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	0
DIMENSION TABLES FOR CONCRETE THRUST BLOCKS FOR VERTICAL BENDS			
	OPSD 1103.021		



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.

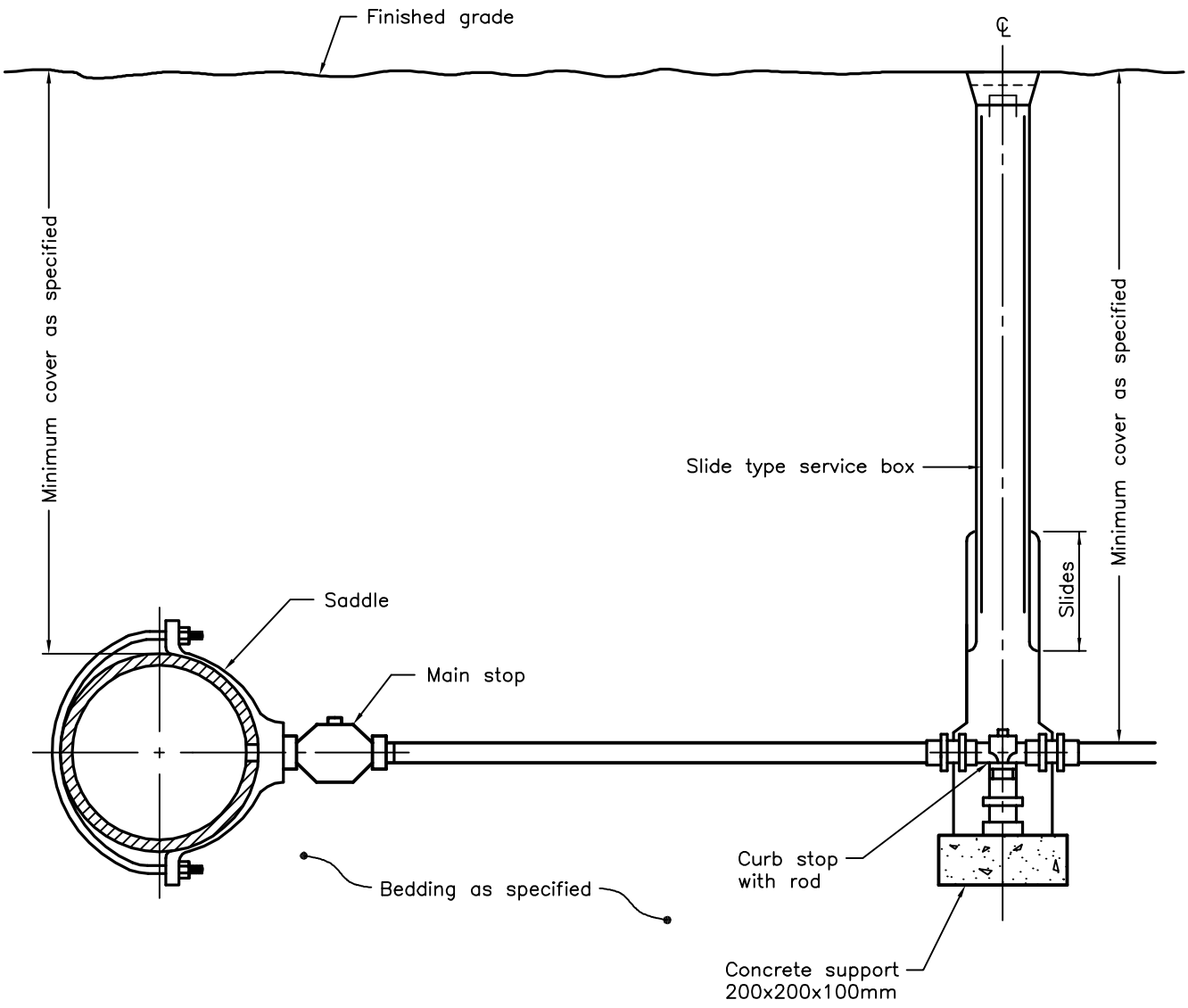
B Couplings shall not be permitted unless the service length exceeds 20m between the main stop and curb stop.

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 19 and 25mm DIAMETER SIZES			
	OPSD 1104.010		



NOTES:

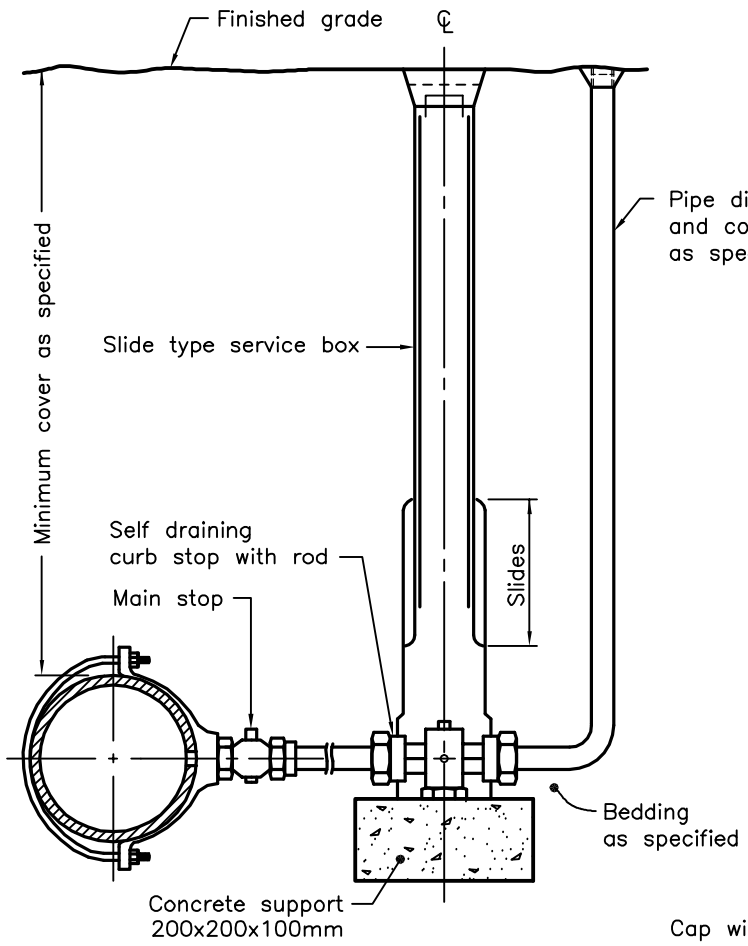
A Couplings shall not be permitted unless the service length exceeds 20m between the main stop and curb stop.

B All water services shall be installed 90° to the longitudinal axis of the watermain.

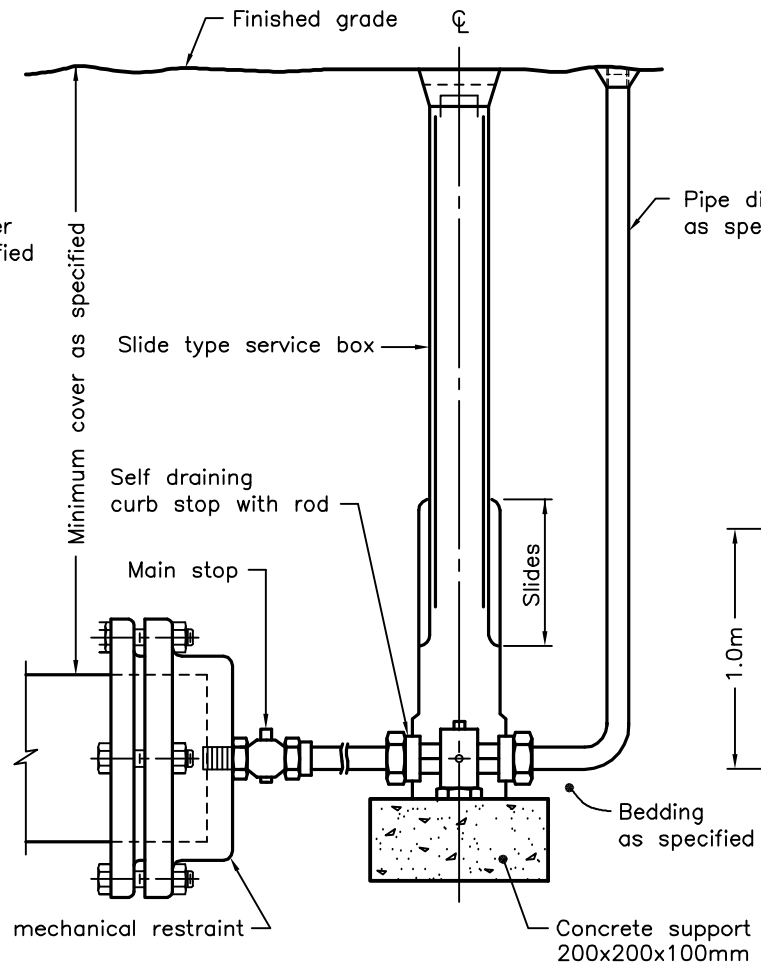
C Backfill material within 500mm of service box shall be native or imported, as specified.

D All dimensions are in millimetres unless otherwise shown.

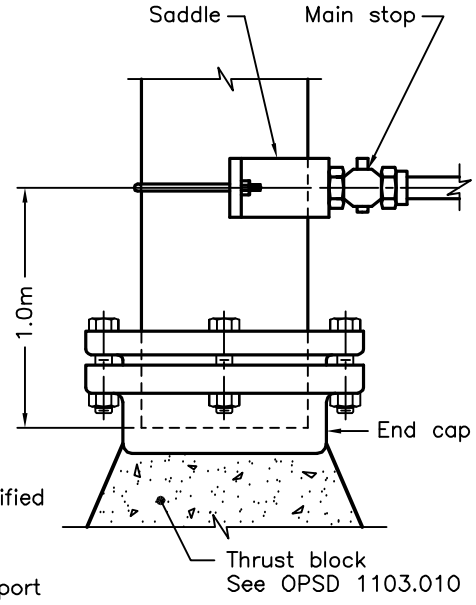
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	2
WATER SERVICE CONNECTION 32, 38, and 50mm DIAMETER SIZES			
	OPSD 1104.020		



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.

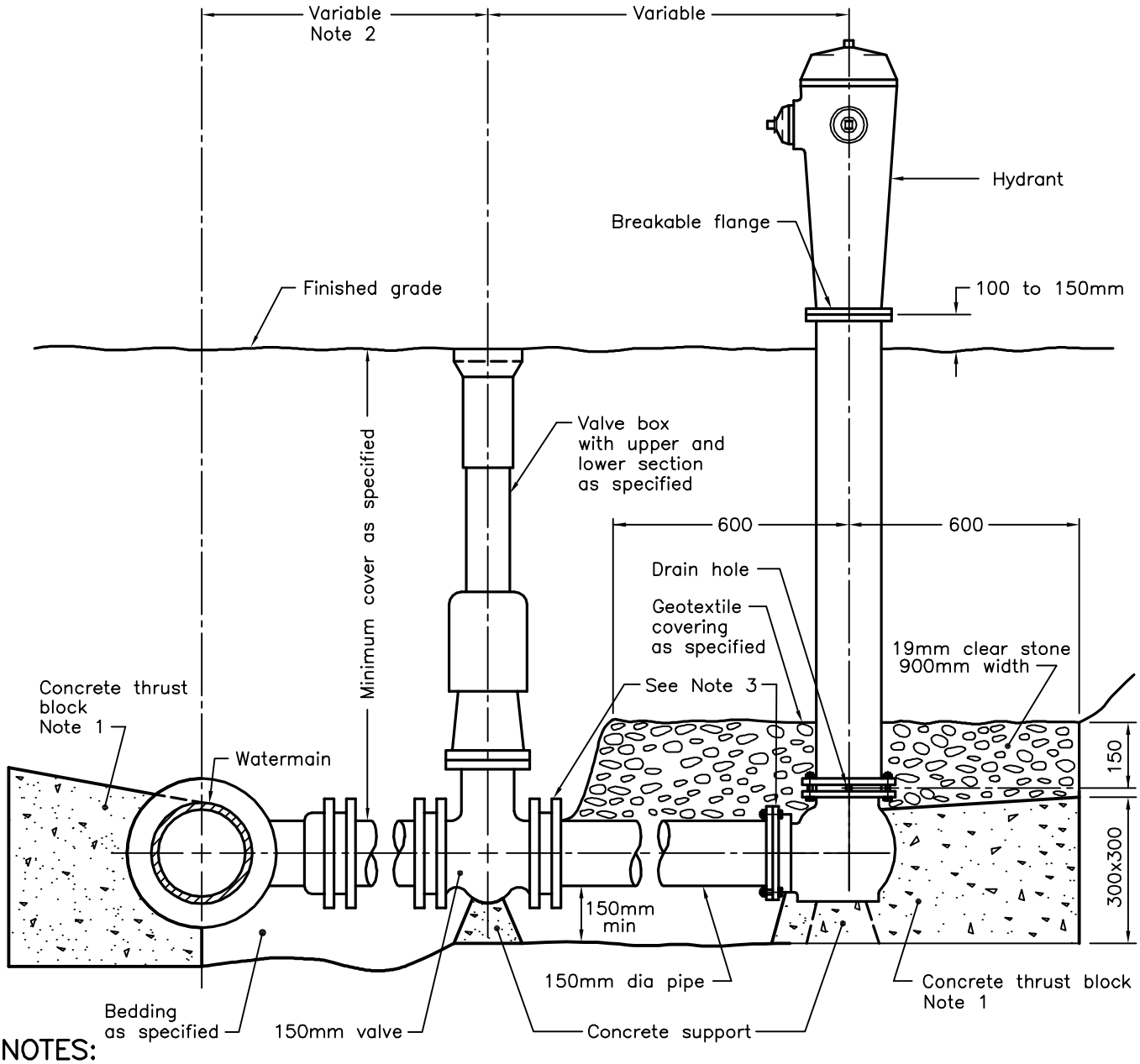
B All dimensions are in millimetres unless otherwise shown.

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.

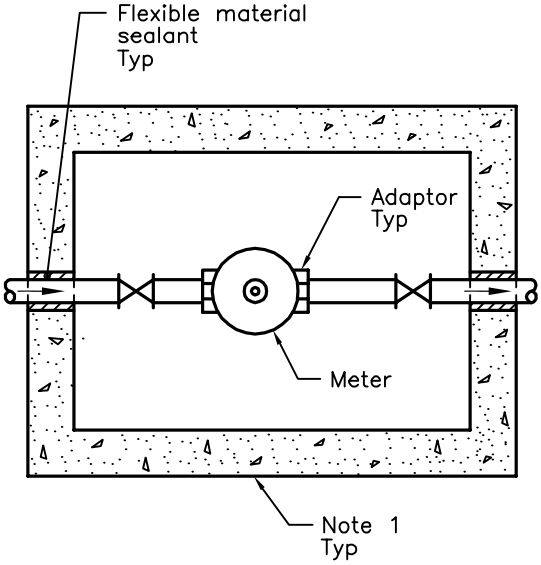
C When required, flange of standpipe extensions shall not be in frost zone.

D This OPSD shall be read in conjunction with OPSD 1103.010 and 1103.020.

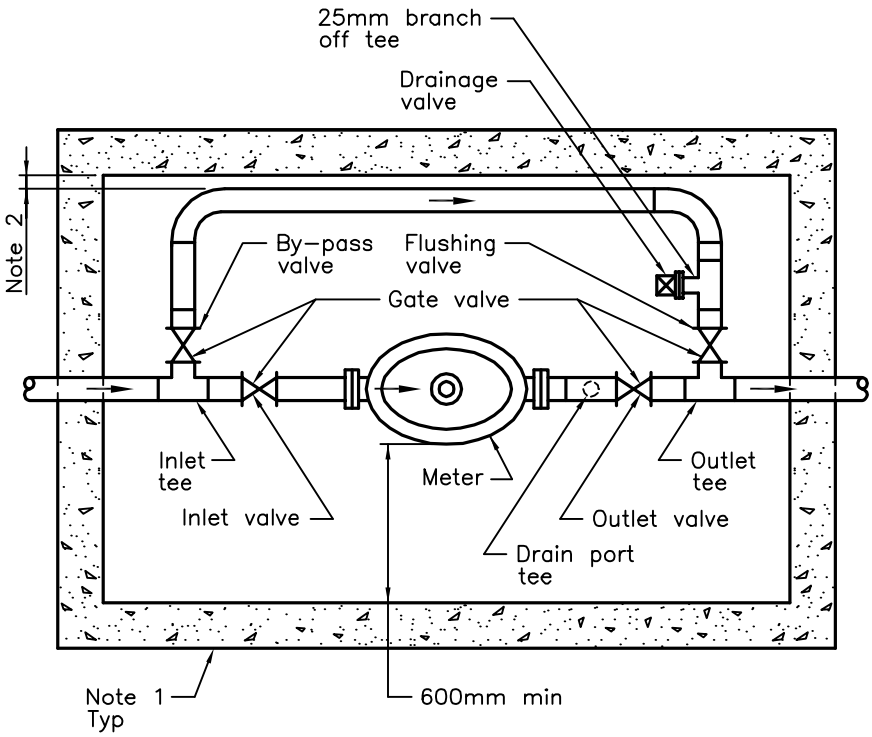
E Backfill material within 500mm of service box shall be native or imported, as specified.

F All dimensions are in millimetres unless otherwise shown.

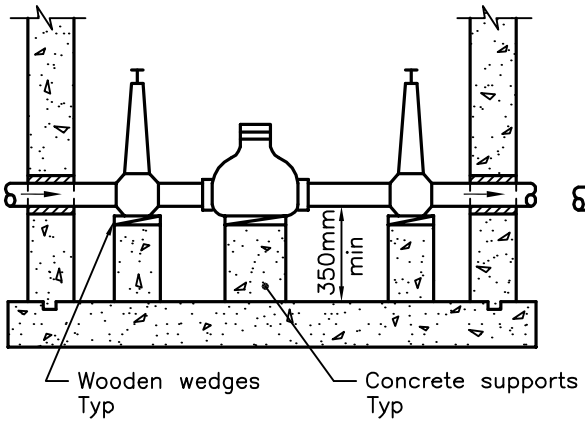
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	2
HYDRANT INSTALLATION			
	OPSD 1105.010		



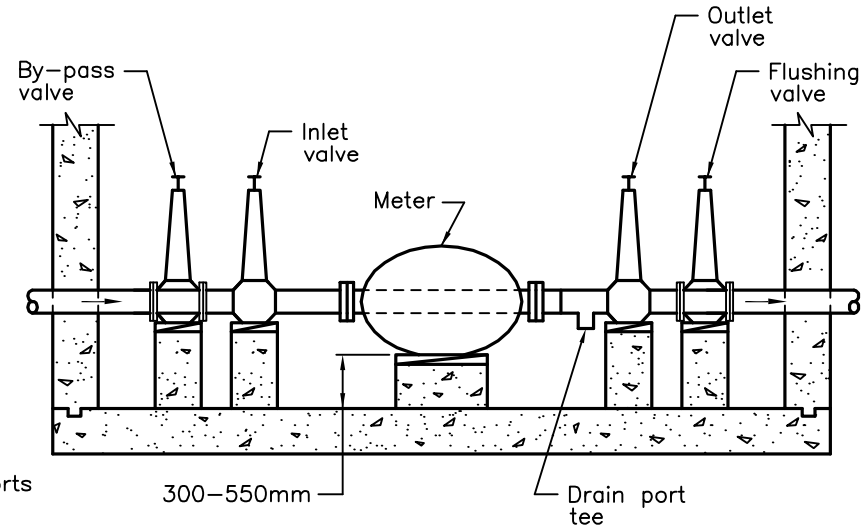
PLAN
NO BY–PASS



PLAN
WITH BY–PASS



ELEVATION



ELEVATION

NOTES:

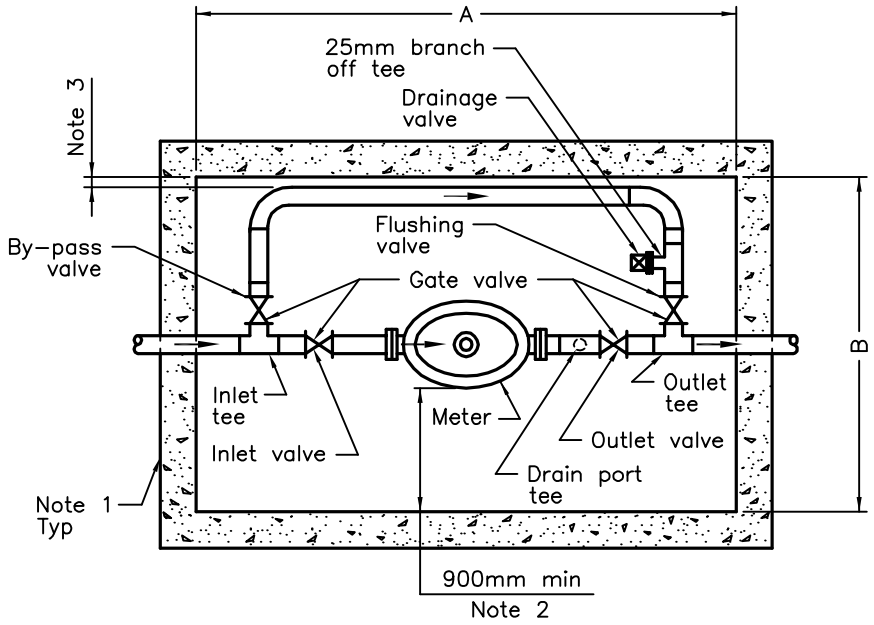
1 Circular chambers may be used, such that 100mm minimum clearances from any pipe to wall shall be maintained.

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.

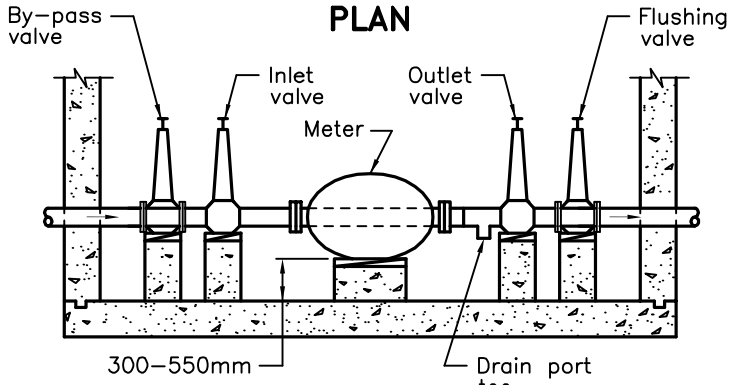
A By–pass line size shall be same size as the meter line.

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.

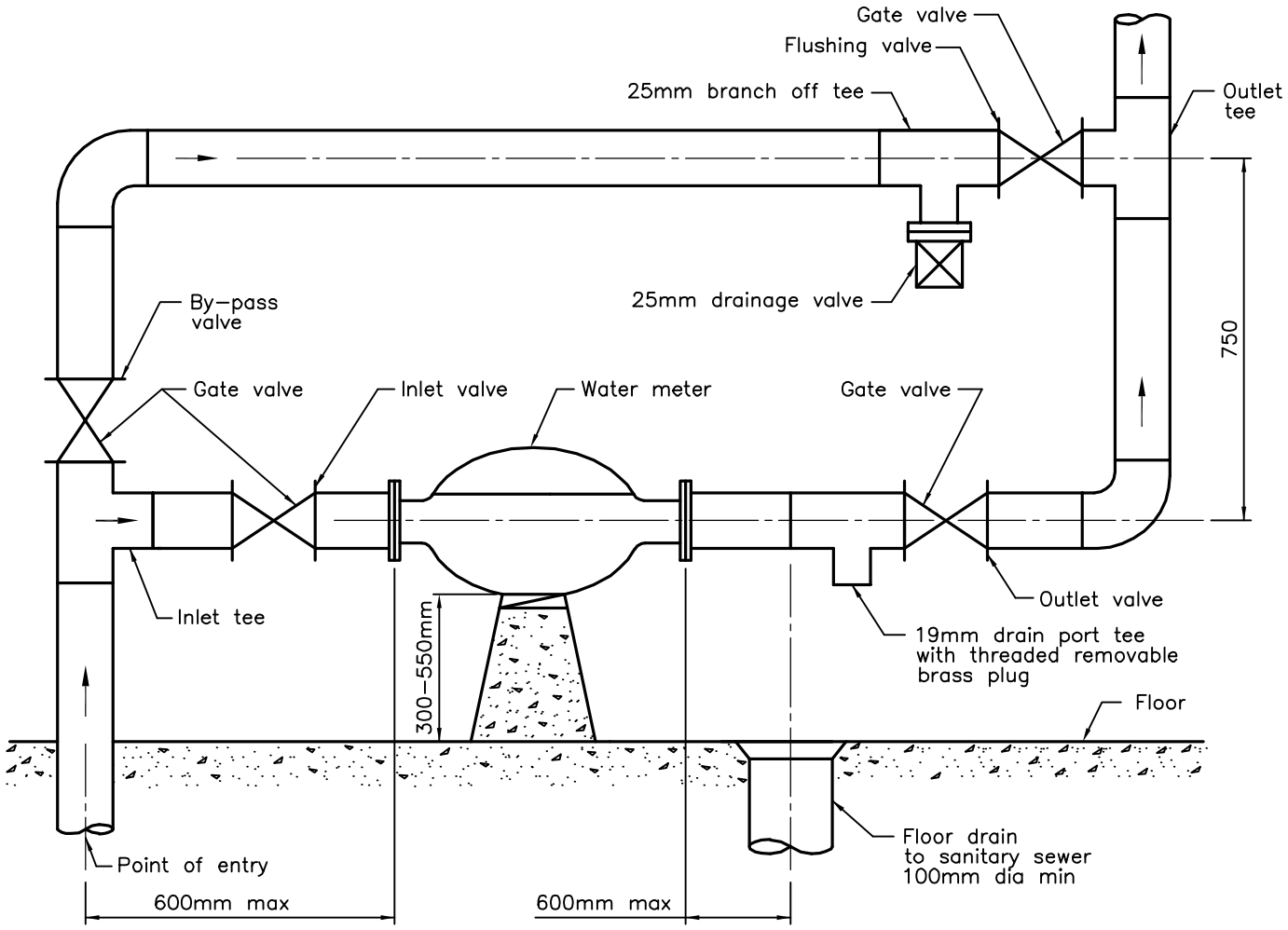
A A 75mm meter shall have 75mm to 100mm increasers on each side.

B By–pass line size shall be same size as the meter line.

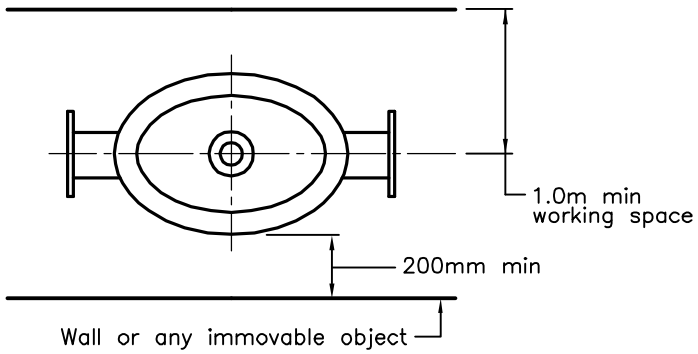
C All joints shall be restrained.

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.

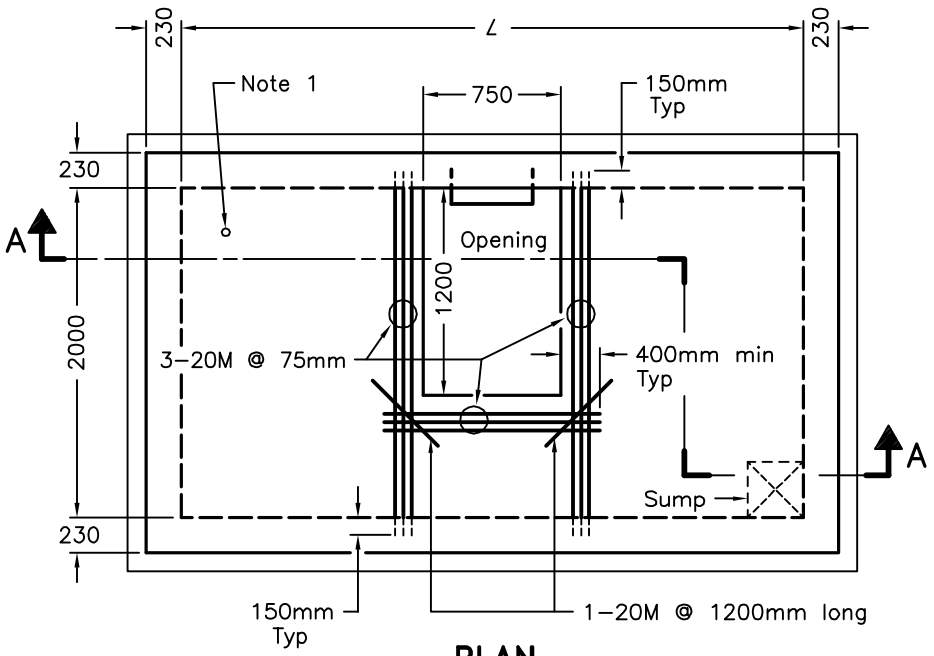
B Flanged fittings are required for all compound meters.

C By–pass line size shall be same size as the meter line.

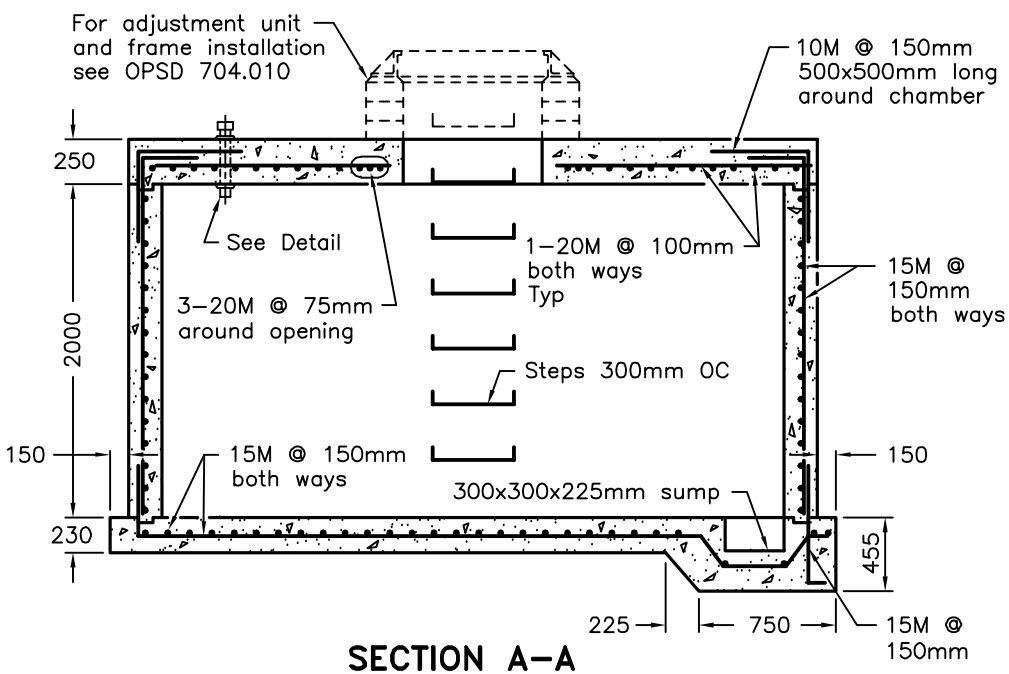
D Working space at the meter shall be a minimum of 2.0m in height.

E All dimensions are in millimetres unless otherwise shown.

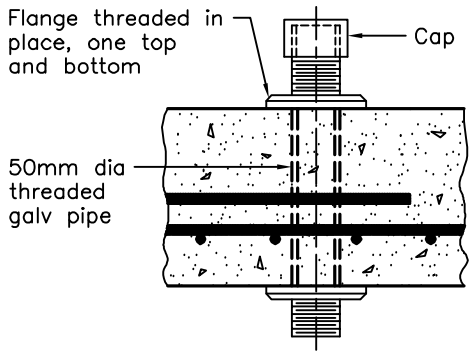
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	2
PIPING LAYOUT FOR WATER METERS IN BUILDING WITH BY–PASS			
	OPSD 1107.030		



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.

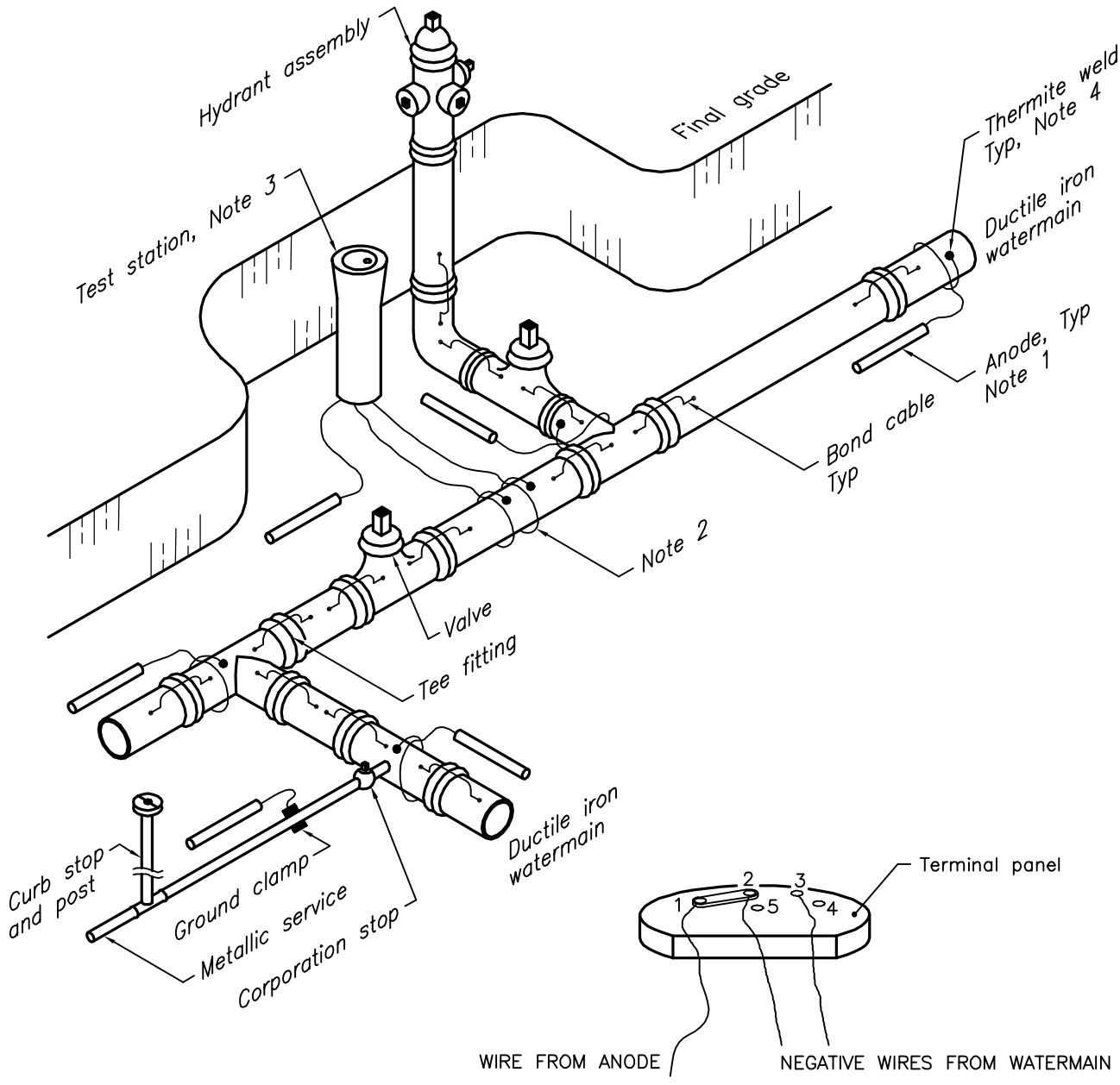
ONTARIO PROVINCIAL STANDARD DRAWING

CAST–IN–PLACE WATER METER CHAMBER FOR 75 TO 250mm METERS

Nov 2013 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 1108.010

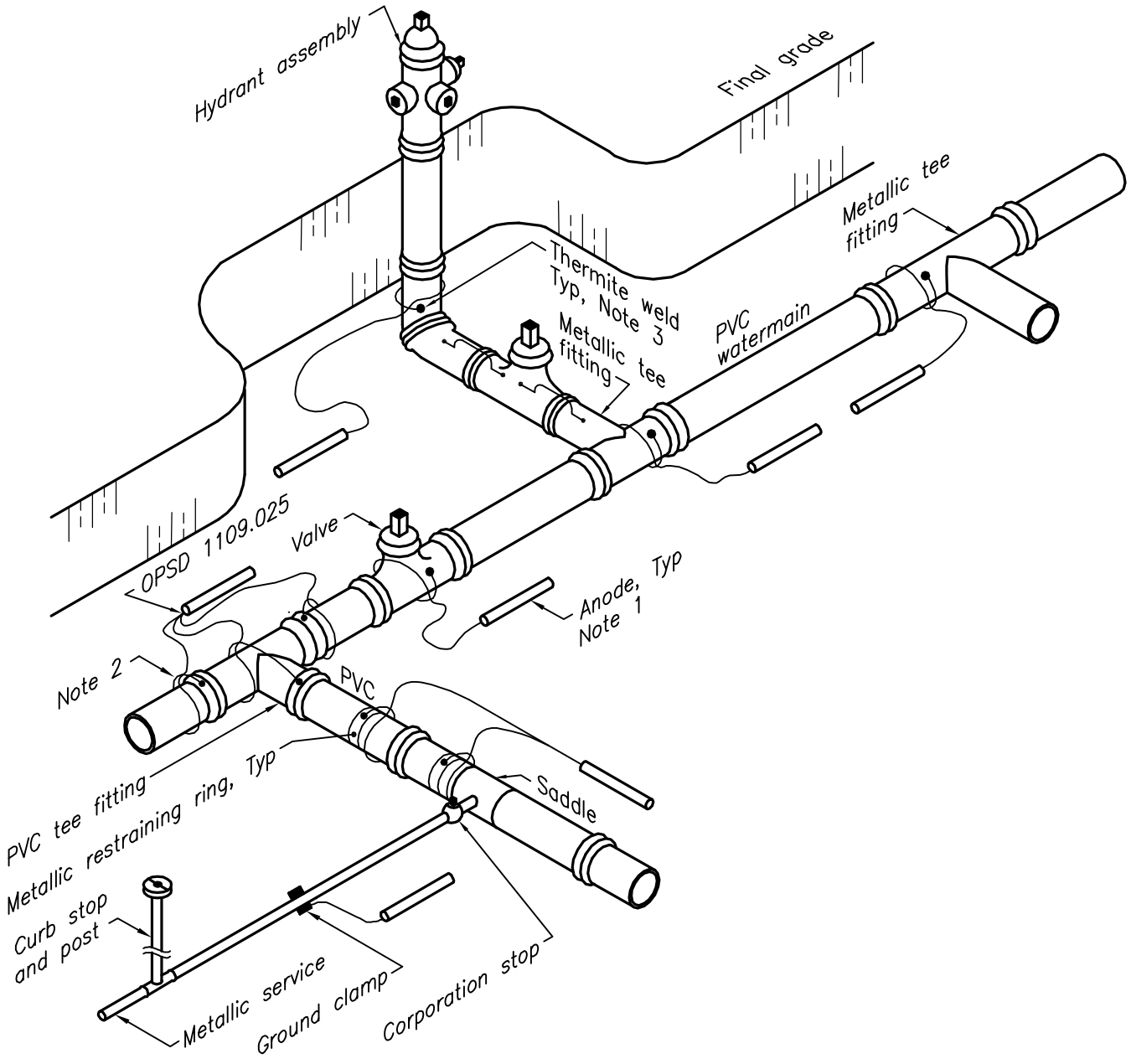


WIRING DETAIL
IN TEST STATION

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		



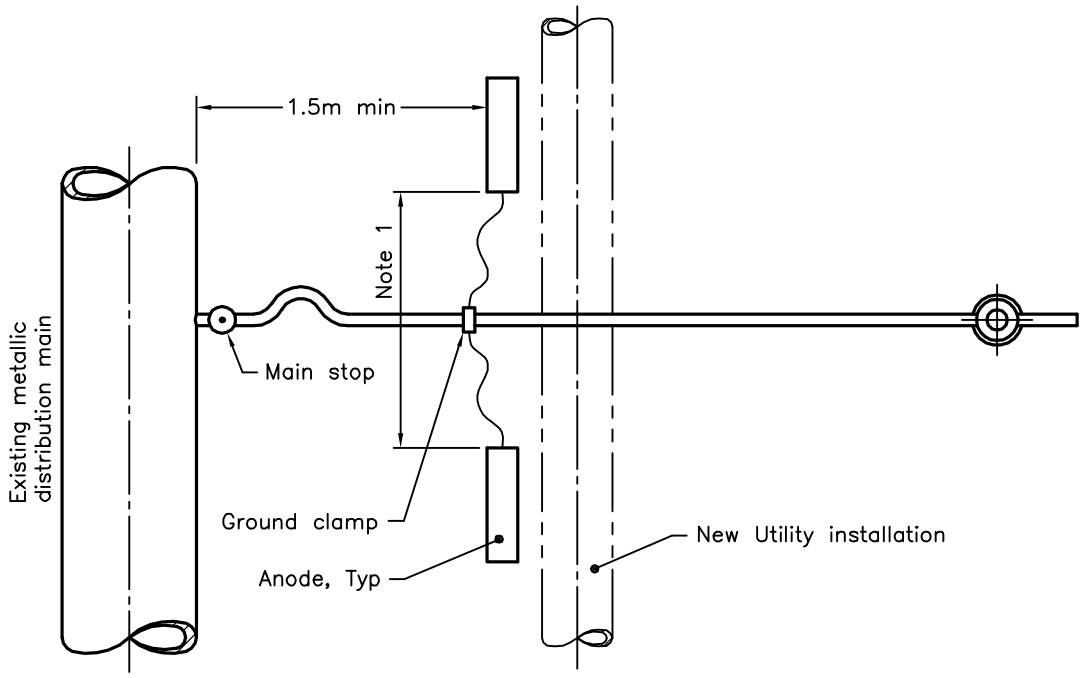
NOTES:

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.

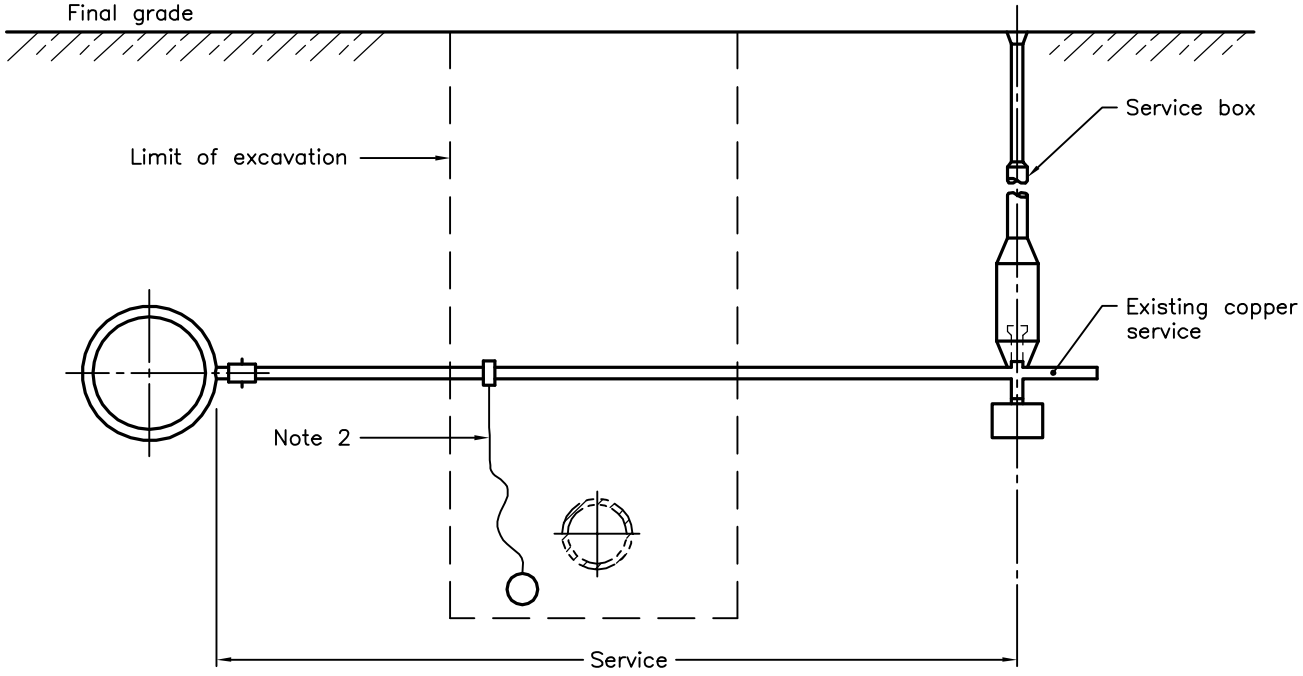
2 Anode connecting wire shall be loosely wrapped around pipes and fittings and knotted.

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

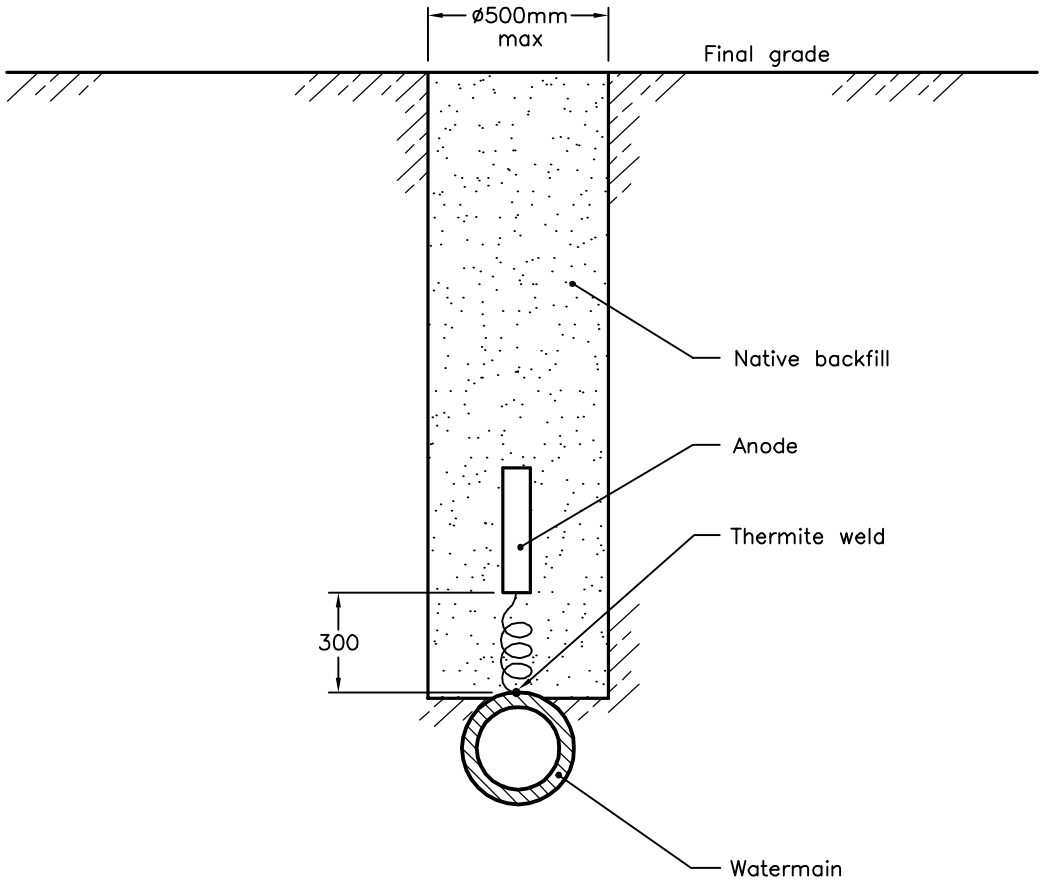
NOTES:

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.

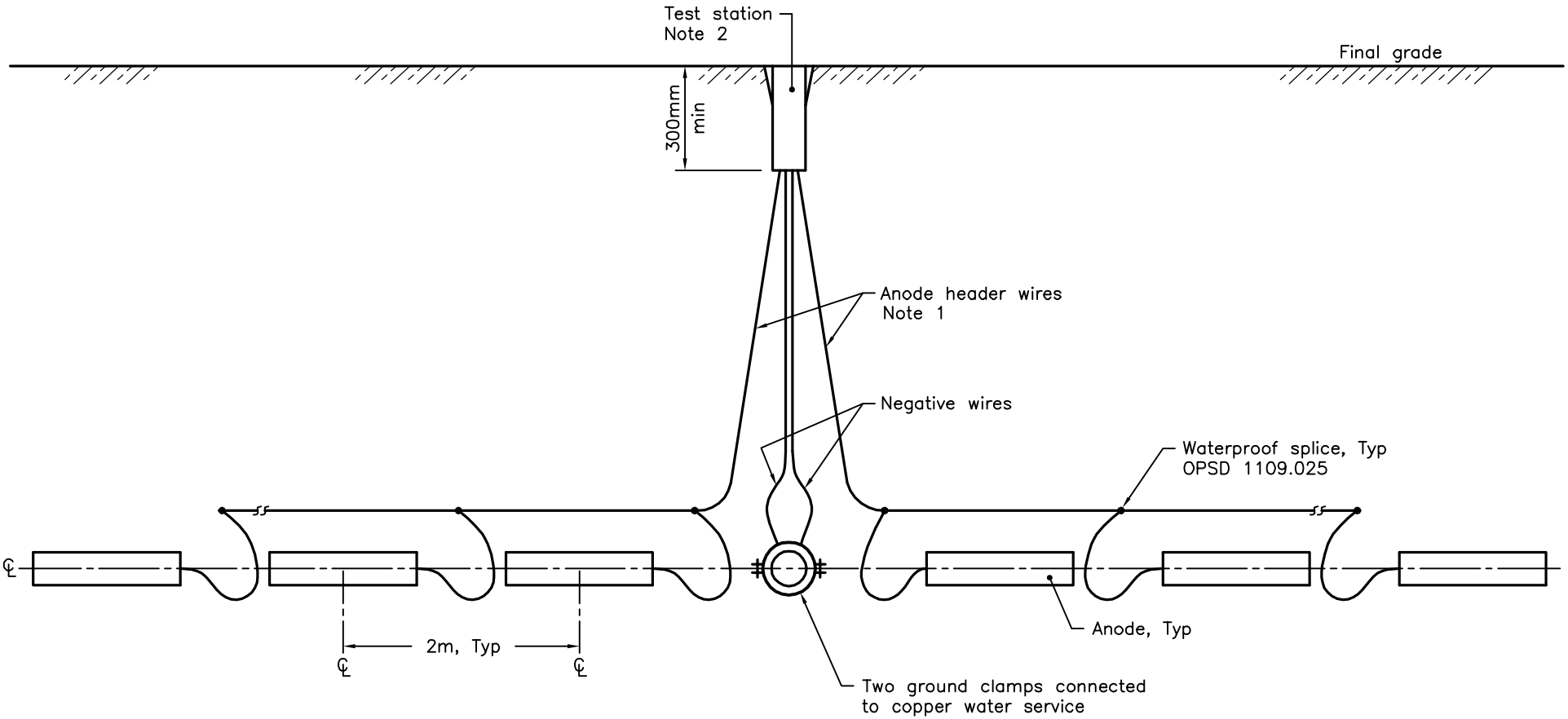
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	1
CATHODIC PROTECTION OF EXISTING METALLIC WATERMAINS EXPOSED SERVICE OR PIPE METHOD			
	OPSD 1109.012		



NOTES:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	1
ANODE INSTALLATION OVER PIPE METHOD 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.

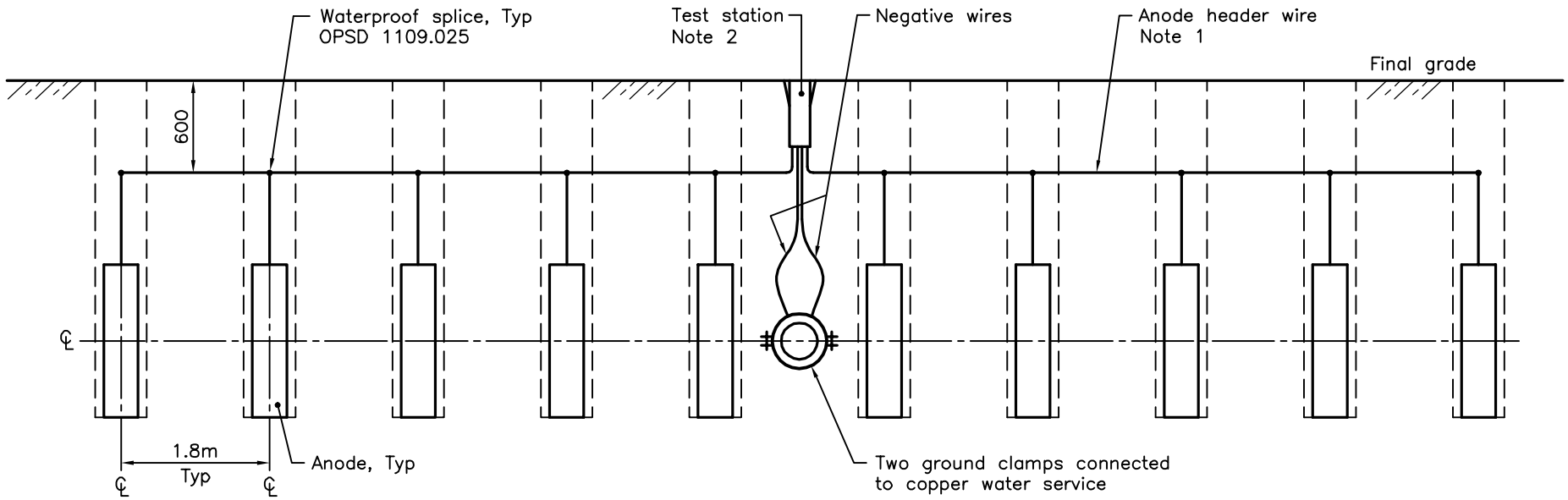
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

HORIZONTAL ANODE BANK AT SERVICE

Nov 2015 | Rev 1

OPSD 1109.014



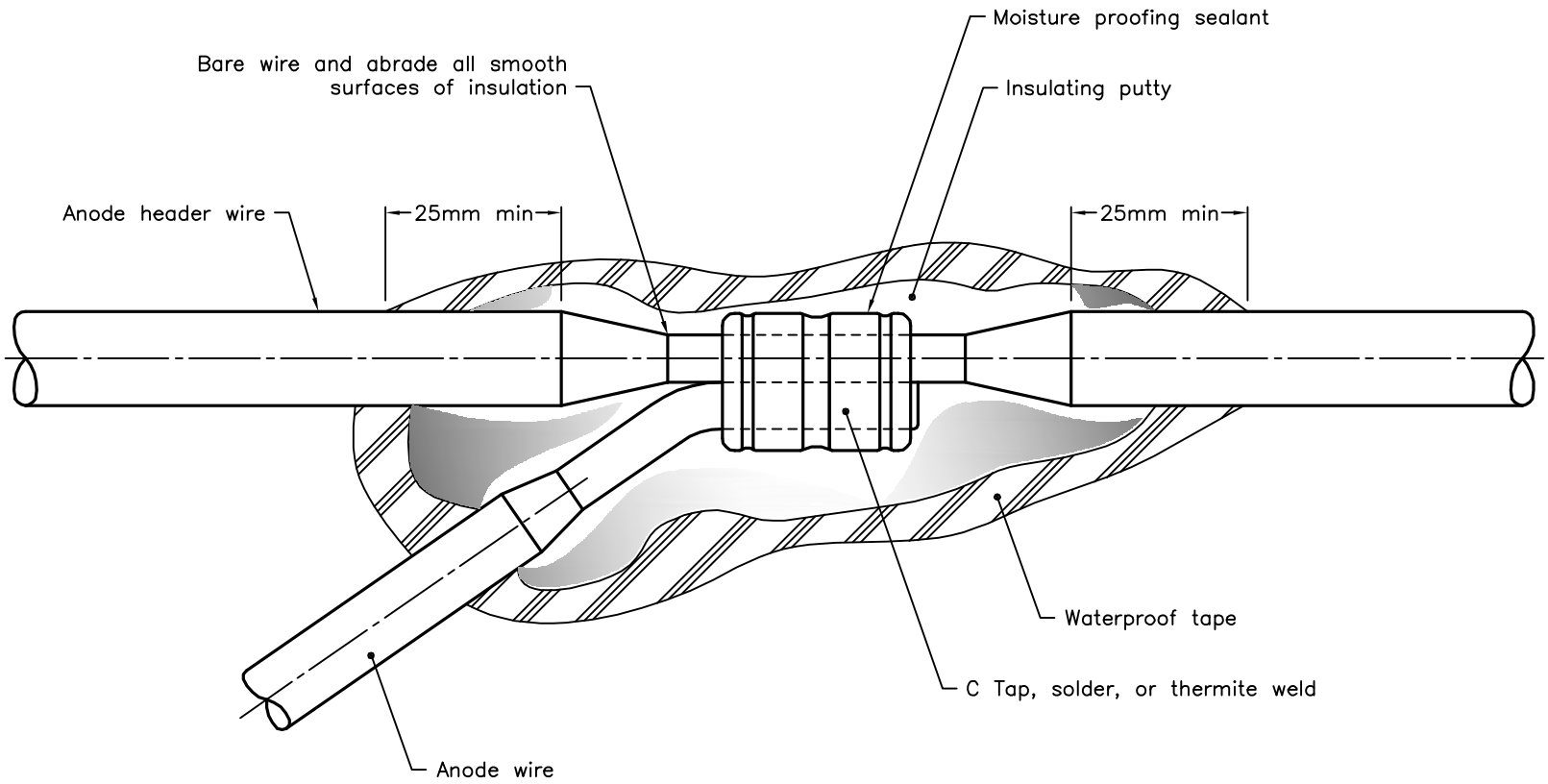
NOTE:

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		



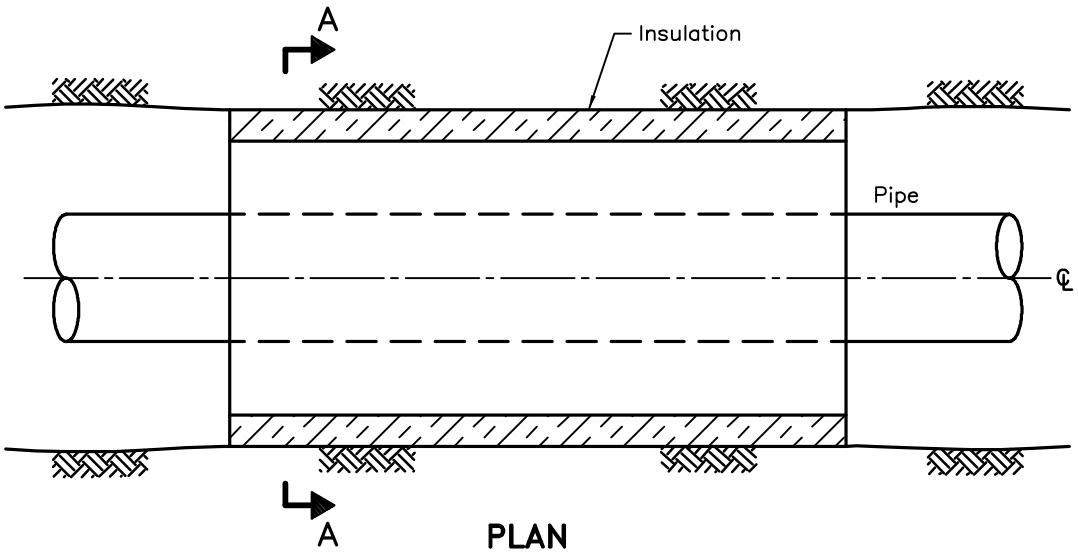
NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

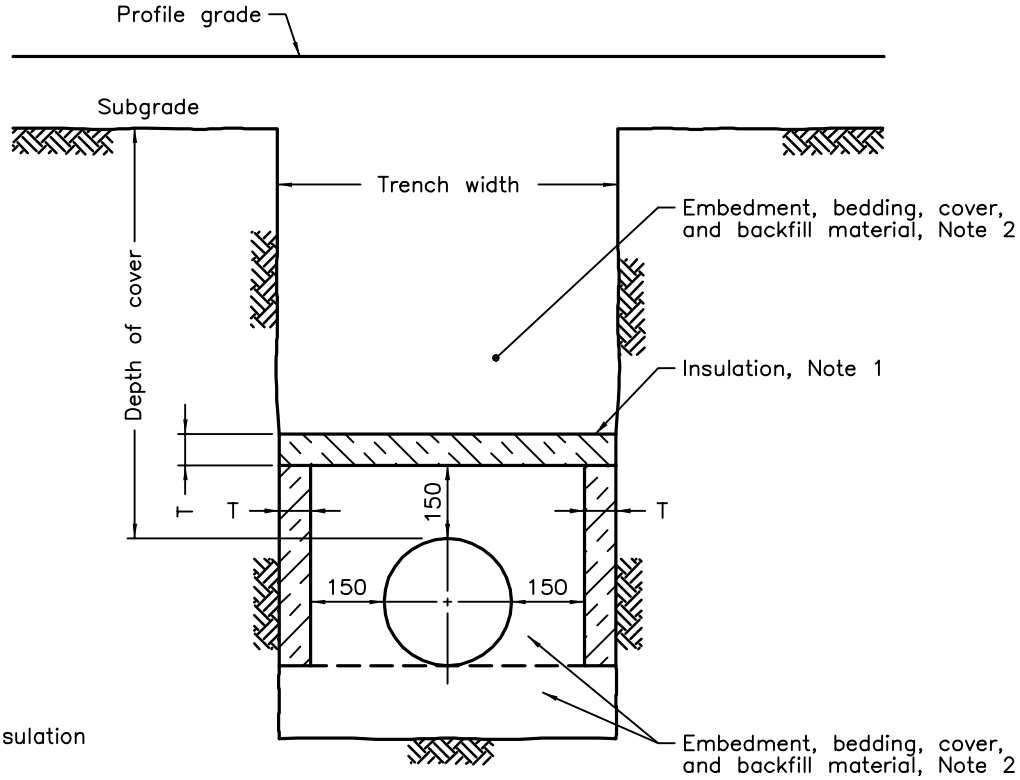
WATERPROOFING OF SPLICES

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.

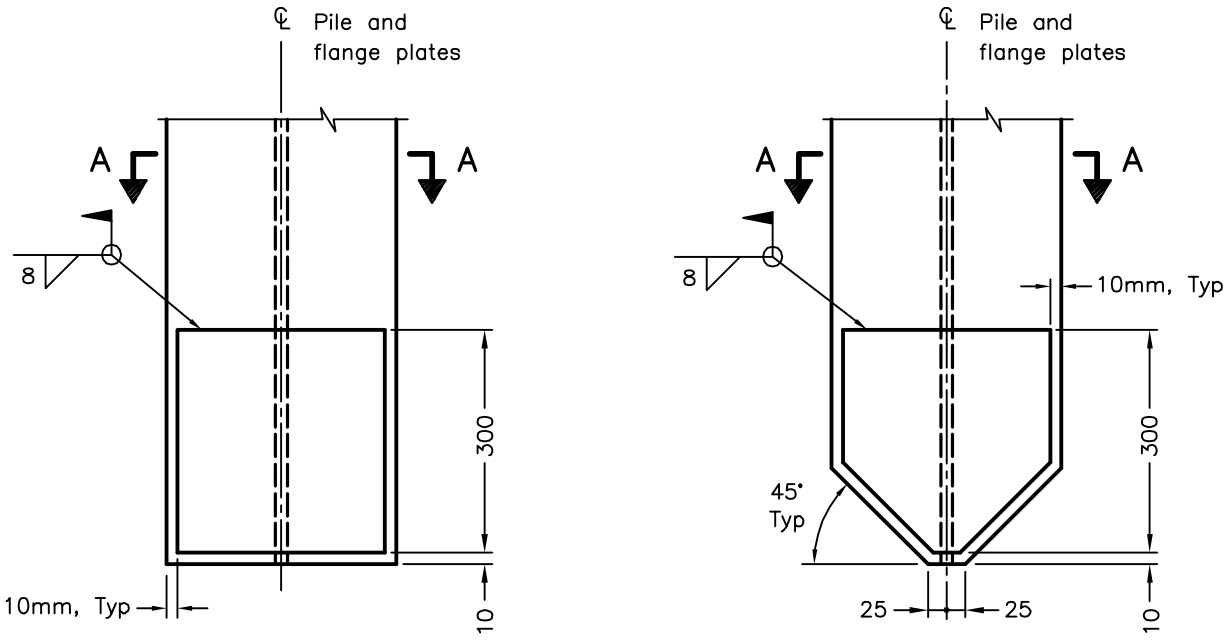
2 Pipe embedment or bedding, cover, and backfill shall be according to:
a) Flexible OPSD 802.010, 802.013, 802.020, and 802.023.
b) Rigid – OPSD 802.030, 802.031, 802.032, 802.033, 802.050, 802.051, 802.052, and 802.053.

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.

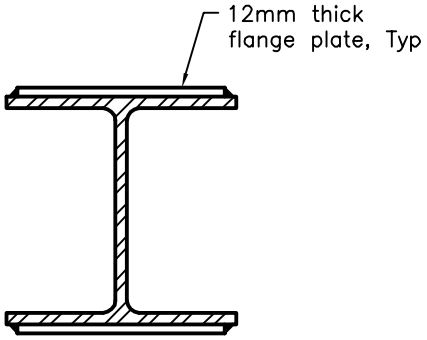
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	0
INSULATION FOR SEWERS AND WATERMAINS IN SHALLOW TRENCHES			
	OPSD 1109.030		



TYPE I

TYPE II

ELEVATION



PILE DRIVING SHOE

SECTION A–A

NOTES:

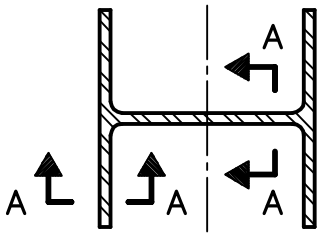
A Flange plates shall be according to CSA G40.20/G40.21, Grade 300W.

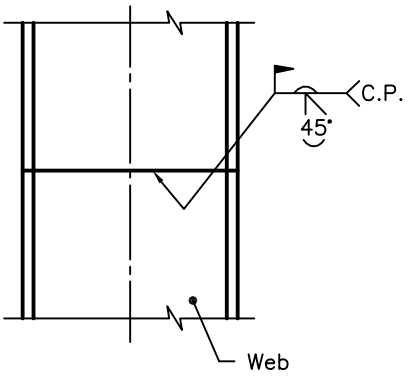
B Welding shall be according to CSA W59.

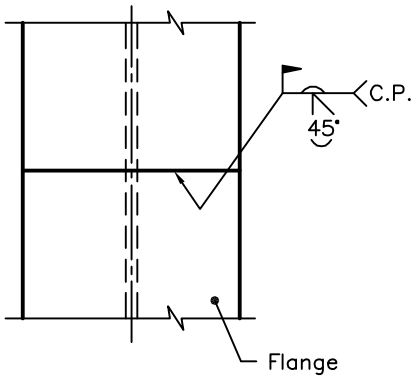
C Driving shoe Type I shall be used unless Type II is specified.

D All dimensions are in millimetres unless otherwise shown.

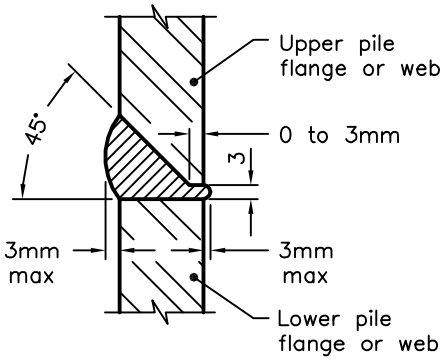
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	2
FOUNDATION PILES STEEL H–PILE DRIVING SHOE	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _		
	OPSD 3000.100		



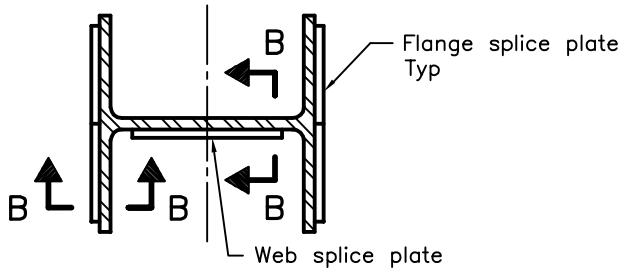


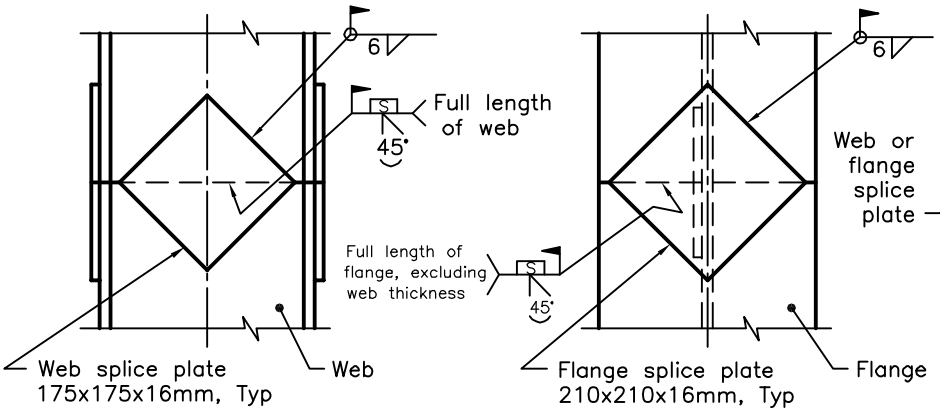


BUTT WELD

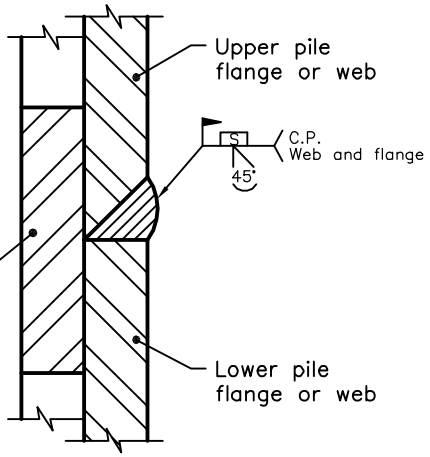


SECTION A–A





BUTT WELD WITH SPLICE PLATES

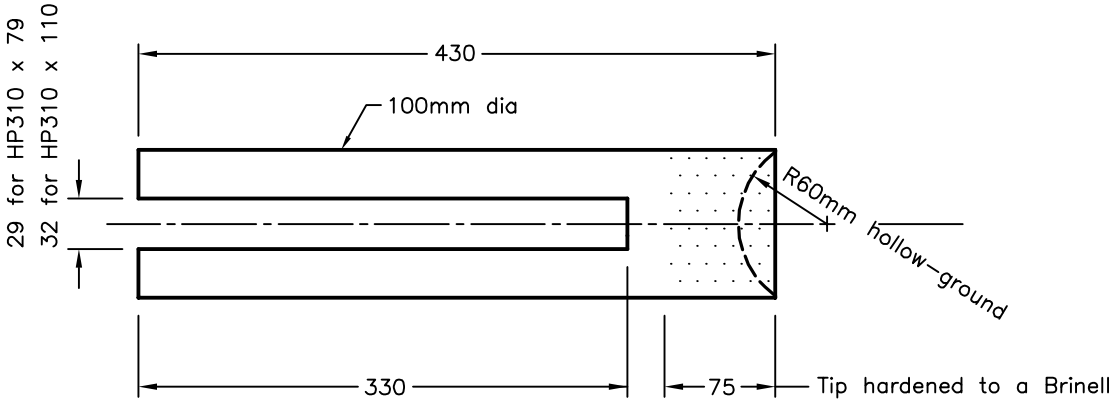


SECTION B–B

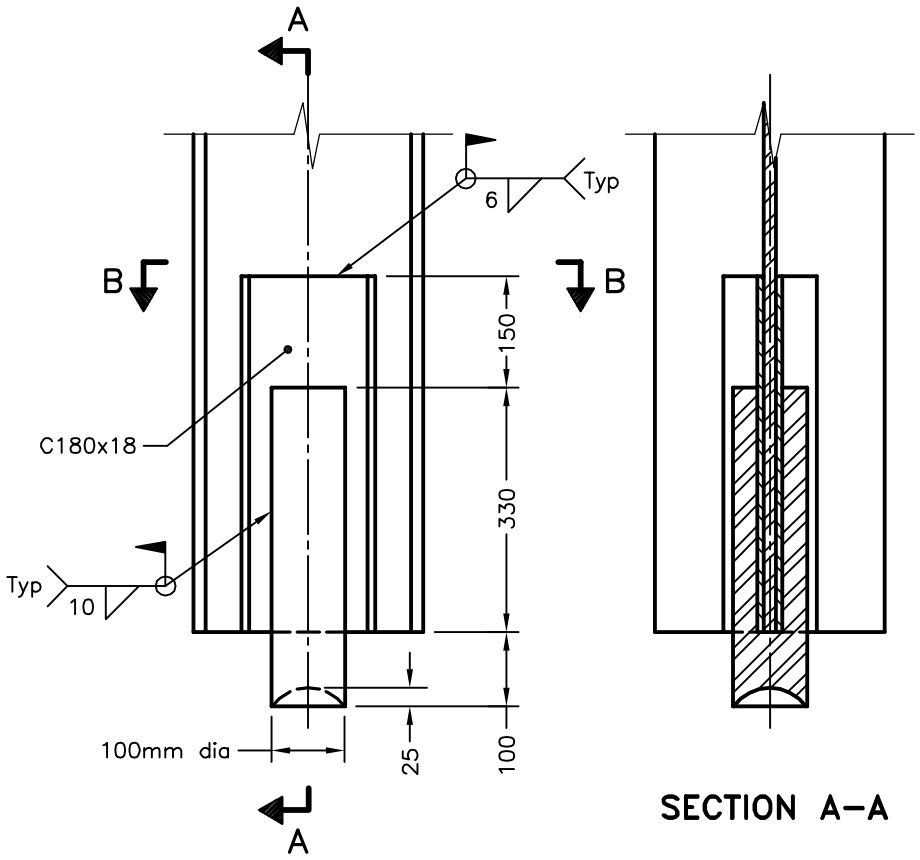
NOTES:

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.

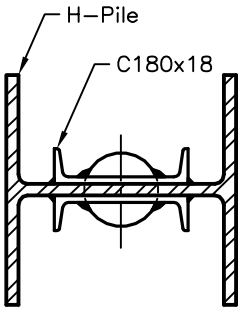
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
FOUNDATION **PILES** **STEEL H–PILE SPLICE**			
	OPSD 3000.150		



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.

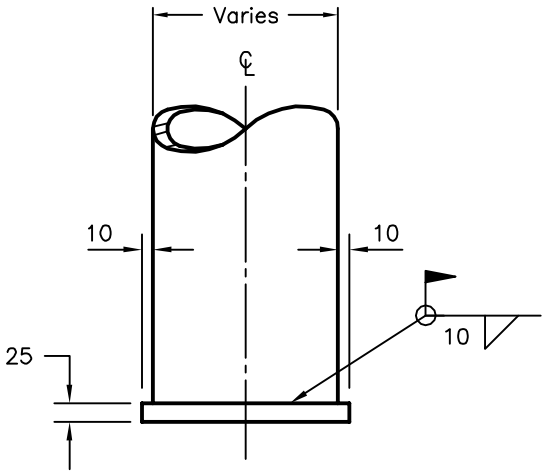
B Welding shall be according to CSA W59.

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.

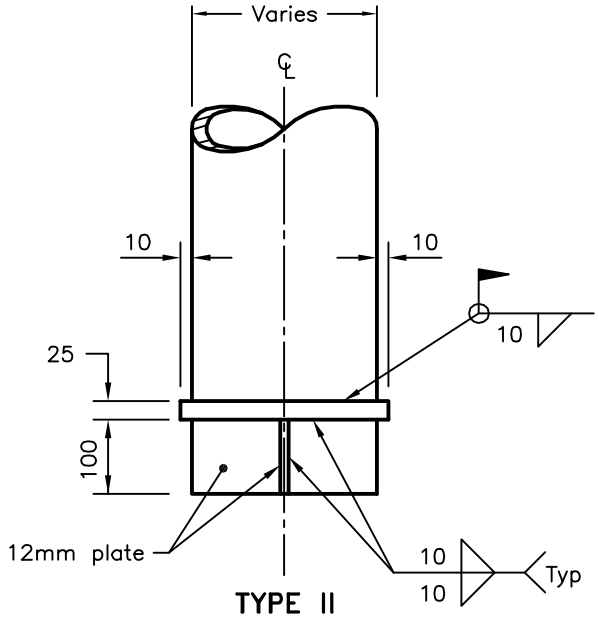
D C180x18 shall be according to CSA G40.20/G40.21, Grade 300W.

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
FOUNDATION PILES STEEL HP 310 OSLO POINT			
	OPSD 3000.201		

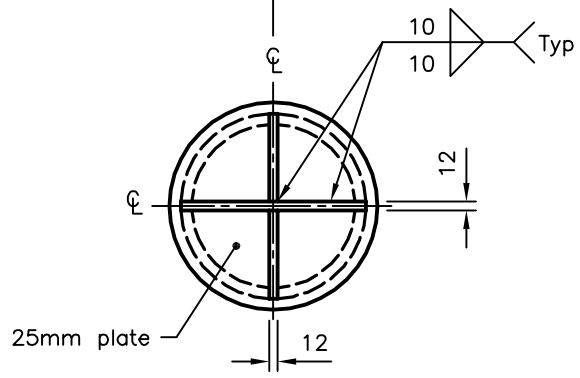


TYPE I



TYPE II

SHOE DETAILS

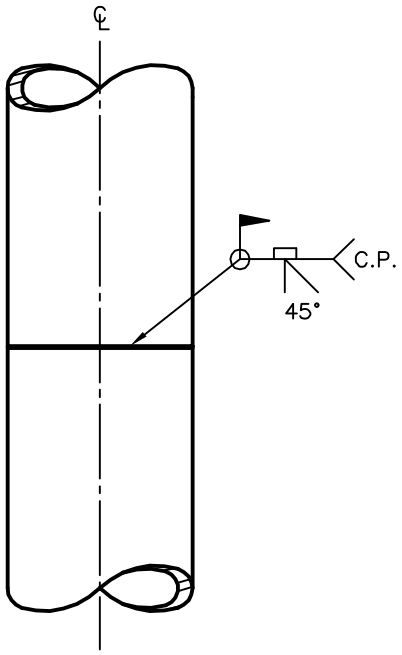


BOTTOM VIEW

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 PILES STEEL TUBE PILE DRIVING SHOE			
	OPSD 3001.100		

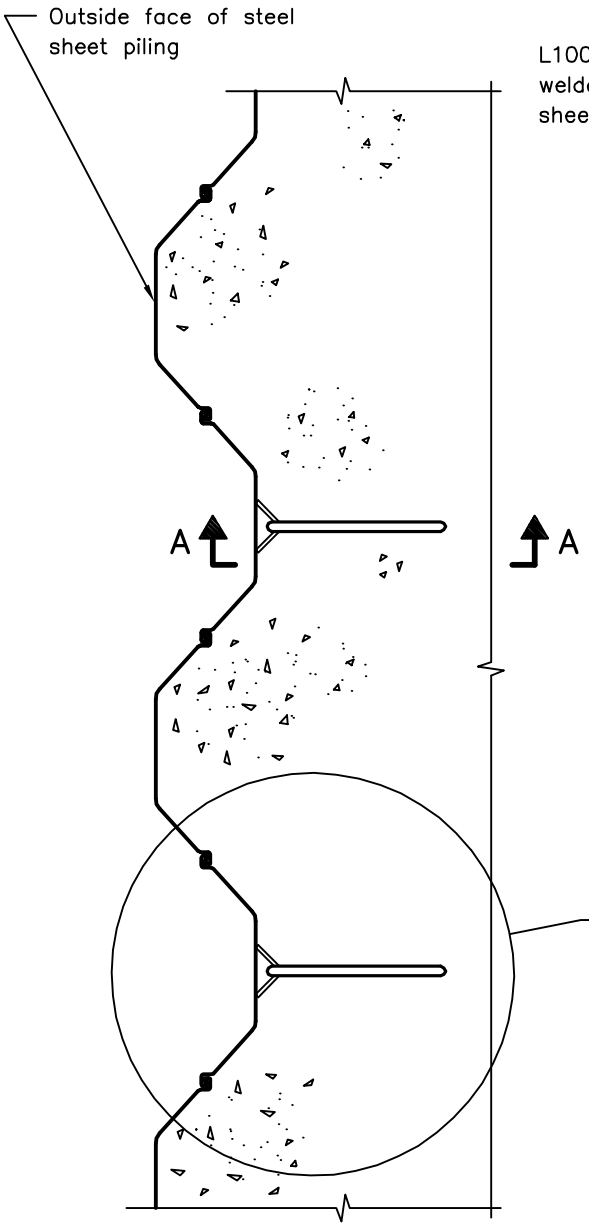


SPLICE DETAILS

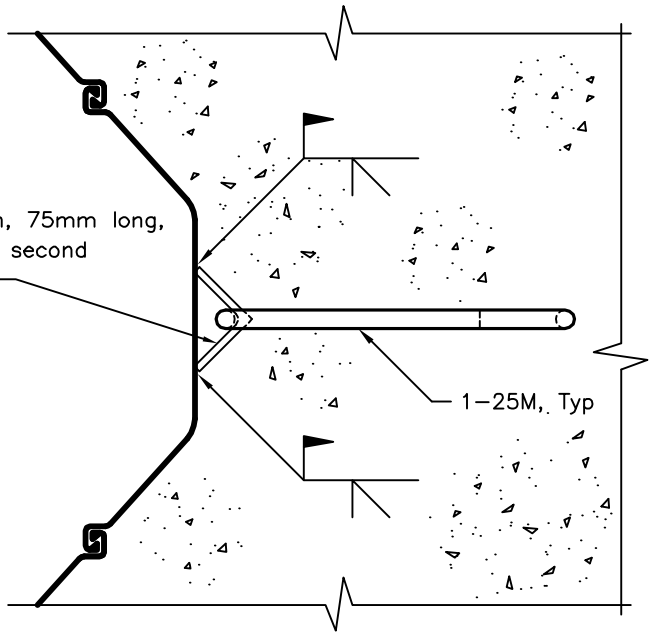
NOTES:

A Splice weld shall be full penetration butt weld perpendicular to centreline of pile.

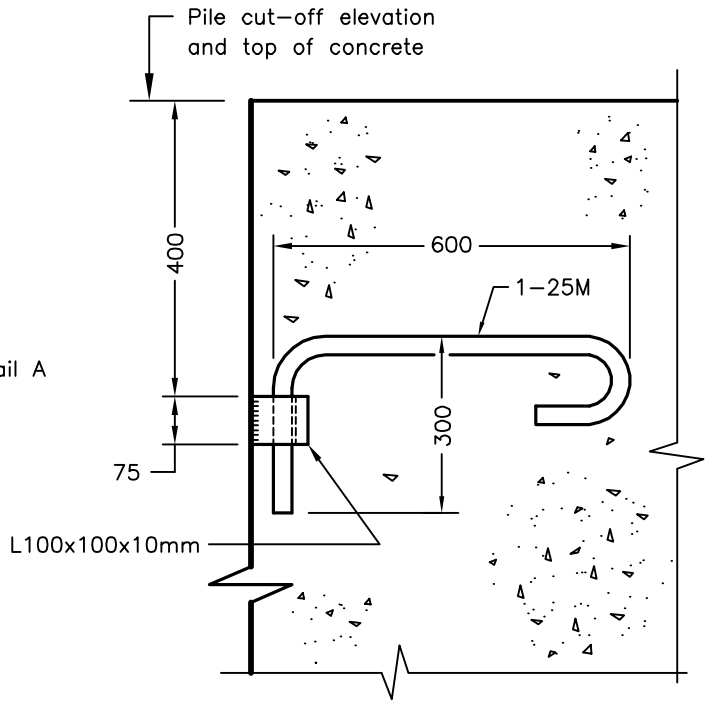
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
FOUNDATION PILES STEEL TUBE PILE SPLICE			
	OPSD 3001.150		



PLAN



DETAIL A



SECTION A–A

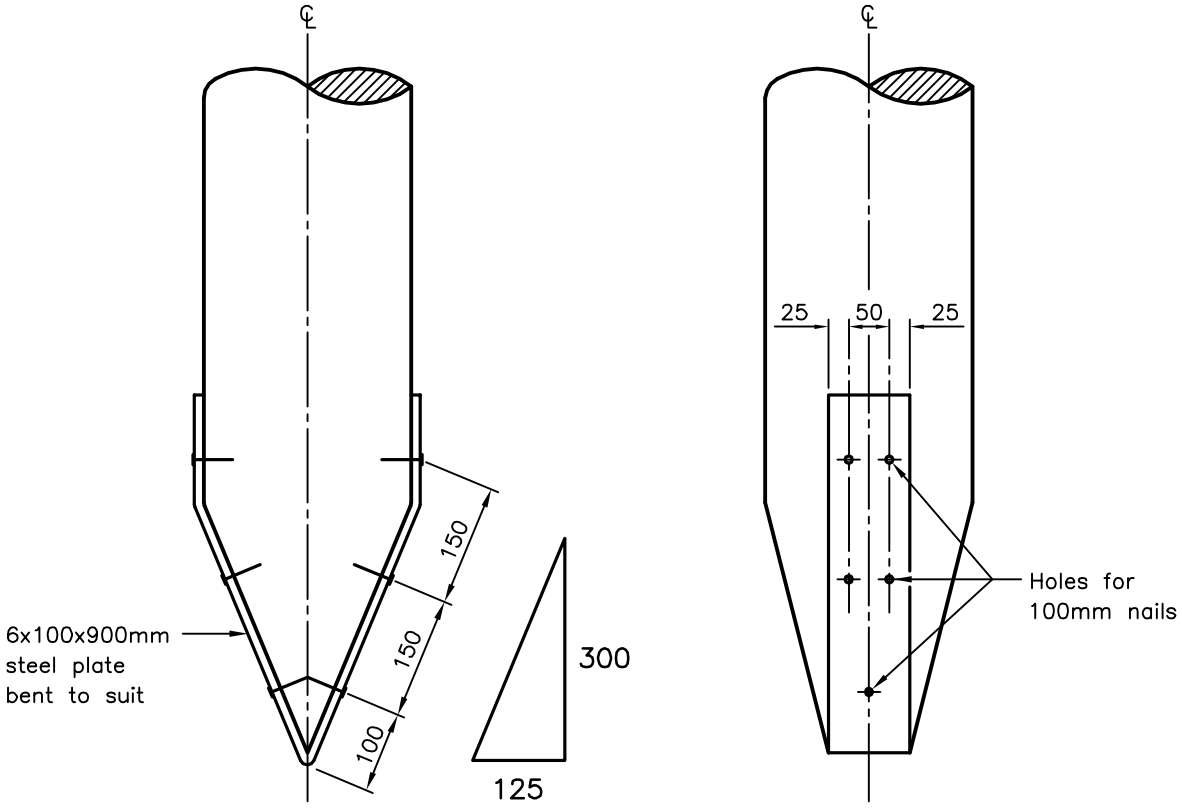
NOTES:

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 PILES STEEL SHEET PILE ANCHORAGE			
	OPSD 3002.200		

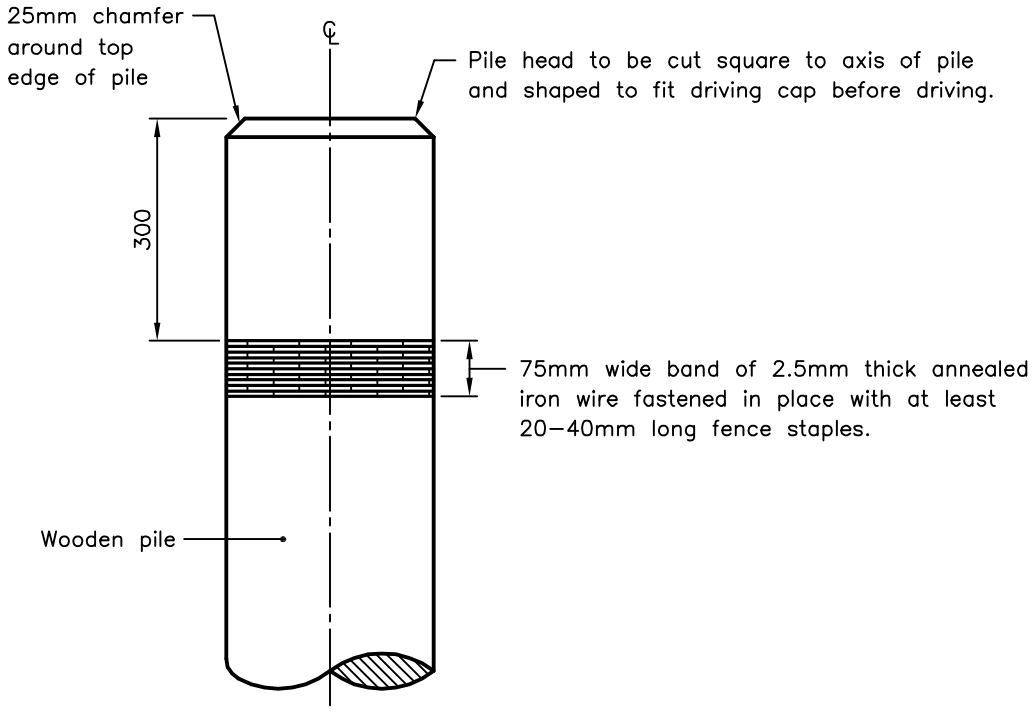


NOTE:

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 PILES 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 PILES WOODEN PILE HEAD PROTECTION	_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _		
	OPSD 3003.150		

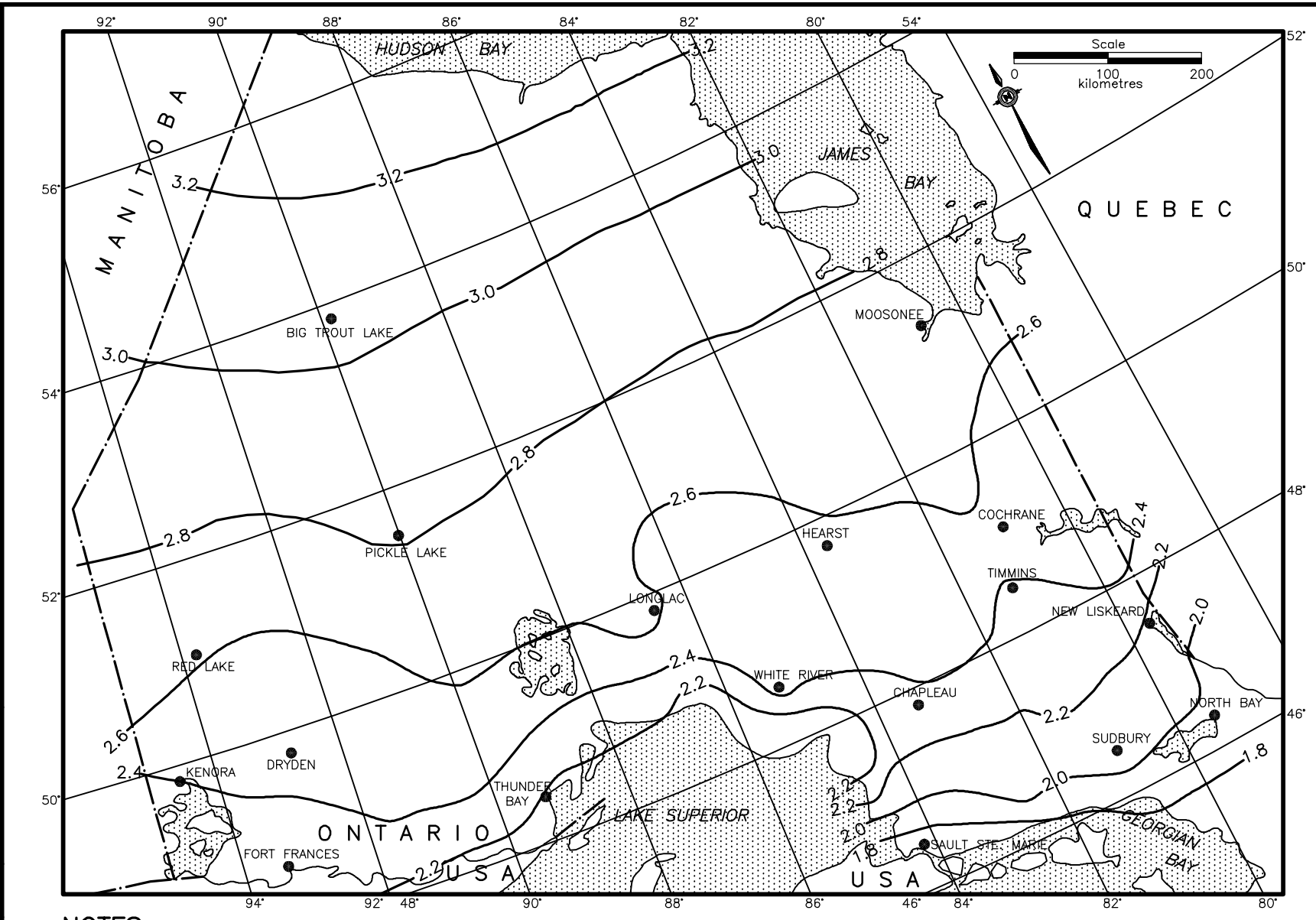
FOUNDATION
FROST PENETRATION DEPTHS
FOR NORTHERN ONTARIO

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.

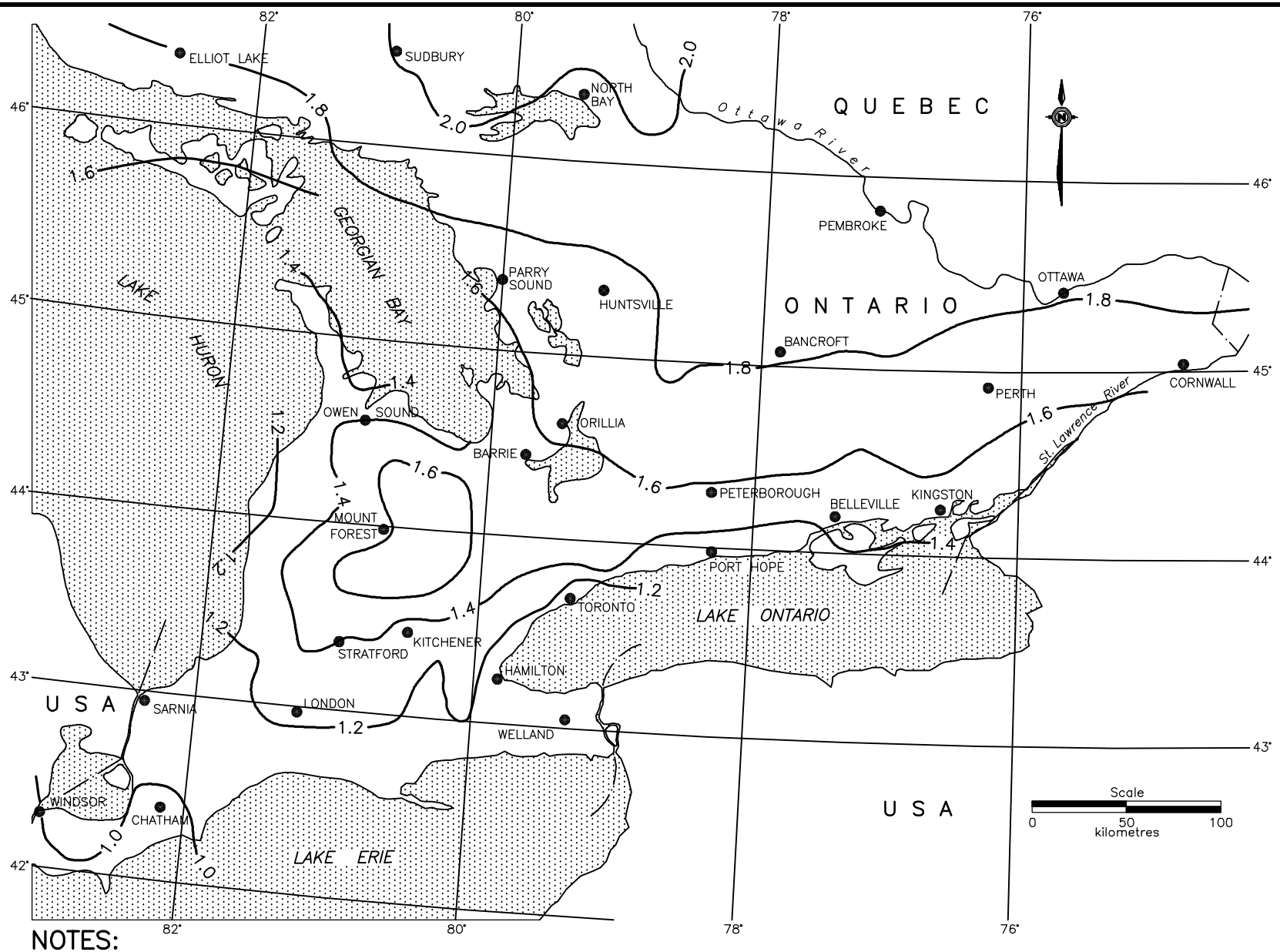
D Frost penetration depths are in metres.

FOUNDATION
FROST PENETRATION DEPTHS
FOR SOUTHERN ONTARIO

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010	Rev	1

OPSD 3090.101



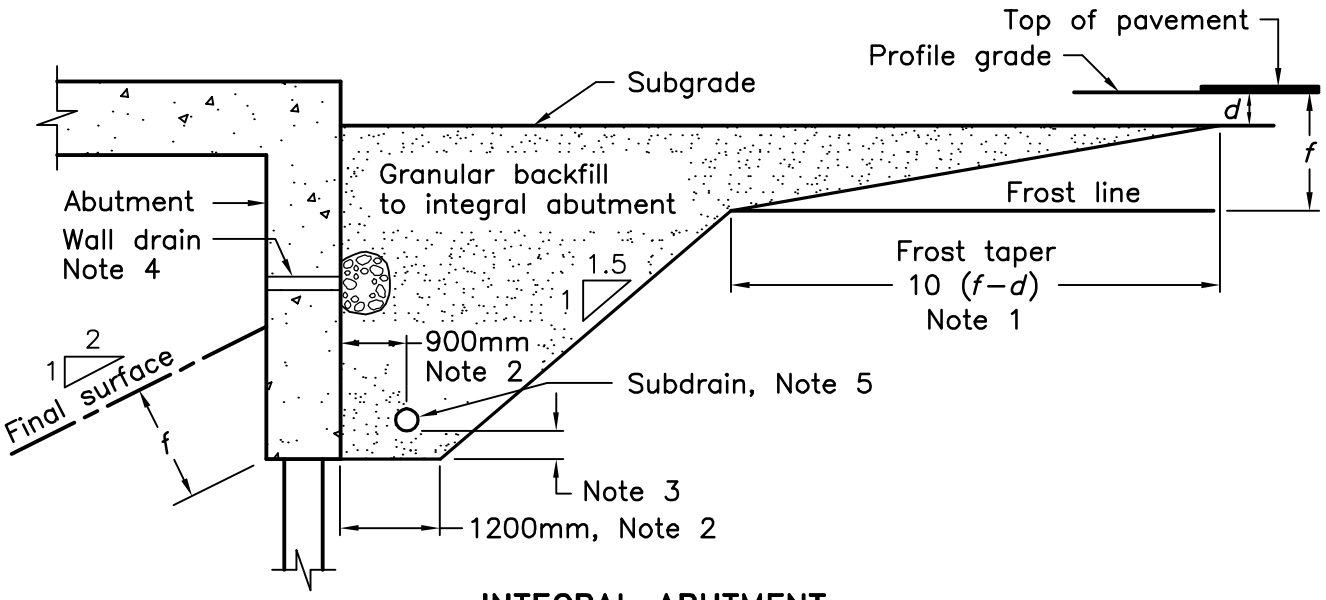
NOTES:

A These values are approximate and should only be used where the recommendations of a geotechnical engineer are not available.

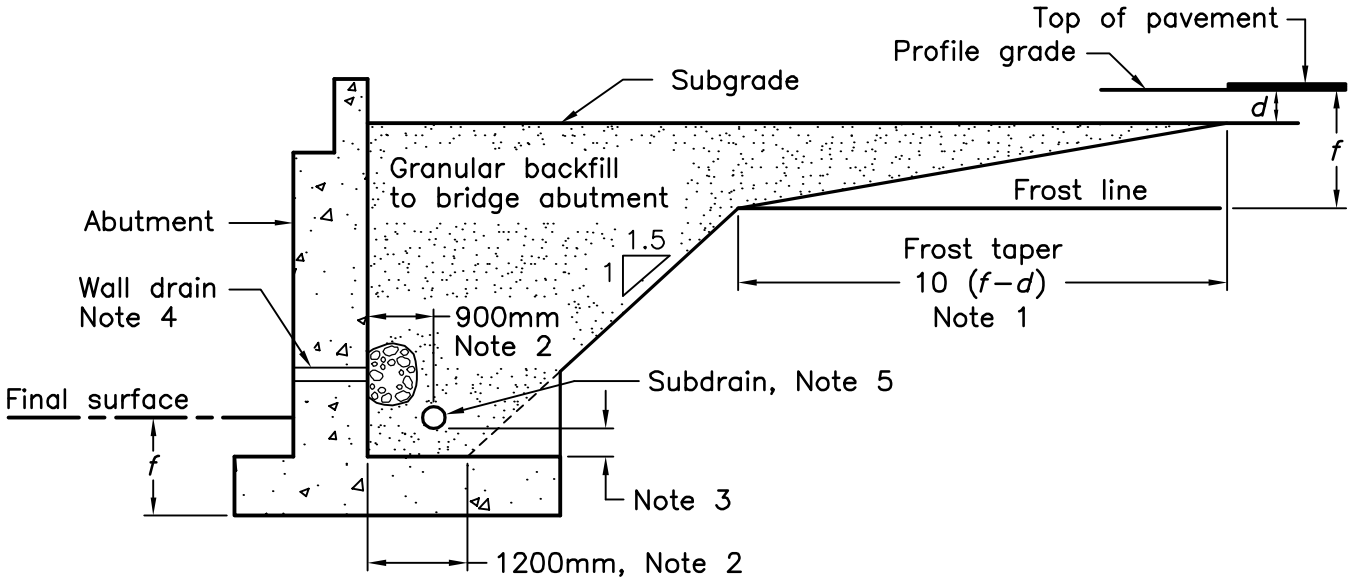
B This information is based on the Ministry of Transportation and Communications Research Publication RR225 "Aspects of Prolonged Exposure of Pavements to Sub–Zero Temperatures" dated December 1981.

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.

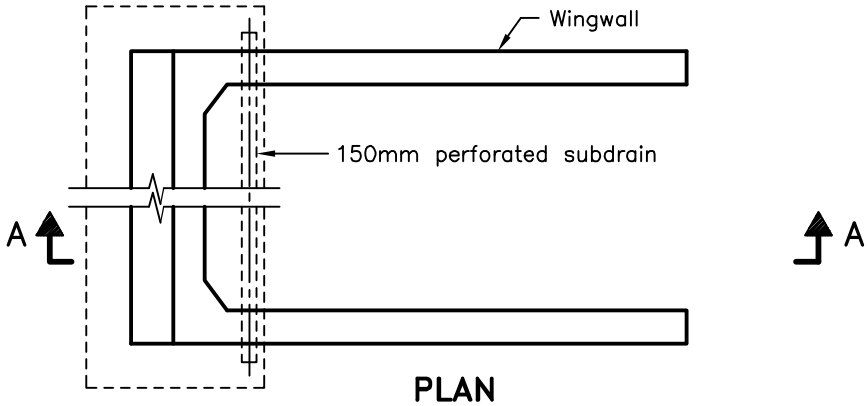
A Lateral limits of granular backfill to bridge abutment to be inside face to inside face of retaining wall or wingwall. Frost taper shall extend the full width of the backfill unless interrupted by the retaining wall or wingwall.

B Sections shown are parallel to centreline of roadway.

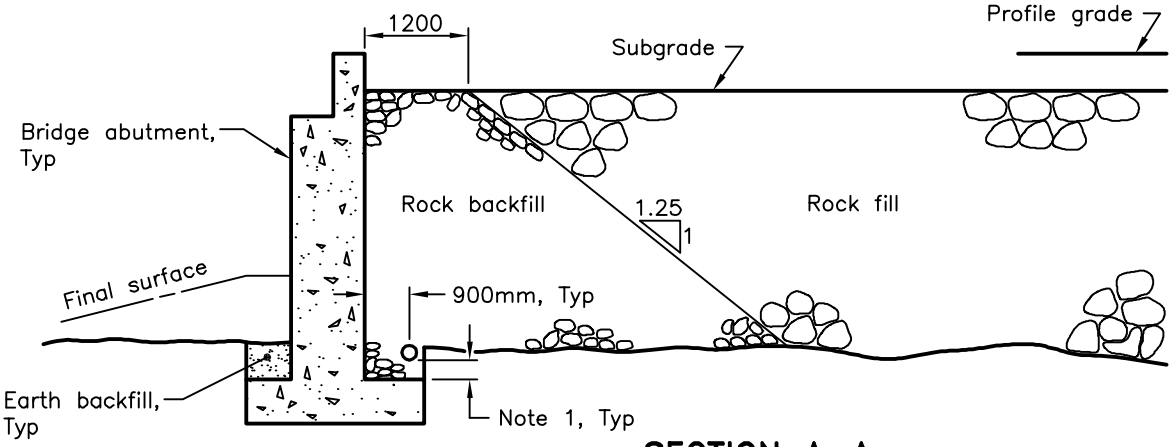
C Subdrain shall be installed with a 2% gradient behind wall.

D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
WALLS **ABUTMENT, BACKFILL** **MINIMUM GRANULAR REQUIREMENT**			
	OPSD 3101.150		

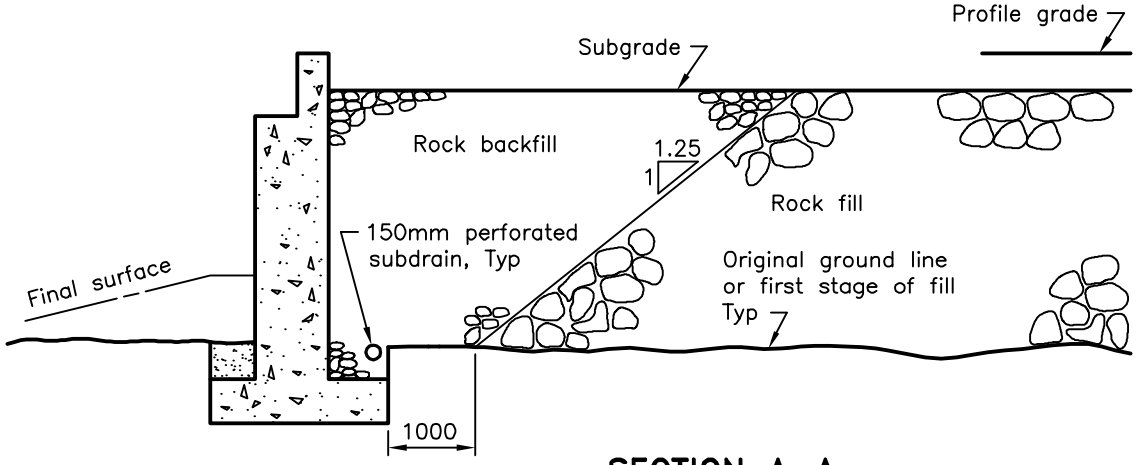


PLAN



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.

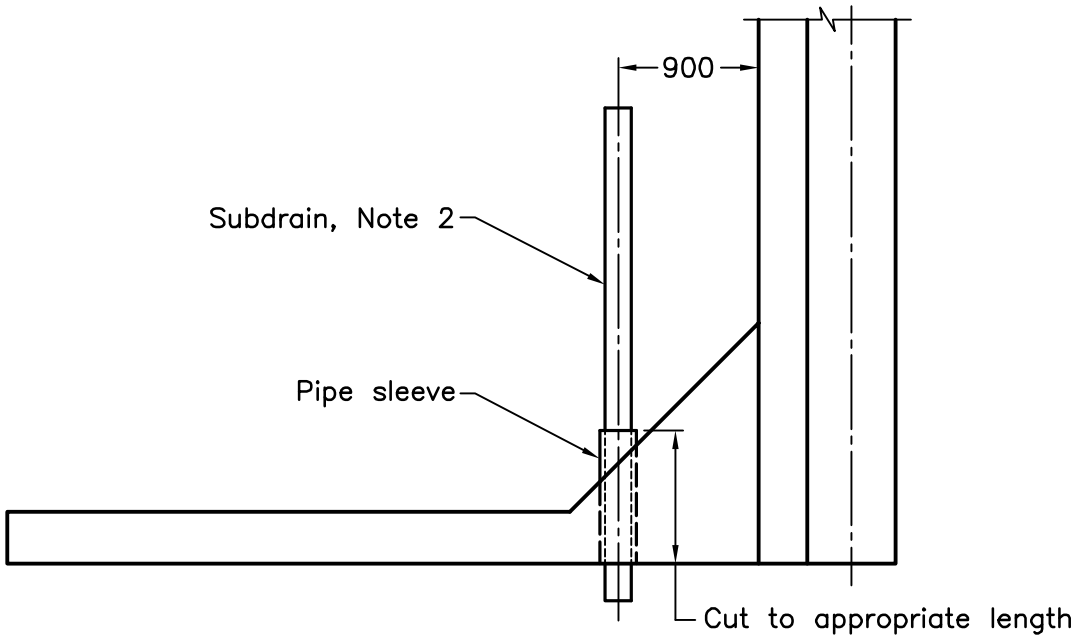
C Lateral limits of backfill to be inside face to inside face of wingwall.

D Section A–A parallel to centreline of roadway.

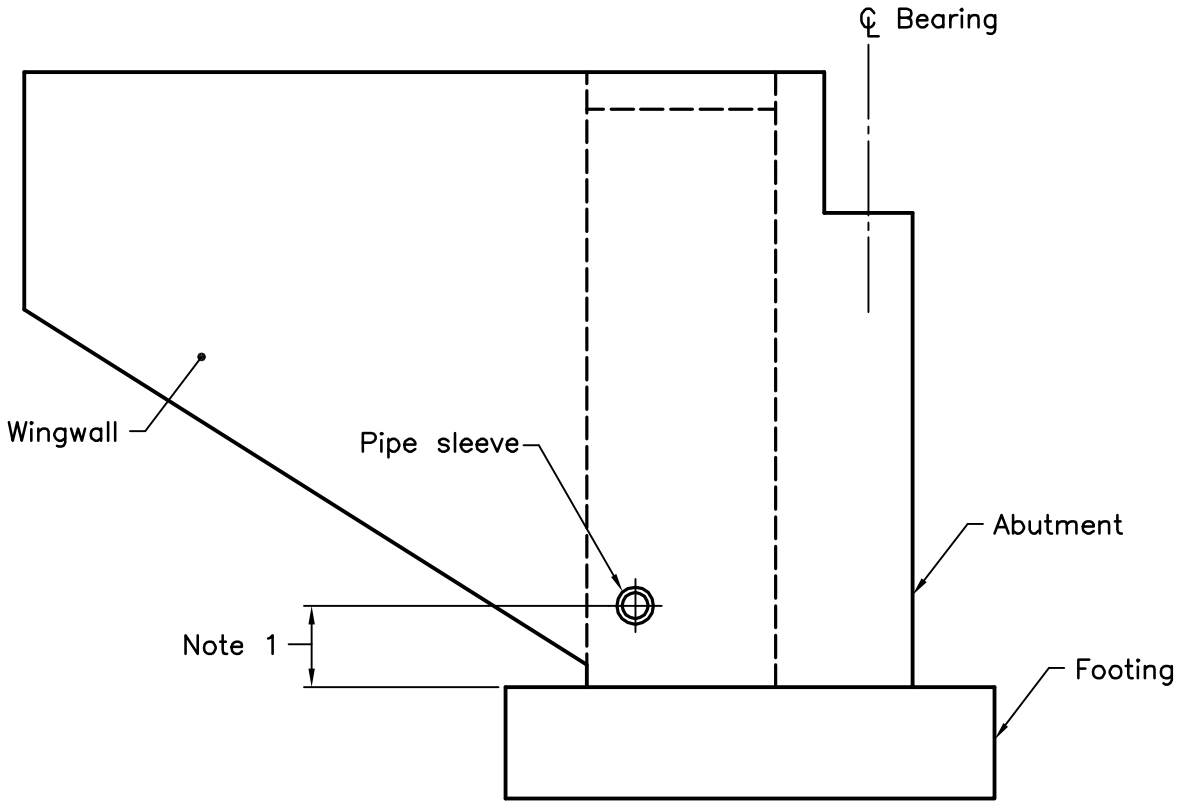
E Subdrain shall be installed with a 2% gradient behind wall.

F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
WALLS ABUTMENT, BACKFILL ROCK			
	OPSD 3101.200		



PLAN



ELEVATION

NOTE:

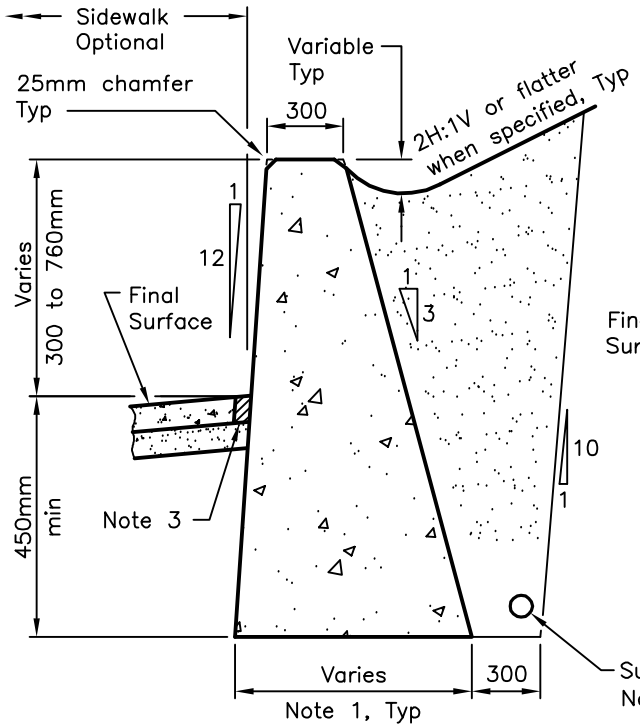
1 Height to be consistent with positive drainage of subdrain as specified.

2 150mm dia perforated pipe subdrain wrapped with geotextile.

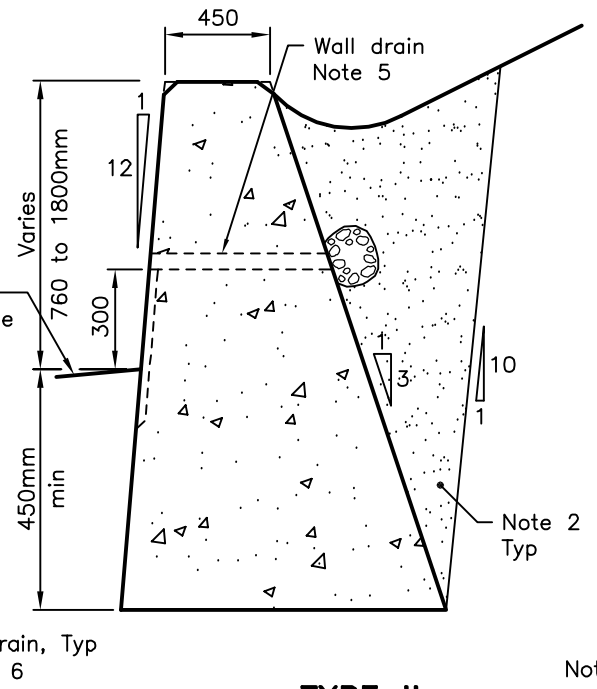
A Subdrain shall be installed with a 2% gradient behind wall.

B All dimensions are in millimetres unless otherwise shown.

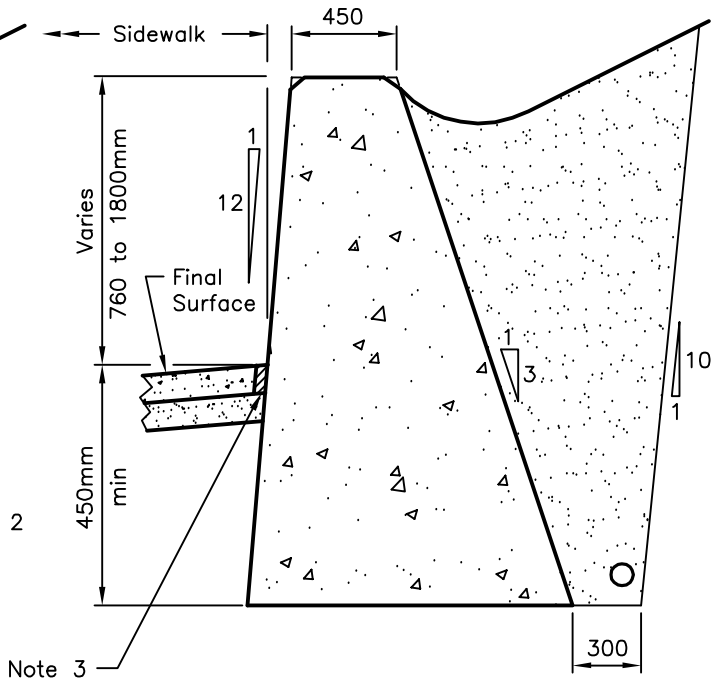
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
WALLS **ABUTMENT** **BACKFILL DRAIN**			
	OPSD 3102.100		



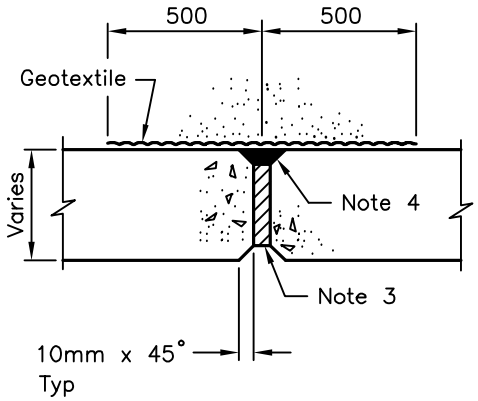
TYPE I



TYPE II



TYPE III



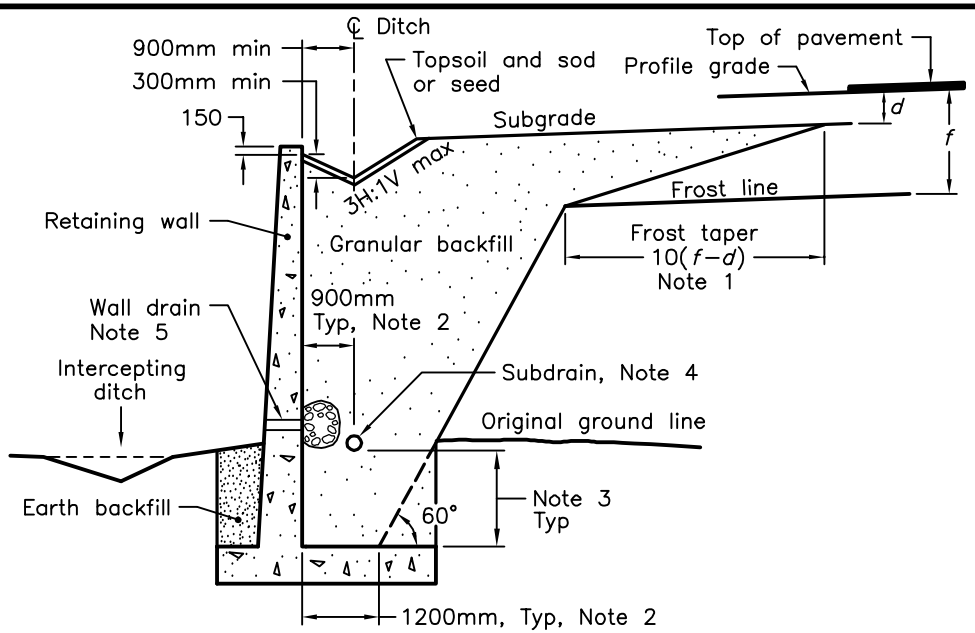
**PLAN OF
JOINT DETAIL
IN CONCRETE TOE WALLS
AT 3.0m SPACING**

NOTES:

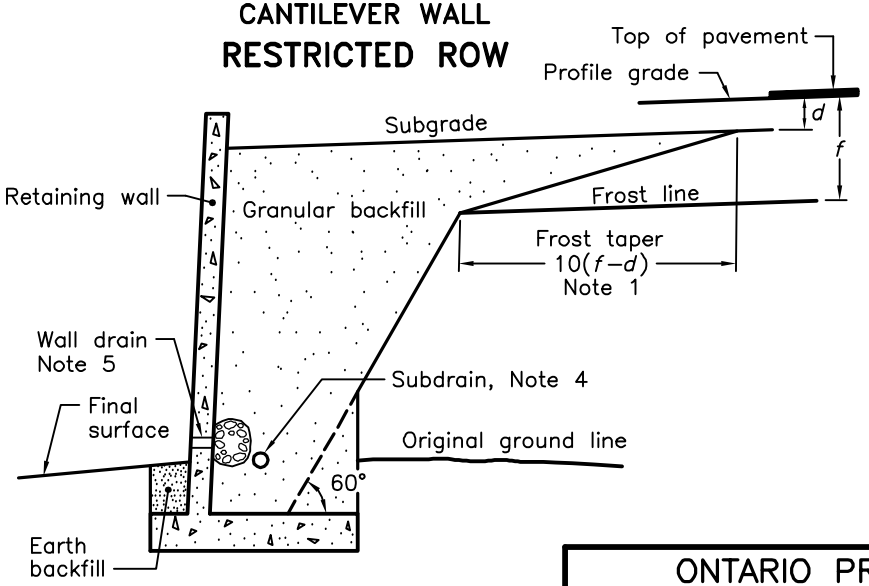
1 Walls shall be founded on undisturbed soil having a minimum bearing capacity at ultimate limit states of 200kPa for Type I and 300kPa for Type II and Type III.
2 Excavation for toe walls shall be backfilled with free draining granular material.
3 10mm preformed joint filler, Type A, non–extruding and 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.

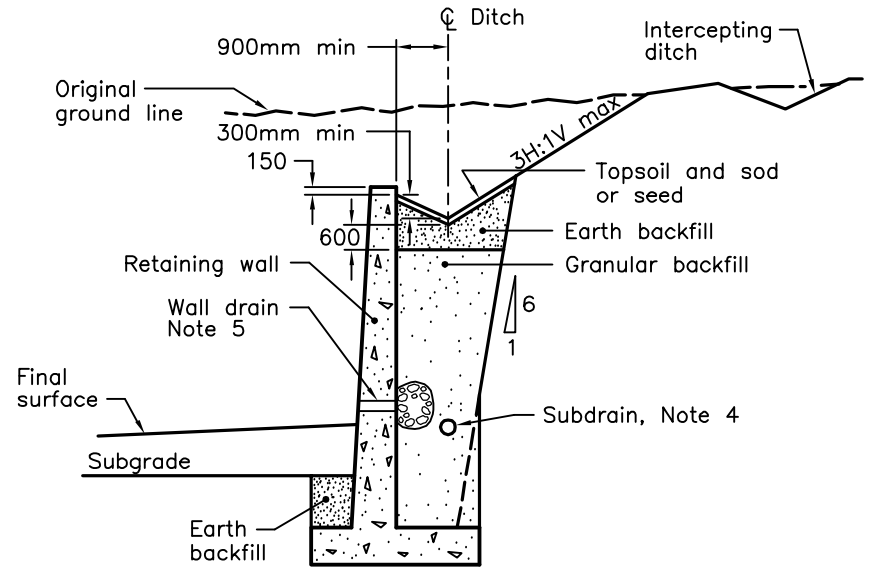
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	2
WALLS RETAINING CONCRETE TOE WALL			
			OPSD 3120.100



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.

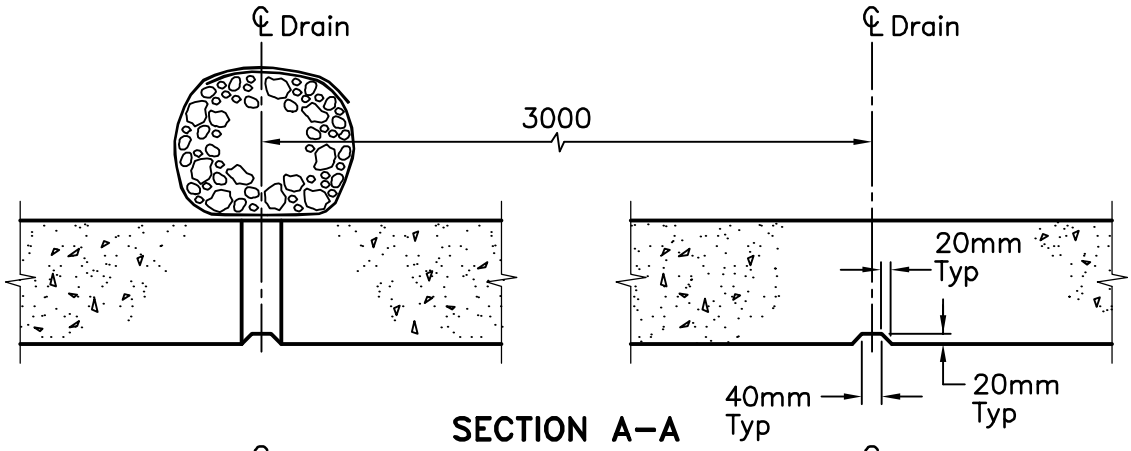
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

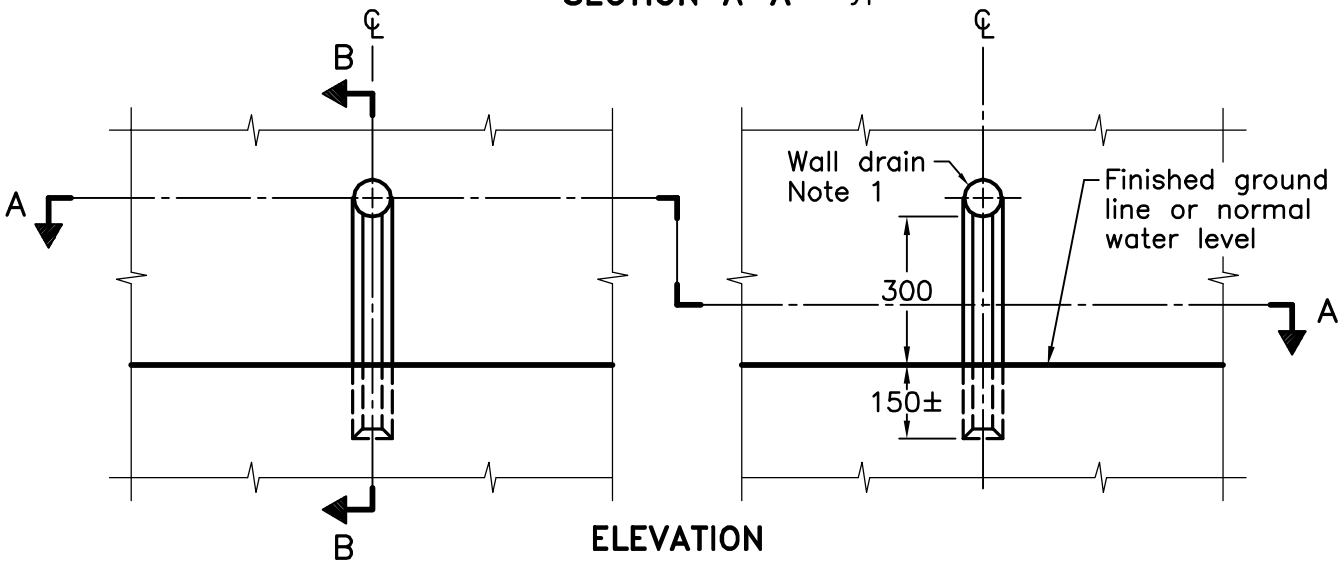
WALLS
RETAINING, BACKFILL
MINIMUM GRANULAR REQUIREMENT

Nov 2010 | Rev 1

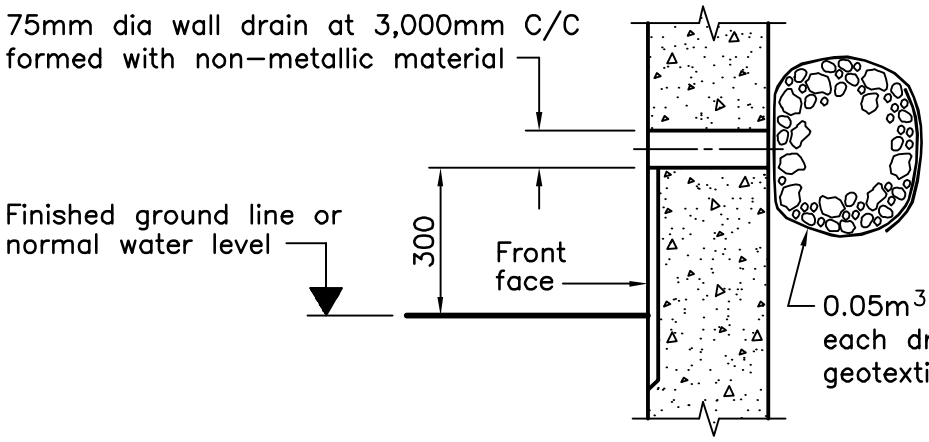
OPSD 3121.150



SECTION A–A



ELEVATION



SECTION B–B

NOTES:

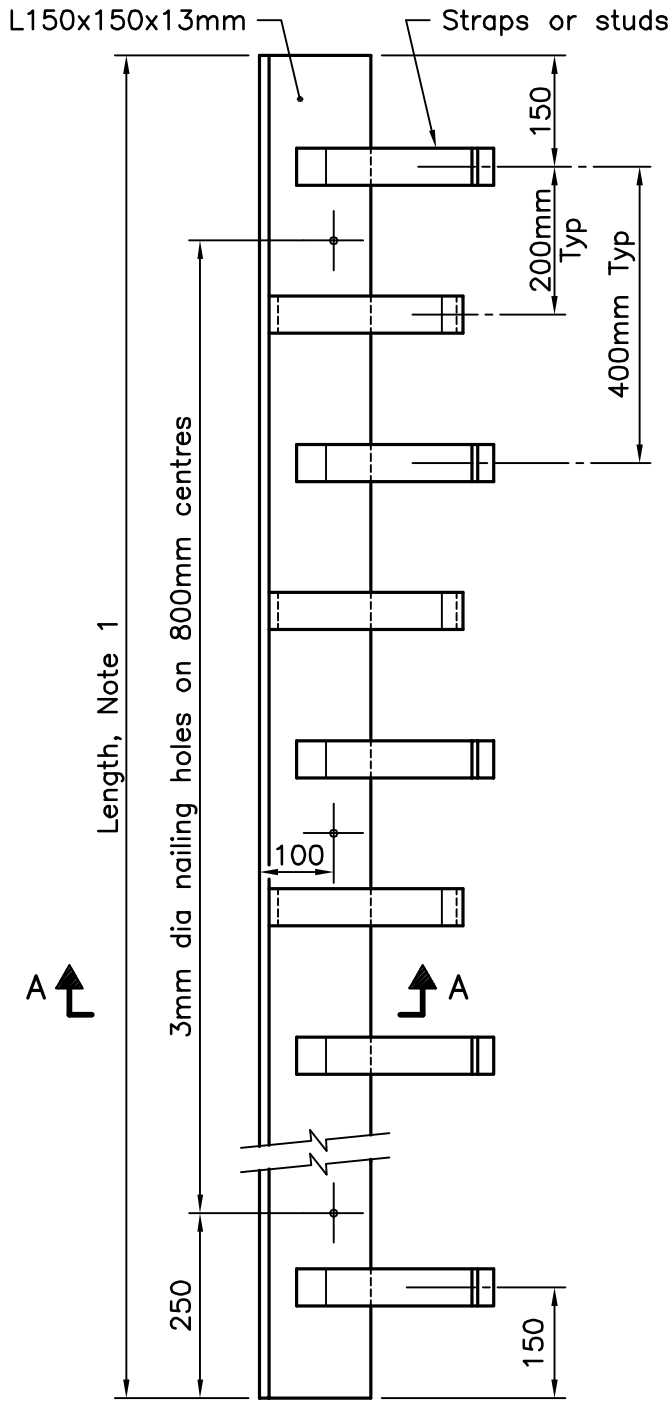
1 Bottom half of drain to be contoured to shape of vertical groove after removal of formwork.

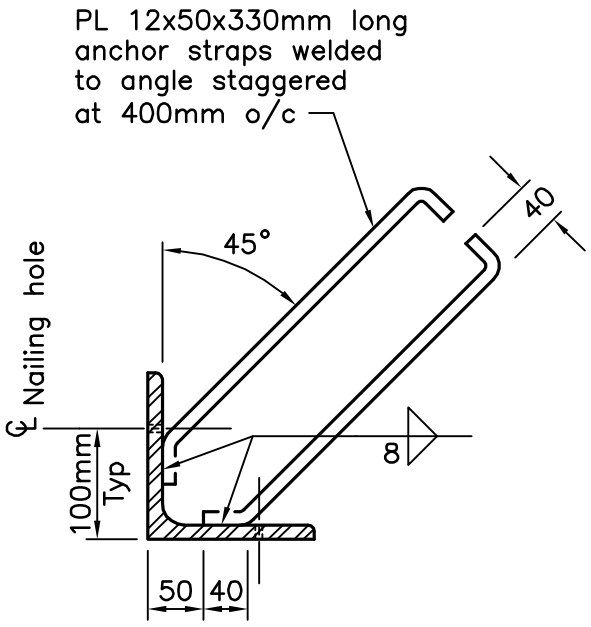
2 Geotextile shall be non–woven, Class II, with an FOS of 125–250 µm.

A Minimum cover to reinforcing bars shall be measured from the base of the groove.

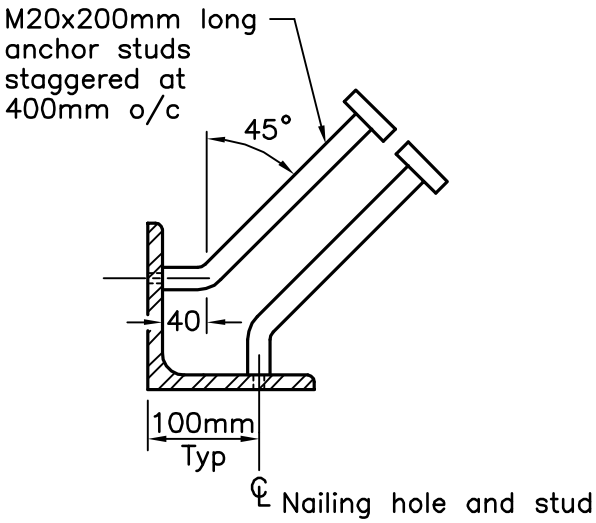
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Apr 2011	Rev	2
WALLS RETAINING AND ABUTMENT 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.

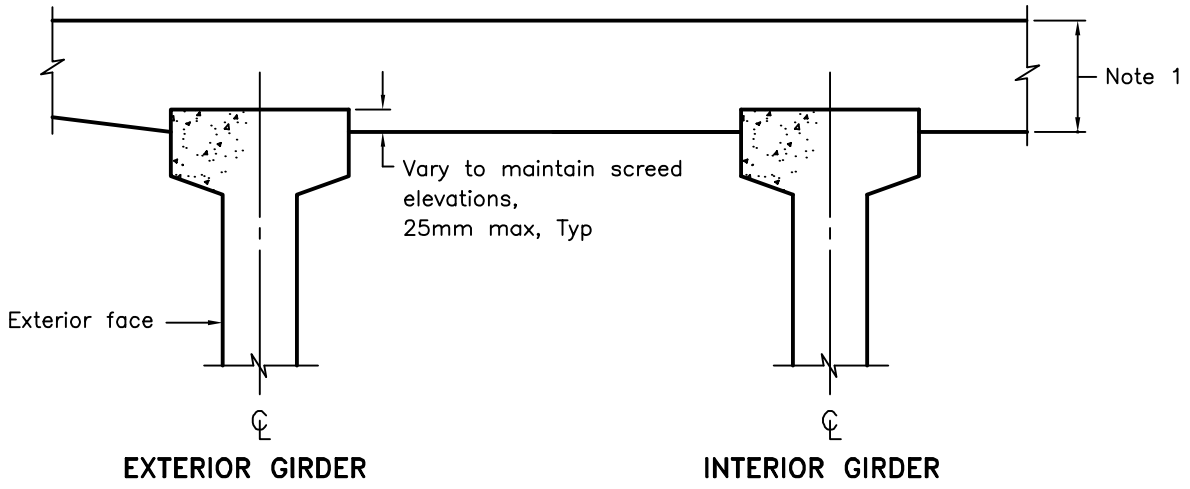
B Cutwater shall be hot dip galvanized after fabrication according to CAN/CSA G164M.

C Welding shall be of a low hydrogen classification and according to CSA W59 with E480xx electrodes.

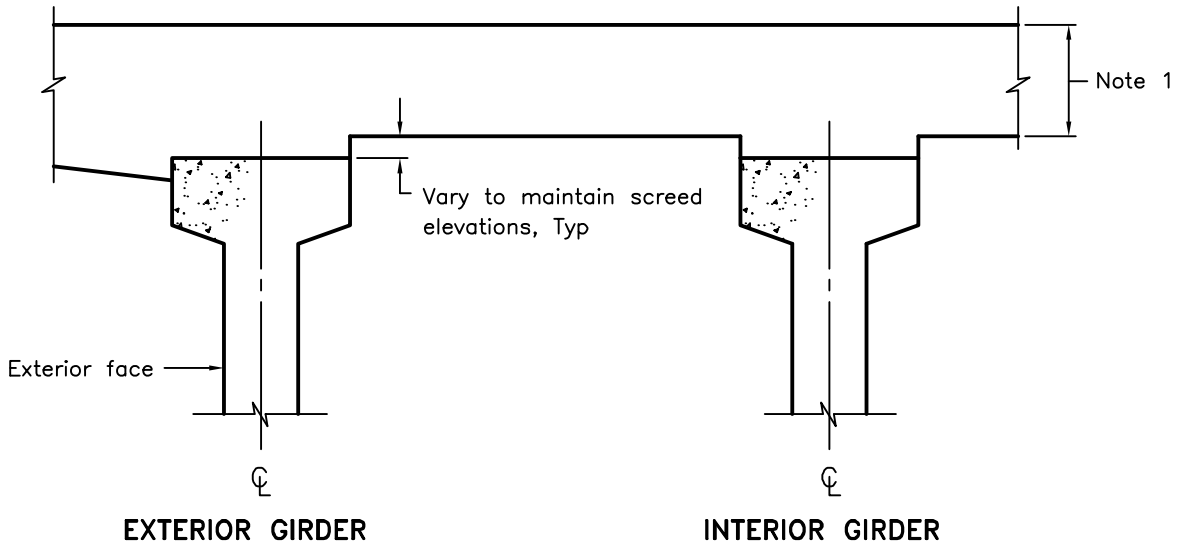
D Anchor studs shall be attached using fusion weld process.

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2011	Rev	1
PIERS CUTWATER ASSEMBLY			
	OPSD 3290.100		



BOTTOM OF DECK BELOW TOP OF GIRDER



BOTTOM OF DECK ABOVE TOP OF GIRDER

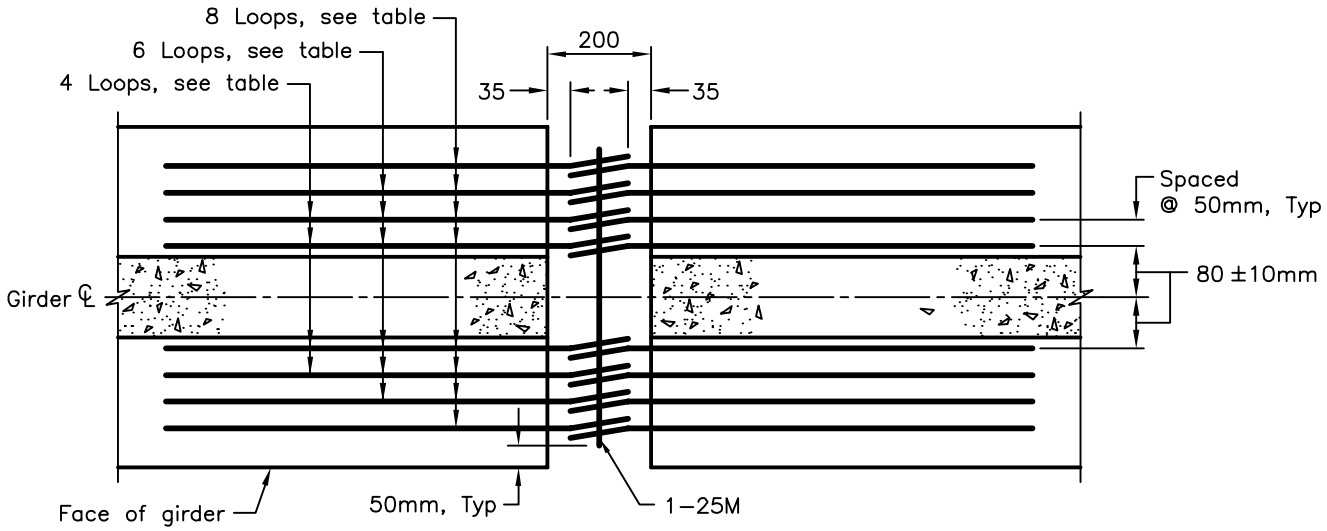
NOTES:

1 Dimension shall not be less than the specified slab thickness.

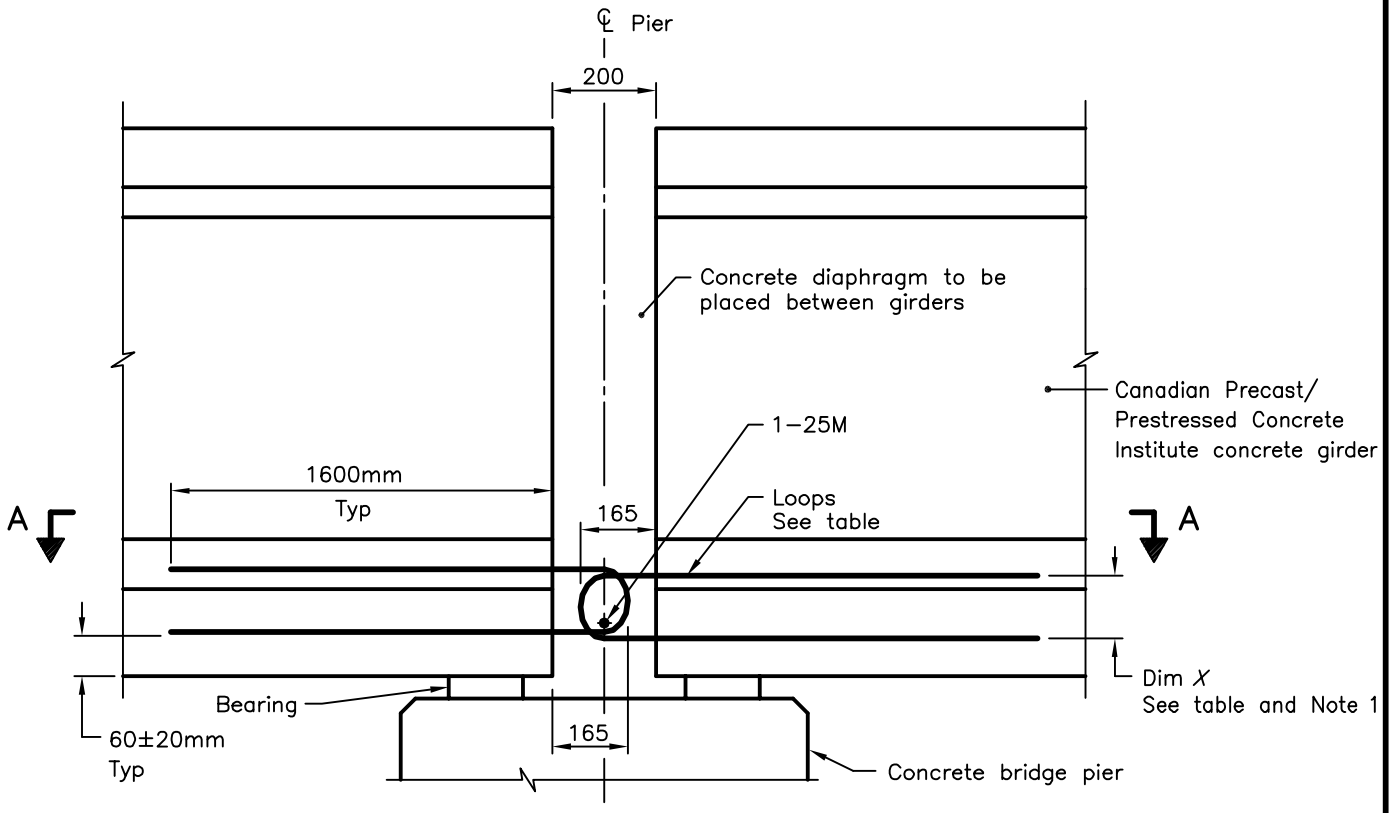
A This standard is also applicable to precast box girders.

B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
DECK GIRDERS, CONCRETE 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.

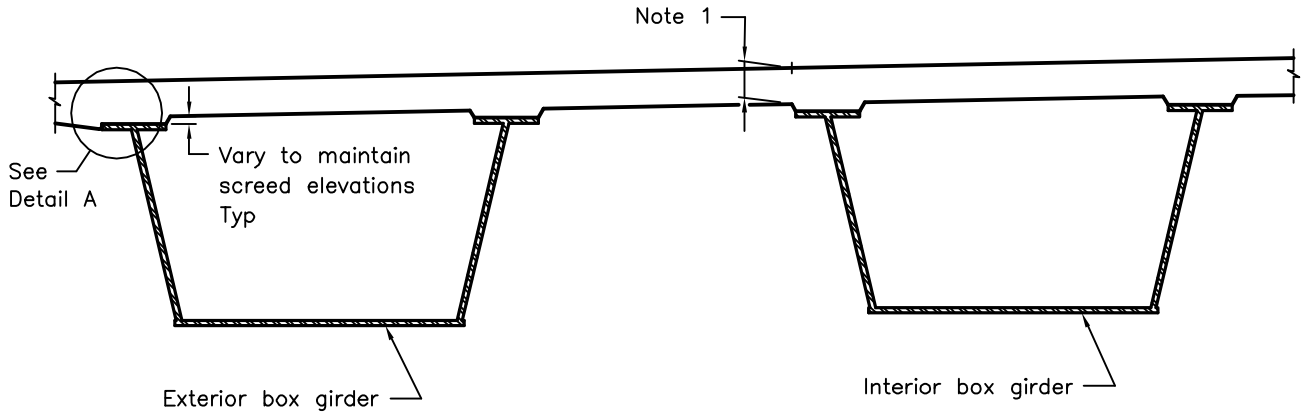
B This OPSD shall not be used at integral supports of integral abutment type structures.

C All dimensions are in millimetres unless otherwise shown.

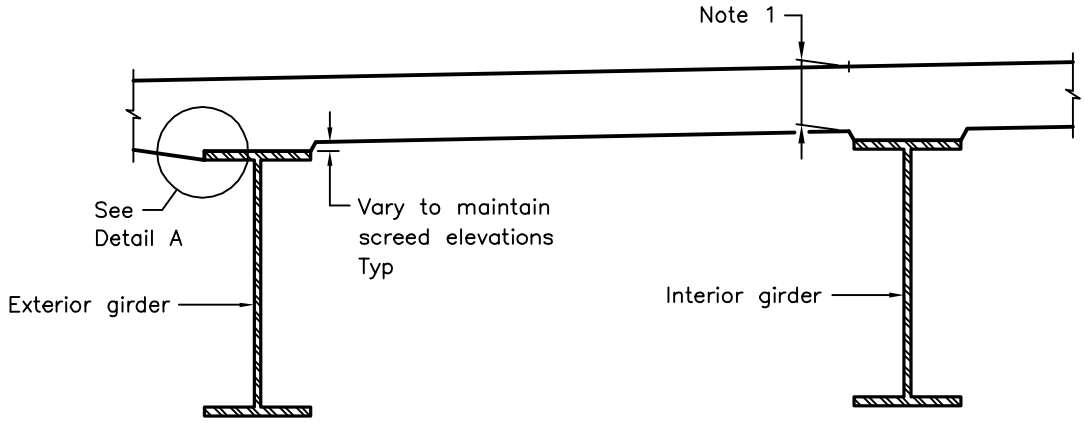
ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev 1

DECK
GIRDERS, CONCRETE
POSITIVE MOMENT CONNECTION AT PIERS

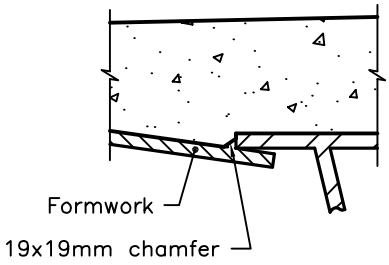
OPSD 3310.150



STEEL BOX GIRDER



STEEL I GIRDER



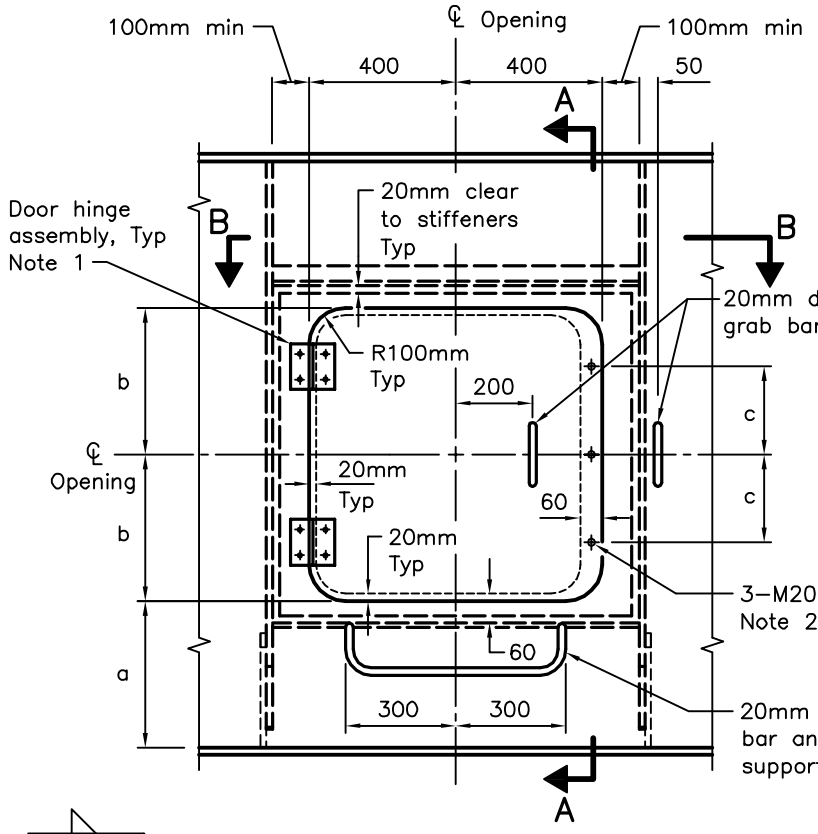
DETAIL A
FORMWORK IN PLACE

NOTE:

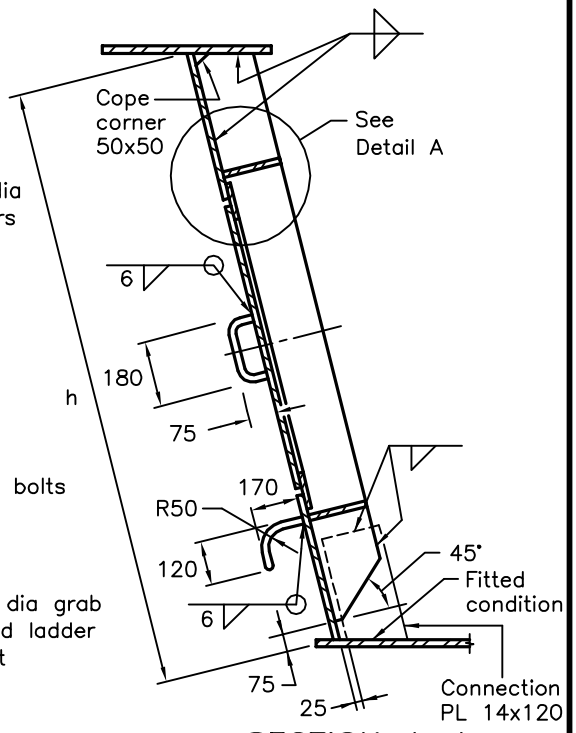
1 Dimension shall not be less than the specified slab thickness.

A All dimensions are in millimetres unless otherwise shown.

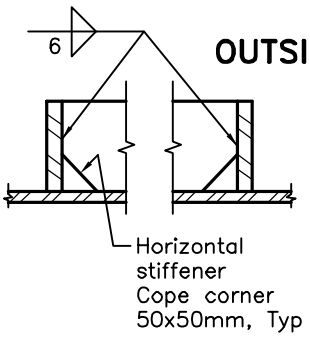
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
DECK GIRDERS, STEEL METHOD OF OBTAINING SCREED ELEVATIONS			
	OPSD 3311.100		



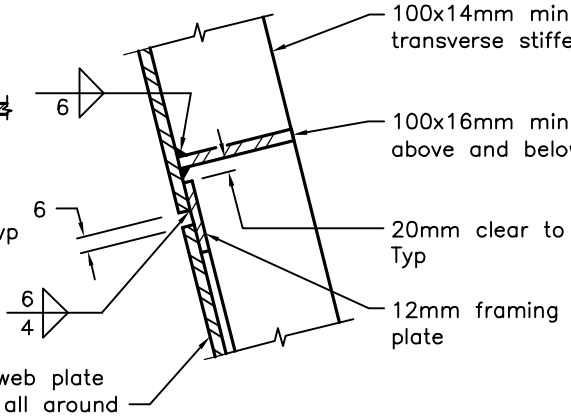
OUTSIDE FACE – ELEVATION



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

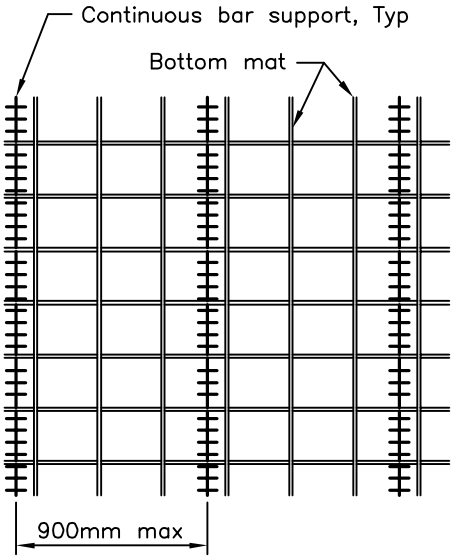
NOTES:

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.

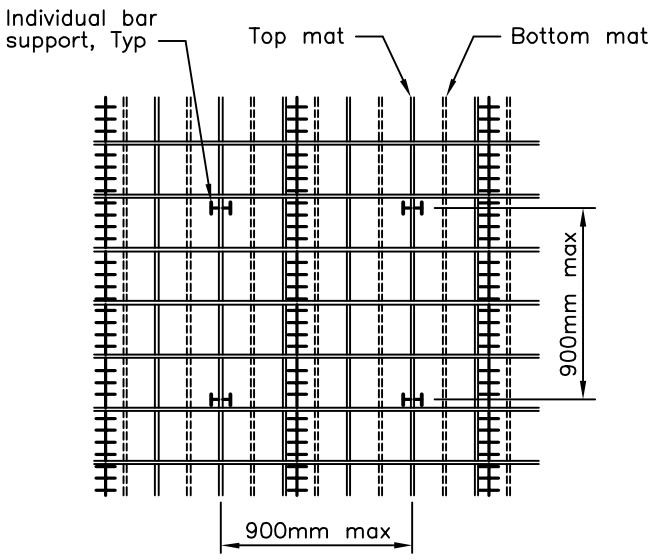
A Hinges and grab bars shall be according to CSA G40.20/G40.21, Grade 300W. The remainder of the steel shall be the same as for the box girder.
B Access hatch shall be placed on interior web of box girder only.
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
DECK GIRDERS, STEEL BOX ACCESS HATCH			

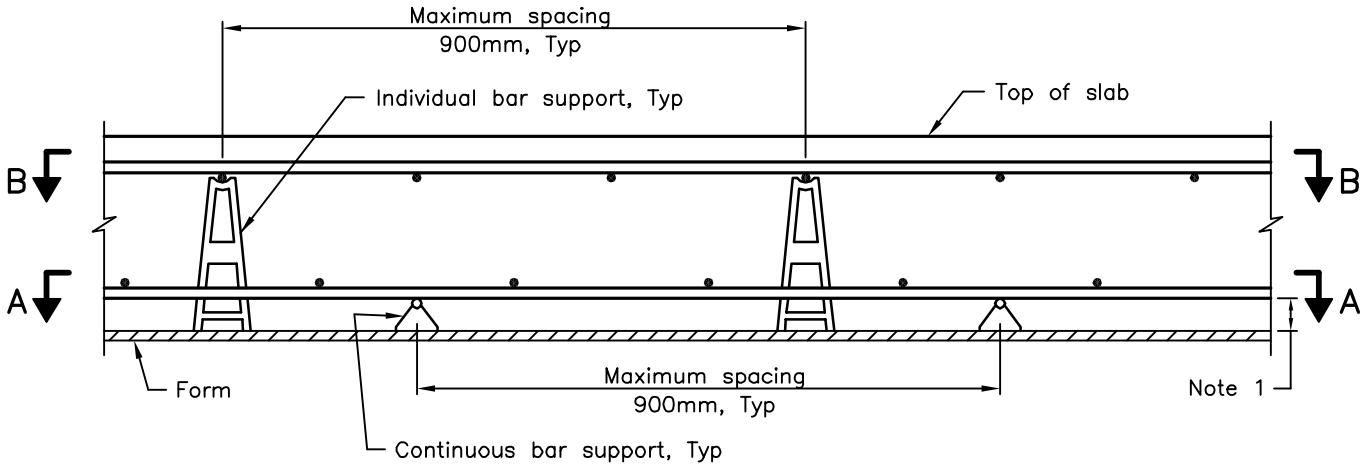
OPSD 3311.900



SECTION A–A



SECTION B–B



TYPICAL SLAB CROSS SECTION

NOTES:

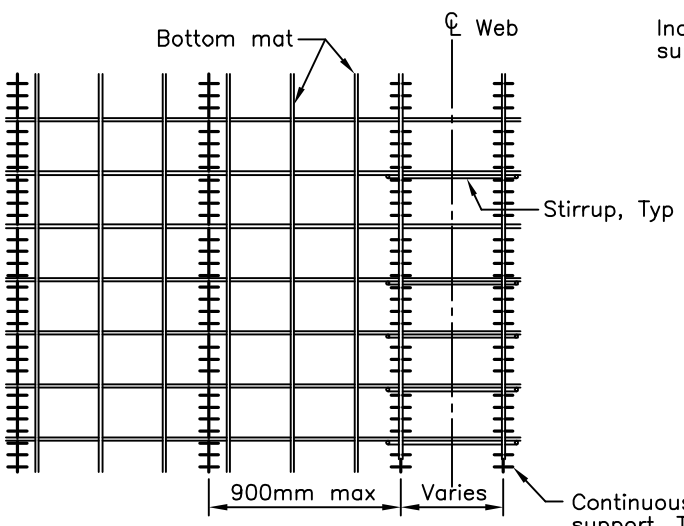
1 Dimension to suit specified nominal cover.

A Bar supports shall be Class D or Class E for maximum protection as detailed in the RSIC Reinforcing Steel Manual of Standard Practice.

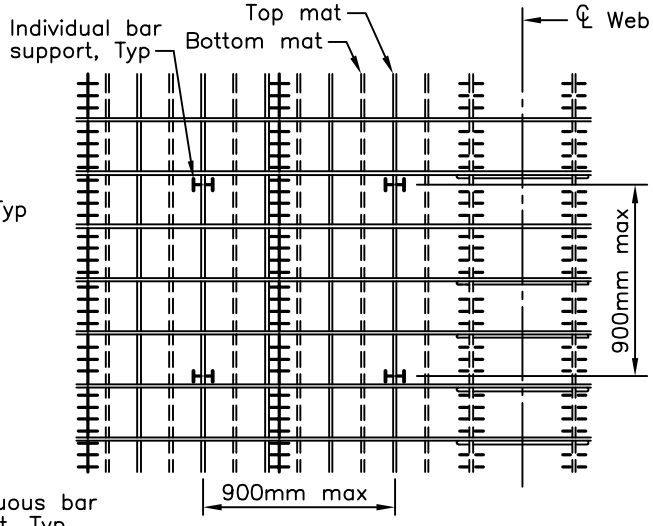
B Metal portions of continuous bar supports shall be plastic encased or approved equivalent.

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.

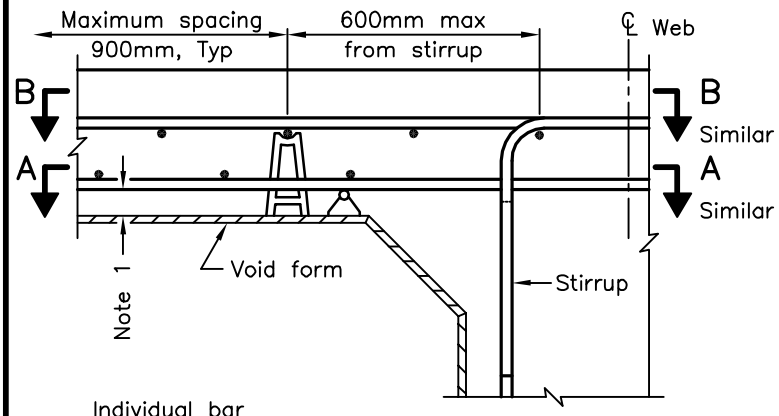
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2011	Rev	1
DECK, REINFORCEMENT SUPPORTS FOR REINFORCING STEEL FOR SLAB DEPTHS 300mm OR LESS			
	OPSD 3329.100		

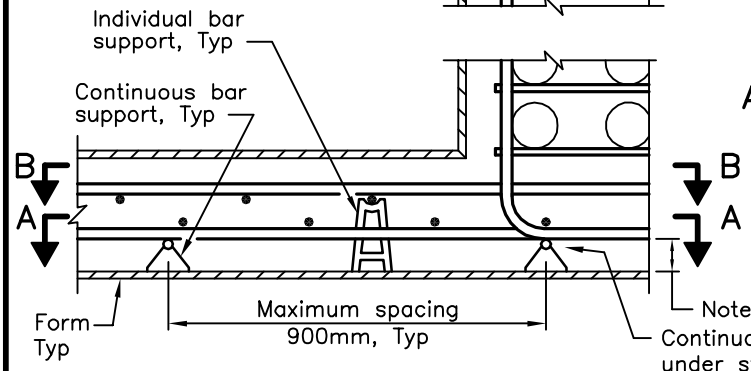


SECTION A–A

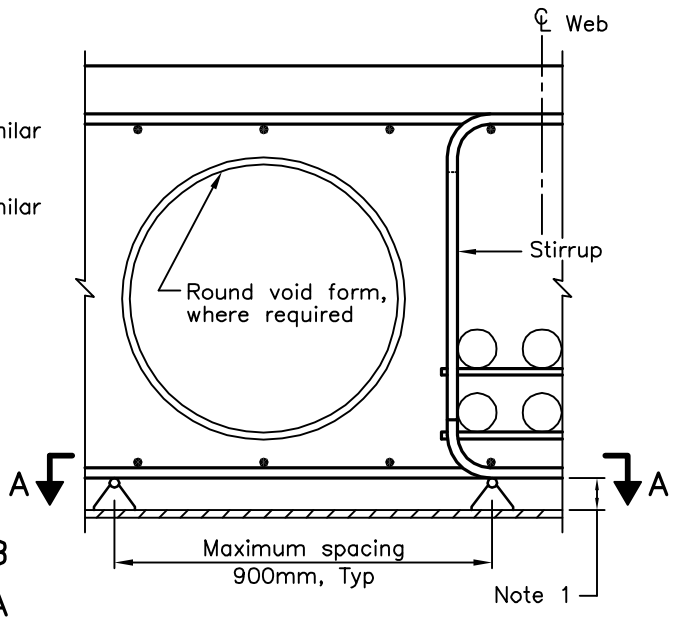


SECTION B–B





DECK WITH RECTANGULAR VOIDS



SOLID DECK OR WITH ROUND VOIDS

NOTES:

1 Dimension to suit specified nominal cover.

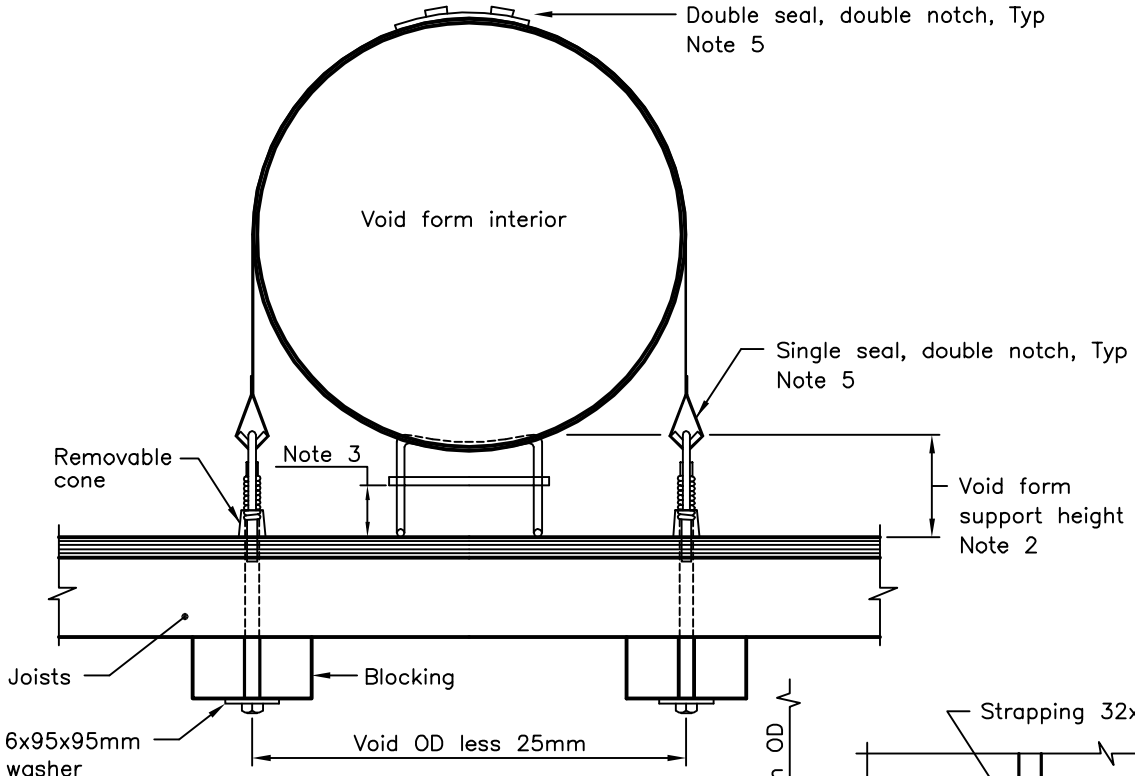
A Individual bar supports shall be placed on a grid of 900mm maximum, except at webs.

B Bar supports shall be Class D or Class E for maximum protection as detailed in the RSIC Reinforcing Steel Manual of Standard Practice.

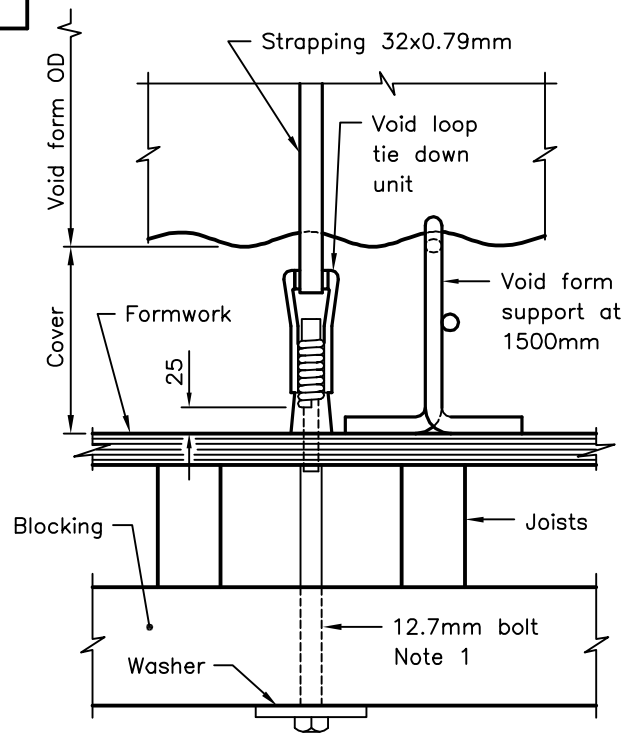
C Metal portions of continuous bar supports shall be plastic encased or approved equivalent.

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.

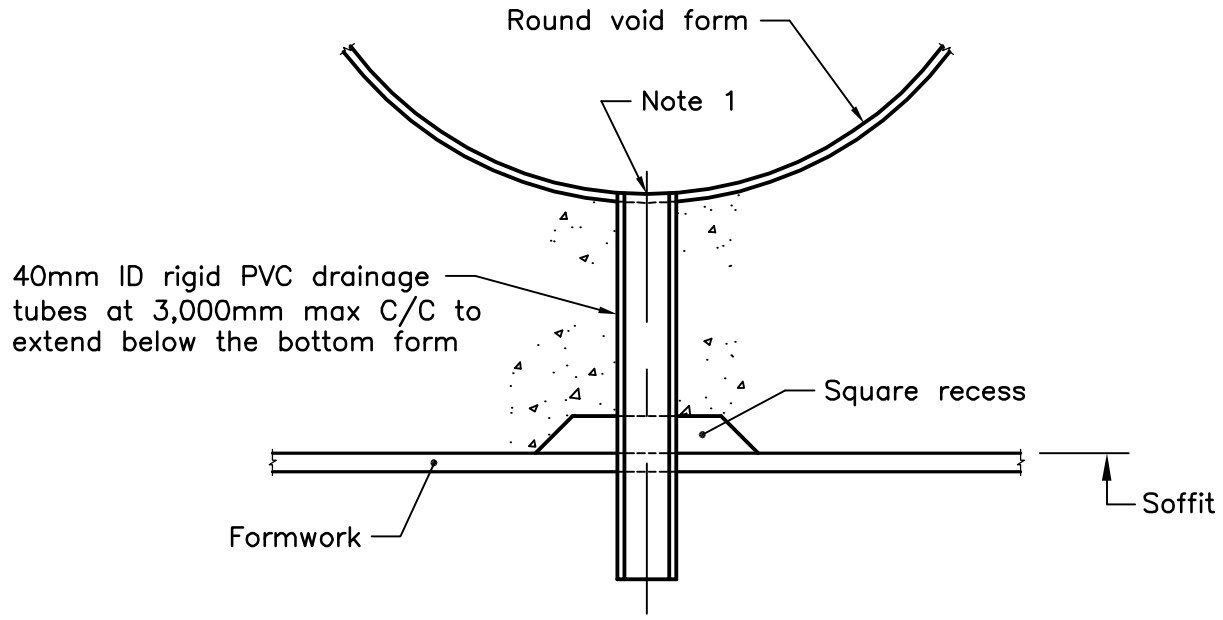
5 Strapping shall be according to CAN/CGSB 43.24M, Type 1, Grade 1.

A Void loop tie–down unit and strapping size and spacing shall suit void size.

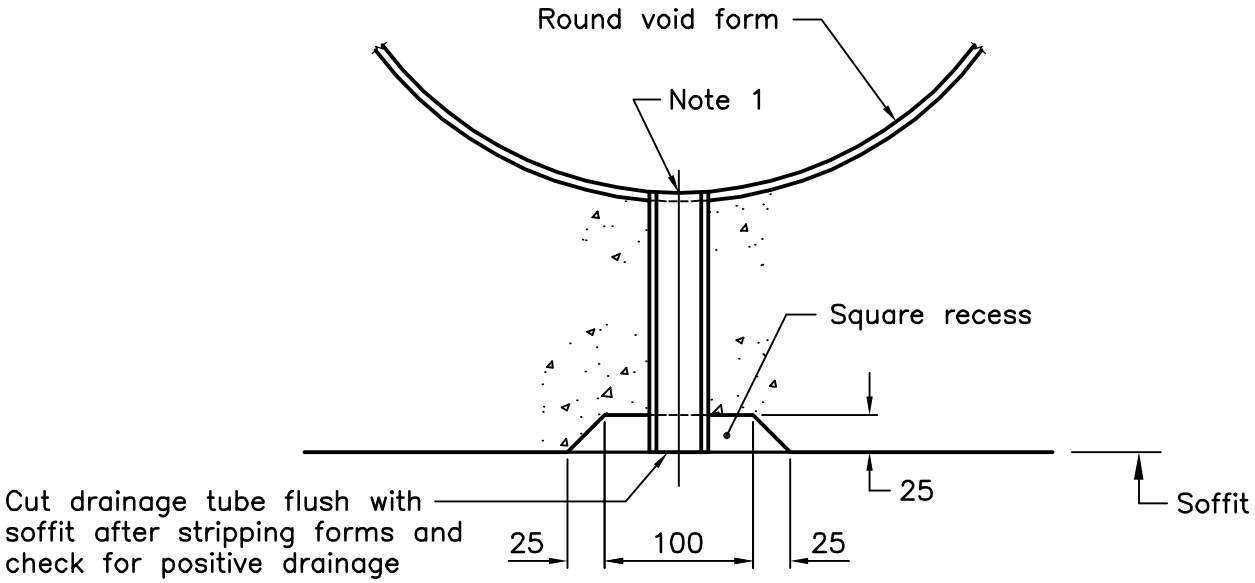
B Void form support size to suit spacing indicated and shall be hot dip galvanized according to CAN/CSA 164M.

C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2011	Rev	1
DECK ROUND VOIDS FORM SUPPORTS AND TIE–DOWNS			
	OPSD 3332.100		



TYPICAL DETAIL WITH FORMWORK IN PLACE



TYPICAL DETAIL WITH FORMWORK REMOVED

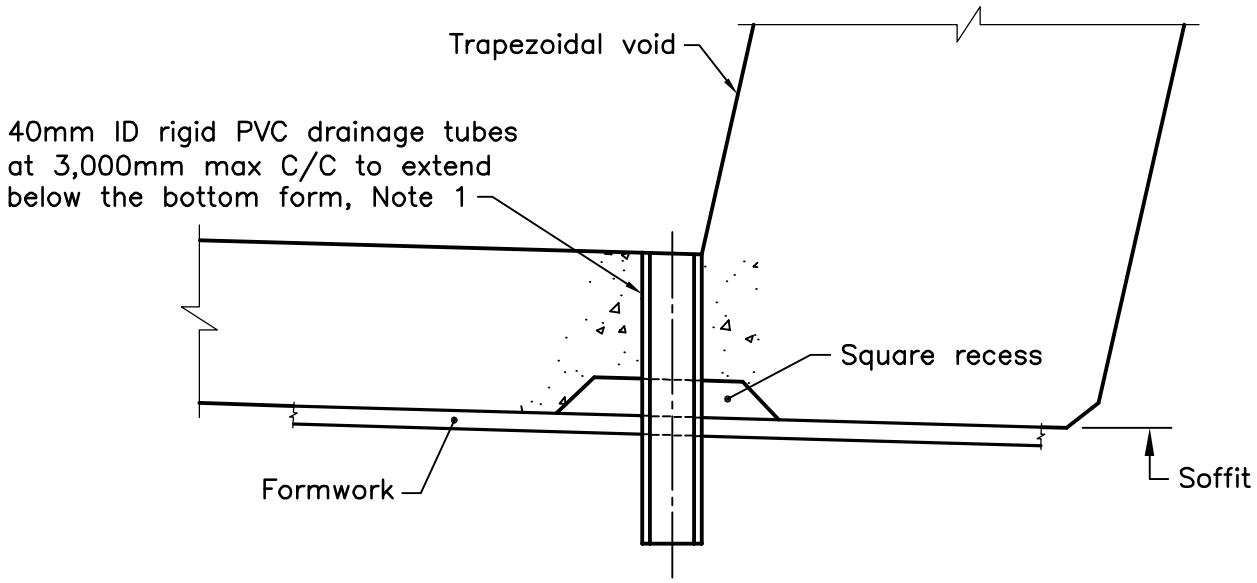
NOTES:

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.

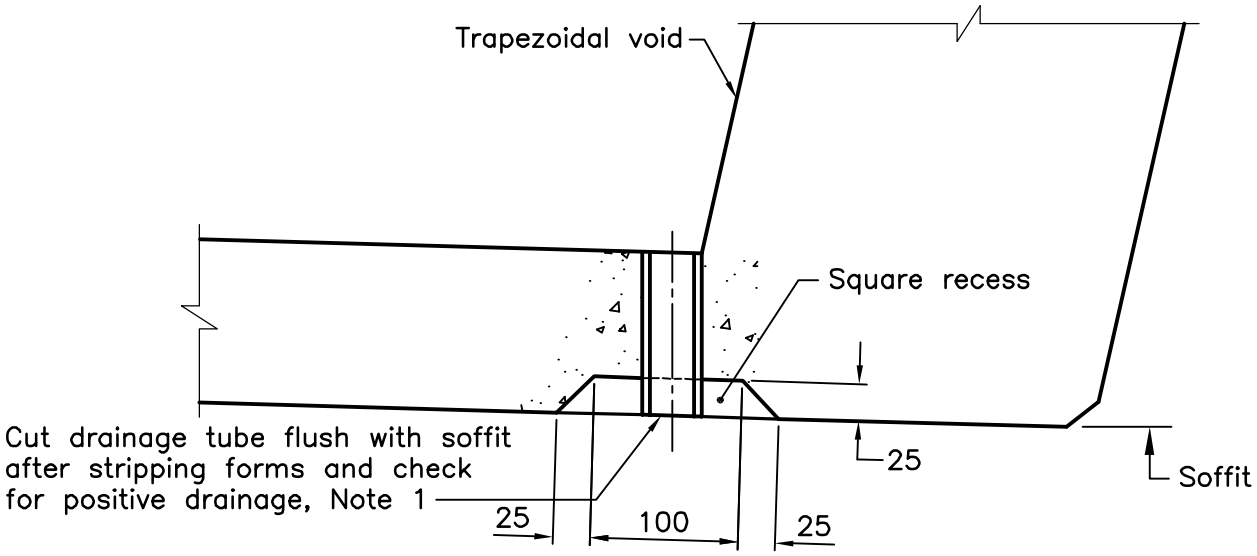
A One of the drainage tubes shall be placed maximum 300mm from the lower end of each void tube.

B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
DECK ROUND VOIDS DRAINS			
	OPSD 3333.100		



TYPICAL DETAIL WITH FORMWORK IN PLACE



TYPICAL DETAIL AFTER FORMWORK REMOVED

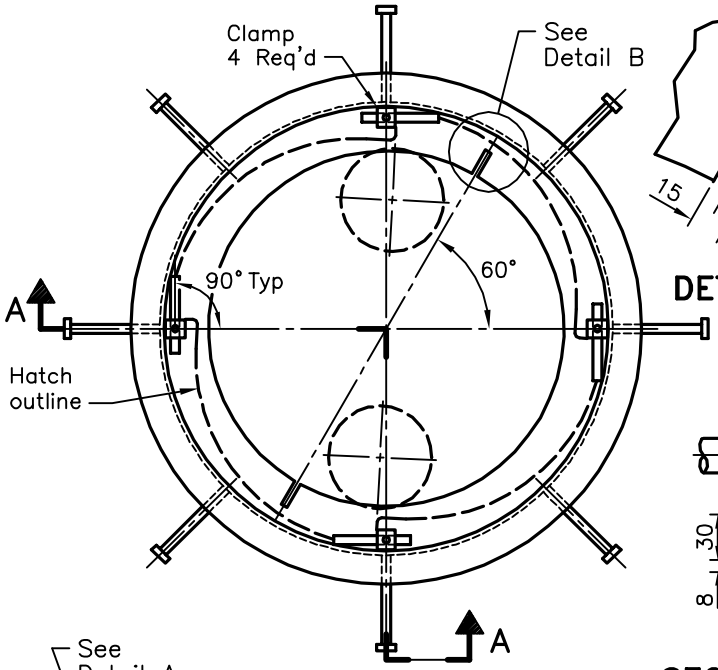
NOTES:

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.

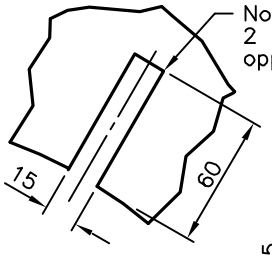
A One of the drainage tubes shall be placed 300mm maximum from the lower end of each void.

B All dimensions are in millimetres unless otherwise shown.

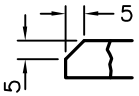
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev 1	
DECK TRAPEZOIDAL VOID DRAINS			OPSD 3333.101



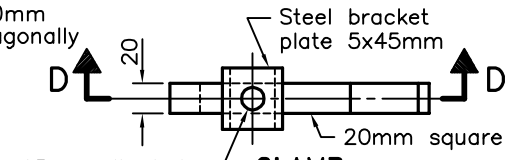
FRAME PLAN



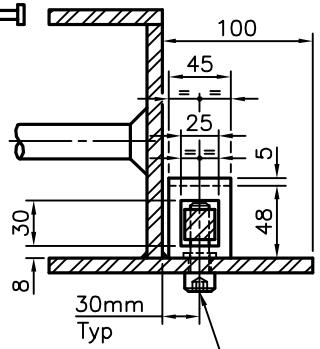
DETAIL B



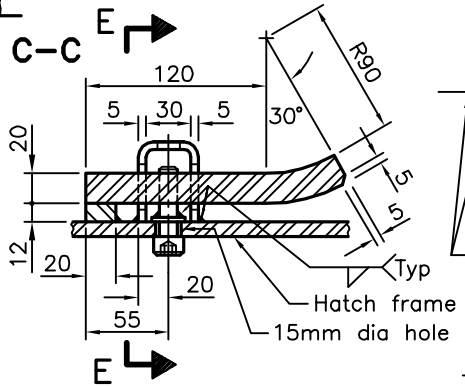
SECTION C–C



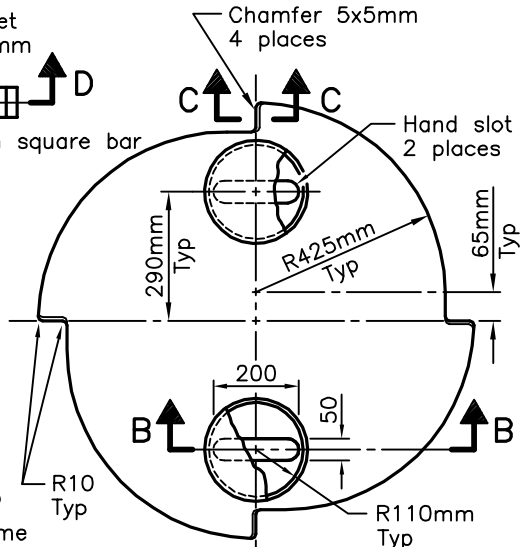
CLAMP PLAN



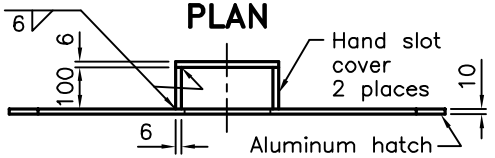
SECTION E–E



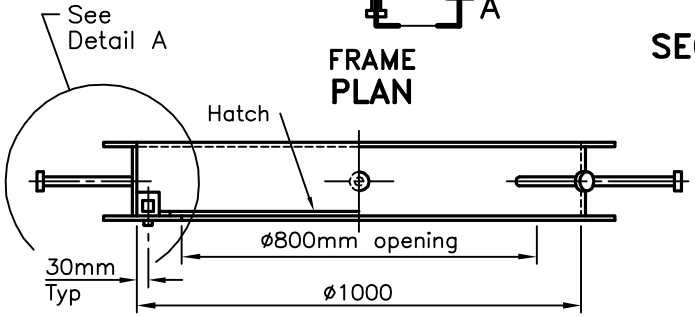
SECTION D–D



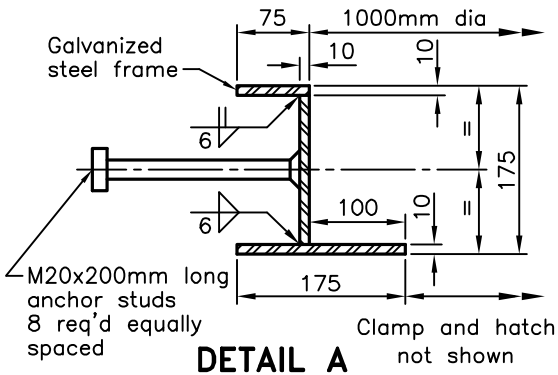
HATCH PLAN



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.

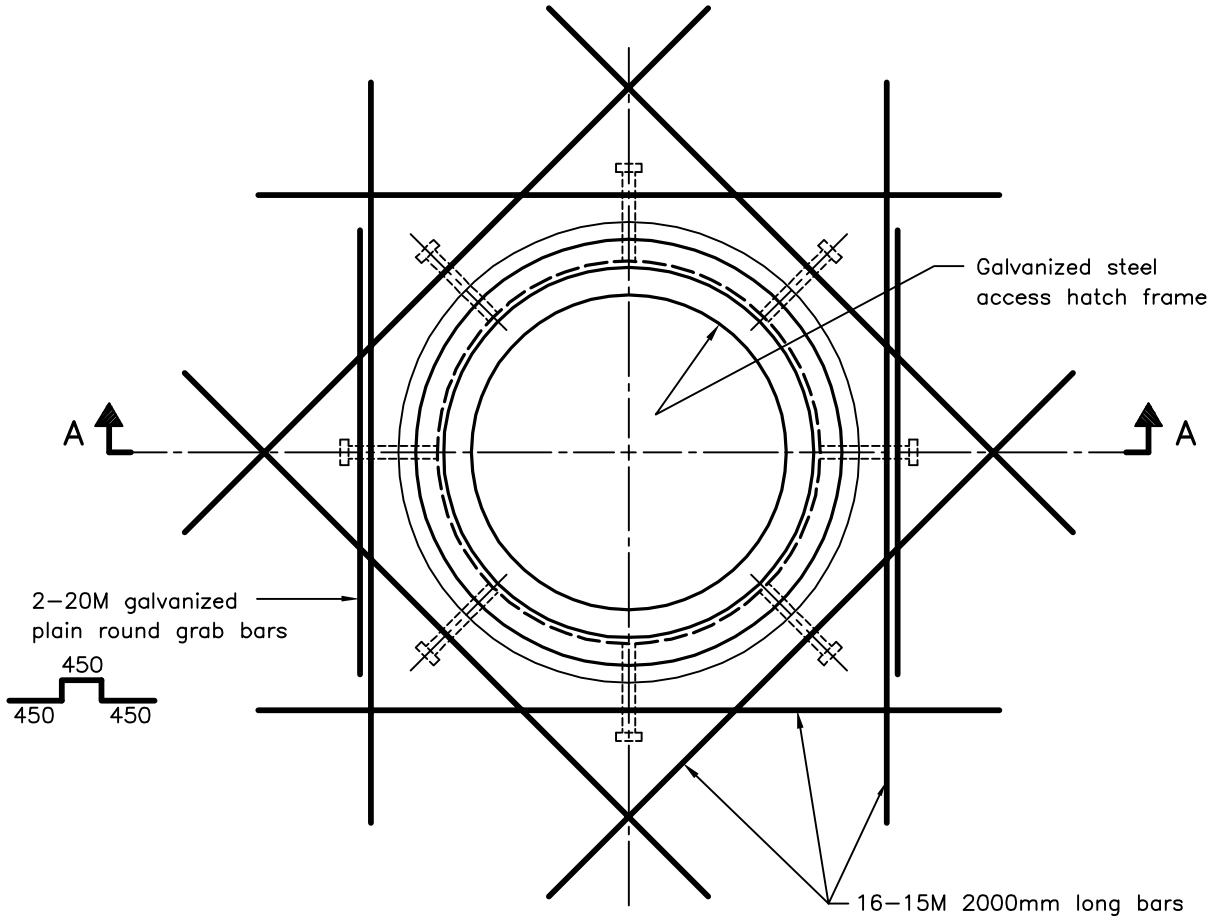
ONTARIO PROVINCIAL STANDARD DRAWING

DECK, VOIDS
ACCESS HATCH FOR CONCRETE BRIDGES
ASSEMBLY

Nov 2011 | Rev 1

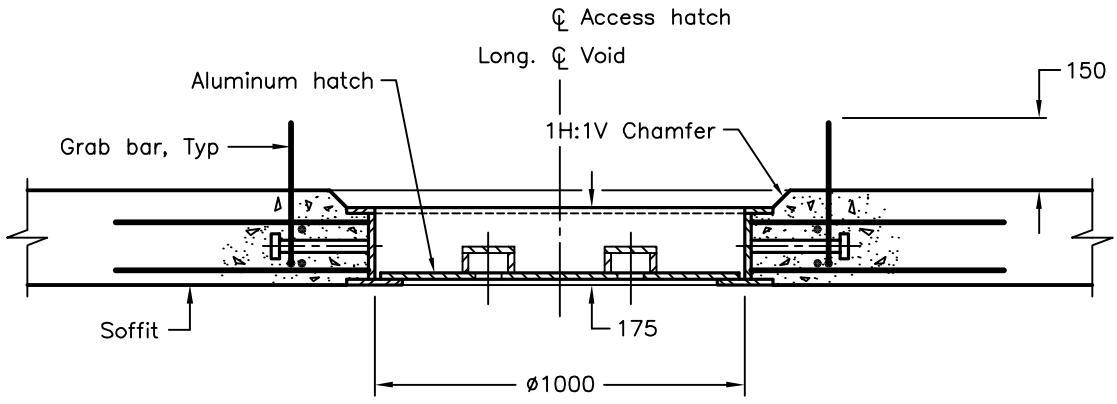
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 3339.100



PLAN

Aluminum hatch not shown



SECTION A–A

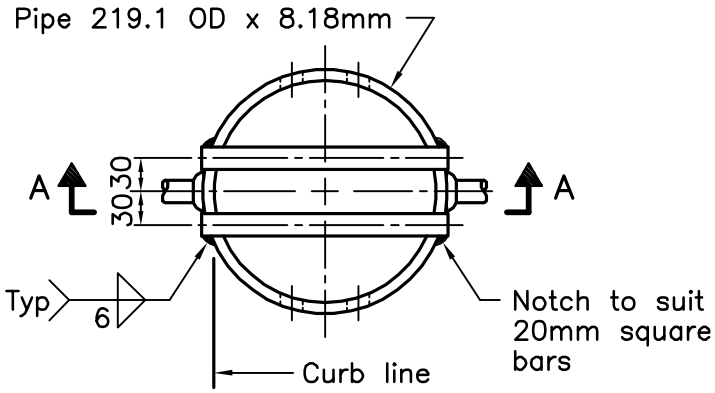
NOTES:

A This OPSD shall be read in conjunction with OPSD 3339.100.

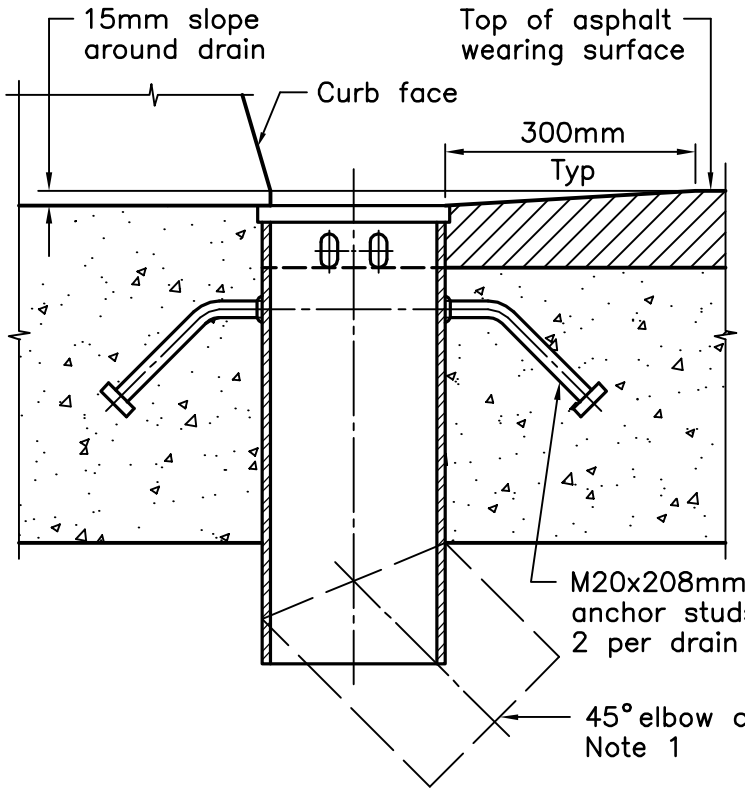
B Reinforcing steel shall be according to CSA G30.18, Grade 400W.

C All dimensions are in millimetres unless otherwise shown.

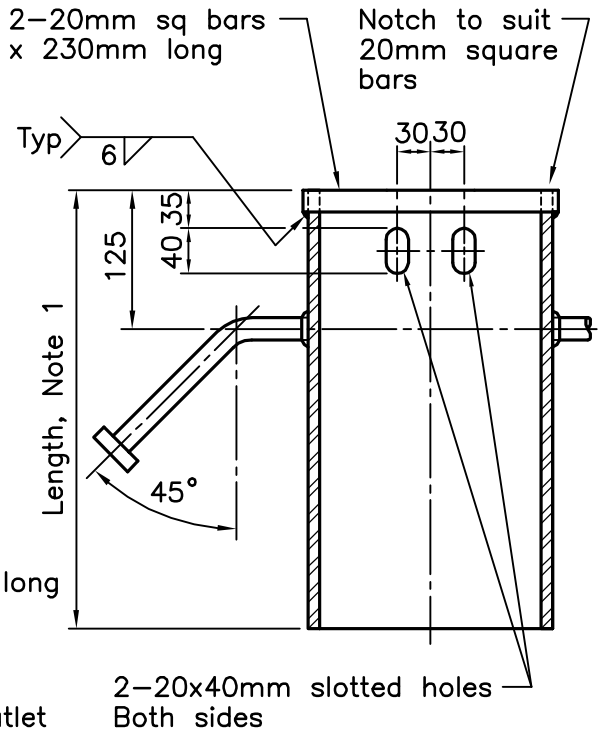
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2011	Rev	1
DECK, VOIDS ACCESS HATCH FOR CONCRETE BRIDGES INSTALLATION			
	OPSD 3339.101		



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.

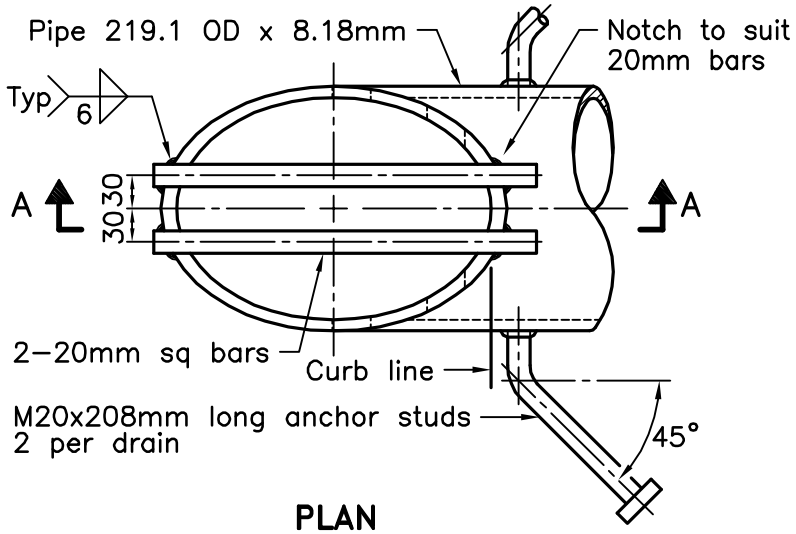
B Anchor studs shall be attached using fusion weld process.

C Pipe shall be according to ASTM A 53M, Grade B.

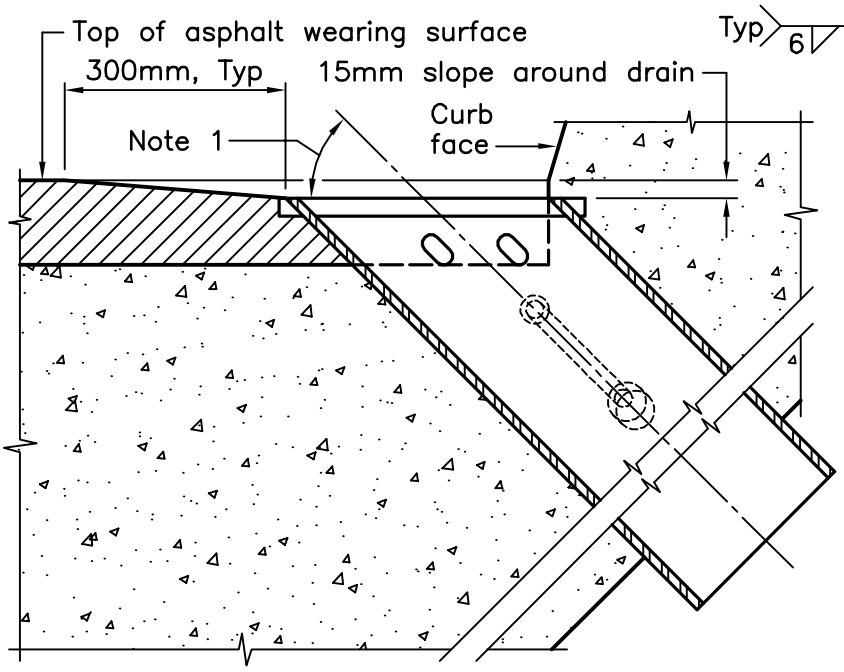
D All welding shall be of a low hydrogen classification and according to CSA W59.

E All dimensions are in millimetres unless otherwise shown.

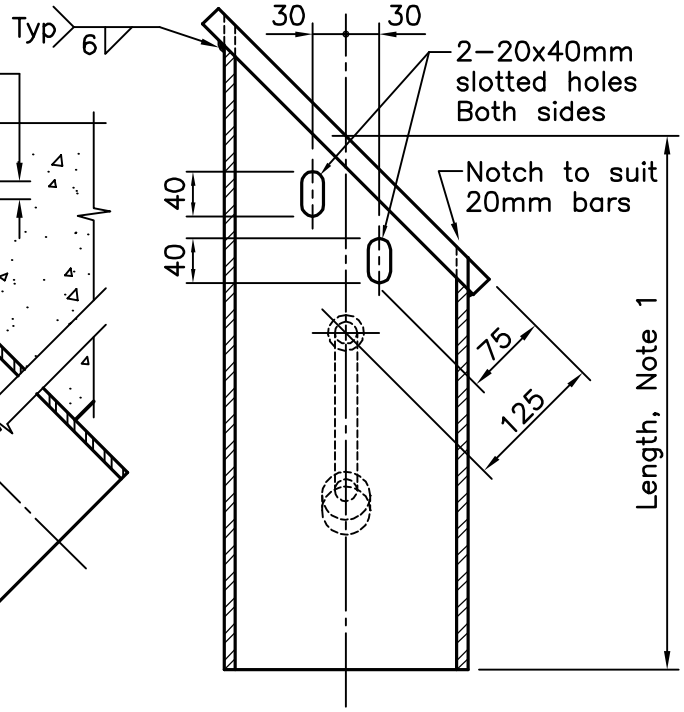
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	2
DECK DRAINS WITH DOWNSPOUT			
	OPSD 3340.100		



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.

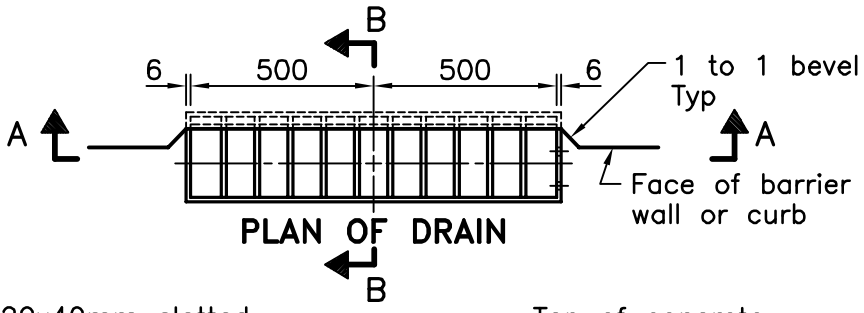
B Anchor studs shall be attached using fusion weld process.

C Pipe shall be according to ASTM A 53M, Grade B.

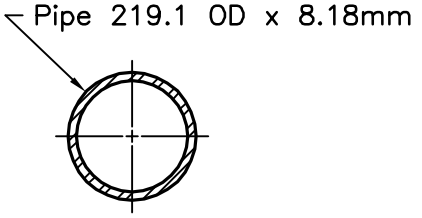
D All welding shall be of a low hydrogen classification and according to CSA W59.

E All dimensions are in millimetres unless otherwise shown.

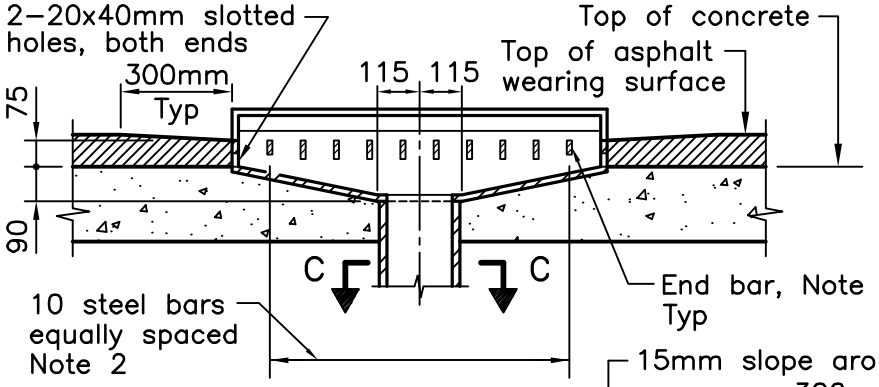
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	2
DECK DRAINS WITH SLOPED DOWNSPOUT			
	OPSD 3340.102		



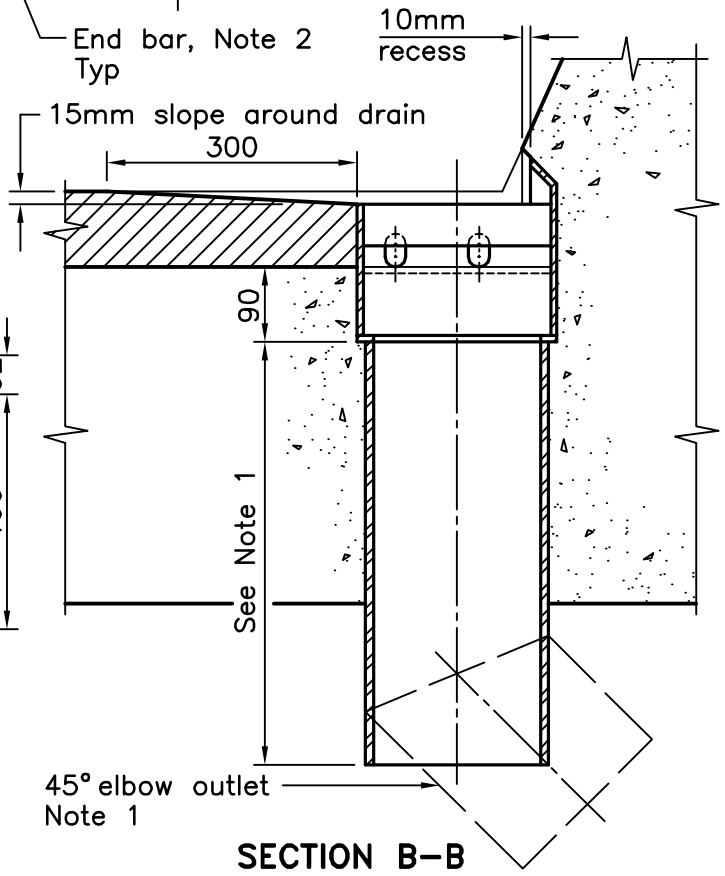
PLAN OF DRAIN



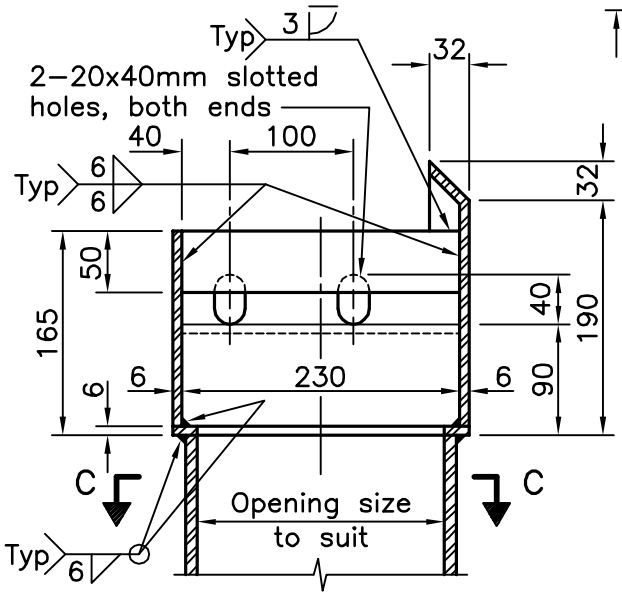
SECTION C–C



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.

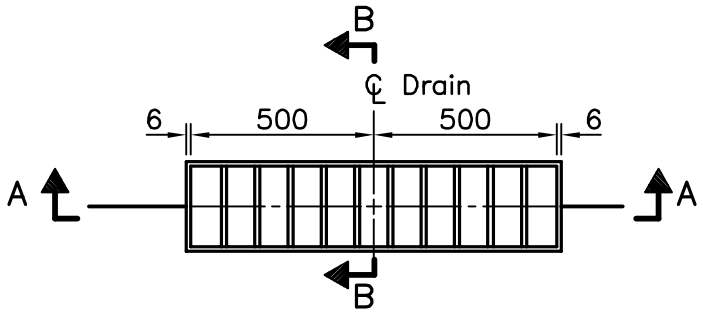
B Pipe shall be according to ASTM A 53M, Grade B.

C Steel bar shall be according to CSA G40.21, Grade 300W.

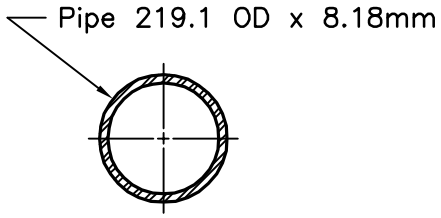
D All welding shall be of a low hydrogen classification and according to CSA W59.

E All dimensions are in millimetres unless otherwise shown.

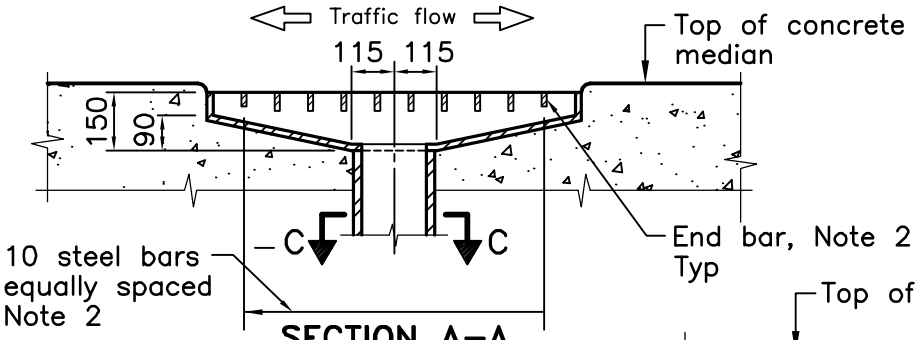
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
DECK DRAINS WITH TRANSVERSE BAR OPENINGS			
	OPSD 3340.150		



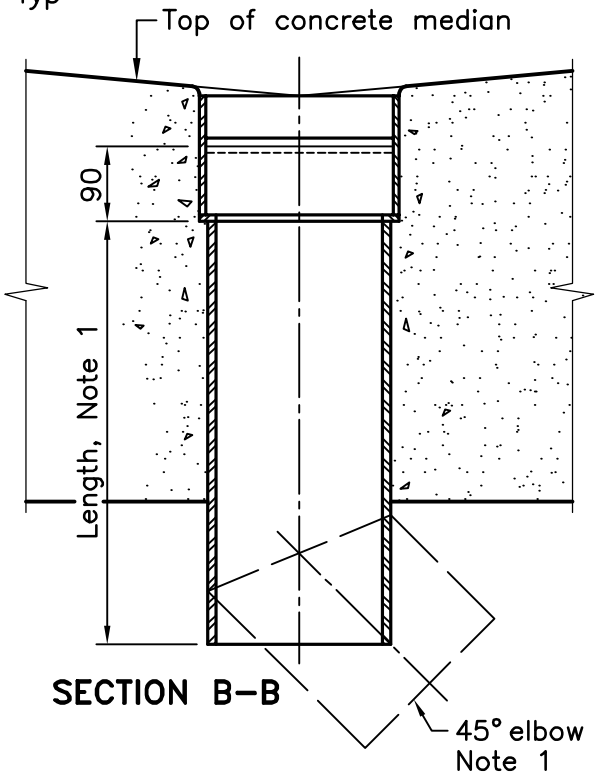
PLAN OF DRAIN



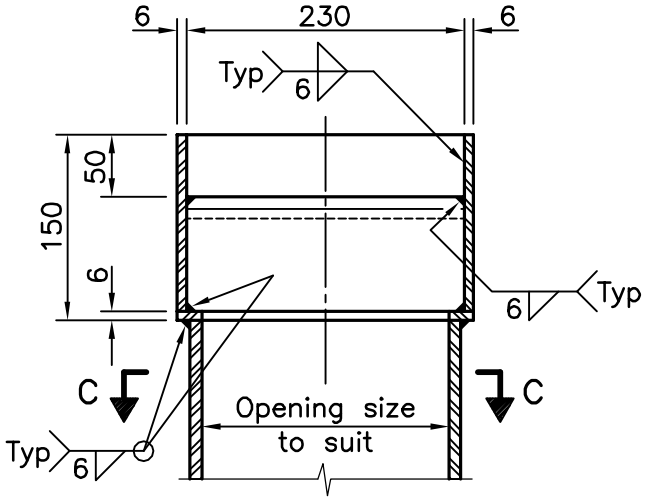
SECTION C–C



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.

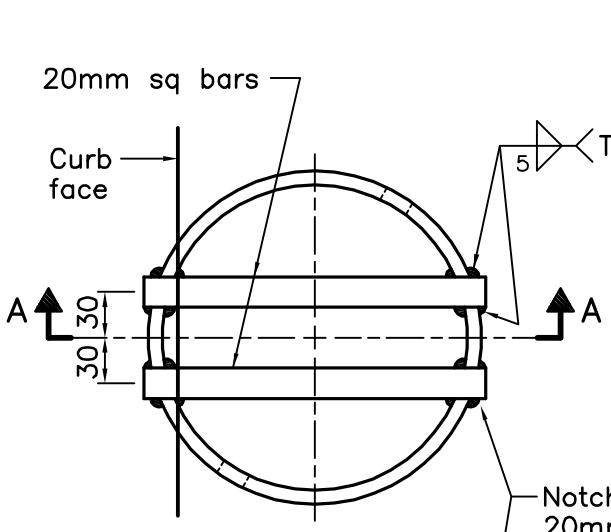
B Pipe shall be according to ASTM A 53M, Grade B.

C Steel bar shall be according to CSA G40.21, Grade 300W.

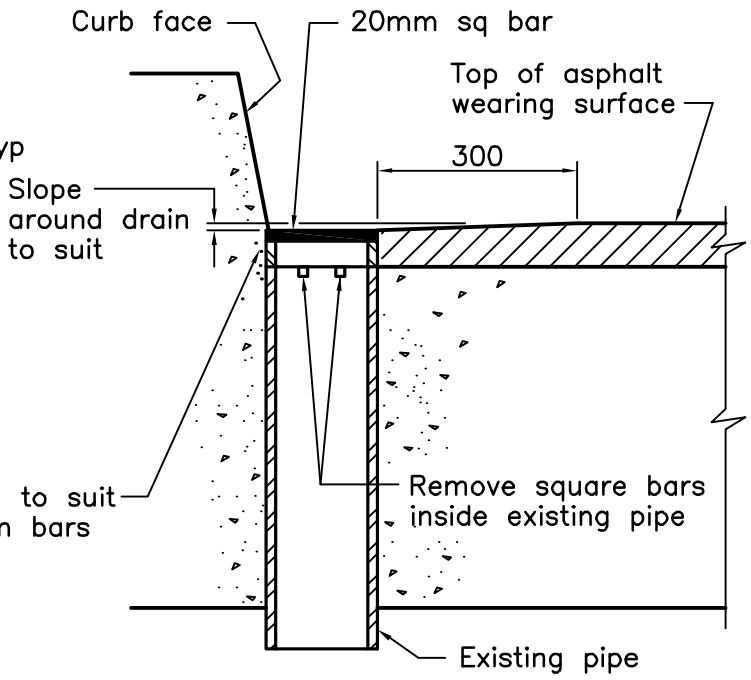
D All welding shall be of a low hydrogen classification and according to CSA W59.

E All dimensions are in millimetres unless otherwise shown.

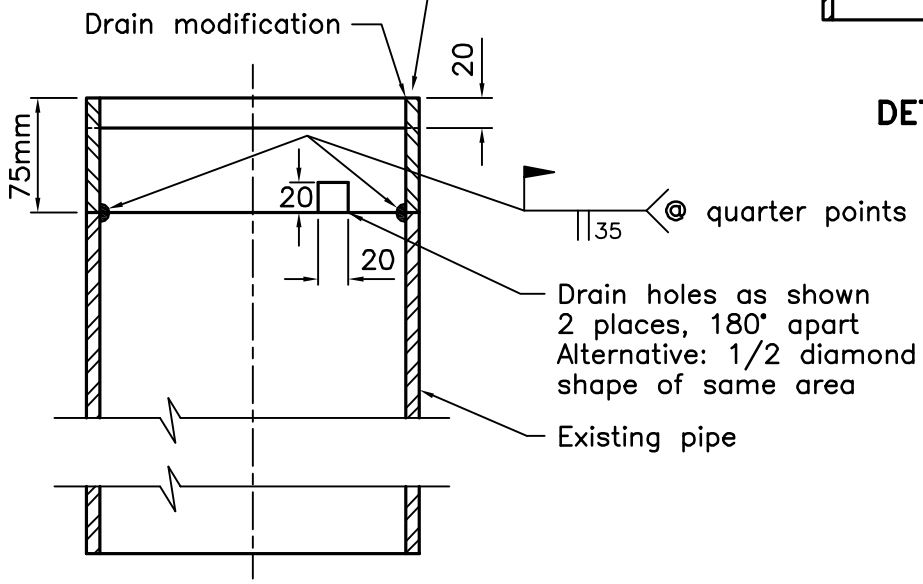
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
DECK DRAINS MEDIAN WITH TRANSVERSE BAR OPENINGS			
	OPSD 3340.153		



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.

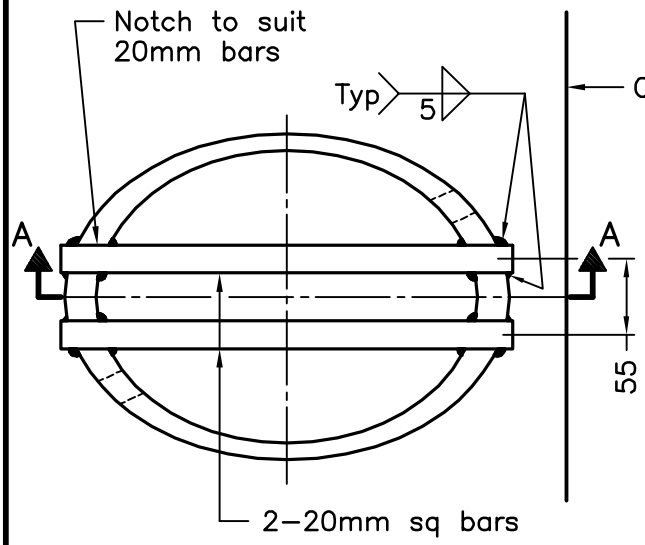
D Welding electrodes shall be of low hydrogen classification and according to CSA W59.

E After fabrication, modification assembly shall be hot–dip galvanized according to ASTM A 123.

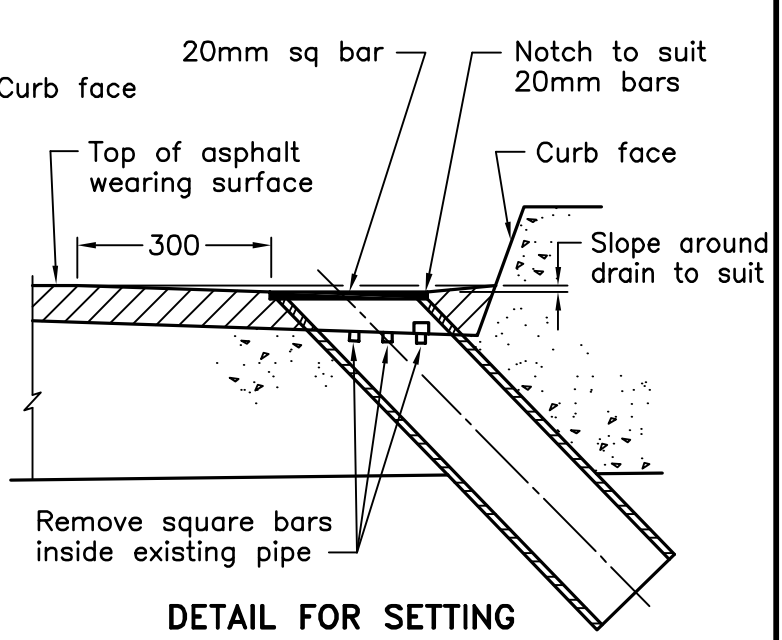
F Field welds shall be painted with an approved zinc rich paint.

G All dimensions are in millimetres unless otherwise shown.

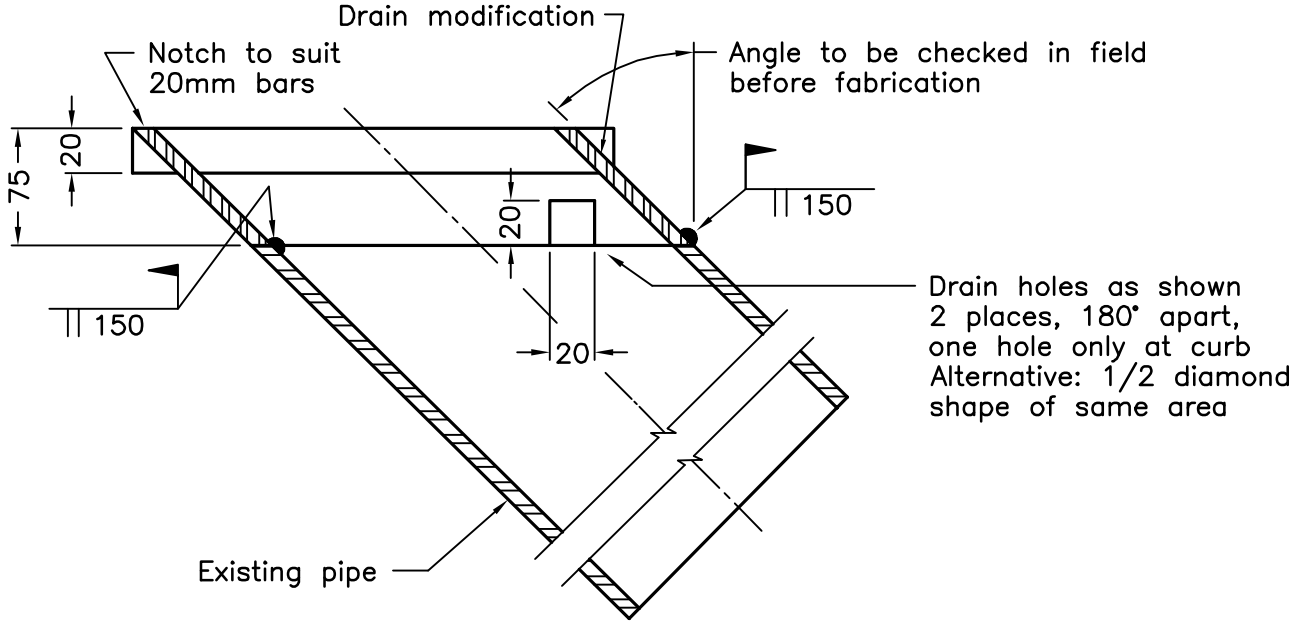
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
DECK DRAINS WITH DOWNSPOUT MODIFICATION FOR ADDITION OF ASPHALT TO EXISTING STRUCTURE			
	OPSD 3340.200		



PLAN OF DRAIN



DETAIL FOR SETTING

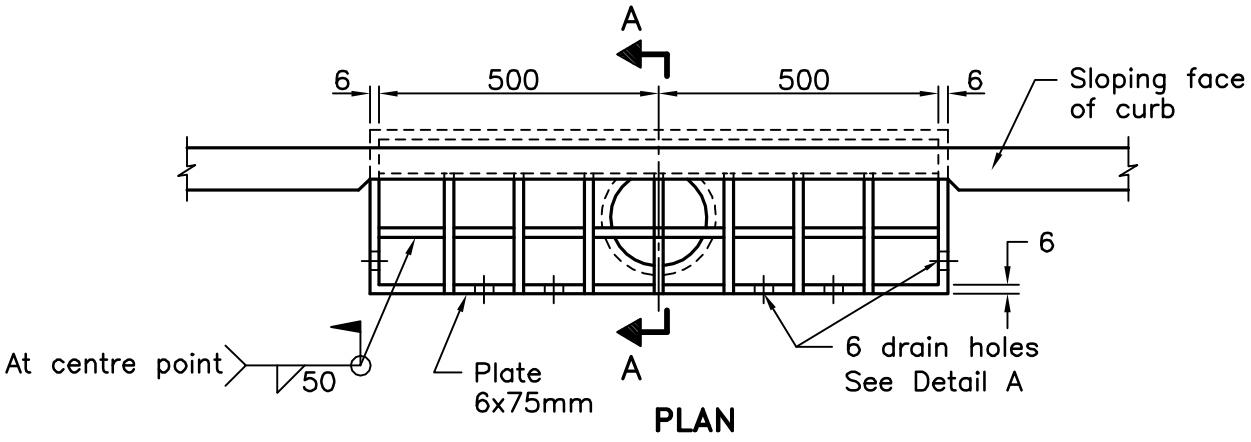


MODIFIED DRAIN
SECTION A–A

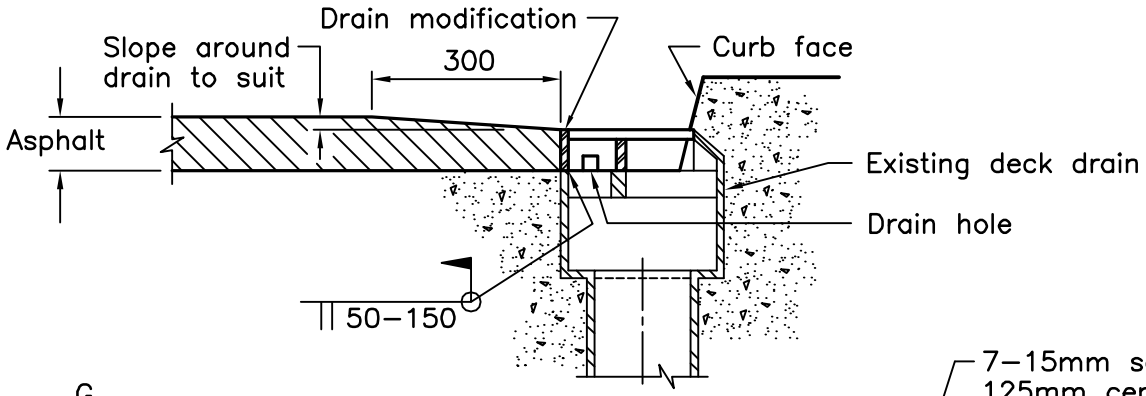
NOTES:

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.

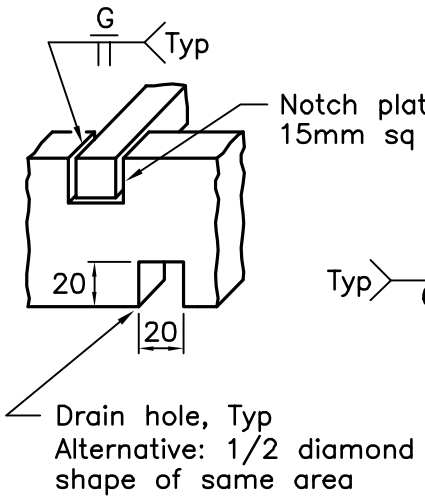
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
DECK DRAINS WITH SLOPED DOWNSPOUT MODIFICATION FOR ADDITION OF ASPHALT TO EXISTING STRUCTURE			
	OPSD 3340.201		



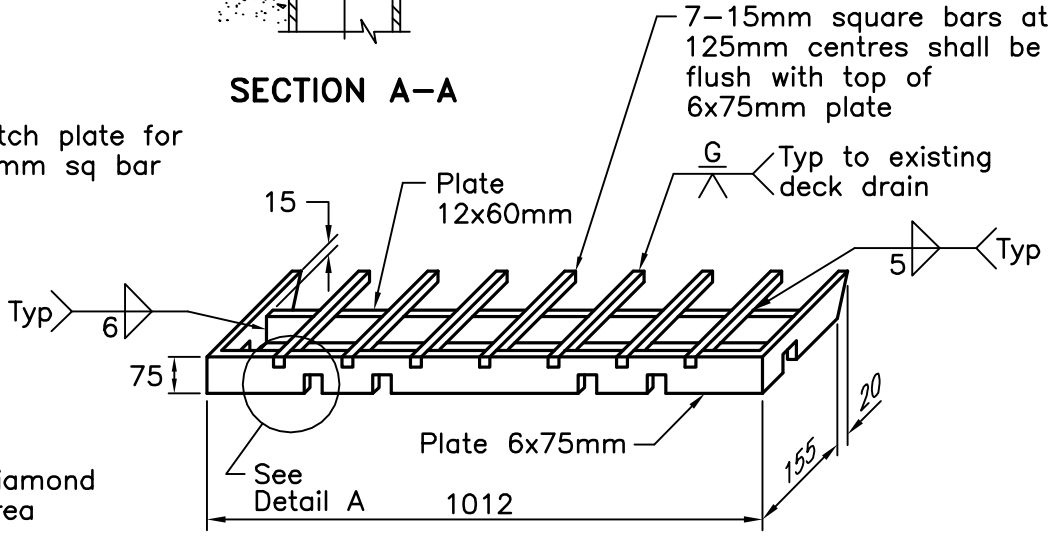
PLAN



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.

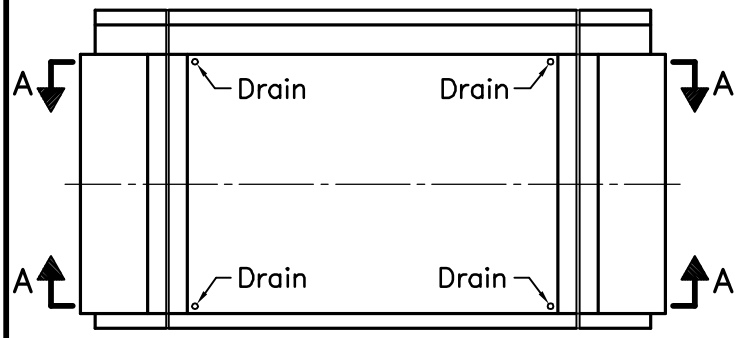
C Dimensions of steel extension shall match existing dimensions.

D Field welds shall be painted with an approved zinc rich paint.

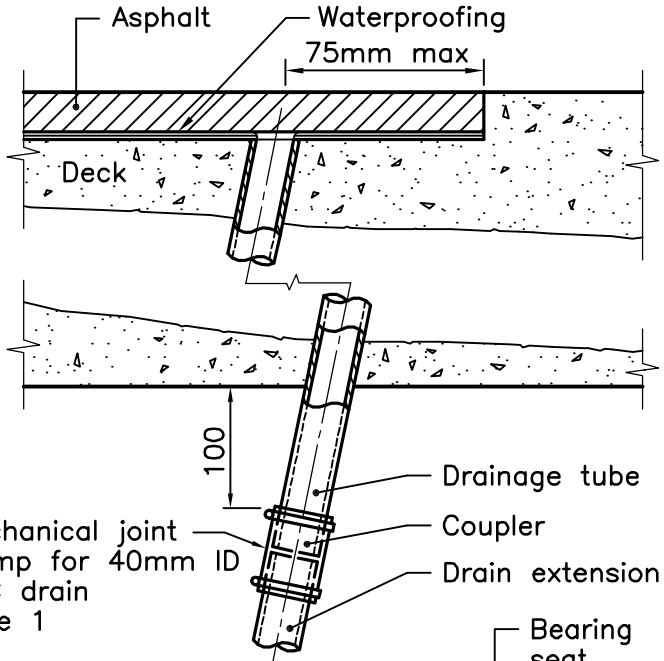
E All welding shall be of a low hydrogen classification and according to CSA W59.

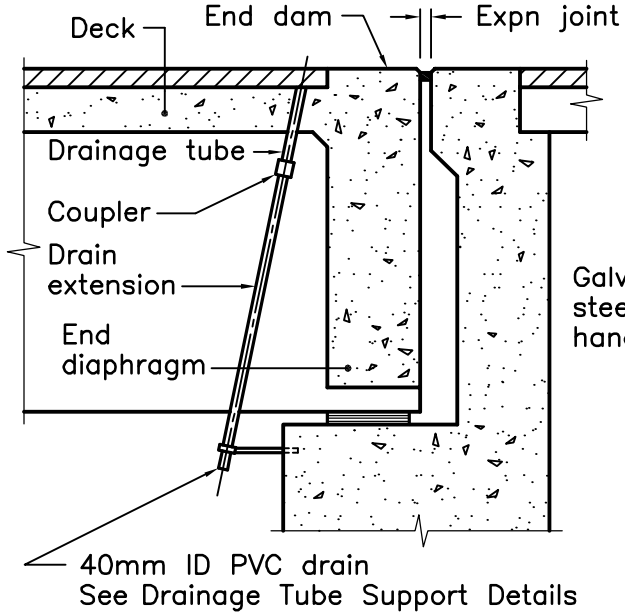
F All dimensions are in millimetres unless otherwise shown.

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		

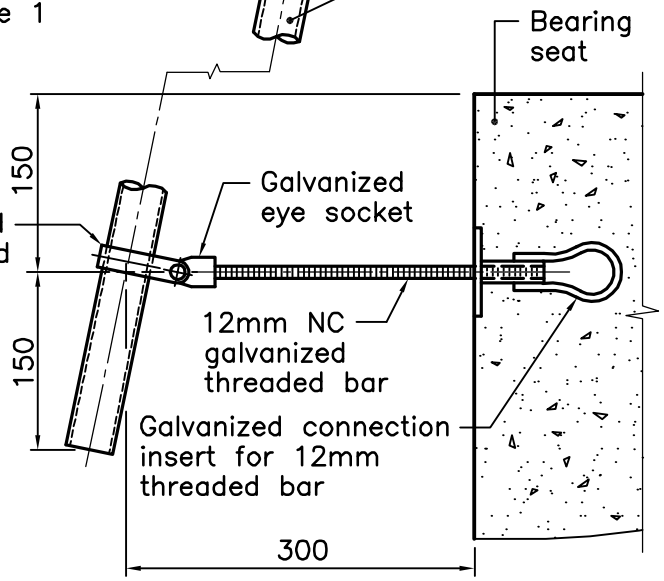


TOP DECK PLAN





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.

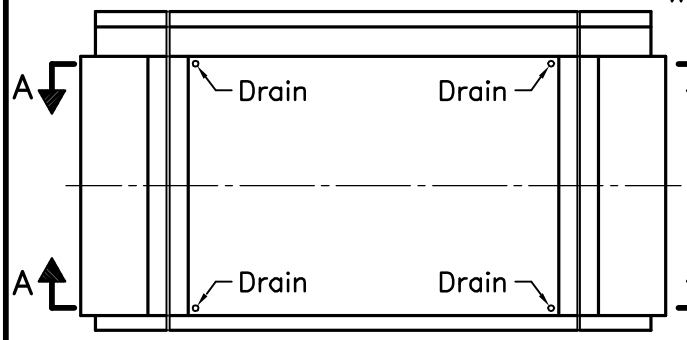
C No waterproofing compound shall be allowed to seal the drainage tubes. Drainage tubes shall be cleaned out prior to placing asphalt.

D Drain extension shall be securely fastened to substructure as shown.

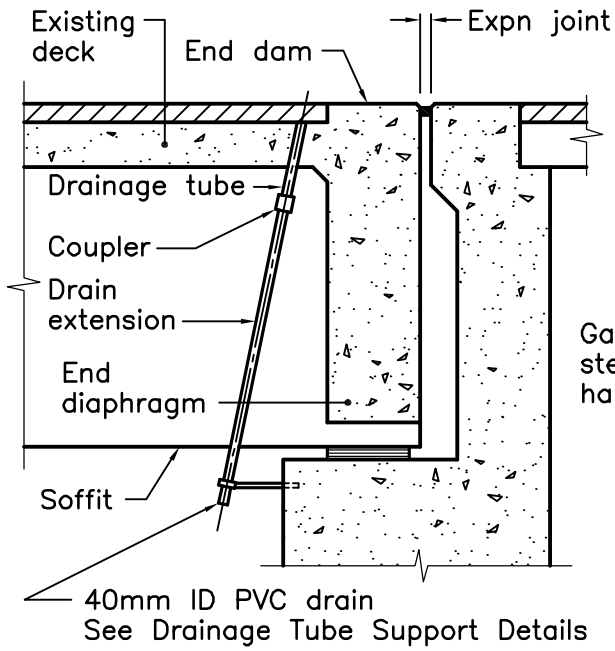
E Drainage tubes shall be straight and shall be positioned to avoid any interference with beams, end diaphragms, stressing cables, voids, and to prevent discharge onto bearing seats of piers or abutments.

F All dimensions are in millimetres unless otherwise shown.

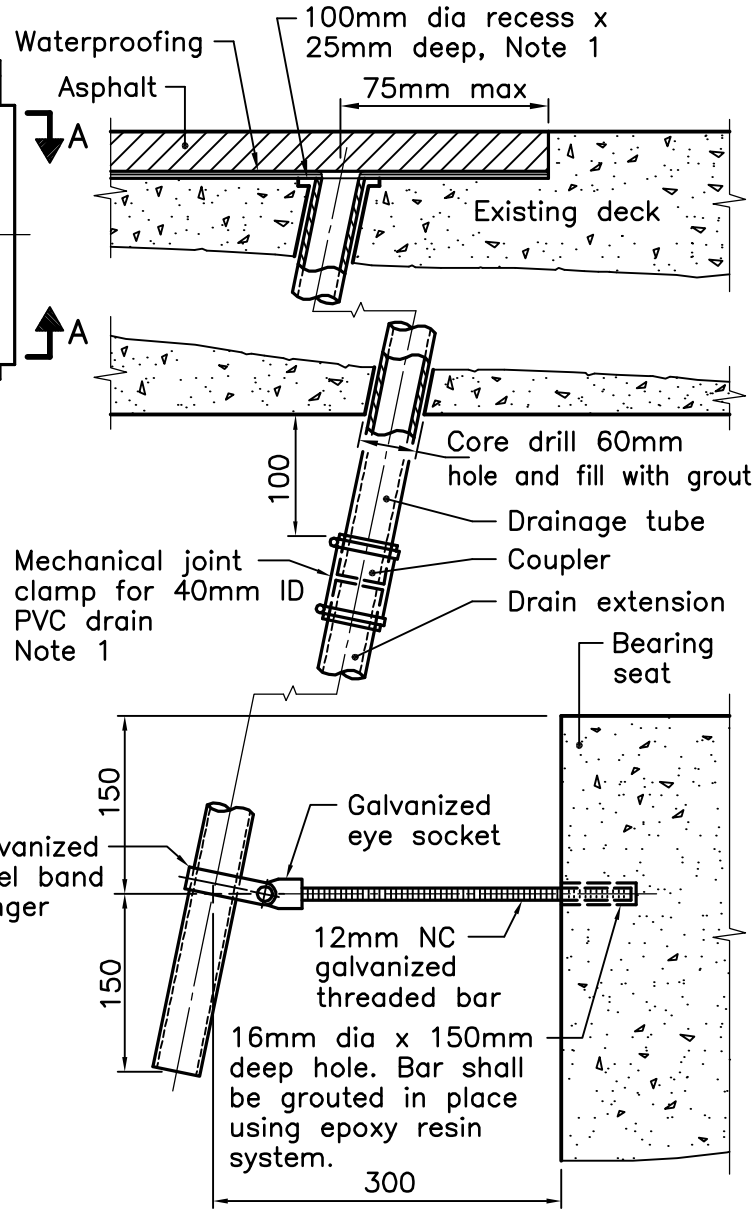
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
DECK, DRAINS DRAINAGE OF NEW DECK BELOW ASPHALT WEARING SURFACE			
	OPSD 3349.100		



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.

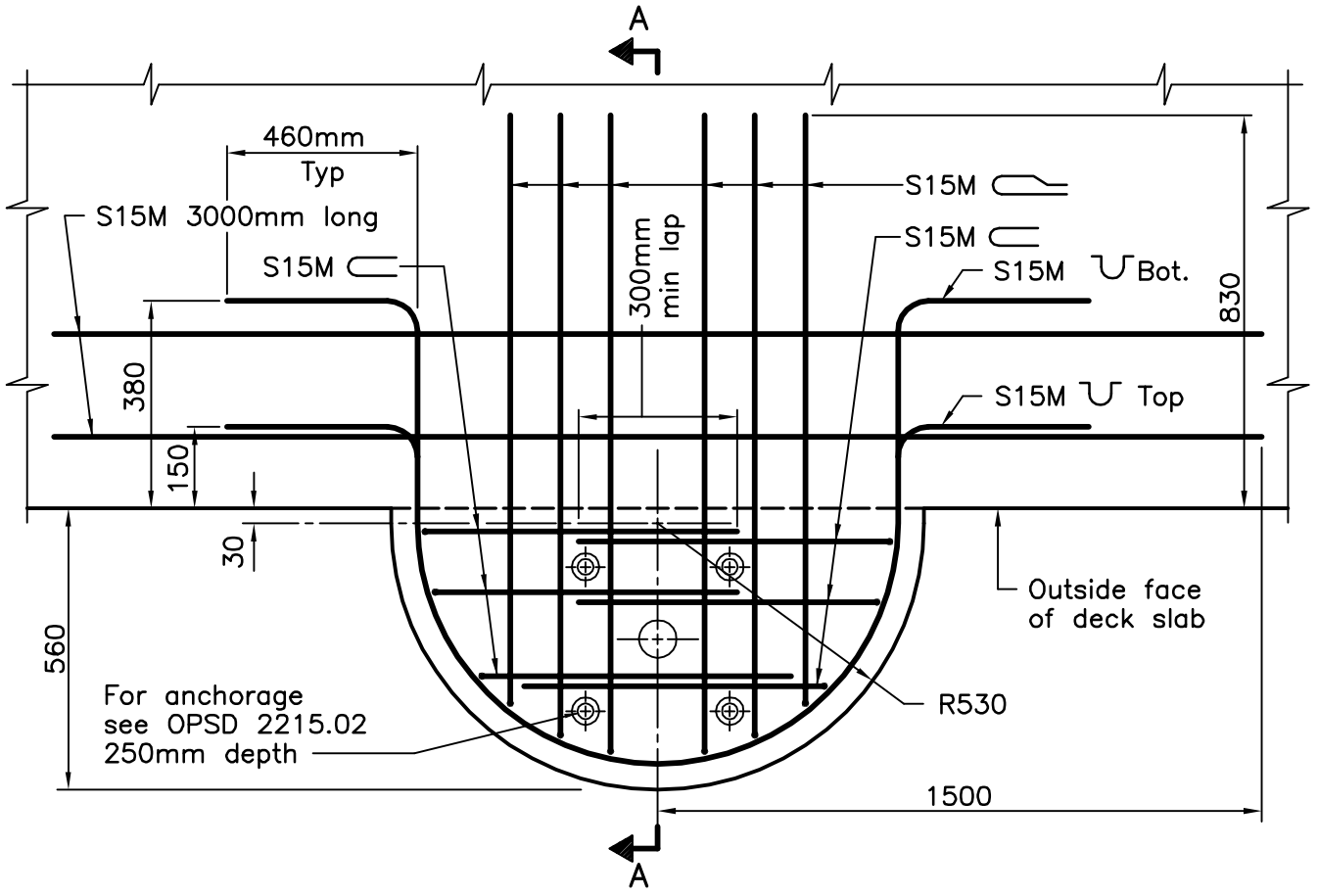
C No waterproofing compound shall be allowed to seal the drainage tubes. Drainage tubes shall be cleaned out prior to placing asphalt.

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.

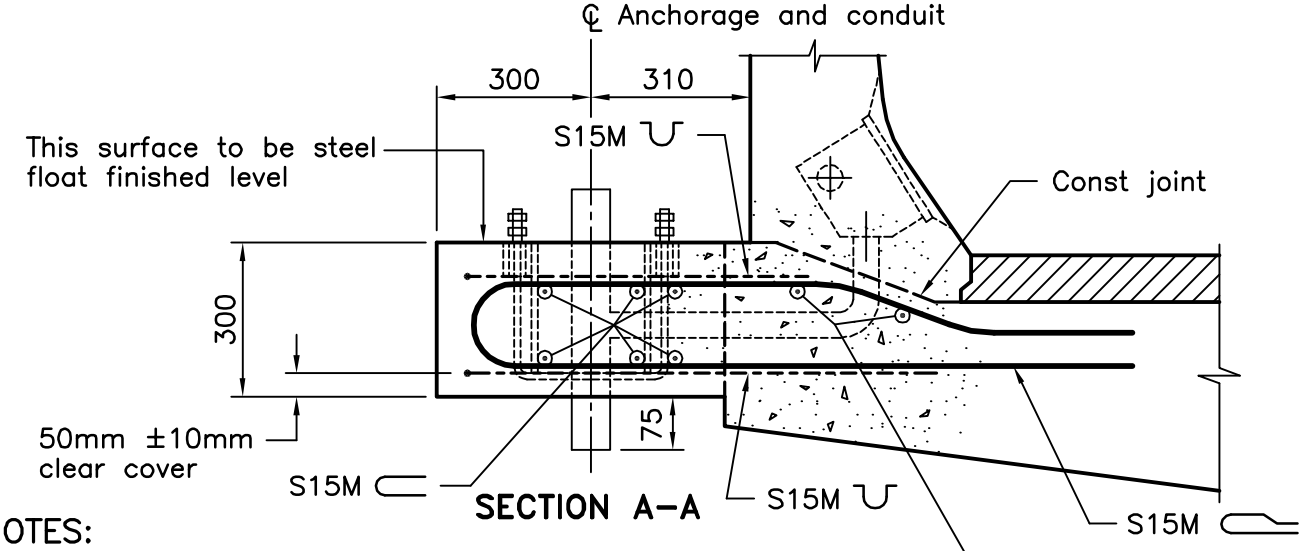
F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
DECK, DRAINS DRAINAGE OF EXISTING DECK BELOW ASPHALT WEARING SURFACE			
	OPSD 3349.101		



PLAN

Barrier wall not shown



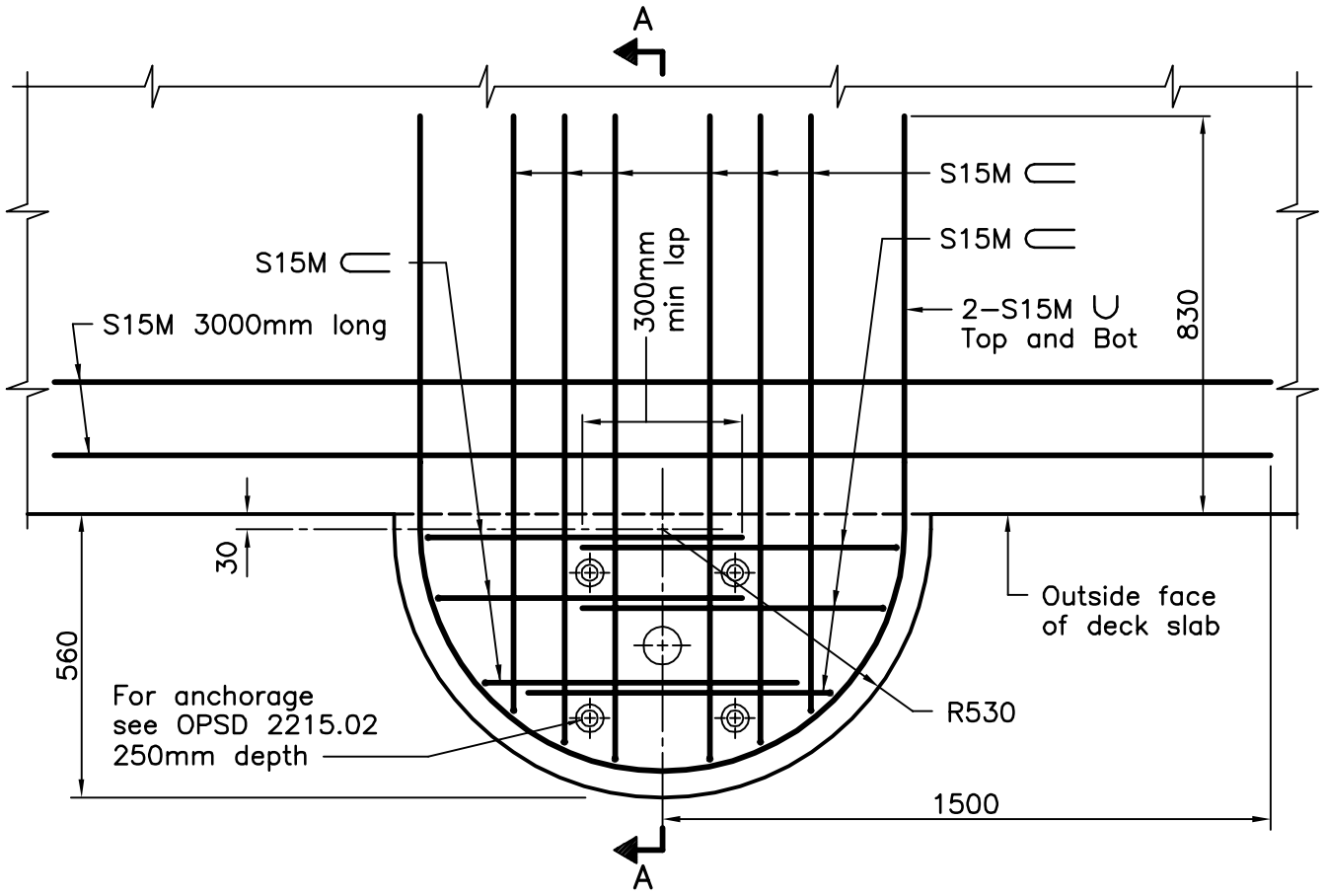
SECTION A–A

NOTES:

A Reinforcing steel for deck and barrier wall not shown.
B Cover to reinforcing steel 70mm ±20mm, except as noted.
C Stainless steel bars shall be Type 316LN or Duplex 2205 with a minimum yield strength of 500 MPa.
D Read in conjunction with bridge electrical details.
E Anchorage based on 4–32mm dia studs on 406mm bolt circle diameter.
F All dimensions are in millimetres unless otherwise shown.

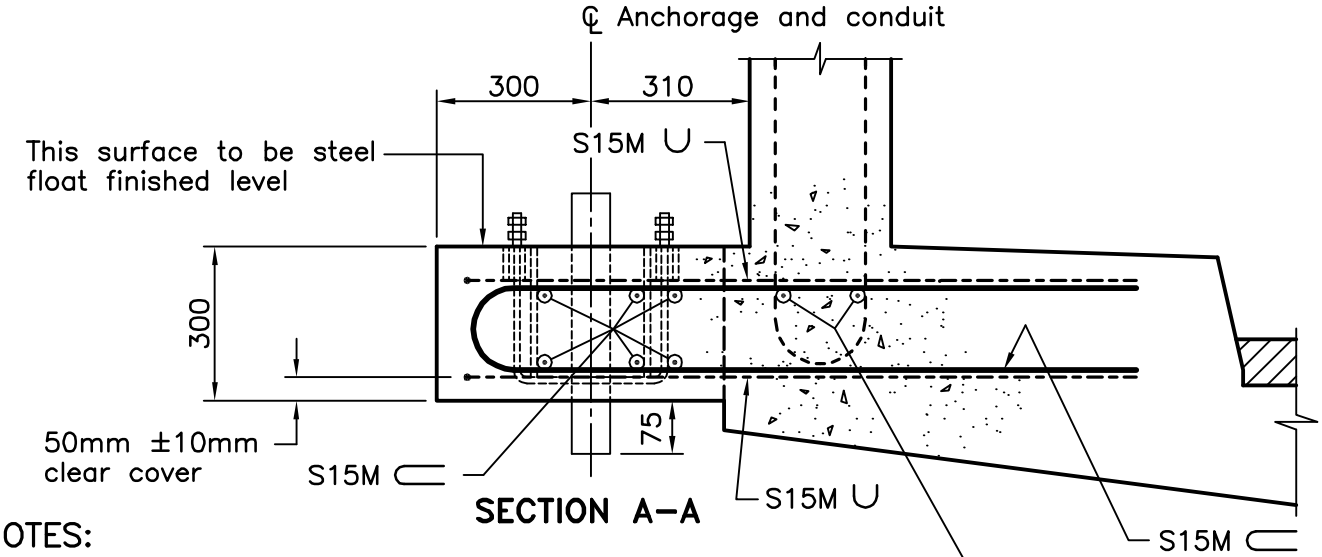
ONTARIO PROVINCIAL STANDARD DRAWING	Apr 2016	Rev	2
DECK LIGHT POLE BASES STRUCTURES WITH BARRIER WALLS			

OPSD 3360.100



PLAN

Parapet wall not shown



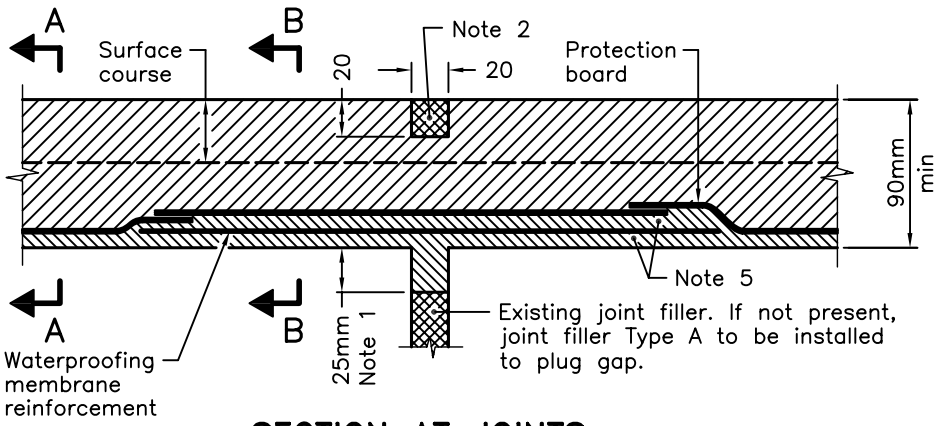
SECTION A–A

NOTES:

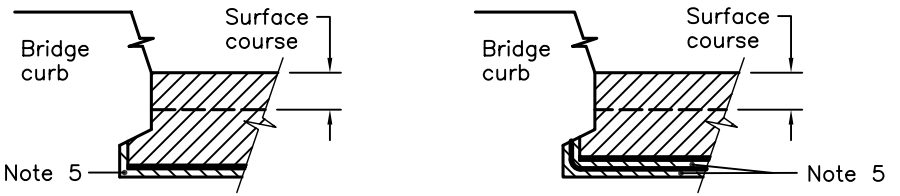
A Reinforcing steel for deck and barrier wall not shown.
B Cover to reinforcing steel 70mm ±20mm, except as noted.
C Stainless steel bars shall be Type 316LN or Duplex 2205 with a minimum yield strength of 500 MPa.
D Read in conjunction with bridge electrical details.
E Anchorage based on 4–32mm dia studs on 406mm bolt circle diameter.
F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Apr 2016	Rev	2
DECK LIGHT POLE BASES STRUCTURES WITH PARAPET WALLS			

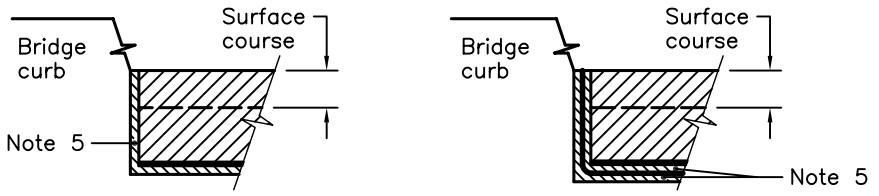
OPSD 3360.200



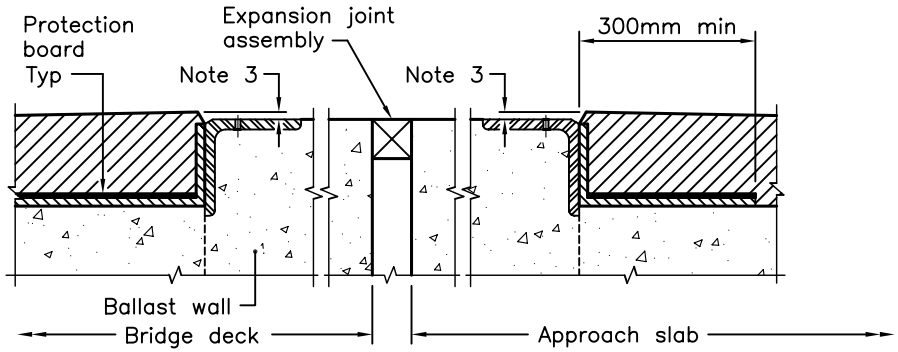
SECTION AT JOINTS EXCEPT AT EXPANSION JOINT ASSEMBLIES



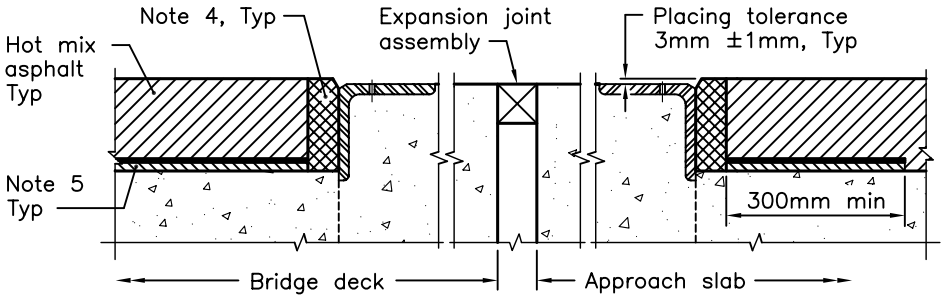
SECTIONS WITH CHASE



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.

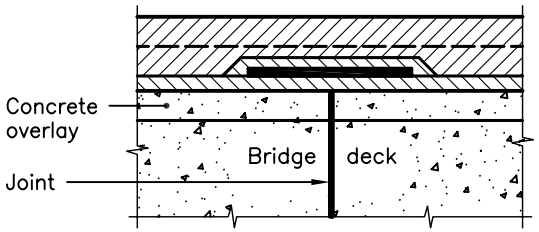
A Joint filler Type A as specified.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

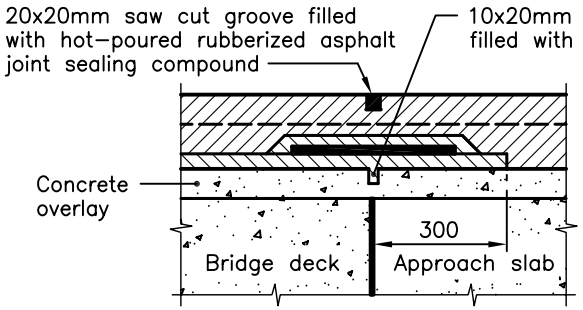
DECK, WATERPROOFING HOT APPLIED ASPHALT MEMBRANE WITH PROTECTION BOARD

Nov 2008 | Rev 2

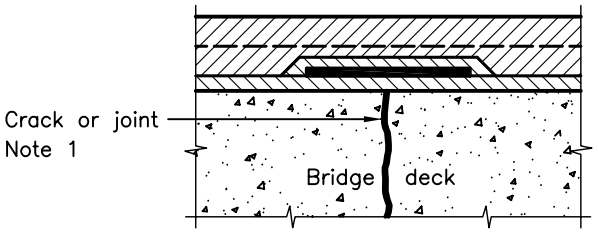
OPSD 3370.100



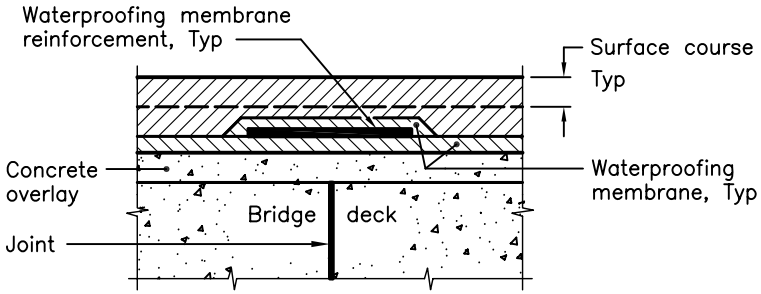
JOINT IN CONCRETE OVERLAY
DIRECTLY ABOVE JOINT
IN BRIDGE DECK



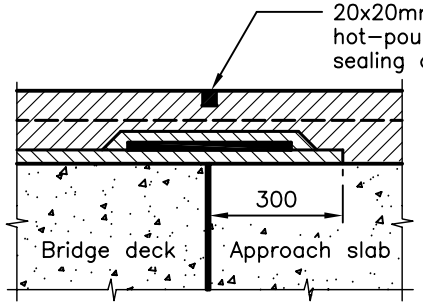
JOINT BETWEEN BRIDGE DECK
AND APPROACH SLAB
WITH CONCRETE OVERLAY



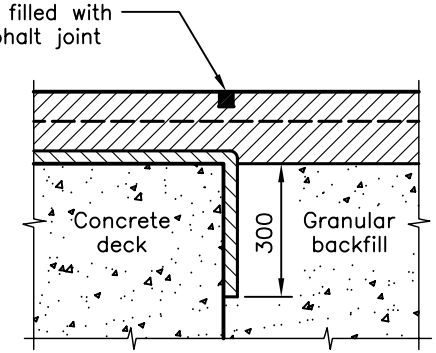
JOINT OR ACTIVE WIDE CRACK
IN BRIDGE DECK



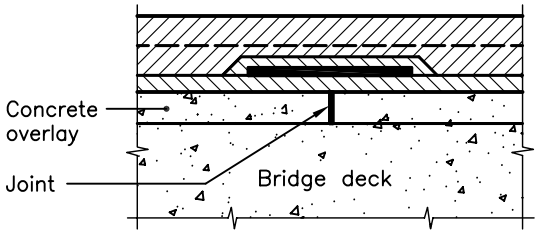
NO JOINT IN CONCRETE OVERLAY
JOINT IN BRIDGE DECK



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:

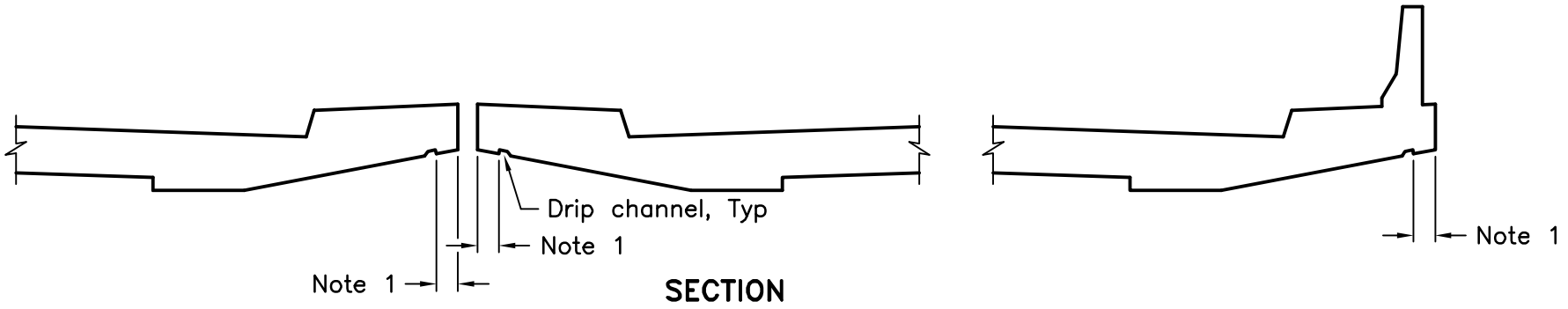
1 Cracks in concrete to be repaired as specified.

A This OPSD is to be read in conjunction with OPSD 3370.100.

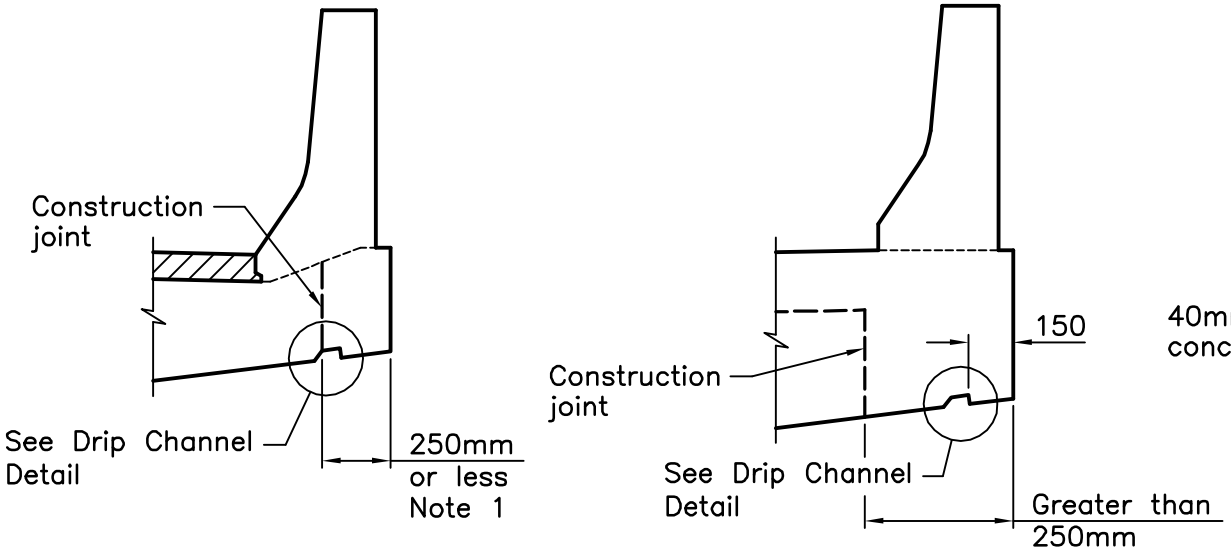
B Protection board is not shown for clarity.

C All dimensions are in millimetres unless otherwise shown.

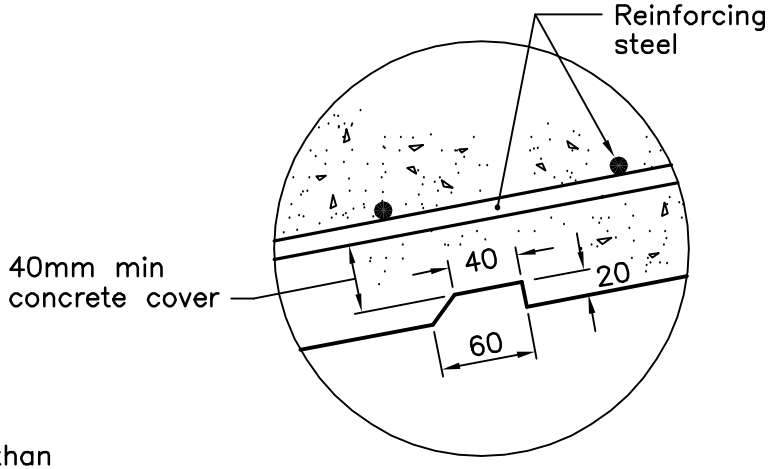
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2008	Rev 2
DECK, WATERPROOFING HOT APPLIED ASPHALT MEMBRANE AT ACTIVE CRACKS GREATER THAN 2mm WIDE AND CONSTRUCTION JOINTS		
		OPSD 3370.101



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.

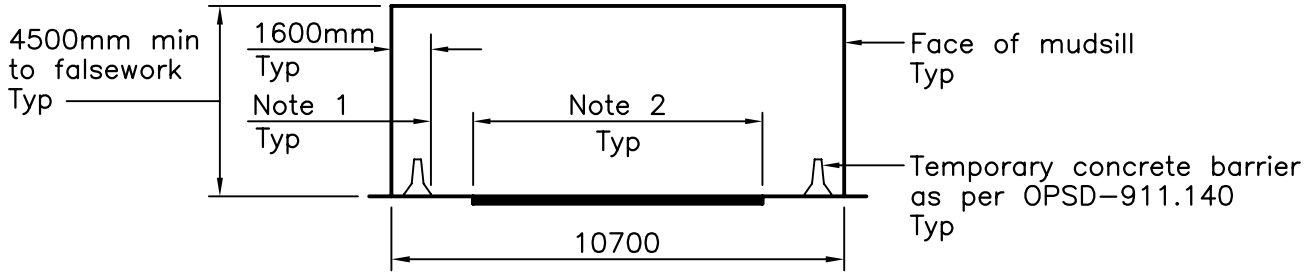
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 | Rev 2

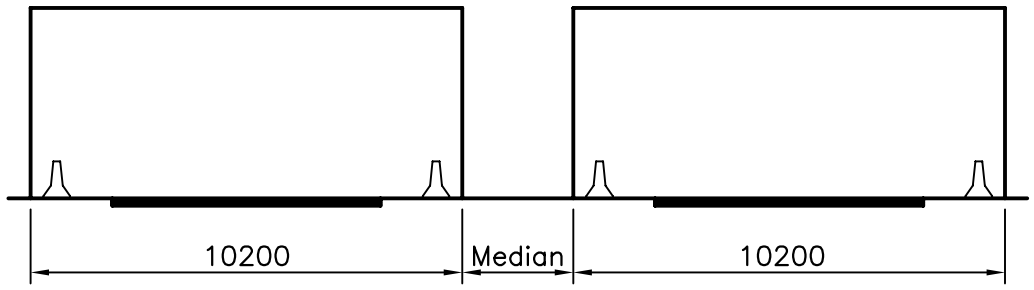
DECK

DRIP CHANNEL

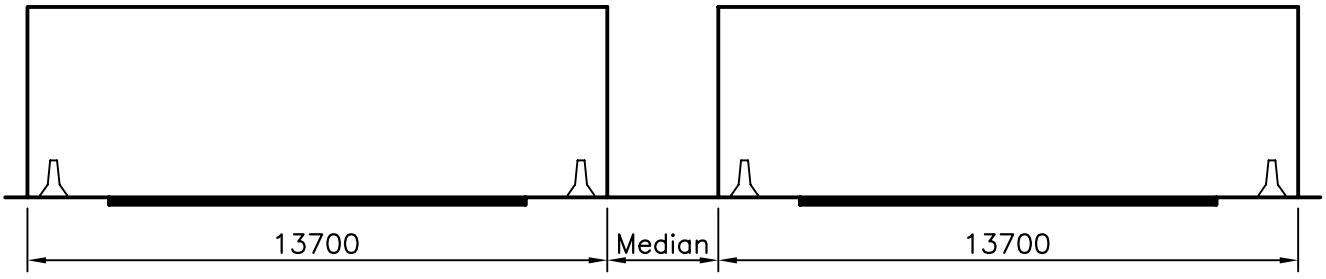
OPSD 3390.100



2 LANE FACILITY
1 LANE IN EACH DIRECTION



4 LANE FACILITY
2 LANES IN EACH DIRECTION



6 LANE FACILITY
3 LANES IN EACH DIRECTION

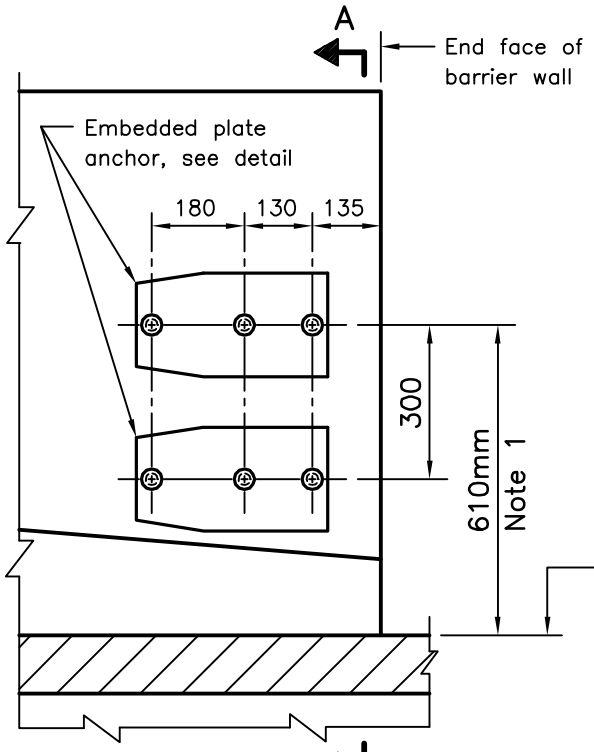
NOTES:

1 Shoulder width shall be as specified.

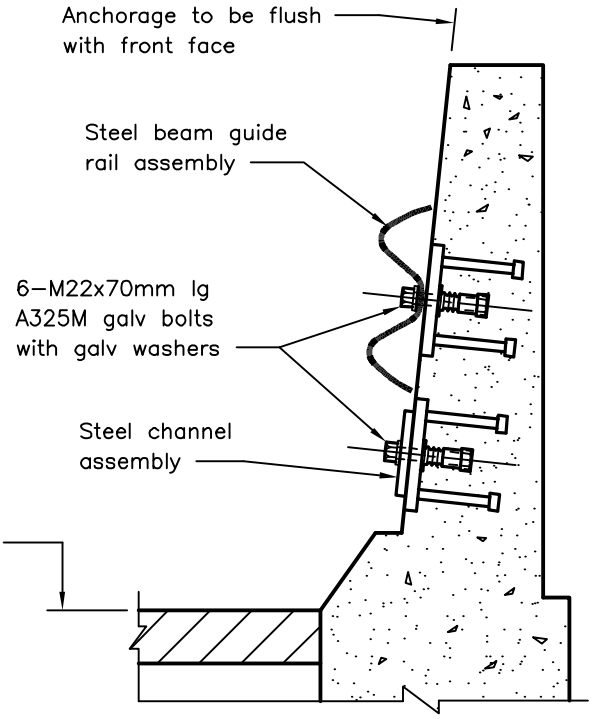
2 Lane widths shall be as specified.

A All dimensions are in millimetres unless otherwise shown.

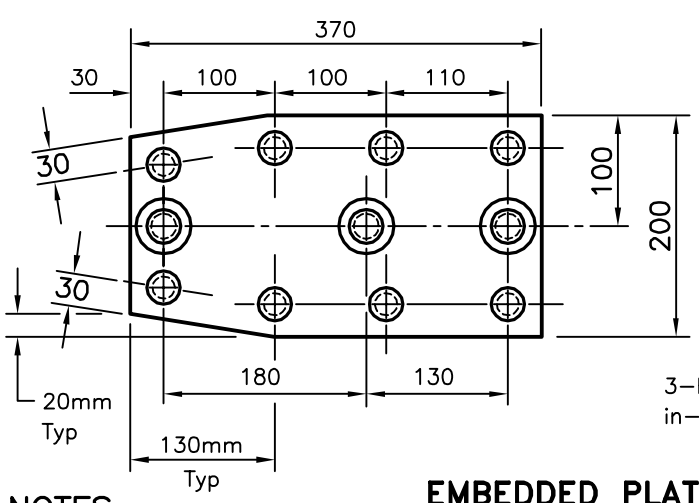
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2005	Rev	0
FALSEWORK CLEARANCE TO TRAFFIC LANES			
	OPSD – 3390.150		

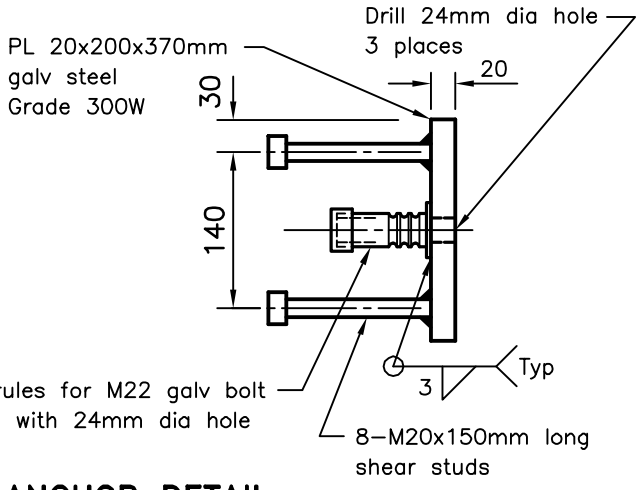


ELEVATION



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.

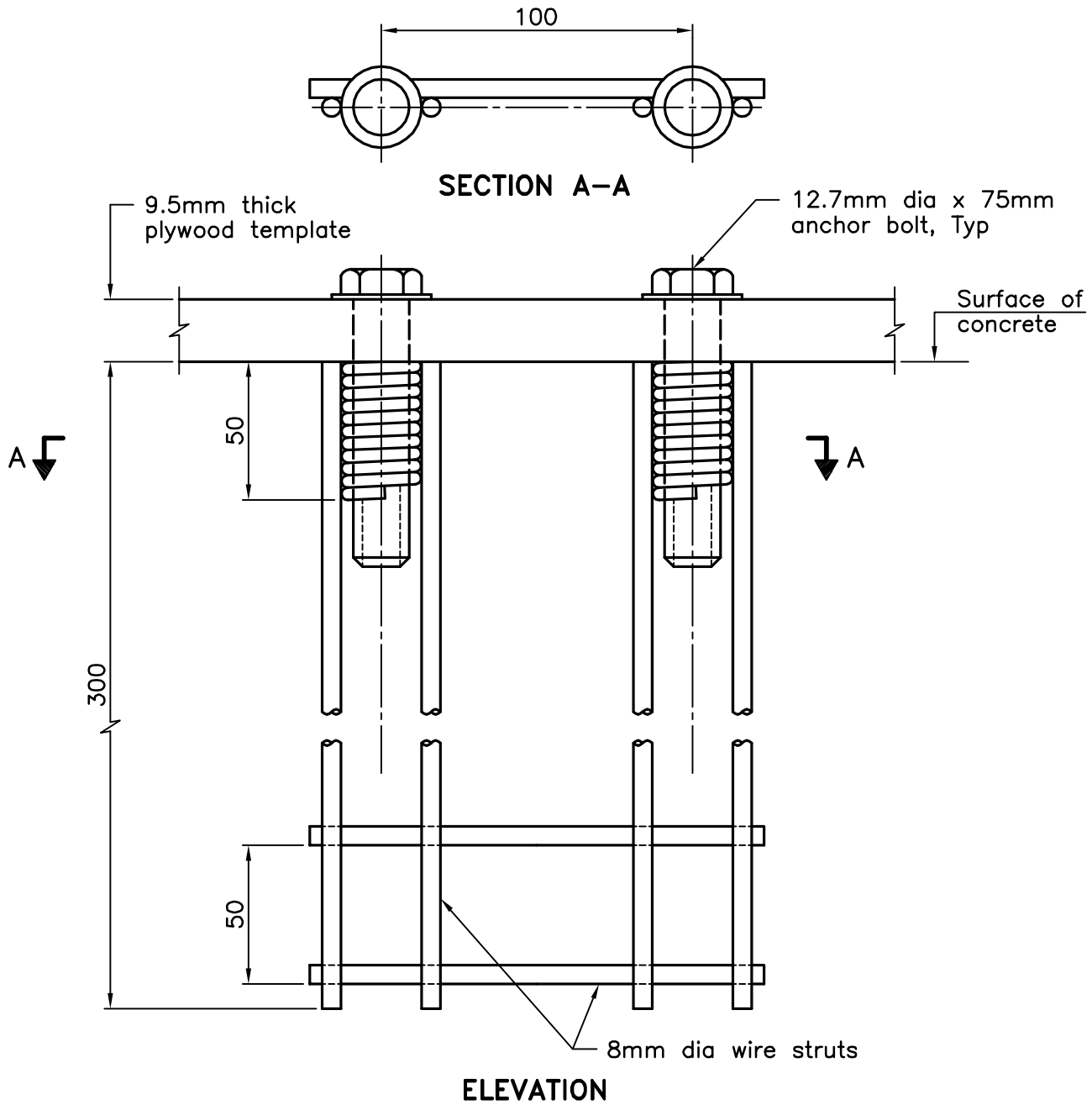
D Welding shall be of a low hydrogen classification according to CSA W59 with E480xx electrodes.

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 STEEL BEAM 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.

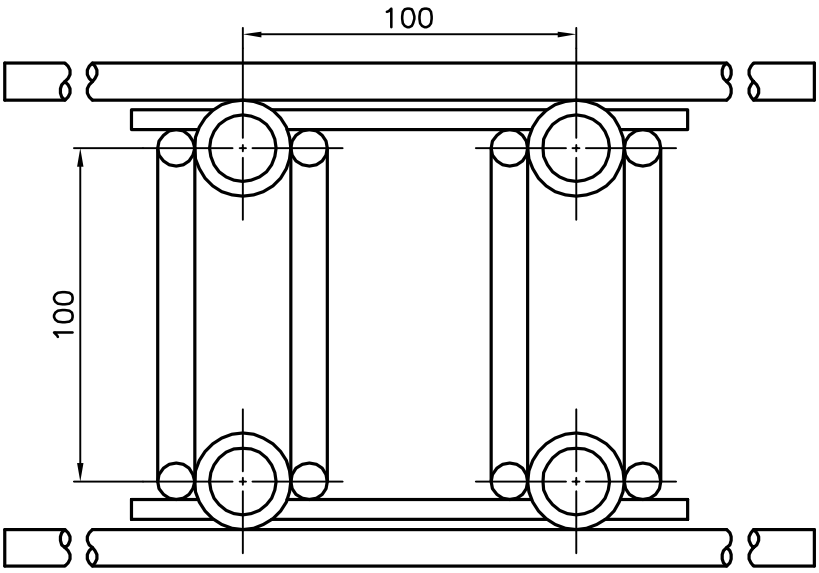
D The complete anchorage assembly including bolts, nuts, and washers shall be hot dip galvanized according to CAN/CSA G164M.

E Bolts shall be given a liberal coating of white non–staining grease.

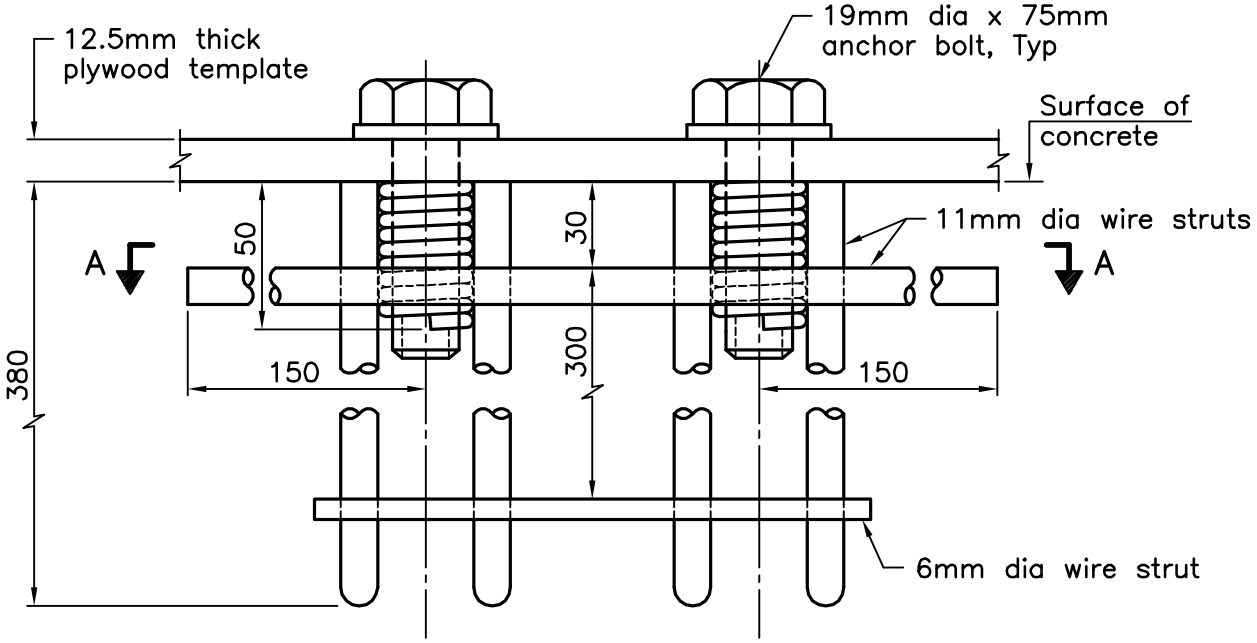
F A plywood setting template shall be provided for accurate positioning of anchorage within the concrete form.

G All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
BARRIERS AND RAILINGS STEEL 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.

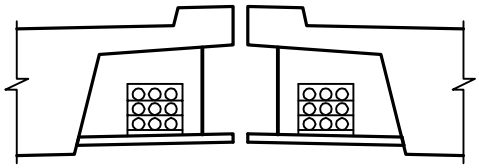
D The complete anchorage assembly including bolts, nuts, and washers shall be hot dip galvanized according to CAN/CSA G164M.

E Bolts shall be given a liberal coating of white non–staining grease.

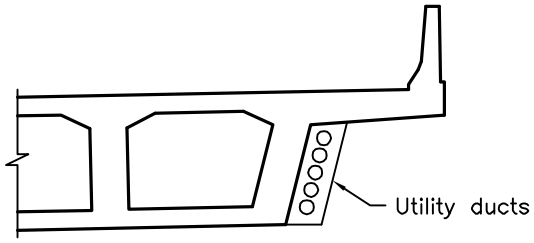
F A plywood setting template shall be provided for accurate positioning of anchorage within the concrete form.

G All dimensions are in millimetres unless otherwise shown.

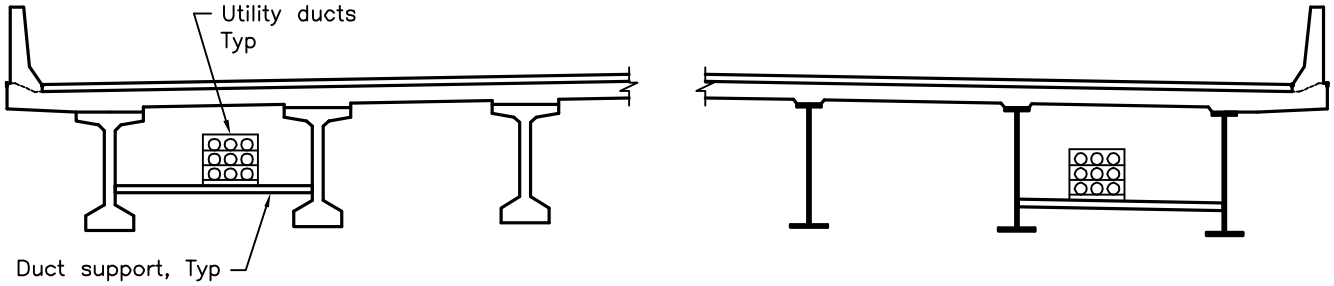
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	1
BARRIERS AND RAILINGS STEEL DOUBLE RAILING ANCHORAGE			
	OPSD 3419.155		



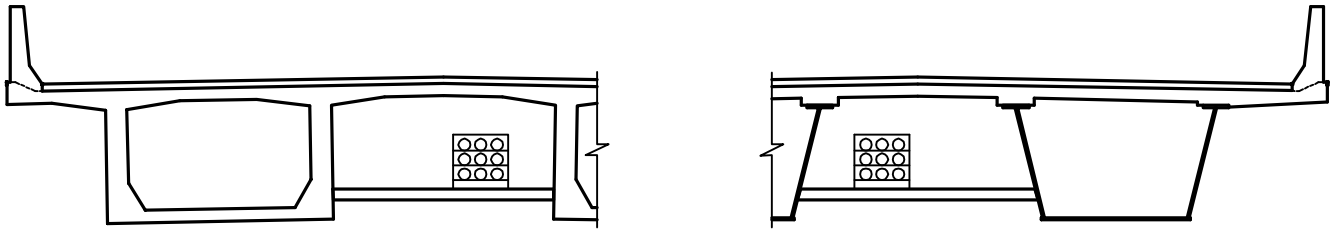
TWINNED CONCRETE VOIDED
POST–TENSIONED DECKS



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.

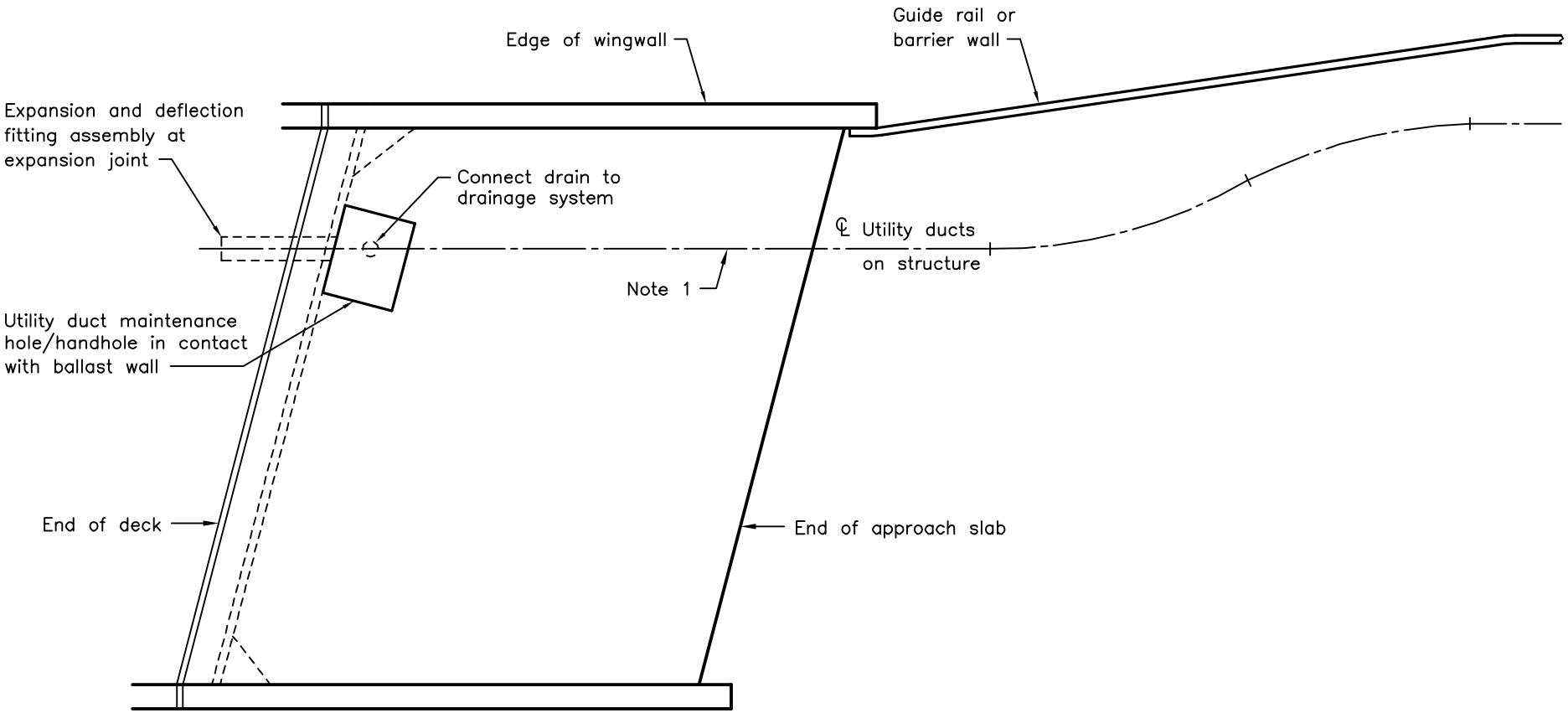
D Utility shall supply ducts, wobble joints, plastic caps, pull rope, duct seal, and epoxy impregnated tape, unless otherwise specified.

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 DUCT LOCATION			

OPSD 3900.100



PLAN

NOTE:
1 Duct layout shall be as specified.

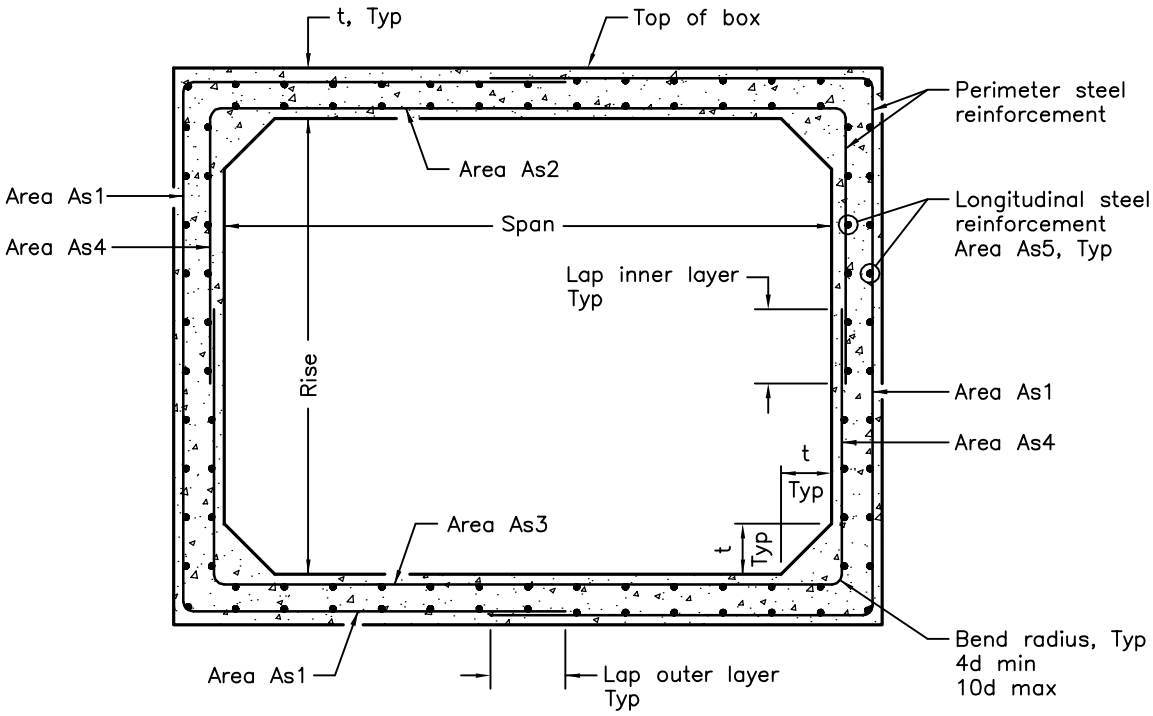
ONTARIO PROVINCIAL STANDARD DRAWING

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.

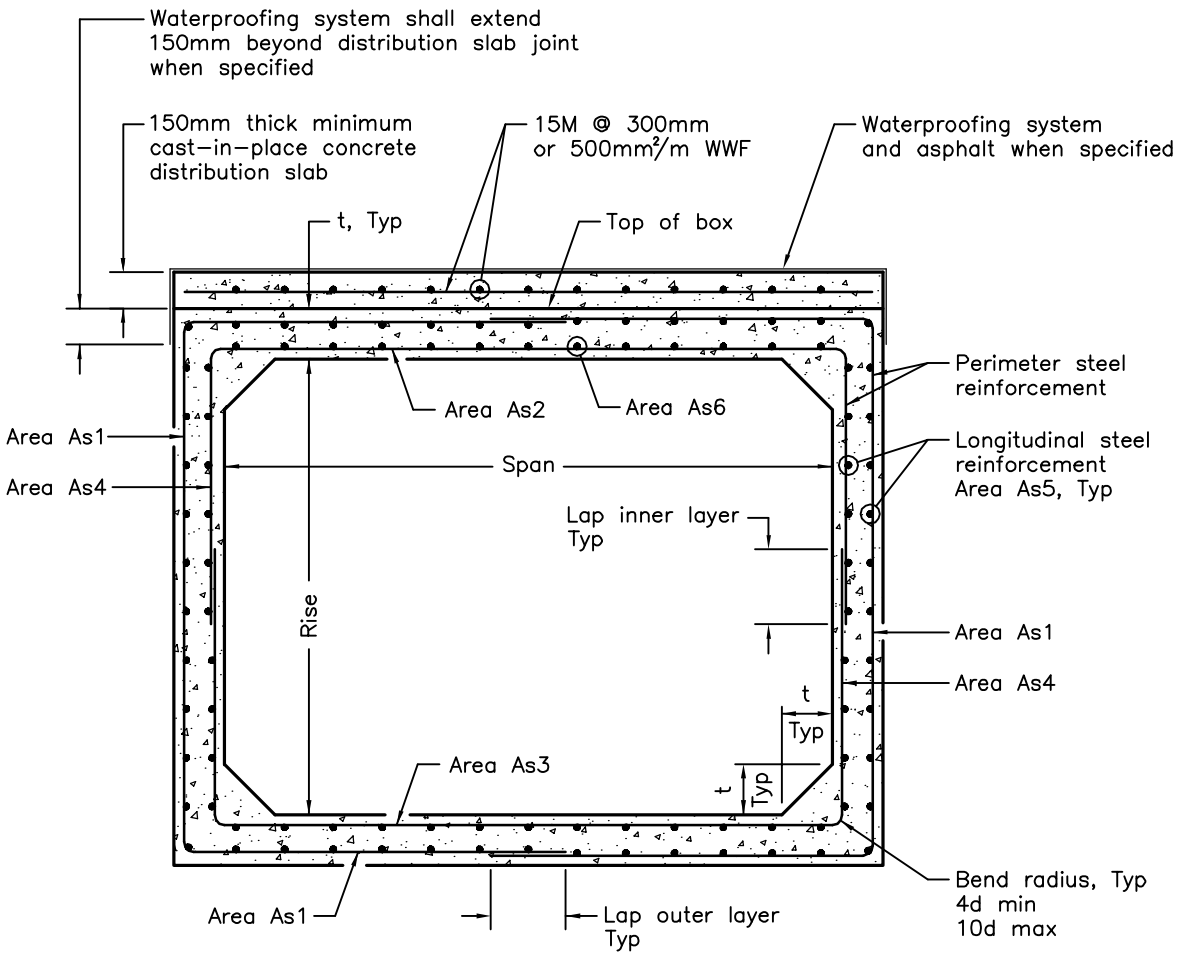
2 As1 to As4 refer to minimum reinforcement areas required at indicated faces.

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		

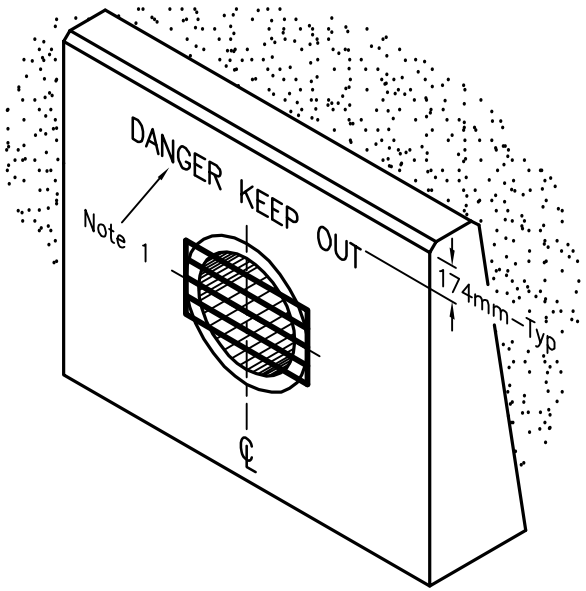


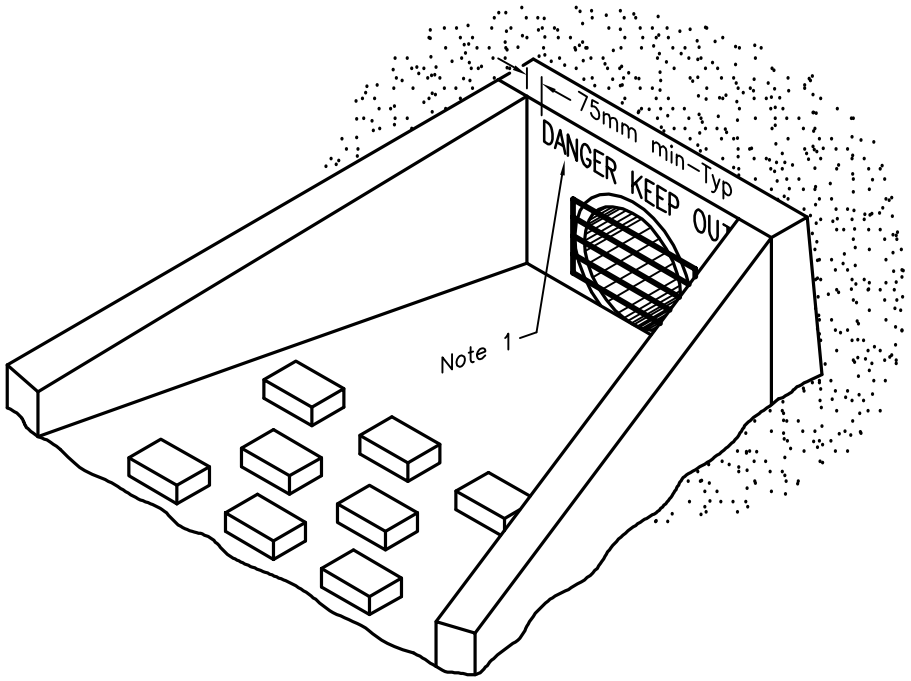
BOX UNIT CROSS-SECTION

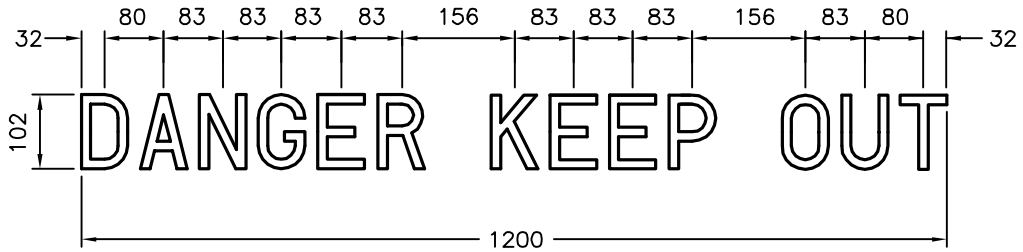
NOTES:

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	Apr 2016	Rev 1
PRECAST REINFORCED CONCRETE BOX CULVERT WITH HEIGHT OF FILL < 0.6M		OPSD 3920.110







SPACING FOR LETTERING

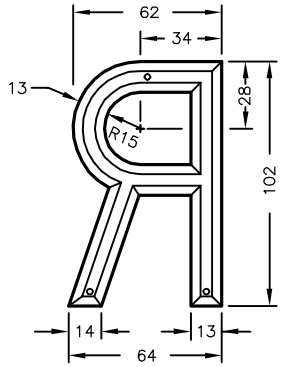
NOTES:

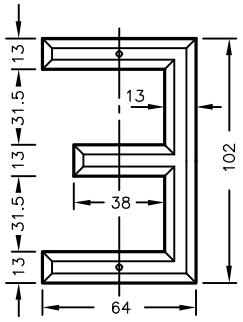
1 Centre warning message over centreline of pipe. Adjust layout of message to suit. Lettering to be set in concrete.

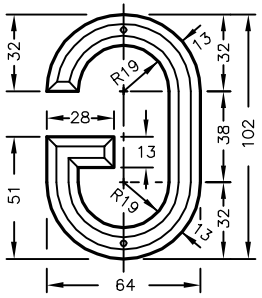
A This OPSD to be read in conjunction with OPSD 3940.151.

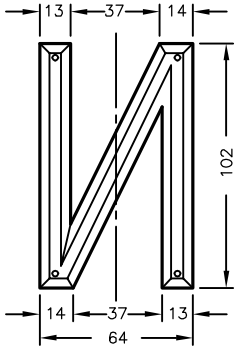
B All dimensions are in millimetres unless otherwise shown.

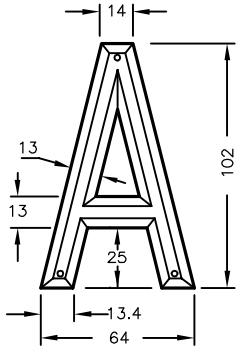
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	2
FIGURES IN CONCRETE WARNING MESSAGE LAYOUT			
	OPSD 3940.150		

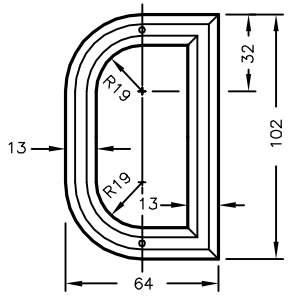


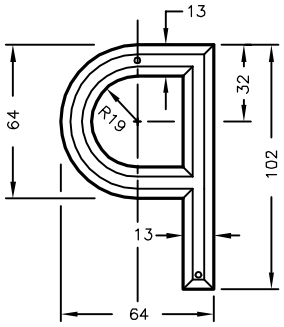


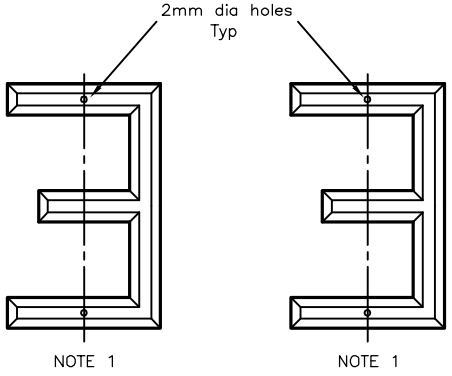


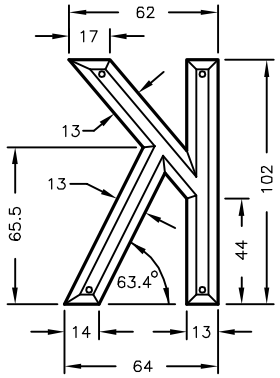


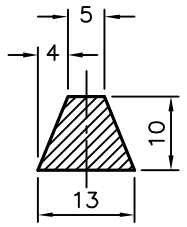




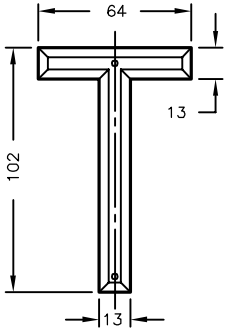


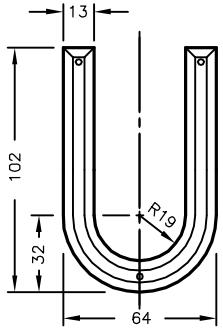


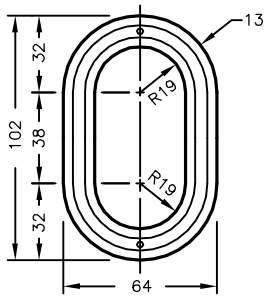




TYPICAL CROSS SECTION







NOTES:

1 See first occurrence of letter E for dimensions.

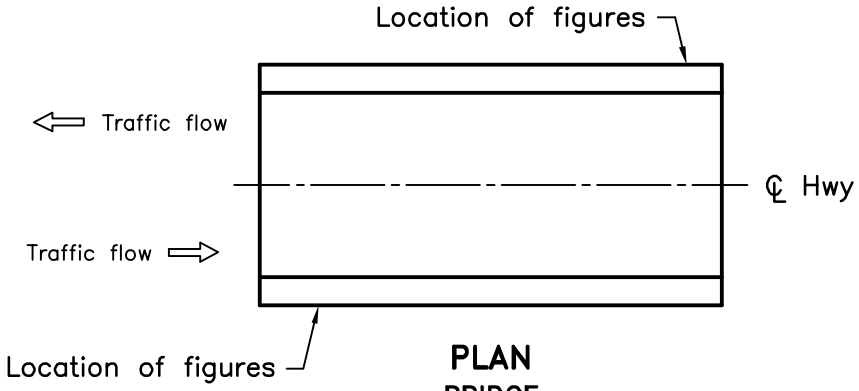
A This OPSD to be read in conjunction with OPSD 3940.150.

B The letters shall be formed from cast acrylic sheet or high impact styrene that shall not stain the concrete.

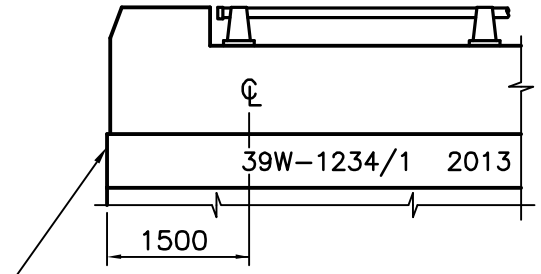
C 2mm dia holes for fastening letters shall be provided in locations shown.

D All dimensions are in millimetres unless otherwise shown.

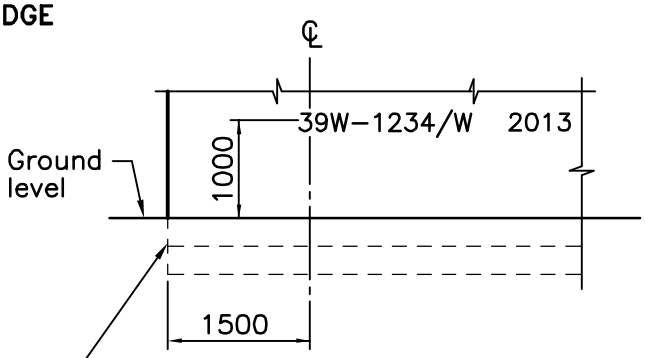
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev	2
FIGURES IN CONCRETE WARNING MESSAGE LETTERS			
	OPSD 3940.151		



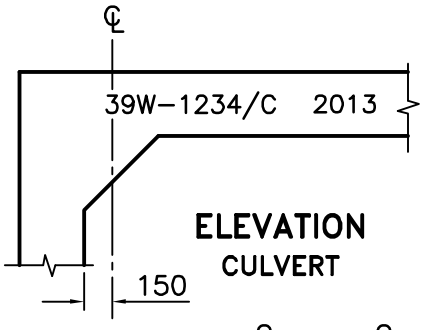
PLAN
BRIDGE



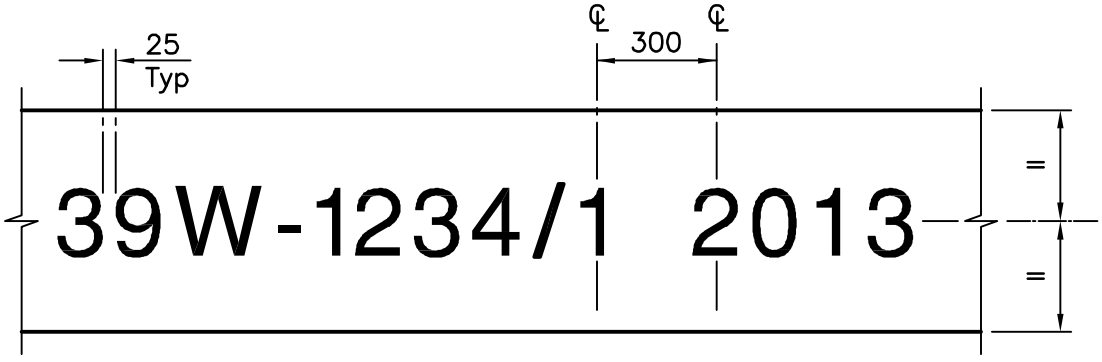
ELEVATION
BRIDGE



ELEVATION
RETAINING WALL



ELEVATION
CULVERT



DETAIL

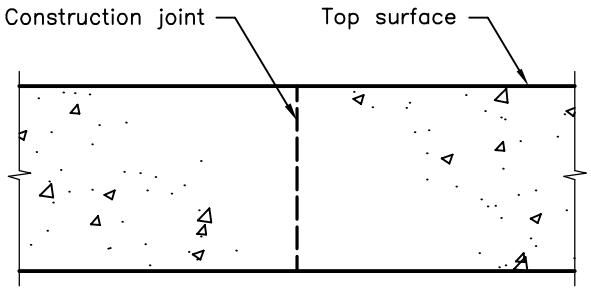
NOTES:

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.

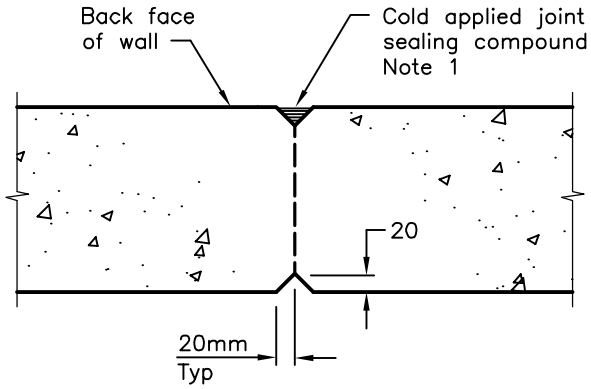
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	2
FIGURES IN CONCRETE SITE NUMBER AND DATE LAYOUT			
	OPSD 3941.200		



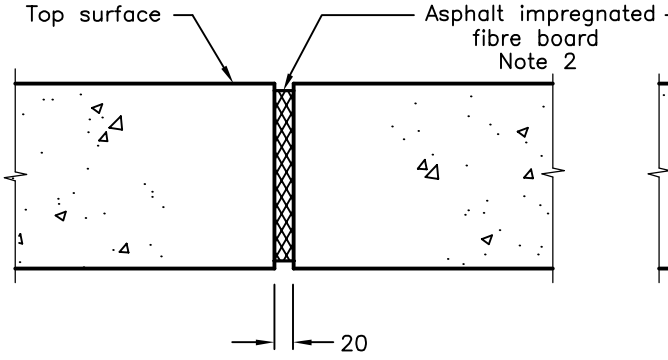
ELEVATION

CONSTRUCTION JOINT IN DECK



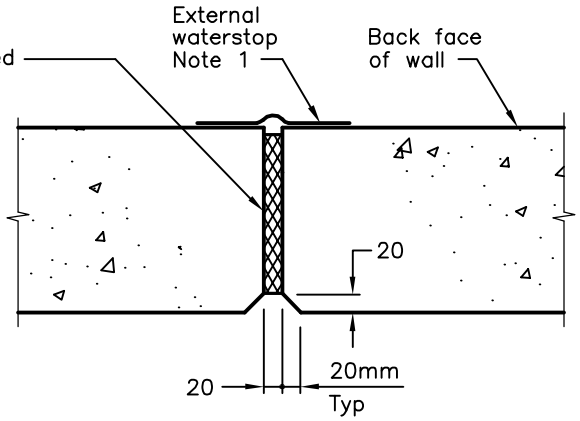
PLAN

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 CONCRETE EXPANSION AND CONSTRUCTION ON STRUCTURE			
	OPSD 3950.100		