

Ontario Provincial Standards for Roads and Public Works



- Volume 3 -

MUNICIPAL AND PROVINCIAL COMMON

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



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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	NOV 2016	Included in new manuals	96		
71			97		
72			98		
73			99		
74			100		
75			101		
76			102		



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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 #70

November 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for use of Ontario Provincial Standards; therefore, manual holders are cautioned about immediately discarding superseded and cancelled standards.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.rags.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	
202.010	2	202.010	3	“SLOPE FLATTENING USING SURPLUS EXCAVATED MATERIAL ON EARTH OR ROCK EMBANKMENT” This drawing has been reaffirmed with no changes to technical information.
202.030	5	202.030	6	“ROADWAY WIDENING FOR ECCENTRIC LOADER TERMINAL SYSTEM” See Summary of Revisions.
202.031	0	202.031	1	“ROADWAY WIDENING FOR STEEL BEAM ENERGY ATTENUATING TERMINAL APPROACH END” See Summary of Revisions.
202.032	1	202.032	2	“ROADWAY WIDENING FOR STEEL BEAM ENERGY ATTENUATING TERMINAL LEAVING END AND CONSTRAINED APPROACH END” See Summary of Revisions.
202.033	0	202.033	1	“ROADWAY WIDENING SINGLE SIDED ENERGY ATTENUATING TERMINALS APPROACH END” Plan View, Label Energy attenuator, OPSD 922.131 or 923.530 renamed to Energy attenuator.
205.010	2	205.010	3	“TRANSITION TREATMENT, EARTH CUT TO EARTH FILL” Transverse Section A-A, addition of 3% grade label to subgrade.
205.020	2	205.020	3	“TRANSITION TREATMENT, ROCK CUT TO ROCK FILL” Transverse Section A-A, addition of 3% grade label.

Superseded/Cancelled (Remove)		Revised/New (Insert)		Remarks
OPSD	Revision	OPSD	Revision	
205.030	2	205.030	3	“TRANSITION TREATMENT, ROCK CUT TO EARTH FILL” Transverse Section A-A, addition of 3% grade label.
205.040	2	205.040	3	“TRANSITION TREATMENT, EARTH FILL TO ROCK FILL AND EATH FILL TO GRANULAR FILL” This drawing has been reaffirmed with no changes to technical information.
205.050	2	205.050	3	“TRANSITION TREATMENT, ROCK CUT TO EARTH FILL” This drawing has been reaffirmed with no changes to technical information.
207.010	2	207.010	3	“CONCRETE PAVEMENT ON OPEN GRADED DRAINAGE LAYER DIVIDED HIGHWAY” This drawing has been reaffirmed with no changes to technical information.
207.020	2	207.020	3	“COMPOSITE PAVEMENT ON OPEN GRADED DRAINAGE LAYER DIVIDED HIGHWAY” This drawing has been reaffirmed with no changes to technical information.
207.030	1	207.030	2	“CONCRETE AND COMPOSITE PAVEMENT ON OPEN GRADED DRAINAGE LAYER – URBAN SECTION” This drawing has been reaffirmed with no changes to technical information.
207.041	3	207.041	4	“SUBDRAIN PIPE - OPEN GRADED DRAINAGE LAYER – HOT MIX ASPHALT, CONCRETE OR COMPOSITE PAVEMENT” This drawing has been reaffirmed with no changes to technical information.
207.044	4	207.044	5	“SUBDRAIN PIPE – CONNECTION AND OUTLET – OPEN GRADED DRAINAGE LAYER” This drawing has been reaffirmed with no changes to technical information.

Superseded/Cancelled (Remove)		Revised/New (Insert)		Remarks
OPSD	Revision	OPSD	Revision	
209.020	2	209.020	3	“WIDENING EXISTING ROCK CUT WITH GRADE RAISE” This drawing has been reaffirmed with no changes to technical information.
210.070	3	210.070	4	“GRANULAR SEALING” This drawing has been reaffirmed with no changes to technical information.
214.010	1	214.010	2	“SINGLE LANE RAMP GRADING FOR ASPHALT PAVEMENT WITH GRANULAR BASE AND SHOULDER” This drawing has been reaffirmed with no changes to technical information.
214.020	1	214.020	2	“SINGLE LANE RAMP GRADING FOR ASPHALT PAVEMENT WITH GRANULAR BASE AND ASPHALT SHOULDER” This drawing has been reaffirmed with no changes to technical information.
214.030	2	214.030	3	“SINGLE LANE RAMP GRADING FOR ASPHALT PAVEMENT WITH GRANULAR BASE AND ASPHALT SHOULDER AND CURB AND GUTTER” This drawing has been reaffirmed with no changes to technical information.
215.010	1	215.010	2	“TWO LANE RAMP GRADING FOR ASPHALT PAVEMENT WITH GRANULAR BASE AND ASPHALT SHOULDER” This drawing has been reaffirmed with no changes to technical information.
215.020	1	215.020	2	“TWO LANE RAMP GRADING FOR ASPHALT PAVEMENT WITH GRANULAR BASE, ASPHALT SHOULDER AND CURB AND GUTTER FOR TANGENT SECTION” This drawing has been reaffirmed with no changes to technical information.

Superseded/Cancelled (Remove)		Revised/New (Insert)		Remarks
OPSD	Revision	OPSD	Revision	
215.030	2	215.030	3	"TWO LANE RAMP GRADING FOR ASPHALT PAVEMENT WITH GRANULAR BASE, ASPHALT SHOULDER AND CURB AND GUTTER FOR SUPERELEVATED SECTION" This drawing has been reaffirmed with no changes to technical information.
561.010	1	561.010	2	"INTERLOCKING CONCRETE PAVERS ON GRANULAR BASE" Note 3 added.
561.020	1	561.020	2	"INTERLOCKING CONCRETE PAVERS ON ASPHALT BASE" Note 4 added.
561.030	1	561.030	2	"INTERLOCKING CONCRETE PAVERS ON RETROFIT CROSSWALK INSTALLATION" This drawing has been reaffirmed with no changes to technical information.
708.010	2	708.010	3	"CATCH BASIN CONNECTION FOR MAIN PIPE SEWER" CONNECTION WITH RISER detail, "Concrete Bedding" detail added and corresponding text updated.
708.020	3	708.020	4	"SUPPORT FOR PIPE AT CATCH BASIN OR MAINTENANCE HOLE" This drawing has been reaffirmed with no changes to technical information.
708.030	2	708.030	3	CATCH BASIN CONNECTION FOR FLEXIBLE PIPE SEWER" This drawing has been reaffirmed with no changes to technical information.
802.095	1	802.095	2	"CLAY SEAL FOR PIPE TRENCHES" Drawing details slightly modified for more clarification.
912.101	2	912.101	3	"GUIDE RAIL SYSTEM, STEEL BEAM, RAIL, COMPONENT" See Summary of Revisions.

Superseded/Cancelled (Remove)		Revised/New (Insert)		Remarks
OPSD	Revision	OPSD	Revision	
912.102	1	912.102	2	“GUIDE RAIL SYSTEM, STEEL BEAM, CHANNEL, COMPONENT” This drawing has been reaffirmed with no changes to technical information.
912.103	1	912.103	2	“GUIDE RAIL SYSTEM, STEEL BEAM, PLASTIC OFFSET BLOCKS, COMPONENT” This drawing has been reaffirmed with no changes to technical information.
912.104	2	912.104	3	“GUIDE RAIL SYSTEM, STEEL BEAM, STEEL POST WITH WOODEN OFFSET BLOCK” This drawing has been reaffirmed with no changes to technical information.
912.105	1	912.105	2	“GUIDE RAIL SYSTEM, STEEL BEAM, BASE PLATE, COMPONENT” This drawing has been reaffirmed with no changes to technical information.
		912.123	0	“GUIDE RAIL SYSTEM, STEEL BEAM, TYPE M RAIL – 476mm HOLE SPACING, COMPONENT” This is a New Drawing.
		912.128	0	“GUIDE RAIL SYSTEM, STEEL BEAM, TYPE M30 STEEL POST WITH OFFSET BLOCK, COMPONENT” This is a New Drawing.
		912.129	0	“GUIDE RAIL SYSTEM, STEEL BEAM, 30cm POLYMER OFFSET BLOCK – P-BLOCK, COMPONENT” This is a New Drawing.
912.130	2	912.130	3	“GUIDE RAIL SYSTEM, STEEL BEAM, STEEL POST WITH OFFSET BLOCK ASSEMBLY, INSTALLATION – SINGLE RAIL” 1915 mm post length deleted throughout drawing.

Superseded/Cancelled (Remove)		Revised/New (Insert)		Remarks
OPSD	Revision	OPSD	Revision	
912.135	0	912.135	1	“GUIDE RAIL SYSTEM, STEEL BEAM, STEEL POST WITH STEEL OFFSET BLOCK ASSEMBLY, ADJUSTMENT – SINGLE RAIL” This drawing has been reaffirmed with no changes to technical information.
912.145	0	912.145	1	“GUIDE RAIL SYSTEM, STEEL BEAM, WOODEN POST ASSEMBLY, ADJUSTMENT – SINGLE RAIL” This drawing has been reaffirmed with no changes to technical information.
		912.185	0	“GUIDE RAIL SYSTEM, STEEL BEAM, TYPE M20, INSTALLATION” This is a New Drawing.
		912.186	0	“GUIDE RAIL SYSTEM, STEEL BEAM, TYPE M20 – ADJACENT TO 2H:1V SLOPE INSTALLATION – RAIL AT SHOULDER” This is a New Drawing.
		912.188	0	“GUIDE RAIL SYSTEM, STEEL BEAM, TYPE M20 – ADJACENT TO CONCRETE CURB, INSTALLATION” This is a New Drawing.
		912.189	0	“GUIDE RAIL SYSTEM, STEEL BEAM, TYPE M30 – ADJACENT TO SIDEWALK, INSTALLATION” This is a New Drawing.
912.234	1			“GUIDE RAIL SYSTEM, STEEL BEAM, END TREATMENT, INSTALLATION – LEAVING END COLLECTOR MEDIAN” OPSD Cancelled. The end treatment is no longer being used as there are better options.
912.240	0			“GUIDE RAIL SYSTEM, STEEL BEAM, TREATMENT AT CULVERTS WITH MINIMAL COVER INSTALLATION – SINGLE RAIL” OPSD Cancelled. The end treatment is no longer being used as there are better options.

Superseded/Cancelled (Remove)		Revised/New (Insert)		Remarks
OPSD	Revision	OPSD	Revision	
		912.245	0	“GUIDE RAIL SYSTEM, STEEL BEAM, TYPE M – 7.62m LONG SPAN TREATMENT, INSTALLATION” This is a New Drawing.
		912.246	0	“GUIDE RAIL SYSTEM, STEEL BEAM, TYPE M – 5.71m LONG SPAN TREATMENT, INSTALLATION” This is a New Drawing.
		912.255	0	“GUIDE RAIL SYSTEM, STEEL BEAM, TYPE M20 AND M30 LEAVING END TREATMENT, INSTALLATION” This is a New Drawing.
		912.256	0	“GUIDE RAIL SYSTEM, STEEL BEAM, TYPE M LEAVING END TREATMENT, COMPONENT – RAIL, TERMINAL SECTION AND POST ANCHOR DETAIL” This is a New Drawing.
		912.315	0	“GUIDE RAIL SYSTEM, STEEL BEAM, TRANSITION FROM TYPE M TO STEEL BEAM GUIDE RAIL WITH CHANNEL FOR STRUCTURE CONNECTION, INSTALLATION” This is a New Drawing.
		912.316	0	“GUIDE RAIL SYSTEM, STEEL BEAM, TYPE M REDUCED DEFLECTION TREATMENT, INSTALLATION” This is a New Drawing.
912.381	1			“GUIDE RAIL SYSTEM, STEEL BEAM, PERMANENT TRANSITION INSTALLATION, SINGLE STEEL BEAM TO 3 CABLE, DIVIDED HIGHWAY” OPSD Cancelled. This single steel beam guide rail to 3 cable guide rail transition is no longer being used as there are better options.
912.530	1	912.530	2	“GUIDE RAIL SYSTEM, STEEL BEAM, STRUCTURE APPROACH TREATMENT, INSTALLATION – RURAL HIGHWAY” This drawing has been reaffirmed with no changes to technical information.

Superseded/Cancelled (Remove)		Revised/New (Insert)		Remarks
OPSD	Revision	OPSD	Revision	
912.531	2			“GUIDE RAIL SYSTEM, STEEL BEAM, INSTALLATION – ENTRANCES AND INTERSECTING ROADWAYS” OPSD Cancelled. The steel beam guide rail entrance and intersecting roadways design is being cancelled due to misuse.
921.101	1	921.101	2	“ENERGY ATTENUATOR, GENERAL, INSTALLTION – GRANULAR APPROACH PAD, MEDIAN” This drawing has been reaffirmed with no changes to technical information.
923.002	0	923.002	1	“ENERGY ATTENUATOR, CRASH CUSHION, COMPONENT – ANCHOR ASSEMBLY” Optional precast concrete pad added.
		923.010	0	“ENERGY ATTENUATOR, CRASH CUSHION, NARROW SYSTEMS, COMPONENT – REINFORCED PRECAST CONCRETE PAD FOR PERMANENT INSTALLATION” This is a New Drawing.
		923.011	0	“ENERGY ATTENUATOR, CRASH CUSHION, COMPONENT – REINFORCED PRECAST CONCRETE PAD FOR MODIFIED TEMPORARY CONCRETE BARRIER” This is a New Drawing.
924.131	0	924.131	1	“ENERGY ATTENUATOR, CRASH CUSHION, ABSORB 350 SYSTEM, INSTALLATION - TEMPORARY CONCRETE BARRIER” Plan view, dimension 2.0m min revised to 1.0m min and label for Edge of driving lane revised to Edge of travelled lane.
924.135	1	924.135	2	“ENERGY ATTENUATOR, CRASH CUSHION, SLED SYSTEM, INSTALLATION - TEMPORARY CONCRETE BARRIER” Plan view, dimension 2.0m min revised to 1.0m min and label for Edge of driving lane revised to Edge of travelled lane.

Superseded/Cancelled (Remove)		Revised/New (Insert)		Remarks
OPSD	Revision	OPSD	Revision	
		924.141	0	“ENERGY ATTENUATOR, CRASH CUSHION, ACZ-350 SYSTEM, INSTALLATION - TEMPORARY CONCRETE BARRIER” This is a New Drawing.
971.101	3	971.101	4	“FENCE, HIGHWAY, IN EARTH, SHALE, LOOSE ROCK, OR FRIABLE ROCK, INSTALLATION” See Summary of Revision.
971.102	1	971.102	2	“FENCE, HIGHWAY, IN SOLID ROCK, INSTALLATION” See Summary of Revision.
		971.103	0	“FENCE, HIGHWAY, INSTALLATION DETAILS” This is a New Drawing.
912.532	1	973.130	0	“FENCE, STEEL BEAM, BARRICADE, INSTALLATION” See Summary of Revisions.
		984.105	0	“FLEXIBLE DELINEATOR POST, INSTALLATION – TEMPORARY AND PERMANENT” This is a new drawing. The MTO representative recommended converting MTOD 984.105 (November 2014) into OPSD 984.105.
1003.010	2	1003.010	3	“CAST IN PLACE MAINTENANCE HOLE DROP STRUCTURE TEE” See Summary of Revisions.
1003.020	2	1003.020	3	“CAST IN PLACE MAINTENANCE HOLE DROP STRUCTURE WYE” SECTION A-A detail, “50mm min” dimension added from the overt.
1003.030	3	1003.030	4	“INTERNAL DROP STRUCTURE FOR EXISTING MAINTENANCE HOLES” This drawing has been reaffirmed with no changes to technical information.

Superseded/Cancelled (Remove)		Revised/New (Insert)		Remarks
OPSD	Revision	OPSD	Revision	
1003.031	2	1003.031	3	“INTERNAL DROP STRUCTURE FOR NEW MAINTENANCE HOLES” This drawing has been reaffirmed with no changes to technical information.
1006.010	2	1006.010	3	“SEWER SERVICE CONNECTIONS FOR MAIN PIPE SEWER” See Summary of Revisions.
1006.020	2			“SEWER SERVICE CONNECTIONS FOR FLEXIBLE MAIN PIPE SEWER” This drawing is Cancelled due to redundancy, since OPSD 1006.010 has now been renamed to remove the word “Rigid” from its title.

SUMMARY OF REVISIONS TO OPSD 202.030

ROADWAY WIDENING FOR ECCENTRIC LOADER TERMINAL SYSTEM

- Title, changed Roadway Widening for Eccentric Loader Terminal System
- Plan View of Widened Roadway, label changed from Guide rail system to Eccentric loader terminal system.
- Plan View of Widened Roadway, Length varies dimension removed.
- Section A-A Fill, label changed from 3H:1V to 4H:1V.
- Section A-A Fill, dimensions, direction and elevation of guide rail system updated.
- Section A-A Fill, end barrel moved to right side, width corrected to proper scaling.
- Section A-A Cut, ditch labeling changed from 3H:1V, 3H:1V to 4H:1V, 8H:1V, 3H:1V.
- Section A-A Cut, dimensions, direction and elevation of guide rail system updated.
- Section A-A Cut, end barrel moved to right side, width corrected to proper scaling.
- Notes, Note A deleted.
- Notes, Note B renamed to Note A.

SUMMARY OF REVISIONS TO OPSD 202.031

ROADWAY WIDENING FOR STEEL BEAM ENERGY ATTENUATING TERMINAL APPROACH END

- Plan View, Label SBEAT, extruder terminal system shown renamed to SBEAT.
- Notes, Note B deleted.
- Notes, Note C renamed to Note B.

SUMMARY OF REVISIONS TO OPSD 202.032

ROADWAY WIDENING FOR STEEL BEAM ENERGY ATTENUATING TERMINAL LEAVING END AND CONSTRAINED APPROACH END

- Plan View, SBEAT, extruder terminal system shown labels renamed to SBEAT.
- Notes, Note B deleted.
- Notes, Note C renamed to Note B.

SUMMARY OF REVISIONS TO OPSD 912.101

GUIDE RAIL SYSTEM, STEEL BEAM, RAIL, COMPONENT

- Front Elevation view, rail replaced with Type M rail.
- Terminal Section details deleted.

SUMMARY OF REVISIONS TO OPSD 971.101

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

- Highway Fence In Earth, Shale, Loose Rock, Or Friable Rock view; 305 mm wire spacing label added.
- Gate Detail view, diagonal wooden brace label deleted.
- Existing Wire Spacing Detail view deleted.
- Existing Splicing Detail view deleted.
- New Note A added. Other note reordered.

SUMMARY OF REVISIONS TO OPSD 971.102

FENCE, HIGHWAY, IN SOLID ROCK, INSTALLATION

- Highway Fence In Solid Rock view; use of wooden line post deleted.
- Existing Detail A, Detail B, and Splicing Detail views deleted. Other detail views reordered.
- Depths of overburden revised throughout drawing.
- Note 1, wooden post spacing deleted.
- Existing Note 2 deleted.
- New Note A added. Other note reordered.

SUMMARY OF REVISIONS TO OPSD 973.130

FENCE, STEEL BEAM, BARRICADE, INSTALLATION

- Drawing renumbered and title revised to be with the fence drawings, which better reflects its purpose as a barricade for traffic access control.
- Elevation view, optional roadway terminal sign requirements added.
- Terminal Section views added.

SUMMARY OF REVISIONS TO OPSS 1003.010

CONSTRUCTION SPECIFICATION FOR CAST-IN-PLACE MAINTENANCE HOLE DROP STRUCTURE TEE

- SIZE OF DROP PIPE table, Updated to include larger pipe diameters and a third column added to clarify that, after a certain size, the table only applies to Storm sewers.
- SECTION A-A detail, "50mm min" dimension added from the obvert.
- SECTION A-A detail, "650mm max" dimension removed.
- Note 2, Note updated to remove "...with 450mm long, side of the drop pipe at 300mm centres".

SUMMARY OF REVISIONS TO OPSS 1006.010

CONSTRUCTION SPECIFICATION FOR SEWER SERVICE CONNECTIONS FOR MAIN PIPE SEWER

- TITLE, The word "Rigid" removed.
- CONNECTION WITHOUT VERTICAL RISER detail, Slope specifications updated to meet Ontario Building Code specifications, and Angle changed from 67.5° to 45°.



**ONTARIO
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SPECIFICATION**

VOLUME 3 INDEX

**MUNICIPAL AND PROVINCIAL COMMON
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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



**ONTARIO
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**MUNICIPAL AND PROVINCIAL COMMON
DRAWINGS FOR ROADS, BARRIERS,
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DATE	OPSD NO.	REV.	TITLE
2016 11	202.010	3	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
2016 11	202.030	6	Roadway Widening for Eccentric Loader Terminal System and Transitions
2016 11	202.031	1	Roadway Widening for Steel Beam Energy Attenuating Terminal Approach End
2016 11	202.032	1	Roadway Widening for Steel Beam Energy Attenuating Terminal Leaving End and Constrained Approach End
2016 11	202.033	1	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
2016 11	205.010	3	Transition Treatment, Earth Cut to Earth Fill
2016 11	205.020	3	Transition Treatment, Rock Cut to Rock Fill
2016 11	205.030	3	Transition Treatment, Rock Cut to Earth Fill
2016 11	205.040	3	Transition Treatment, Earth Fill to Rock Fill and Earth Fill to Granular Fill
2016 11	205.050	3	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
2016 11	207.010	3	Concrete Pavement on Open Graded Drainage Layer, Divided Highway
2016 11	207.020	3	Composite Pavement on Open Graded Drainage Layer, Divided Highway



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2016 11	207.030	2	Concrete and Composite Pavement on Open Graded Drainage Layer, Urban Section
2016 11	207.041	4	Subdrain Pipe, Open Graded Drainage Layer, Hot Mix Asphalt, Concrete, or Composite Pavement
2016 11	207.044	5	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
2016 11	209.020	3	Widening Existing Rock Cut with Grade Rise
2010 11	210.010	1	Tangent Shoulders, Rural
2010 11	210.020	1	Superelevated Shoulders, Rural
2016 11	210.070	4	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
2016 11	214.010	2	Single-Lane Ramp Grading for Asphalt Pavement with Granular Base and Shoulder
2016 11	214.020	2	Single-Lane Ramp Grading for Asphalt Pavement with Granular Base and Asphalt Shoulder
2016 11	214.030	3	Single-Lane Ramp Grading for Asphalt Pavement with Granular Base, Asphalt Shoulder, and Curb with Gutter
2016 11	215.010	2	Two-Lane Ramp Grading for Asphalt Pavement with Granular Base and Asphalt Shoulder



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DATE	OPSD NO.	REV.	TITLE
2016 11	215.020	2	Two-Lane Ramp Grading for Asphalt Pavement with Granular Base, Asphalt Shoulder, and Curb with Gutter for Tangent Section
2016 11	215.030	3	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



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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

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



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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



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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



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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



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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



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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
2016 11	561.010	2	Interlocking Concrete Pavers on Granular Base
2016 11	561.020	2	Interlocking Concrete Pavers on Concrete or Asphalt Base
2016 11	561.030	2	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



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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



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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



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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



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2014 11	707.010	3	Precast Concrete Maintenance Hole Manufactured Tee
2016 11	708.010	3	Catch Basin Connection for Rigid Main Pipe Sewer
2016 11	708.020	4	Support for Pipe at Catch Basin or Maintenance Hole
2016 11	708.030	3	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
2014 11	802.010	3	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



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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
2016 11	802.095	2	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



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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



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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



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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



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2015 11	911.430	1	Guide Rail System, Concrete Barrier, Temporary - Leaving End Treatment, Installation – Divided Highway
2016 11	912.101	3	Guide Rail System, Steel Beam, Rail, Component
2016 11	912.102	2	Guide Rail System, Steel Beam, Channel, Component
2016 11	912.103	2	Guide Rail System, Steel Beam, Plastic Offset Blocks, Component
2016 11	912.104	3	Guide Rail System, Steel Beam, Steel Post with Wooden Offset Block, Component
2016 11	912.105	2	Guide Rail System, Steel Beam, Base Plate, Component
2016 11	912.123	0	Guide Rail System, Steel Beam, Type M Rail – 476mm Hole Spacing, 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
2016 11	912.128	0	Guide Rail System, Steel Beam, Type M30 Steel Post With Offset Block, Component
2016 11	912.129	0	Guide Rail System, Steel Beam, 30cm Polymer Offset Block – P-Block, Component
2016 11	912.130	3	Guide Rail System, Steel Beam, Steel Post with Wooden Offset Block Assembly, Installation - Single Rail
2016 11	912.135	1	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
2016 11	912.145	1	Guide Rail System, Steel Beam, Wooden Post Assembly, Adjustment - Single Rail



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2016 11	912.185	0	Guide Rail System, Steel Beam, Type M20, Installation
2016 11	912.186	0	Guide Rail System, Steel Beam, Type M20 – Adjacent To 2H:1V Slope Installation – Rail At Shoulder
2016 11	912.188	0	Guide Rail System, Steel Beam, Type M20 – Adjacent To Concrete Curb, Installation
2016 11	912.189	0	Guide Rail System, Steel Beam, Type M30 – Adjacent To Sidewalk, Installation
2010 11	912.235	1	Guide Rail System, Steel Beam, Leaving End Treatment, Installation
2016 11	912.245	0	Guide Rail System, Steel Beam, Type M – 7.62m Long Span Treatment, Installation
2016 11	912.246	0	Guide Rail System, Steel Beam, Type M – 5.71m Long Span Treatment, Installation
2016 11	912.255	0	Guide Rail System, Steel Beam, Type M20 AND M30 Leaving End Treatment, Installation
2016 11	912.256	0	Guide Rail System, Steel Beam, Type M Leaving End Treatment, Component – Rail, Terminal Section And Post Anchor Detail
2016 11	912.315	0	Guide Rail System, Steel Beam, Transition From Type M To Steel Beam Guide Rail With Channel For Structure Connection, Installation
2016 11	912.316	0	Guide Rail System, Steel Beam, Type M Reduced Deflection Treatment, Installation
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



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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
2016 11	912.530	2	Guide Rail System, Steel Beam, Structure Approach Treatment, Installation - Rural Highway
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
2016 11	921.101	2	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



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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
2016 11	923.002	1	Energy Attenuator, Crash Cushion, Component - Anchor Assembly
2011 11	923.004	0	Energy Attenuator, Crash Cushion, Wide Systems, Component - Reinforced Concrete Pad
2011 11	923.005	0	Energy Attenuator, Crash Cushion, Extra Wide Systems, Component - Reinforced Concrete Pad
2015 11	923.006	0	Energy Attenuator, Crash Cushion, Quadguard Super Wide System, Component – Reinforced Concrete Pad



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2016 11	923.010	0	Energy Attenuator, Crash Cushion, Narrow Systems, Component – Reinforced Precast Concrete Pad for Permanent Installation
2016 11	923.011	0	Energy Attenuator, Crash Cushion, Component – Reinforced Precast Concrete Pad for Modified Temporary Concrete Barrier
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, Unidirectional
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 Unidirectional



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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



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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
2016 11	924.131	1	Energy Attenuator, Crash Cushion, ABSORB 350 System, Installation - Temporary Concrete Barrier
2016 11	924.135	2	Energy Attenuator, Crash Cushion, ACZ-350 System, Installation - Temporary Concrete Barrier
2016 11	924.141	0	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



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2016 11	971.101	4	Fence, Highway, In Earth, Shale, Loose Rock, Or Friable Rock, Installation
2016 11	971.102	2	Fence, Highway, In Solid Rock, Installation
2016 11	971.103	0	Fence, Highway, Installation Details
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
2016 11	973.130	0	Fence, Steel Beam, Barricade, installation
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
2016 11	984.105	0	Flexible Delineator Post, Installation – temporary and Permanent
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



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2013 11	985.220	0	Small Sign Support System, Double Breakaway Wooden Post, 140x140mm and 140x184mm, Installation - Double Post Assembly
2013 11	987.101	0	Small Sign Support System, Lap Splice Rib-Bak Breakaway System, Components
2013 11	987.110	0	Small Sign Support, Lap Splice Rib-Bak Breakaway System, Installation - Single Post Assembly
2013 11	987.210	0	Small Sign Support System, Lap Splice Rib-Bak Breakaway System, Installation - Double Post Assembly
2013 11	987.310	0	Small Sign Support System, Lap Splice Rib-Bak Breakaway System, Installation - Triple Post Assembly
2013 11	989.110	0	Small Sign Support System, Sqr-Loc Perforated Steel Square Sign Post System, Installation - Single Post Assembly
2013 11	989.210	0	Small Sign Support System, Sqr-Loc Perforated Steel Square Post System, Installation - Double Post
2014 11	990.110	1	Small Sign Support System, Non-Breakaway U-Flange Post, Installation - Single Post Assembly
2014 11	991.130	3	Expanded Metal Anti-Glare Screen, Installation - Concrete Barrier
2014 11	991.131	3	Expanded Metal Anti-Glare Screen, Installation - Steel Beam Guide Rail with Wooden Post
2012 11	991.132	2	Expanded Metal Anti-Glare Screen, Installation - Chain-Link Fence

DIVISION 1000 - SANITARY SEWERS

2016 11	1003.010	3	Cast-in-Place Maintenance Hole Drop Structure Tee
2016 11	1003.020	3	Cast-in-Place Maintenance Hole Drop Structure Wye
2016 11	1003.030	4	Internal Drop Structure for Existing Maintenance Hole
2016 11	1003.031	3	Internal Drop Structure for New Maintenance Hole
2016 11	1006.010	3	Sewer Service Connections for Rigid Main Pipe Sewer



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DATE	OPSD NO.	REV.	TITLE
DIVISION 1100 - WATERMAINS			
2014 11	1100.010	3	Cast-in-Place Chamber for Valves Up to 350 mm Diameter
2014 11	1100.011	2	Piping Layout for Butterfly and Gate Valves Up to 350 mm Diameter in Cast-in-Place Chambers
2015 11	1101.010	4	Precast Valve Chamber, 1200 mm and 1500 mm Diameter
2013 11	1101.012	2	Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 1800 x 2400 mm Components
2013 11	1101.013	2	Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 1800 x 2400 mm, Riser and Base
2013 11	1101.014	2	Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 1800 x 2400 mm, Thrust Blocks
2013 11	1101.015	2	Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 1800 x 2400 mm, Chimney and Cap
2013 11	1101.016	2	Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 2400 x 3000 mm Components
2013 11	1101.017	2	Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 2400 x 3000 mm Riser and Base
2013 11	1101.018	3	Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 2400 x 3000 mm Thrust Blocks
2013 11	1101.019	2	Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 2400 x 3000 mm Chimney and Cap
2013 11	1101.020	3	Valve Operator
2013 11	1101.030	0	Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 3000 x 3000 mm Components
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



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



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DATE	OPSD NO.	REV.	TITLE
DIVISION 3000 - STRUCTURES			
2010 11	3000.100	2	Foundation, Piles, Steel H-Pile Driving Shoe
2010 11	3000.150	1	Foundation, Piles, Steel H-Pile Splice
2010 11	3000.201	1	Foundation, Piles, Steel HP 310 Oslo Point
2010 11	3001.100	1	Foundation, Piles, Steel Tube Pile Driving Shoe
2010 11	3001.150	1	Foundation, Piles, Steel Tube Pile Splice
2010 11	3002.200	1	Foundation, Piles, Steel Sheet Pile Anchorage
2010 11	3003.100	1	Foundation, Piles, Wooden Pile Driving Shoe
2010 11	3003.150	1	Foundation, Piles, Wooden Pile Head Protection
2010 11	3090.100	1	Foundation, Frost Penetration Depths for Northern Ontario
2010 11	3090.101	1	Foundation, Frost Penetration Depths for Southern Ontario
2010 11	3101.150	1	Walls, Abutment, Backfill, Minimum Granular Requirement
2010 11	3101.200	1	Walls, Abutment, Backfill, Rock
2010 11	3102.100	1	Walls, Abutment, Backfill Drain
2010 11	3120.100	2	Walls, Retaining, Concrete Toe Wall
2010 11	3121.150	1	Walls, Retaining, Backfill, Minimum Granular Requirement
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



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DATE	OPSD NO.	REV.	TITLE
2011 11	3329.100	1	Deck, Reinforcement, Supports for Reinforcing Steel for Slab Depths 300 mm or Less
2011 11	3329.101	1	Deck, Reinforcement, Supports for Reinforcing Steel for Slab Depths Greater Than 300 mm
2011 11	3332.100	1	Deck, Round Voids, Form Supports and Tie-Downs
2010 11	3333.100	1	Deck, Round Voids, Drains
2010 11	3333.101	1	Deck, Trapezoid Void, Drains
2011 11	3339.100	1	Deck, Voids, Access Hatch for Concrete Bridges, Assembly
2011 11	3339.101	1	Deck, Voids, Access Hatch for Concrete Bridges, Installation
2014 11	3340.100	2	Deck, Drains with Downspout
2014 11	3340.102	2	Deck, Drains with Sloped Downspout
2012 11	3340.150	2	Deck, Drains with Transverse Bar Openings
2012 11	3340.153	2	Deck, Drains, Median with Transverse Bar Openings
2012 11	3340.200	2	Deck, Drains with Downspout Modification for Addition of Asphalt to Existing Structure
2012 11	3340.201	2	Deck, Drains, with Sloped Downspout Modification for Addition of Asphalt to Existing Structure
2012 11	3340.250	2	Deck, Drains, with Transverse or Longitudinal Bar Openings, Modification for Addition of Asphalt to Existing Structure
2012 11	3349.100	2	Deck, Drains, Drainage of New Deck Below Asphalt Wearing Surface
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



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DATE	OPSD NO.	REV.	TITLE
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 $\geq 0.6\text{m}$
2016 04	3920.110	1	Precast Reinforced Concrete Box Culvert With Height Of Fill $< 0.6\text{m}$
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)	C	coated
Abut or A	abutment	CaB	carriage bolt
AC	asphalt coated, asphalt curb, or asphalt cement	CAH	controlled access highway
		Can	Canadian
AC&G	asphalt curb with gutter	CB	catch basin
AC PI	asphalt coated and paved invert	CBMH	catch basin—maintenance hole
Add'l	additional	CC	concrete curb
AG	asphalt gutter	C/C	centre to centre
AISC	American Institute of Steel Construction	CC&G	concrete curb with gutter
		CG	concrete gutter
ALT	alternate	CGR	cable guide rail
Allice	allowance	Chkd	checked
Asph	asphalt	CI	cast iron
ASTM	ASTM International (formerly American Society for Testing and Materials)	CIP	clay pipe
		Circ	circular
A S/W	asphalt sidewalk	CJ	construction joint
Ave	avenue	C/L or $\mathcal{C}$	centreline
		CLF	chain link fence
B or Bot	bottom	Co	county
BB—BEAT	box beam bursting energy absorbing terminal	Con	concession
		Conc or C	concrete
BBGR	box beam guide rail	Const or C	construction
BC	beginning of curve	Cont	contract
BCA	Bell cable aerial	CP	concrete pipe
BCU	Bell cable underground	CPCI	Canadian Precast/Prestressed Concrete Institute
BCUM	Bell cable underground marker		
BF	back face	Cr	creek or crushed
Bfi	backfill	CS	circular curve to spiral
BFS	beginning of full superelevation	CSA	CSA Standards (formerly Canadian Standards Association)
BH	button head bolt		
B/L	base line	CSP	corrugated steel pipe
Bld (y)	boulder (y)	CSPA	corrugated steel pipe arch
Bldg	building	C S/W	concrete sidewalk
Blk	block	Culv	culvert
Blvd	boulevard	C/W	come with
BM	bench mark	CWB	Canadian Welding Bureau
Br	brick		
B/R	bottom of rail		
Brg	bearing		
BS	beginning of superelevation		
BVC	beginning of vertical curve		
BWF	barbed wire fence		

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ABBREVIATIONS

GENERAL A—C



OPSD 100.010

D	ditch	G	grading
Def	deflection	Ga	gauge
Deg	degree	Galv	galvanized
DI	ditch inlet or ductile iron	GB	granular base
Dia	diameter	GBC	granular base course
DICB	ditch inlet catch basin	GBfl	granular backfill
Dist	district	GC	grading and culverts
Div	division	GD	grading and drainage
D/W	driveway	GL	ground level
Dwg	drawing	GP	grade point
		Gran	granular
EB	eastbound	GSB	granular sub base
EBL	eastbound line		
EC	end of curve	HL	hot laid
ED	earth ditching	HM	hot mix
EF	each face	HOC	hub on curve
EFS	end of full superelevation	HOST	hub on subtangent
Elev or El	elevation	HOT	hub on tangent
EMH	electrical maintenance hole	Hor	horizontal
Ent	entrance	HP	high point
EP	edge of pavement	HPC	high performance concrete
Eq	equally	Ht	height
ES	edge of shoulder or end of superelevation	HT	high tension
		HTL	high tension line
EVC	end of vertical curve	Hw	headwall
EW	each way	HWL	high water level
Exc	excavation	HWM	high water mark
Exist	existing	Hwy	highway
Exp	expansion	Hyd	hydrant
Expy	expressway		
Extn	extension	IB	iron bar
E _T	external distance of a spiralled curve	ID	inside diameter
		IF	iron fence or inside face
		Incl (ing) (sive)	include (ing)(sive)
		Inst	instrument
Fdn	foundation	Inv Elev	invert elevation
FF	front face	IP	iron pipe
FL	fence line		
Ftg	footing		
Fr	frame	Jt or J	joint

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2006

Rev 1

ABBREVIATIONS

GENERAL D-J



OPSD 100.011

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

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ABBREVIATIONS

GENERAL L-R



OPSD 100.012

S	rate of superelevation	UNO	unless noted otherwise
San	sanitary	Upass	underpass
SB	southbound	U/S	underside
SBEAT	steel beam energy attenuating terminal	Var	varies, variable
SBGR	steel beam guide rail	VC	vertical curve
SBL	southbound lane	VCP	vitrified clay pipe
SC	spiral to circular curve	Vert	vertical
SD	side ditch	Vol	volume
Sec (ary)	second (ary)		
Serv Rd	service road	W	water main
SF	stone fence	WB	westbound
Sh Rk	shot rock	WBL	westbound lane
SHLG, Sh or SH	shoulder	WF	wire fence
SP	special provision	WIF	wrought iron fence
Spec	specification	WL	water level
SQ	square	WMF	wire mesh fence
SR	side road	W/O	water out
ST	spiral to tangent or short tangent or storm sewer	WP	work project
St	stripping	WT	water table
Sta	station	WW	wing wall
Std	standard	WWF	welded wire fabric
Stm	storm	WWR	welded wire reinforcement
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		

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ABBREVIATIONS

GENERAL S-W

OPSD 100.013

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. 2- If description involves only one building, this group is omitted.	A number of designating the number of storeys of the building. 1 1/2 2 If description of building involves only one storey, this group is omitted.	Letter preceding the name-of-building group. Br brick C concrete CB concrete block F insulbrick F metal clad Fr frame M metal S stone St stucco Or combination of letters as a group, e.g., Br&St Brick & Stucco Br&S Brick & Stone. All descriptions shall contain this group.	Letter that designates the name of the building. 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 Or combination of letters as a group, e.g., SS&R Service Station and Restaurant. All descriptions shall contain this group.	The letter B after name-of-building group denotes basement. If no letter appears after the name, the building has no basement.	All descriptions shall contain a name-of-building group. As a general rule, if there is ambiguity in the description, then the full abbreviated or long form description shall be written out. Examples: Arena Building Church Fire Hall Hotel Library Motel Rec Hall School

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ABBREVIATIONS **BUILDING DESCRIPTIONS**

OPSD 100.050



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

SUSCEPTIBILITY TO FROST HEAVING

HSFH - High
MSFH - Medium
LSFH - Low

ONTARIO PROVINCIAL STANDARD DRAWING

ABBREVIATIONS

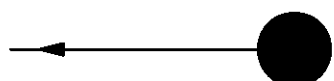
GEOTECHNICAL

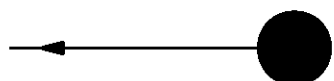
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OPSD 100.060

■ 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

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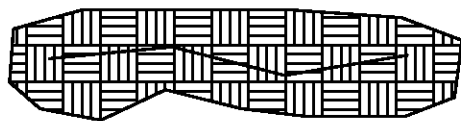
TOPOGRAPHY PLAN FEATURES
 MONUMENT FEATURES



OPSD 101.010



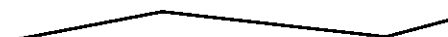
top of rock cut
hachure for rock/earth cut/fill
bottom of rock cut



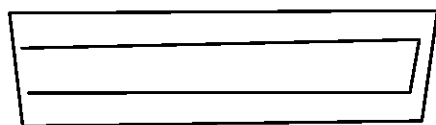
rock outline & string
of rock outcrop, Note 1



asphalt outline &
asphalt string, Note 1



bank of river, Note 1



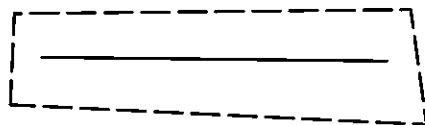
concrete outline &
concrete string, Note 1

+ DS

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.

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TOPOGRAPHY PLAN FEATURES

GROUND FEATURES



OPSD 101.011

	asphalt edge
	bridge deck
	crown of road
	curb
	edge of gutter
	driving line, lane edge, Note 1
	edge of pavement
	edge of shoulder
	gravel entrance
	paved entrance
	ripple strip
	paved sideroad
	unpaved sideroad
 CC&G	concrete curb with gutter

NOTE:

1 These items are not normally plotted.

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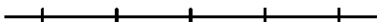
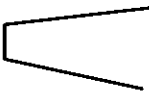
TOPOGRAPHY PLAN FEATURES

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.

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TOPOGRAPHY PLAN FEATURES

BARRIER AND VEGETATION FEATURES



OPSD 101.013

✓ AN

anchor for pole



hydro tower outline

● GM

gas meter

● GV

gas valve

● WM

water meter

● WV

water valve

● B

Bell pole

● B&H

Bell & hydro pole

● FH

fire hydrant

● H

hydro pole

● LS

light standard

● PO

pole other



pole well (crib)

■ TB

terminal box

● TS

traffic signal pole

● 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



OPSD 101.014



CB

catch basin, center



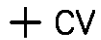
DI

ditch inlet, centre of grate



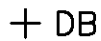
MH

maintenance hole



CV

culvert invert elevation, Note 1



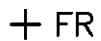
DB

ditch inlet bottom of opening, Note 1



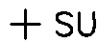
DT

ditch inlet top of opening, Note 1



FR

frustum elevation, Note 1



SU

sump elevation, Note 1



high water mark



culvert



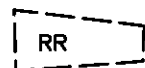
bottom of ditch with flow



drainage centerline



edge of water



rip-rap outline



swamp or muskeg



storm sewer



sanitary sewer

NOTE:

1 These items are not normally plotted.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2006

Rev 1

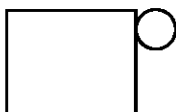
TOPOGRAPHY PLAN FEATURES

DRAINAGE FEATURES



OPSD 101.015

● CBP concrete bridge pillar



building, silo

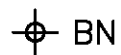


grid north orientation

• DD deck drain



Com S commercial sign



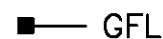
BN bullnose, Note 1



BO borehole



EV miscellaneous elevation, Note 1



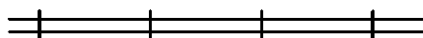
GFL gate with flashing light



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

N 4 750 000

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

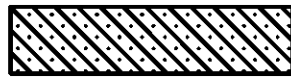
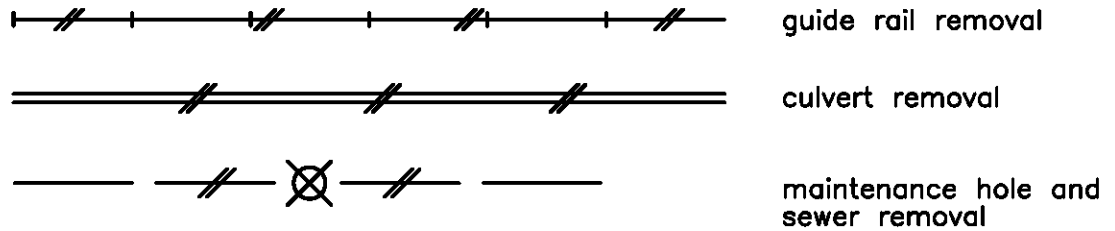
RIGHT-OF-WAY FEATURES



OPSD 101.017

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

Examples:



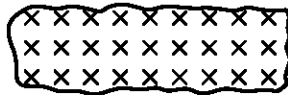
concrete pavement with bituminous surface to be removed



bituminous pavement to be removed



concrete pavement to be removed



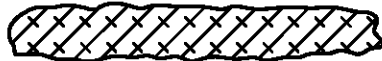
area to be close cut cleared



area to be cleared



area to be grubbed



area to be cleared and grubbed

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2006

Rev 1

REMOVALS

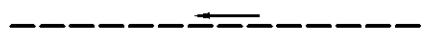
LEGEND

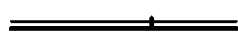


OPSD 102.010

 NUMBER	MH	existing	maintenance hole	 NUMBER	MH	new
 NUMBER	CB	existing	catch basin	 NUMBER	CB	new

 TICB, TIMH, TDICB, TDMH twin inlet catch basin or maintenance hole, twin ditch, inlet catch basin or maintenance hole

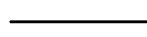
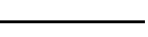
 sub-drain, flow indicated

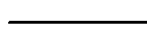
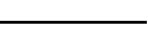
 or  curb, gutter, or curb with gutter transition

 drop curb


OR
 gutter outlet 90 °


OR
 gutter outlet 45 °

 ST  storm sewer

 SAN  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

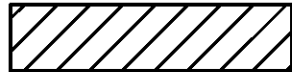
LEGEND 1



OPSD 103.010



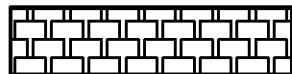
backfill



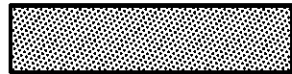
gore area



rip rap



gabions



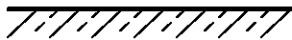
pavement



miscellaneous paving



concrete section



earth section



rock section



rock shatter



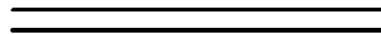
paved shoulder



pier

'x'm RSS-RW or 'x'm CIP-RW

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

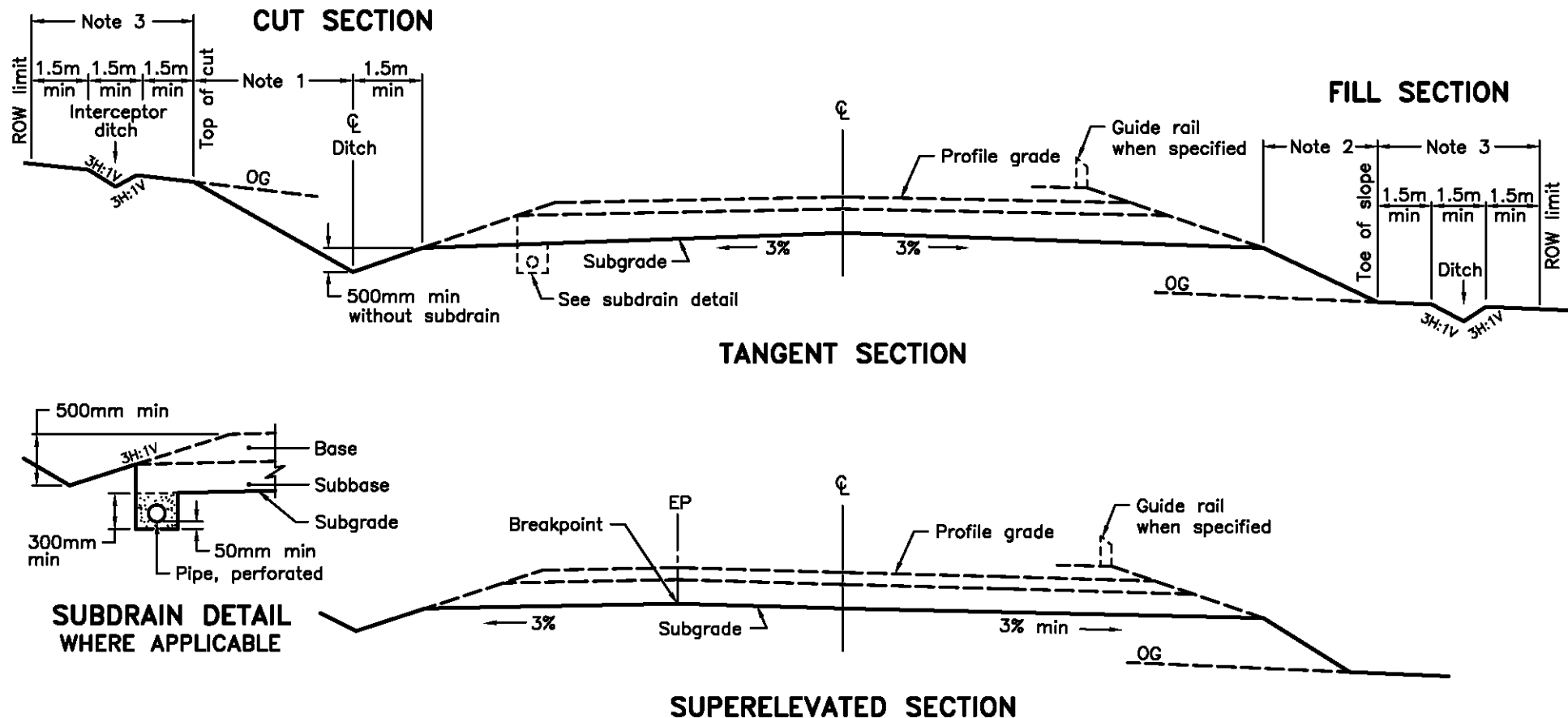
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2007 Rev 0

MISCELLANEOUS SYMBOLS

OPSD 104.010





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

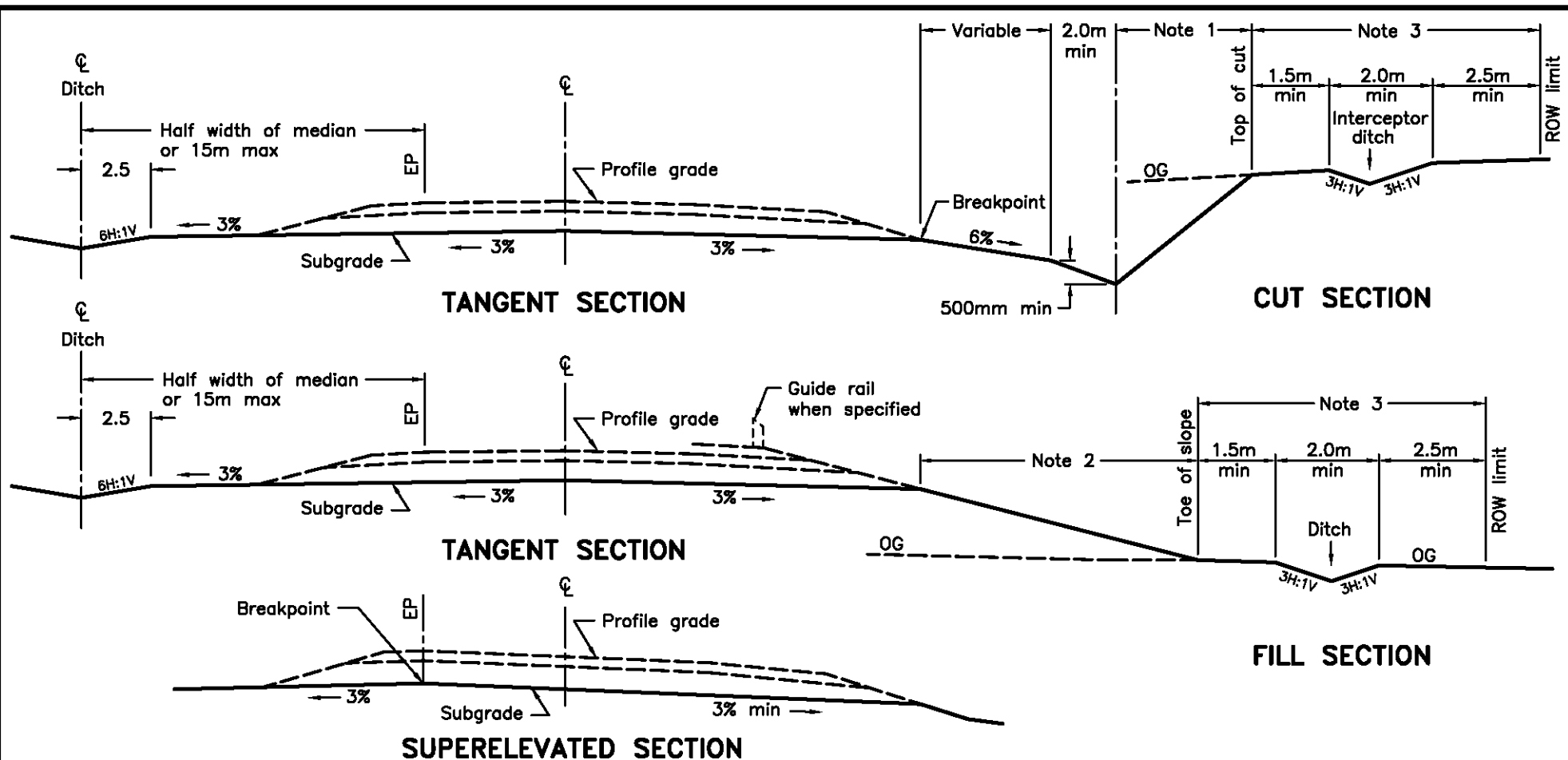
Rev 2

EARTH/SHALE GRADING

UNDIVIDED RURAL

OPSD 200.010





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			

TANGENT SECTION

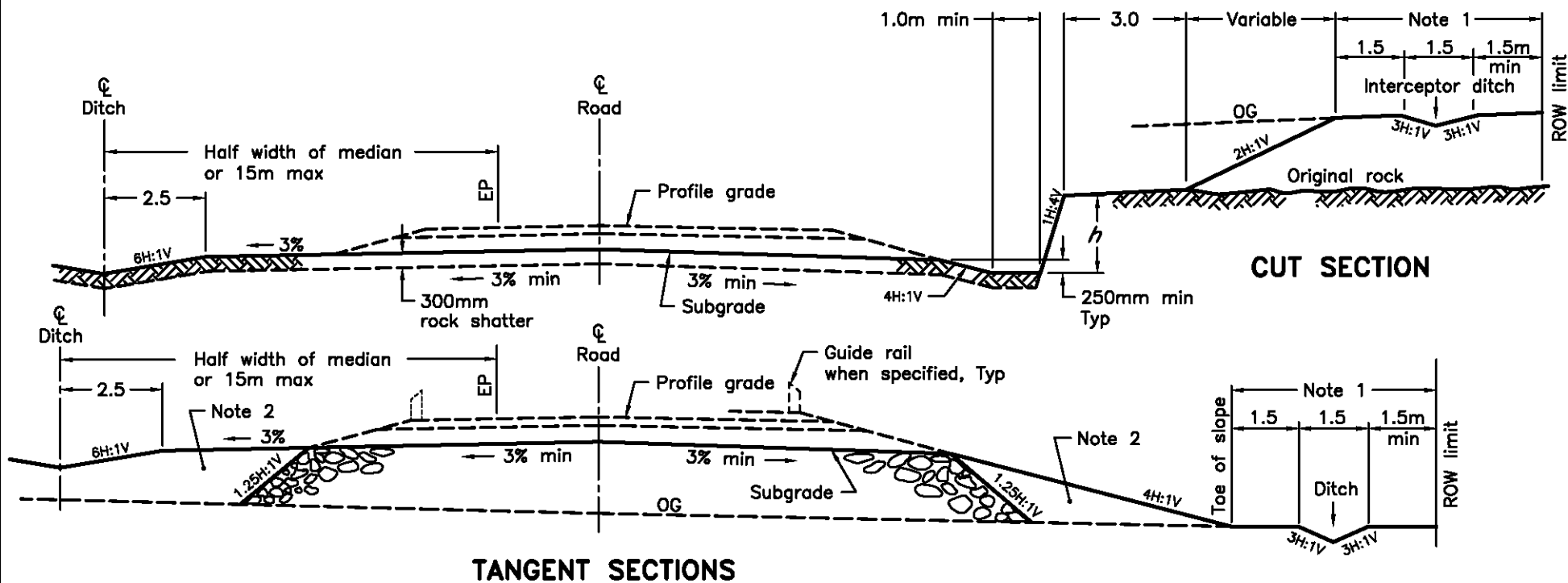
SUPERELEVATED SECTION

- 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.

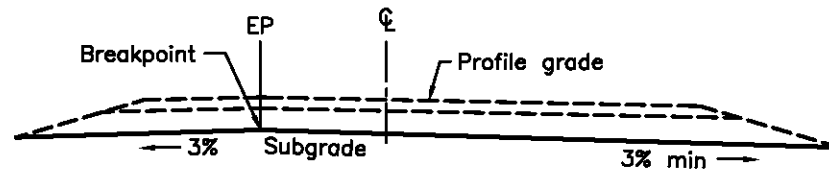
A Shale shall be treated according to earth grading standards.
B This OPSP to be read in conjunction with OPSP 202.010 and
OPSP 202.020.
C All dimensions are in metres unless otherwise shown.

h – Height of rock face

ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2009	Rev	2	
ROCK GRADING UNDIVIDED RURAL					
		OPSD 201.010			



TANGENT SECTIONS



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

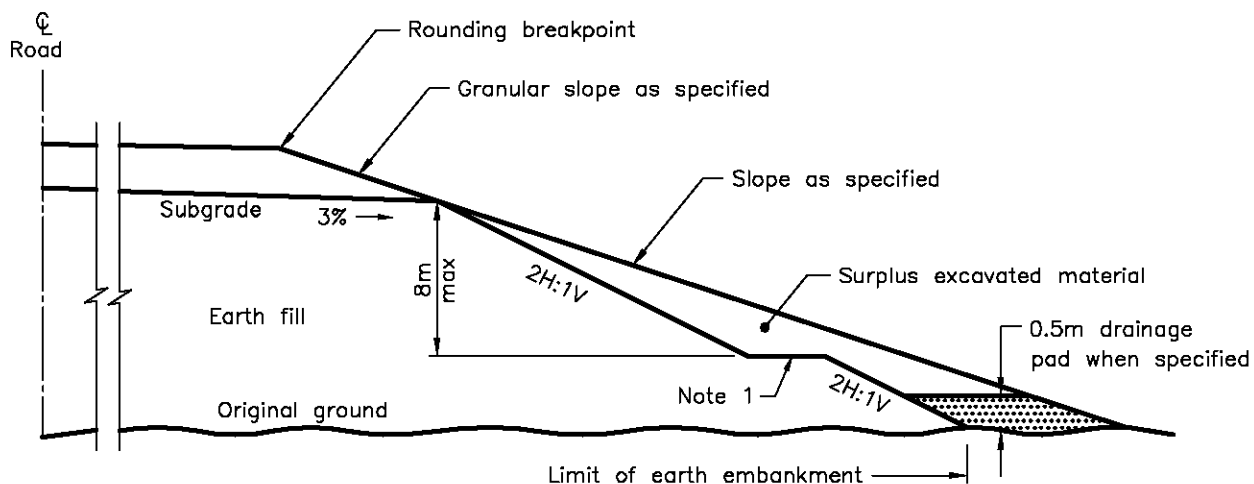
ONTARIO PROVINCIAL STANDARD DRAWING

ROCK GRADING
DIVIDED RURAL

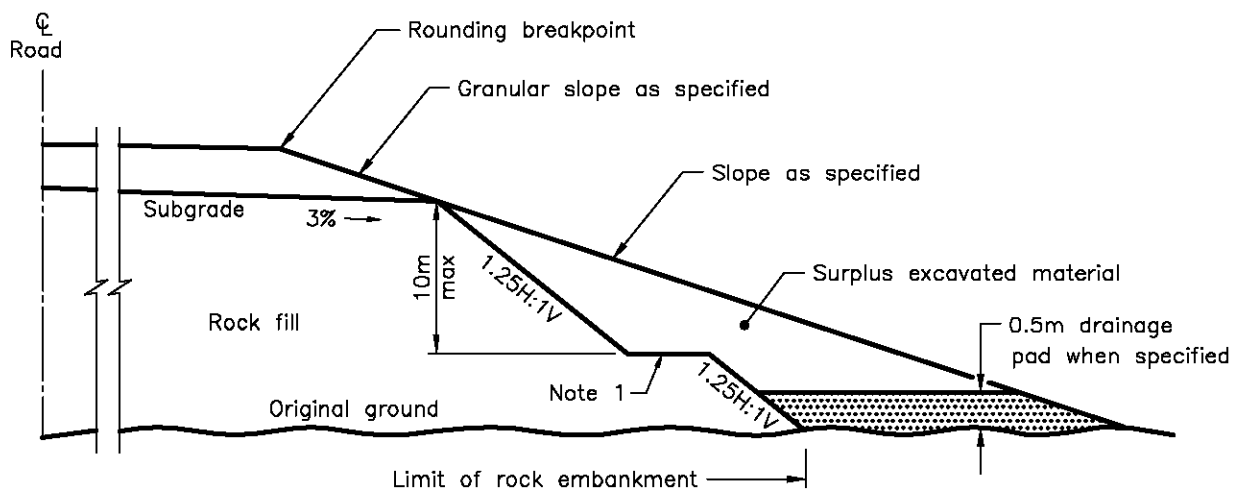
Nov 2009 Rev 2

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

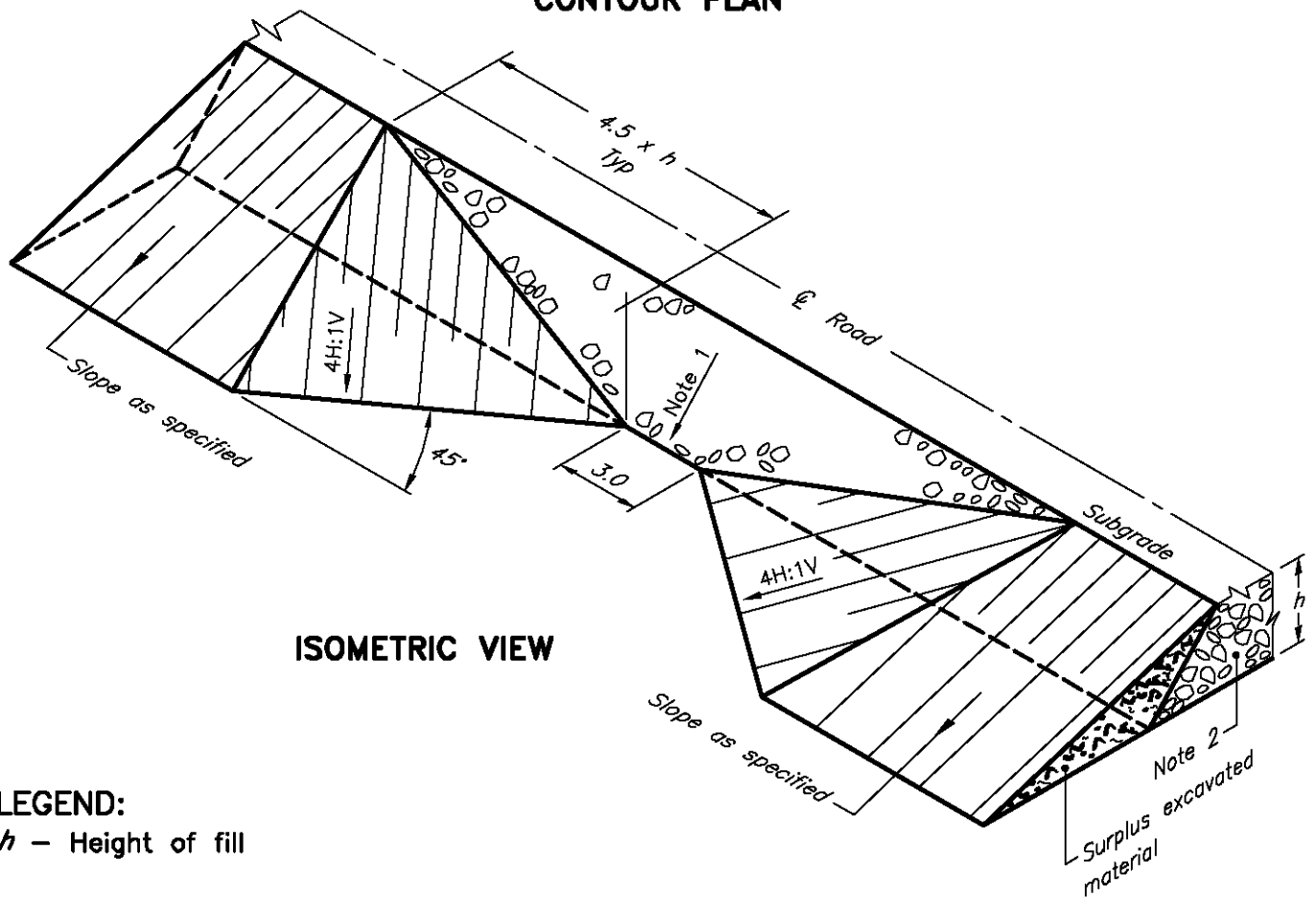
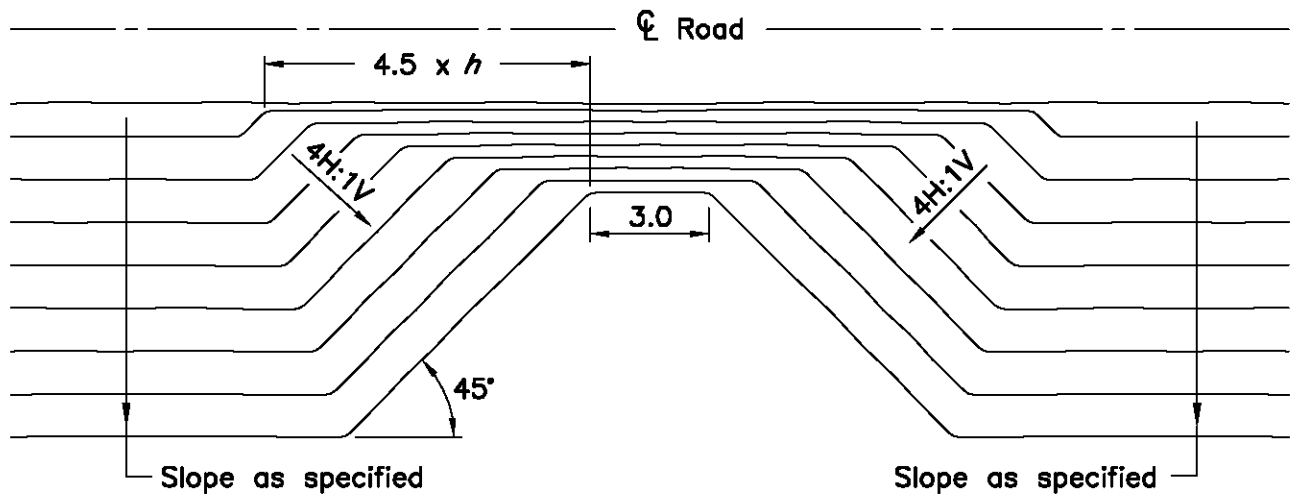
Nov 2016

Rev 3

**SLOPE FLATTENING
USING SURPLUS EXCAVATED MATERIAL
ON EARTH OR ROCK EMBANKMENT**



OPSD 202.010



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.

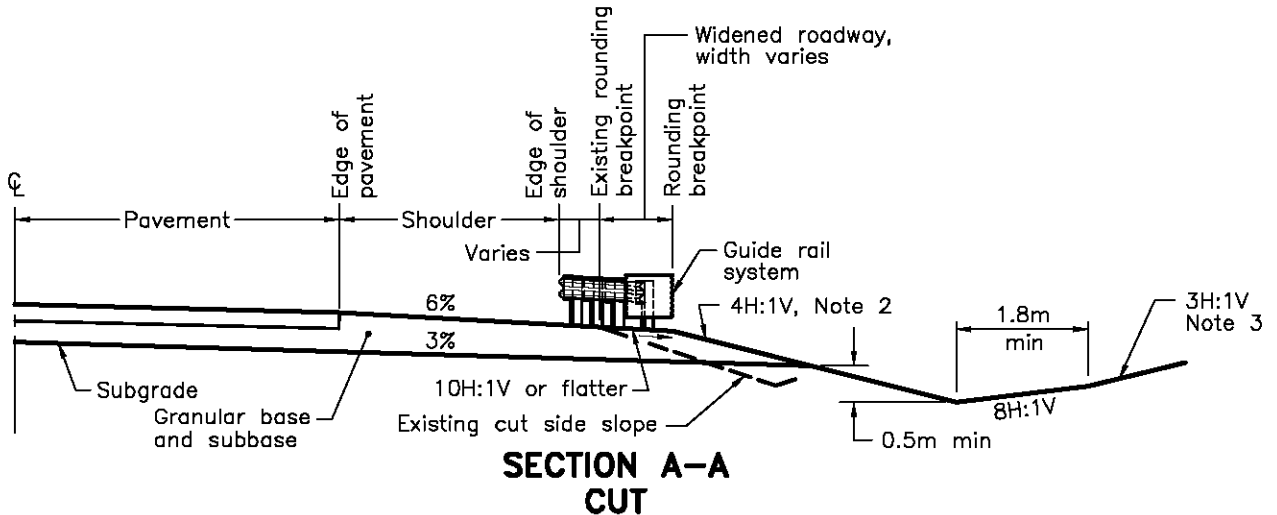
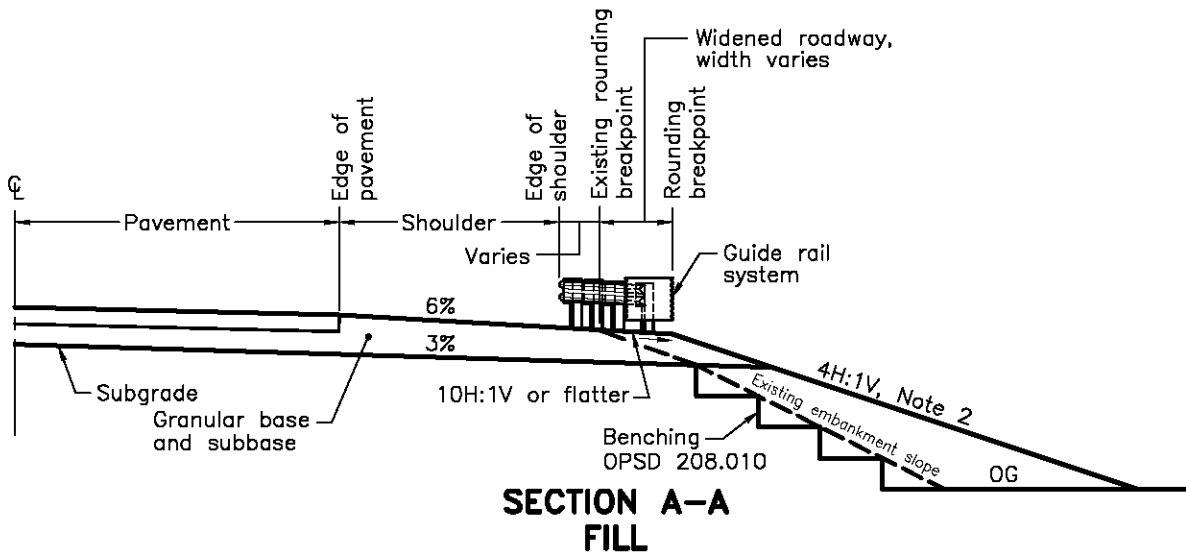
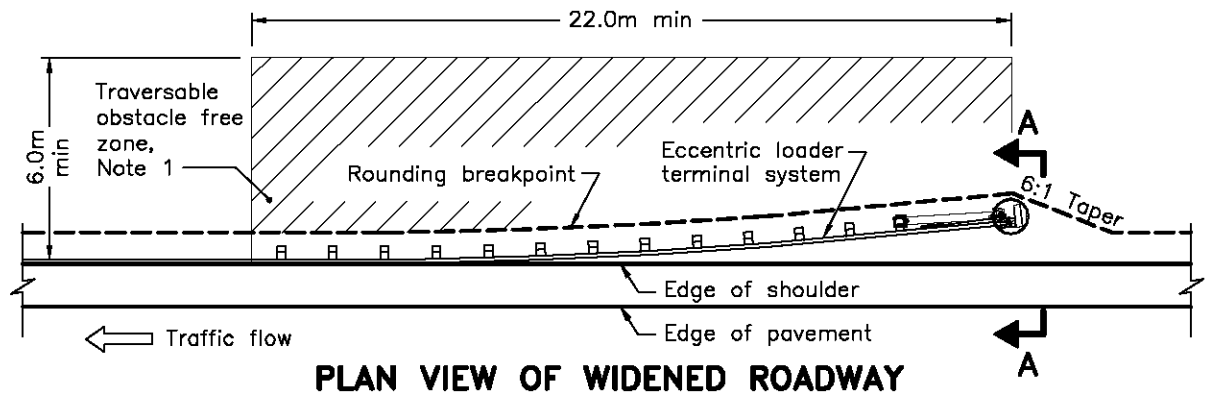
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 Rev 3

**DRAINAGE GAP
FOR SLOPE FLATTENING
ON ROCK OR GRANULAR EMBANKMENT**



OPSD 202.020



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 All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

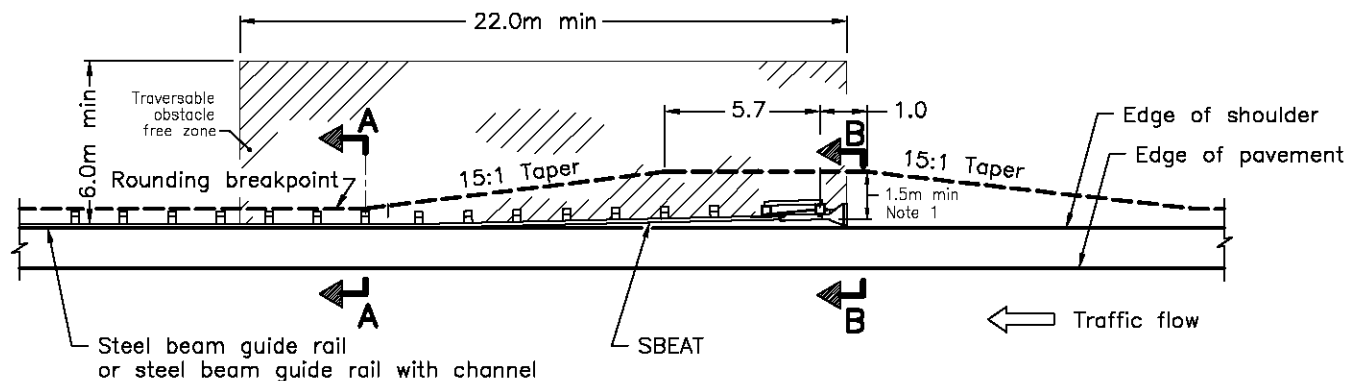
Nov 2016

Rev 6

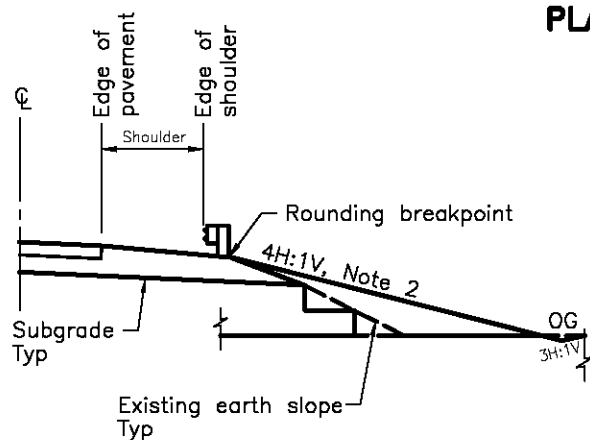
ROADWAY WIDENING
FOR ECCENTRIC LOADER TERMINAL
SYSTEM

OPSD 202.030

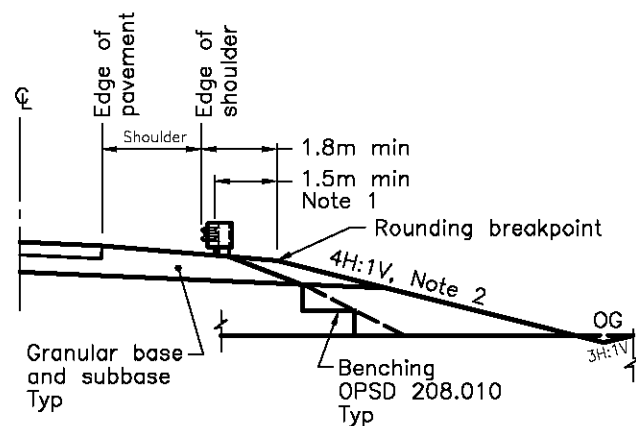




PLAN

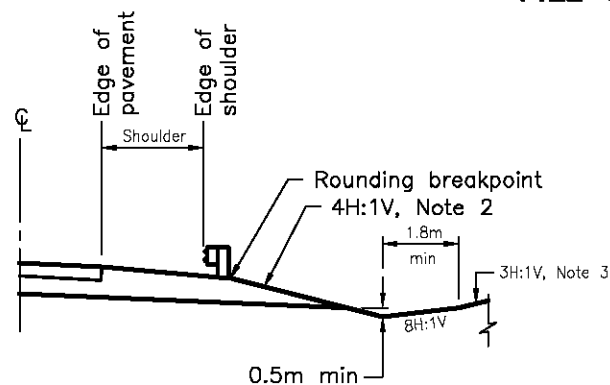


SECTION A-A

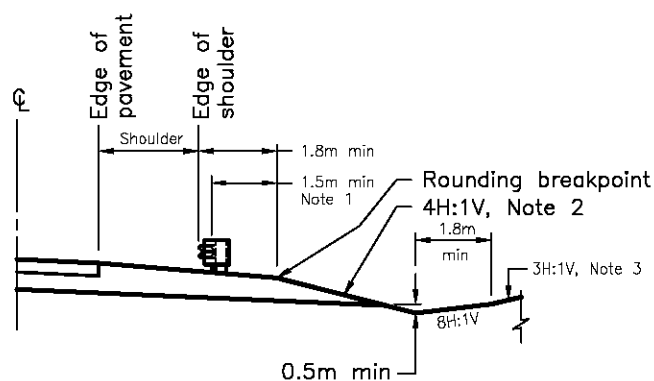


SECTION B-B

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 All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

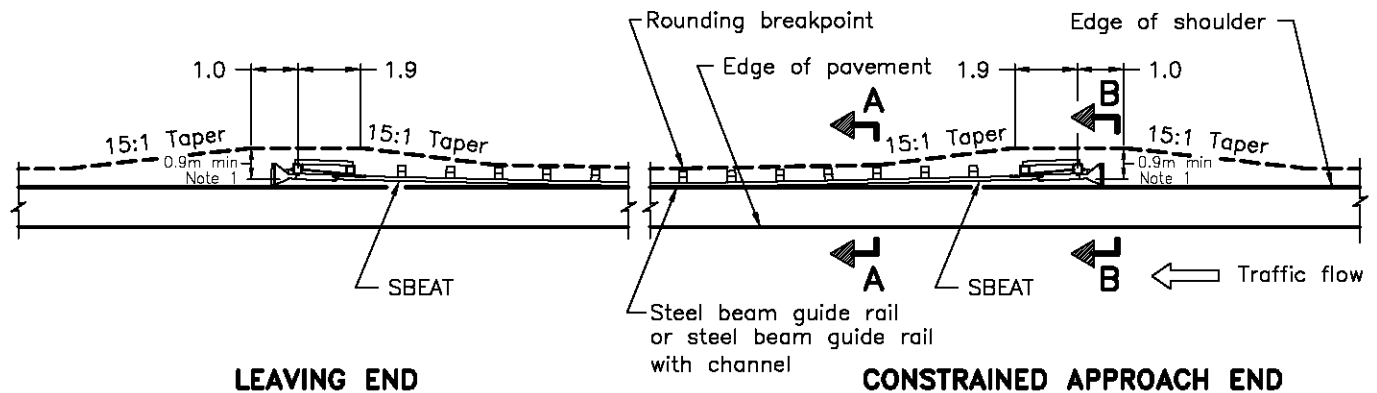
Nov 2016

Rev 1

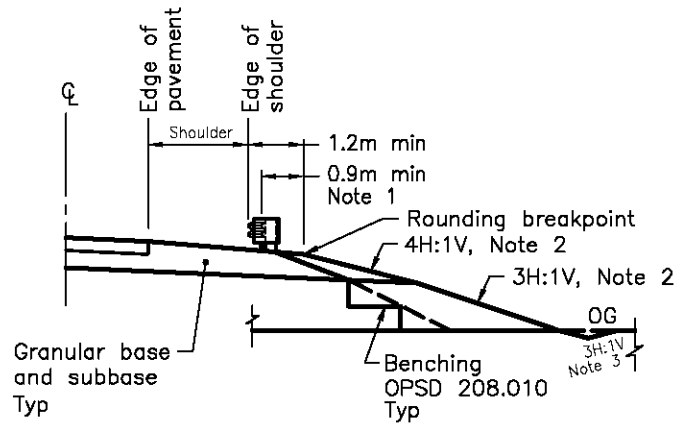
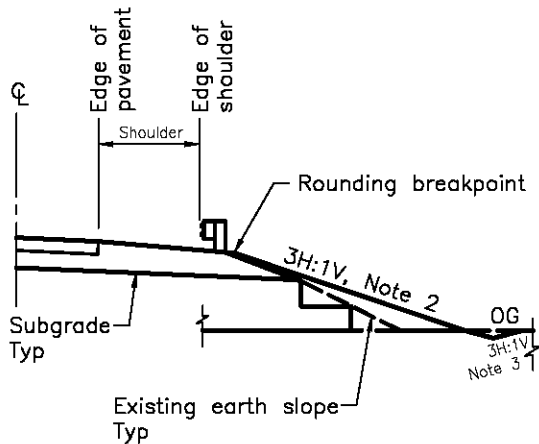
**ROADWAY WIDENING FOR
STEEL BEAM ENERGY ATTENUATING TERMINAL
APPROACH END**



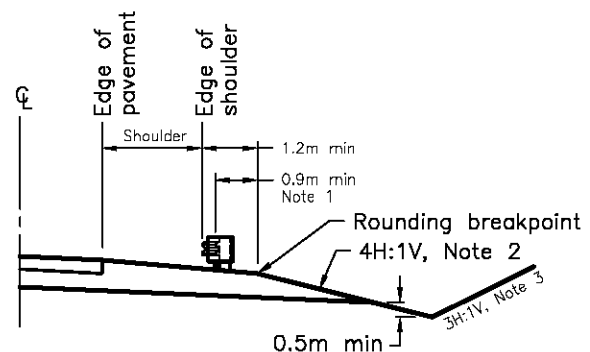
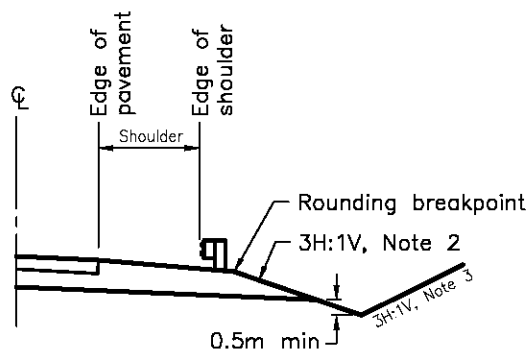
OPSD 202.031



PLAN



FILL SECTION



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 All dimensions are in metres unless otherwise shown.

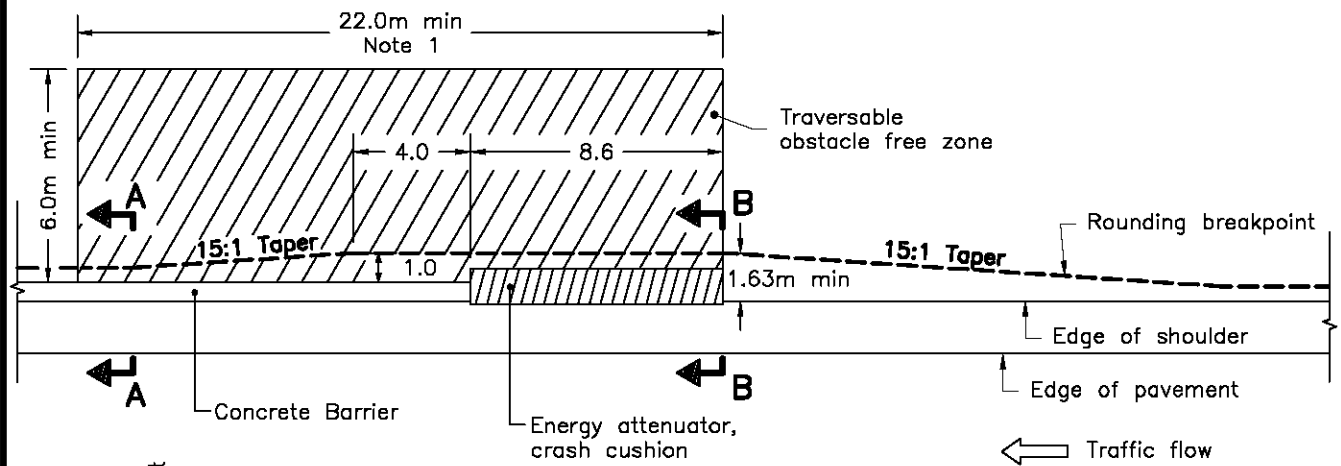
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2016 Rev 2

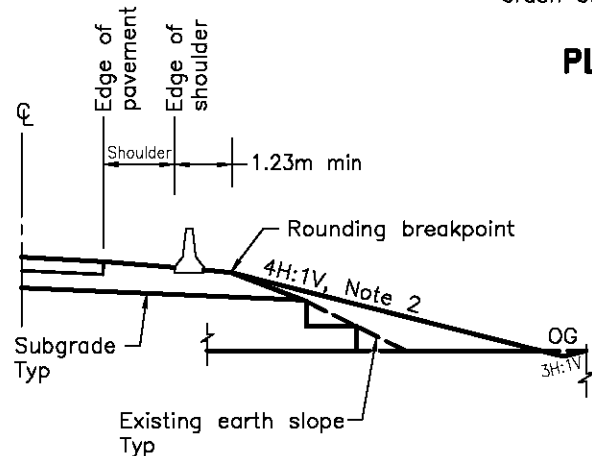
**ROADWAY WIDENING FOR
STEEL BEAM ENERGY ATTENUATING TERMINAL
LEAVING END AND
CONSTRAINED APPROACH END**



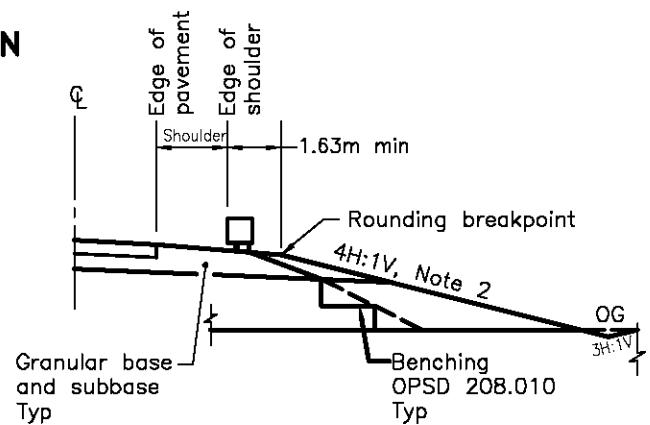
OPSD 202.032



PLAN

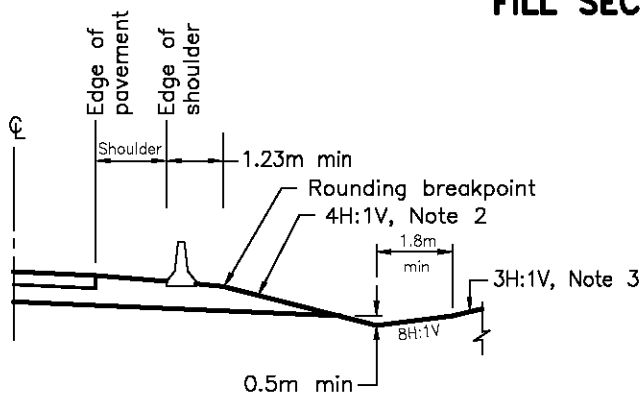


SECTION A-A

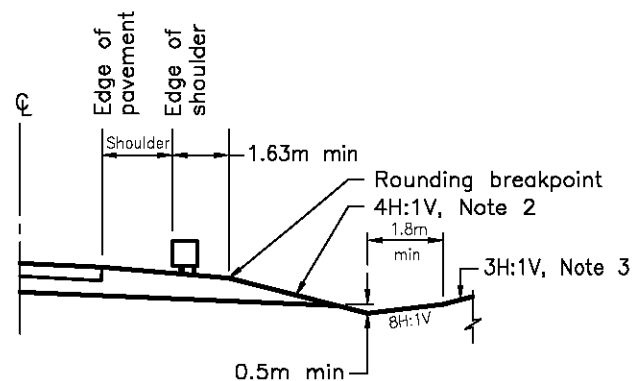


SECTION B-B

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

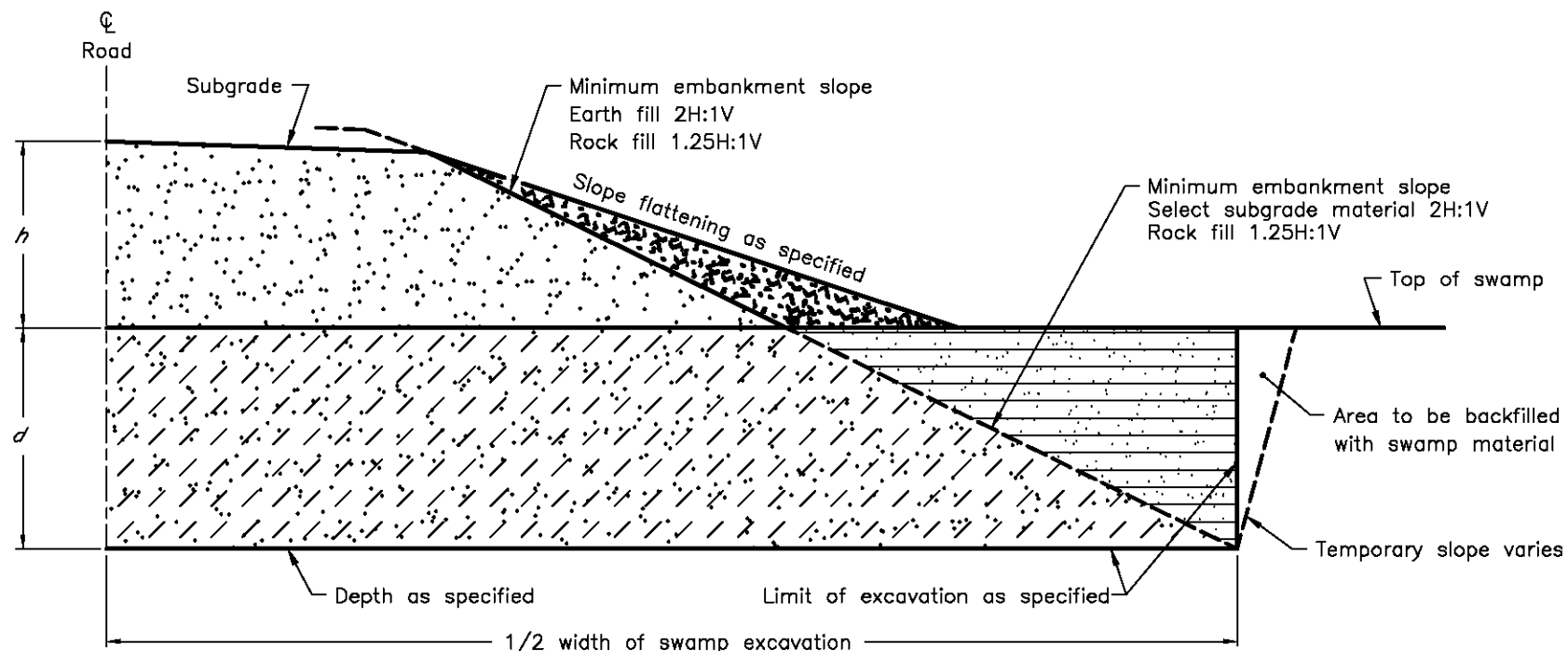
Nov 2016

Rev 1

**ROADWAY WIDENING
SINGLE SIDED ENERGY ATTENUATING TERMINALS
APPROACH END**

OPSD 202.033

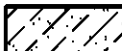
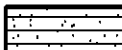




NOTES:

- A For this OPSD, $h \leq 4.5\text{m}$ and $d \leq 6.0\text{m}$.
- 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 $< 10\text{m}$, excavate swamp material full width.
- D For divided roads with median $\geq 10\text{m}$, 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

Nov 2010

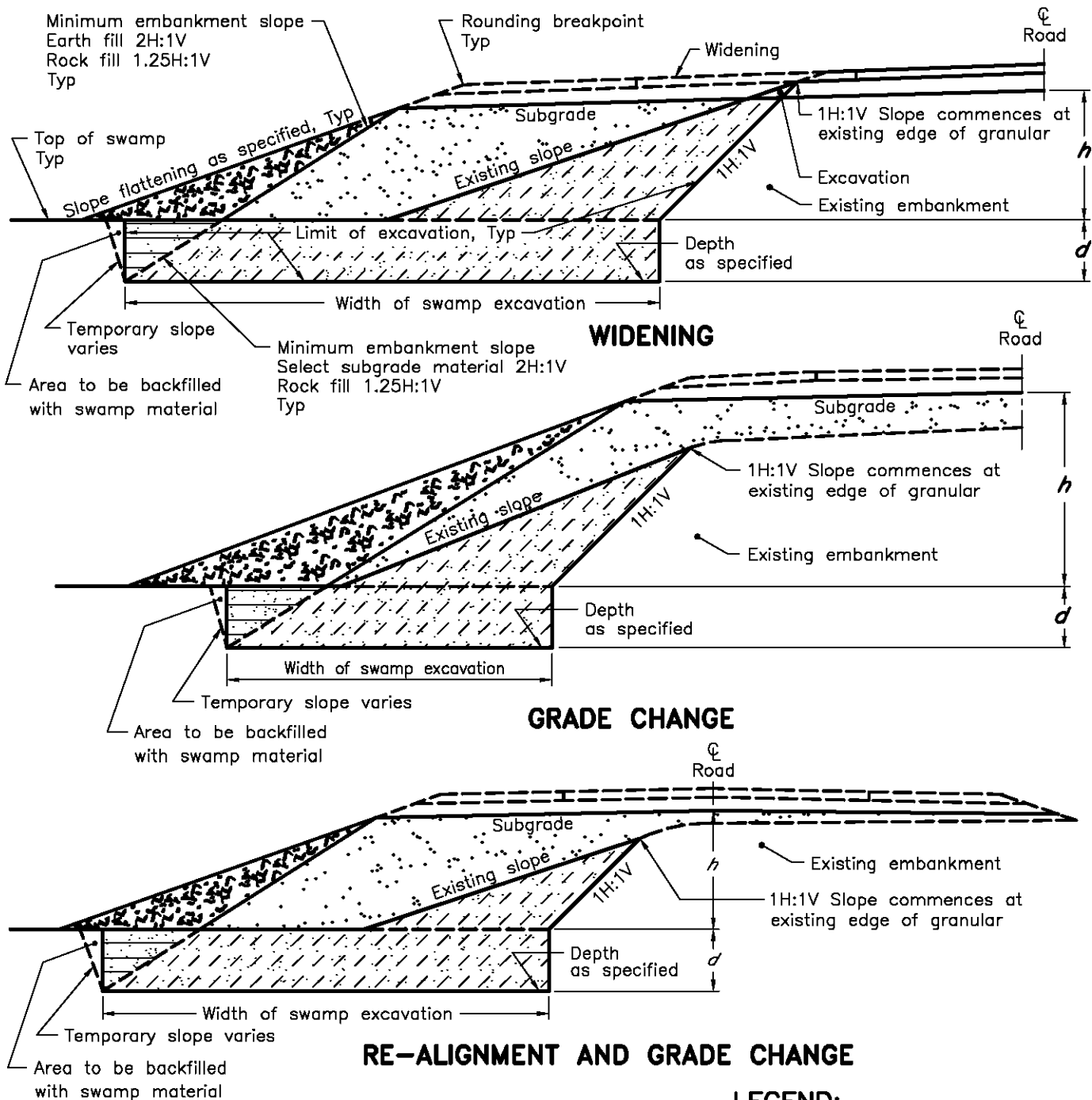
Rev 3

EMBANKMENTS OVER SWAMP

NEW CONSTRUCTION

OPSD 203.010





NOTES:

- A For this OPSD, $h \leq 4.5\text{m}$ and $d \leq 6.0\text{m}$.
- 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.

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

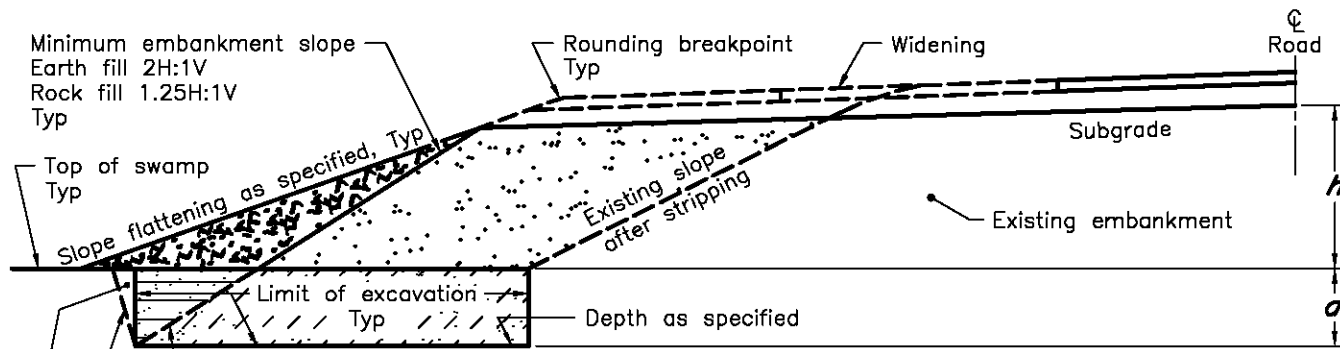
Nov 2010 Rev 3

EMBANKMENTS OVER SWAMP

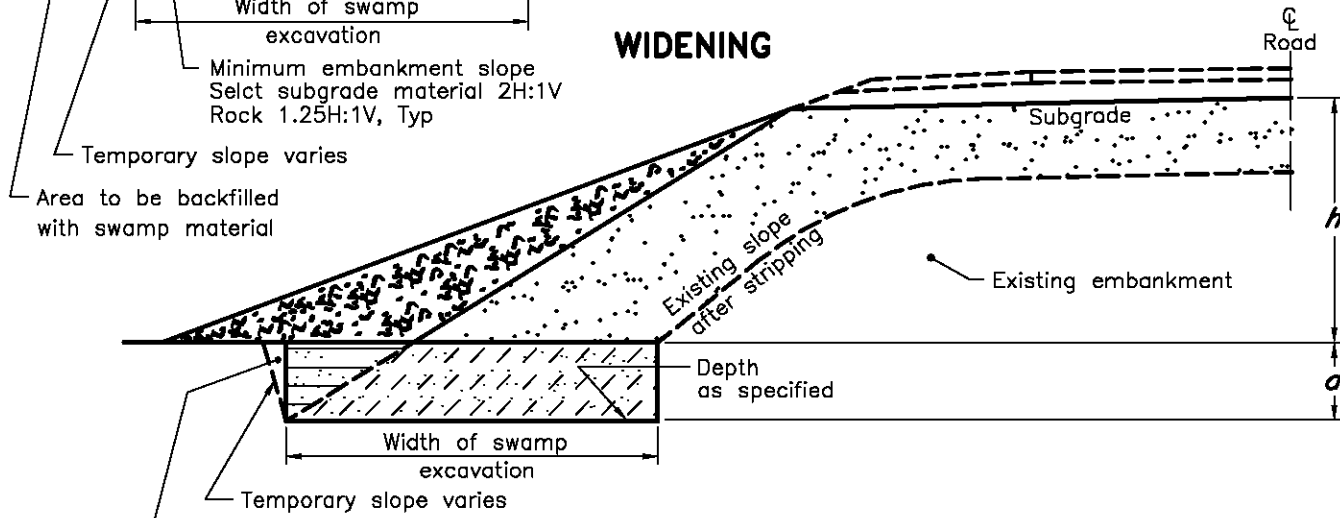
EXISTING SLOPE EXCAVATED TO 1H:1V



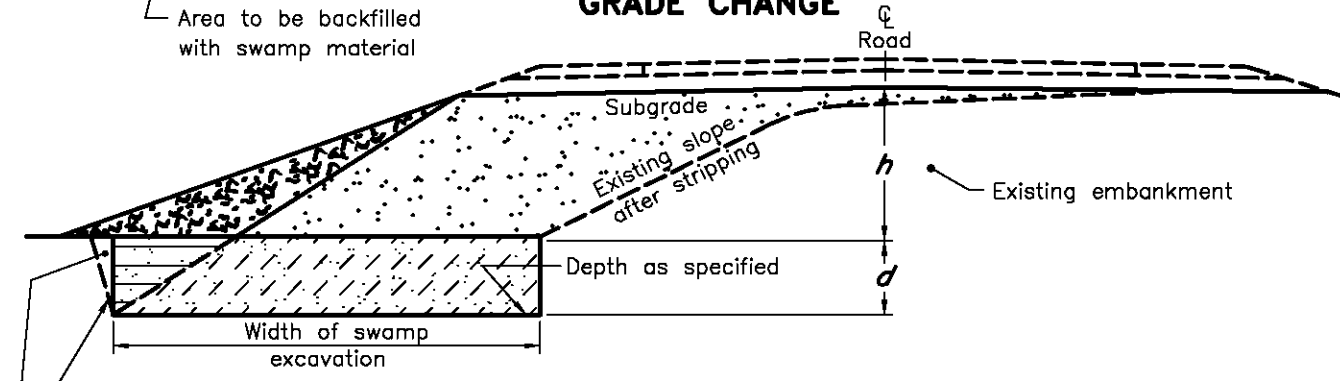
OPSD 203.020



WIDENING



GRADE CHANGE



RE-ALIGNMENT AND GRADE CHANGE

Area to be backfilled with swamp material

NOTES:

- A For this OPSD, $h \leq 4.5\text{m}$ and $d \leq 6.0\text{m}$.
- 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

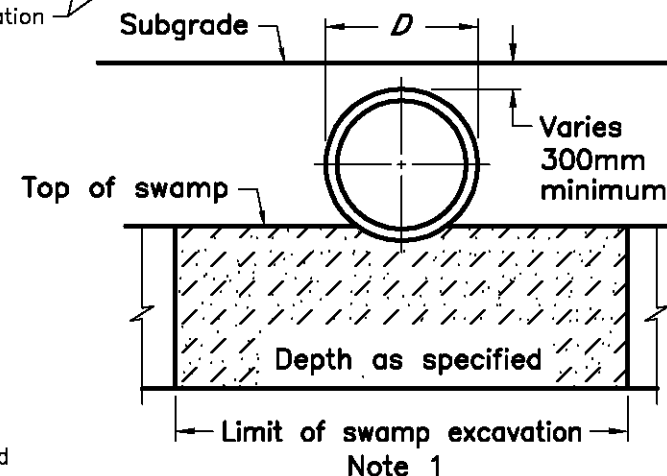
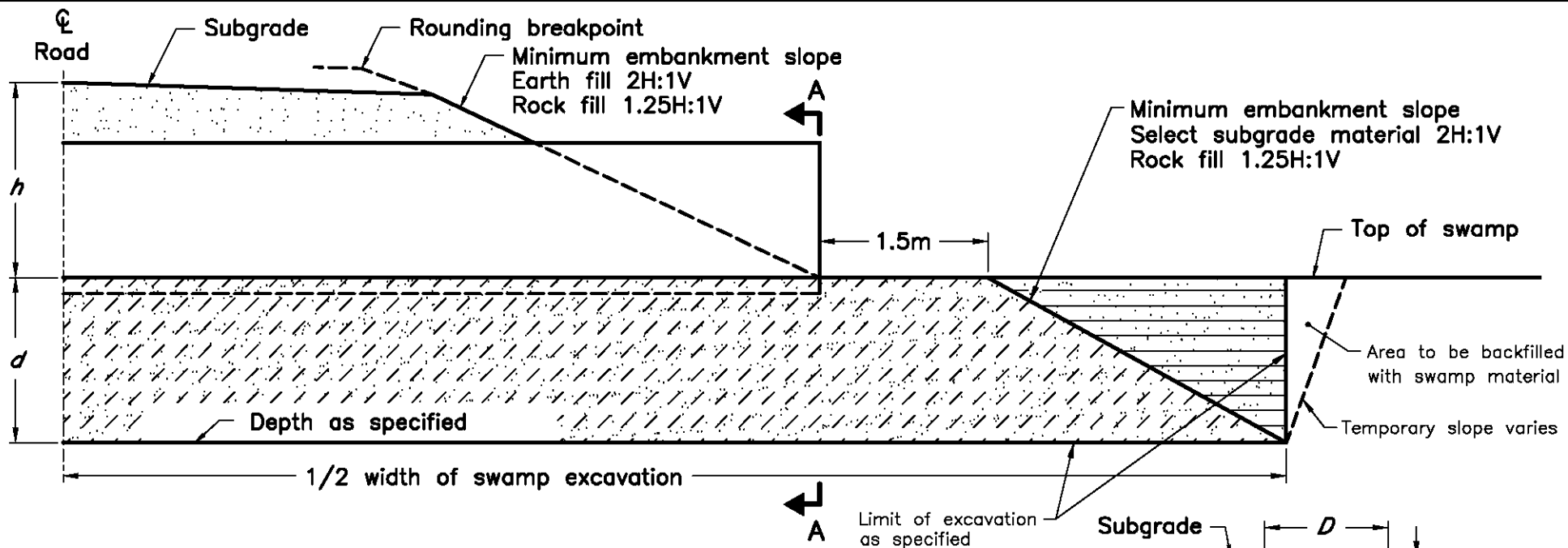
Nov 2010 Rev 3

EMBANKMENTS OVER SWAMP

EXISTING SLOPES MAINTAINED



OPSD 203.030



NOTES:

1 Width of excavation shall be $D + 1.0\text{m}$ for pipes $\leq 1000\text{mm}$ in diameter and $2D$ for pipes $> 1000\text{mm}$ in diameter.

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

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

SECTION A-A

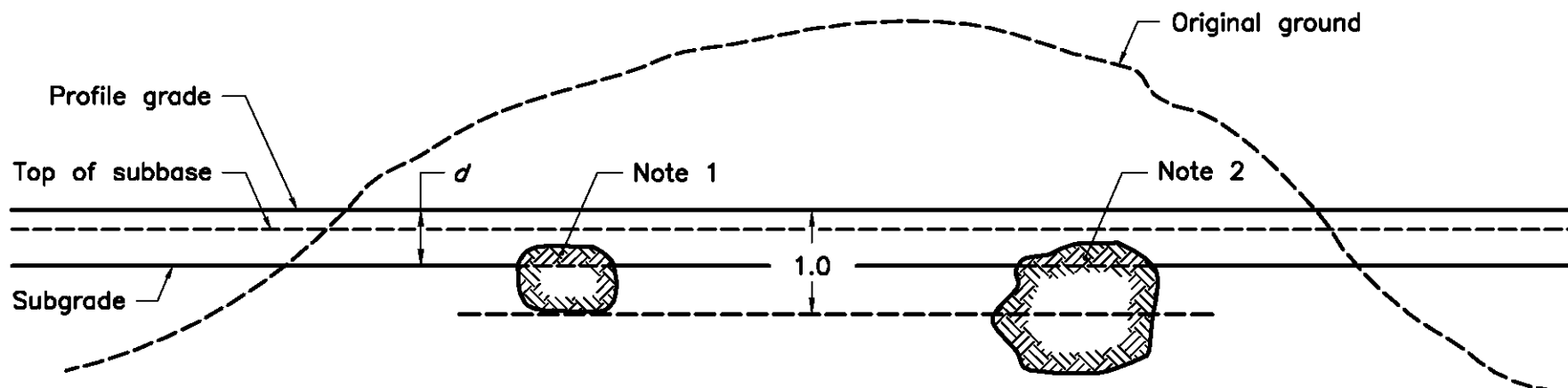
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010 Rev 3

EMBANKMENTS OVER SWAMP
AT PIPE CULVERTS $\leq 1500\text{mm}$

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

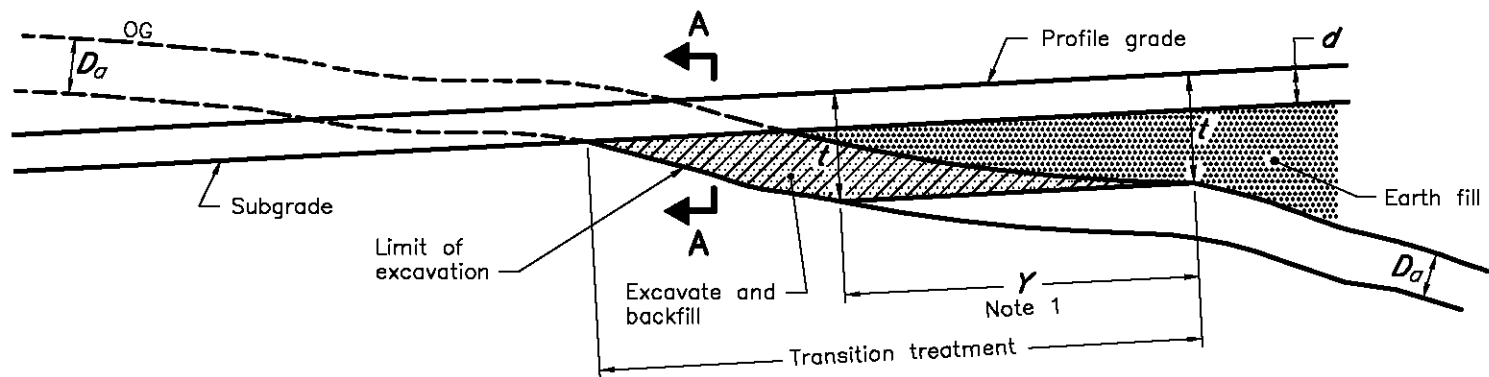
BOULDER TREATMENT CUT SECTIONS-SUBGRADE

Nov 2015

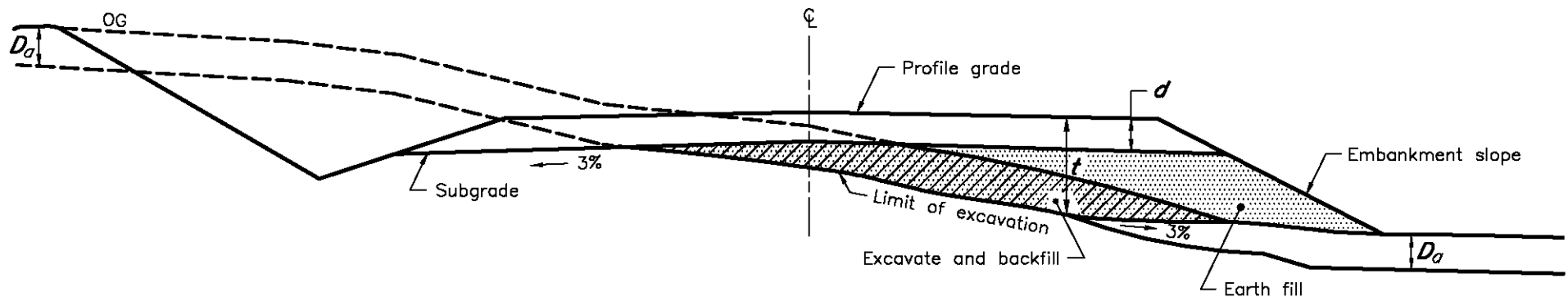
Rev 3



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

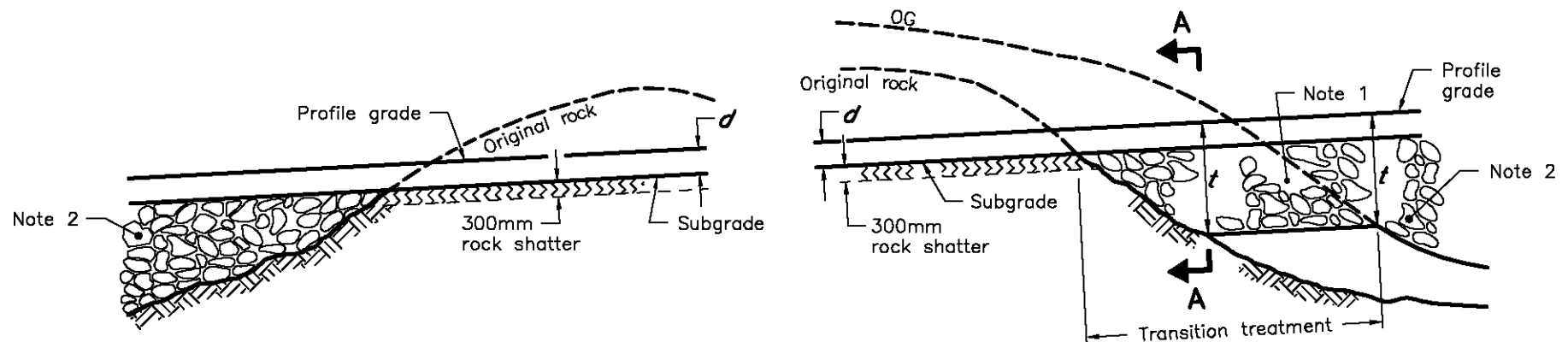
ONTARIO PROVINCIAL STANDARD DRAWING

TRANSITION TREATMENT
 EARTH CUT TO EARTH FILL

Nov 2016 Rev 3



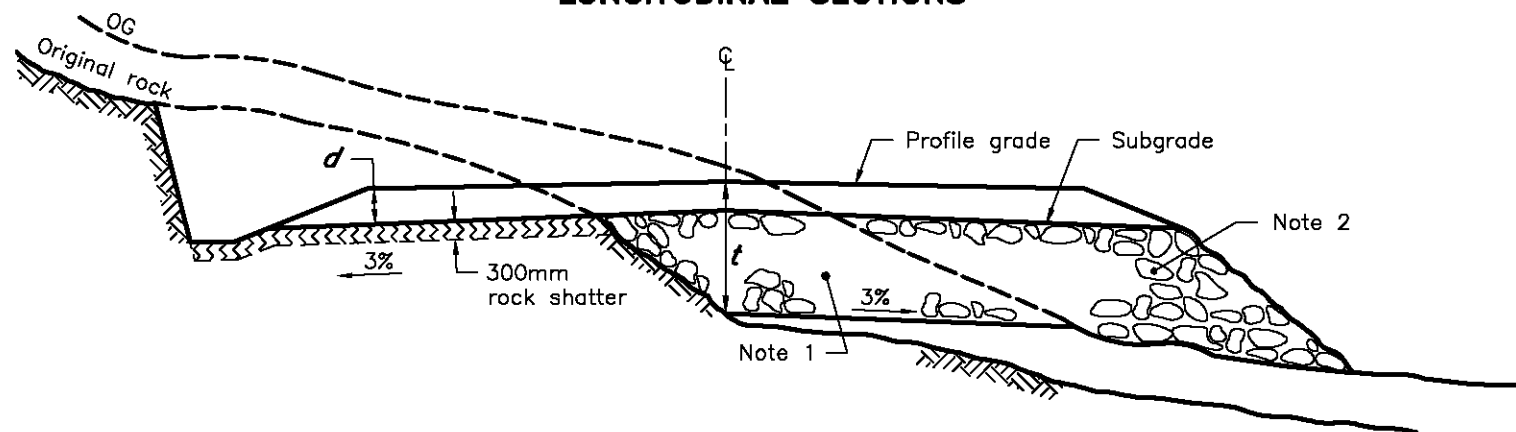
OPSD 205.010



WITHOUT OVERBURDEN

LONGITUDINAL SECTIONS

WITH OVERBURDEN



TRANSVERSE SECTION A-A

NOTES:

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

LEGEND:

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

ONTARIO PROVINCIAL STANDARD DRAWING

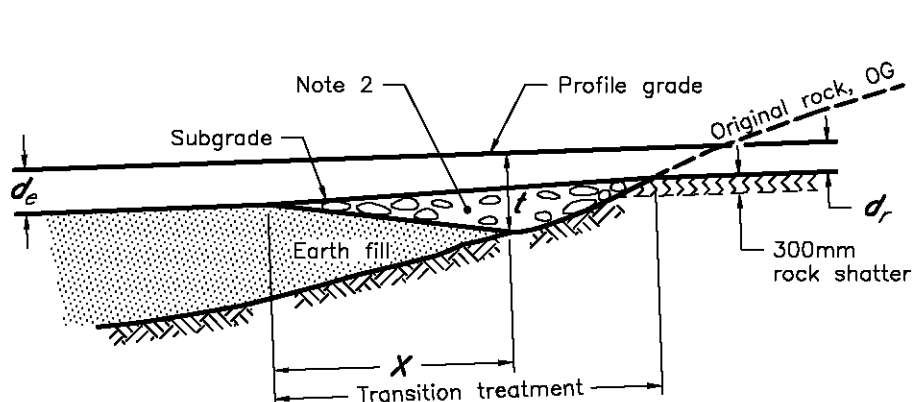
Nov 2016 Rev 3

TRANSITION TREATMENT

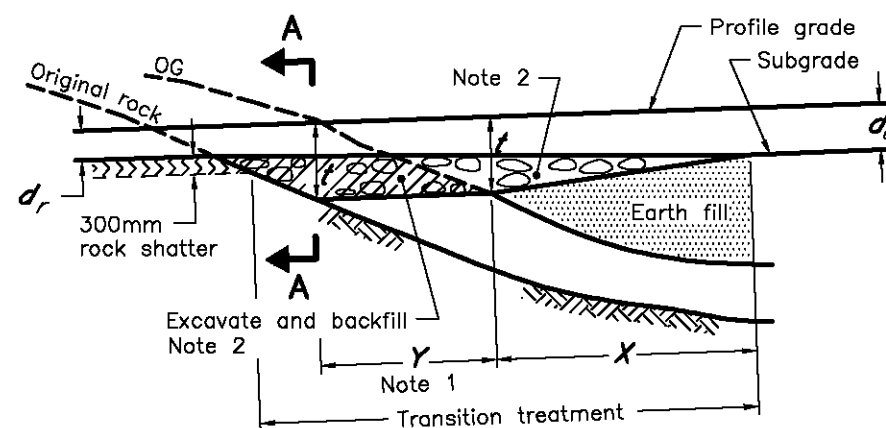
ROCK CUT TO ROCK FILL



OPSD 205.020

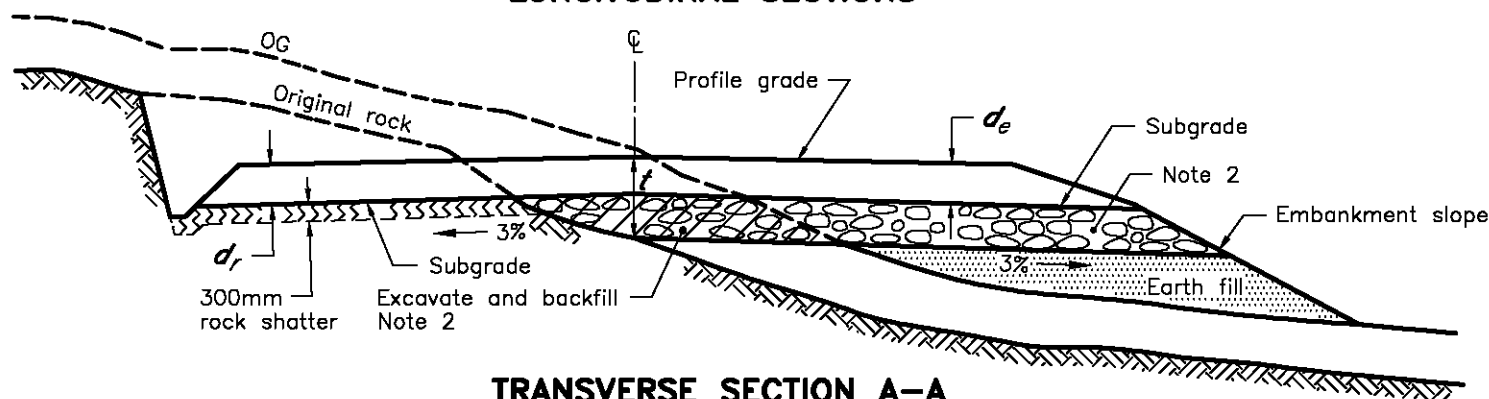


WITHOUT OVERBURDEN



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 metres 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

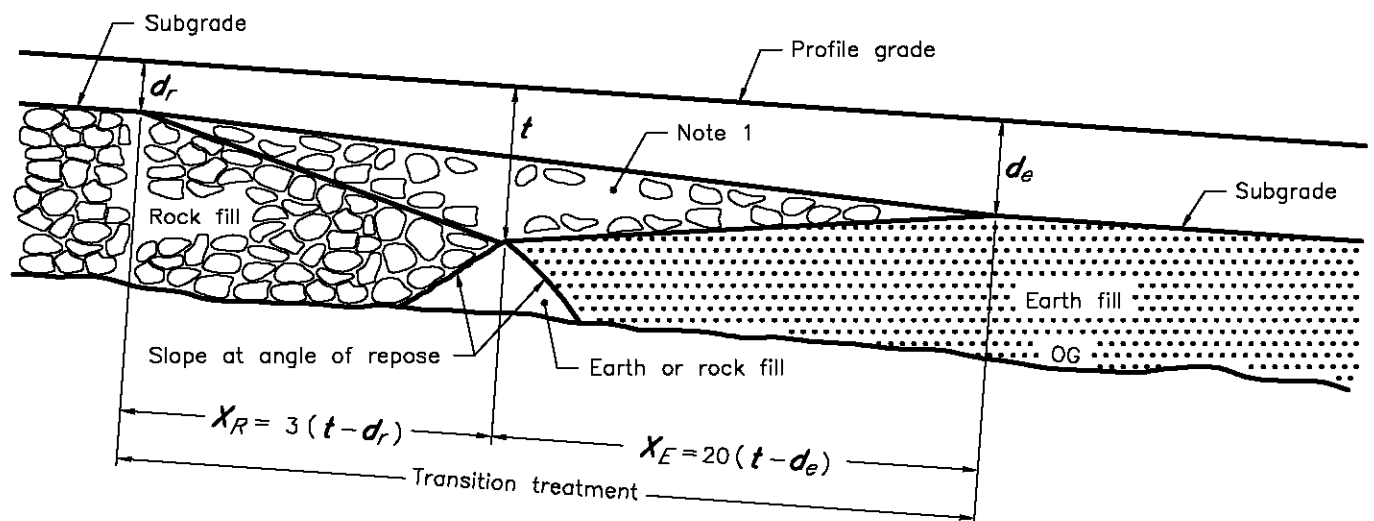
ROCK CUT TO EARTH FILL

Nov 2016

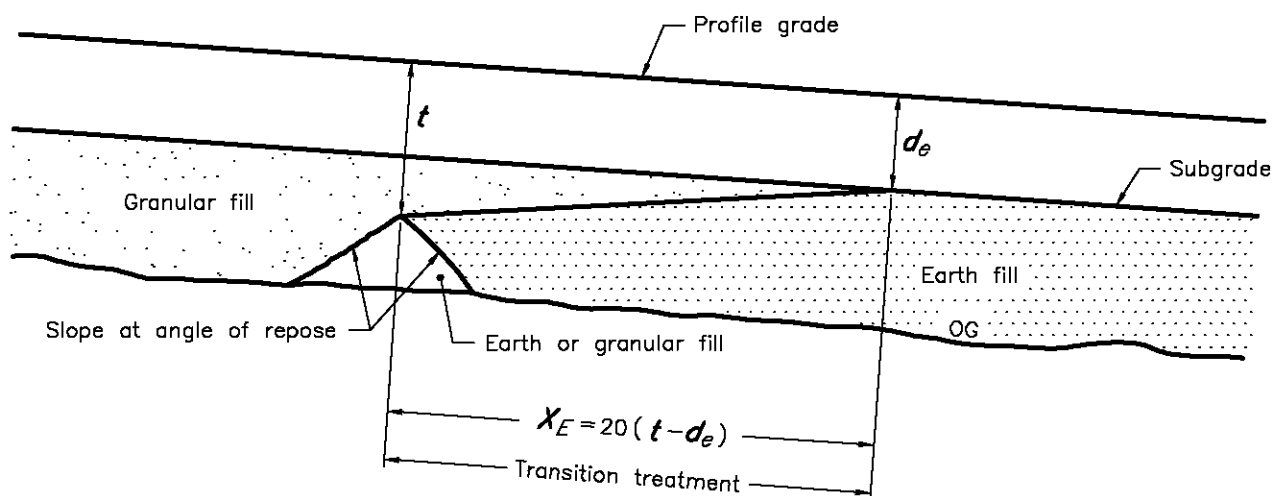
Rev 3



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

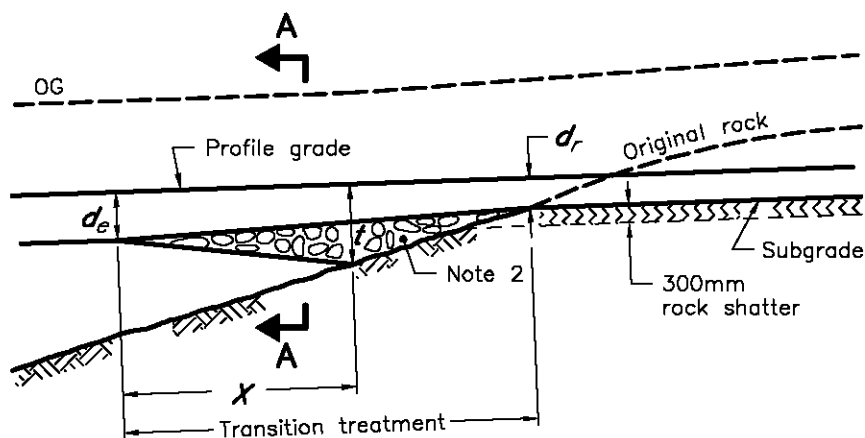
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2016 Rev 3

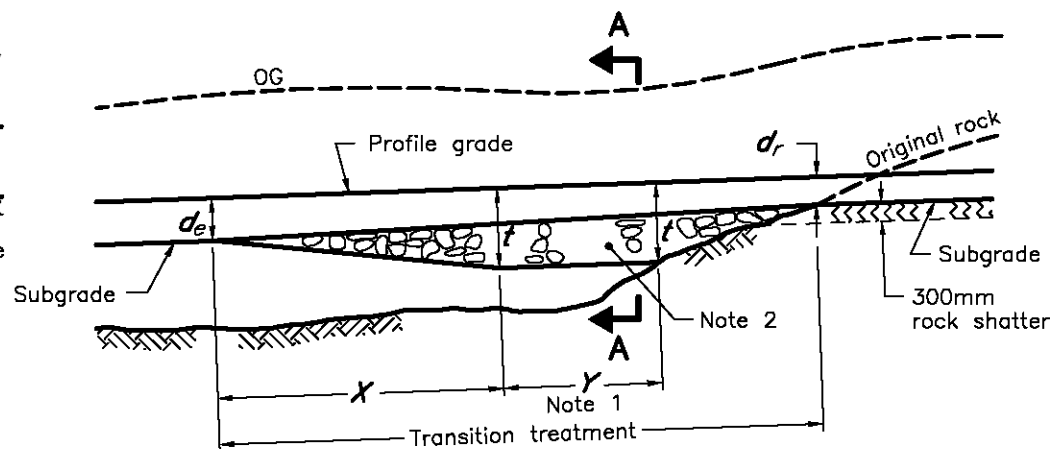
TRANSITION TREATMENT
EARTH FILL TO ROCK FILL AND
EARTH FILL TO GRANULAR FILL



OPSD 205.040

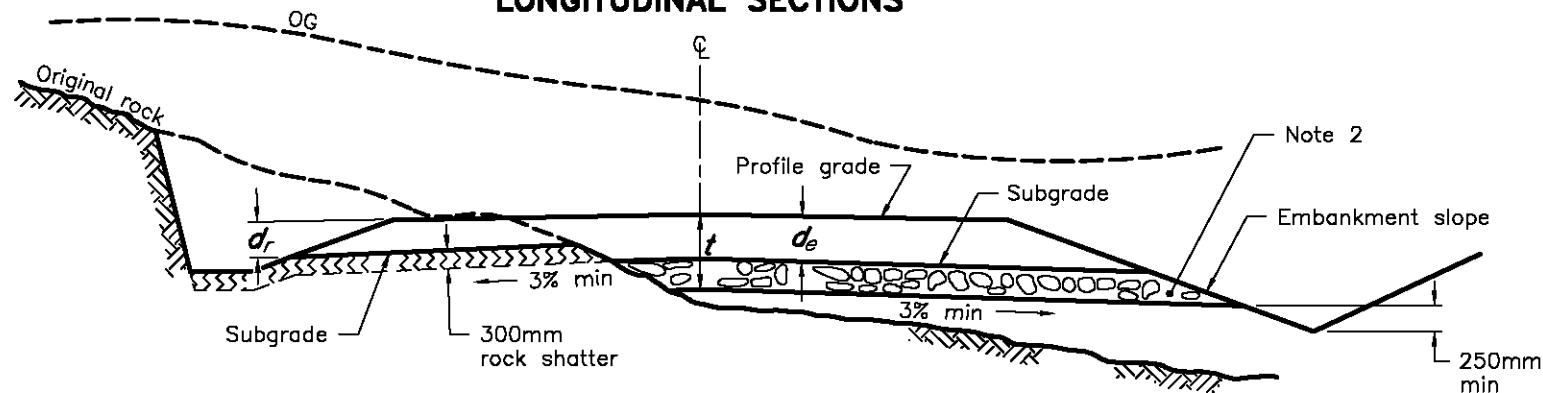


NON-FROST SUSCEPTIBLE SOILS



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 metres 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

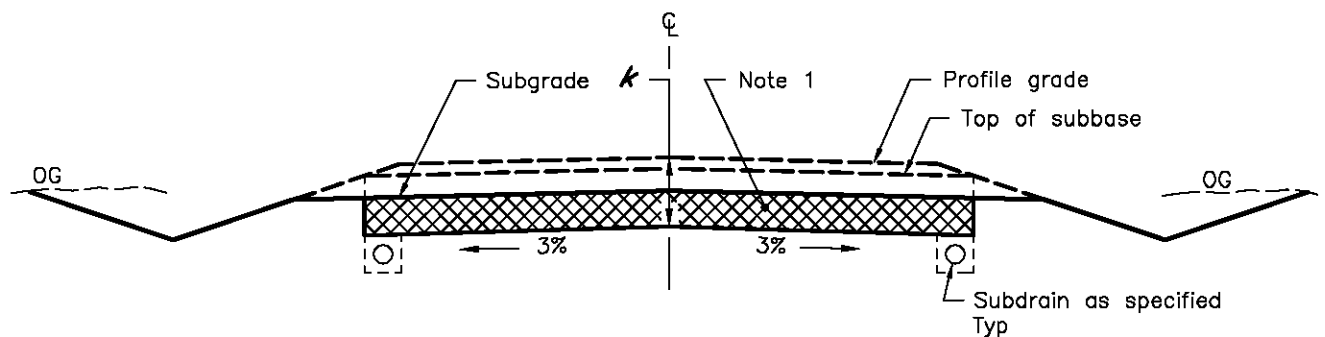
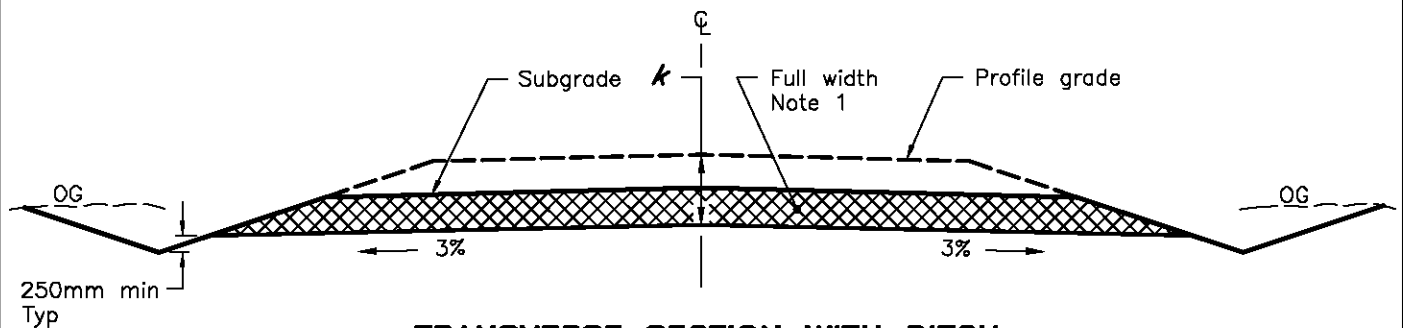
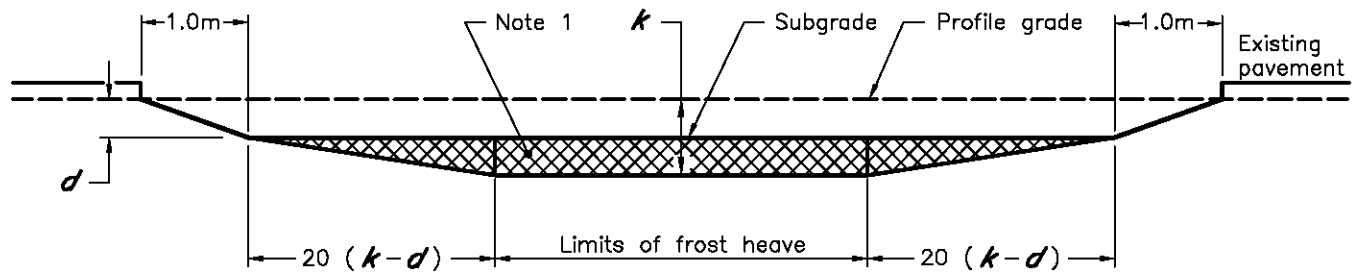
ROCK CUT TO EARTH CUT

Nov 2016

Rev 3



OPSD 205.050



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

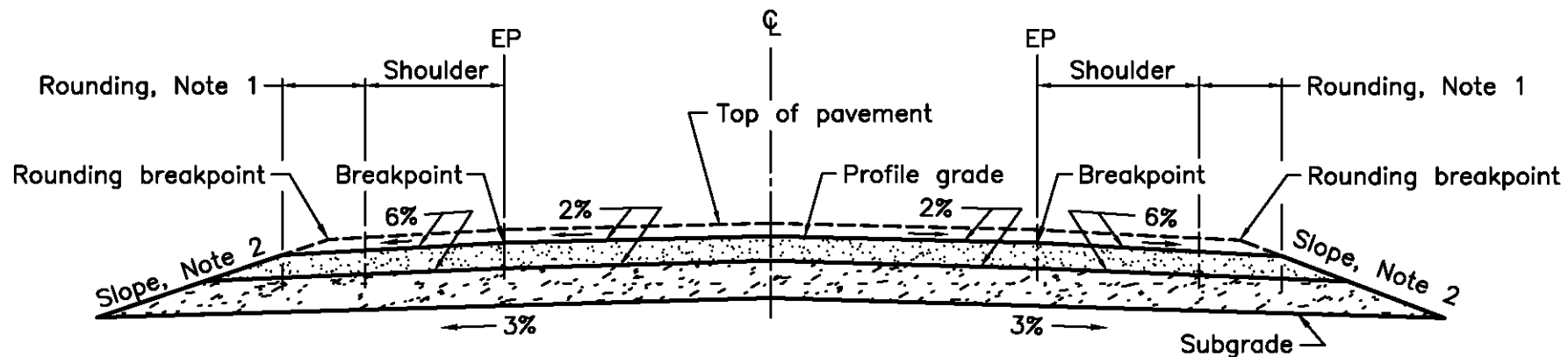
Nov 2014

Rev 3

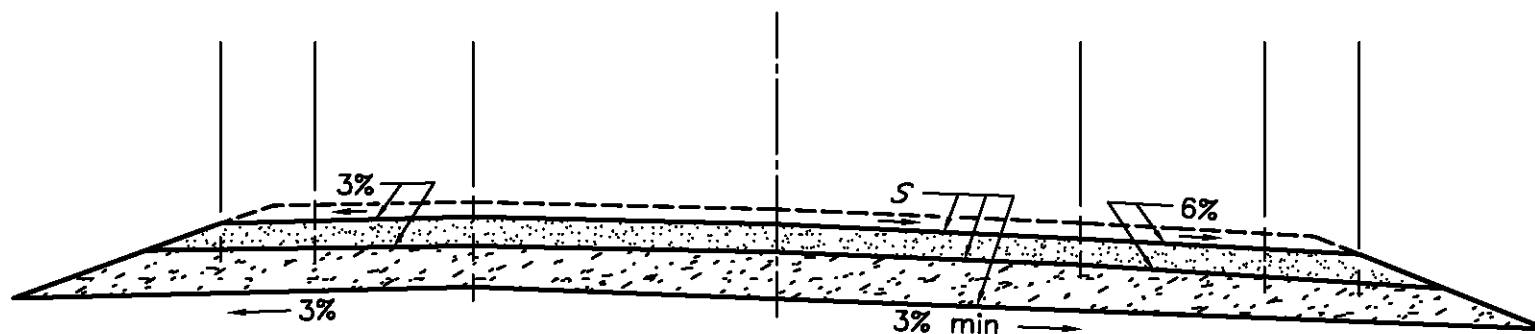
FROST HEAVE TREATMENT



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

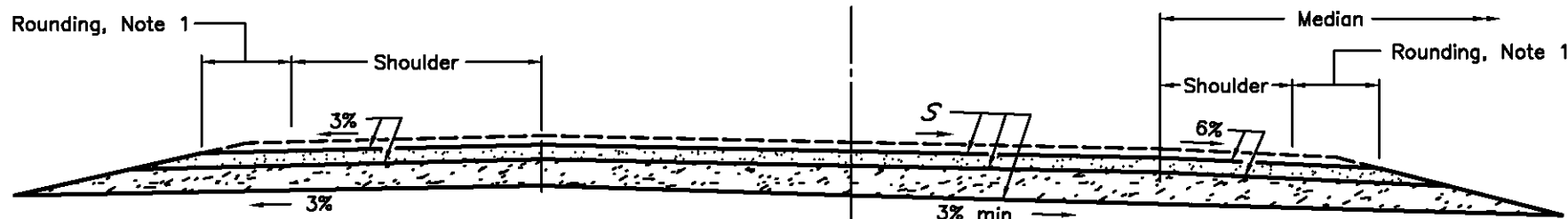
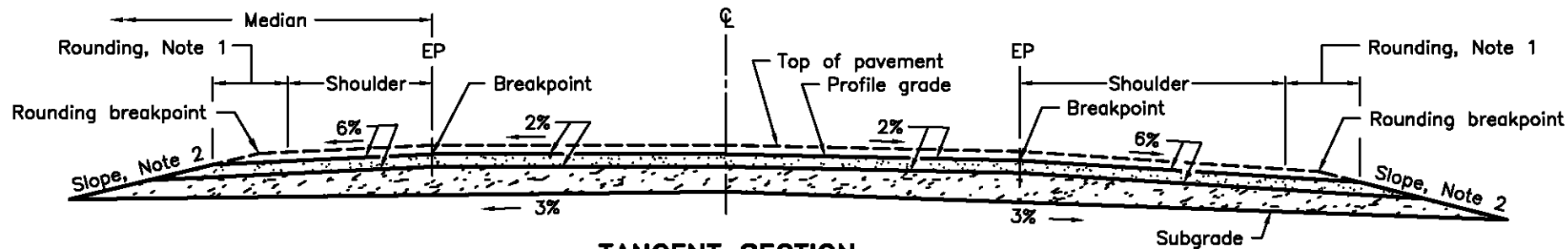
UNDIVIDED RURAL

Nov 2009

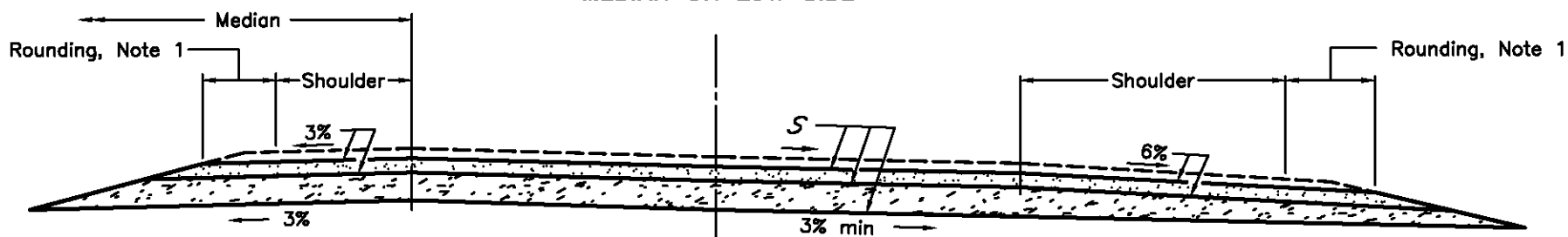
Rev 1



OPSD 206.010



MEDIAN ON LOW SIDE



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

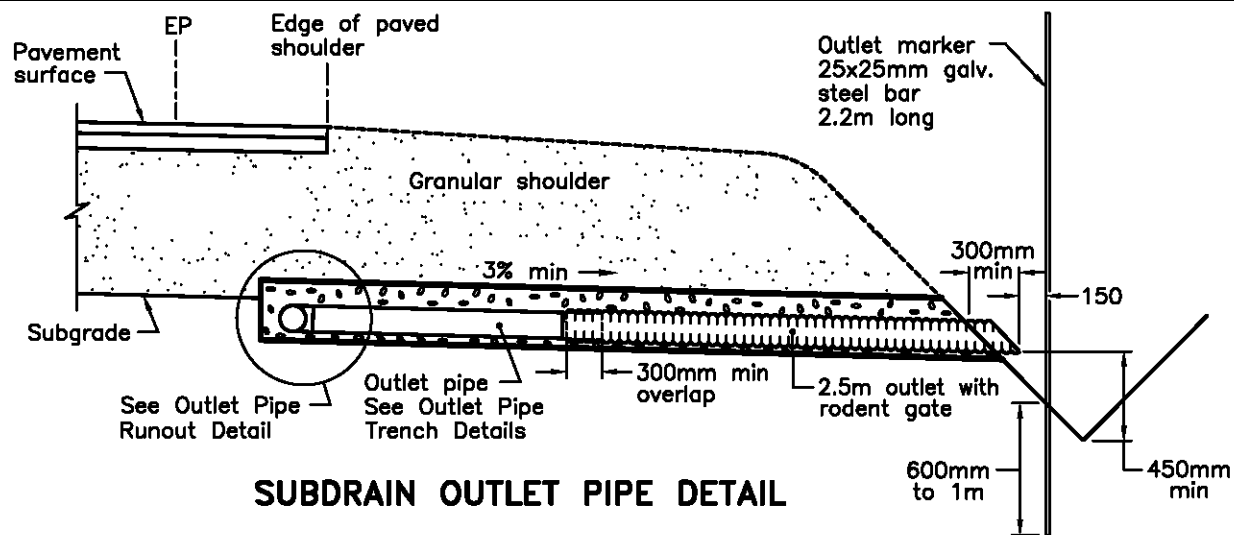
DIVIDED RURAL

Nov 2009

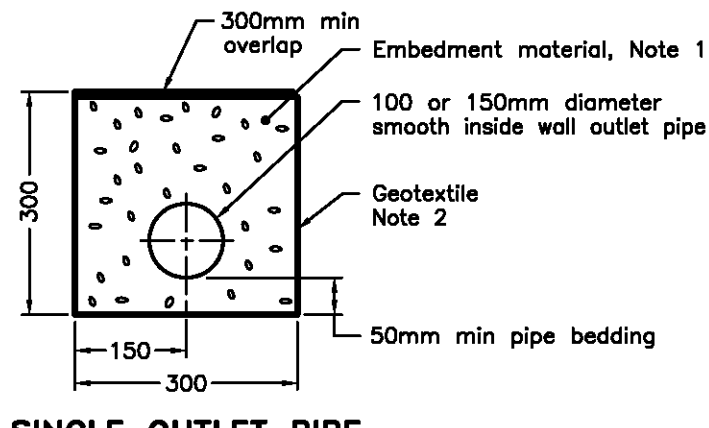
Rev 1



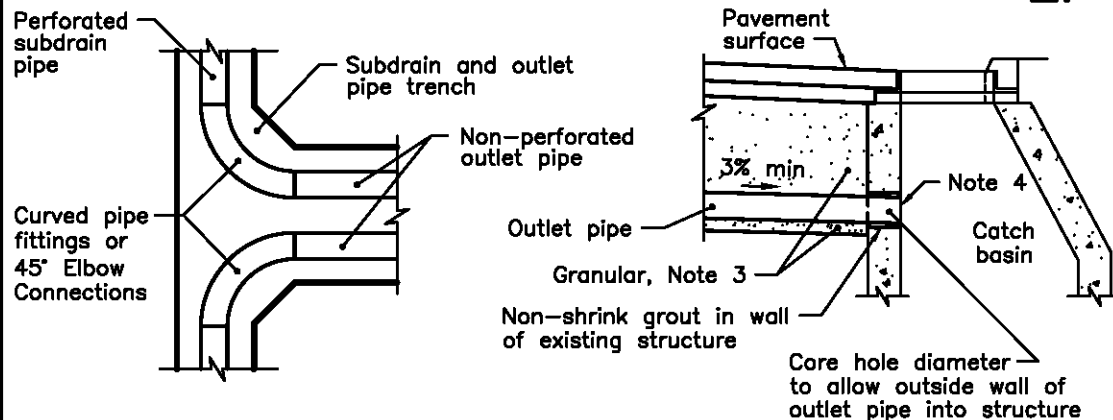
OPSD 206.020



SUBDRAIN OUTLET PIPE DETAIL

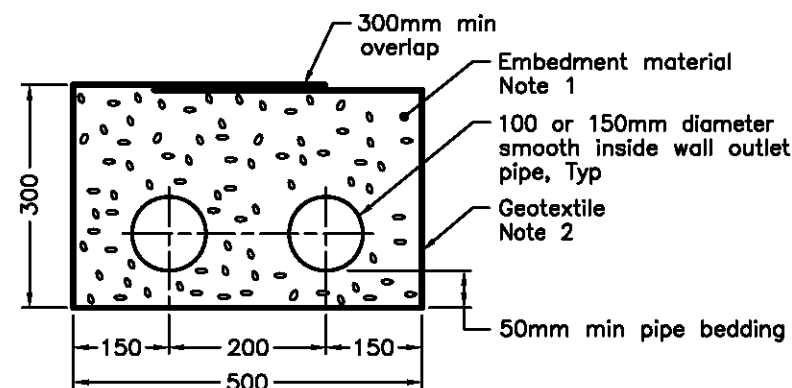


SINGLE OUTLET PIPE TRENCH DETAIL



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

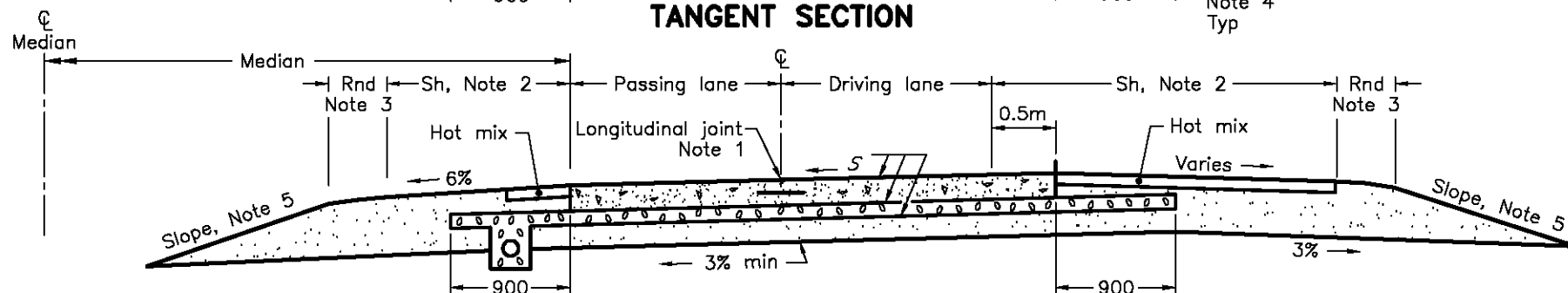
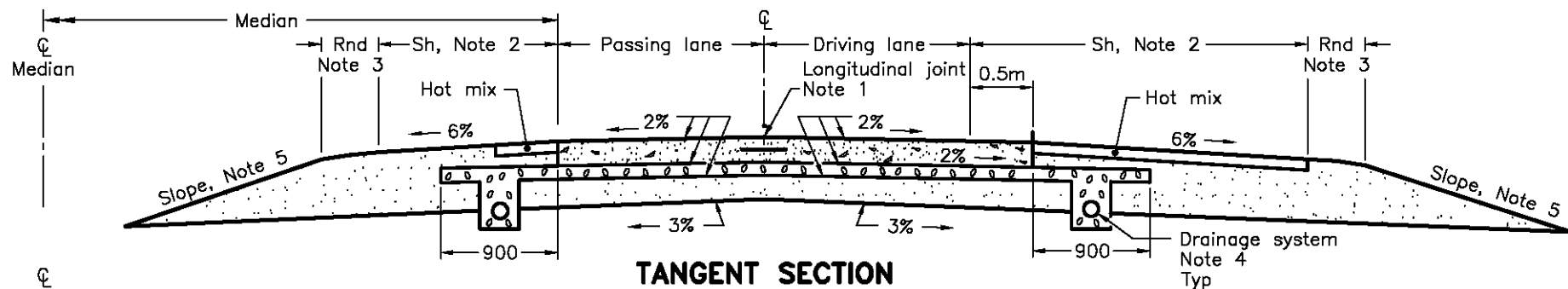
Nov 2008

Rev 1

**SUBDRAIN PIPE
CONNECTION AND OUTLET
RURAL**

OPSD 206.050





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.
 - 5 Slope shall be 4H:1V or flatter when specified.
- A All dimensions are in millimetres unless otherwise shown.

LEGEND:

- S — rate of superelevation in %
-  Open graded drainage layer
-  Granular
-  Concrete pavement

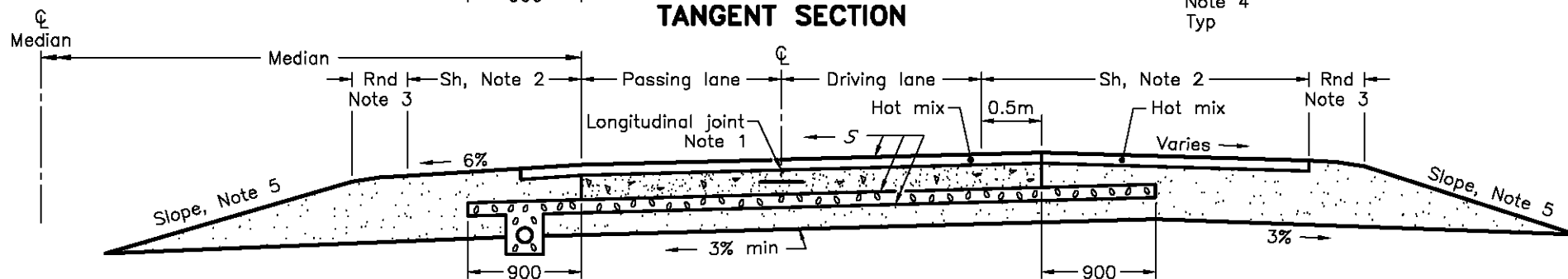
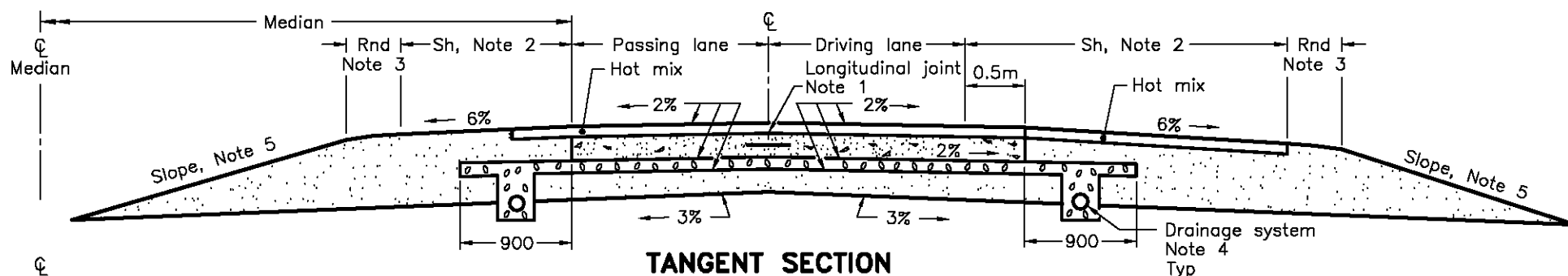
ONTARIO PROVINCIAL STANDARD DRAWING

**CONCRETE PAVEMENT
ON OPEN GRADED DRAINAGE LAYER
DIVIDED HIGHWAY**

Nov 2016 Rev 3



OPSD 207.010



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.
 - 5 Slope shall be 4H:1V or flatter when specified.
- A All dimensions are in millimetres unless otherwise shown.

LEGEND:

- S — rate of superelevation in %
- Open graded drainage layer
 - Granular
 - Concrete base

ONTARIO PROVINCIAL STANDARD DRAWING

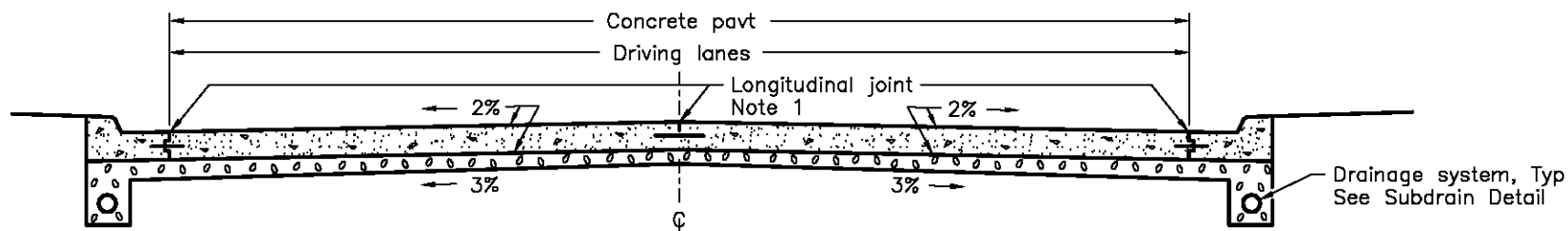
**COMPOSITE PAVEMENT
ON OPEN GRADED DRAINAGE LAYER
DIVIDED HIGHWAY**

Nov 2016

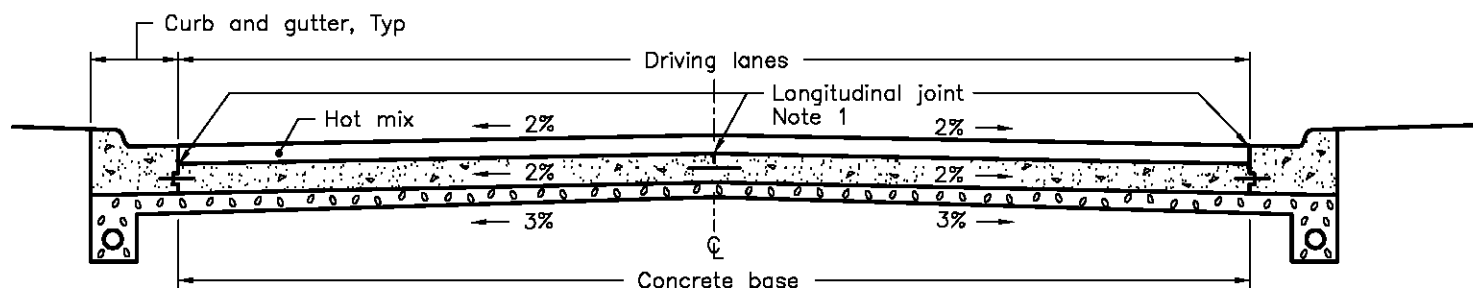
Rev 3



OPSD 207.020



CONCRETE PAVEMENT



COMPOSITE PAVEMENT

LEGEND:

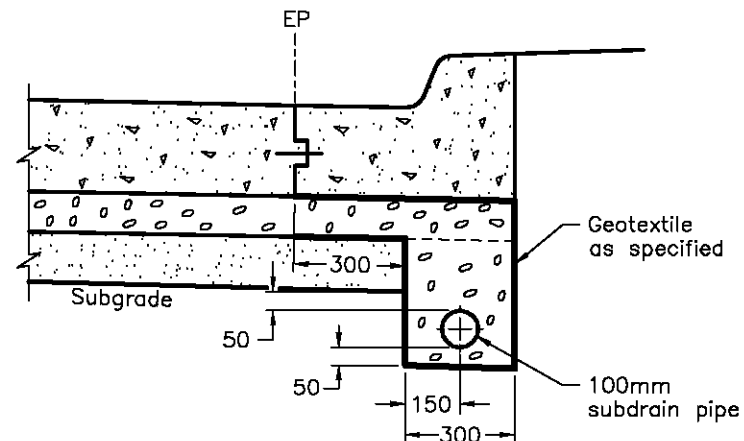
-  Granular
-  Open graded drainage layer

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.



SUBDRAIN DETAIL

ONTARIO PROVINCIAL STANDARD DRAWING

CONCRETE AND COMPOSITE PAVEMENT
ON OPEN GRADED DRAINAGE LAYER

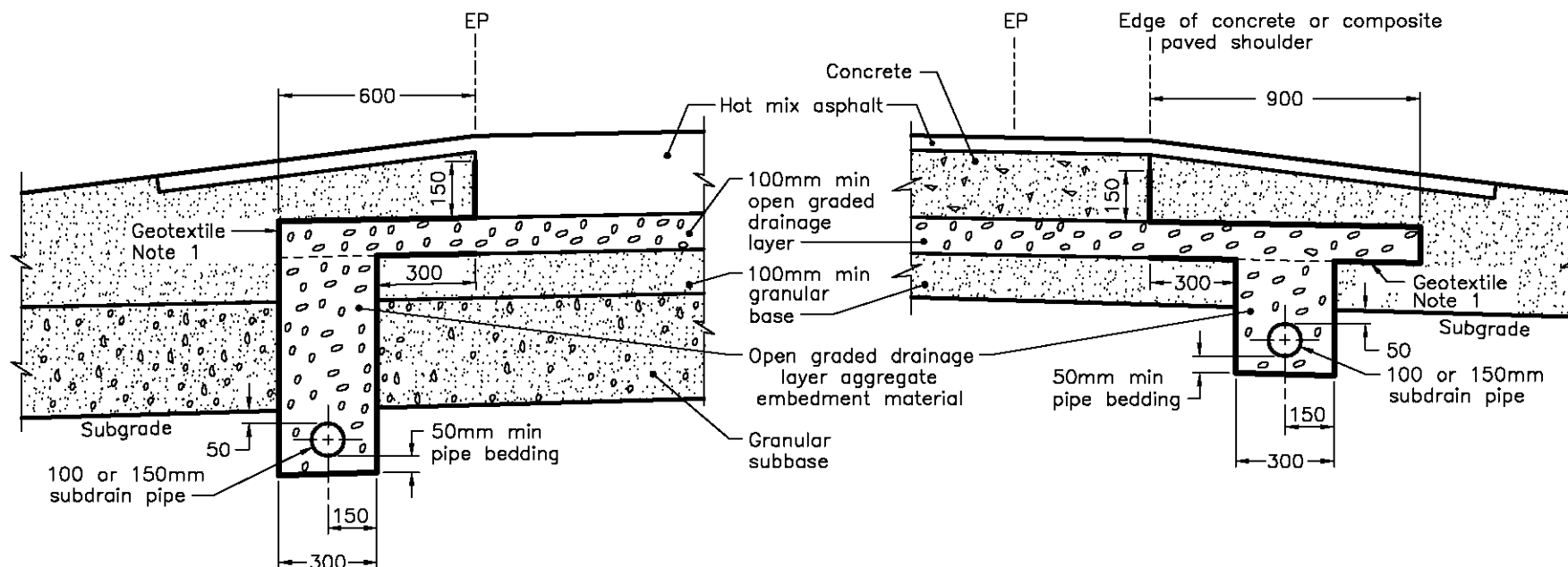
URBAN SECTION

Nov 2016

Rev 2



OPSD 207.030



HOT MIX ASPHALT PAVEMENT

**EXPOSED CONCRETE
OR COMPOSITE PAVEMENT**

LEGEND:

-  Open graded drainage layer
-  Granular
-  Concrete pavement

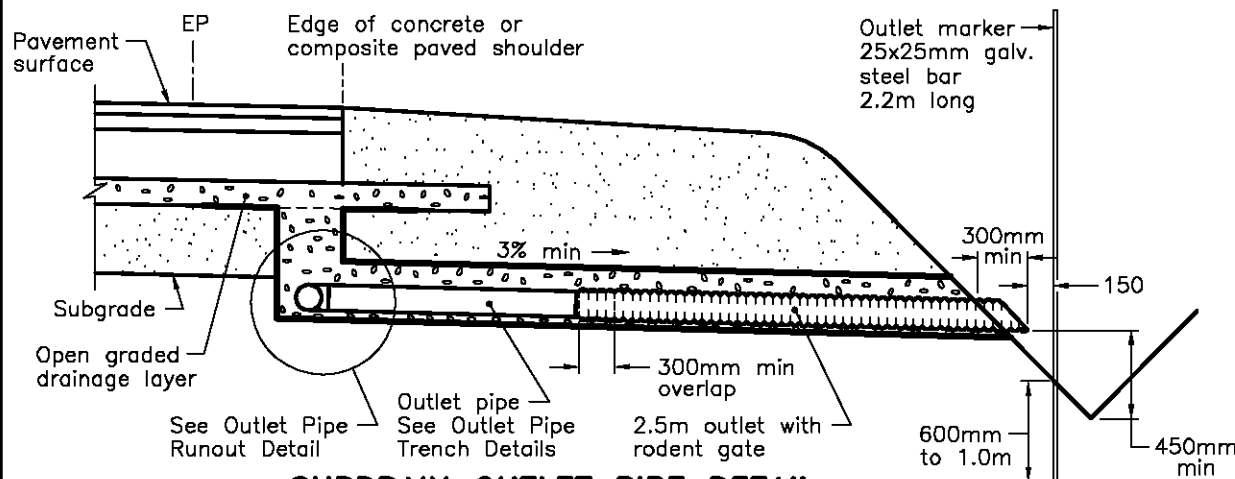
NOTES:

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.

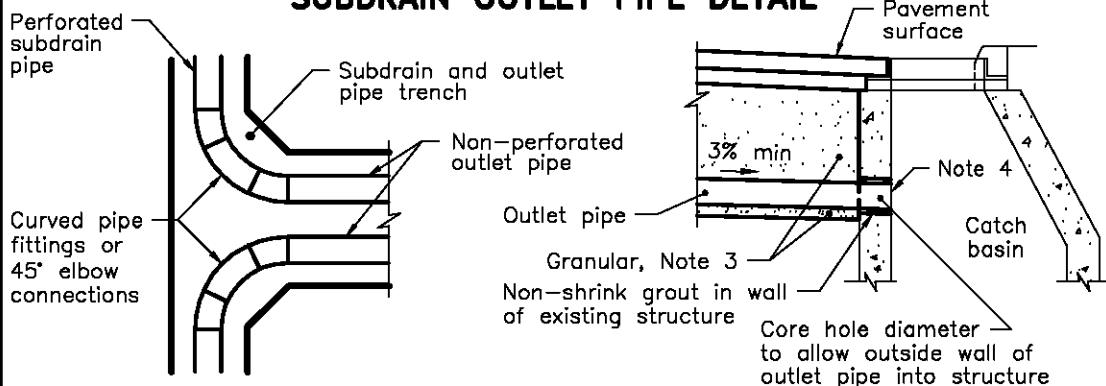
A This standard to be read in conjunction with OPSD 207.044.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2016	Rev	4	
SUBDRAIN PIPE OPEN GRADED DRAINAGE LAYER HOT MIX ASPHALT, CONCRETE, OR COMPOSITE PAVEMENT		-----			

		OPSD 207.041			



SUBDRAIN OUTLET PIPE DETAIL



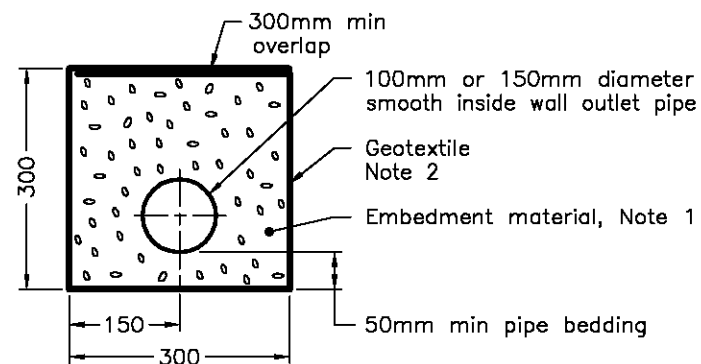
OUTLET PIPE RUNOUT DETAIL

OUTLET PIPE CONNECTION TO CATCH BASIN DETAIL

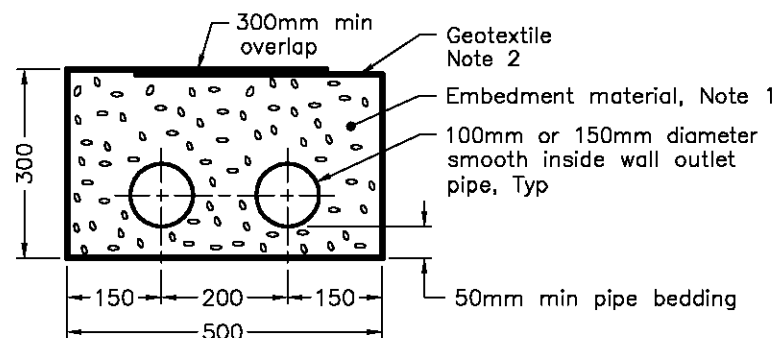
NOTES:

- 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.



SINGLE OUTLET PIPE TRENCH DETAIL



DUAL OUTLET PIPE TRENCH DETAIL

LEGEND:

- Open graded drainage layer
- Granular
- Concrete pavement

ONTARIO PROVINCIAL STANDARD DRAWING

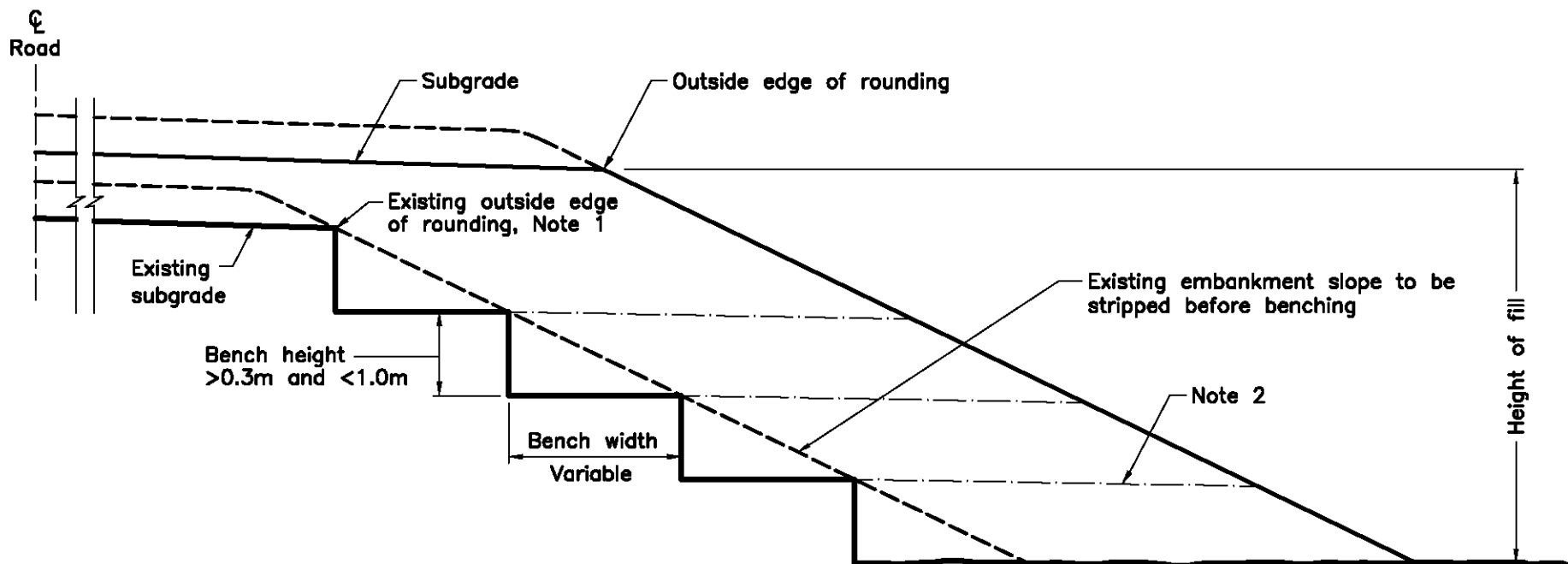
Nov 2016

Rev 5

**SUBDRAIN PIPE
CONNECTION AND OUTLET
OPEN GRADED DRAINAGE LAYER**

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

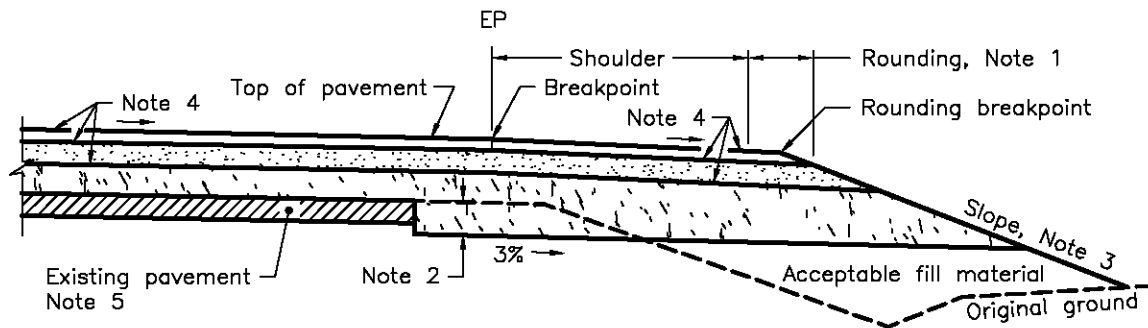
Nov 2013

Rev 3

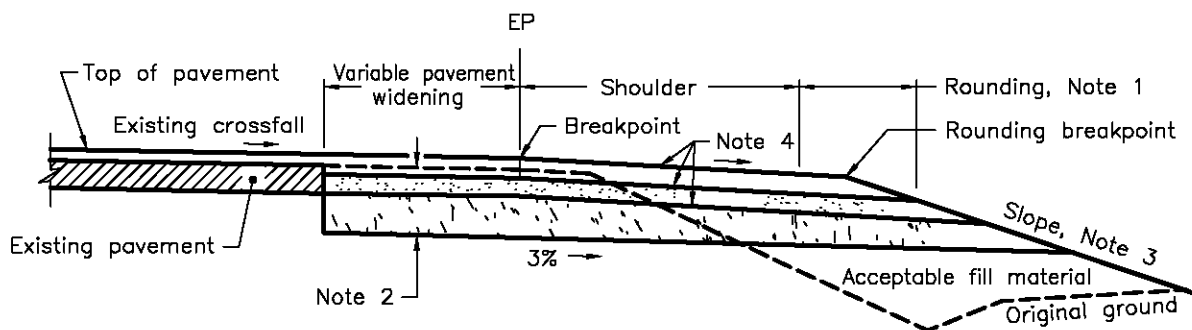
BENCHING OF EARTH SLOPES

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.

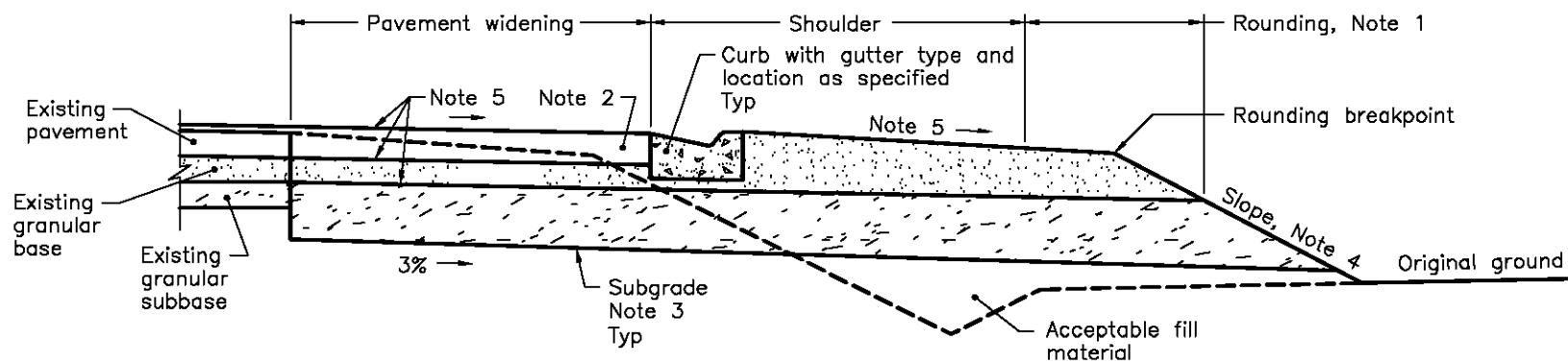
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2009 | Rev | 1

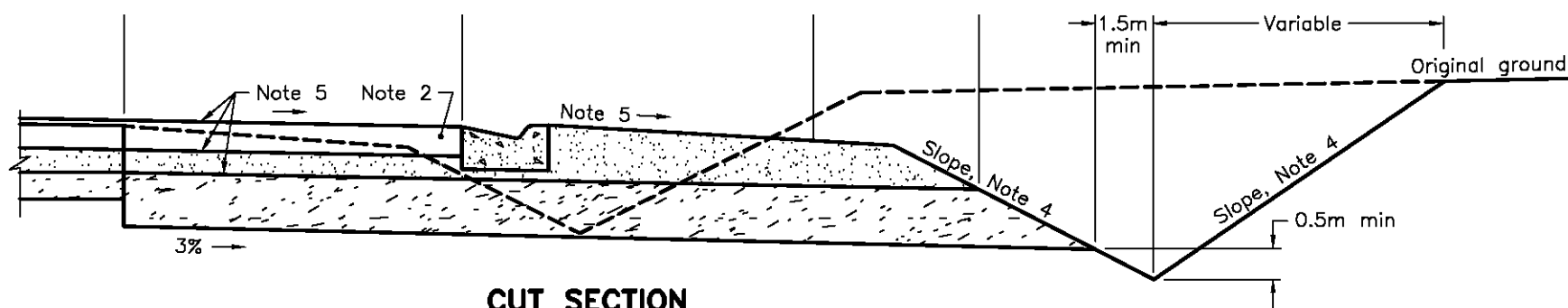
RURAL PAVEMENT WIDENING



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

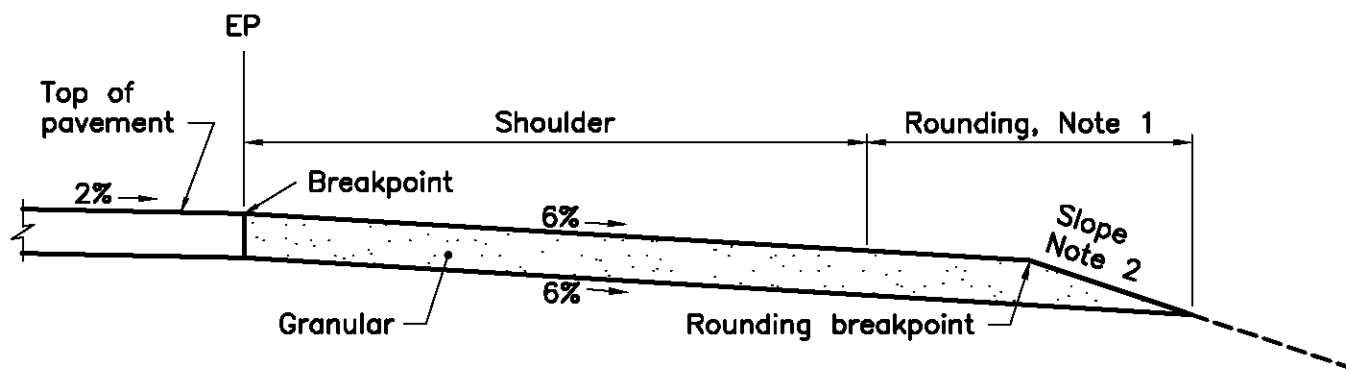
**RURAL PAVEMENT WIDENING
CURB WITH GUTTER**

Nov 2009

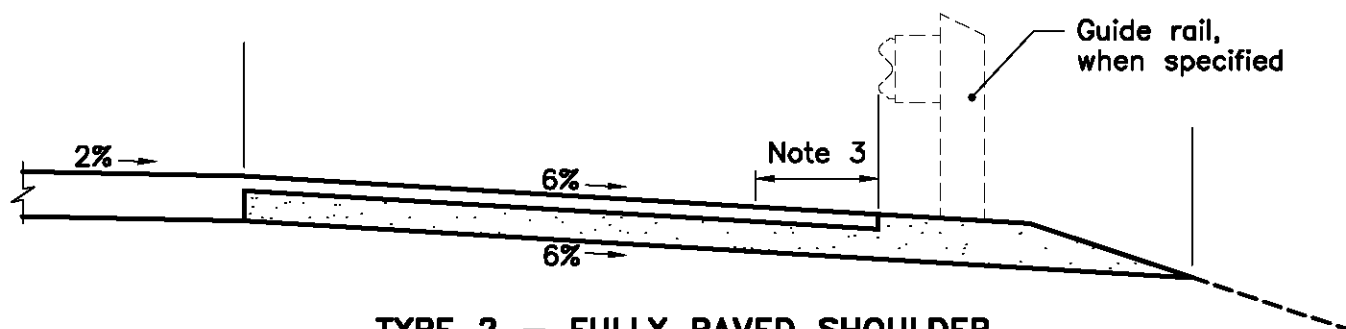
Rev 2



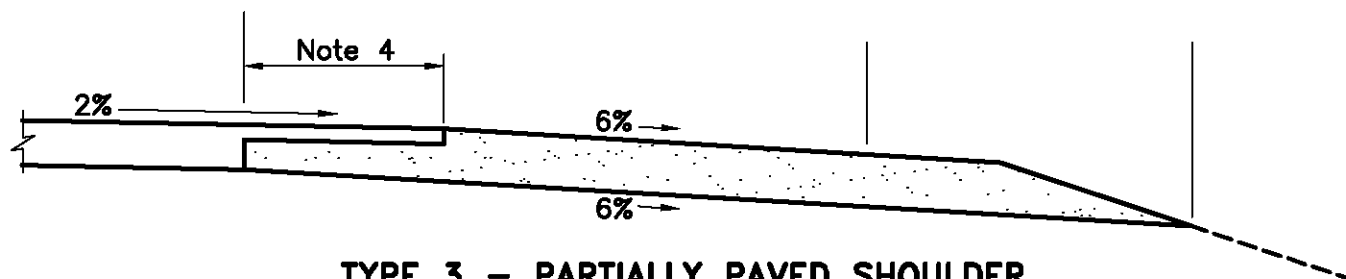
OPSD 209.011



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

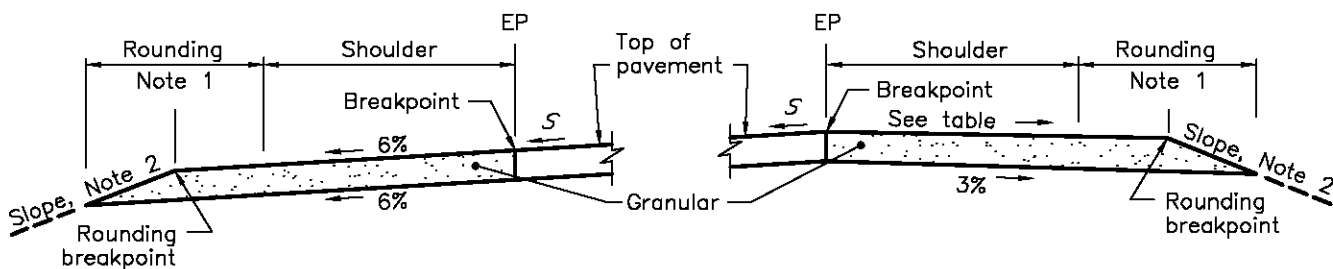
1

TANGENT SHOULDERS

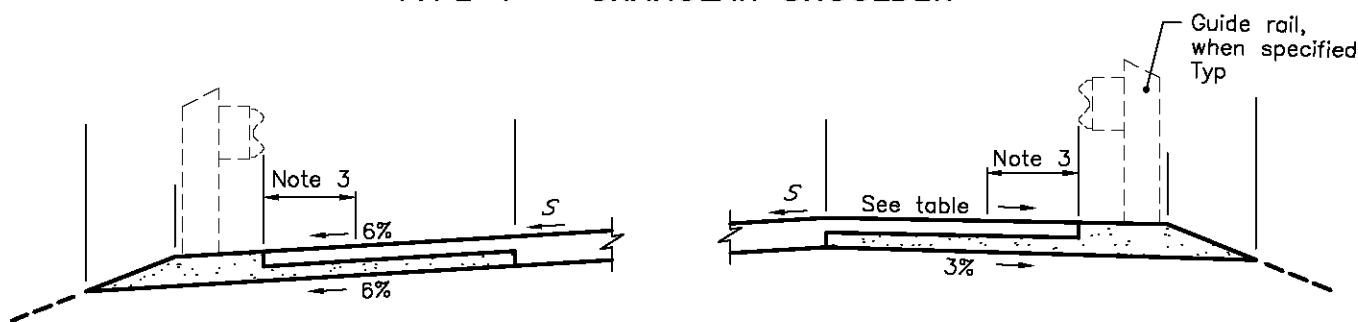
RURAL



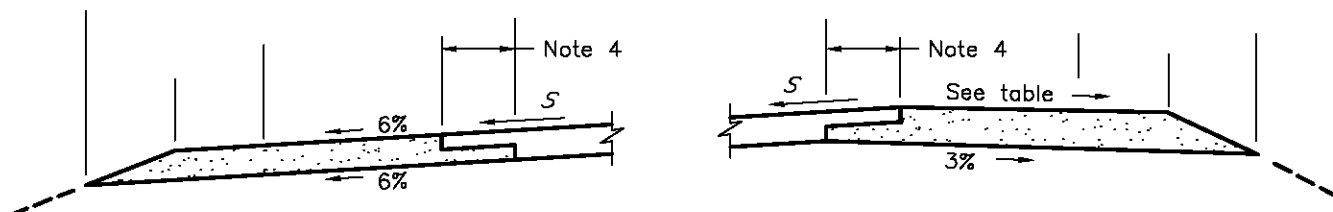
OPSD 210.010



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

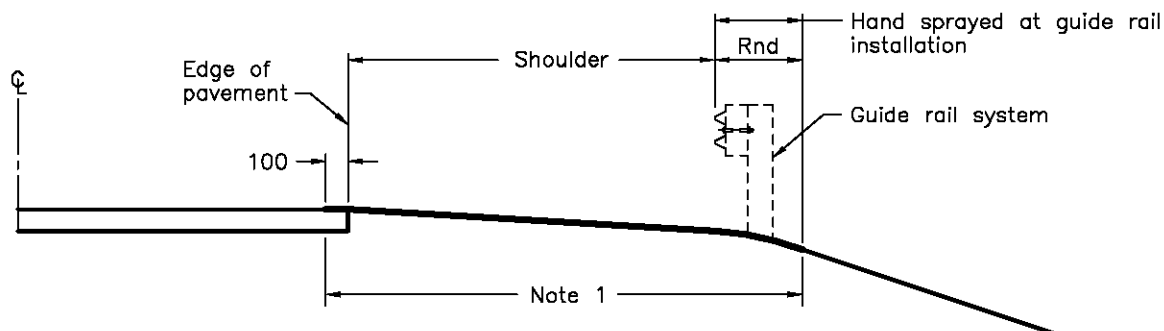
1

SUPERELEVATED SHOULDERS

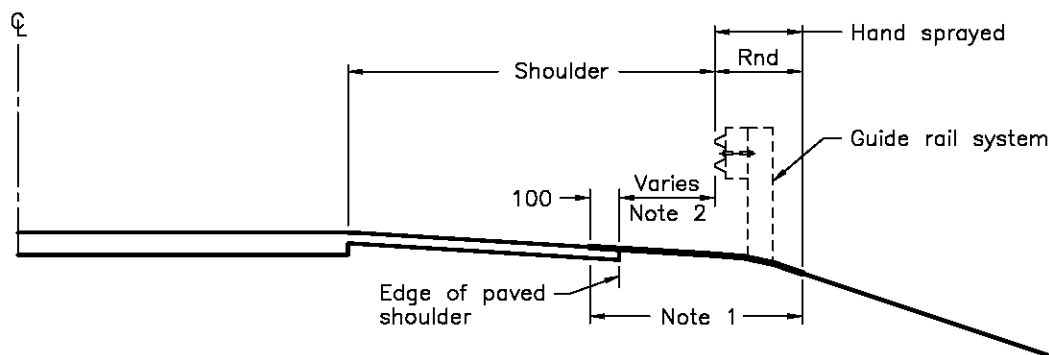
RURAL



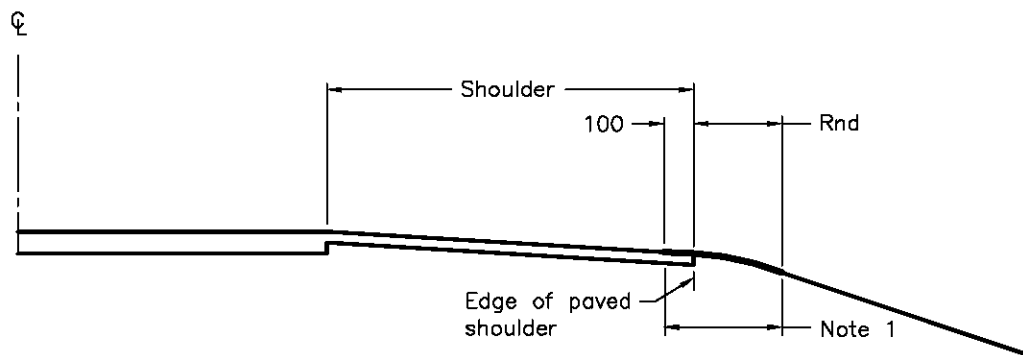
OPSD 210.020



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

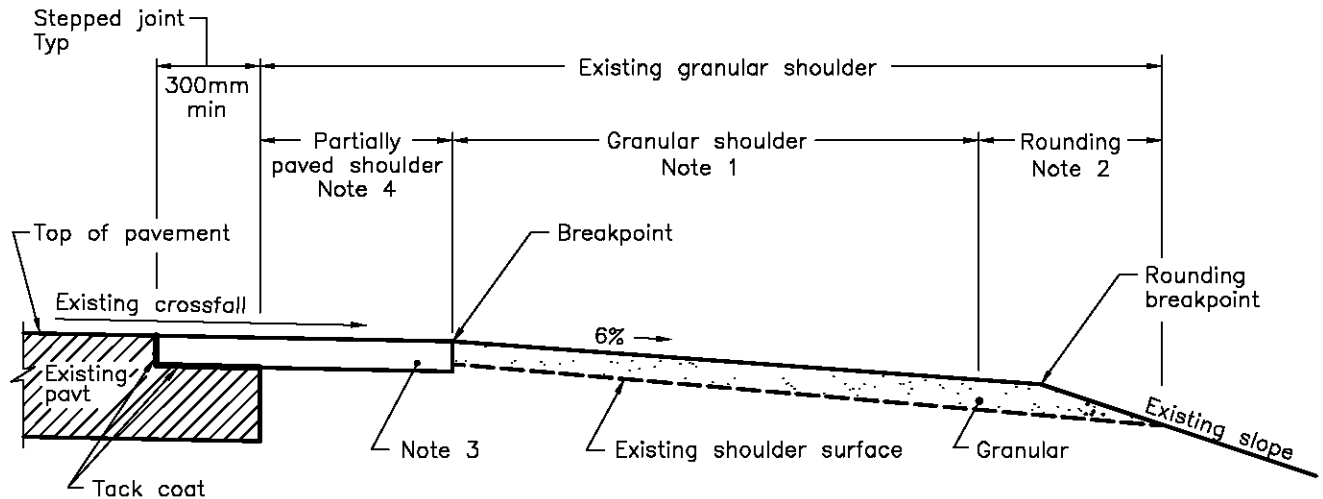
Nov 2016

Rev 4

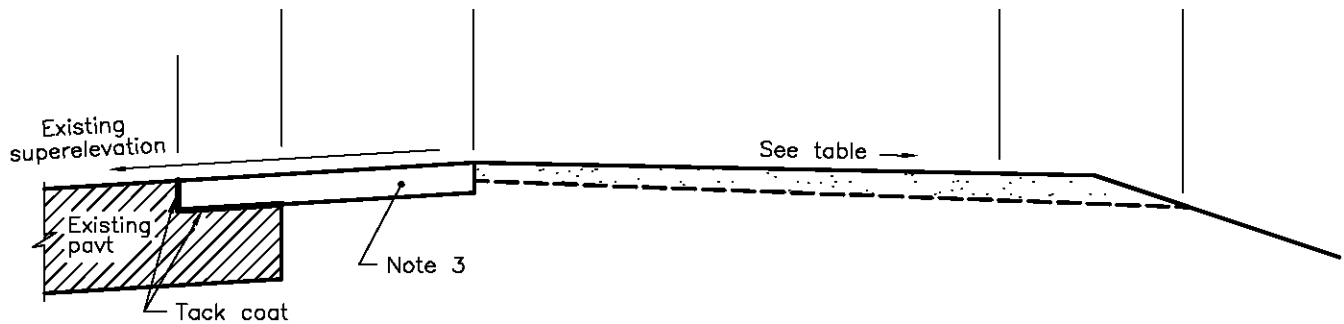
GRANULAR SEALING



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
Granular shoulder	-2	-2	-2	-3	-3	-3	-4	-5	-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

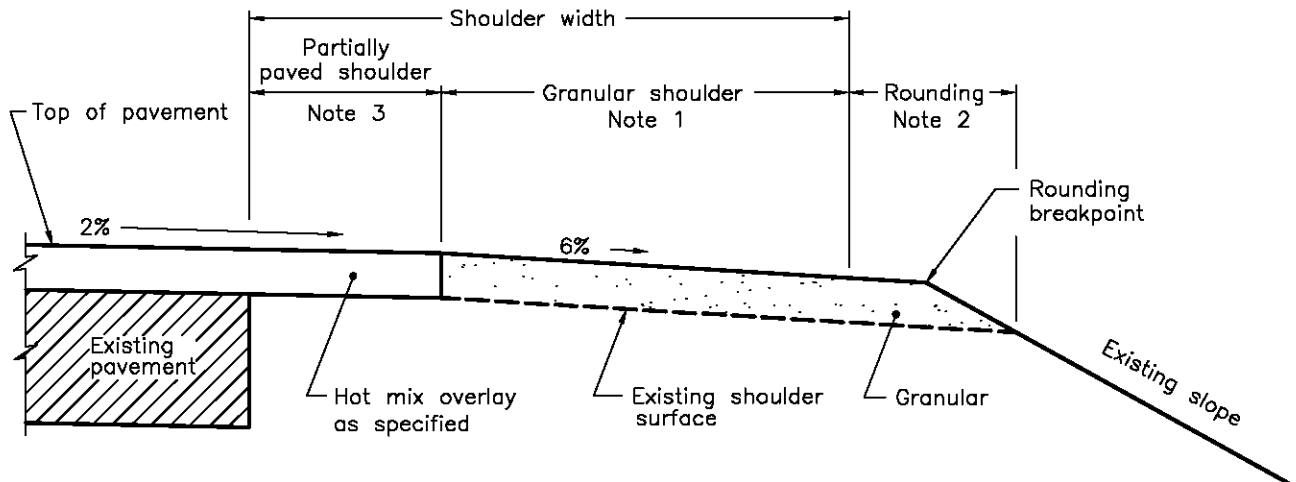
Nov 2010

Rev 2

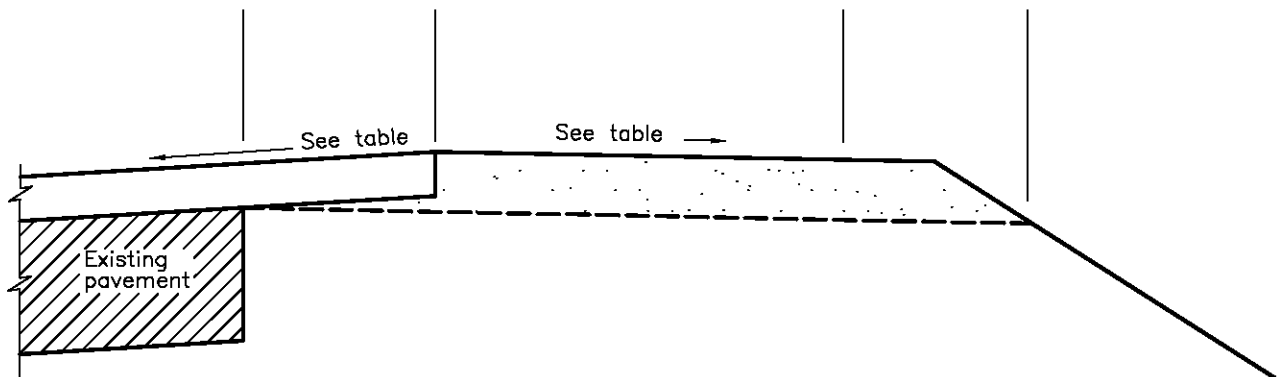
**PARTIALLY PAVED SHOULDERS
EXISTING PAVEMENT MAINTAINED**

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.

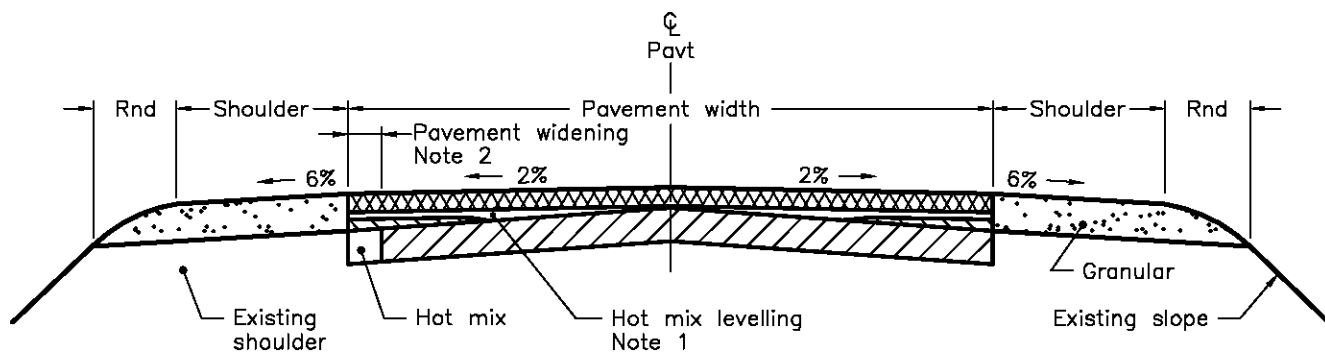
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010 Rev 2

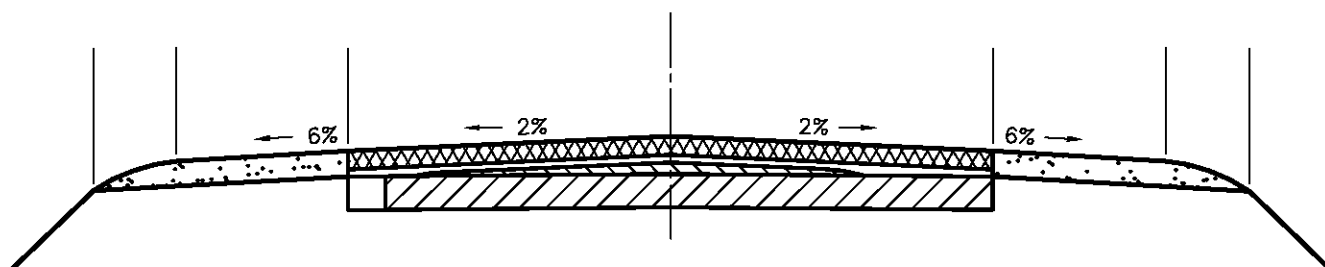
**PARTIALLY PAVED SHOULDERS
EXISTING PAVEMENT RESURFACED**

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

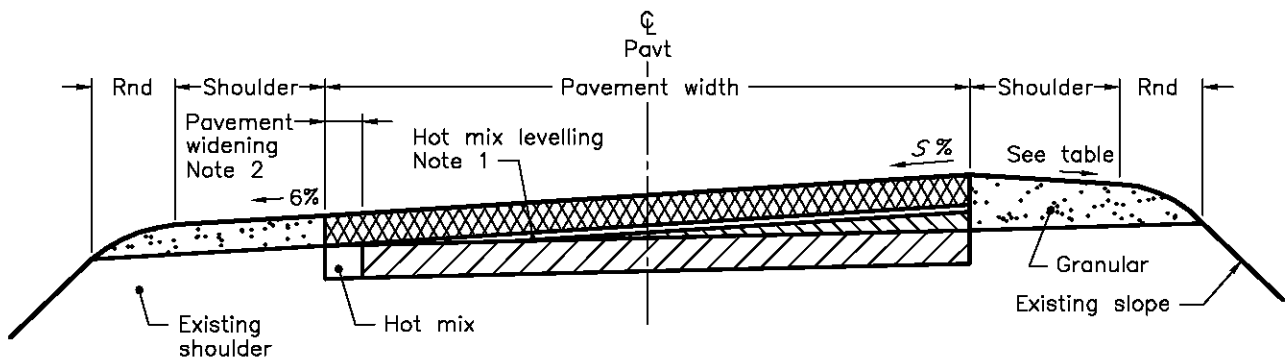
**RESURFACING WITH CROSSFALL CORRECTION
WITH HOT MIX ASPHALT
TANGENT SECTION**

Nov 2009

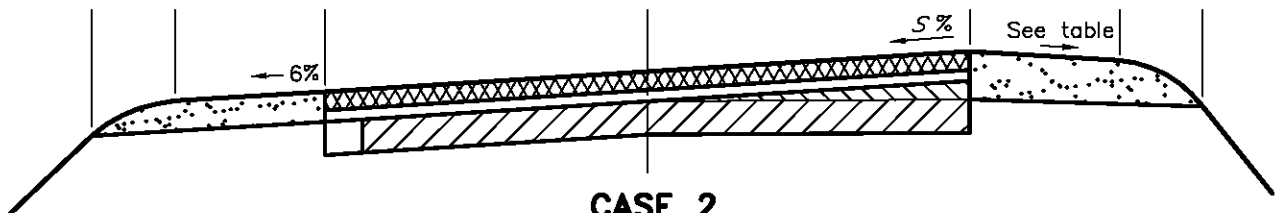
Rev 1



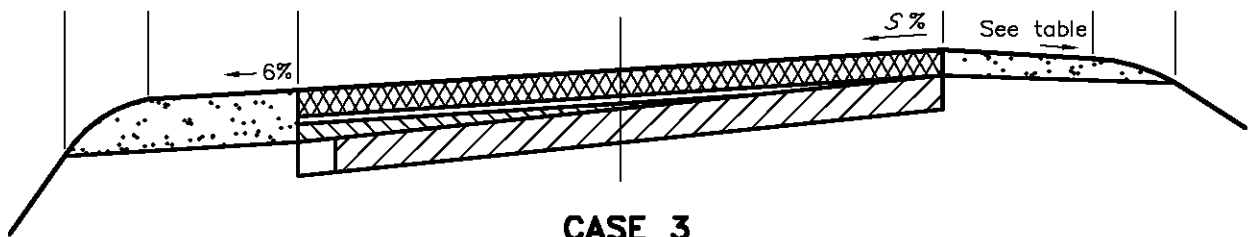
OPSD 212.010



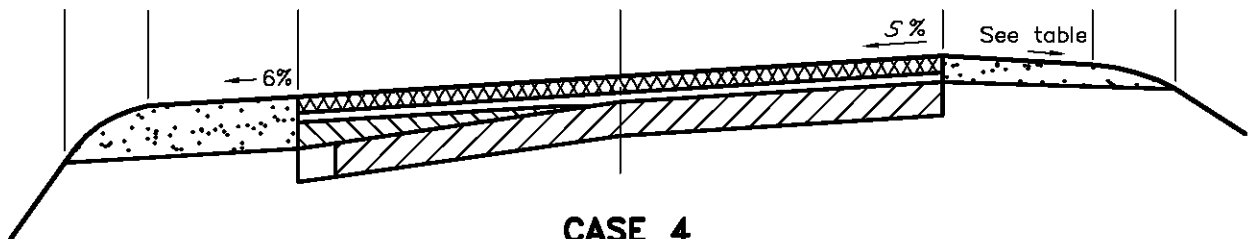
CASE 1



CASE 2



CASE 3



CASE 4

LEGEND:

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

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

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

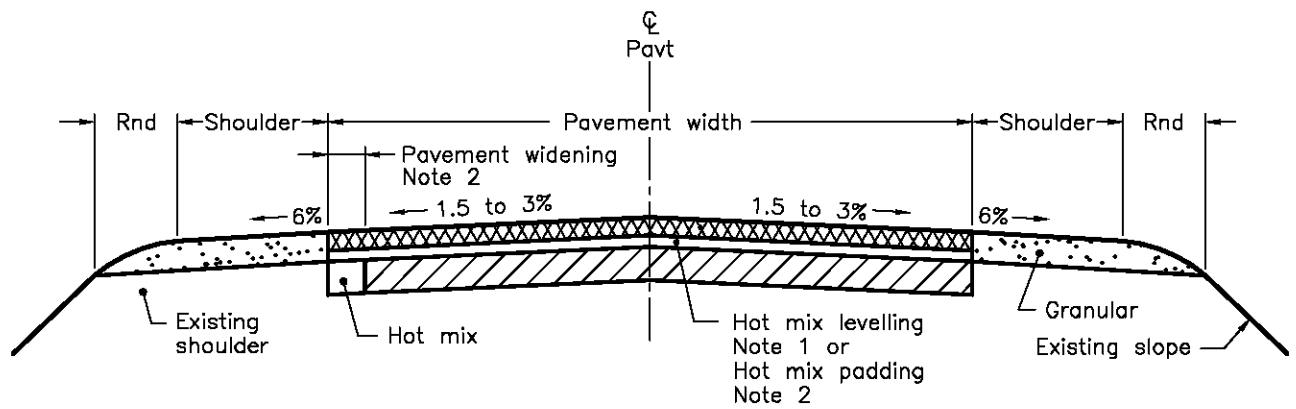
**RESURFACING WITH CROSSFALL CORRECTION
WITH HOT MIX ASPHALT
SUPERELEVATED SECTION**

Nov 2009

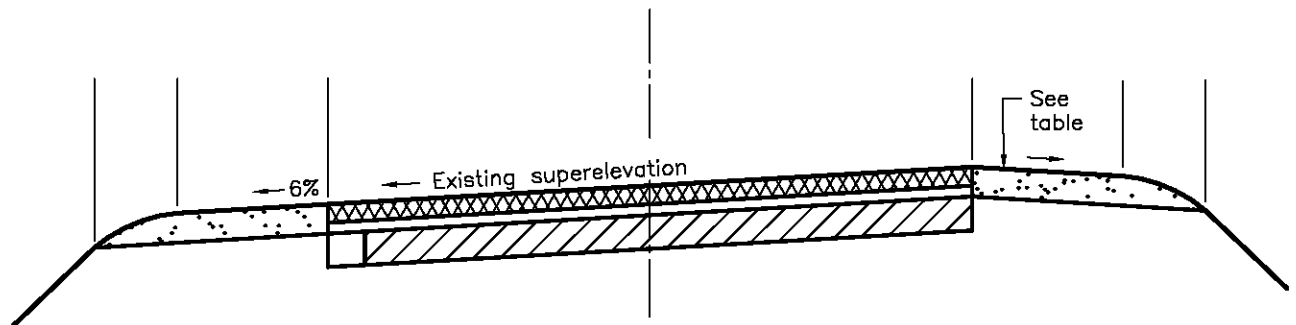
Rev 1



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

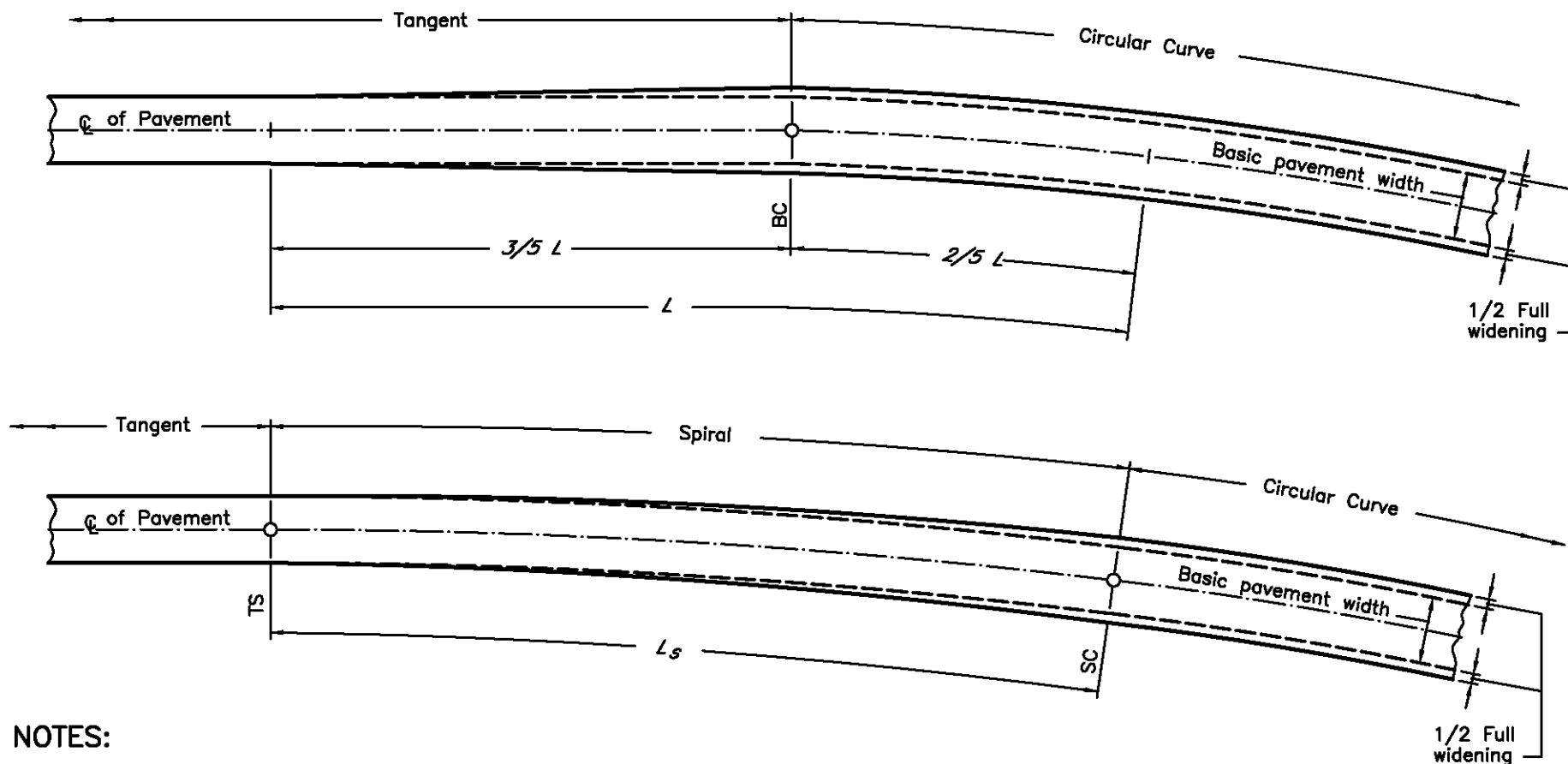
Nov 2009

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

PAVEMENT WIDENING ON CURVES

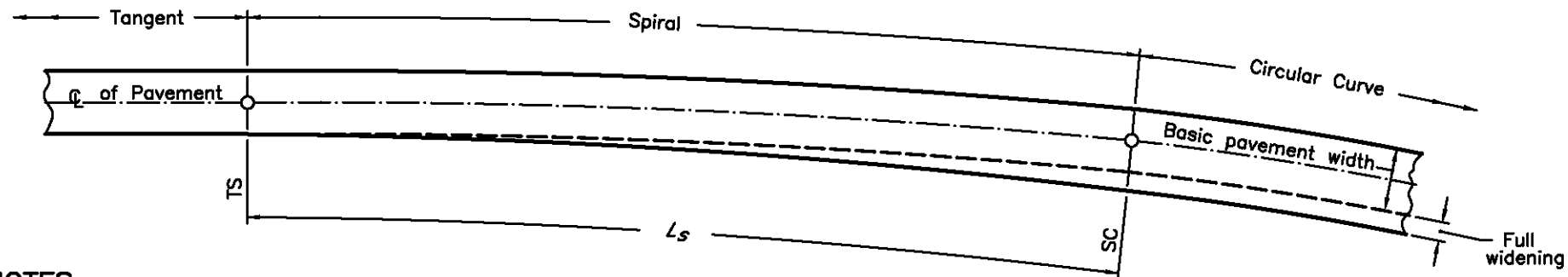
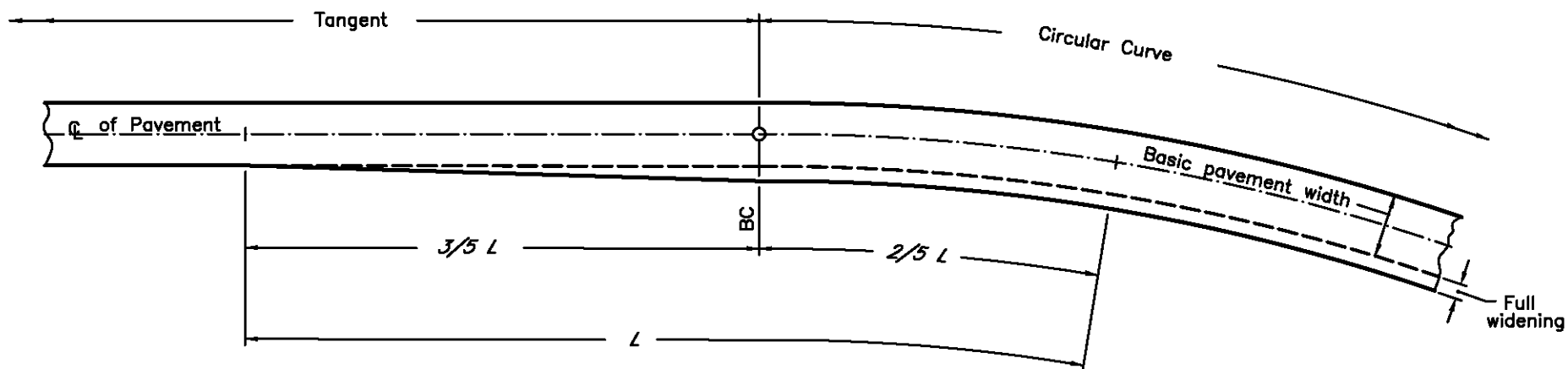
WIDENING ON BOTH SIDES OF CURVE
WITH OR WITHOUT SPIRALS

Dec 1983

Rev 0



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

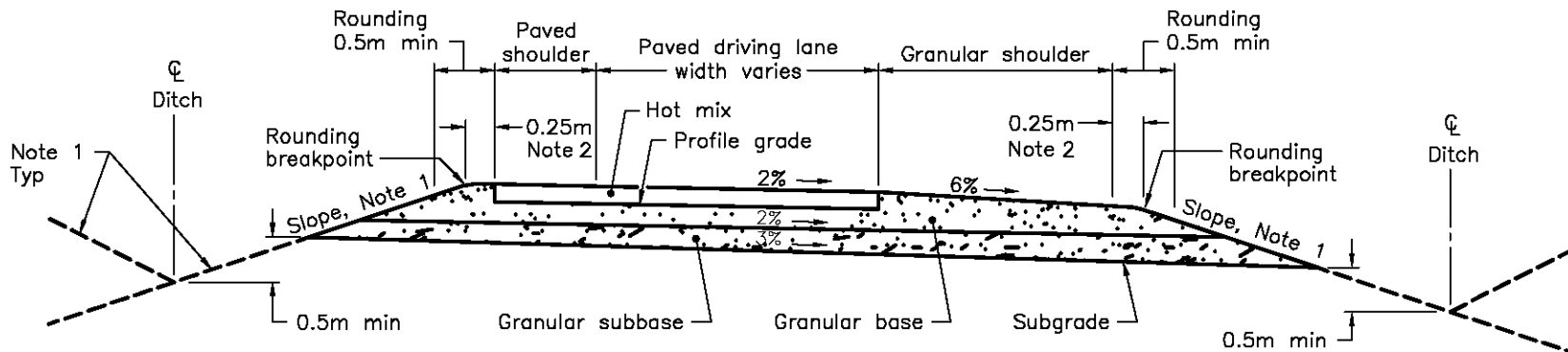
WIDENING ON INSIDE OF CURVES
WITH OR WITHOUT SPIRALS

Dec 1983

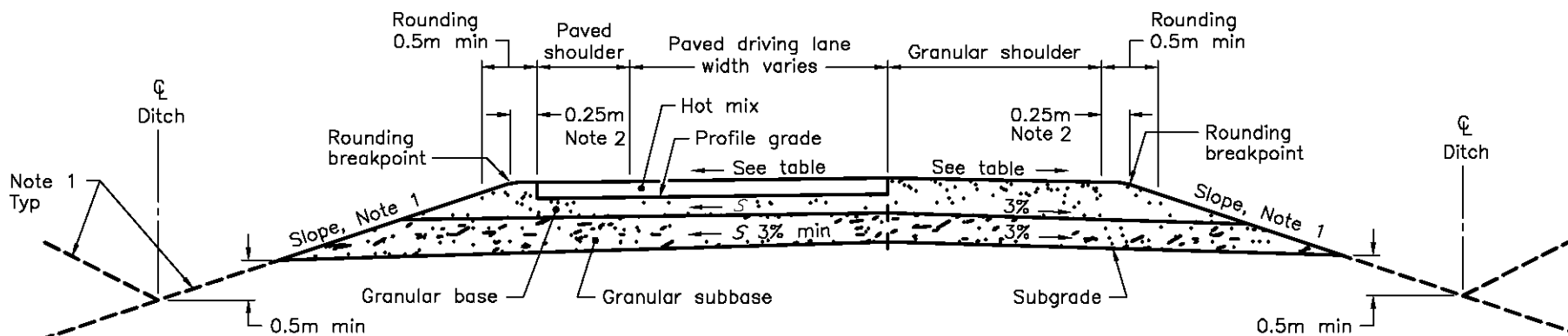
Rev 0



OPSD — 213.02



TANGENT SECTION



SUPERELEVATED SECTION

LEGEND:

S – rate of superelevation in %

NOTES:

- 1 Fill and cut slopes shall be 3H:1V or flatter when specified.
- 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

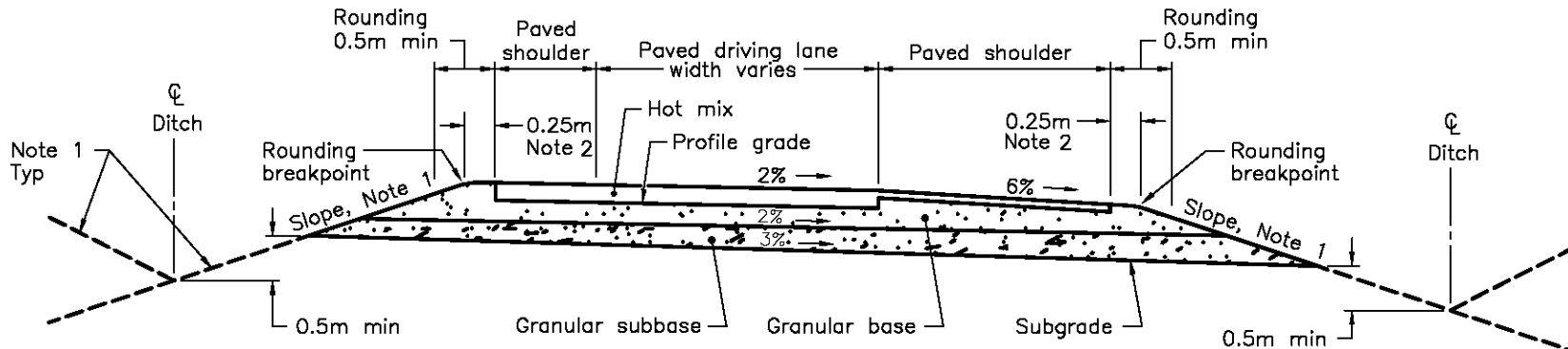
**SINGLE LANE RAMP GRADING
FOR ASPHALT PAVEMENT WITH
GRANULAR BASE AND SHOULDER**

Nov 2016

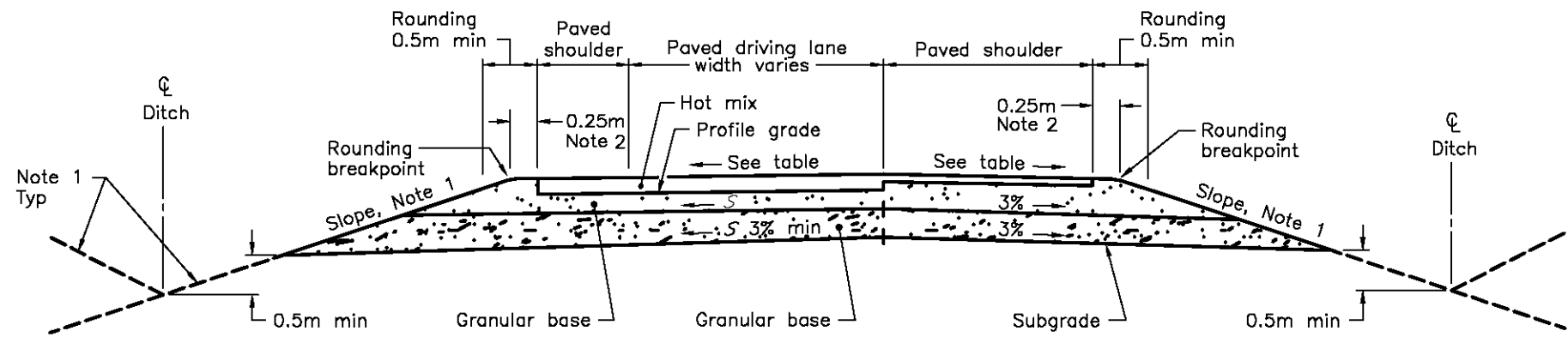
Rev 2



OPSD 214.010



TANGENT SECTION



SUPERELEVATED SECTION

LEGEND:

S – rate of superelevation in %

NOTES:

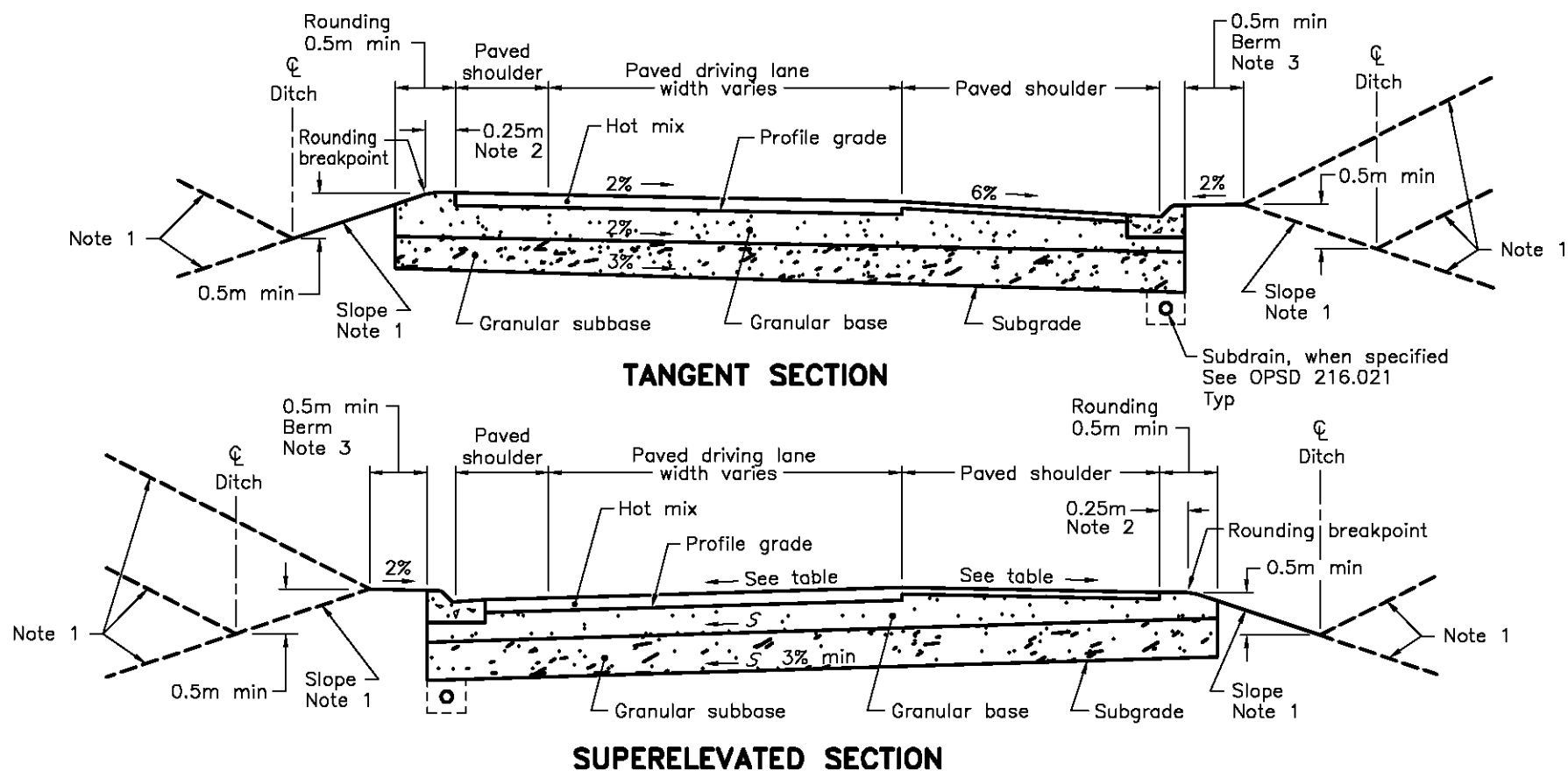
- 1 Fill and cut slopes shall be 3H:1V or flatter when specified.
- 2 Where steel beam guide rail is specified, the minimum rounding shall be 1.0m, with 0.5m specified from edge of paved shoulder to rounding breakpoint.

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	Nov 2016	Rev 2	
SINGLE LANE RAMP GRADING FOR ASPHALT PAVEMENT WITH GRANULAR BASE AND ASPHALT SHOULDER			
OPSD 214.020			



LEGEND:

S – rate of superelevation in %

NOTES:

- 1 Fill and cut slopes shall be 3H:1V or flatter when specified.
- 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.

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
Paved shoulder	-2	-2	-2	-3	-3	-3	-4	-5	-6	-6	-6	-6

ONTARIO PROVINCIAL STANDARD DRAWING

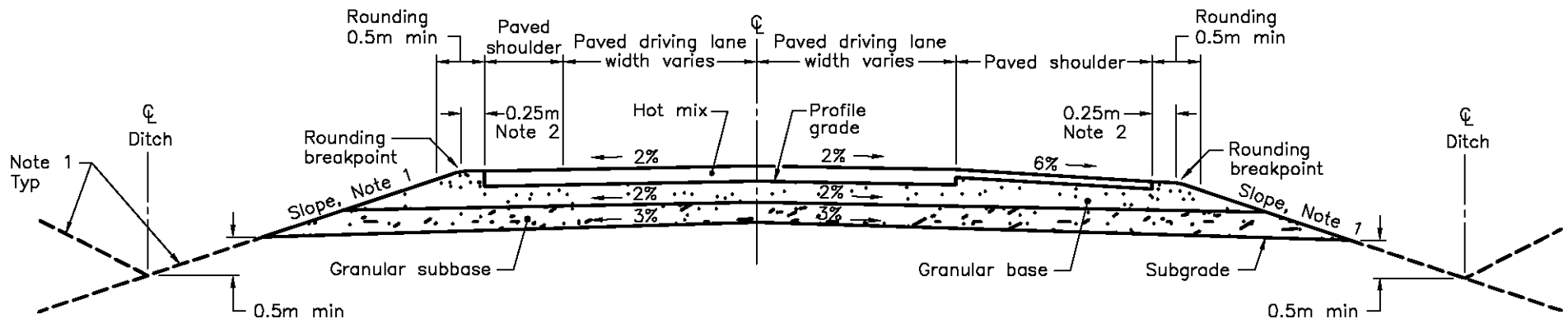
**SINGLE LANE RAMP GRADING
FOR ASPHALT PAVEMENT WITH GRANULAR BASE,
ASPHALT SHOULDER, AND CURB WITH GUTTER**

Nov 2016

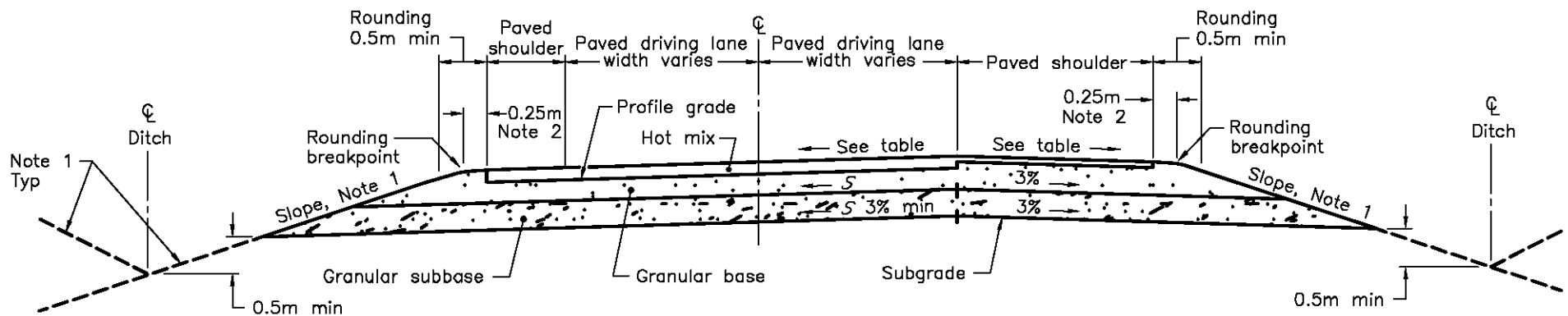
Rev 3



OPSD 214.030



TANGENT SECTION



SUPERELEVATED SECTION

LEGEND:

S – rate of superelevation in %

NOTES:

1 Fill and cut slopes shall be 3H:1V or flatter when specified.

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
Paved shoulder	-2	-2	-2	-3	-3	-3	-4	-5	-6	-6	-6	-6

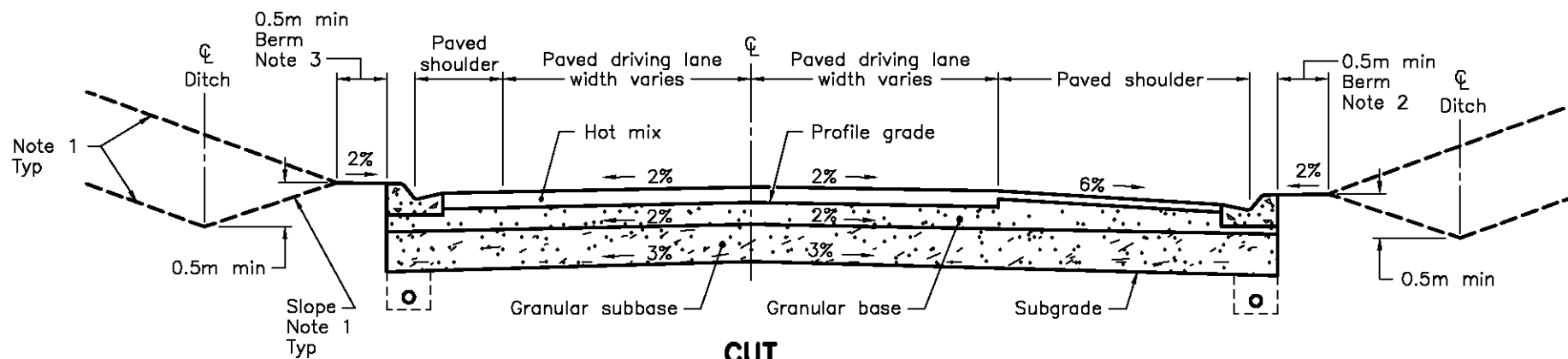
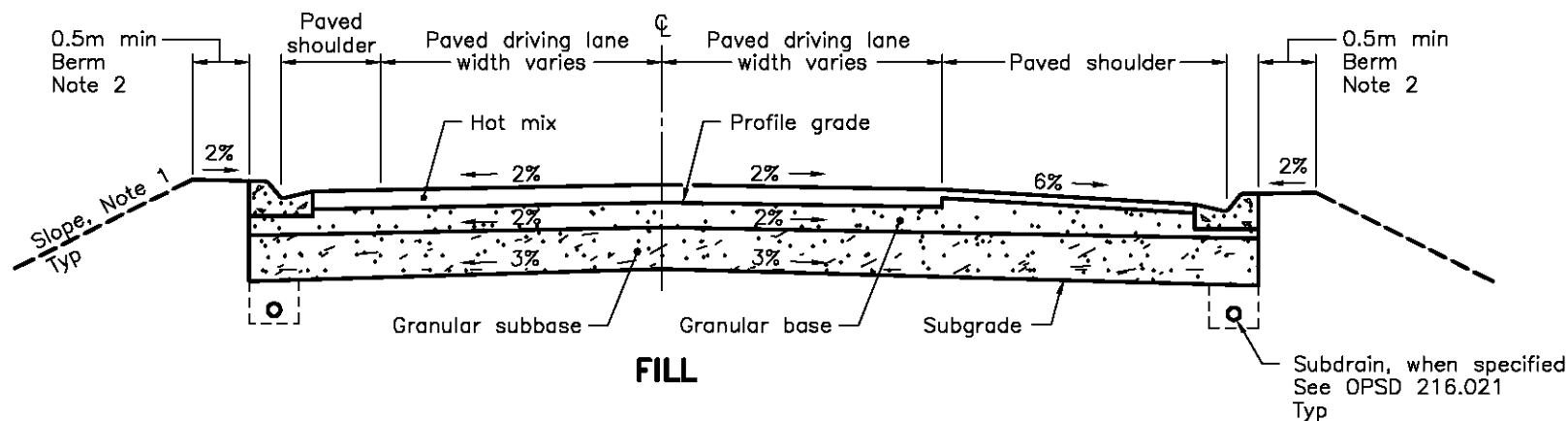
ONTARIO PROVINCIAL STANDARD DRAWING

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

Nov 2016 **Rev 2**



OPSD 215.010



NOTES:

- 1 Fill and cut slopes shall be 3H:1V or flatter when specified.
- 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

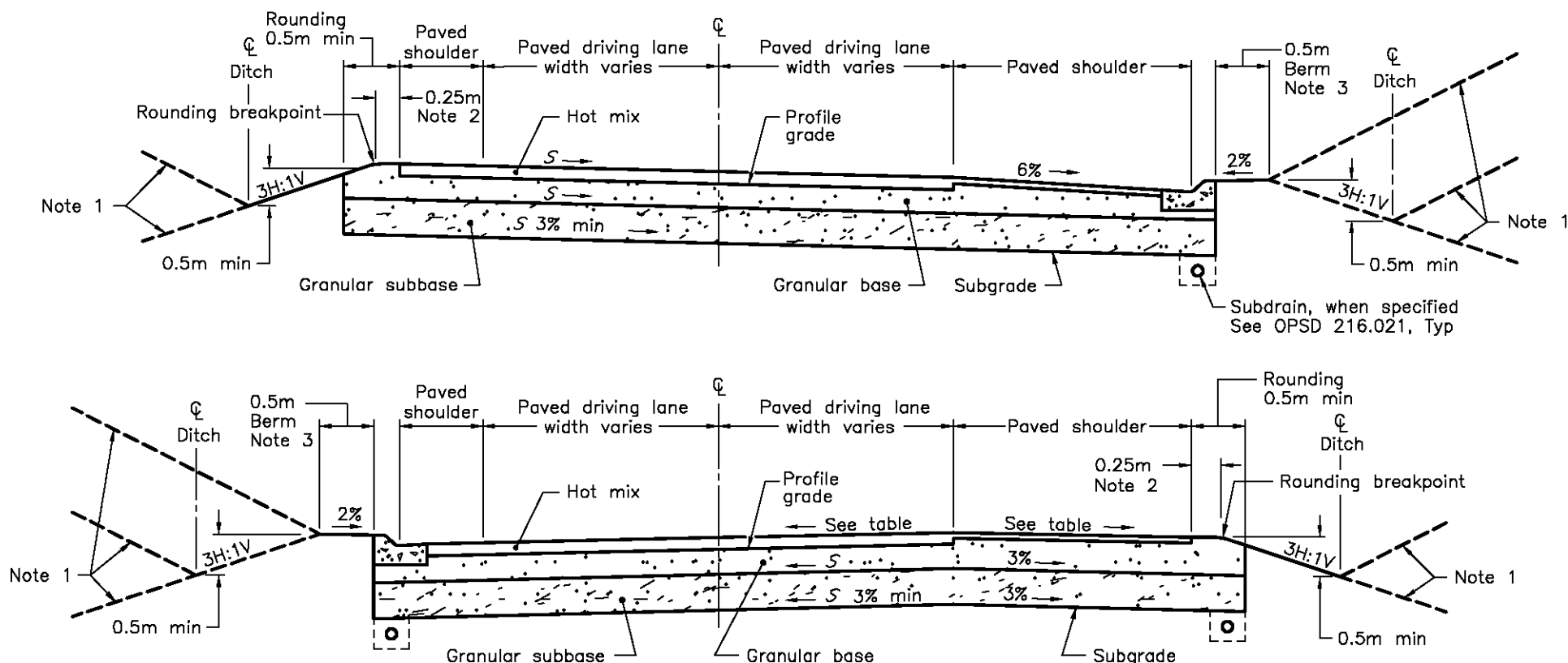
**TWO LANE RAMP GRADING
FOR ASPHALT PAVEMENT WITH GRANULAR BASE,
ASPHALT SHOULDER, AND CURB WITH GUTTER
FOR TANGENT SECTION**

Nov 2016

Rev 2



OPSD 215.020



LEGEND:

S – rate of superelevation in %

NOTES:

- 1 Fill and cut slopes shall be 3H:1V or flatter when specified.
- 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.

A All dimensions are in metres unless otherwise shown.

TABLE
FOR SUPERELEVATED SECTION

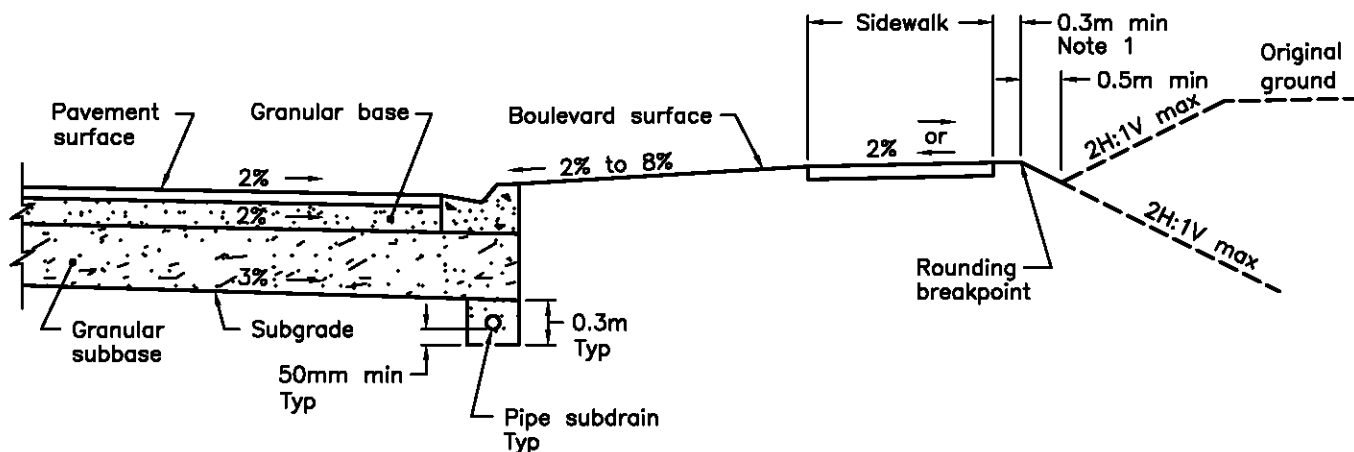
CROSS FALL %												
Paved driving lane	+6	+5	+4	+3	+2	+1	0	-1	-2	-3	-4	-5
Paved shoulder	-2	-2	-2	-3	-3	-3	-4	-5	-6	-6	-6	-6

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

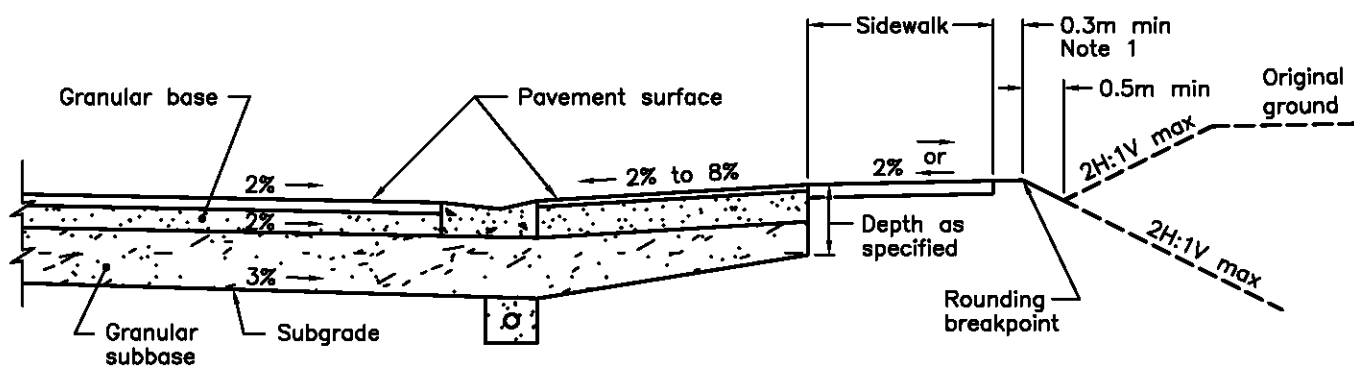
Nov 2016 Rev 3



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

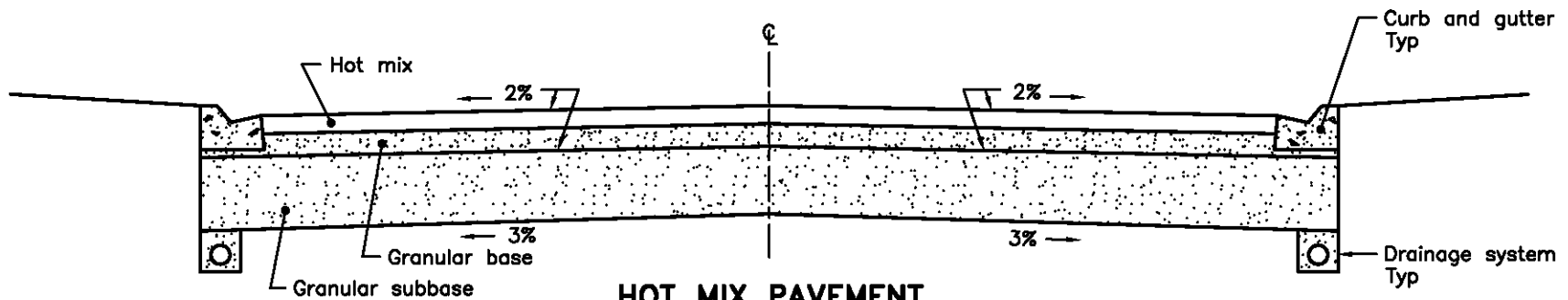
1

BOULEVARD TREATMENTS

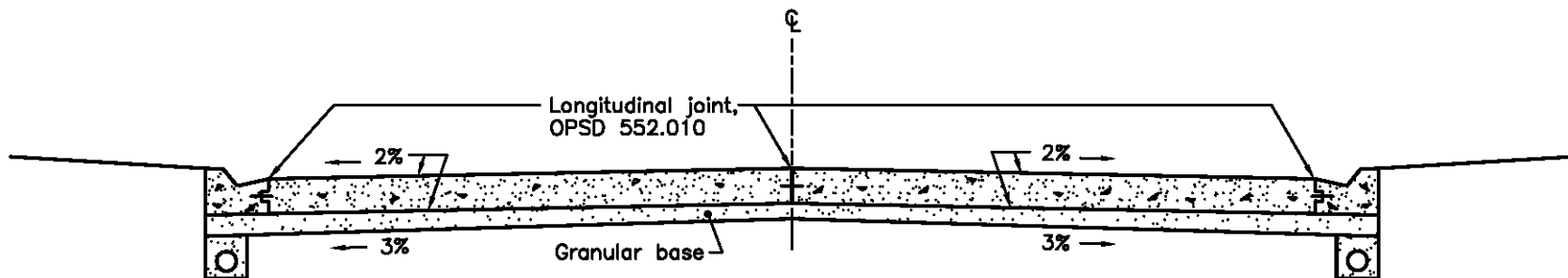
URBAN SECTION



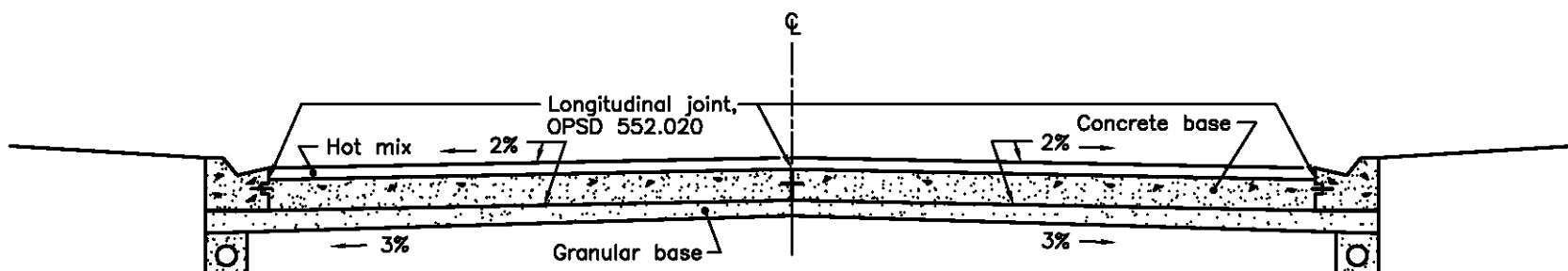
OPSD 216.010



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

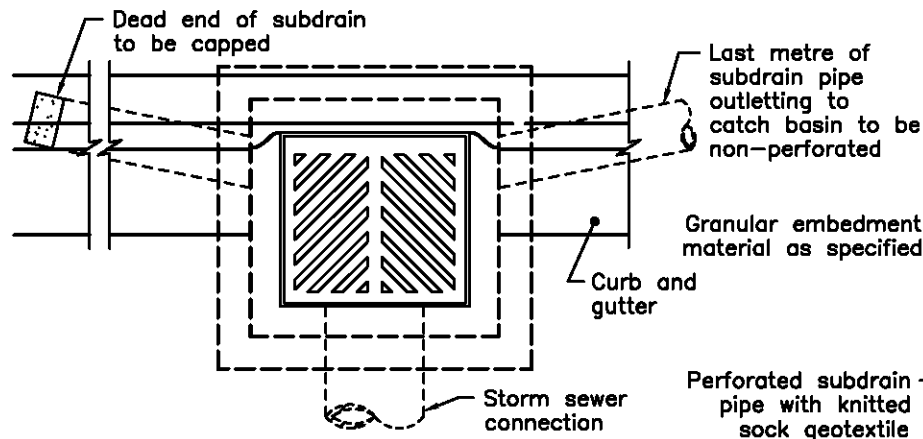
**HOT MIX, CONCRETE, AND
COMPOSITE PAVEMENT ON GRANULAR BASE
URBAN SECTION**

Nov 2008

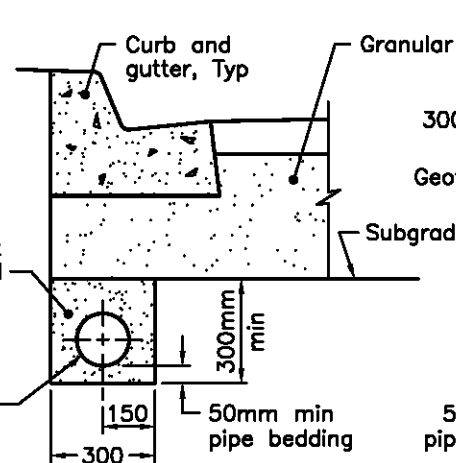
Rev 1



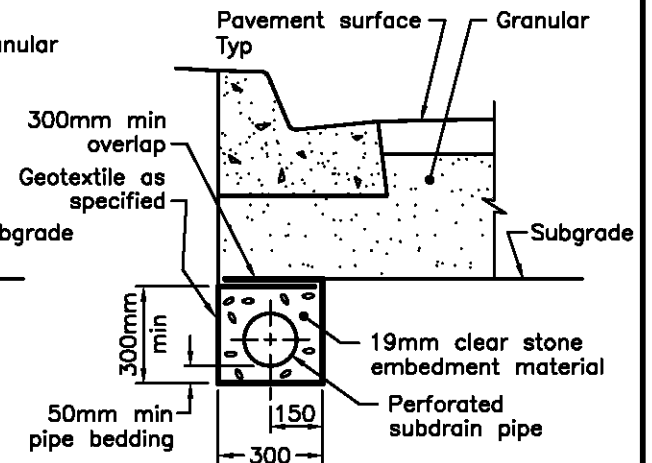
OPSD 216.020



**LONGITUDINAL SUBDRAIN
CONNECTION TO CATCH BASIN**



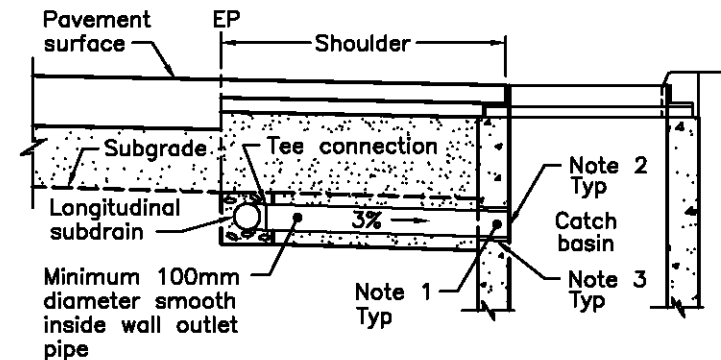
UNWRAPPED TRENCH



WRAPPED TRENCH

NOTES:

- 1 Core hole diameter to allow outlet pipe into structure.
 - 2 Install outlet pipe flush with inside face of catch basin.
 - 3 Annular space around pipe to be filled with non-shrink grout.
- A Use compatible manufactured fittings for all connectors, couplings, and caps.
- B Trench dimensions shown to accommodate 100 or 150mm diameter subdrain pipe.
- C Longitudinal subdrain pipe shall be installed parallel to the grade of the gutter.
- D All dimensions are in millimetres unless otherwise shown.



**LATERAL SUBDRAIN OUTLET PIPE
CONNECTION TO CATCH BASIN**

ONTARIO PROVINCIAL STANDARD DRAWING

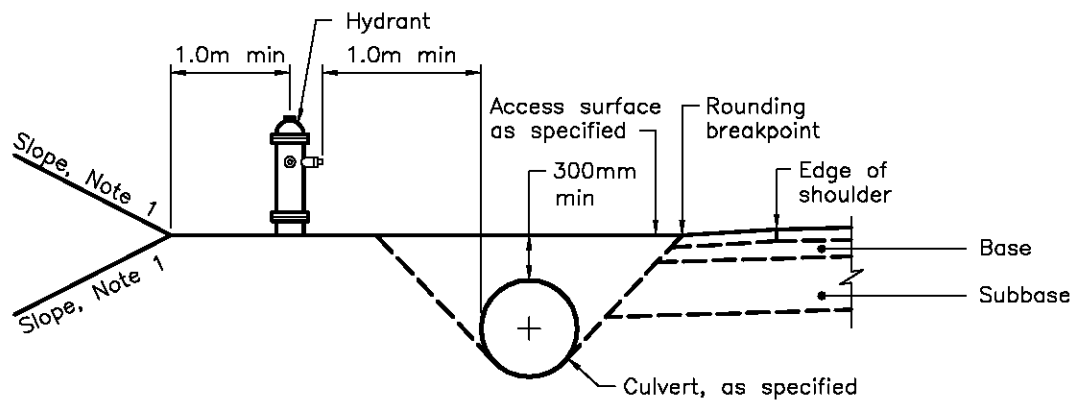
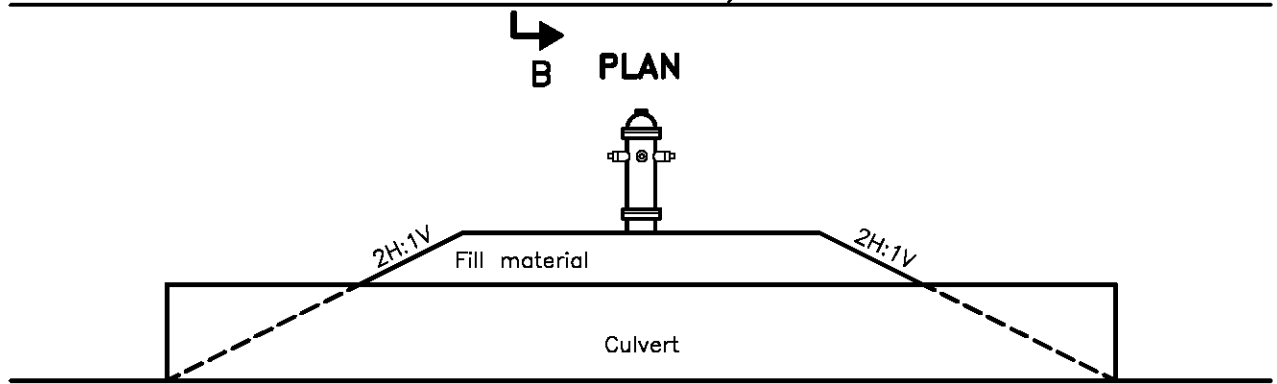
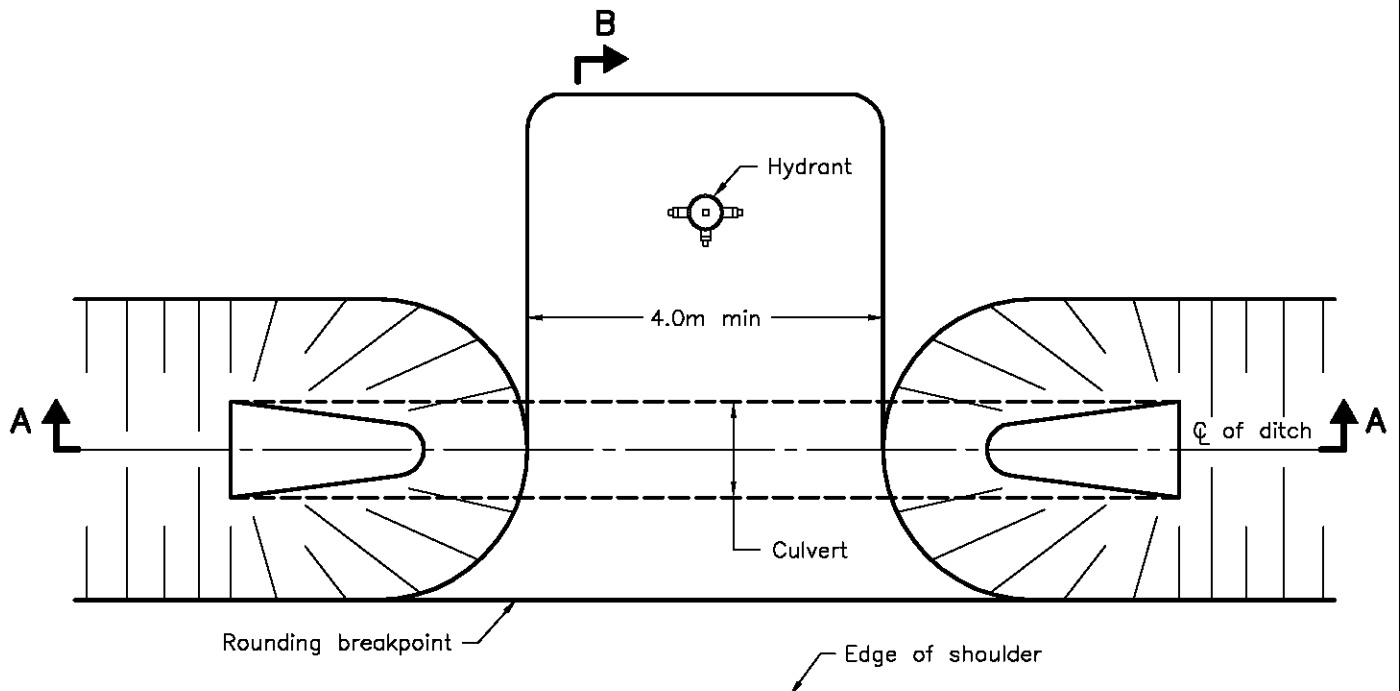
Nov 2008

Rev 2

**SUBDRAIN PIPE
CONNECTION AND OUTLET
URBAN**

OPSD 216.021





NOTE:

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

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

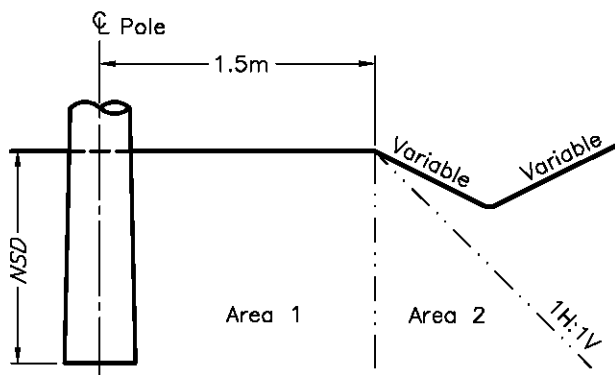
Nov 2011

Rev 2

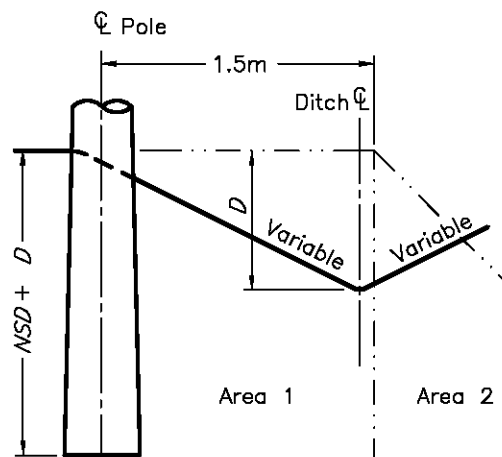
**ACCESS TO HYDRANT
ACROSS DITCH**

OPSD 217.050

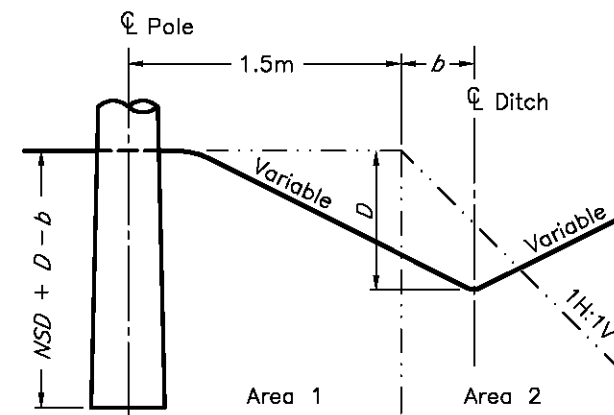




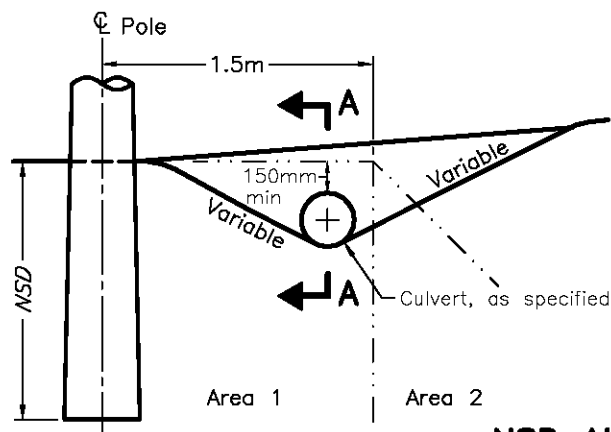
DITCH BEYOND AREAS 1 AND 2



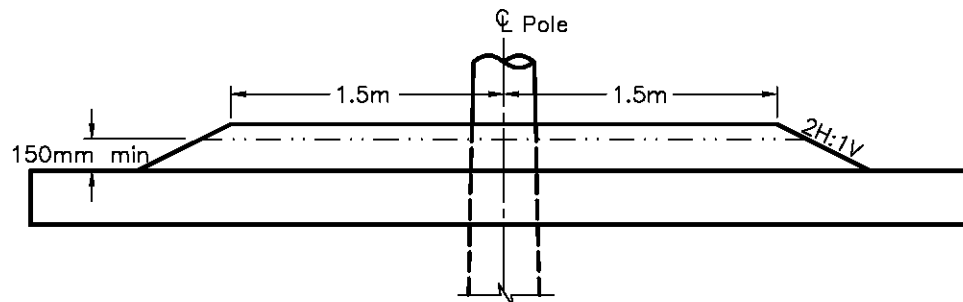
DITCH BOTTOM WITHIN AREA 1



DITCH BOTTOM WITHIN AREA 2



NSD ALTERNATIVE USING CULVERT
NOTE 1



SECTION A-A

NOTES:

1 When pipe cover is less than $\text{Dia}/3$, 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

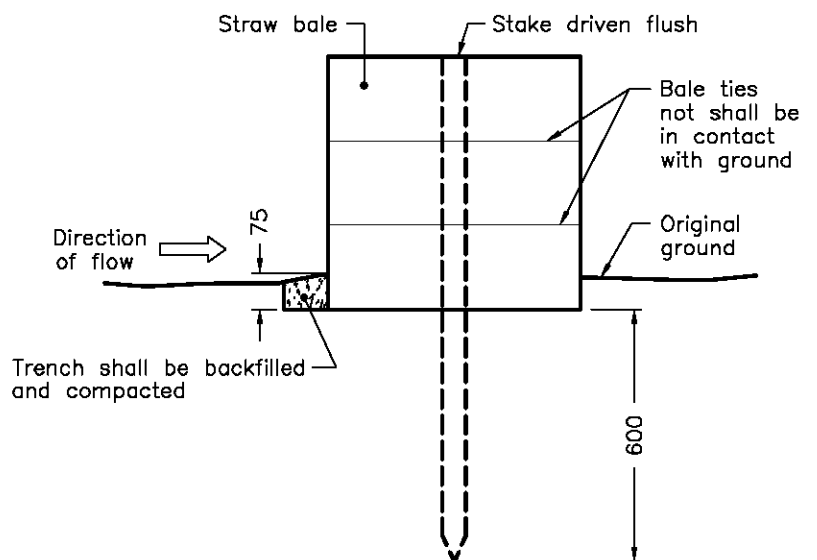
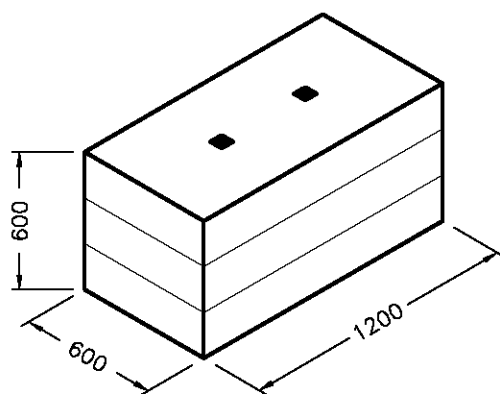
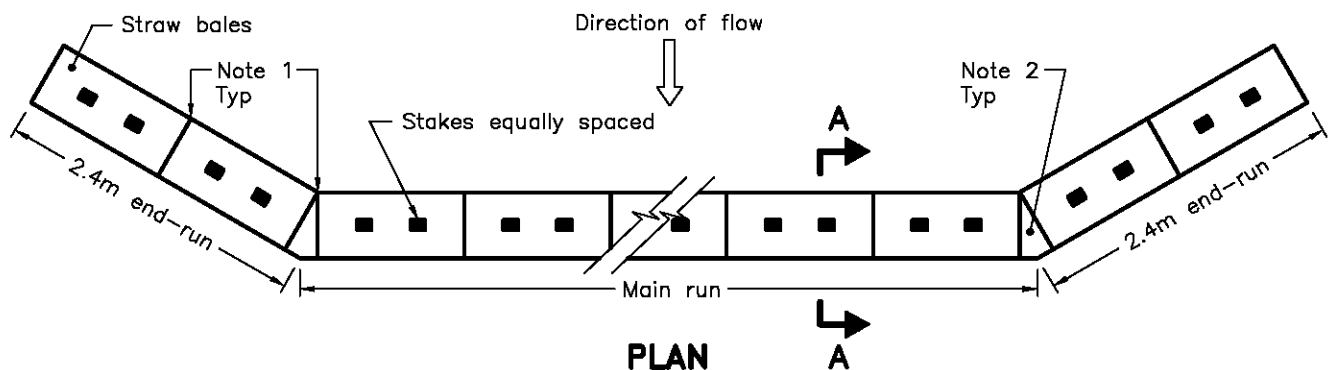
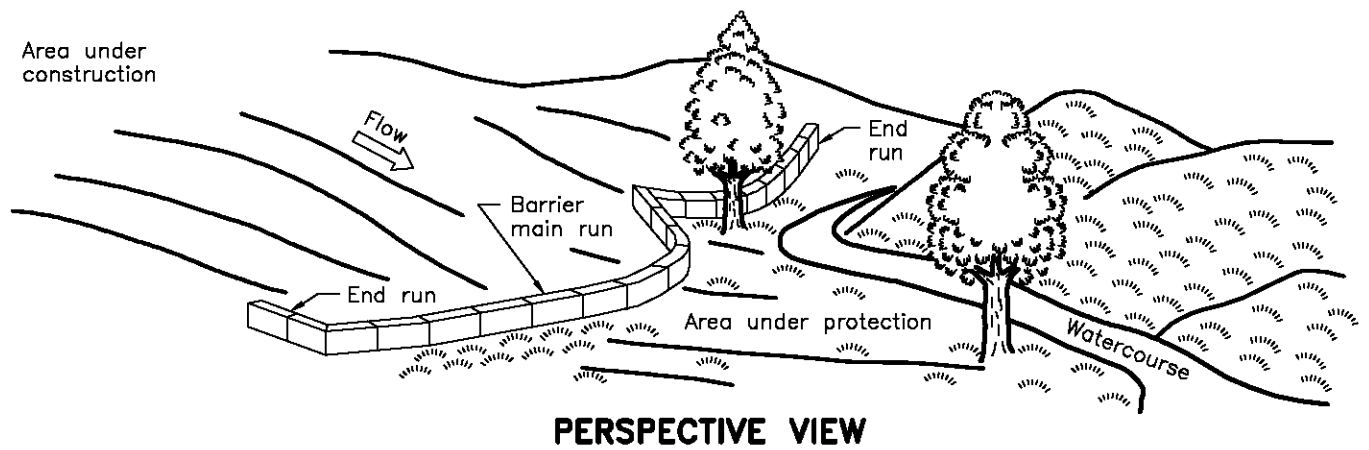
Nov 2011

Rev 2

**UTILITY POLE SETTING DEPTH
AT DITCH LOCATIONS**

OPSD 217.060





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

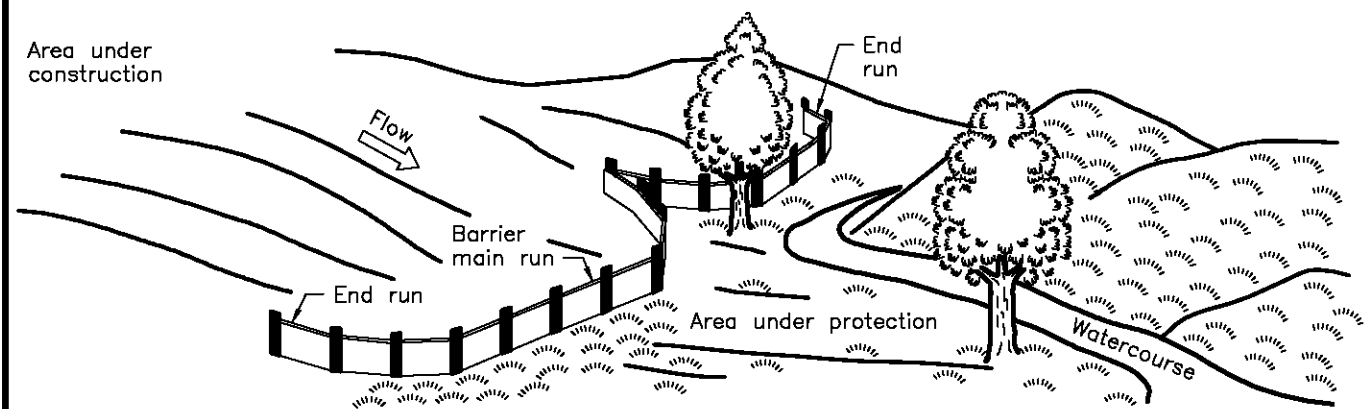
Nov 2015

Rev 2

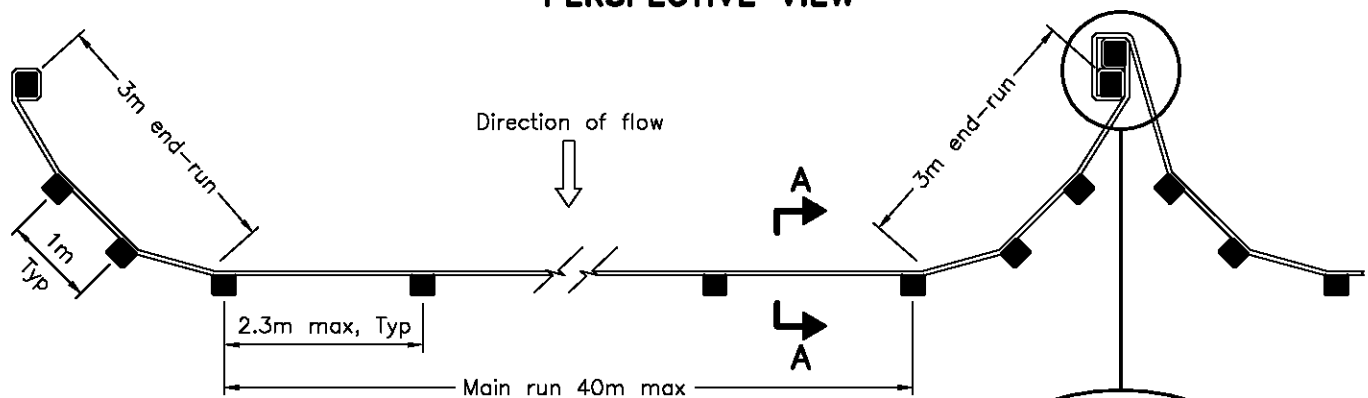
**LIGHT-DUTY
STRAW BALE BARRIER**



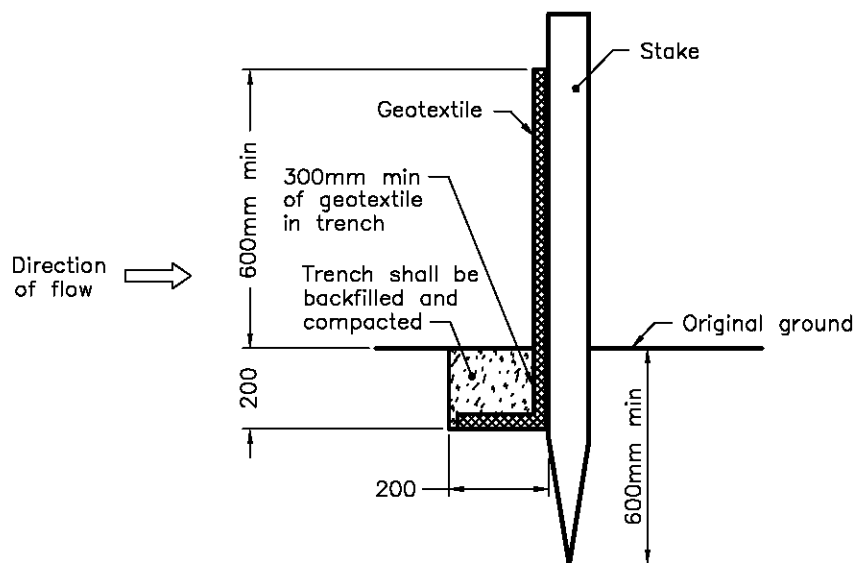
OPSD 219.100



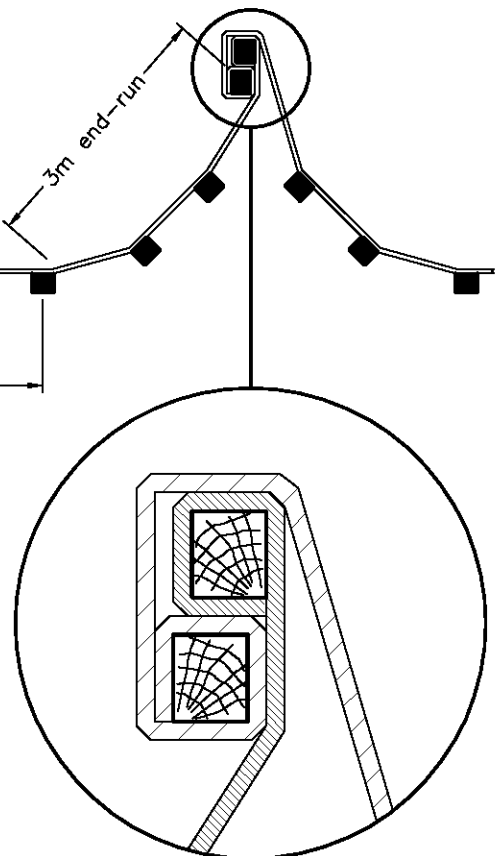
PERSPECTIVE VIEW



PLAN



SECTION A-A



JOINT DETAIL

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

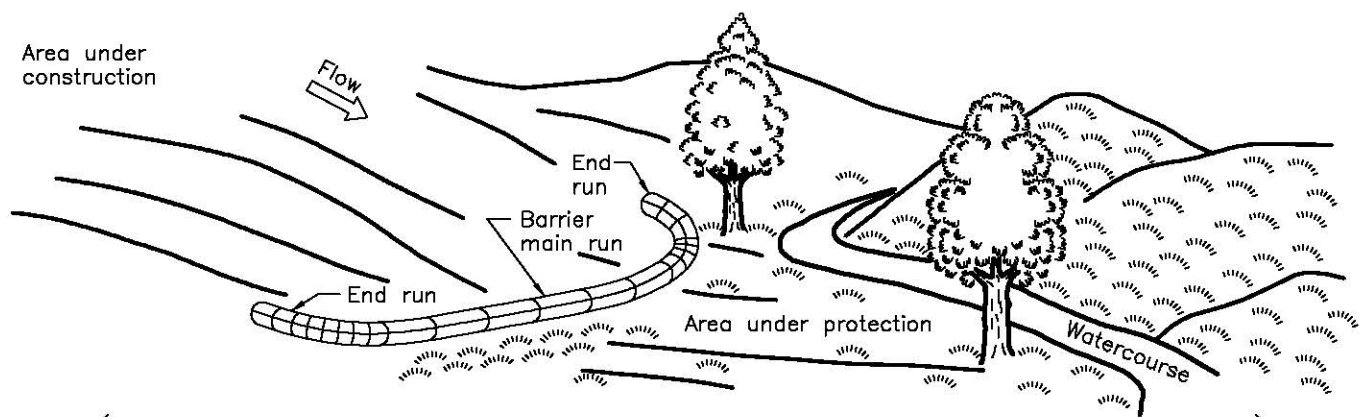
Nov 2015

Rev 2

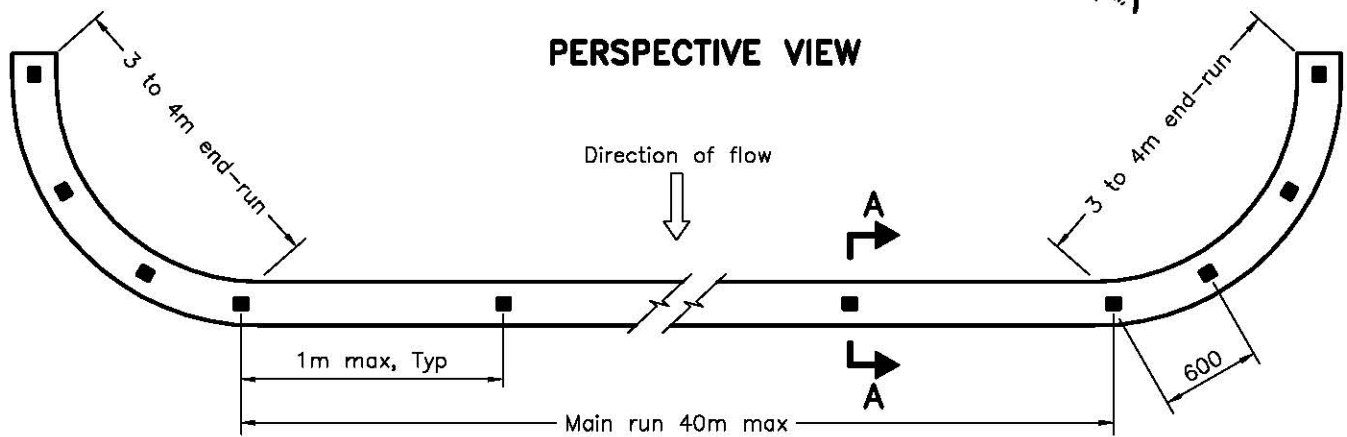
**LIGHT-DUTY
SILT FENCE BARRIER**



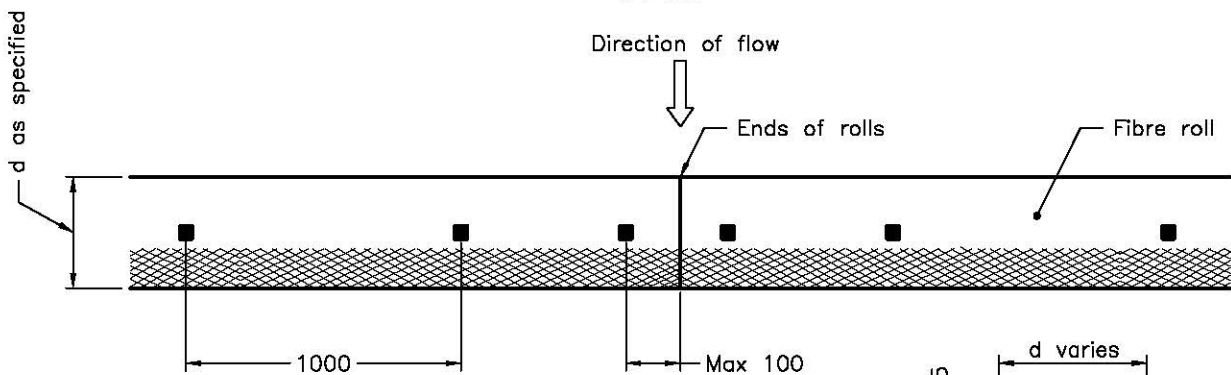
OPSD 219.110



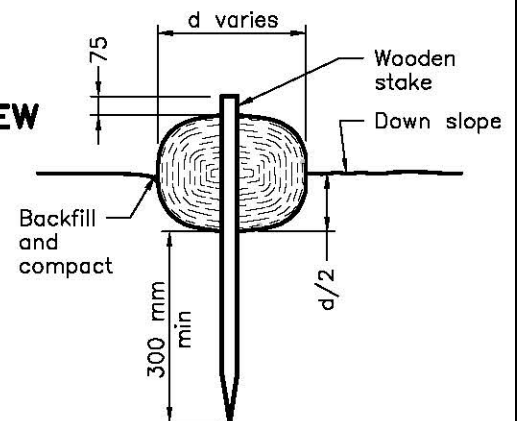
PERSPECTIVE VIEW



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

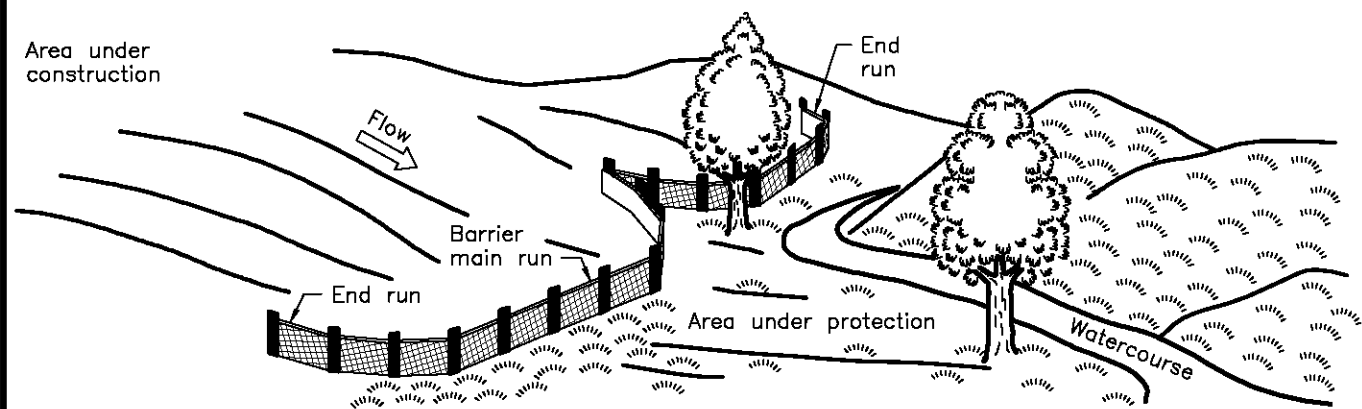
Nov 2015

Rev 0

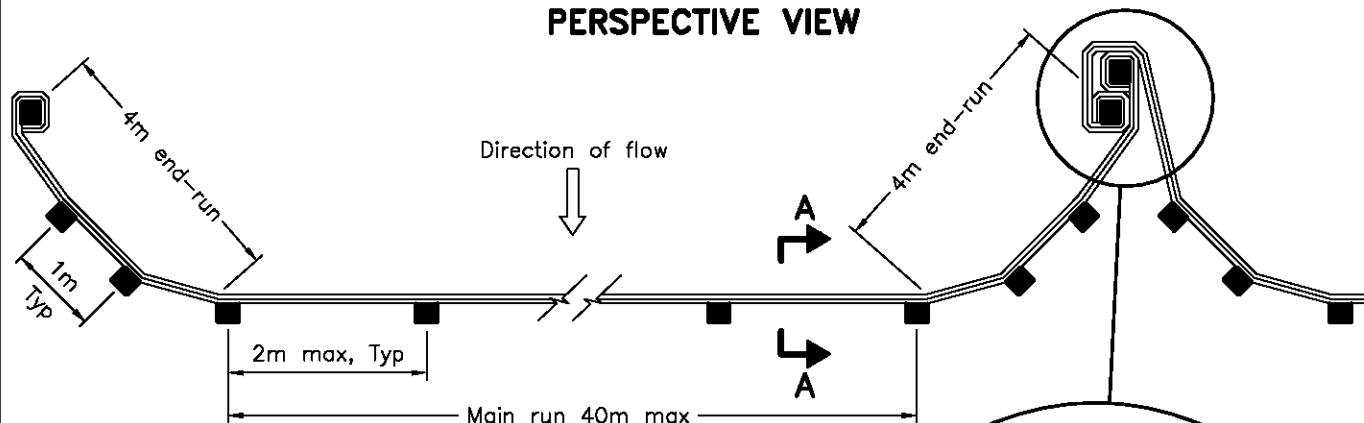
**LIGHT-DUTY
FIBRE ROLL BARRIER**



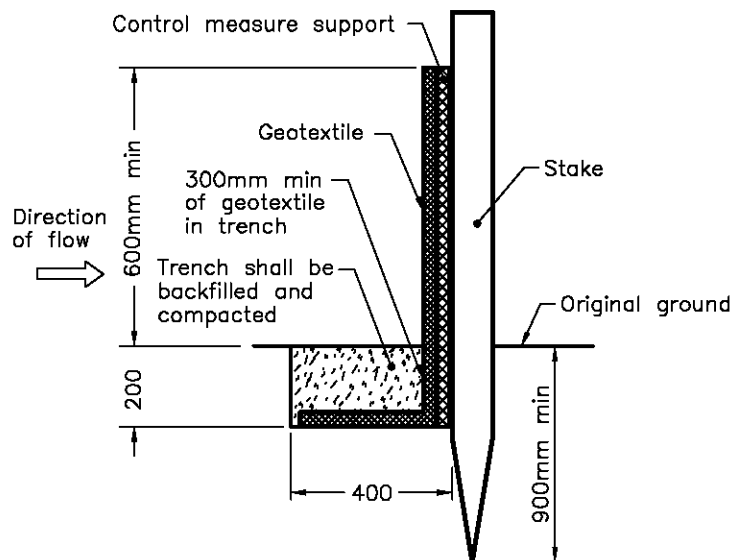
OPSD 219.120



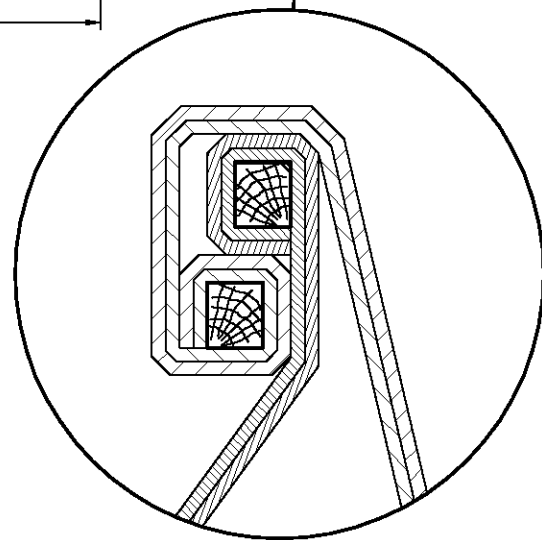
PERSPECTIVE VIEW



PLAN



SECTION A-A



JOINT DETAIL

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

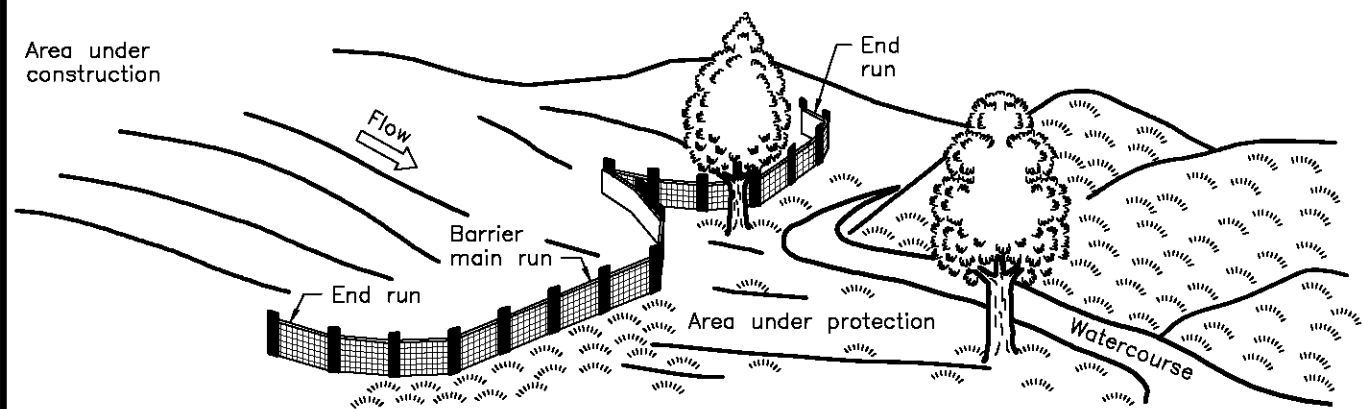
Nov 2015

Rev 2

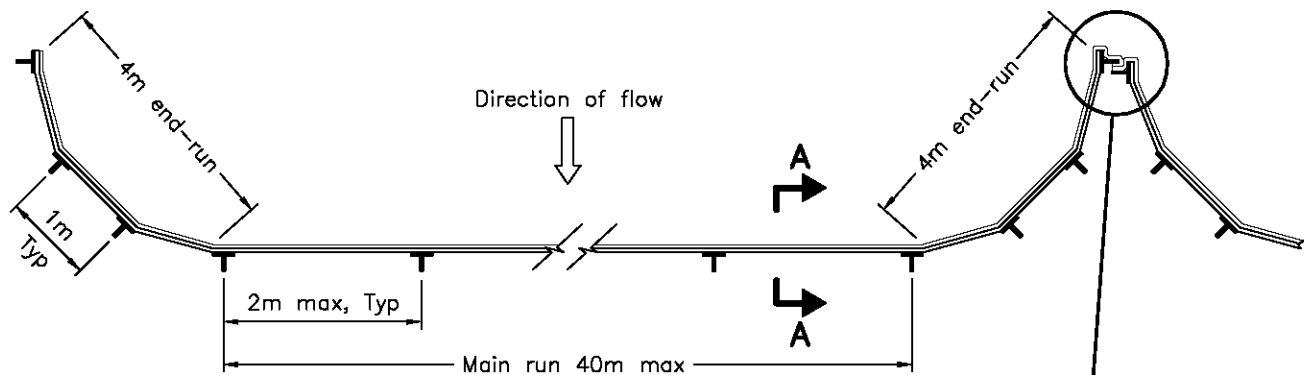
**HEAVY-DUTY
SILT FENCE BARRIER**



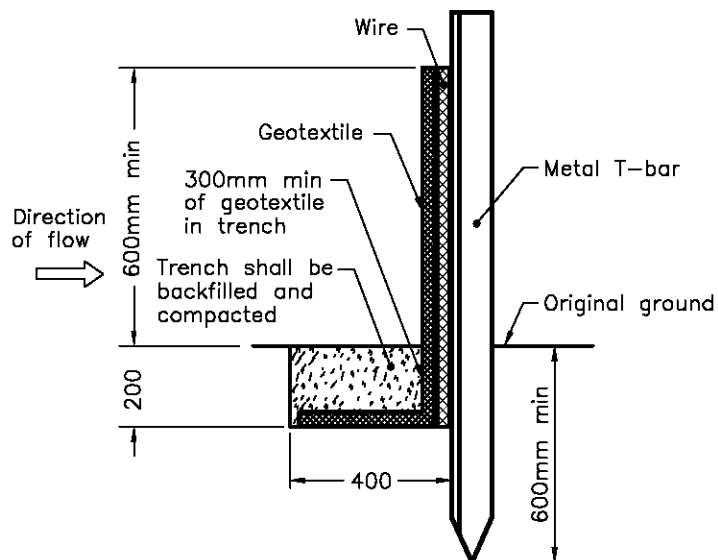
OPSD 219.130



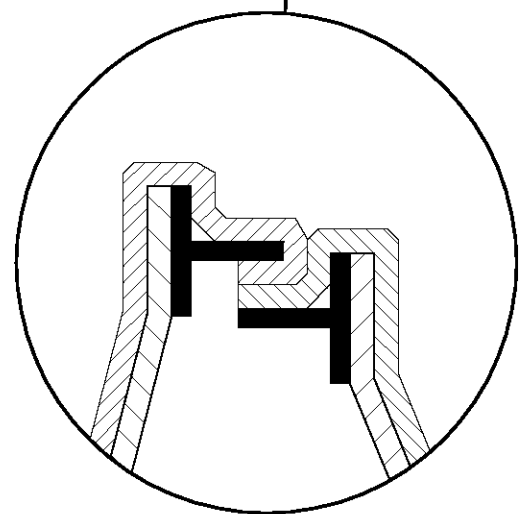
PERSPECTIVE VIEW



PLAN



SECTION A-A



JOINT DETAIL

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

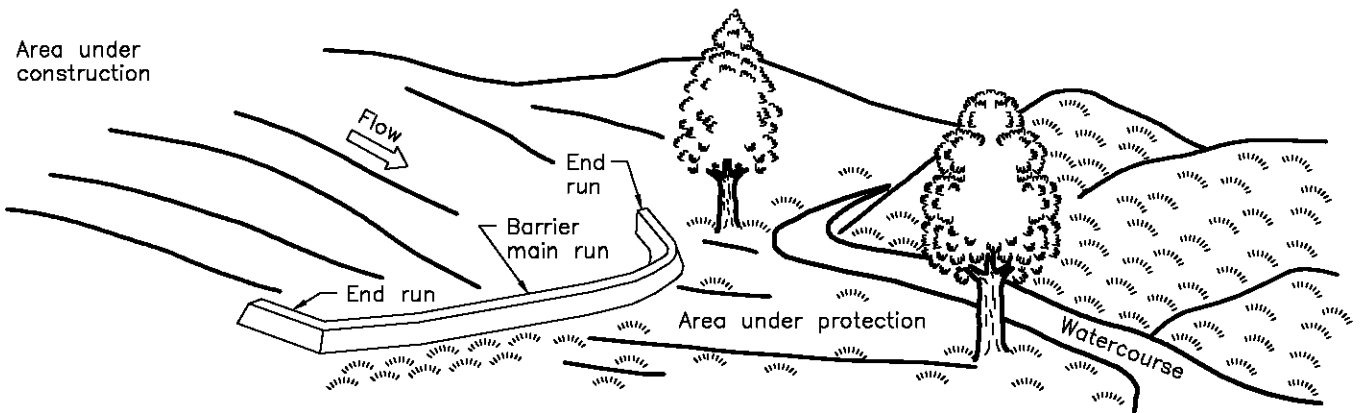
Nov 2015

Rev 0

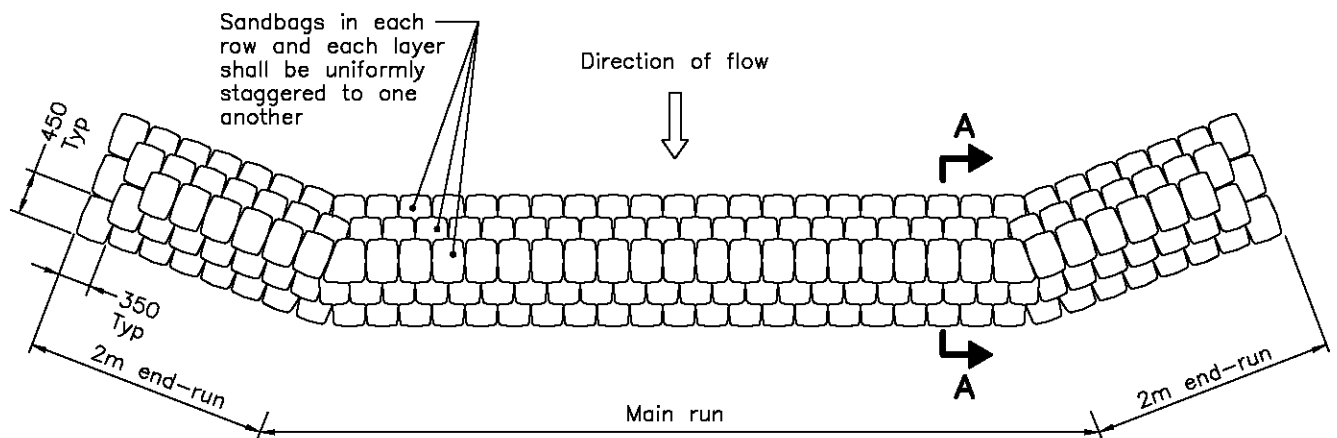
**HEAVY-DUTY WIRE-BACKED
SILT FENCE BARRIER**

OPSD 219.131

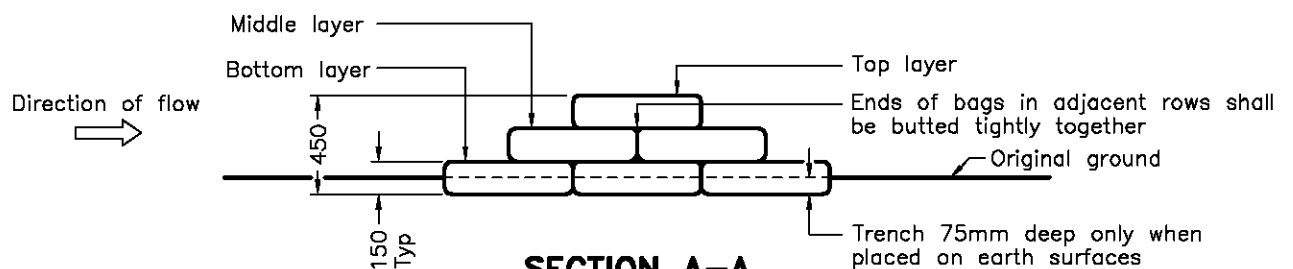




PERSPECTIVE VIEW



PLAN



SECTION A-A

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

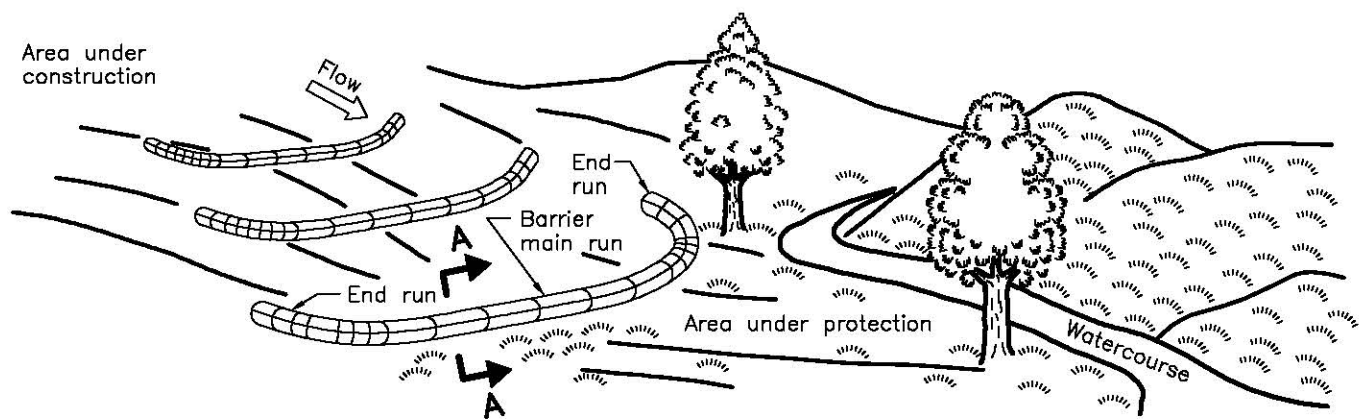
Nov 2015

Rev 2

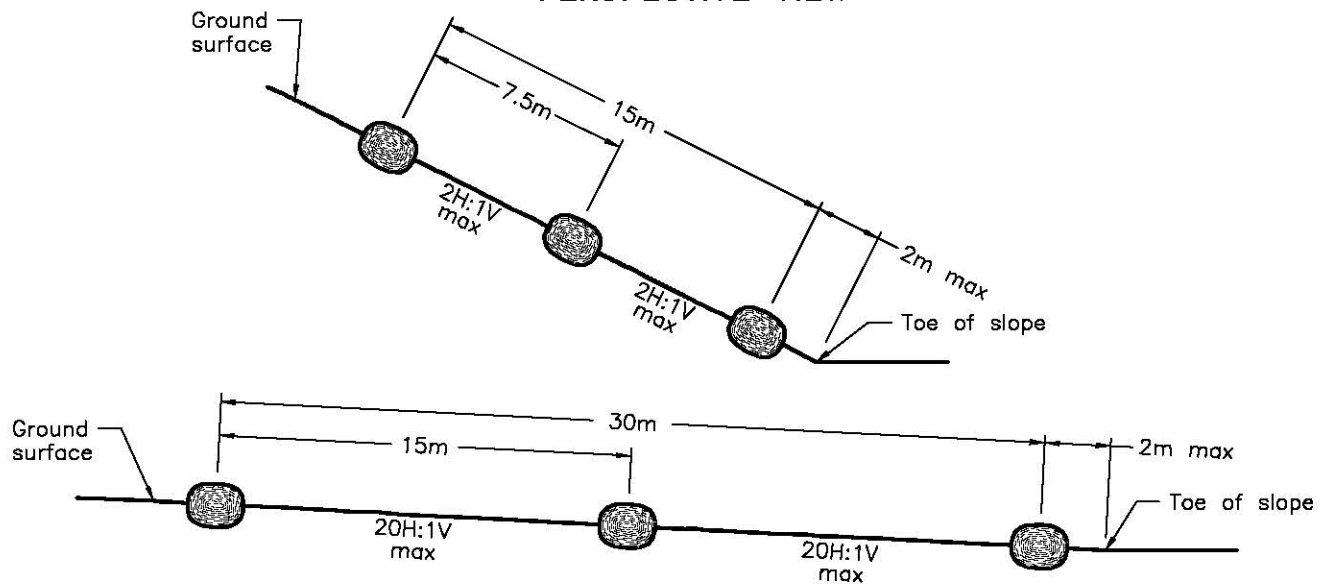
SANDBAG BARRIER



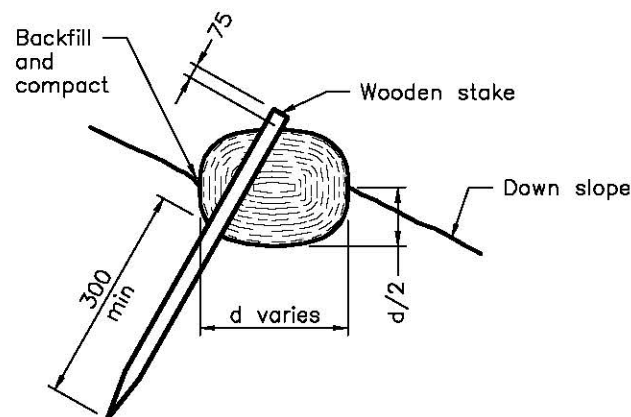
OPSD 219.150



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

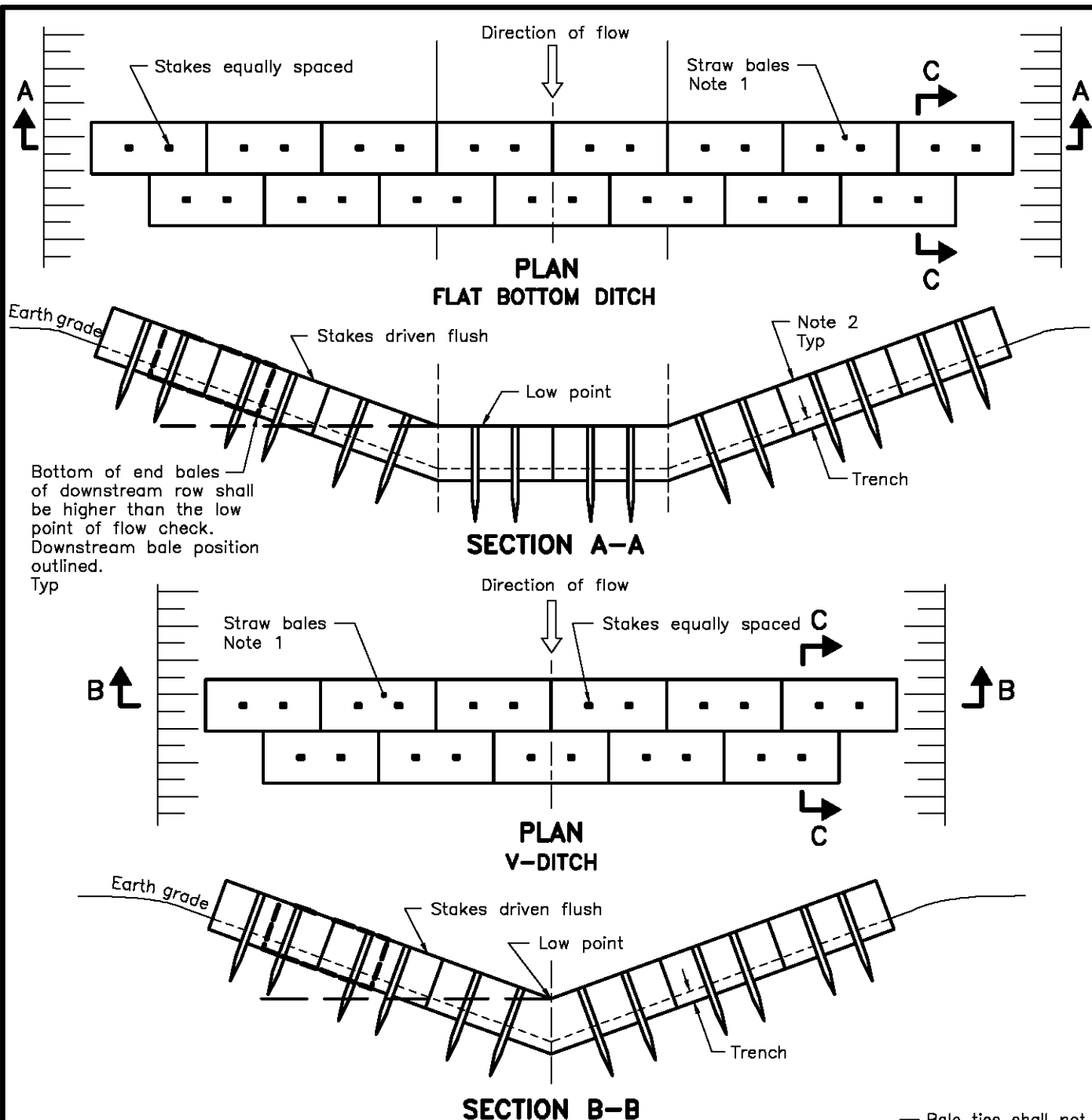
Nov 2015

Rev 0

FIBRE ROLL GRADE BREAKS

OPSD 219.160





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

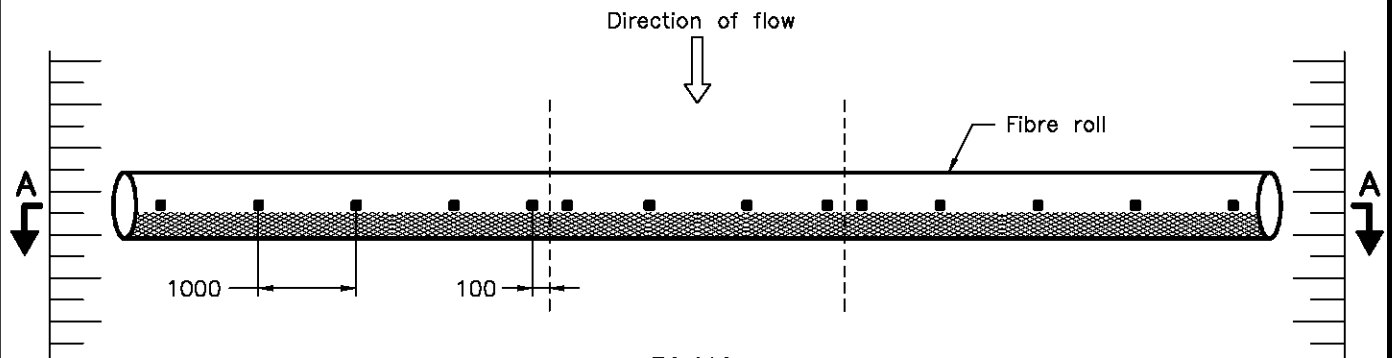
Nov 2015

Rev 2

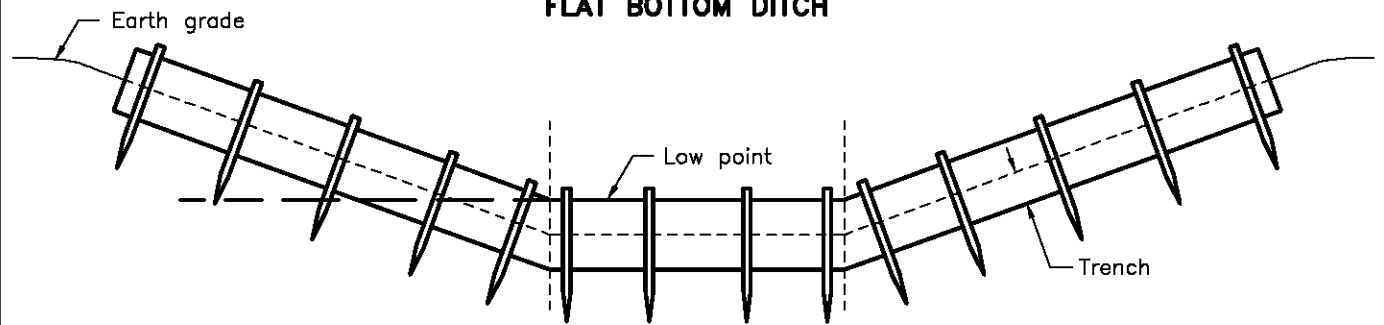
STRAW BALE FLOW CHECK DAM



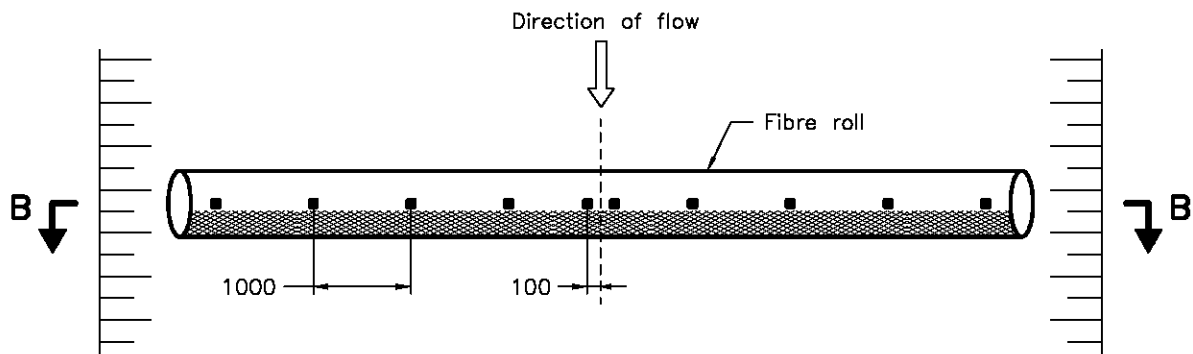
OPSD 219.180



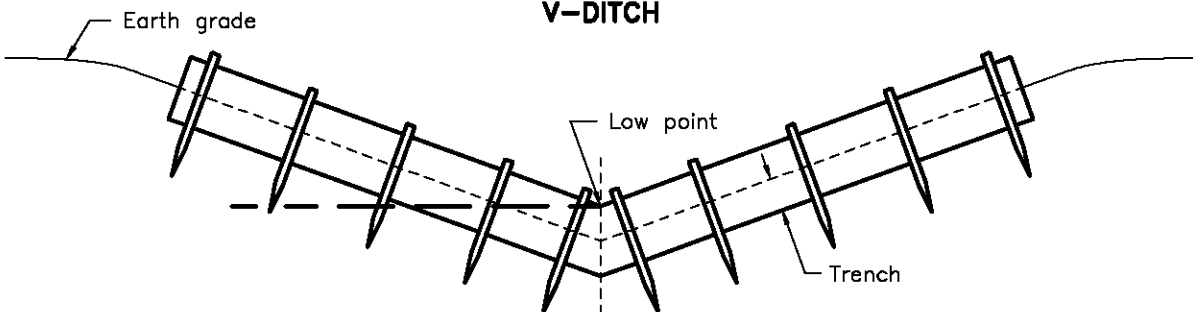
**PLAN
FLAT BOTTOM DITCH**



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

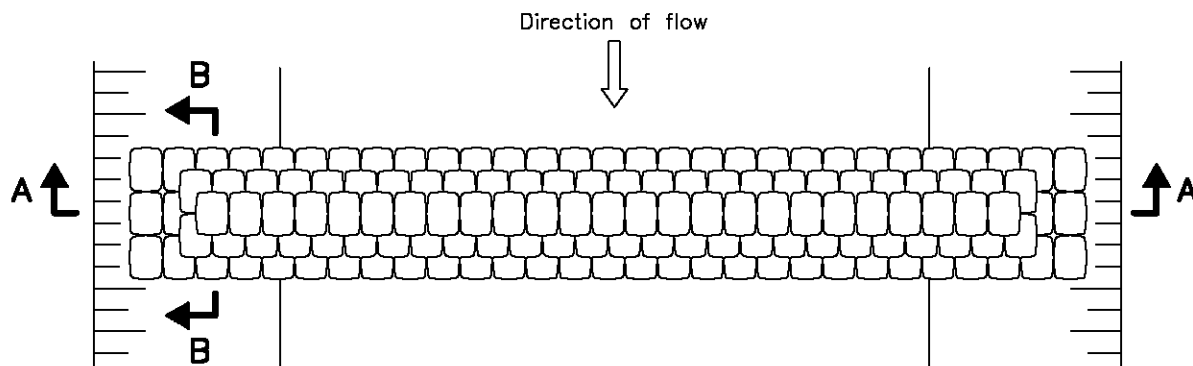
Nov 2015

Rev 0

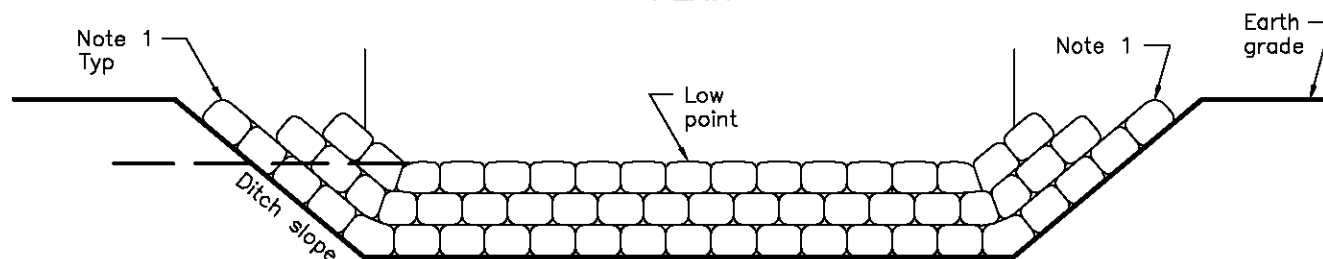
FIBRE ROLL FLOW CHECK DAMS



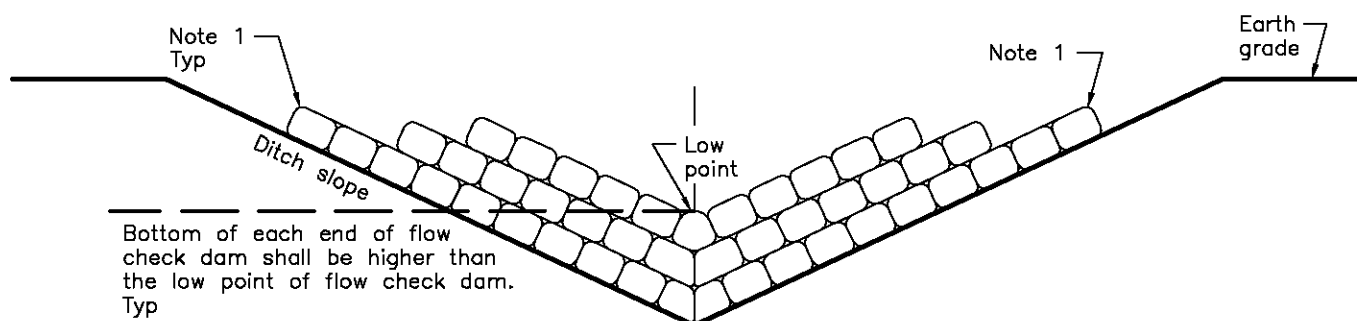
OPSD 219.191



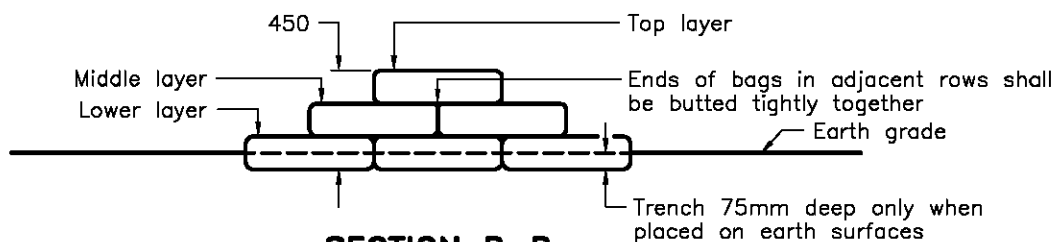
PLAN



**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.

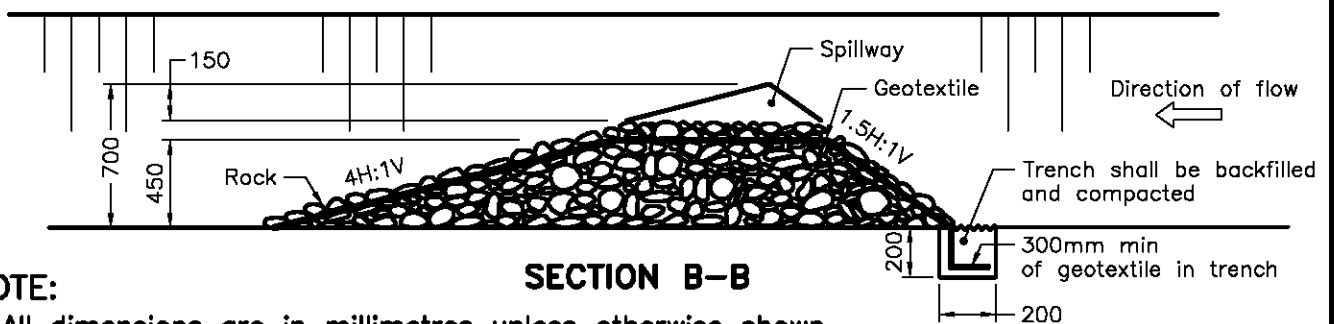
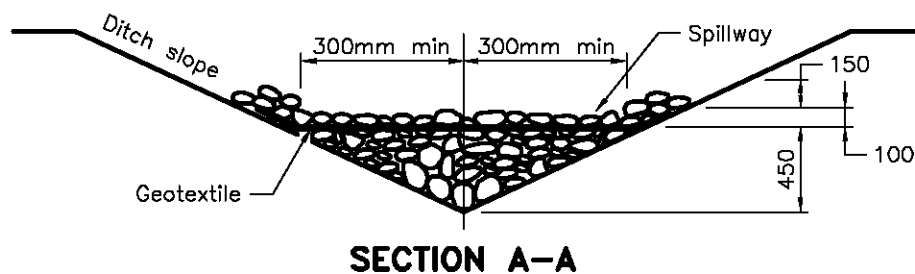
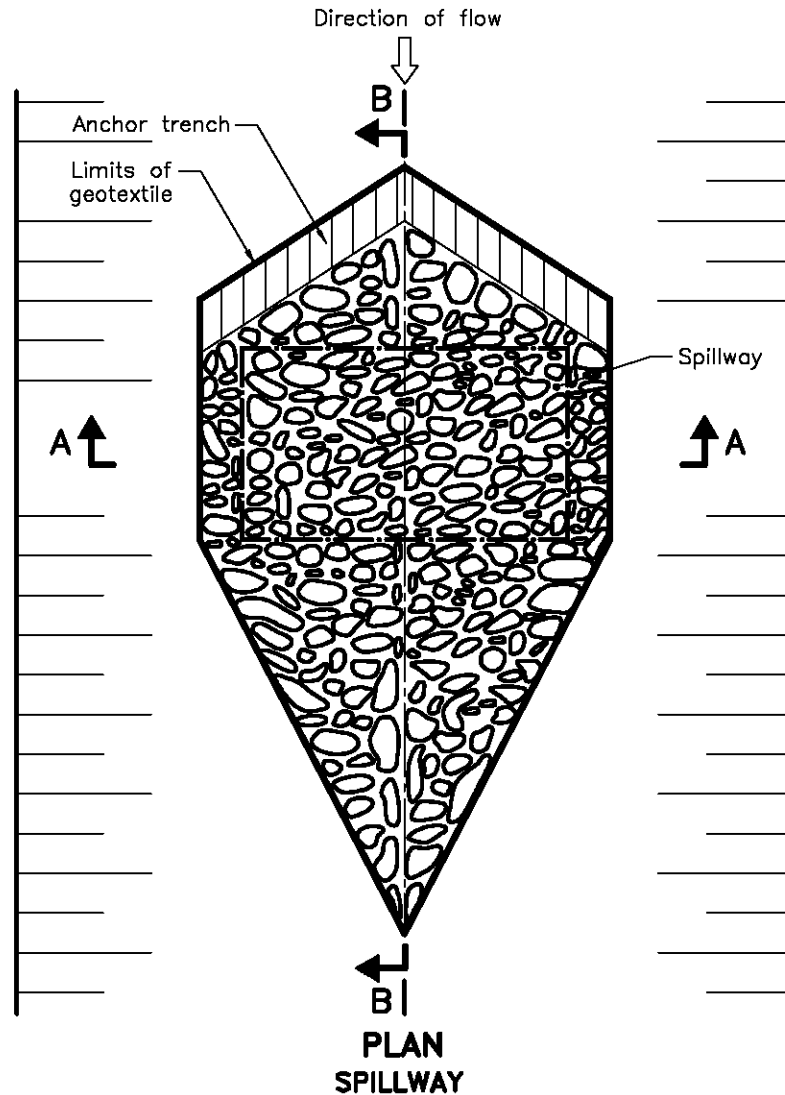
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2015 Rev 2

SANDBAG FLOW CHECK DAM

OPSD 219.200





NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

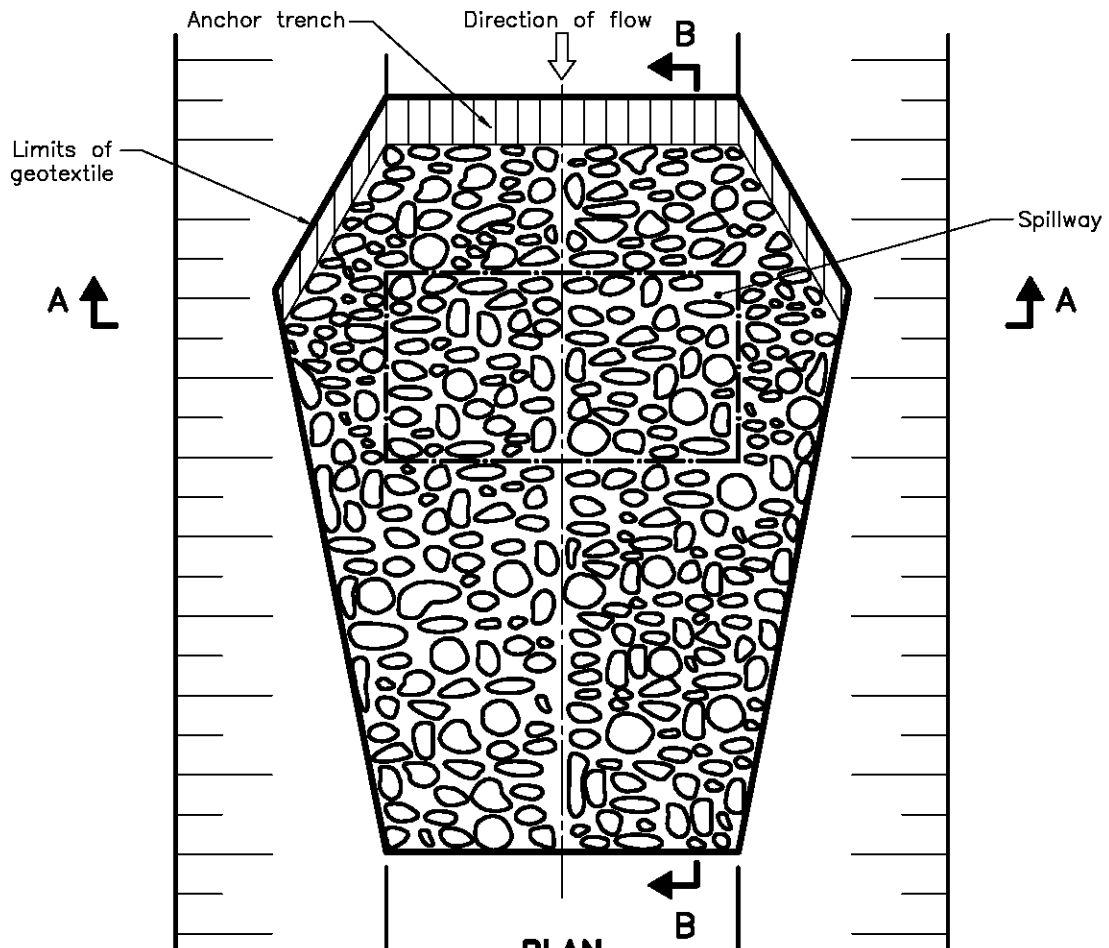
Nov 2015

Rev 2

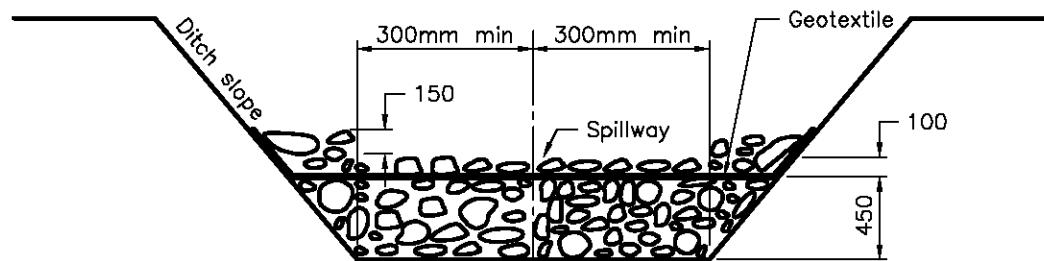
TEMPORARY
ROCK FLOW CHECK DAM
V-DITCH



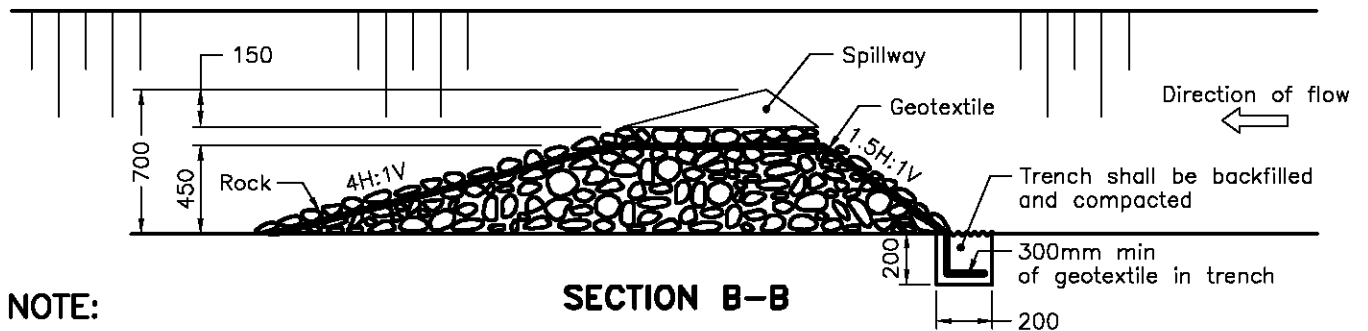
OPSD 219.210



**PLAN
SPILLWAY**



SECTION A-A



SECTION B-B

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

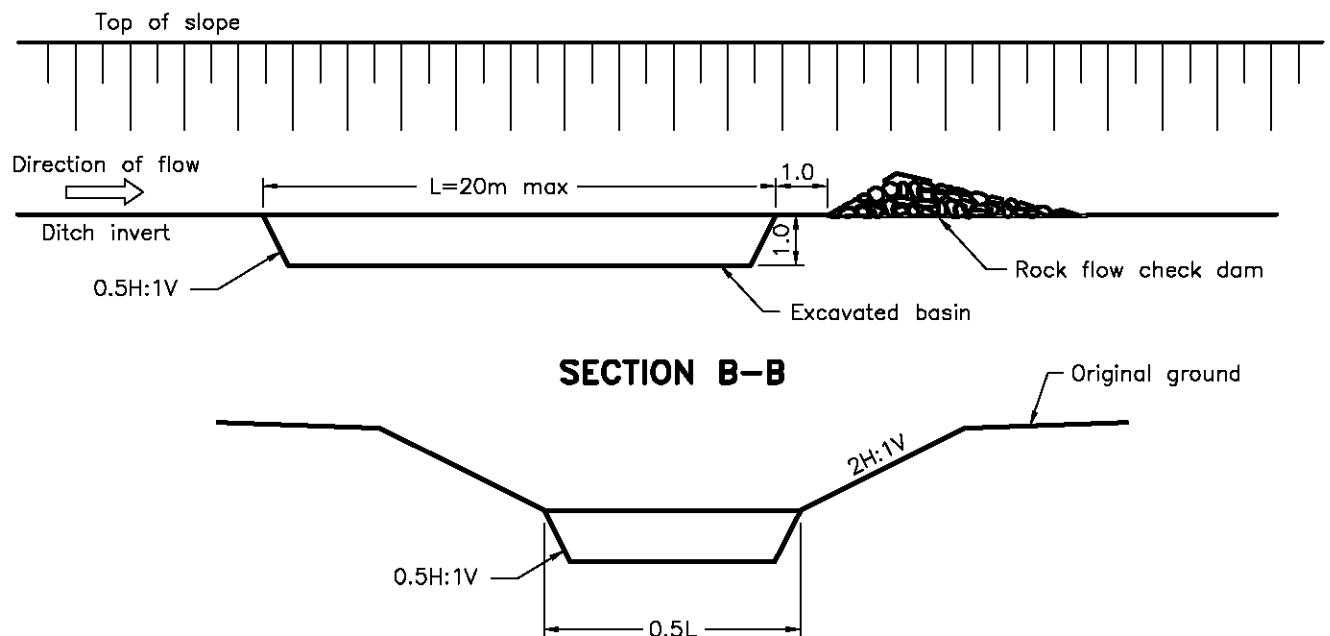
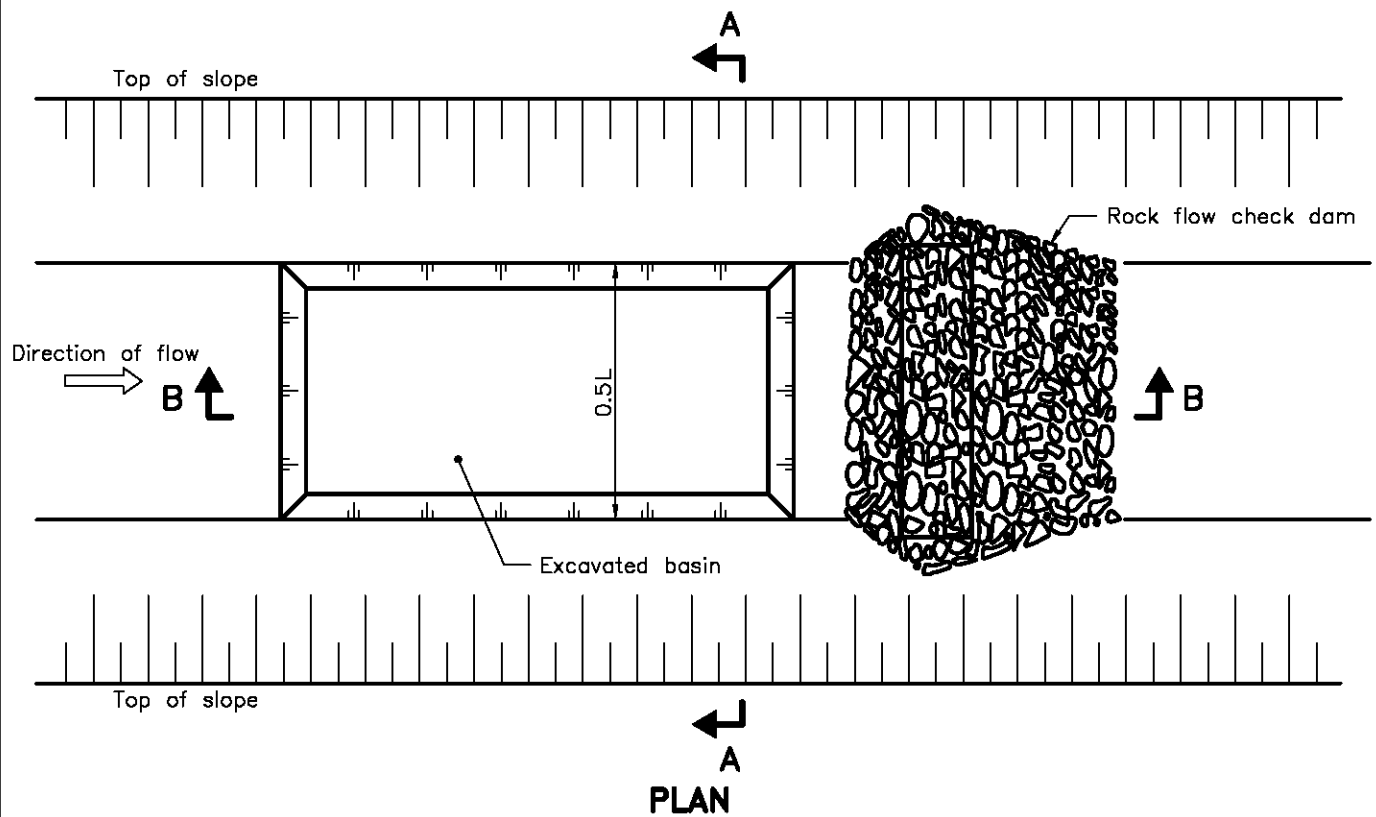
Nov 2015

Rev 2

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



OPSD 219.211



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 conjunction with OPSD 219.210 or 219.211.

C All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

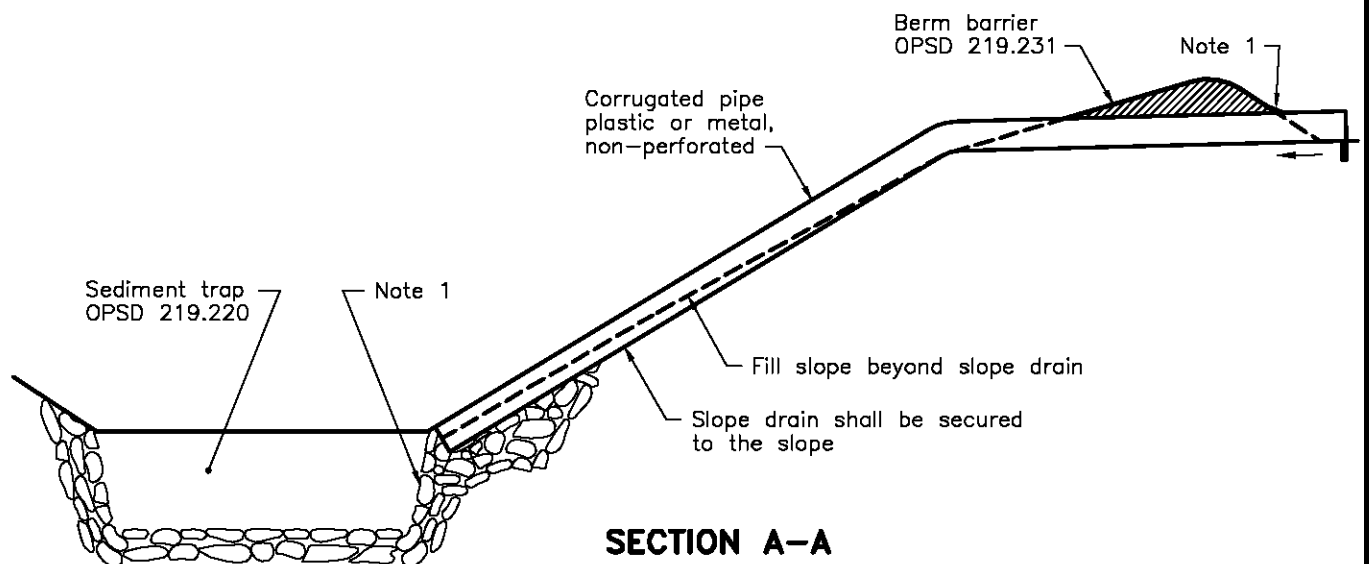
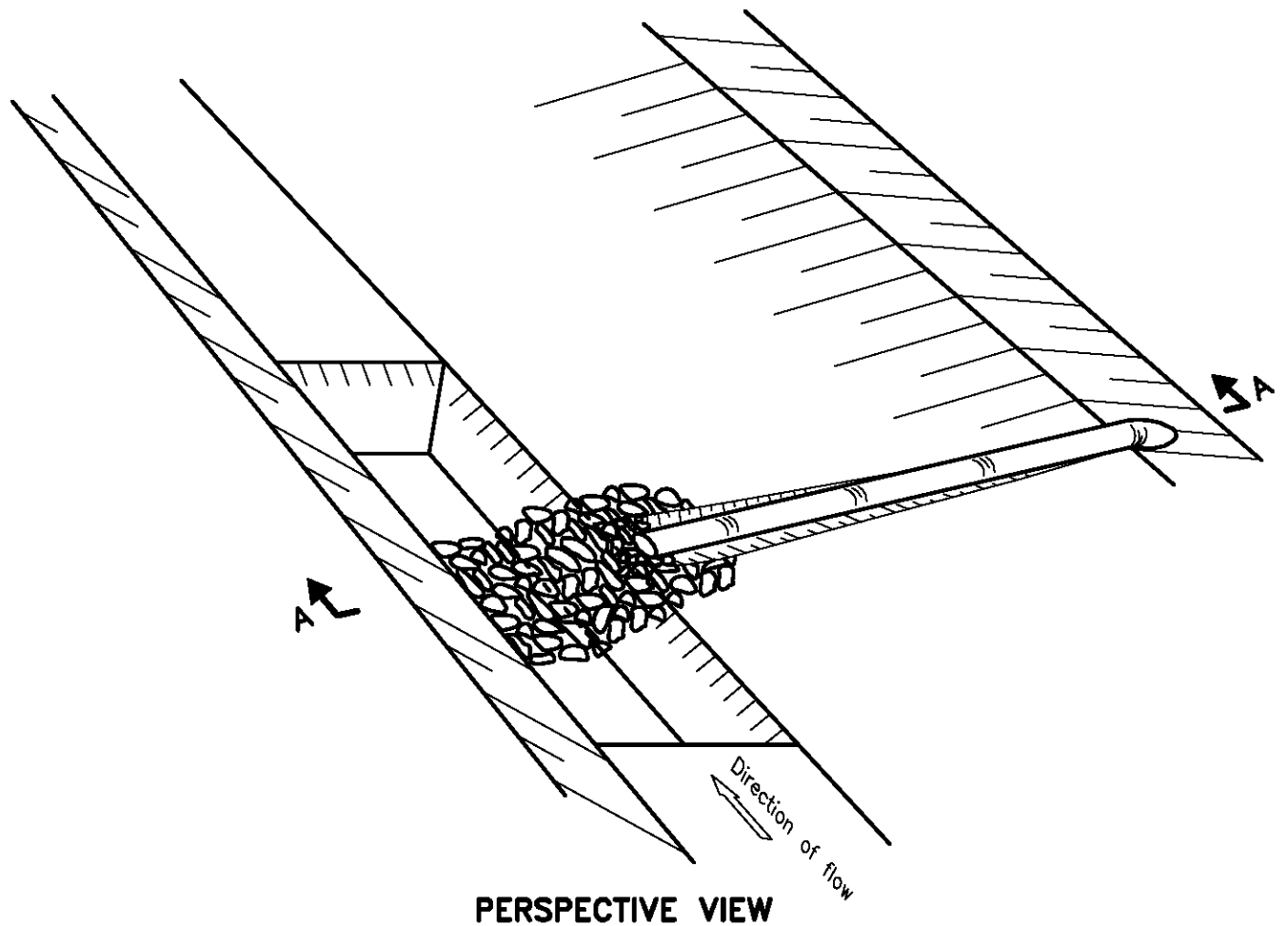
Nov 2015

Rev 2

SEDIMENT TRAP IN DITCH



OPSD 219.220



NOTES:

1 Scour protection according to OPSD 810.010.

ONTARIO PROVINCIAL STANDARD DRAWING

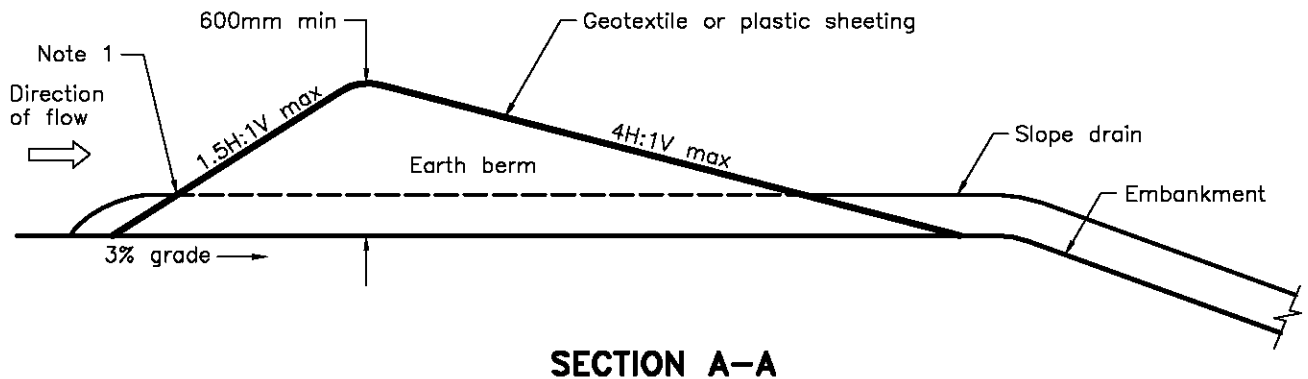
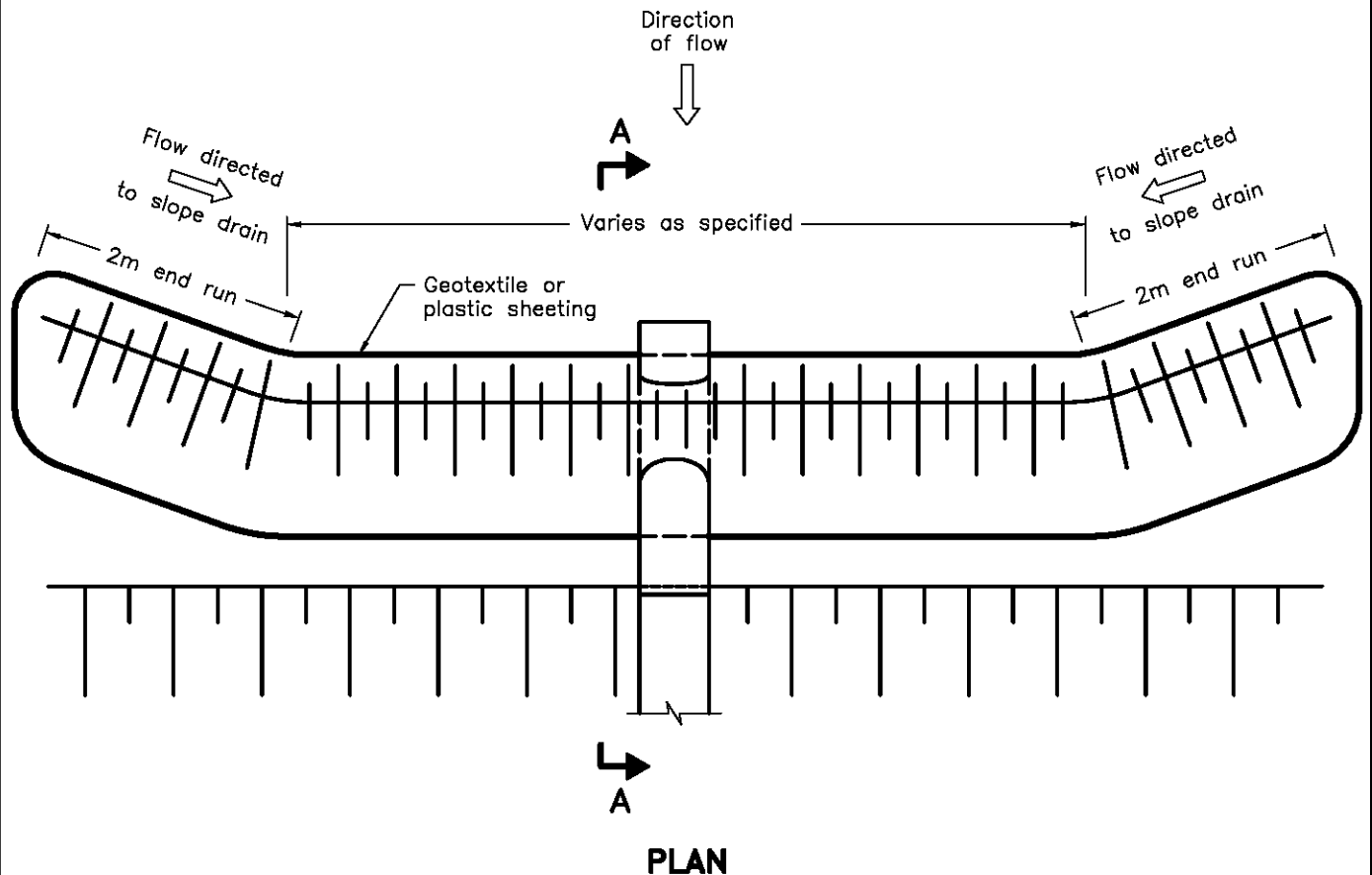
Nov 2015

Rev 4

**TEMPORARY SLOPE DRAIN FOR
SEDIMENT TRAP**

OPSD 219.230





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

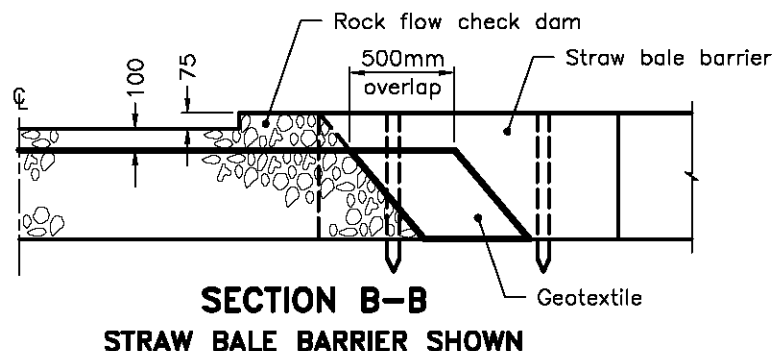
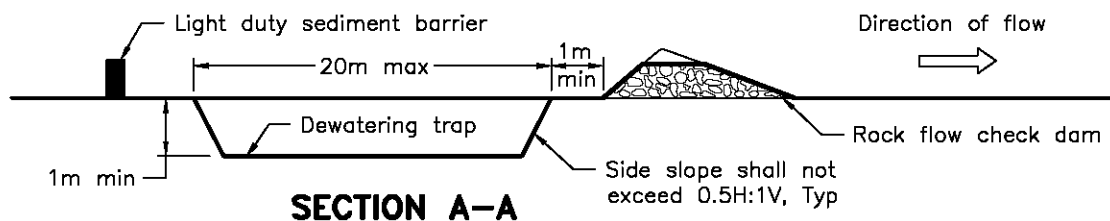
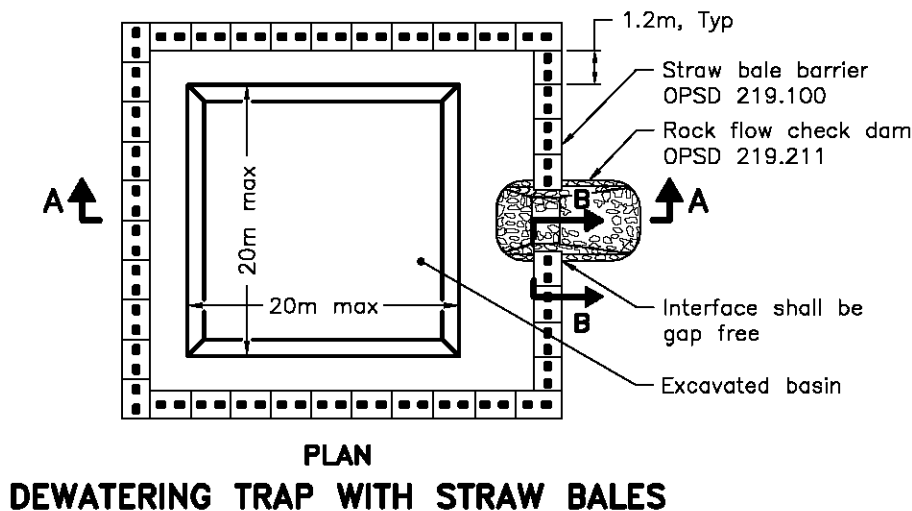
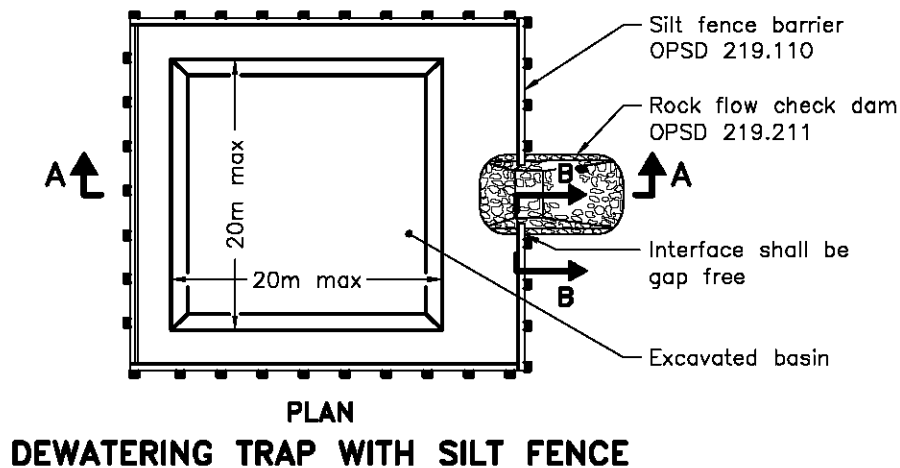
Nov 2015

Rev 1

**TEMPORARY BERM BARRIER
FOR SLOPE DRAIN**



OPSD 219.231



NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

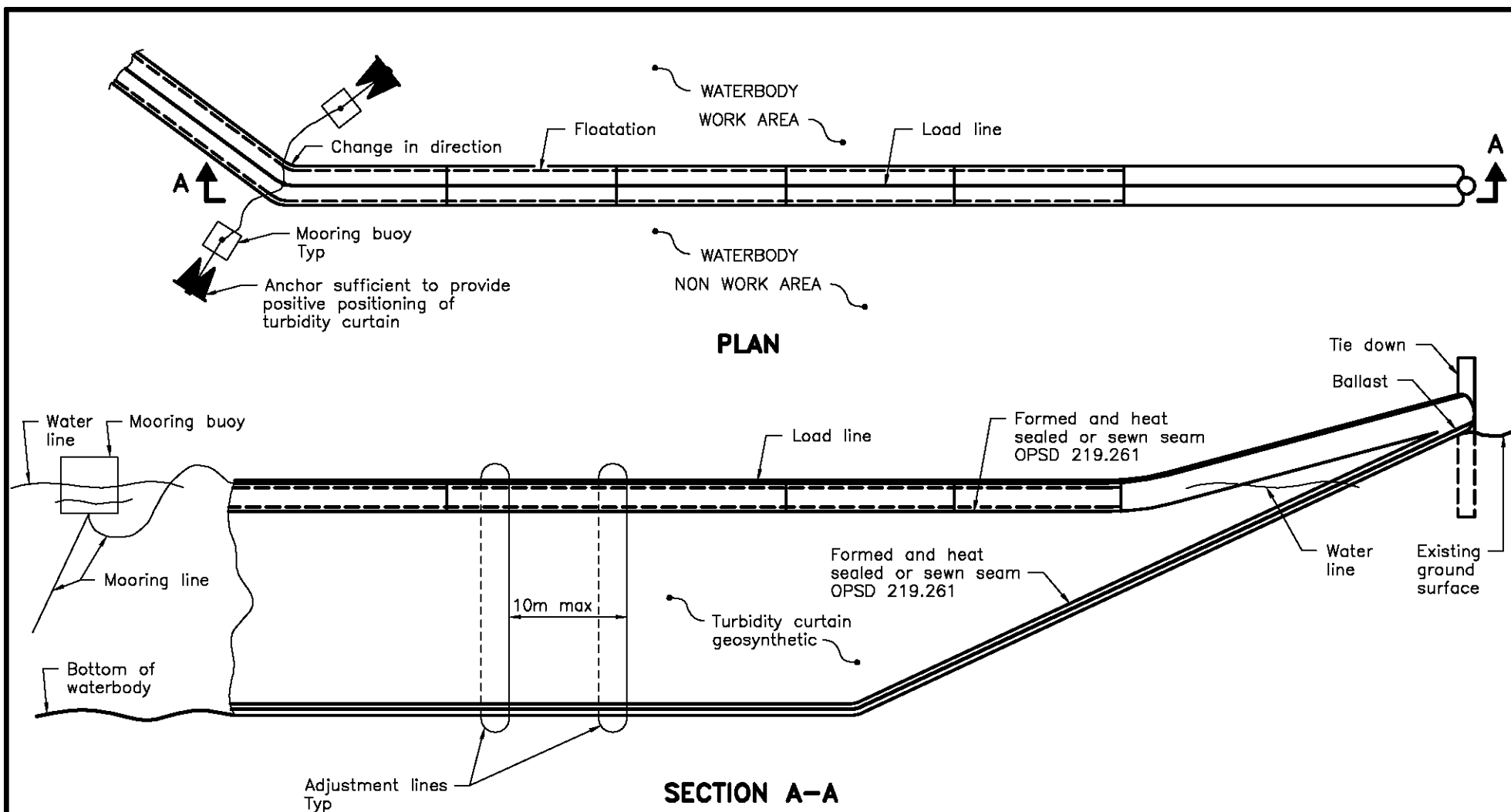
Nov 2015

Rev 2

SEDIMENT TRAP FOR DEWATERING

OPSD 219.240





NOTES:

A All dimensions are in millimeters unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

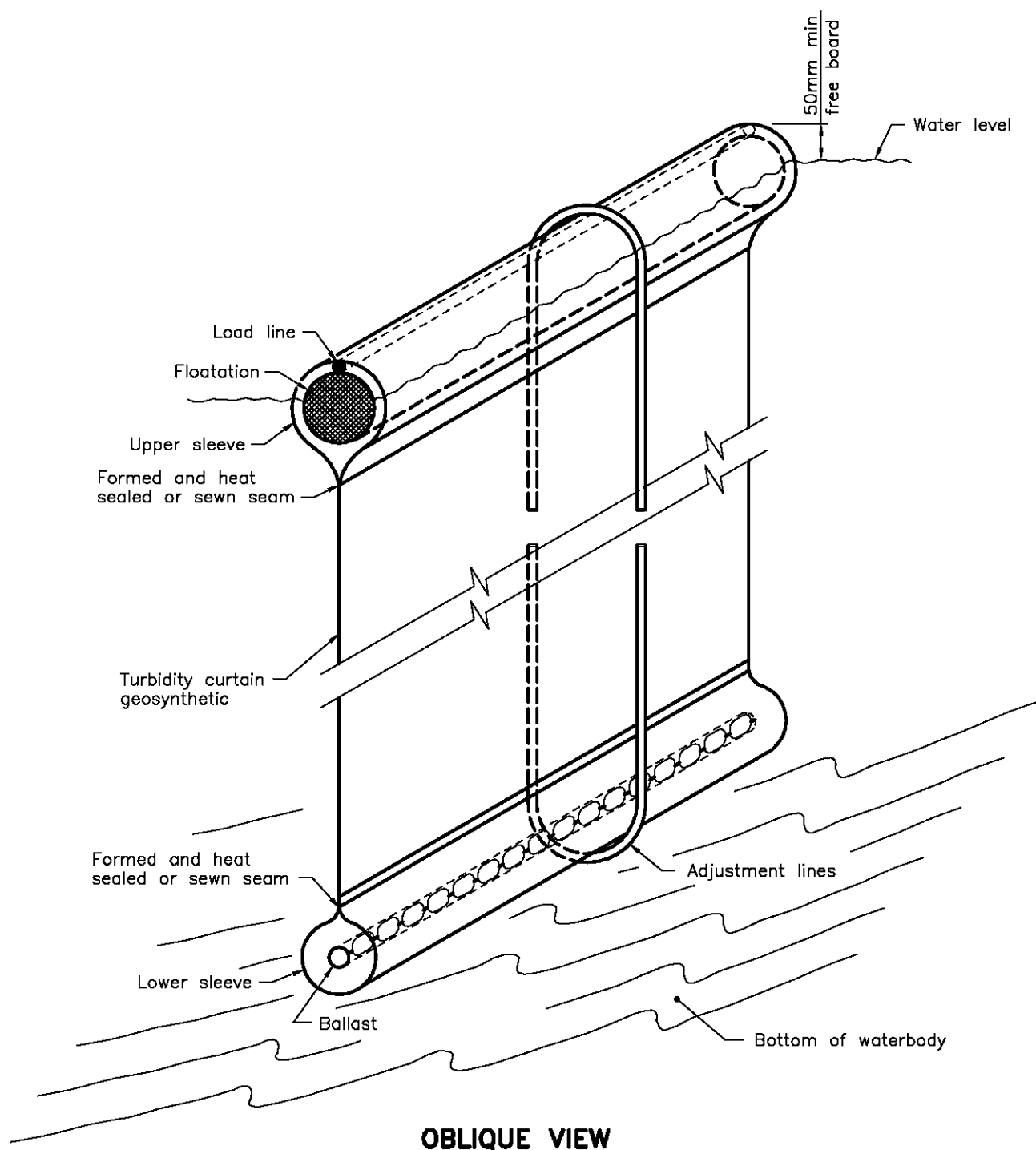
Nov 2015

Rev 2

TURBIDITY CURTAIN



OPSD 219.260

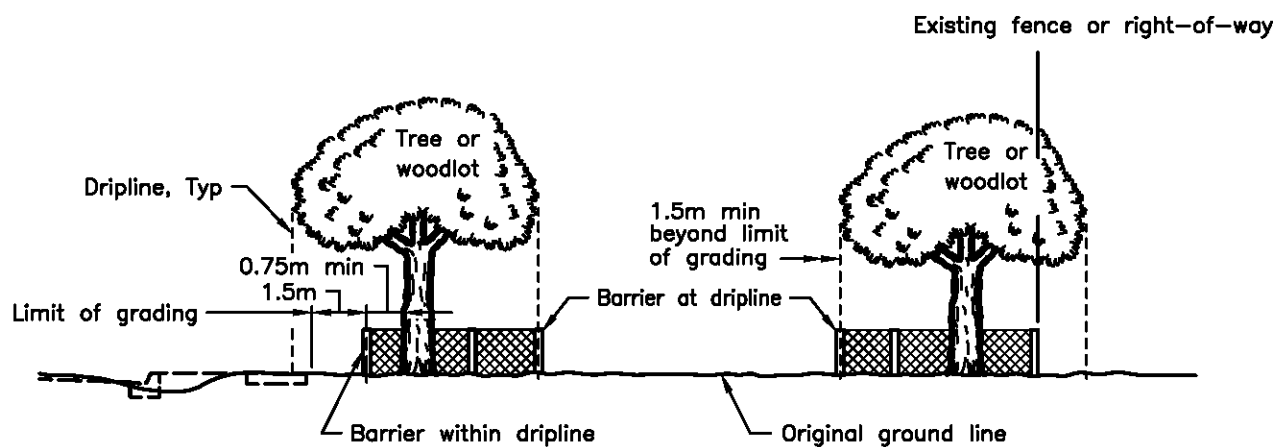
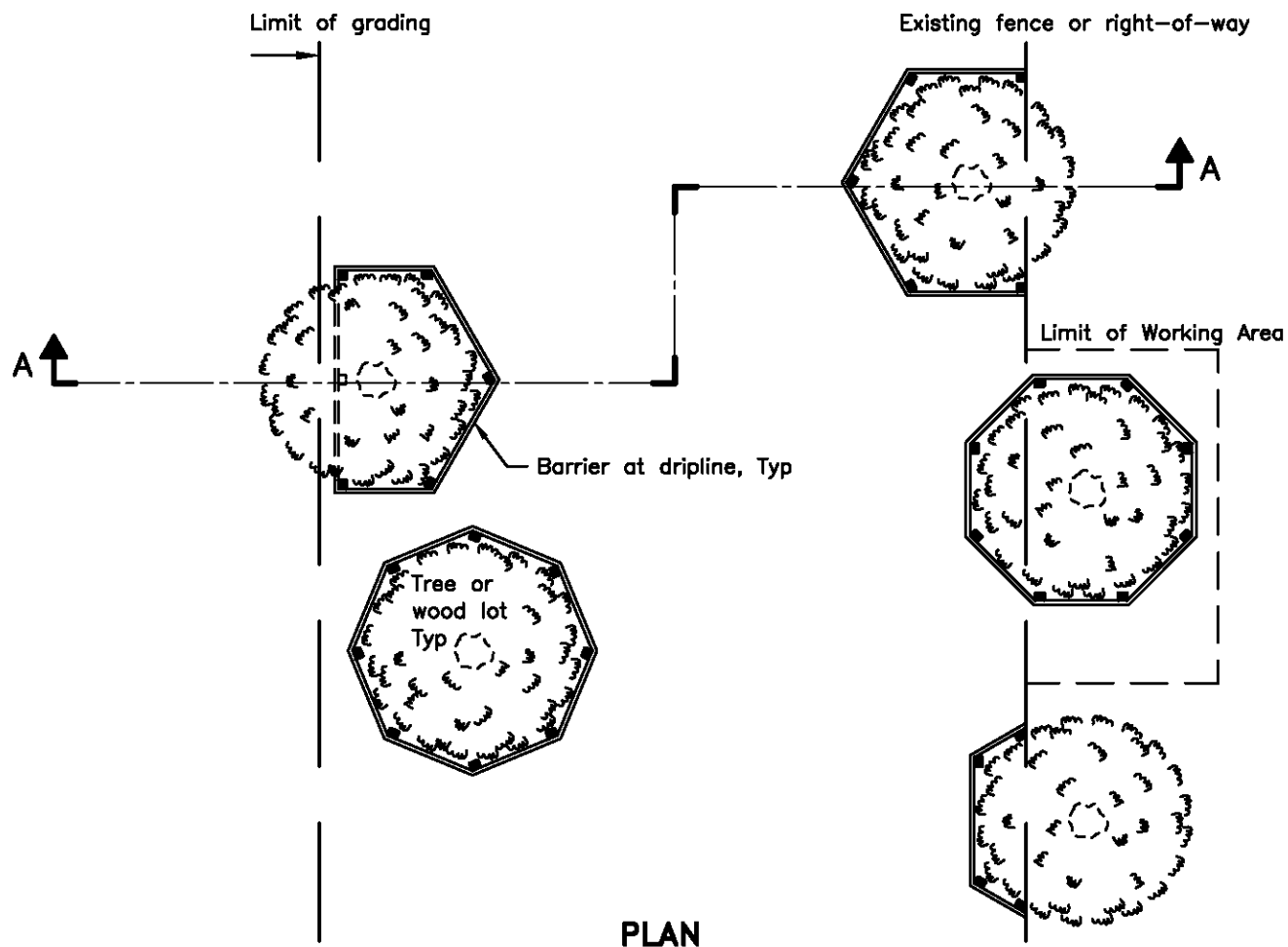


NOTES:

A All dimensions are in millimeters.

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

		OPSD 219.261			



ONTARIO PROVINCIAL STANDARD DRAWING

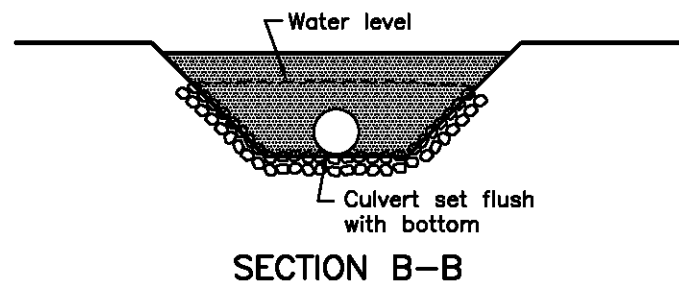
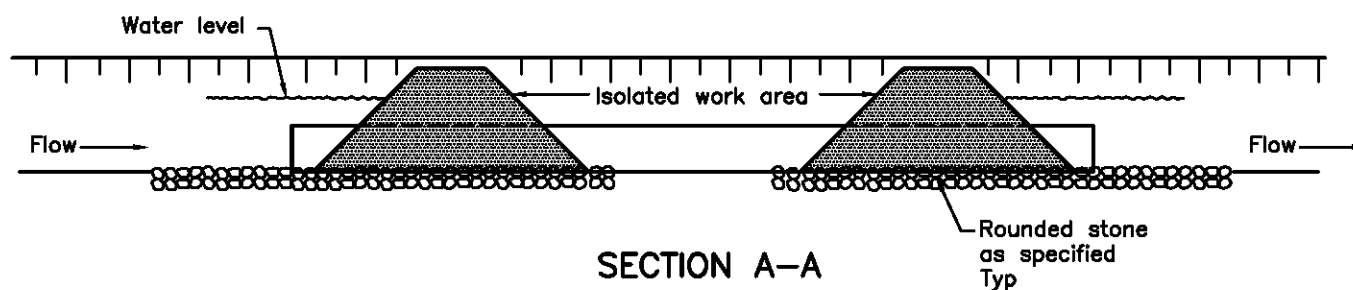
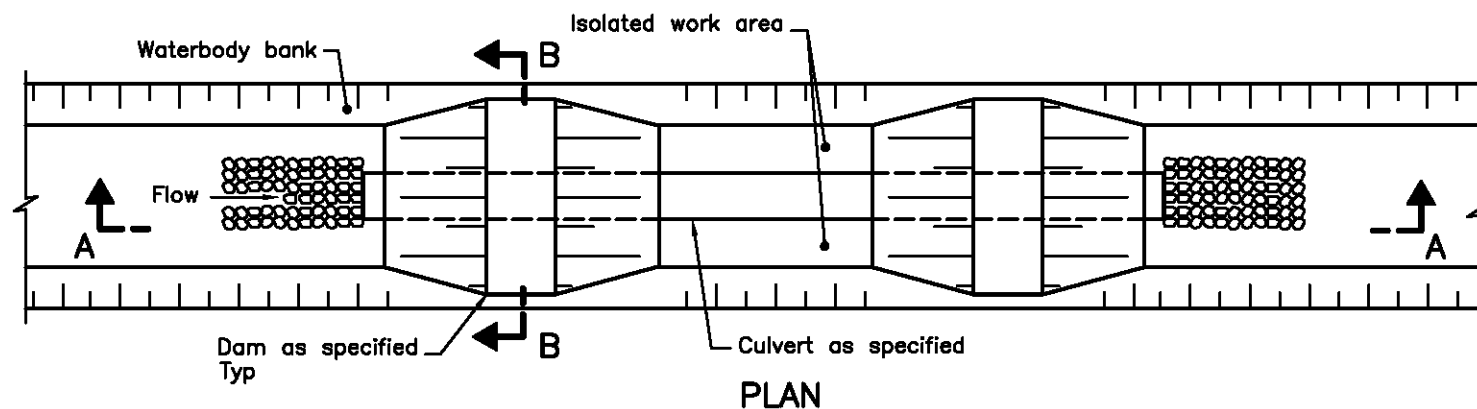
Nov 2007

Rev 0

BARRIER FOR TREE PROTECTION



OPSD 220.010



NOTE:
A Schematic only.

ONTARIO PROVINCIAL STANDARD DRAWING

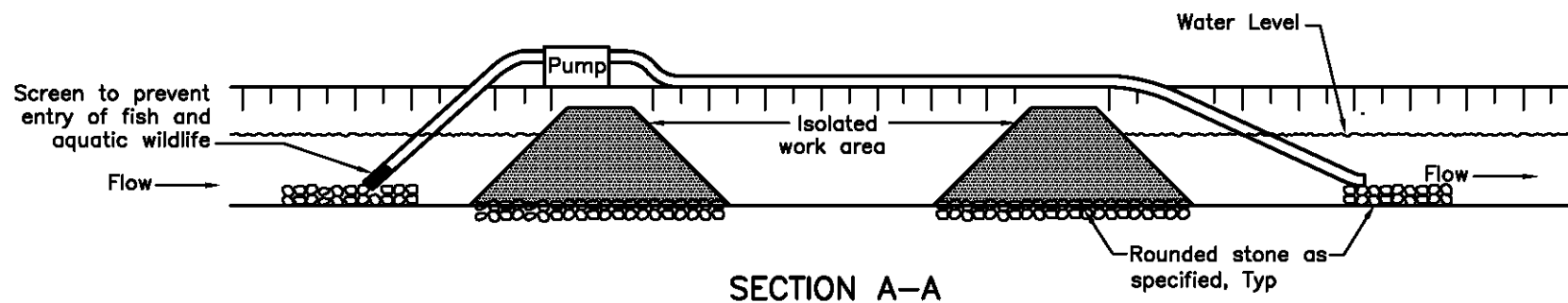
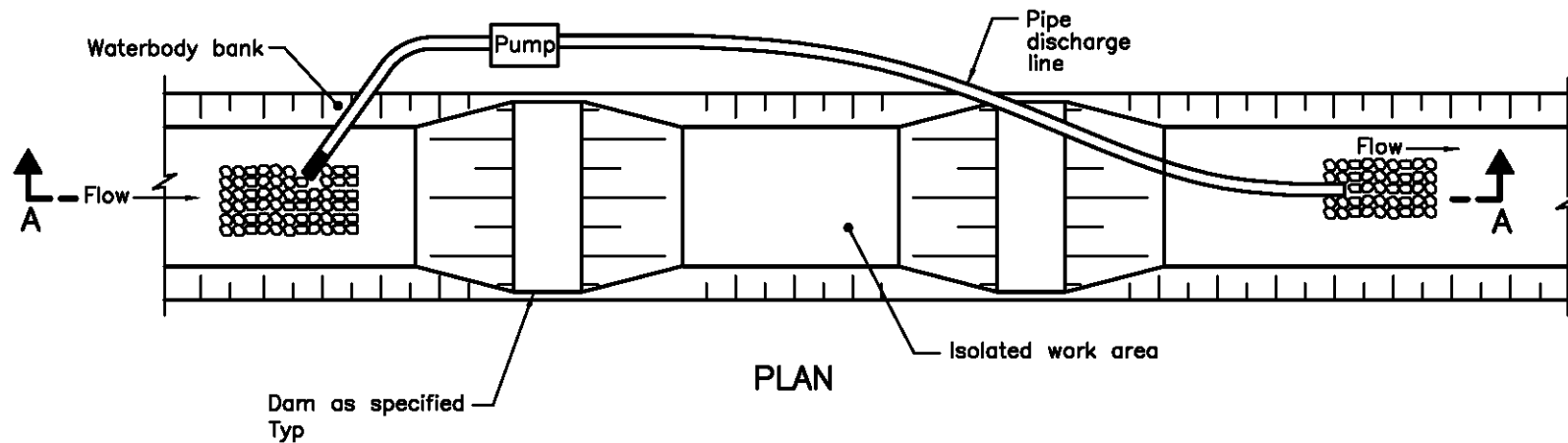
Nov 2000

Rev 0

TEMPORARY WATER PASSAGE SYSTEM
CULVERT IN WATERCOURSE

OPSD - 221.010





NOTE:
A Schematic only.

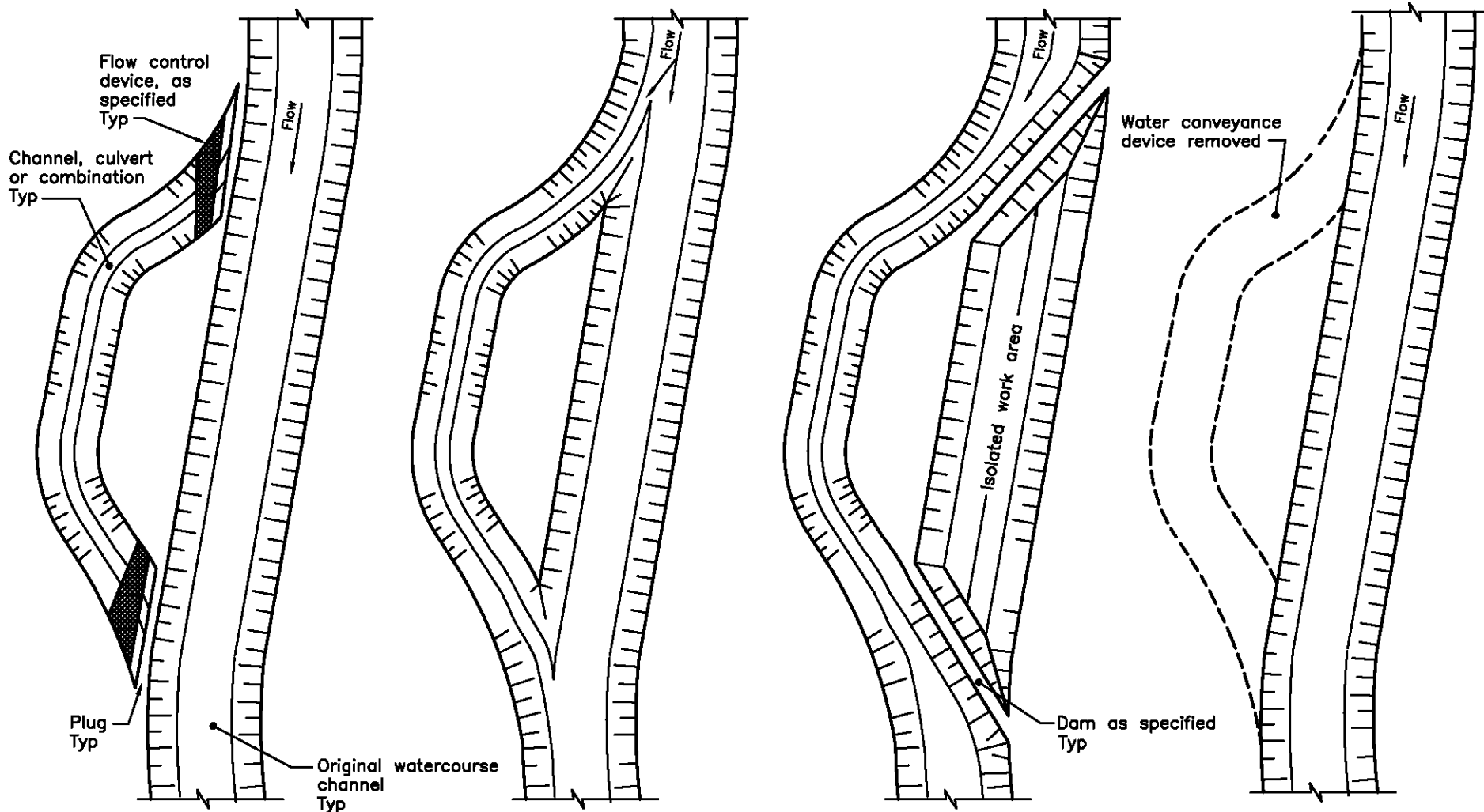
ONTARIO PROVINCIAL STANDARD DRAWING

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

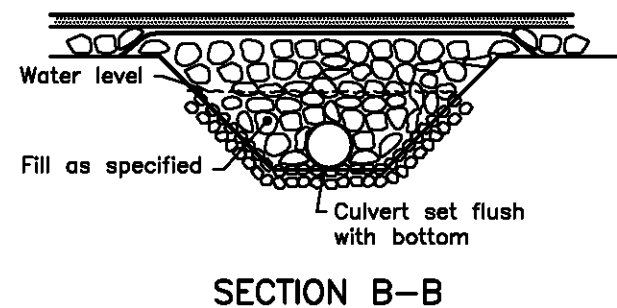
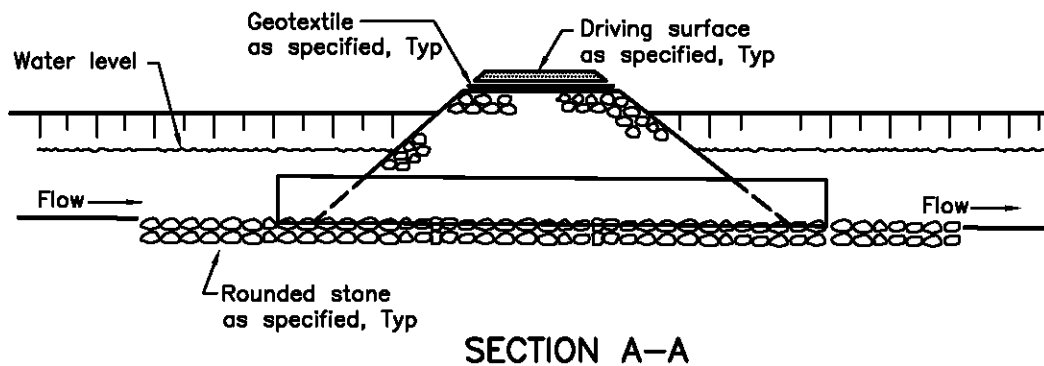
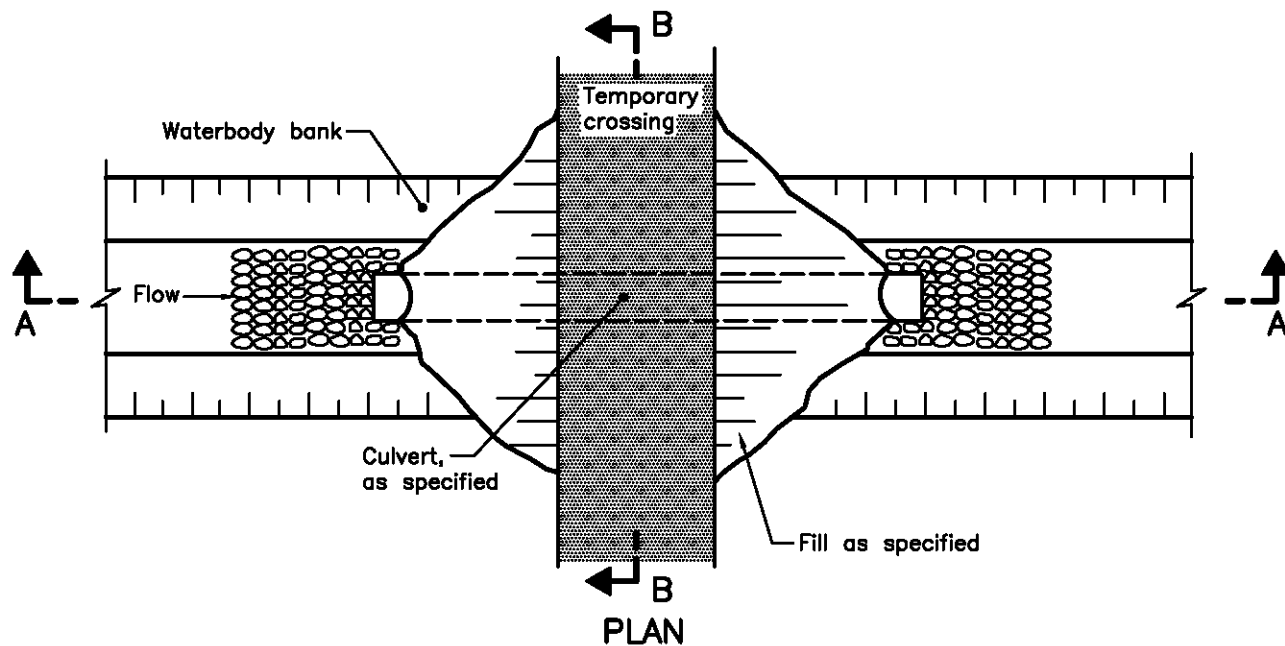
PLAN VIEWS

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	





NOTE:

A Approaches to the temporary crossing shall be clearly marked

B Schematic only.

ONTARIO PROVINCIAL STANDARD DRAWING

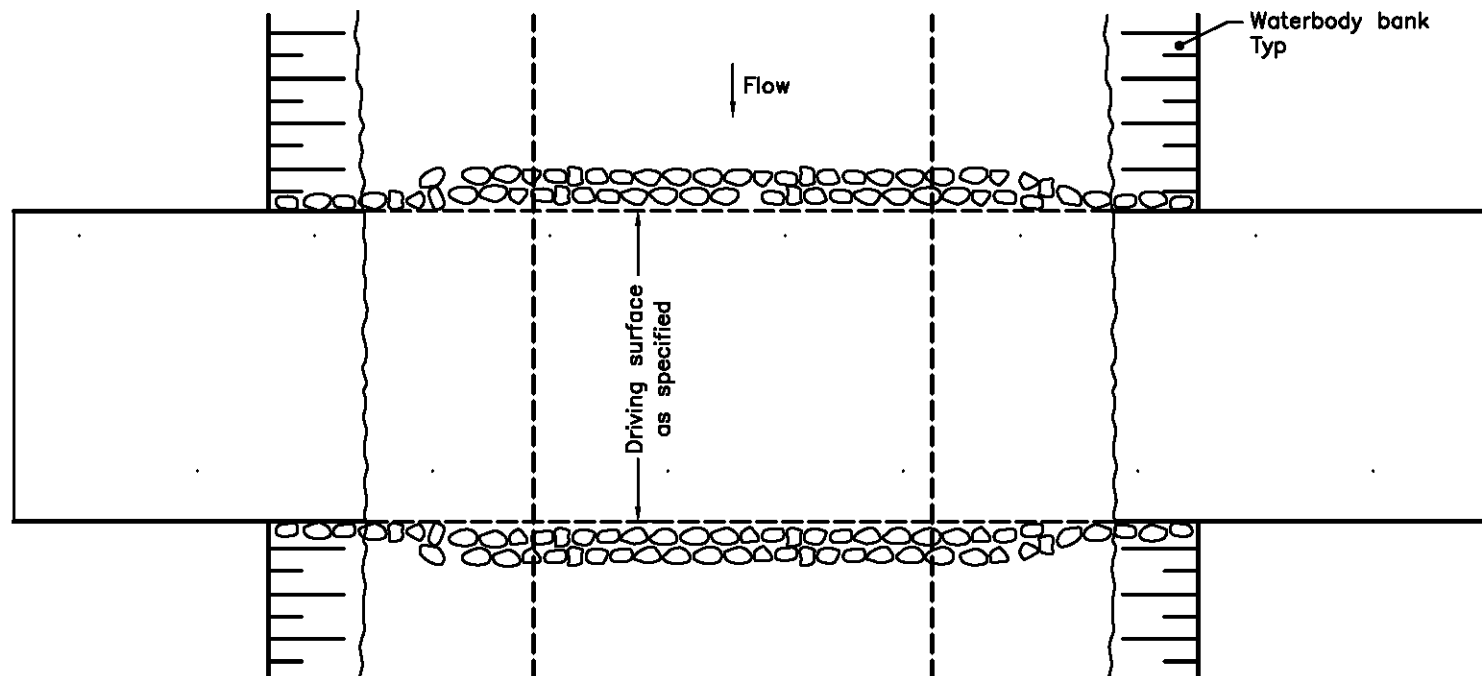
Nov 2000

Rev 0

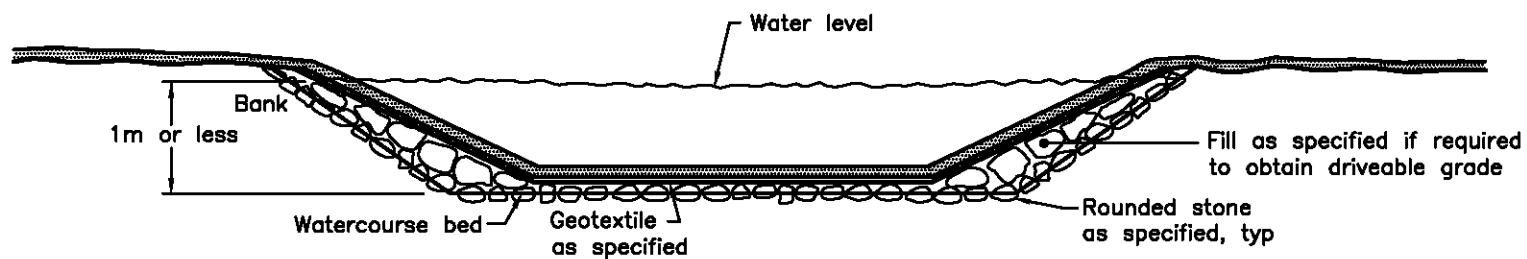
TEMPORARY WATERBODY CROSSING
FILL AND CULVERT



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

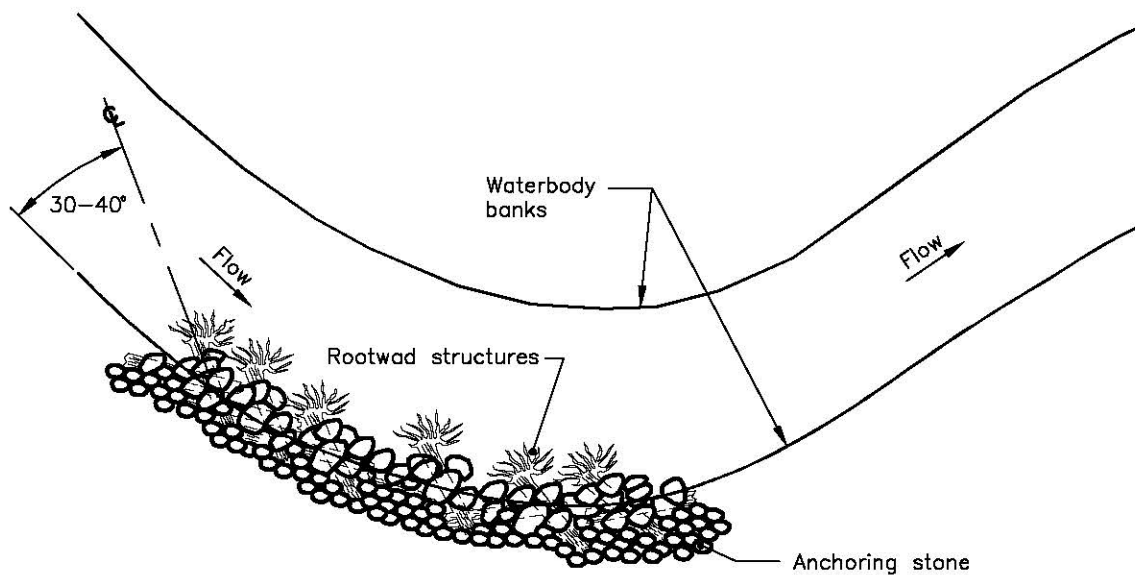
Nov 2000

Rev 0

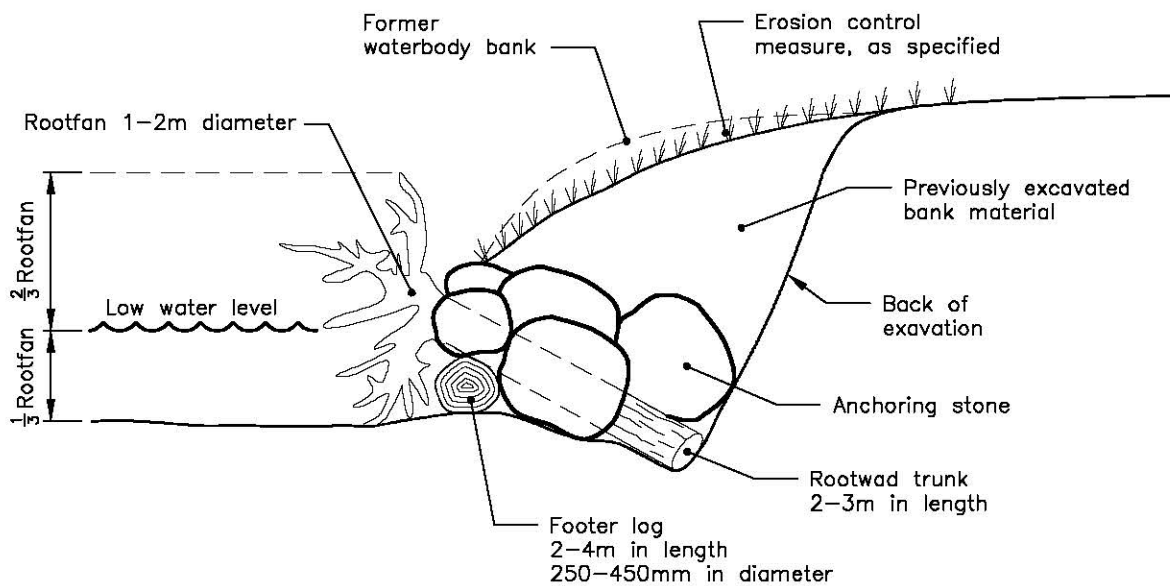
TEMPORARY WATERBODY CROSSING
FORD

OPSD - 221.050





**PLAN
LOW WATER LEVEL**



SECTION

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

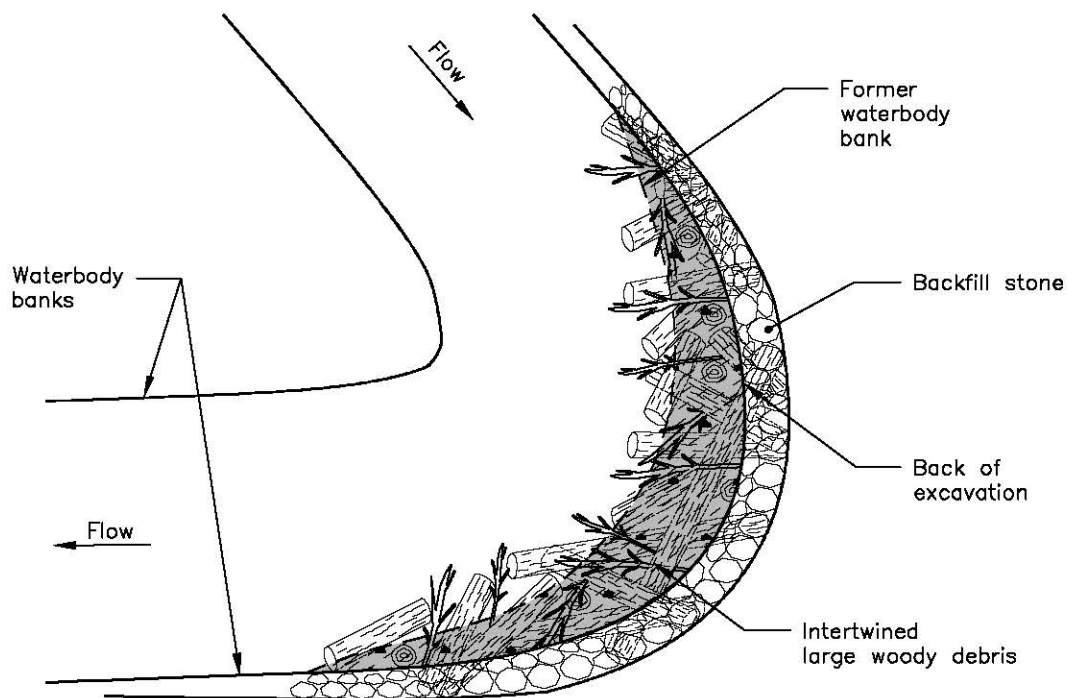
Nov 2014

Rev 1

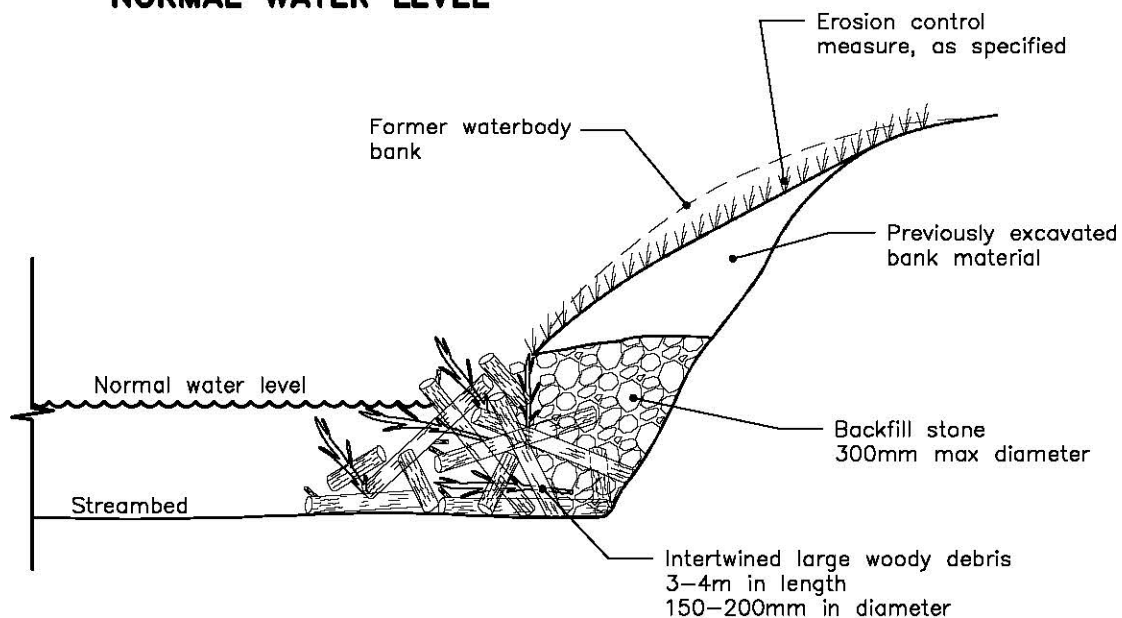
**ROOTWAD STRUCTURES
FOR WATERBODY BANKS**



OPSD 222.010



**PLAN
NORMAL WATER LEVEL**



SECTION

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

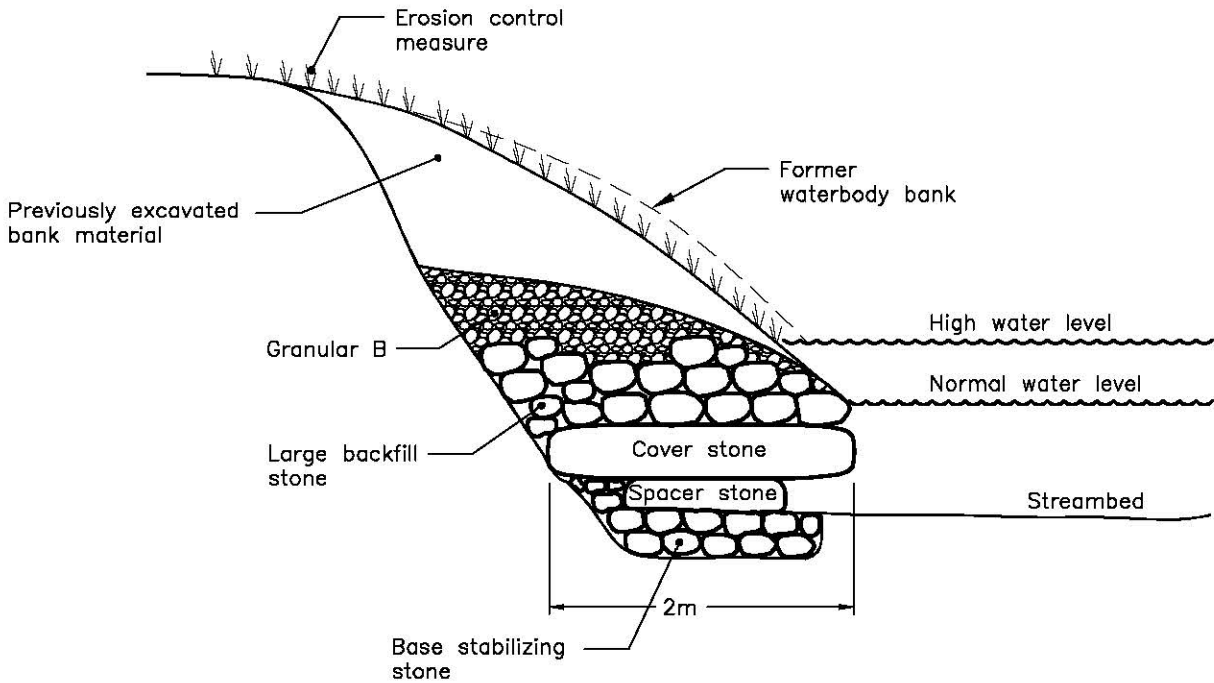
Nov 2013

Rev 0

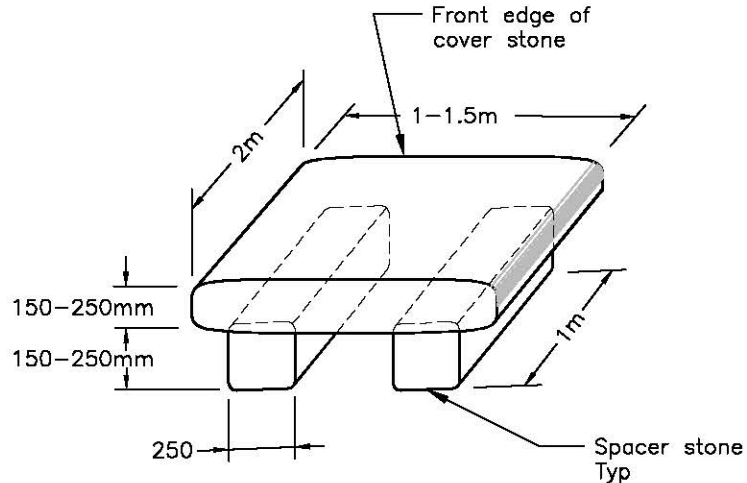
**LARGE WOODY DEBRIS
FOR WATERBODY BANKS**



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

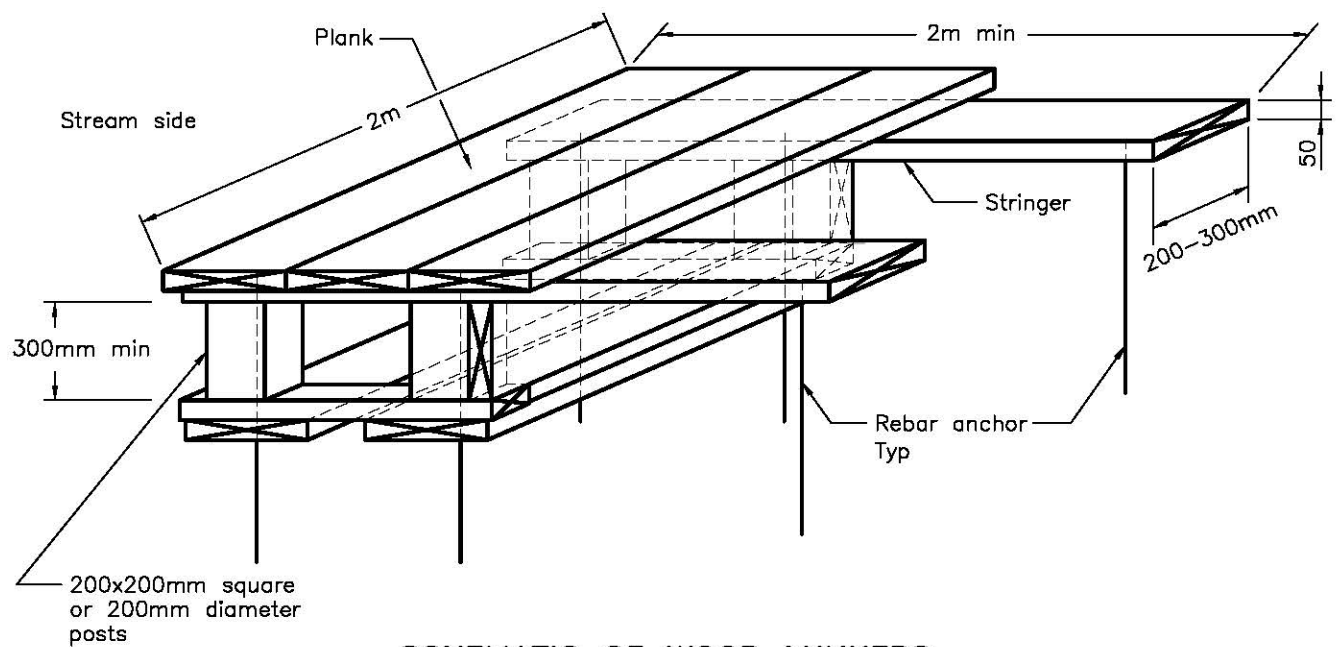
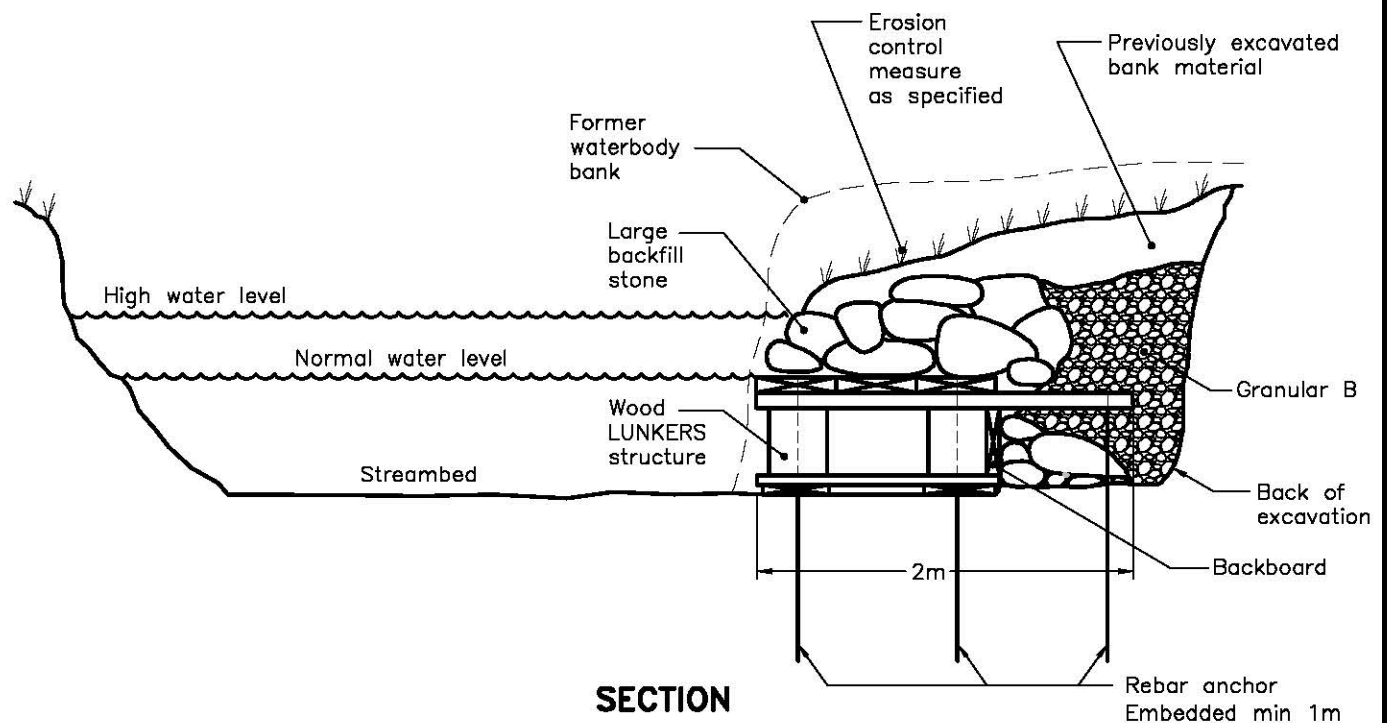
Nov 2013

Rev 0

STONE LUNKERS



OPSD 222.030



NOTES:

A All lumber sizes are nominal.

B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

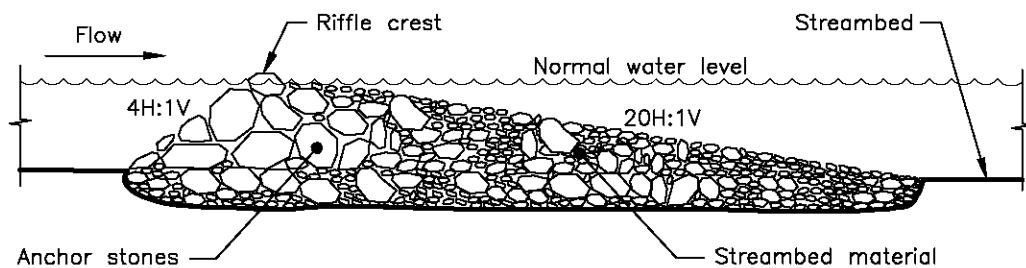
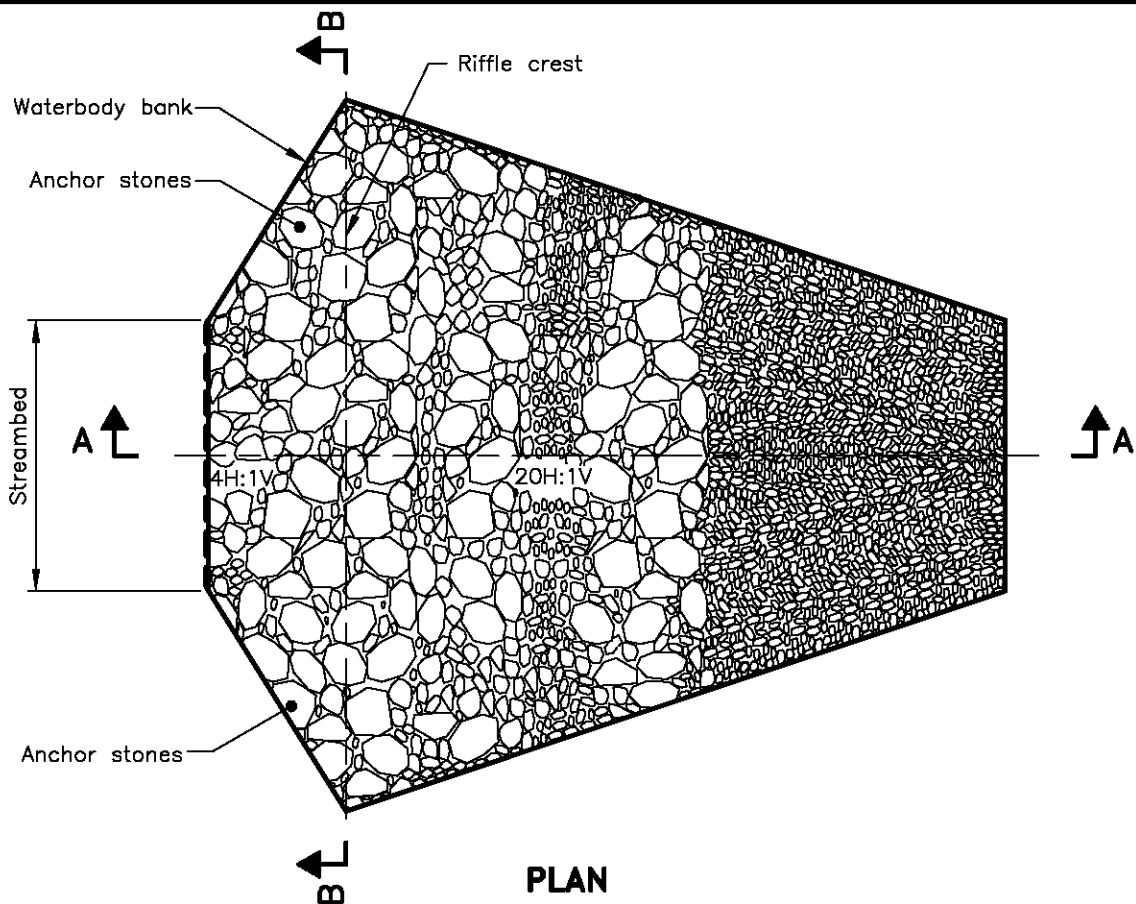
Nov 2013

Rev 0

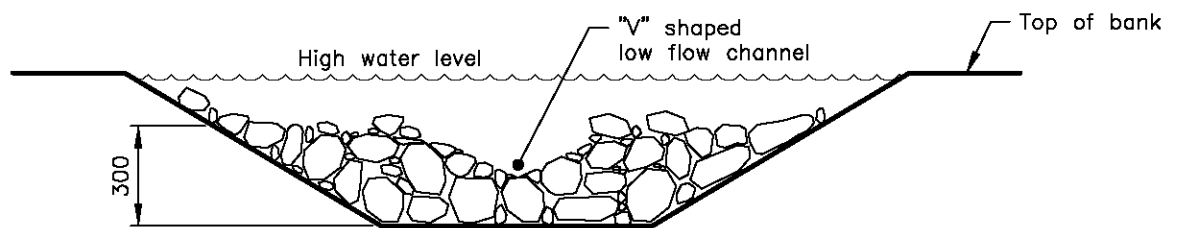
WOOD LUNKERS



OPSD 222.040



SECTION A-A



SECTION B-B

NOTES:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

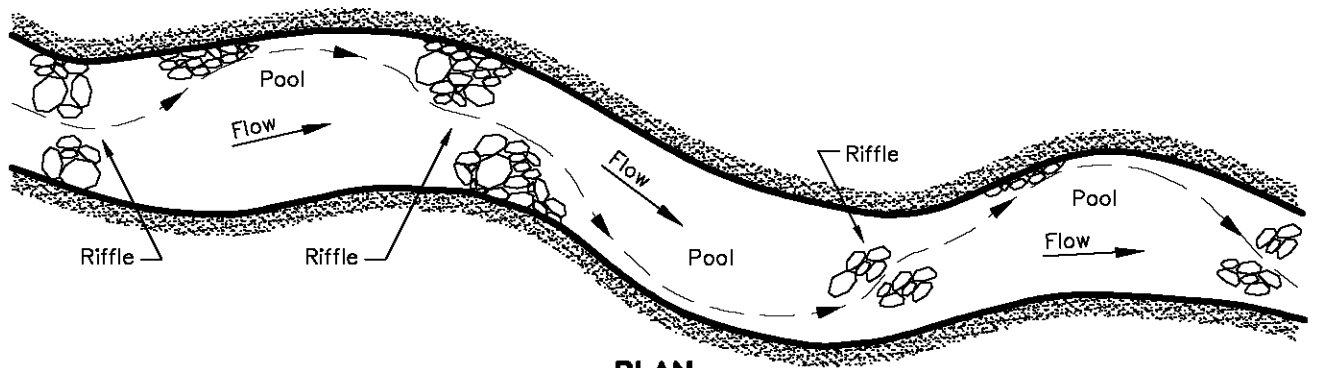
Nov 2014

Rev 0

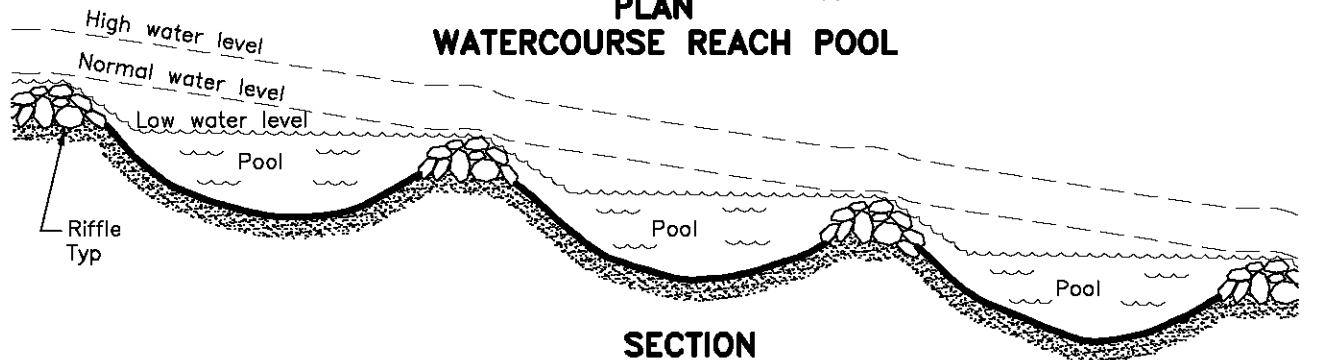
RIFFLES ON STREAMBEDS



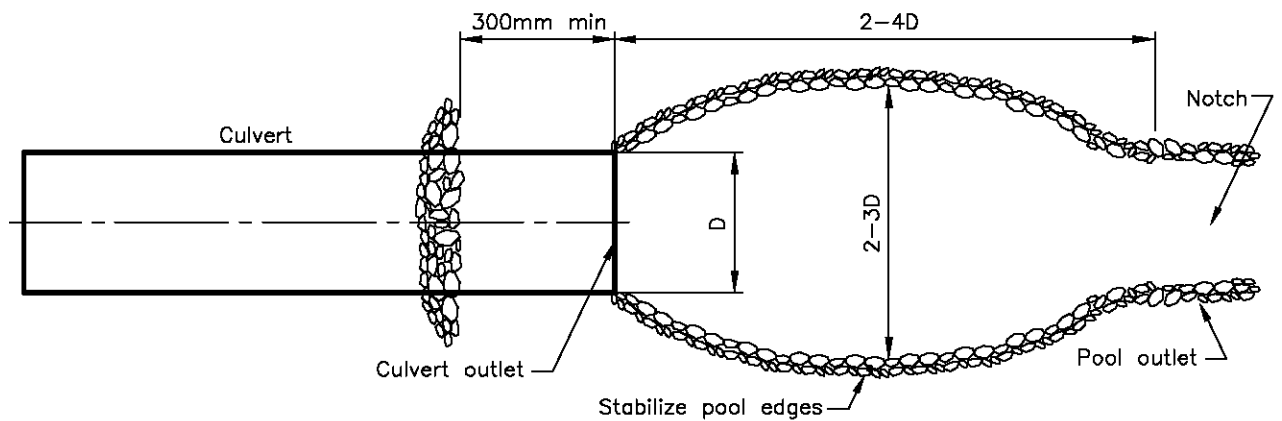
OPSD 222.050



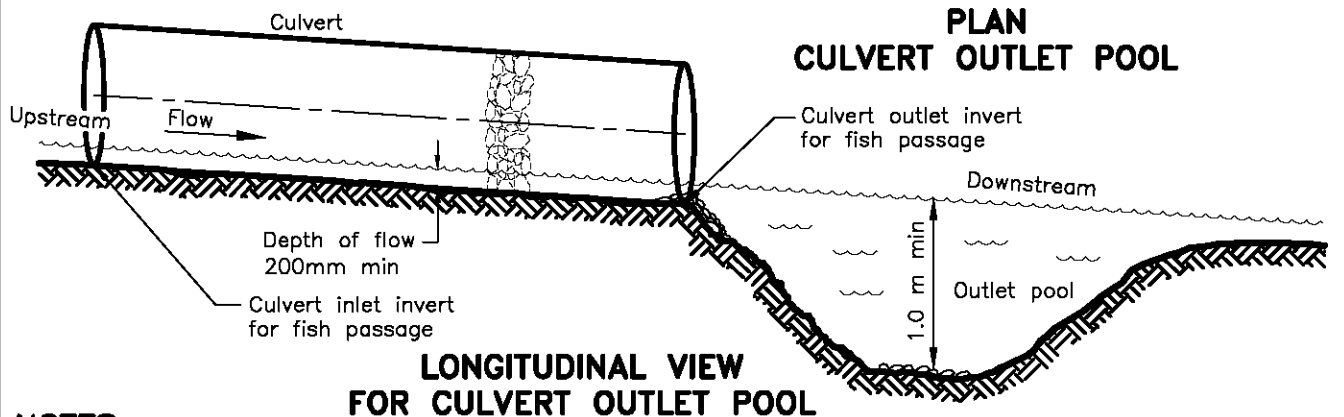
**PLAN
WATERCOURSE REACH POOL**



**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

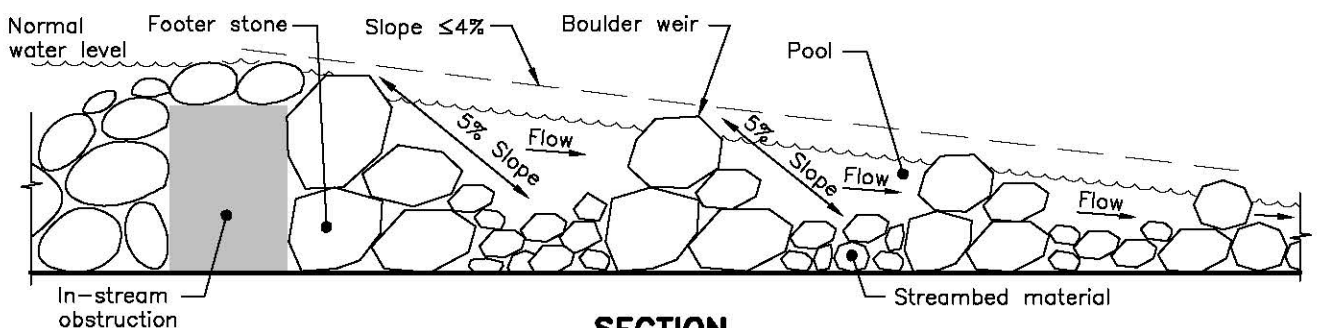
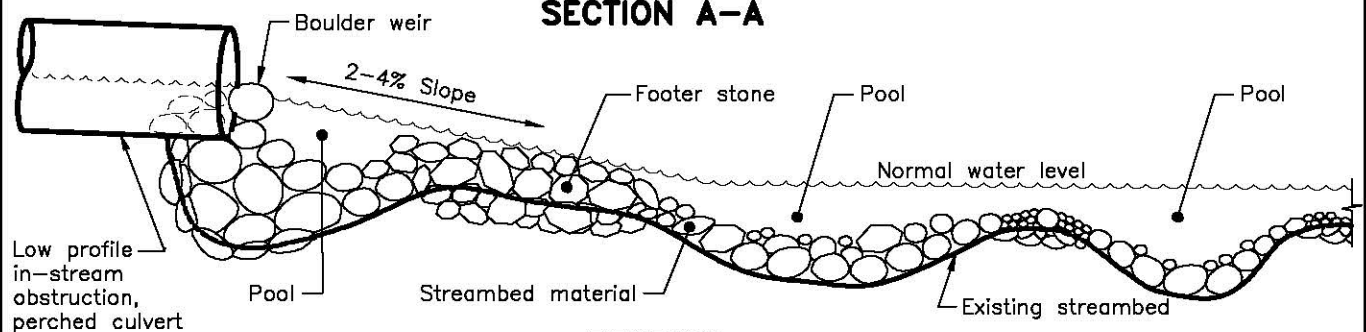
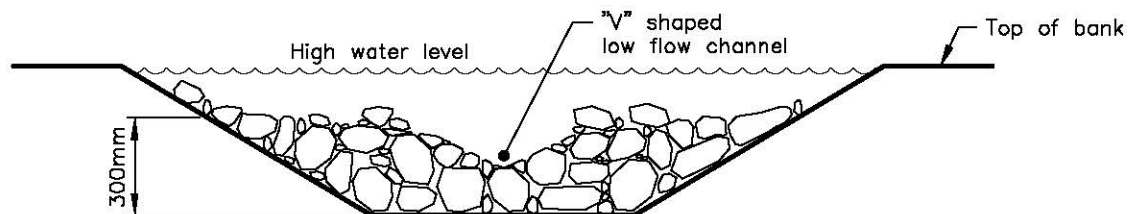
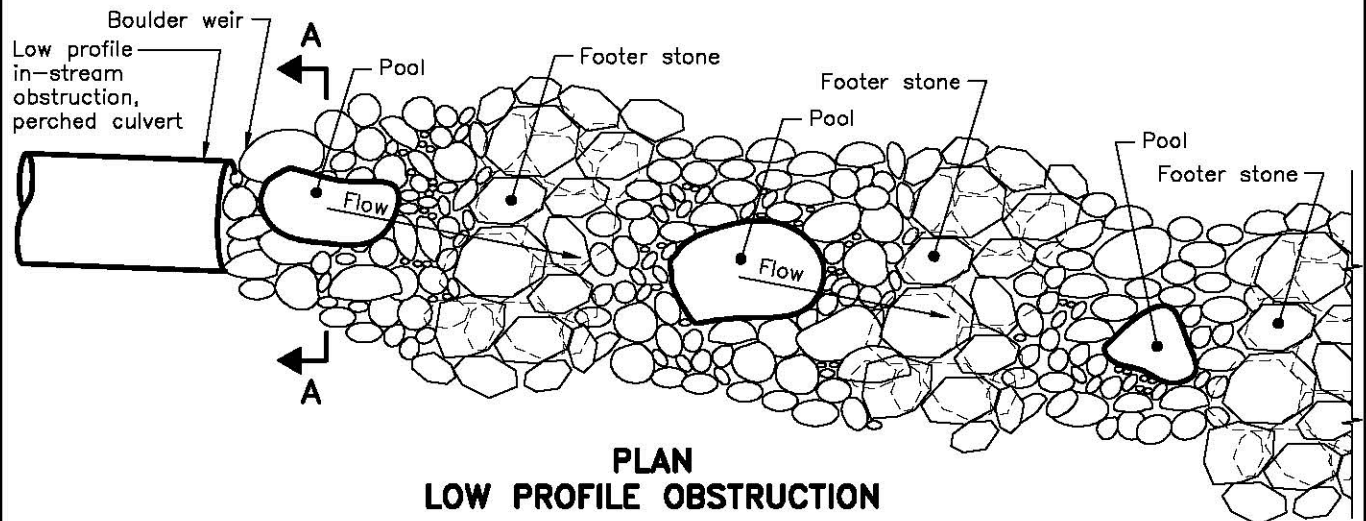
Nov 2014

Rev 0

POOLS IN STREAMBEDS



OPSD 222.060



NOTES:

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

ONTARIO PROVINCIAL STANDARD DRAWING

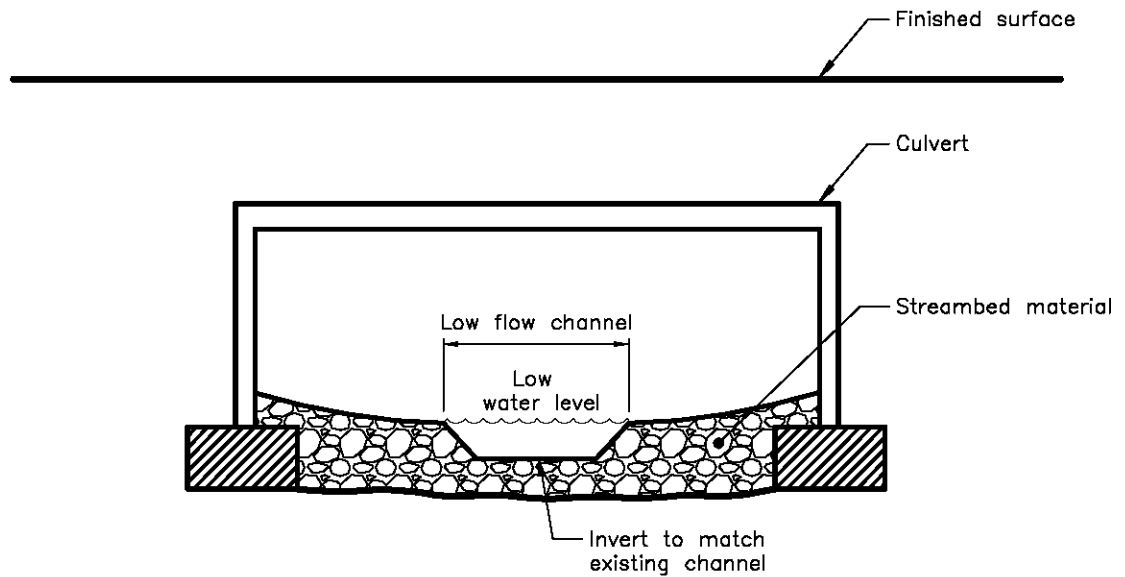
Nov 2014

Rev 0

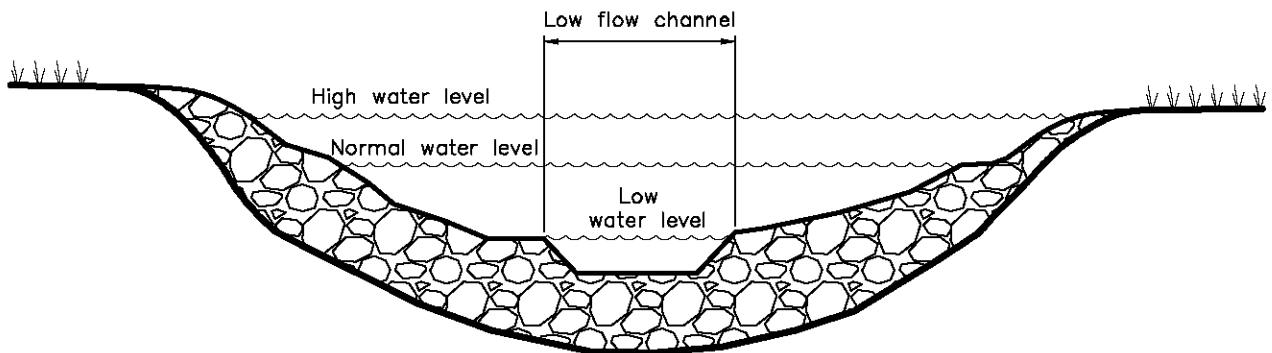
ROCKY RAMPS ON STREAMBEDS

OPSD 222.070





**SECTION
LOW FLOW CHANNEL INSIDE OF CULVERT**



**SECTION
LOW FLOW CHANNEL**

ONTARIO PROVINCIAL STANDARD DRAWING

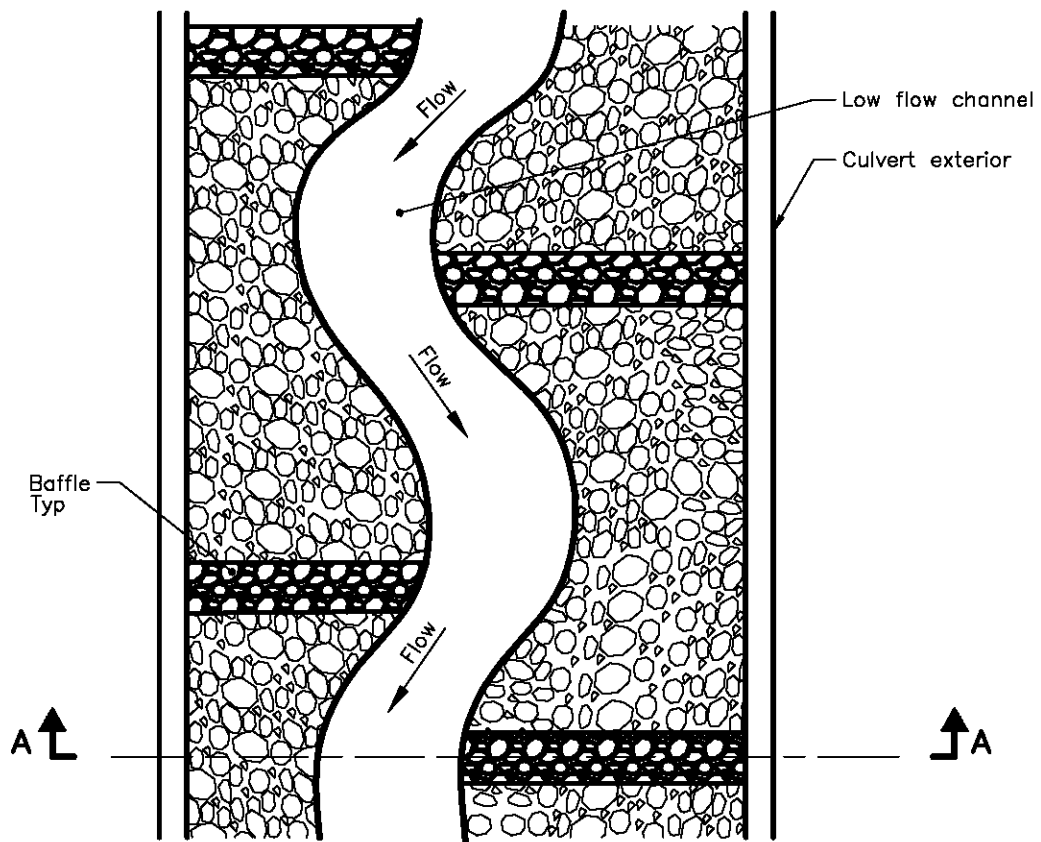
Nov 2014

Rev 0

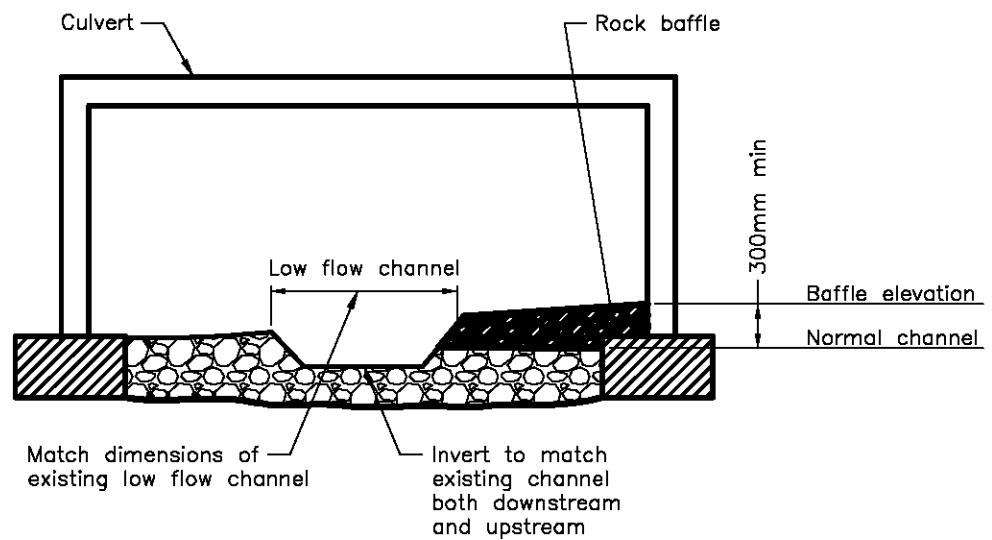


LOW FLOW CHANNEL

OPSD 222.080



PLAN



SECTIONAL A-A

NOTES:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

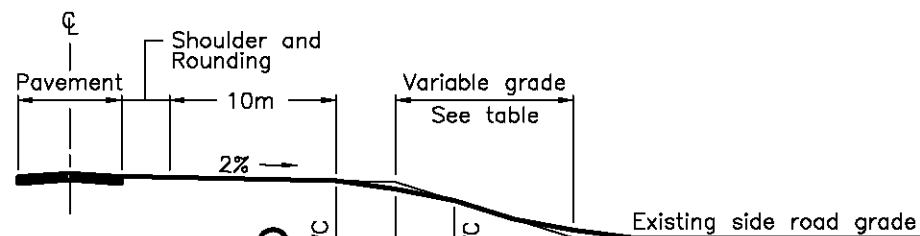
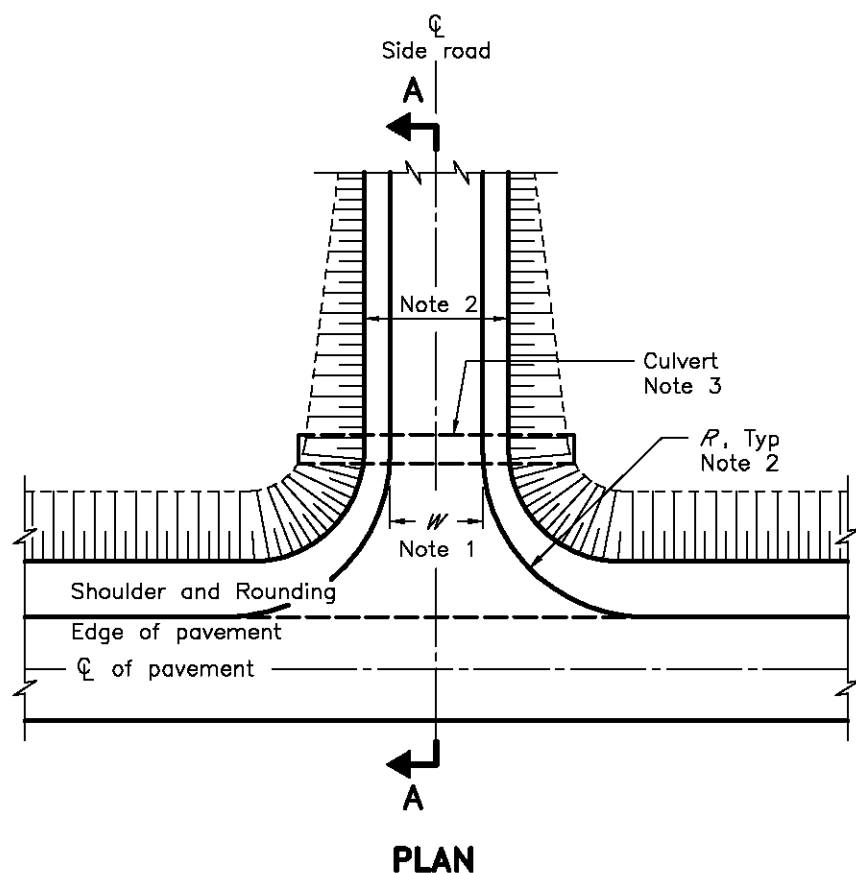
Nov 2014

Rev 0

BAFFLES IN A CULVERT

OPSD 222.090





SECTION A-A

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

NOTES:

- 1 When curb and gutter is specified, W shall be 8.5m minimum.
Taper to existing pavement width at 1:25 along each pavement edge.
- 2 Side road radii and pavement and shoulder widths shall be as specified.
- 3 Culvert type, dimensions, and location shall be as specified.
- A All dimensions are in millimetres unless otherwise shown.

LEGEND:

- L - Length of vertical curve
 R - Side road radius
 W - Pavement width

ONTARIO PROVINCIAL STANDARD DRAWING

SIDE ROAD INTERSECTION

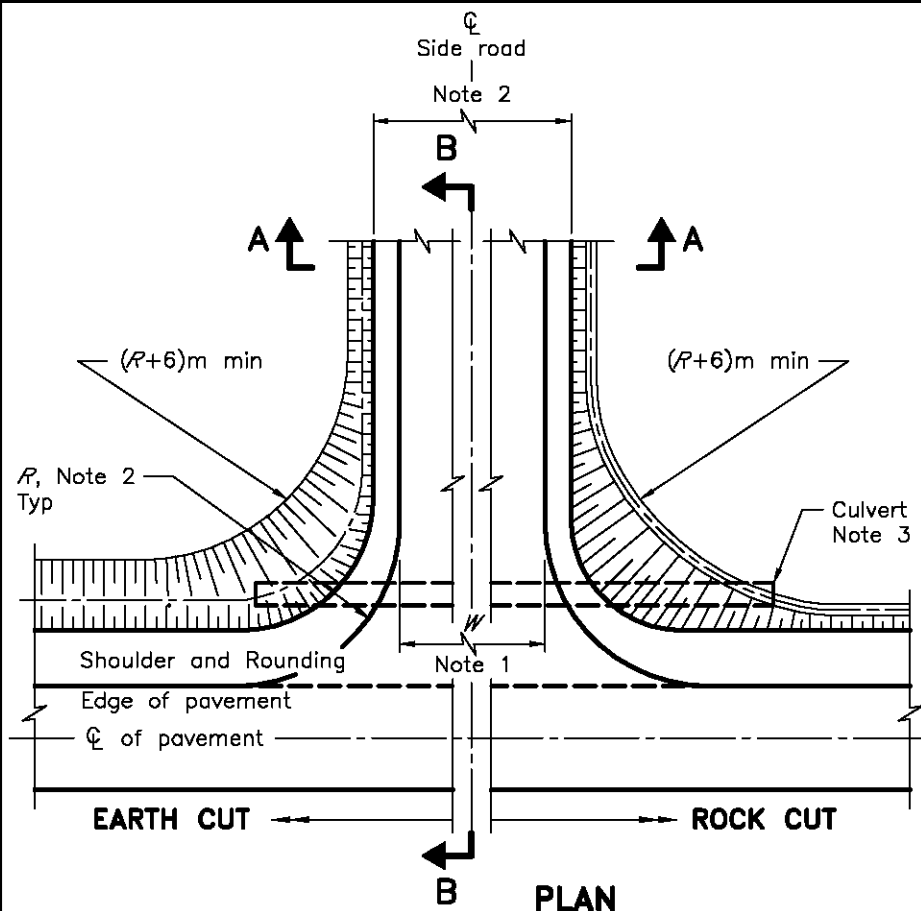
FILL

Nov 2011

Rev 2



OPSD 300.010

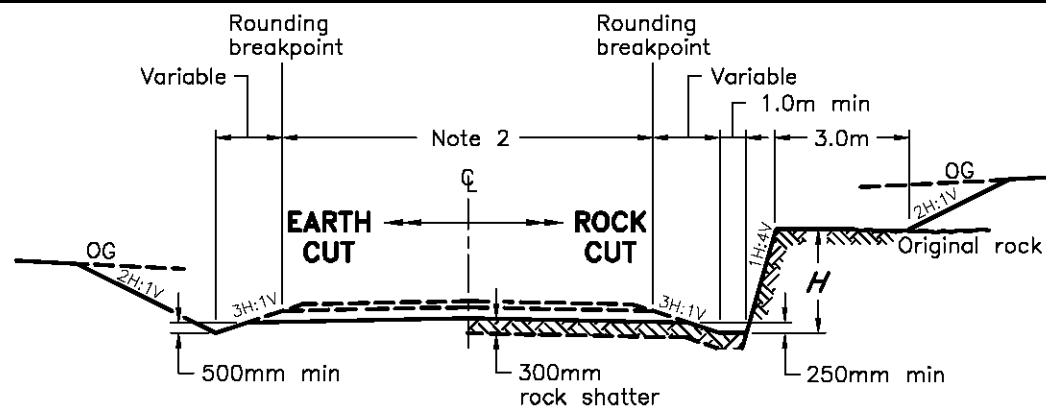


NOTES:

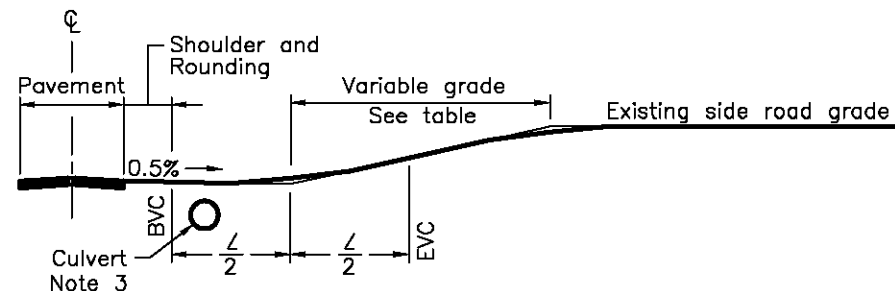
- 1 When curb and gutter is specified, W shall be 8.5m minimum. Taper to existing pavement width at 1:25 along each pavement edge.
 - 2 Side road radii and pavement and shoulder widths shall be as specified.
 - 3 Culvert type, dimensions, and location shall be as specified.
- A All dimensions are in millimetres unless otherwise shown.

LEGEND:

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

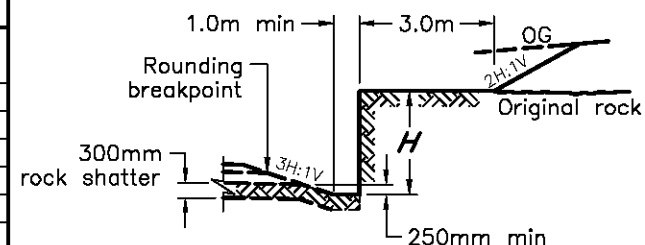


SECTION A-A



SECTION B-B

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



**ALTERNATIVE ROCK CUT DETAIL
when specified**

ONTARIO PROVINCIAL STANDARD DRAWING

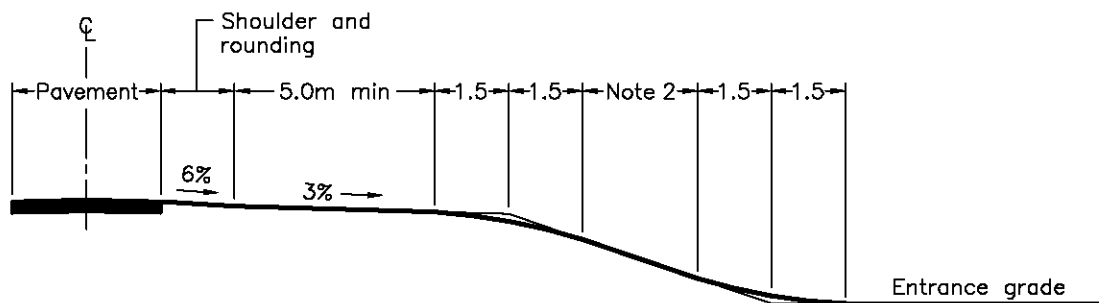
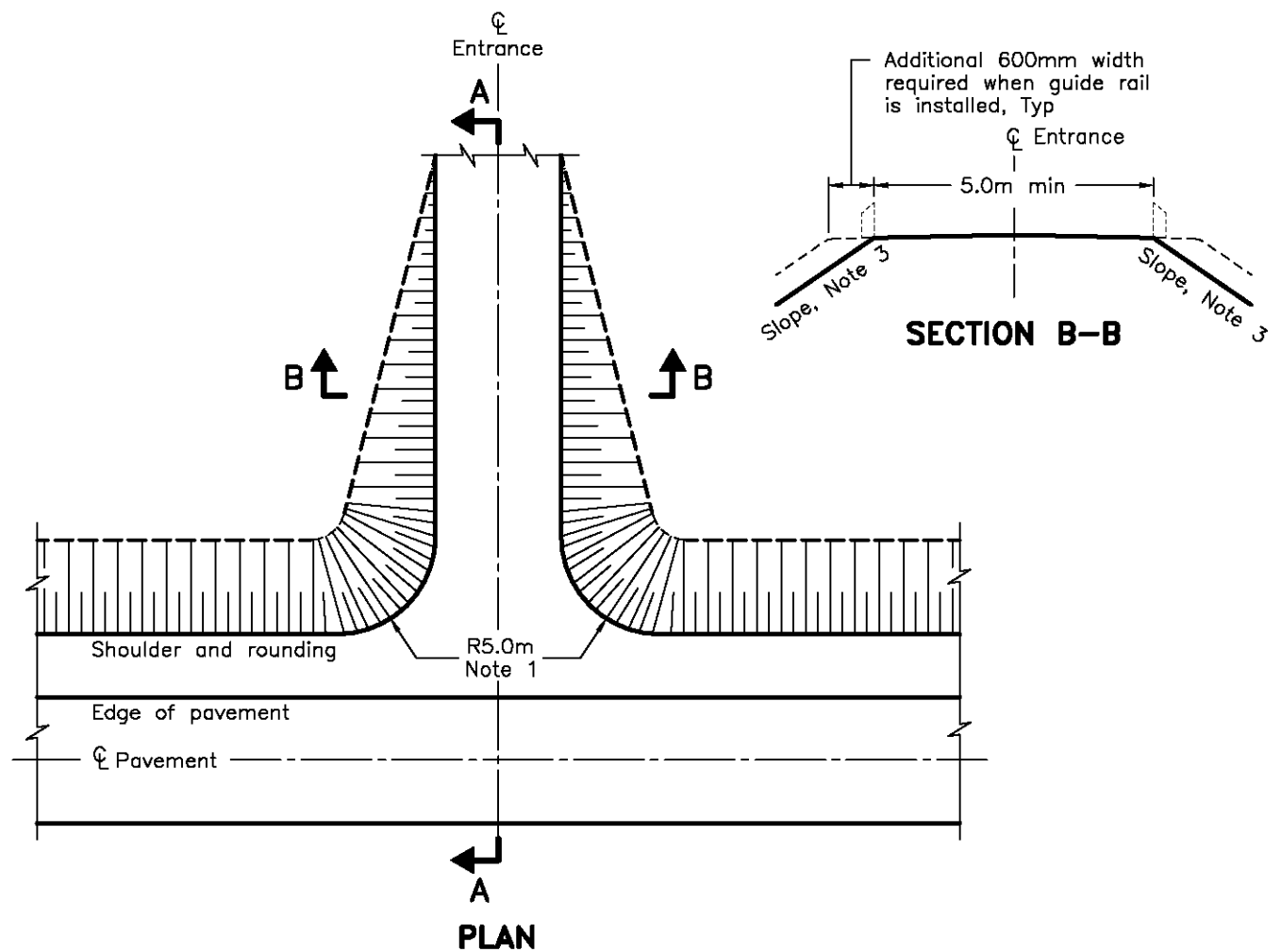
SIDE ROAD INTERSECTION

CUT

Nov 2011 Rev 2



OPSD 300.020



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

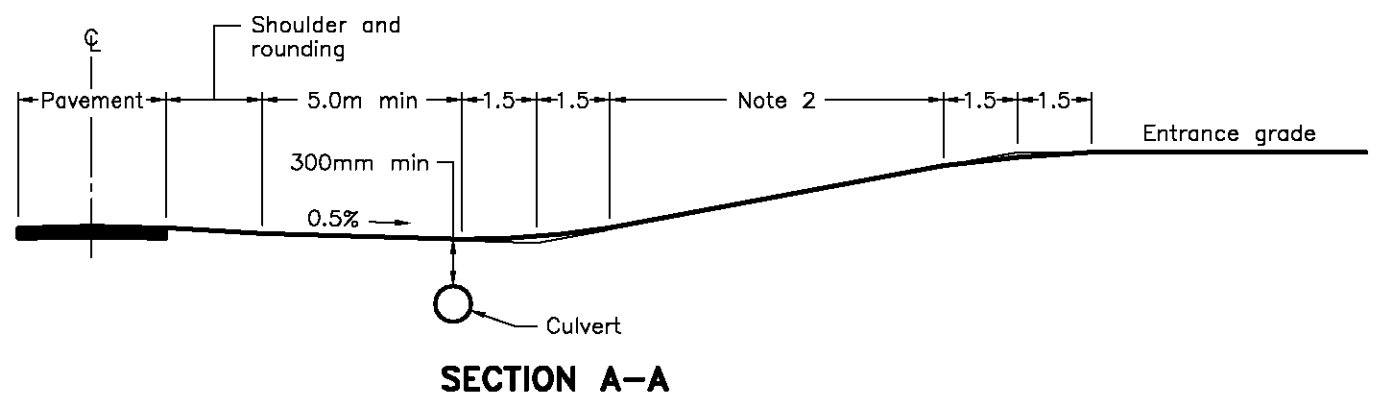
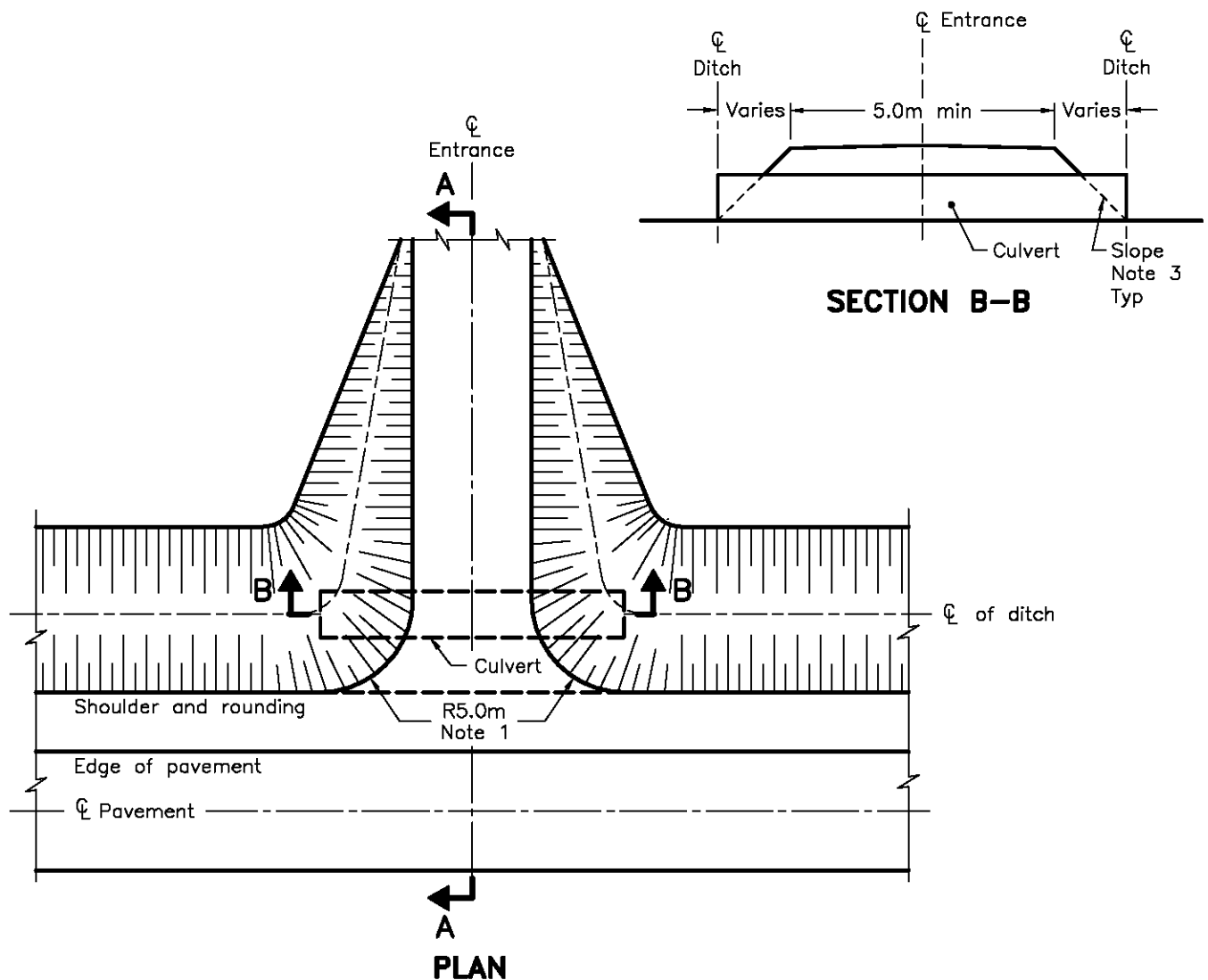
Nov 2010

Rev 2

**RURAL ENTRANCES
TO ROADS ON FILL**



OPSD 301.010



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

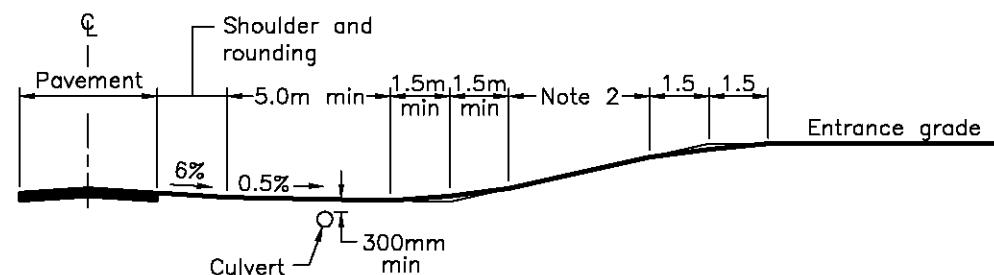
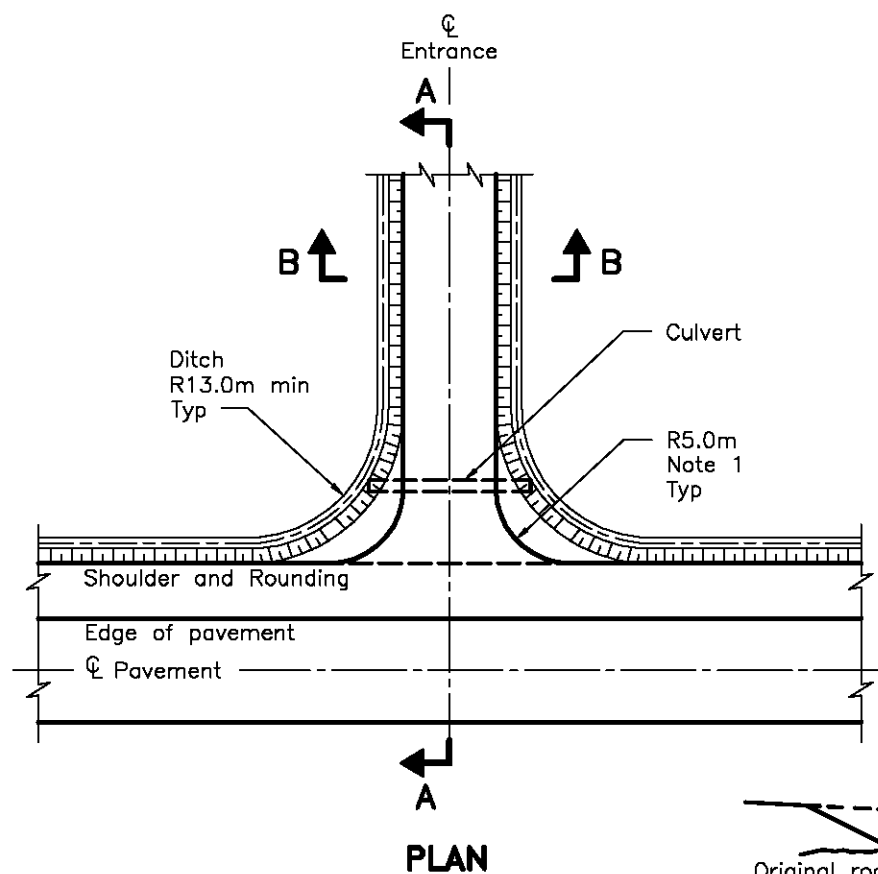
Nov 2010

Rev 2

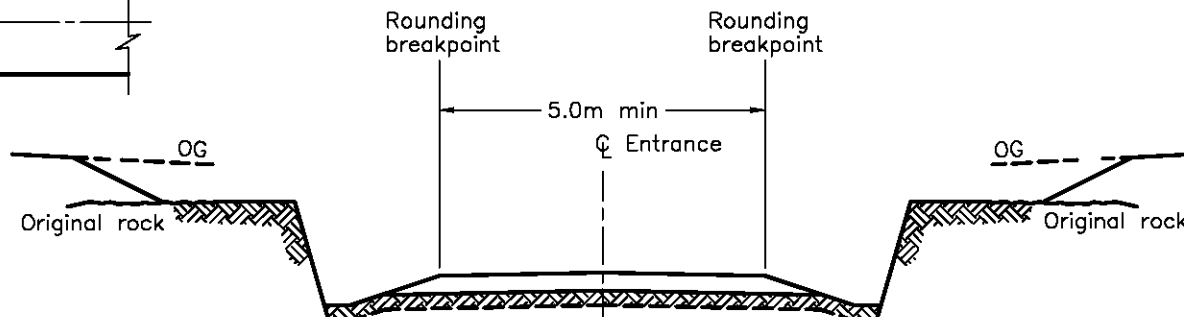
**RURAL ENTRANCES
TO ROADS IN EARTH CUT**



OPSD 301.020



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

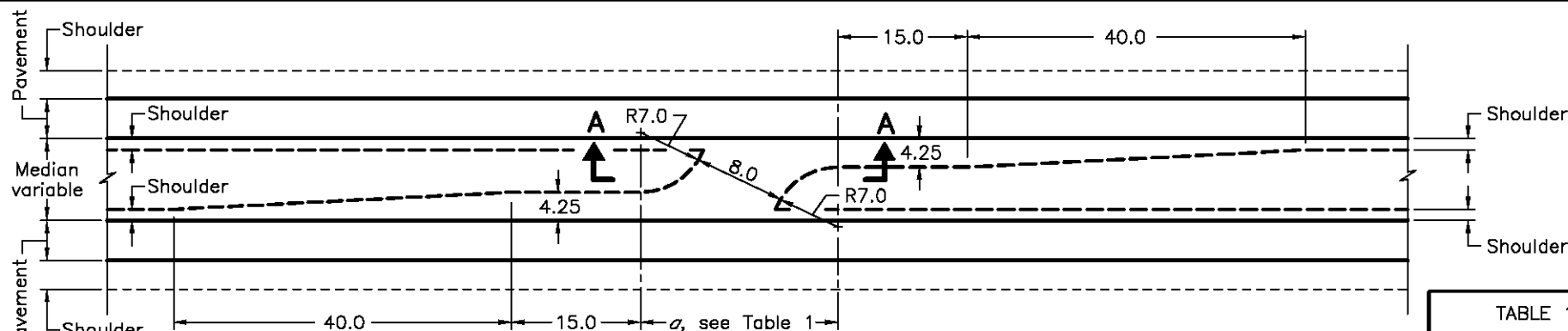
Nov 2010

Rev 2

RURAL ENTRANCE
ROCK CUT

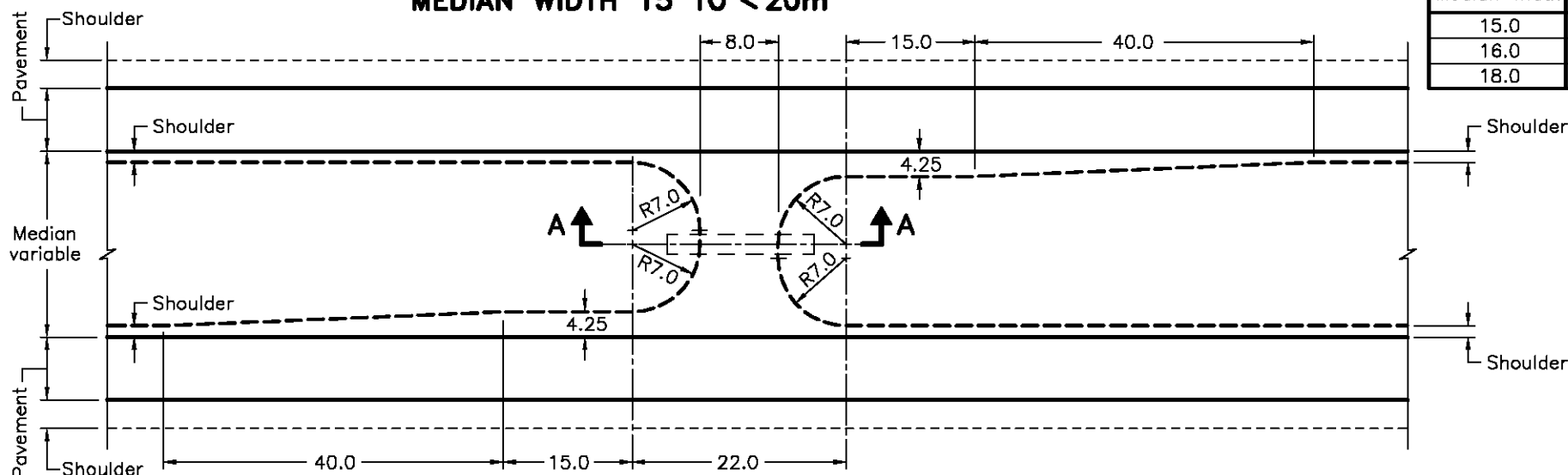


OPSD 301.030



MEDIAN WIDTH 15 TO < 20m

TABLE 1	
Median Width	σ
15.0	20.68
16.0	21.02
18.0	21.54



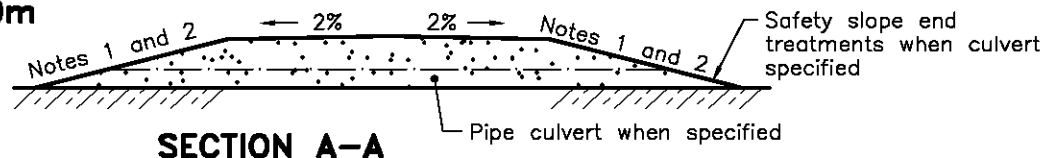
MEDIAN WIDTH $\geq 20m$

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

Nov 2015

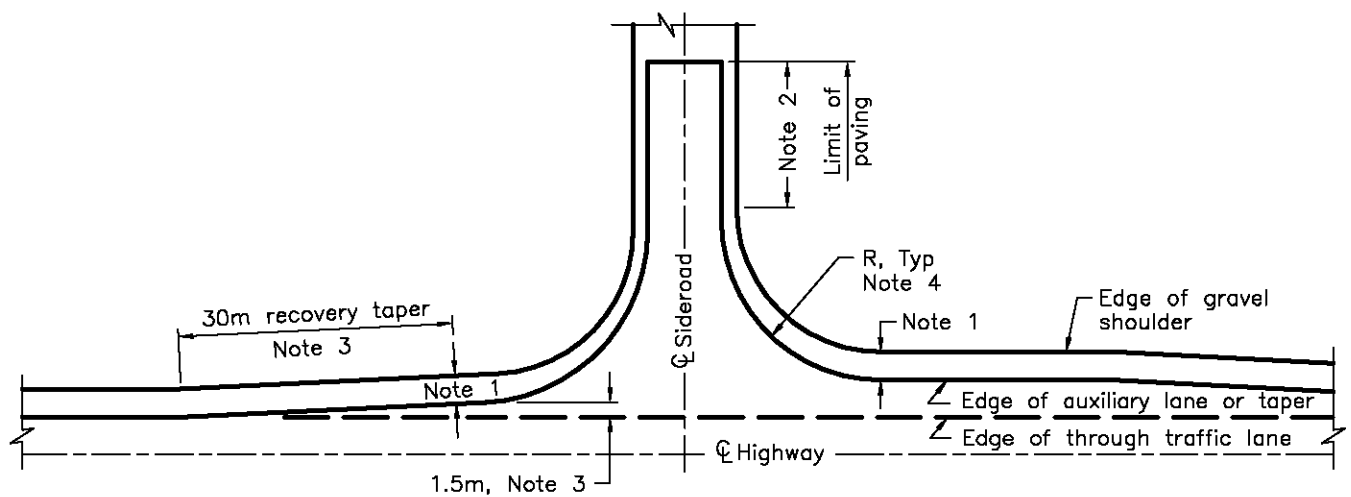
Rev 2

MEDIAN CROSSOVERS

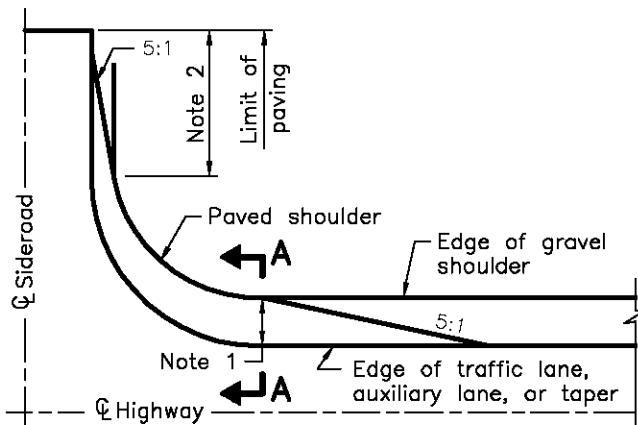
FOR SERVICE AND EMERGENCY VEHICLES



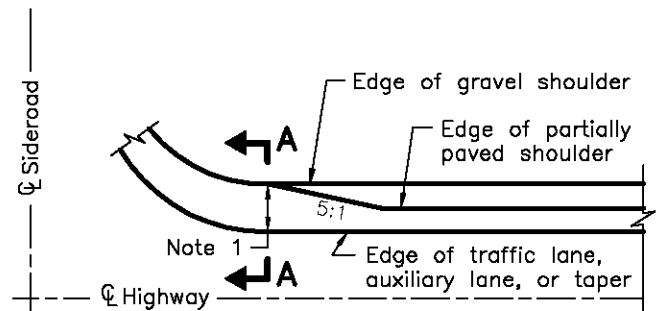
OPSD 302.010



PLAN A, AUXILIARY LANE OR TAPER – GRAVEL SHOULDER

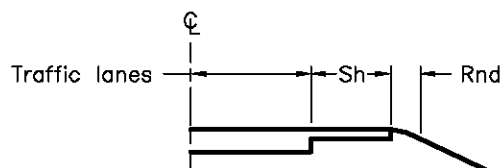


PAVED SHOULDER RADIUS WITH GRAVEL SHOULDER ON HIGHWAY



PAVED SHOULDER RADIUS WITH PARTIALLY PAVED SHOULDER ON HIGHWAY

PLAN B, PAVED SHOULDER OR PARTIALLY PAVED SHOULDER

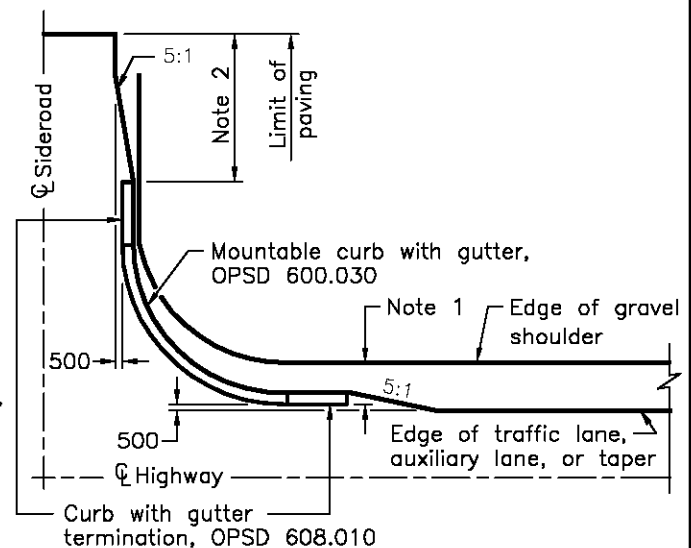


SECTION A-A

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.



PLAN C, CURB AND GUTTER

ONTARIO PROVINCIAL STANDARD DRAWING

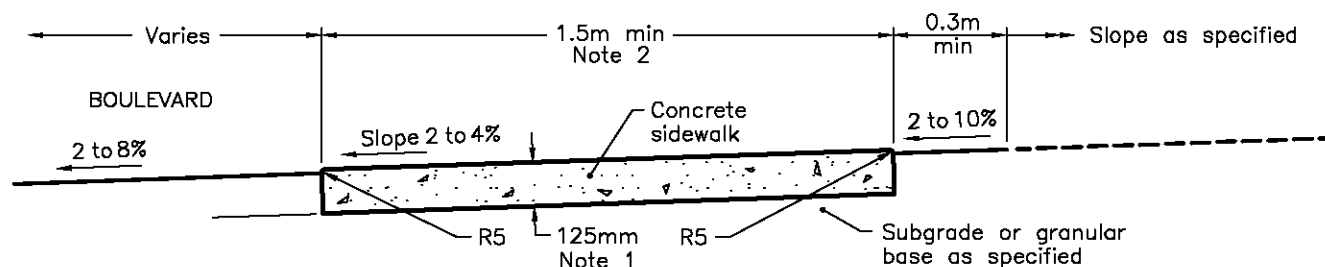
Nov 2009

Rev 1

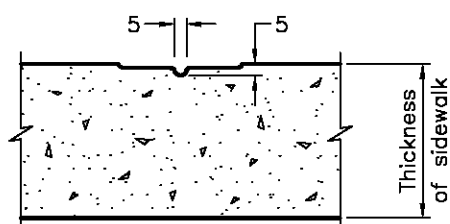
**SHOULDER TREATMENT
SIDEROAD INTERSECTIONS**



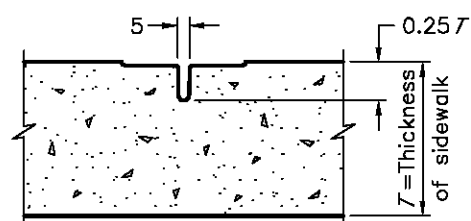
OPSD 304.010



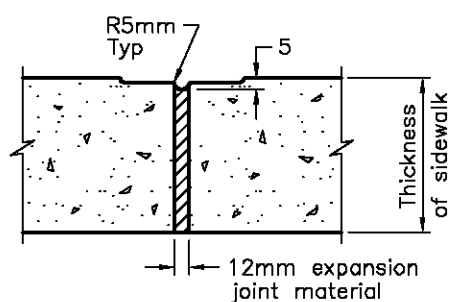
TYPICAL SECTION



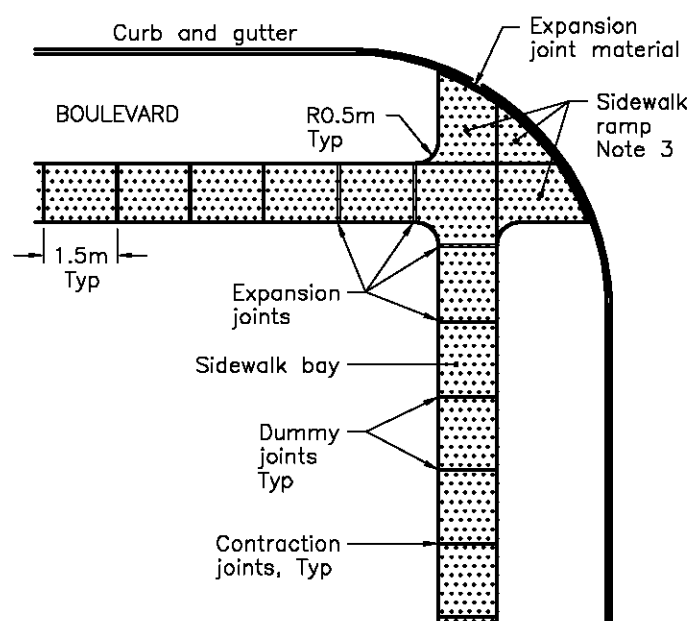
DUMMY JOINT (OPTIONAL)



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

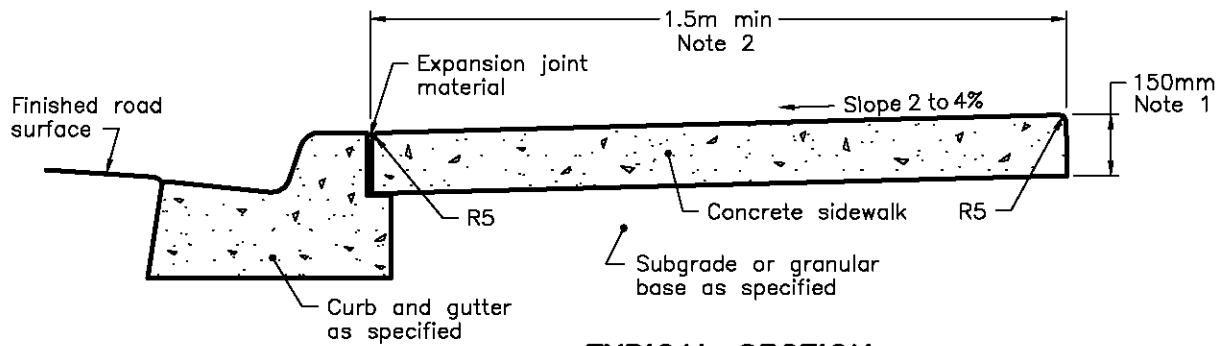
Nov 2015

Rev 2

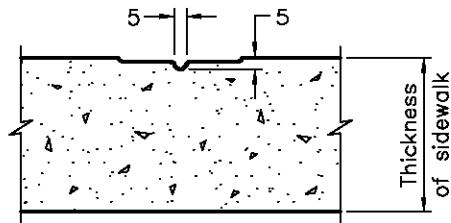
CONCRETE SIDEWALK

OPSD 310.010

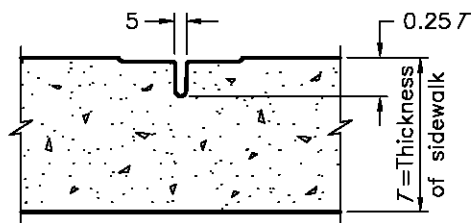




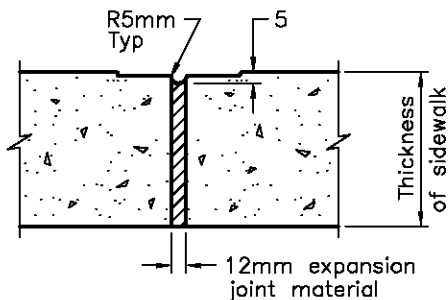
TYPICAL SECTION



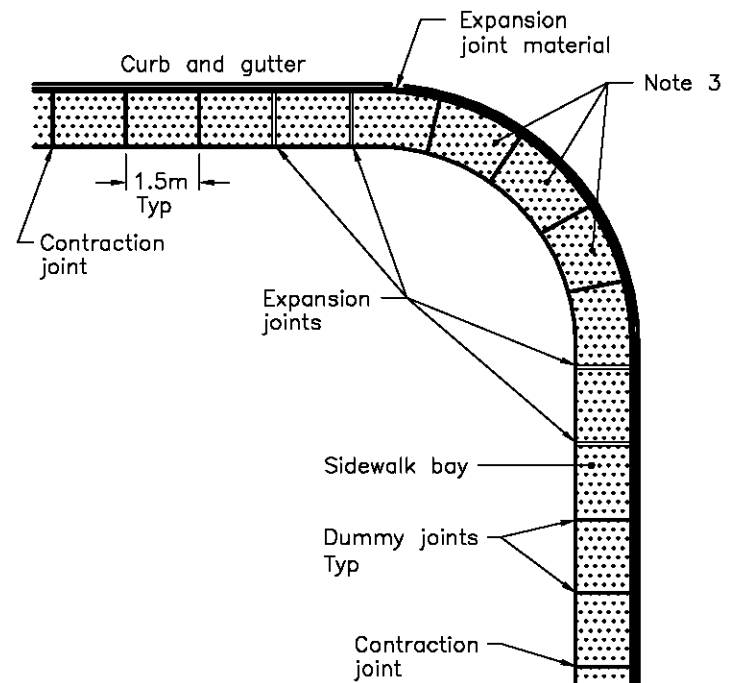
DUMMY JOINT



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

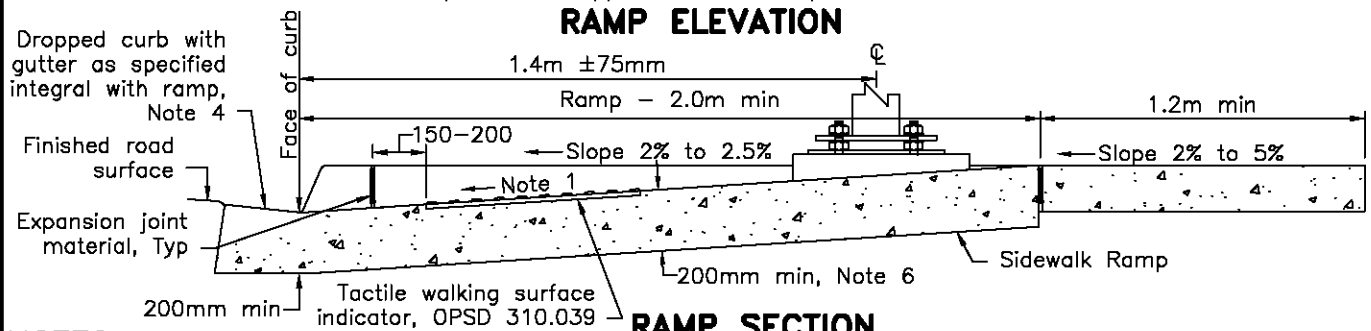
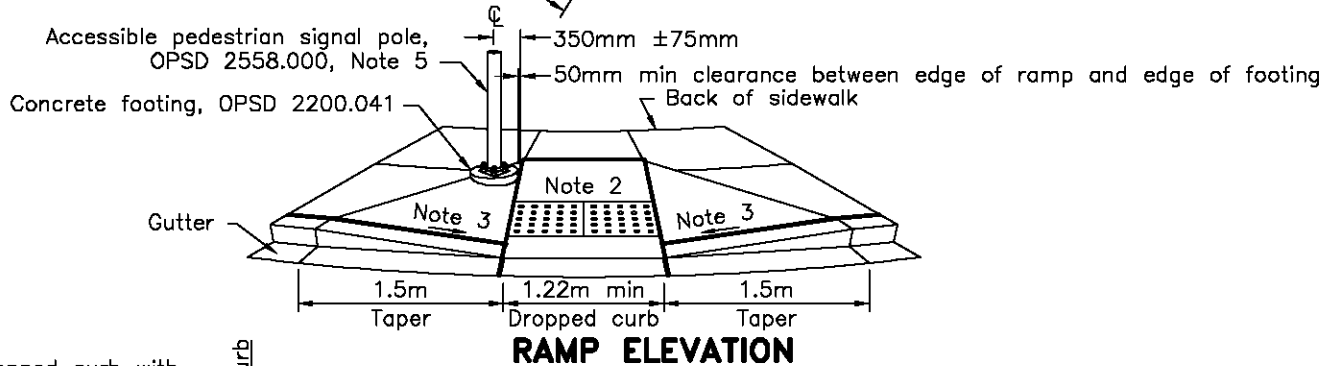
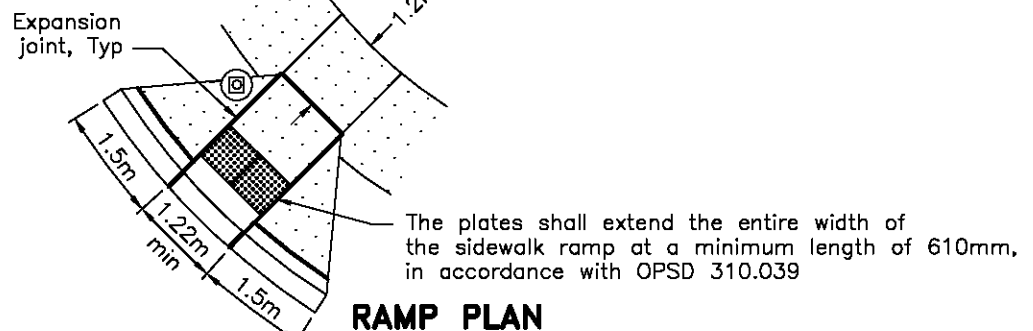
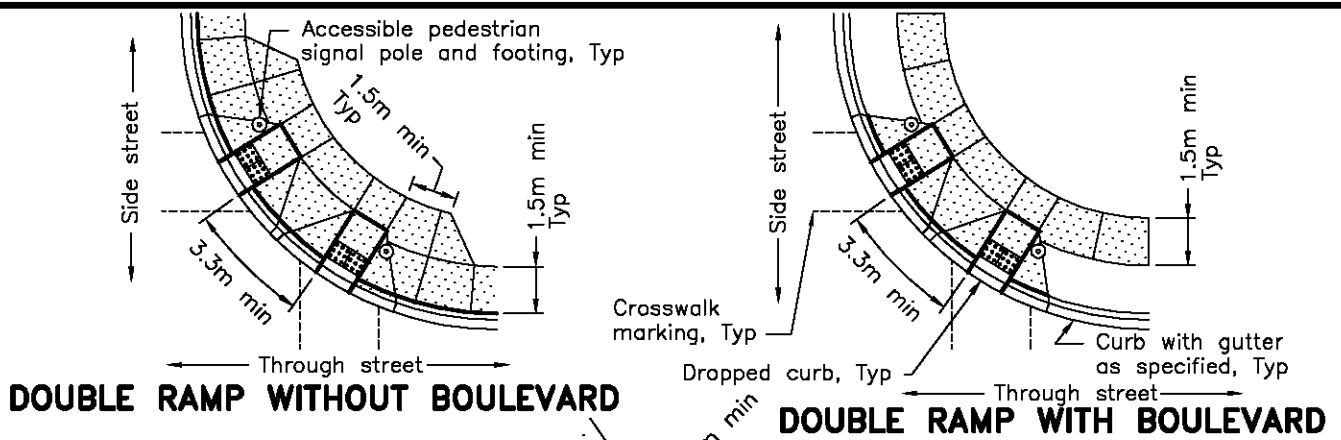
Nov 2015

Rev 2

**CONCRETE SIDEWALK
ADJACENT TO CURB AND GUTTER**



OPSD 310.020



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

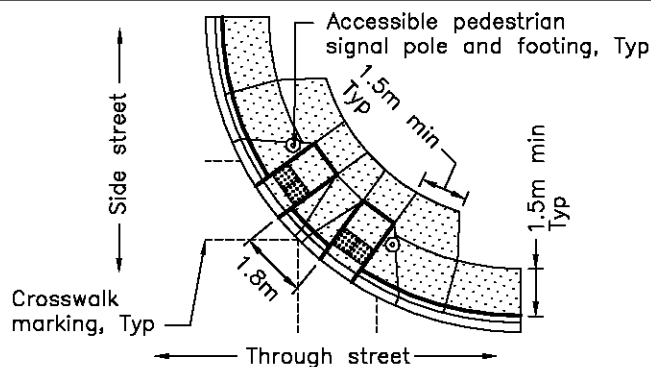
Nov 2015

Rev 1

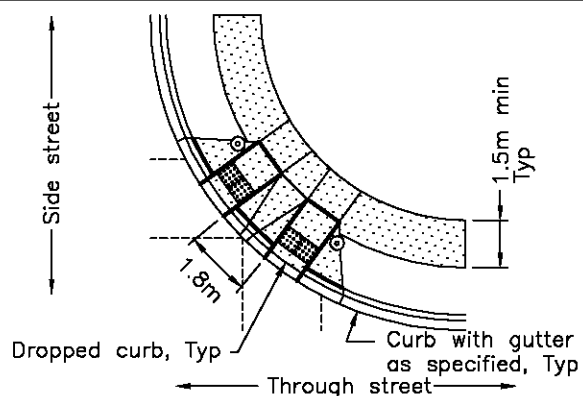
**CONCRETE SIDEWALK RAMPS AT
SIGNALIZED INTERSECTIONS**

OPSD 310.030

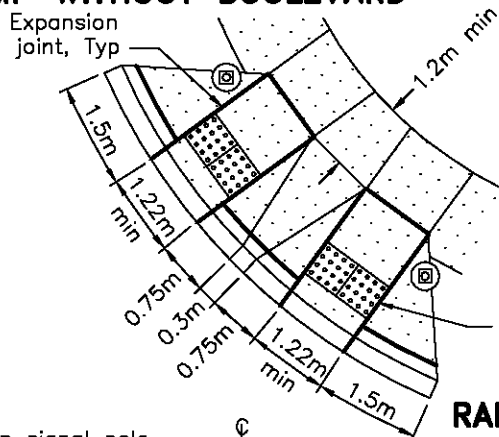




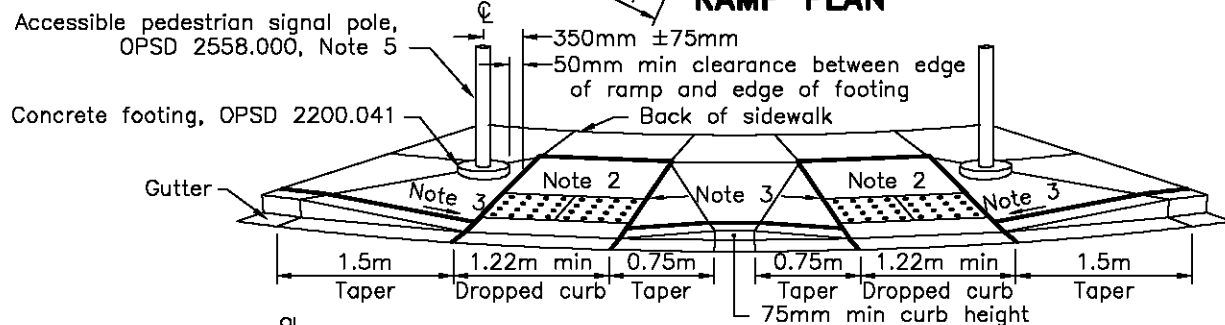
DOUBLE RAMP WITHOUT BOULEVARD



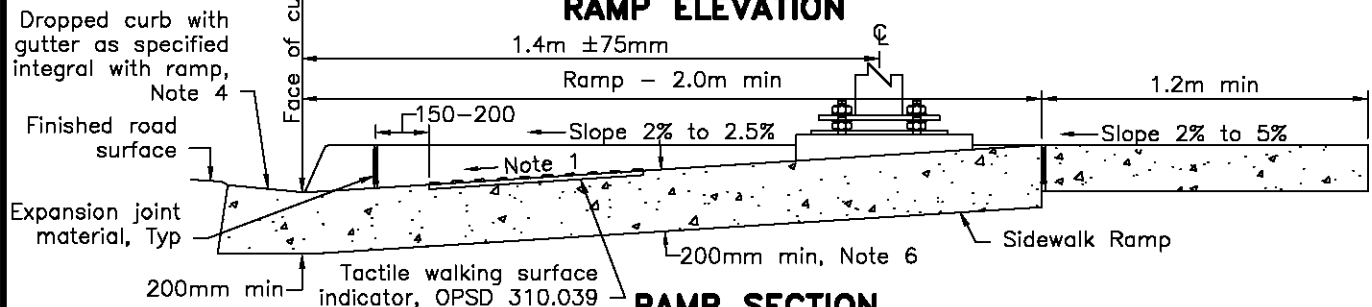
DOUBLE RAMP WITH BOULEVARD



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

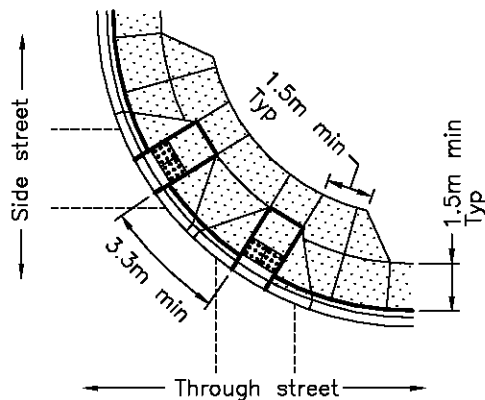
Nov 2015

Rev 0

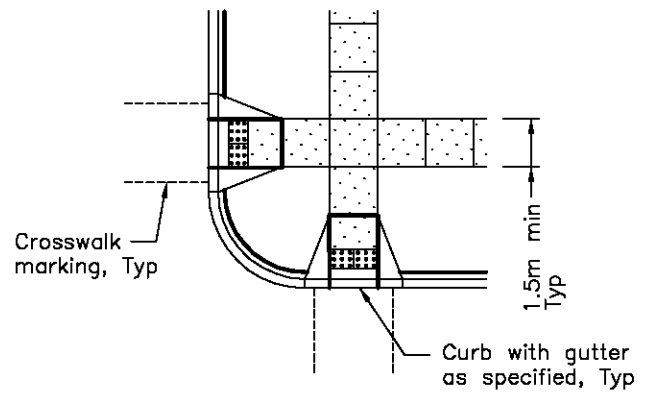
**CONCRETE SIDEWALK RAMPS AT
SIGNALIZED INTERSECTIONS WITH
INTERSECTING CROSSWALKS**

OPSD 310.031

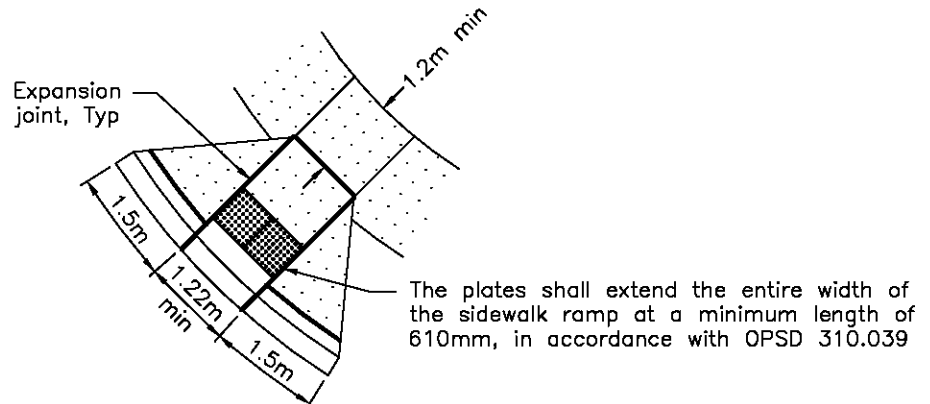




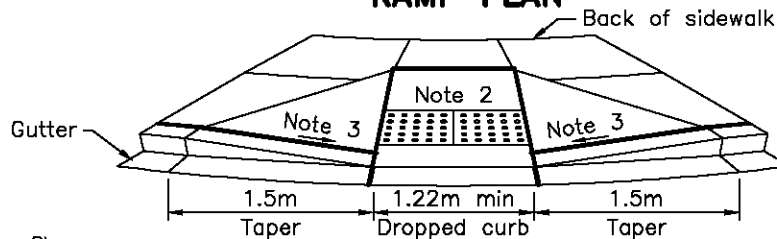
DOUBLE RAMP WITHOUT BOULEVARD



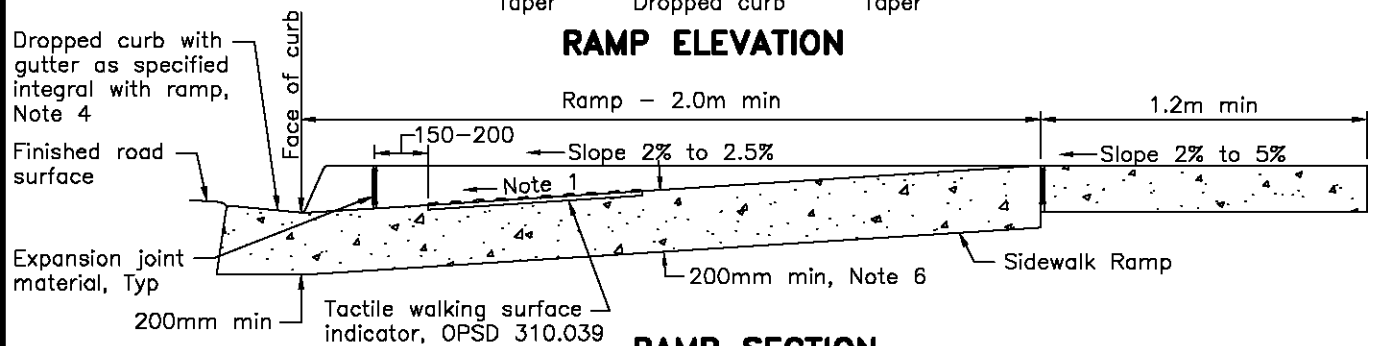
RAMPS WITH BOULEVARD



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

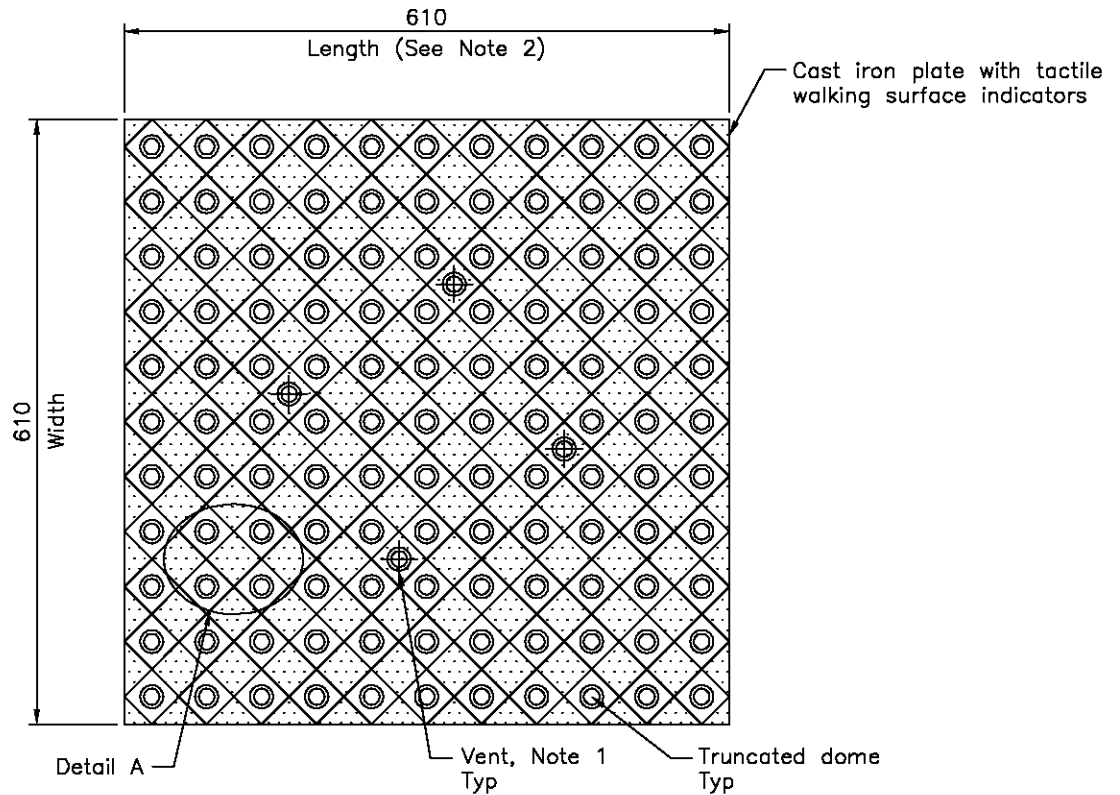
Nov 2015

Rev 0

**CONCRETE SIDEWALK RAMPS AT
UNSIGNALIZED INTERSECTIONS**

OPSD 310.033

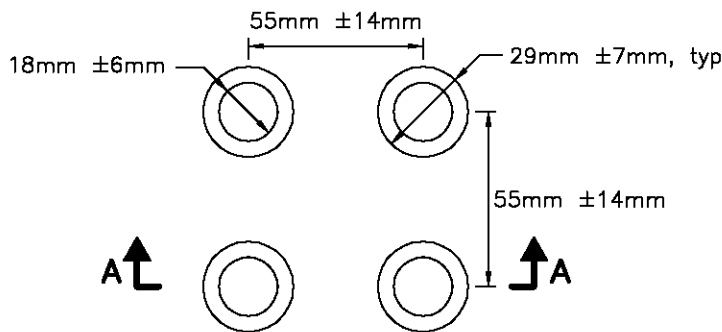




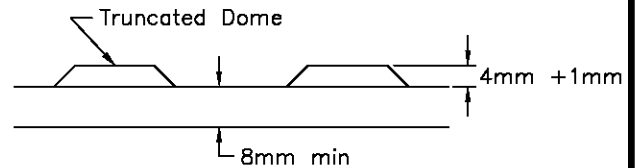
PLAN



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

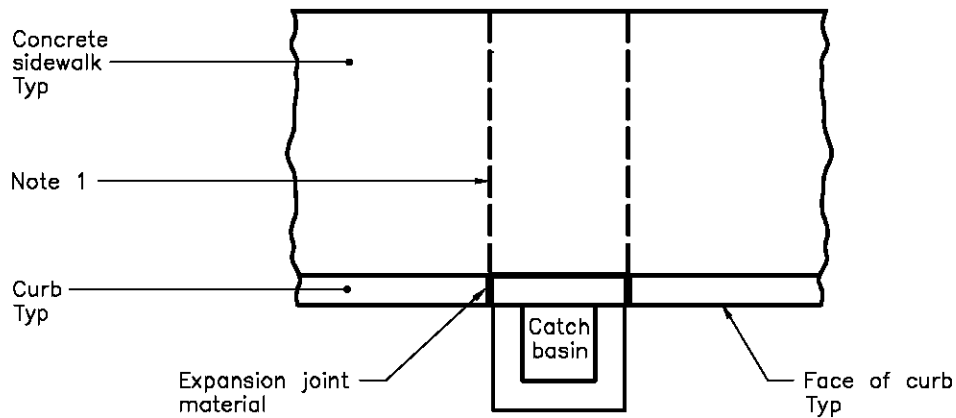
**CONCRETE SIDEWALK RAMPS
TACTILE WALKING SURFACE
INDICATORS COMPONENT**

Nov 2015

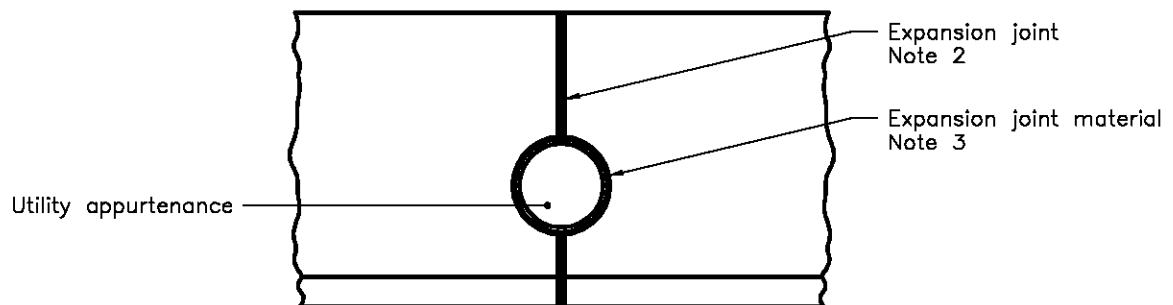
Rev 0



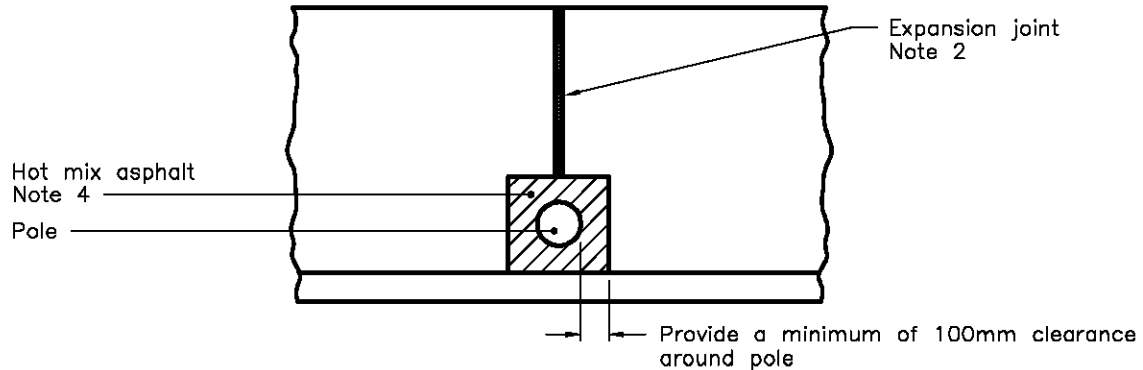
OPSD 310.039



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

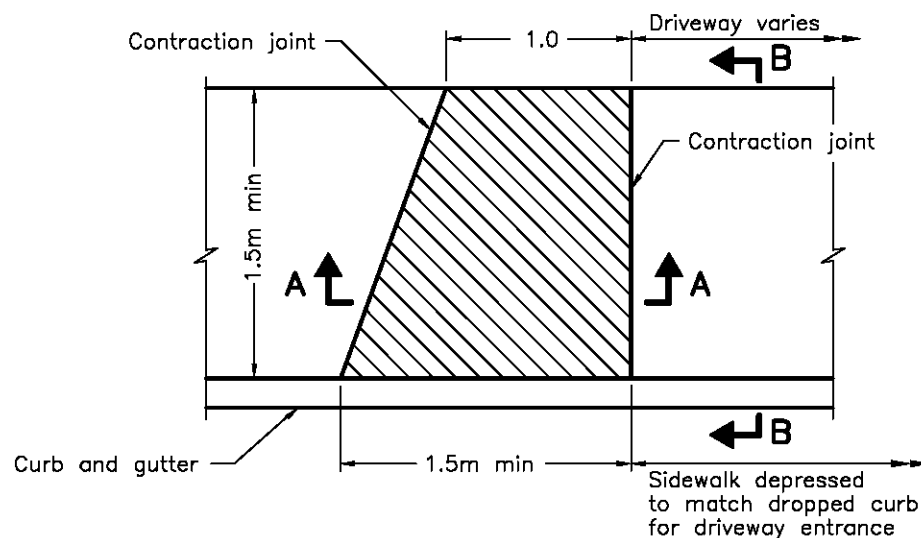
Nov 2015

Rev 2

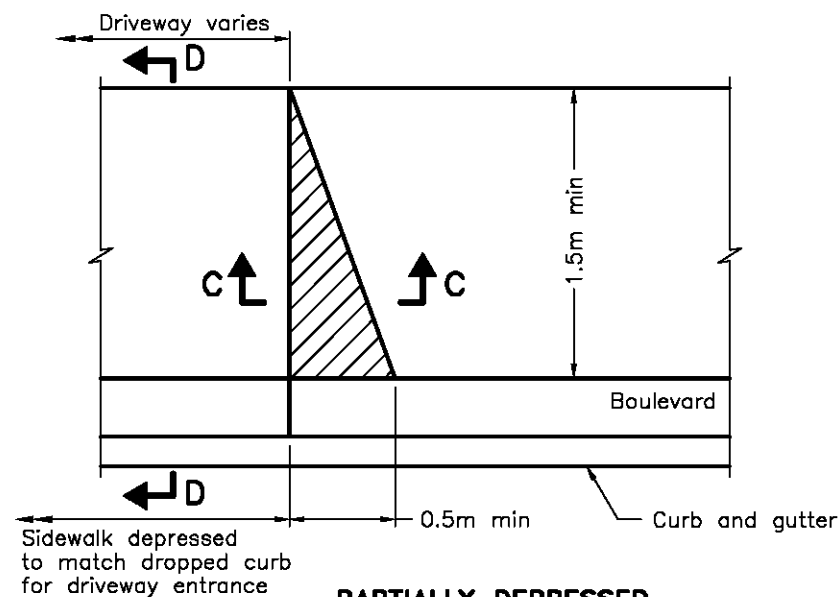
**UTILITY ISOLATION
IN CONCRETE SIDEWALKS**



OPSD 310.040

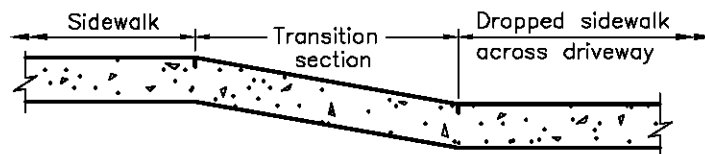


FULLY DEPRESSED

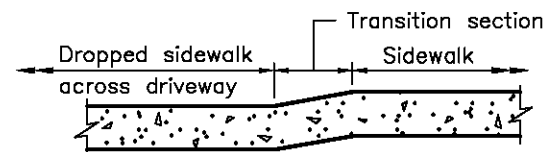


PARTIALLY DEPRESSED

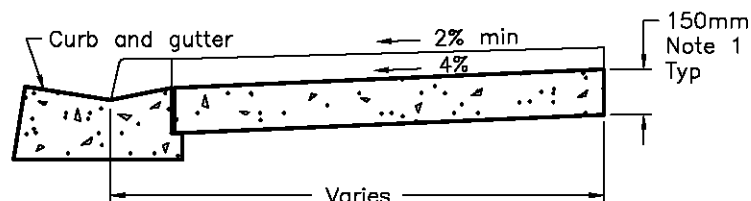
PLAN



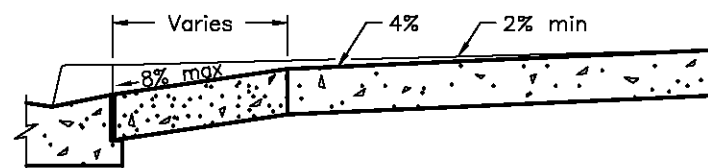
**SIDEWALK WITHOUT BOULEVARD
SECTION A-A**



**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

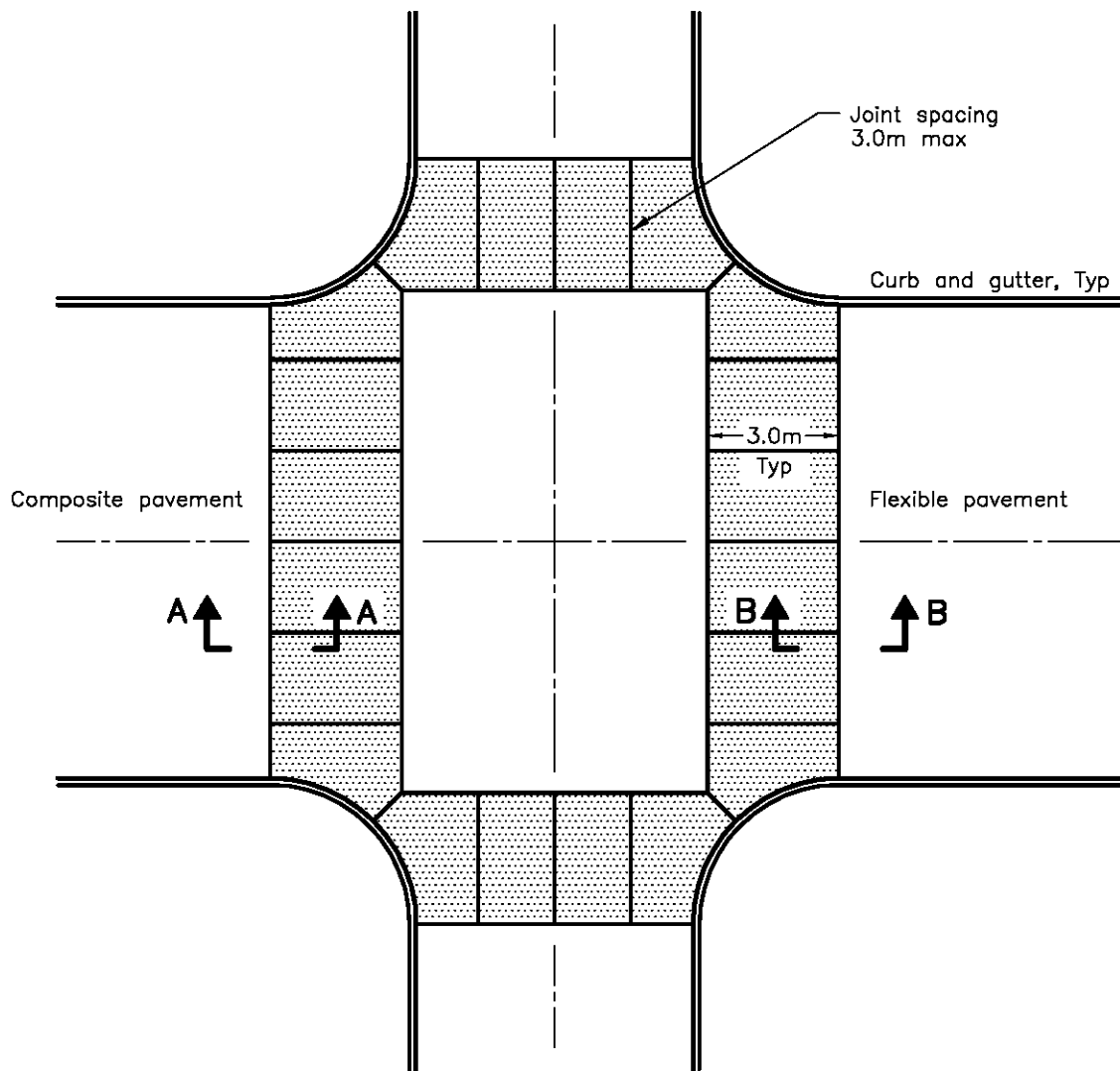
Nov 2015

Rev 2

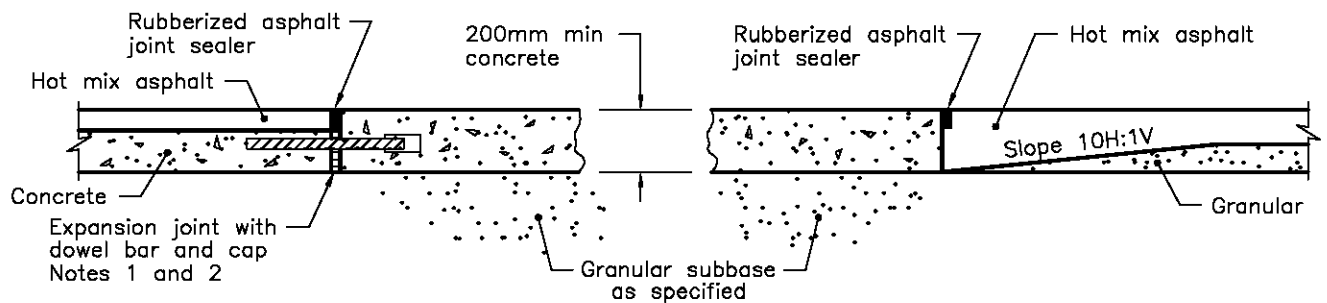
**CONCRETE SIDEWALK
DRIVEWAY ENTRANCE DETAILS**

OPSD 310.050





PLAN



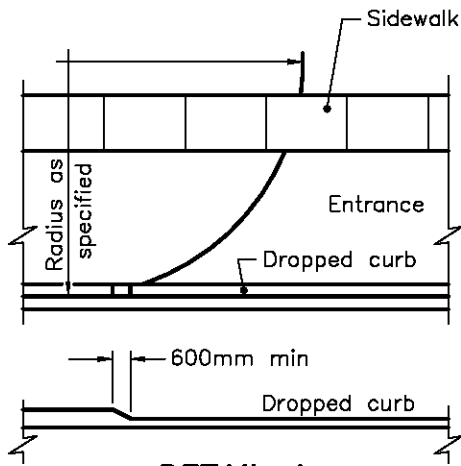
**COMPOSITE PAVEMENT
SECTION A-A**

**FLEXIBLE PAVEMENT
SECTION B-B**

NOTES:

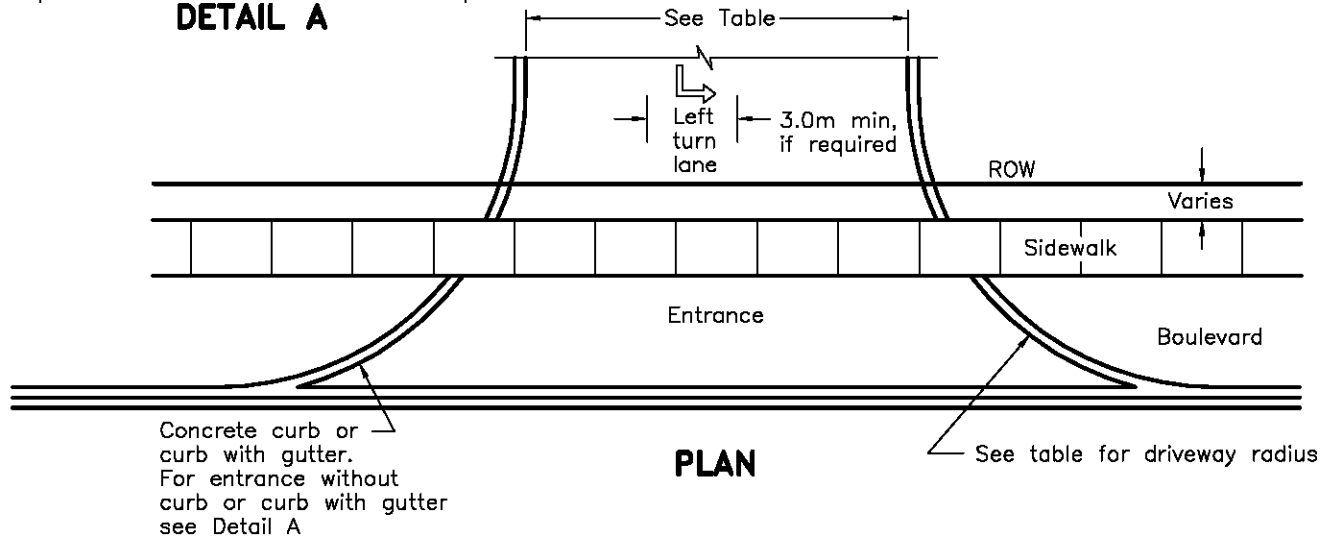
- 1 For expansion joint detail, see OPSD 552.020.
- 2 Dowel bar with cap shall be installed at 300mm centres.
- A All dimensions are in millimetres unless otherwise shown.

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		

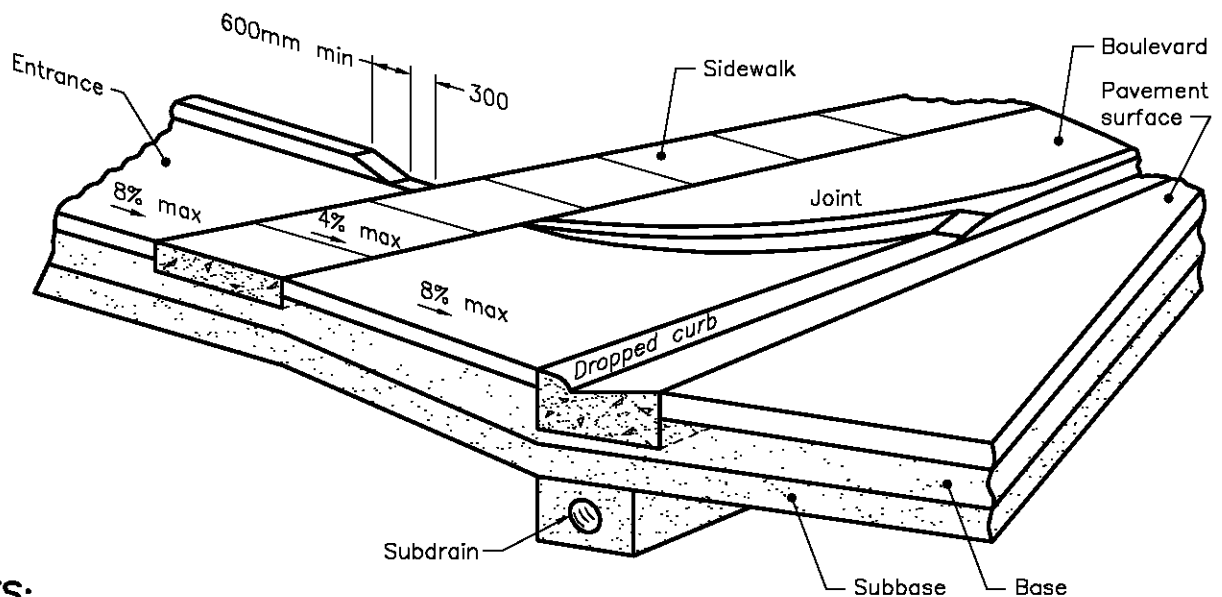


DETAIL A

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



PLAN



NOTES:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

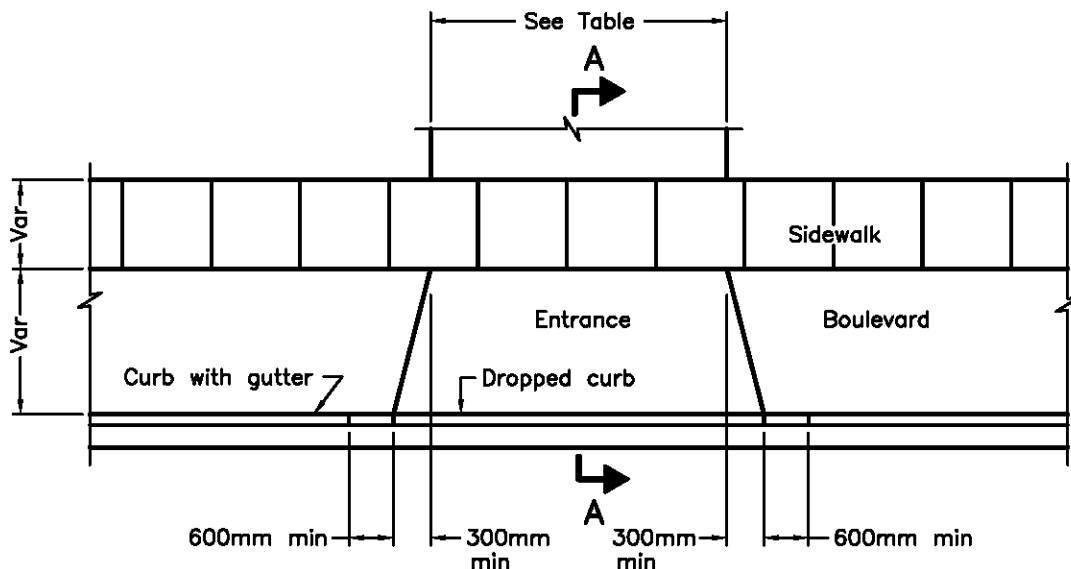
Nov 2009

Rev 1

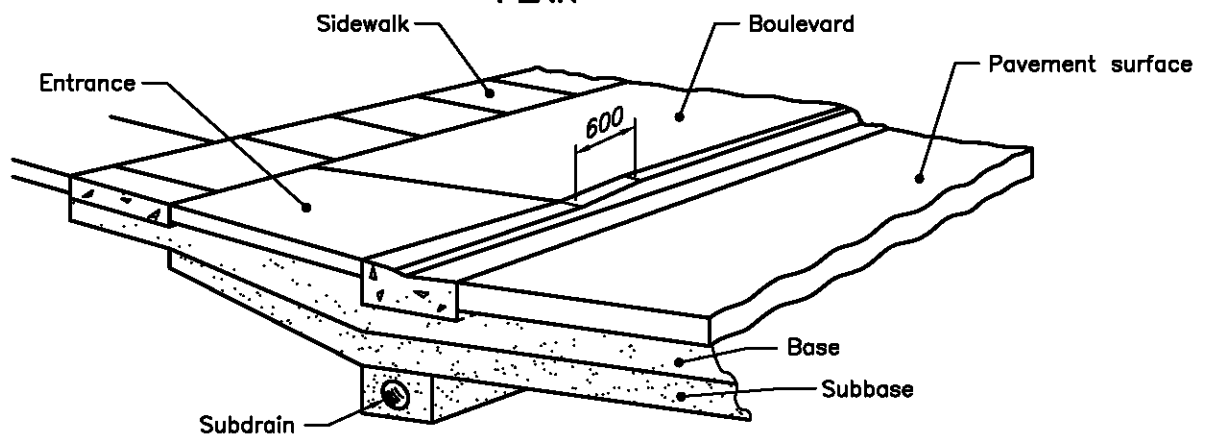
**URBAN
INDUSTRIAL, COMMERCIAL, AND
APARTMENT ENTRANCES**



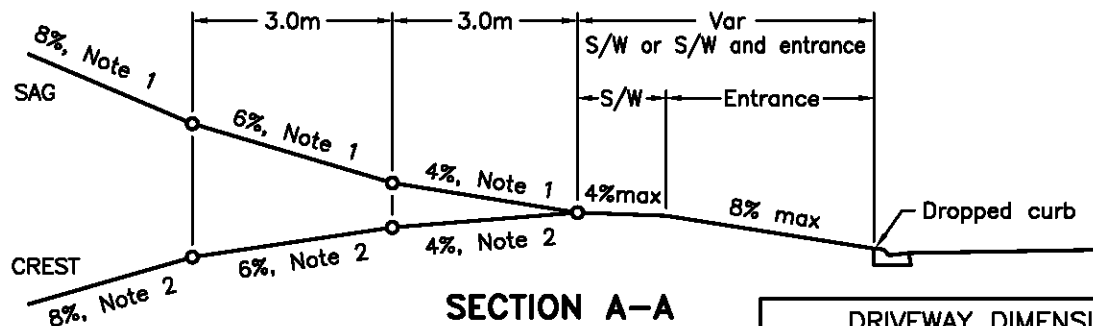
OPSD 350.010



PLAN



ISOMETRIC VIEW



SECTION A-A

NOTES:

- 1 Maximum upgrade shall be 10%.
- 2 Maximum downgrade shall be 8%.

A All dimensions are in millimetres unless otherwise shown.

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

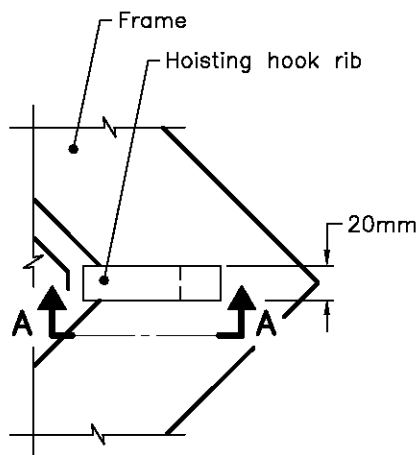
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2009 Rev 1

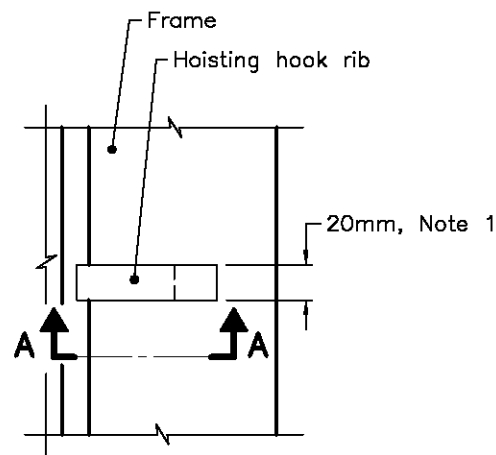
URBAN RESIDENTIAL
ENTRANCE



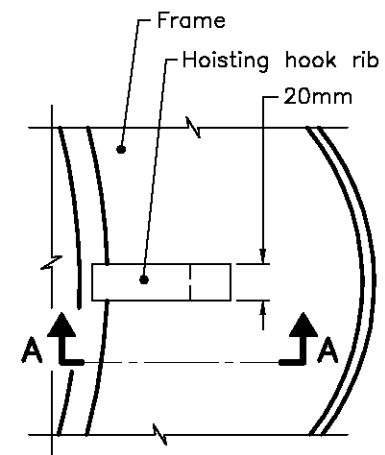
OPSD 351.010



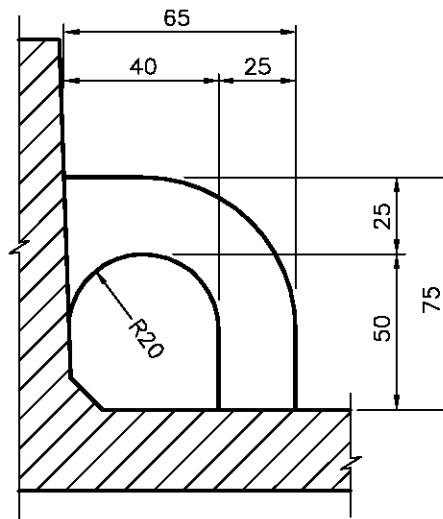
**SQUARE FRAME PLAN
SQUARE CORNER**



**SQUARE FRAME PLAN
MID-SECTION**



**SQUARE FRAME PLAN
ROUND CORNER**



SECTION A-A

NOTES:

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

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

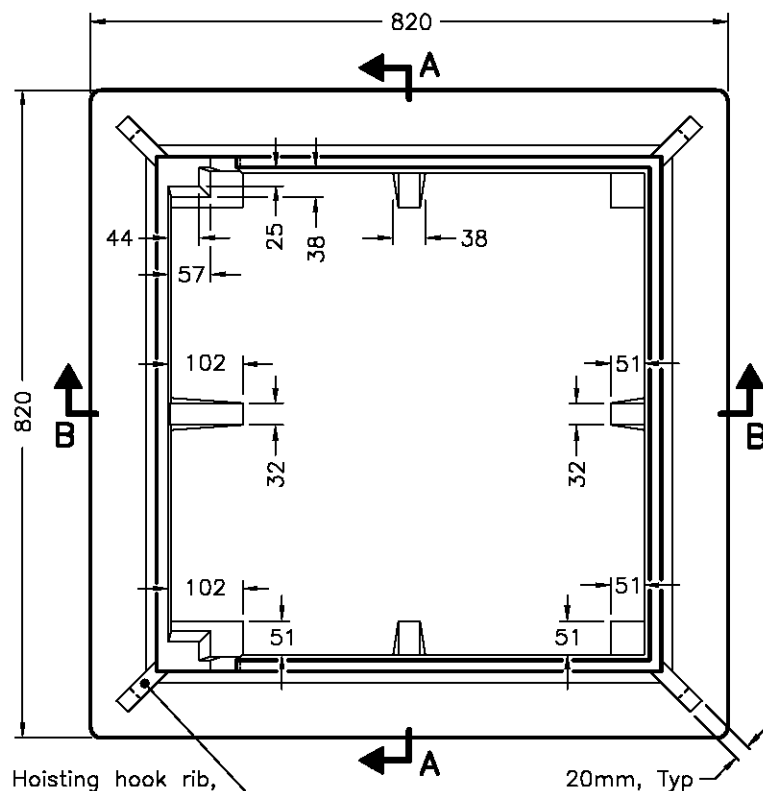
**HOISTING HOOK RIB FOR CAST IRON FRAMES
FOR CATCH BASINS, MAINTENANCE HOLES,
AND VALVE CHAMBERS**

Nov 2013

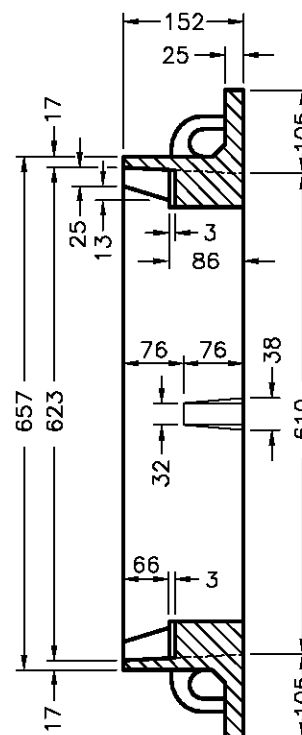
Rev 1



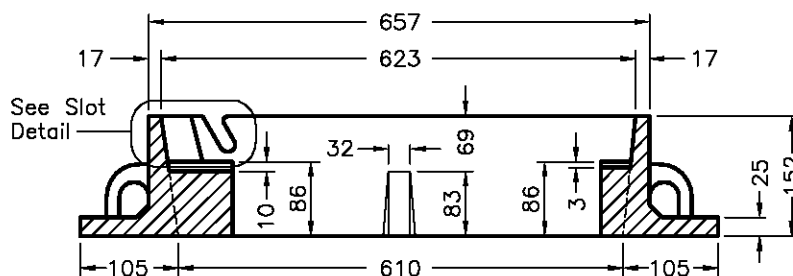
OPSD 400.001



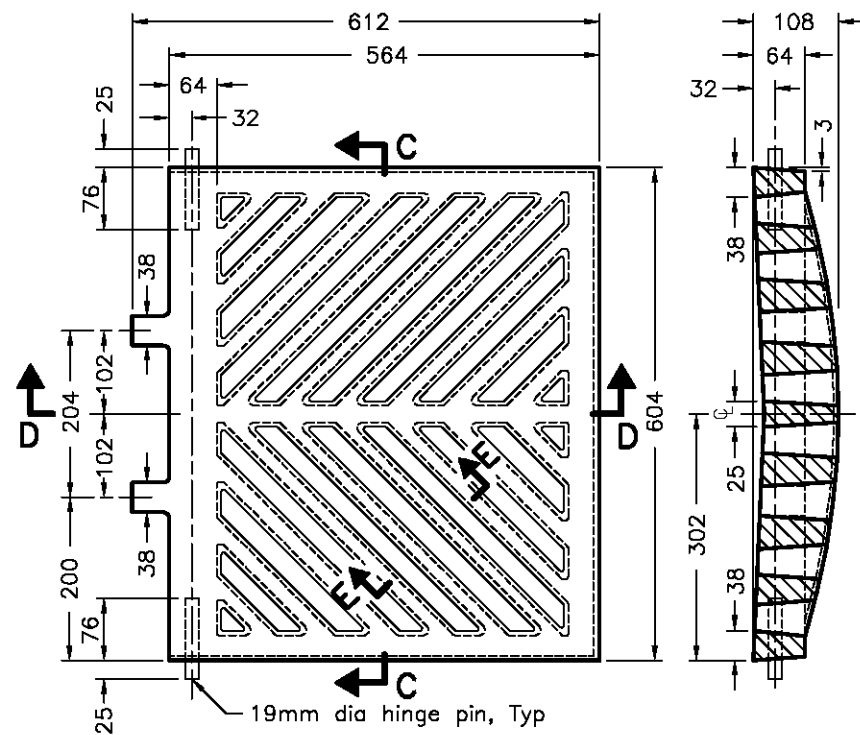
FRAME PLAN



SECTION A-A

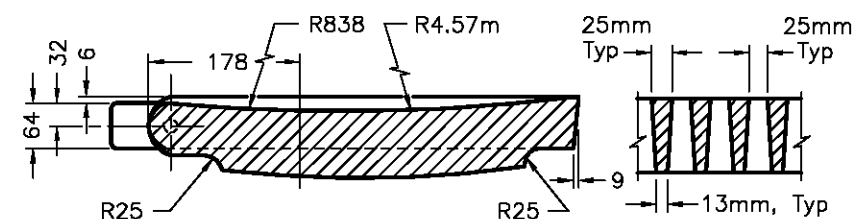


SECTION B-B



GRATE PLAN

SECTION C-C

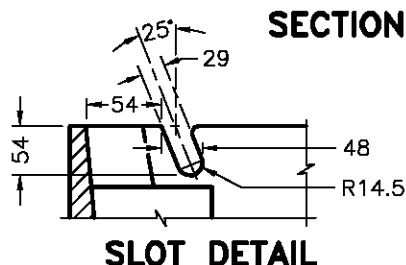


SECTION D-D

SECTION E-E

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.



SLOT DETAIL

ONTARIO PROVINCIAL STANDARD DRAWING

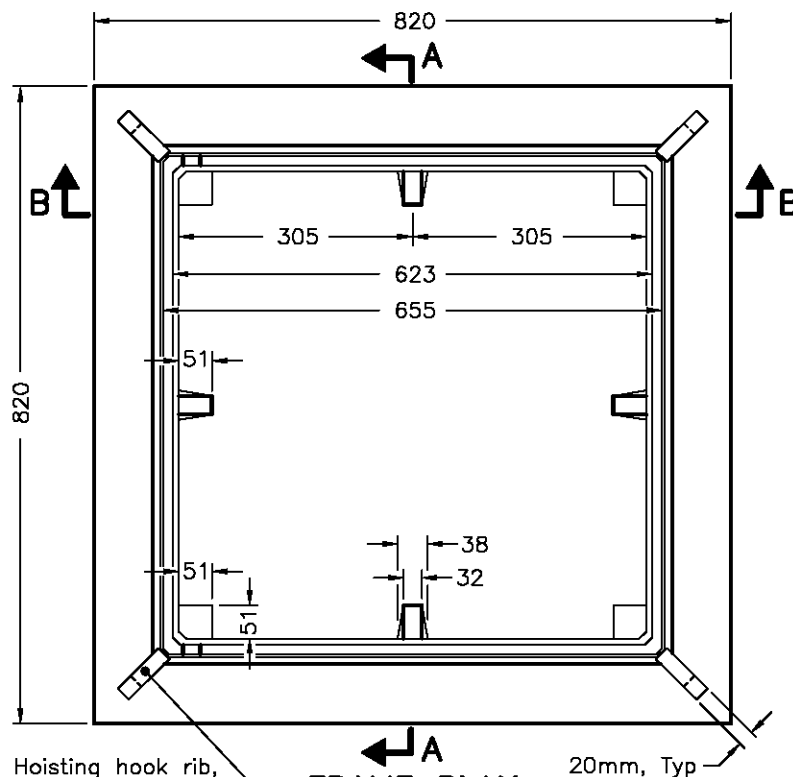
**CAST IRON, SQUARE FRAME WITH
SQUARE OVERFLOW TYPE DISHED GRATE FOR
CATCH BASINS, HERRING BONE OPENINGS**

Nov 2013

Rev 2

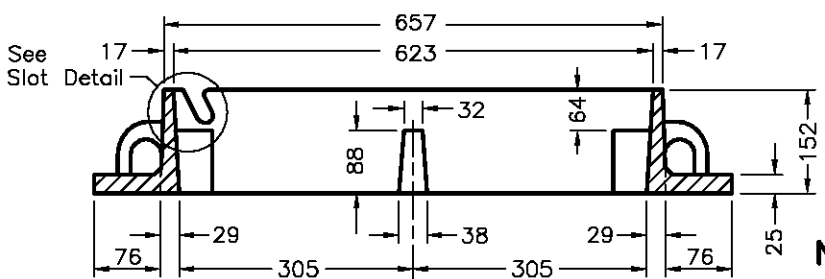


OPSD 400.010

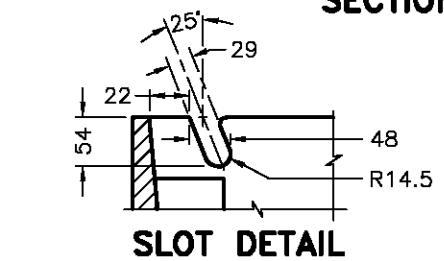


Hoisting hook rib,
Typ, OPSD 400.001

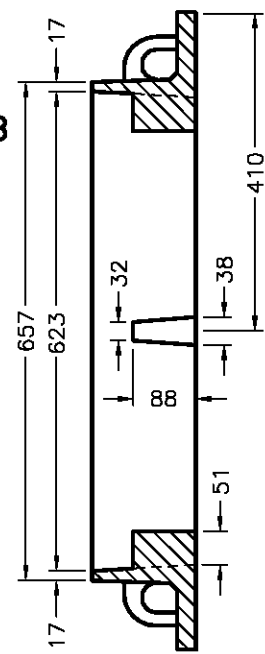
FRAME PLAN



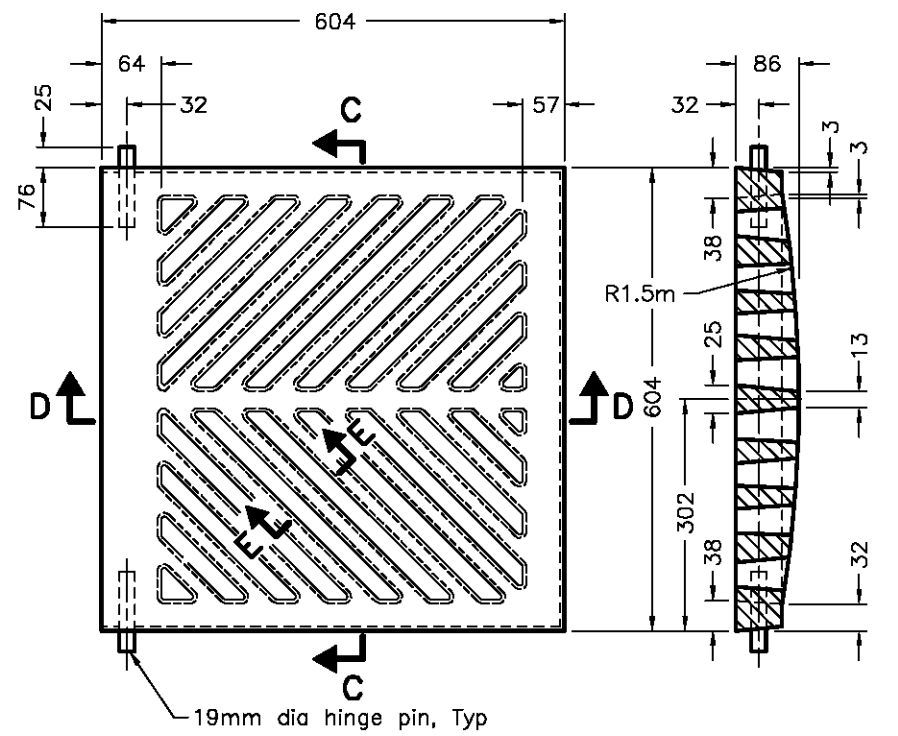
SECTION B-B



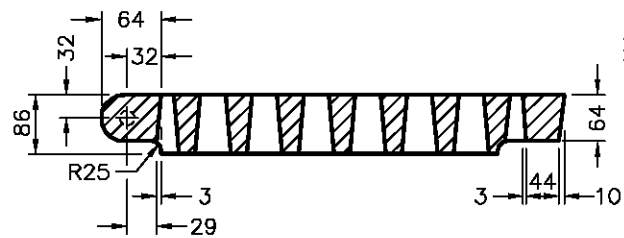
SLOT DETAIL



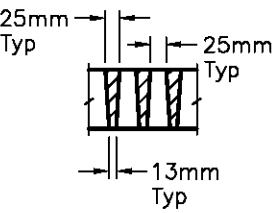
SECTION A-A



GRATE PLAN



SECTION D-D



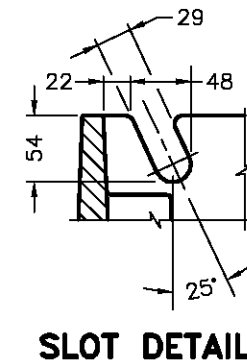
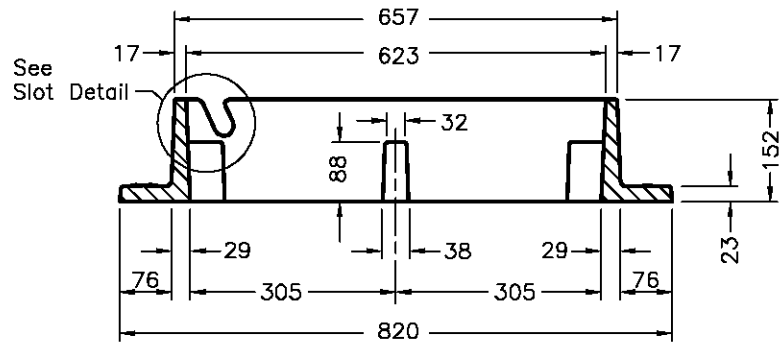
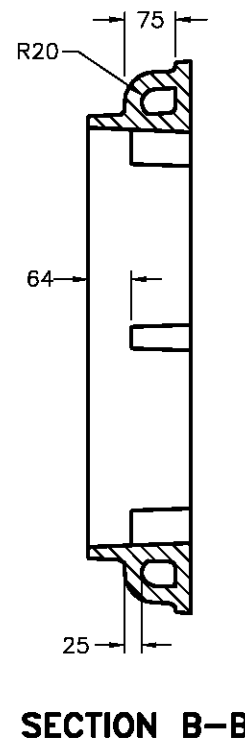
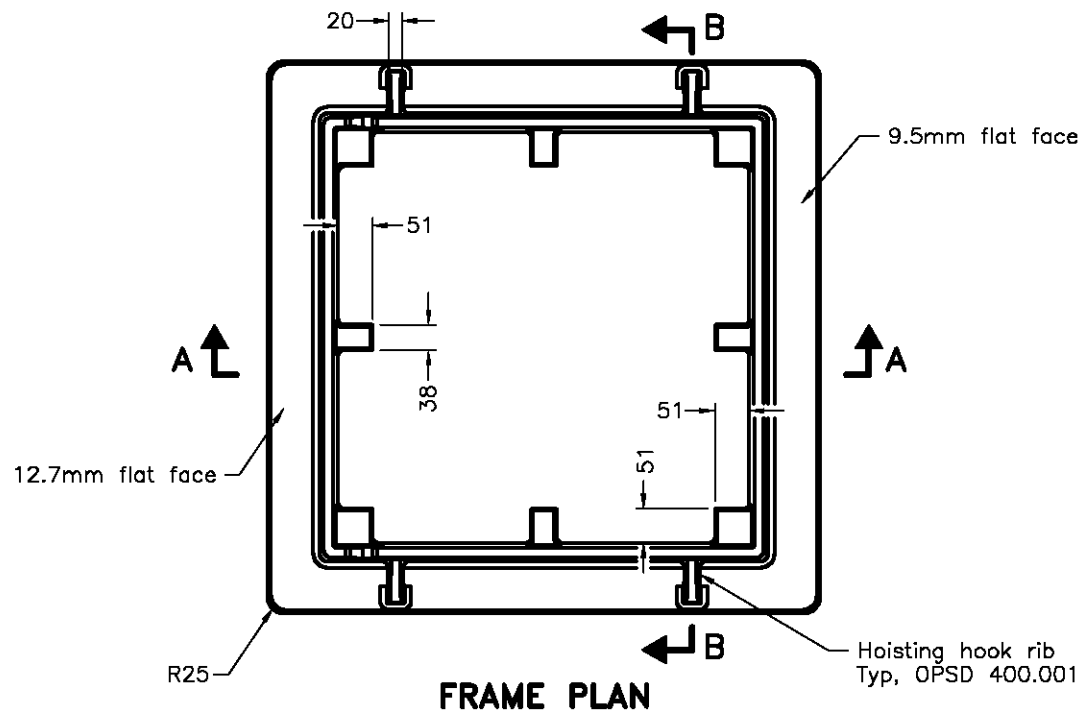
SECTION E-E

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 FLAT GRATE FOR CATCH BASINS, HERRING BONE OPENINGS	-----			

OPSD 400.020				



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

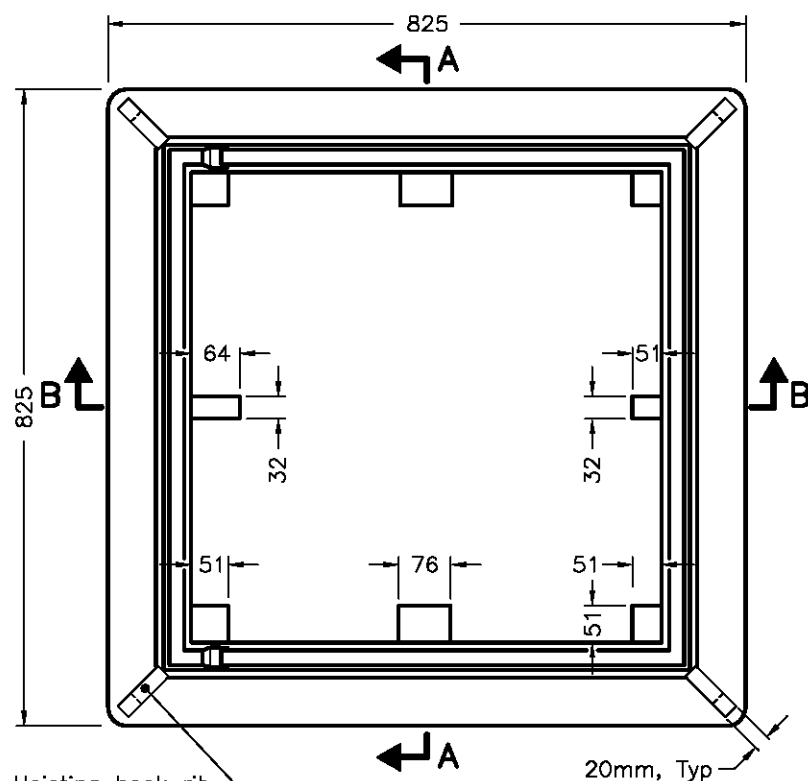
Nov 2013

Rev 0

**CAST IRON, SQUARE FRAME
FOR CURB INLET OVERFLOW**

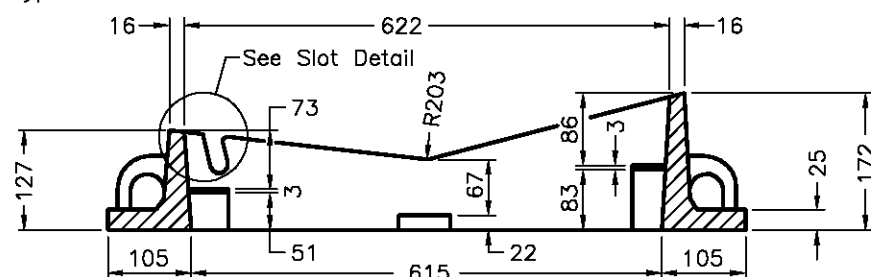
OPSD 400.021



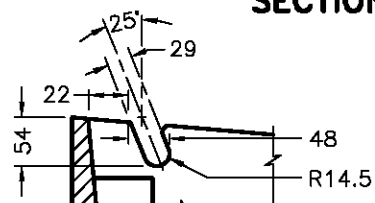


Hoisting hook rib,
Typ. OPSD 400.001

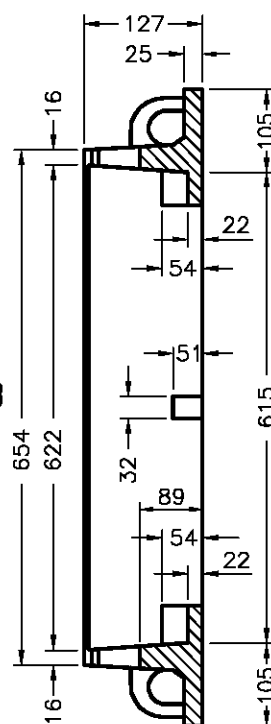
FRAME PLAN



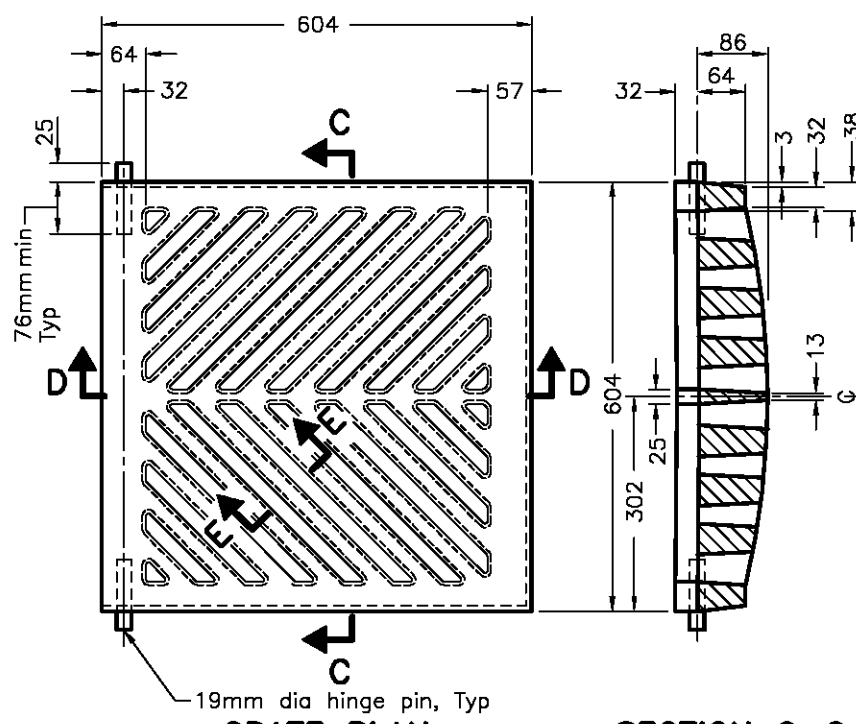
SECTION B-B



SLOT DETAIL

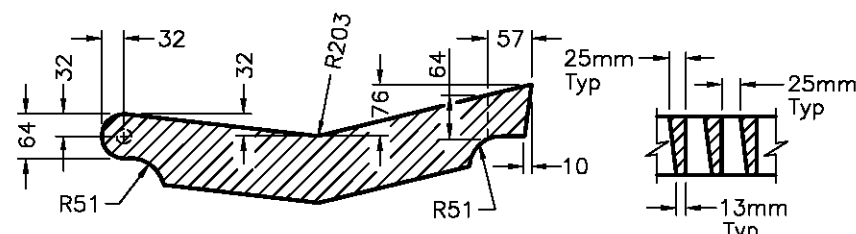


SECTION A-A



GRATE PLAN

SECTION C-C



SECTION D-D

SECTION E-E

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

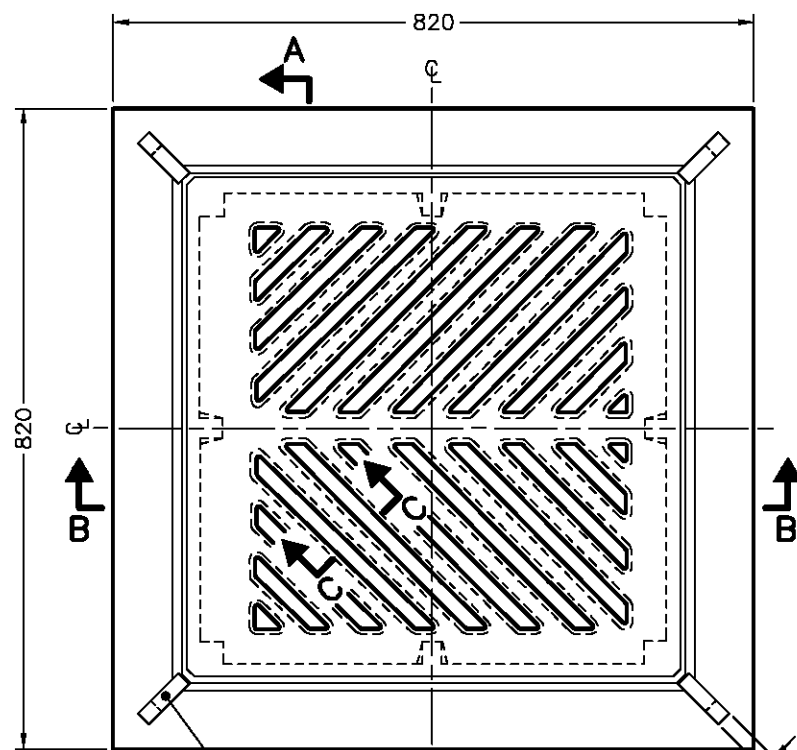
Nov 2013

Rev 2

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

OPSD 400.030

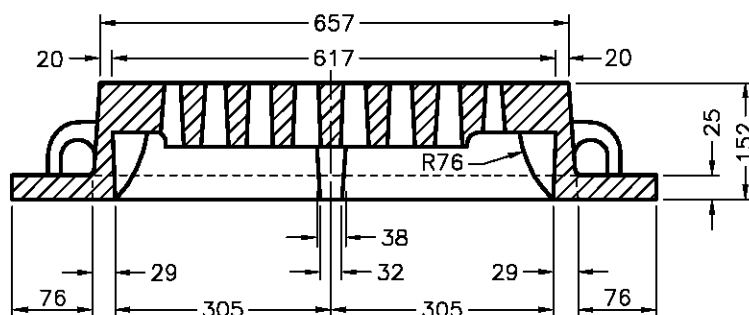




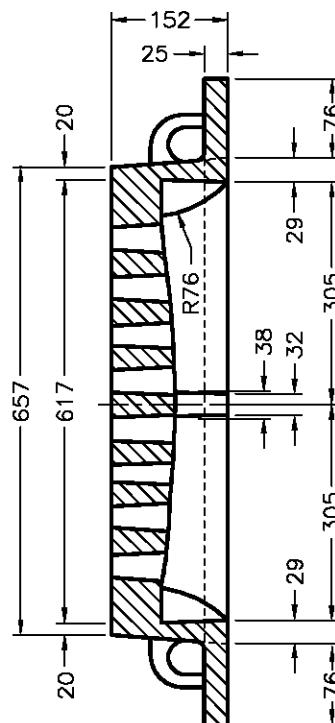
Hoisting hook rib,
Typ, OPSD 400.001

A FRAME PLAN

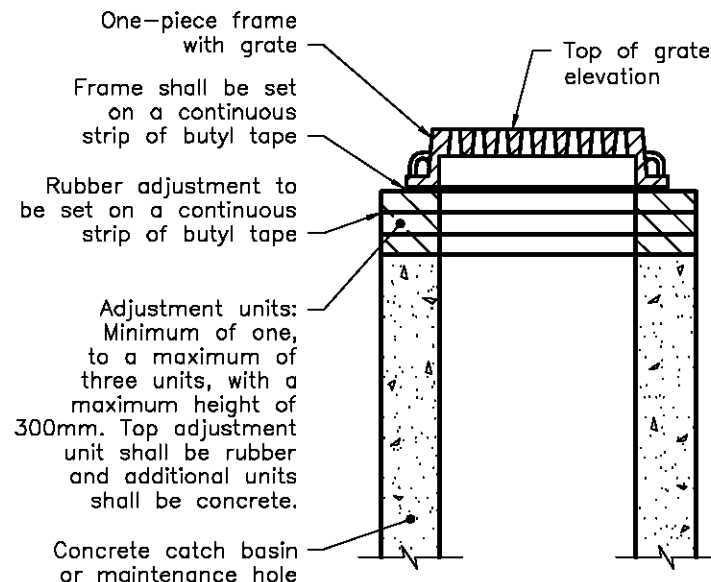
20mm, Typ



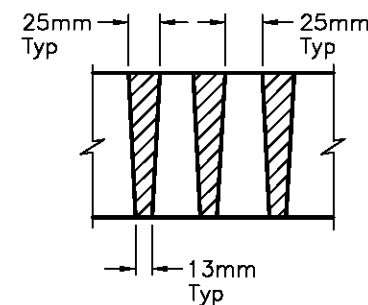
SECTION B-B



SECTION A-A



INSTALLATION



SECTION C-C

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

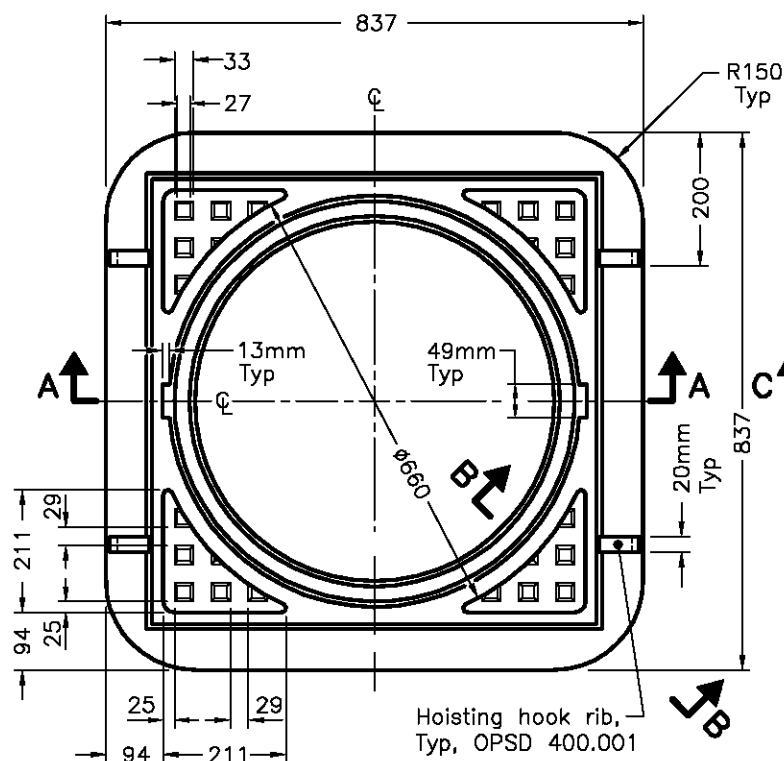
**CAST IRON, ONE-PIECE FRAME AND FLAT
SQUARE GRATE FOR TEMPORARY INSTALLATION,
HERRING BONE OPENINGS**

Nov 2013

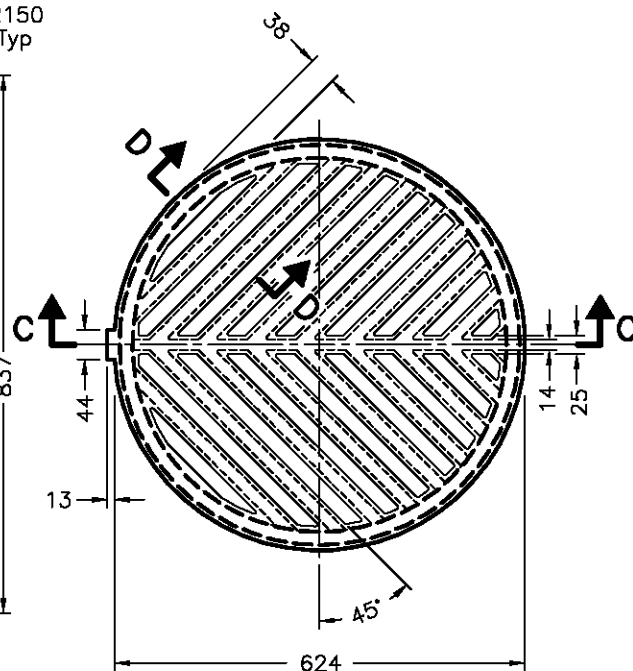
Rev 2



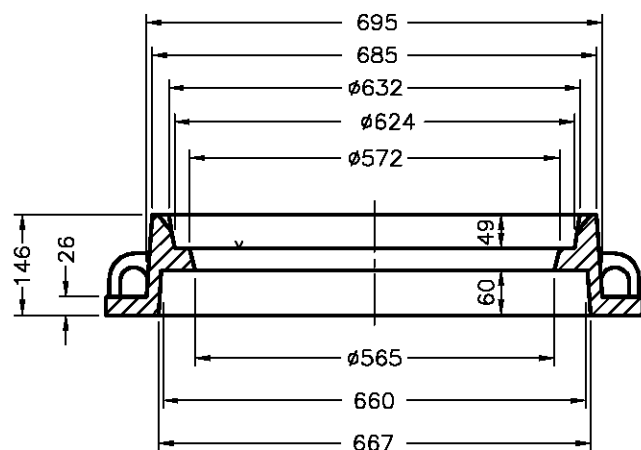
OPSD 400.040



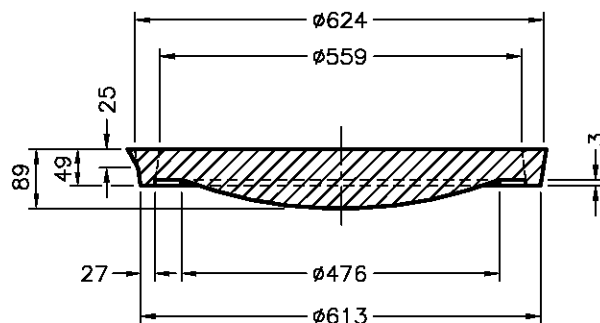
FRAME PLAN



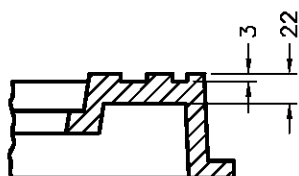
GRATE PLAN



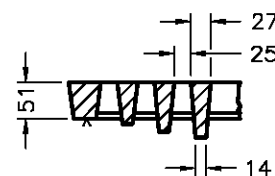
SECTION A-A



SECTION C-C



SECTION B-B



SECTION D-D

NOTES:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

CAST IRON, RAISED SQUARE FRAME

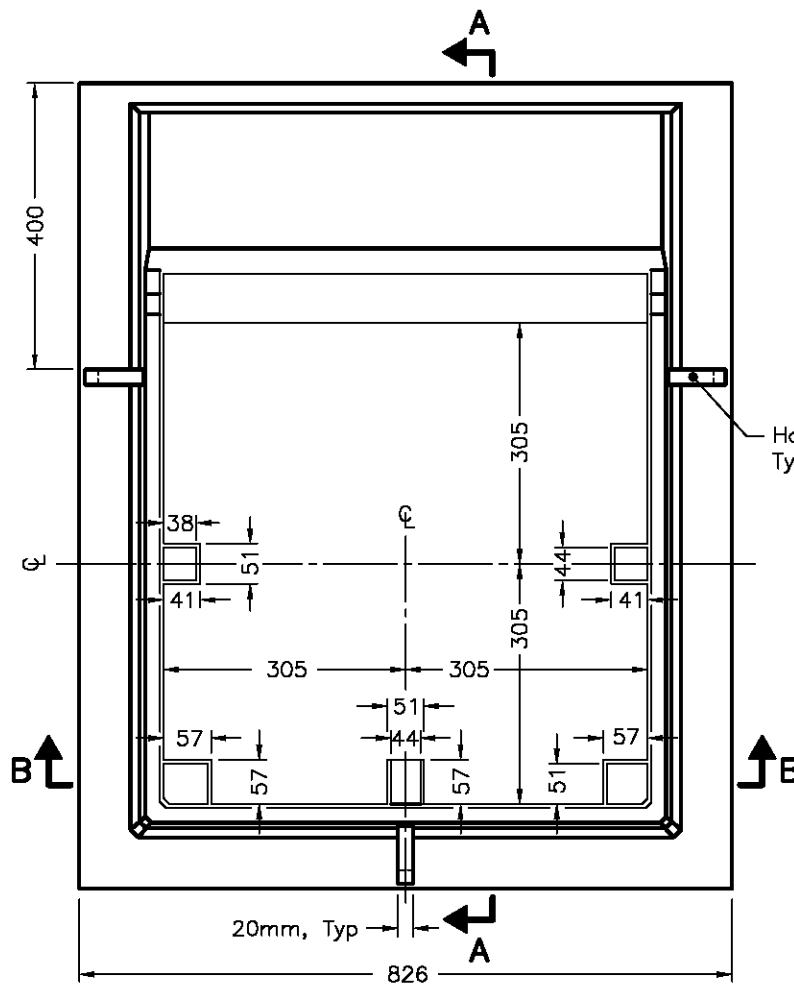
WITH CIRCULAR FLAT GRATE FOR

CATCH BASINS, HERRING BONE OPENINGS

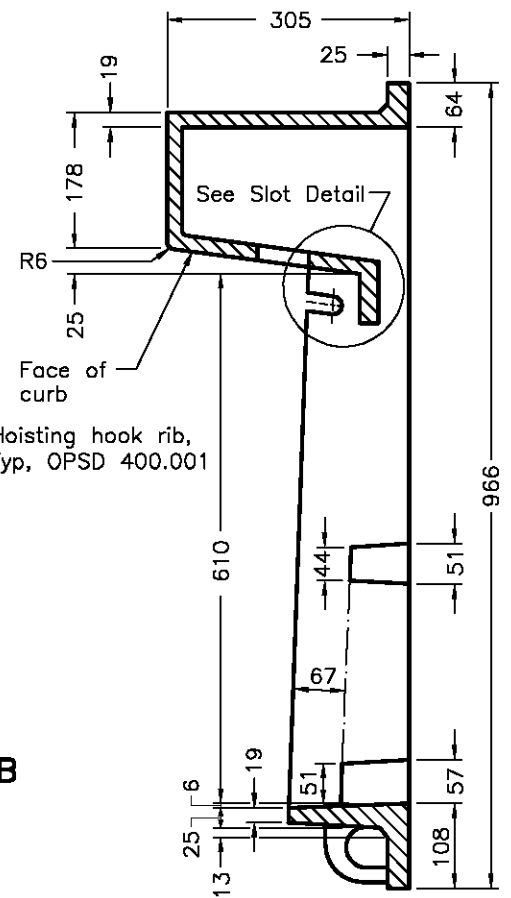
Nov 2014 Rev 5



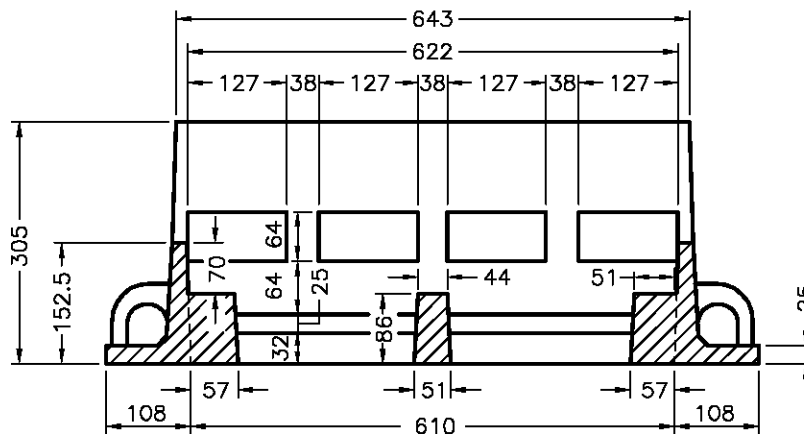
OPSD 400.070



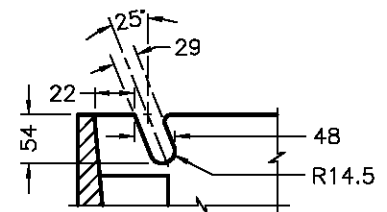
FRAME PLAN



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

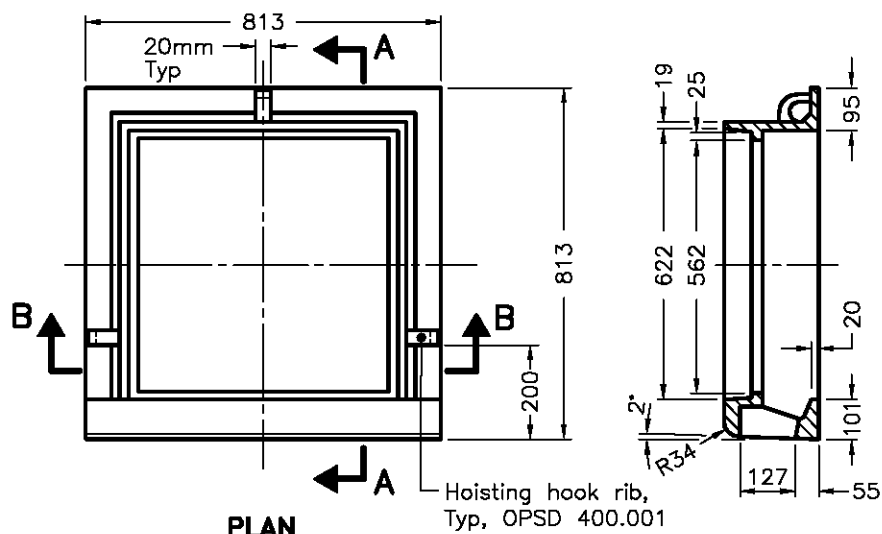
Apr 2016

Rev 3

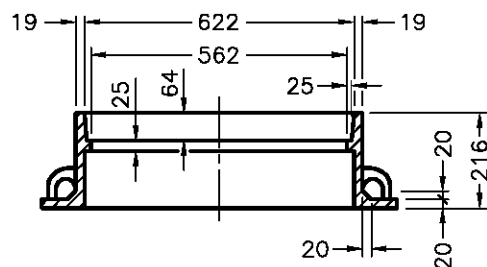
**CAST IRON, SIDE INLET
FOR CATCH BASINS**



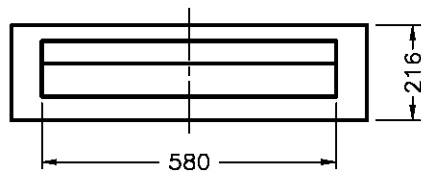
OPSD 400.080



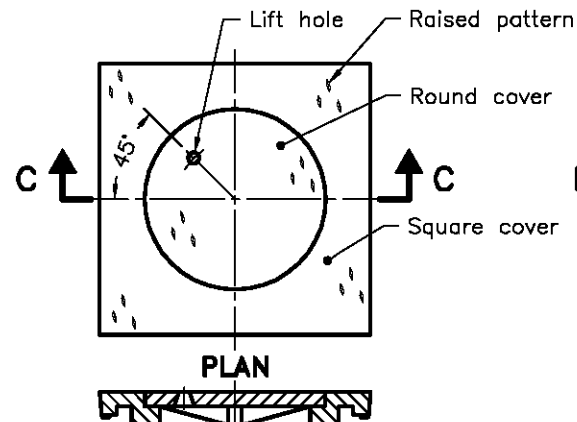
SECTION A-A



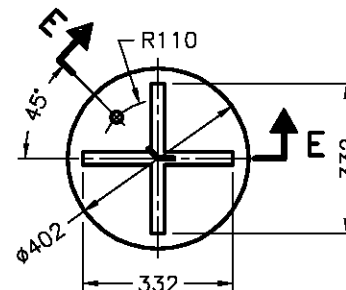
SECTION B-B



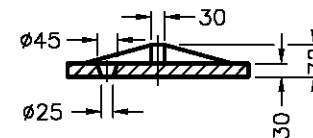
**CURB ELEVATION
FRAME**



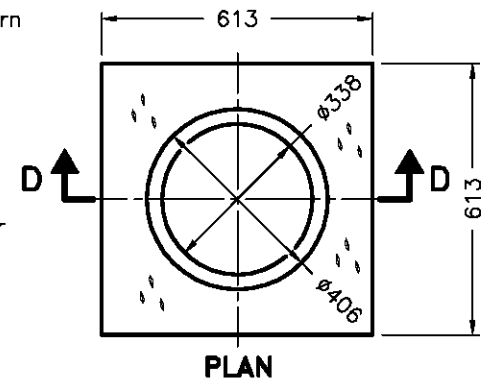
**SECTION C-C
COVER**



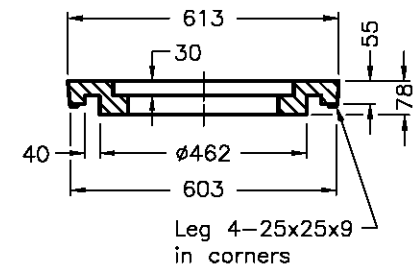
BOTTOM VIEW



**SECTION E-E
ROUND COVER**



PLAN



**SECTION D-D
SQUARE COVER**

NOTE:

A Installation shall be according to OPSD 610.030.

B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

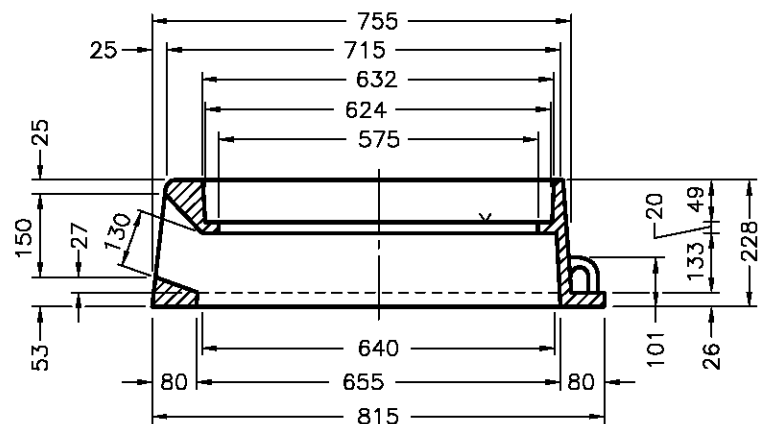
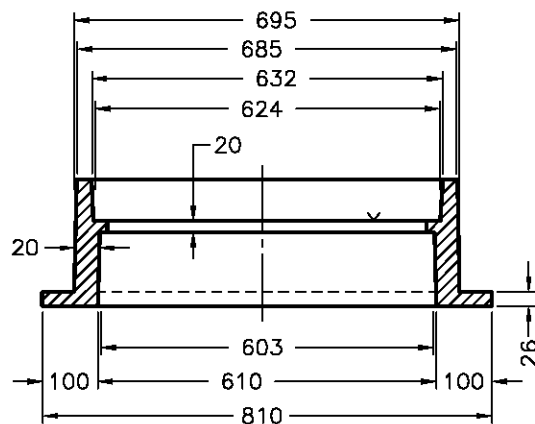
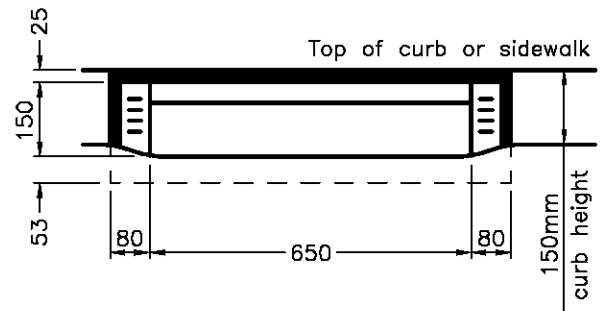
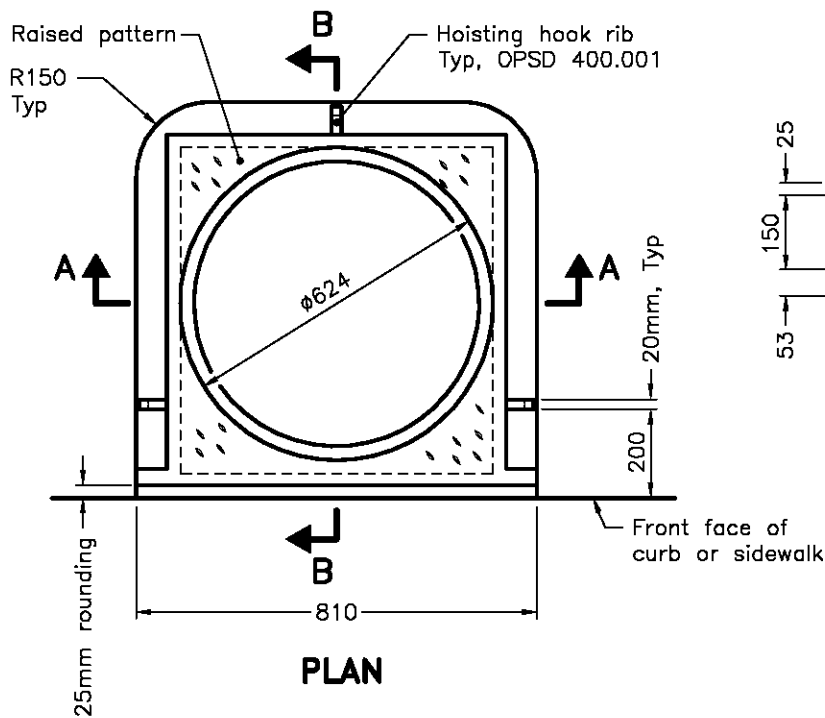
**CAST IRON, CURB INLET FRAME
WITH TWO-PIECE RAISED COVER
FOR CATCH BASINS OUT OF ROADWAY**

Nov 2013

Rev 2



OPSD 400.081



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.

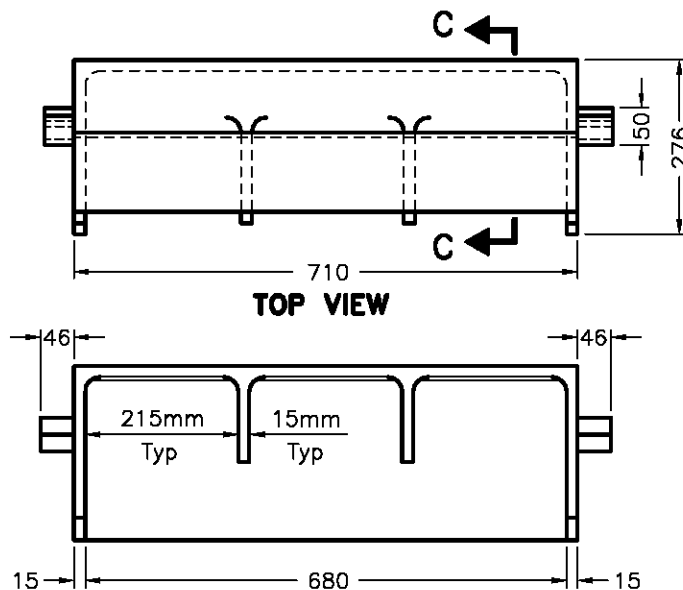
ONTARIO PROVINCIAL STANDARD DRAWING

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

Nov 2014 | Rev | 4



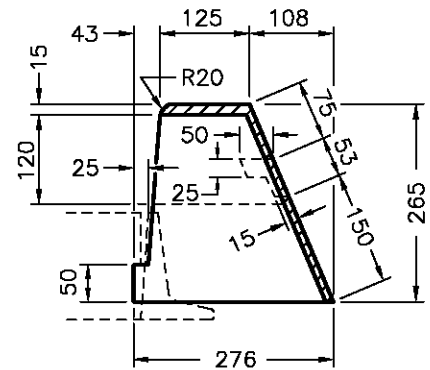
OPSD 400.082



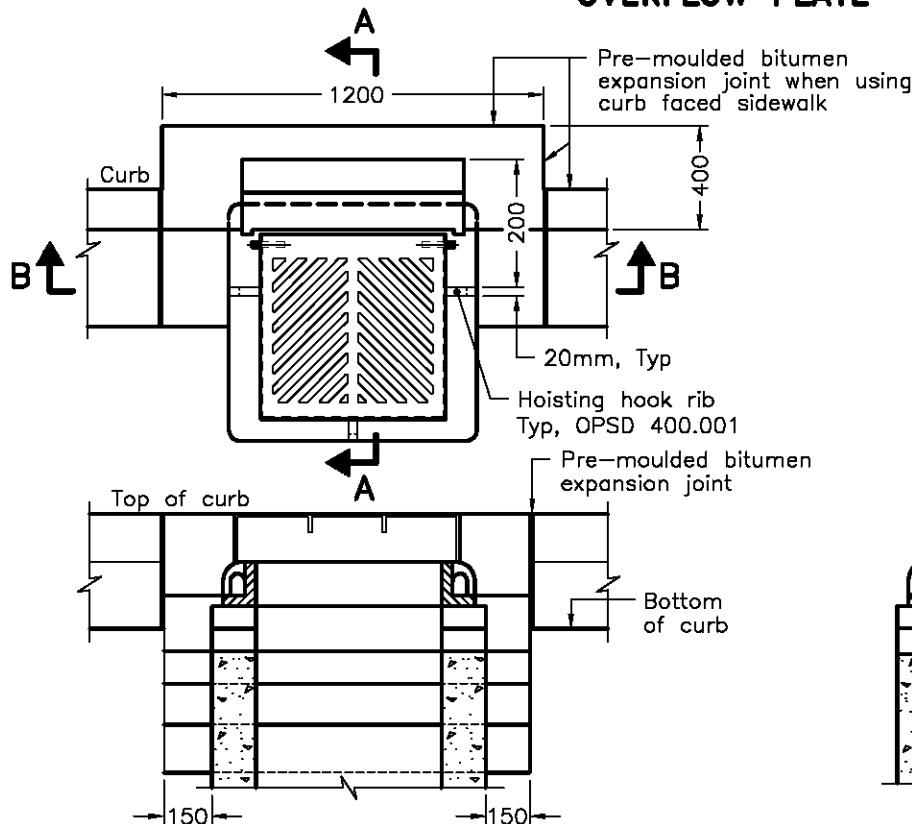
TOP VIEW

FRONT VIEW

OVERFLOW PLATE

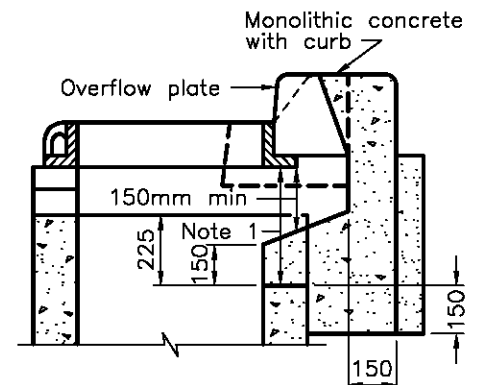


SECTION C-C



SECTION B-B

INSTALLATION DETAIL



SECTION A-A

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.

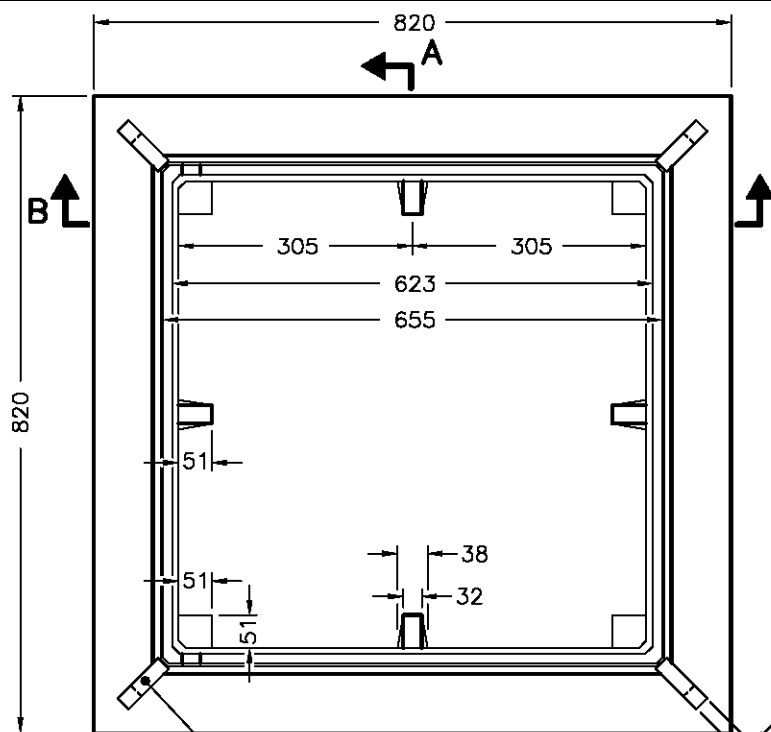
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 Rev 2

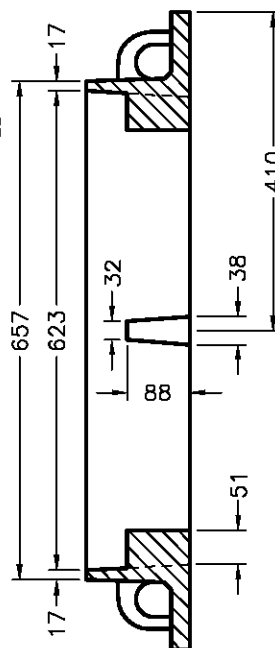
**CAST IRON
CURB INLET OVERFLOW
FOR CATCH BASINS**

OPSD 400.090

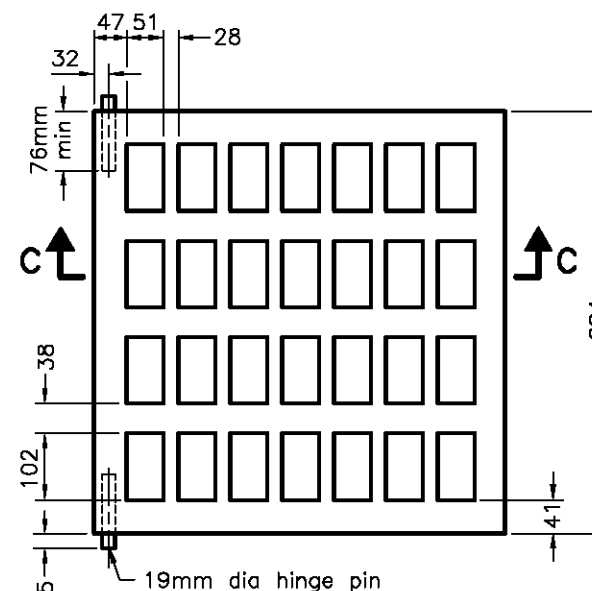




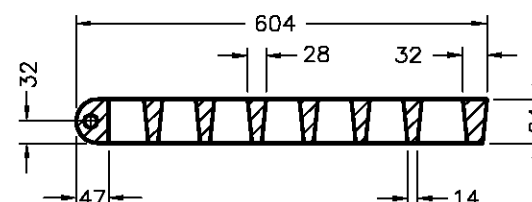
FRAME PLAN



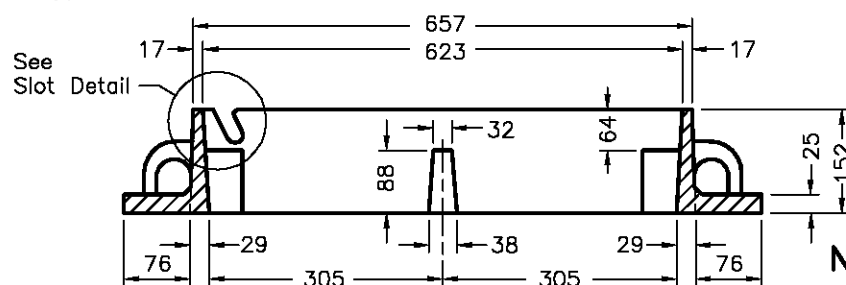
SECTION A-A



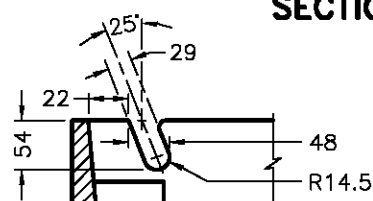
GRATE PLAN



SECTION C-C



SECTION B-B



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

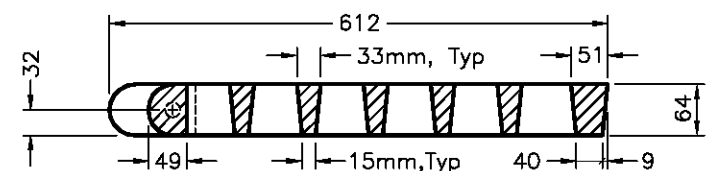
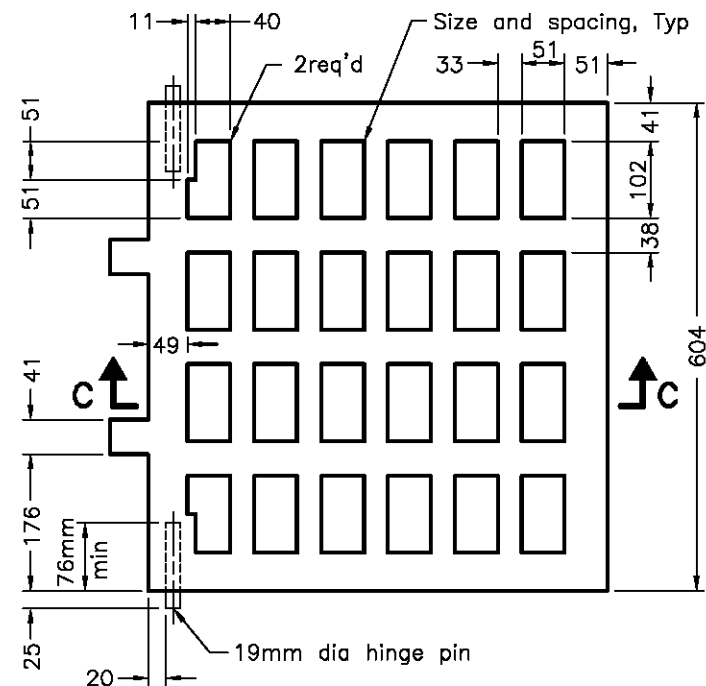
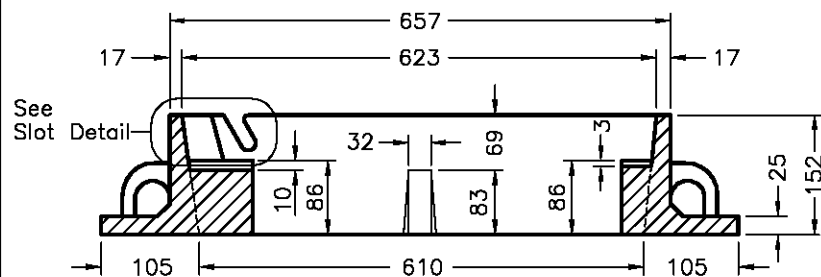
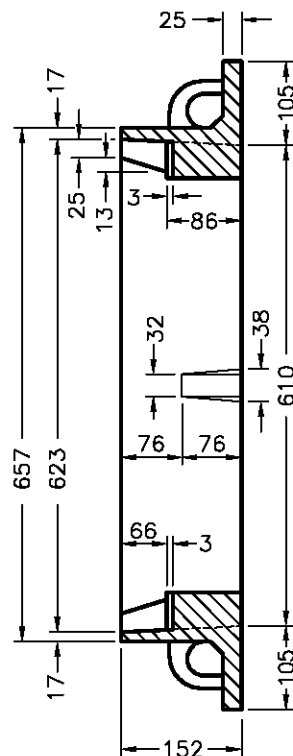
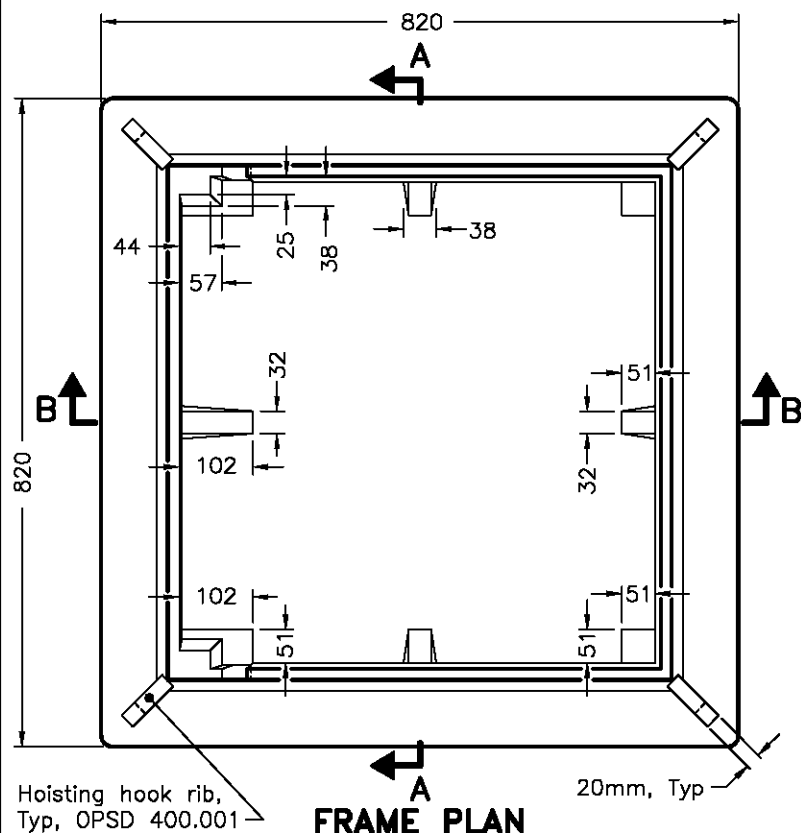
**CAST IRON, SQUARE FRAME
WITH SQUARE FLAT GRATE FOR
CATCH BASINS, PERFORATED OPENINGS**

Nov 2013

Rev 2

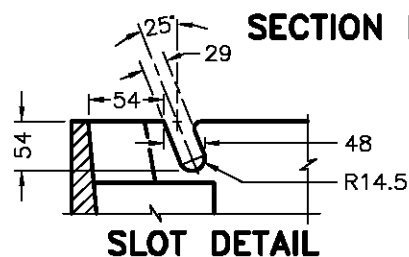


OPSD 400.100



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.



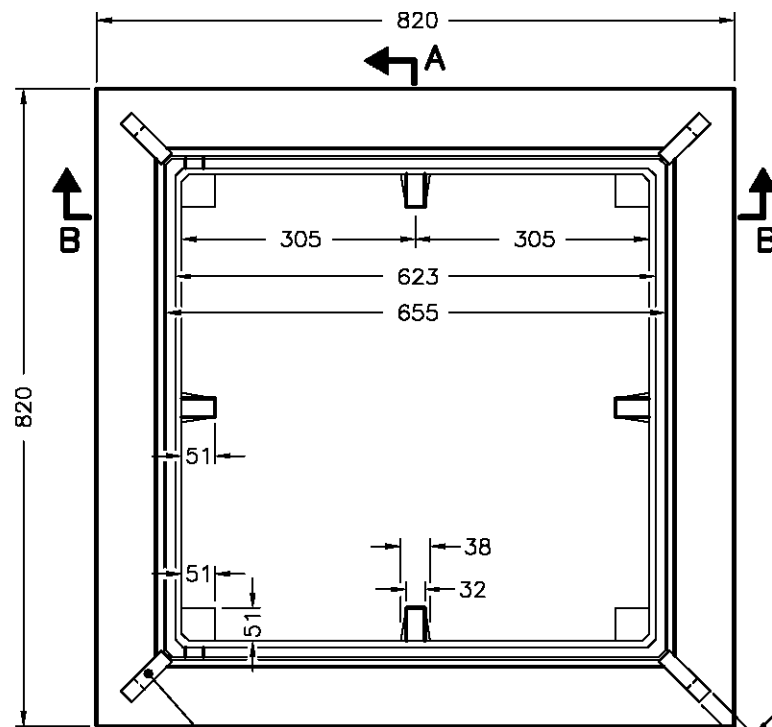
ONTARIO PROVINCIAL STANDARD DRAWING

**CAST IRON, SQUARE FRAME WITH
 SQUARE OVERFLOW TYPE FLAT GRATE FOR
 CATCH BASINS, PERFORATED OPENINGS**

Nov 2013 Rev 2

OPSD 400.110

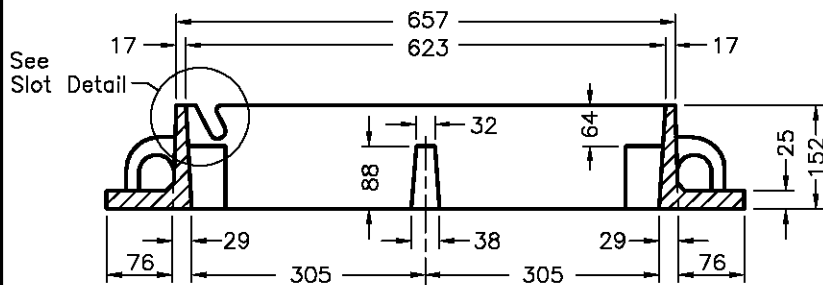




Hoisting hook rib,
Typ, OPSD 400.001

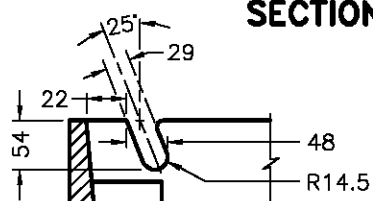
FRAME PLAN

20mm, Typ

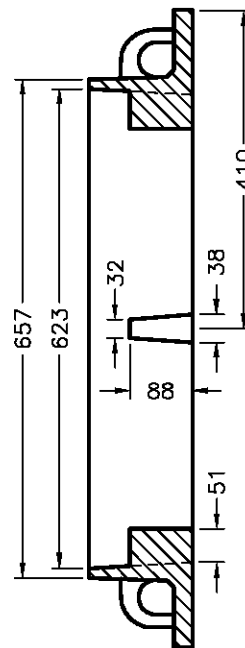


See
Slot Detail

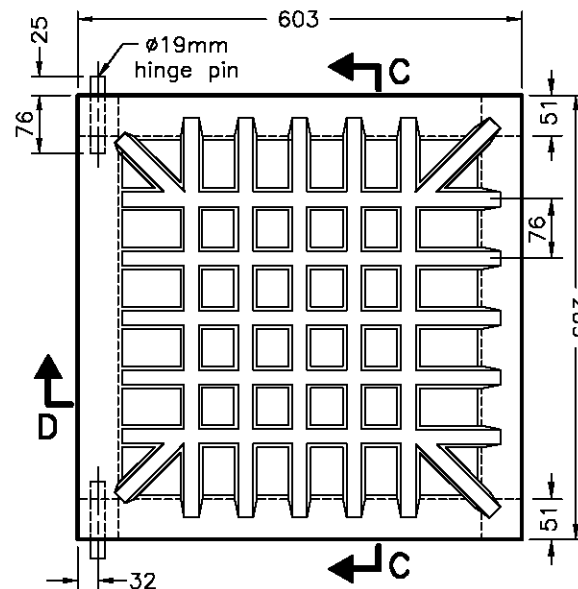
SECTION B-B



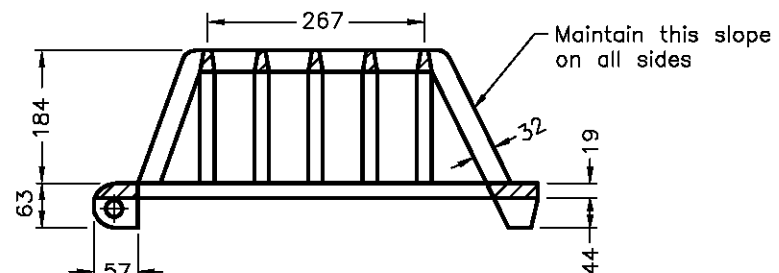
SLOT DETAIL



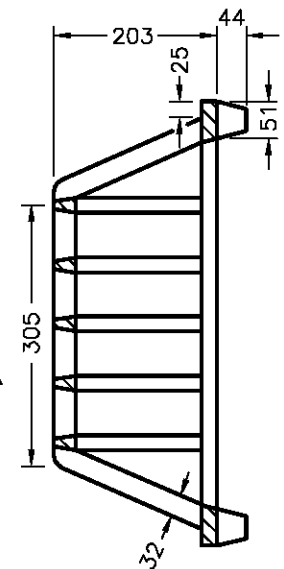
SECTION A-A



GRATE PLAN



SECTION D-D



SECTION C-C

NOTES:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

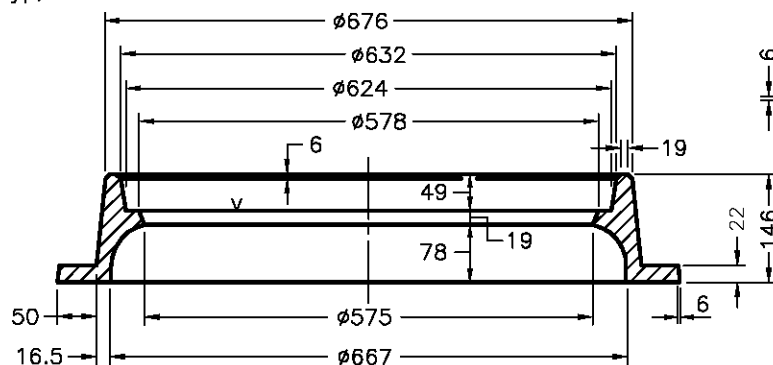
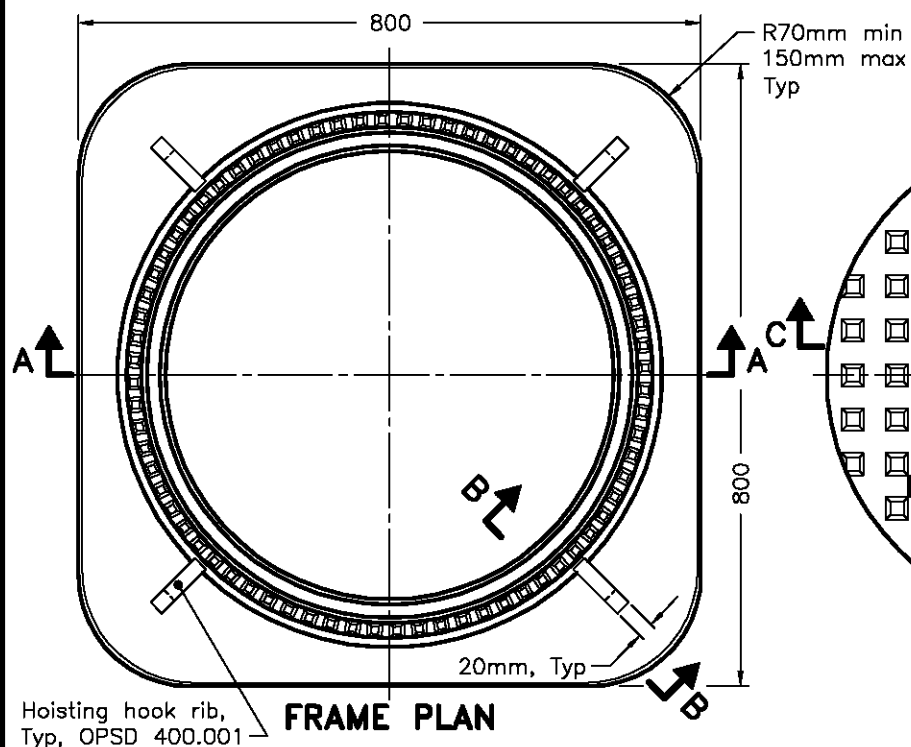
**CAST IRON, SQUARE FRAME
WITH BIRDCAGE GRATE
FOR CATCH BASINS**

Nov 2013

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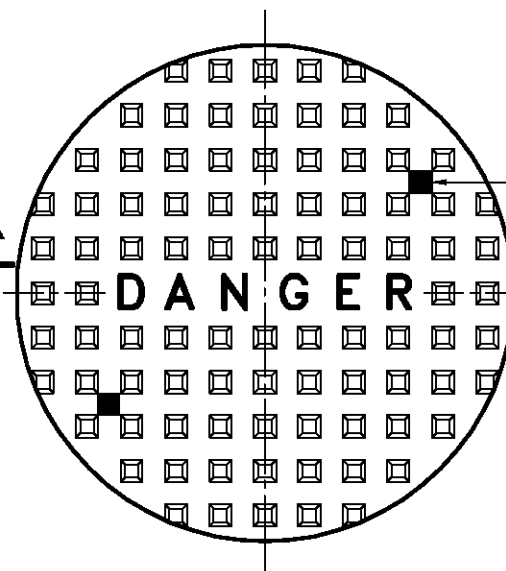
OPSD 400.120



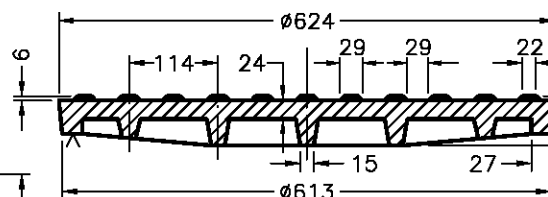
SECTION A-A



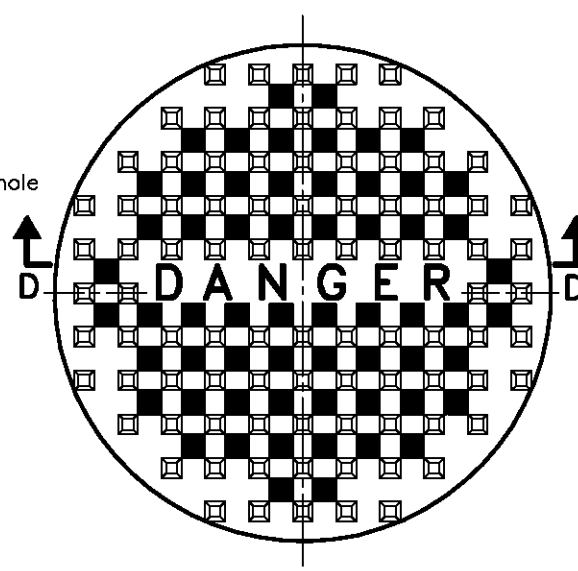
SECTION B-B



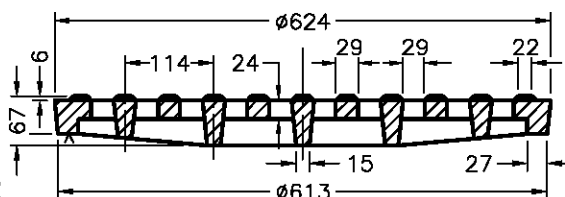
**TYPE A
CLOSED COVER**



SECTION C-C



**TYPE B
OPEN COVER**



SECTION D-D

NOTES:

- A Covers shall be Type A or Type B, as specified.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

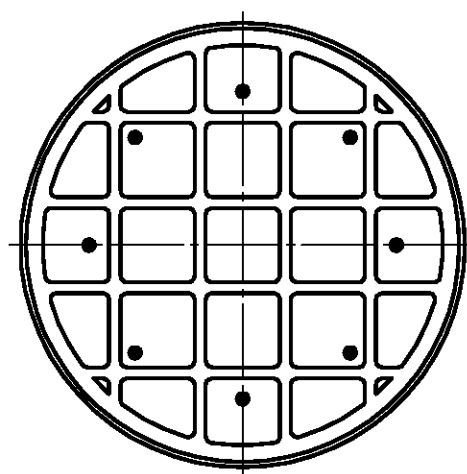
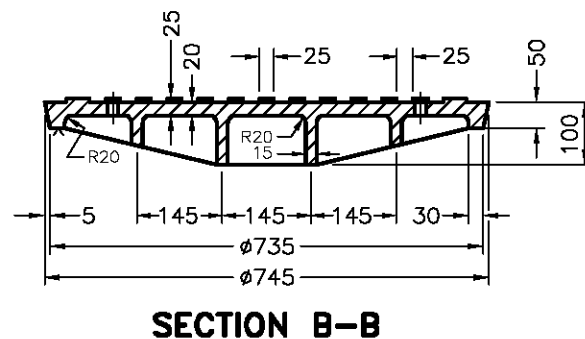
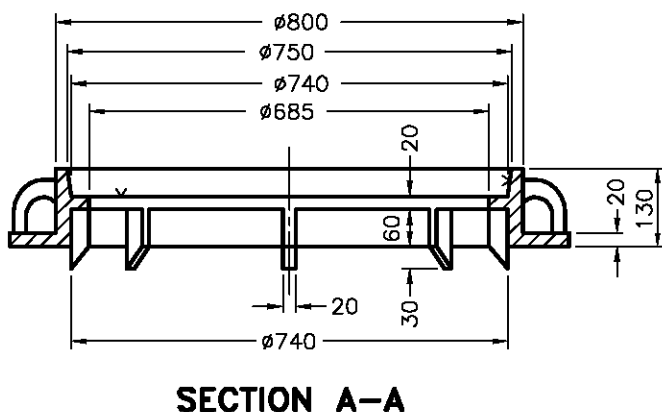
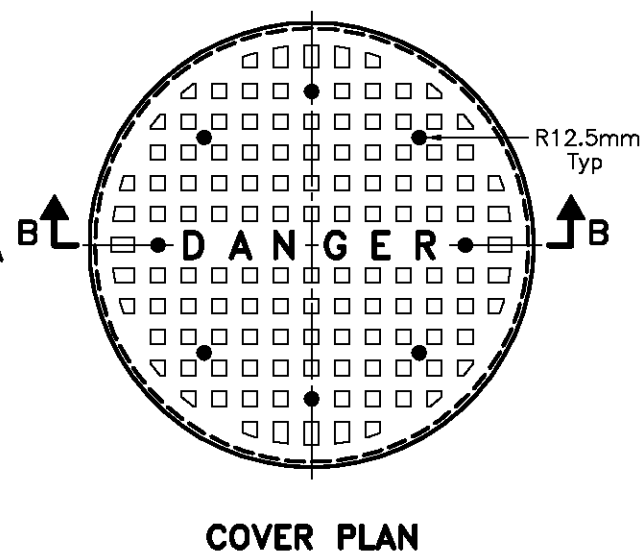
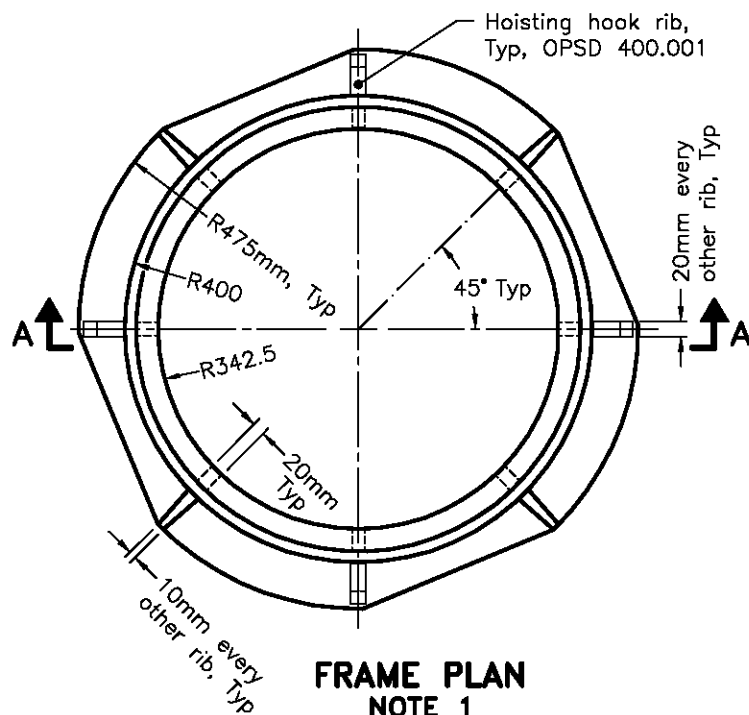
**CAST IRON, SQUARE FRAME WITH
CIRCULAR CLOSED OR OPEN COVER
FOR MAINTENANCE HOLES**

Nov 2013

Rev 3



OPSD 401.010



NOTE:

1 As an option, frame may be completely round.

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

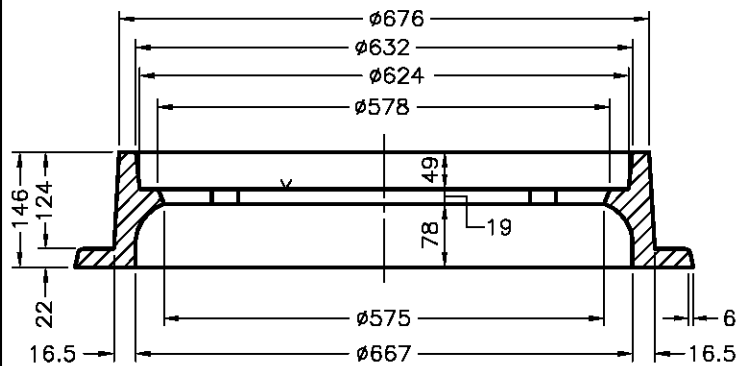
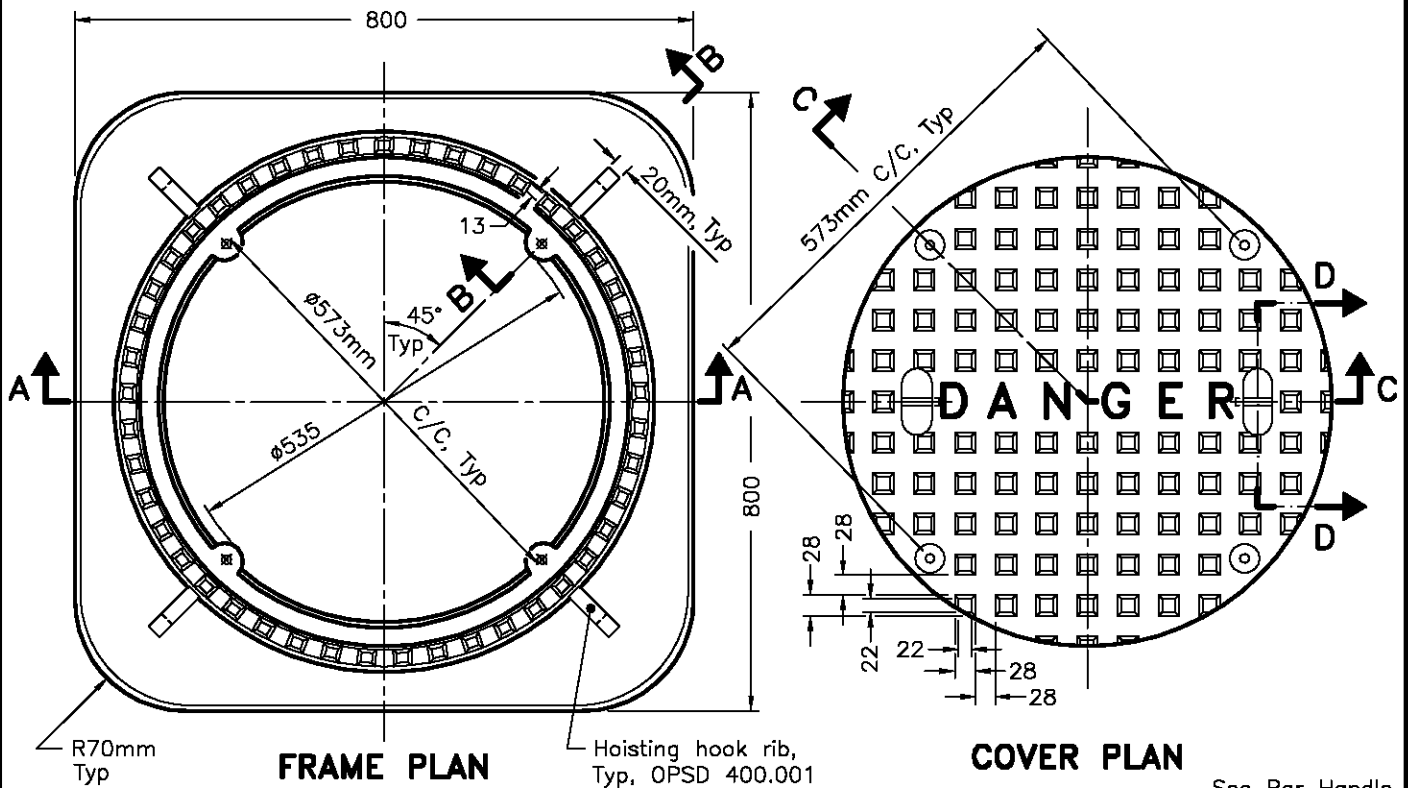
CAST IRON, CIRCULAR FRAME WITH
CIRCULAR 745mm COVER
FOR MAINTENANCE HOLES

Nov 2013

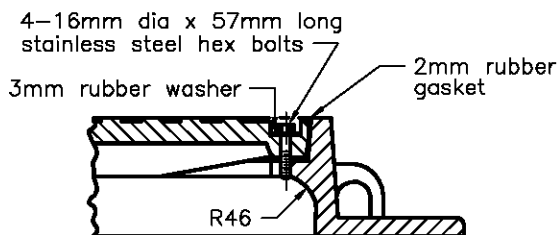
Rev 3



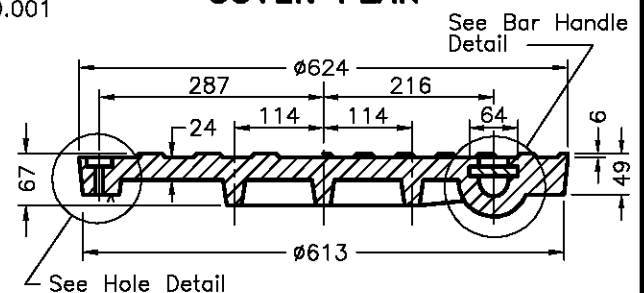
OPSD 401.020



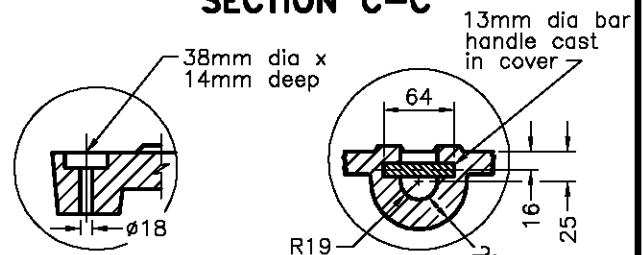
SECTION A-A



SECTION B-B

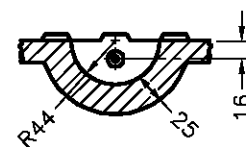


SECTION C-C



HOLE DETAIL

BAR HANDLE DETAIL



SECTION D-D

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

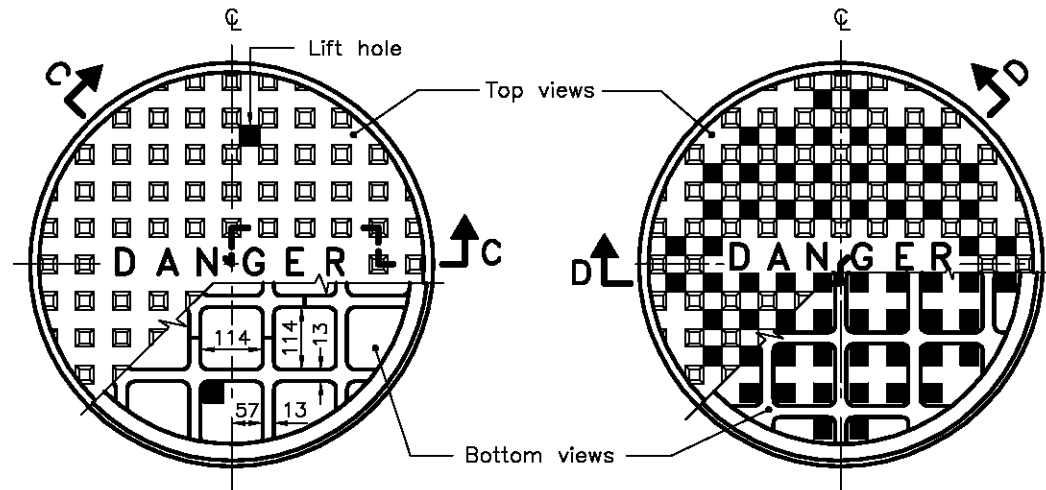
**CAST IRON, SQUARE FRAME WITH
CIRCULAR WATERTIGHT COVER
FOR MAINTENANCE HOLES**

Nov 2013

Rev 3

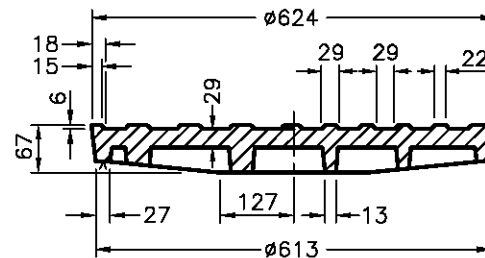


OPSD 401.030

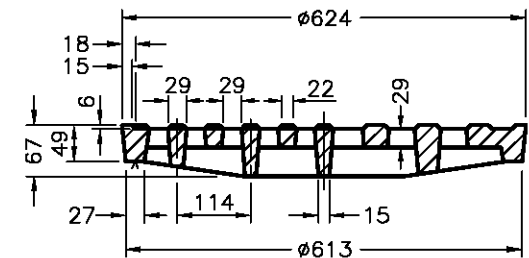


**TYPE A
CLOSED COVER**

**TYPE B
OPEN COVER**



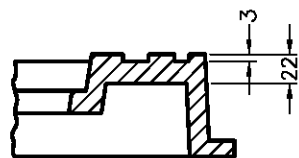
SECTION C-C



SECTION D-D

A Covers shall be Type A or Type B, as specified.
B All dimensions are in millimetres unless otherwise shown.

SECTION A-A



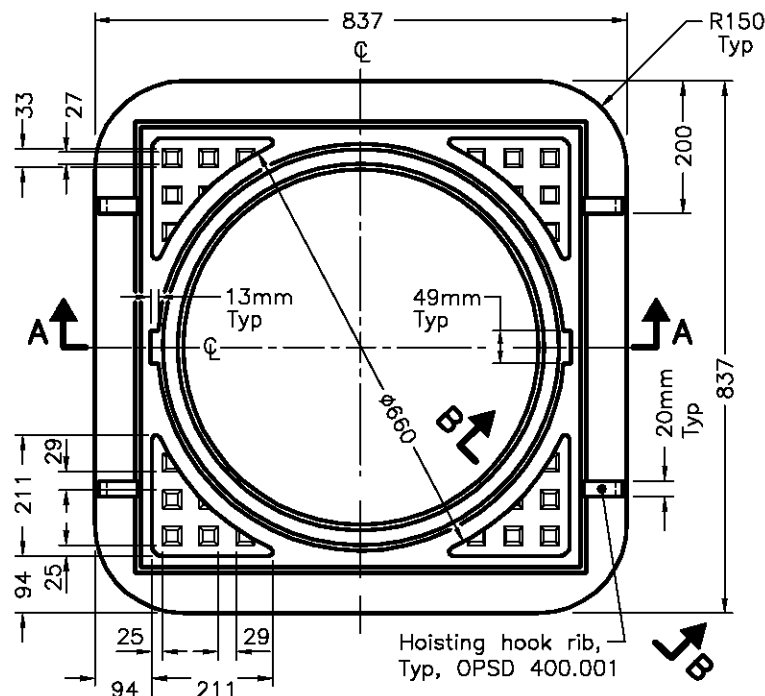
SECTION B-B

Apr 2015	Rev	4

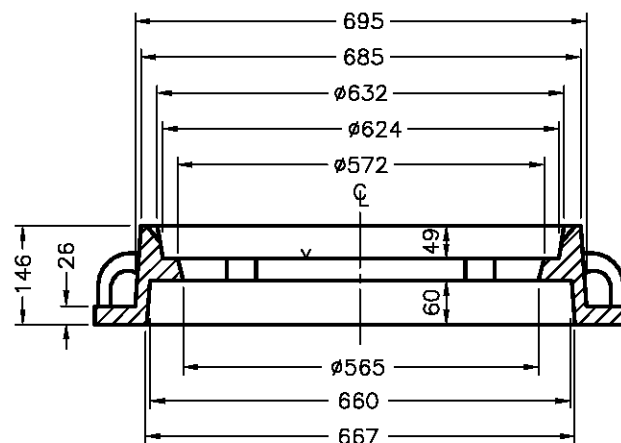
**CAST IRON, RAISED SQUARE FRAME WITH
CIRCULAR CLOSED OR OPEN COVER
FOR MAINTENANCE HOLES**



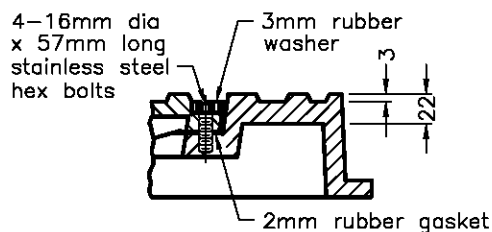
OPSD 401.040



FRAME PLAN

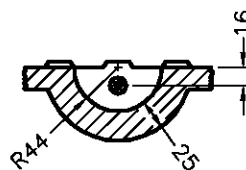


SECTION A-A

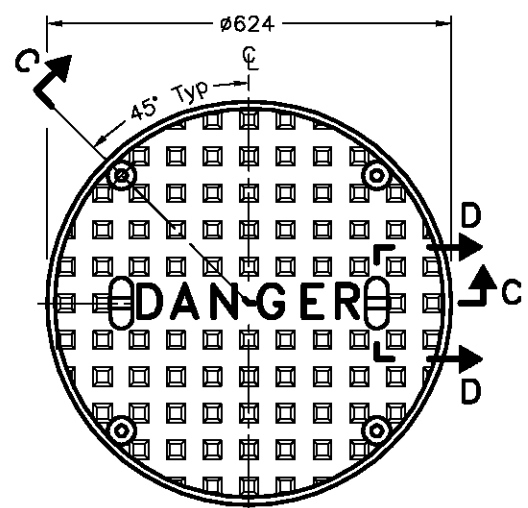


SECTION B-B

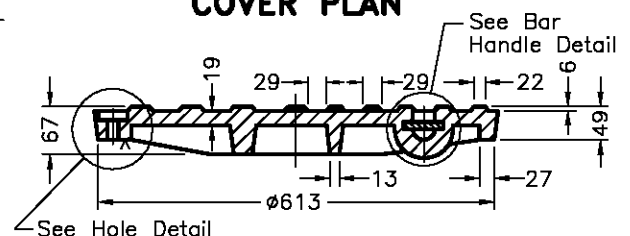
SHOWN WITH COVER IN PLACE



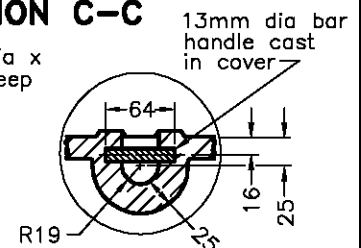
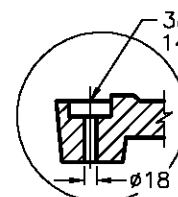
SECTION D-D



COVER PLAN

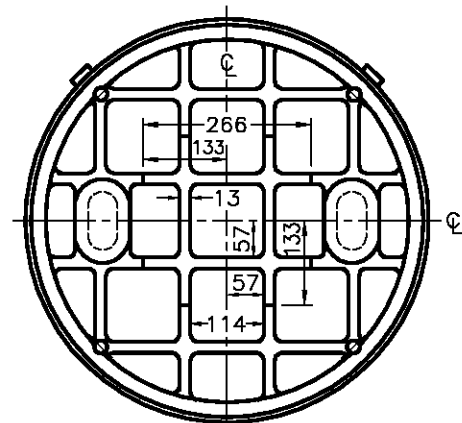


SECTION C-C



HOLE DETAIL

BAR HANDLE DETAIL



BOTTOM VIEW

NOTES:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

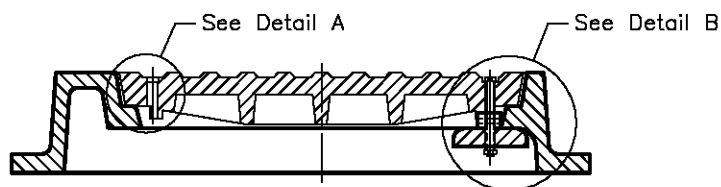
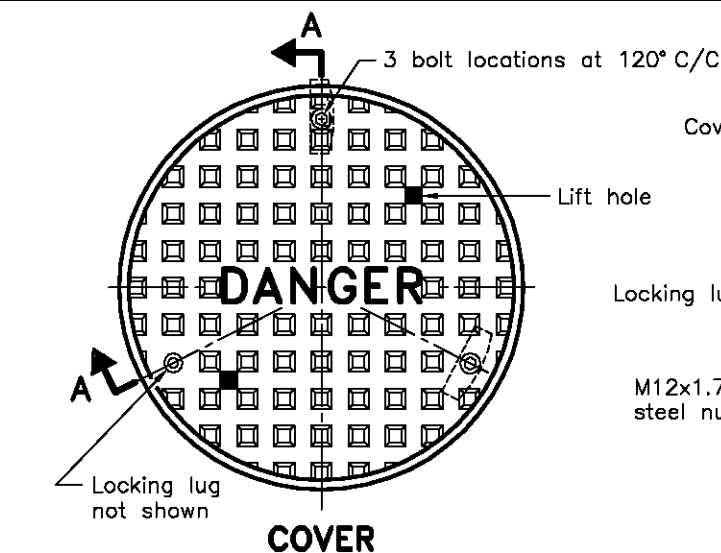
Apr 2015

Rev 4

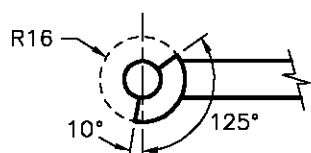
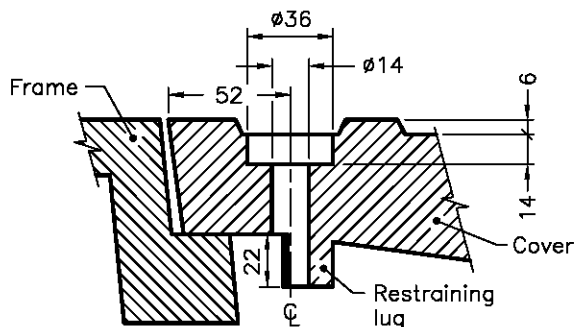
CAST IRON, RAISED SQUARE FRAME WITH
CIRCULAR WATERTIGHT COVER
FOR MAINTENANCE HOLES



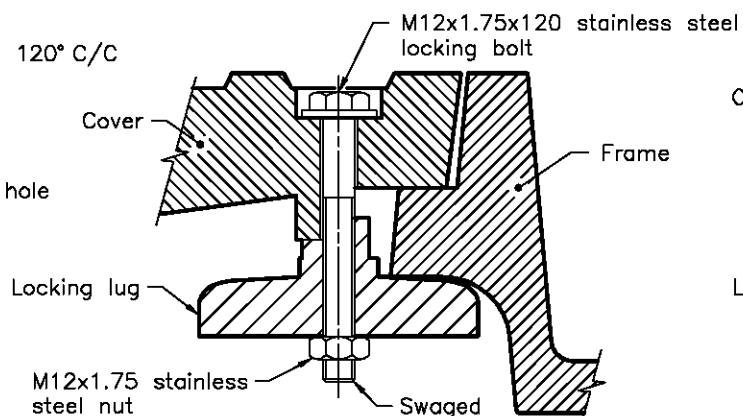
OPSD 401.050



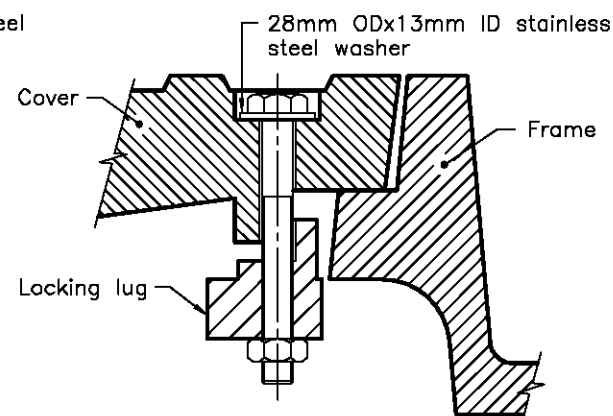
**SECTION A-A
FRAME WITH COVER SHOWN**



DETAIL A

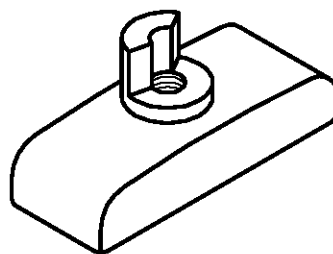


LOCKED POSITION

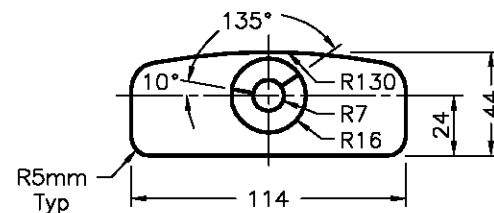


OPEN POSITION

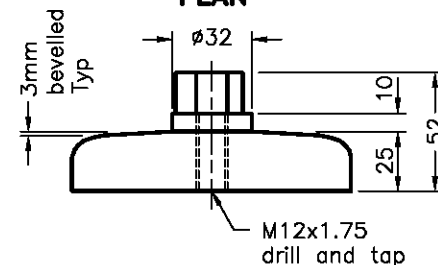
DETAIL B



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

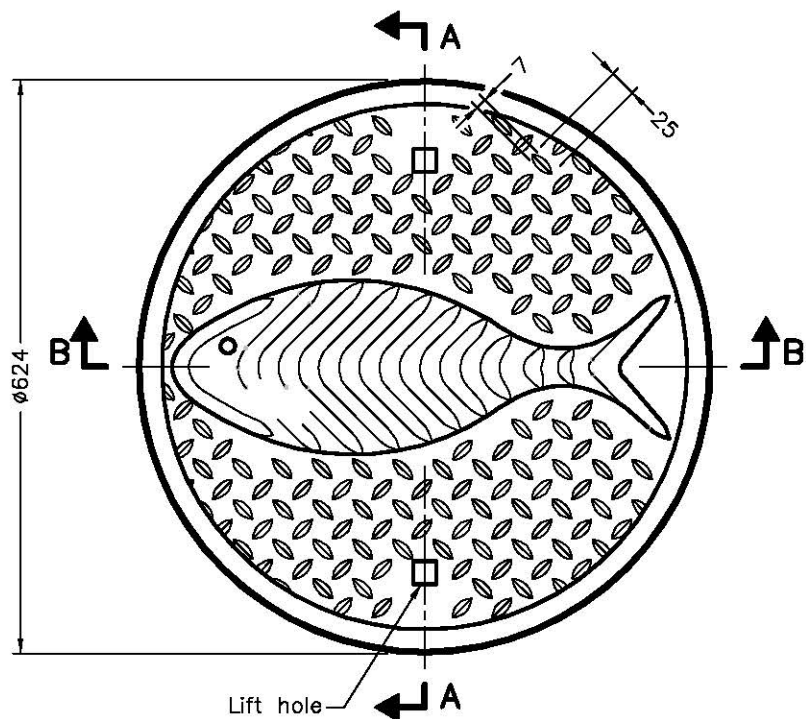
Nov 2013

Rev 3

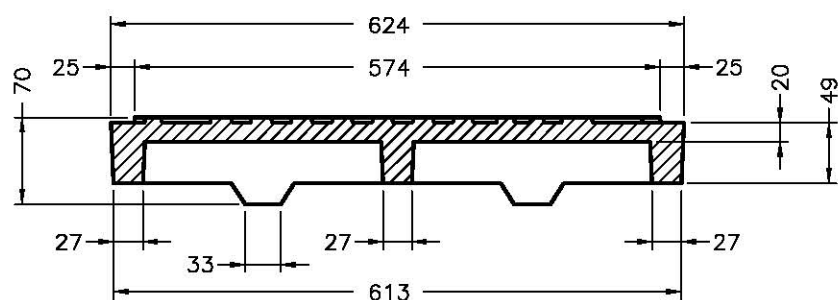
**CAST IRON
CIRCULAR LOCKING COVER
FOR MAINTENANCE HOLES**

OPSD 401.060

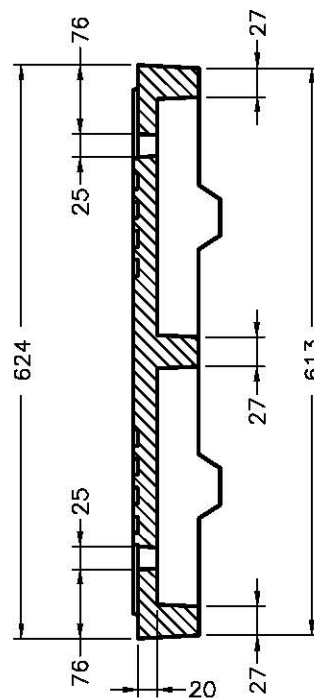




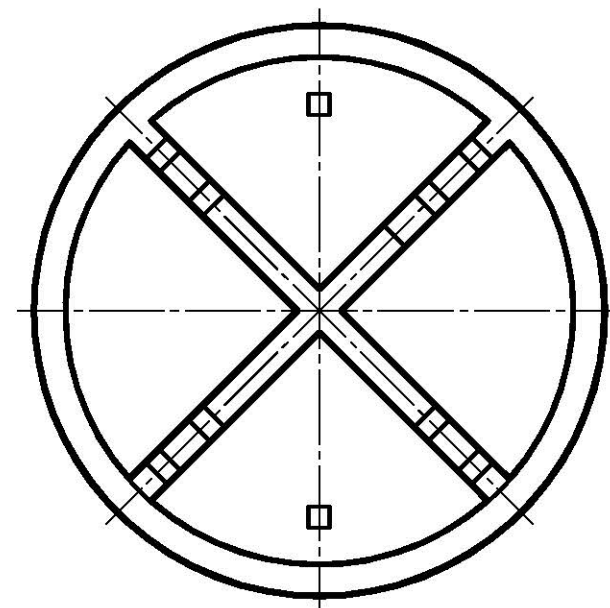
PLAN



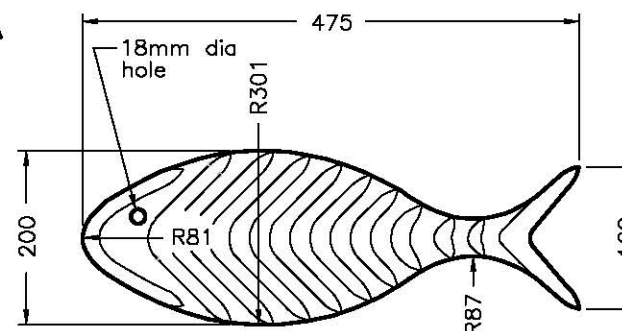
SECTION B-B



SECTION A-A



BOTTOM VIEW



FISH DETAIL

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

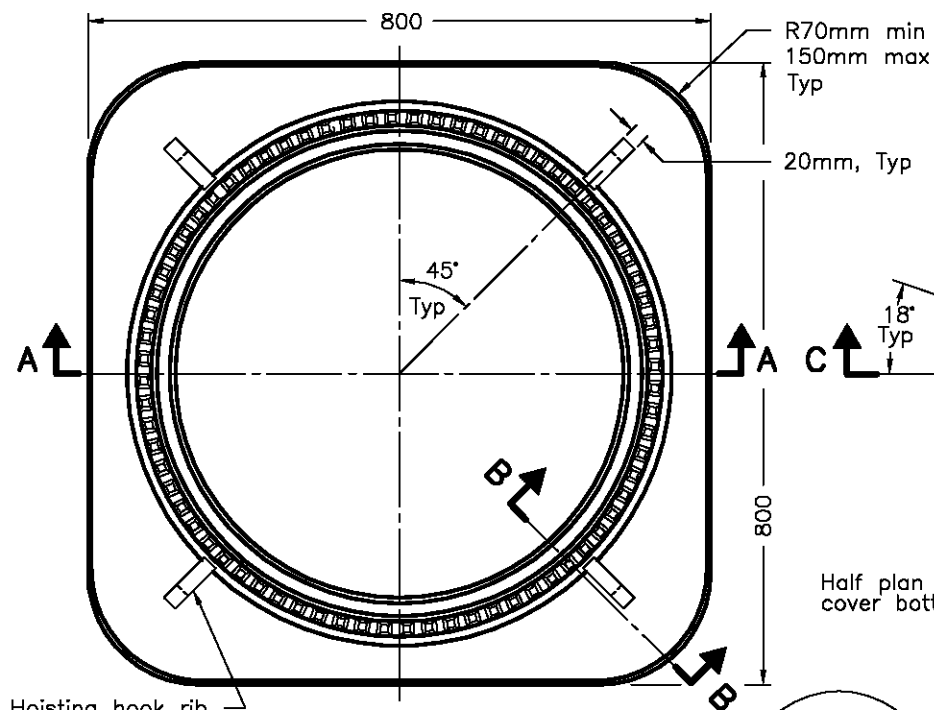
**CAST IRON, CURB INLET
FISH TYPE COVER FOR CATCH BASINS
OUT OF ROADWAY**

Nov 2014

Rev 0

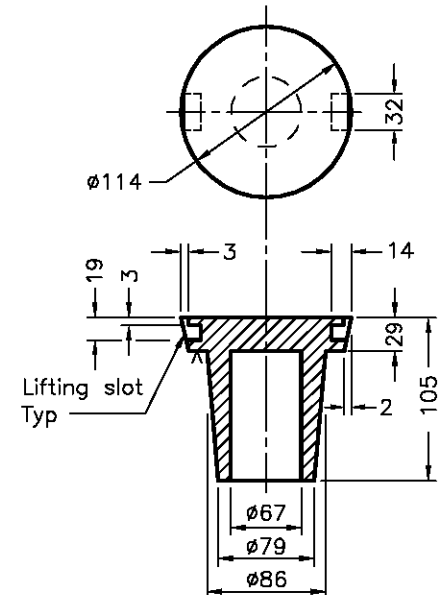
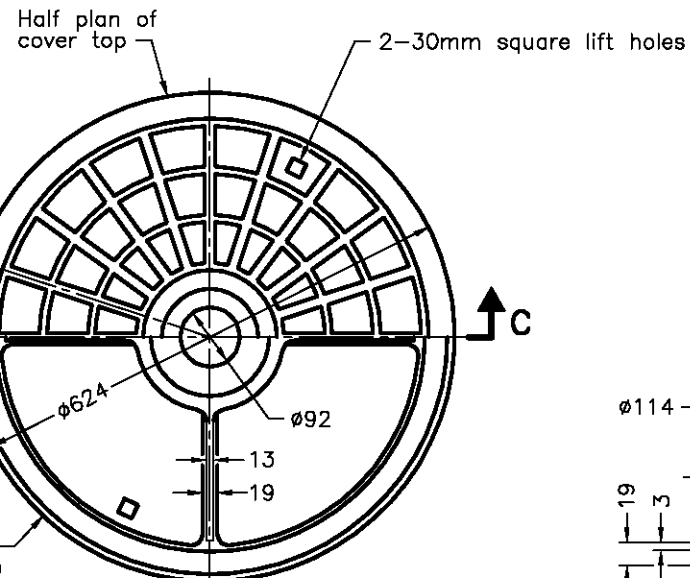


OPSD 401.080

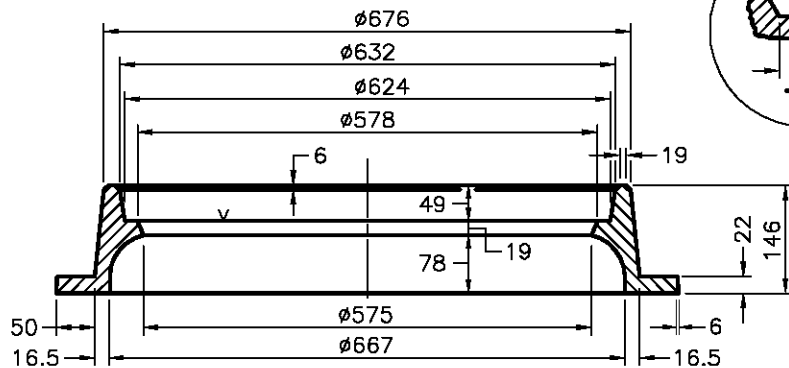


Hoisting hook rib
Typ, OPD 400.001

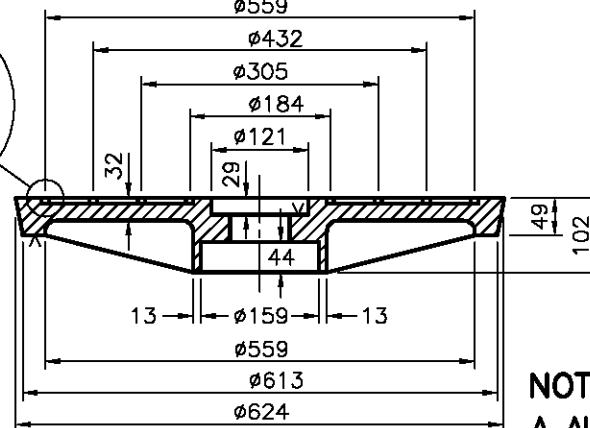
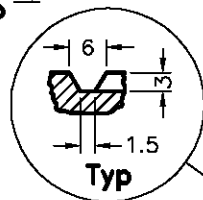
FRAME PLAN



PLUG DETAIL



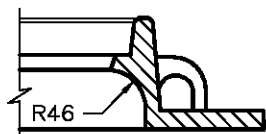
SECTION A-A



SECTION C-C

NOTES:

A All dimensions are in millimetres
unless otherwise shown.



SECTION B-B

ONTARIO PROVINCIAL STANDARD DRAWING

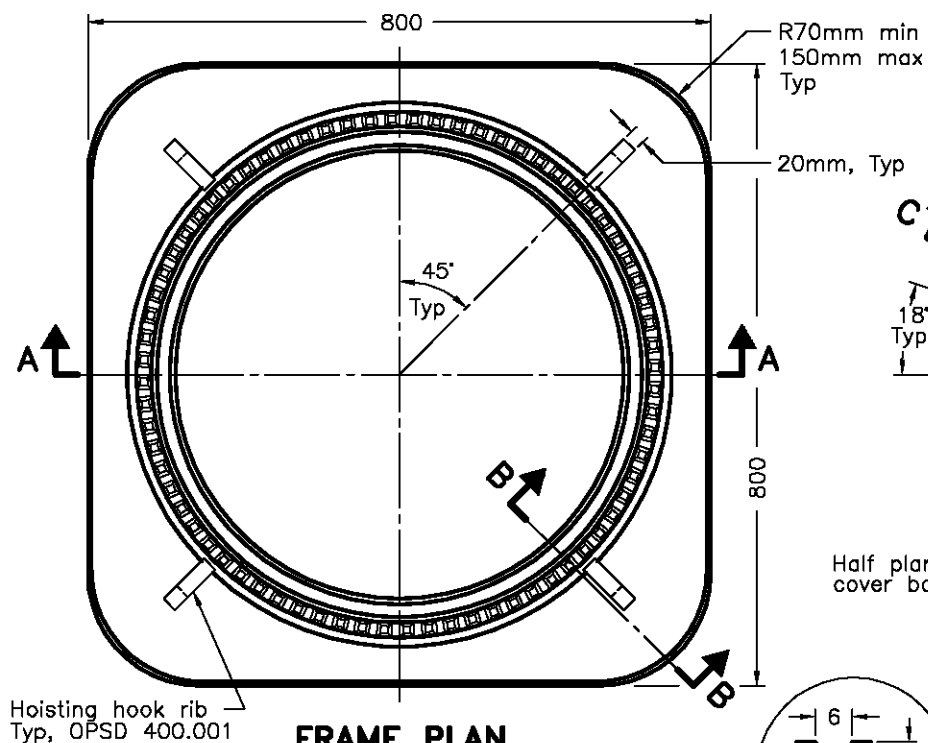
CAST IRON, SQUARE FRAME WITH
CIRCULAR COVER AND PLUG
FOR VALVE CHAMBERS

Nov 2014

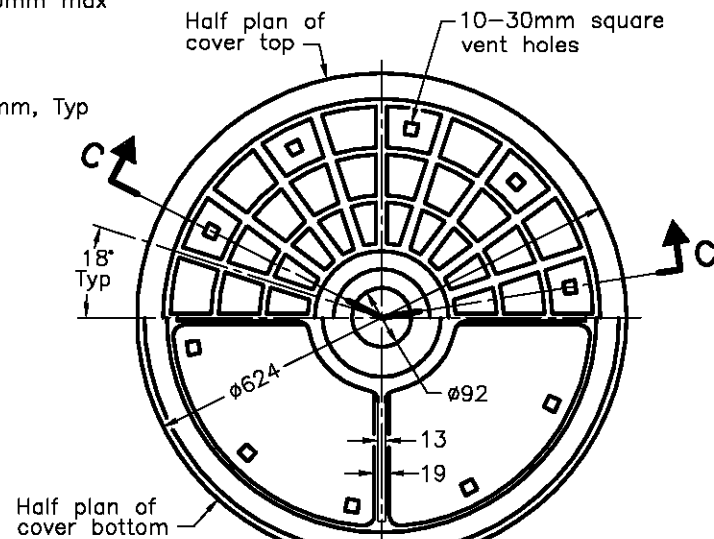
Rev 3



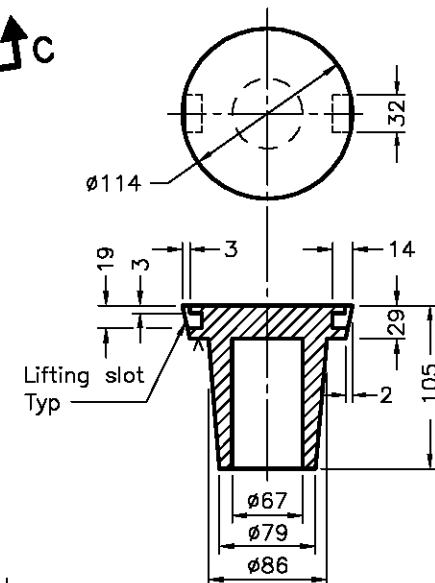
OPSD 402.010



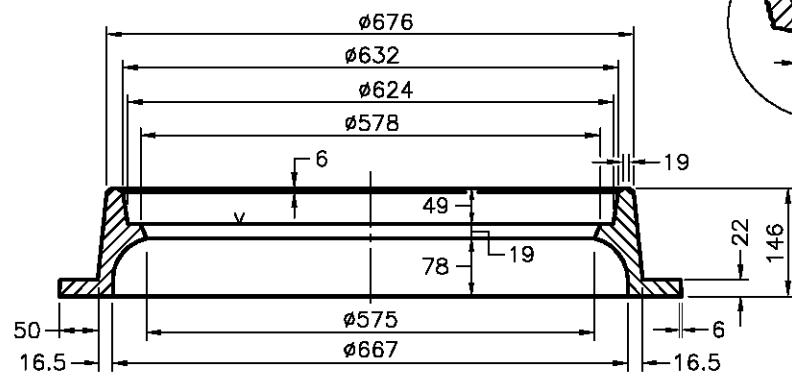
FRAME PLAN



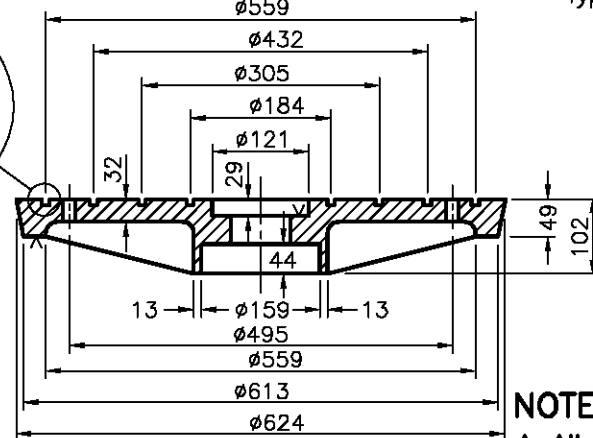
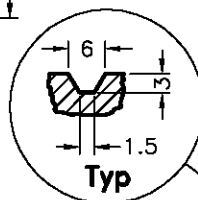
PLAN



PLUG DETAIL



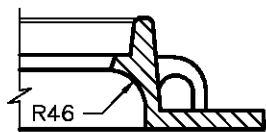
SECTION A-A



SECTION C-C

NOTES:

A All dimensions are in millimetres
unless otherwise shown.



SECTION B-B

ONTARIO PROVINCIAL STANDARD DRAWING

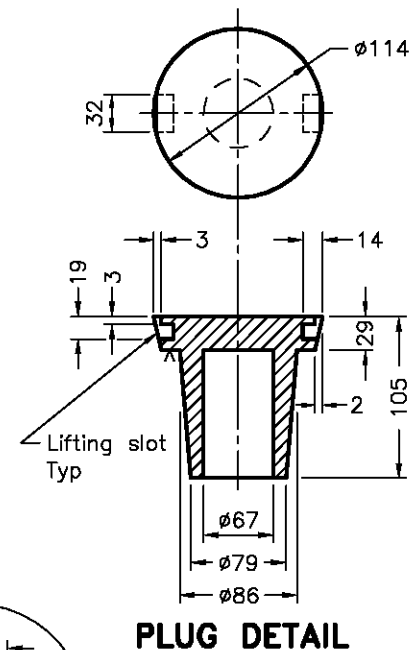
**CAST IRON, SQUARE FRAME WITH
VENTED CIRCULAR COVER AND PLUG
FOR VALVE CHAMBERS**

Nov 2014

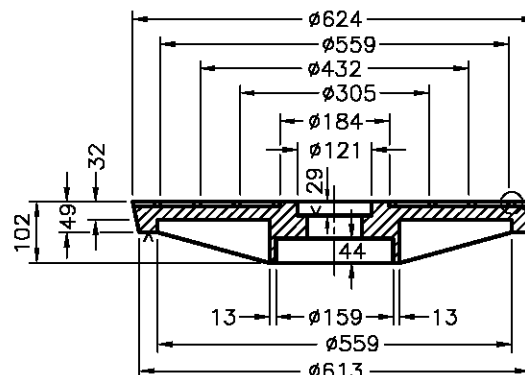
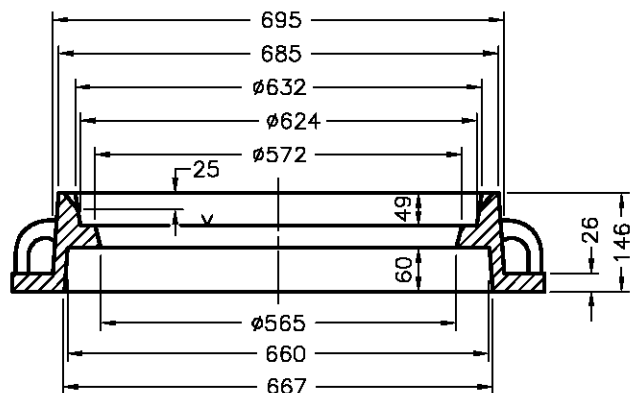
Rev 3



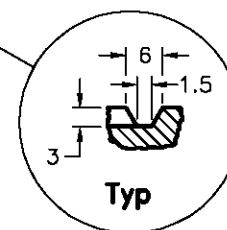
OPSD 402.011



PLUG DETAIL

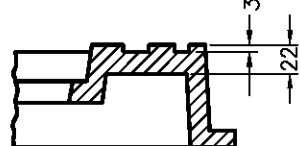


SECTION C-C



NOTES:

A All dimensions are in millimetres unless otherwise shown.



SECTION B-B

ONTARIO PROVINCIAL STANDARD DRAWING

Apr 2015

Rev	4

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



OPSD 402.020

FRAME PLAN

SECTION A-A

SECTION B-B

PLAN

SECTION C-C

NOTES:

A All dimensions are in millimetres unless otherwise shown.

PLUG DETAIL

Typ

ONTARIO PROVINCIAL STANDARD DRAWING

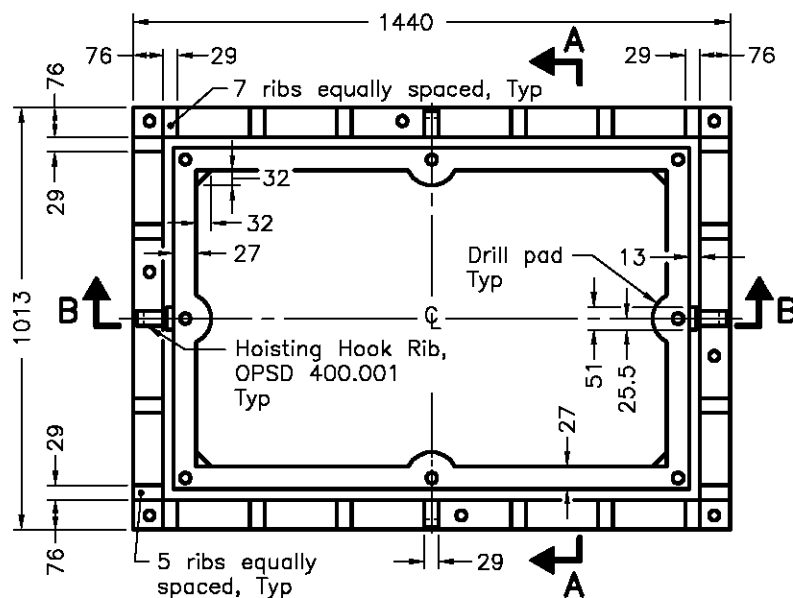
**CAST IRON, RAISED SQUARE FRAME WITH
VENTED CIRCULAR COVER AND PLUG
FOR VALVE CHAMBERS**

Apr 2015

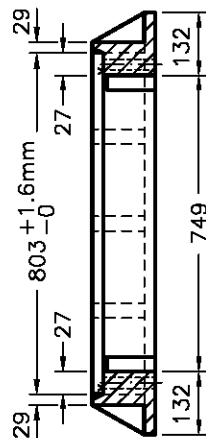
Rev	3



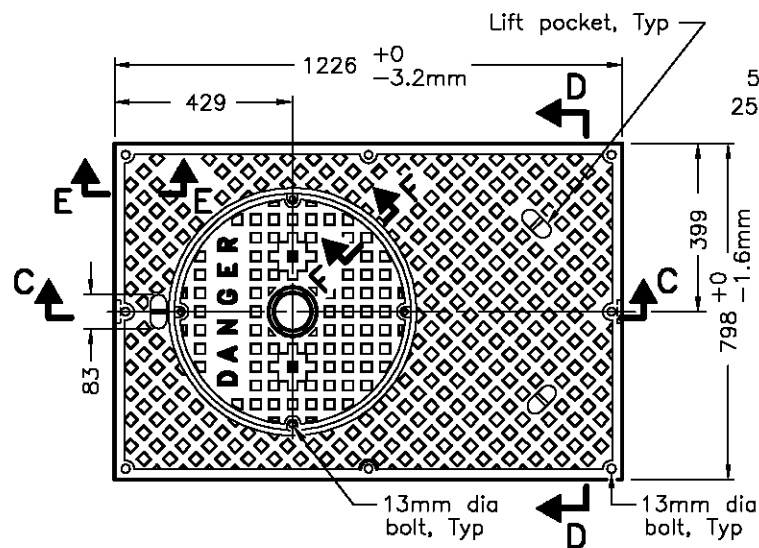
OPSD 402.021



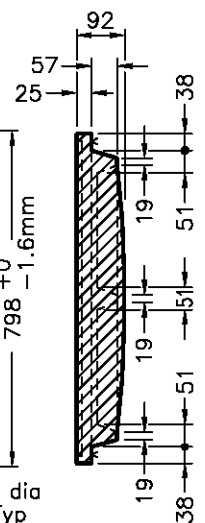
FRAME PLAN



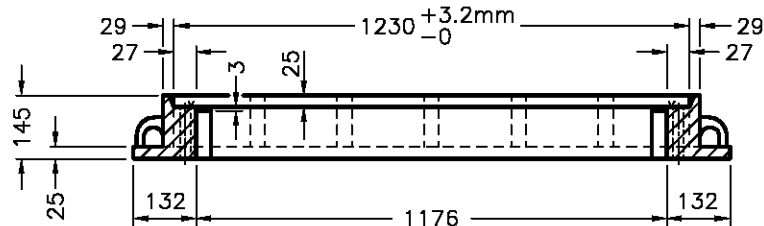
SECTION A-A



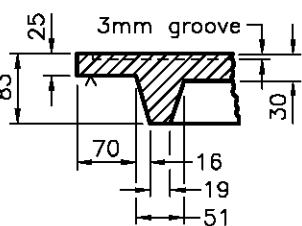
LARGE COVER PLAN



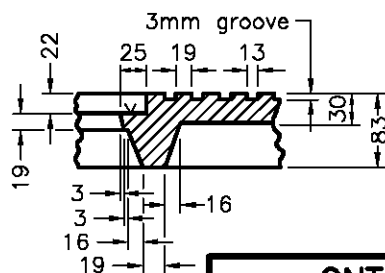
SECTION D-D



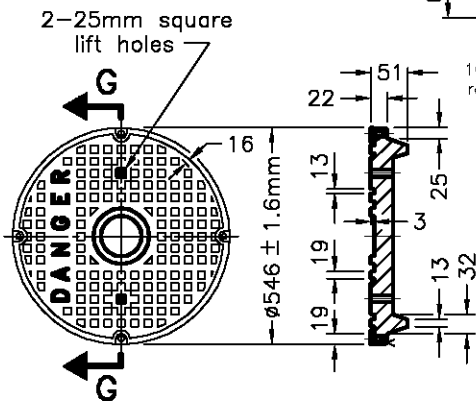
SECTION B-B



SECTION E-E

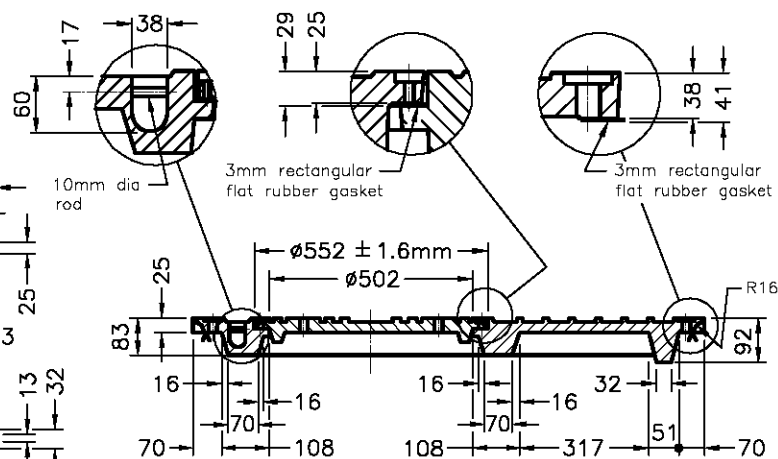


SECTION F-F



CIRCULAR COVER

SECTION G-G



SECTION C-C

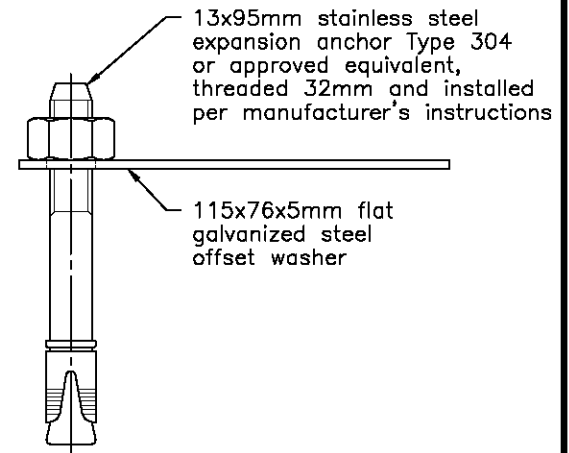
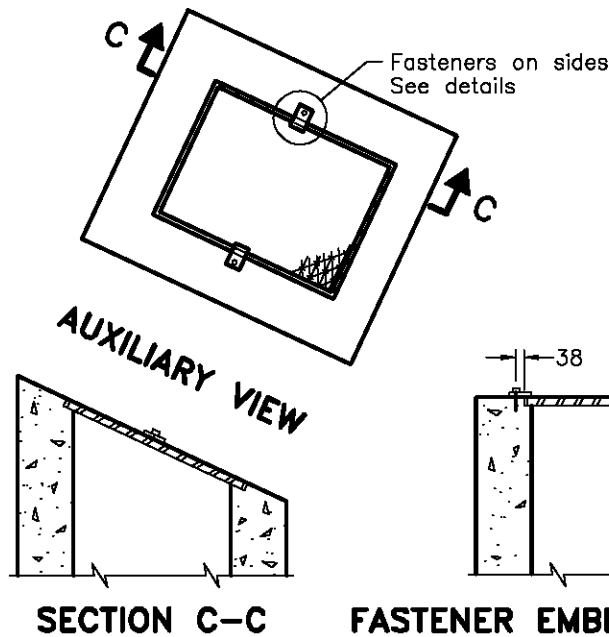
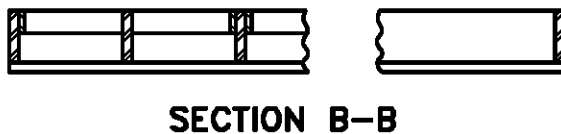
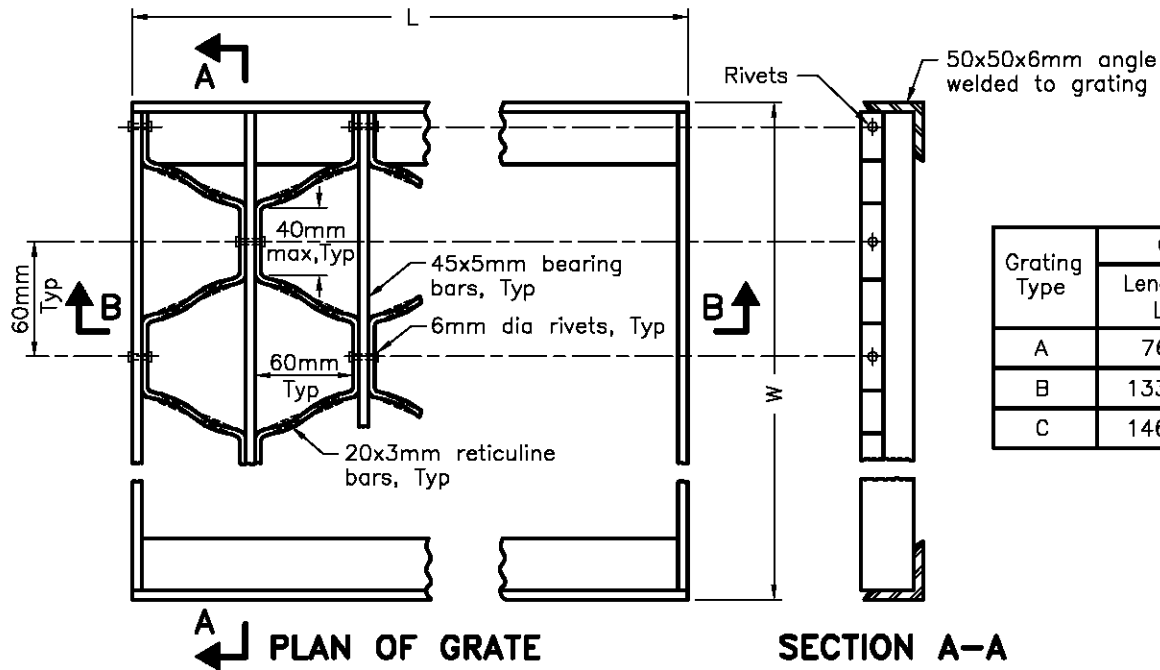
NOTE:
All dimensions are in millimetres
unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING
**CAST IRON, RECTANGULAR FRAME
WITH TWO PIECE COVER**
FOR METER AND VALVE CHAMBERS

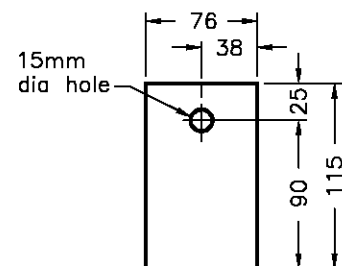
Nov 2014 Rev 4



OPSD 402.030



FASTENER 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

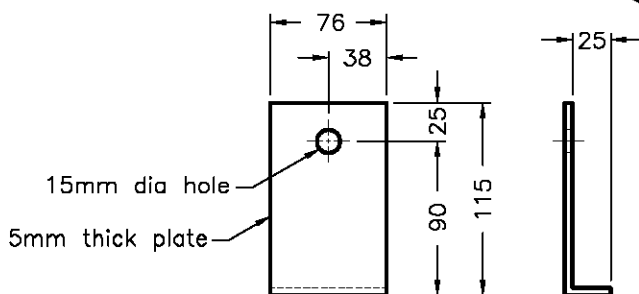
Nov 2013 Rev 2

**GALVANIZED STEEL
HONEYCOMB GRATING
FOR DITCH INLETS**

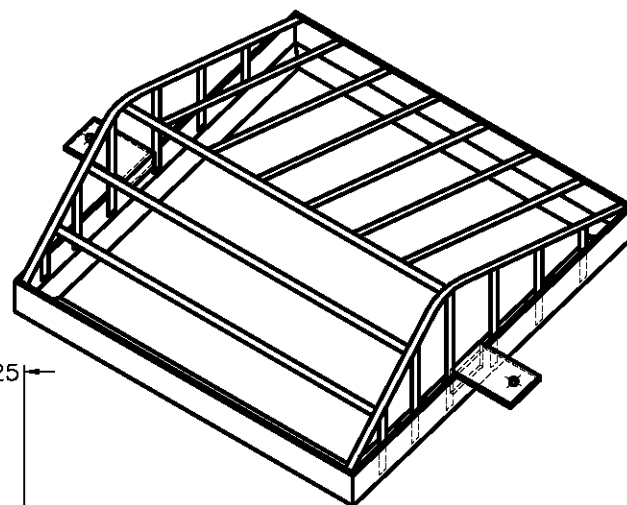


OPSD 403.010

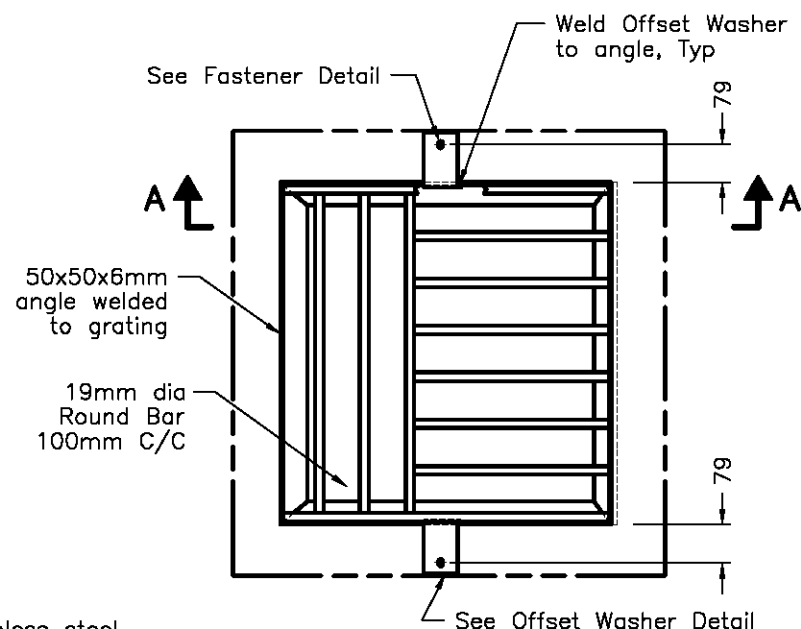
Slope of Grating	Dimension a
2H:1V	343
3H:1V	243
4H:1V	186



OFFSET WASHER DETAIL



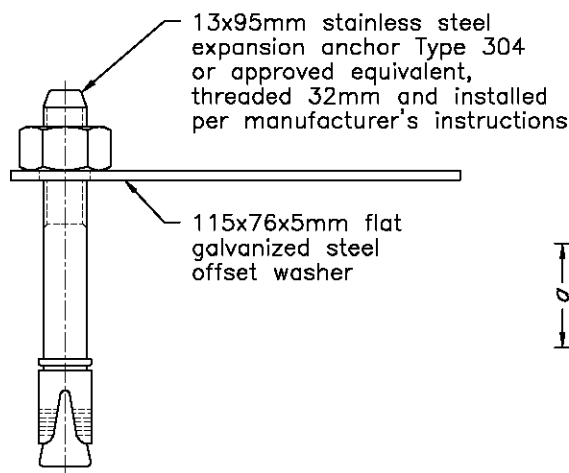
GRATE ISOMETRIC VIEW



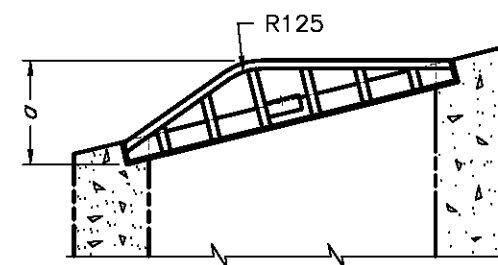
PLAN OF GRATE

NOTES:

- A Grate dimensions shall be according to OPSD 705.030.
- B Bearing bars shall be welding quality steel having the minimum tensile strength of SAE 1015.
- C When specified, all surfaces shall be painted in the shop with one coat of asphalt or tar base black paint having a minimum softening point of 71° C.
All joints and crevices shall be thoroughly coated.
- D Bearing bars shall be welded to angle bar along both legs with a 5mm fillet weld.
- E All dimensions are in millimetres unless otherwise shown.



FASTENER DETAIL



SECTION A-A

ONTARIO PROVINCIAL STANDARD DRAWING

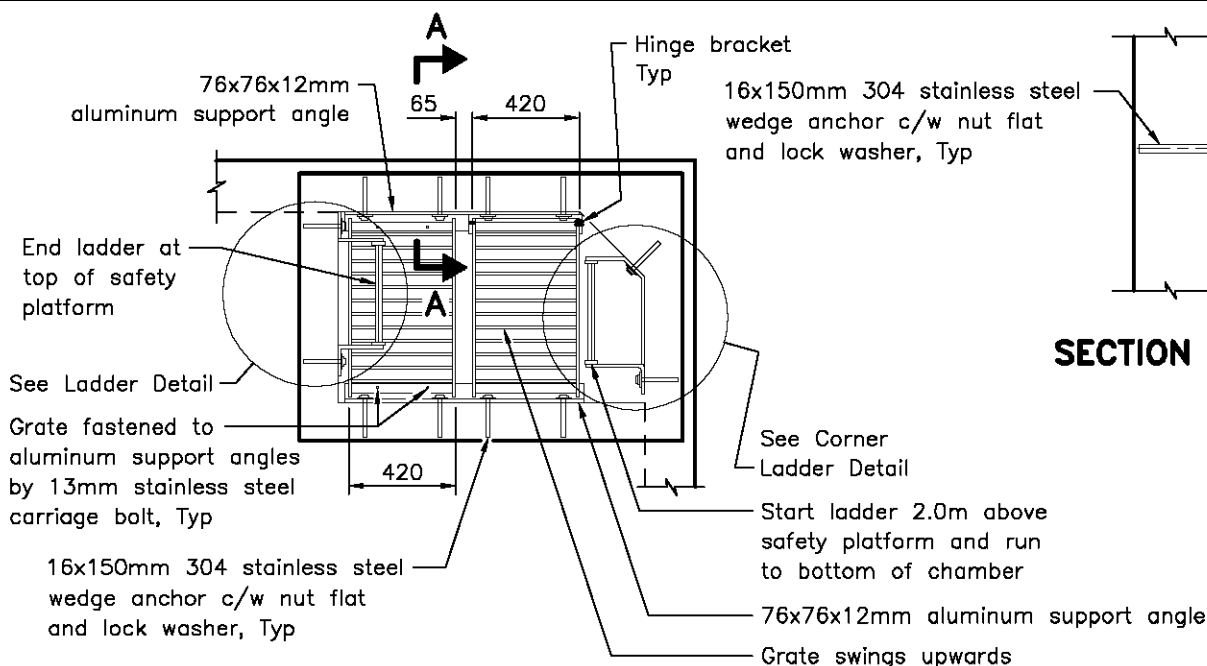
**RAISED BAR GRATE
FOR DITCH INLET
600 x 600mm**

Nov 2012

Rev 0



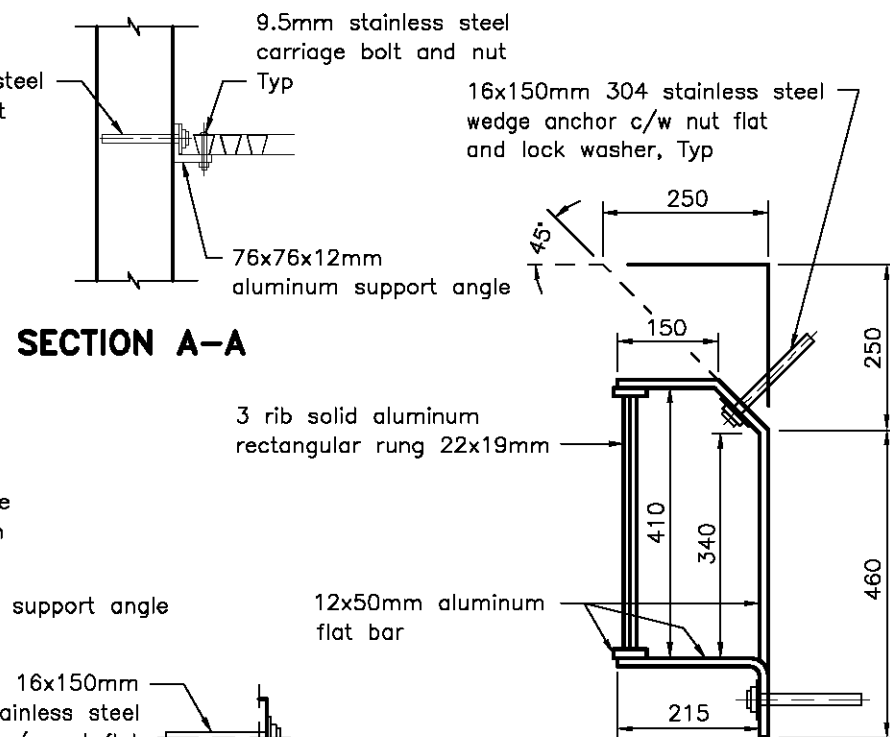
OPSD 403.011



SAFETY PLATFORM IN CHIMNEY

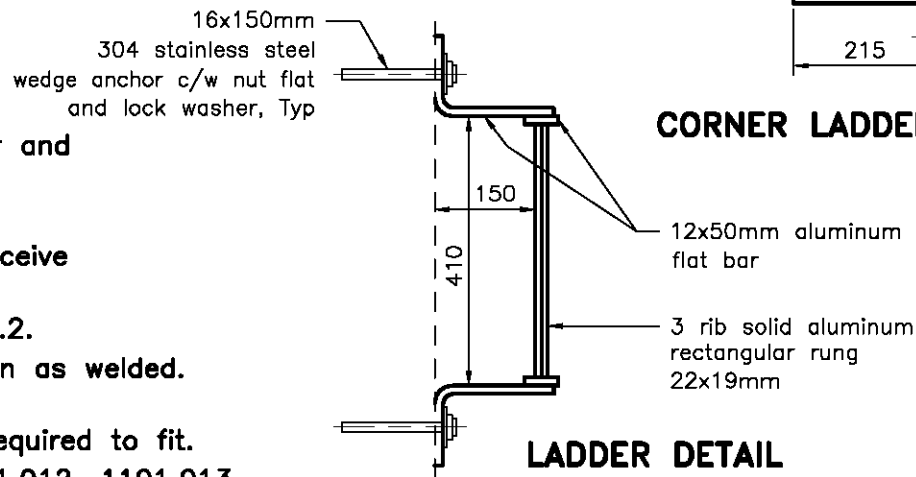
NOTES:

- 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.



SECTION A-A

CORNER LADDER DETAIL



LADDER DETAIL

ONTARIO PROVINCIAL STANDARD DRAWING

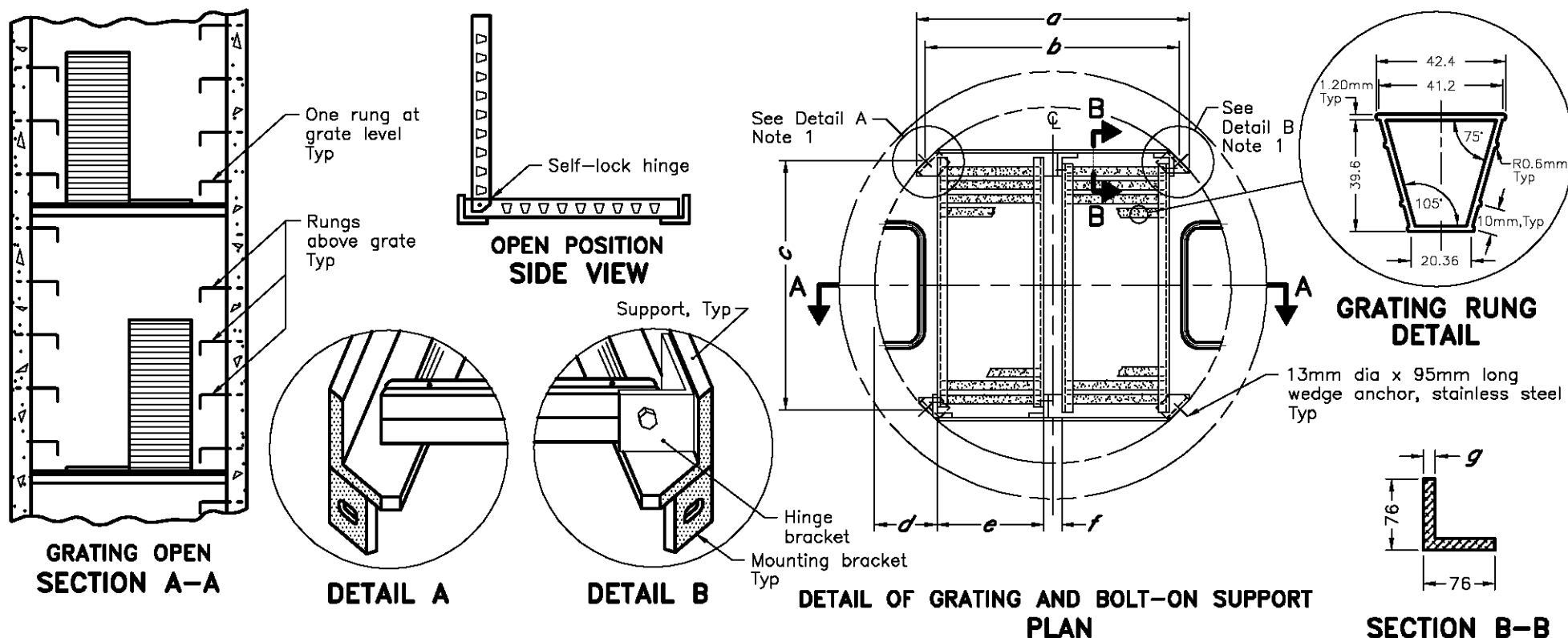
**ALUMINUM SAFETY PLATFORM AND LADDER
FOR RECTANGULAR PRECAST
CONCRETE VALVE CHAMBERS**

Nov 2012

Rev 1

OPSD 404.010





NOTES:

- 1 All hinge brackets and mounting brackets shall be welded all around to support angle.
- A All aluminum in contact with concrete shall be thoroughly coated with asphalt paint.
- B Maintenance hole depth between 5.0m and 10.0m, grate shall be placed at midpoint. Maintenance hole depth between 10.0m and 15.0m, grates shall be placed at third-points.
- C All fasteners shall be 304 stainless steel.
- D All welding shall be according to CSA W47.2 and W59.2.
- E All aluminum components shall be 6000 series structural aluminum.
- F All dimensions are in millimetres unless otherwise shown.

MH Diameter	No of Grates	a	b	c	d	e	f	g
1200	2	900	850	850	225	352	65	10
1500	2	1128	1078	1078	311	419	65	12
1800	3	1344	1293	1293	308	360	65	12
2400	4	1774	1724	1724	401	360	65	12

ONTARIO PROVINCIAL STANDARD DRAWING

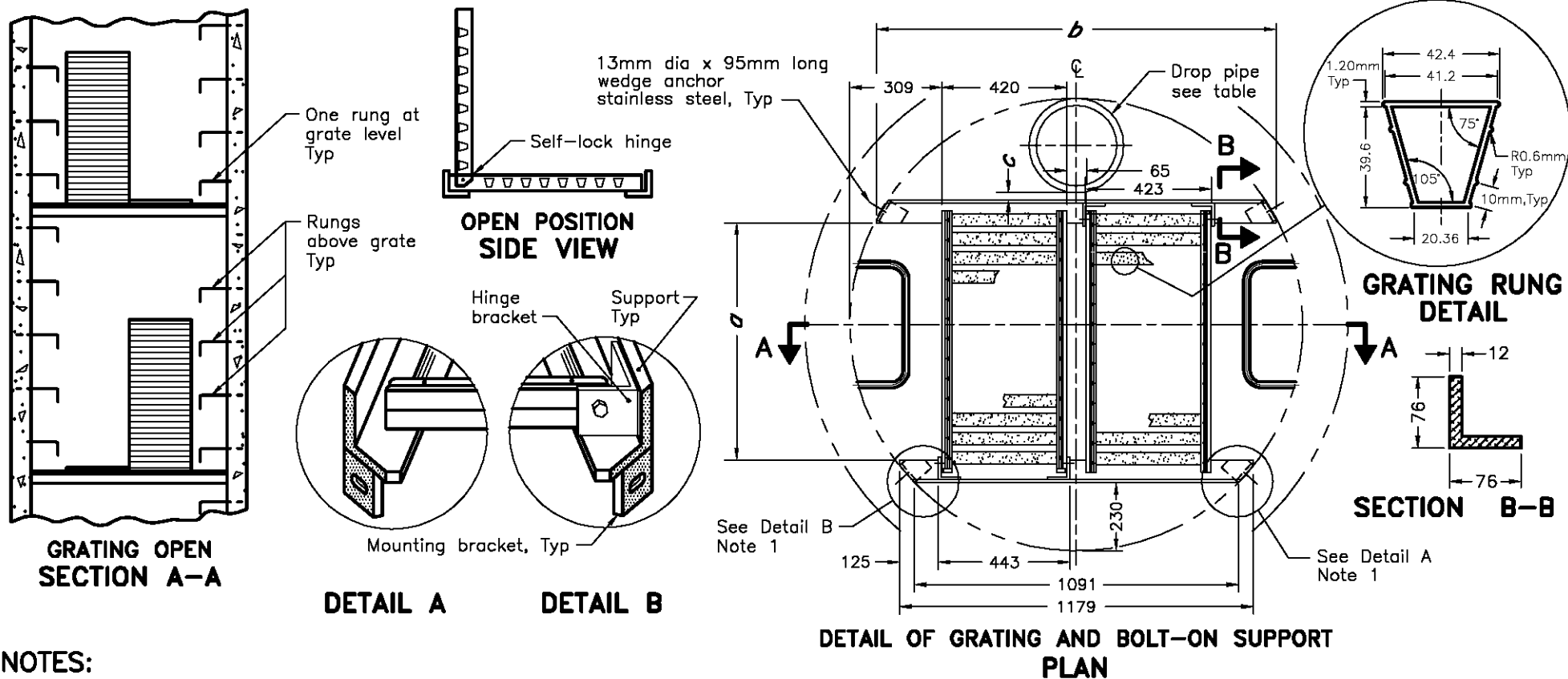
Nov 2013

Rev 3

ALUMINUM SAFETY PLATFORM
FOR CIRCULAR
MAINTENANCE HOLES

OPSD 404.020





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	<i>a</i>	<i>b</i>	<i>c</i>	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

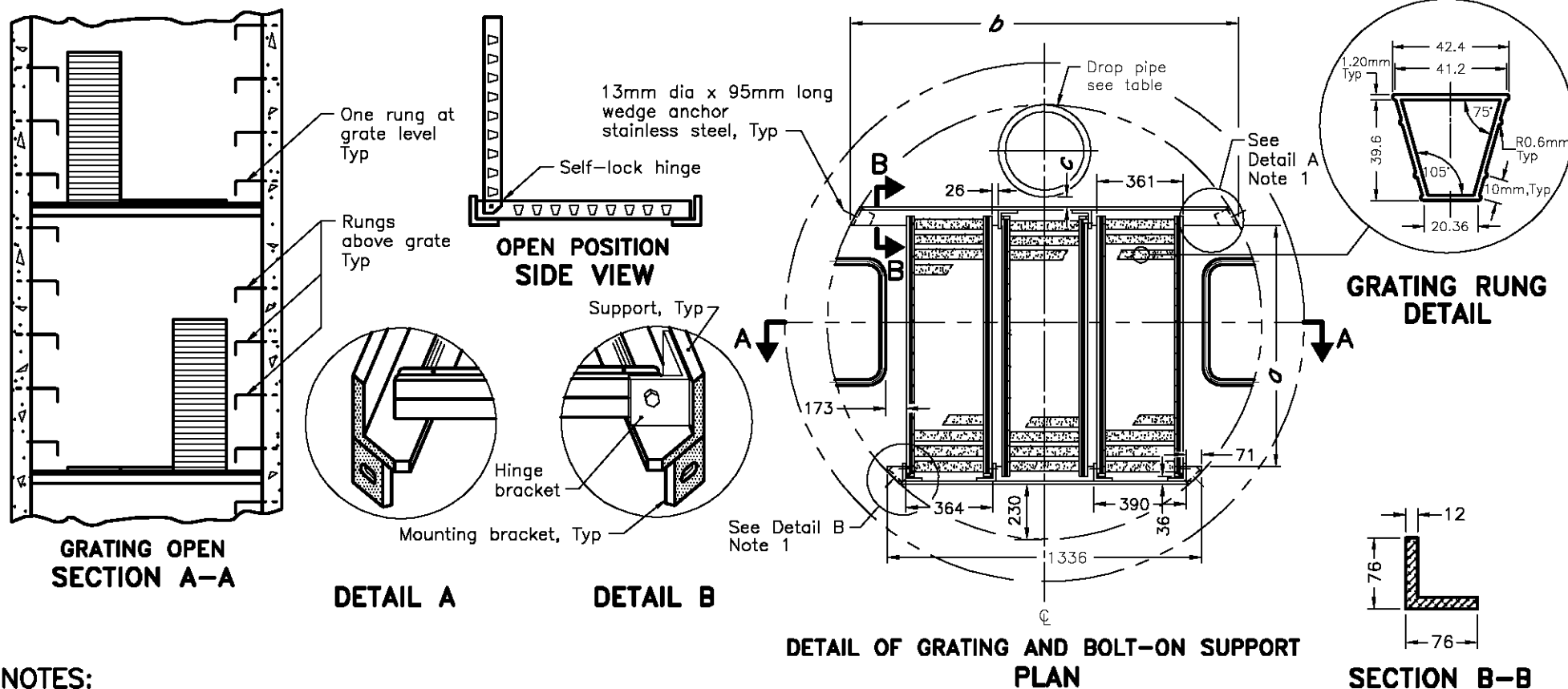
ONTARIO PROVINCIAL STANDARD DRAWING

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

Nov 2013 Rev 2



OPSD 404.021



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

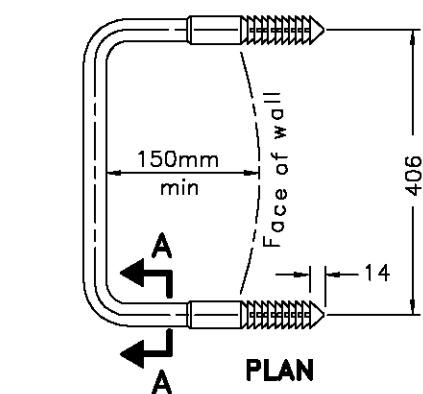
ONTARIO PROVINCIAL STANDARD DRAWING

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

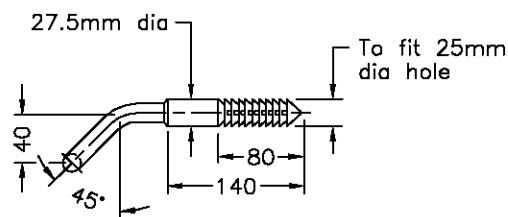
Nov 2013 Rev 2



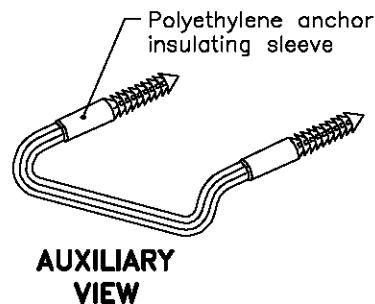
OPSD 404.022



PLAN



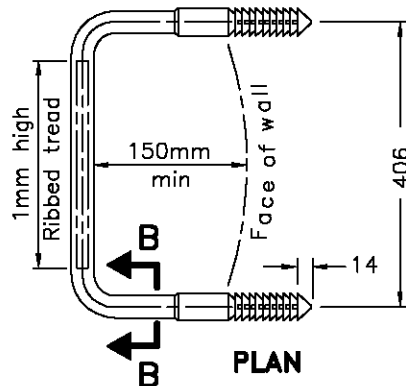
SIDE VIEW



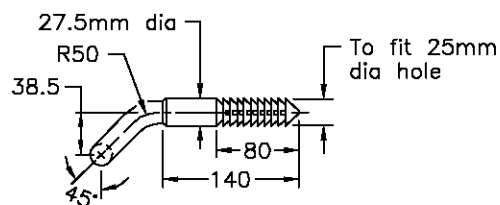
AUXILIARY VIEW

EXTRUDED
CIRCULAR SECTION A-A

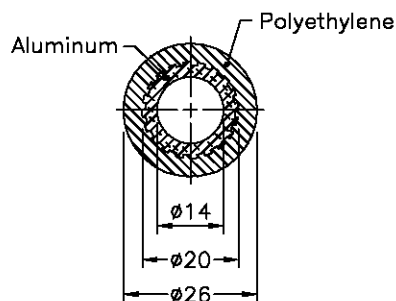
CIRCULAR ALUMINUM



PLAN

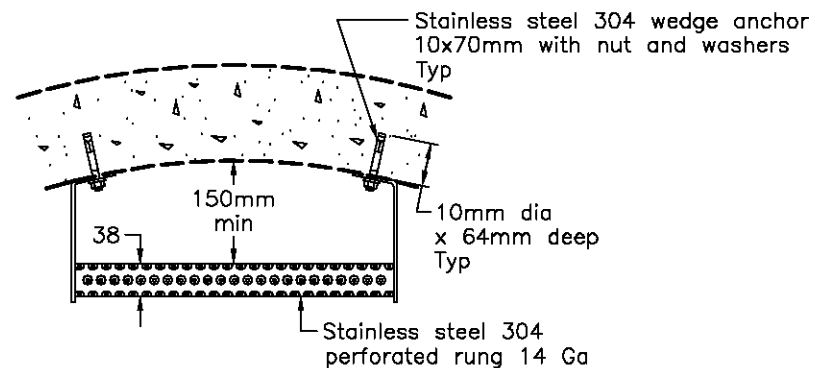


SIDE VIEW

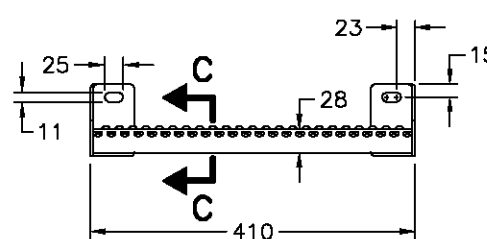


SECTION B-B

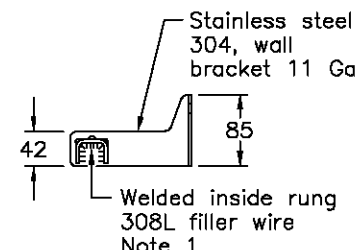
CIRCULAR ALUMINUM WITH
POLYETHYLENE ENCASEMENT



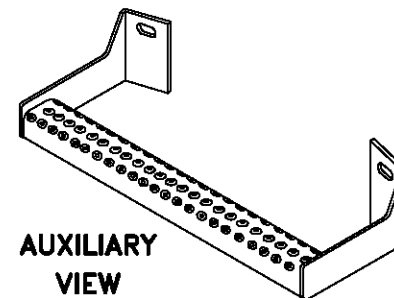
PLAN



FRONT VIEW



SECTION C-C



AUXILIARY VIEW

RECTANGULAR STAINLESS STEEL

NOTE:

1 The company undertaking welded fabrication shall be certified according to CSA W47.1. All welding shall be according to CSA W59.

A All aluminum components shall be 6000 series structural aluminum.

B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013

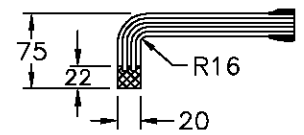
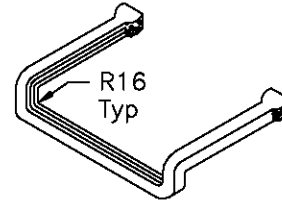
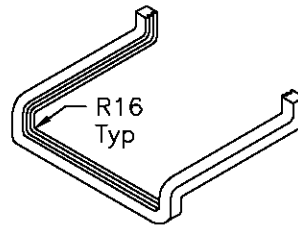
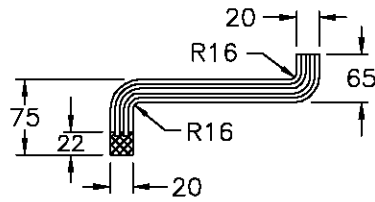
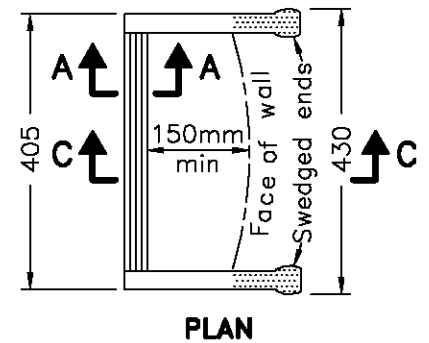
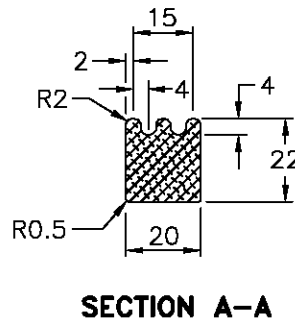
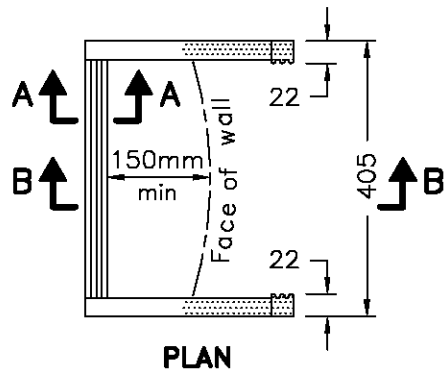
Rev 3

MAINTENANCE HOLE STEPS

HOLLOW

OPSD 405.010

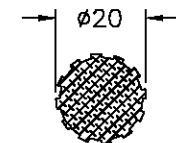
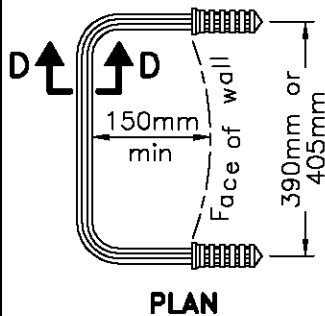




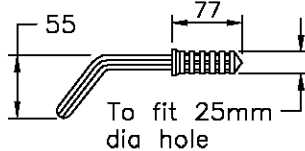
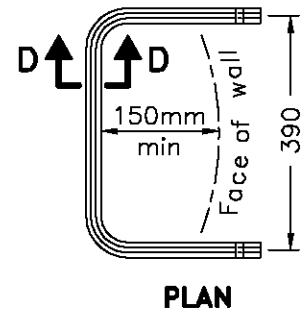
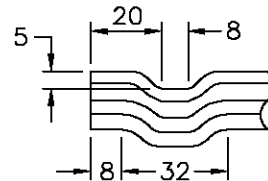
TYPE A

TYPE B

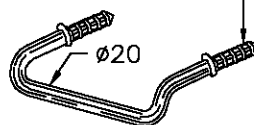
RECTANGULAR ALUMINUM



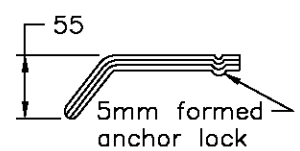
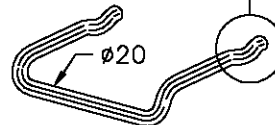
FORMED ANCHOR LOCK DETAIL



Polyethylene anchor
insulating sleeve, Typ



See formed
anchor lock detail



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

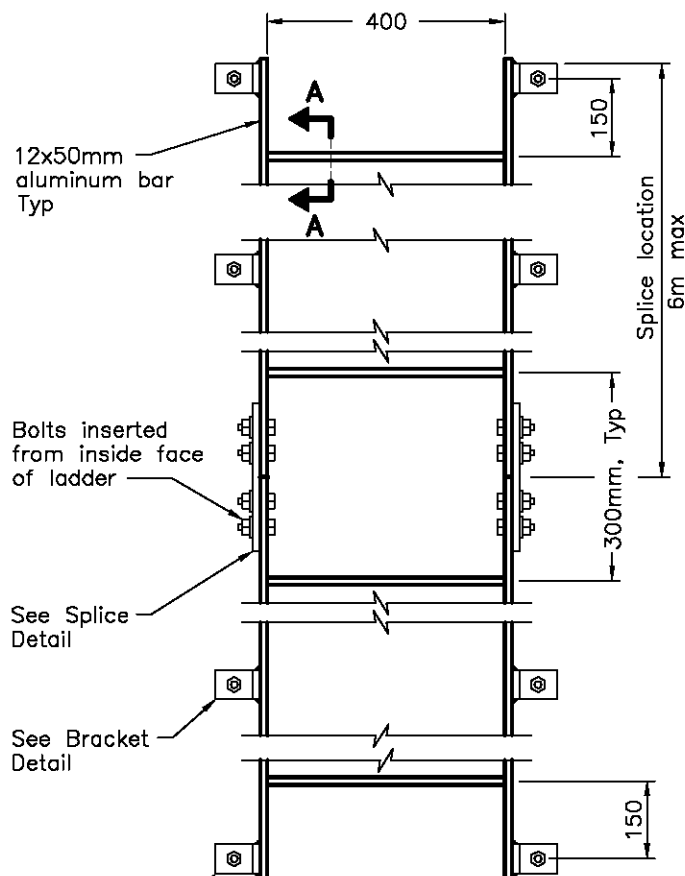
SOLID



OPSD 405.020

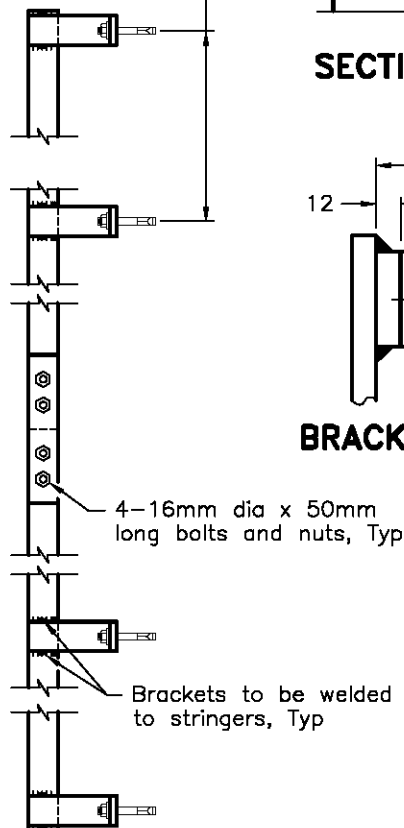
Type 304 stainless steel
wedge anchor 16x150mm
with nut and lock washer
Typ

PLAN

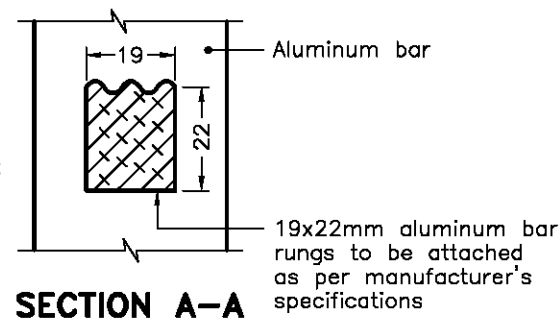


ELEVATION

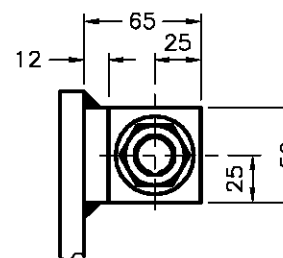
Spacing between
brackets 1.5m max
Typ



SIDE VIEW



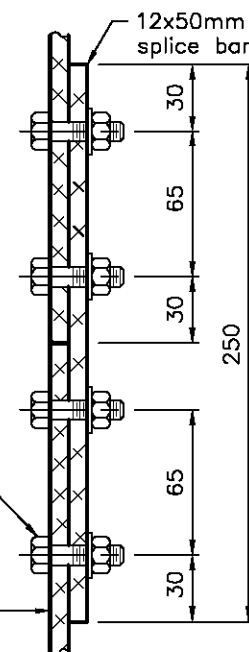
SECTION A-A



BRACKET DETAIL

Type 304 stainless
steel hex bolt
16x40mm with
nut and lock
washer, Typ

Aluminum bar



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

Nov 2013

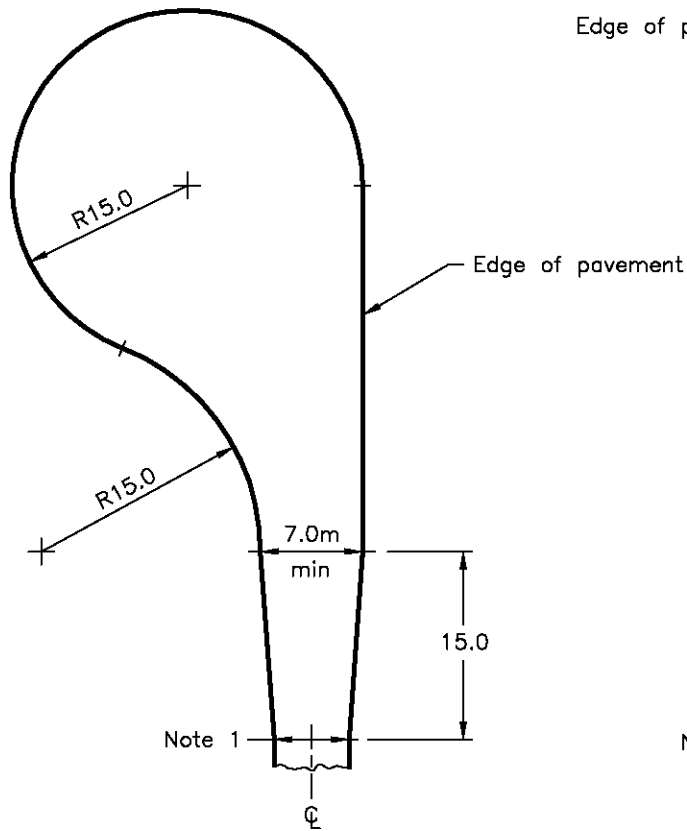
Rev 2

ALUMINUM LADDER

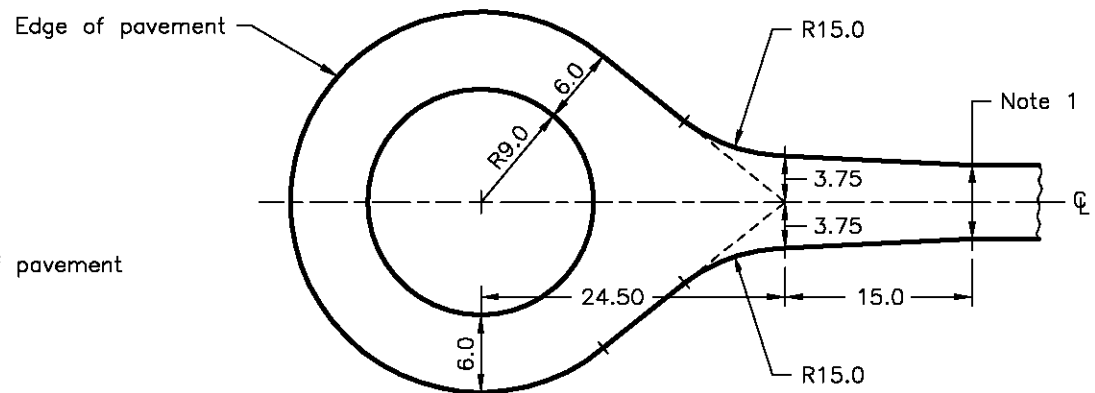
FOR MAINTENANCE HOLES

OPSD 406.010

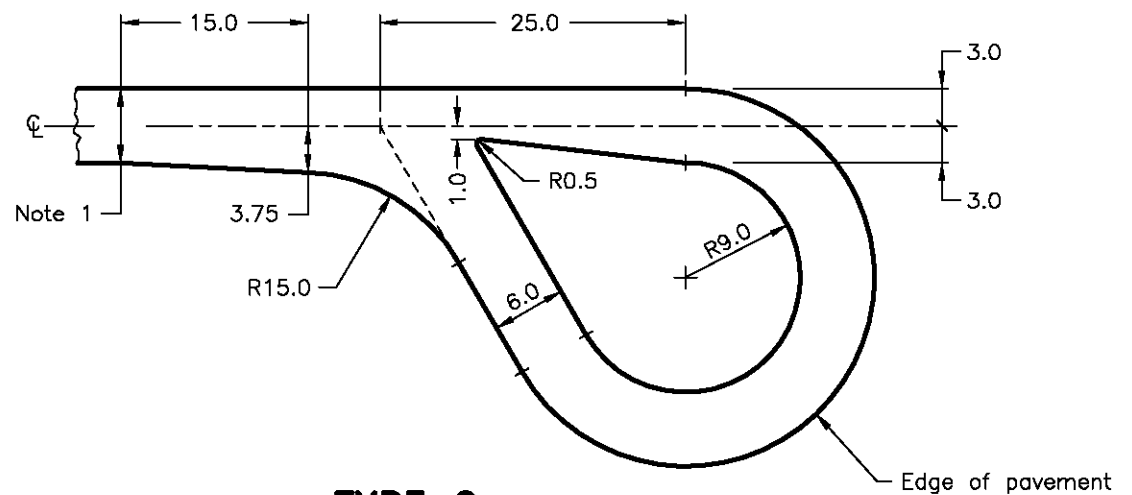




TYPE A



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

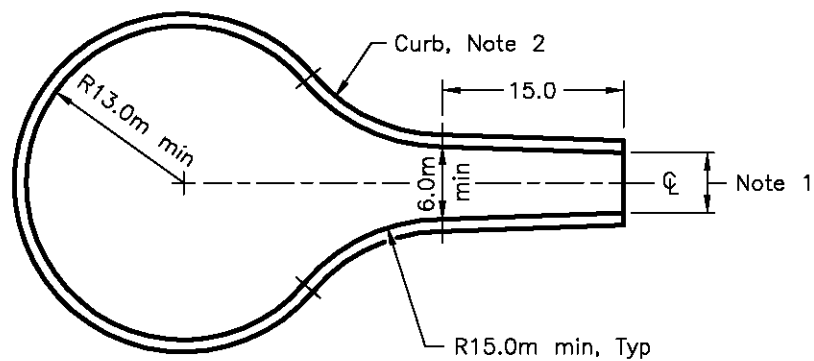
Nov 2009

Rev 0

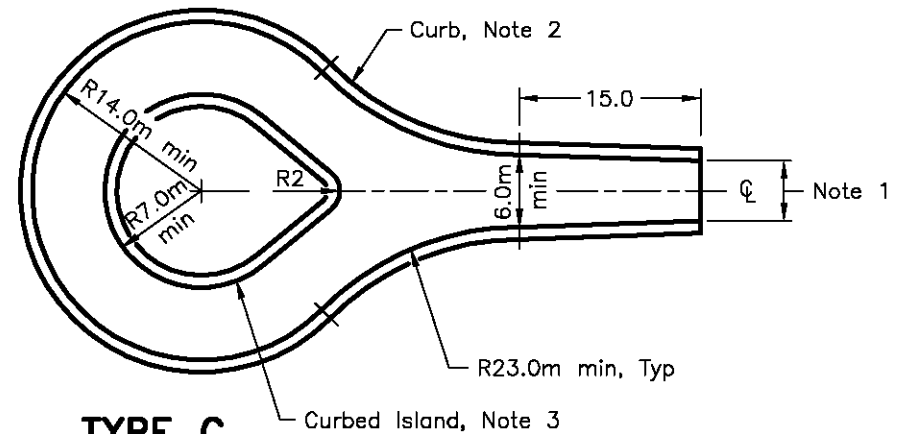
**TURNING BASINS
FOR TERMINATED RURAL ROADWAYS**

OPSD 500.010

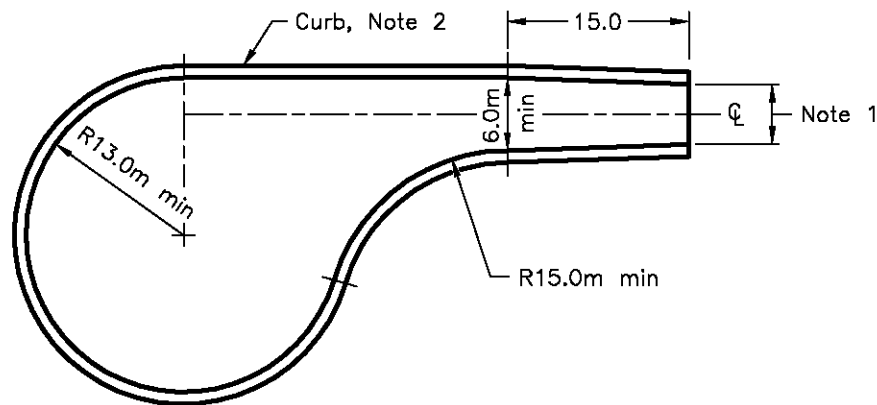




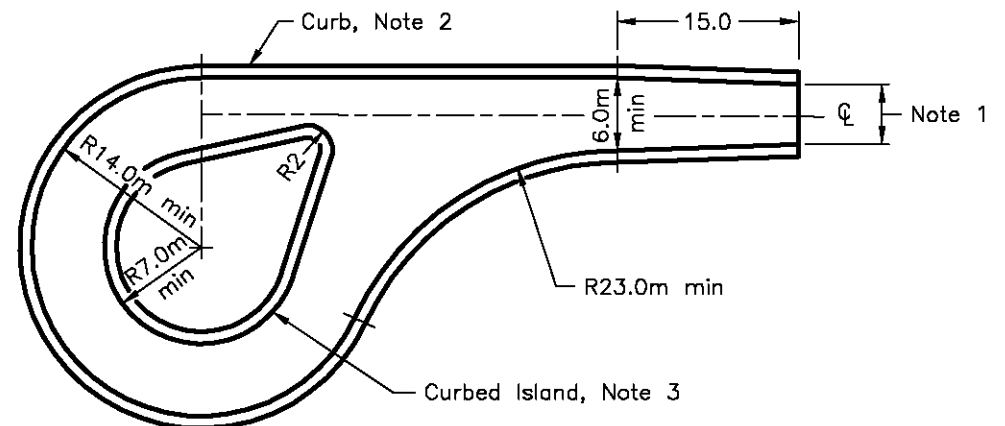
TYPE A



TYPE C



TYPE B



TYPE D

NOTES:

- 1 Width of pavement to match terminated roadway.
- 2 Type of curb to match terminated roadway.
- 3 Island curb shall be according to OPSD 600.090.
- A Drainage and grading as specified.
- B All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

**TURNING BASINS
FOR TERMINATED URBAN ROADWAYS
RESIDENTIAL**

Nov 2009 Rev 0

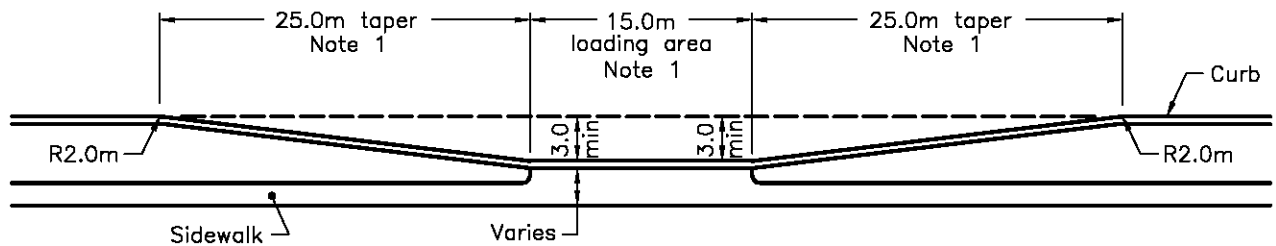


OPSD 500.020

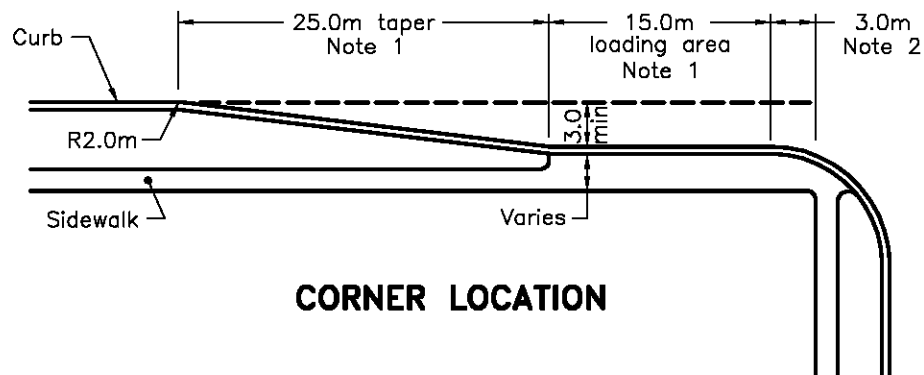


B All dimensions are in metres unless otherwise shown.

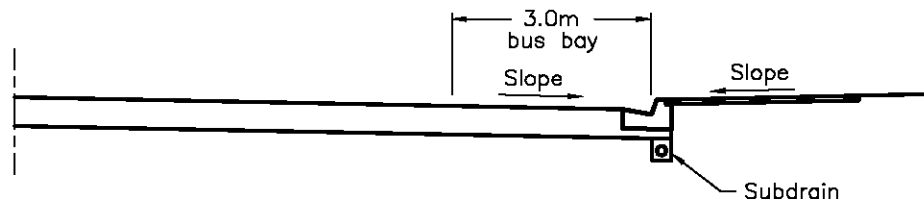
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev	0	
TURNING BASINS FOR TERMINATED URBAN ROADWAYS INDUSTRIAL AND COMMERCIAL				
	OPSD 500.030			



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

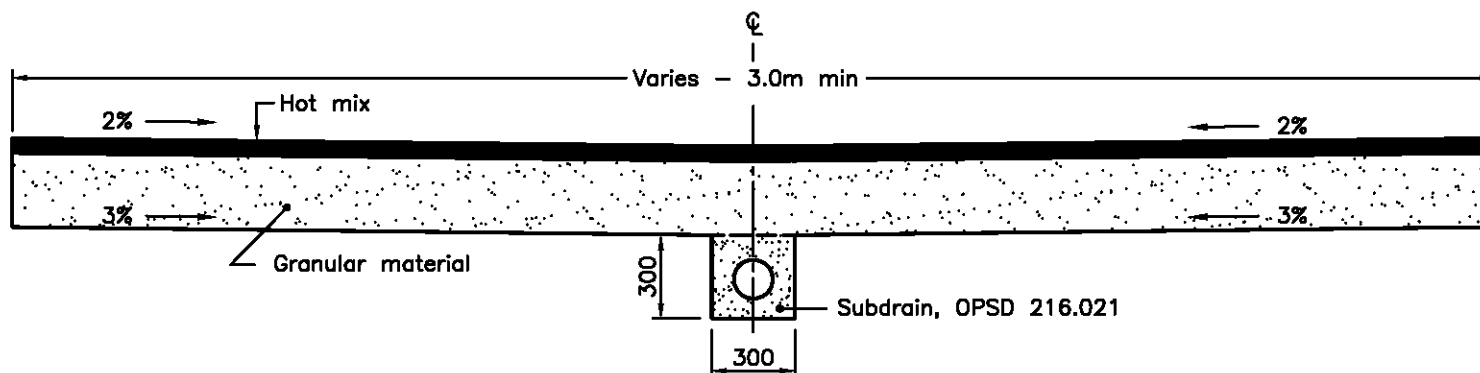
Nov 2010

Rev 1

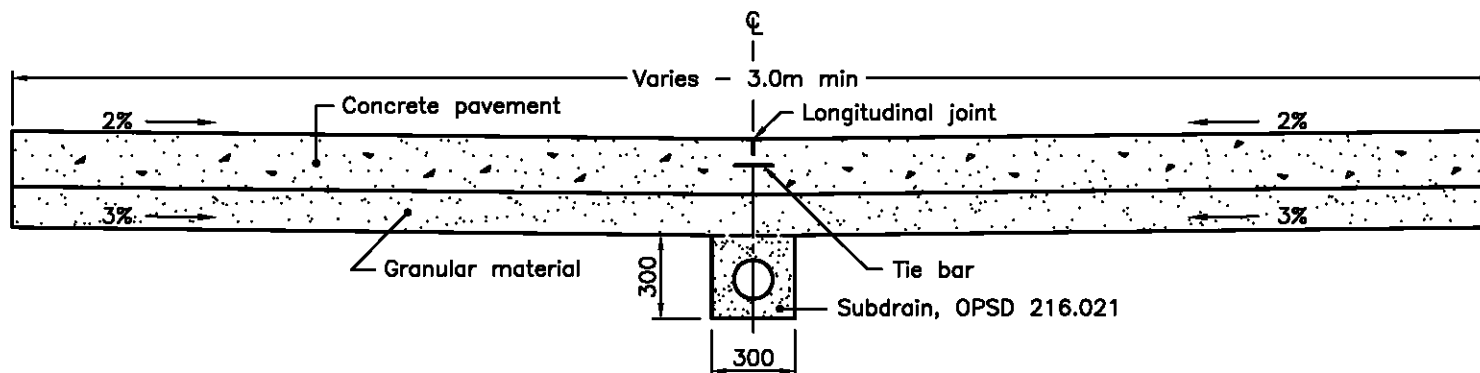
BUS BAYS



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

Nov 2009

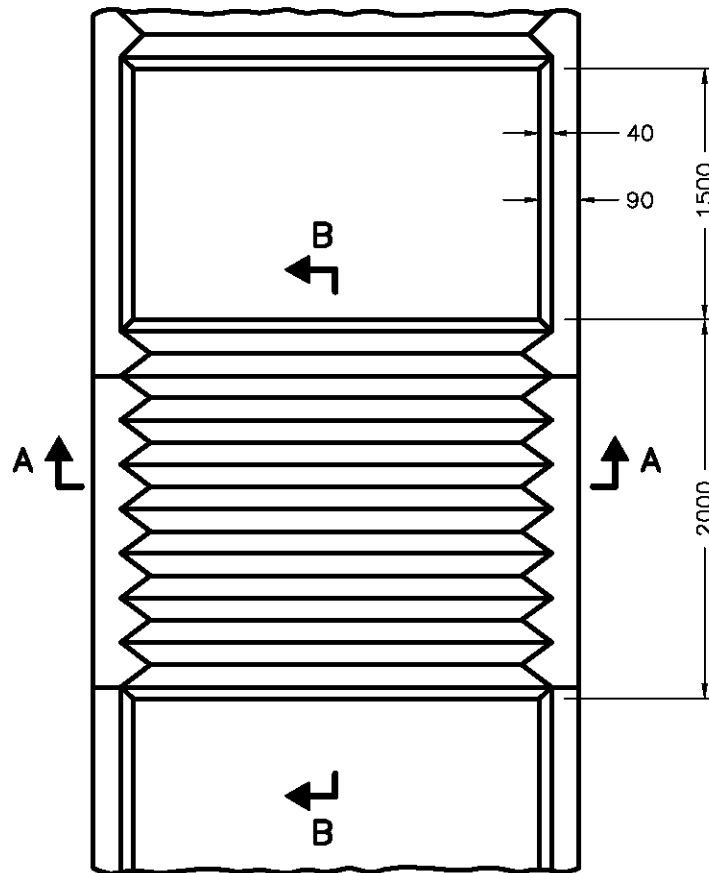
Rev 1

ACCESS LANES

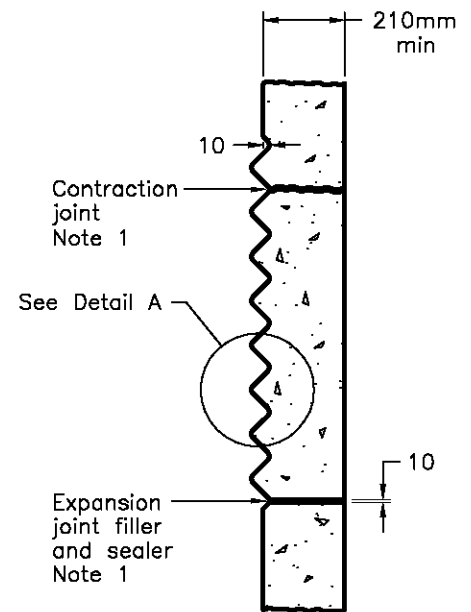
FOR REAR LOTS

OPSD 502.010

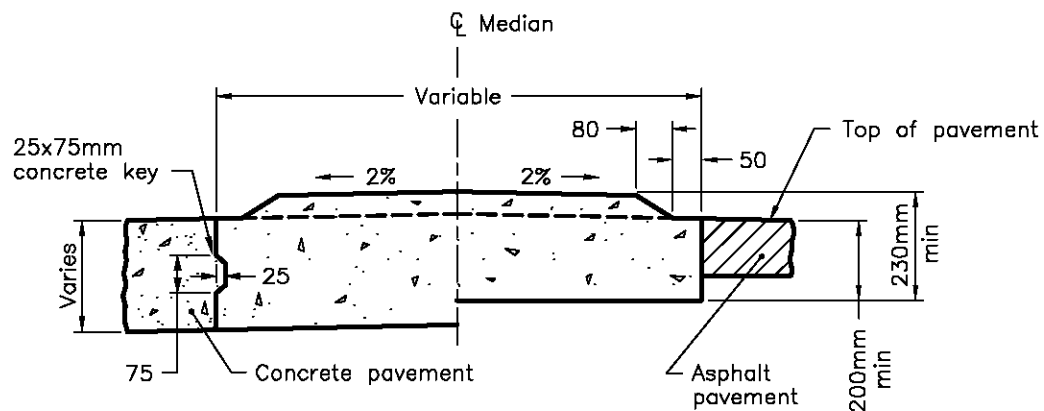




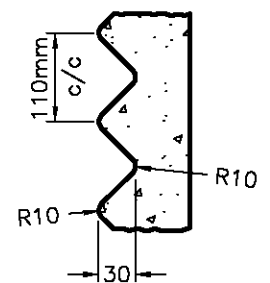
PLAN



SECTION B-B



SECTION A-A



DETAIL A

NOTES:

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

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

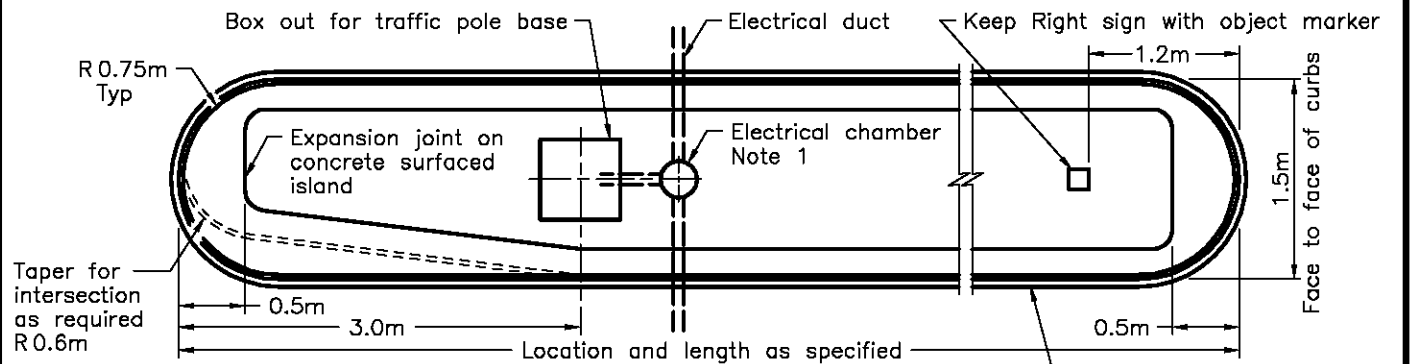
Nov 2011

Rev 1

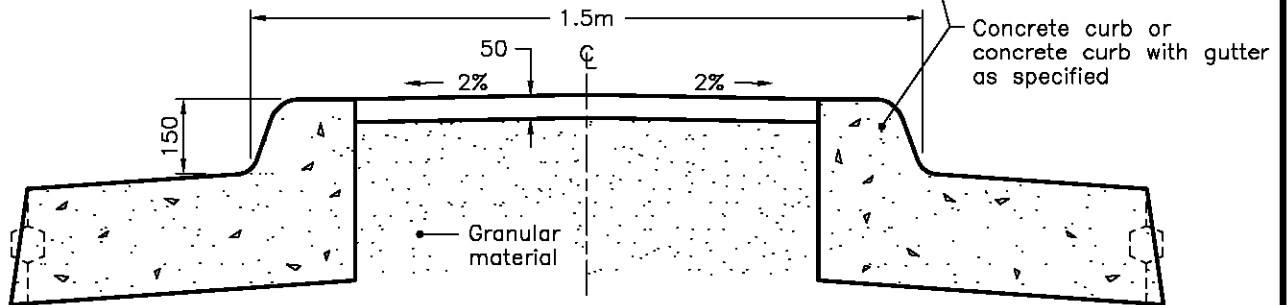
CONCRETE RIPPLE STRIP

OPSD 503.010

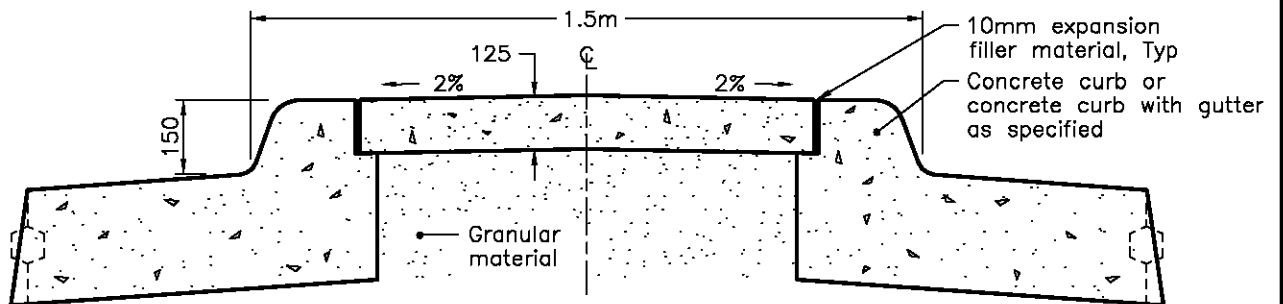




PLAN

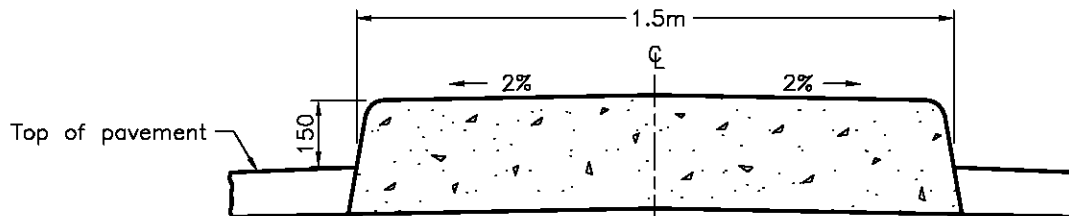


ASPHALT SURFACE



CONCRETE SURFACE

Note 2



CONCRETE SLAB

Note 3

NOTES:

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

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

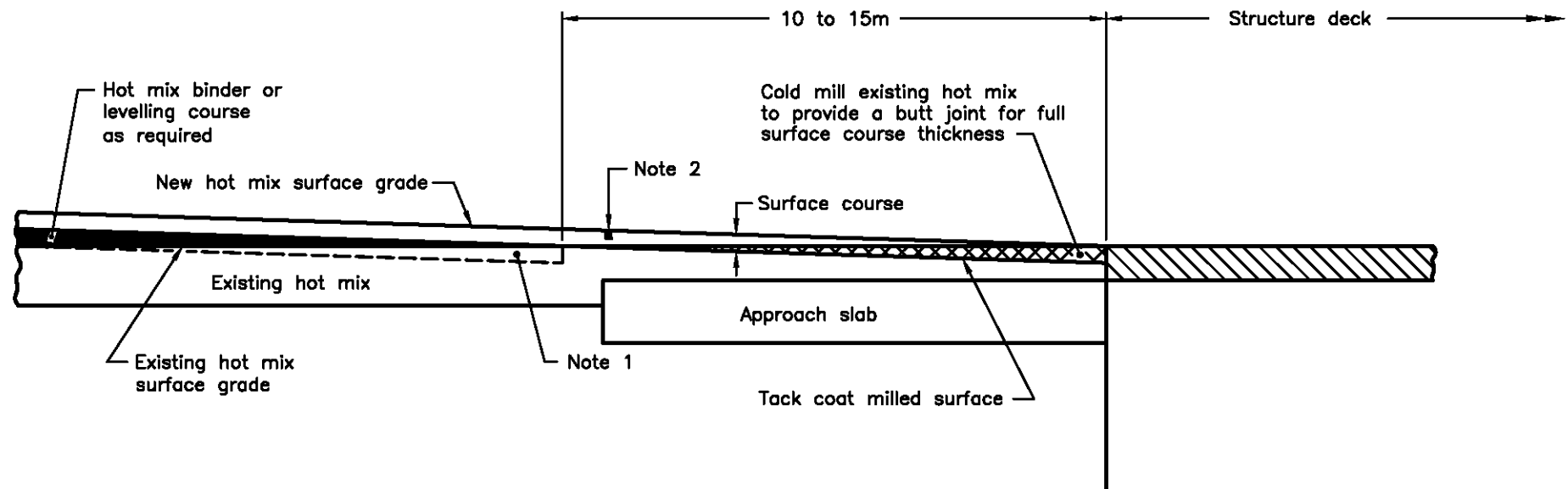
Nov 2012

Rev 1

RAISED TRAFFIC ISLAND

OPSD 504.010





NOTES:

- 1 As an alternative, cold mill existing hot mix to provide a butt joint for full binder course thickness.
- 2 For integral and semi-integral abutments provide for a 25 x 25mm sawn joint filled with hot poured rubberized asphalt joint sealing compound in the hot mix over the end of the approach slab.

A All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

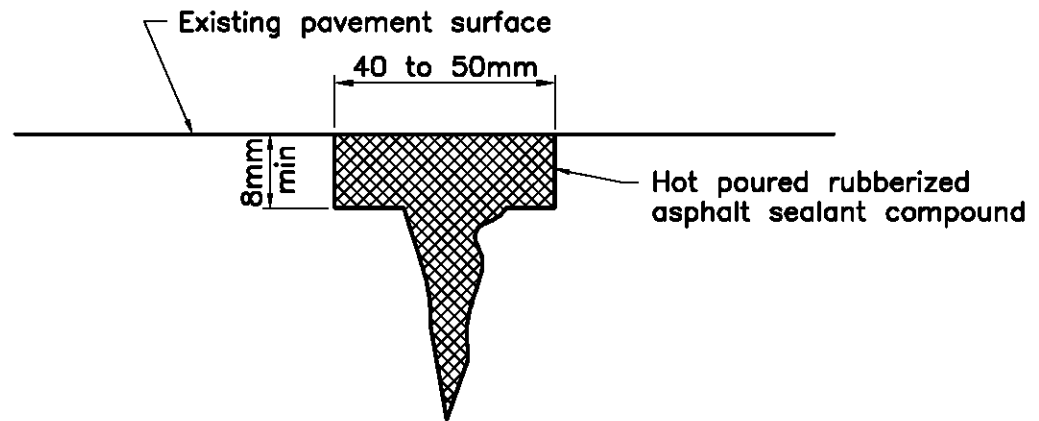
Nov 2009

Rev 1

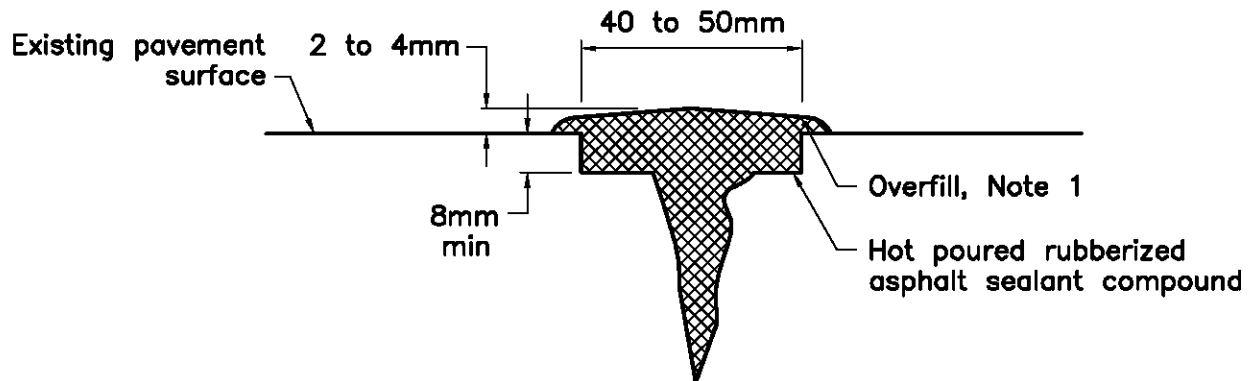
HOT MIX RESURFACING TREATMENT
AT STRUCTURE APPROACHES

OPSD 506.010

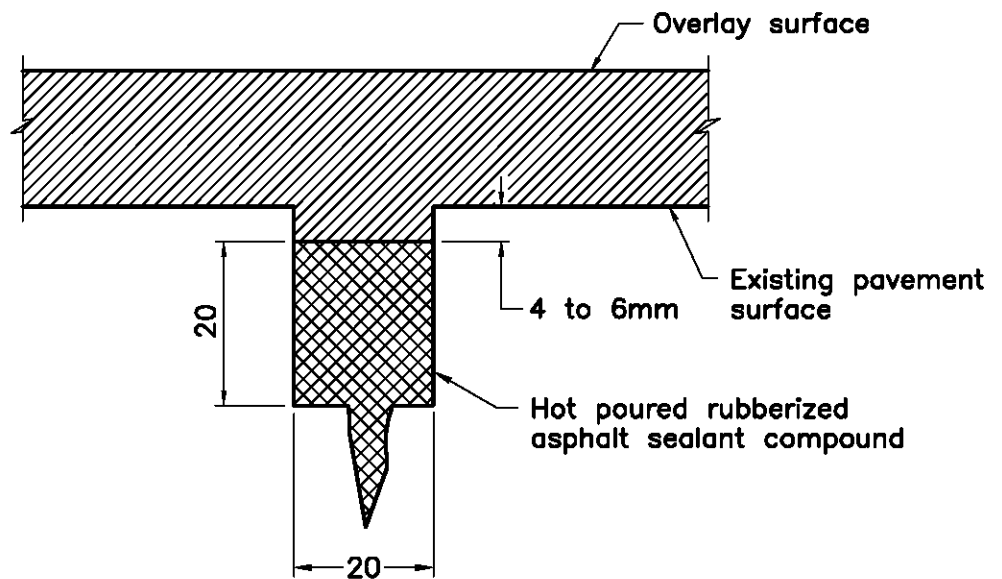




FLUSH FILL OF CRACKS WITHOUT OVERLAY



OVERFILL OF CRACKS WITHOUT OVERLAY



CRACKS WITH ASPHALT OVERLAY

NOTE:

- 1 Final overfill geometry after cooling of sealant material.
- A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

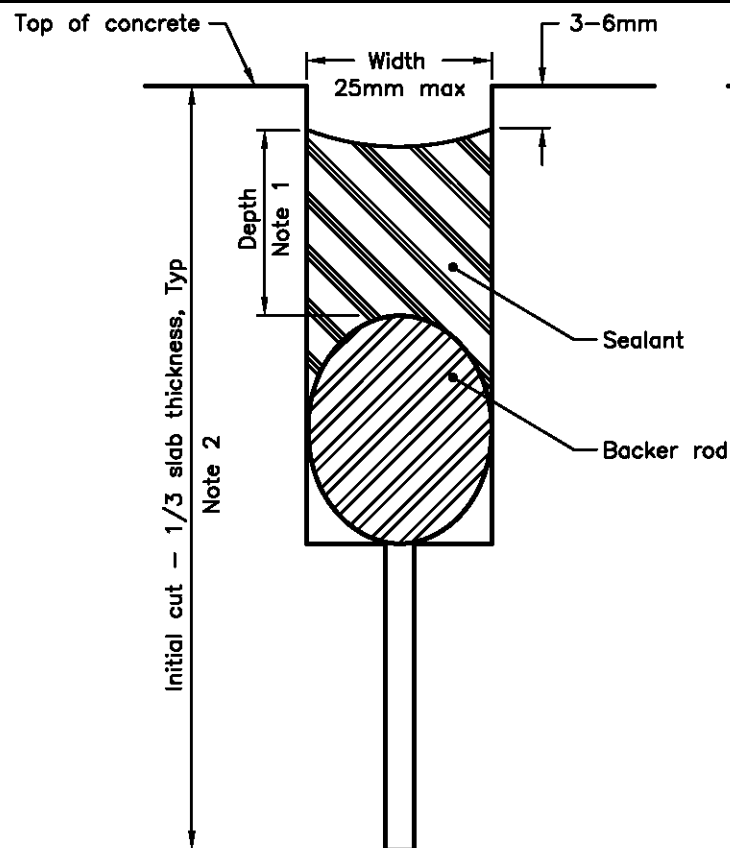
Nov 2015

Rev 2

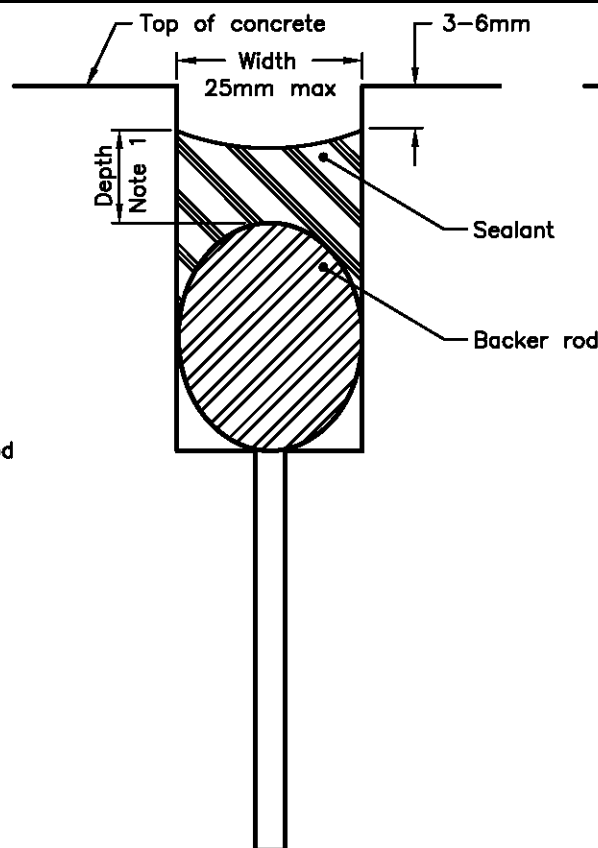
ROUTING AND SEALING CRACKS
UP TO 20mm IN WIDTH
IN ASPHALT PAVEMENT



OPSD 508.010

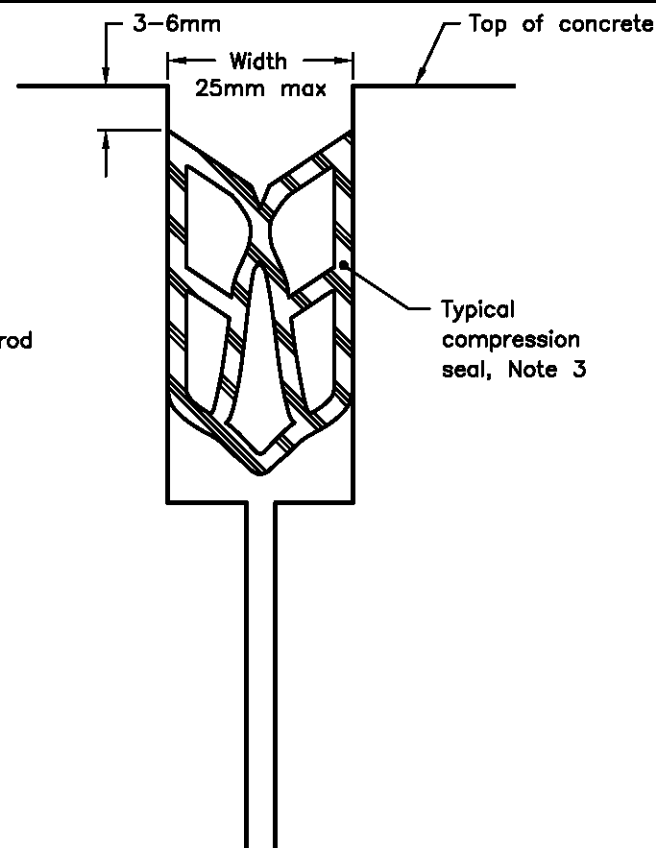


HOT POURED RUBBERIZED SEALANT



SILICONE SEALANT

NOTE 4



COMPRESSION SEAL

NOTE 4

NOTES:

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

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

ONTARIO PROVINCIAL STANDARD DRAWING

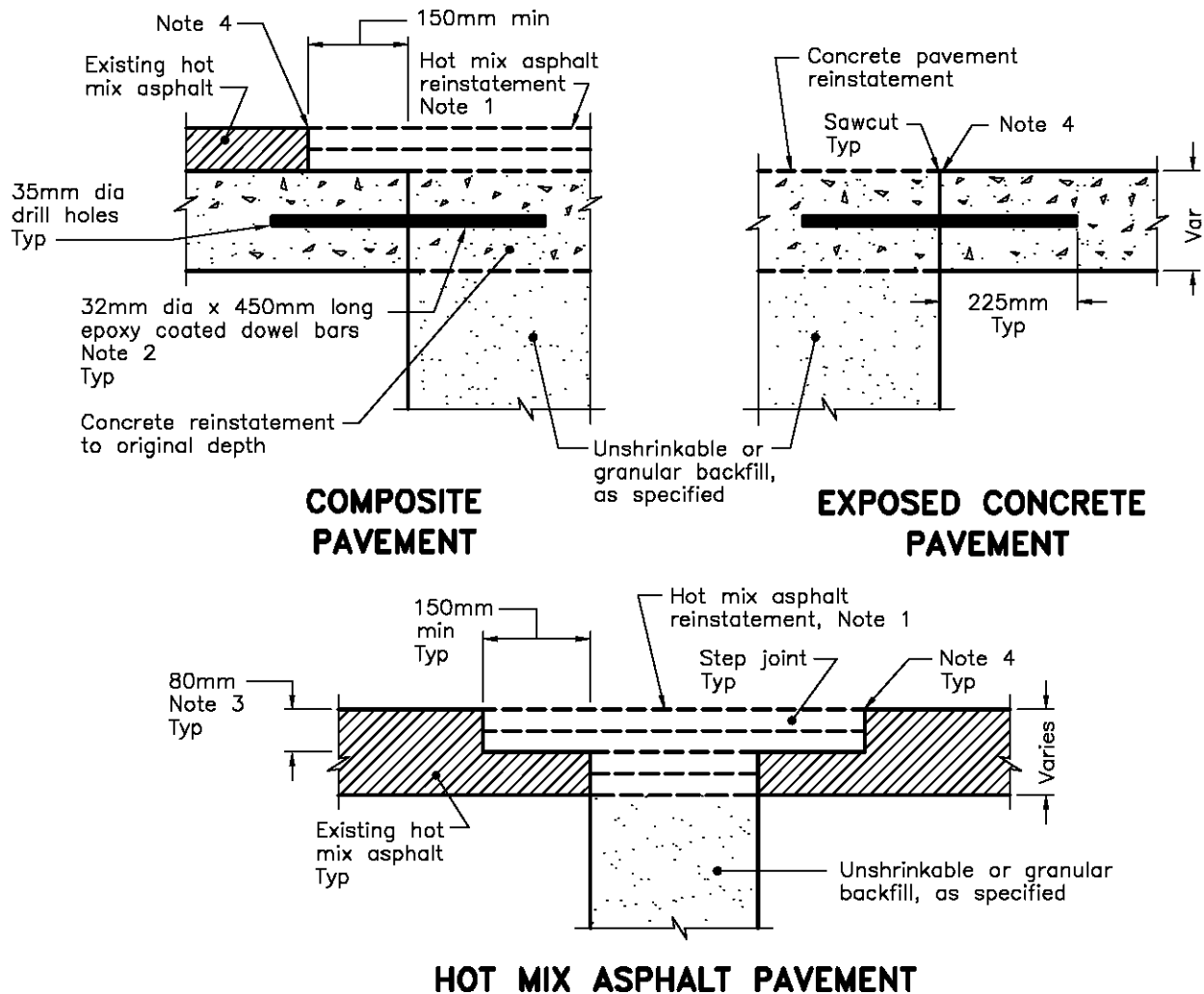
**SEALING OR RESEALING
OF JOINTS AND CRACKS IN CONCRETE
PAVEMENT AND CONCRETE BASE**

Nov 2008

Rev 2



OPSD 508.020



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: $\pm 15\text{mm}$ along the length of the dowel bar.
 - b) Horizontal Alignment: $\pm 15\text{mm}$ along the length of the dowel bar.
 - c) Side Shift: The centre of the dowel bar shall lie within $\pm 40\text{mm}$ 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 $\pm 15\text{mm}$ 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.

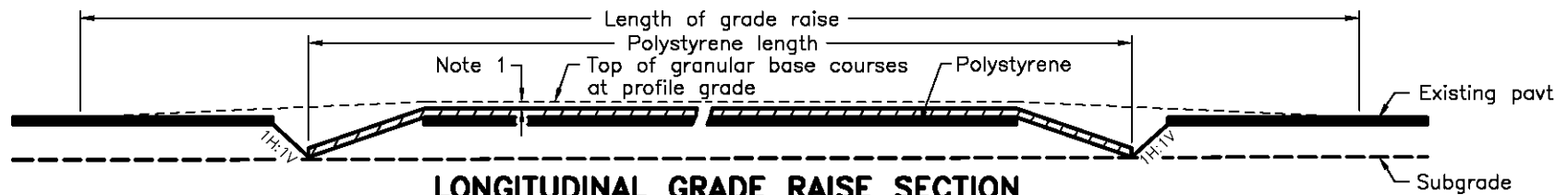
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 | Rev | 2

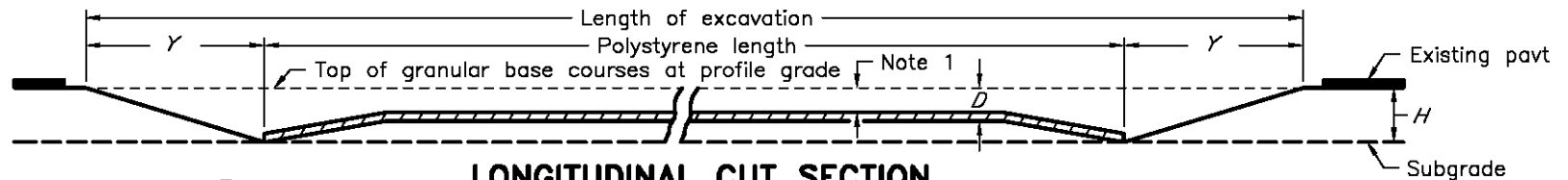
**PAVEMENT REINSTATEMENT
FOR UTILITY CUTS**



OPSD 509.010



LONGITUDINAL GRADE RAISE SECTION



LONGITUDINAL CUT SECTION

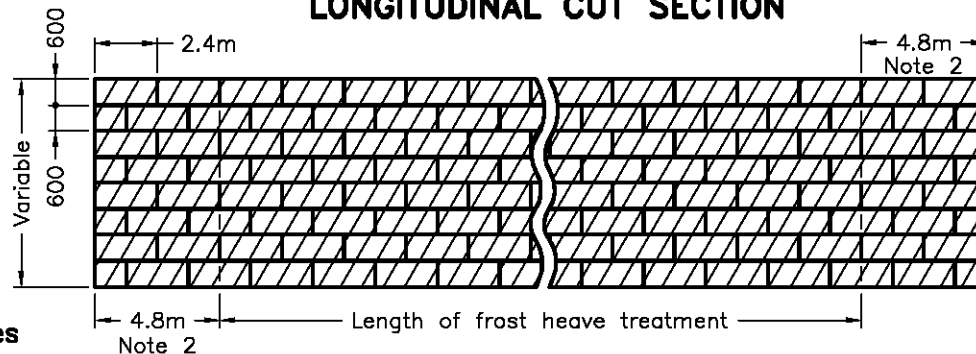
NOTES:

- 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.

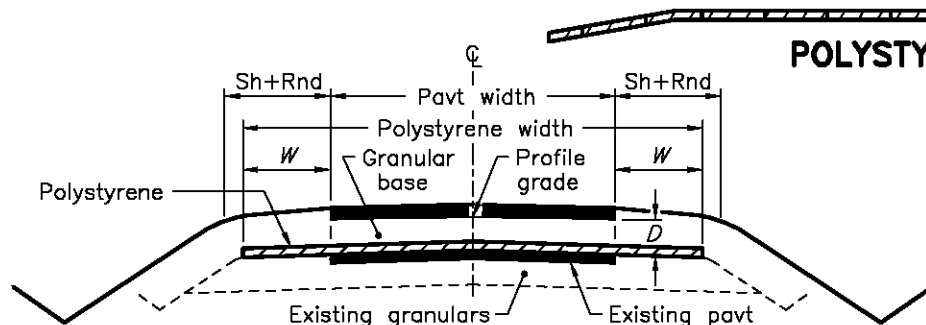


POLYSTYRENE PLAN

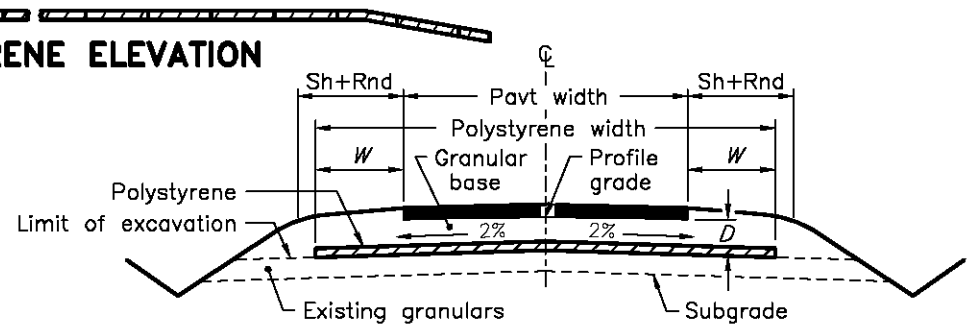
LEGEND:

- 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

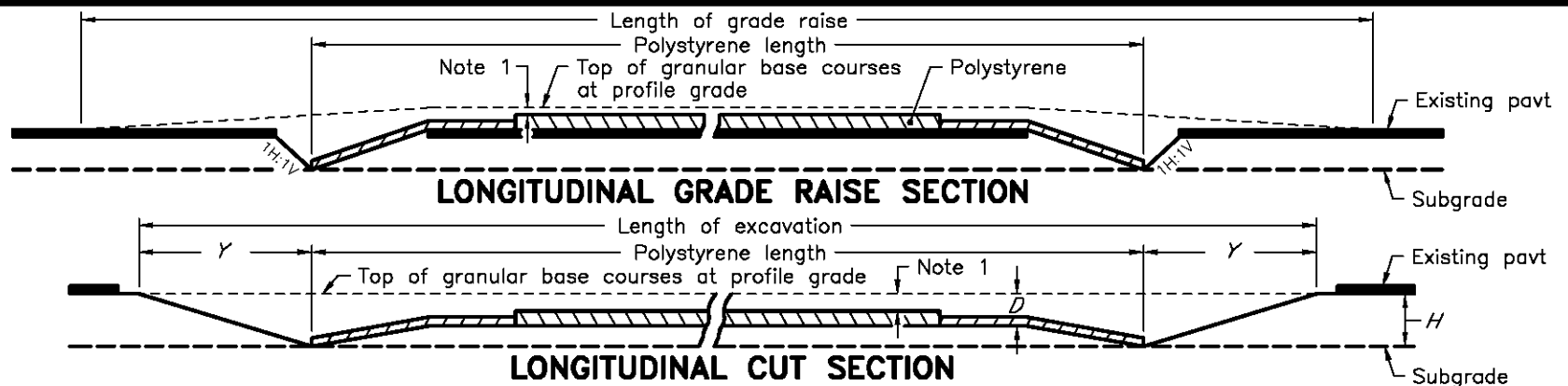
EXTRUDED EXPANDED POLYSTYRENE
FROST HEAVE TREATMENT

25mm THICKNESS

Nov 2010 Rev 1



OPSD 514.010



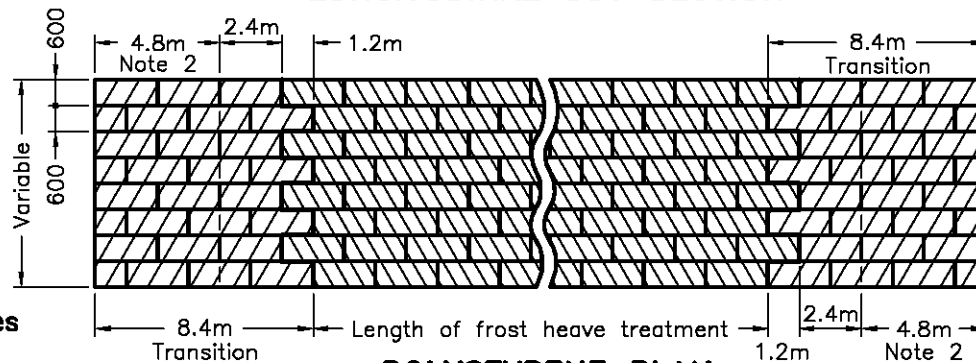
NOTES:

- 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.

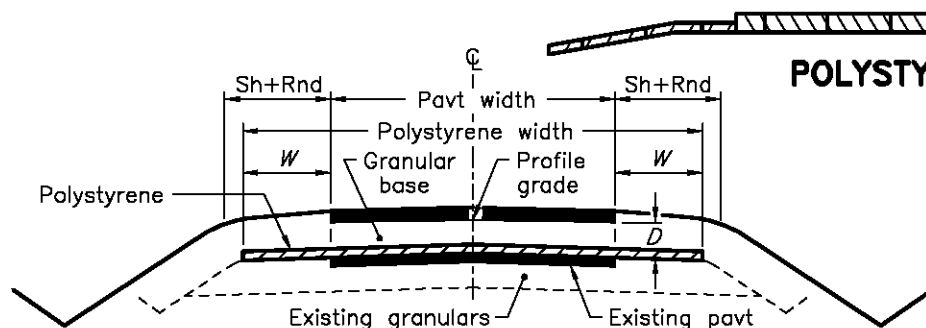


POLYSTYRENE PLAN

LEGEND:

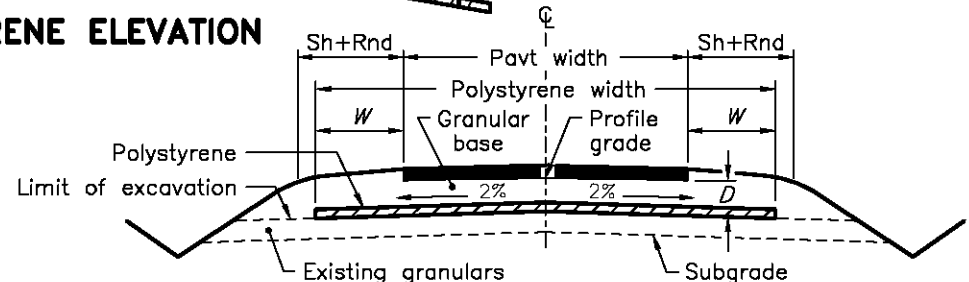
- 25mm polystyrene thickness
- 40mm polystyrene thickness

- 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
- γ = Length of excavation taper = $4H$



TRANSVERSE GRADE RAISE SECTION

POLYSTYRENE ELEVATION



TRANSVERSE CUT SECTION

ONTARIO PROVINCIAL STANDARD DRAWING

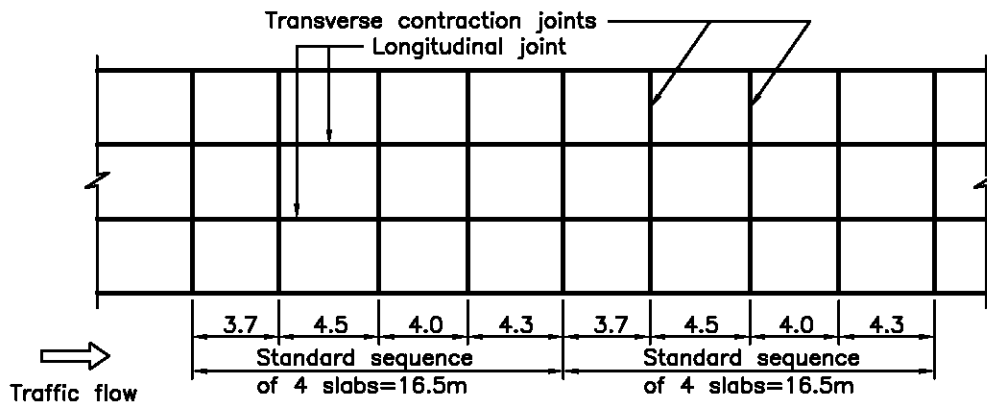
EXTRUDED EXPANDED POLYSTYRENE
FROST HEAVE TREATMENT

40mm THICKNESS

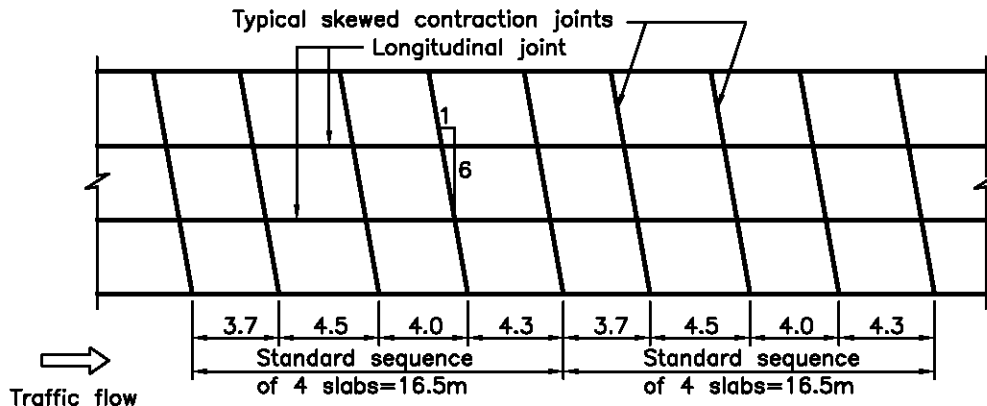
Nov 2010 Rev 1



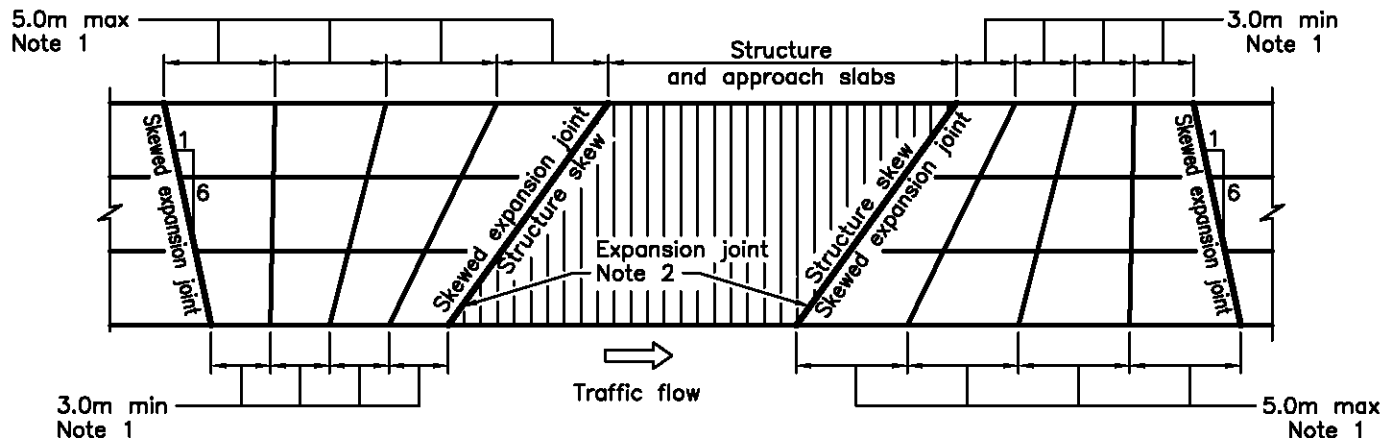
OPSD 514.020



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.

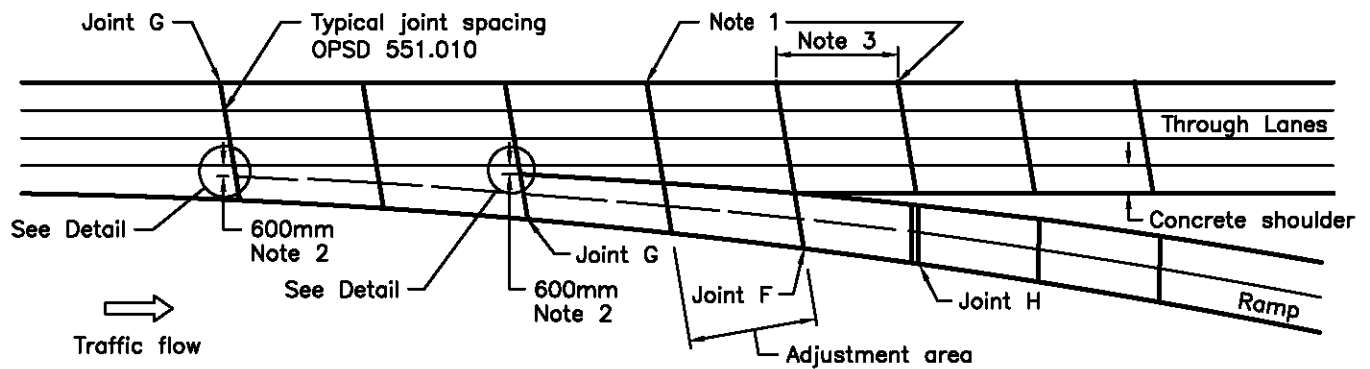
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2008 Rev 1

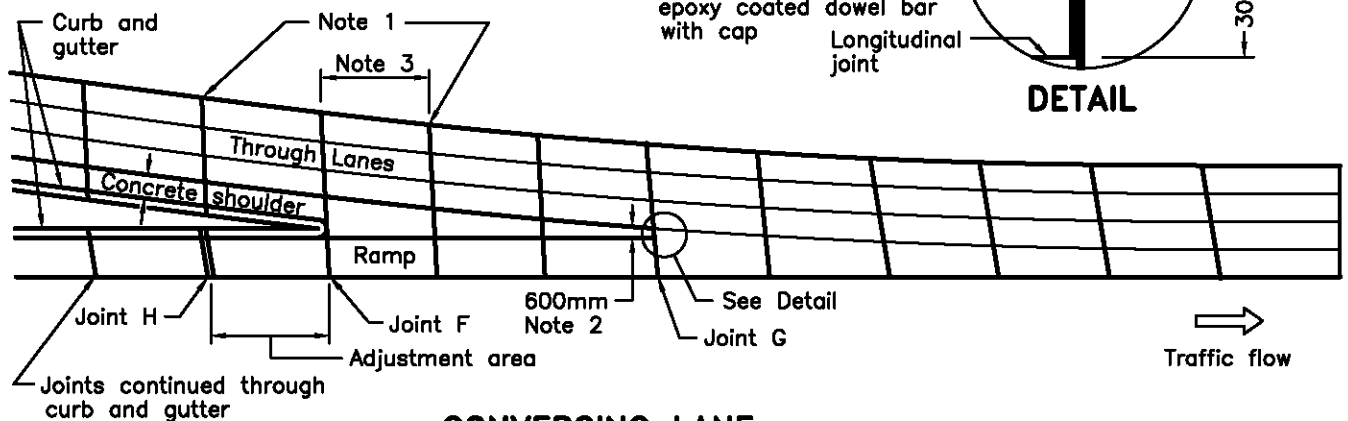
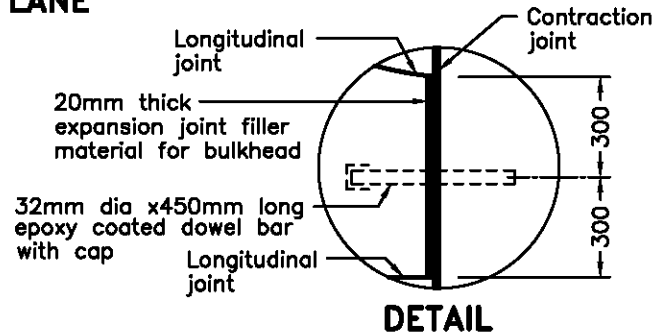
CONCRETE AND COMPOSITE PAVEMENT
JOINT SPACING

OPSD 551.010

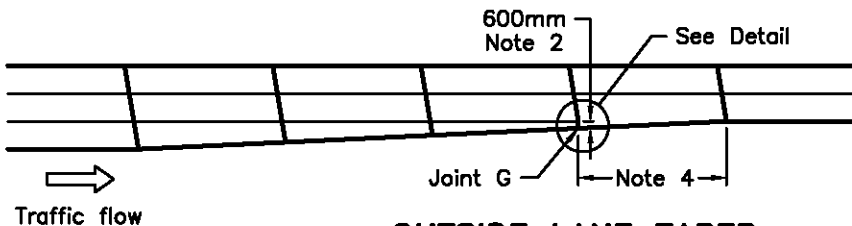




DIVERGING LANE



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.

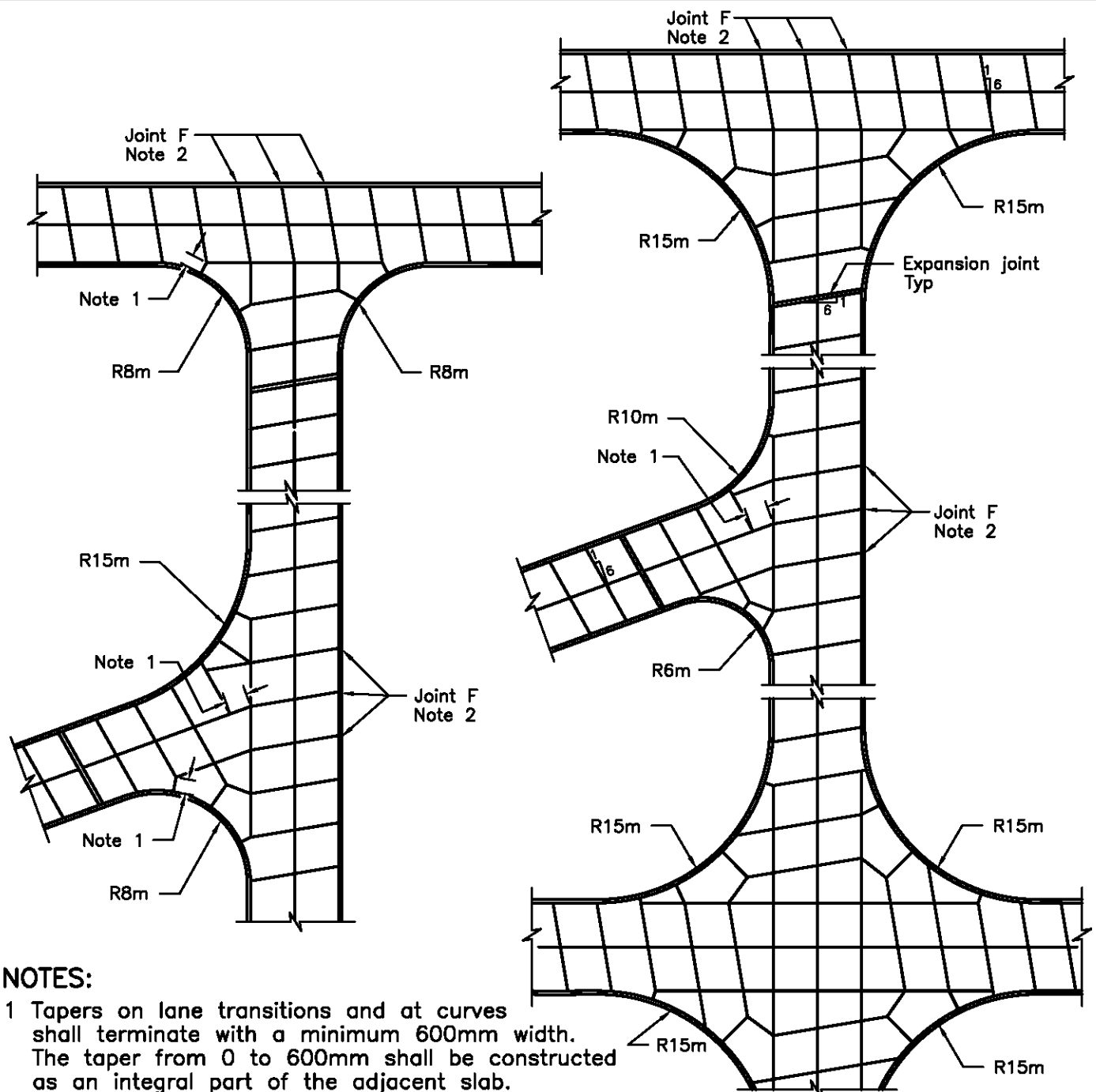
ONTARIO PROVINCIAL STANDARD DRAWING

CONCRETE AND COMPOSITE PAVEMENT
JOINT LAYOUT
AT CONVERGING OR DIVERGING LANES

Nov 2008 | Rev | 1



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

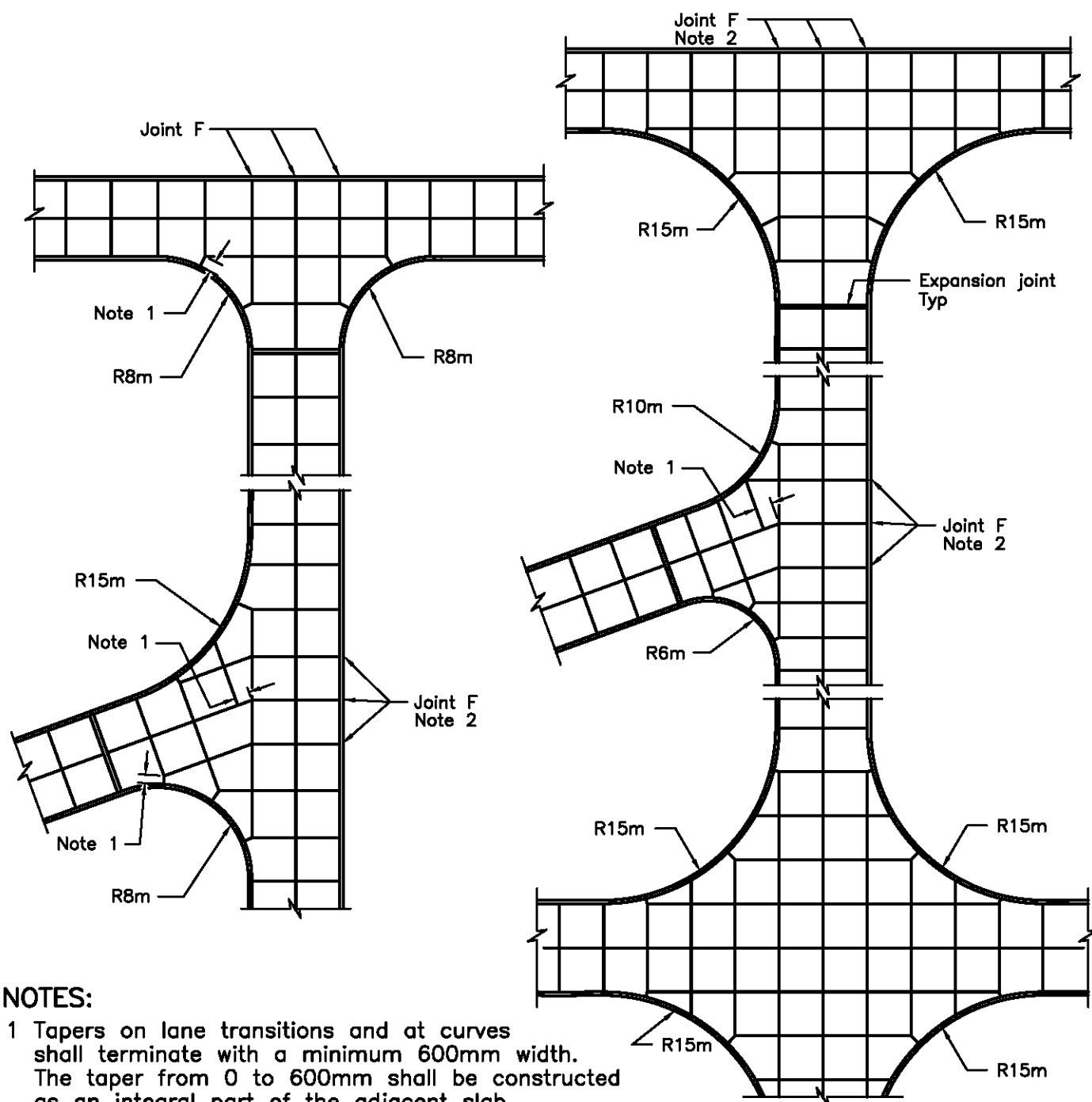
CONCRETE AND COMPOSITE PAVEMENT
SKEWED JOINT LAYOUT
AT INTERSECTIONS

Nov 2008

Rev 2



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.

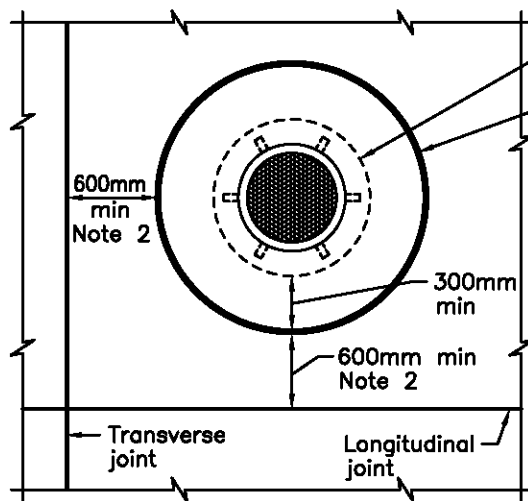
ONTARIO PROVINCIAL STANDARD DRAWING

CONCRETE AND COMPOSITE PAVEMENT
RIGHT ANGLE JOINT LAYOUT
AT INTERSECTIONS

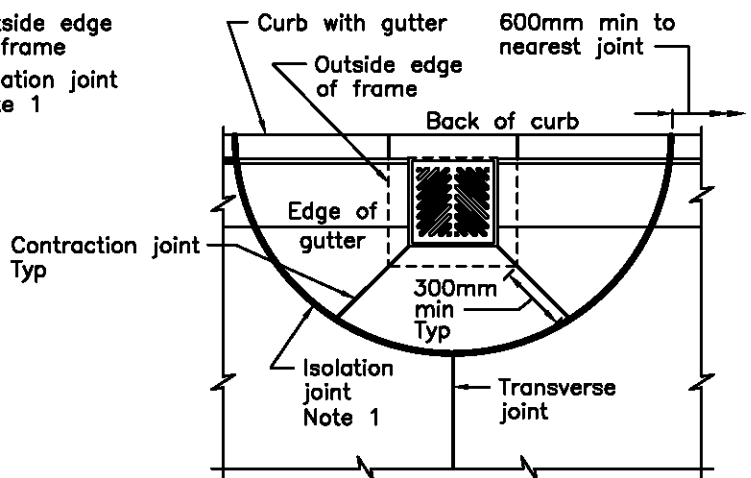
Nov 2008 Rev 2



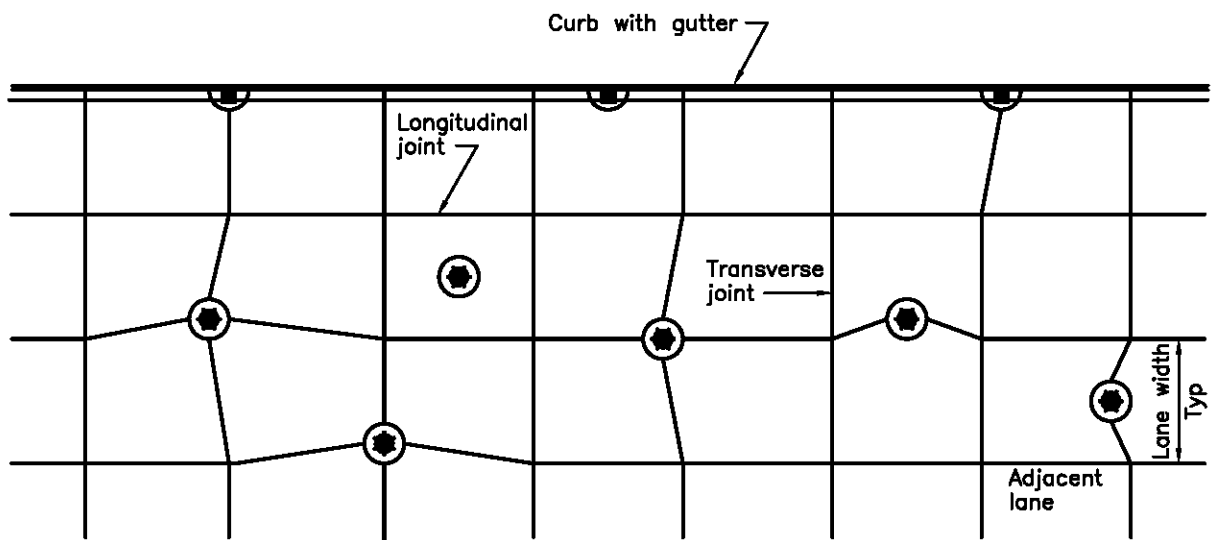
OPSD 551.031



**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

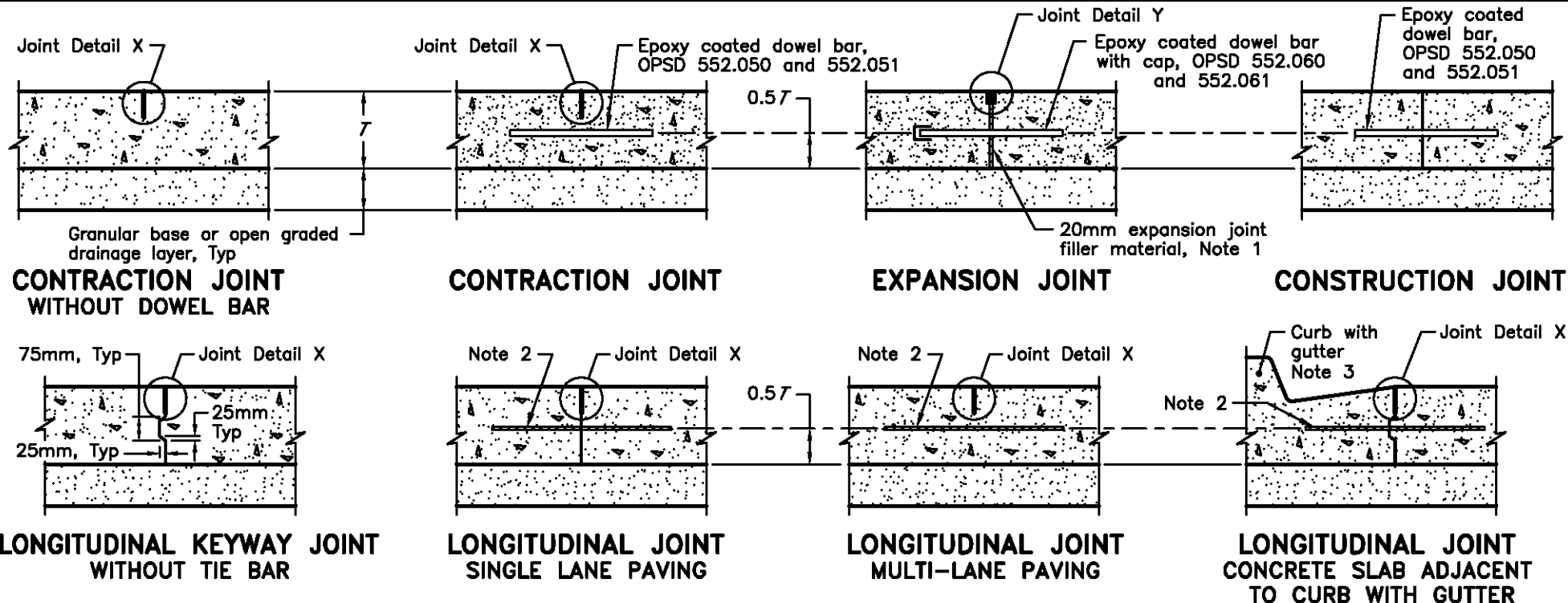
Nov 2008

Rev 2

**CONCRETE AND COMPOSITE PAVEMENT
UTILITY ISOLATION**

OPSD 551.032



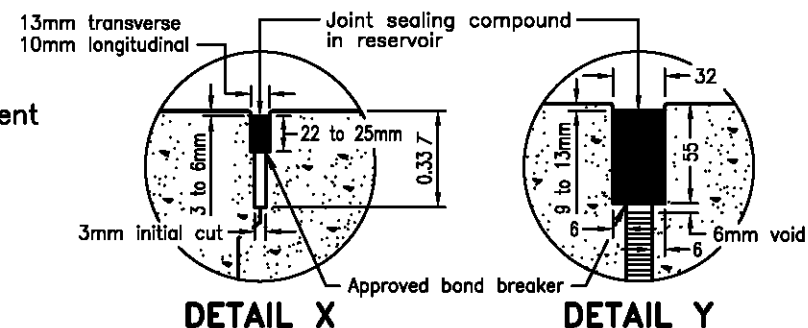


NOTES:

- 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 0.57.
 - 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:

7 – Concrete slab thickness



**JOINT DETAILS
RESERVOIR CUT TYPE**

ONTARIO PROVINCIAL STANDARD DRAWING

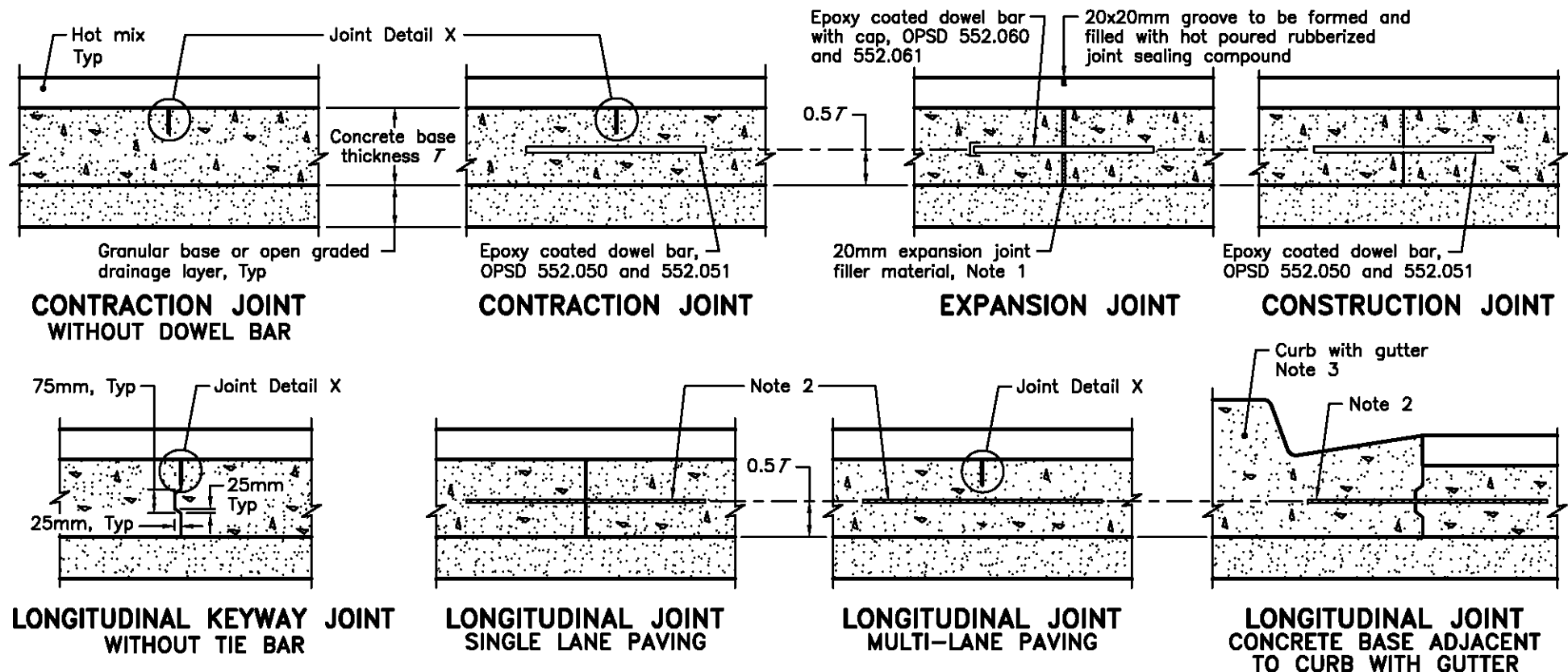
Nov 2008

Rev 1

CONCRETE PAVEMENT JOINT DETAILS

OPSD 552.010



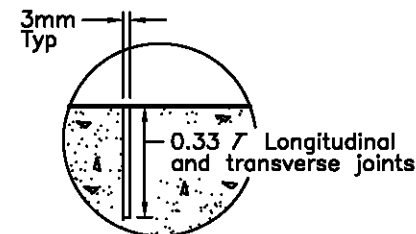


NOTES:

- 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 0.57.
 - 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

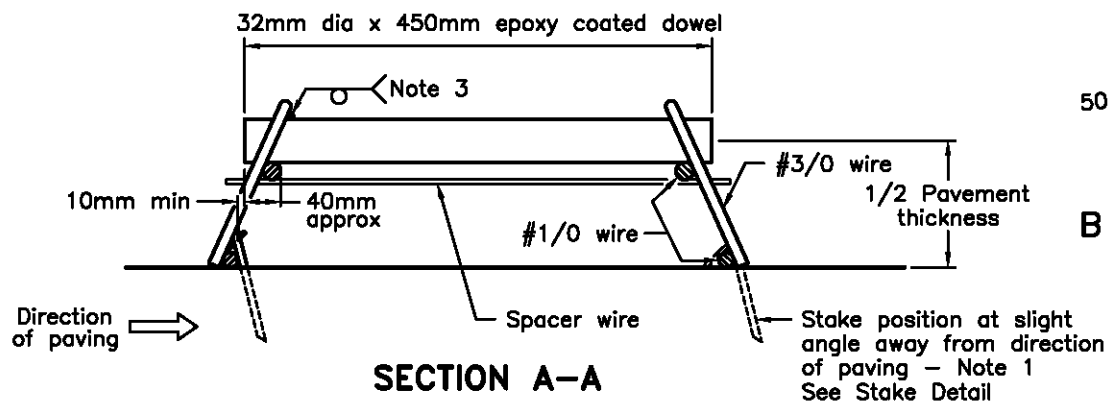
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2008 Rev 1

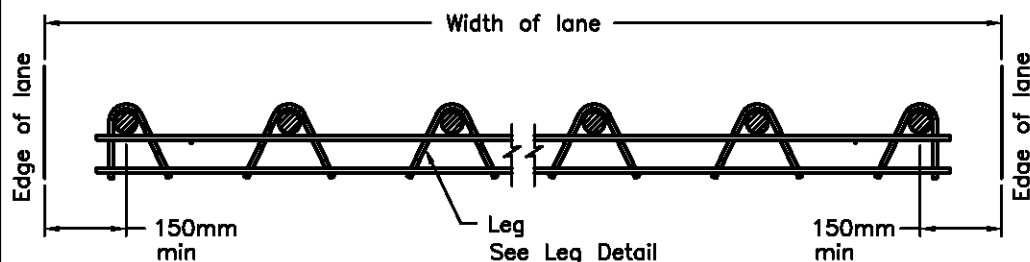
**COMPOSITE PAVEMENT
JOINT DETAILS**

OPSD 552.020

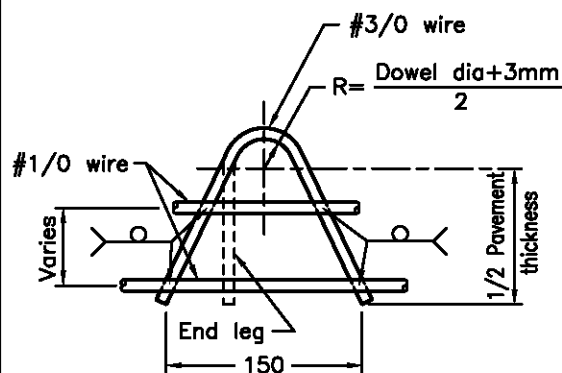




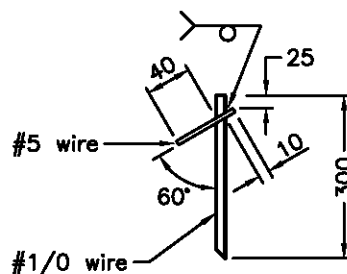
SECTION A-A



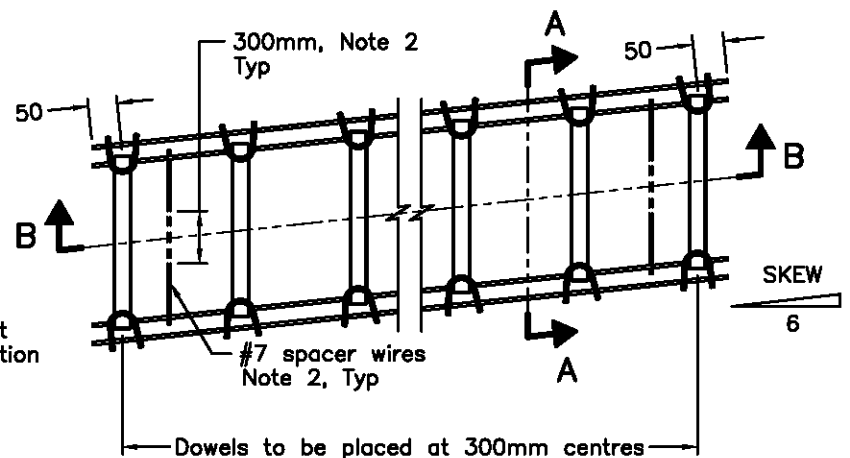
SECTION B-B



LEG DETAIL



STAKE DETAIL



PLAN

NOTES:

- 1 A minimum of 3 stakes shall be uniformly spaced per side per lane.
 - 2 Spacer wire shall be cut in two places and the mid section removed after staking assembly is in position. Section removed shall be a minimum length of 300mm.
 - 3 Arc or resistance spot weld, alternate ends of adjacent dowels only, top or bottom of dowel bar.
- A At bridge approaches the skew shall match the approach slab skew.
- B Load transfer device shall be shop coated with RC-250, Tectyl 506, or Protec 6116-DS Amber.
- C Load transfer devices not required in shoulders or gore areas.
- D All dimensions are in millimetres unless otherwise shown.

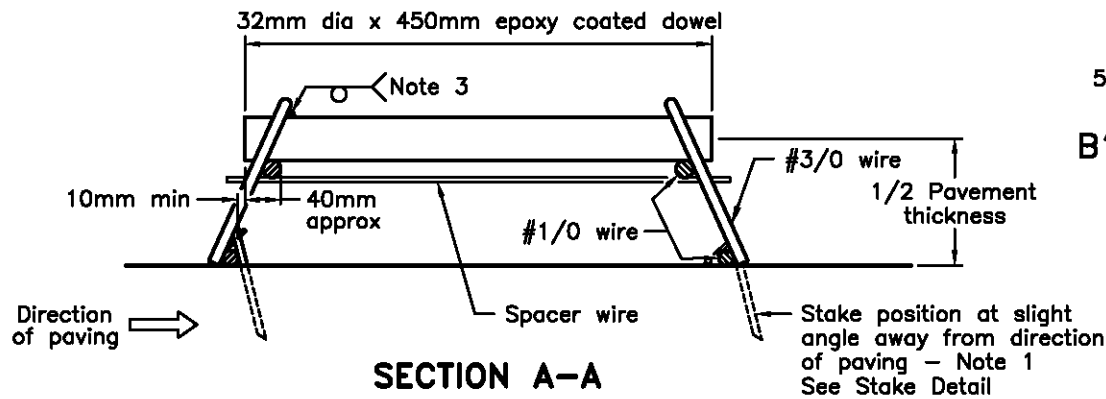
ONTARIO PROVINCIAL STANDARD DRAWING

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

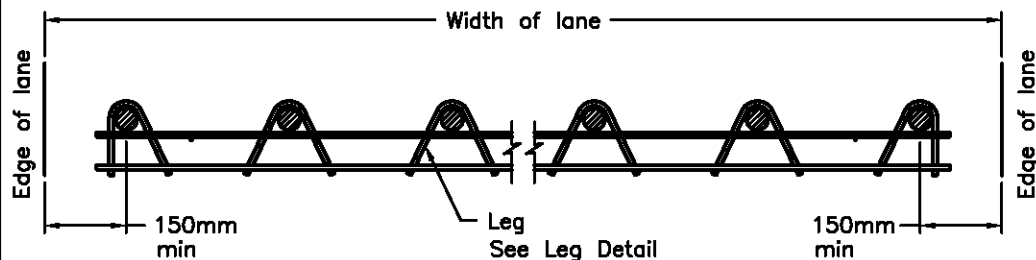
Nov 2008 Rev 2



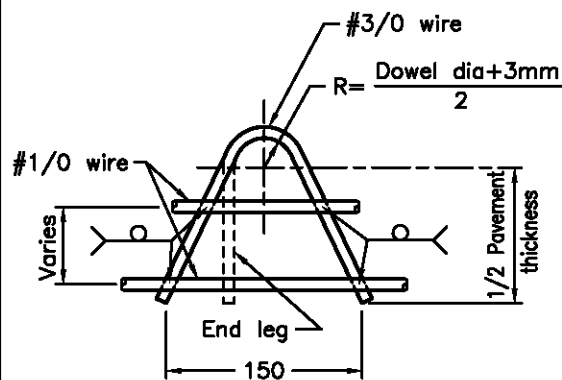
OPSD 552.050



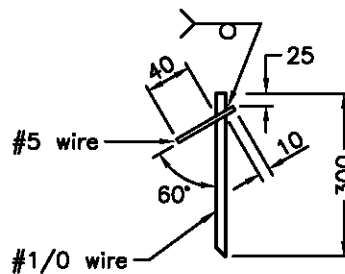
SECTION A-A



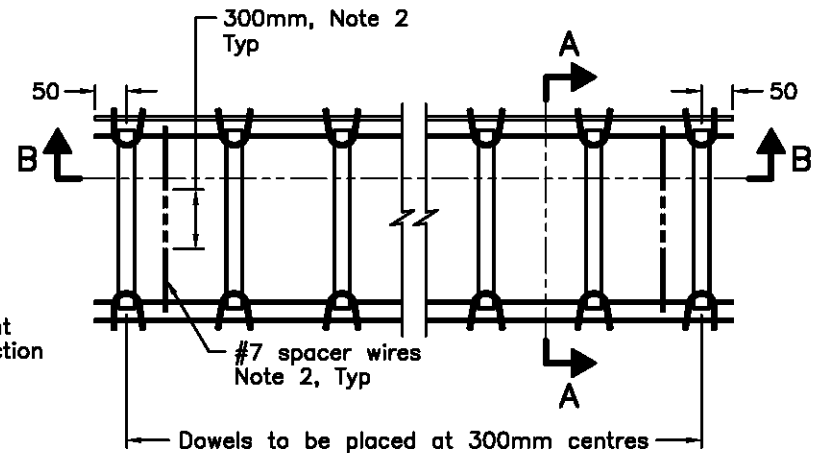
SECTION B-B



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.

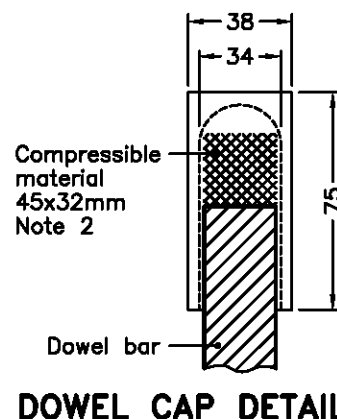
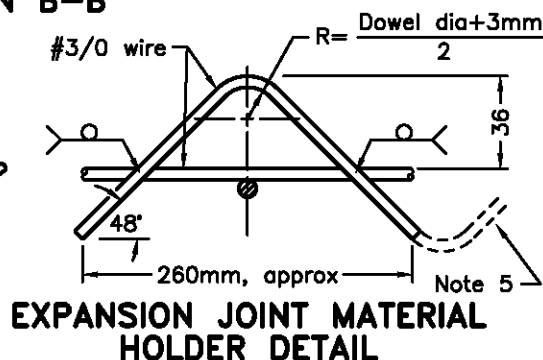
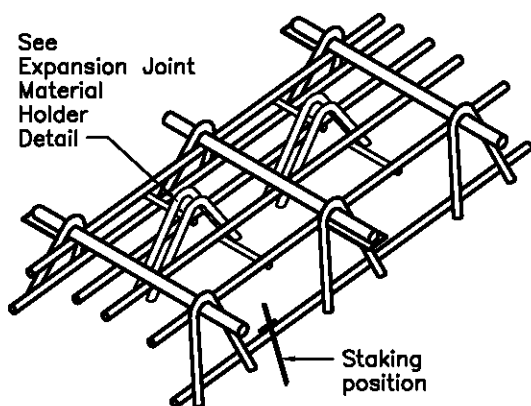
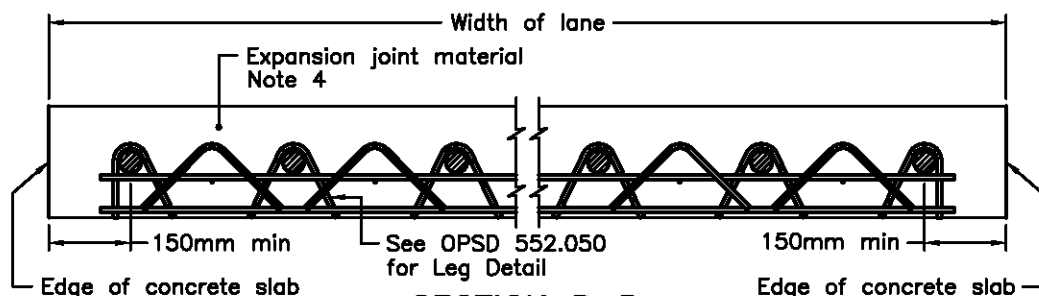
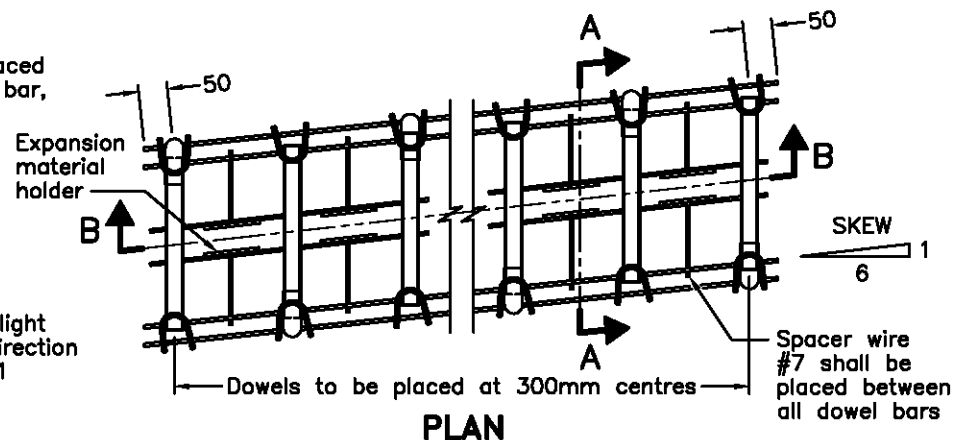
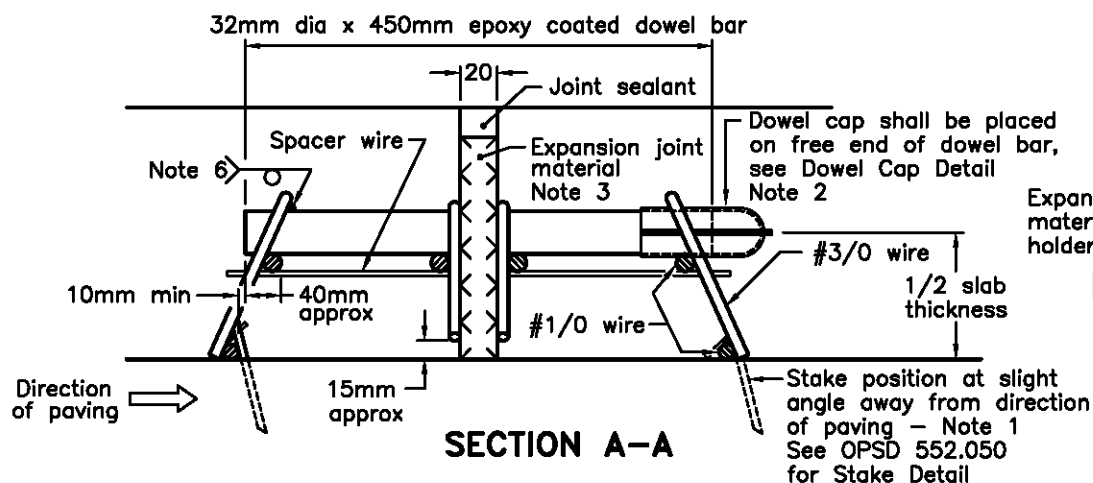
ONTARIO PROVINCIAL STANDARD DRAWING

LOAD TRANSFER DEVICE
RIGHT ANGLE CONTRACTION JOINT
 CONCRETE OR COMPOSITE PAVEMENT

Nov 2008 Rev 2



OPSD 552.051



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.

- 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.

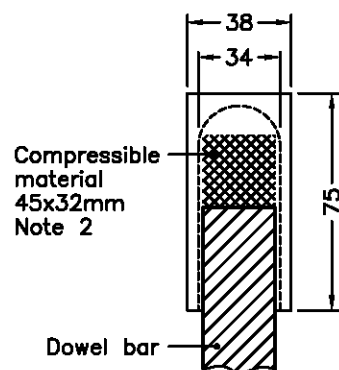
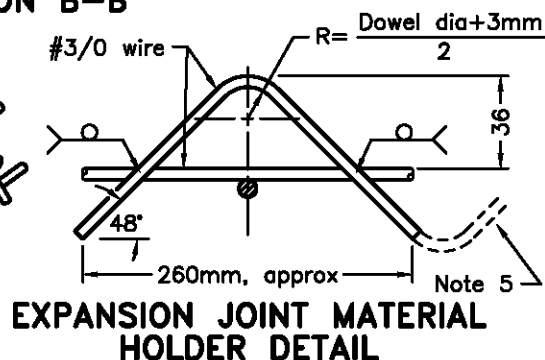
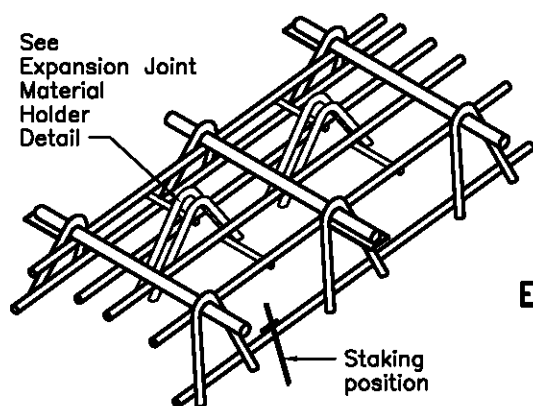
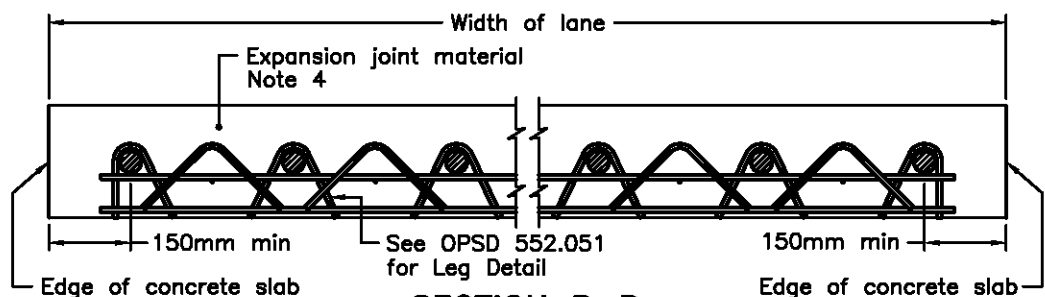
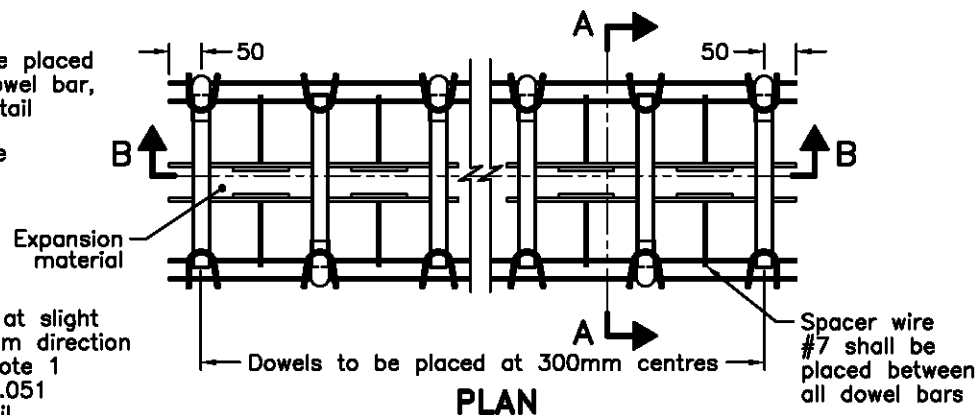
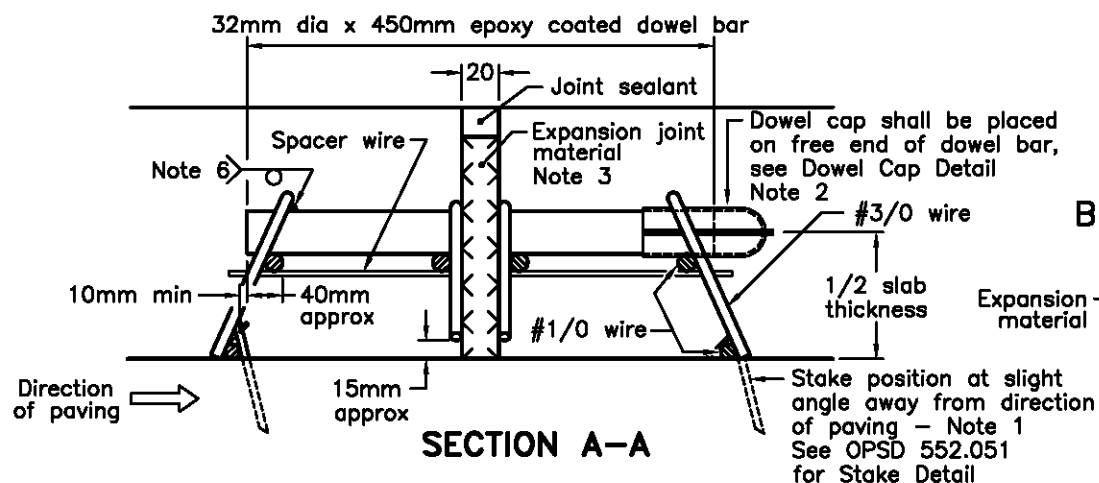
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2008 Rev 2

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

OPSD 552.060





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.

- 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.

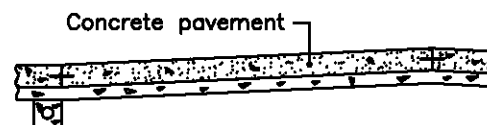
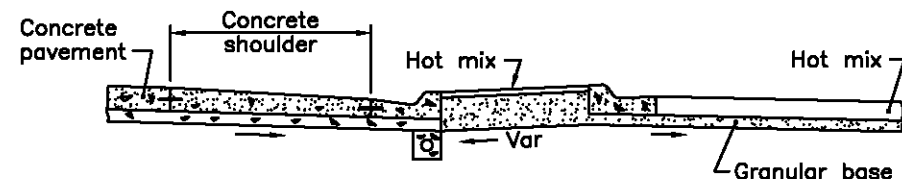
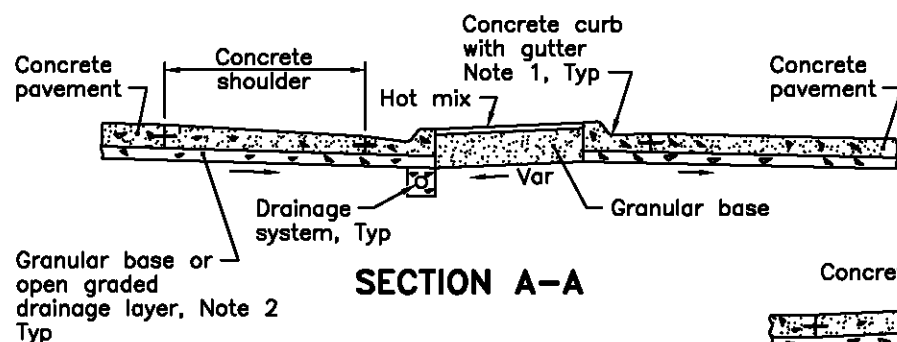
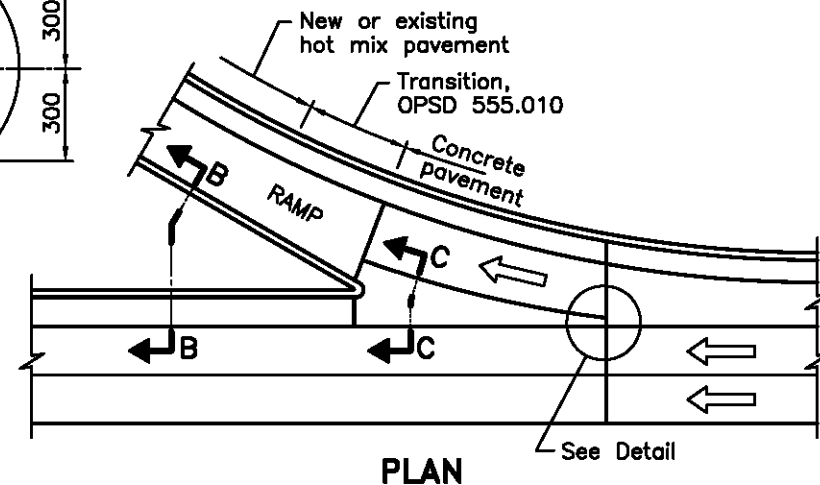
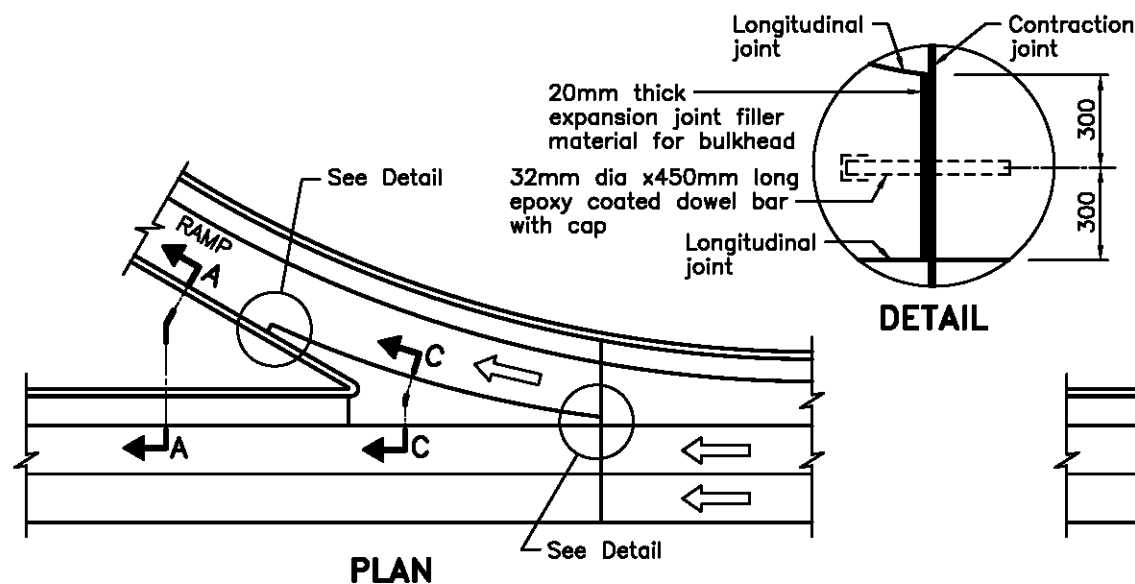
ONTARIO PROVINCIAL STANDARD DRAWING

LOAD TRANSFER DEVICE RIGHT ANGLE EXPANSION JOINT CONCRETE OR COMPOSITE PAVEMENT

Nov 2008 Rev 2



OPSD 552.061



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

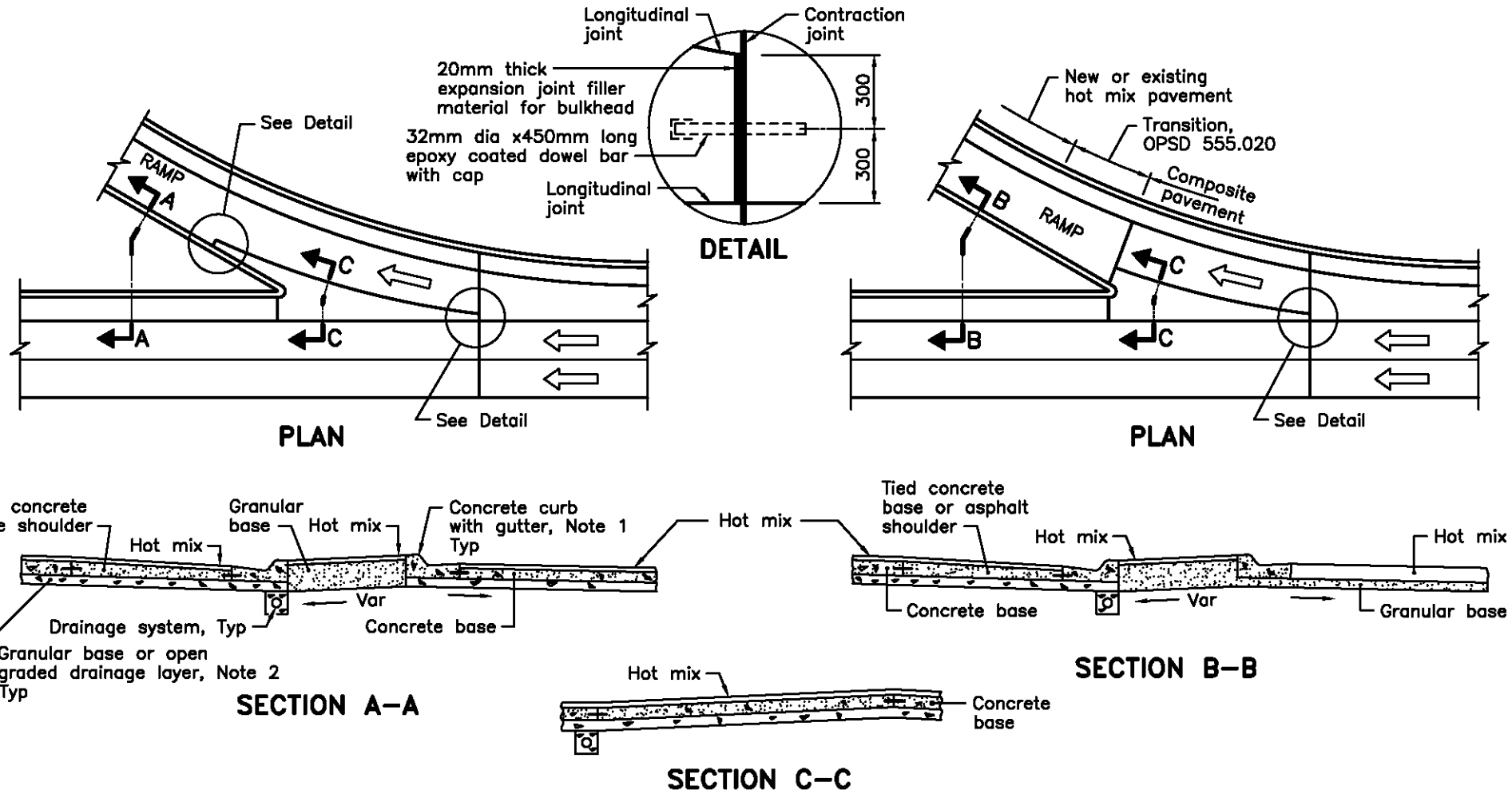
CONCRETE PAVEMENT IN GORE AREAS

Nov 2008

Rev 1



OPSD 553.010



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

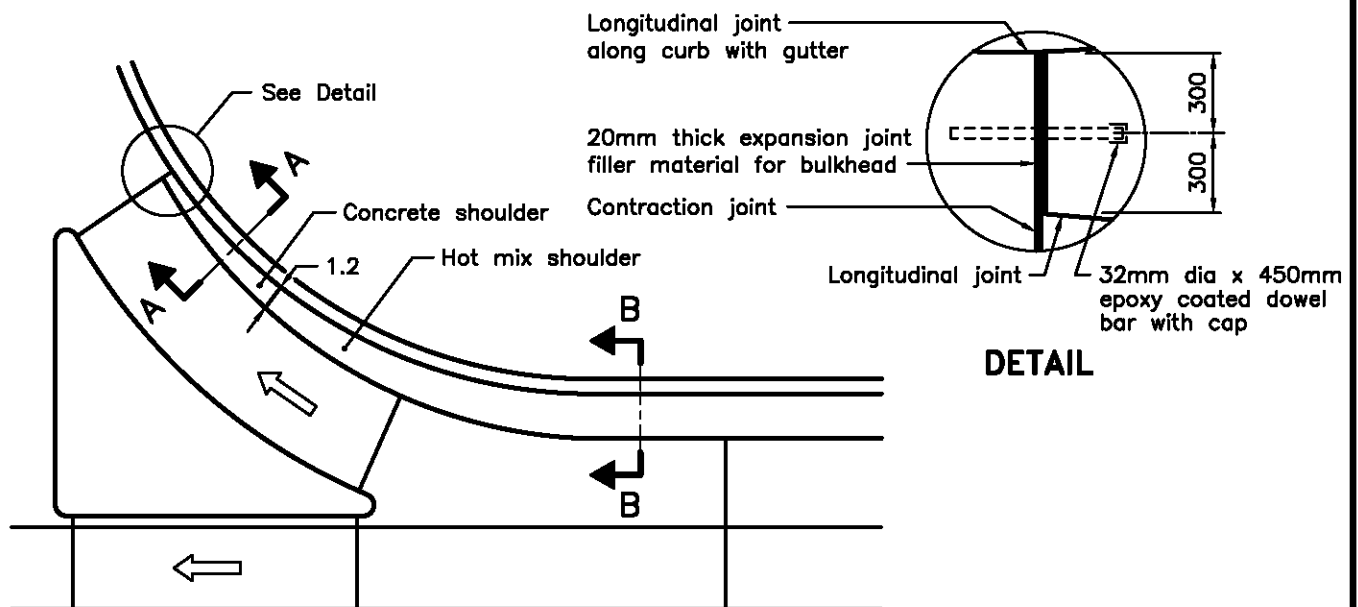
COMPOSITE PAVEMENT IN GORE AREAS

Nov 2008

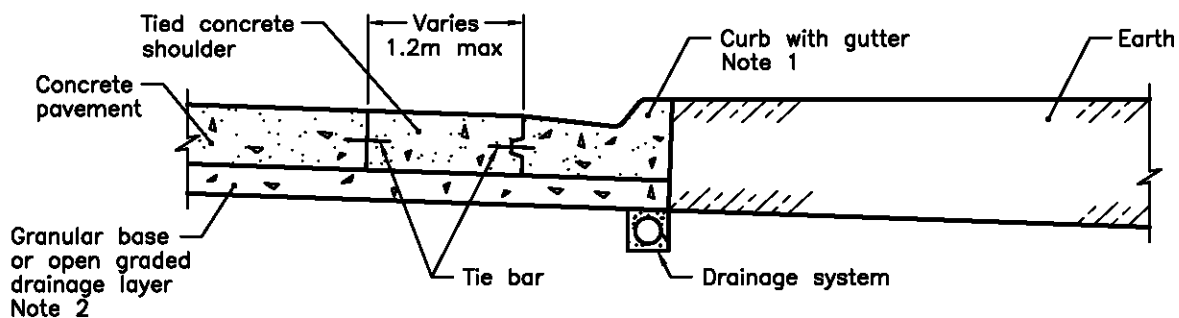
Rev 1



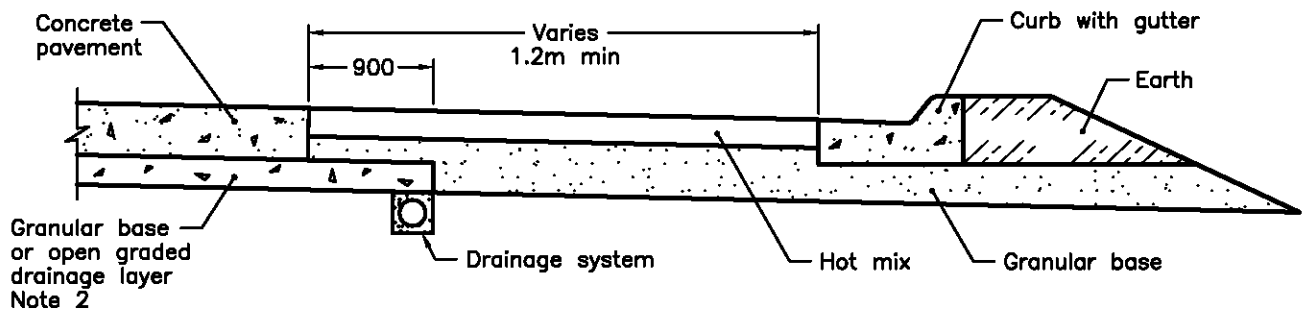
OPSD 553.020



PLAN



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.

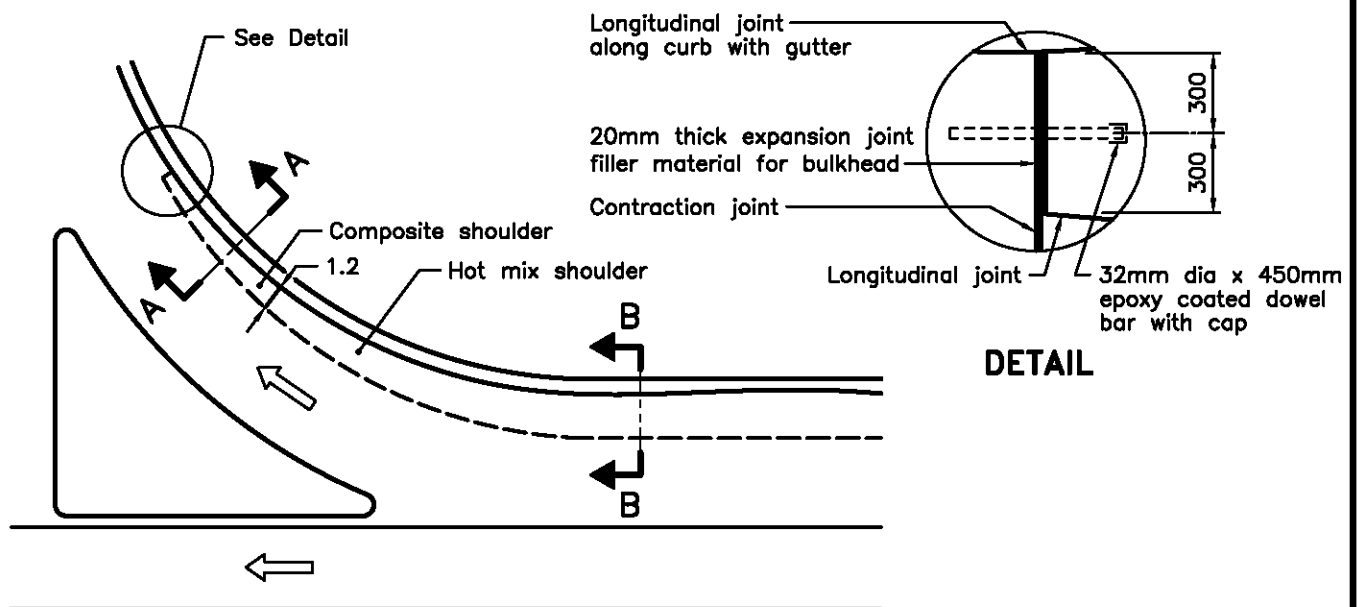
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2008 Rev 1

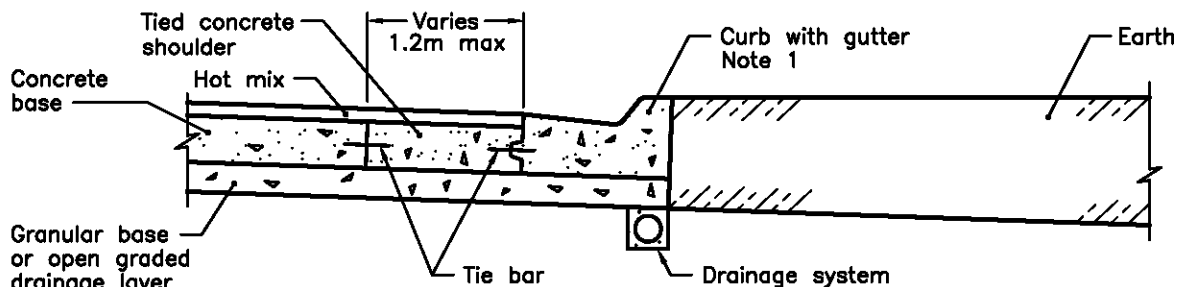
CONCRETE PAVEMENT
SHOULDER TERMINAL



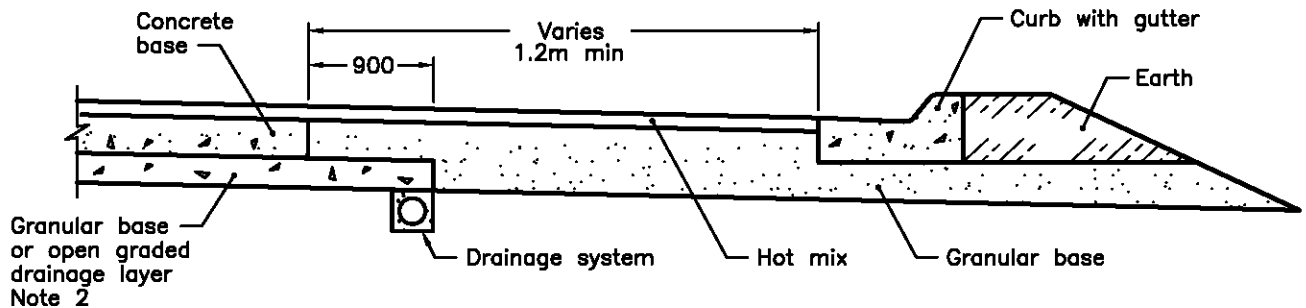
OPSD 554.010



PLAN



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.

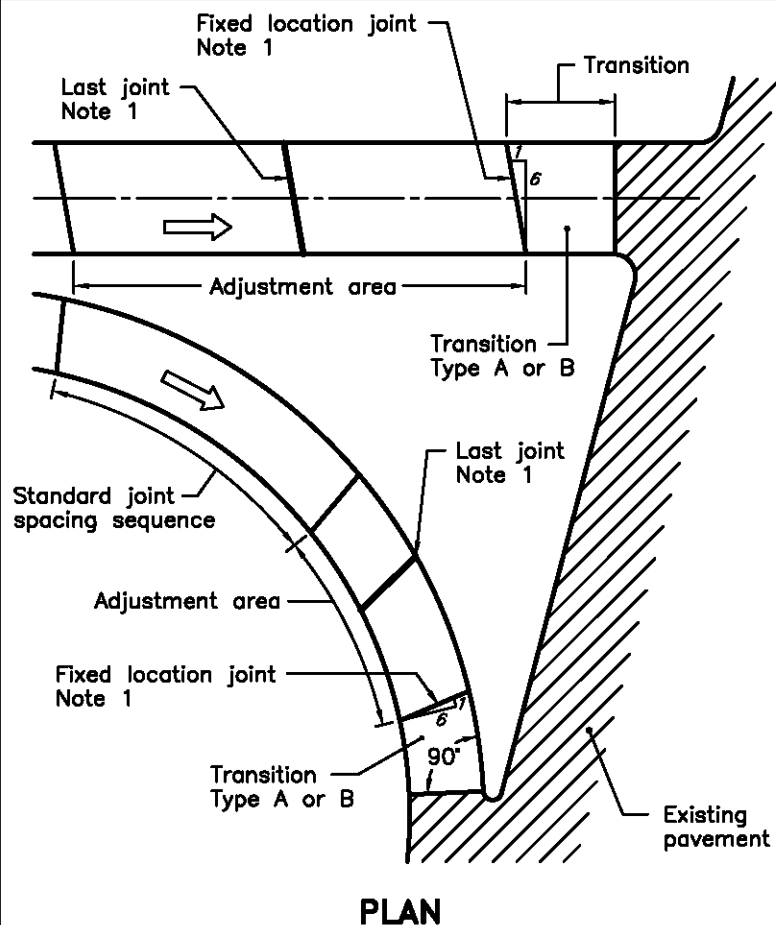
ONTARIO PROVINCIAL STANDARD DRAWING

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**COMPOSITE PAVEMENT
SHOULDER TERMINAL**



OPSD 554.020



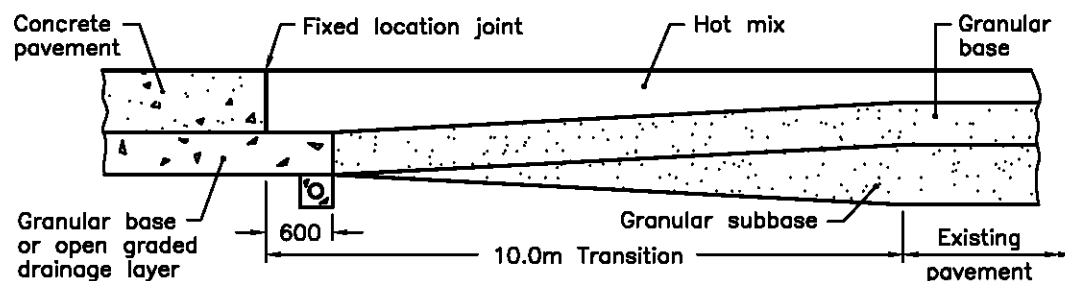
NOTES:

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.

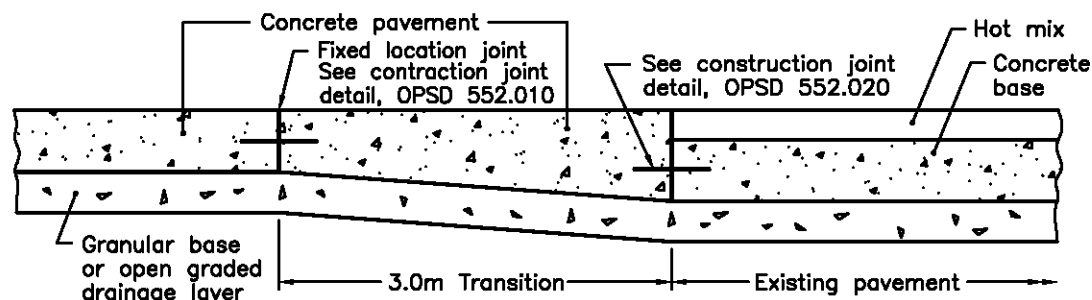
A When base is open graded drainage layer, a minimum 100mm of Granular A material is required beneath it.

B For details of approach slab see bridge drawing.

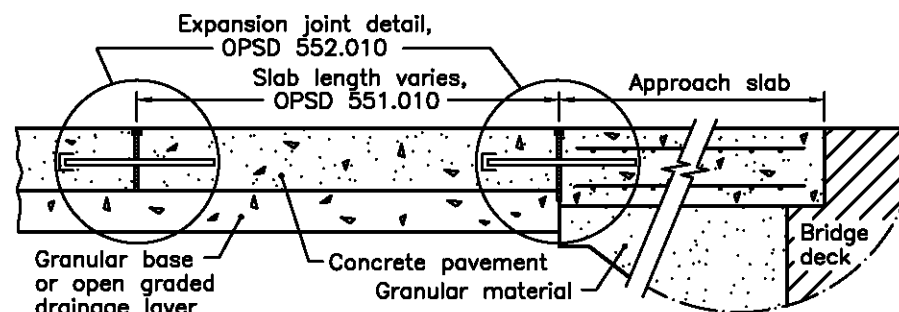
C All dimensions are in millimetres unless otherwise shown.



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

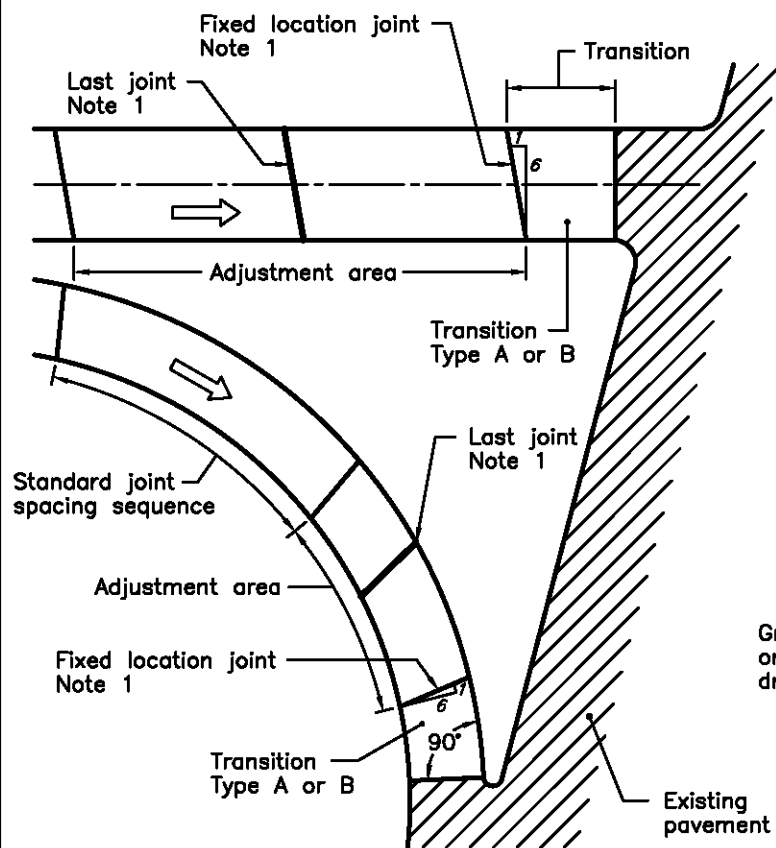
ONTARIO PROVINCIAL STANDARD DRAWING

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

Nov 2008 Rev 1



OPSD 555.010



PLAN

NOTES:

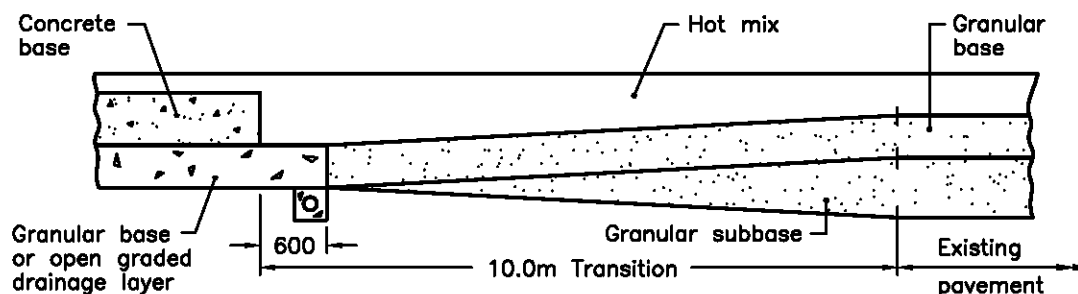
1 Adjust the position of the last joint immediately previous to the fixed location joint, so that the slabs on each side of this last joint are not shorter than 3.0m, nor longer than 5.0m. Last joint to be an expansion joint for Type B section.

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

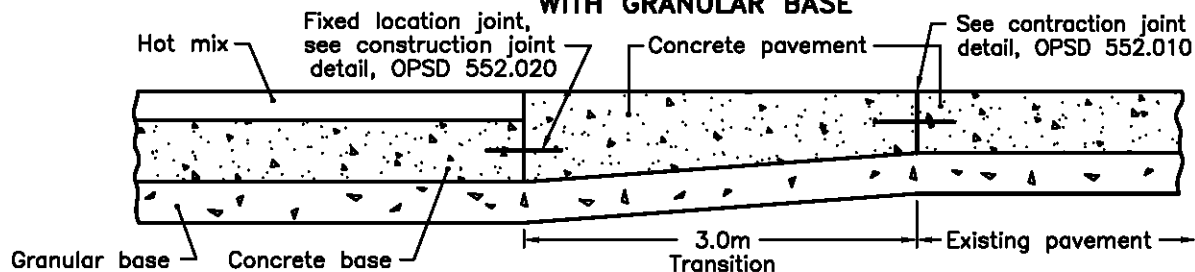
B All concrete surfaces in contact with hot mix pavement shall be treated with a tack coat prior to hot mix paving.

C For details of approach slab see bridge drawing.

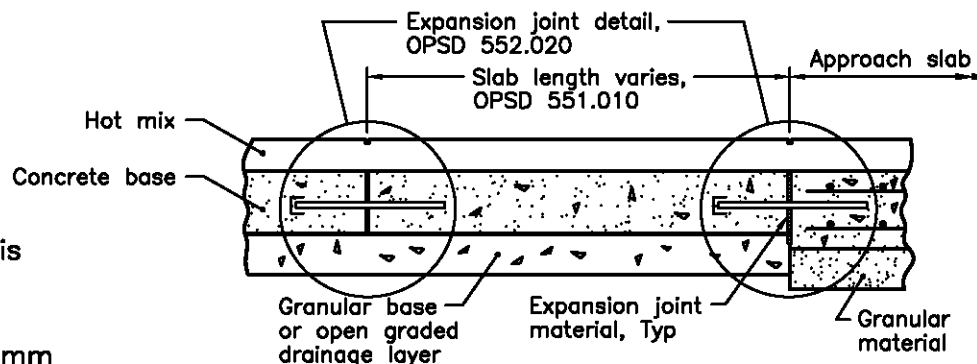
D All dimensions are in millimetres unless otherwise shown.



**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**

ONTARIO PROVINCIAL STANDARD DRAWING

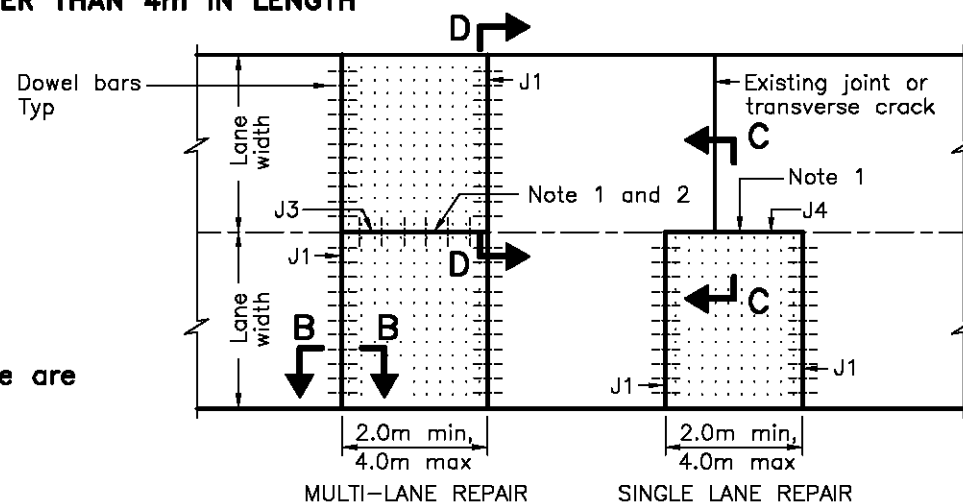
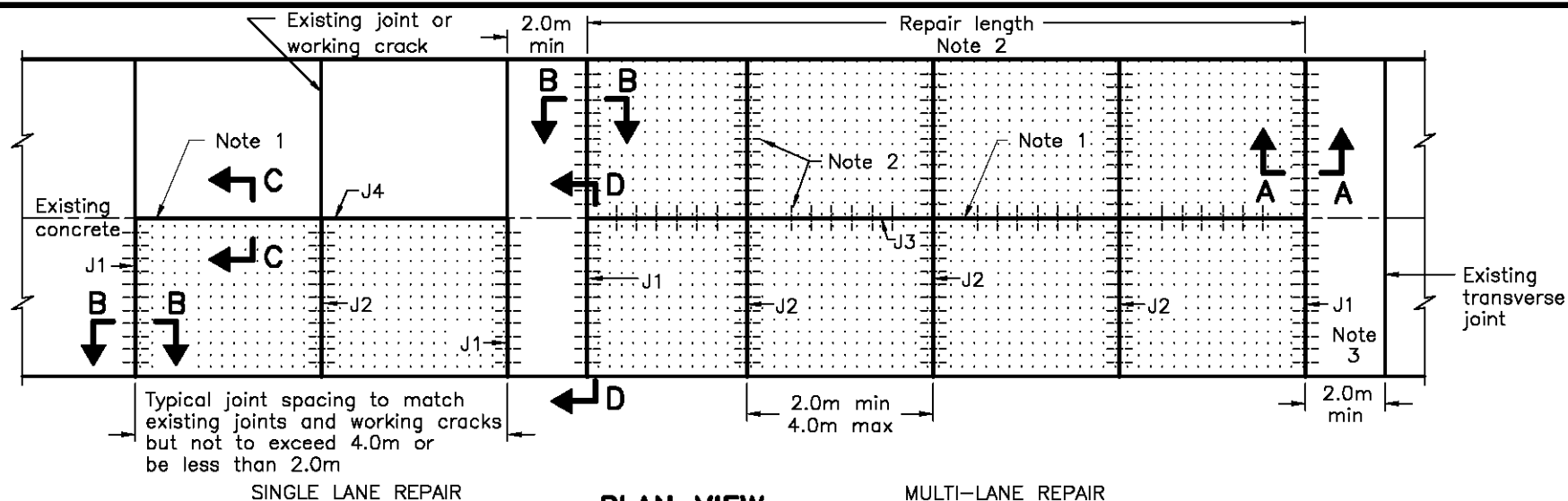
**COMPOSITE PAVEMENT
APPROACH TREATMENT TO
HOT MIX AND CONCRETE PAVEMENTS AND
STRUCTURE APPROACHES**

Nov 2008

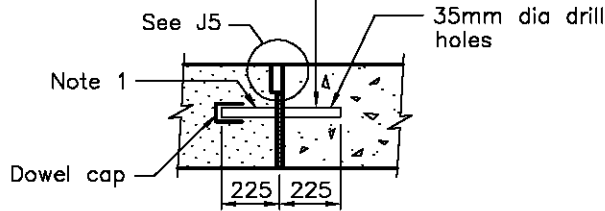
Rev 1

OPSD 555.020



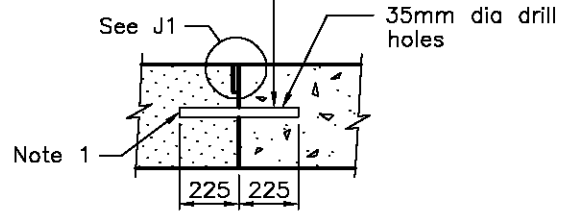


32mm dia x 450mm long epoxy coated smooth dowel bars grouted into holes with epoxy resin
Note 2

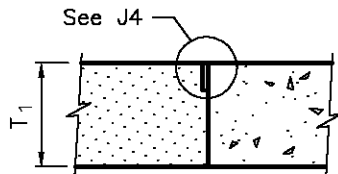


**SECTION A-A
EXPANSION JOINT**

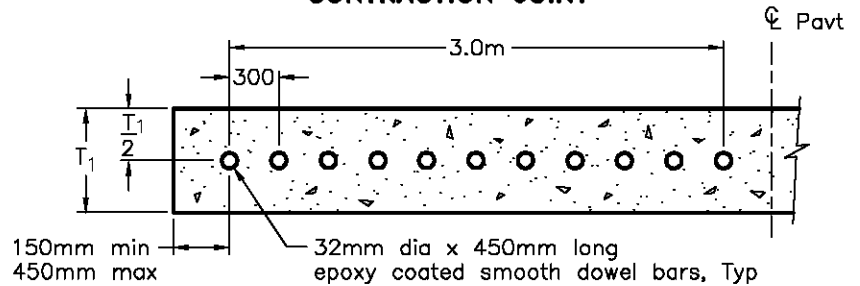
32mm dia x 450mm long epoxy coated smooth dowel bars grouted into holes with epoxy resin
Note 2



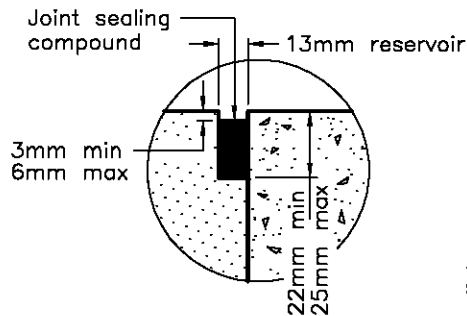
**SECTION B-B
CONTRACTION JOINT**



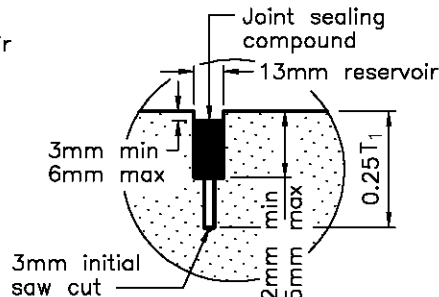
**SECTION C-C
LONGITUDINAL JOINT**



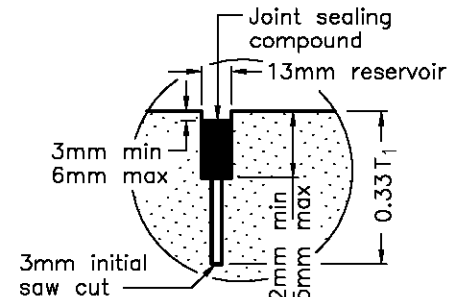
SECTION D-D



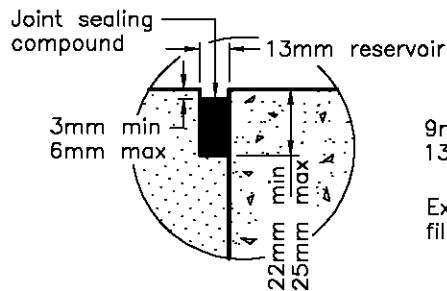
J1, CONTRACTION JOINT



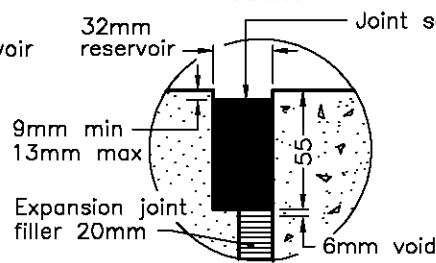
J2, CONTRACTION JOINT



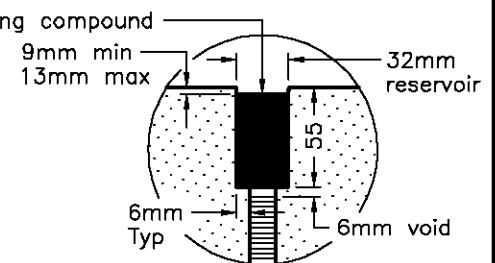
J3, LONGITUDINAL JOINT



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

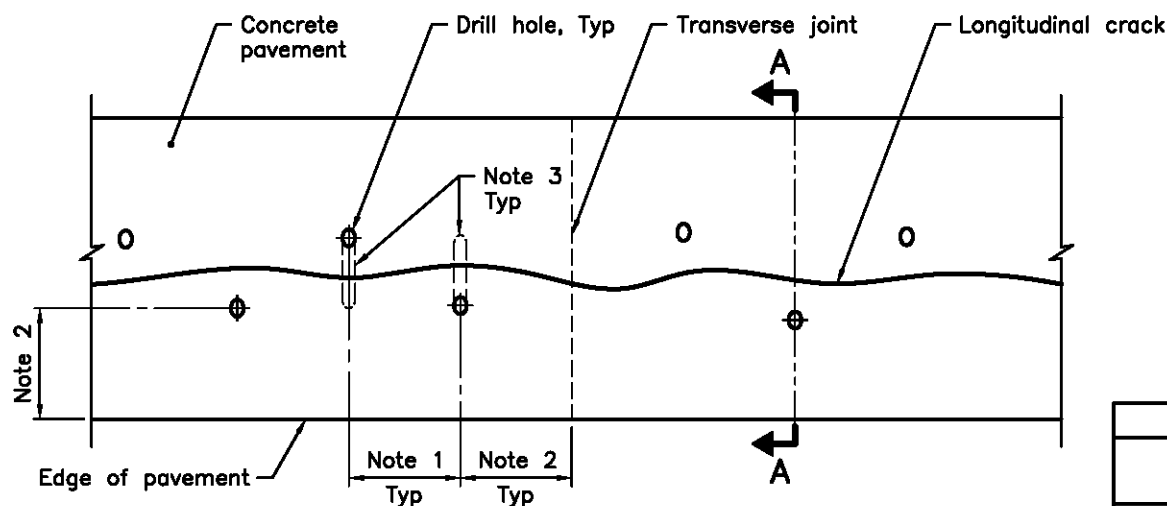
Nov 2010

Rev 2

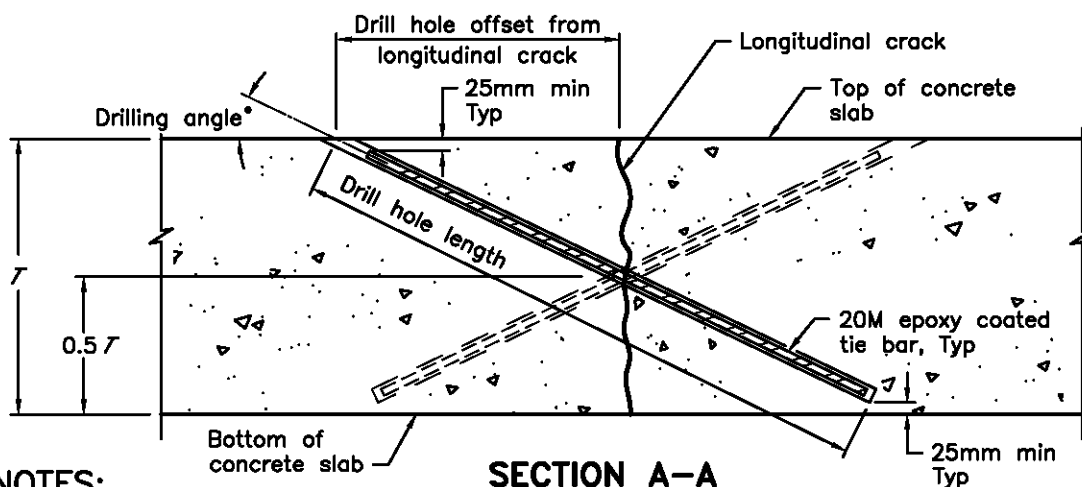
**EXPOSED CONCRETE PAVEMENT
FULL DEPTH CONCRETE SLAB REPAIR
JOINT DETAILS**

OPSD 560.020





PLAN



SECTION A-A

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:

γ – Concrete pavement thickness

Cross-Stitching Drill Hole and Tie Bar Requirements				
γ	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

ONTARIO PROVINCIAL STANDARD DRAWING

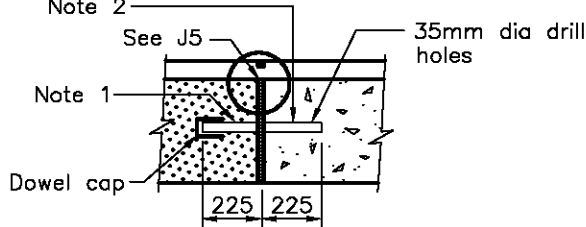
Nov 2008 Rev 0

**CONCRETE PAVEMENT
AND CONCRETE BASE
CROSS-STITCHING LONGITUDINAL CRACKS**

OPSD 560.025

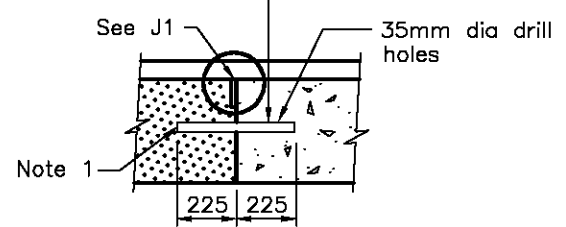


32mm dia x 450mm long epoxy coated smooth dowel bars grouted into holes with epoxy resin,
Note 2



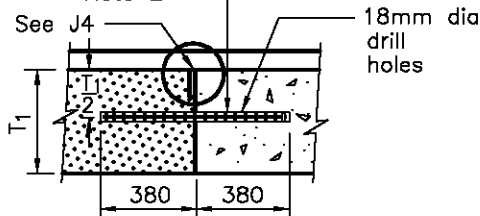
**SECTION A-A
EXPANSION JOINT**

32mm dia x 450mm long epoxy coated smooth dowel bars grouted into holes with epoxy resin,
Note 2

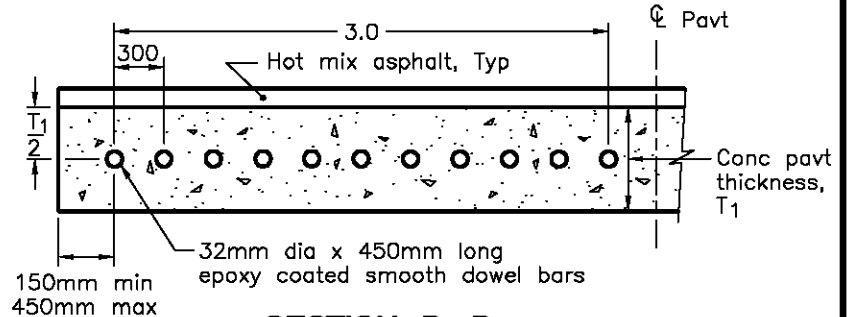


**SECTION B-B
CONTRACTION JOINT**

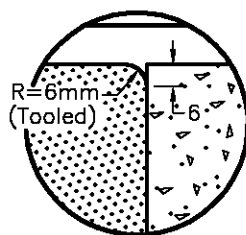
15mm dia epoxy coated deformed tie bars grouted into holes with epoxy resin at 600mm centres,
Note 2



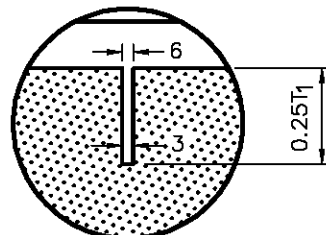
**SECTION C-C
LONGITUDINAL JOINT**



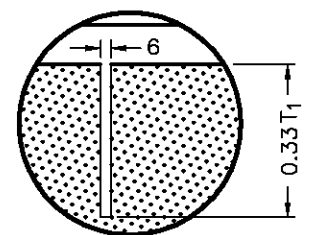
SECTION D-D



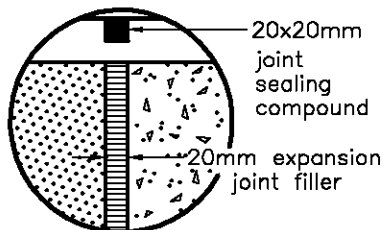
**J1, CONTRACTION JOINT
J4, LONGITUDINAL JOINT**



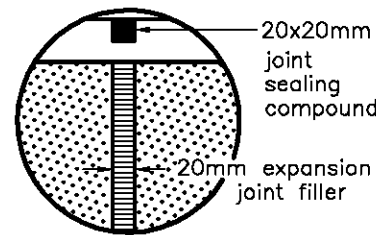
J2, CONTRACTION JOINT



**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

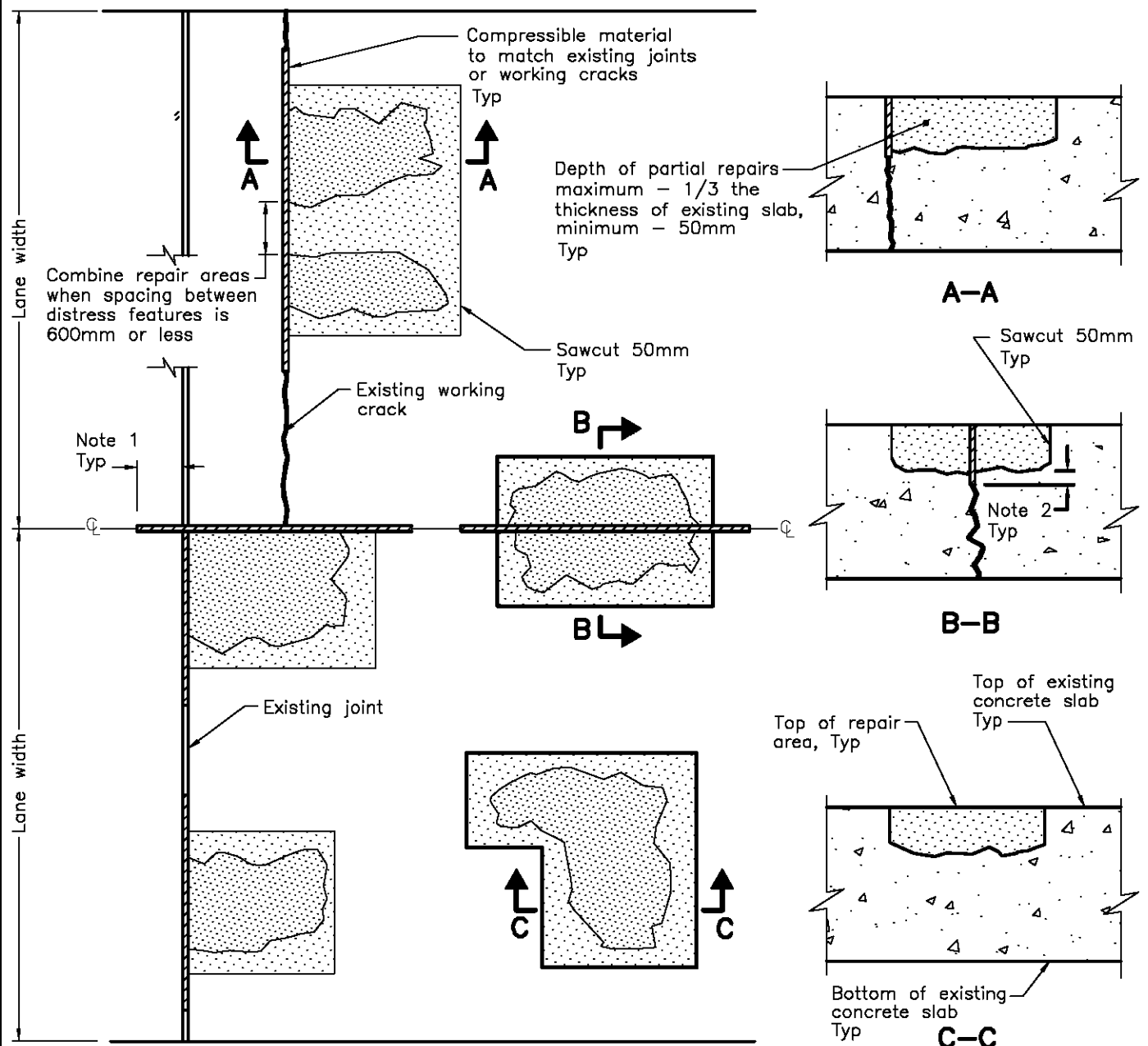
Rev 1

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:



ONTARIO PROVINCIAL STANDARD DRAWING

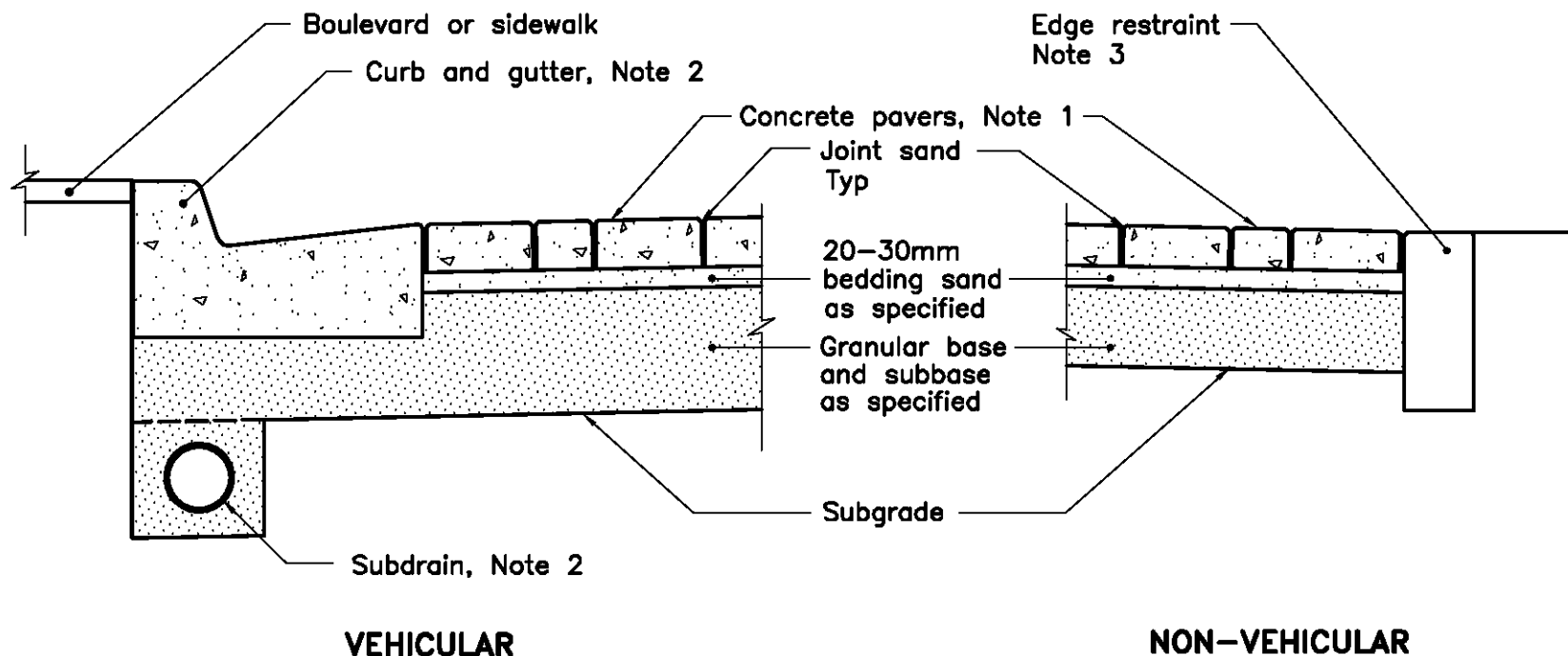
Nov 2010

Rev 1

**PARTIAL DEPTH REPAIRS
IN CONCRETE PAVEMENT**



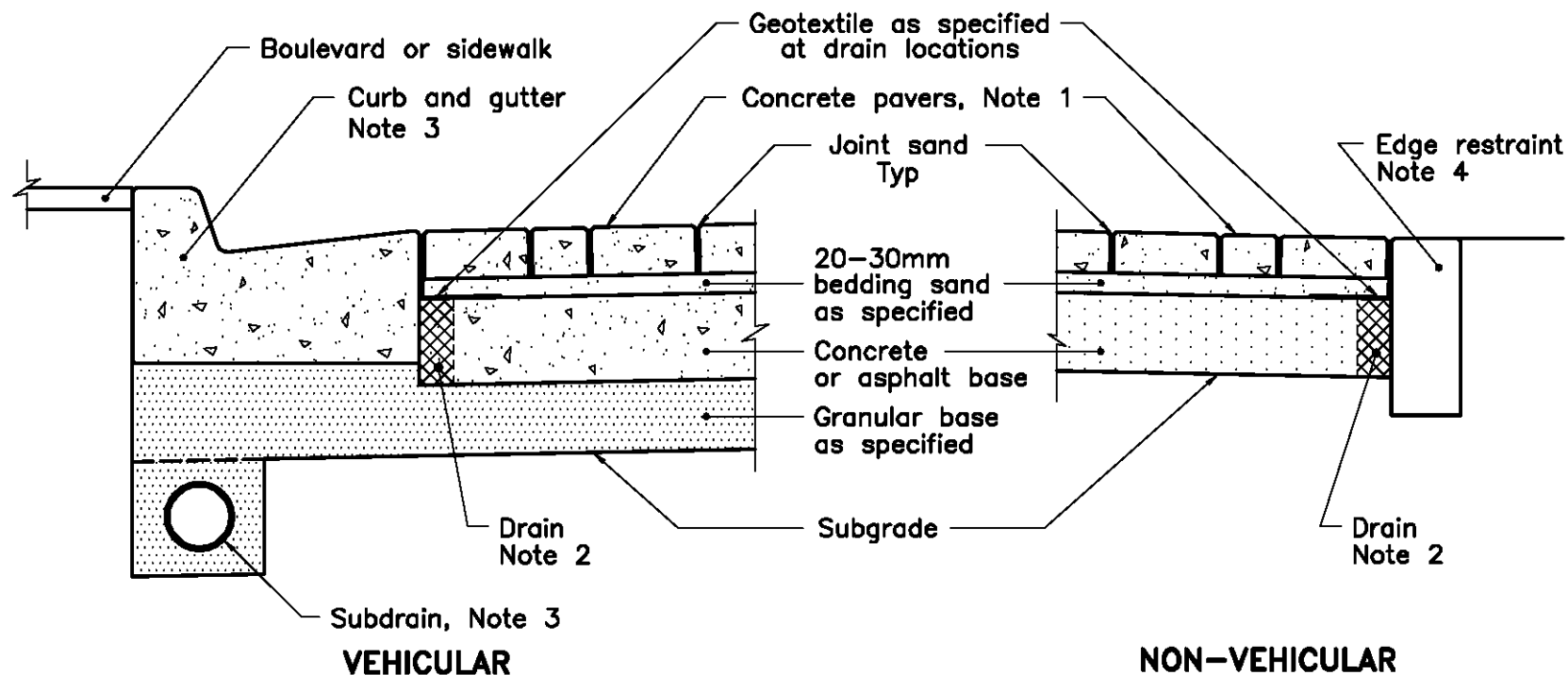
OPSD 560.040



NOTES:

- 1 Concrete paver thickness:
 - for vehicular traffic – 80mm minimum.
 - for non-vehicular traffic – 60mm minimum.
- 2 This OPSD shall be read in conjunction with OPSD 200 and 600 series drawings.
- 3 Edge restraint according to manufacturer's requirements.
- A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2016	Rev	2	
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 shall be installed at low points and selected intervals through concrete or asphalt base to suit subgrade conditions.
- 3 This OPSD shall be read in conjunction with OPSD 200 and 600 Series drawings.
- 4 Edge restraint according to manufacturer's requirements.
- A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

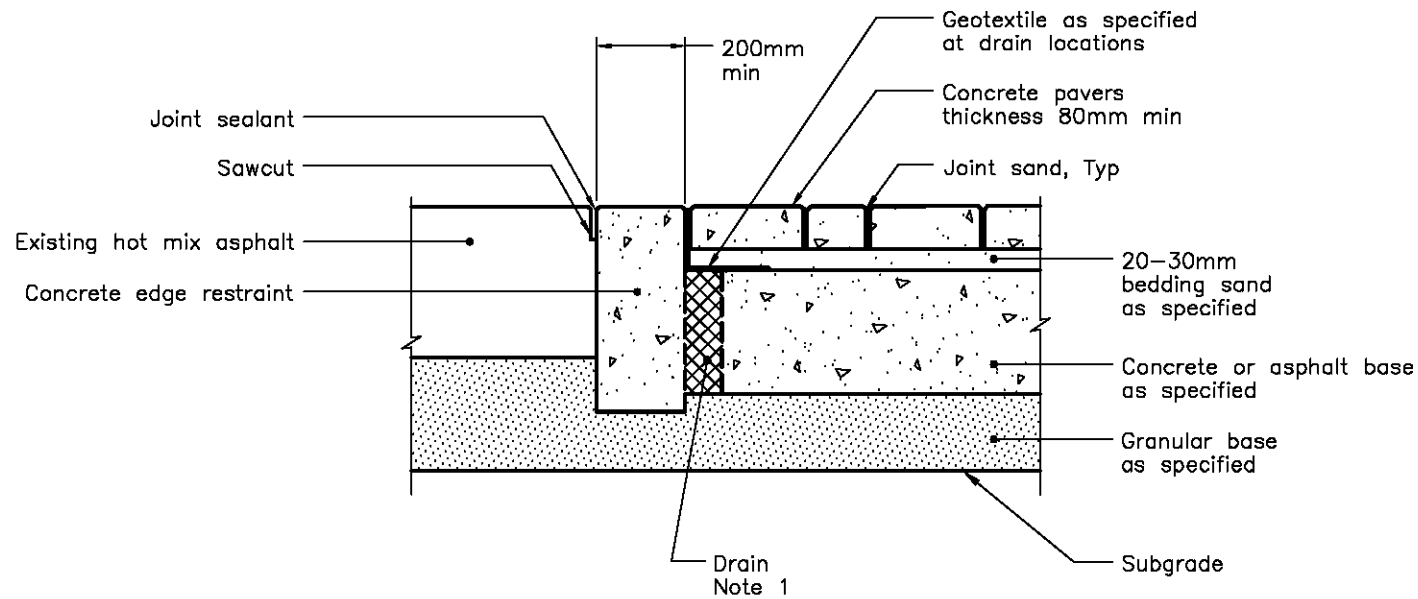
Nov 2016

Rev 2

**INTERLOCKING CONCRETE PAVERS
ON CONCRETE OR ASPHALT BASE**

OPSD 561.020





NOTES:

1 Drains shall 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

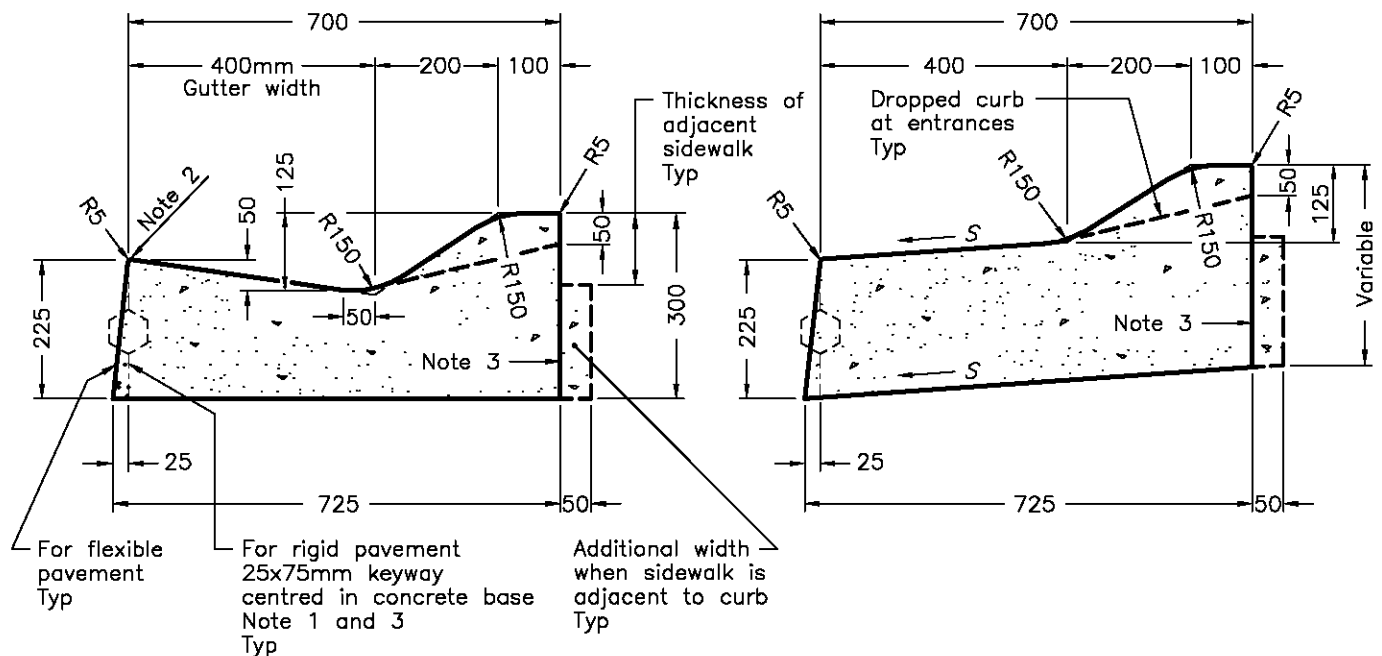
Nov 2016

Rev 2

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.

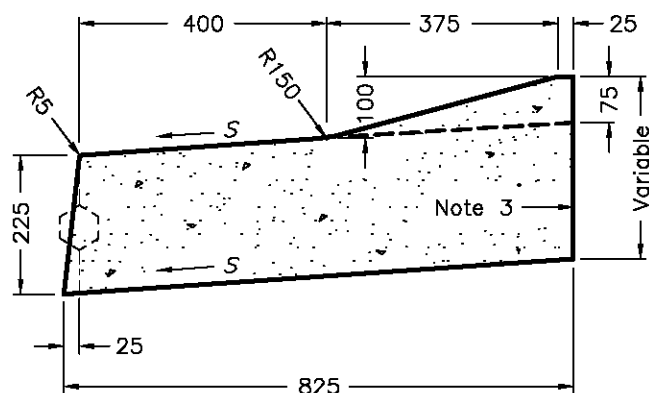
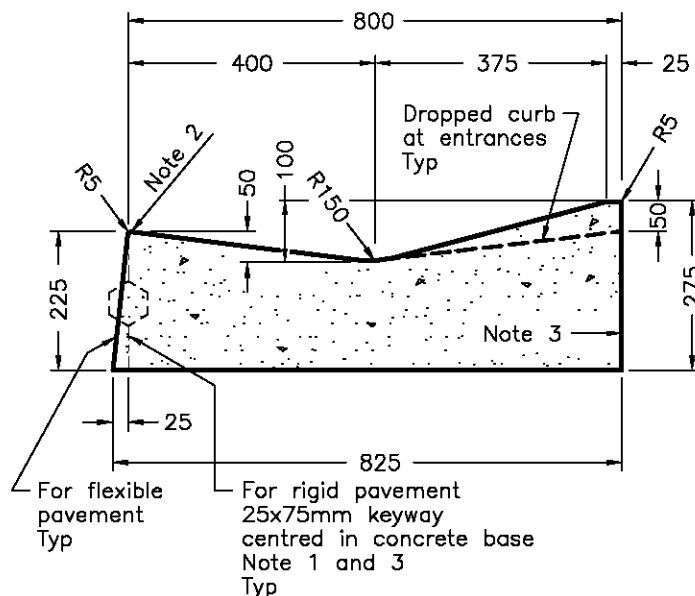
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2

CONCRETE SEMI-MOUNTABLE
CURB WITH WIDE GUTTER

OPSD 600.020





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.

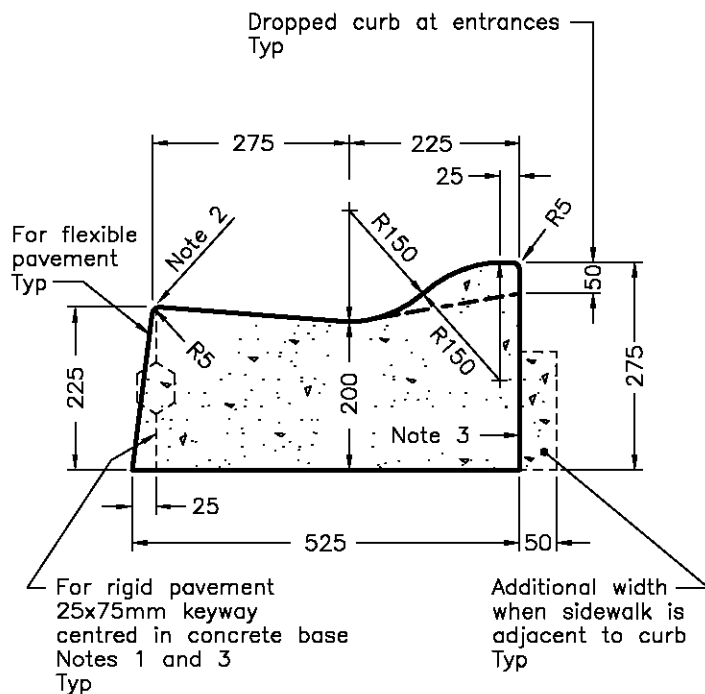
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2

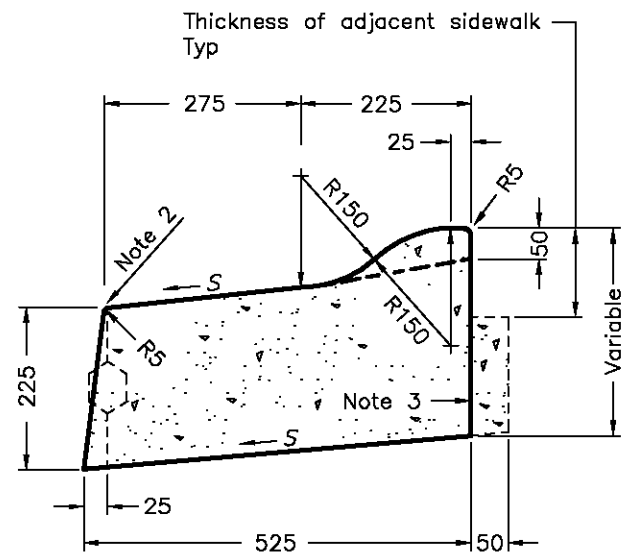
**CONCRETE MOUNTABLE CURB
WITH WIDE GUTTER**

OPSD 600.030





TANGENT



SUPERELEVATED

LEGEND:

S — Rate of pavement superelevation in percent, %.

NOTES:

- 1 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.

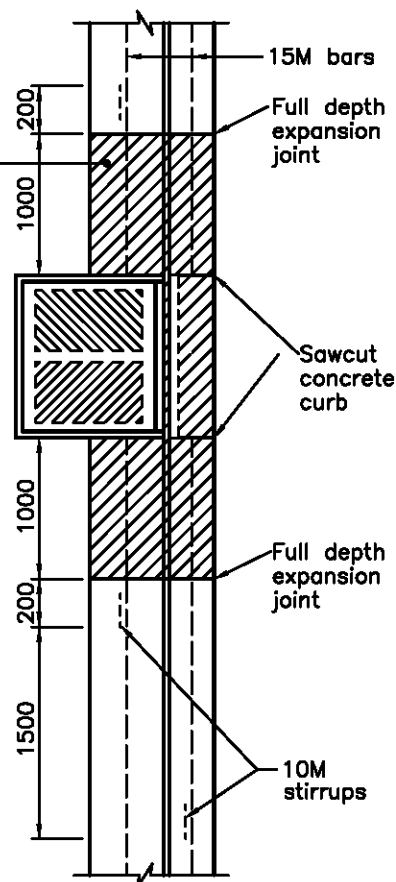
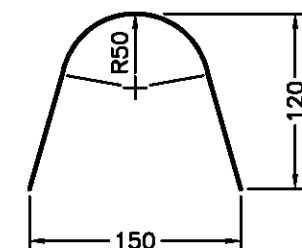
ONTARIO PROVINCIAL STANDARD DRAWING

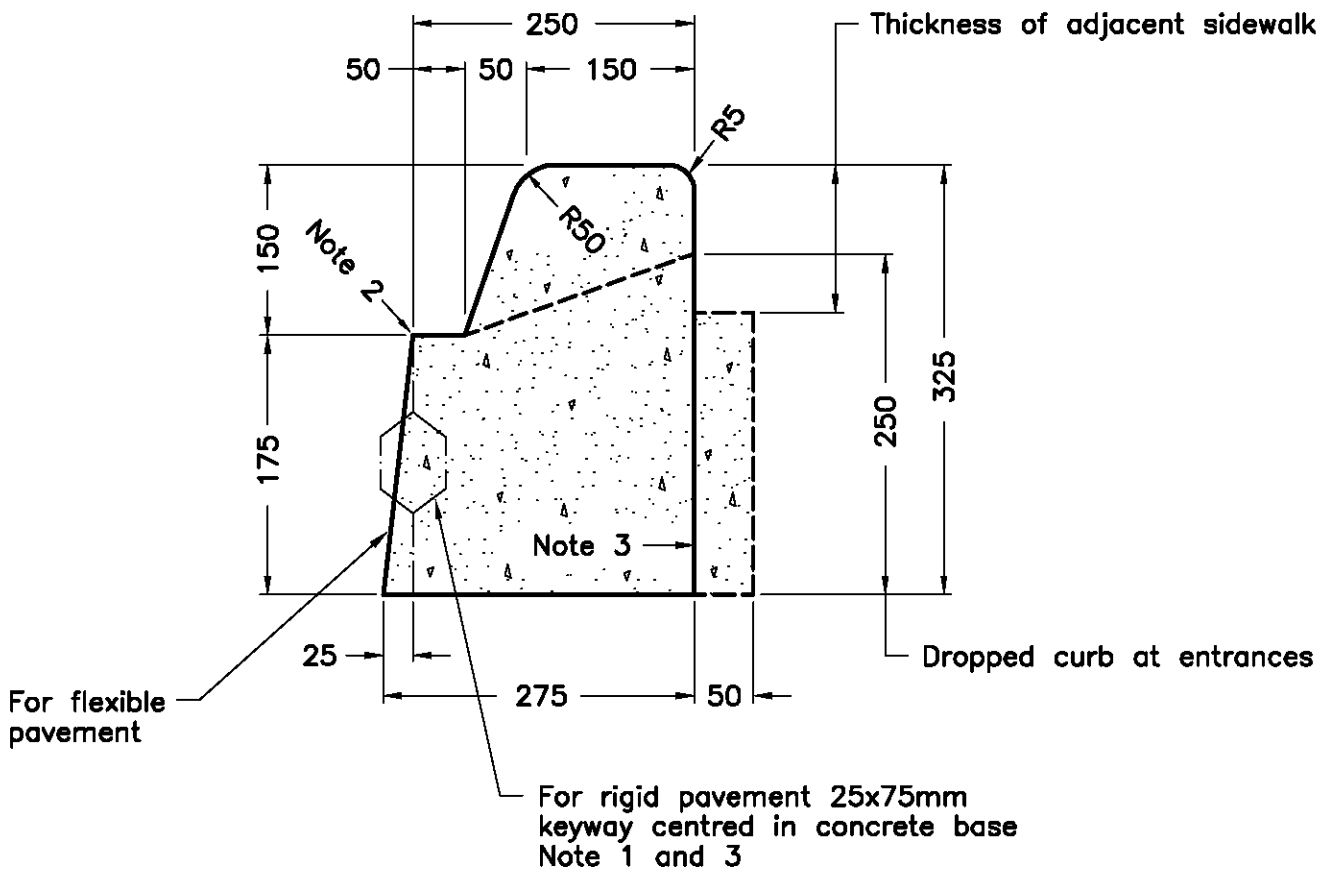
Nov 2012 | Rev | 2

**CONCRETE SEMI-MOUNTABLE
CURB WITH STANDARD GUTTER**

OPSD 600.060







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.

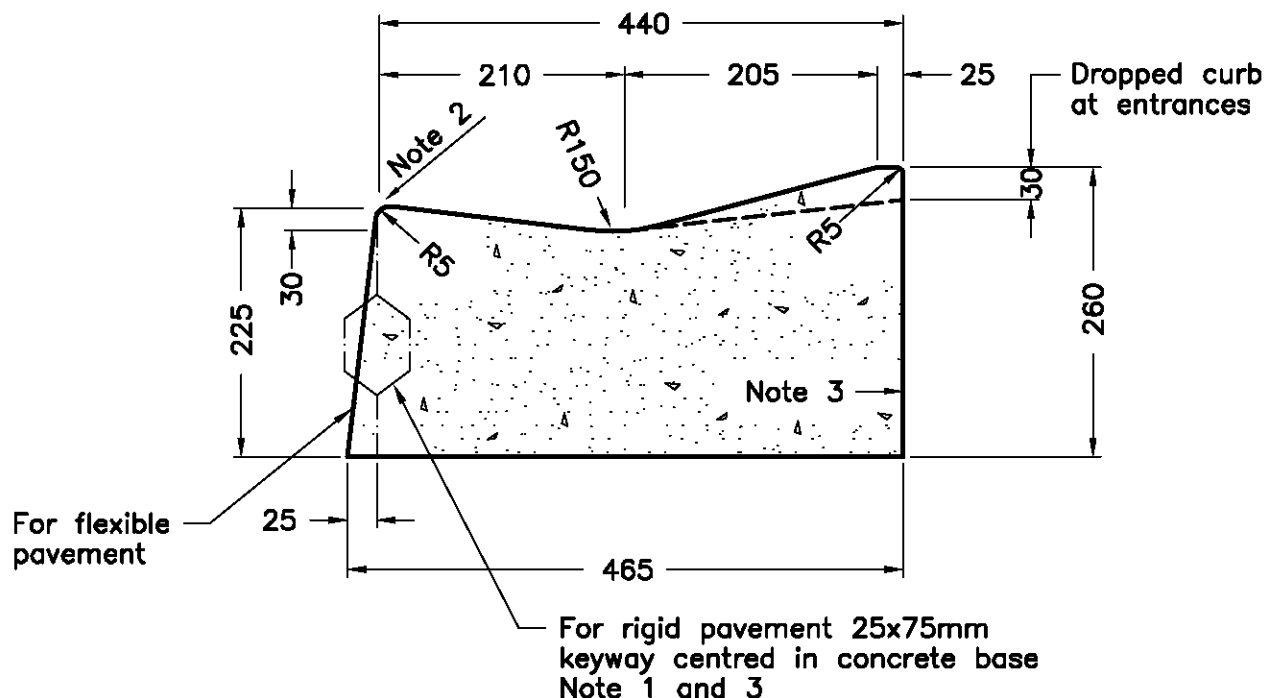
ONTARIO PROVINCIAL STANDARD DRAWING

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.

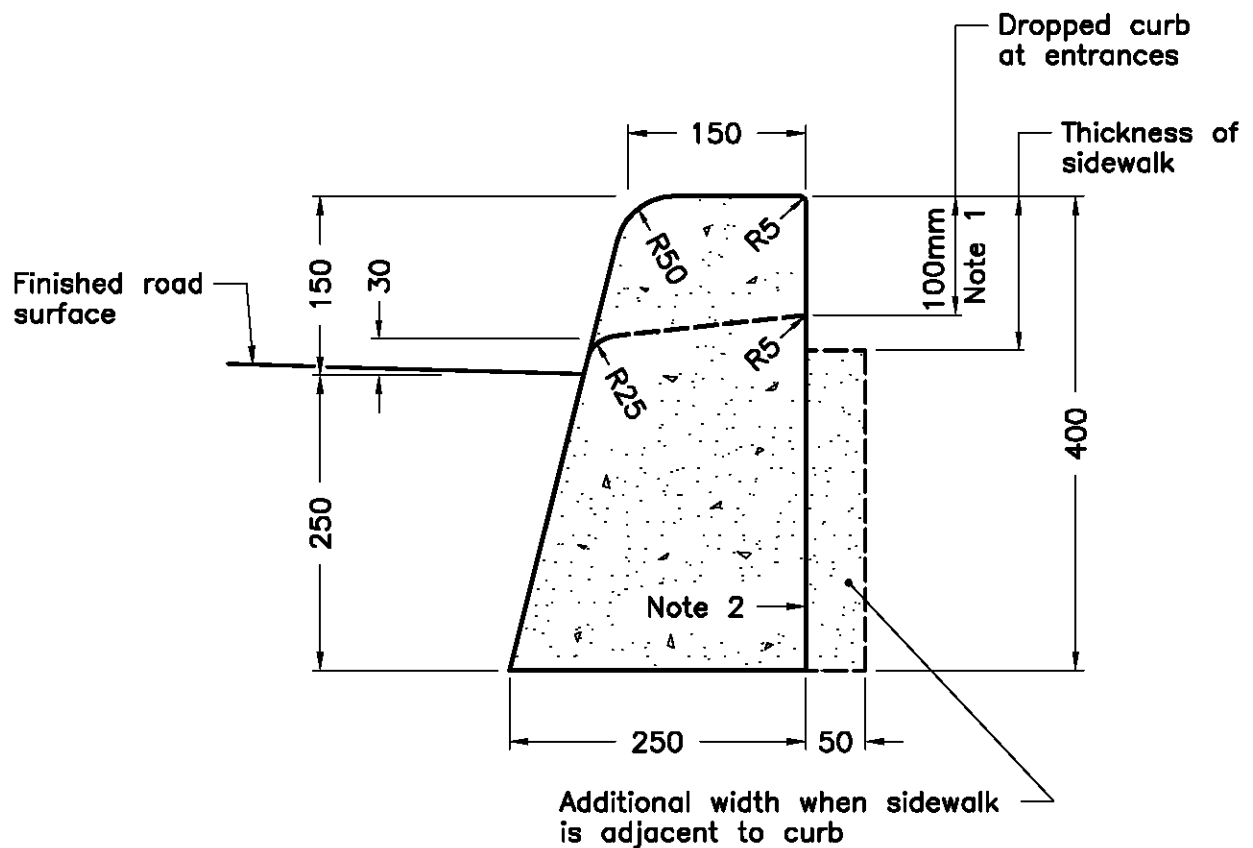
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2

**CONCRETE 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.

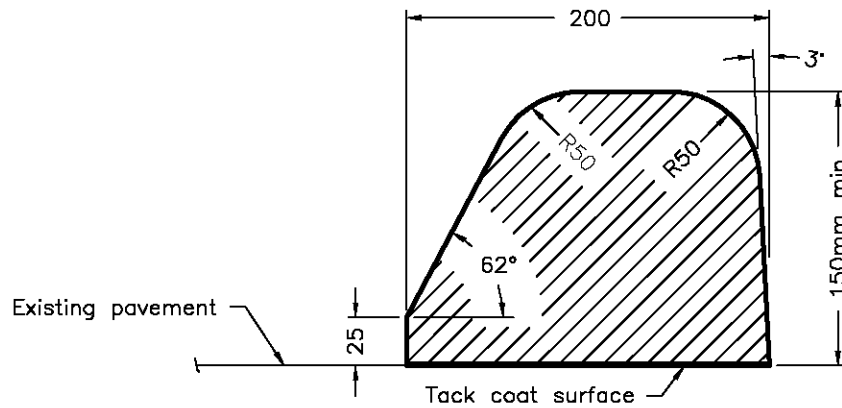
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2

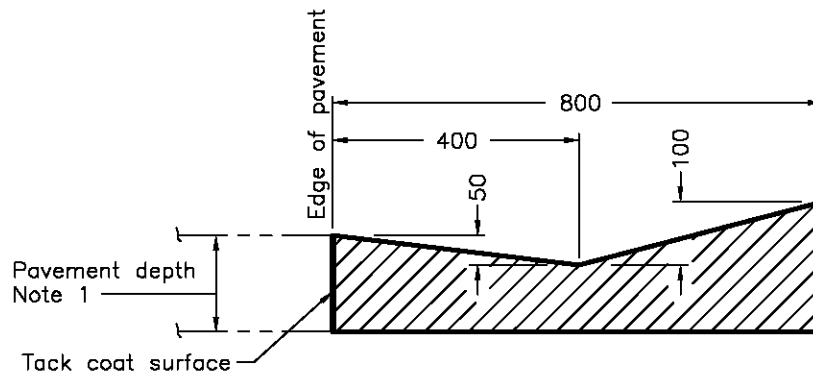
CONCRETE BARRIER CURB



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.

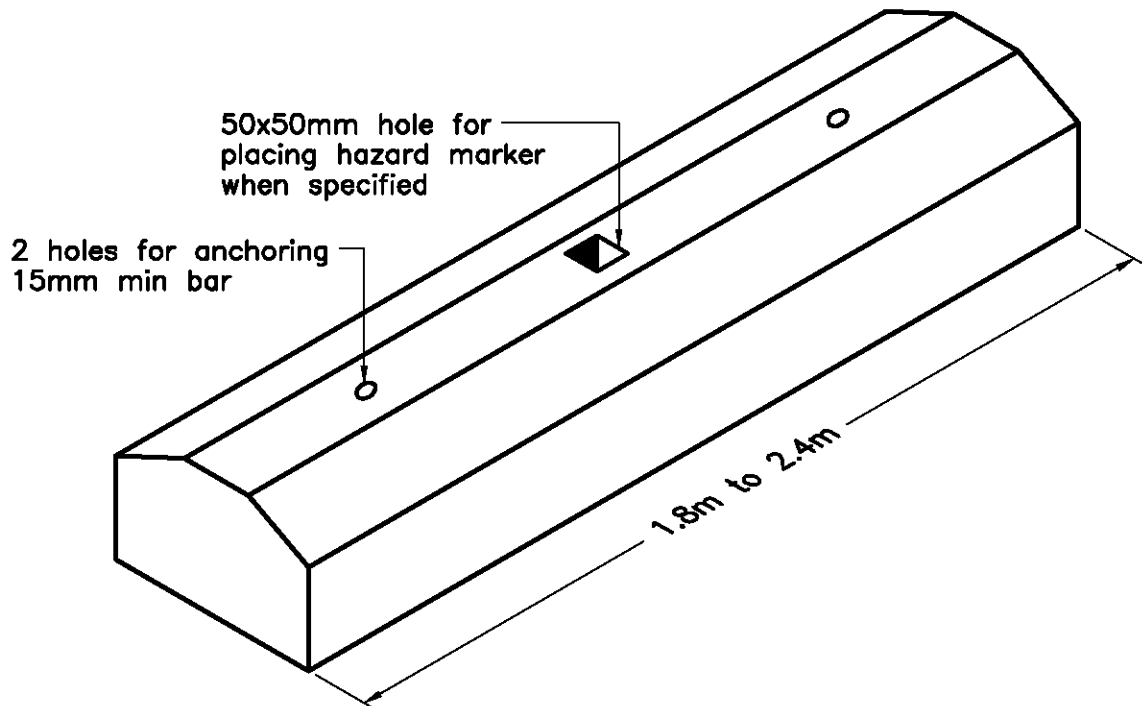
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 | Rev | 2

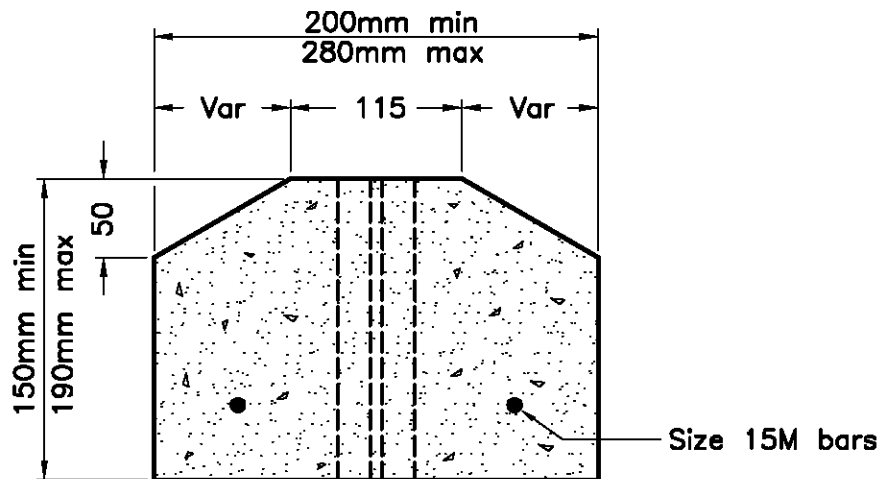
**ASPHALT CURB AND
ASPHALT CURB WITH GUTTER**



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

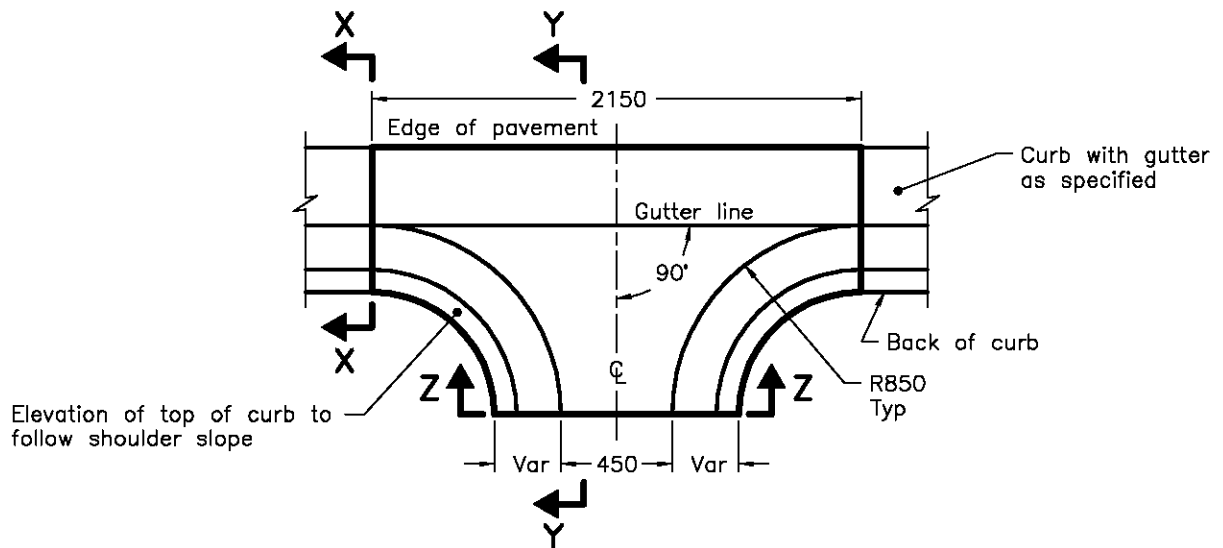
Rev

2

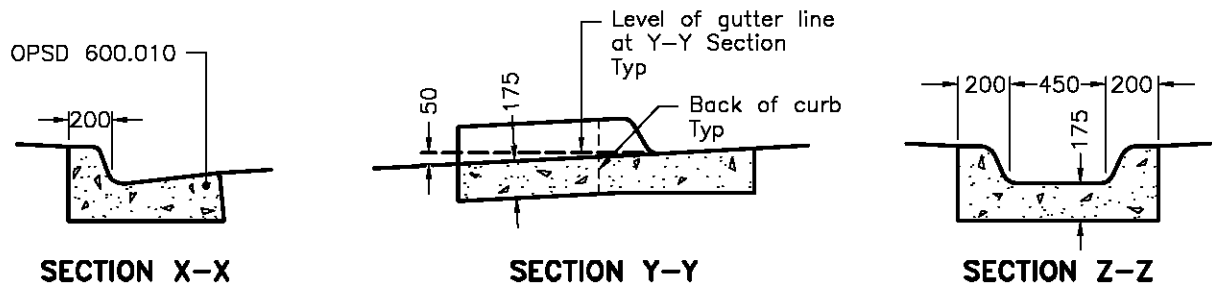
PRECAST CONCRETE CURB

OPSD 603.020

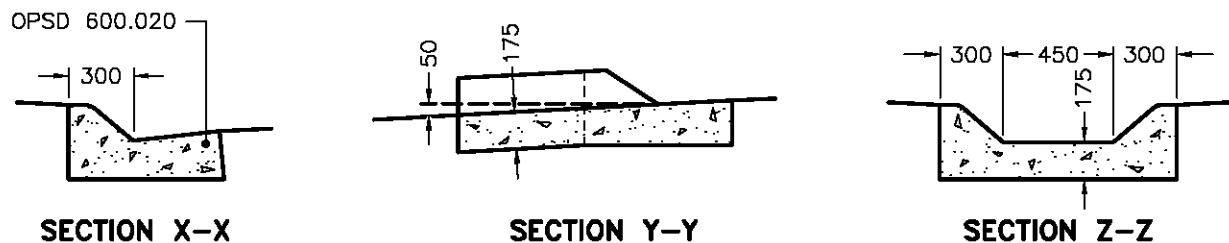




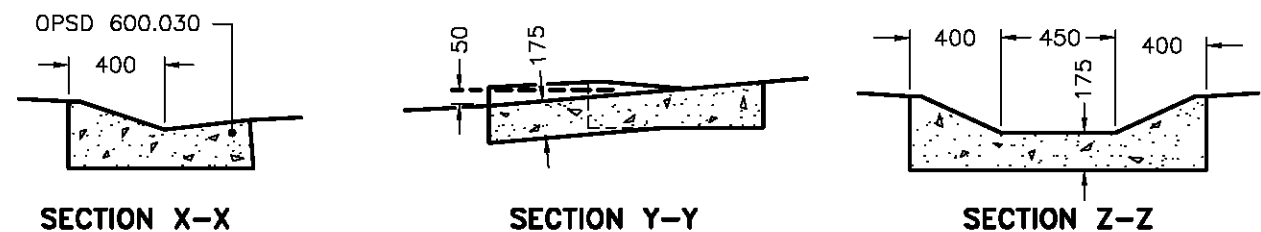
TYPICAL PLAN VIEW



BARRIER CURB with GUTTER



SEMI-MOUNTABLE CURB with GUTTER



MOUNTABLE CURB with GUTTER

NOTES:

- A For asphalt spillway details refer to OPSD 605.040.
B All dimensions are in millimetres unless otherwise shown.

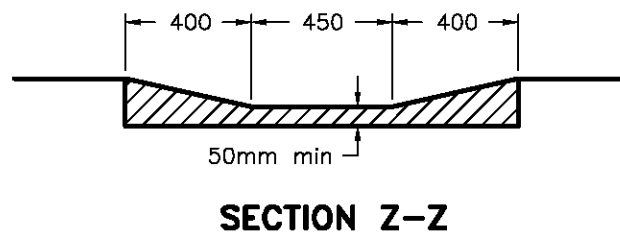
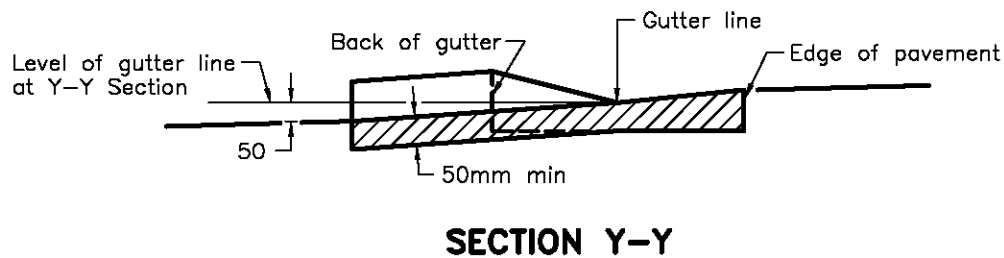
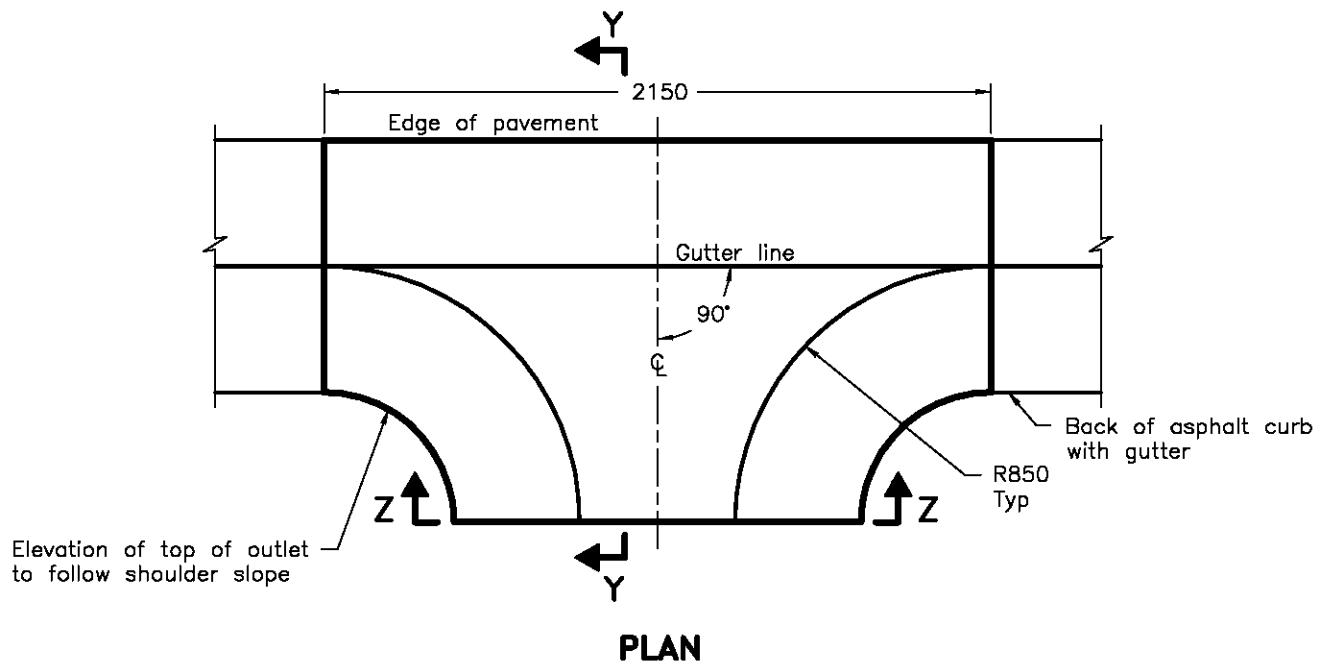
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2



90° CONCRETE OUTLET
FOR CONCRETE CURB WITH GUTTER

OPSD 604.010



NOTES:

- A For asphalt spillway details refer to OPSD 605.040.
 B All dimensions are in millimetres unless otherwise shown.

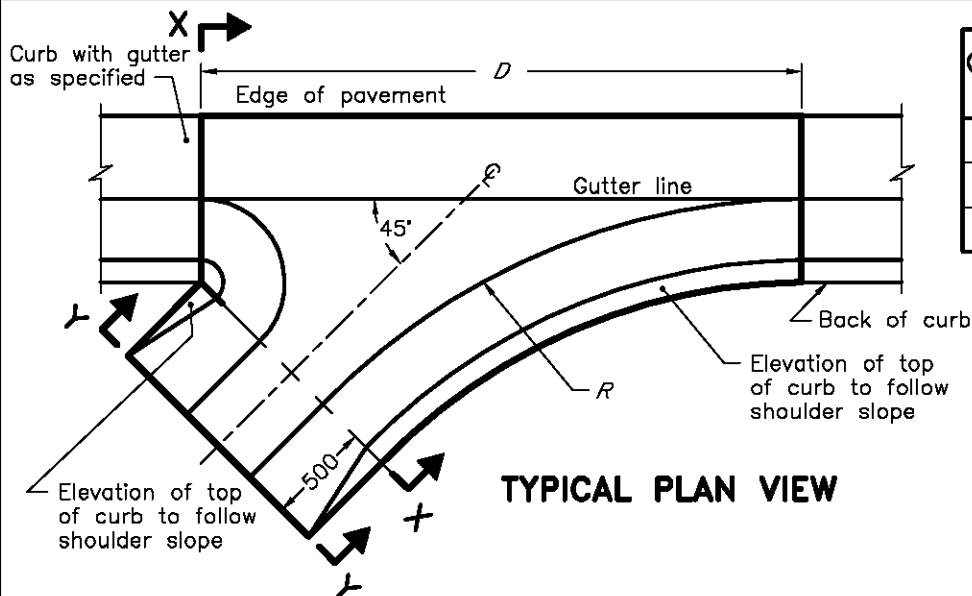
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 Rev 2

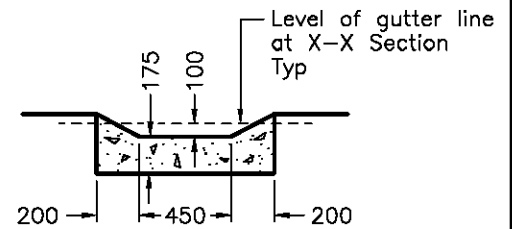
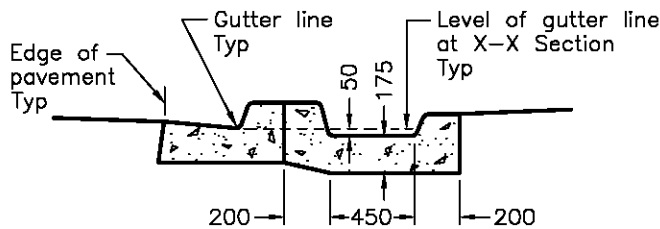
**90° ASPHALT OUTLET
 FOR ASPHALT CURB WITH GUTTER**

OPSD 604.020

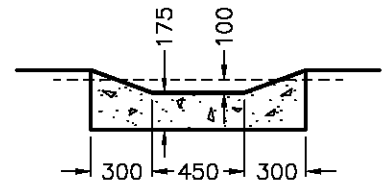
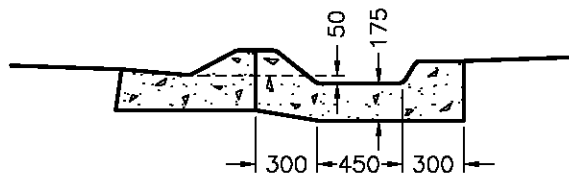




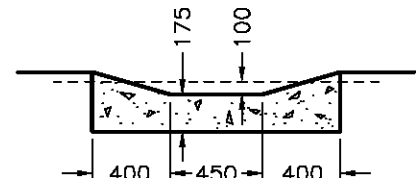
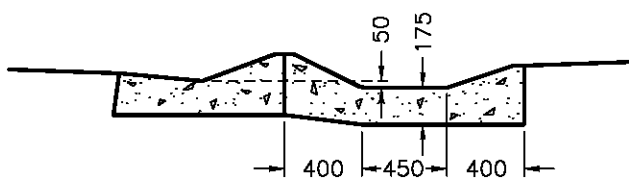
CURB with GUTTER Type	D m	R m
Barrier	1.9	2.1
Semi-Mountable	2.5	2.8
Mountable	2.9	2.9



BARRIER CURB with GUTTER



SEMI-MOUNTABLE CURB with GUTTER



MOUNTABLE CURB with GUTTER

NOTES:

A For asphalt spillway details refer to OPSD 605.040.

B All dimensions are in millimetres unless otherwise shown.

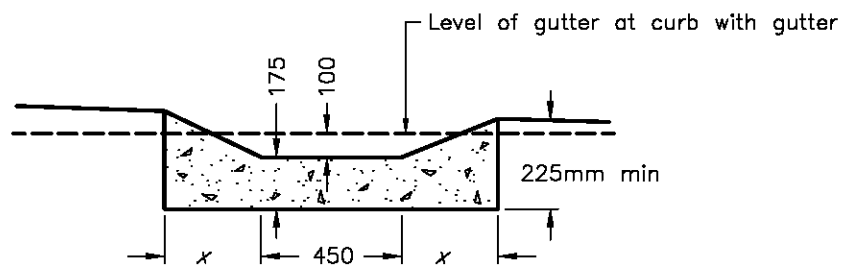
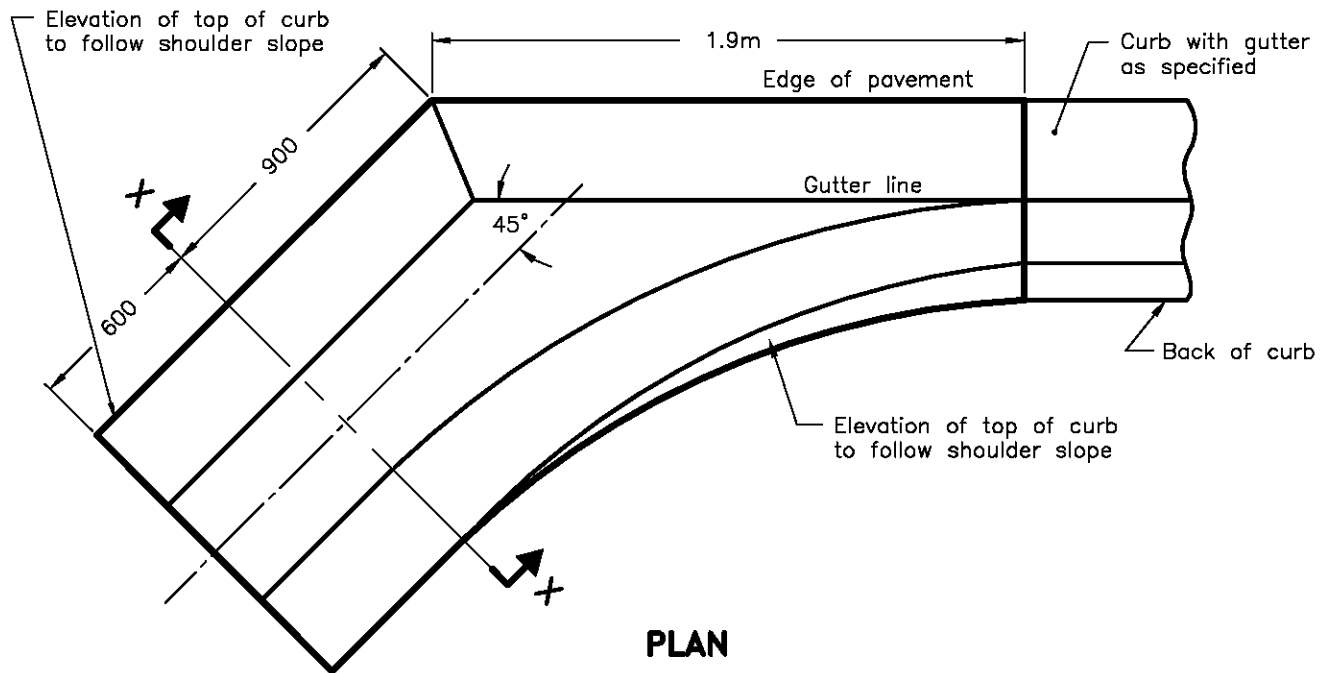
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2



45° CONCRETE OUTLET
FOR CONCRETE CURB WITH GUTTER

OPSD 605.010



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

NOTES:

A All dimensions are in millimetres unless otherwise shown.

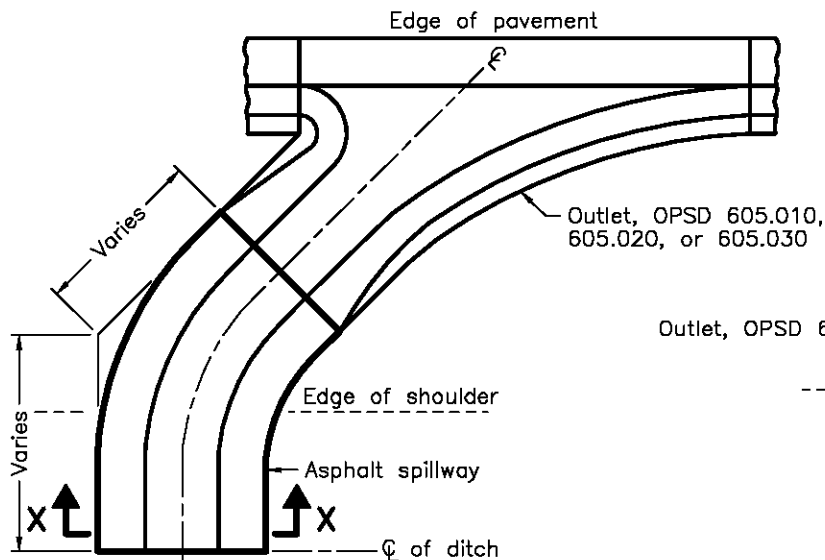
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 | Rev | 2

45° CONCRETE OUTLET
FOR CONCRETE CURB WITH GUTTER
AT END OF RUN

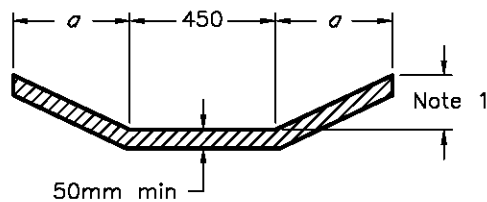


OPSD 605.030



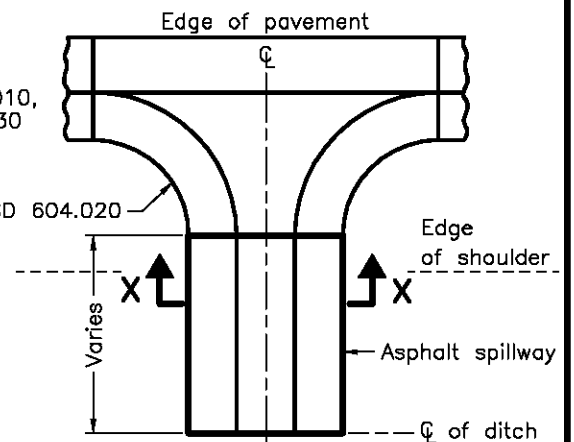
PLAN

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



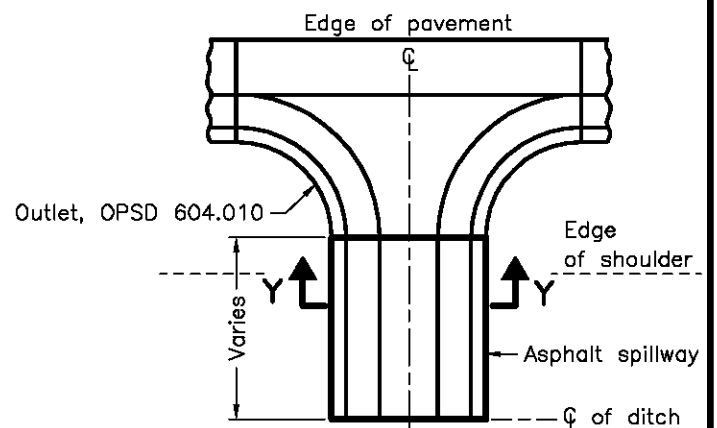
SECTION X-X

Outlet OPSD	Curb with Gutter Type	<i>a</i>	<i>b</i>
604.020 605.020	Mountable	400	—
605.010	Barrier	200	—
605.030	Semi-mountable	300	—
	Mountable	400	—
604.010	Barrier	—	200
	Semi-mountable	—	300
	Mountable	—	400



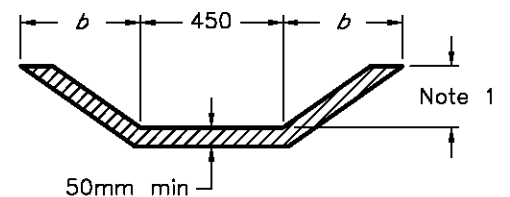
PLAN

WITH 90° ASPHALT OUTLET



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

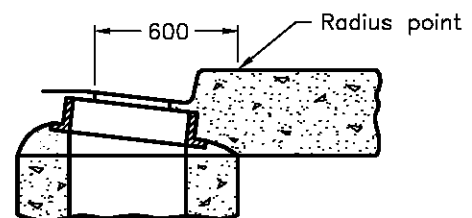
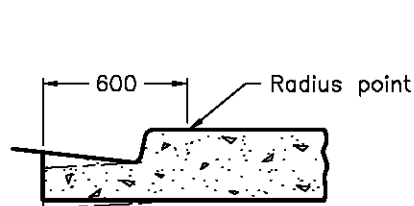
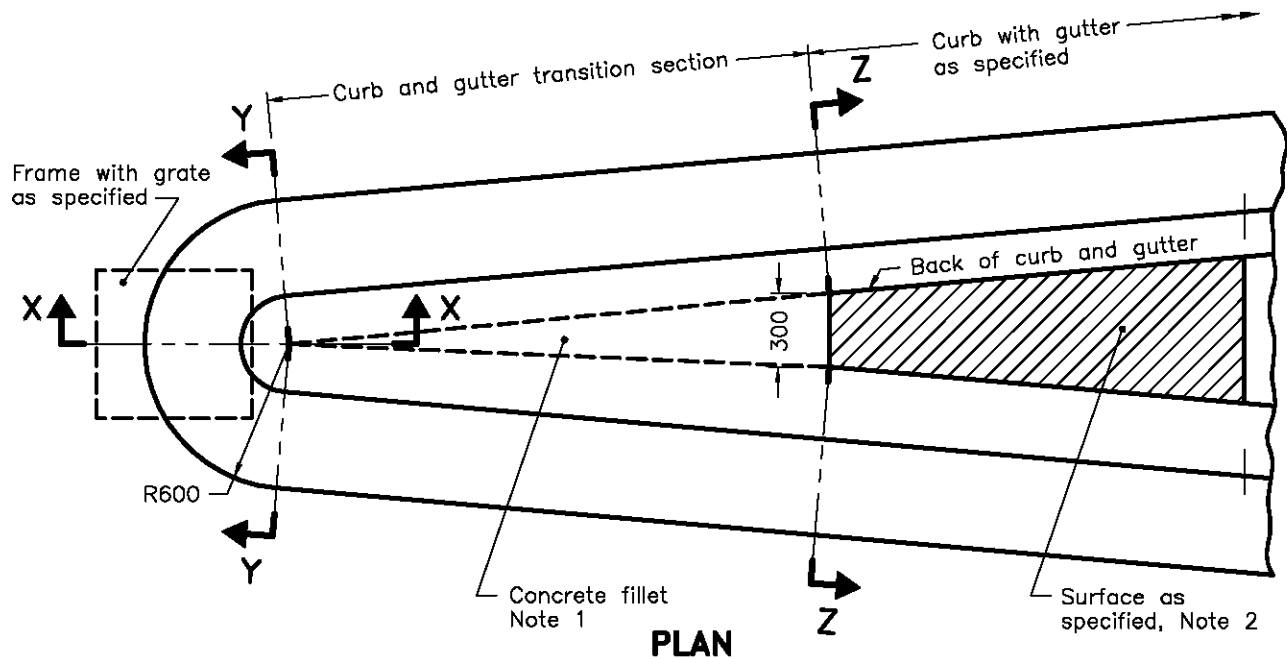
Nov 2013

Rev 2

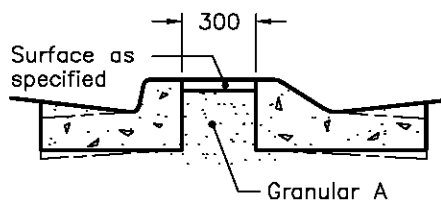
ASPHALT SPILLWAYS

OPSD 605.040





SECTION X-X



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.

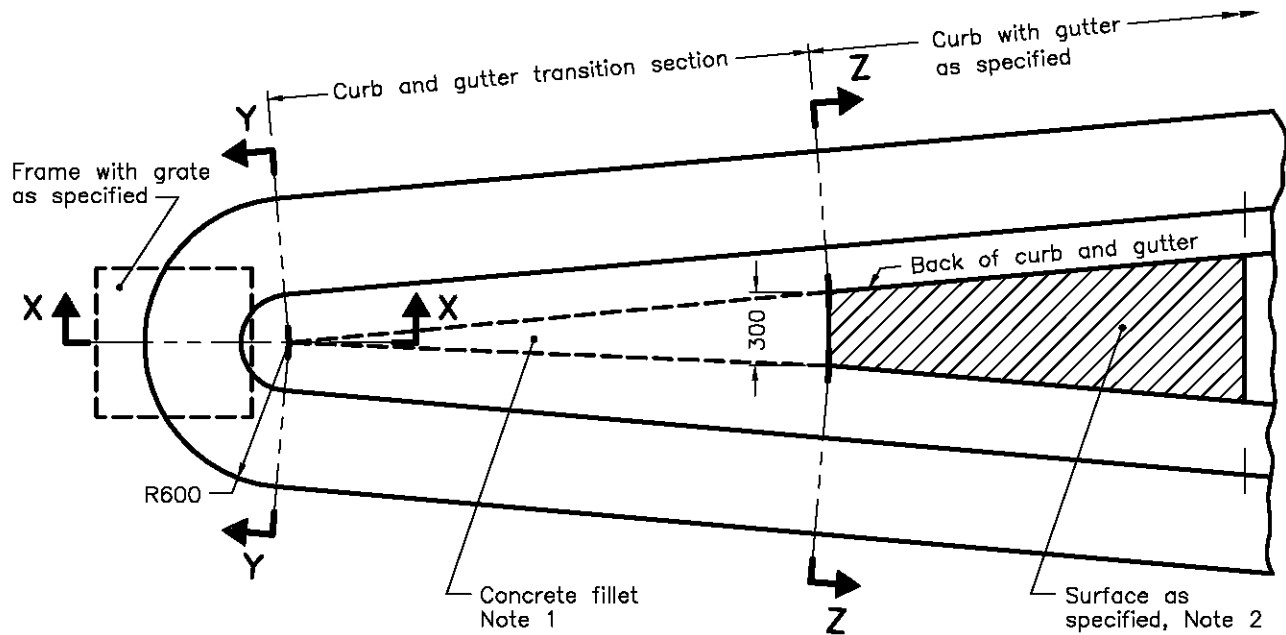
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2

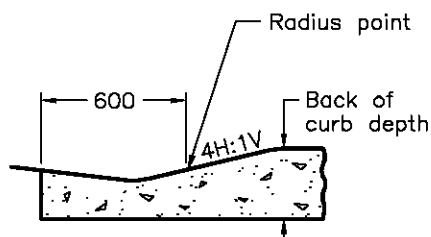
**600mm RADIUS
BARRIER BULLNOSE**



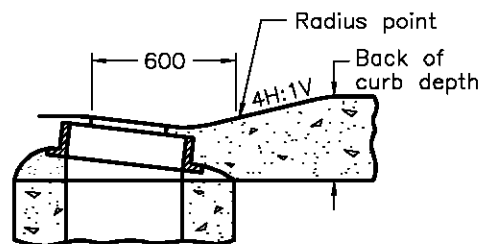
OPSD 606.010



PLAN



WITHOUT CATCH BASIN

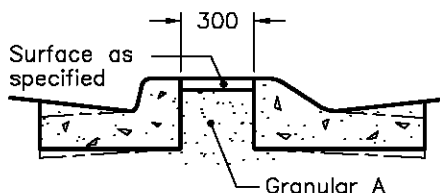


WITH CATCH BASIN

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

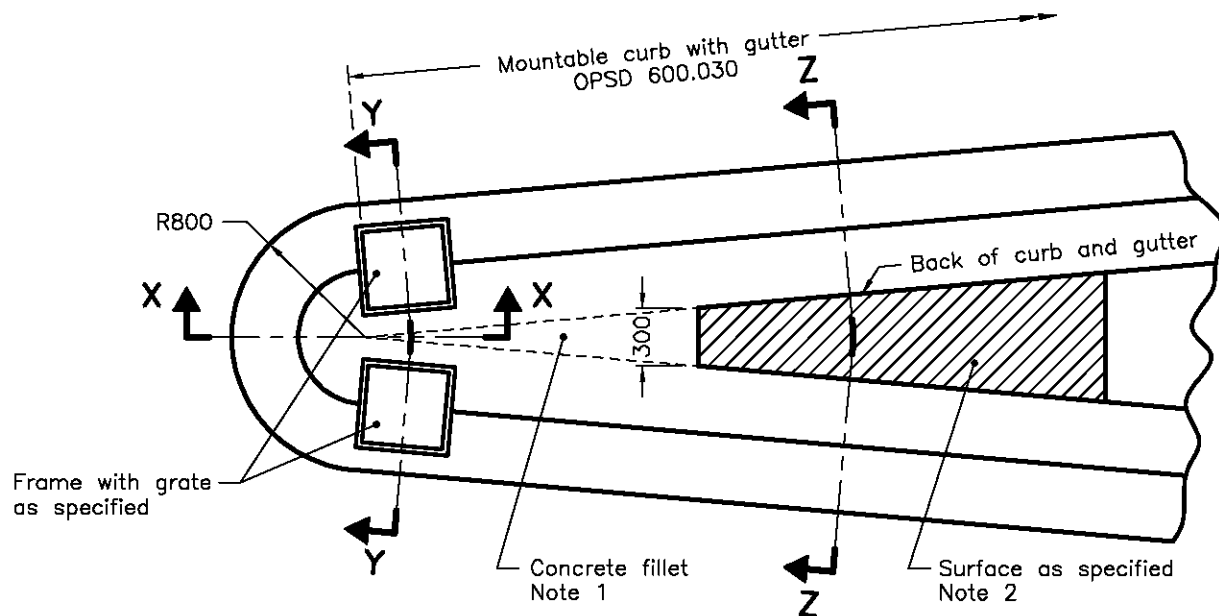
Nov 2012

Rev 2

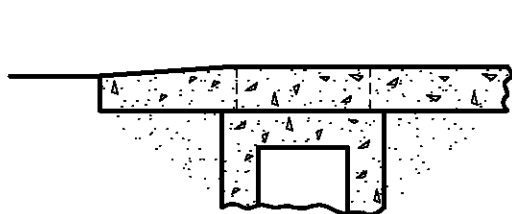
**600mm RADIUS
MOUNTABLE BULLNOSE**

OPSD 606.020

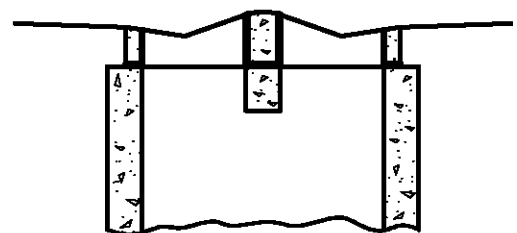




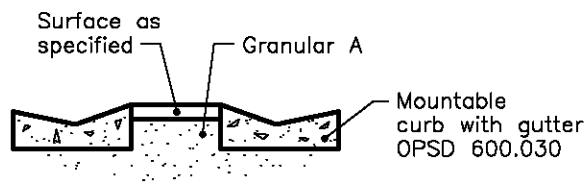
PLAN



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

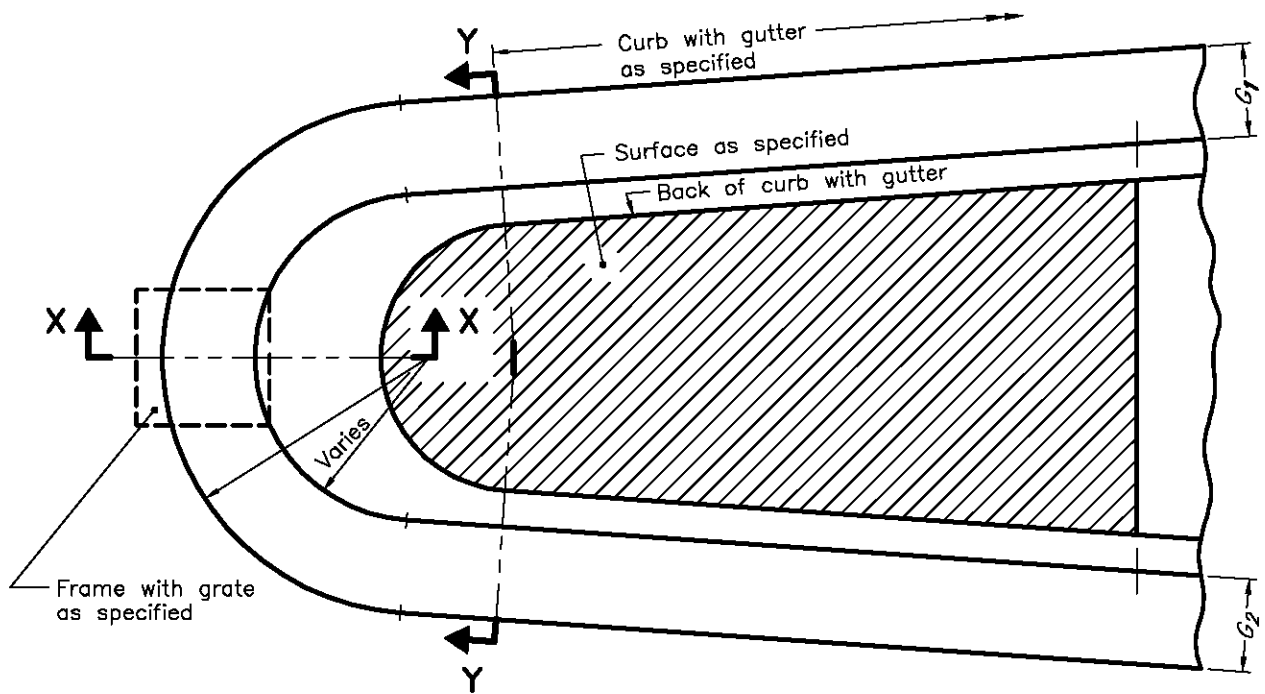
Nov 2012

Rev 2

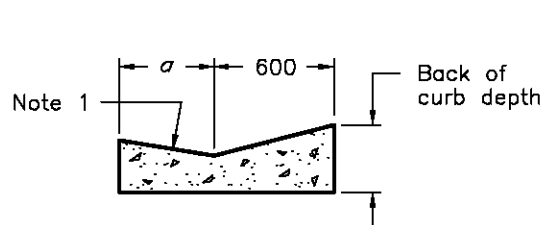
**800mm RADIUS
MOUNTABLE BULLNOSE
CURB WITH GUTTER TWIN INLET**

OPSD 606.030

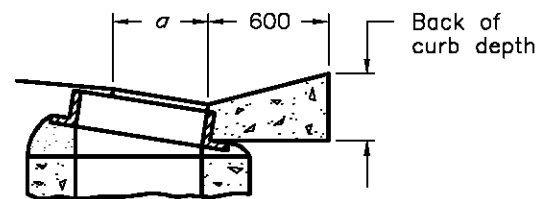




PLAN

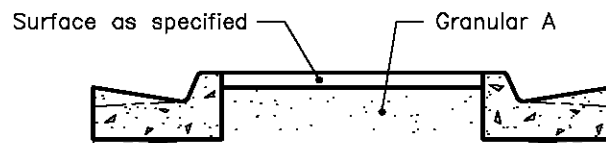


WITHOUT CATCH BASIN



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.

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

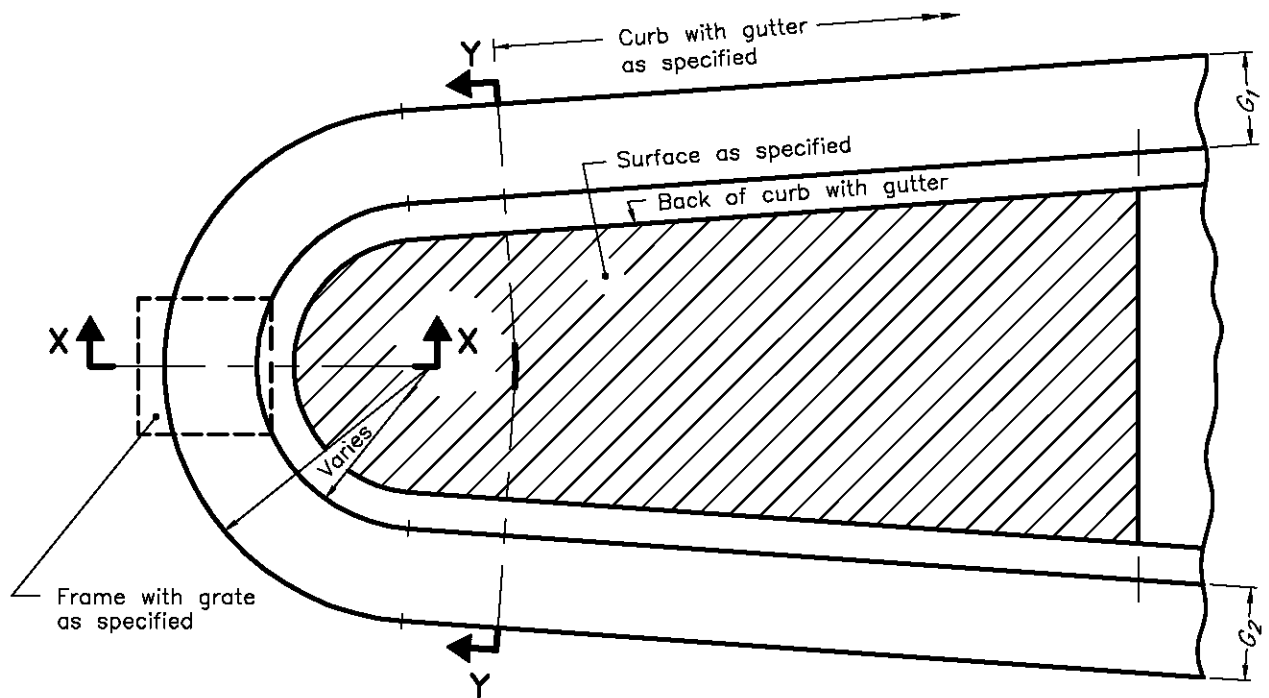
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2

**OVER 600mm RADIUS
MOUNTABLE BULLNOSE**

OPSD 607.010



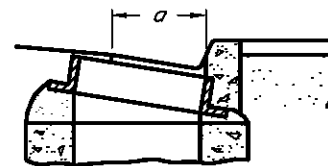


PLAN



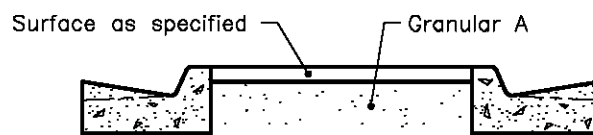
Note 1

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

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

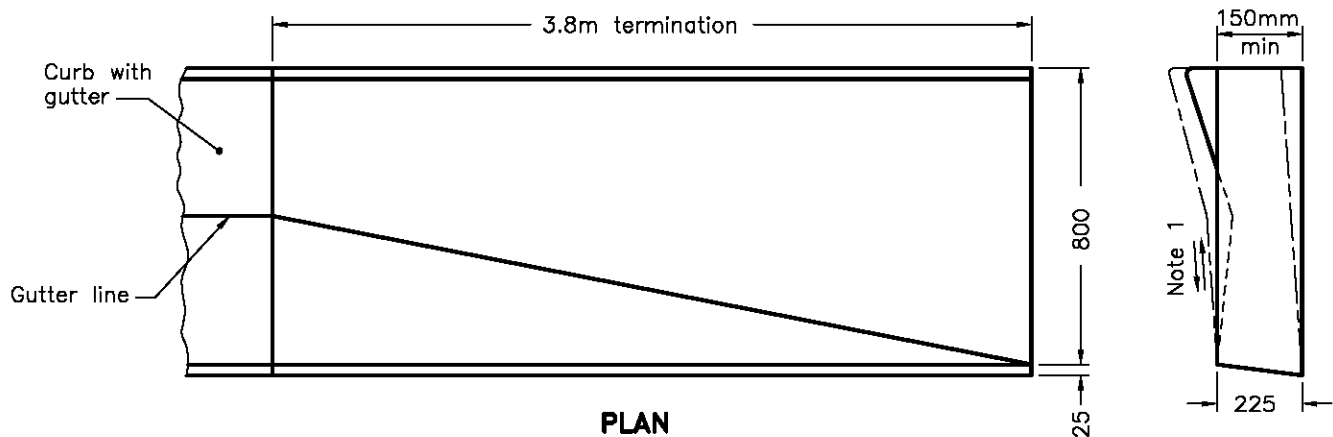
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 | Rev | 2

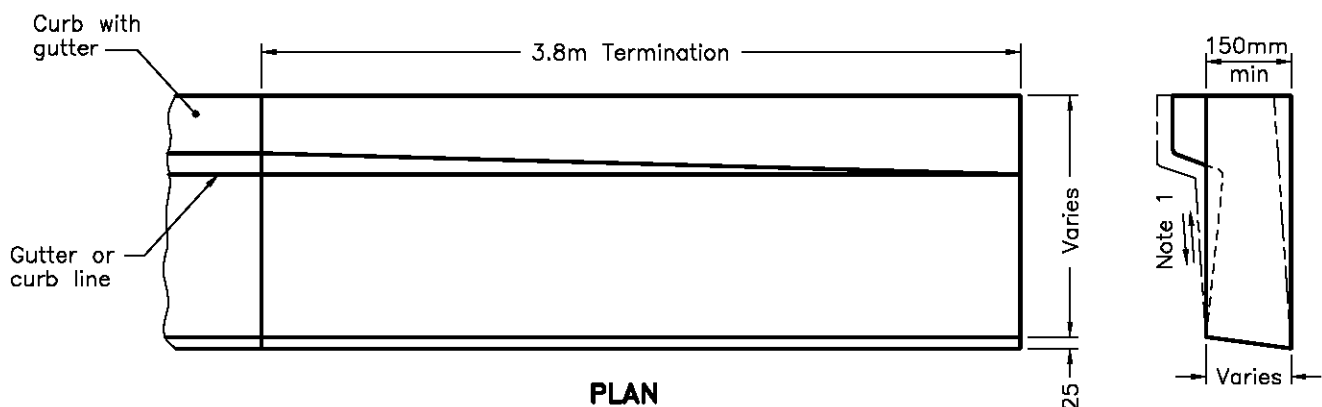
**OVER 600mm RADIUS
BARRIER BULLNOSE**

OPSD 607.020





**ELEVATION
MOUNTABLE CURB WITH GUTTER**



**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

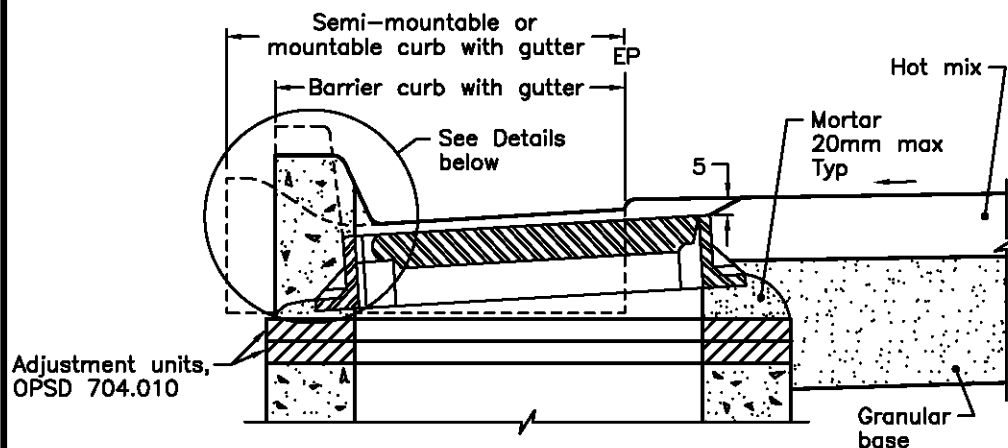
Rev 2

METHOD OF TERMINATION

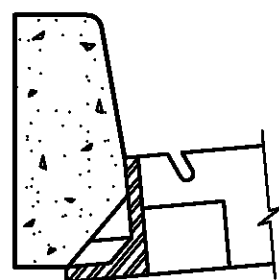
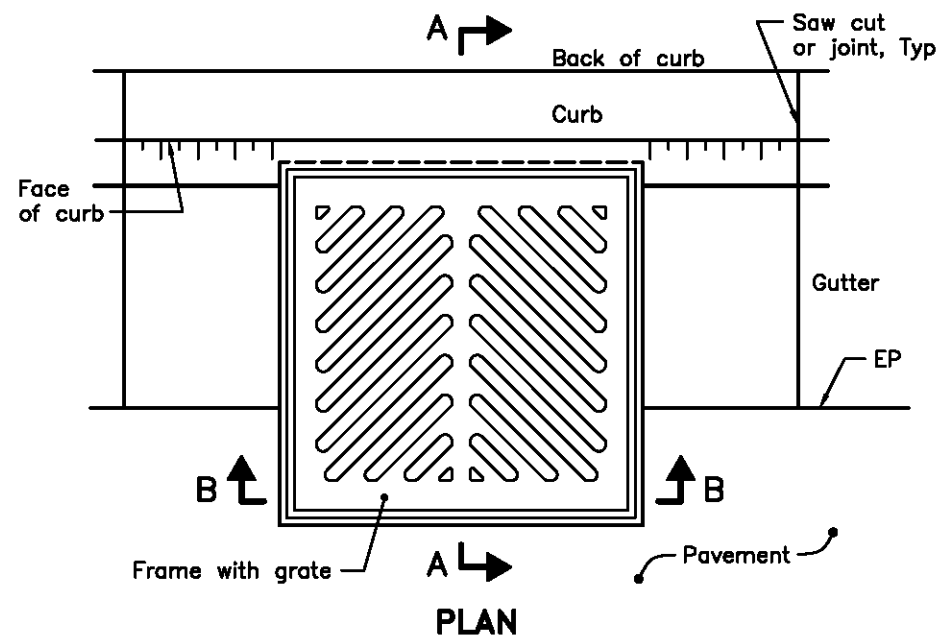
FOR CONCRETE CURB WITH GUTTER

OPSD 608.010

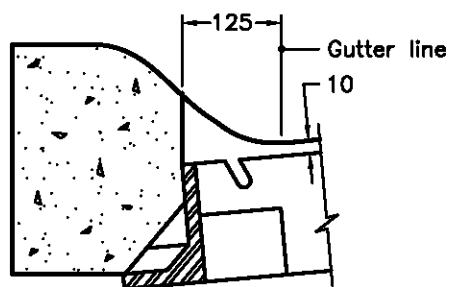




SECTION A-A

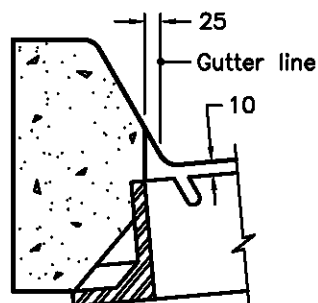


BARRIER CURB

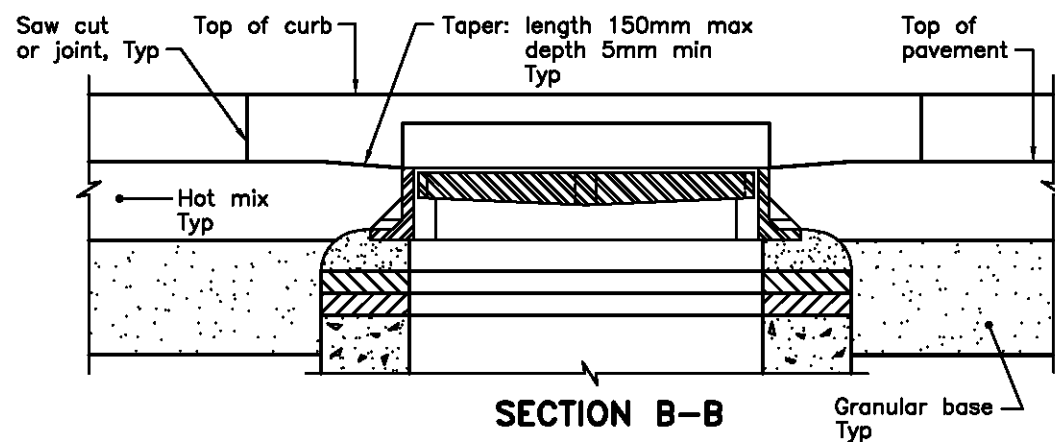


SEMI-MOUNTABLE or MOUNTABLE CURB WITH GUTTER

DETAILS



BARRIER CURB WITH GUTTER



NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

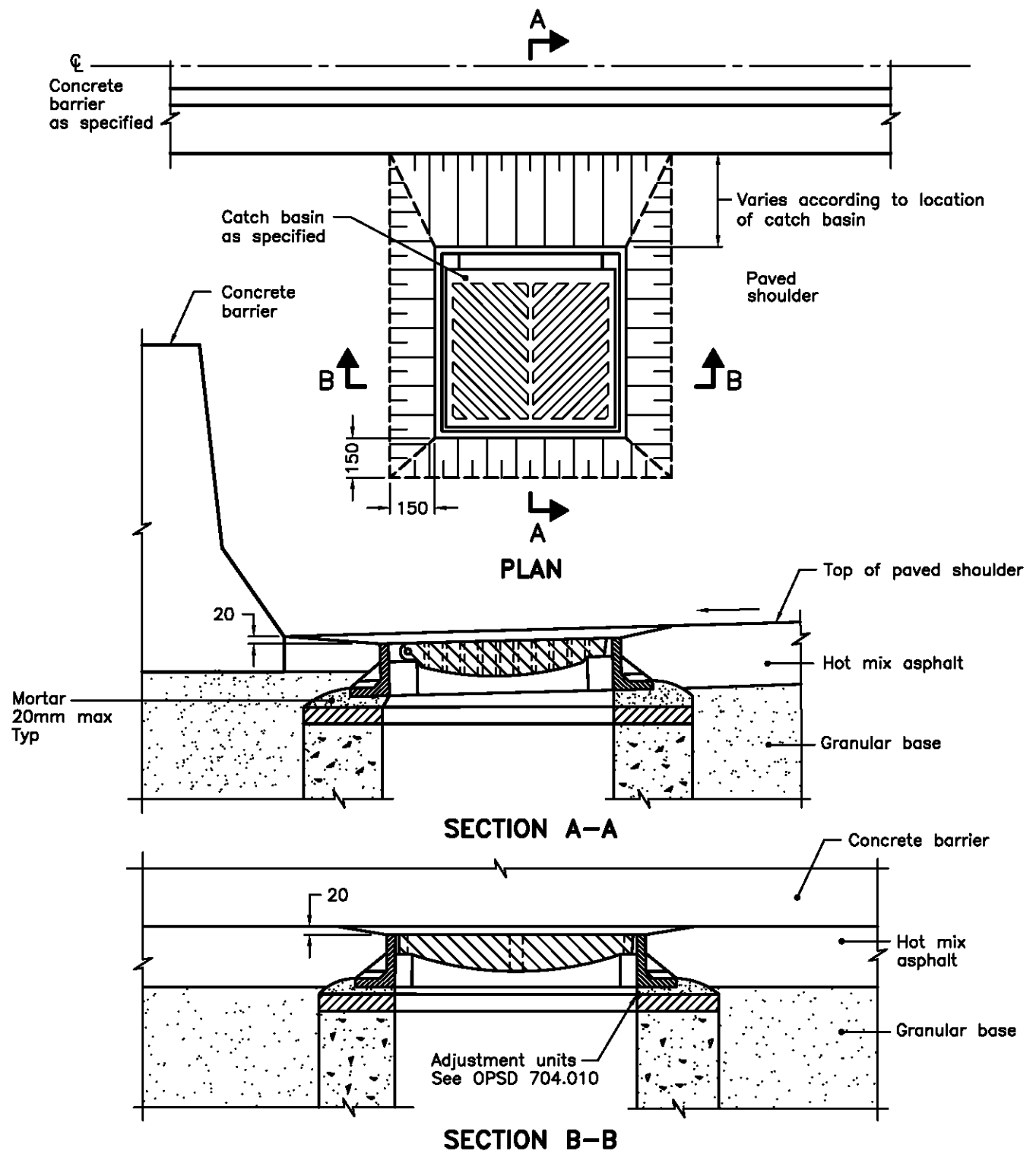
**CATCH BASIN FRAME WITH GRATE
INSTALLATION AT
CURB WITH GUTTER**

Nov 2009

Rev 1



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

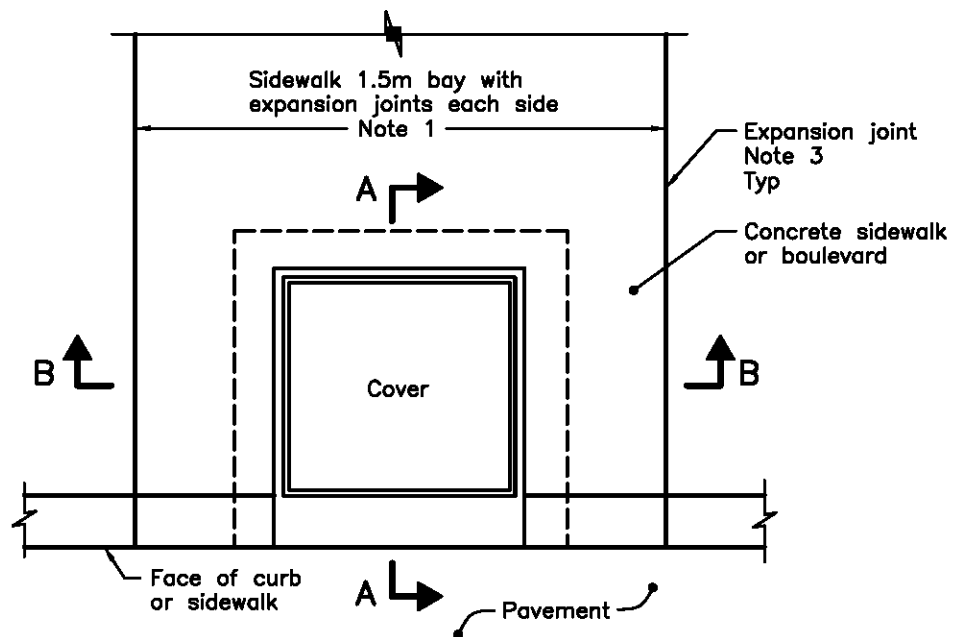
Nov 2006

Rev 2

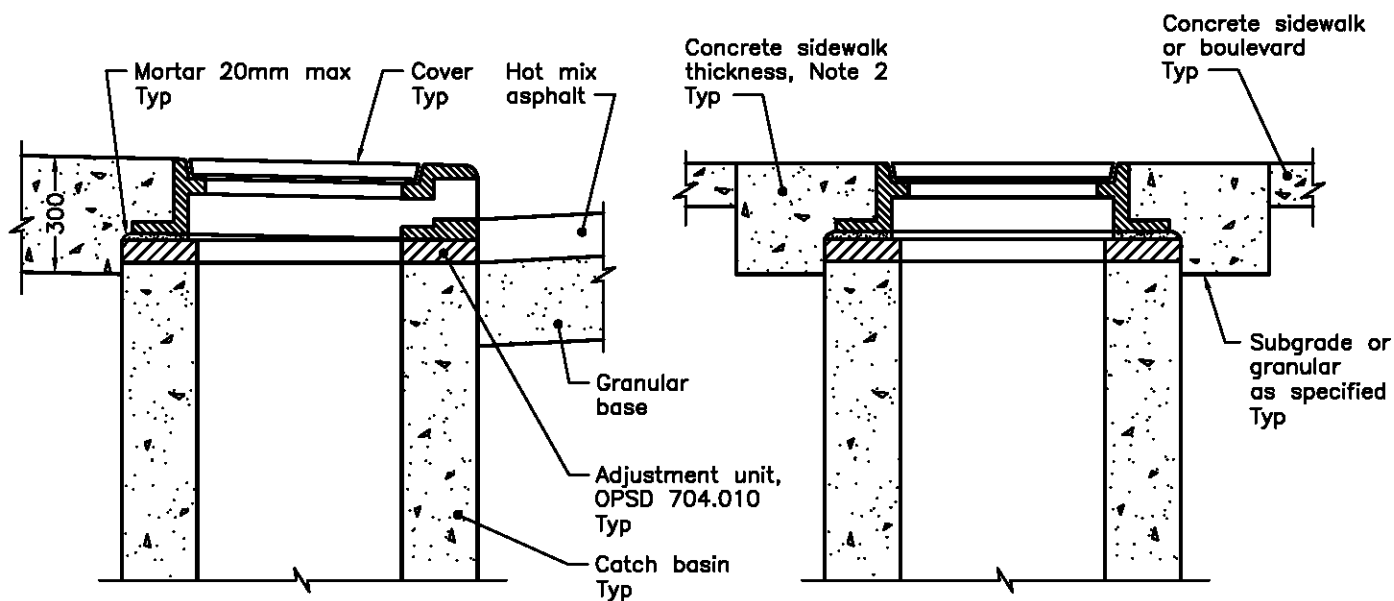
**CATCH BASIN FRAME WITH GRATE
SHOULDER INSTALLATION
AT CONCRETE BARRIER**



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

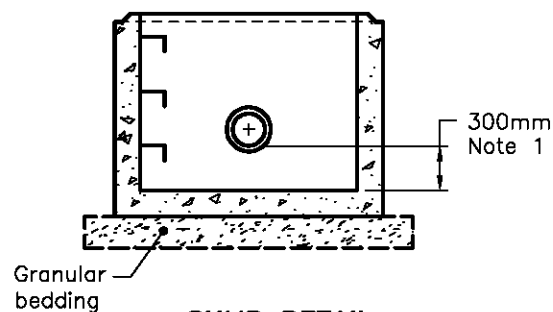
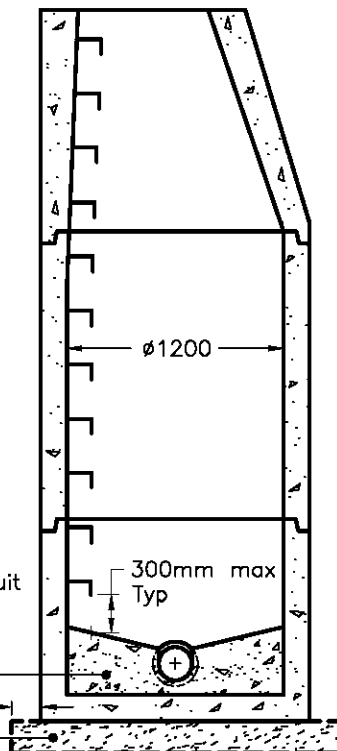
Tapered top
See alternative C

Riser sections
as required

Monolithic base with inlet
and outlet openings to suit
See alternatives A and B

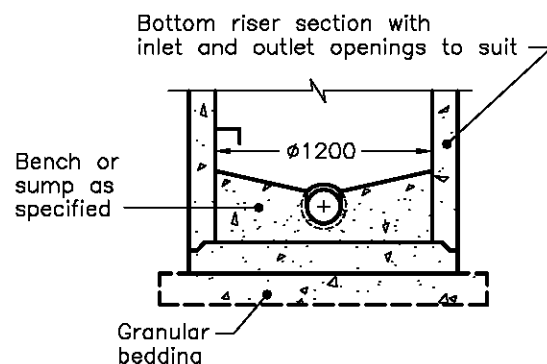
Bench or sump
as specified

300mm, Typ
Granular bedding

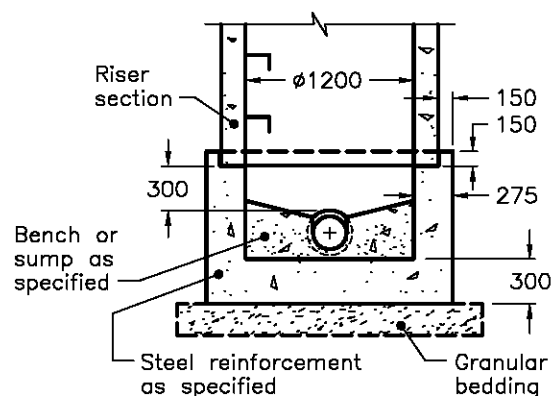


SUMP DETAIL

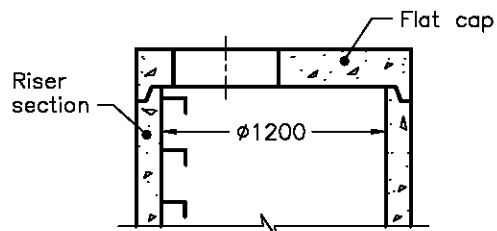
ALTERNATIVES



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

**PRECAST CONCRETE
MAINTENANCE HOLE**
1200mm DIAMETER

Nov 2014 | Rev | 5



OPSD 701.010

Tapered top
See alternatives D
and E

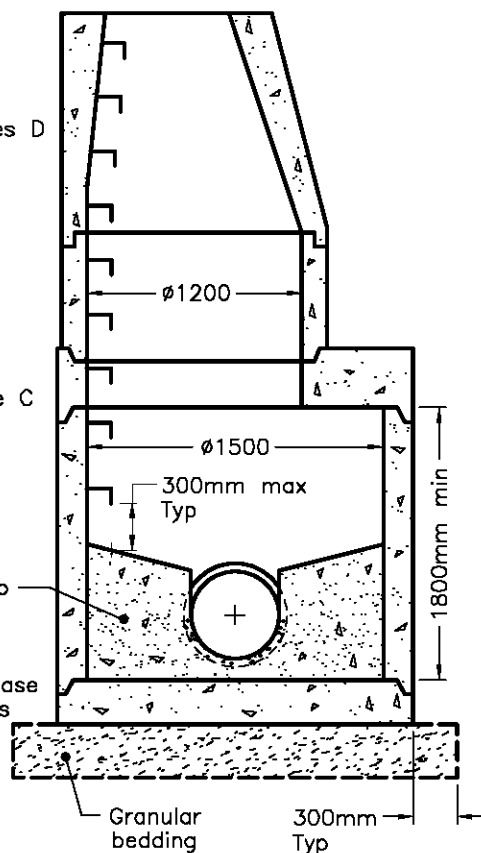
Riser sections
as required

Transition slab
See alternative C

Riser sections
as required

Bench or sump
as specified
Note 1

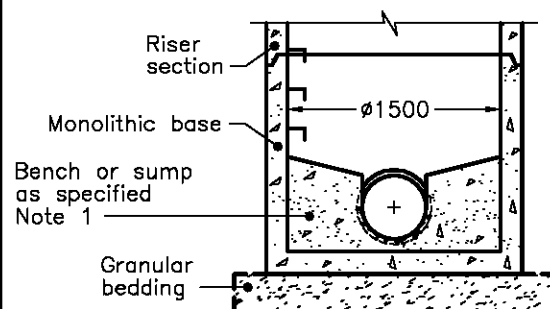
Precast slab base
See alternatives
A and B



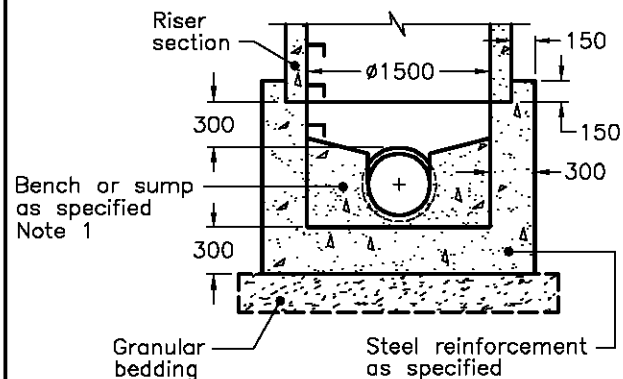
NOTES:

- 1 For sump detail, see OPSD 701.010.
- A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
- B Precast concrete components shall be according to OPSD 701.030, 701.031, 701.040, 701.041, 703.011, 703.021, and 706.010.
- C Structures exceeding 5.0m in depth shall include safety platform according to OPSD 404.020 or 404.021.
- D Pipe support shall be according to OPSD 708.020.
- E For benching and pipe opening details, see OPSD 701.021.
- F For adjustment unit and frame installation, see OPSD 704.010.
- G All dimensions are nominal.
- H All dimensions are in millimetres unless otherwise shown.

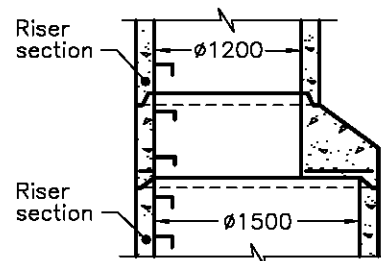
ALTERNATIVES



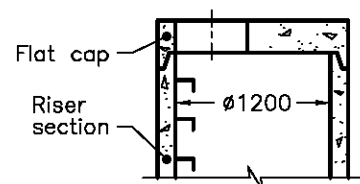
A PRECAST MONOLITHIC BASE



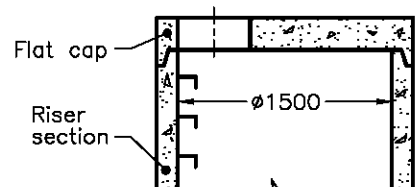
B CAST-IN-PLACE BASE



C TAPERED TRANSITION SLAB



D 1200mm PRECAST FLAT CAP



E 1500mm PRECAST FLAT CAP

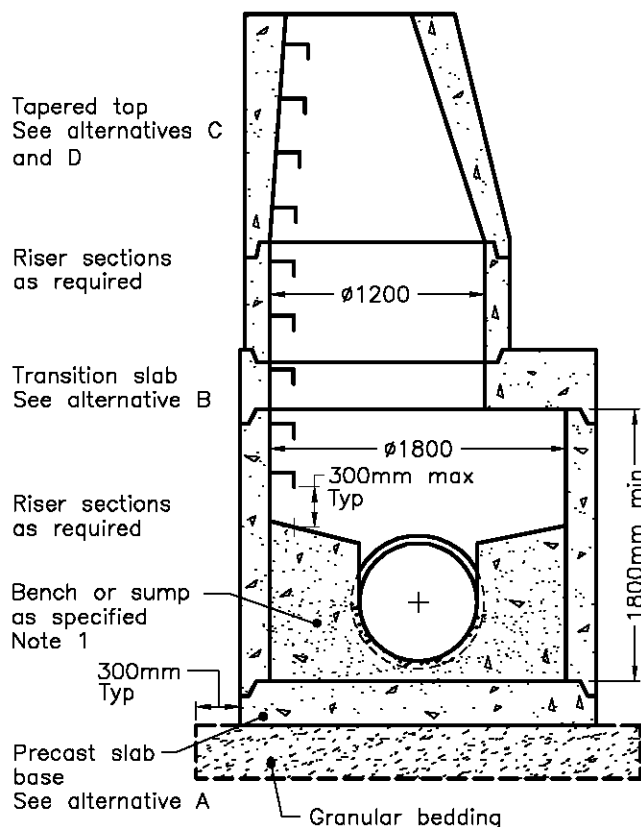
ONTARIO PROVINCIAL STANDARD DRAWING

**PRECAST CONCRETE
MAINTENANCE HOLE**
1500mm DIAMETER

Nov 2014 Rev 5



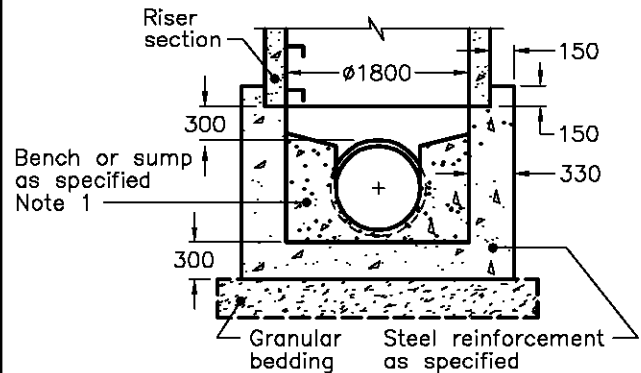
OPSD 701.011



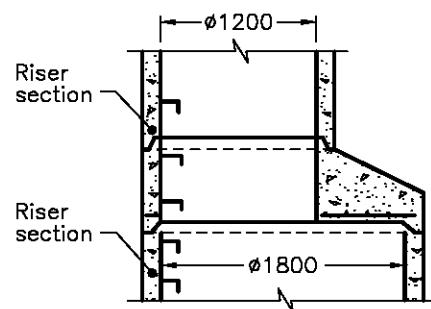
NOTES:

- 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.

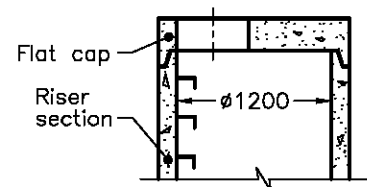
ALTERNATIVES



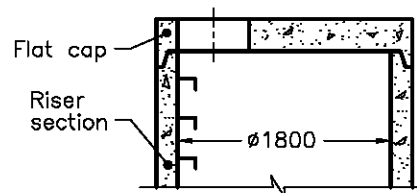
A CAST-IN-PLACE BASE



B TAPERED TRANSITION SLAB



C 1200mm PRECAST FLAT CAP



D 1800mm PRECAST FLAT CAP

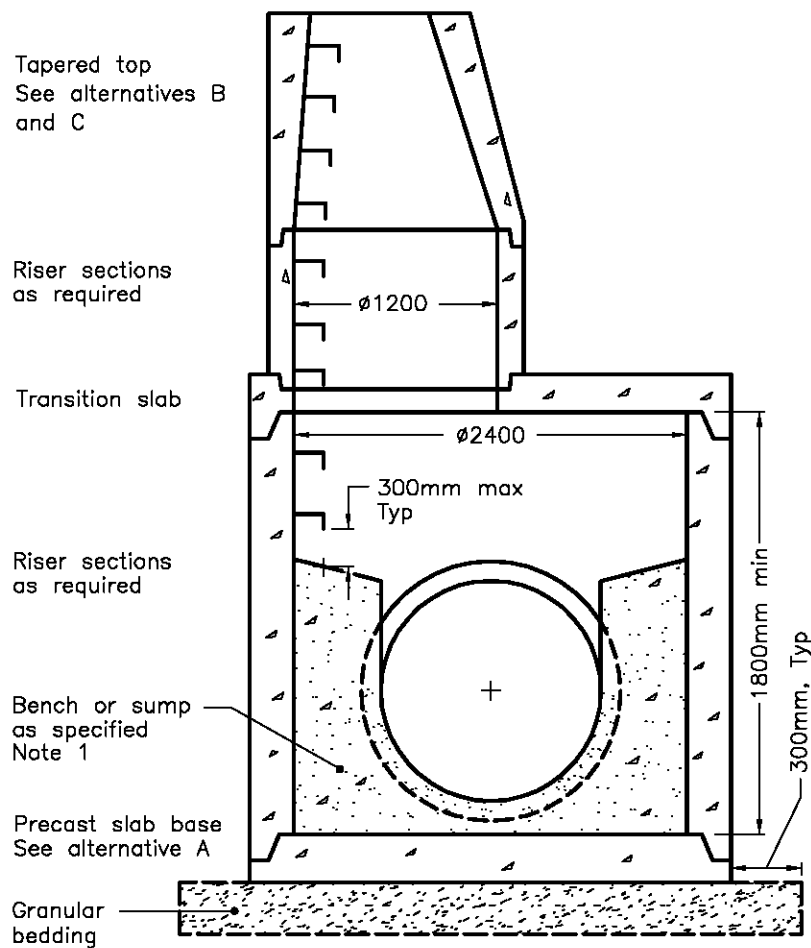
ONTARIO PROVINCIAL STANDARD DRAWING

**PRECAST CONCRETE
MAINTENANCE HOLE**
1800mm DIAMETER

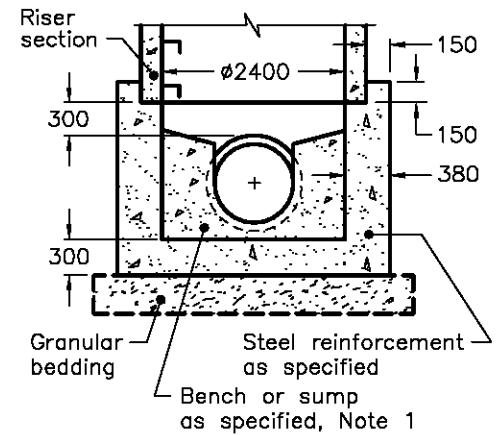
Nov 2014 Rev 5



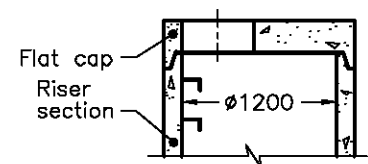
OPSD 701.012



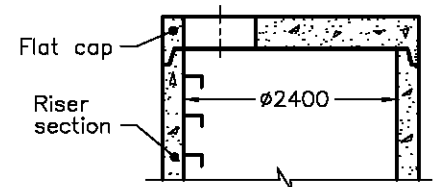
ALTERNATIVES



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

**PRECAST CONCRETE
MAINTENANCE HOLE**
2400mm DIAMETER

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OPSD 701.013

Tapered top
See alternatives B
and C

Riser sections
as required

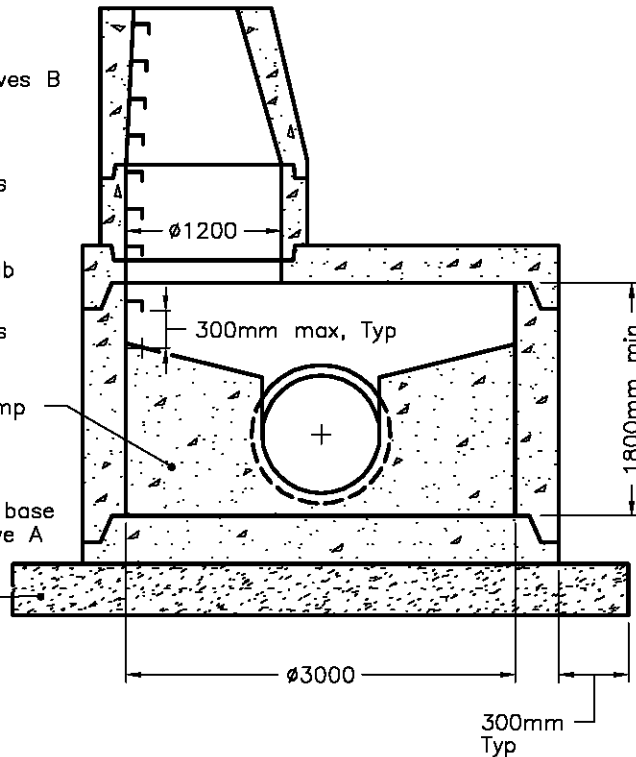
Transition slab

Riser sections
as required

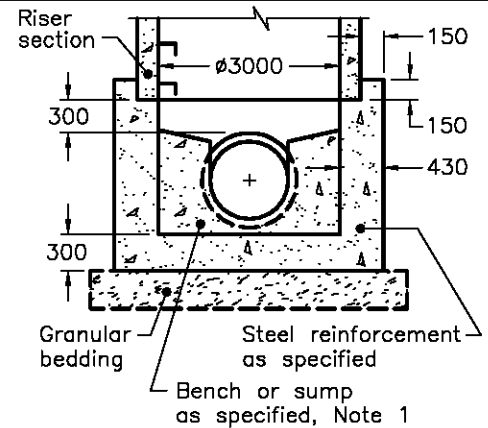
Bench or sump
as specified
Note 1

Precast slab base
See alternative A

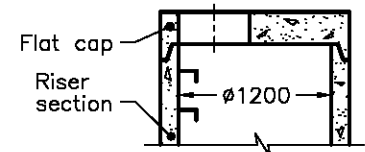
Granular
bedding



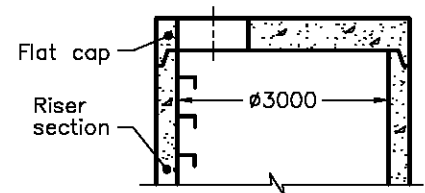
ALTERNATIVES



A CAST-IN-PLACE BASE



B 1200mm PRECAST FLAT CAP



C 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

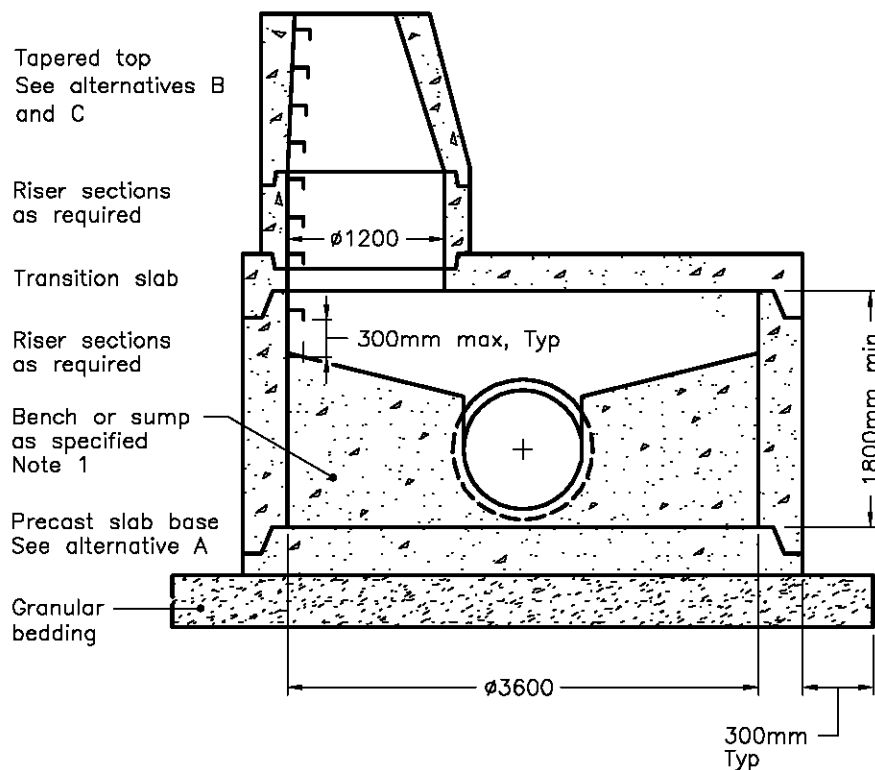
**PRECAST CONCRETE
MAINTENANCE HOLE
3000mm DIAMETER**

Nov 2014

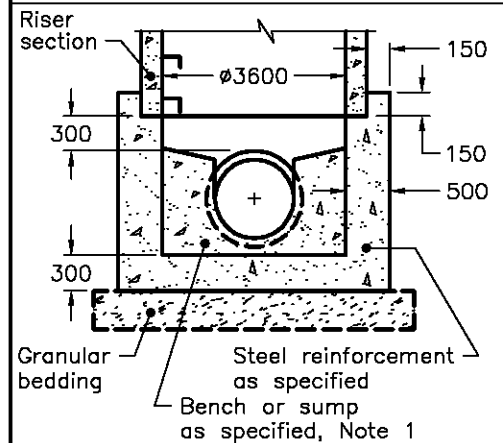
Rev 4



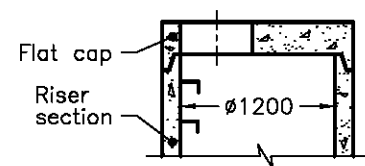
OPSD 701.014



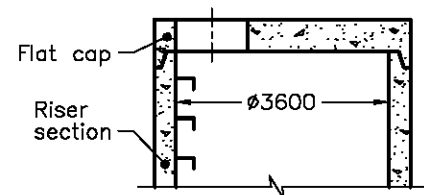
ALTERNATIVES



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.

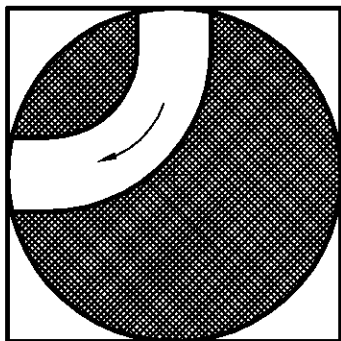
ONTARIO PROVINCIAL STANDARD DRAWING

**PRECAST CONCRETE
MAINTENANCE HOLE**
3600mm DIAMETER

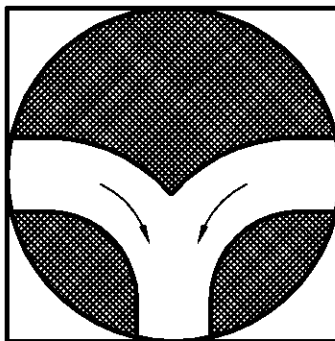
Nov 2014 | Rev | 4



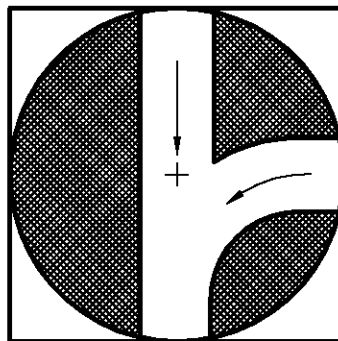
OPSD 701.015



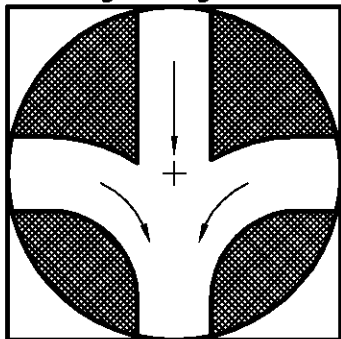
1. Right angle bend



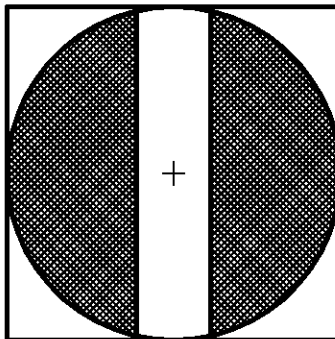
2. Tee connection



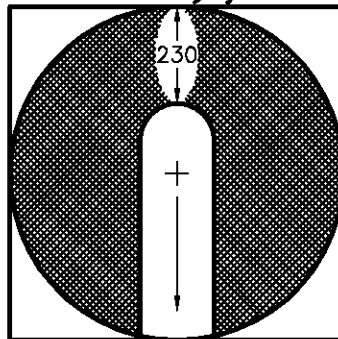
3. Three way junction



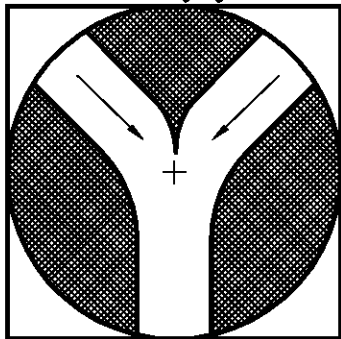
4. Four way junction



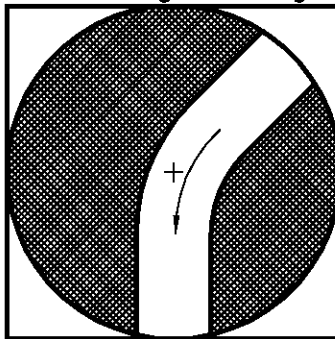
5. Straight through



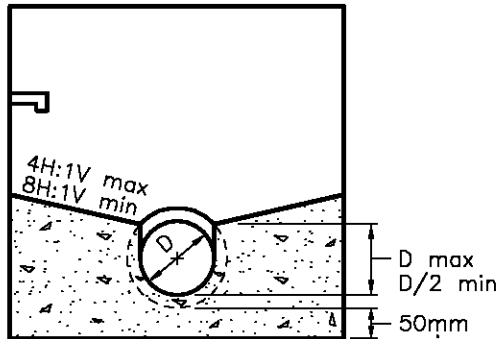
6. Dead end



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-finished, it shall be given wood float finish, channel shall be given steel trowel finish.

C Benchng slope and height shall be as specified.

D When specified, maintenance holes that are 1200mm in diameter with a uniform channel for 200 or 250mm pipe may be prebenched at the manufacturer with standardized benching slope and channel orientation.

E All dimensions are nominal.

F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014

Rev 4

**MAINTENANCE HOLE BENCHING
AND PIPE OPENING ALTERNATIVES**

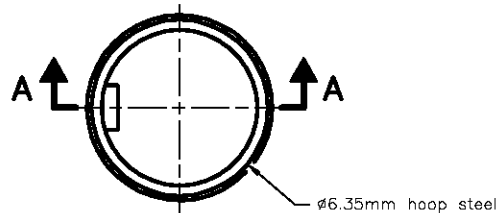
OPSD 701.021



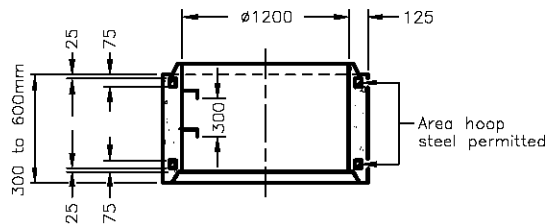


- A This drawing shall be read in conjunction with OPSD 701.031 and 701.032.
- B Centre reinforcing steel in riser $\pm 20\text{mm}$. All other reinforcing steel shall have 25mm minimum cover.
- C Steps shall be according to OPSD 405.010 or 405.020.
- D All dimensions are nominal.
- E All dimensions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

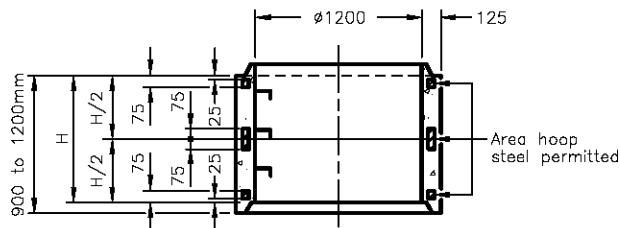
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	4	
PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS 1200mm DIAMETER TAPERED TOP AND FLAT CAP				
	OPSD 701.030			



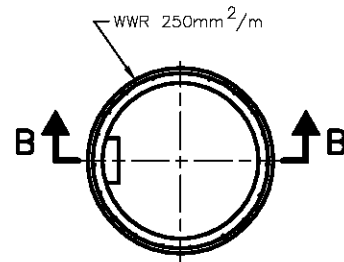
**PLAN OF RISER
WITH HOOP STEEL**



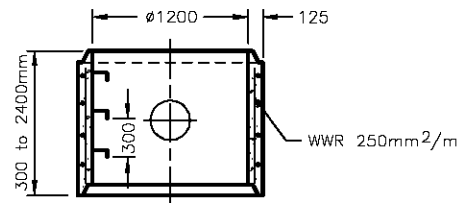
**SECTION A-A
RISERS < 900mm HIGH**



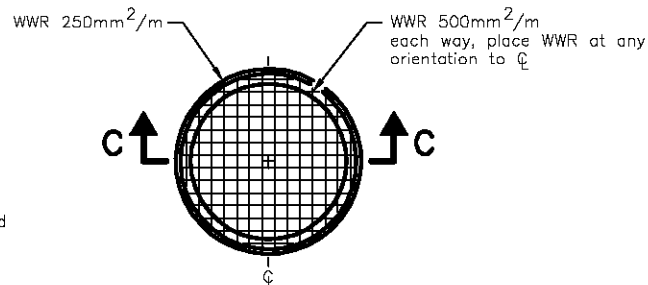
**SECTION A-A
RISERS ≥ 900mm**



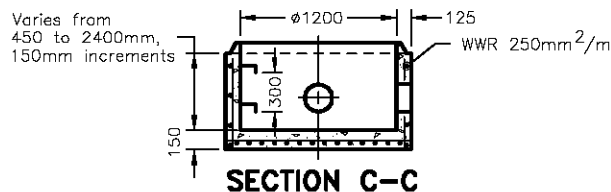
**PLAN OF RISER
WITH WWR**



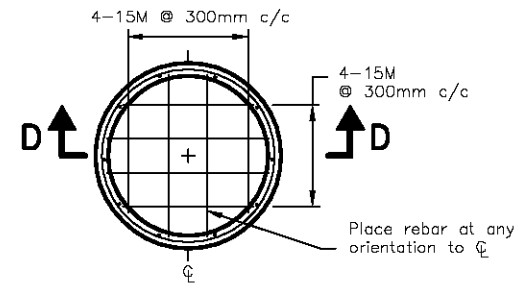
SECTION B-B



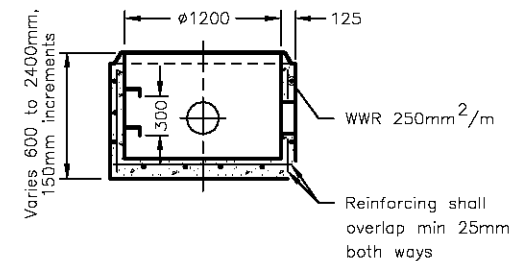
PLAN OF MONOLITHIC BASE WITH WWR



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

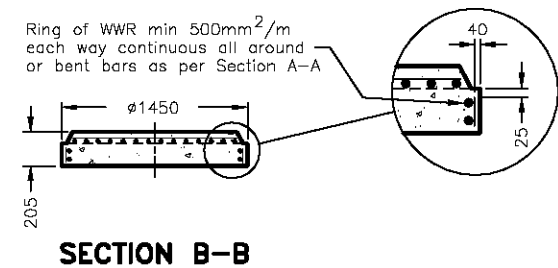
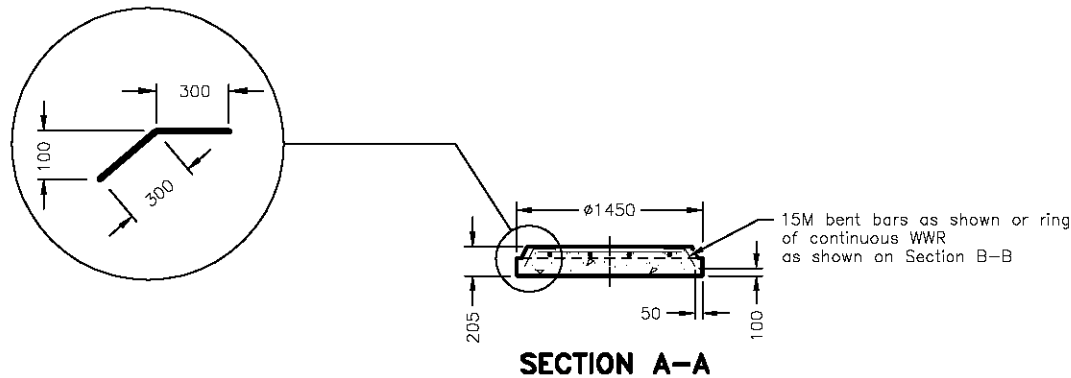
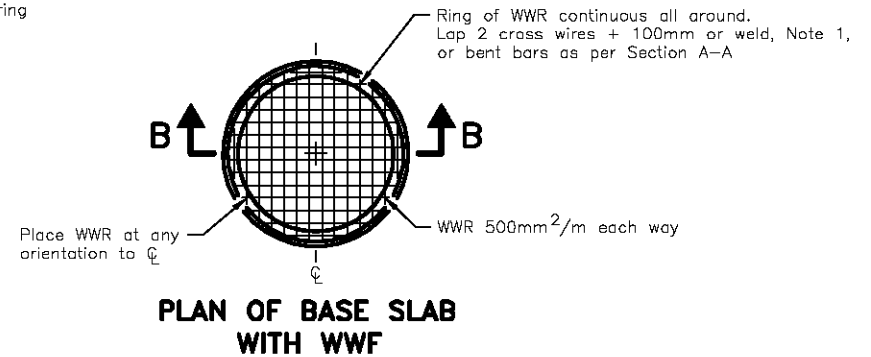
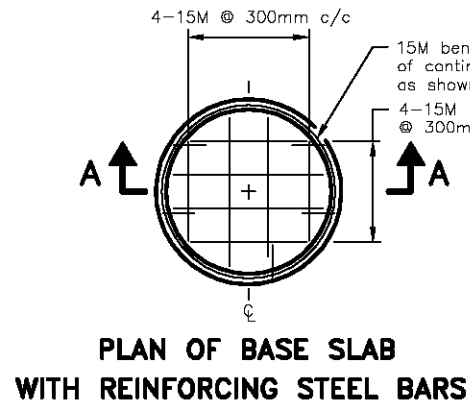
**PRECAST CONCRETE
MAINTENANCE HOLE COMPONENTS
1200mm DIAMETER
RISER AND MONOLITHIC BASE**

Nov 2014

Rev 2



OPSD 701.031



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 ± 20 mm. All other reinforcing steel shall have 25mm minimum cover.
- C All dimensions are nominal.
- D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

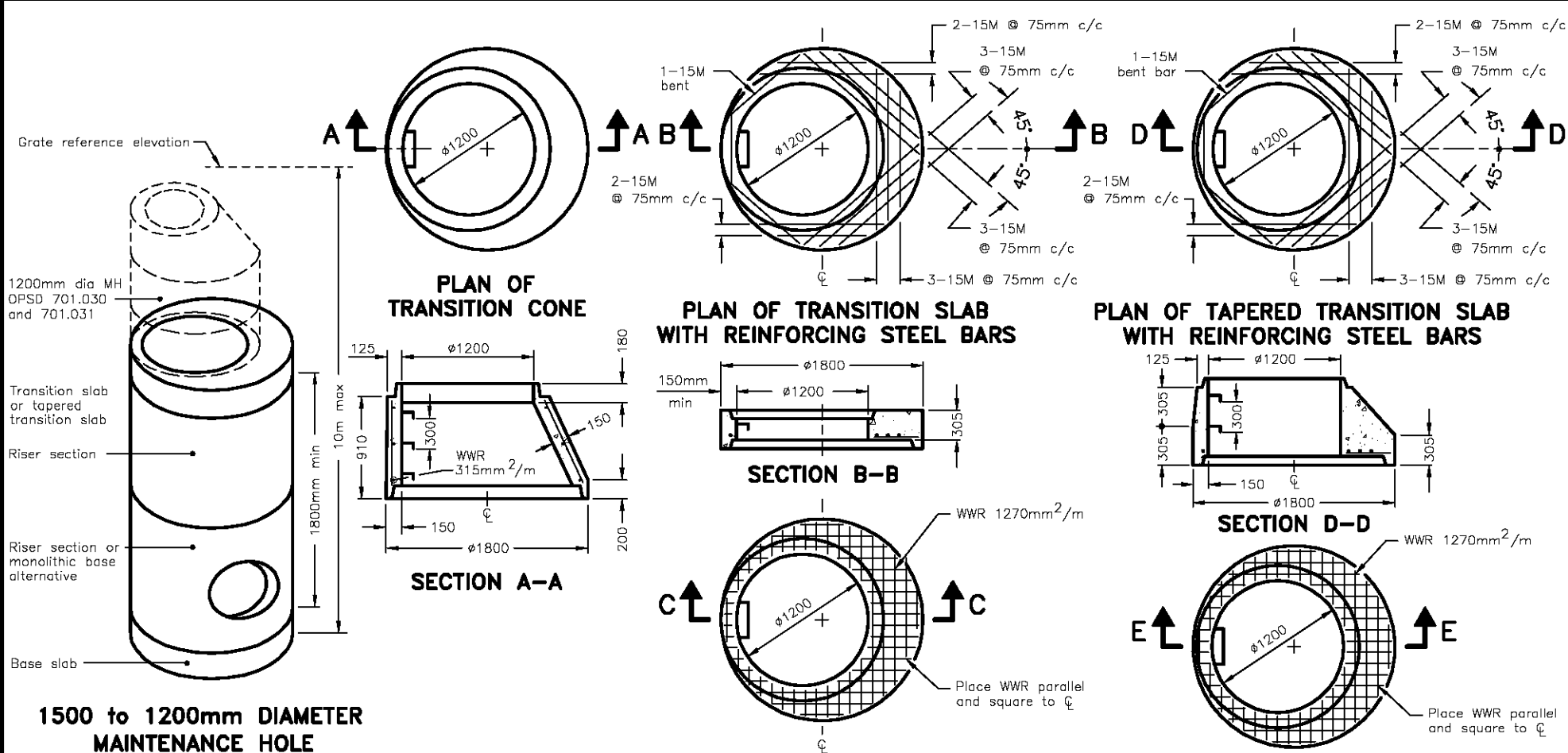
**PRECAST CONCRETE
MAINTENANCE HOLE COMPONENTS
1200mm DIAMETER
BASE SLAB**

Nov 2014

Rev 2



OPSD 701.032



NOTES:

- A This OPSD shall be read in conjunction with OPSD 701.041.
- B Centre reinforcing in transition cone ± 25 mm. 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

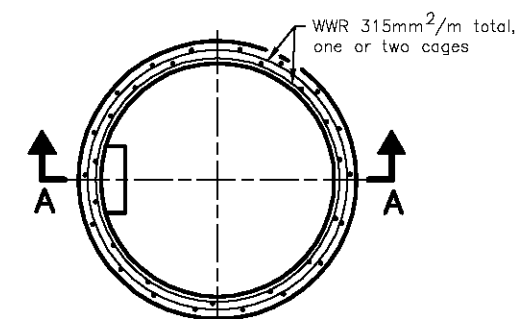
PRECAST CONCRETE
MAINTENANCE HOLE COMPONENTS
1500mm DIAMETER
TRANSITION CONE AND SLABS

Nov 2014

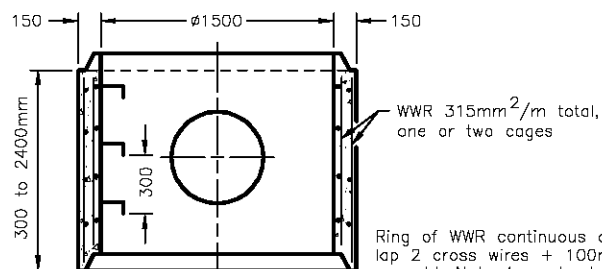
Rev 4



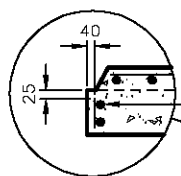
OPSD 701.040



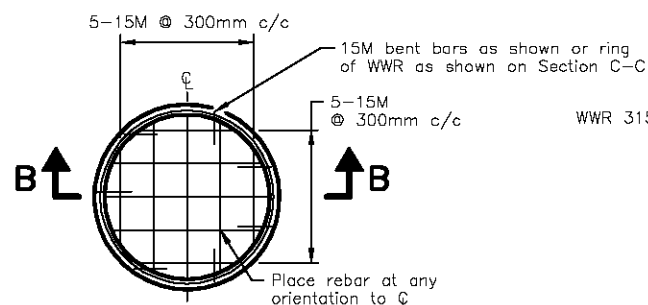
**PLAN OF RISER
WITH WWR**



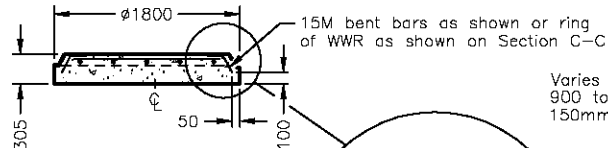
SECTION A-A



Ring of WWR continuous all around
lap 2 cross wires + 100mm
or weld, Note 1, or bent bars
as shown on Section B-B

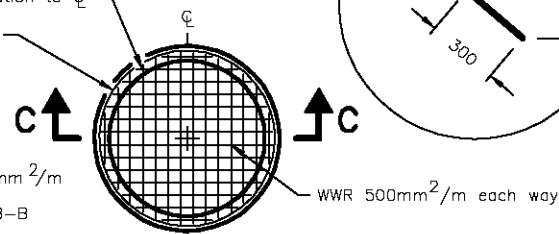


**PLAN OF BASE SLAB
WITH REINFORCING STEEL BARS**

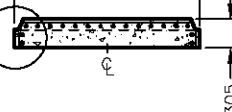


SECTION B-B

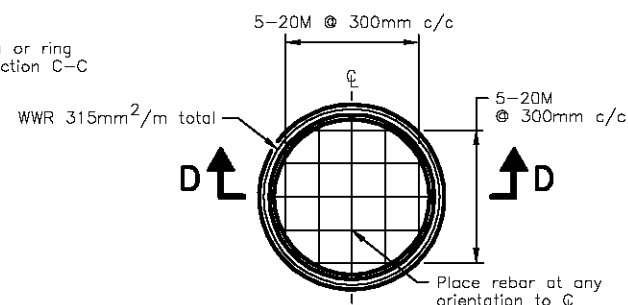
Place WWR at any
orientation to ϕ



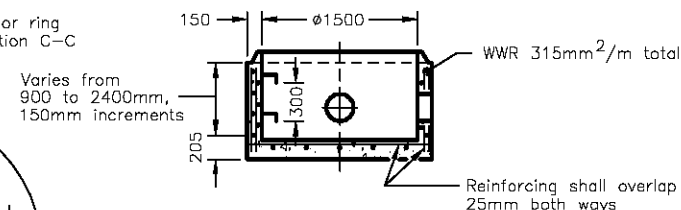
**PLAN OF BASE SLAB
WITH WWR**



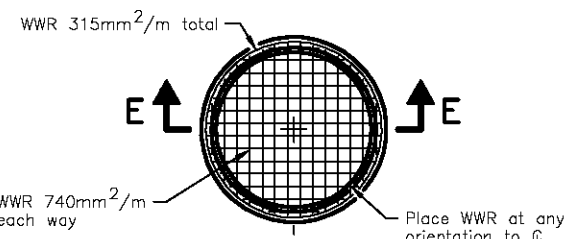
SECTION C-C



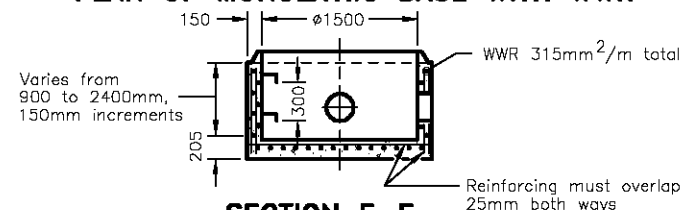
**PLAN OF MONOLITHIC BASE
WITH REINFORCING STEEL BARS**



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 ± 25 mm. 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

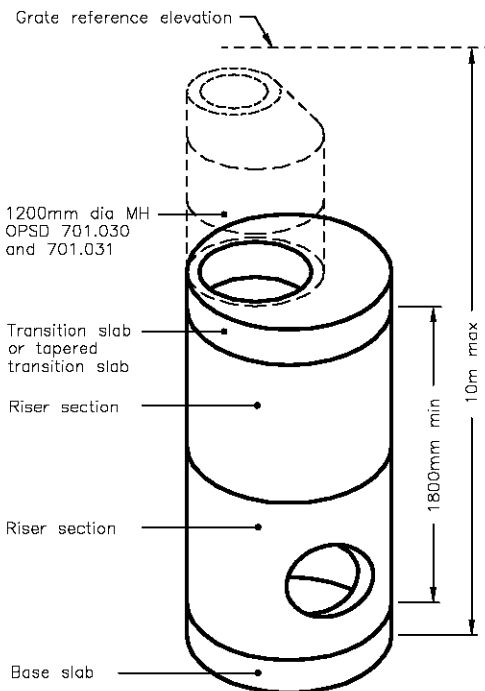
**PRECAST CONCRETE
MAINTENANCE HOLE COMPONENTS
1500mm DIAMETER
RISER AND BASES**

Nov 2014

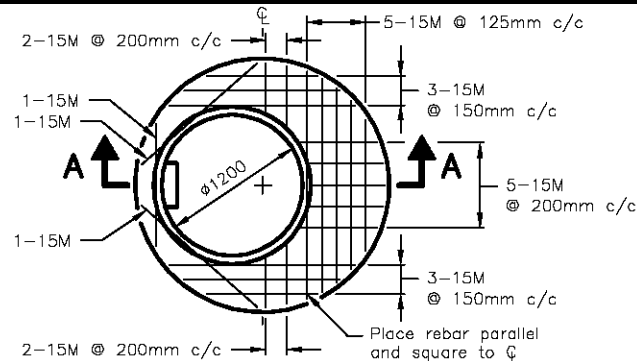
Rev 2



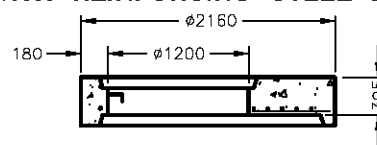
OPSD 701.041



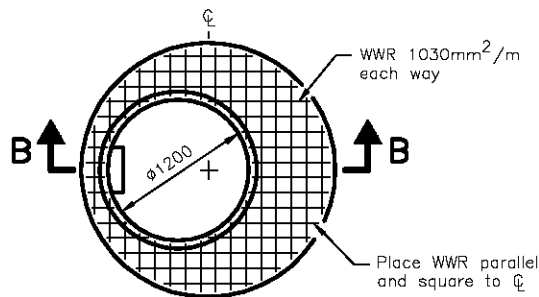
1800 to 1200mm DIAMETER MAINTENANCE HOLE



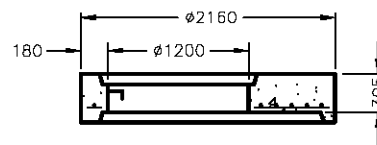
**PLAN OF TRANSITION SLAB
WITH REINFORCING STEEL BARS**



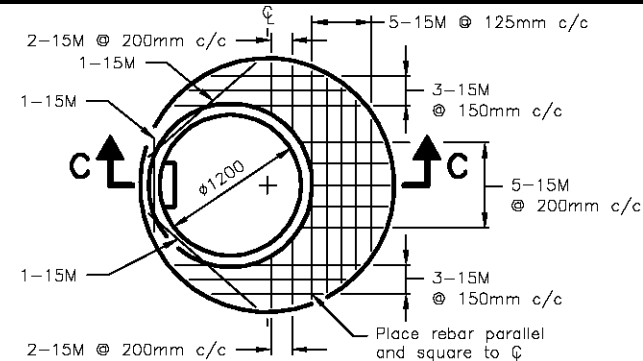
SECTION A-A



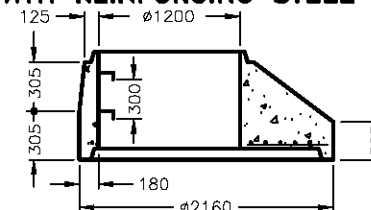
**PLAN OF TRANSITION SLAB
WITH WWR**



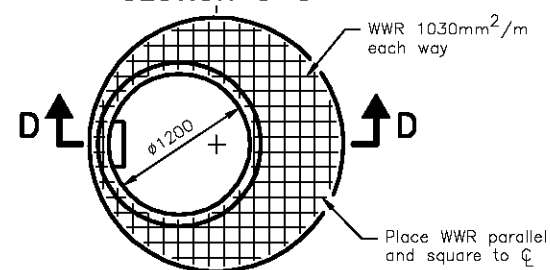
SECTION B-B



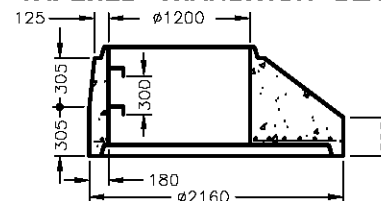
**PLAN OF TAPERED TRANSITION SLAB
WITH REINFORCING STEEL BARS**



SECTION C-C



PLAN OF TAPERED TRANSITION SLAB WITH WWR



SECTION D-D

NOTES:

- A This OPSP shall be read in conjunction with OPSP 701.051.
- B All reinforcing steel shall have 25mm minimum cover.
- C Steps shall be according to OPSP 405.010 or 405.020.
- D All dimensions are nominal.
- E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

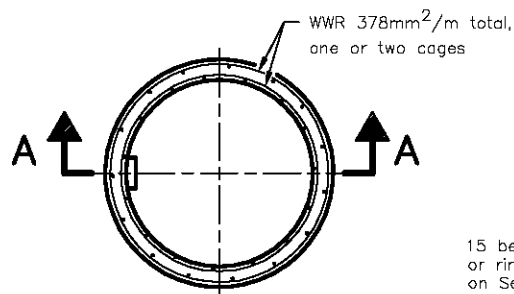
**PRECAST CONCRETE
MAINTENANCE HOLE COMPONENTS
1800mm DIAMETER
TRANSITION SLABS**

Nov 2014

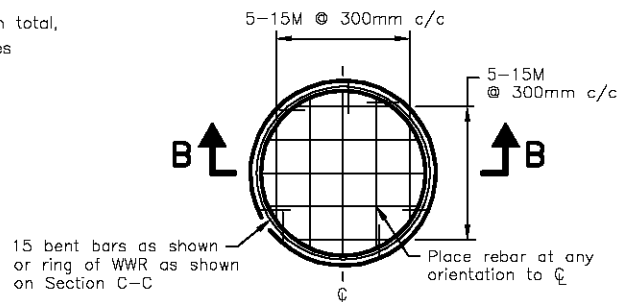
Rev 4



OPSD 701.050

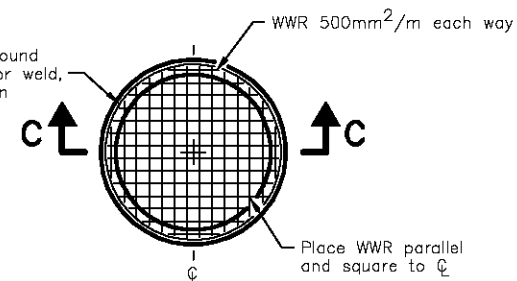


**PLAN OF RISER
WITH WWR**

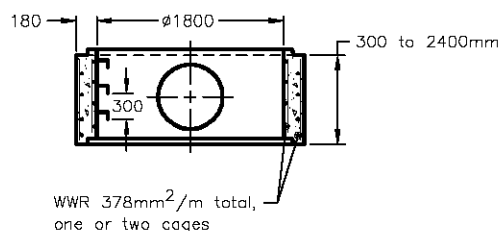


**PLAN OF BASE SLAB
WITH REINFORCING STEEL BARS**

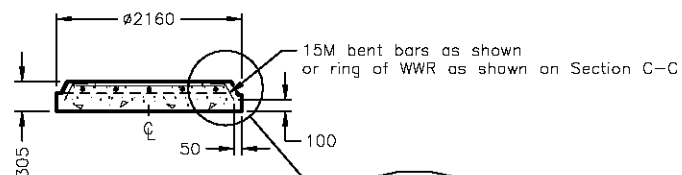
Ring of WWR continuous all around
lap 2 cross wires + 100mm or weld,
Note 1, or bent bars as shown
on Section B-B



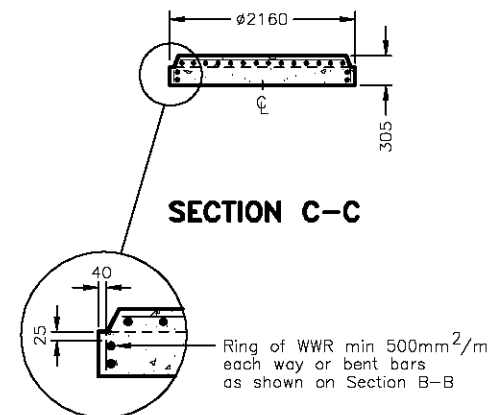
**PLAN OF BASE SLAB
WITH WWR**



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 ± 25 mm. 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

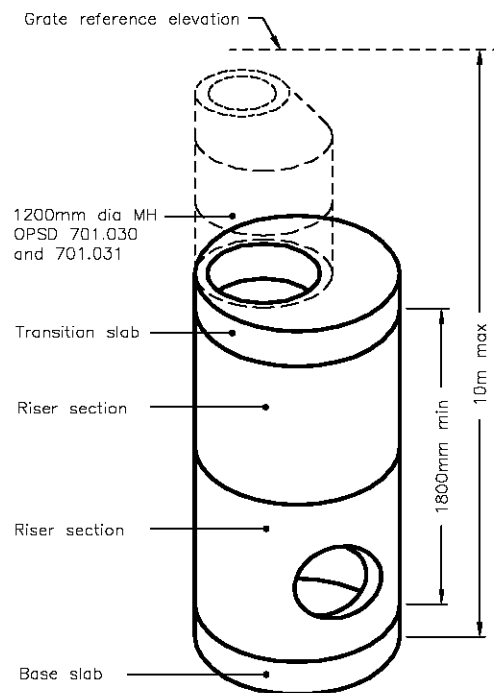
**PRECAST CONCRETE
MAINTENANCE HOLE COMPONENTS
1800mm DIAMETER
RISER AND BASE SLAB**

Nov 2014

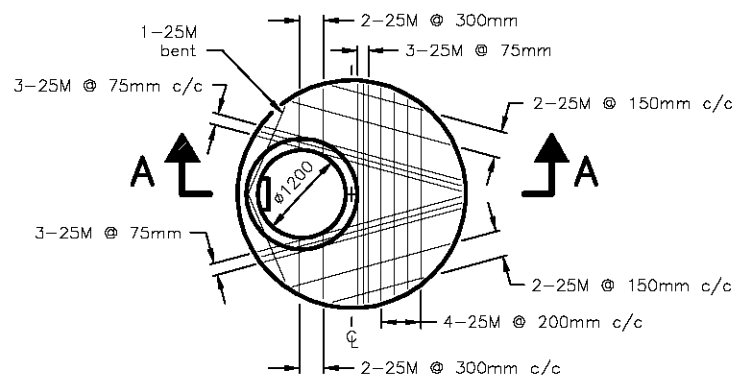
Rev 2



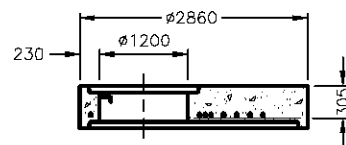
OPSD 701.051



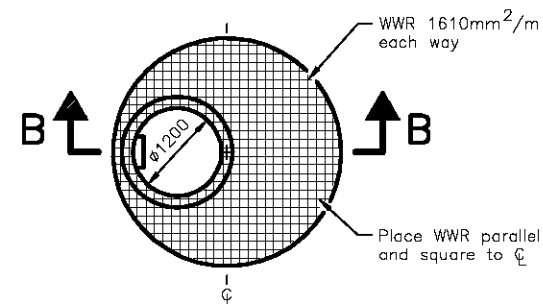
**2400 to 1200mm DIAMETER
MAINTENANCE HOLE**



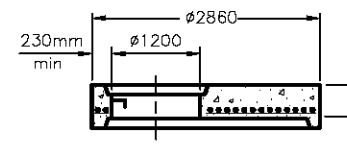
**PLAN OF TRANSITION SLAB
WITH REINFORCING STEEL BARS**



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

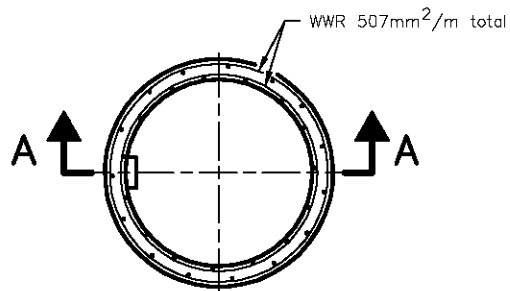
**PRECAST CONCRETE
MAINTENANCE HOLE COMPONENTS
2400mm DIAMETER
TRANSITION SLAB**

Nov 2014

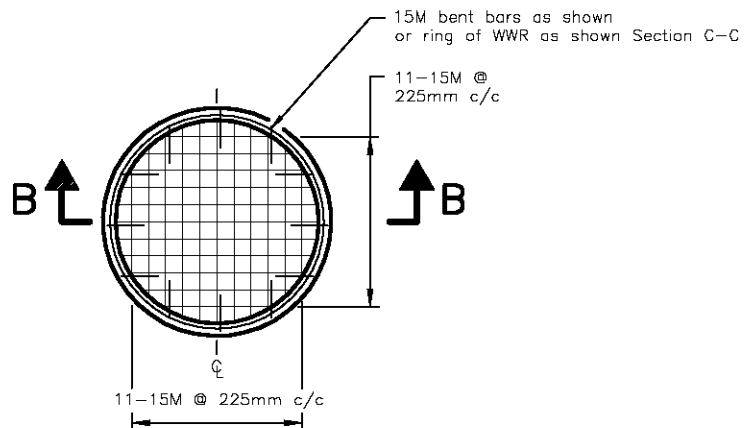
Rev 4



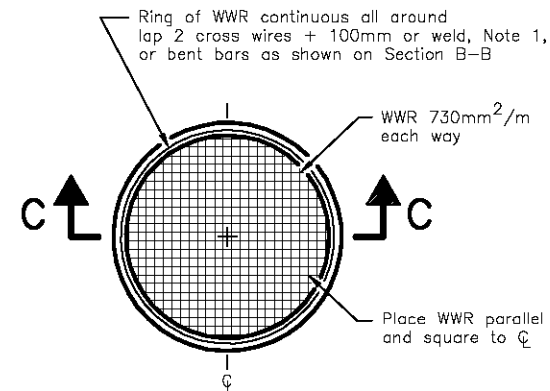
OPSD 701.060



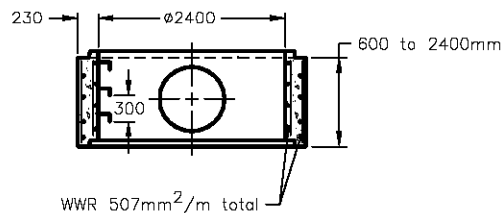
PLAN OF RISER



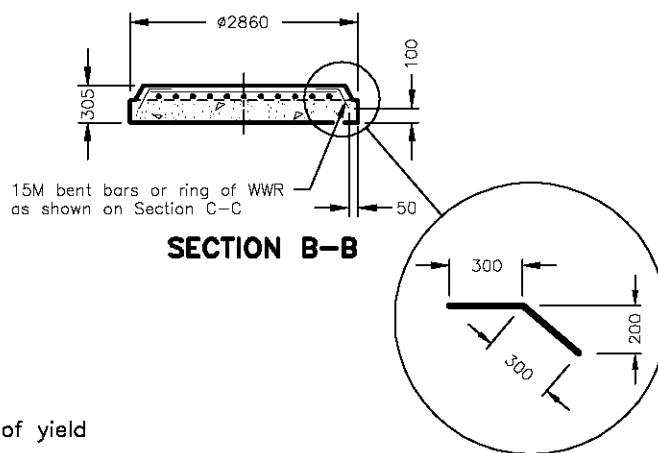
**PLAN OF BASE SLAB
WITH REINFORCING STEEL BARS**



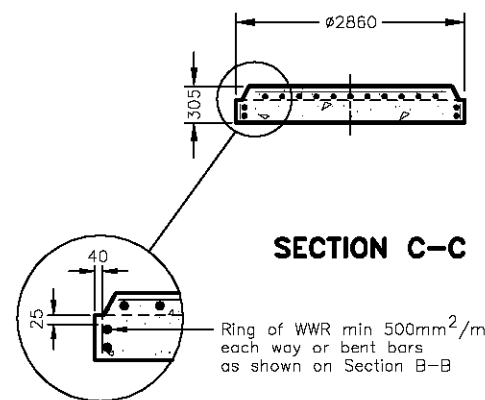
**PLAN OF BASE SLAB
WITH WWR**



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

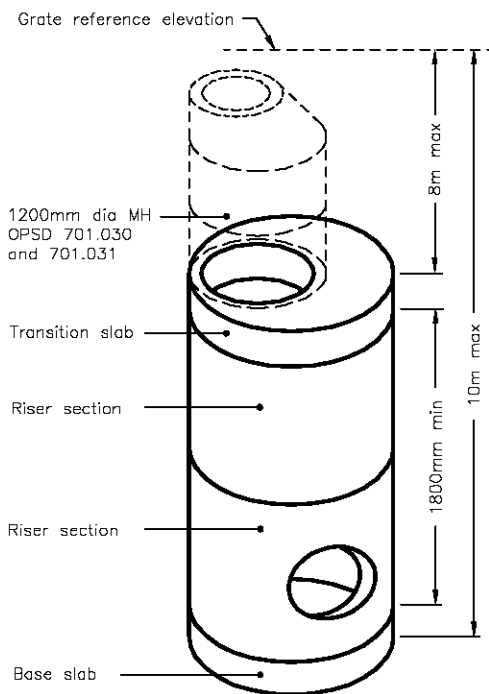
**PRECAST CONCRETE
MAINTENANCE HOLE COMPONENTS
2400mm DIAMETER
RISER AND BASE SLAB**

Nov 2014

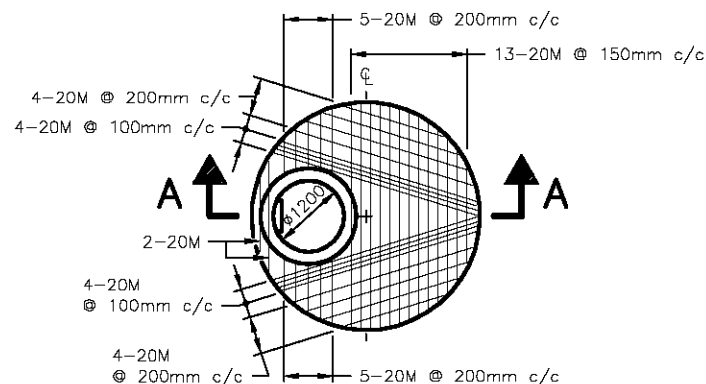
Rev 2



OPSD 701.061



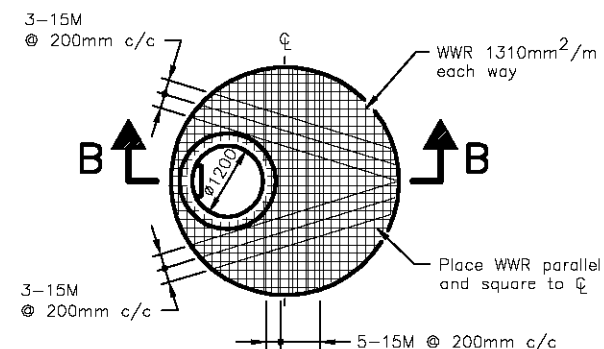
**3000 to 1200mm DIAMETER
MAINTENANCE HOLE**



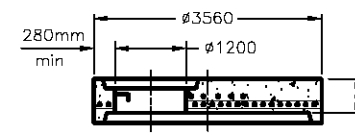
**PLAN OF TRANSITION SLAB
WITH REINFORCING STEEL BARS**



SECTION A-A



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



SECTION B-B

NOTES:

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

ONTARIO PROVINCIAL STANDARD DRAWING

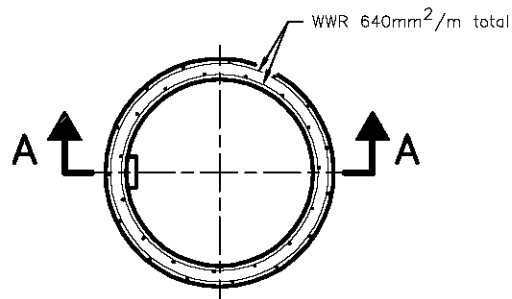
**PRECAST CONCRETE
MAINTENANCE HOLE COMPONENTS
3000mm DIAMETER
TRANSITION SLAB**

Nov 2014

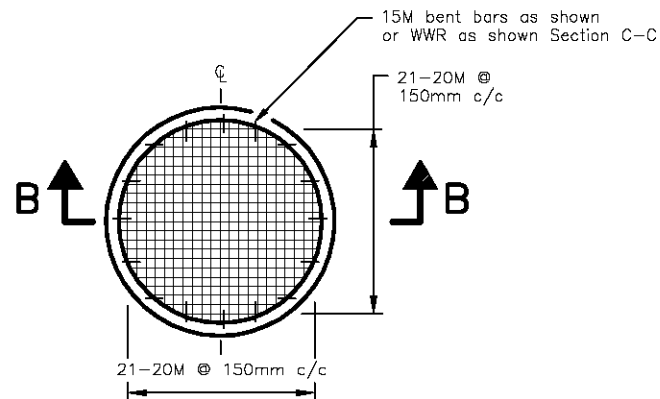
Rev 3



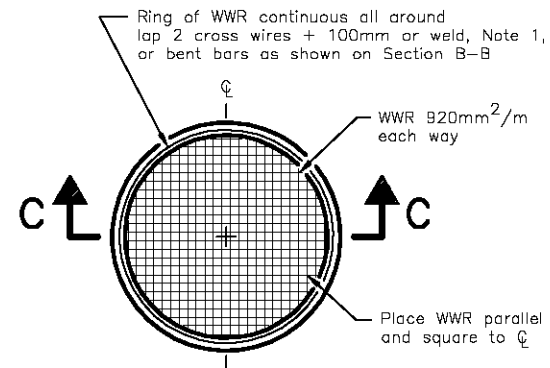
OPSD 701.070



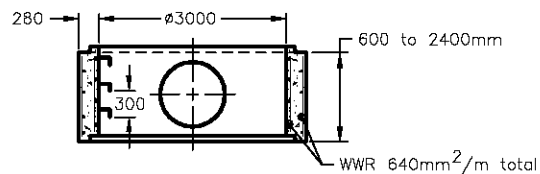
PLAN OF RISER



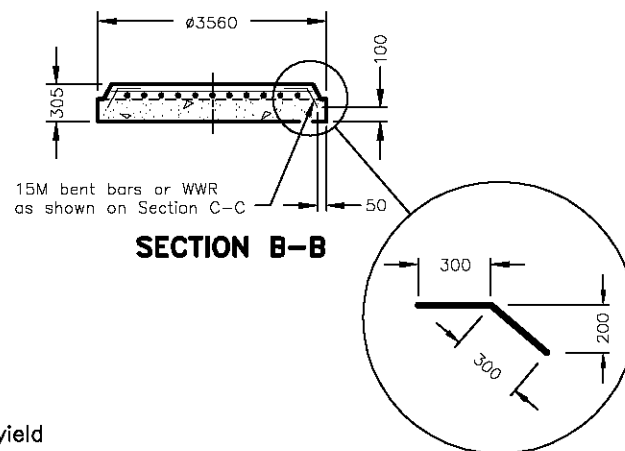
**PLAN OF BASE SLAB
WITH REINFORCING STEEL BARS**



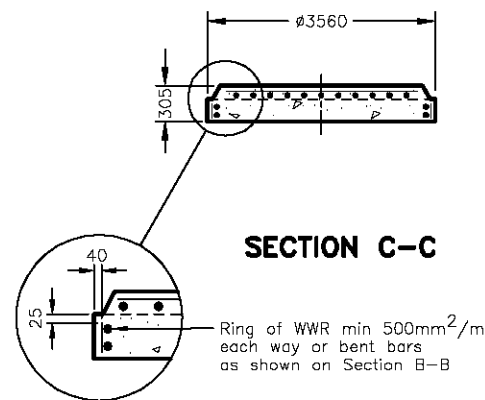
**PLAN OF BASE SLAB
WITH WWR**



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

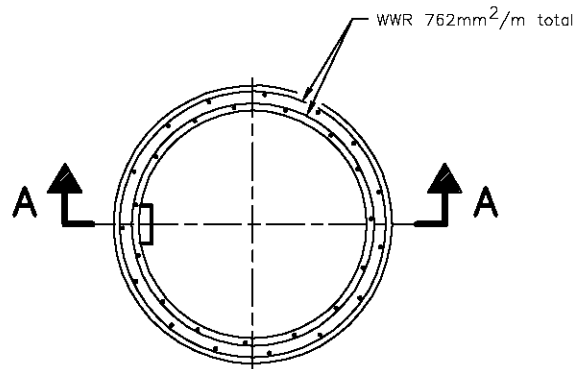


OPSD 701.071

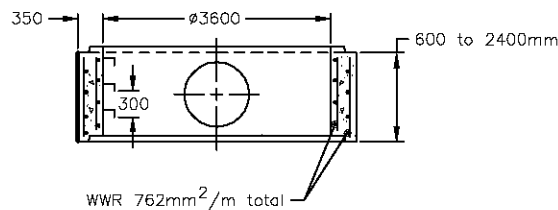


- A This OPSD shall be read in conjunction with OPSD 701.081.
- B All reinforcing steel shall have 25mm minimum cover.
- C Steps shall be according to OPSD 405.010 or 405.020.
- D All dimensions are nominal.
- E All dimensions are in millimetres unless otherwise shown.

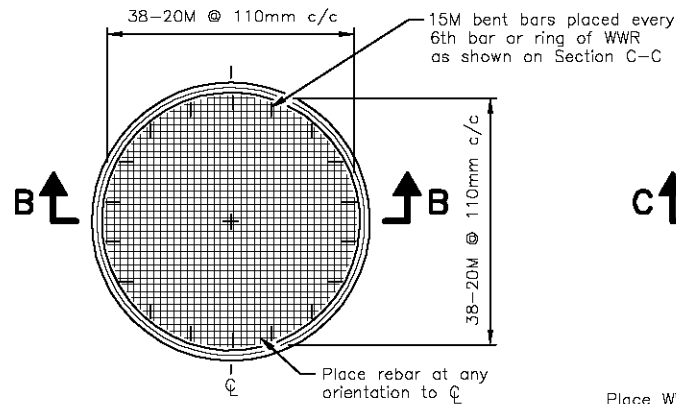
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev	3	
PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS 3600mm DIAMETER TRANSITION SLAB	----- -----			
	OPSD 701.080			



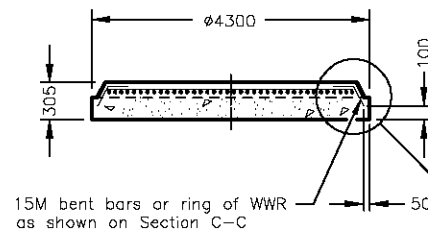
PLAN OF RISER



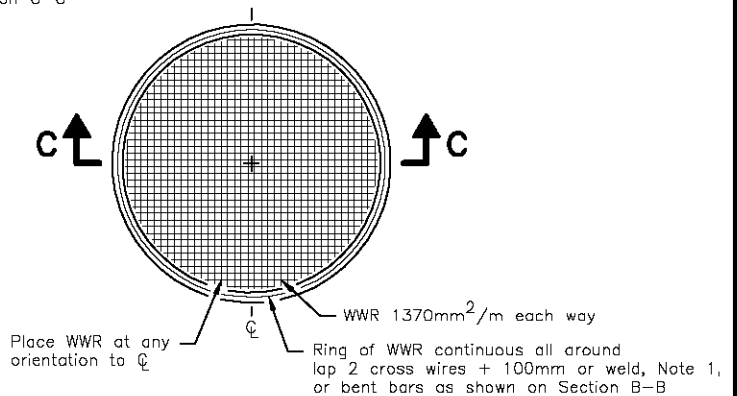
SECTION A-A



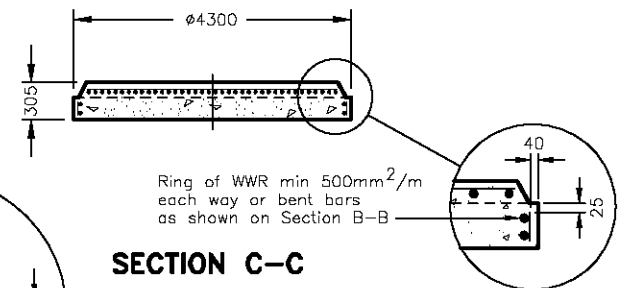
**PLAN OF BASE SLAB
WITH REINFORCING STEEL BARS**



SECTION B-B



**PLAN OF BASE SLAB
WITH WWR**



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

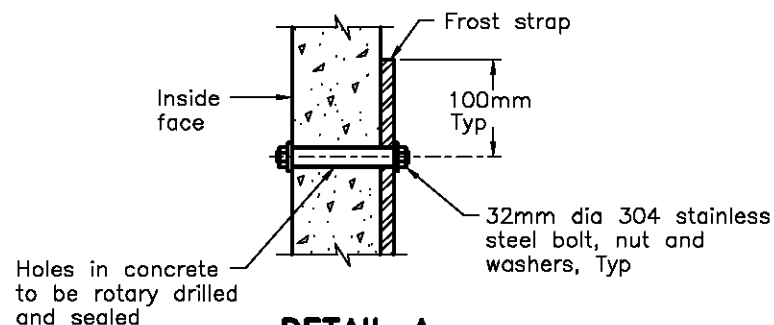
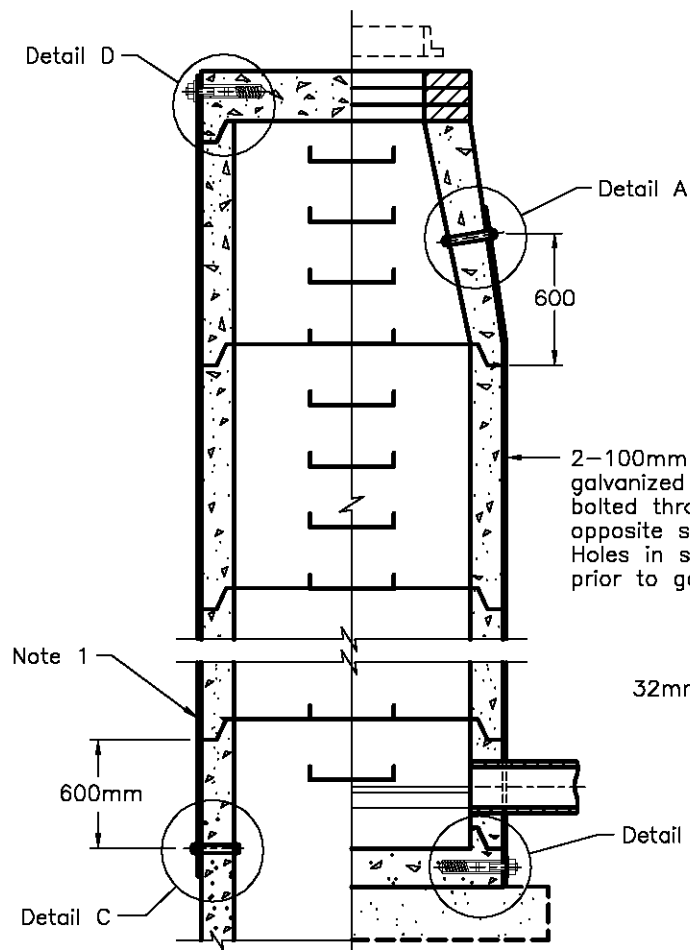
**PRECAST CONCRETE
MAINTENANCE HOLE COMPONENTS
3600mm DIAMETER
RISER AND BASE SLAB**

Nov 2014

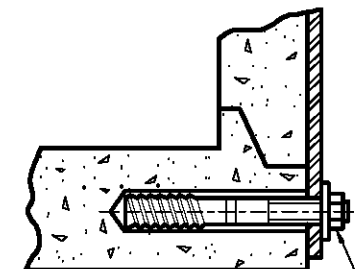
Rev 2



OPSD 701.081

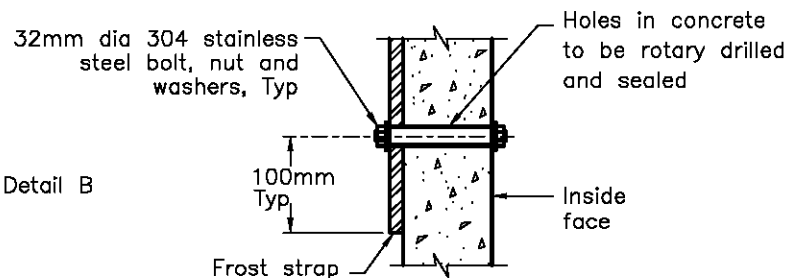


DETAIL A

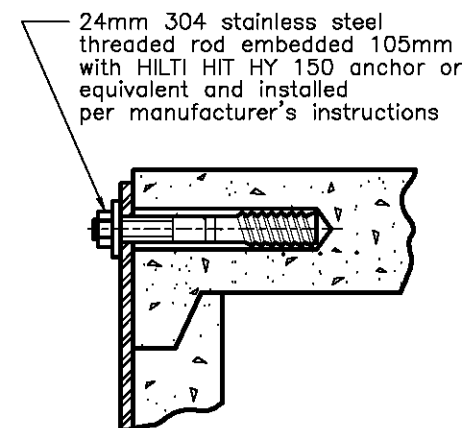


24mm 304 stainless steel threaded rod embedded 105mm with HILTI HIT HY 150 anchor or equivalent and installed per manufacturer's instructions

DETAIL B



DETAIL C



DETAIL D

NOTES:

- 1 Depth of frost strap shall be as specified.
- A Frost straps shall be placed so they do not interfere with sewer pipe openings and the steps.
- B Frost straps shall be placed when specified.
- C Galvanizing shall be according to CAN/CSA G164.
- D All dimensions are in millimetres unless otherwise shown.

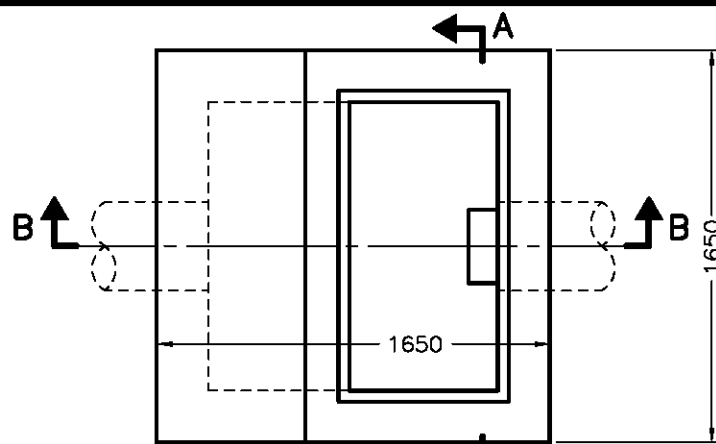
ONTARIO PROVINCIAL STANDARD DRAWING

FROST STRAP INSTALLATION

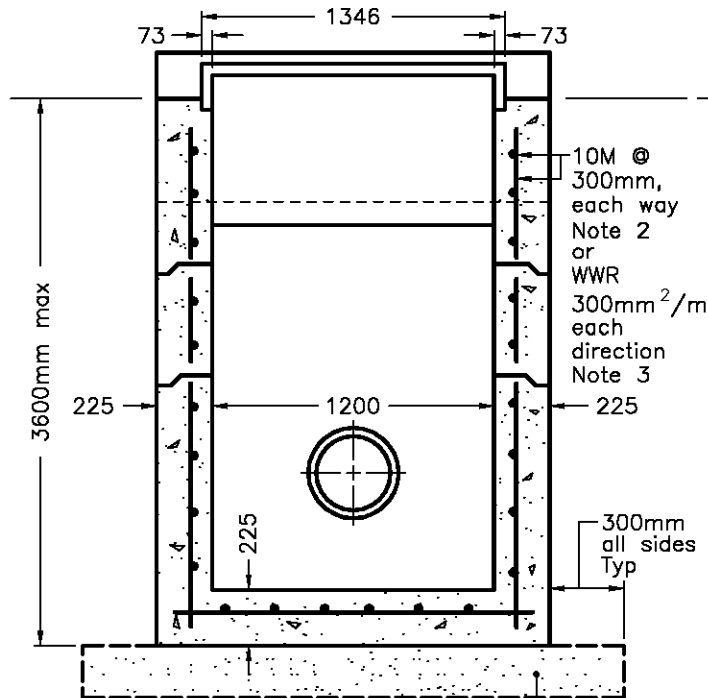
Nov 2010 Rev 2



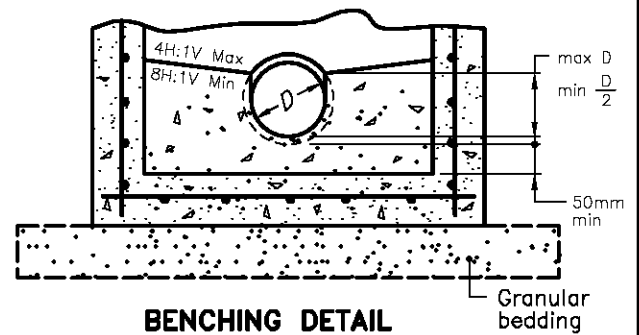
OPSD 701.100



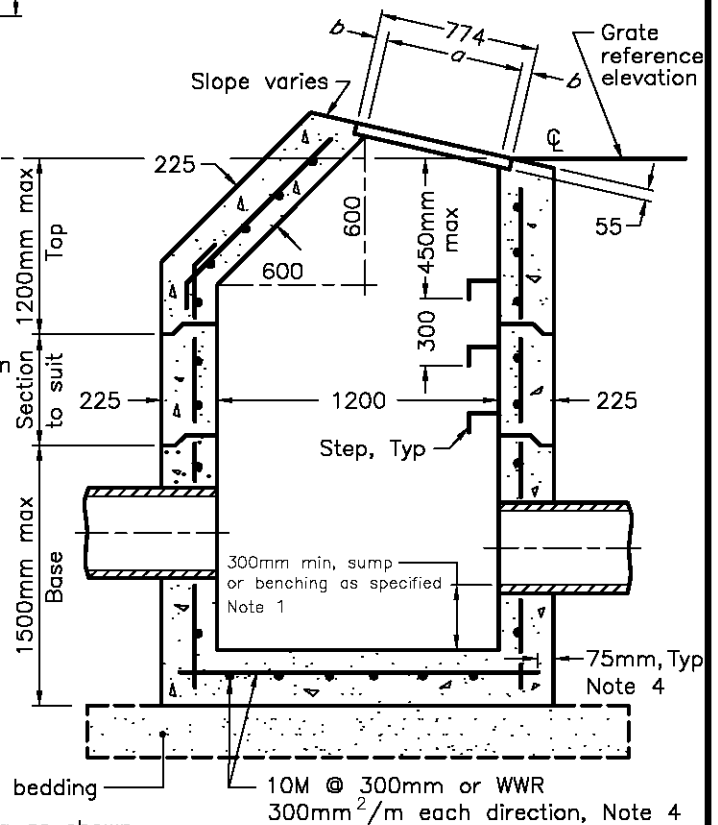
PLAN



SECTION A-A



BENCHING DETAIL



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 ± 35 mm. 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 Type	Slope	<i>a</i>	<i>b</i>
B	2H:1V	670	52
	3H:1V	632	71
	4H:1V	618	78
	6H:1V	608	83
	HOR	600	87

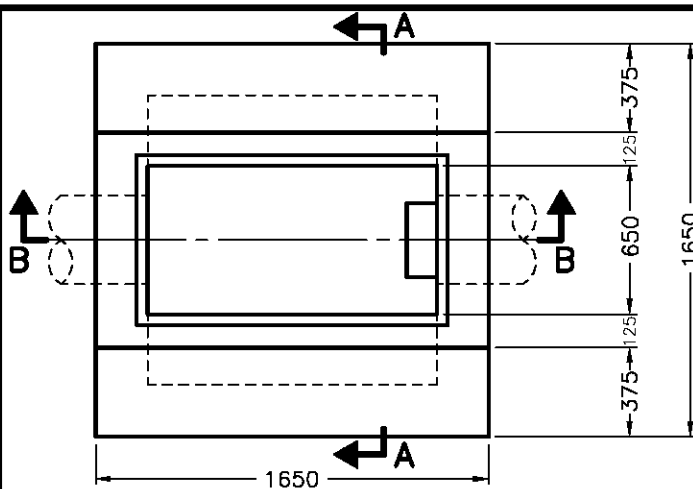
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 | Rev 3

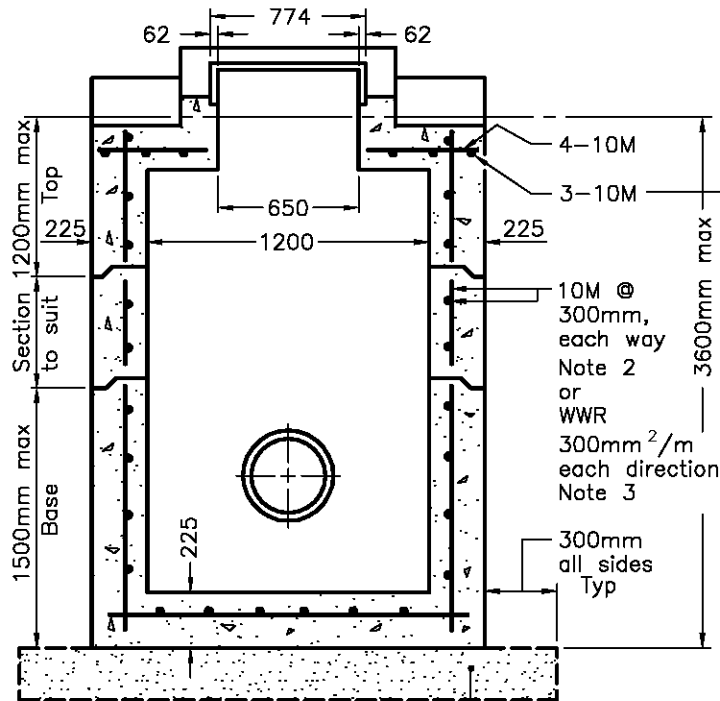
**PRECAST CONCRETE
DITCH INLET MAINTENANCE HOLE – TYPE A
1200 x 1200mm**

OPSD 702.040



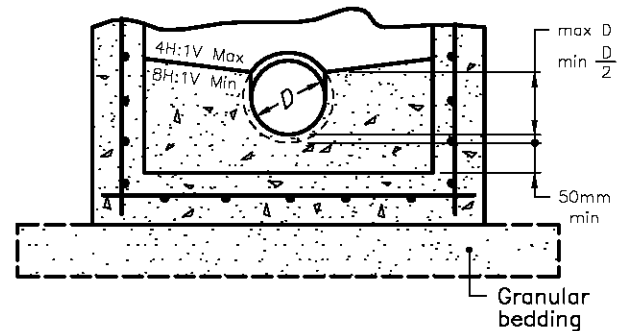


PLAN

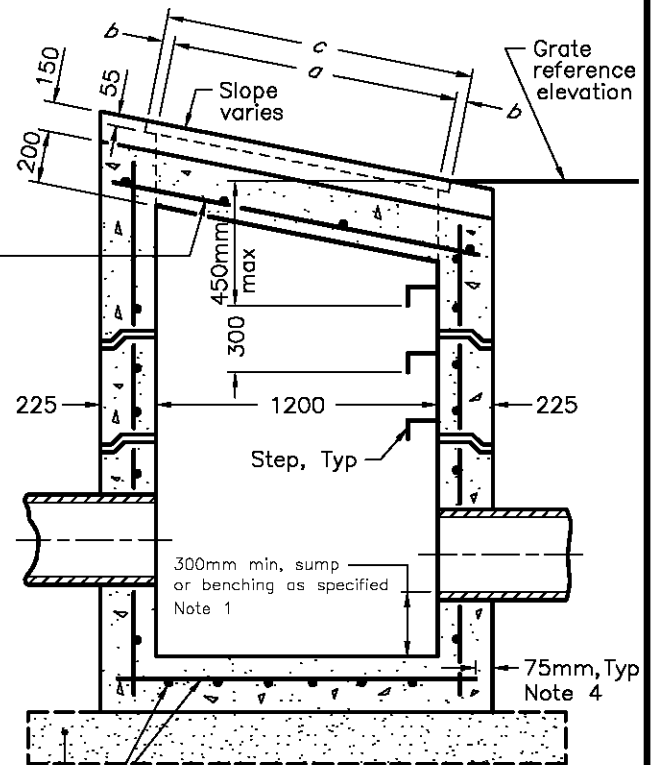


NOTES: SECTION A-A

- 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 ± 35 mm. All other reinforcing shall have a minimum cover of 25mm.
- J All dimensions are nominal.
- K All dimensions are in millimetres unless otherwise shown.



BENCHING DETAIL



SECTION B-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
	8H:1V	1210	68	1346
	10H:1V	1206	70	1346
	HOR	1200	73	1346

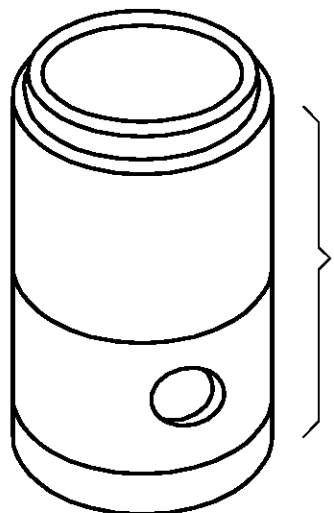
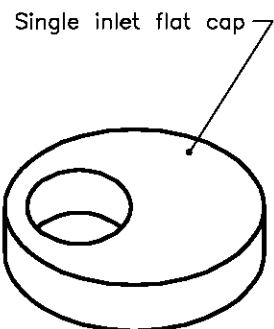
ONTARIO PROVINCIAL STANDARD DRAWING

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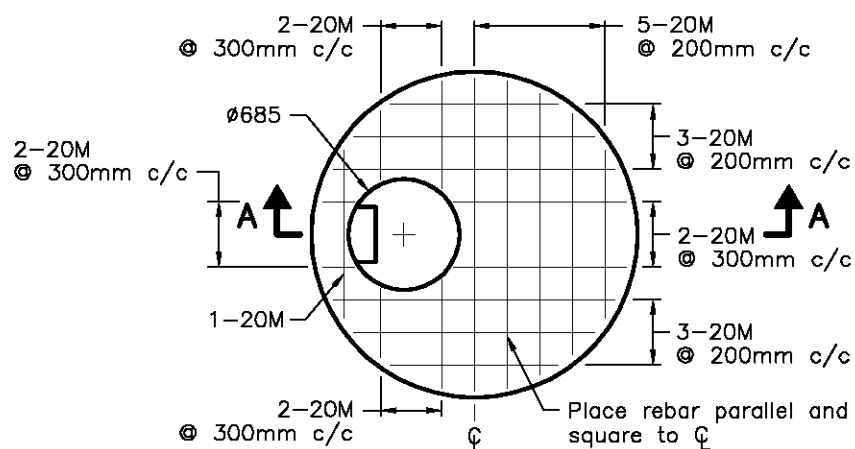
PRECAST CONCRETE
DITCH INLET MAINTENANCE HOLE — TYPE B
 1200 x 1200mm

OPSD 702.050

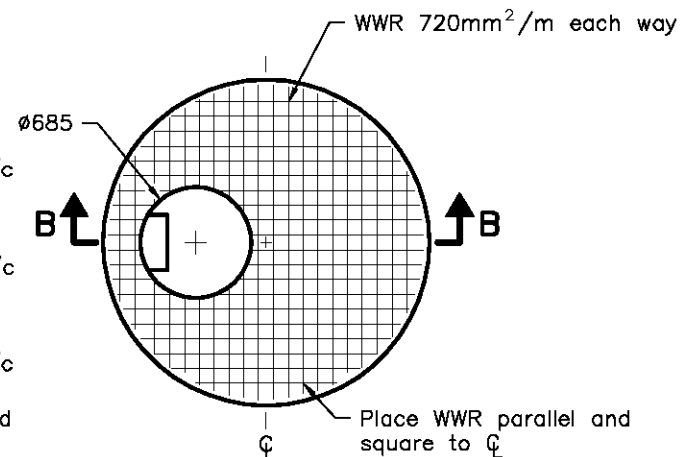




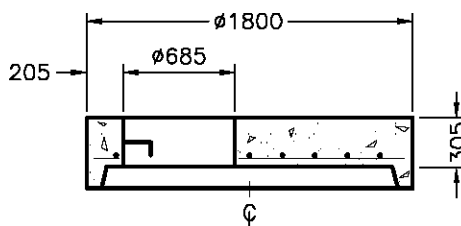
**1500mm DIAMETER
MAINTENANCE HOLE**



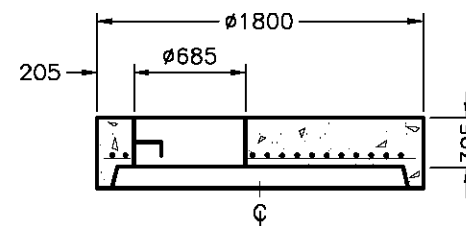
**PLAN OF FLAT CAP
WITH REINFORCING STEEL BARS**



**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

Nov 2014

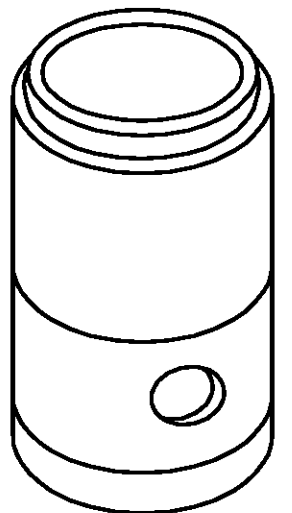
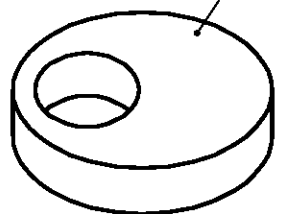
Rev 2

**PRECAST CONCRETE
SINGLE INLET FLAT CAP
1500mm DIAMETER**

OPSD 703.011

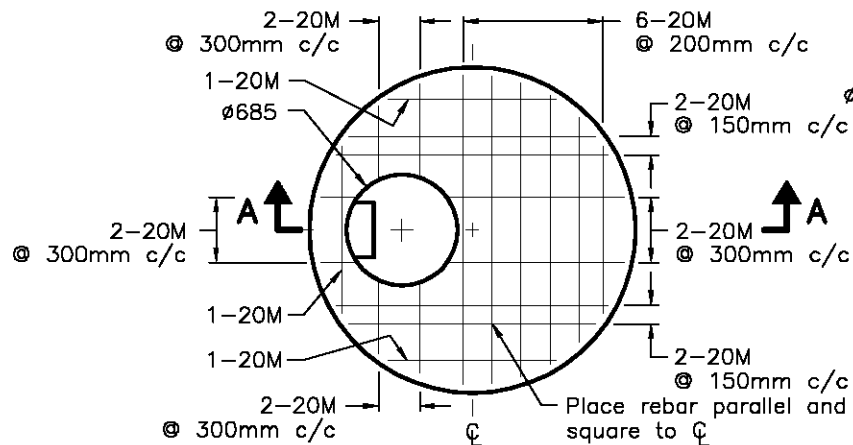


Single inlet flat cap

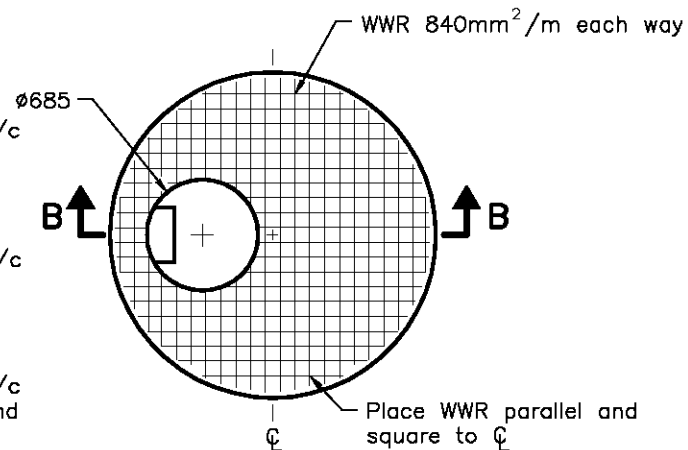


**1800mm DIAMETER
MAINTENANCE HOLE**

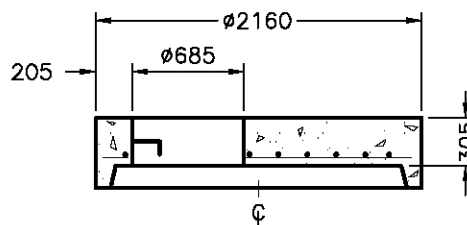
Precast units,
OPSD 701.051



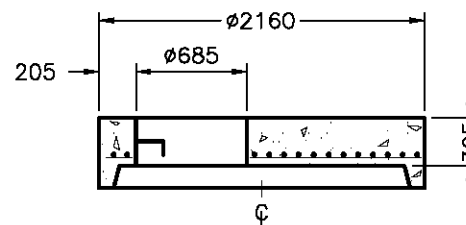
**PLAN OF FLAT CAP
WITH REINFORCING STEEL BARS**



**PLAN OF FLAT CAP
WITH WWR**



SECTION A-A



SECTION B-B

NOTES:

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

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014

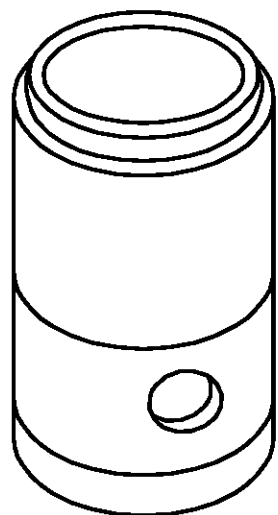
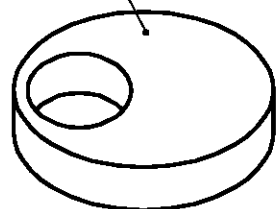
Rev 2

**PRECAST CONCRETE
SINGLE INLET FLAT CAP
1800mm DIAMETER**

OPSD 703.012

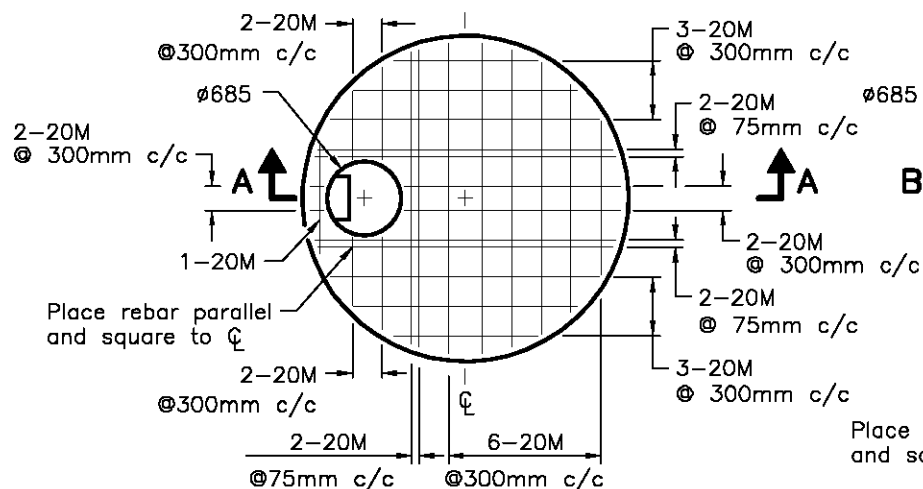


Single inlet flat cap

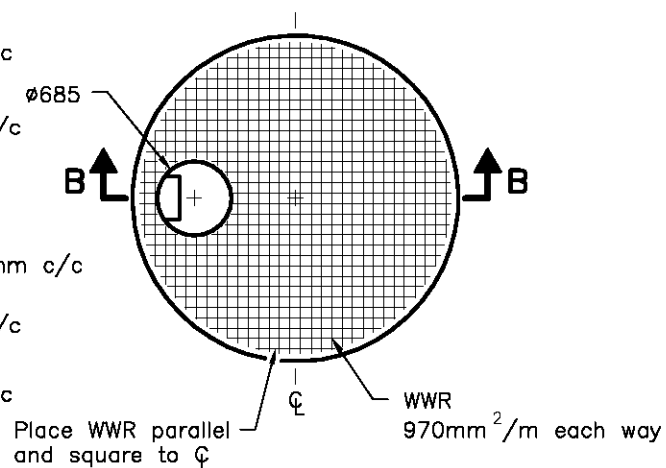


Precast units,
OPSD 701.061

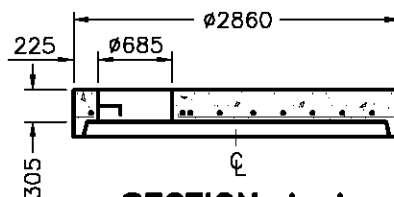
**2400mm DIAMETER
MAINTENANCE HOLE**



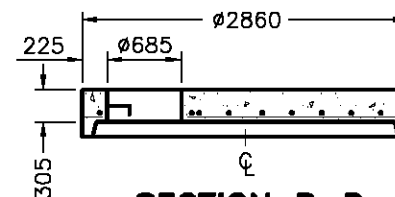
**PLAN OF FLAT CAP
WITH REINFORCING STEEL BARS**



**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

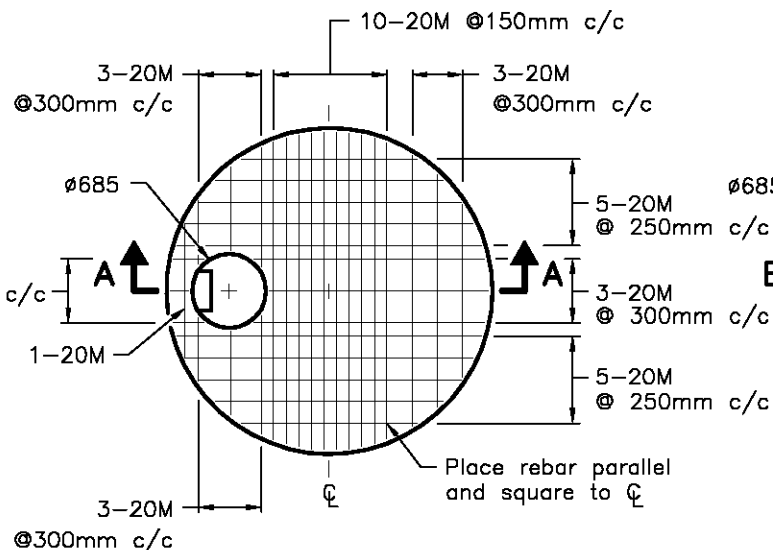
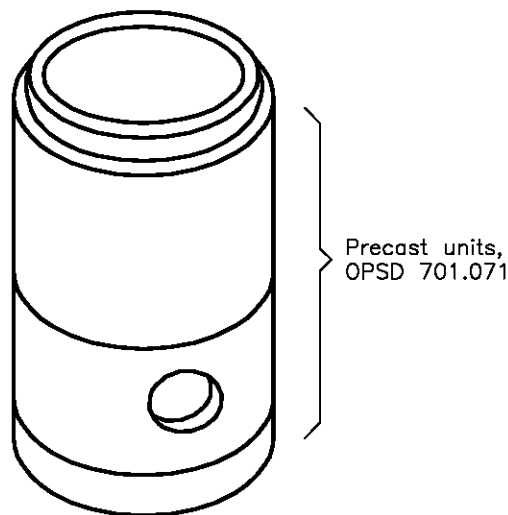
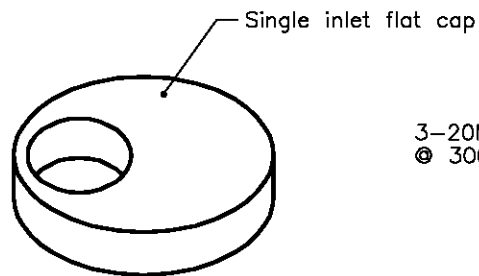
Nov 2014

Rev 2

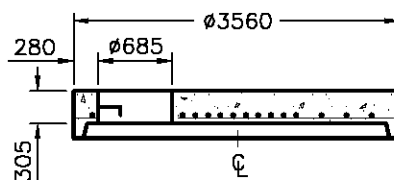
**PRECAST CONCRETE
SINGLE INLET FLAT CAP
2400mm DIAMETER**

OPSD 703.013

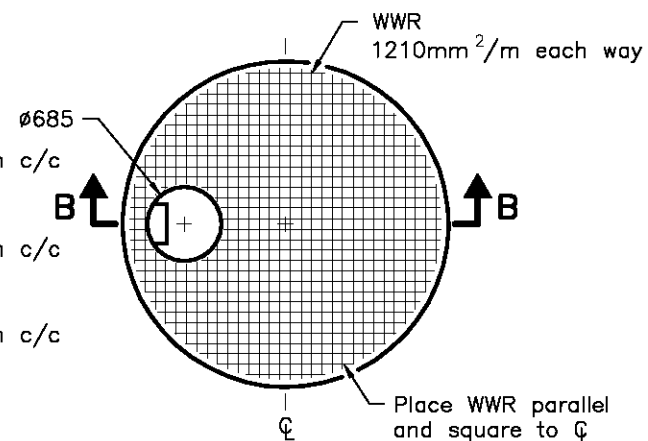




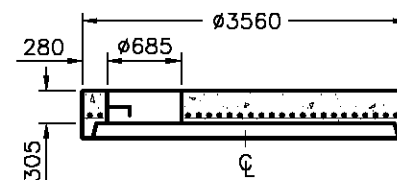
**PLAN OF FLAT CAP
WITH REINFORCING STEEL BARS**



SECTION A-A



**PLAN OF FLAT CAP
WITH WWR**



SECTION B-B

3000mm DIAMETER MAINTENANCE HOLE

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

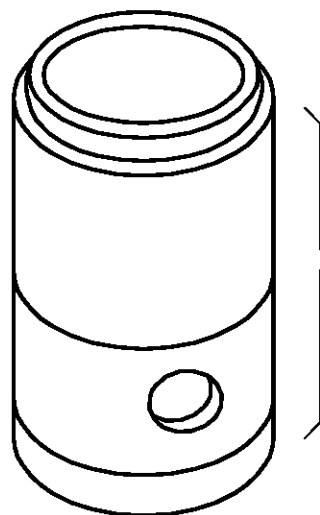
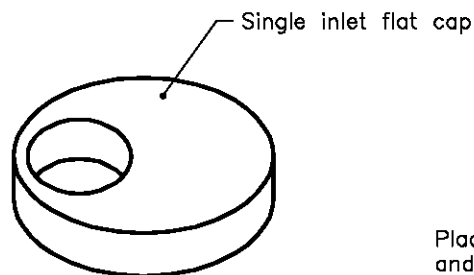
Nov 2014

Rev 2

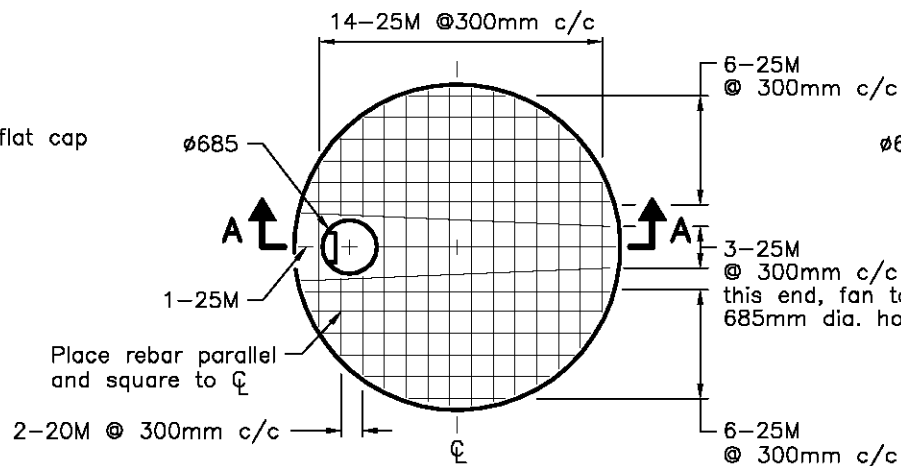
**PRECAST CONCRETE
SINGLE INLET FLAT CAP
3000mm DIAMETER**

OPSD 703.014

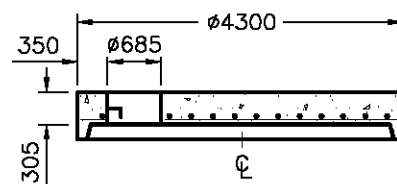




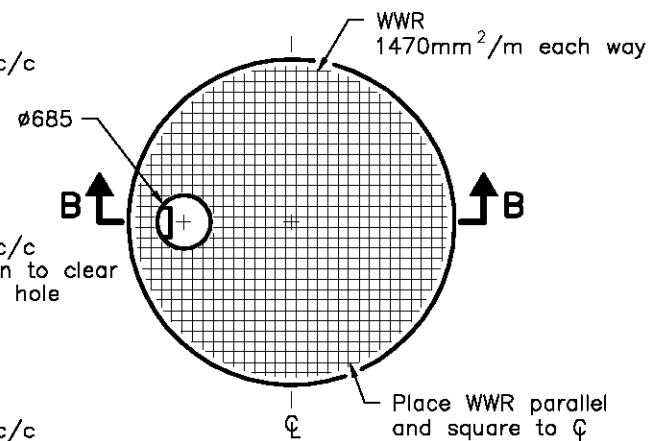
3600mm DIAMETER MAINTENANCE HOLE



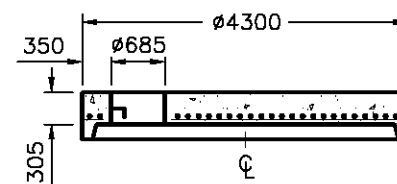
**PLAN OF FLAT CAP
WITH REINFORCING STEEL BARS**



SECTION A-A



**PLAN OF FLAT CAP
WITH WWR**



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

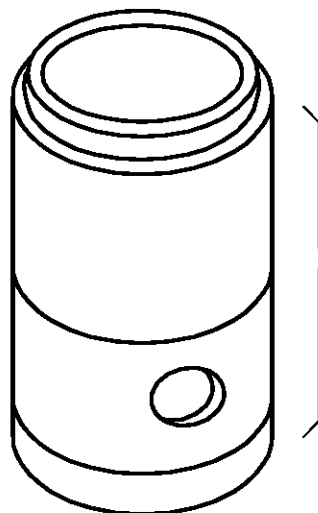
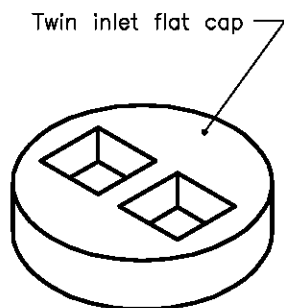
Nov 2014

Rev 2

**PRECAST CONCRETE
SINGLE INLET FLAT CAP
3600mm DIAMETER**

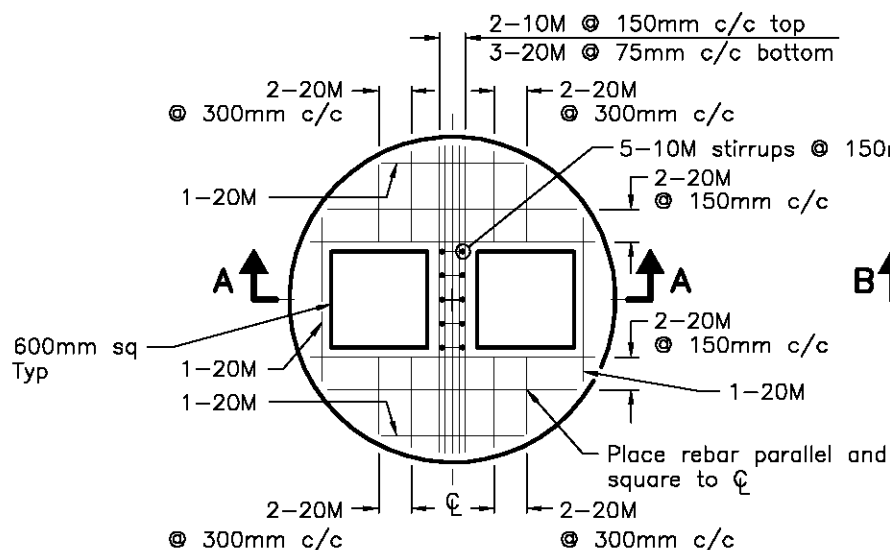
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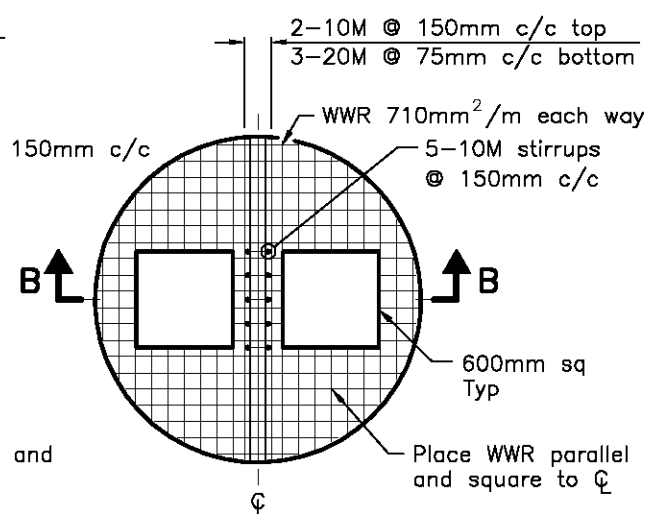


**1500mm DIAMETER
MAINTENANCE HOLE**

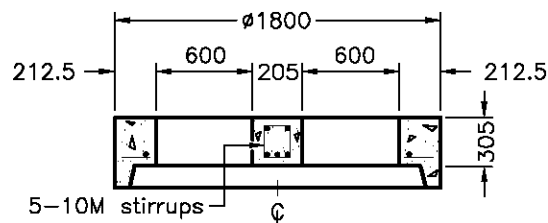
Precast units,
OPSD 701.041



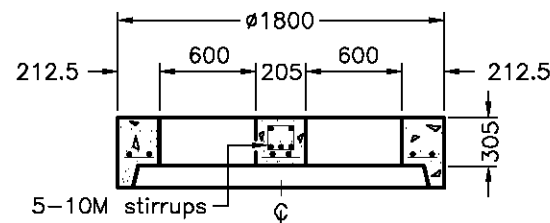
**PLAN OF TWIN INLET FLAT CAP
WITH REINFORCING STEEL BARS**



**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

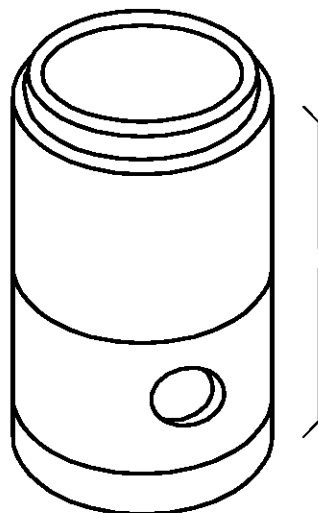
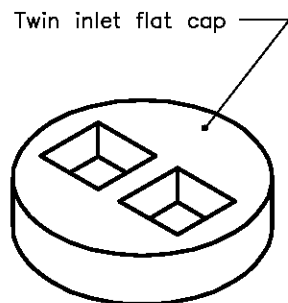
**PRECAST CONCRETE
TWIN INLET FLAT CAP
1500mm DIAMETER**

Nov 2014

Rev 2

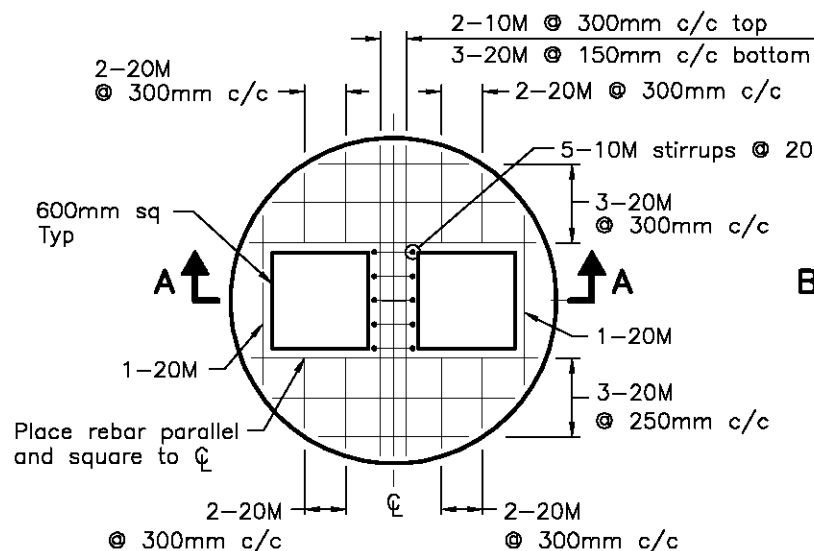


OPSD 703.021

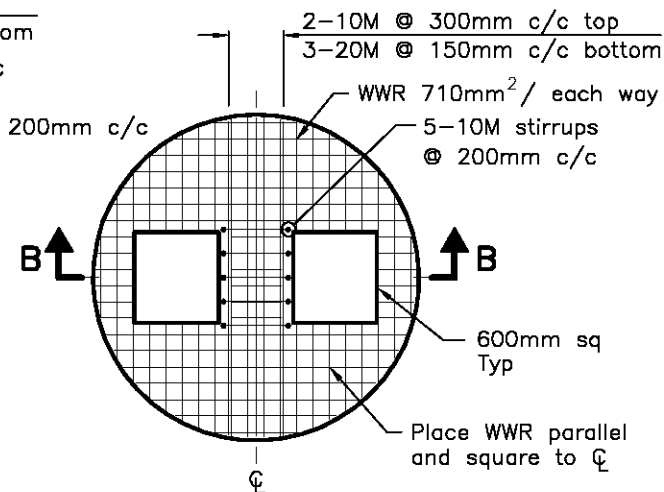


**1800mm DIAMETER
MAINTENANCE HOLE**

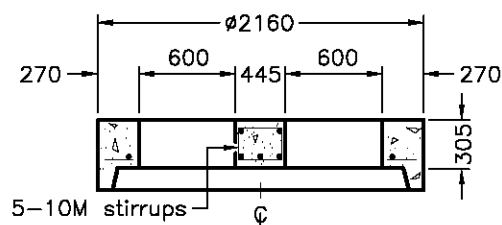
Precast units,
OPSD 701.051



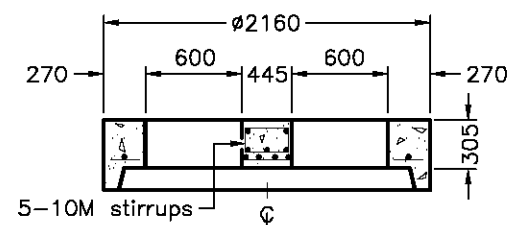
**PLAN OF TWIN INLET FLAT CAP
WITH REINFORCING STEEL BARS**



**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

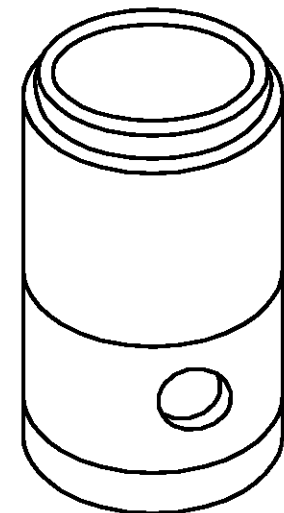
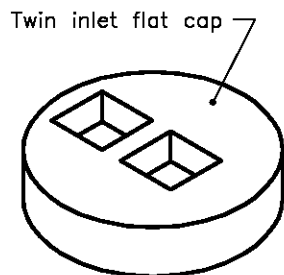
**PRECAST CONCRETE
TWIN INLET FLAT CAP
1800mm DIAMETER**

Nov 2014

Rev 2

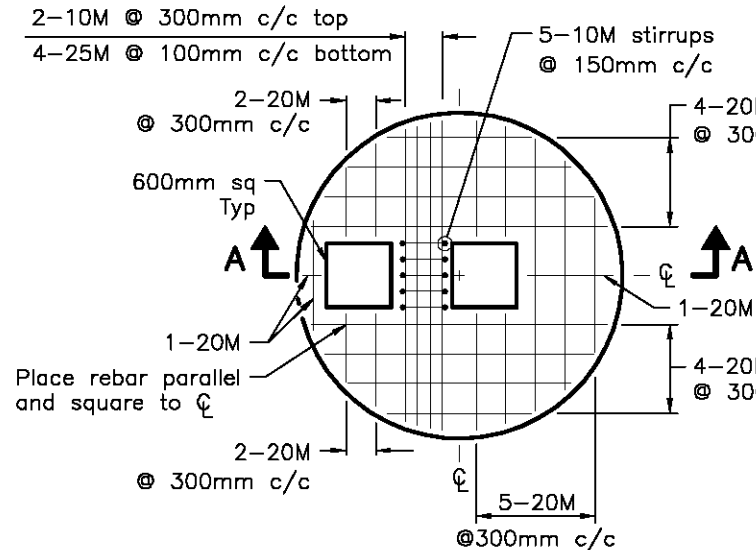


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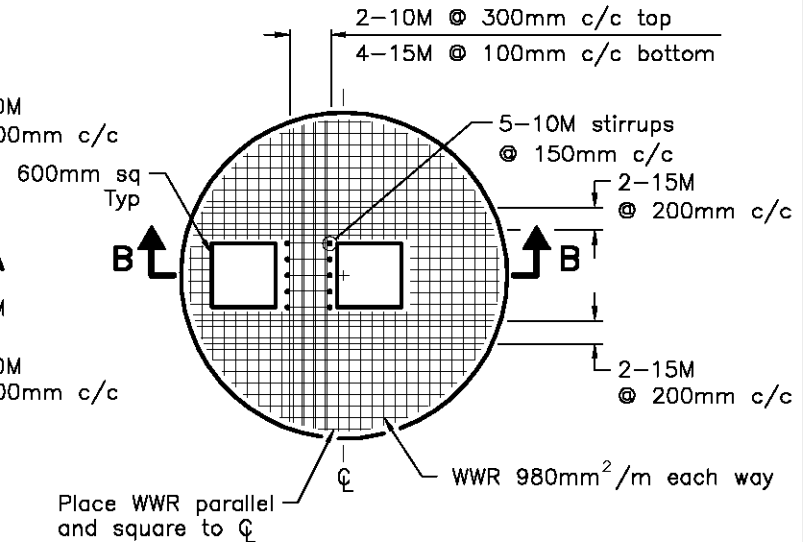


**2400mm DIAMETER
MAINTENANCE HOLE**

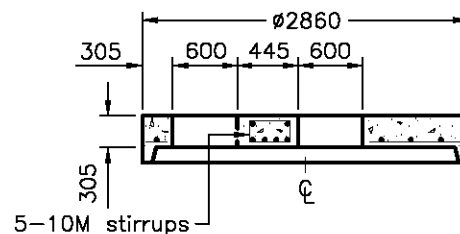
Precast units,
OPSD 701.061



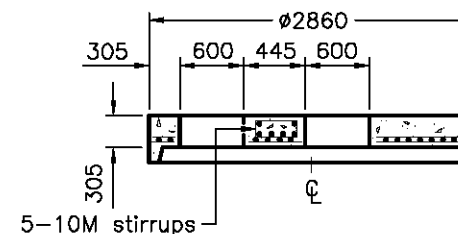
**PLAN OF TWIN INLET FLAT CAP
WITH REINFORCING STEEL BARS**



**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

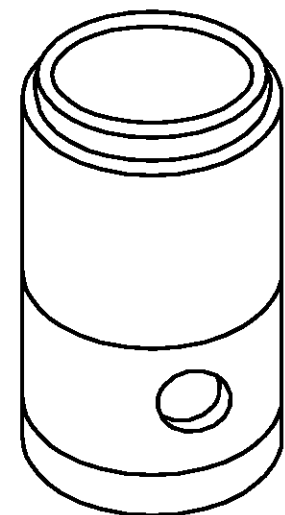
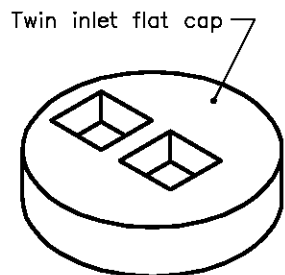
Nov 2014

Rev 2

**PRECAST CONCRETE
TWIN INLET FLAT CAP
2400mm DIAMETER**

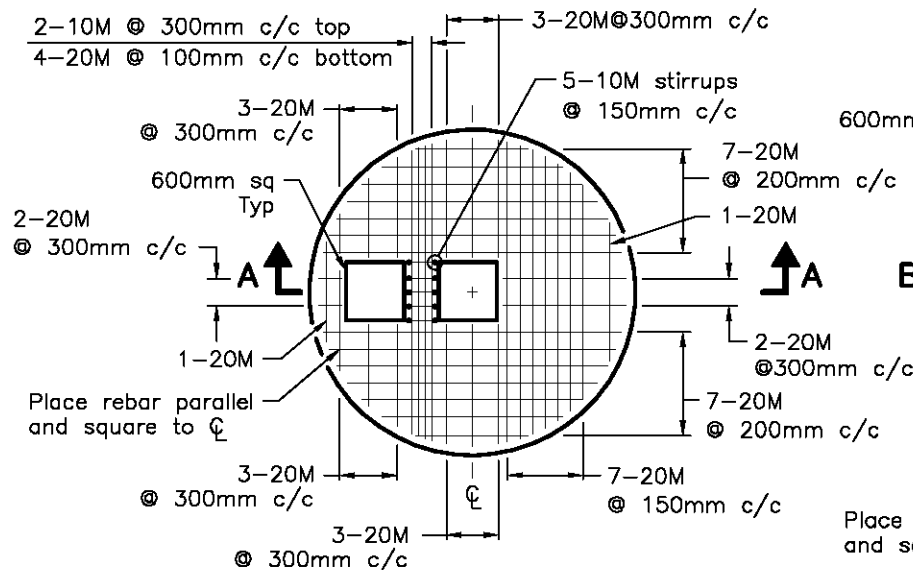
OPSD 703.023



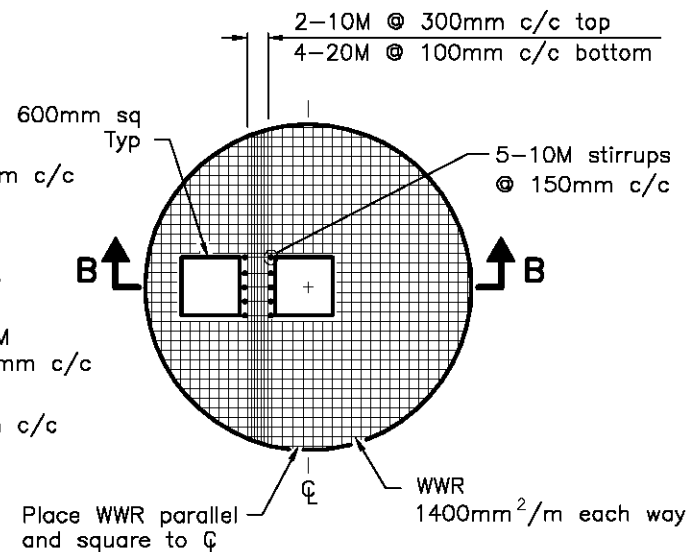


**3000mm DIAMETER
MAINTENANCE HOLE**

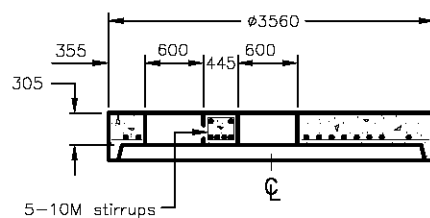
Precast units,
OPSD 701.071



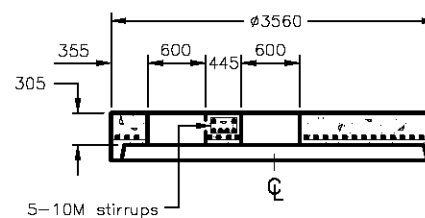
**PLAN OF TWIN INLET FLAT CAP
WITH REINFORCING STEEL BARS**



**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

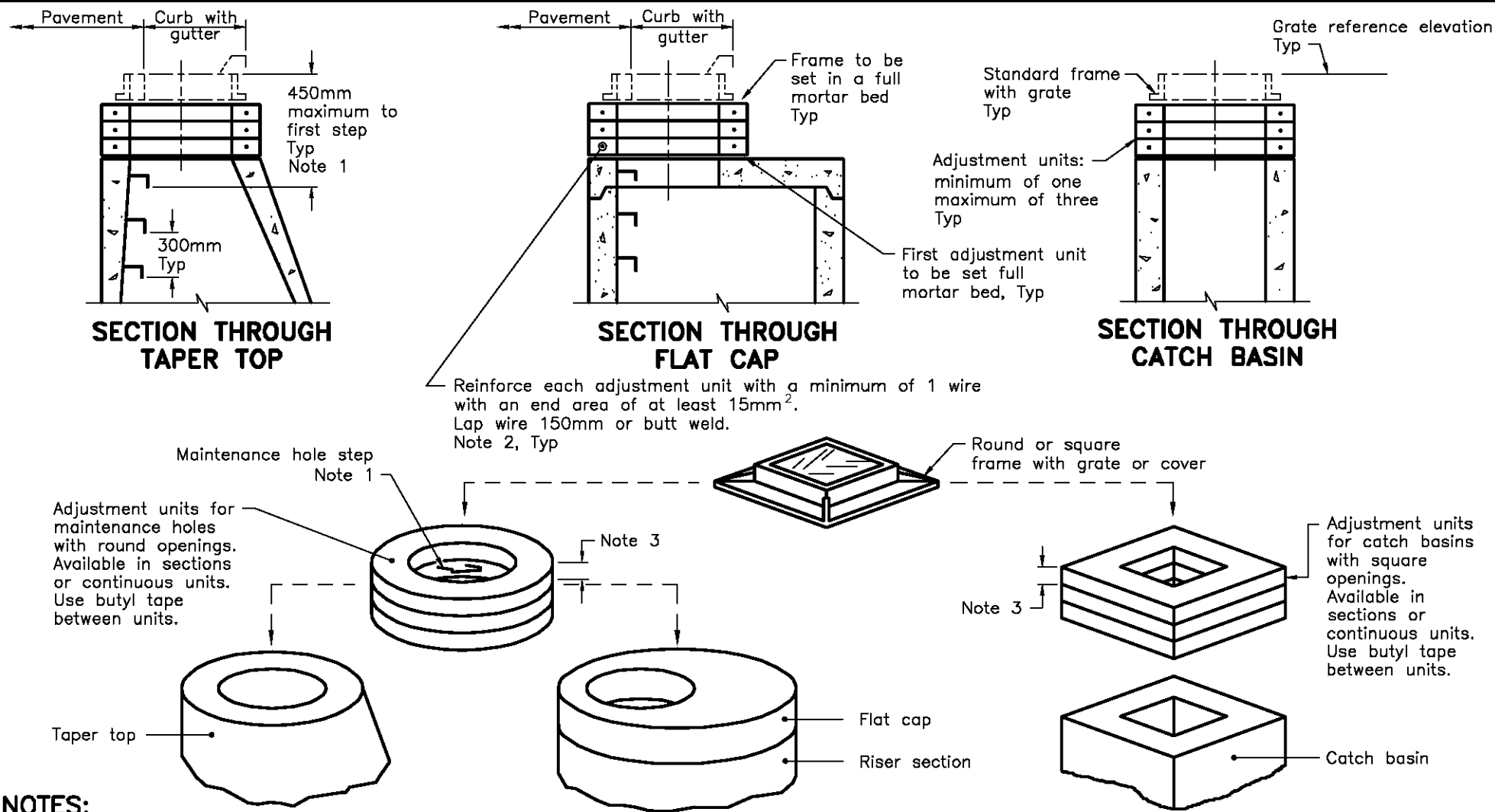
**PRECAST CONCRETE
TWIN INLET FLAT CAP
3000mm DIAMETER**

Nov 2014

Rev 2

OPSD 703.024





NOTES:

- 1 If first step is in an adjustment unit, the adjustment unit shall be of the type manufactured with a step in place.
- 2 Centre reinforcing in adjustment unit ± 10 mm.
- 3 Round and square adjustment units are available in sizes of 50, 75, 100, 150, and 300mm.

A Adjustment units shall not extend beyond the outside edge of the structure.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

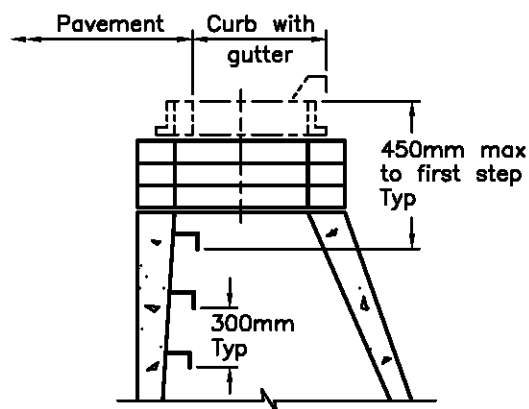
PRECAST CONCRETE ADJUSTMENT UNITS
FOR MAINTENANCE HOLES, CATCH BASINS,
AND VALVE CHAMBERS

Nov 2014

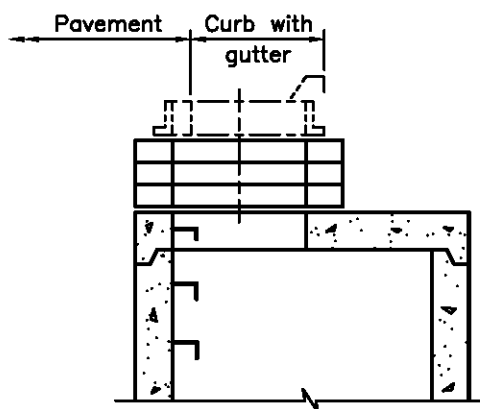
Rev 3



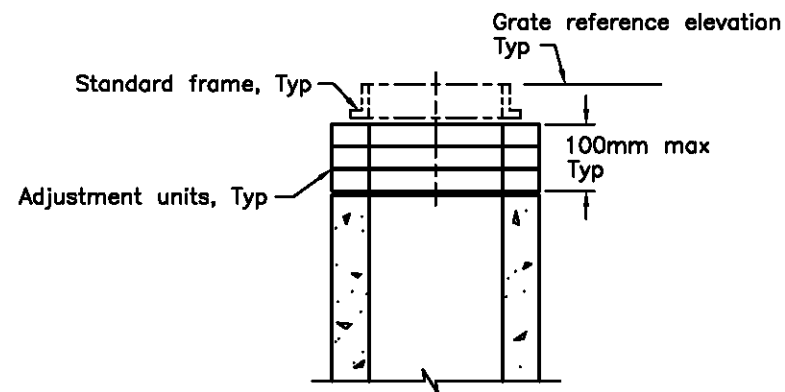
OPSD 704.010



**SECTION THROUGH
TAPER TOP**



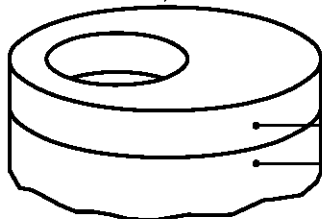
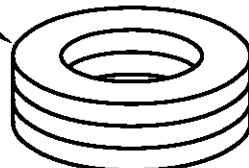
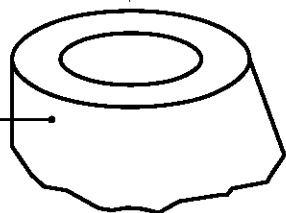
**SECTION THROUGH
FLAT CAP**



**SECTION THROUGH
CATCH BASIN**

Adjustment units for maintenance holes with round openings. Flat or sloped adjustment units are available in sections or continuous units.

Taper top

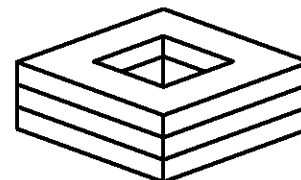


Flat cap

Riser section

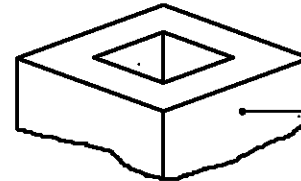


Round or square frame with grate or cover



Adjustment units for catch basins with square openings. Flat or sloped adjustment units are available in sections or continuous units.

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

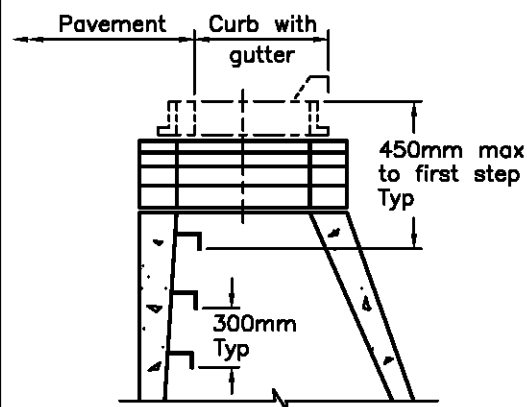
**HIGH DENSITY POLYETHYLENE
ADJUSTMENT UNITS FOR MAINTENANCE HOLES,
CATCH BASINS, AND VALVE CHAMBERS**

Nov 2008

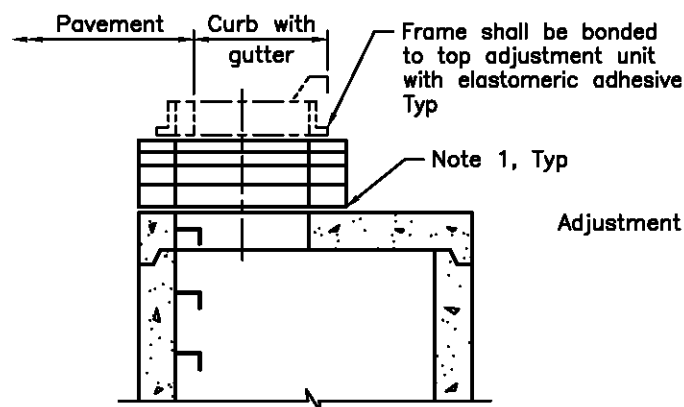
Rev 1



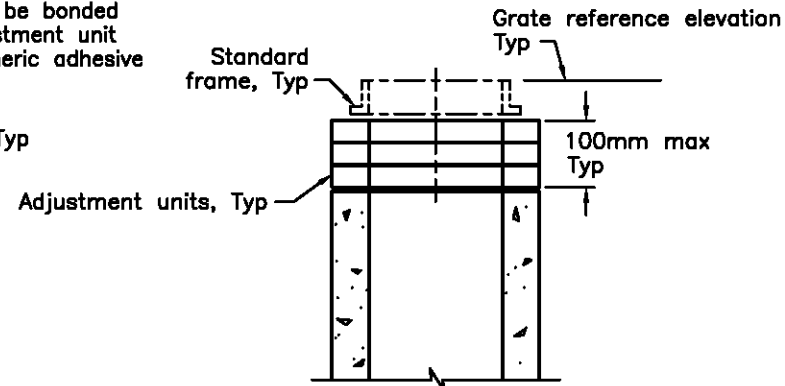
OPSD 704.011



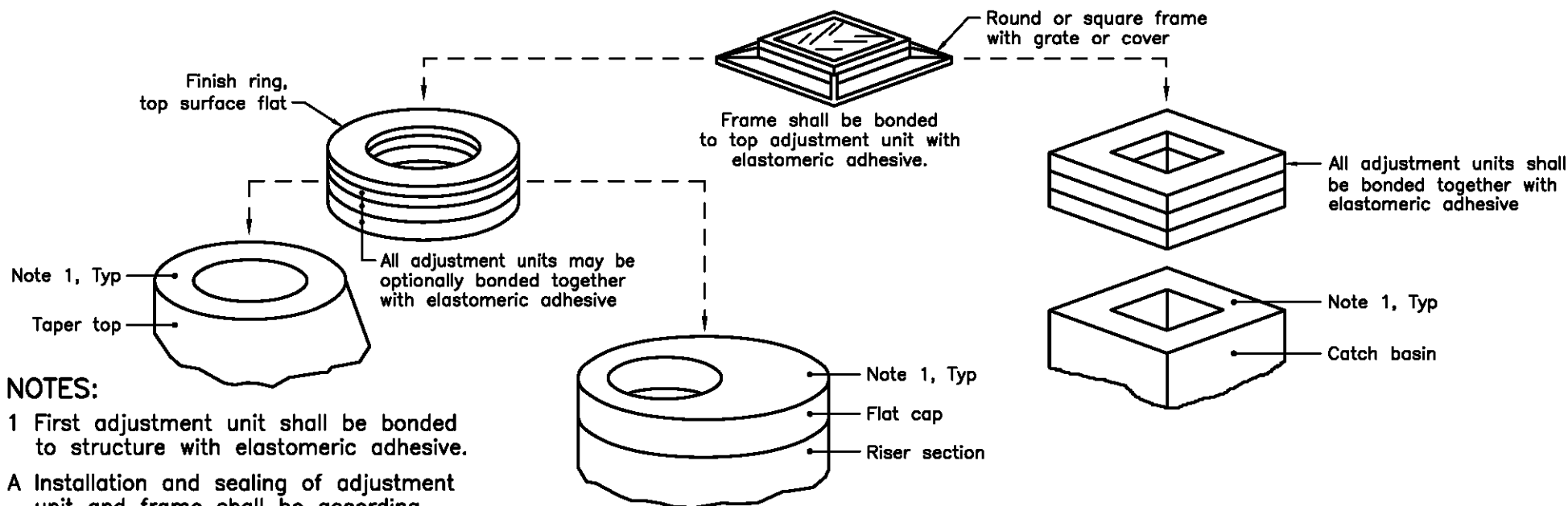
**SECTION THROUGH
TAPER TOP**



**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

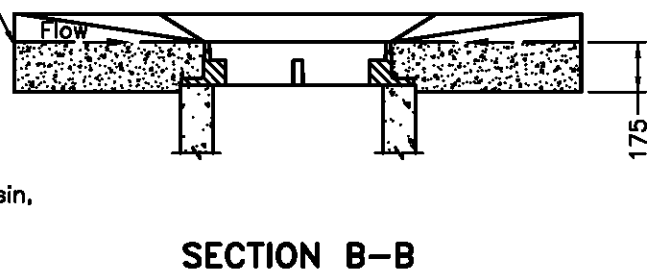
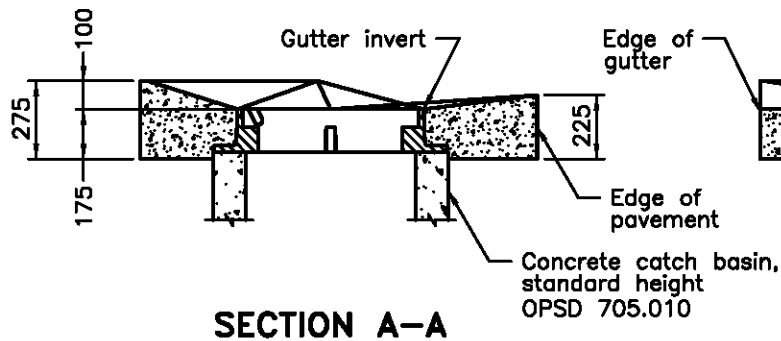
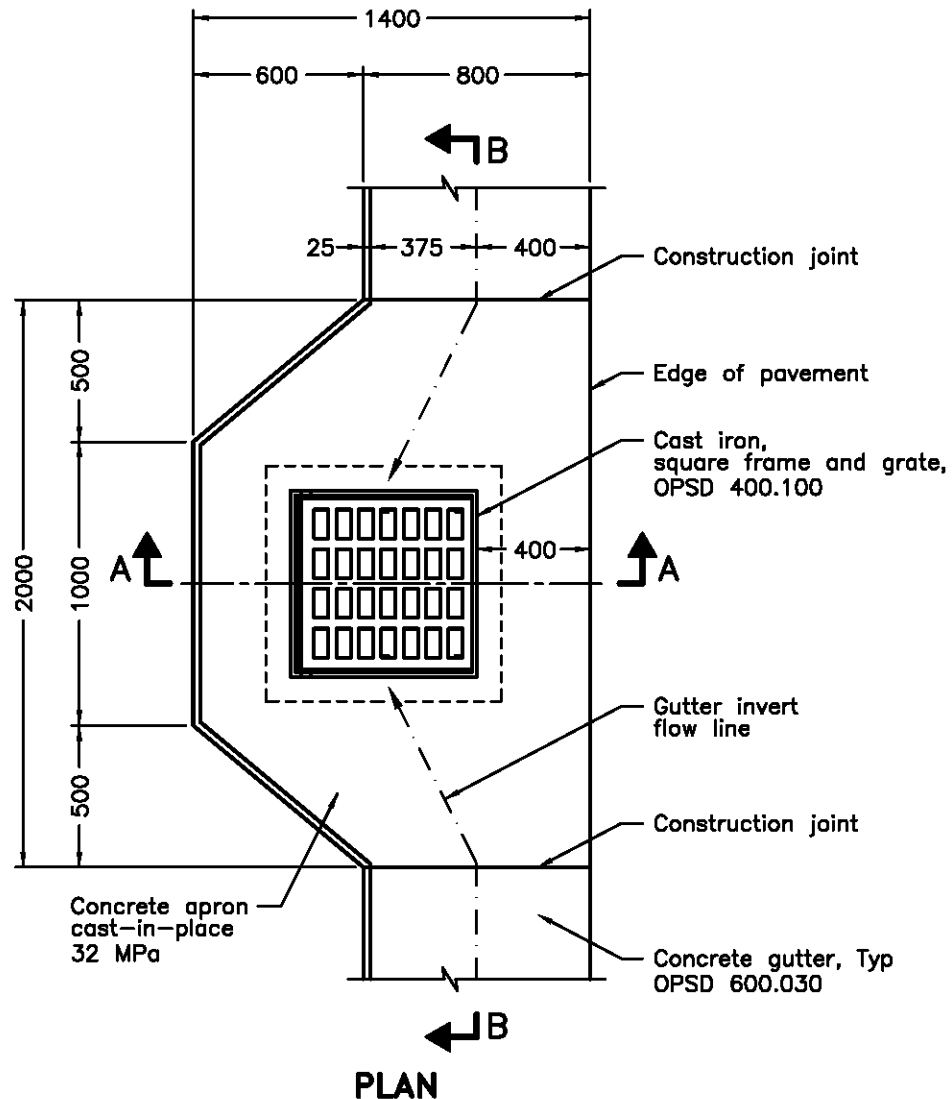
**EXPANDED POLYSTYRENE (EPS)
ADJUSTMENT UNITS
FOR MAINTENANCE HOLES, CATCH BASINS,
AND VALVE CHAMBERS**

April 2013

Rev 0



OPSD 704.012



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

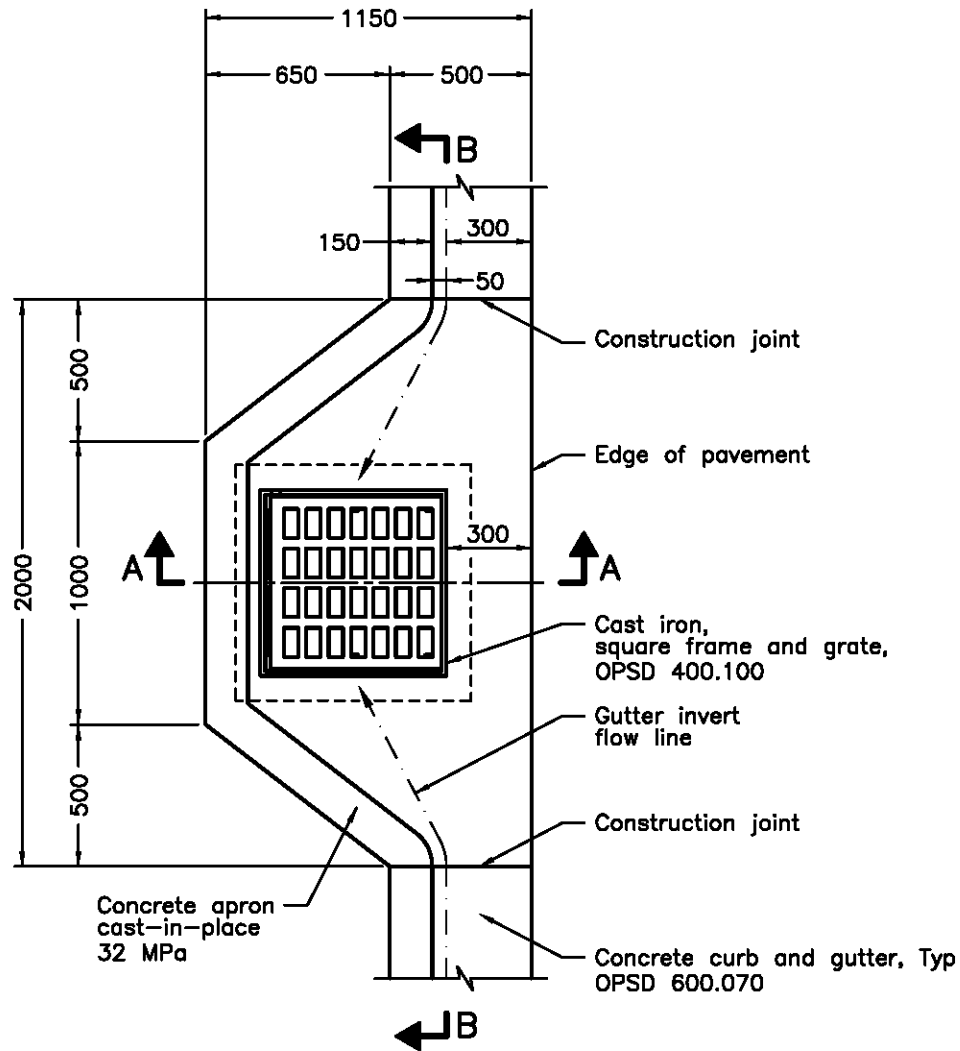
CONCRETE CATCH BASIN APRON
MOUNTABLE CURB
WITH WIDE GUTTER

Nov 2014

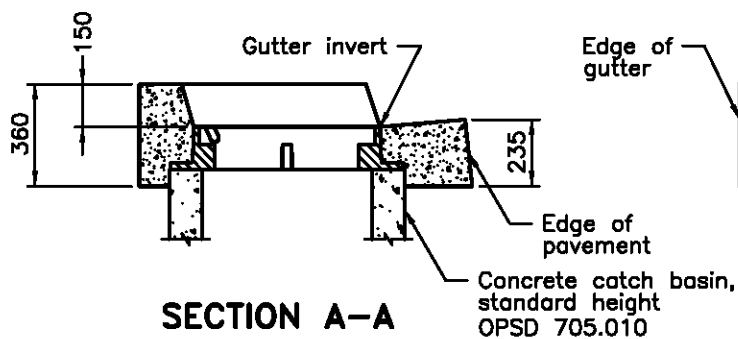
Rev 0



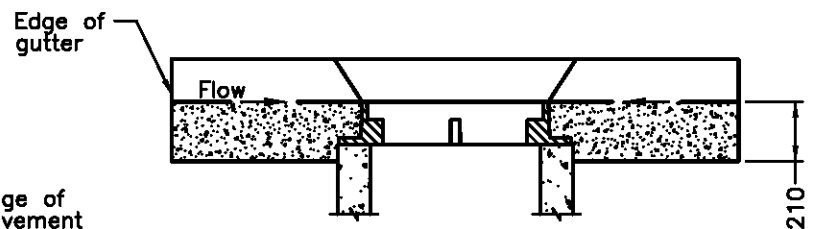
OPSD 705.001



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

**CONCRETE CATCH BASIN APRON
BARRIER CURB
WITH STANDARD GUTTER**

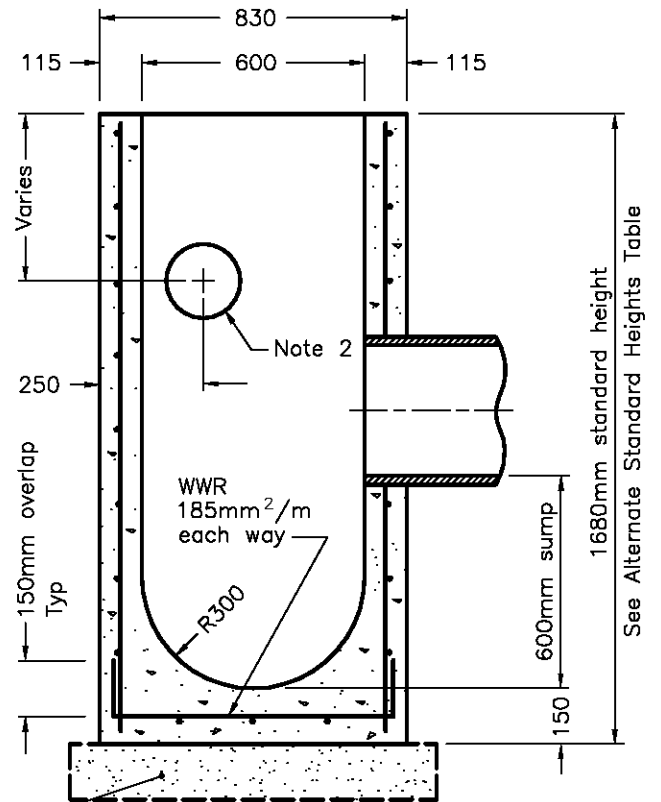
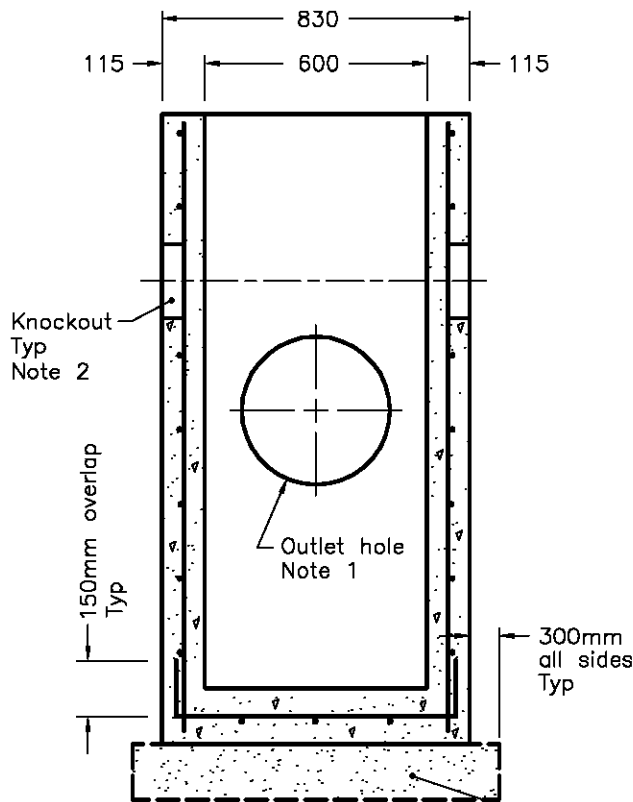
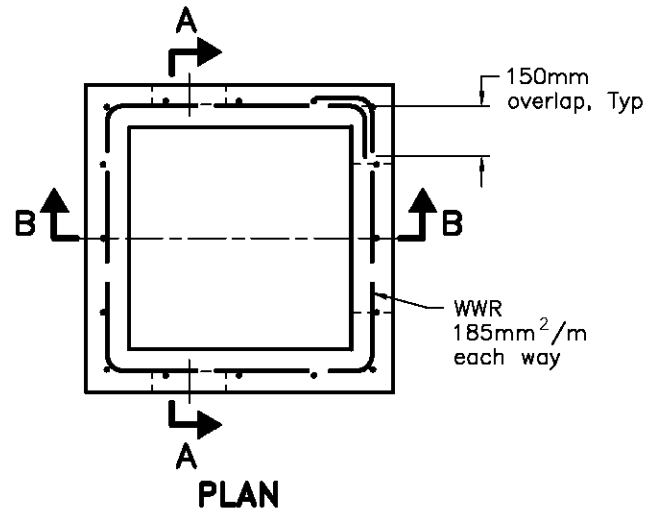
Nov 2014

Rev 0



OPSD 705.002

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



NOTES:

- 1 Outlet hole size 525mm diameter maximum, location as required.
- 2 200mm diameter knockout to accommodate subdrain. Knockout shall be 60mm deep.
- A Centre reinforcing in base slab and walls ± 20 mm.
- B Granular backfill shall be placed to a minimum thickness of 300mm all around the catch basin.

- C Frame, grate, and adjustment units shall be installed according to OPSD 704.010.
- D Pipe support shall be according to OPSD 708.020.
- E All dimensions are nominal.
- F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

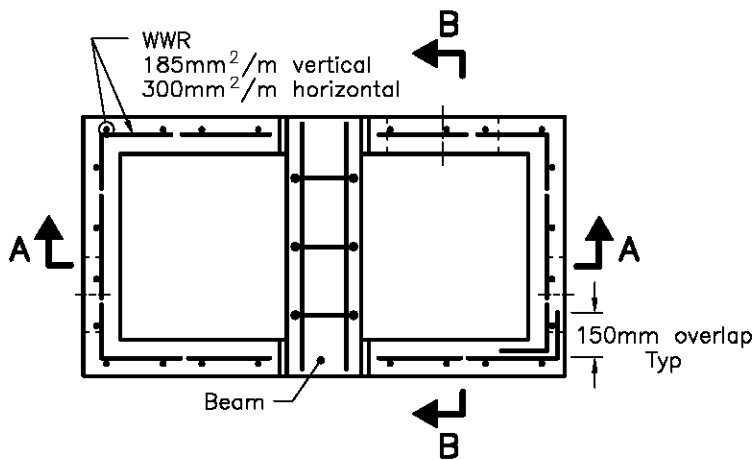
PRECAST CONCRETE CATCH BASIN

600x600mm

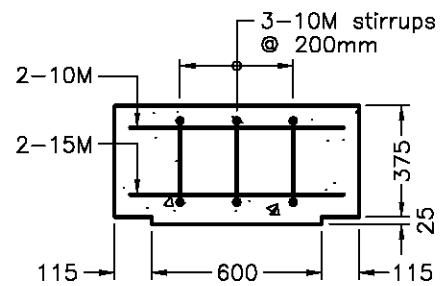
Nov 2014 Rev 3



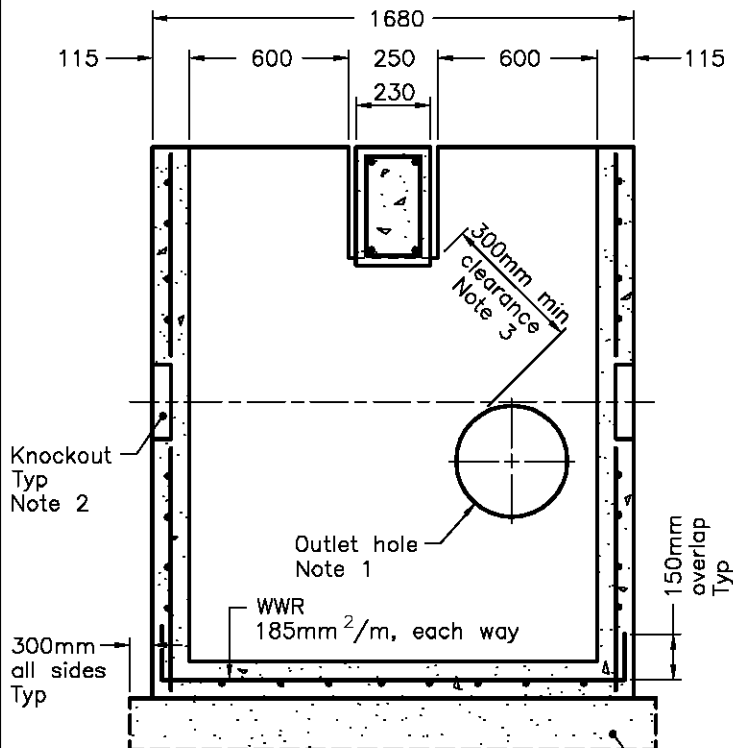
OPSD 705.010



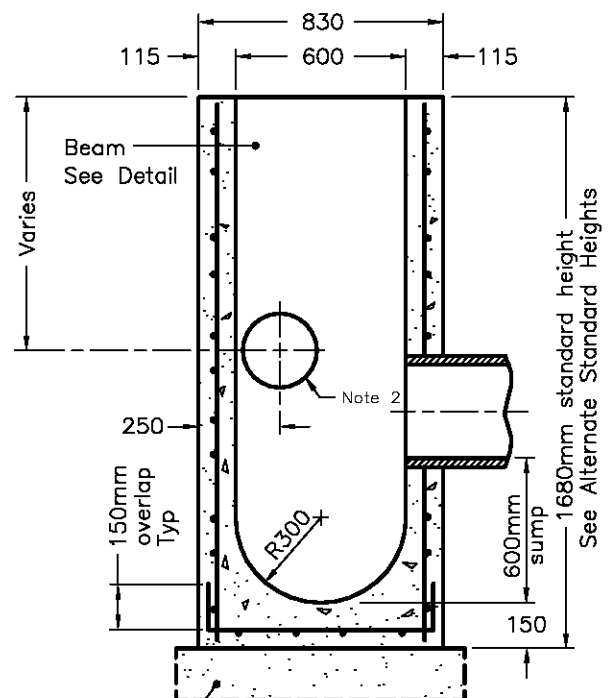
PLAN



BEAM DETAIL



SECTION A-A



SECTION B-B

NOTES:

- 1 Outlet hole size 525mm diameter maximum, location as required.
- 2 200mm diameter knockout to accommodate subdrain. Knockout shall be 60mm deep.
- 3 Minimum clearance between beam recess and hole for pipe shall be 300mm or minimum clearance can be 150mm with addition of two 15M size rebar on 45 degree diagonal.
- A Centre reinforcing in base slab and walls ± 20 mm.
- B Granular backfill shall be placed to a minimum thickness of 300mm all around the catch basin.
- C Frame, grate, and adjustment units shall be installed according to OPSD 704.010.
- D Pipe support shall be according to OPSD 708.020.
- E All dimensions are nominal.
- F All dimensions are in millimetres unless otherwise shown.

ALTERNATE STANDARD HEIGHTS	
ALTERNATIVE	DIMENSION
A	1980
B	1830
C	1680

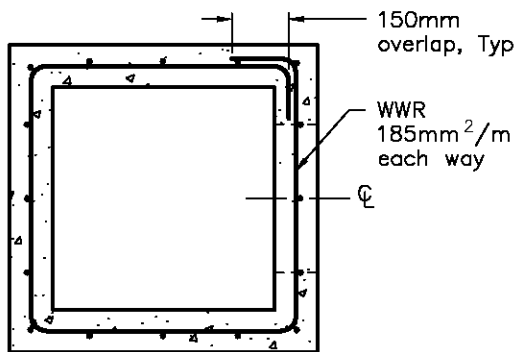
ONTARIO PROVINCIAL STANDARD DRAWING

**PRECAST CONCRETE
TWIN INLET CATCH BASIN
600 x 1450mm**

Nov 2014 | Rev | 3



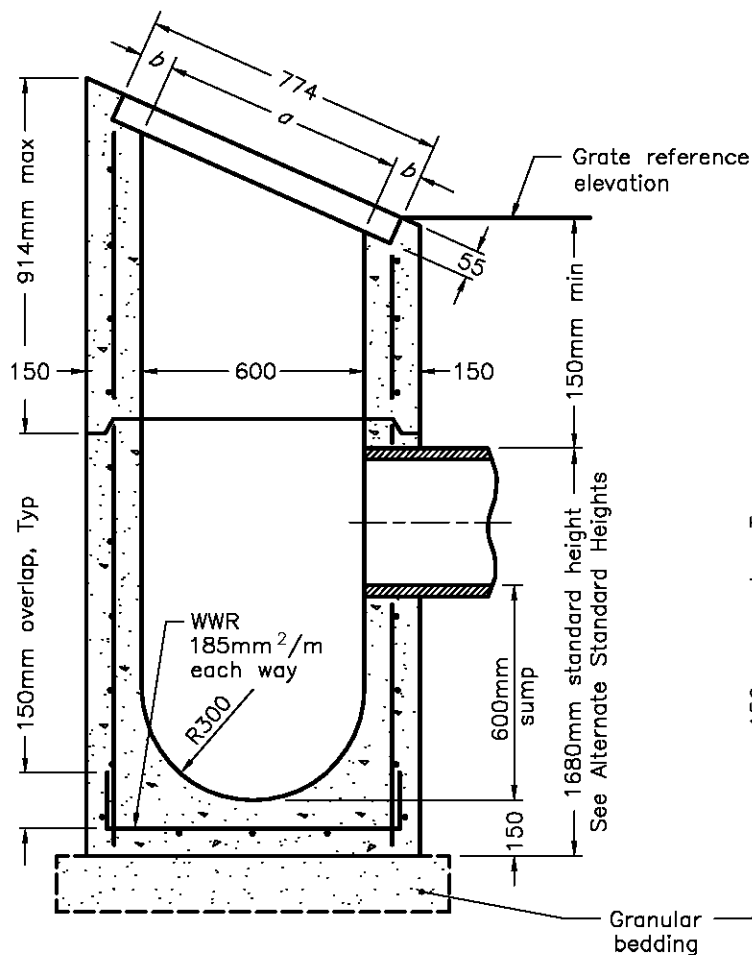
OPSD 705.020



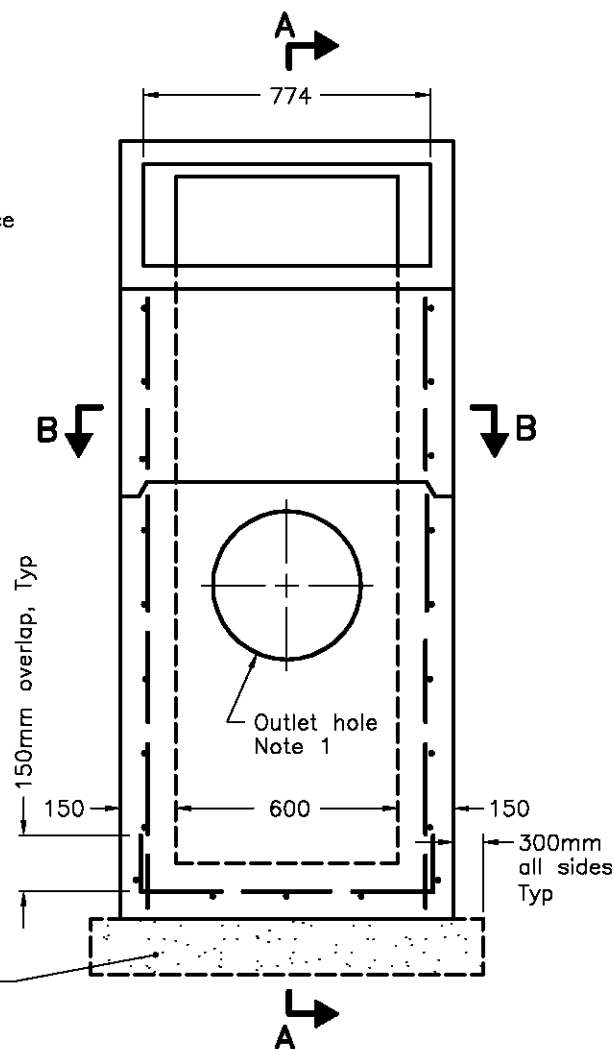
SECTION B-B

Alternate Standard Heights	
Alternate	Dimension
A	1980
B	1520
C	1380

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



SECTION A-A



FRONT VIEW

NOTES:

- 1 Outlet hole size 525mm maximum diameter, location as required.
- A Where inlet is placed across ditch and is accessible to vehicular traffic, grating slope shall be 6H:1V or flatter.
- B Center reinforcing in wall and slab ± 25 mm.
- C Granular backfill shall be placed to a minimum thickness of 300mm all around the ditch inlet.
- D Grating shall be according to OPSD 403.010.
- E Pipe support shall be according to OPSD 708.020.
- F All dimensions are nominal.
- G All dimensions are in millimetres unless otherwise shown.

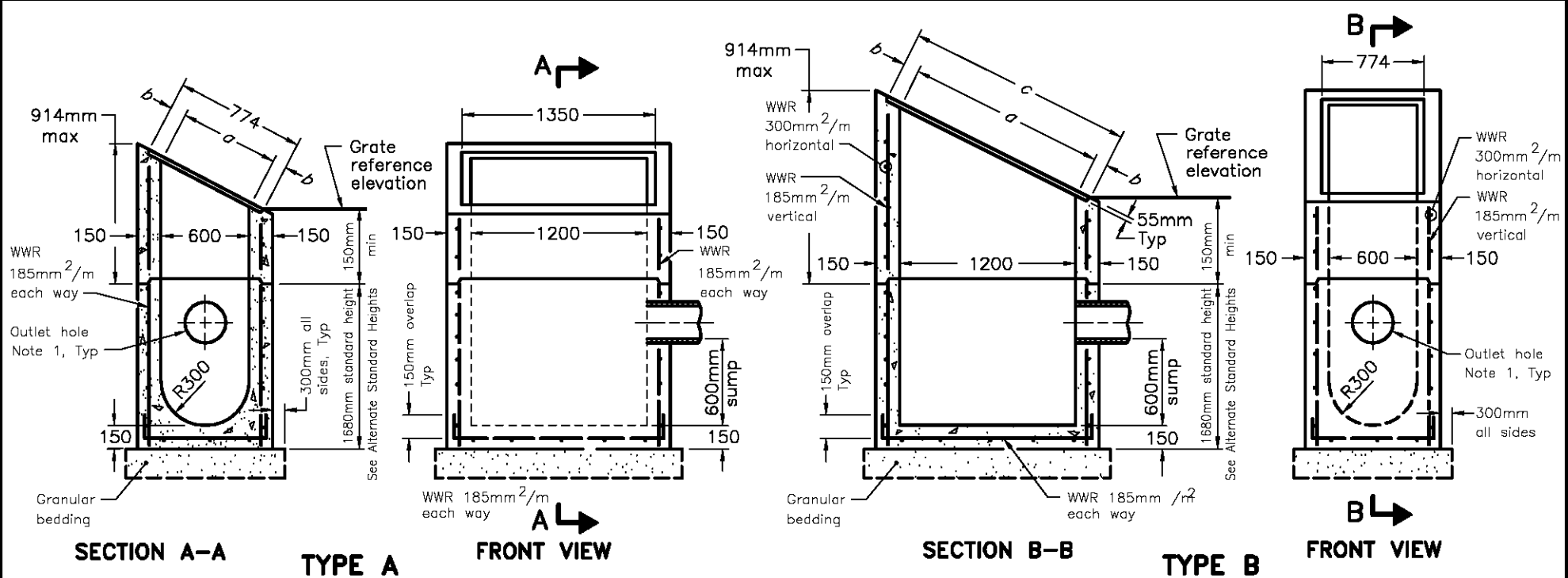
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 Rev 3

PRECAST CONCRETE DITCH INLET
600 x 600mm

OPSD 705.030





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

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 ± 25 mm.
- 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

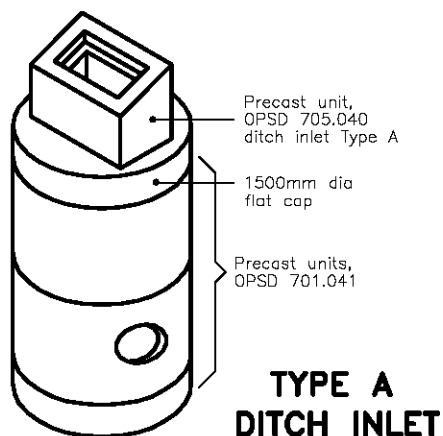
Nov 2014

Rev 3

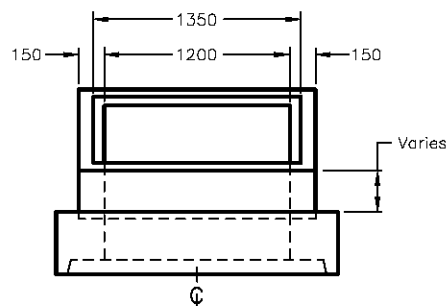
PRECAST CONCRETE DITCH INLETS
600 x 1200mm

OPSD 705.040

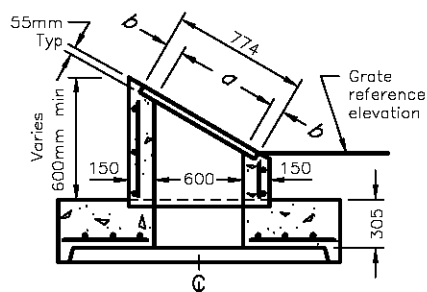




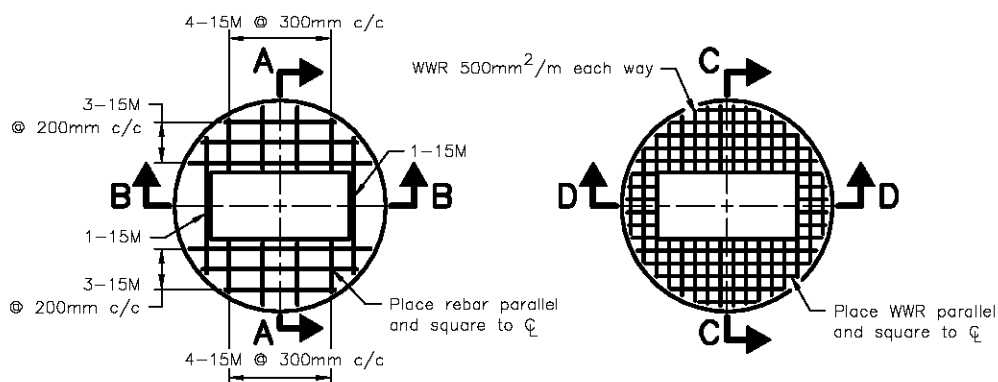
**TYPE A
DITCH INLET**



FRONT VIEW

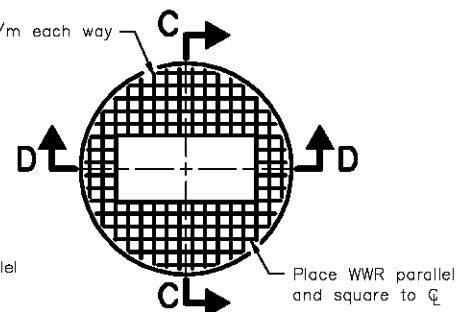


SECTION A-A



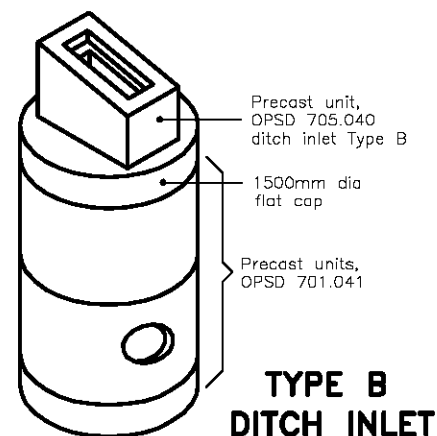
**PLAN OF FLAT CAP
WITH REINFORCING STEEL BARS**

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

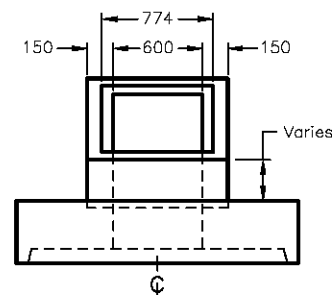


**PLAN OF FLAT CAP
WITH WWR**

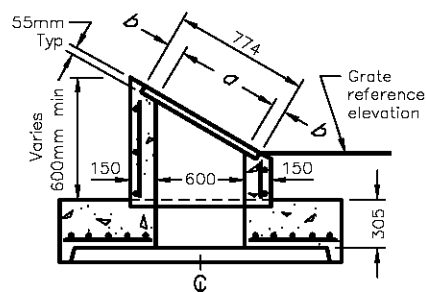
Opening Dimensions				
Grate				
Type	Slope	a	b	c
C	2H:1V	1341	66	1473
	3H:1V	1265	104	1473
	4H:1V	1237	118	1473
	6H:1V	1216	65	1346
B	Horizontal	1200	73	1346



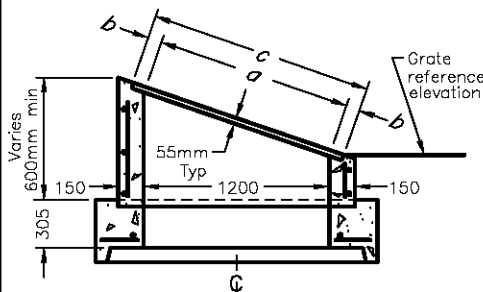
**TYPE B
DITCH INLET**



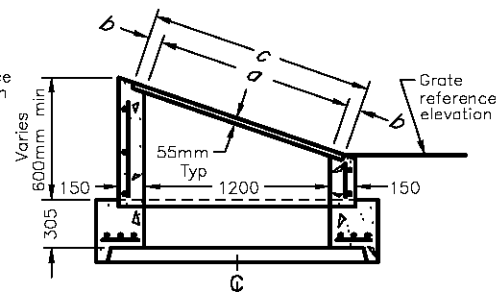
FRONT VIEW



SECTION C-C



SECTION B-B



SECTION D-D

NOTES:

- A Where inlet is placed across ditch and is accessible to vehicular traffic, grate 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.

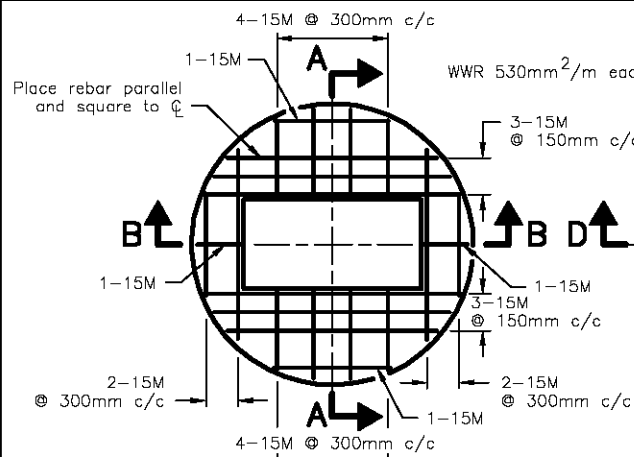
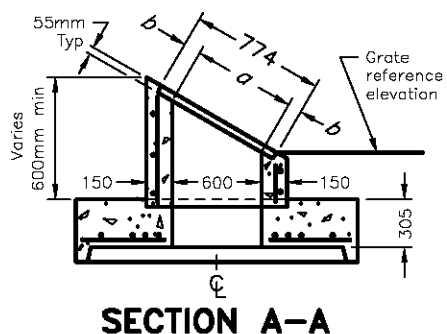
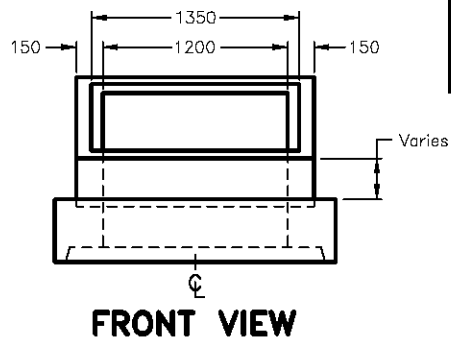
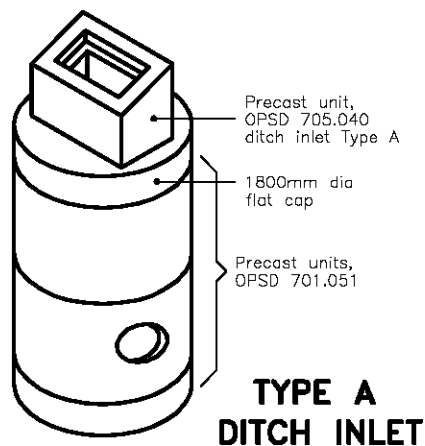
ONTARIO PROVINCIAL STANDARD DRAWING

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

Nov 2014 Rev 3

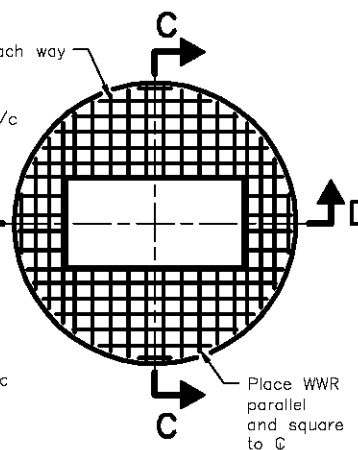


OPSD 706.010



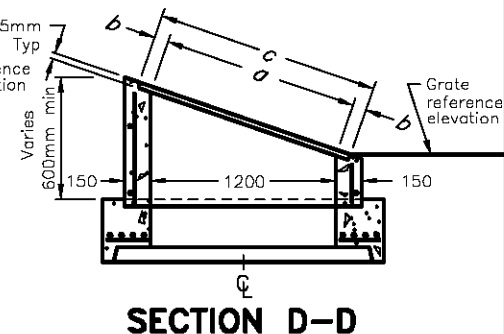
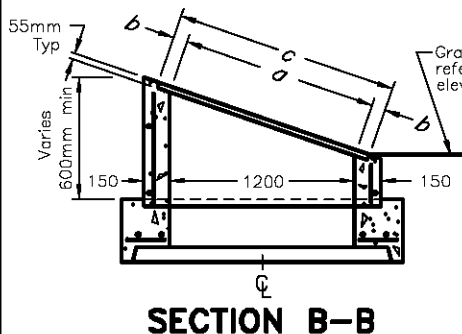
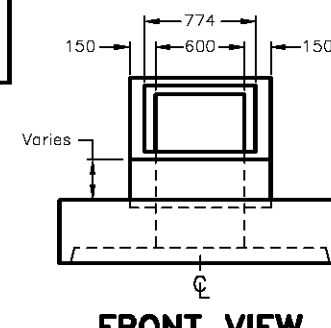
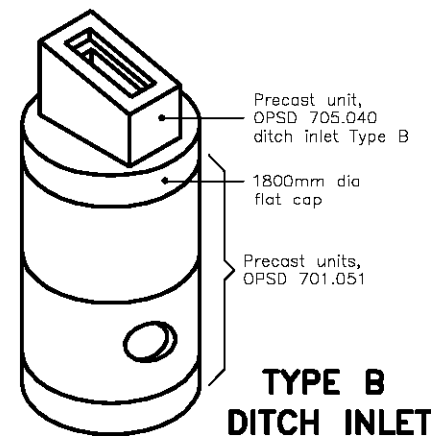
**PLAN OF FLAT CAP WITH
REINFORCING STEEL BARS**

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



**PLAN OF FLAT CAP
WITH WWR**

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



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.

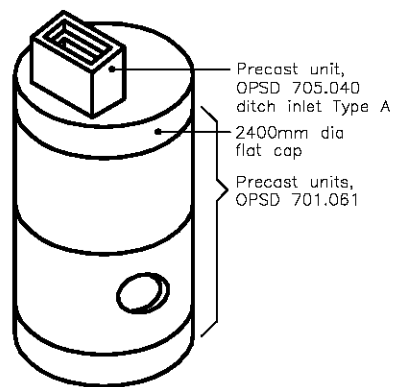
ONTARIO PROVINCIAL STANDARD DRAWING

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

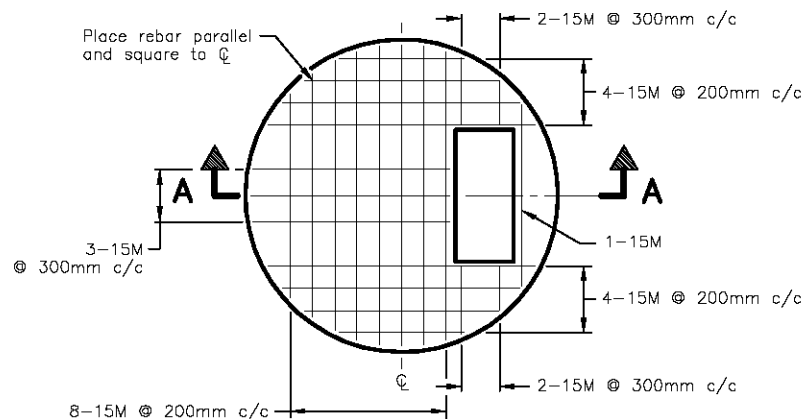
Nov 2014 Rev 3



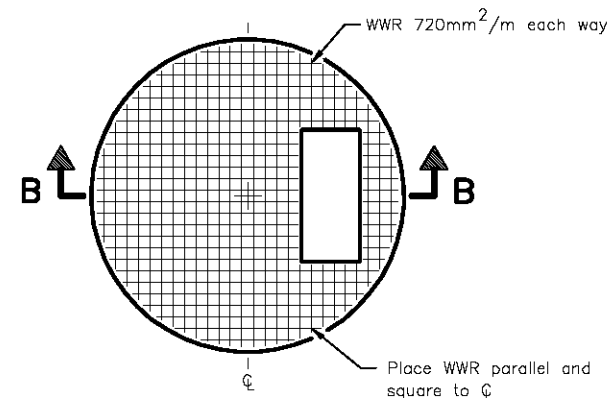
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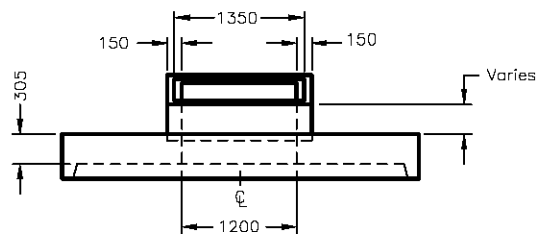
**TYPE A
DITCH INLET**



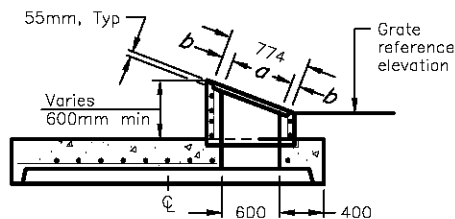
**PLAN OF FLAT CAP
WITH REINFORCING STEEL BARS**



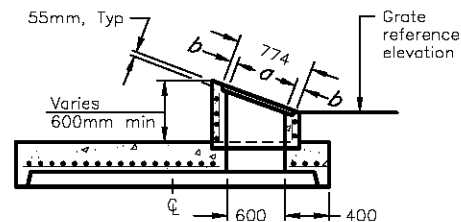
**PLAN OF FLAT CAP
WITH WWR**



FRONT VIEW



SECTION A-A



SECTION B-B

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.

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

ONTARIO PROVINCIAL STANDARD DRAWING

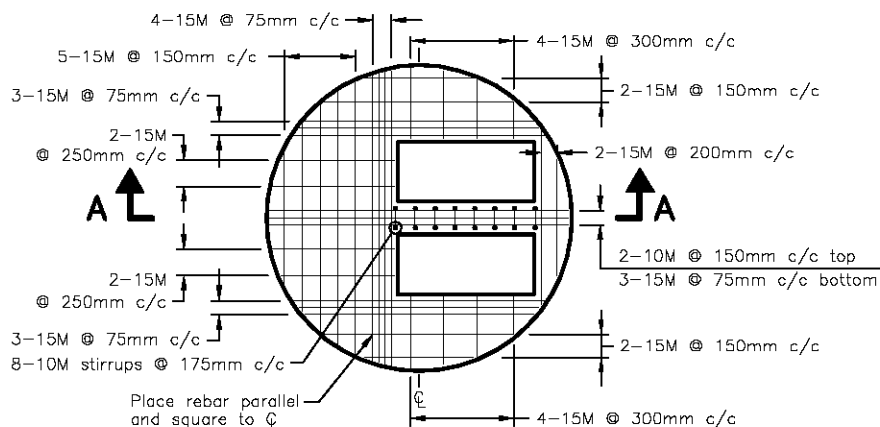
**PRECAST CONCRETE DITCH INLET – TYPE A
600x1200mm
WITH 2400mm DIAMETER FLAT CAP**

Nov 2014

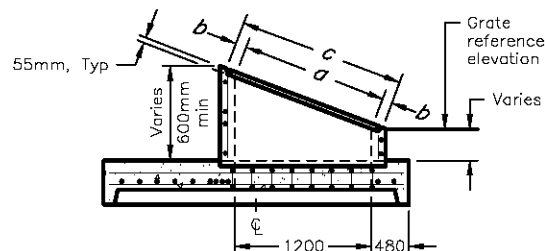
Rev 3



OPSD 706.030

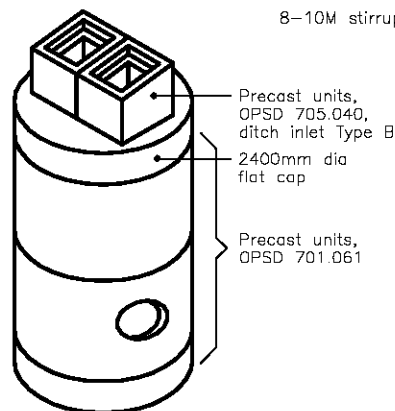


**PLAN OF FLAT CAP
WITH REINFORCING STEEL BARS**

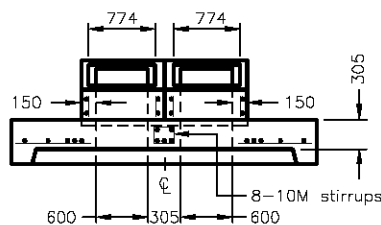


SECTION A-A

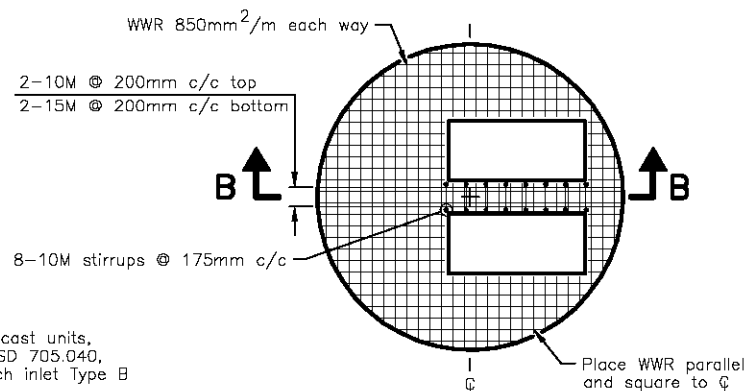
Opening Dimensions				
Grate		a	b	c
Type	Slope			
C	2H:1V	1341	66	1473
	3H:1V	1265	104	1473
	4H:1V	1237	118	1473
B	6H:1V	1216	65	1346
	Horizontal	1200	73	1346



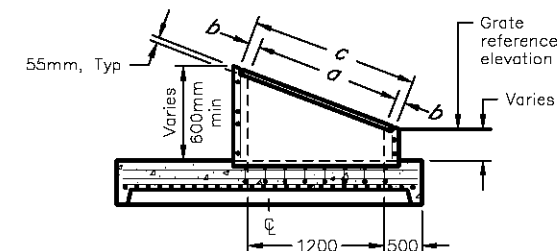
**TYPE B
DITCH INLET**



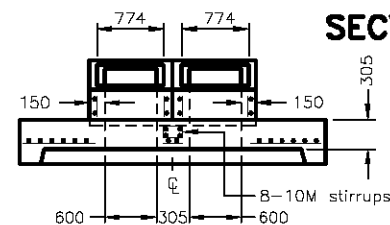
**FRONT VIEW OF FLAT CAP
WITH REINFORCING STEEL BARS**



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



SECTION B-B



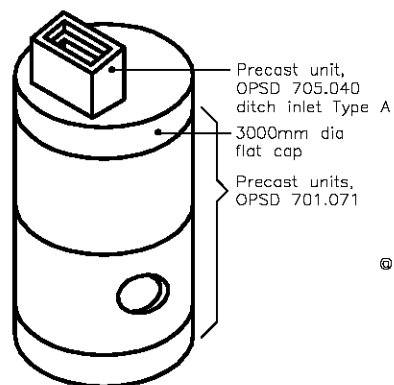
**FRONT VIEW OF FLAT CAP
WITH WWR**

NOTES:

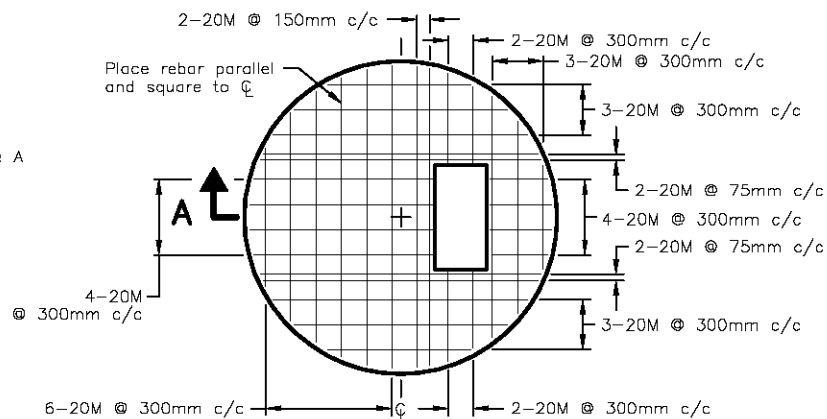
- A Where inlet is placed across ditch and is accessible to vehicular traffic, grating slope shall be 6H:1V or flatter.
- B All reinforcing steel shall have 25mm minimum cover.
- C Grating shall be according to OPSP 403.010.
- D All dimensions are nominal.
- E All dimensions are in millimetres unless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

ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2014	Rev	2
PRECAST CONCRETE DITCH INLET – TYPE B 600x1200mm WITH 2400mm DIAMETER FLAT CAP		-----		
		OPSD 706.031		

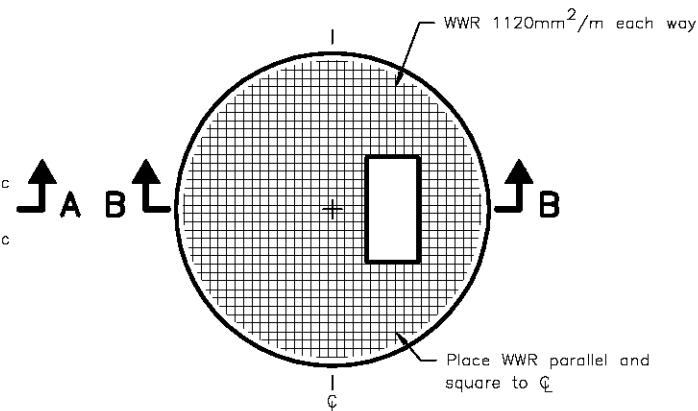




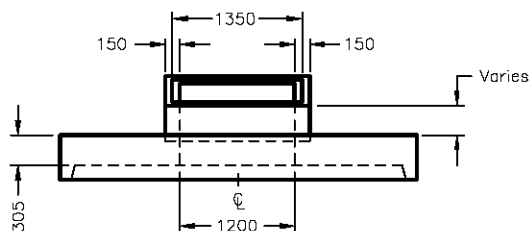
**TYPE A
DITCH INLET**



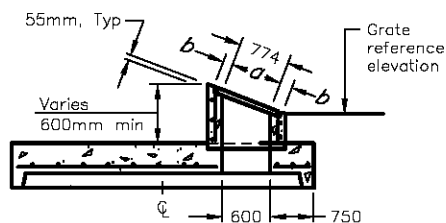
**PLAN OF FLAT CAP
WITH REINFORCING STEEL BARS**



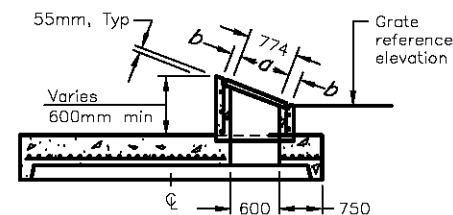
**PLAN OF FLAT CAP
WITH WWR**



FRONT VIEW



SECTION A-A



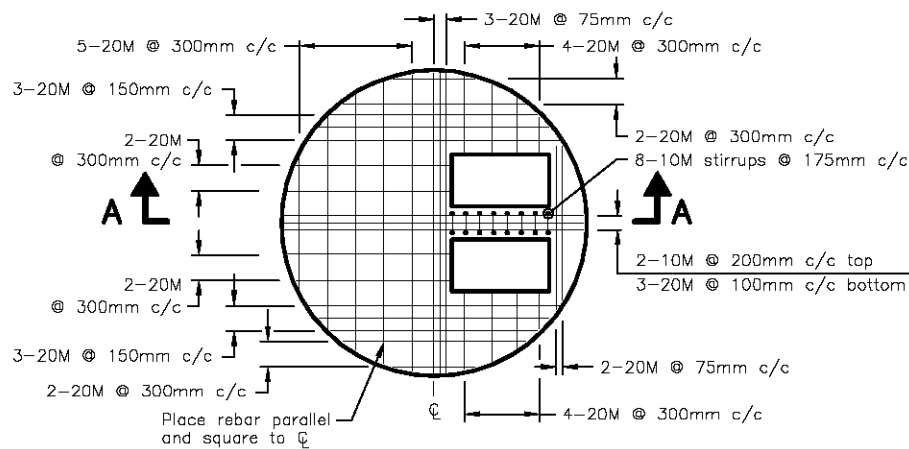
SECTION B-B

NOTES:

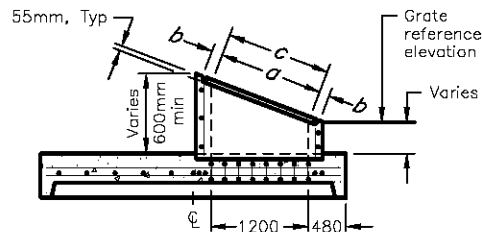
- A Where inlet is placed across ditch and is accessible to vehicular traffic, grating slope shall be 6H:1V or flatter.
- B All reinforcing steel shall have 25mm minimum cover.
- C Grating shall be according to OPSD 403.010.
- D All dimensions are nominal.
- E All dimensions are in millimetres unless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

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

ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2014	Rev	3
PRECAST CONCRETE DITCH INLET – TYPE A 600x1200mm WITH 3000mm DIAMETER FLAT CAP				
		OPSD 706.040		

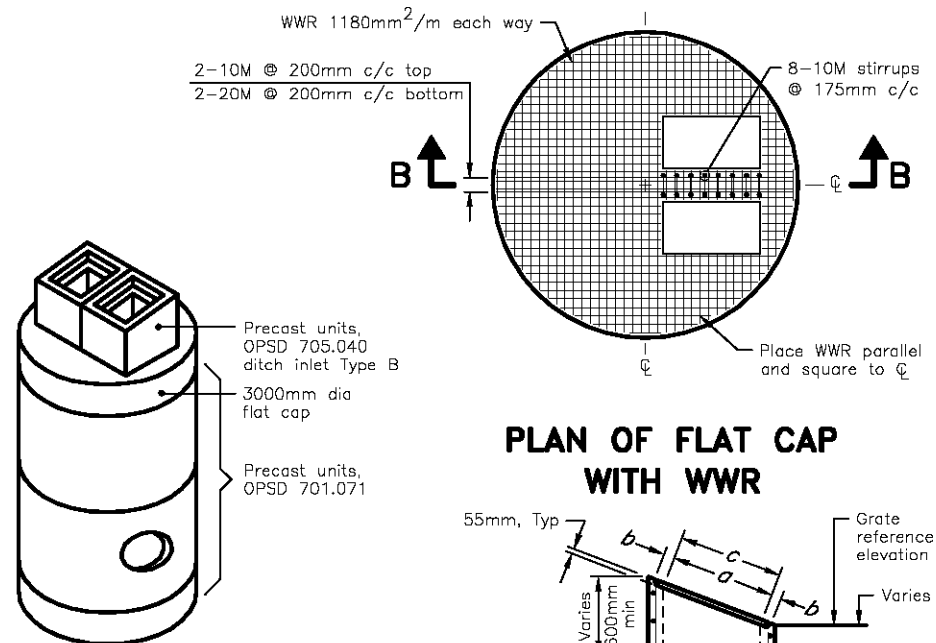


**PLAN OF FLAT CAP
WITH REINFORCING STEEL BARS**

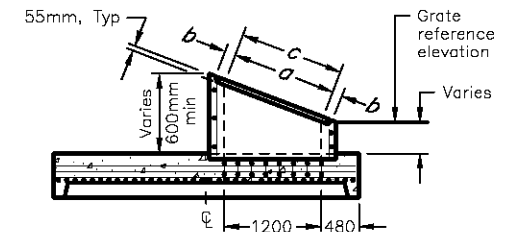


SECTION A-A

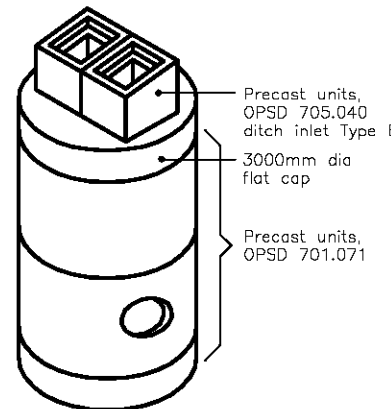
Opening Dimensions				
Grate		a	b	c
Type	Slope			
C	2H:1V	1341	66	1473
	3H:1V	1265	104	1473
	4H:1V	1237	118	1473
B	6H:1V	1216	65	1346
	Horizontal	1200	73	1346



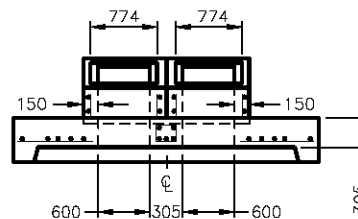
**PLAN OF FLAT CAP
WITH WWR**



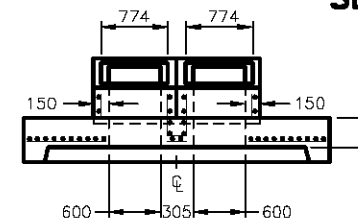
SECTION B-B



**TYPE B
DITCH INLET**



**FRONT VIEW
WITH REINFORCING STEEL BARS**



**FRONT VIEW
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 OPSP 403.010.
- D All dimensions are nominal.
- E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

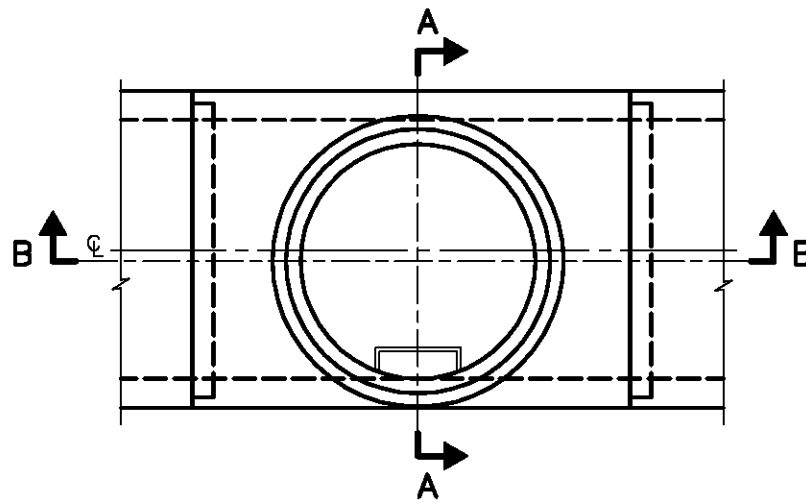
**PRECAST CONCRETE DITCH INLET – TYPE B
600x1200mm
WITH 3000mm DIAMETER FLAT CAP**

Nov 2014

Rev 2



OPSD 706.041

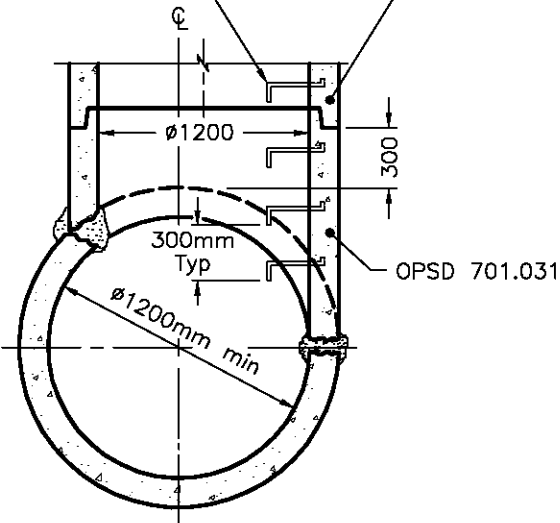


PLAN

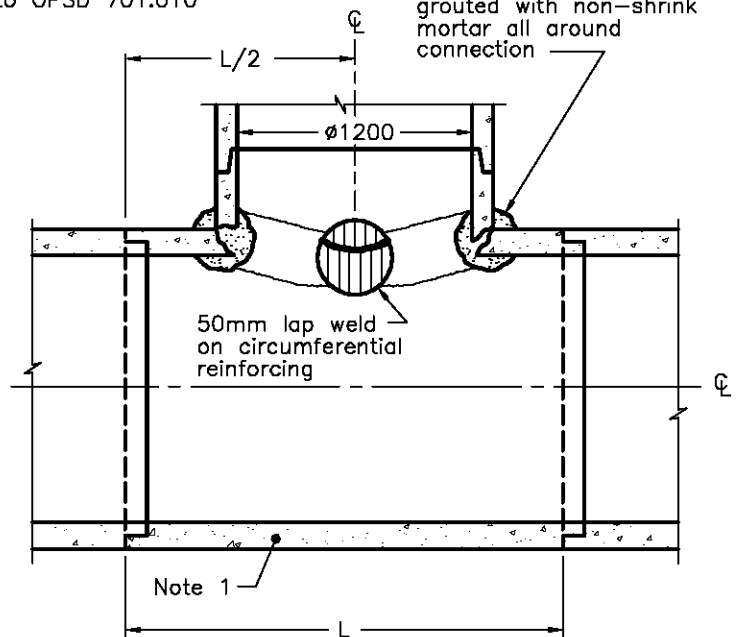
Steps according to
OPSD 405.010 or
405.020

Balance of maintenance hole
according to OPSD 701.010

Reinforcing 50mm min
lap weld and connection
grouted with non-shrink
mortar all around
connection



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

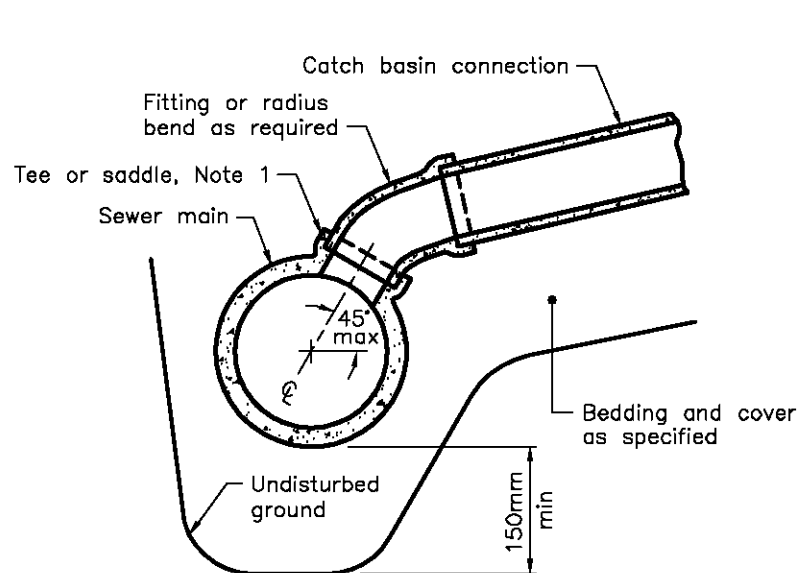
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 | Rev | 3

**PRECAST CONCRETE MAINTENANCE
HOLE MANUFACTURED TEE**



OPSD 707.010



CONNECTION WITHOUT RISER

NOTES:

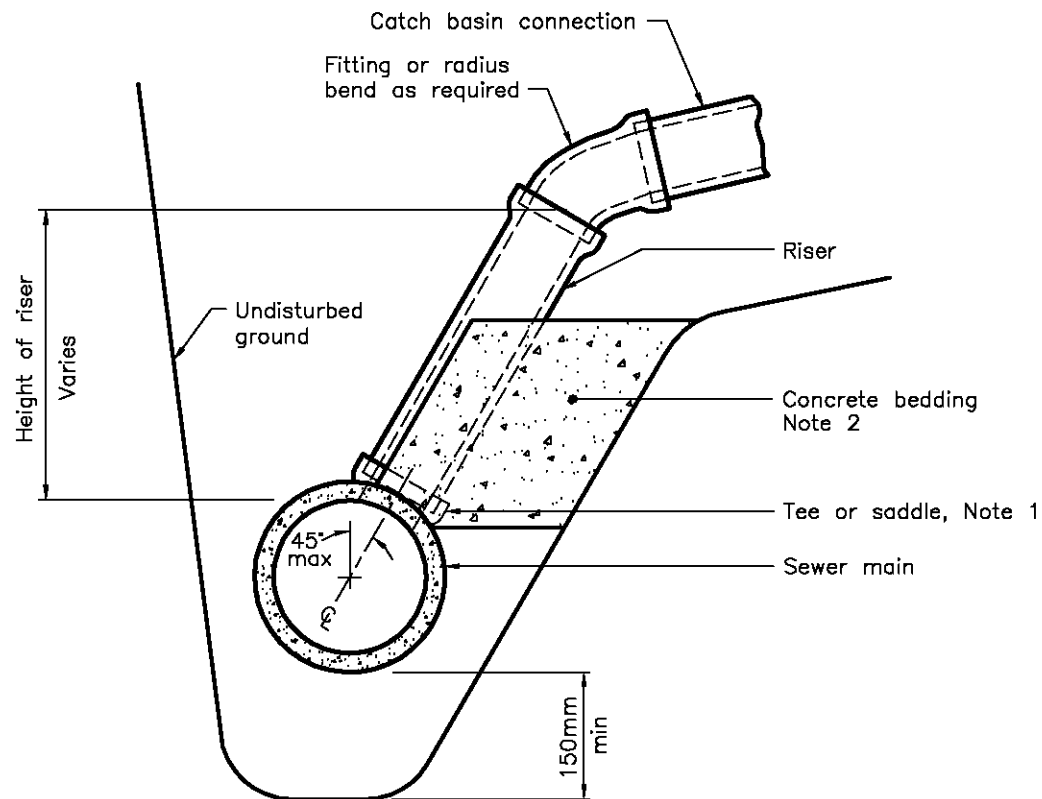
1 For sewers smaller than 450mm dia, connections shall be made using approved factory made tees. For all other sizes, either factory made tees or approved saddles may be used.

2 Riser bedding shall have a minimum width of riser pipe 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.



CONNECTION WITH RISER

ONTARIO PROVINCIAL STANDARD DRAWING

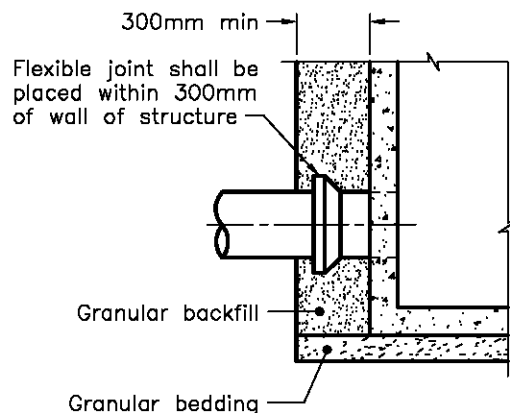
Nov 2016

Rev 3

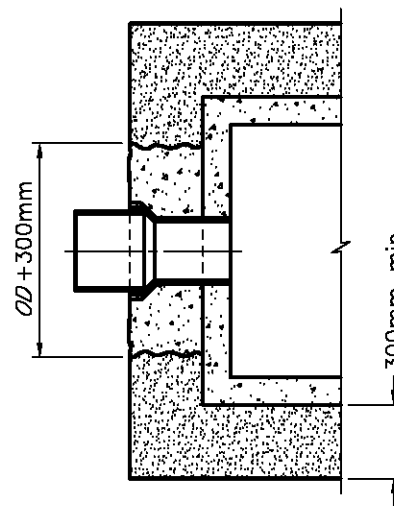
CATCH BASIN CONNECTION
FOR RIGID MAIN PIPE SEWER



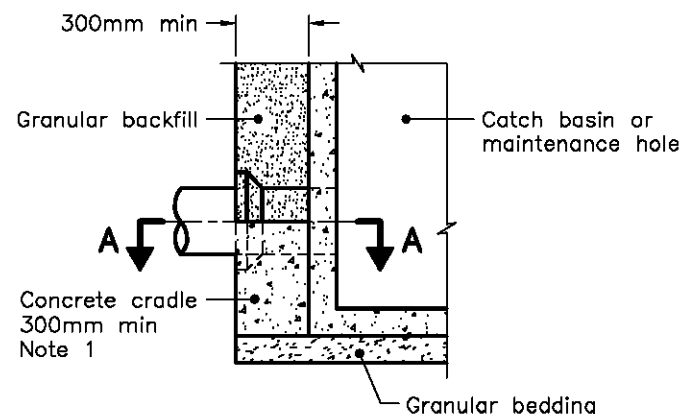
OPSD 708.010



ELEVATION
FLEXIBLE JOINT
RIGID AND FLEXIBLE PIPE



SECTION A-A



ELEVATION
CONCRETE CRADLE
RIGID PIPE

For installation of these connectors refer to manufacturer's instructions.

A full length of pipe may be used in conjunction with a flexible watertight connector.

FLEXIBLE, WATERTIGHT CONNECTOR
RIGID AND FLEXIBLE PIPE

NOTES:

1 Pipe shall be supported with concrete or unshrinkable fill to the first pipe joint.

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

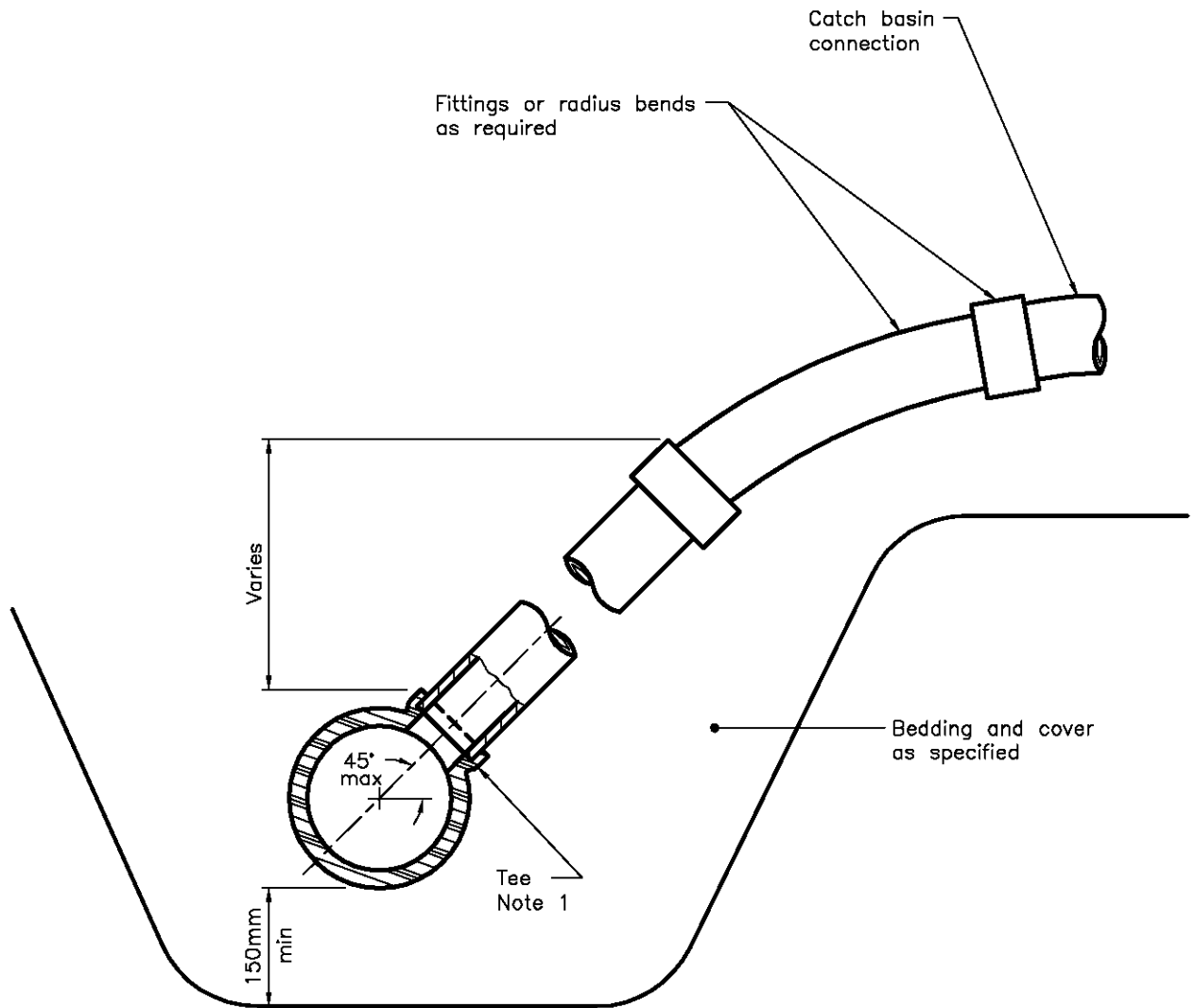
SUPPORT FOR PIPE
AT CATCH BASIN
OR MAINTENANCE HOLE

Nov 2016

Rev 4



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 in diameter, maintenance holes shall be used at the main sewer.

B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

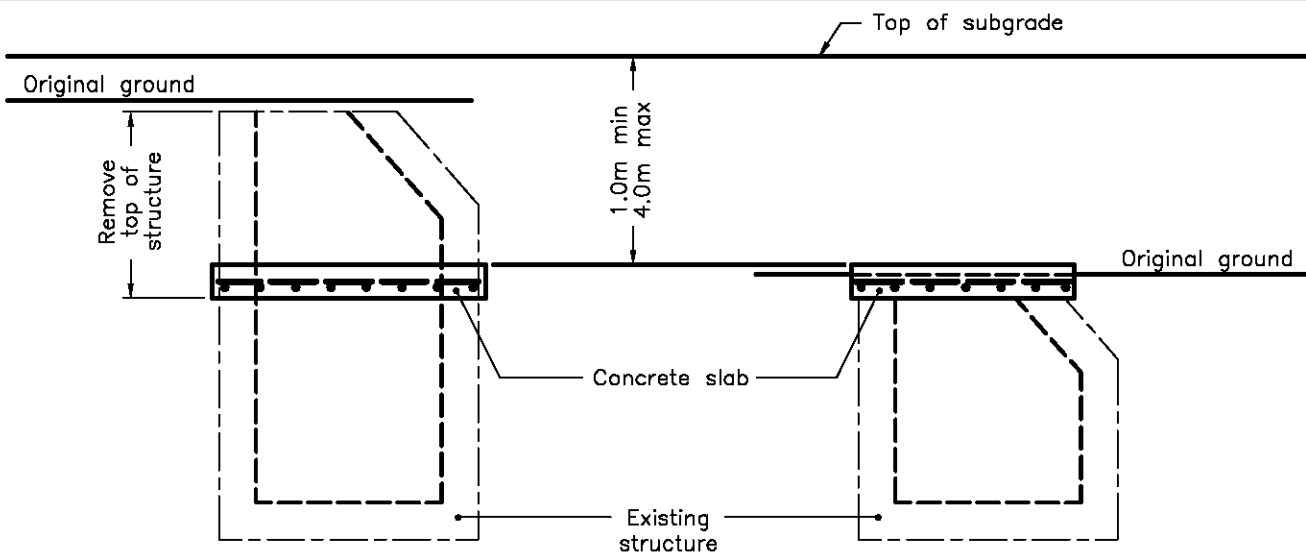
Nov 2016

Rev 3

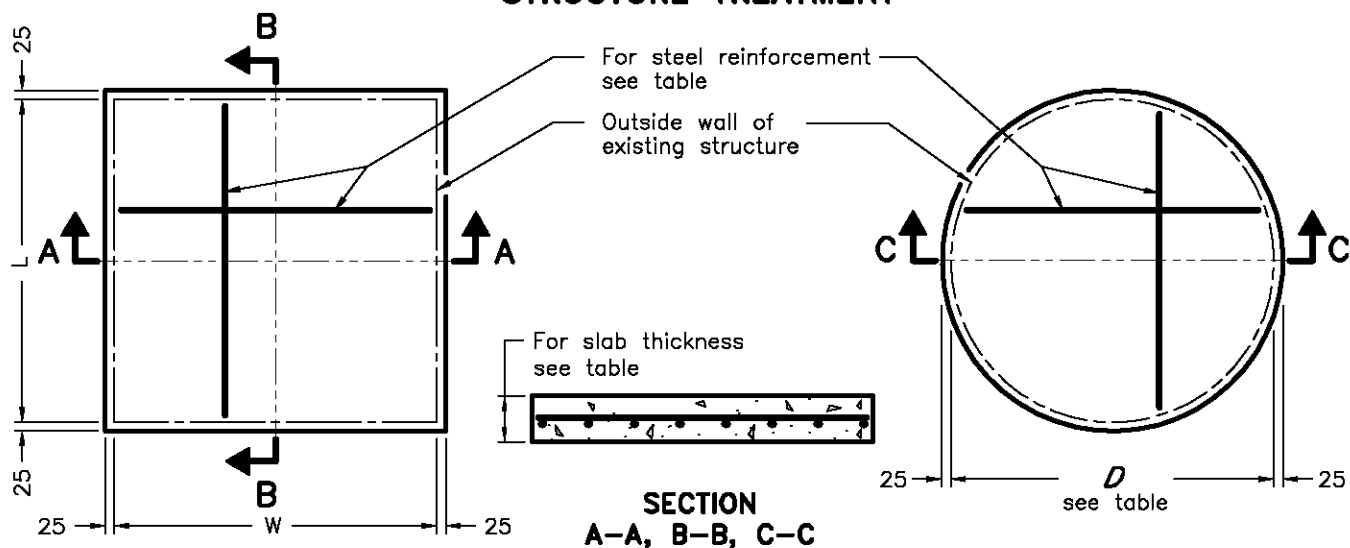
**CATCH BASIN CONNECTION
FOR FLEXIBLE MAIN PIPE SEWER**



OPSD 708.030



STRUCTURE TREATMENT



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

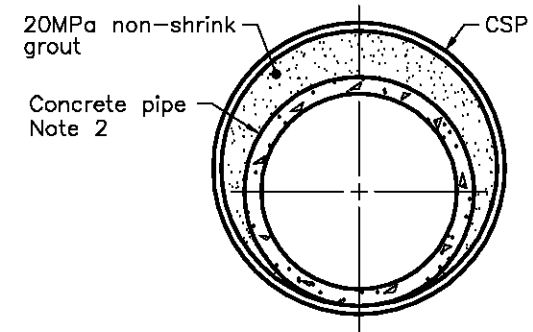
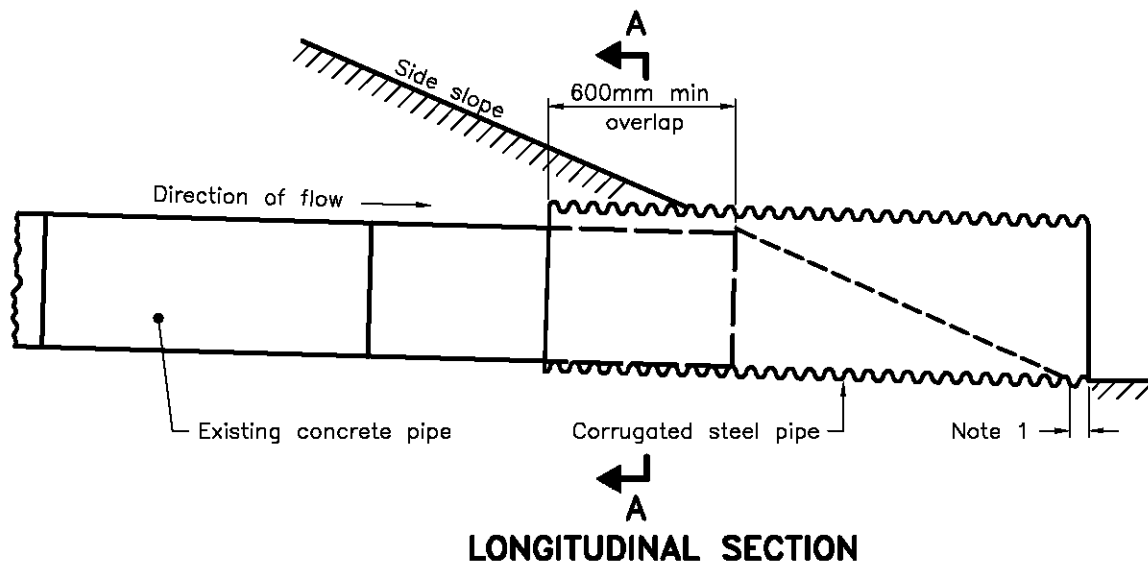
Rev 3

CAPPING EXISTING STRUCTURES

MAXIMUM 4.0m COVER



OPSD 710.010



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

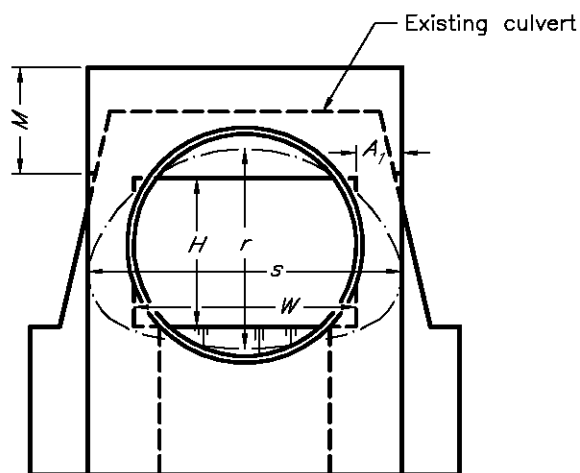
**CONCRETE PIPE CULVERT AND
SEWER EXTENSIONS USING CORRUGATED
STEEL PIPE**

TEMPORARY CONDITIONS

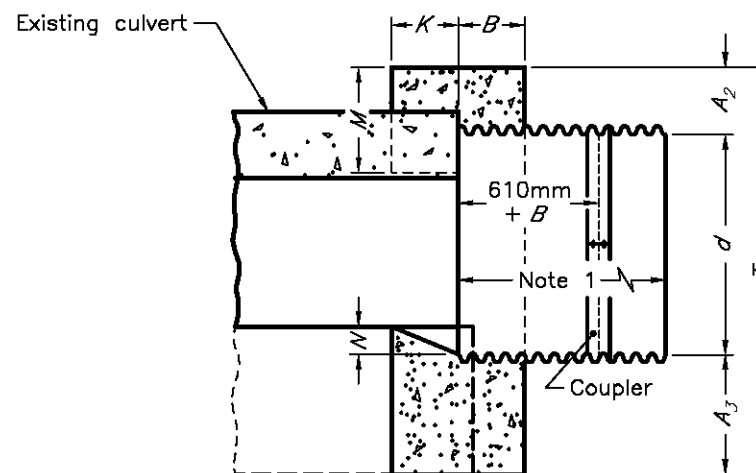
Nov 2012 Rev 2



OPSD 800.010



**FRONT ELEVATION
NOTE 2**



**LONGITUDINAL SECTION
NOTE 2**

TABLE SHOWING DIMENSIONS

Culvert $W \times H$	CSP d	CSP Arch $s \times r$	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:

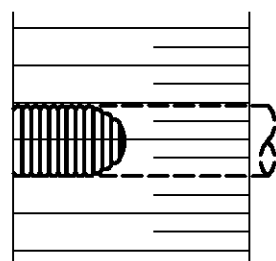
- 1 Corrugated steel pipe shall be cut 610mm + B from end and installed as in longitudinal section.
 - 2 Open frame culvert shown. For box frame culverts, $K=0$. T is the same for open and box frame culverts.
- A Culverts with headwalls: $K=0$ and $M=0$.
 B Class of concrete shall be 30MPa.
 C Bedding 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

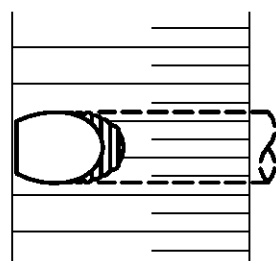
Nov 2012 Rev 2



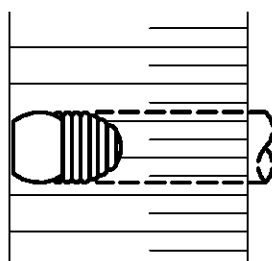
OPSD 800.011



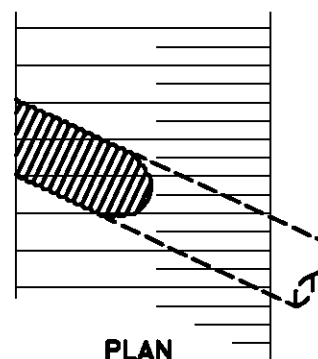
PLAN



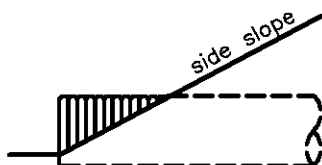
PLAN



PLAN



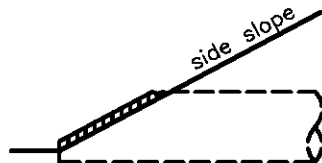
PLAN



ELEVATION

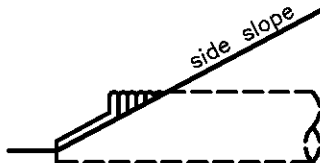
**SQUARE END
END FINISH**

**ALL TYPES
CORRUGATED
STEEL PIPE**



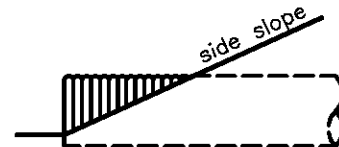
ELEVATION

**PARTIAL BEVEL
NOTE 1**



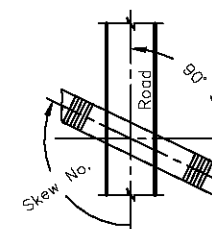
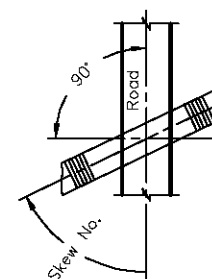
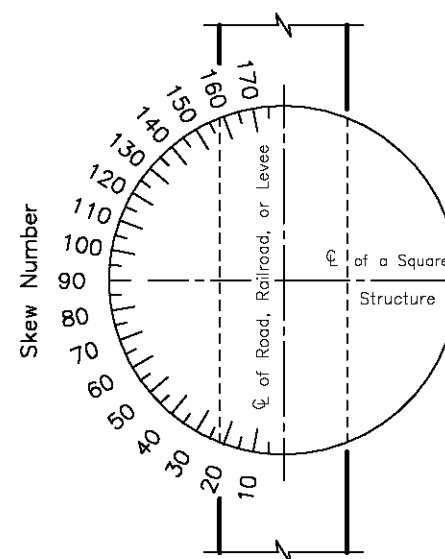
ELEVATION

**STEP-BEVEL
NOTE 1**



ELEVATION
SKIEW END

**END FINISH
STRUCTURAL PLATE CORRUGATED STEEL PIPE**



**PLAN
SKIEW 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

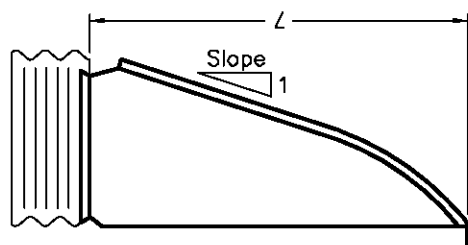
Nov 2012

Rev 2

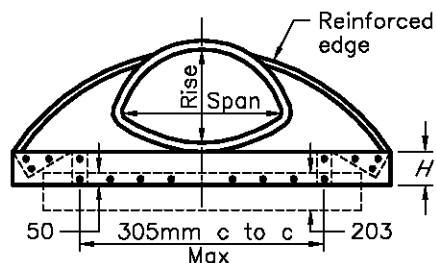
**CUT END FINISH
CIRCULAR PIPE AND PIPE-ARCH
CORRUGATED STEEL PIPE**



OPSD 801.010

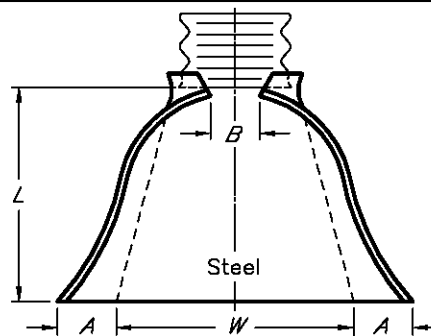


SIDE ELEVATION

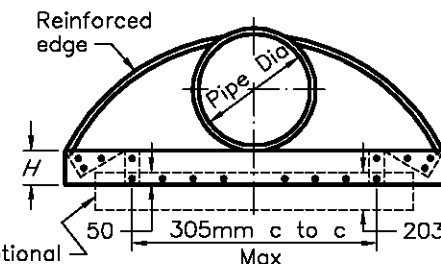


FRONT ELEVATION

PIPE-ARCH



PLAN



Optional
toe plate,
Typ

FRONT ELEVATION

CIRCULAR PIPE

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 x 1120	2.8	455	760	330	1755	2590	1.875	2Pc
1880 x 1260	2.8/3.5	455	915	330	1955	3200	1.625	3Pc

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 CSP 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

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**END SECTION DETAILS
CORRUGATED STEEL PIPE**



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

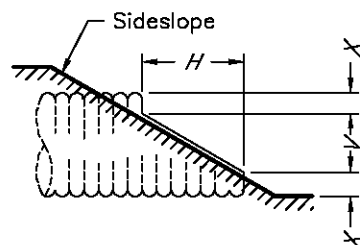
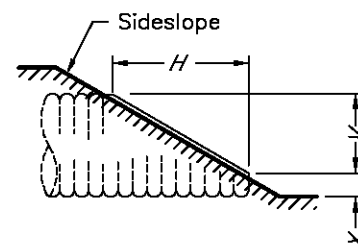
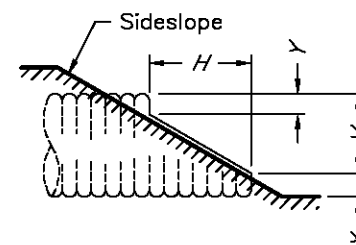
STEP-BEVEL
CIRCULAR STRUCTURAL PLATE PIPEPARTIAL BEVEL
PIPE-ARCH STRUCTURAL PLATE PIPESTEP-BEVEL
PIPE-ARCH STRUCTURAL PLATE PIPE

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.

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

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

OPSD 801.030



STEEL END SECTION FOR ELLIPTICAL CONCRETE PIPE

Equiv. Dia	Ellipse Dimensions		Steel Minimum Thickness	Toe Plate Dimensions				L 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				L 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

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.

STEEL END SECTION FOR ARCHED STEEL PIPE

Equivalent Diameter	Ellipse Dimensions		Steel Minimum Thickness	Toe Plate Dimensions				L 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

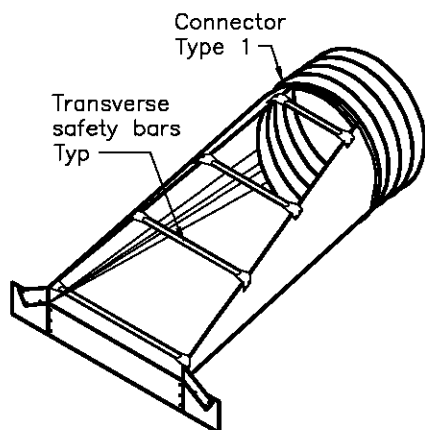
ONTARIO PROVINCIAL STANDARD DRAWING

CULVERT AND SEWER
SAFETY SLOPE END TREATMENT
NOTES AND TABLES

Nov 2012 Rev 2

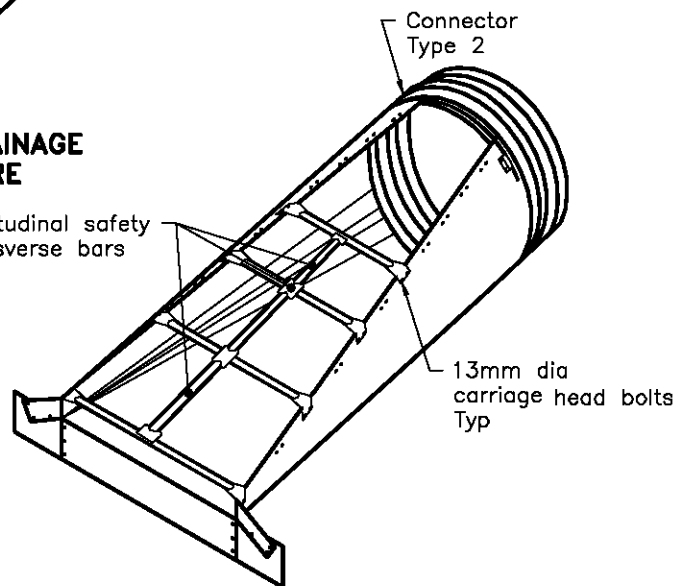


OPSD 801.040

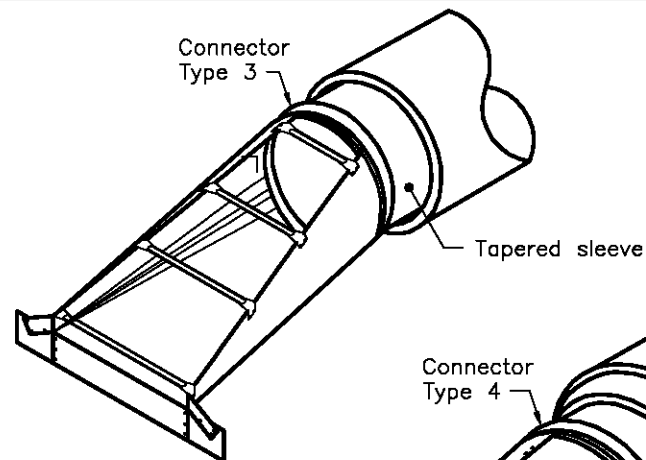


PARALLEL DRAINAGE STRUCTURE

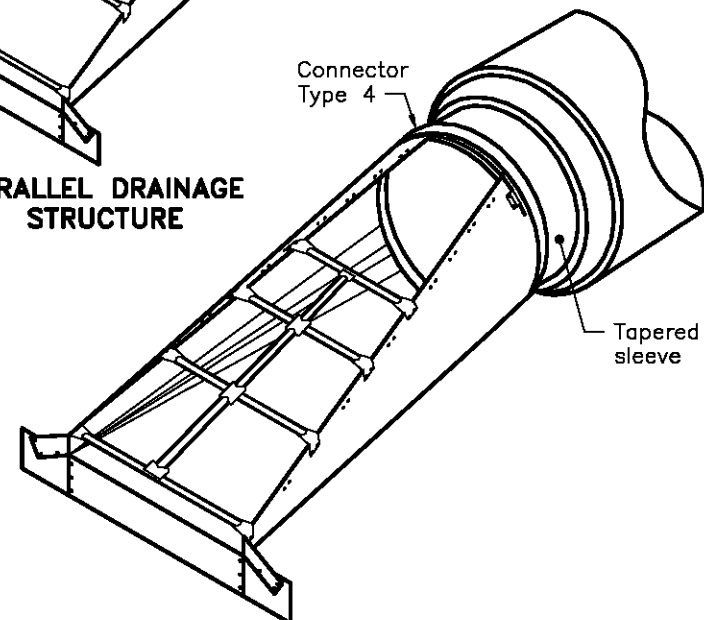
Optional longitudinal safety bar with transverse bars
Note 1
Typ



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

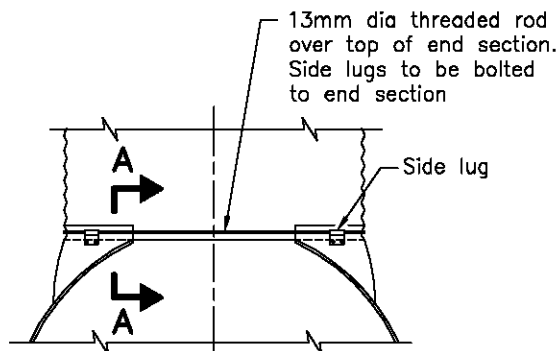
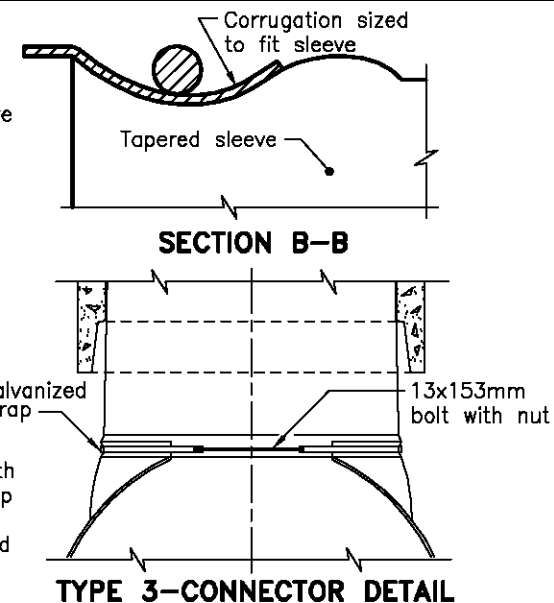
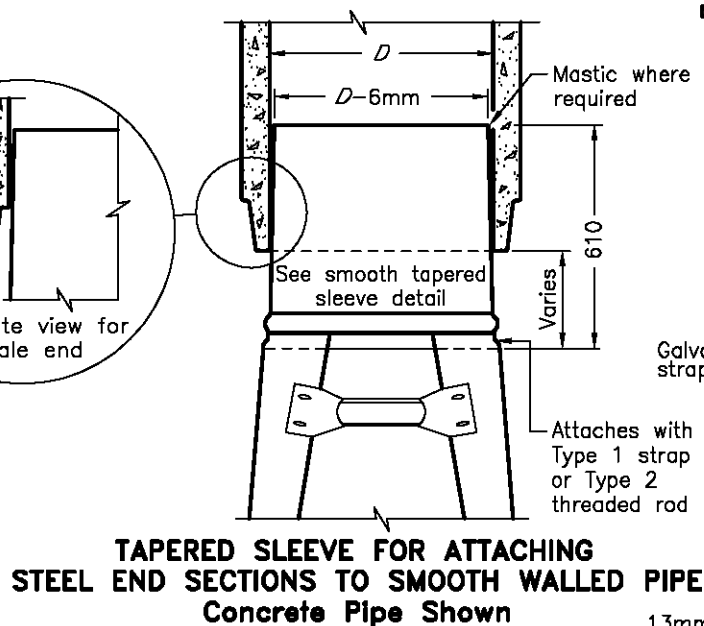
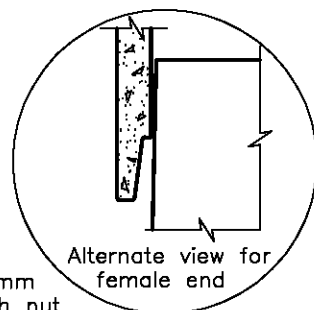
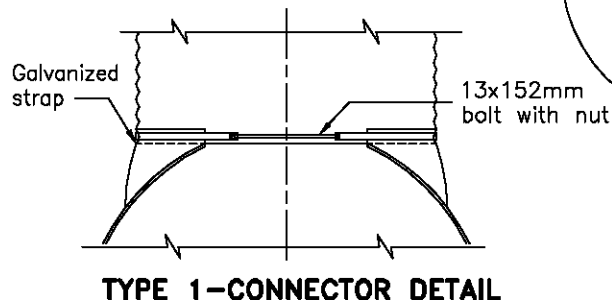
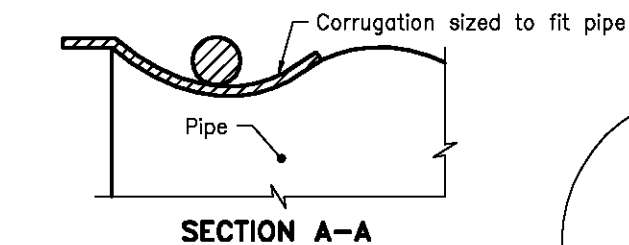
CULVERT AND SEWER SAFETY SLOPE END TREATMENT ASSEMBLY DETAILS

Nov 2012

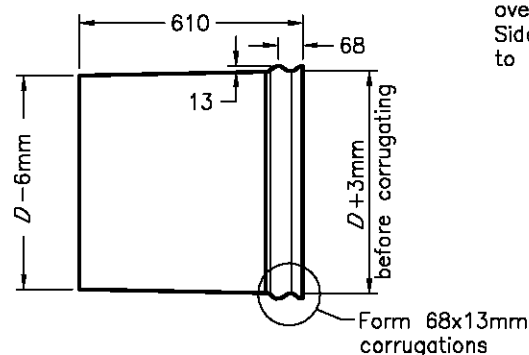
Rev 2



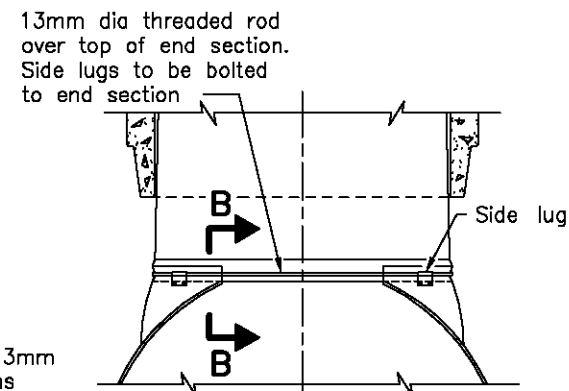
OPSD 801.041



TYPE 2-CONNECTOR DETAIL
CIRCULAR AND ARCHED CORRUGATED PIPES



SMOOTH TAPERED SLEEVE DETAIL
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

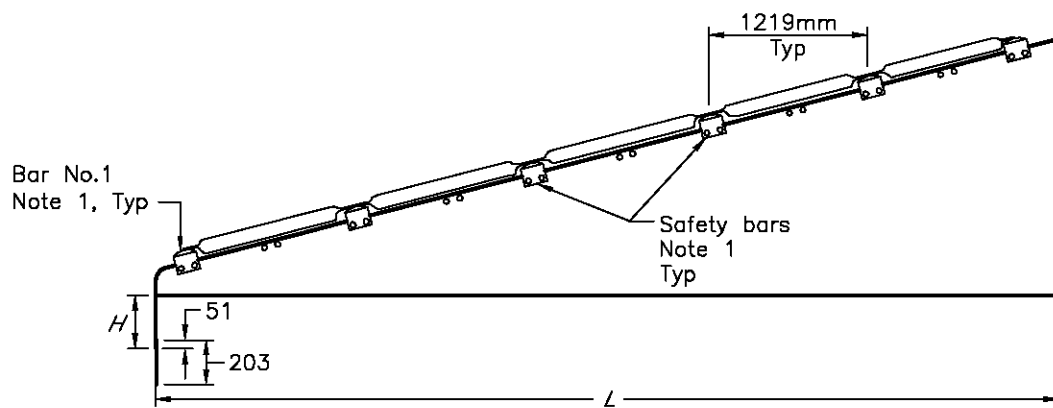
**CULVERT AND SEWER
SAFETY SLOPE END TREATMENT
CONNECTION DETAILS**

Nov 2012

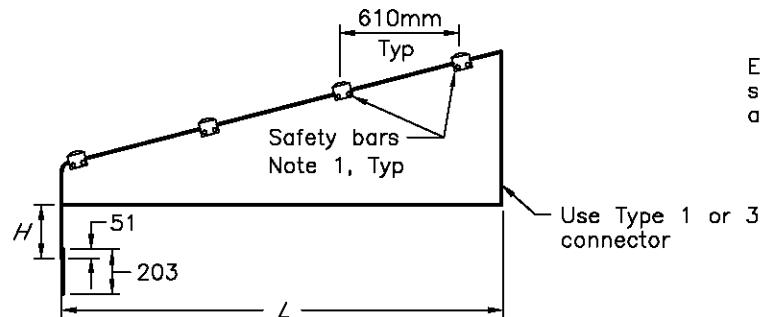
Rev 2



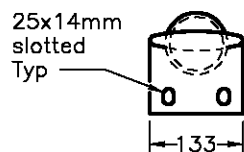
OPSD 801.042



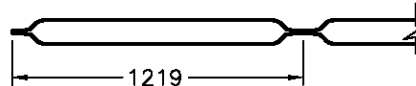
SIDE ELEVATION FOR CROSS DRAINAGE STRUCTURE



SIDE ELEVATION OF PARALLEL DRAINAGE STRUCTURE



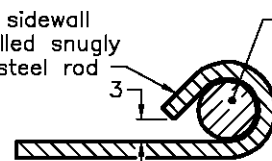
TRANSVERSE BARS



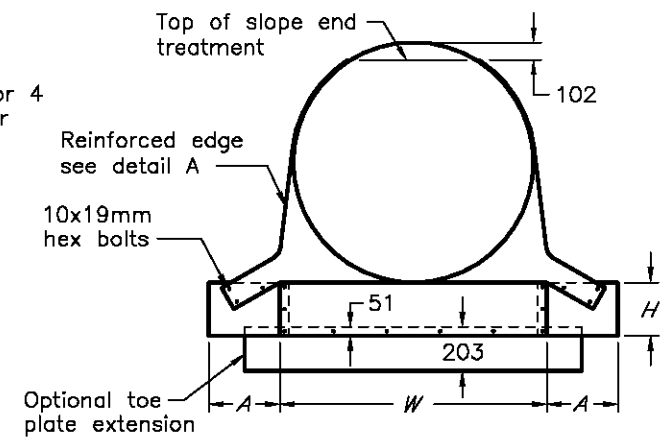
LONGITUDINAL BAR

DETAIL OF SAFETY BARS

Edge of sidewall
sheet rolled snugly
against steel rod

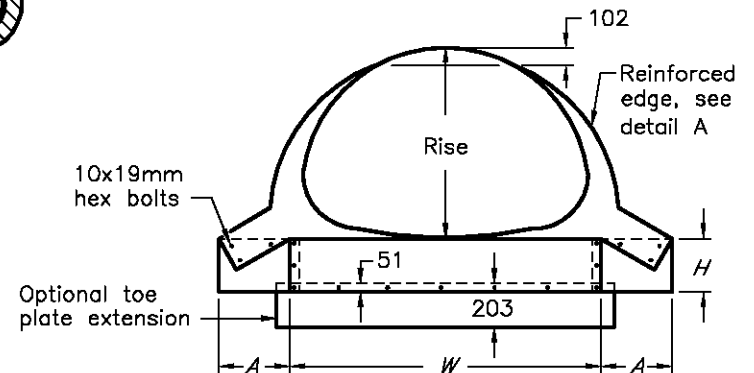


DETAIL A



FRONT VIEW

CIRCULAR SMOOTH WALLED PIPE



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

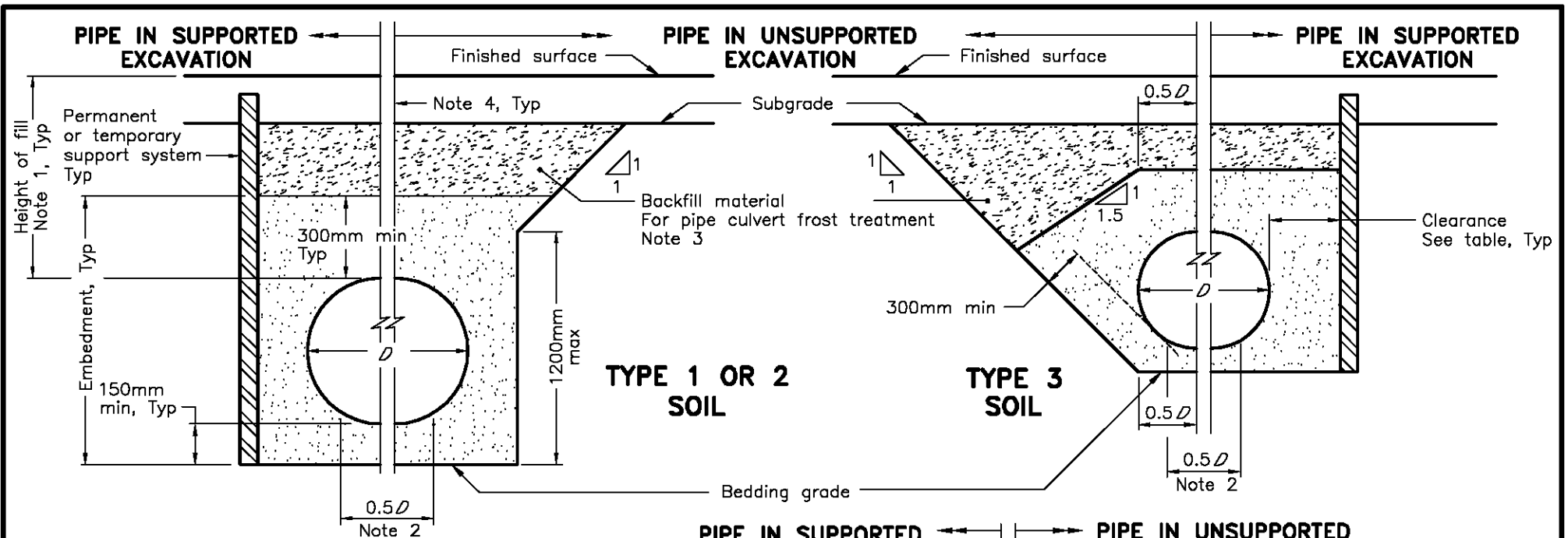
**CULVERT AND SEWER
SAFETY SLOPE END TREATMENT
INSTALLATION DETAILS**

Nov 2012

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OPSD 801.043

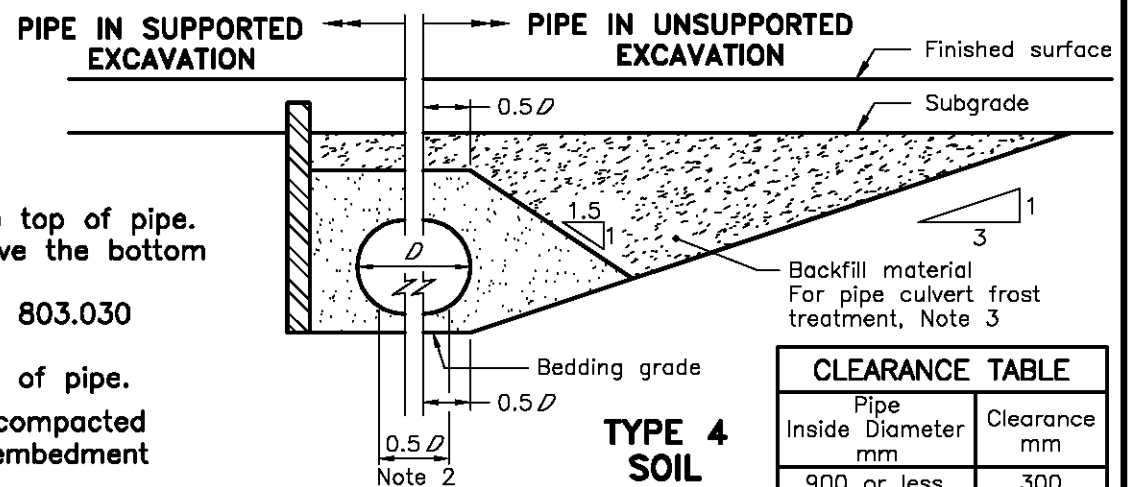


LEGEND:

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

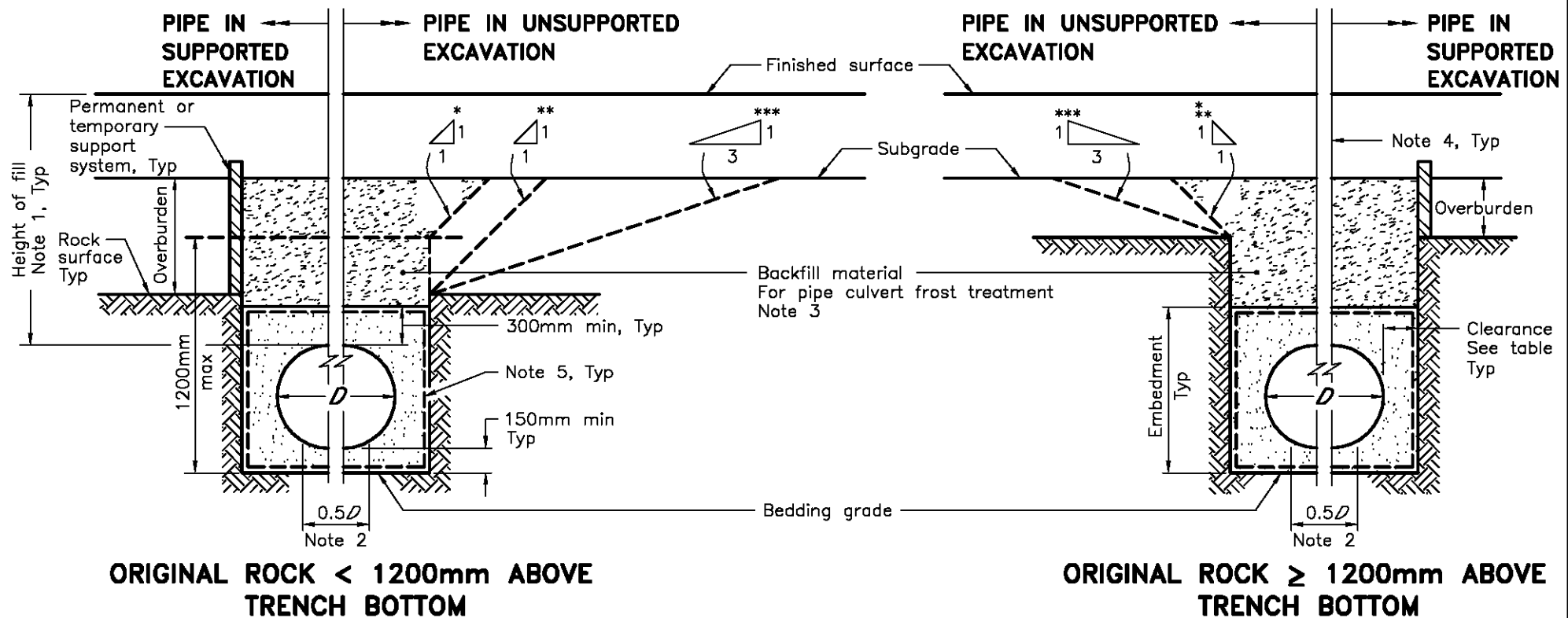
ONTARIO PROVINCIAL STANDARD DRAWING

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FLEXIBLE PIPE
EMBEDMENT AND BACKFILL
EARTH EXCAVATION

OPSD 802.010





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

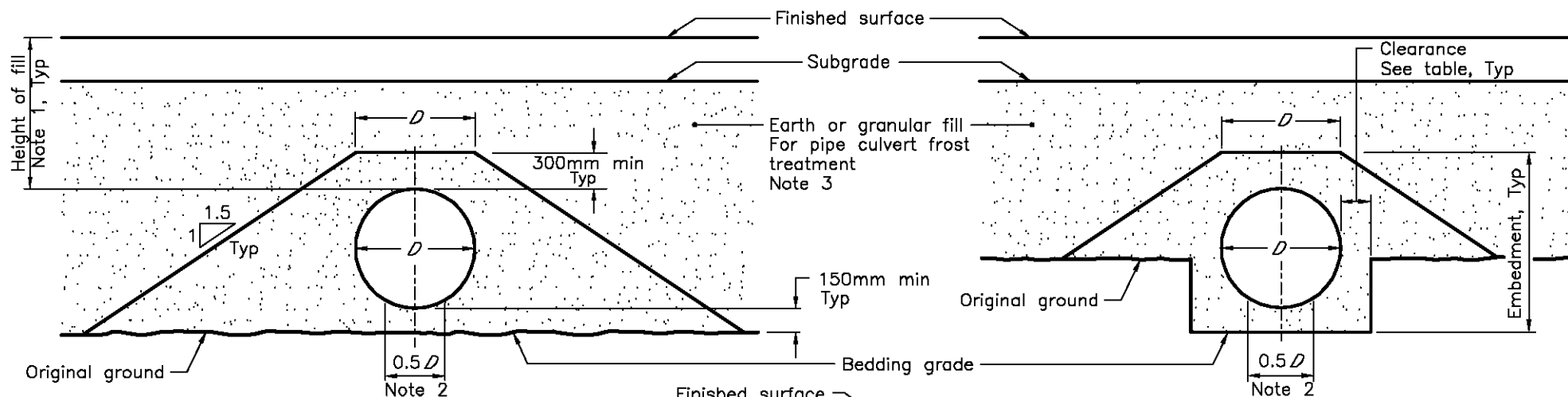
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 Rev 3

**FLEXIBLE PIPE
EMBEDMENT AND BACKFILL
ROCK EXCAVATION**

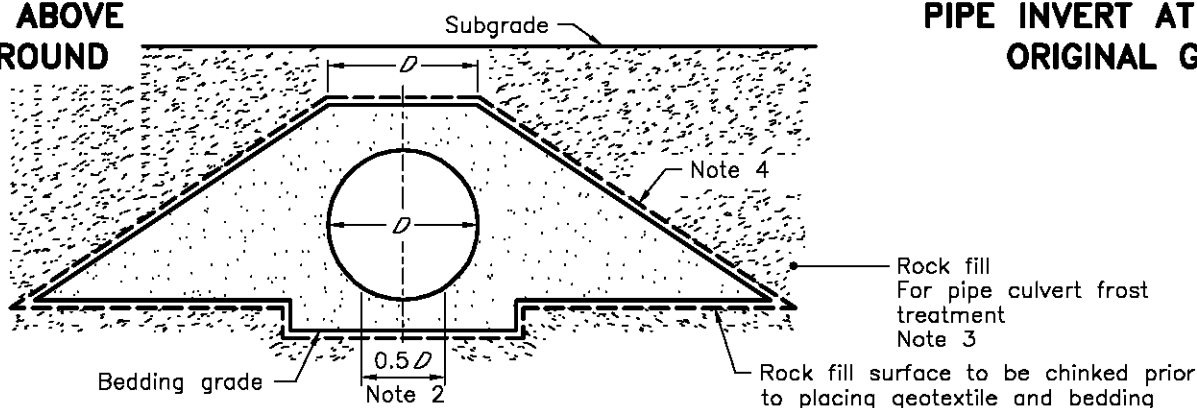
OPSD 802.013





**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.

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.

CLEARANCE TABLE

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

ONTARIO PROVINCIAL STANDARD DRAWING

**FLEXIBLE PIPE EMBEDMENT
IN EMBANKMENT**

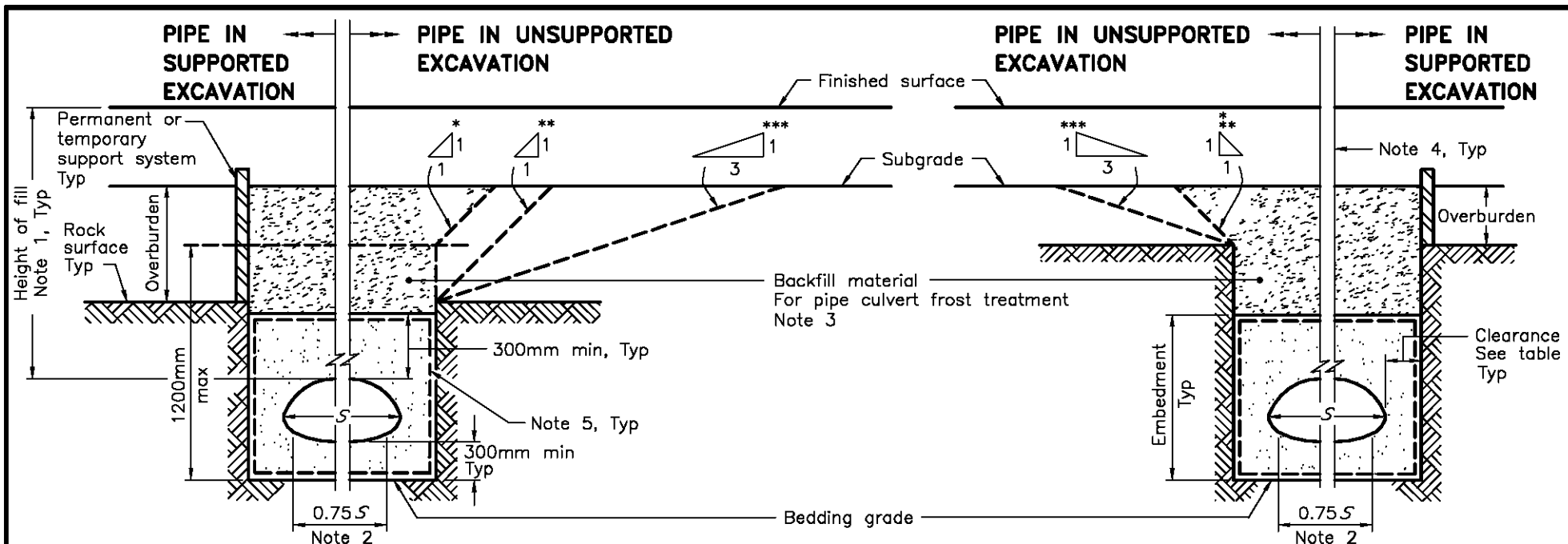
ORIGINAL GROUND: EARTH OR ROCK

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OPSD 802.014



**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 $0.75S$, 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 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.

**ORIGINAL ROCK $\geq$ 1200mm ABOVE
TRENCH BOTTOM**

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

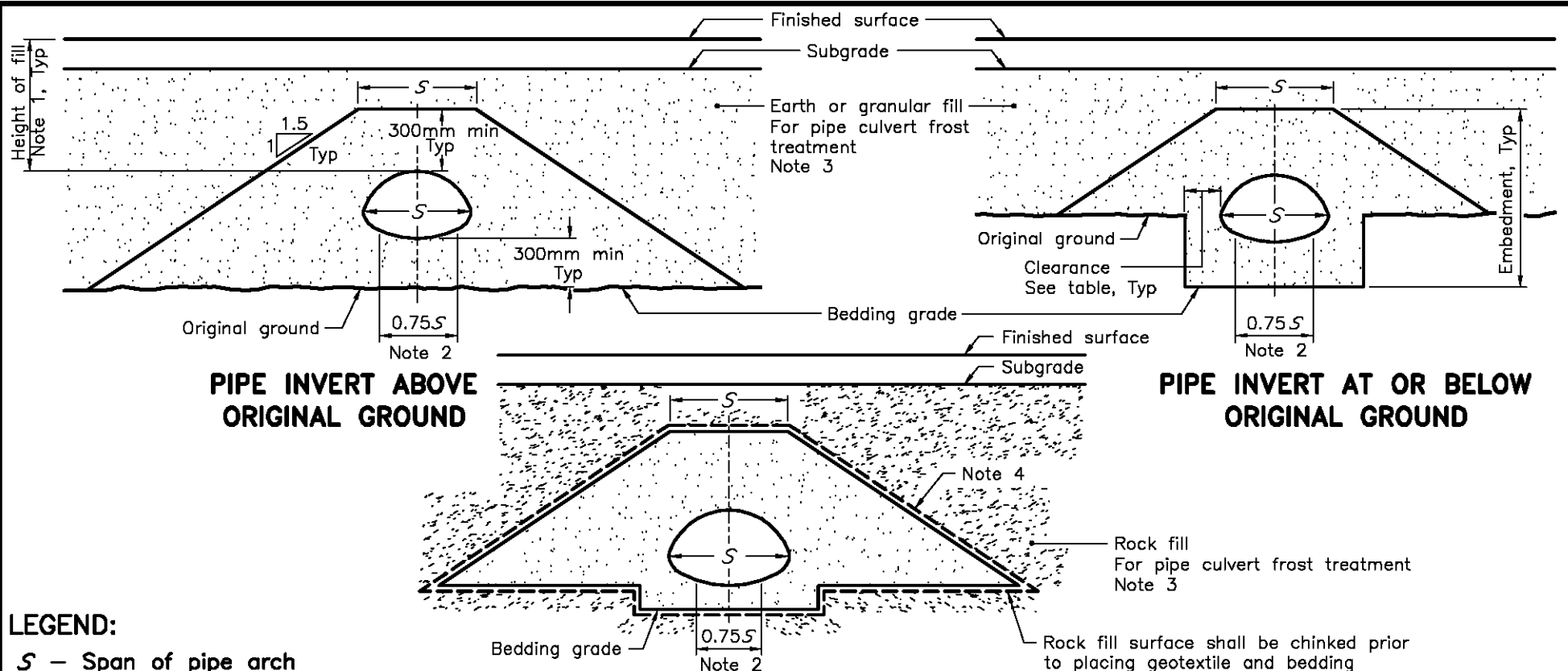
**FLEXIBLE PIPE ARCH
EMBEDMENT AND BACKFILL
ROCK EXCAVATION**

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OPSD 802.023



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

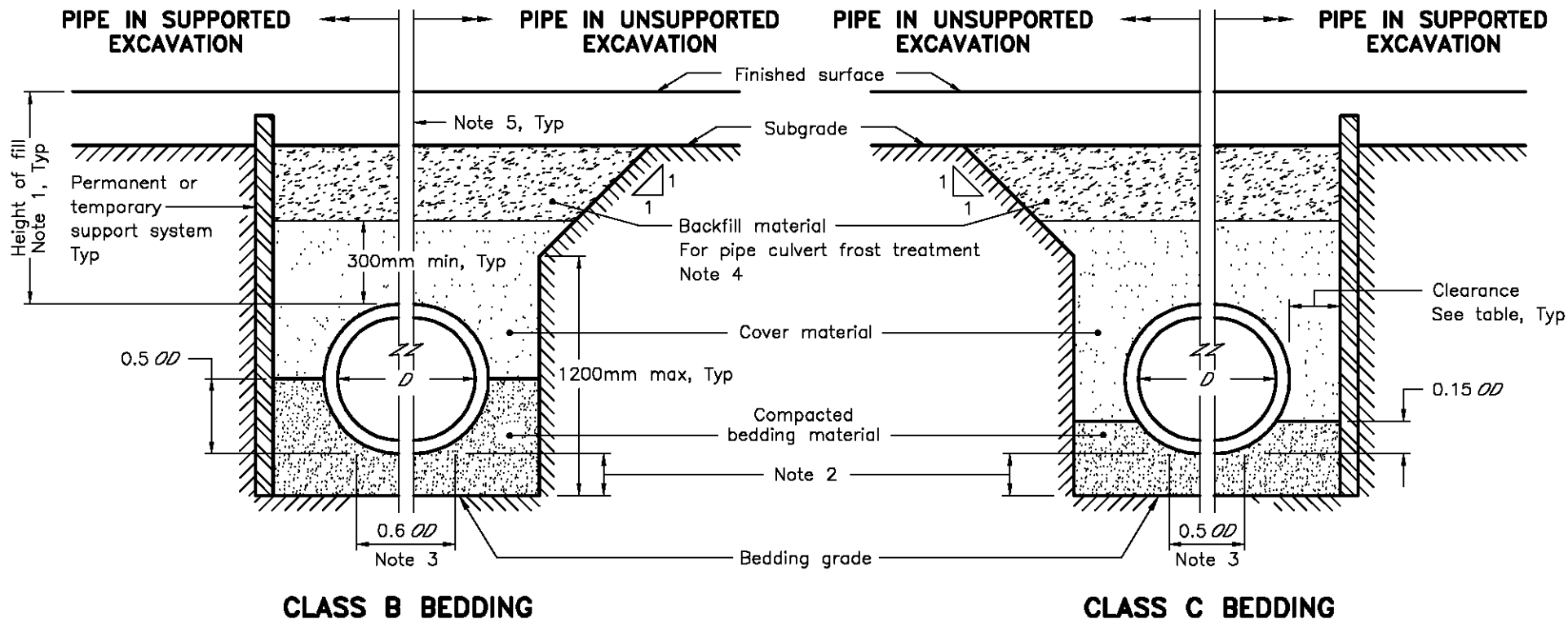
FLEXIBLE PIPE ARCH EMBEDMENT
IN EMBANKMENT

ORIGINAL GROUND: EARTH OR ROCK

Nov 2015 Rev 3



OPSD 802.024



NOTES:

- 1 Height of fill is measured from the finished surface to top of pipe.
 - 2 The minimum bedding depth below the pipe shall be $0.15D$. In no case shall this dimension be less than 150mm or greater than 300mm.
 - 3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
 - 4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
 - 5 Condition of excavation is symmetrical about centreline of pipe.
- A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
- B All dimensions are in metres unless otherwise shown.

LEGEND:

D – Inside diameter
 OD – Outside diameter

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

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2015

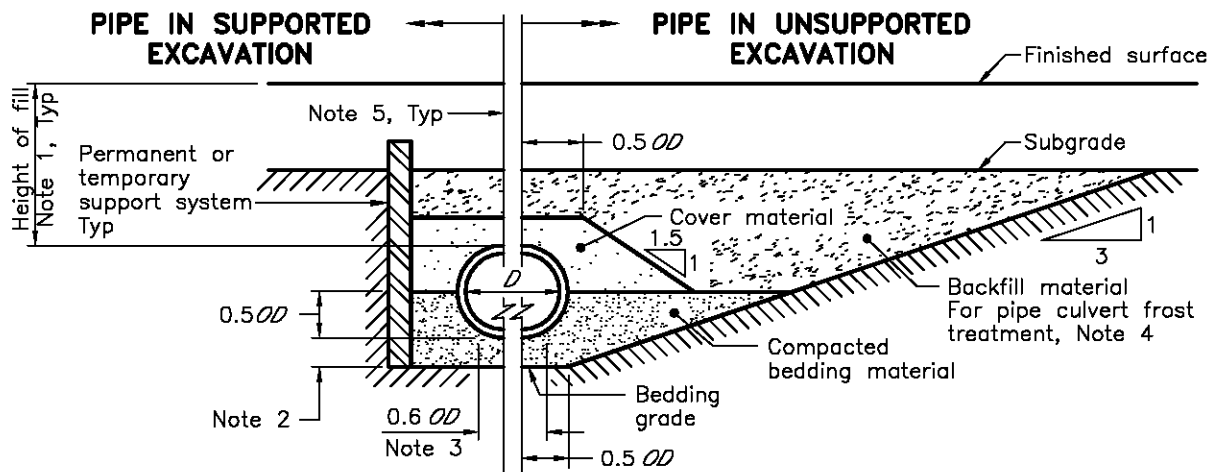
Rev 3

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

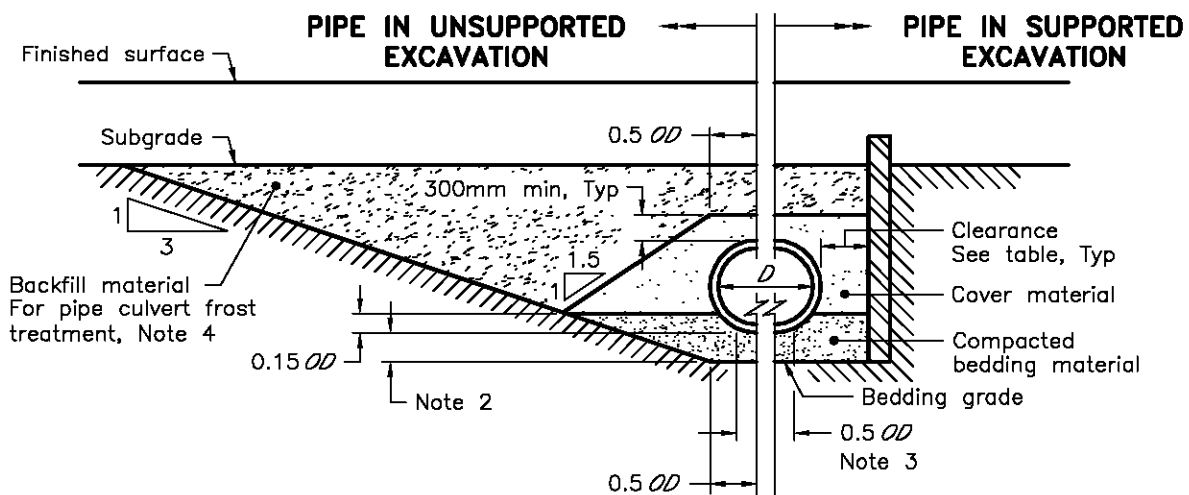
OPSD 802.030







CLASS B BEDDING



CLASS C BEDDING

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 $0.15D$.
In no case shall this dimension be less than 150mm or greater than 300mm.
- 3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
- 4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
- 5 Condition of excavation is symmetrical about centreline of pipe.
- A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
- B All dimensions are in metres unless otherwise shown.

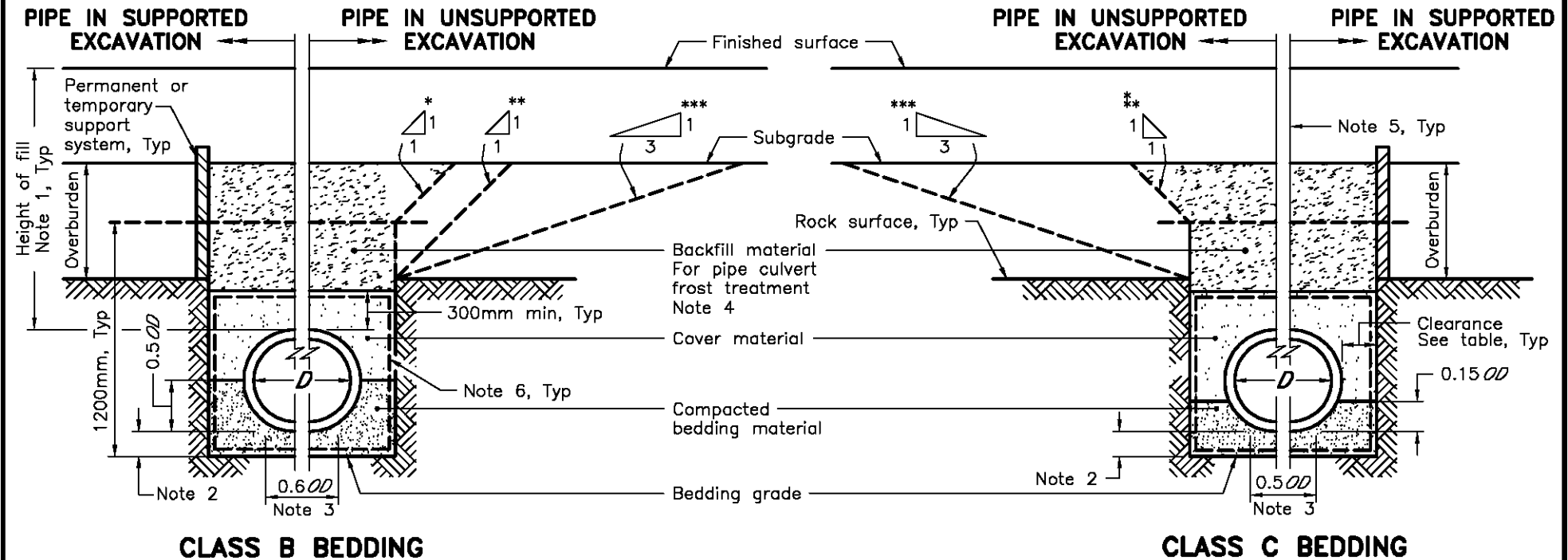
ONTARIO PROVINCIAL STANDARD DRAWING

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 $0.25D$. 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

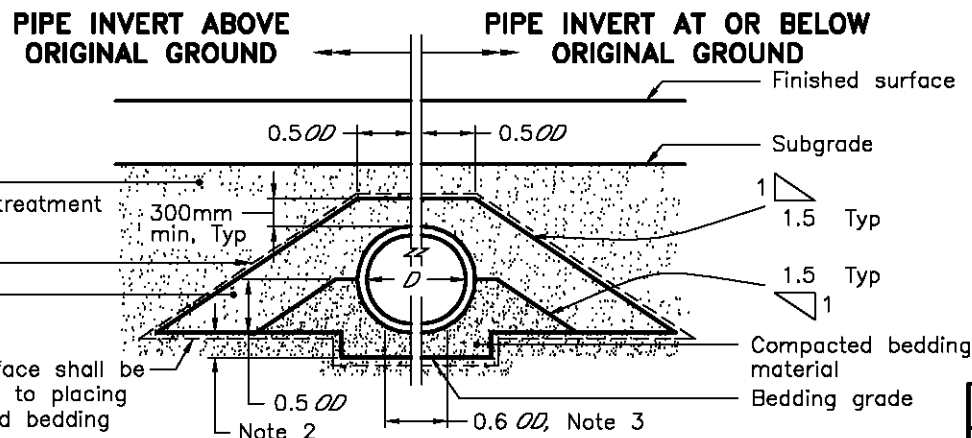
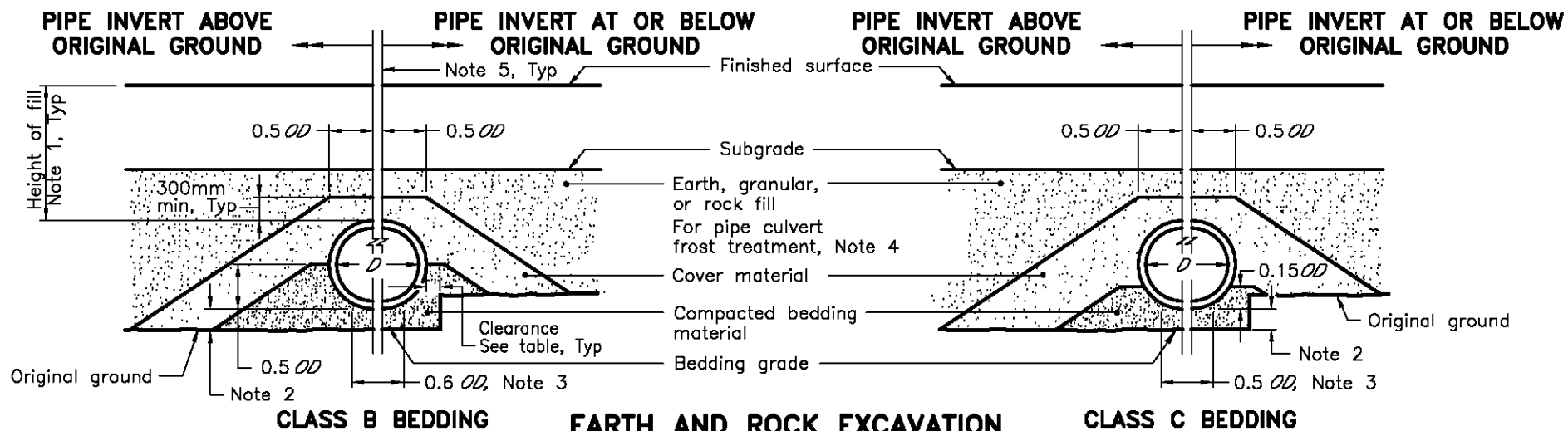
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2015 Rev 3

**RIGID PIPE BEDDING,
COVER, AND BACKFILL
ROCK EXCAVATION**

OPSD 802.033





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 $0.15D$, except on a rock foundation where the minimum bedding depth shall be $0.25D$. In no case shall the minimum dimension be less than 150mm or greater than 300mm.
- 3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
- 4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
- 5 Condition of excavation is symmetrical about centreline of pipe.
- 6 Bedding and cover material shall be wrapped in non-woven geotextile when specified.

A All dimensions are in metres unless otherwise shown.

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

ONTARIO PROVINCIAL STANDARD DRAWING

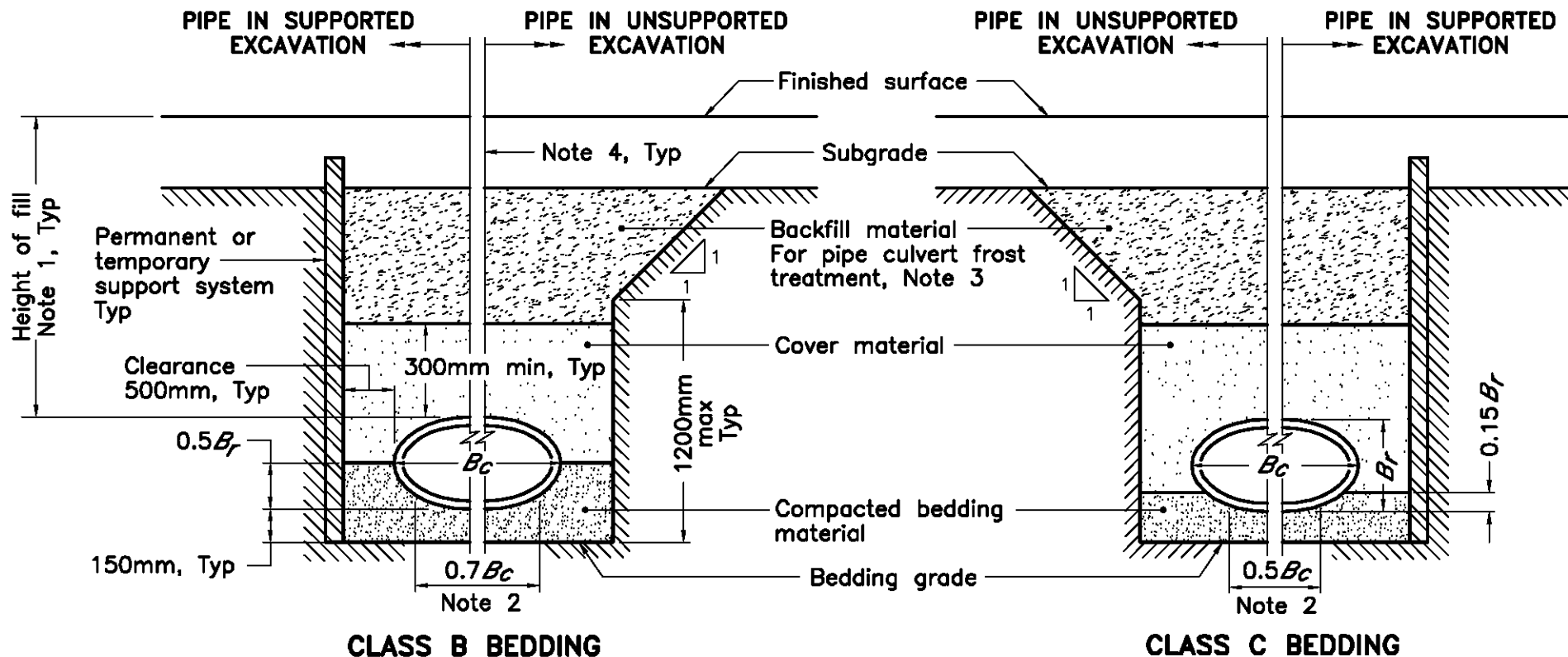
**RIGID PIPE BEDDING AND COVER
 IN EMBANKMENT
 ORIGINAL GROUND: EARTH OR ROCK**

Nov 2015

Rev 3



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

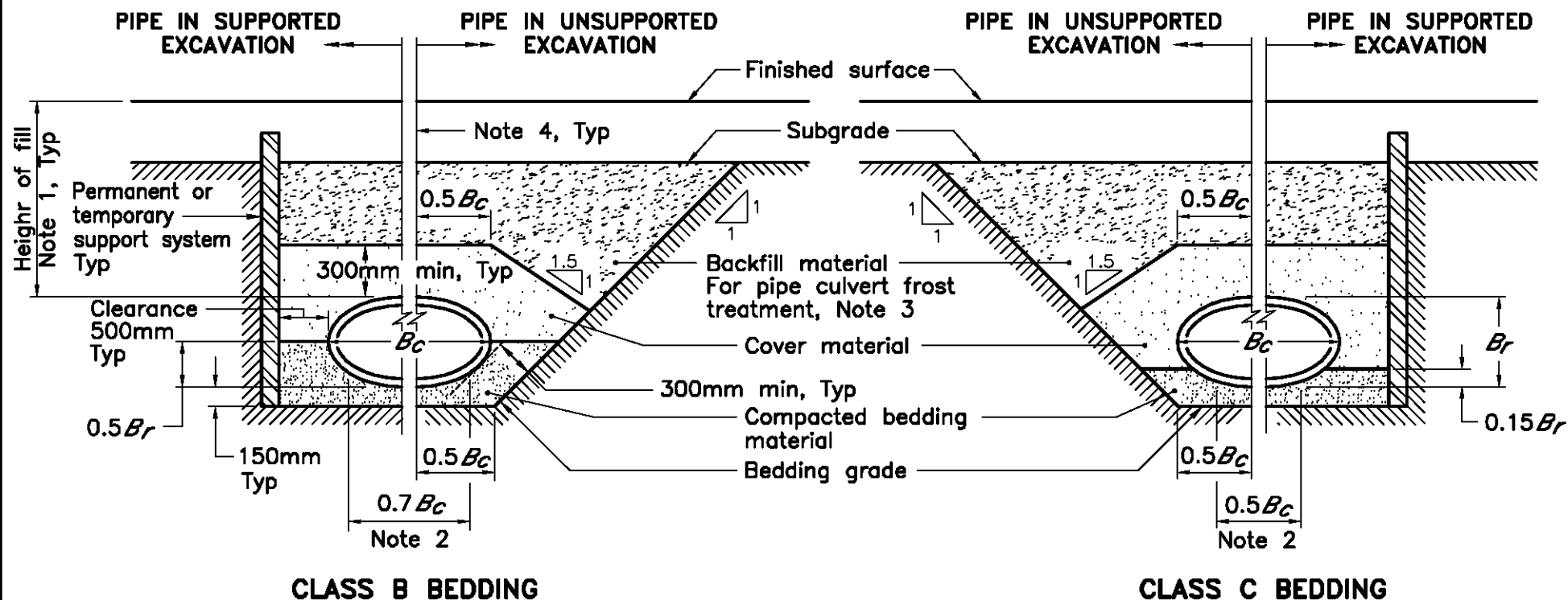
B_r = Outside vertical rise

ONTARIO PROVINCIAL STANDARD DRAWING
**HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING,
 COVER, AND BACKFILL**
 TYPE 1 OR 2 SOIL – EARTH EXCAVATION

Nov 2015 Rev 3



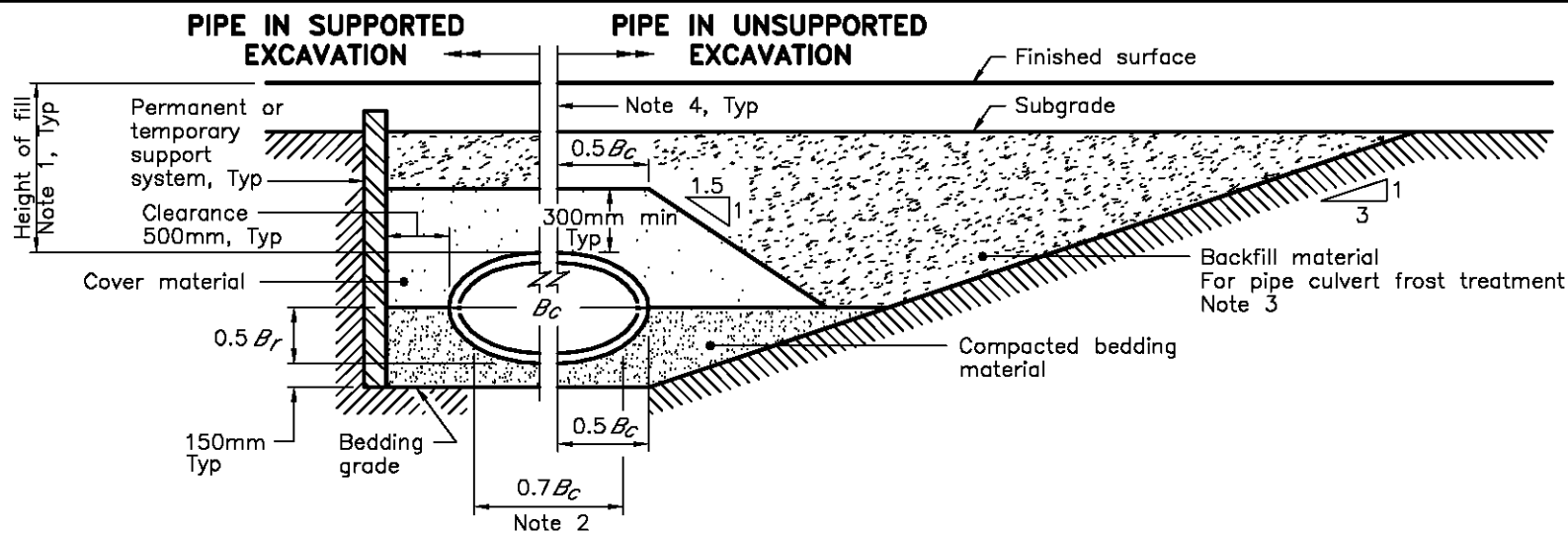
OPSD 802.050



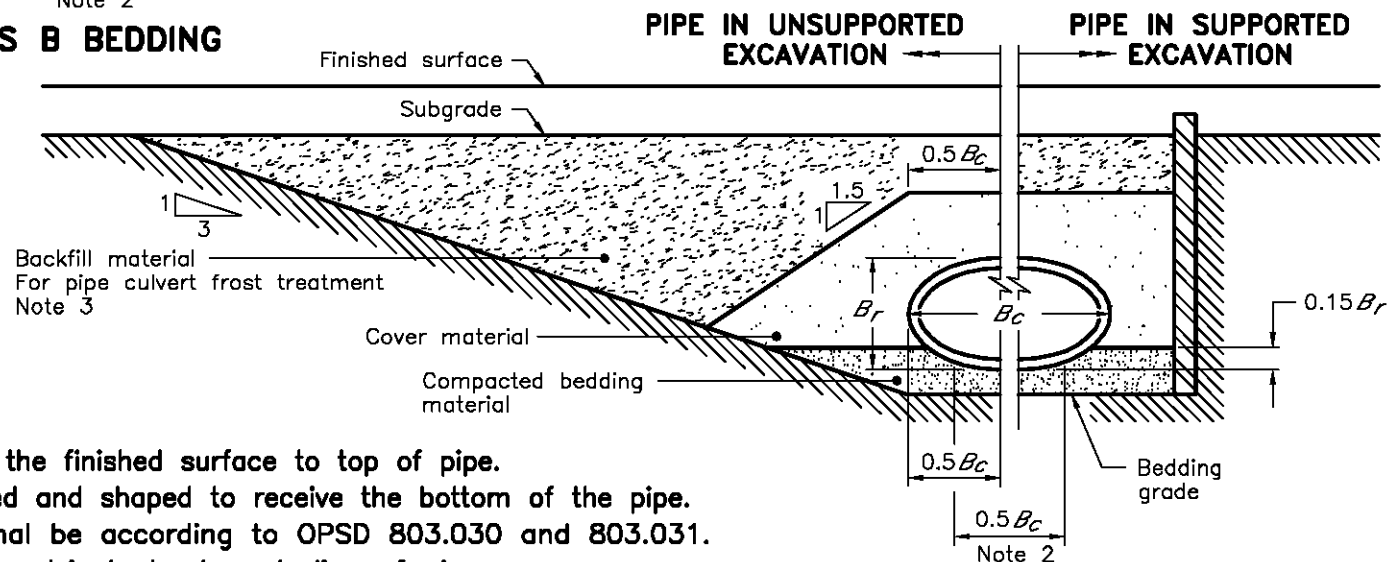
ONTARIO PROVINCIAL STANDARD DRAWING HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 3 SOIL – EARTH EXCAVATION



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 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.

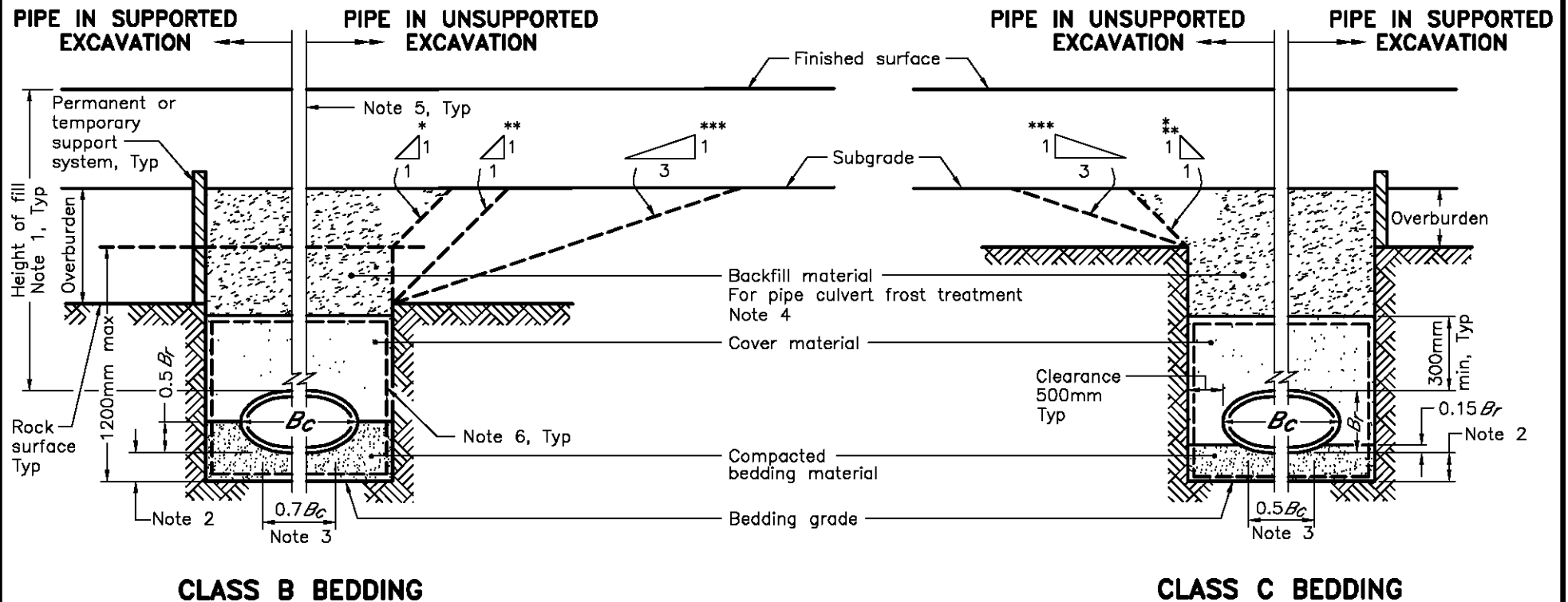
B All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING
HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING,
COVER, AND BACKFILL
TYPE 4 SOIL – EARTH EXCAVATION

Nov 2015 Rev 3



OPSD 802.052



NOTES:

- 1 Height of fill is measured from the finished surface to top of pipe.
- 2 The minimum bedding depth below the pipe shall be $0.25B_c$. In no case shall this dimension be less than 150mm or greater than 300mm.
- 3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
- 4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
- 5 Condition of excavation is symmetrical about centreline of pipe.
- 6 Embedment material shall be wrapped in non-woven geotextile when specified.

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

B Fractured rock shall be treated as Type 1 soil.

C All dimensions are in metres unless otherwise shown.

LEGEND:

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

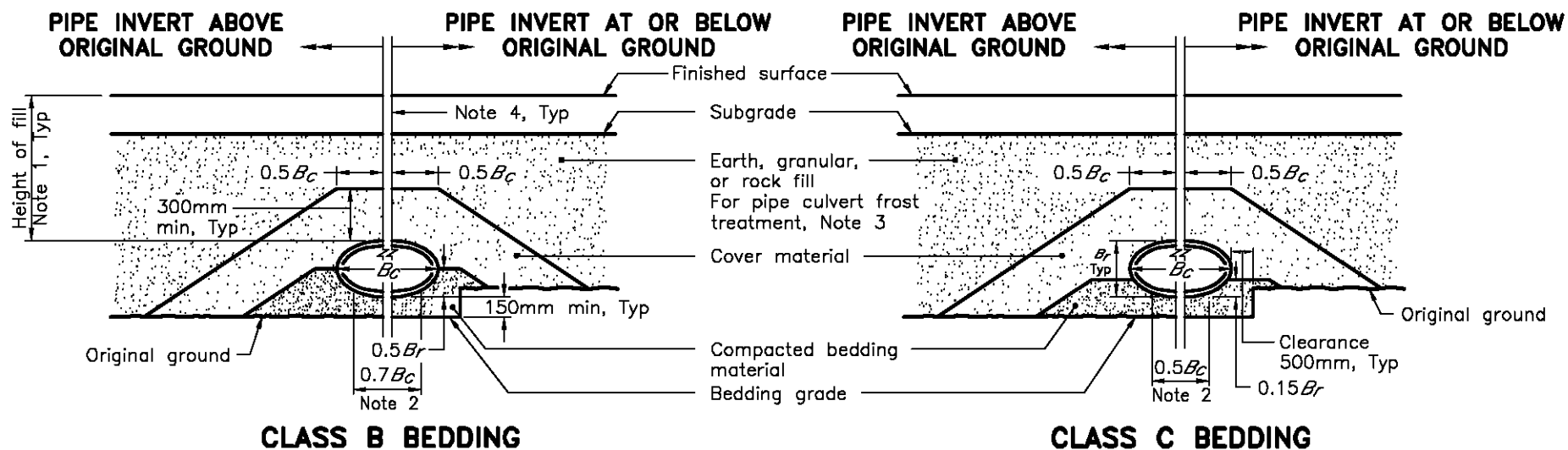
ONTARIO PROVINCIAL STANDARD DRAWING

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

Nov 2015 Rev 3



OPSD 802.053



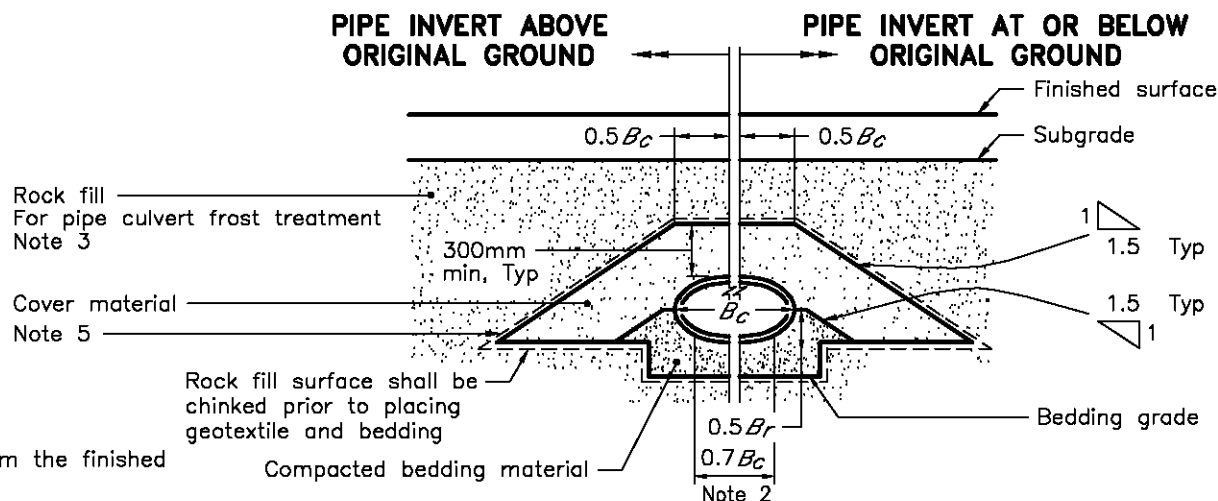
LEGEND:

B_c = Outside horizontal span
 B_r = Outside vertical rise

NOTES:

- Height of fill is measured from the finished surface to top of pipe.
- The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
- Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
- Condition of excavation is symmetrical about centreline of pipe.
- Bedding and cover material shall be wrapped in non-woven geotextile when specified.

A All dimensions are in metres unless otherwise shown.



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

ONTARIO PROVINCIAL STANDARD DRAWING

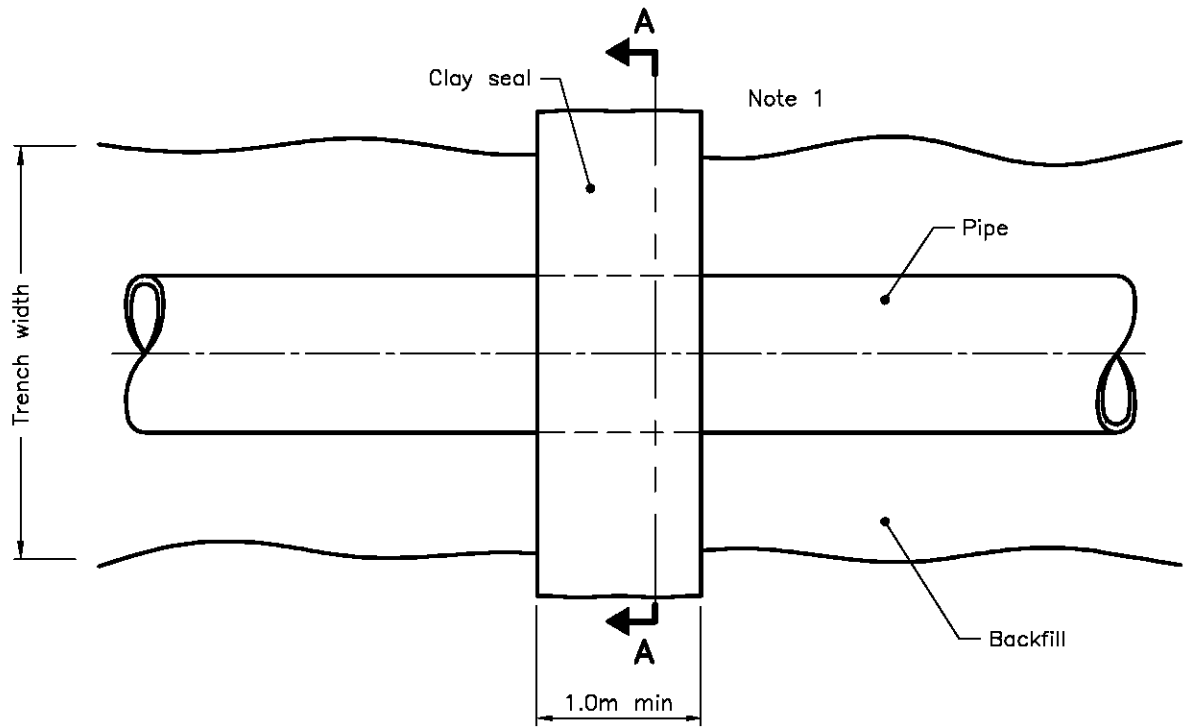
**HORIZONTAL ELLIPTICAL RIGID PIPE
BEDDING AND COVER IN EMBANKMENT
ORIGINAL GROUND: EARTH OR ROCK**

Nov 2015

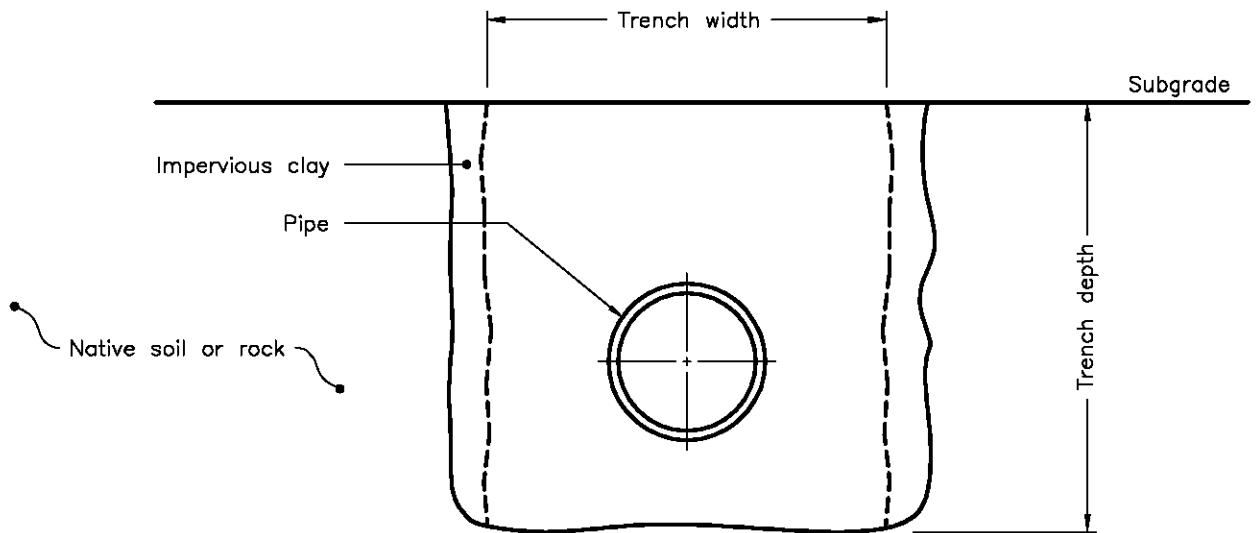
Rev 3



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 2016

Rev 2

CLAY SEAL FOR PIPE TRENCHES

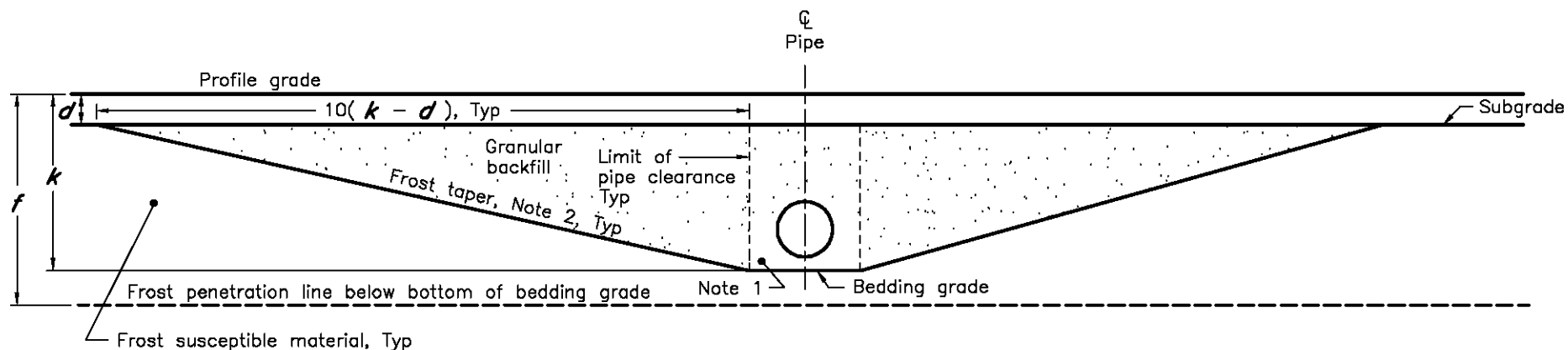


OPSD 802.095

The drawing consists of two parts: a longitudinal section and a cross-section labeled 'SECTION A-A'.

LONGITUDINAL SECTION: This view shows the structure from the side. It features a central 'Box frame and precast box' section. Above this, the 'Open frame' is indicated. The structure is supported by 'Granular or native backfill as specified Typ'. A dashed line represents the 'Original ground' level. A horizontal line indicates the 'Frost penetration line above this limit'. Section lines 'A-A' are shown with arrows pointing towards the cross-section.

SECTION A-A: This is a cross-section of the structure. It shows a central rectangular opening. The top of the structure is at 'Profile grade'. Below the grade is the 'Subgrade'. A dashed line indicates the 'Frost penetration line above this limit'. The structure is composed of several layers: '300mm min cover, Typ' on the top and bottom, '75mm levelling course, precast only, Typ' on the sides, and 'Bedding as specified, precast only, Typ' at the base. A dimension 'd' is shown for the depth of the structure. A note 'Note 1, Typ' is also present.



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

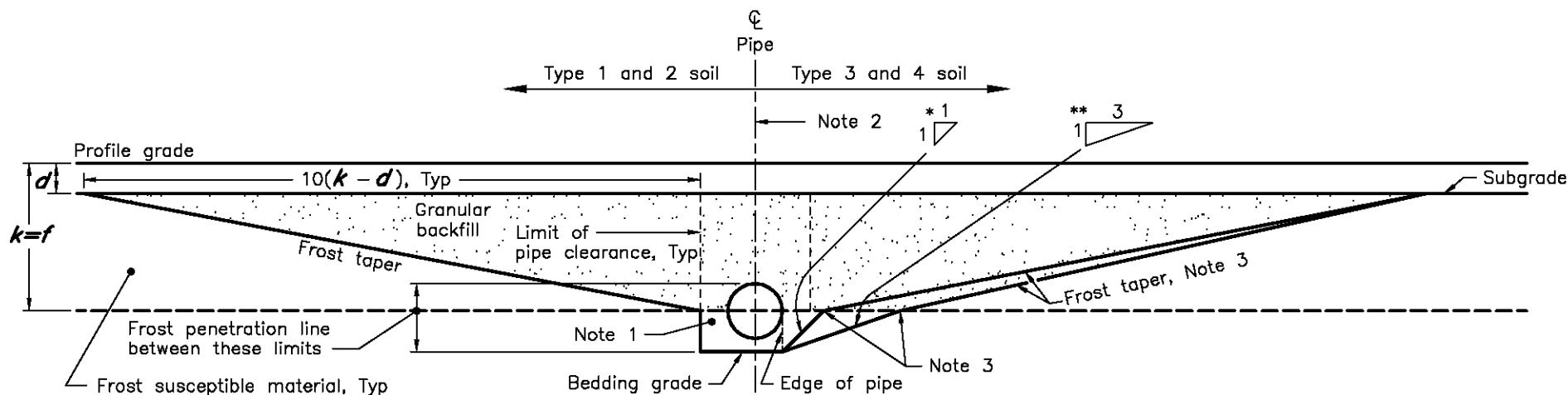
**FROST TREATMENT — PIPE CULVERTS
FROST PENETRATION LINE BELOW
BEDDING GRADE**

Nov 2015

Rev 3



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

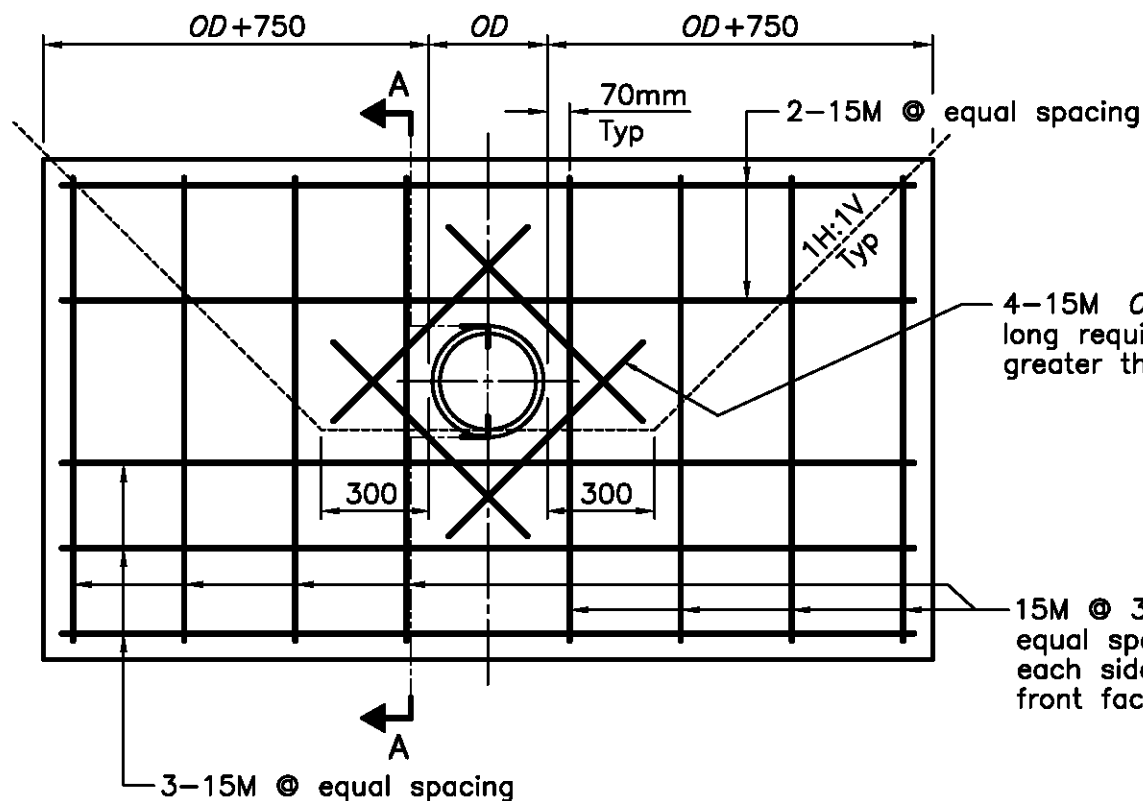
FROST TREATMENT – PIPE CULVERTS
 FROST PENETRATION LINE BETWEEN
 TOP OF PIPE AND BEDDING GRADE

Nov 2015

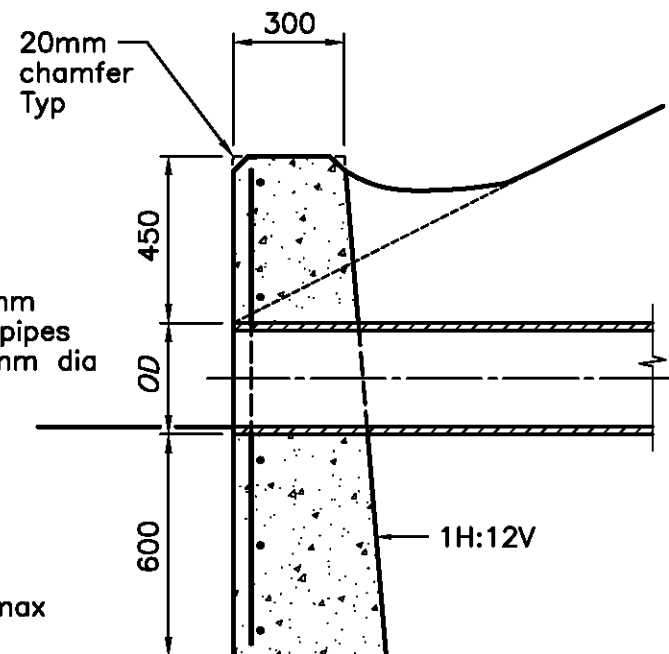
Rev 4



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

Nov 2006

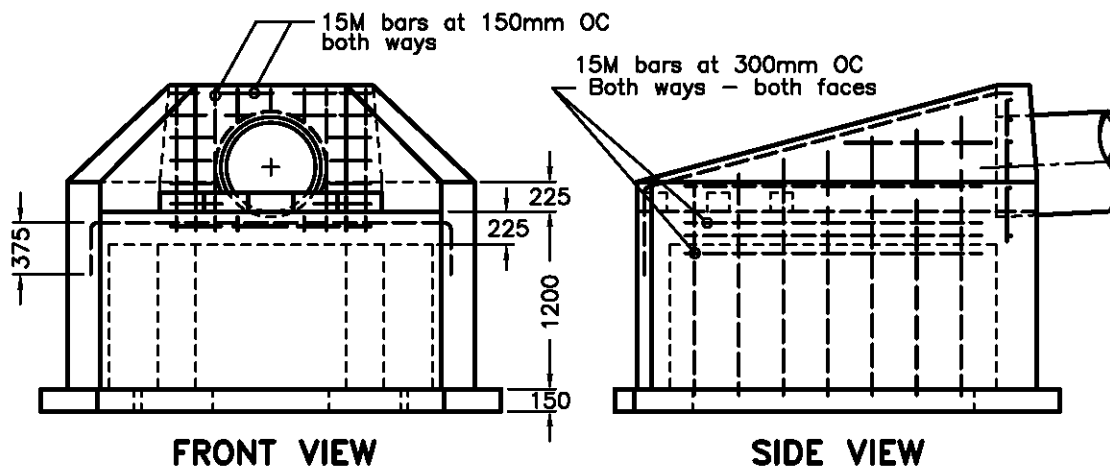
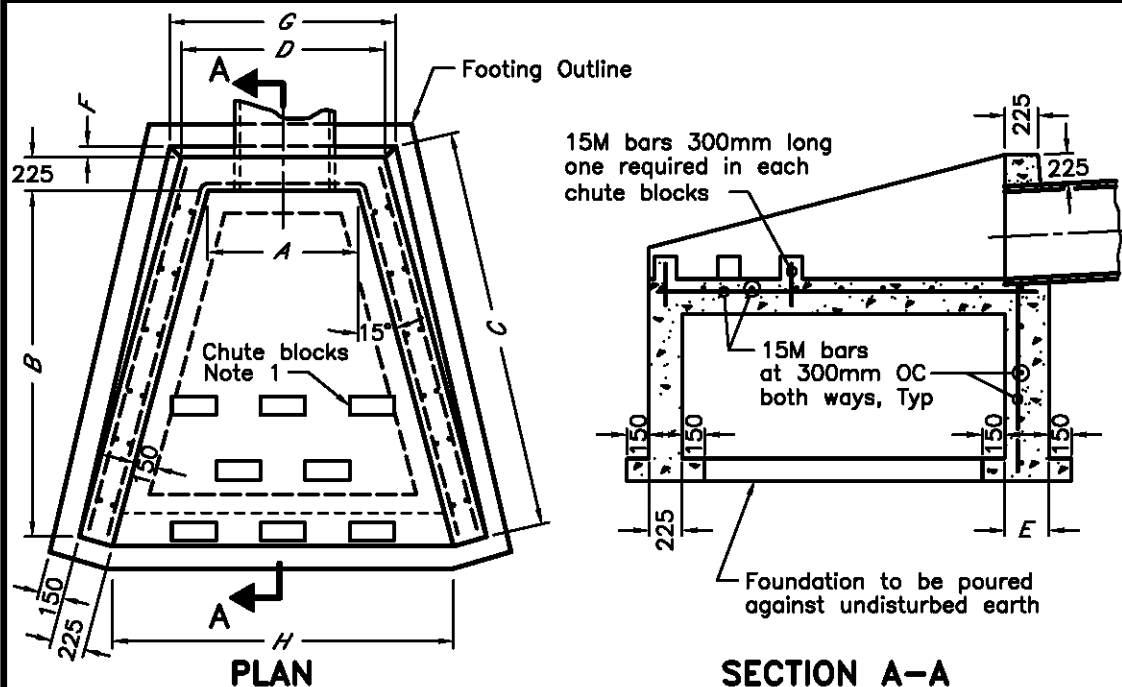
Rev 1

CONCRETE HEADWALL

FOR PIPE LESS THAN 900mm DIAMETER

OPSD 804.030





PIPE DIA	ENDWALL DIMENSIONS							
	A	B	C	D	E	F	G	H
600	1050	2400	2725	1400	300	75	1525	2350
675	1125	2400	2725	1475	300	75	1600	2425
750	1200	2400	2725	1550	300	75	1675	2500
825	1275	2400	2725	1625	300	75	1755	2575
900	1350	2400	2725	1700	300	75	1825	2650
975	1425	2400	2725	1775	375	150	1975	2725
1050	1500	3000	3400	1850	375	150	2050	3100
1200	1650	3000	3400	2000	375	150	2200	3250
1350	1800	3000	3400	2150	375	150	2350	3400
1500	1950	3000	3400	2300	375	150	2500	3550
1650	2100	3000	3400	2450	375	150	2650	3700
1800	2250	3000	3400	2600	375	150	2800	3850
2400	3000	3000	3400	3350	375	150	3550	4600

NOTES:

- 1 Poured concrete chute blocks 300x200x100mm high.
- A This OPSD to be read in conjunction with OPSD 3940.150.
- B Class of concrete: 30MPa.
- C Cover to reinforcing bars: 75mm $\pm$ 20mm.
- D Granular backfill to be placed to 300mm min thickness on all sides.
- E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2006 Rev 0

CONCRETE HEADWALL
FOR SEWER OR CULVERT PIPE OUTLET

OPSD 804.040



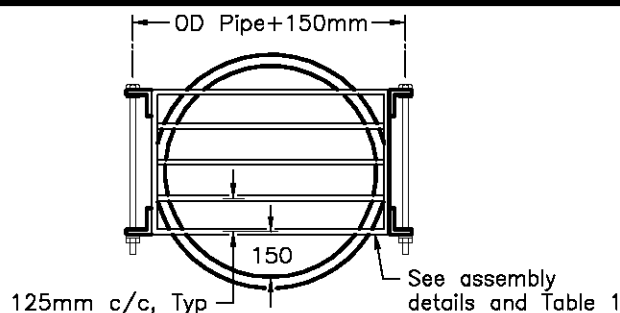
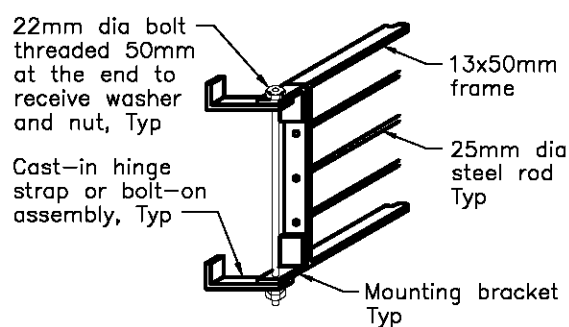


TABLE 1 — NUMBER OF RODS IN FRAME	
PIPE DIA	No of RODS
450	1
525	1
600	2
675	3
750	3
825	4
900	4
975	5
1050	6
1200	7

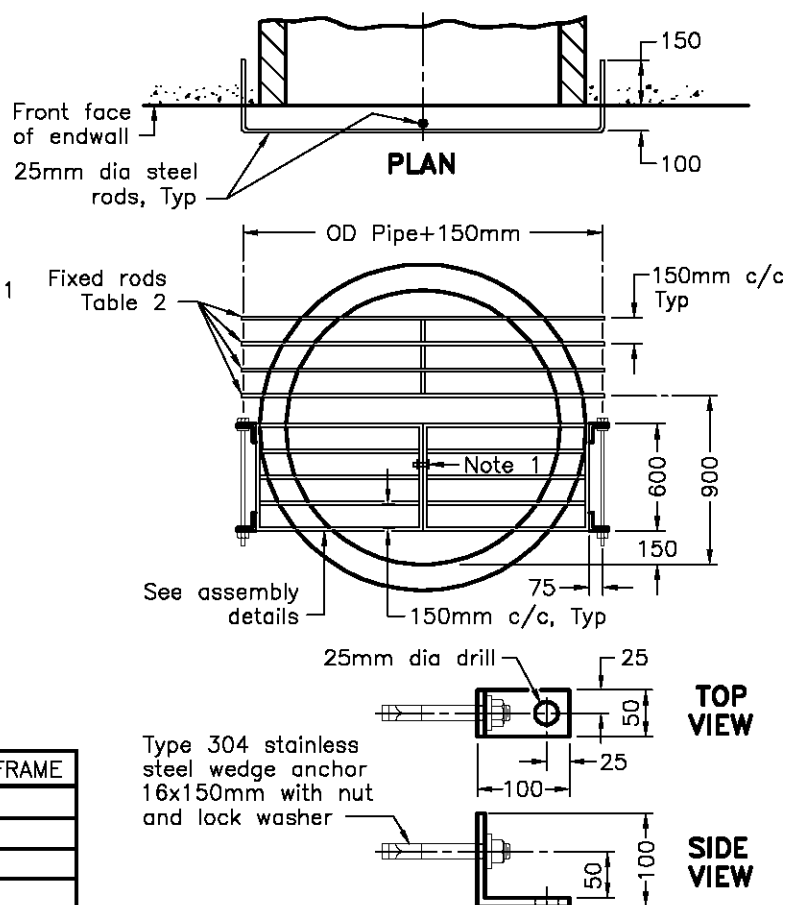
PIPE DIA up to 1200mm

TABLE 2 — NUMBER OF RODS IN FIXED UPPER FRAME	
PIPE DIA	No of RODS
1350	1
1500	2
1650	3
1800	4
1950	5
2100	6
2250	7
2400	8

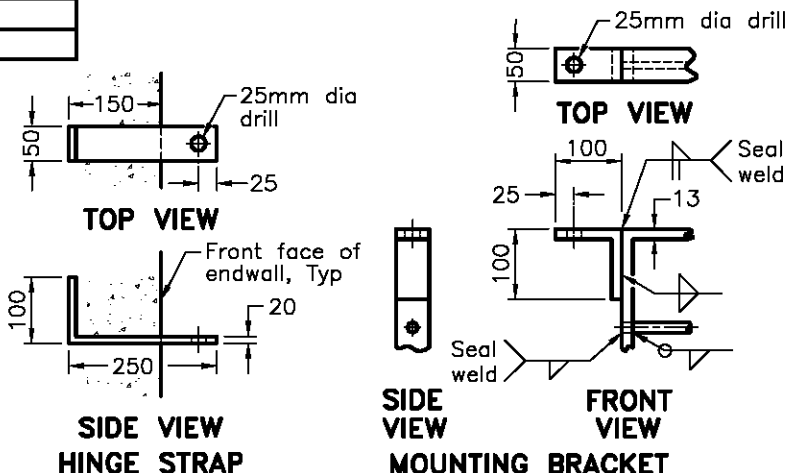
PIPE DIA 1350 to 2400mm



ASSEMBLY



BOLT-ON ASSEMBLY DETAIL



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

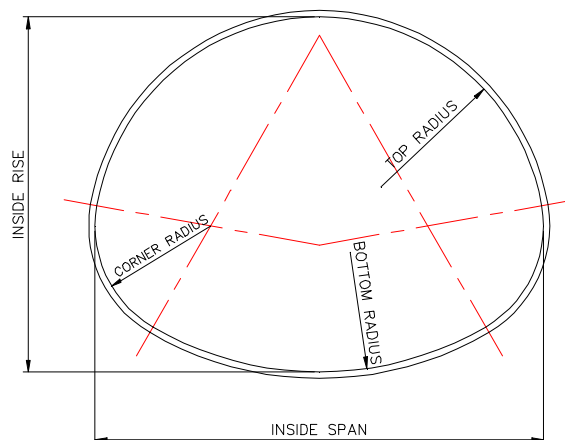
Nov 2013 | Rev | 1

GRATING
FOR CONCRETE ENDWALL



OPSD 804.050

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

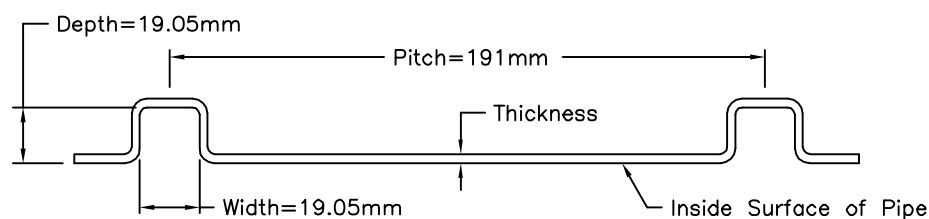
Rev 2



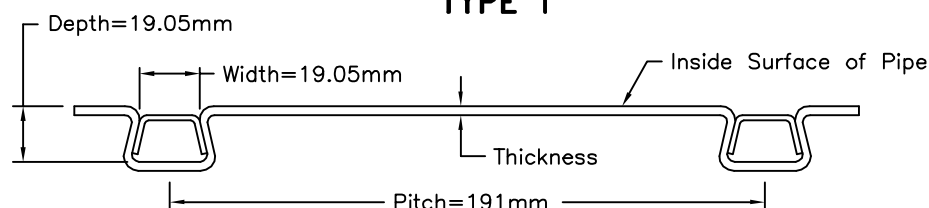
HEIGHT OF FILL TABLE
CORRUGATED STEEL PIPE-ARCH AND
STRUCTURAL PLATE CORRUGATED STEEL PIPE-ARCH

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.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014

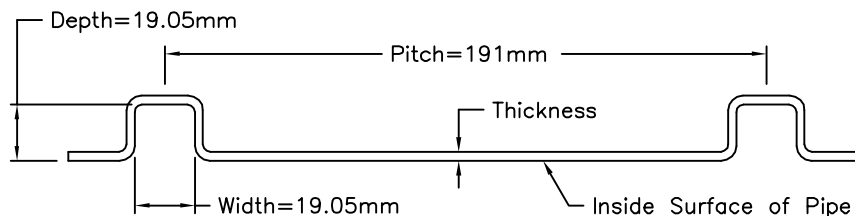
Rev 2



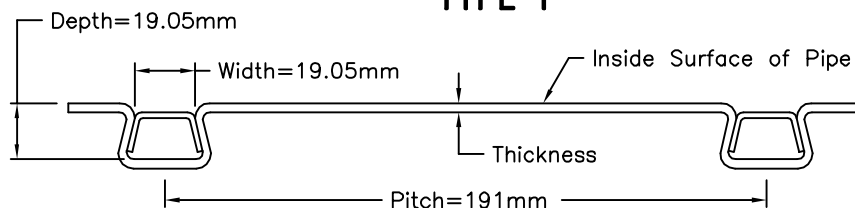
**HEIGHT OF FILL TABLE
SPIRAL RIB ROUND PIPE**

OPSD 805.030

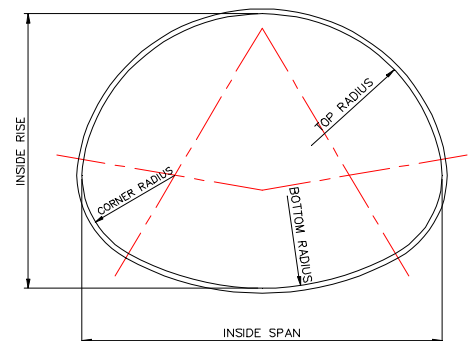
Span	Rise	Equivalent Diameter	Area m ²	Minimum Height of Fill	Metal Thickness		
					1.6	2.0	2.8
					Maximum Height of Fill Over Pipe m Corner Bearing Pressure Limited to 200 kPa (Note 3)		
500	410	450	0.15	300	4.0		
580	490	525	0.21	300	5.2		
680	540	600	0.27	300	5.2		
830	660	750	0.43	300	5.2		
1010	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

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HEIGHT OF FILL TABLE SPIRAL RIB PIPE-ARCH

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/m².
- 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

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HEIGHT OF FILL TABLE

DUAL WALL CORRUGATED POLYETHYLENE
GRAVITY SEWER PIPE — 320 kPa and RSC 160

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/m³.
 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		Nov 2014	Rev	2	
HEIGHT OF FILL TABLE CLOSED PROFILE WALL POLYETHYLENE PIPE RSC 160 AND RSC 250		-----			

		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/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 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/m³ 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

Nov 2014

Rev 0

HEIGHT OF FILL TABLE
SOLID WALL POLYETHYLENE PIPE
SDR 32.5

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		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/m³.

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:

DR = 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 $E' < 6864\text{kN/m}^2$, 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

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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/m³.
G For confined trench K_μ=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

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HEIGHT OF FILL TABLE

REINFORCED CONCRETE PIPE – CONFINED TRENCH
CLASS 50-D, 65-D, 100-D, and 140-D

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/m³.
 F For positive projecting embankment $K_u=0.190$, $p=0.7$, 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		_____			

		OPSD 807.030			

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 $K_u=0.190$, $p=0.7$, 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.

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

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2015 Rev 2

HEIGHT OF FILL TABLE
NON-REINFORCED CONCRETE PIPE
CLASS 3

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 x3840	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/m³.

E For Confined Trench $K_{\mu}=0.130$, $p=0.7$, and $r_{sd}=0.7$.

F For positive projecting embankment $K_{\mu}=0.190$, $p=0.7$, and $r_{sd}=0.7$.

G Conditions other than those indicated shall be calculated from first principles.

H This OPSD shall be read in conjunction with OPSD 802.050.

I All dimensions are in metres unless otherwise shown.

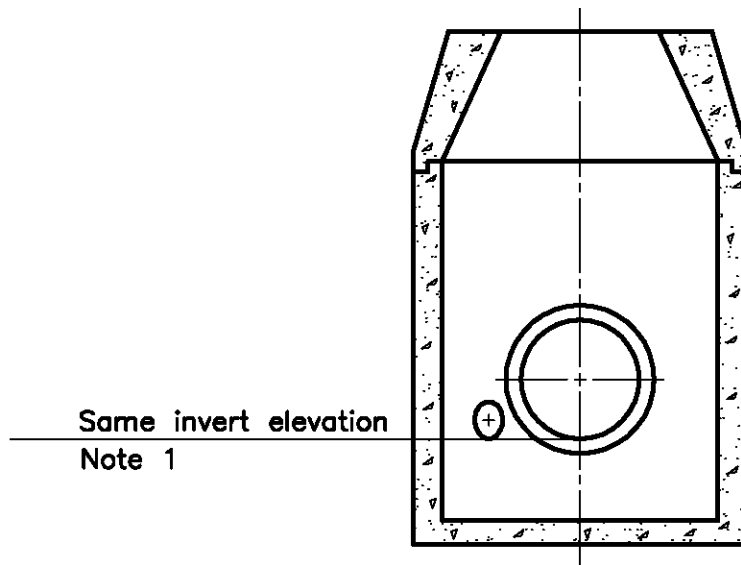
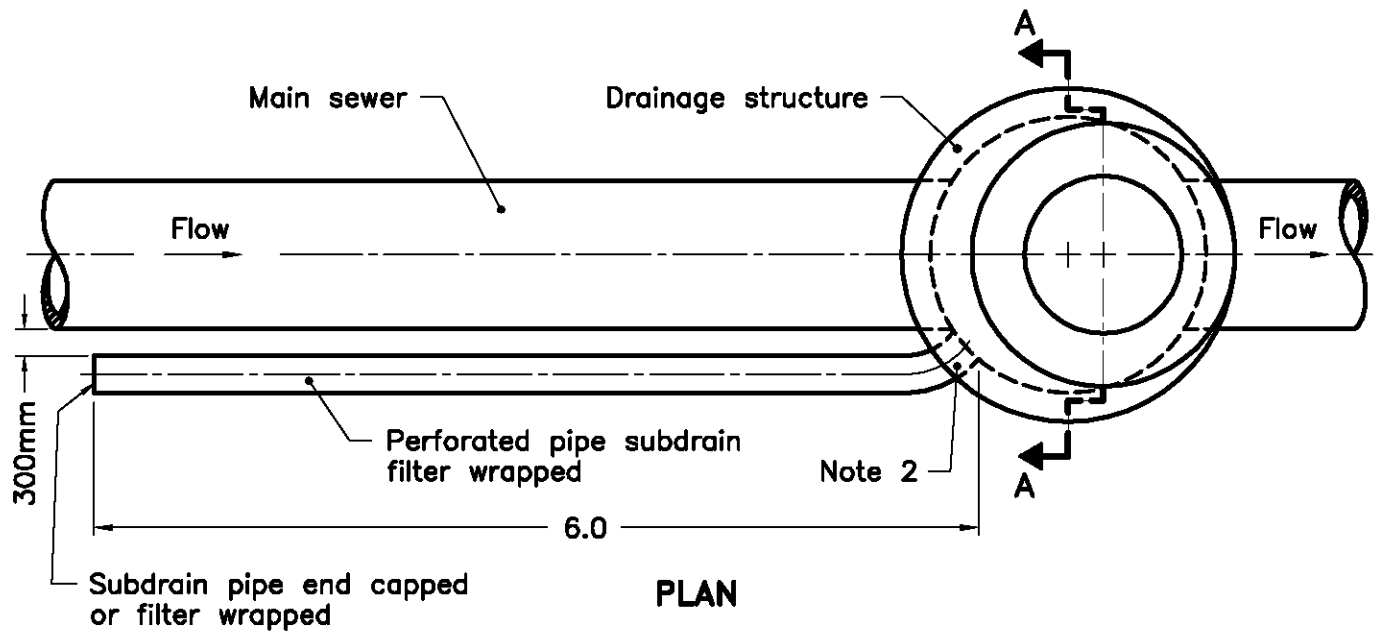
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2015 Rev 3

HEIGHT OF FILL TABLE
HORIZONTAL ELLIPTICAL CONCRETE PIPE
CLASS HE-A, HE-I, HE-II, HE-III, and HE-IV

OPSD 807.050





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.

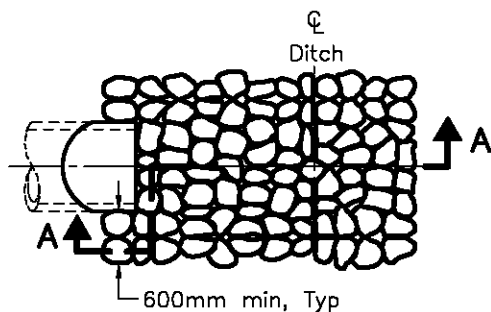
ONTARIO PROVINCIAL STANDARD DRAWING

PERFORATED PIPE SUBDRAIN
IN GRANULAR TRENCH
MAIN STORM SEWER CONNECTION
TO DRAINAGE STRUCTURE

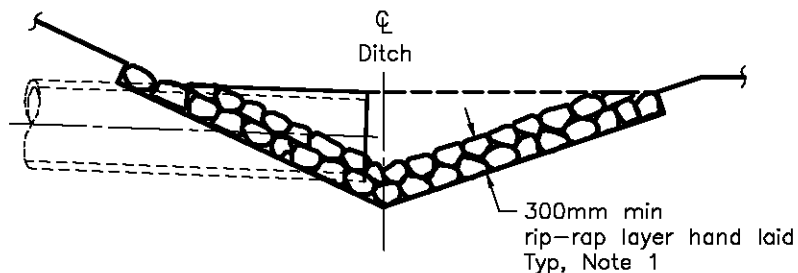
Nov 2013 Rev 3



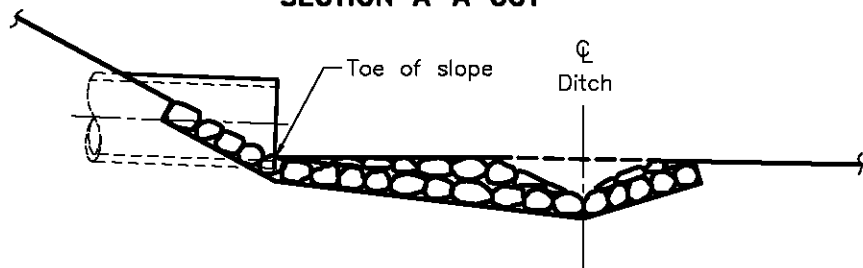
OPSD 809.010



**PLAN
CUT OR FILL**

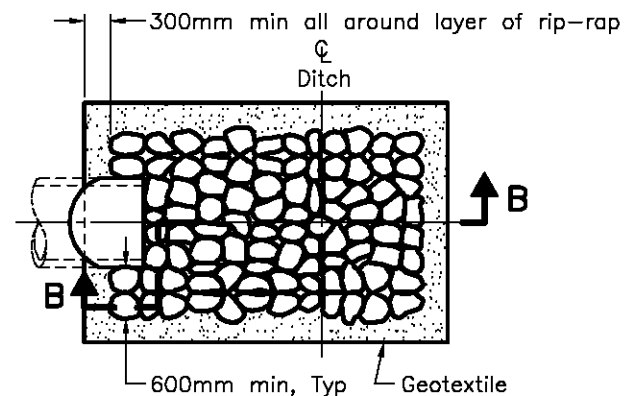
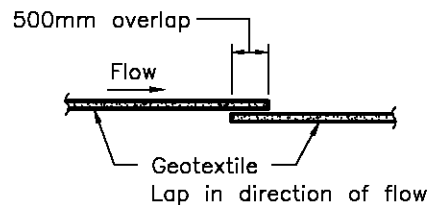


SECTION A-A CUT

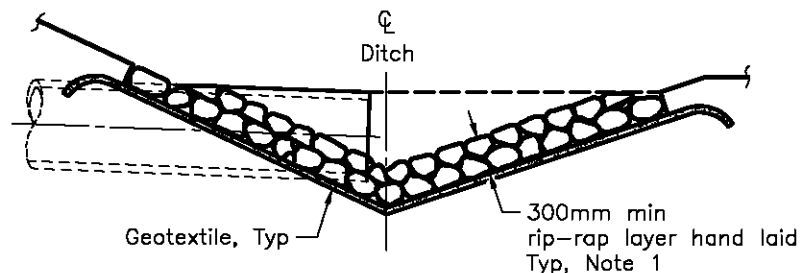


SECTION A-A FILL

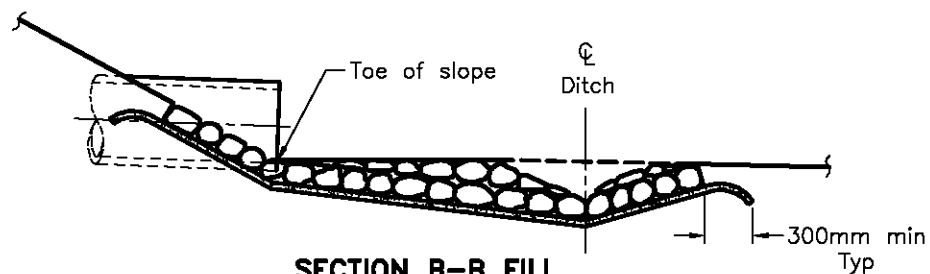
TYPE A – WITHOUT GEOTEXTILE



**PLAN
CUT OR FILL**



SECTION B-B CUT



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

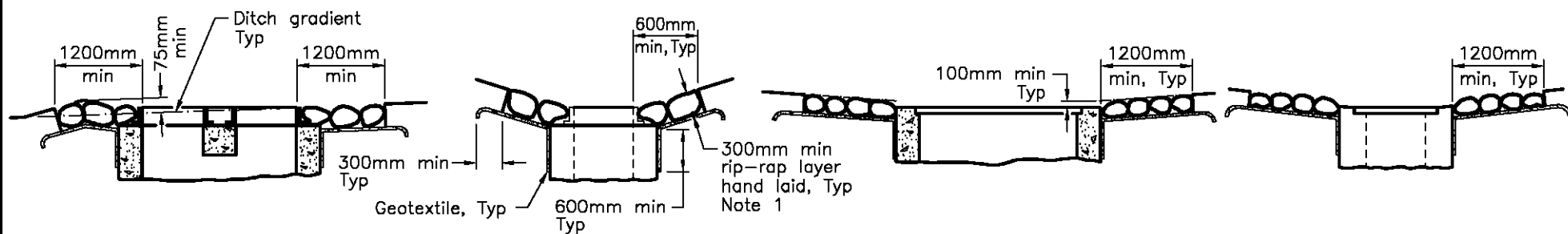
**GENERAL RIP-RAP LAYOUT
FOR SEWER AND CULVERT OUTLETS**

Nov 2013

Rev 2



OPSD 810.010



Ditch Longitudinal Section

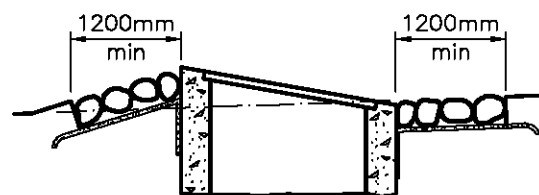
TWIN INLET-INTERMEDIATE

Ditch Cross-Section

Ditch Longitudinal Section

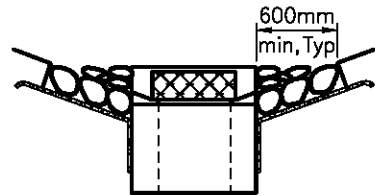
SINGLE INLET-SUMP

Ditch Cross-Section

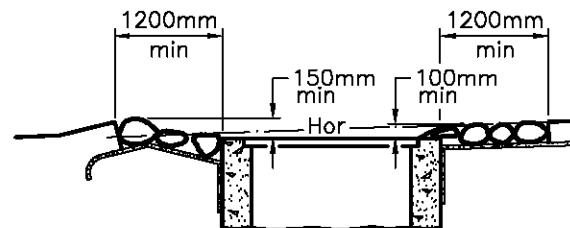


Ditch Longitudinal Section

SINGLE INLET-INTERMEDIATE

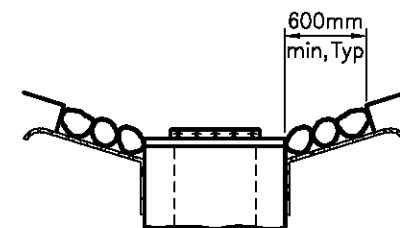


Ditch Cross-Section

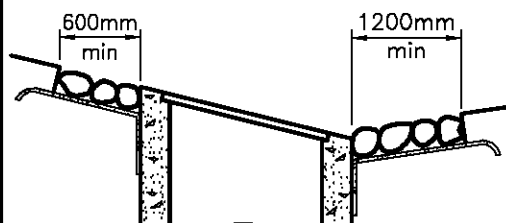


Ditch Longitudinal Section

SINGLE INLET-INTERMEDIATE

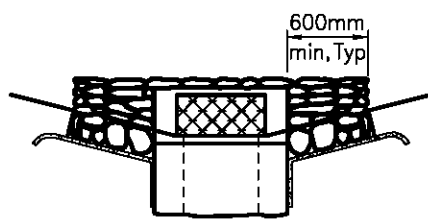


Ditch Cross-Section



Ditch Longitudinal Section

SINGLE INLET-END OF DITCH



Ditch Cross-Section

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

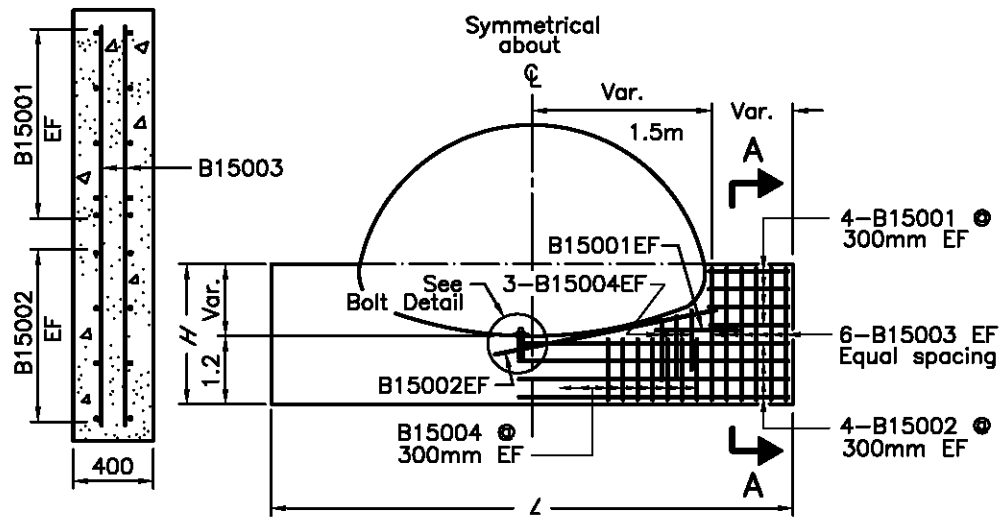
GENERAL RIP-RAP LAYOUT
FOR DITCH INLETS

OPSD 810.020



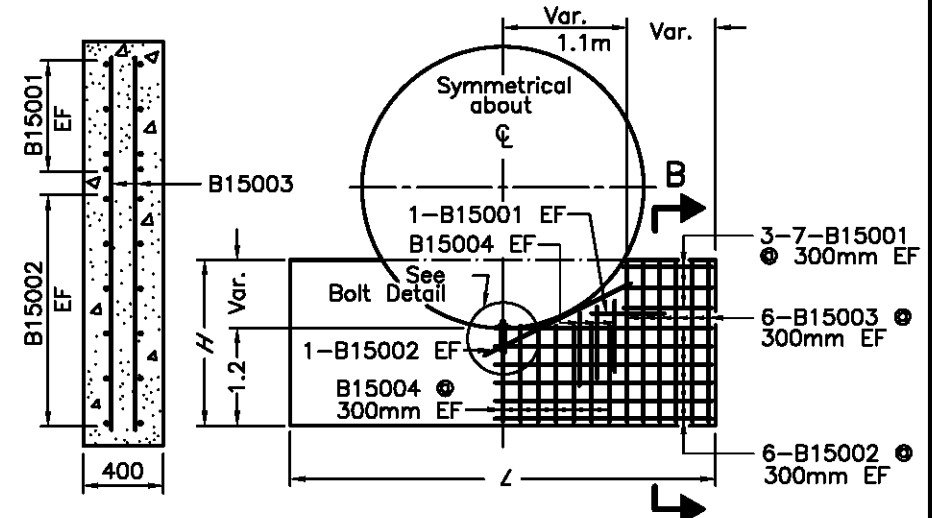
PIPE		B15001		B15002		B15003		B15004		L m	H m
Span	Rise	No	Length m	No	Length m	No	Length m	No	Length m		
3730	2290	20	1.06	20	3.20	24	2.13	36	1.06	6.17	2.28
3890	2690	20	1.06	20	3.27	24	2.13	36	1.06	6.32	2.28
4370	2870	20	1.37	20	3.86	24	2.28	40	1.06	7.46	2.43
4720	3070	20	1.37	20	4.01	24	2.28	42	1.06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



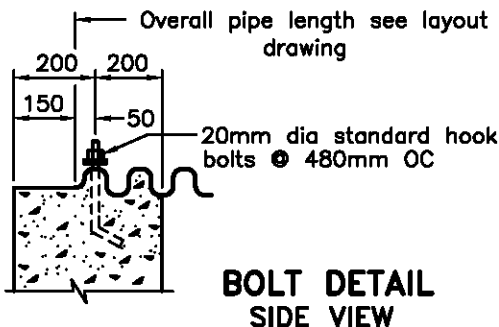
SECTION
A-A

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

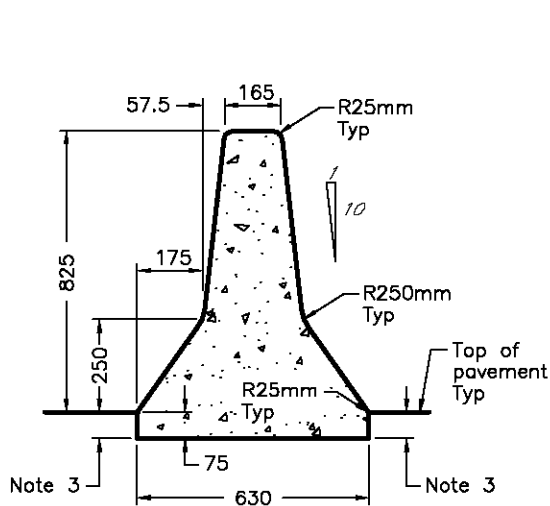
CUT OFF WALL FOR
STRUCTURAL PLATE PIPE ARCH
AND CIRCULAR CSP

Nov 2006

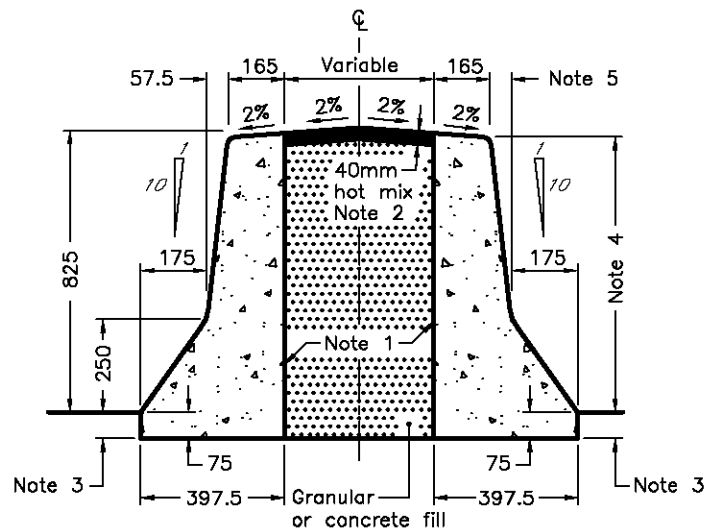
Rev 0



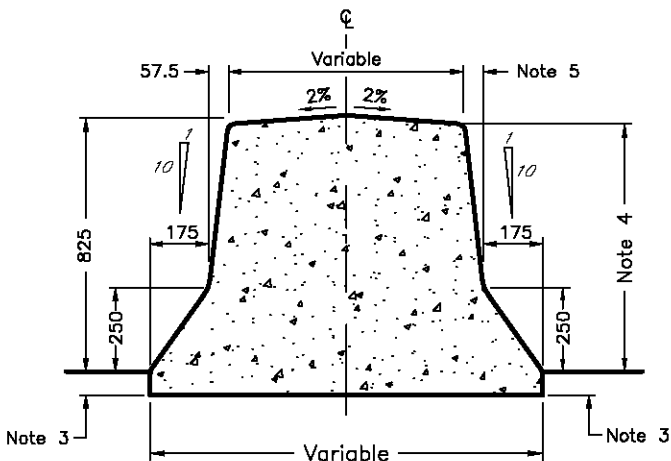
OPSD 812.010



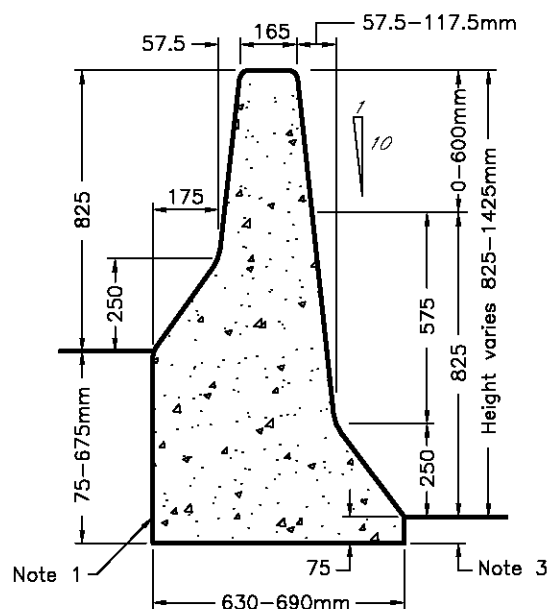
TYPE A



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.

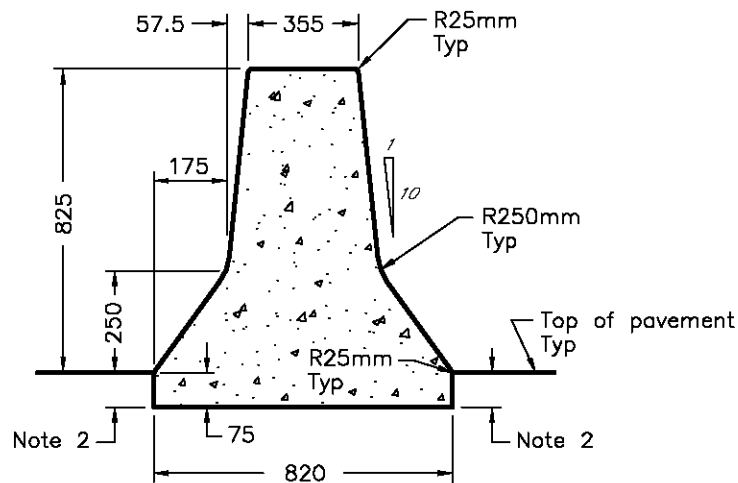
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2015 Rev 1

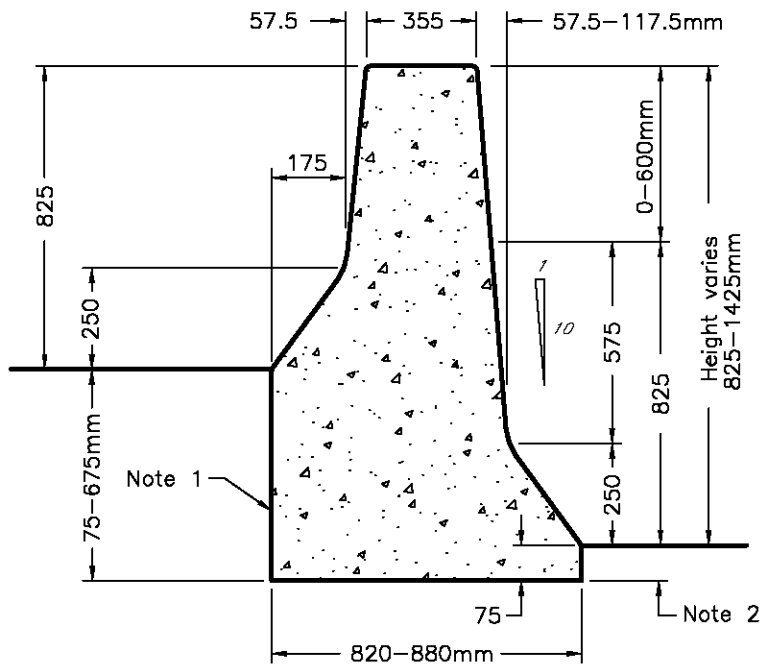
**GUIDE RAIL SYSTEM, CONCRETE BARRIER
CAST-IN-PLACE, TYPE A
INSTALLATION**



OPSD 911.130



TYPE C

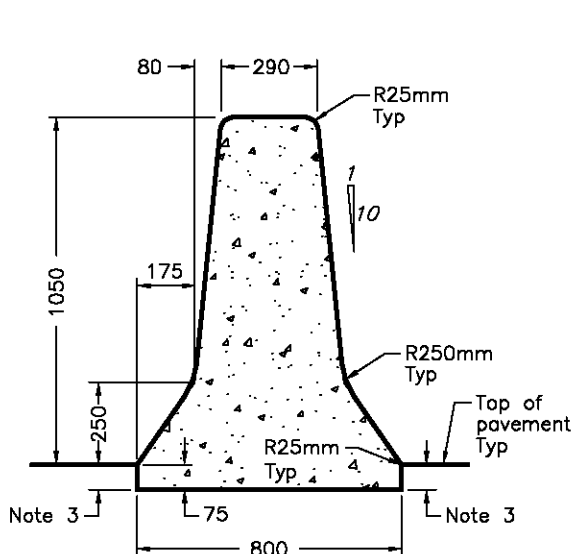


**TYPE C-1
ASYMMETRIC SECTION**

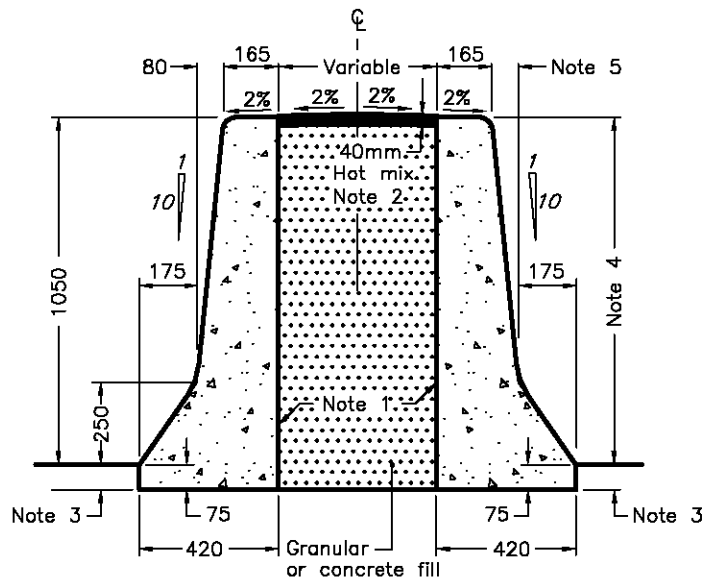
NOTES:

- 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.

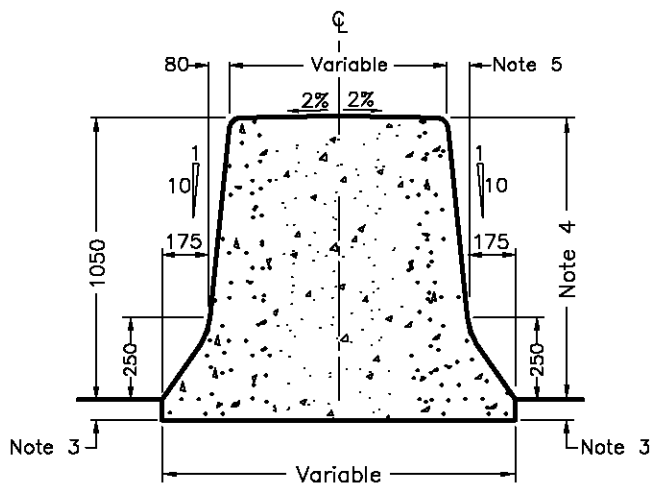
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	1	
GUIDE RAIL SYSTEM, CONCRETE BARRIER CAST-IN-PLACE, TYPE C INSTALLATION				
	OPSD 911.131			



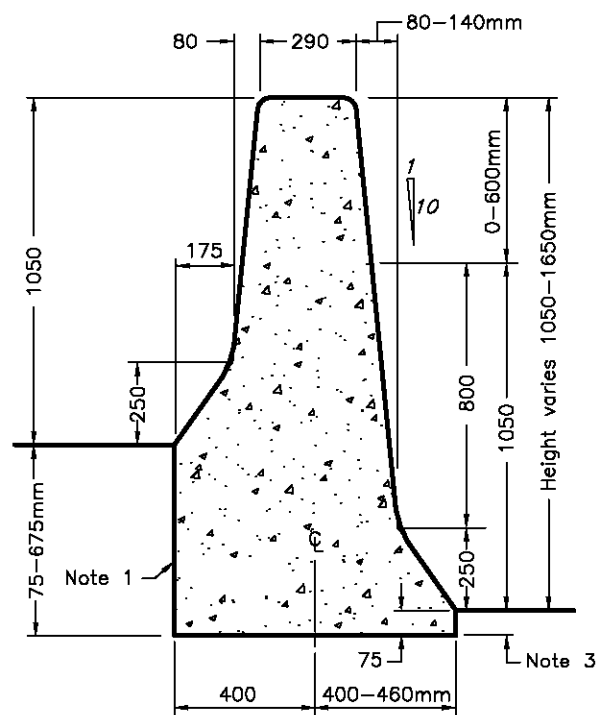
TYPE TW



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

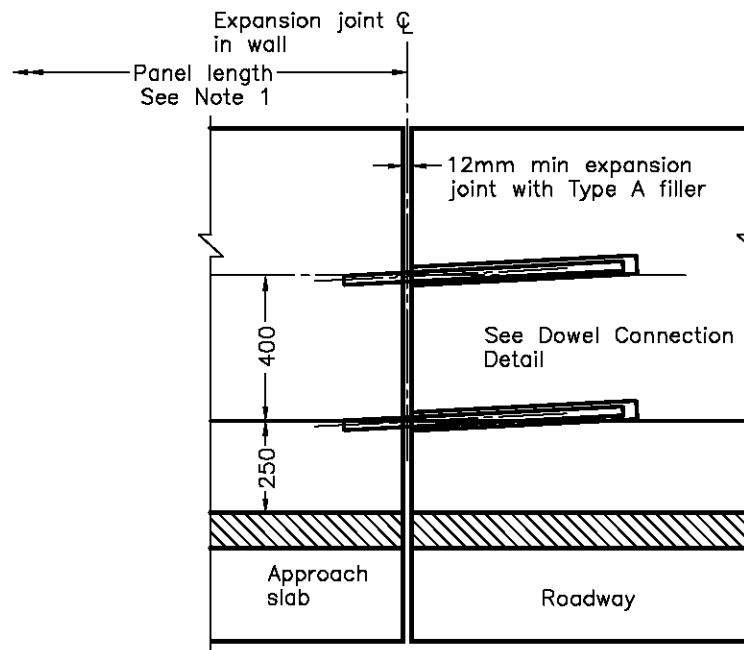
Nov 2015

Rev 1

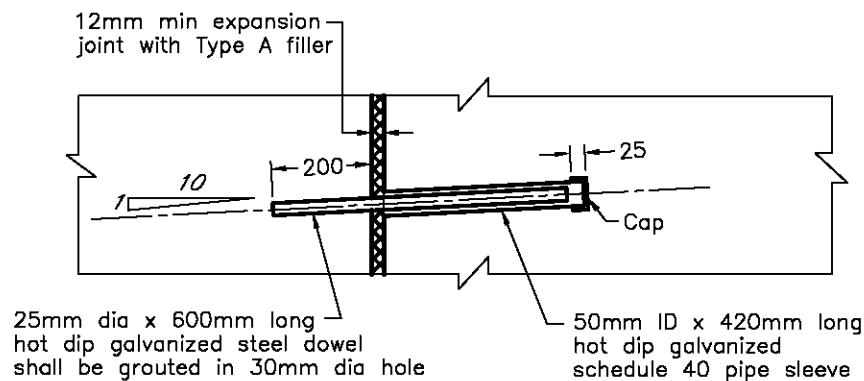
**GUIDE RAIL SYSTEM, CONCRETE BARRIER
CAST-IN-PLACE, TALL WALL
INSTALLATION**



OPSD 911.132



ELEVATION

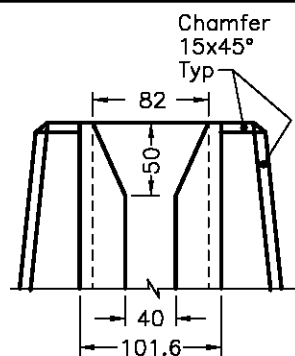


DOWEL CONNECTION DETAIL

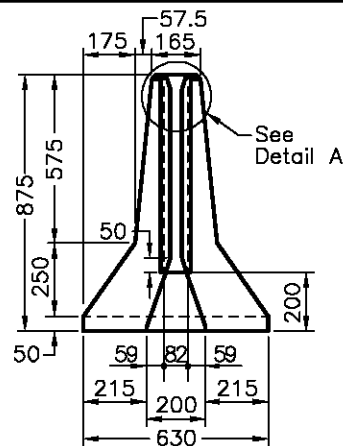
NOTES:

- 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 $\pm$ 20mm at all joints.
- D All dimensions are in millimetres unless otherwise shown.

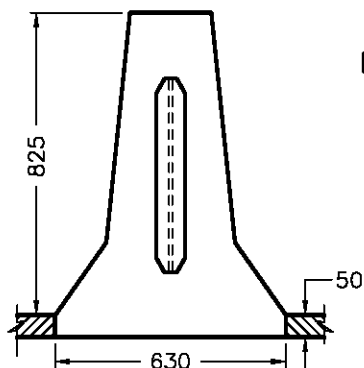
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	1	
GUIDE RAIL SYSTEM, CONCRETE BARRIER INSTALLATION – MEDIAN CONCRETE BARRIER TO STRUCTURE				
	OPSD 911.134			



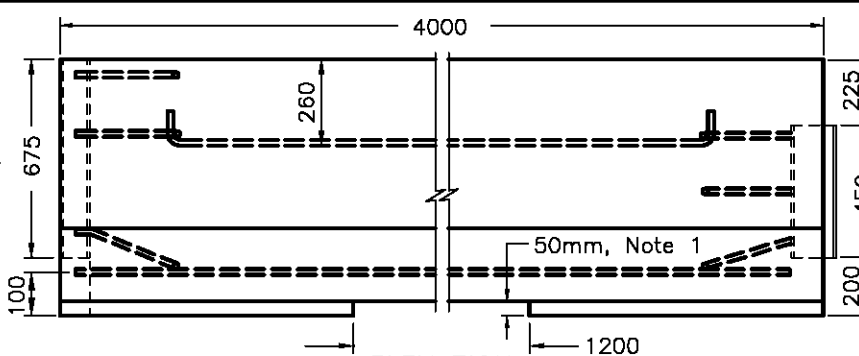
DETAIL A



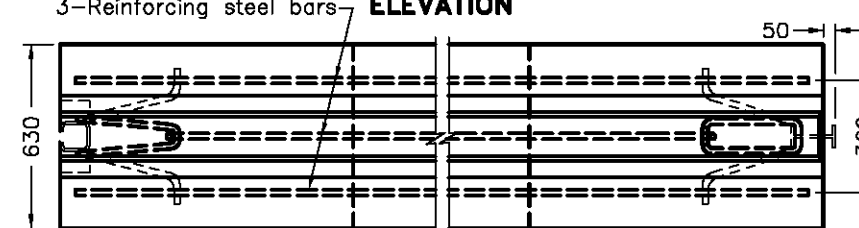
FEMALE END ELEVATION
See Installation
Detail B or C



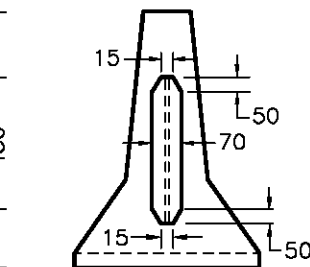
DETAIL B
PERMANENT INSTALLATION



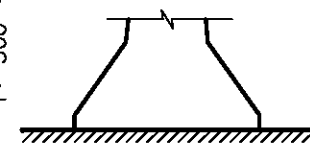
ELEVATION



PLAN



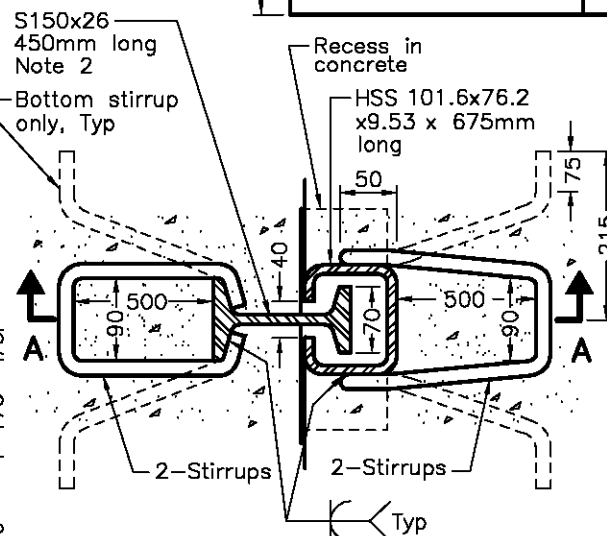
MALE END ELEVATION
See Installation
Detail B or C



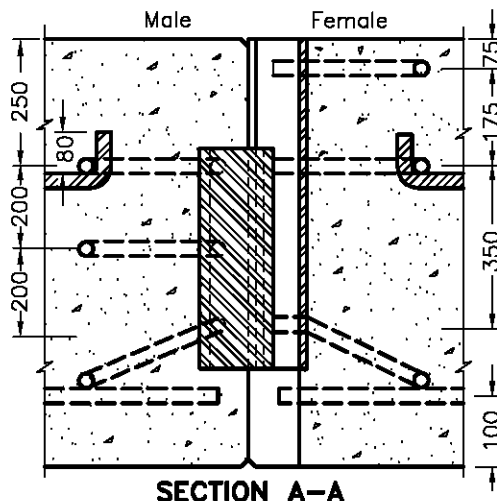
DETAIL C
TEMPORARY INSTALLATION

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.



CONNECTION ASSEMBLY DETAIL, Note 3



SECTION A-A

ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, CONCRETE BARRIER

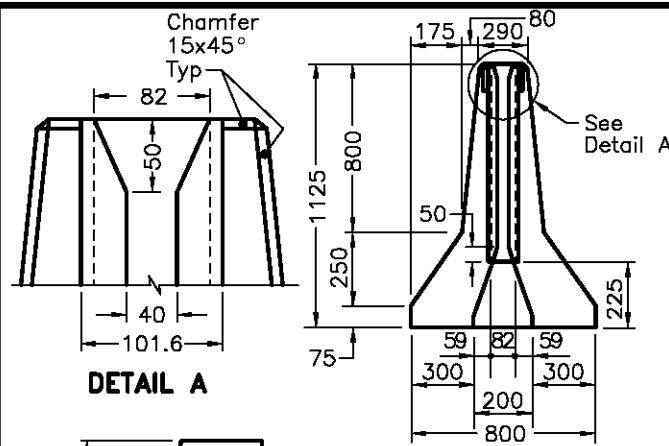
PRECAST I-LOCK CONNECTION

INSTALLATION-TEMPORARY AND PERMANENT

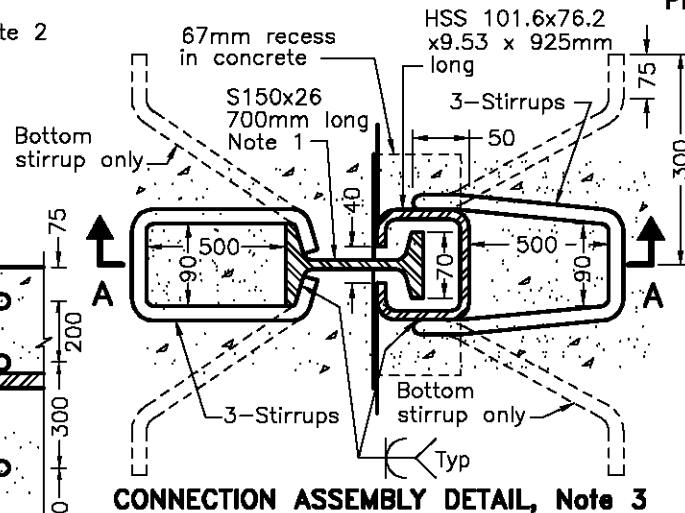
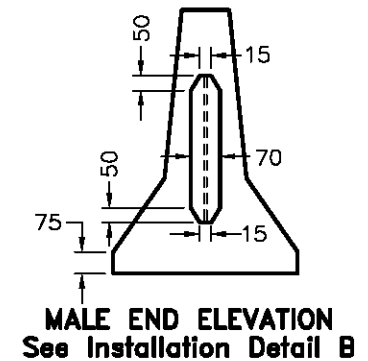
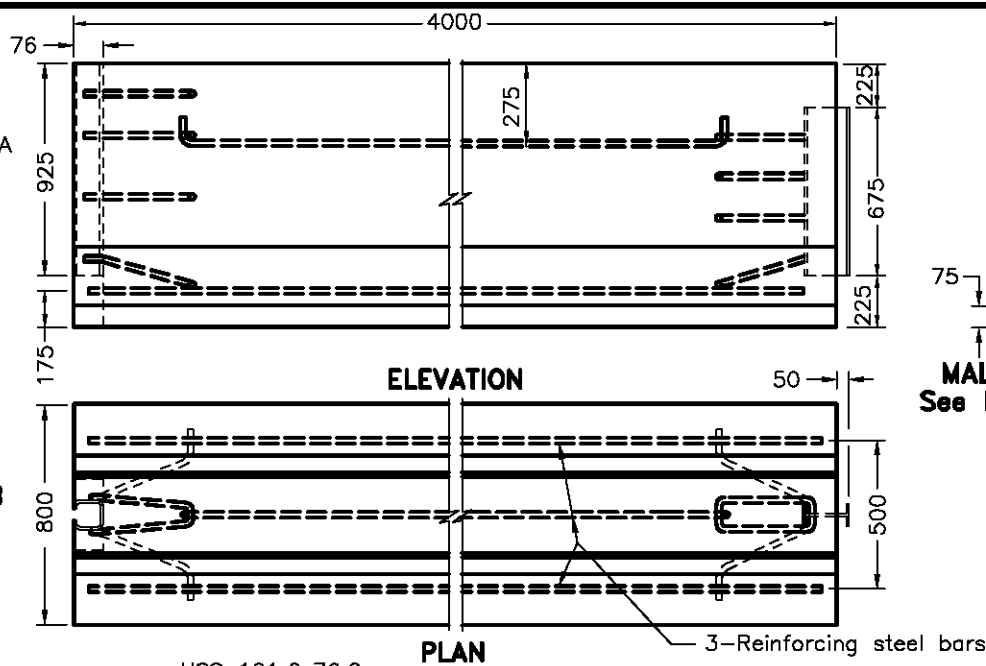
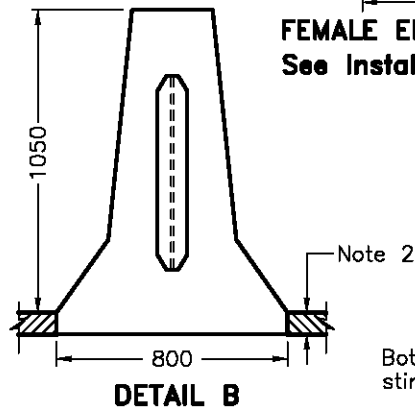
Nov 2013 Rev 1



OPSD 911.140

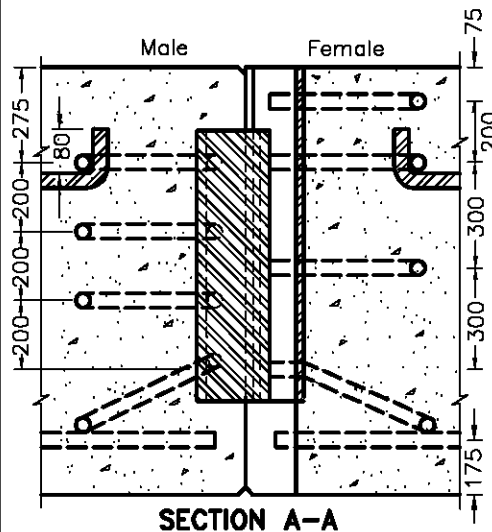


FEMALE END ELEVATION
See Installation Detail B



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.



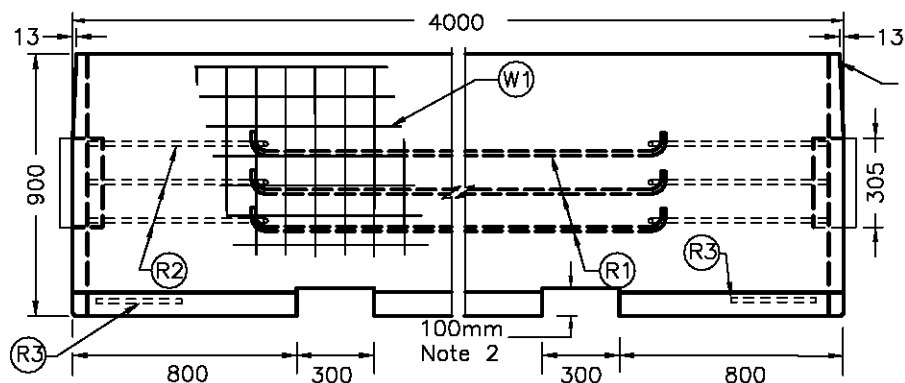
ONTARIO PROVINCIAL STANDARD DRAWING

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

Nov 2013 Rev 1

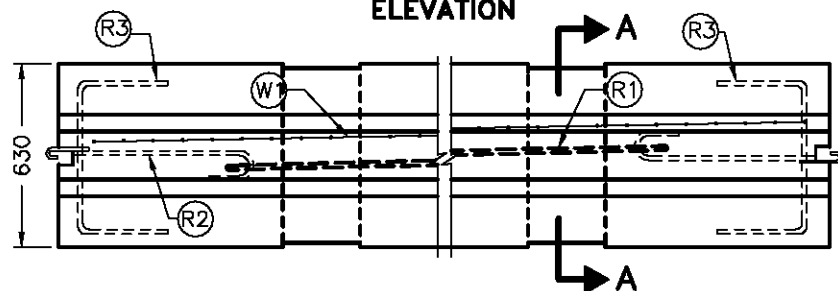


OPSD 911.143



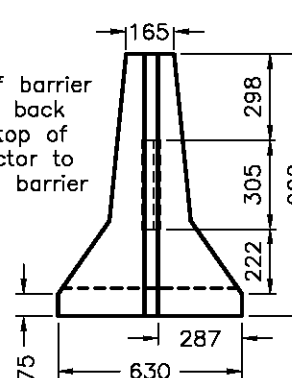
ELEVATION

End of barrier
sloped back
from top of
connector to
top of barrier

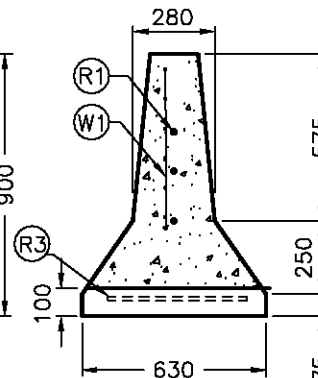


PLAN

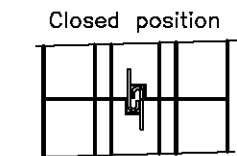
REINFORCING STEEL BARS						
BAR	SIZE	GRADE	TYPE	LENGTH	SHAPE	NO. REQ'D
R1	15M	400W	Deformed	3200		3
R2	15M	400W	Deformed	814		6
R3	10M	400W	Deformed	1080		2
W1	152X152 MW18.7XMW18.7 (456X3810)					



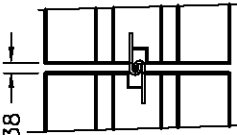
END ELEVATION



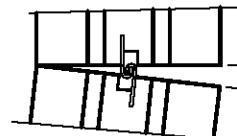
SECTION A-A



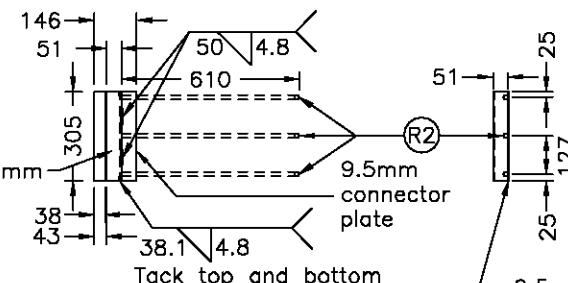
Closed position



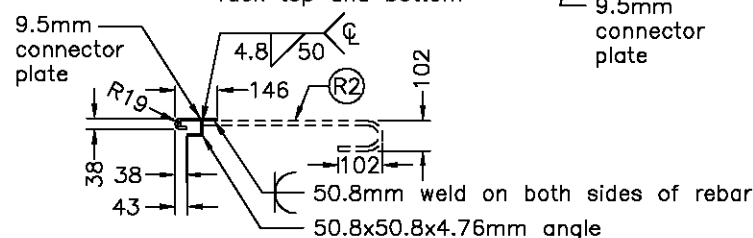
Max. separation



BARRIER TO BARRIER
CONNECTION



Tack top and bottom



Type J Connection DETAIL, Note 3

NOTES:

- Minimum horizontal radius shall be 31m.
- Drainage openings. Temporary concrete barriers manufactured prior to September 2009 with one 600mm long x 100mm high drainage opening are acceptable.
- 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

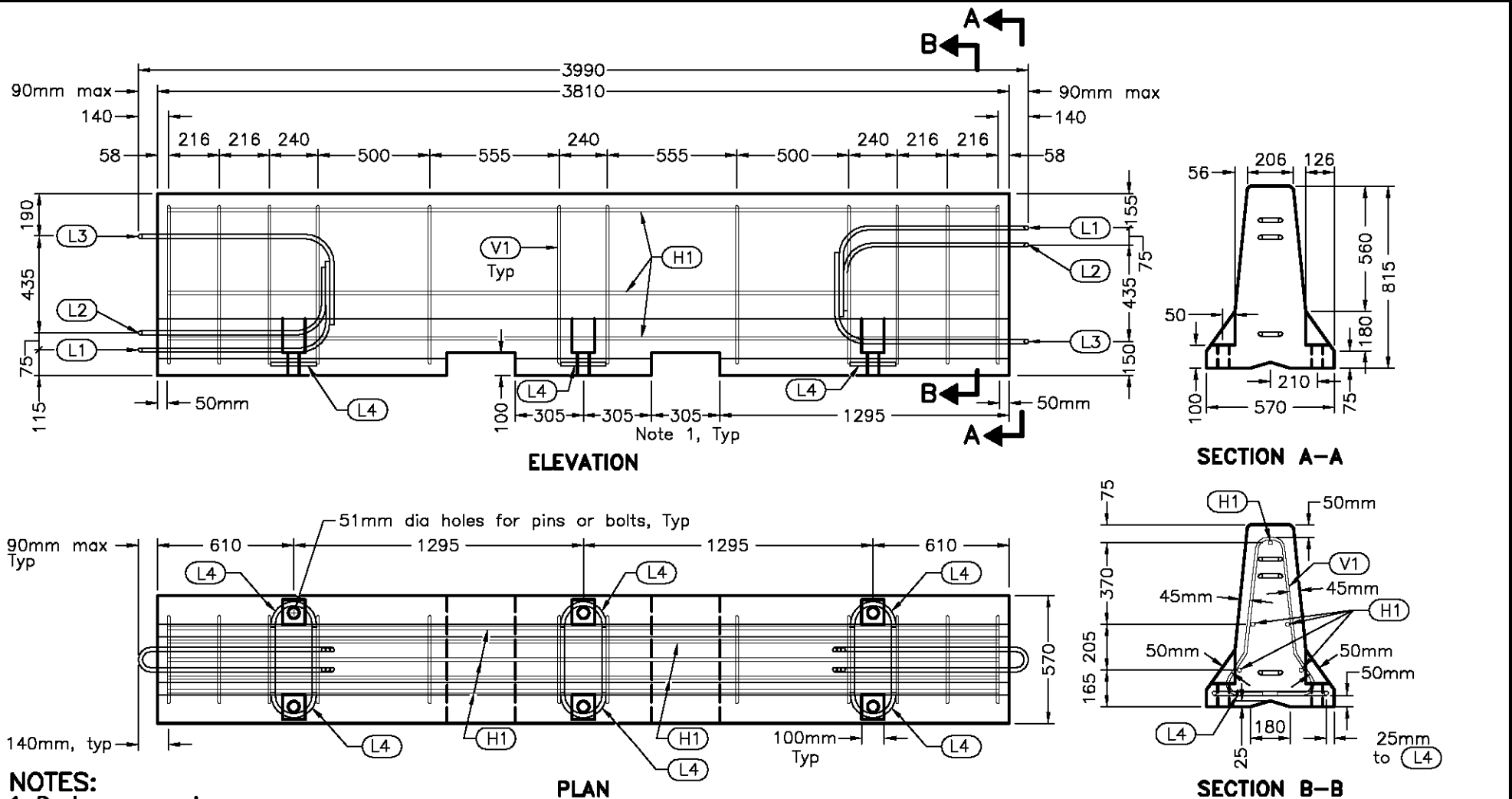
GUIDE RAIL SYSTEM, CONCRETE BARRIER
TYPE J CONNECTION, 4m LENGTH
INSTALLATION-TEMPORARY

Nov 2013

Rev 0



OPSD 911.150



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

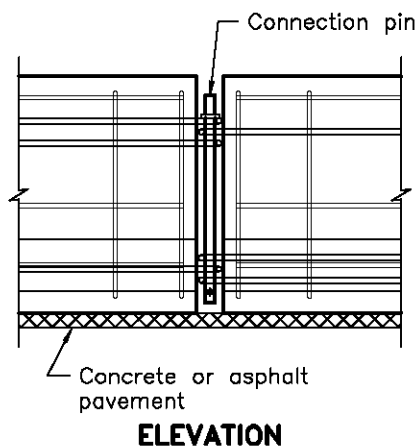
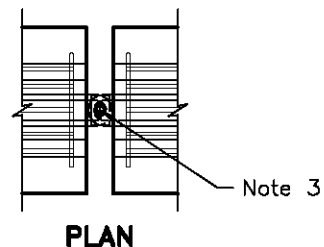
GUIDE RAIL SYSTEM, CONCRETE BARRIER
TYPE M CONNECTION
INSTALLATION-TEMPORARY 1

Nov 2013

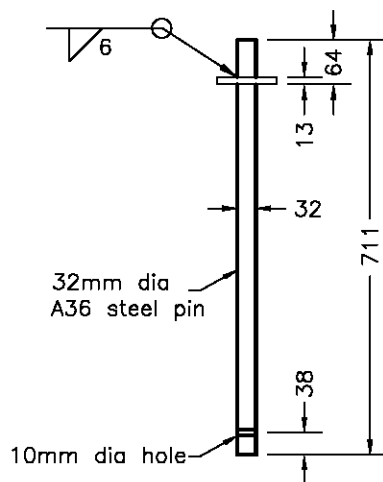
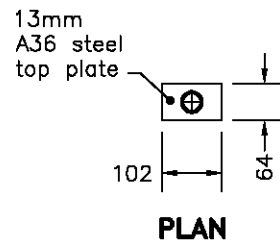
Rev 0



OPSD 911.160



CONNECTION DETAIL

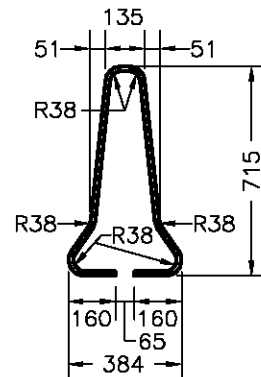
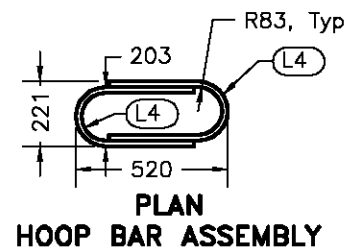


CONNECTION PIN

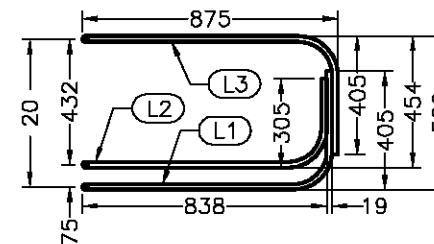
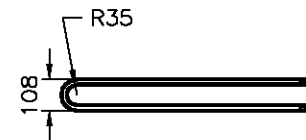
NOTES:

- 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.



STIRRUPS



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	1791	12

ONTARIO PROVINCIAL STANDARD DRAWING

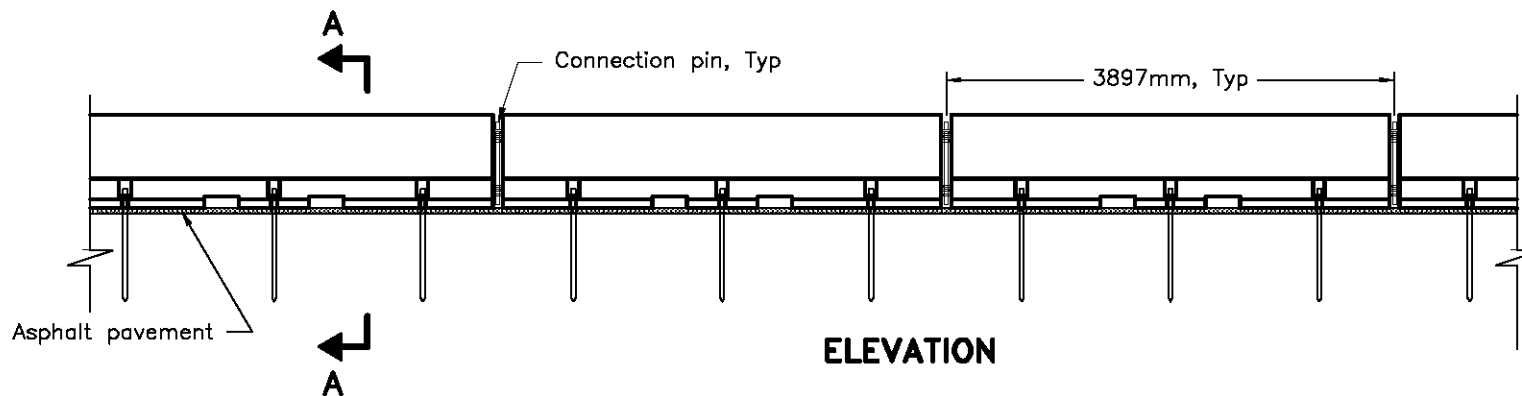
GUIDE RAIL SYSTEM, CONCRETE BARRIER
TYPE M CONNECTION
INSTALLATION-TEMPORARY 2

Nov 2013

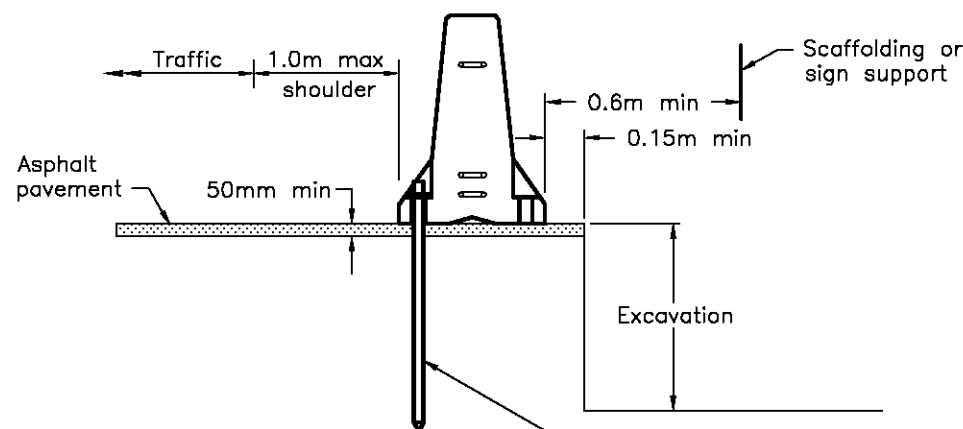
Rev 0



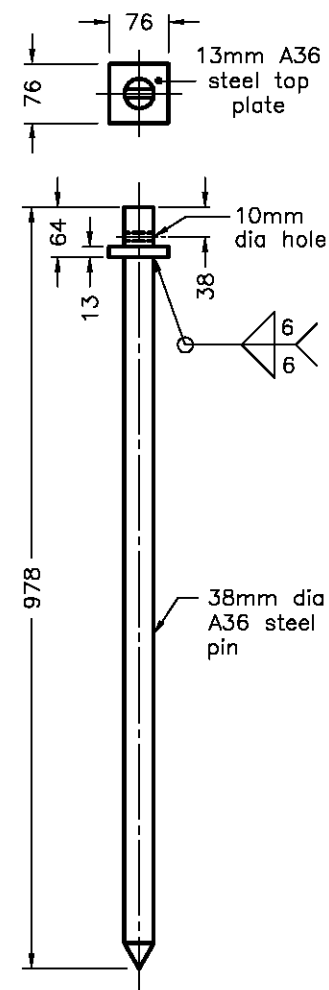
OPSD 911.161



ELEVATION



SECTION A-A



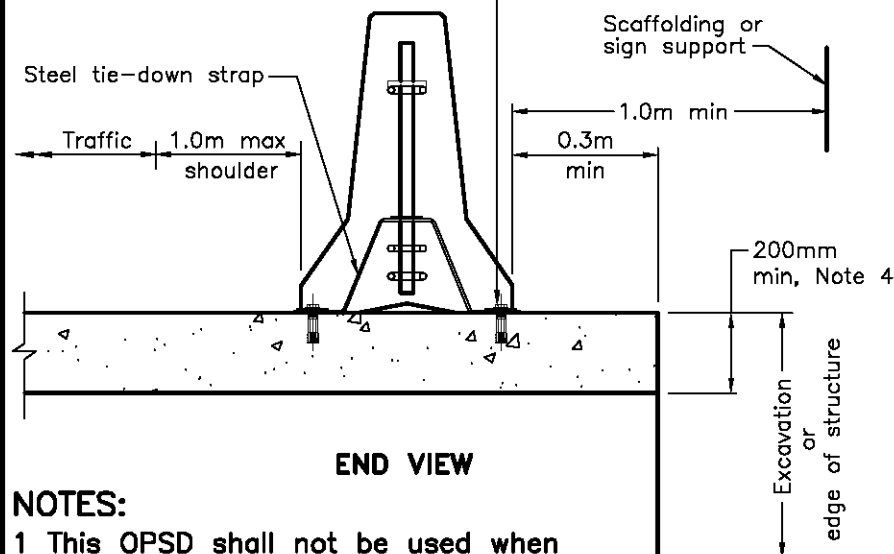
**STEEL PIN ASSEMBLY
FOR ASPHALT PAVEMENT**

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	Nov 2013	Rev 0	
GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION			
INSTALLATION – TEMPORARY RESTRAINED SYSTEM PINNED TO ASPHALT PAVEMENT			
OPSD 911.162			

Two 3/4" dia x 1 3/4" SAE Grade 2 bolts into Hilti HDI 3/4" drop-in anchors with 81mm min embedment or two 19mm dia x 57mm long ISO Class 8.8 bolts into Red Head 19mm dia drop-in anchors with 81mm min embedment, Note 3

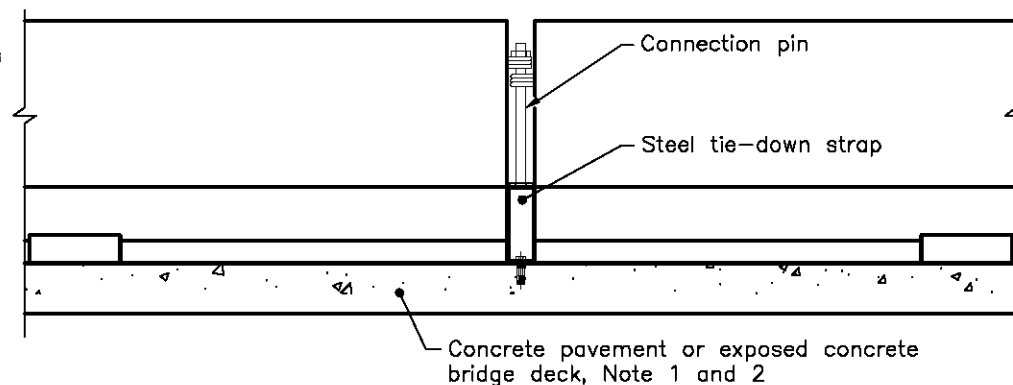


END VIEW

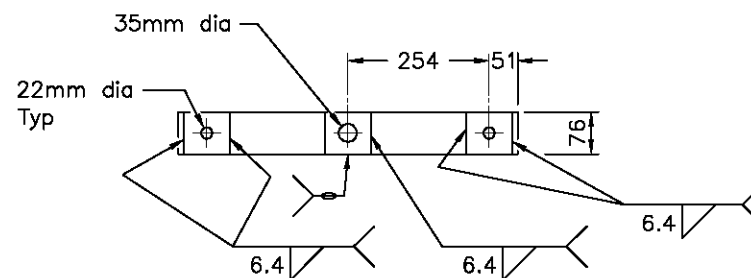
NOTES:

- 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.

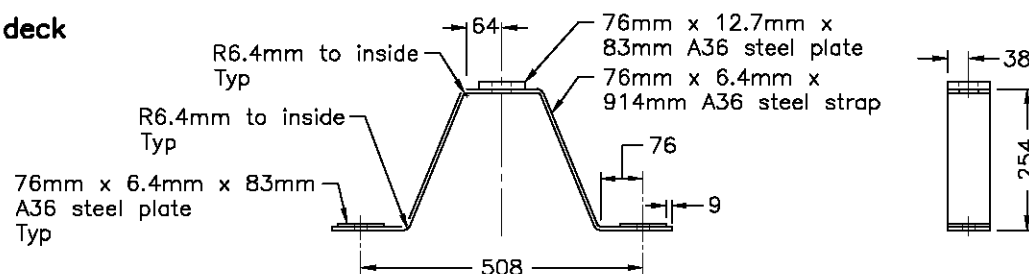
- A This OPSD shall be read in conjunction with OPSD 911.160 and 911.171.
- B System configuration meets NCHRP Report 350 TL-3.
- C Welds shall be according to CSA W59.
- D All dimensions are in millimetres unless otherwise shown.



ELEVATION



PLAN



STEEL TIE-DOWN STRAP

ONTARIO PROVINCIAL STANDARD DRAWING

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

Nov 2013

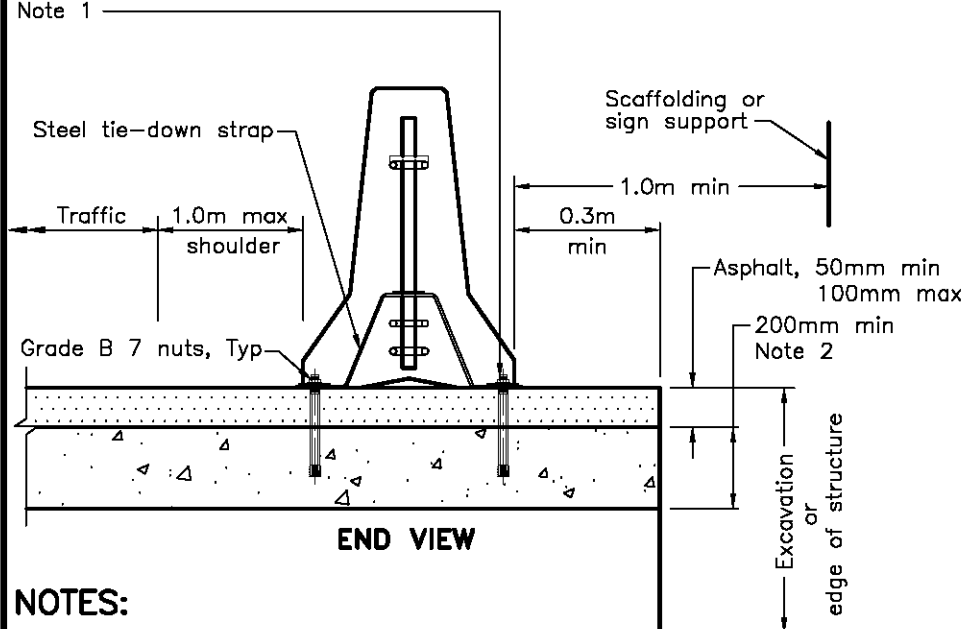
Rev 0



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



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.

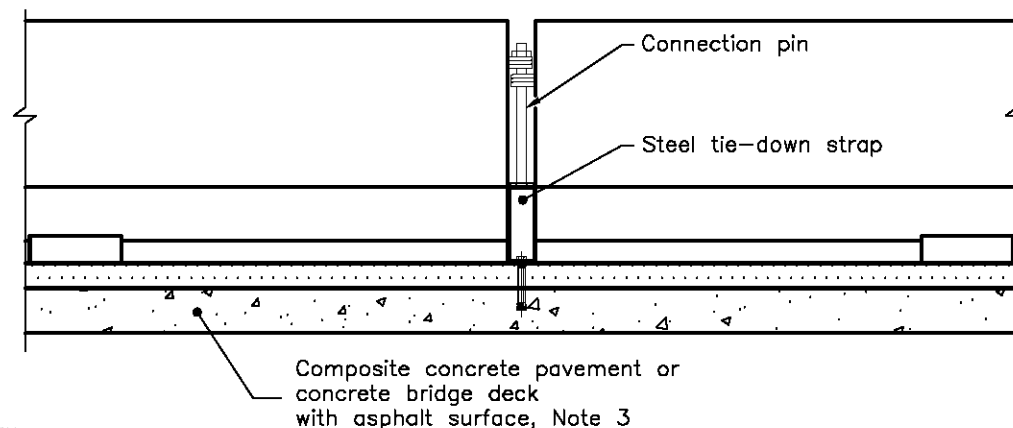
A This OPSD shall be read in conjunction with OPSD 911.160 and 911.171.

B System configuration is equivalent to OPSD 911.163, which meets NCHRP Report 350 TL-3.

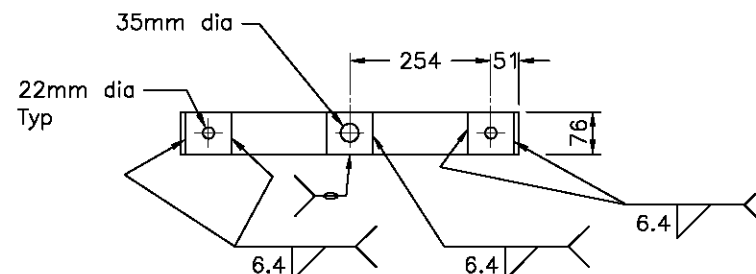
C Barriers shall be pulled tight during installation to remove slack.

D Welds shall be according to CSA W59.

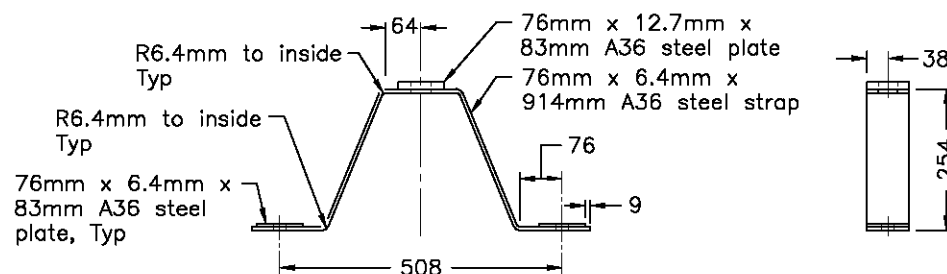
E All dimensions are in millimetres unless otherwise shown.



ELEVATION



PLAN



STEEL TIE-DOWN STRAP

ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION

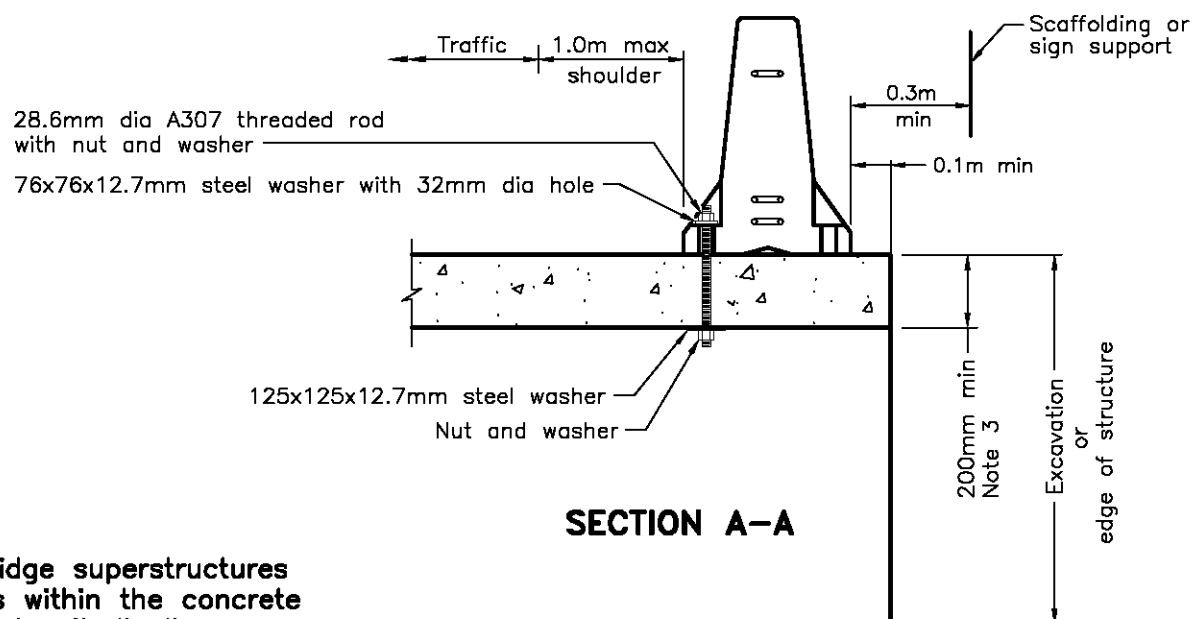
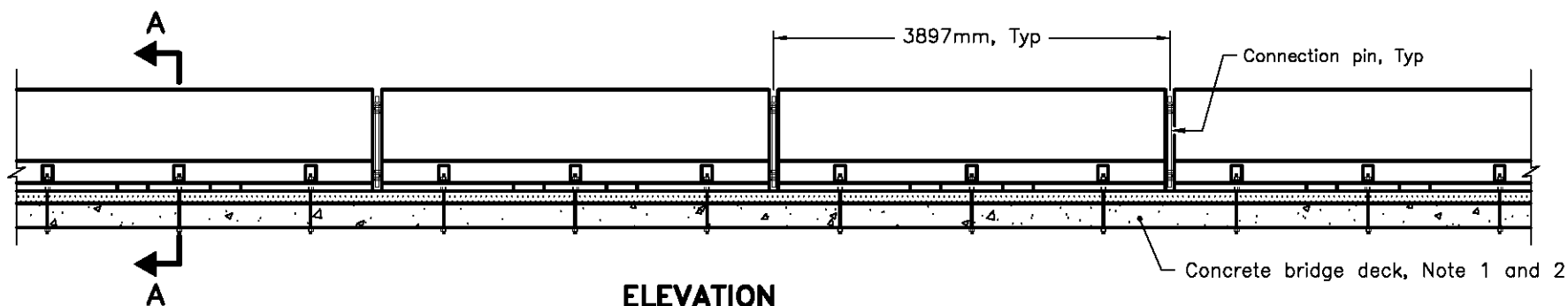
INSTALLATION - TEMPORARY RESTRAINT SYSTEM STRAPPED TO CONCRETE WITH ASPHALT SURFACE

Nov 2013

Rev 0



OPSD 911.164



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 conjunction with OPSD 911.160 and 911.172.
- B System configuration meets NCHRP Report 350 TL-3.
- C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, CONCRETE BARRIER

TYPE M CONNECTION

INSTALLATION – TEMPORARY RESTRAINT SYSTEM

BOLTED THROUGH CONCRETE

Nov 2013 Rev 0

OPSD 911.167



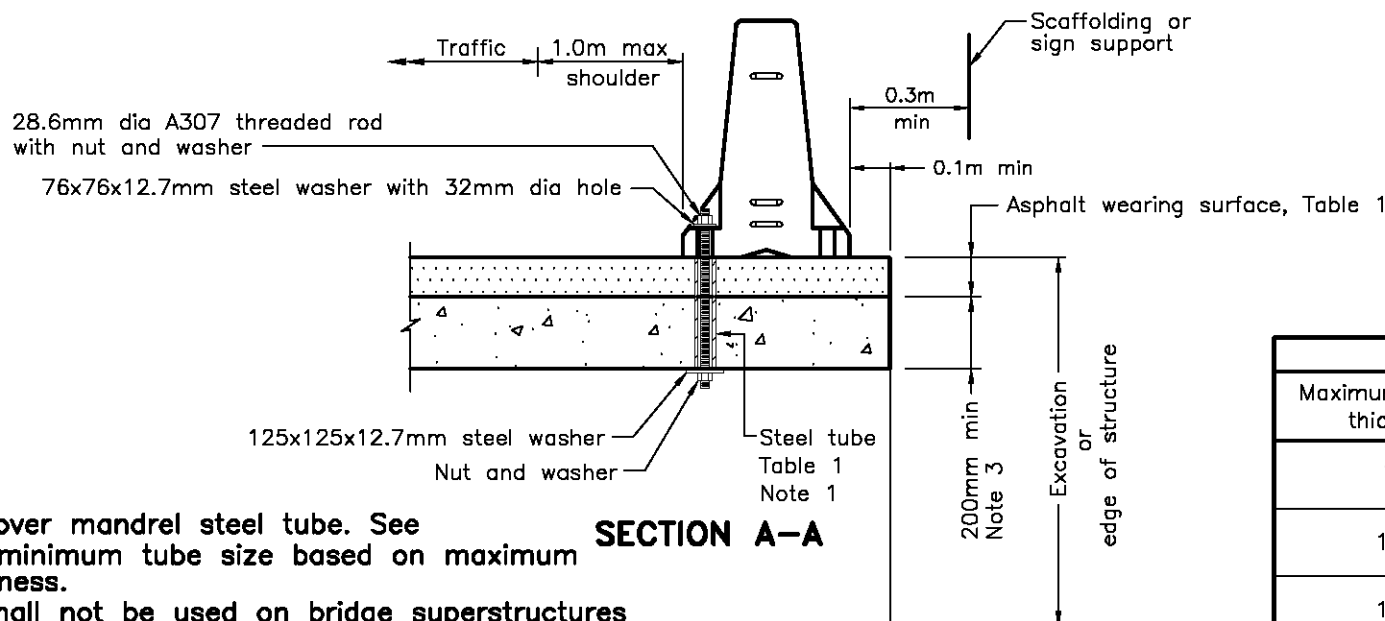
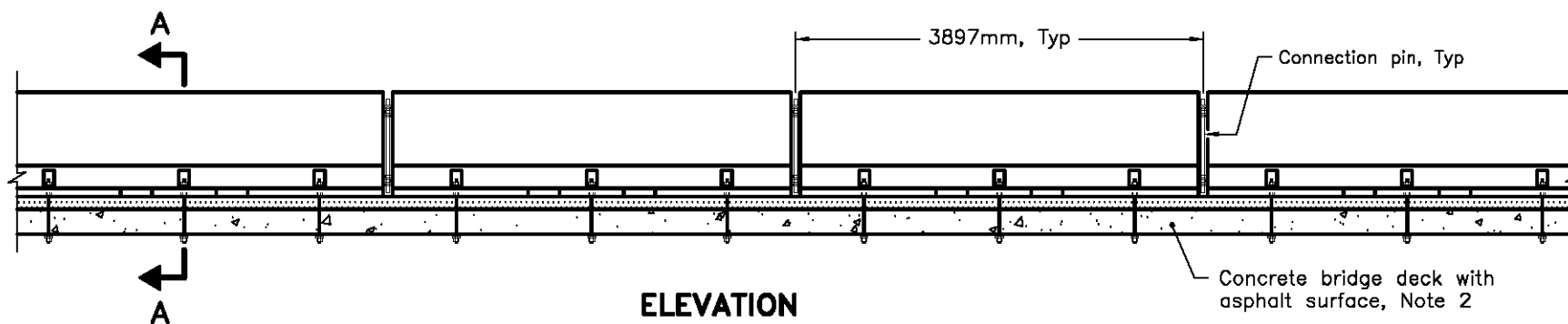


Table 1	
Maximum asphalt thickness	Steel tube diameter
76	73 OD 41 ID
100	83 OD 51 ID
150	95 OD 64 ID

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**

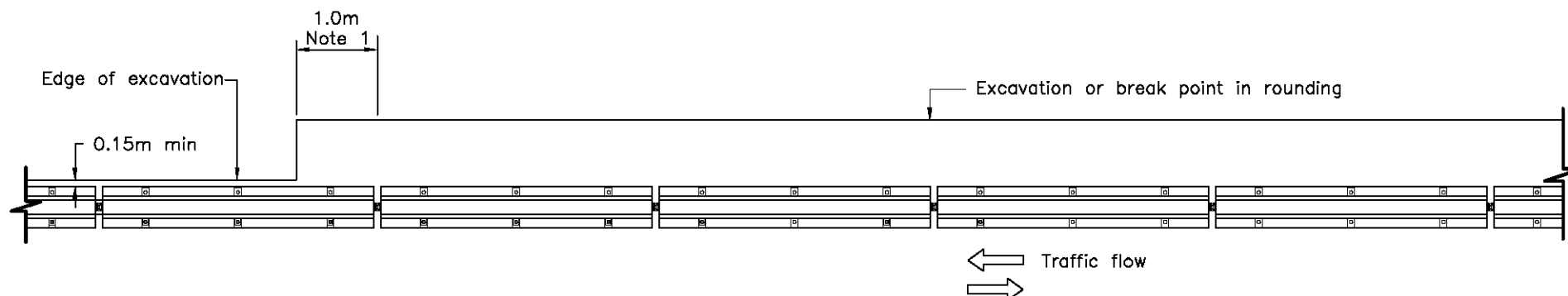
**INSTALLATION - TEMPORARY RESTRAINT SYSTEM
BOLTED THROUGH CONCRETE WITH ASPHALT SURFACE**

Nov 2013

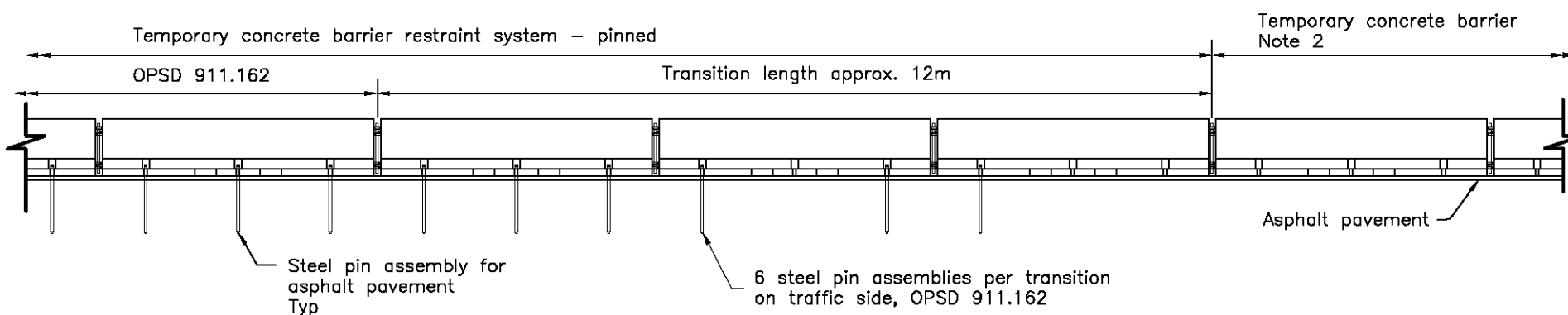
Rev 0



OPSD 911.168



PLAN



ELEVATION

NOTES:

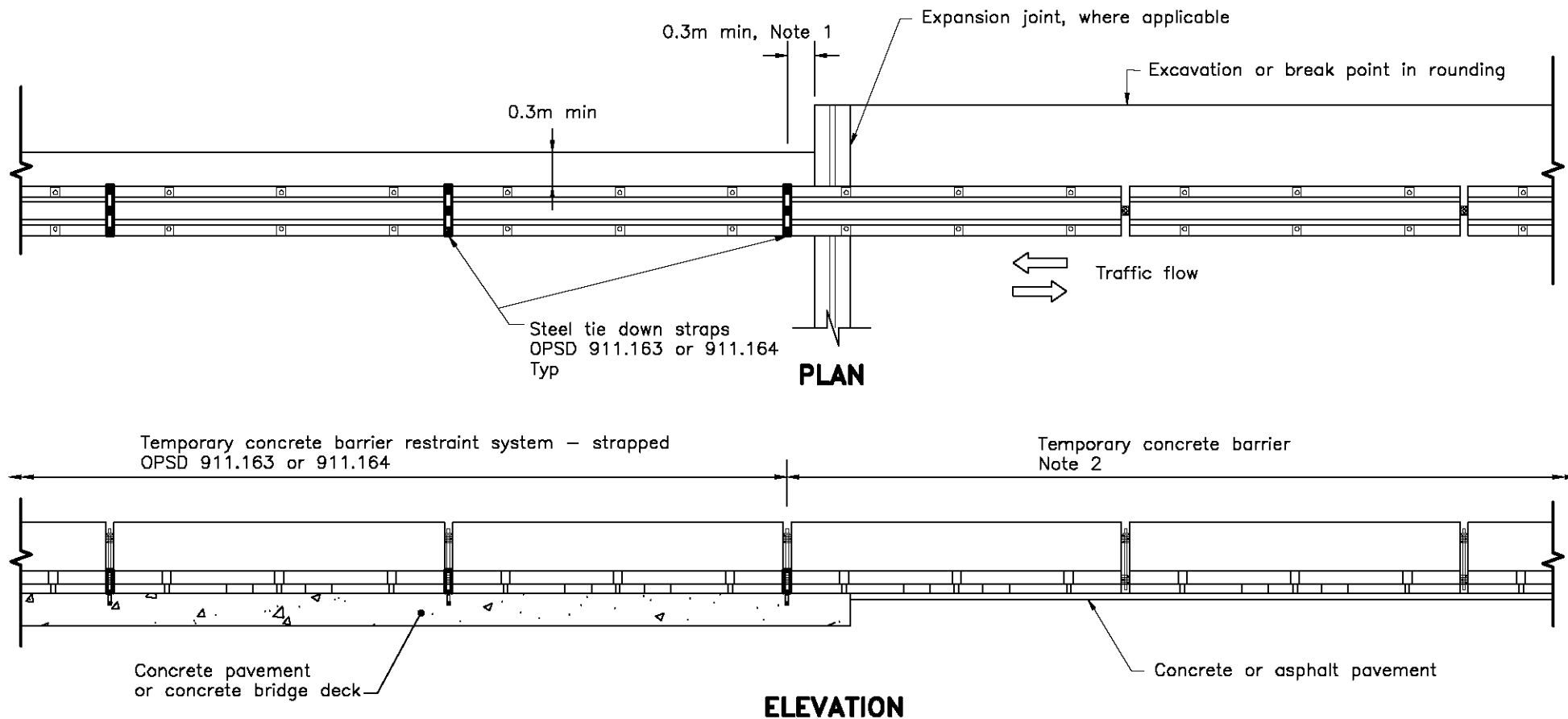
- 1 Decreased offset to excavation located minimum 1.0m beyond transition.
- 2 Type M temporary concrete barrier shown. Transition to another connection type shall be completed according to OPSD 911.340.
- A This OPSD shall be read in conjunction with OPSD 911.160 and 911.162.
- B System configuration 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

OPSD 911.170





NOTES:

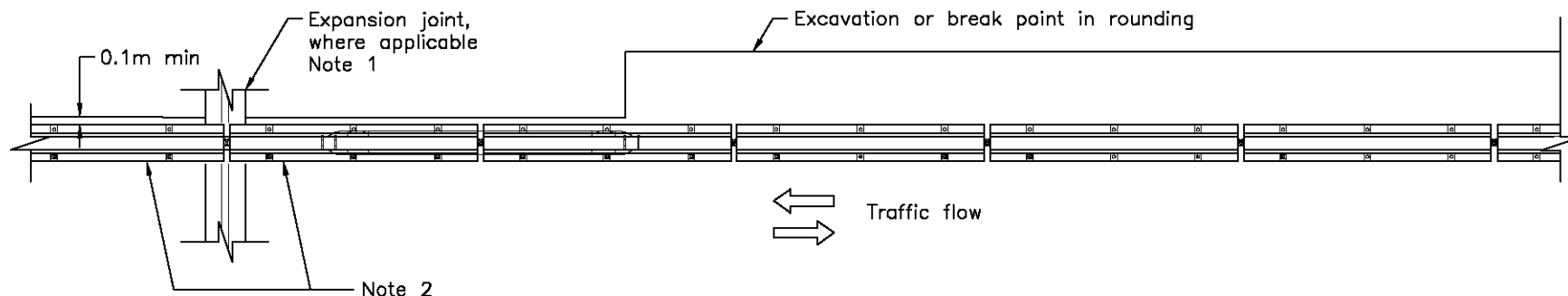
- 1 Bridge deck expansion joint shall be located beyond tie-down strap.
- 2 Type M temporary concrete barrier shown. Transition to another connection type shall be completed according to OPSD 911.340.
- A This OPSD shall be read in conjunction with OPSD 911.160, 911.163, and 911.164.
- B System configuration 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

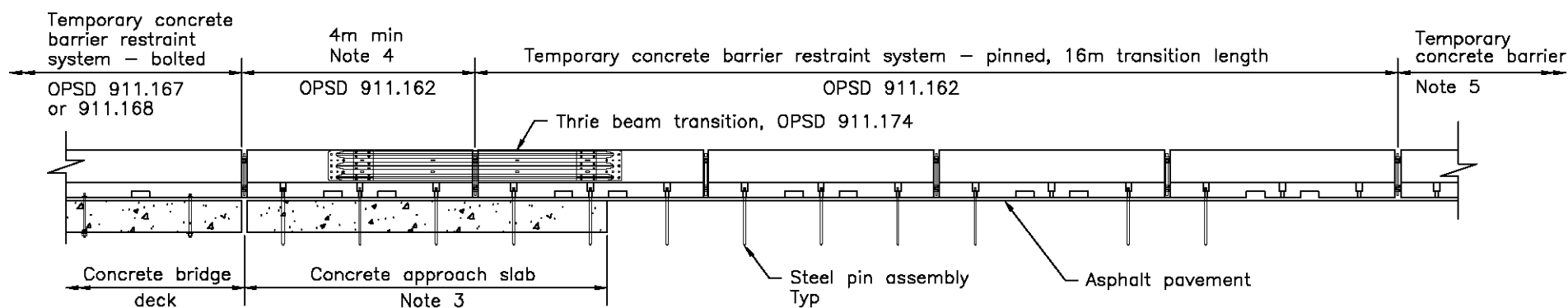
Nov 2014 Rev 1

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 OSPD 911.340.
- A This OSPD shall be read in conjunction with OSPD 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

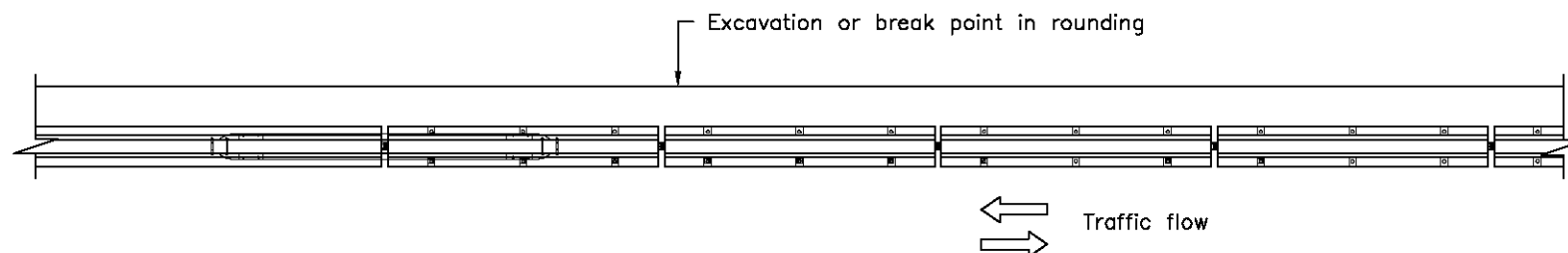
INSTALLATION - TEMPORARY RESTRAINT SYSTEM

TRANSITION TO BOLTED TCB

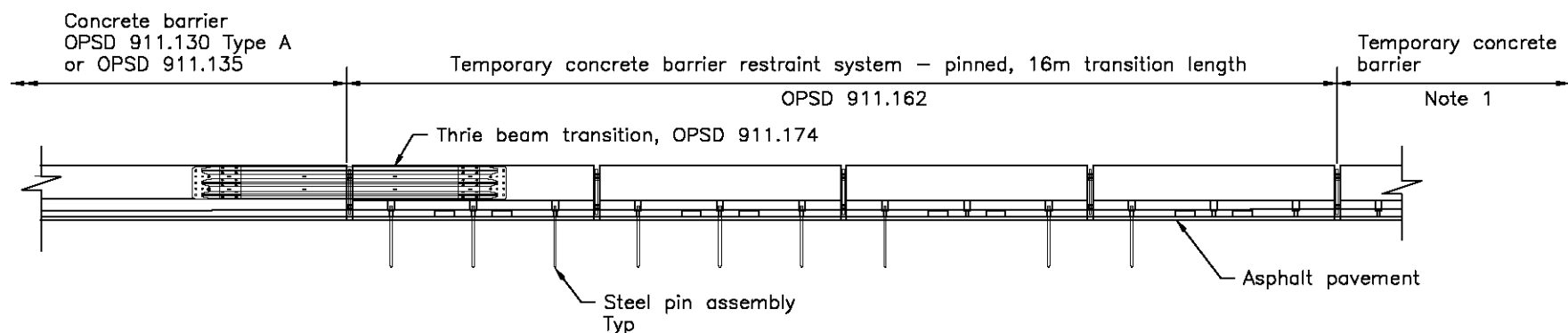
Nov 2014 | Rev | 1

OPSD 911.172





PLAN

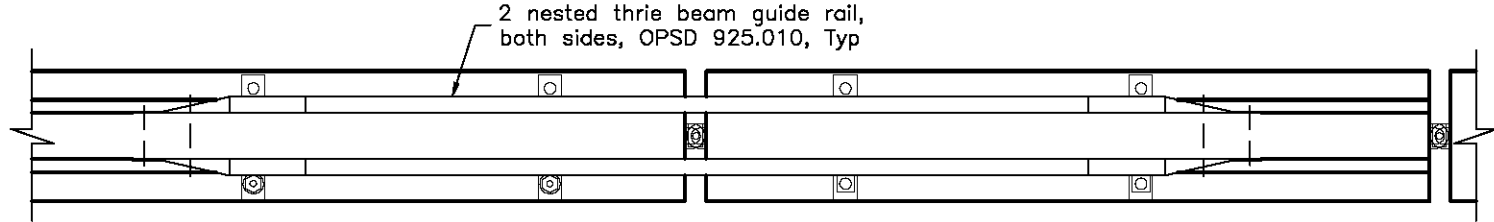


ELEVATION

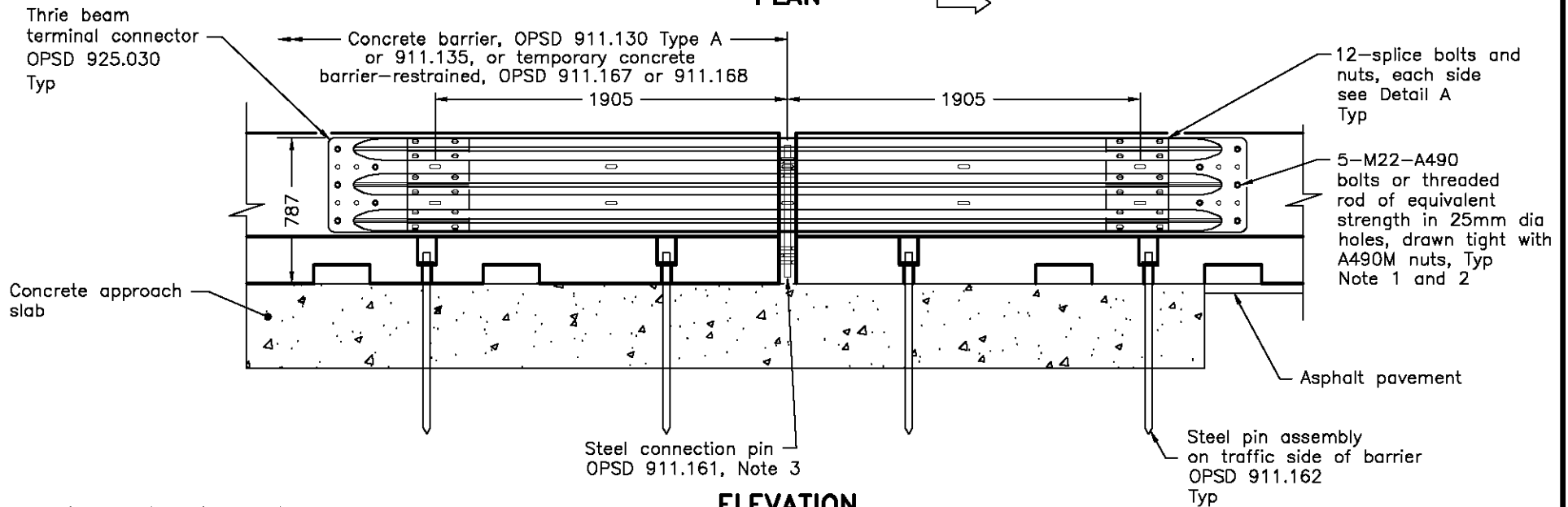
NOTES:

- 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			



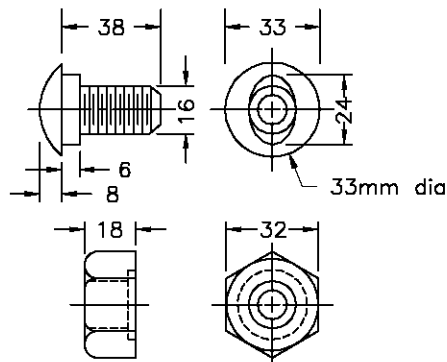
PLAN



ELEVATION

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.



**SPLICE BOLT AND NUT
DETAIL A**

ONTARIO PROVINCIAL STANDARD DRAWING

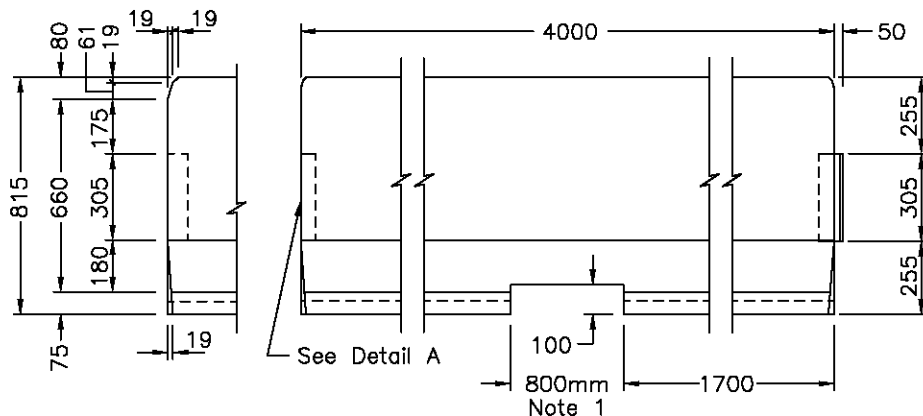
**GUIDE RAIL SYSTEM, CONCRETE BARRIER
TYPE M CONNECTION
COMPONENT-THRIE BEAM TRANSITION**

Nov 2015

Rev 1



OPSD 911.174



DETAIL A

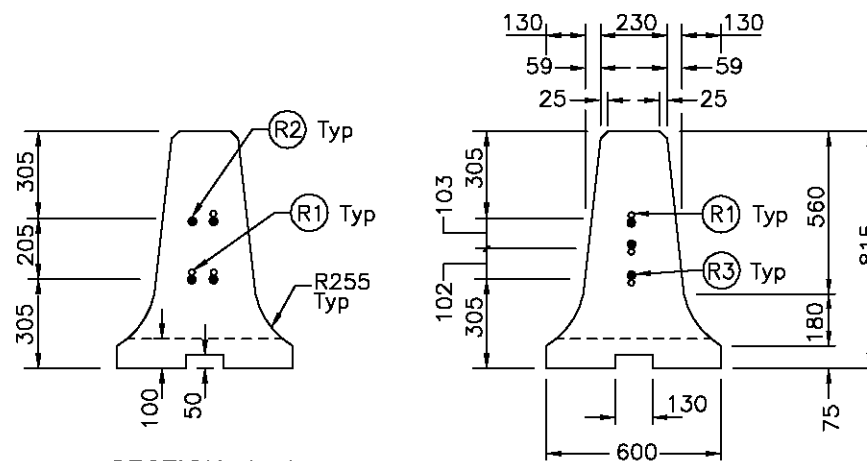
ELEVATION

PLAN

REINFORCING STEEL BARS					
BAR	SIZE	GRADE	TYPE	LENGTH	NO. REQ'D
R1	15M	400W	Deformed	3898	3
R2	20M	400W	Deformed	610	4
R3	20M	400W	Deformed	915	3

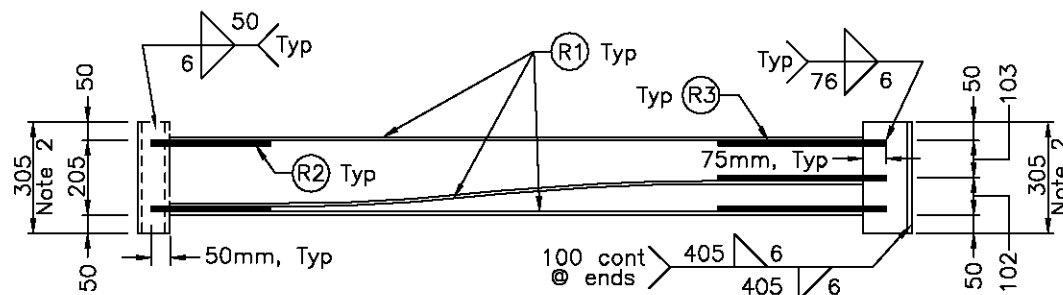
NOTES:

- 1 Drainage opening.
- 2 Type T connections with 610mm long T-Lok connections manufactured before March 2010 may be used.
- A Minimum horizontal radius shall be 26m.
- B T-Lok connection is proprietary to Rockingham Precast.
- C System configuration meets NCHRP Report 350 TL-3 and AASHTO MASH TL-3.
- D Concrete cover 50mm minimum.
- E All concrete edges shall have 15x45° chamfers.
- F Welds shall be according to CSA W59.
- G All dimensions are in millimetres unless otherwise shown.

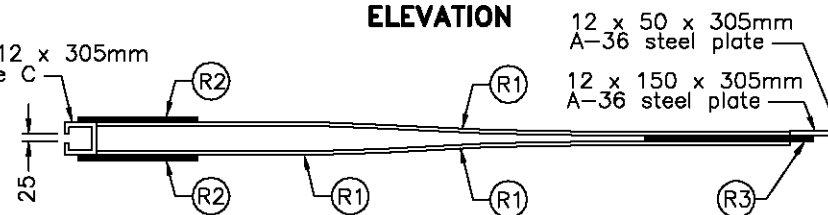


SECTION A-A

SECTION B-B



ELEVATION



PLAN

STEEL DETAILS

ONTARIO PROVINCIAL STANDARD DRAWING

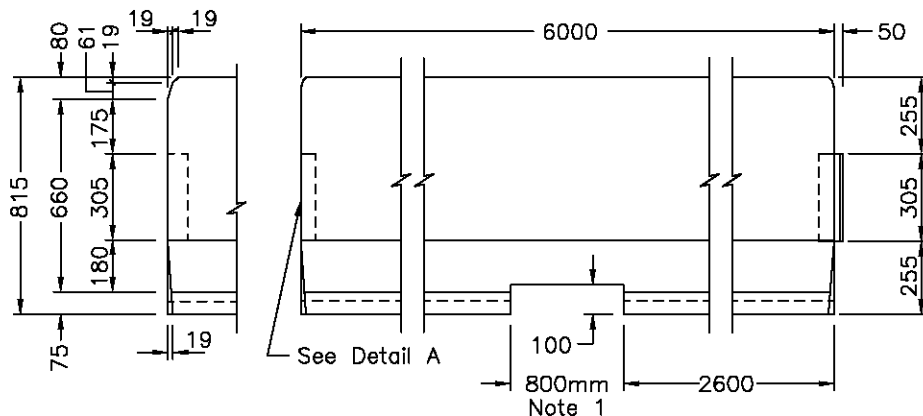
GUIDE RAIL SYSTEM, CONCRETE BARRIER
TYPE T CONNECTION, 4.0m LENGTH
INSTALLATION-TEMPORARY

Nov 2013

Rev 0



OPSD 911.180



DETAIL A

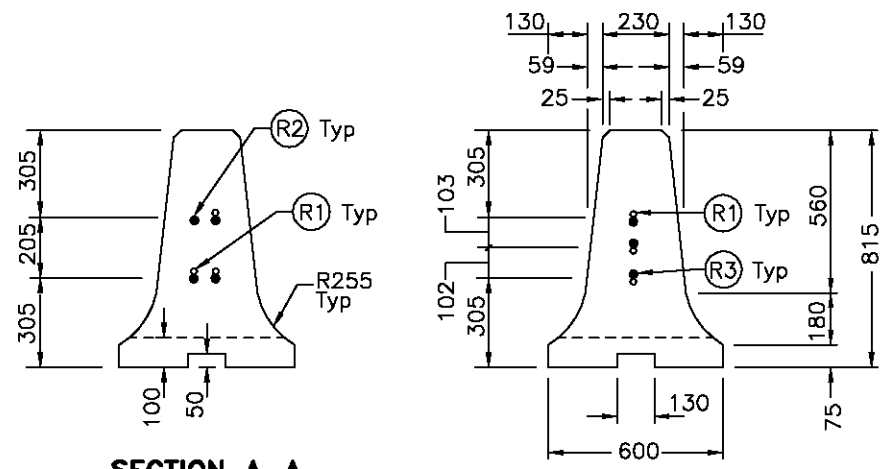
ELEVATION

PLAN

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

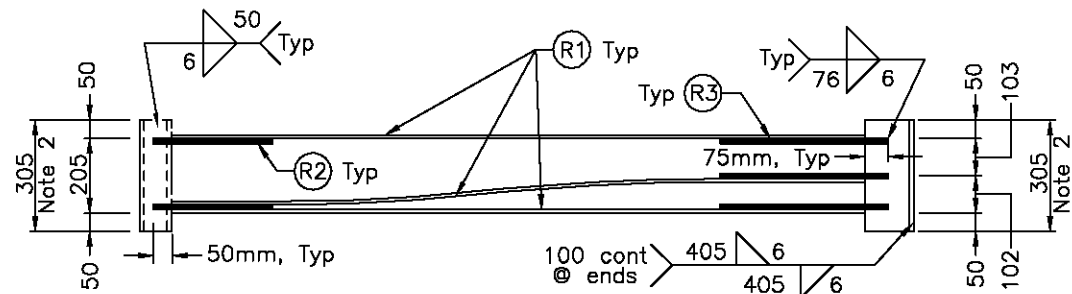
NOTES:

- 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.

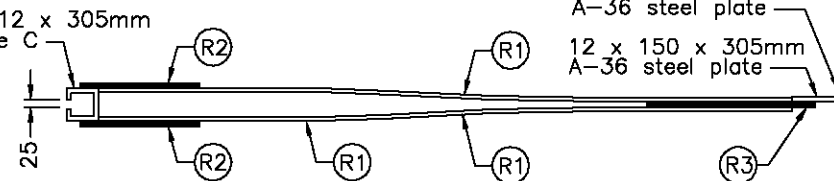


SECTION A-A

SECTION B-B



ELEVATION



PLAN
STEEL DETAILS

HSS 101.6 x 101.6 x 12 x 305mm
A500 Grade B or Grade C

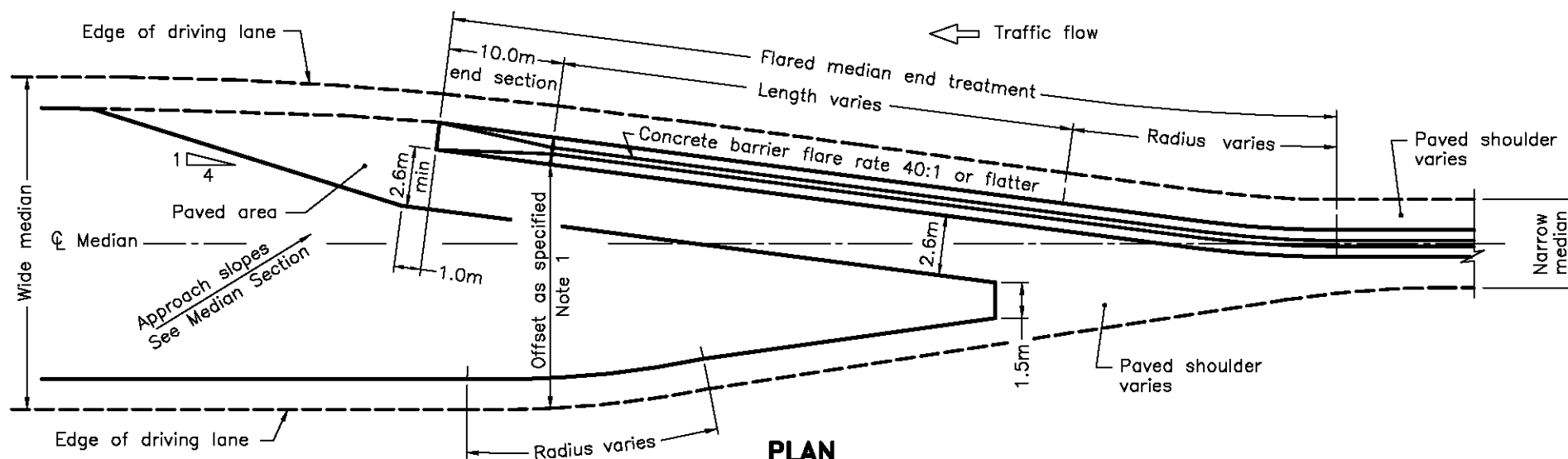
ONTARIO PROVINCIAL STANDARD DRAWING

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

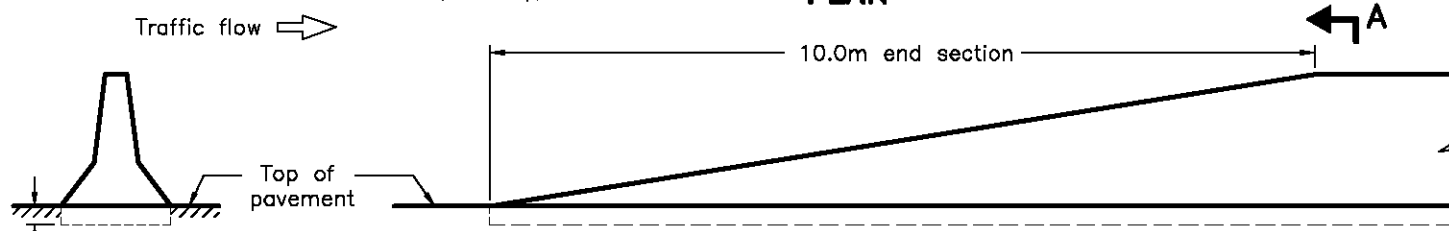
Nov 2013 Rev 0



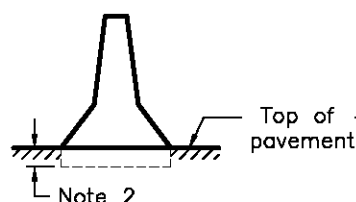
OPSD 911.181



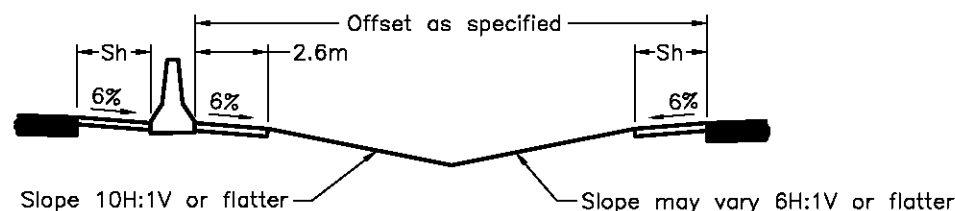
PLAN



SIDE ELEVATION



SECTION A-A



MEDIAN SECTION

NOTES:

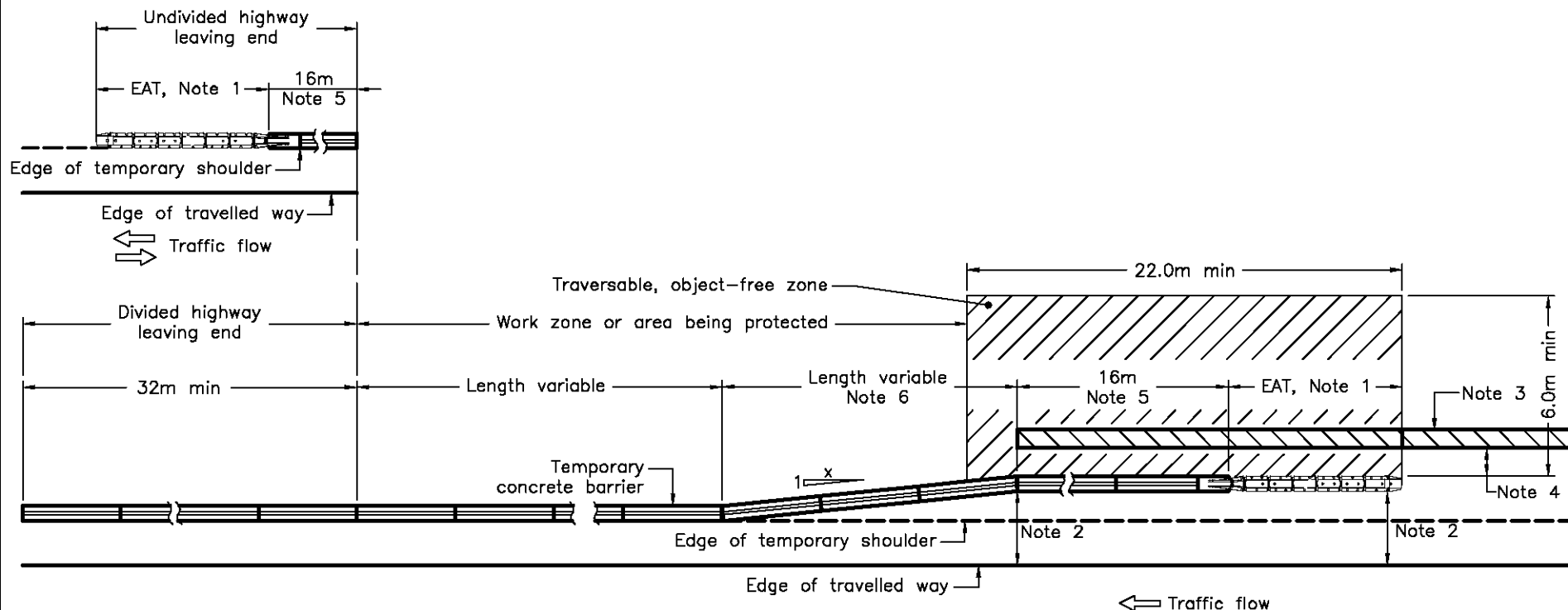
- 1 Where minimum clearance cannot be obtained, an approved end treatment or energy attenuator shall be installed.
- 2 Embedment shall be 75mm into adjacent pavement.
- A This OPSD shall be read in conjunction with OPSD 911.130, 911.131, and 911.132.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING
 GUIDE RAIL SYSTEM, CONCRETE BARRIER
 MEDIAN END TREATMENT
 INSTALLATION

Nov 2015 Rev 1



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 $\leq 0.3\text{m}$ or $\geq 3.0\text{m}$; 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

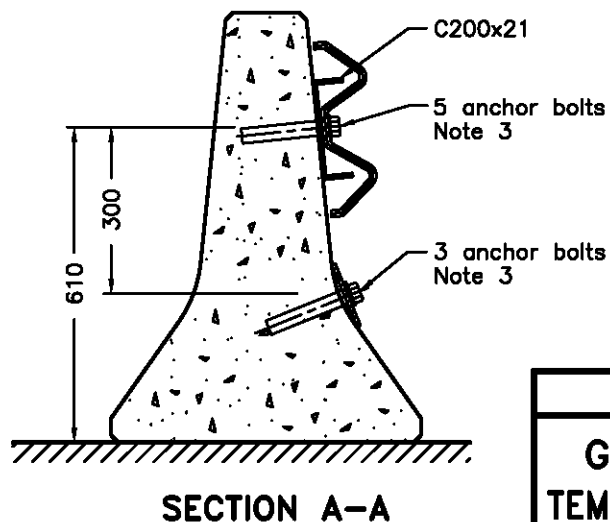
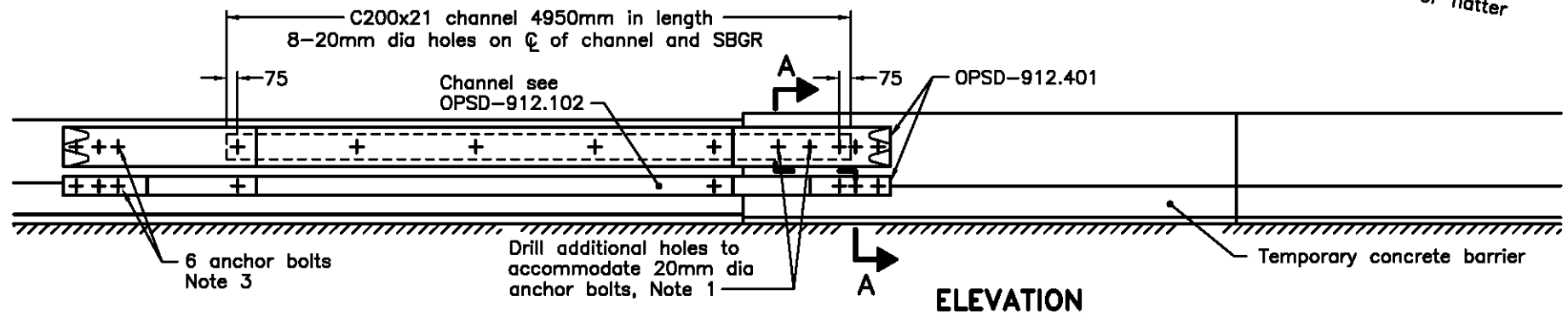
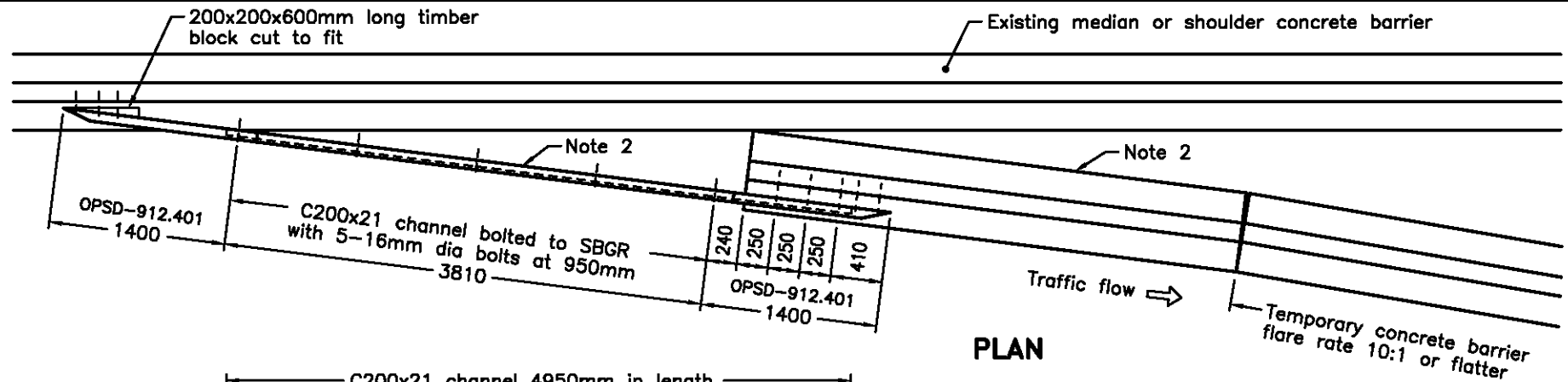
GUIDE RAIL SYSTEM, CONCRETE BARRIER
ENERGY ATTENUATOR
INSTALLATION – TEMPORARY

Nov 2014

Rev 1



OPSD 911.232



NOTES:

- 1 OPSD-912.401 rail connections shall consist of double SBGR panels. Additional holes may be field drilled.
- 2 Flare rate of temporary transition rail and first temporary concrete barrier unit shall be 12:1 or flatter.
- 3 20mm dia removable anchor bolts each with an ultimate pullout value of 100kN in 30MPa concrete.
- A When transitioning from a curb section onto a lower surface the temporary concrete barrier shall be supported to attain a grade of 10% or flatter.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

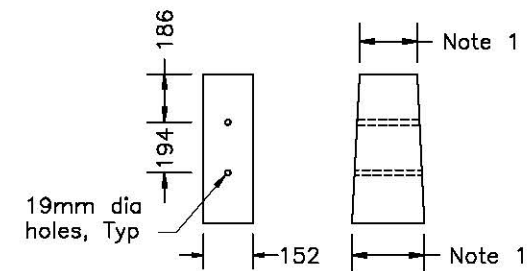
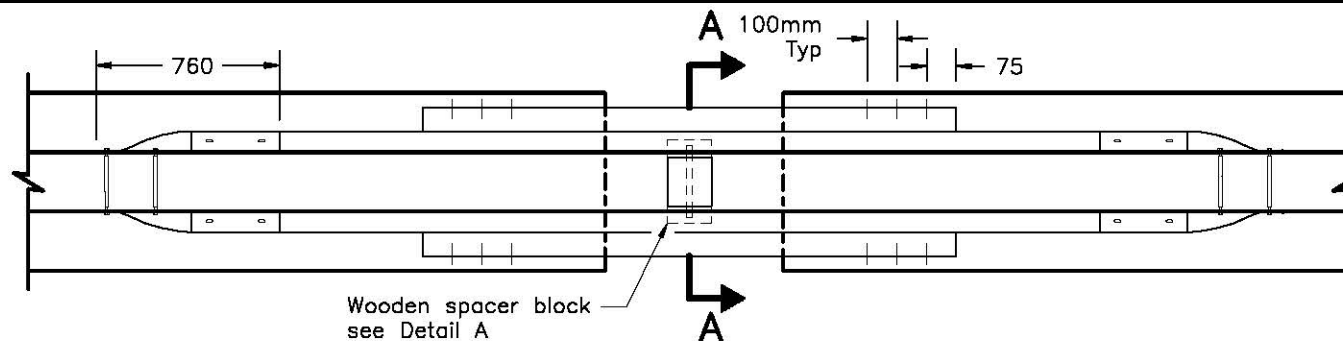
Nov 2001

Rev 0

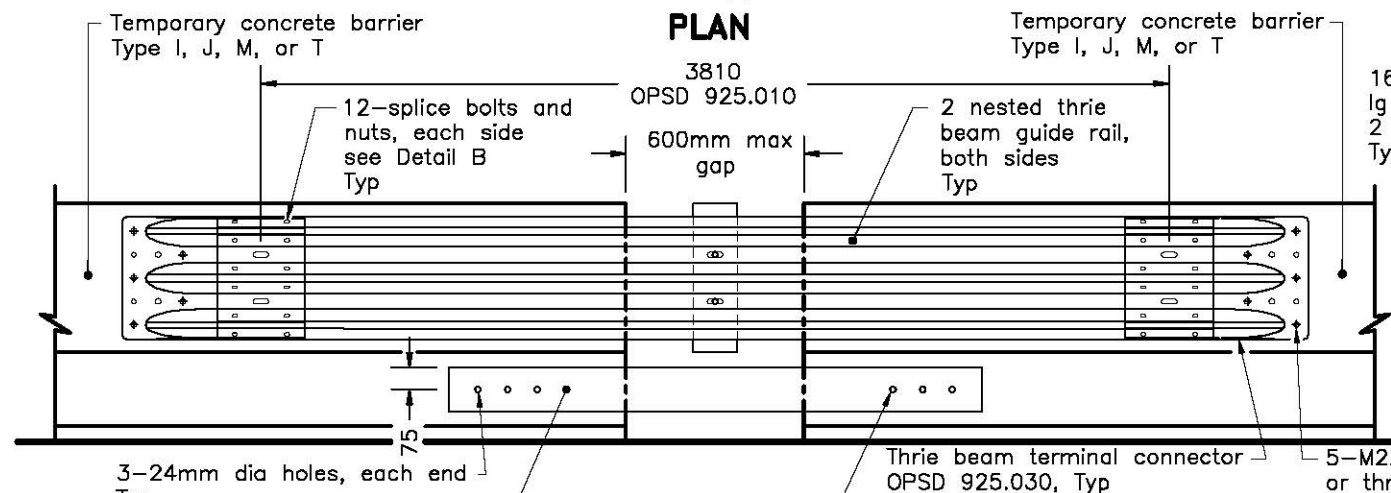
GUIDE RAIL SYSTEM, CONCRETE BARRIER
TEMPORARY TRANSITION INSTALLATION-RAIL METHOD
CONCRETE BARRIER TO TEMPORARY CONCRETE BARRIER

OPSD - 911.330

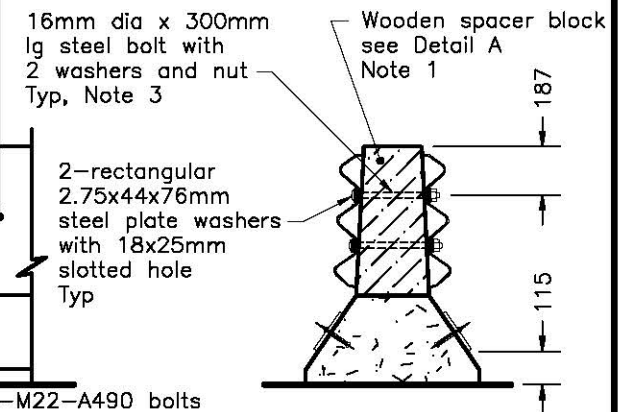




**WOODEN SPACER BLOCK
DETAIL A**

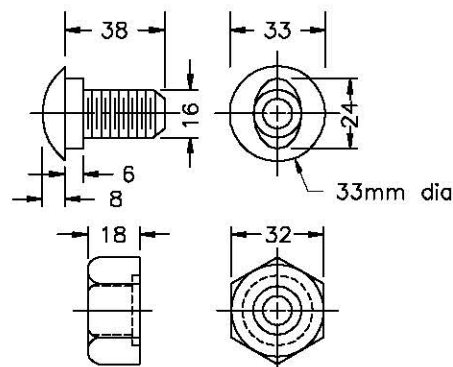


ELEVATION



SECTION A-A

9.5x150x1800mm steel plate both sides
Typ



**SPLICE BOLT AND NUT
DETAIL B**

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.

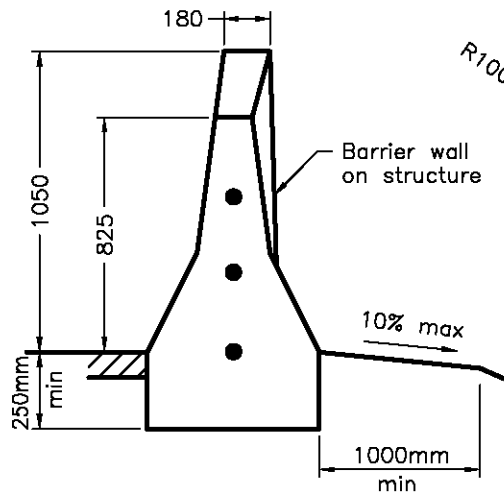
ONTARIO PROVINCIAL STANDARD DRAWING

**GUIDE RAIL SYSTEM, CONCRETE BARRIER
TEMPORARY CONCRETE BARRIER TRANSITION
INSTALLATION – TEMPORARY**

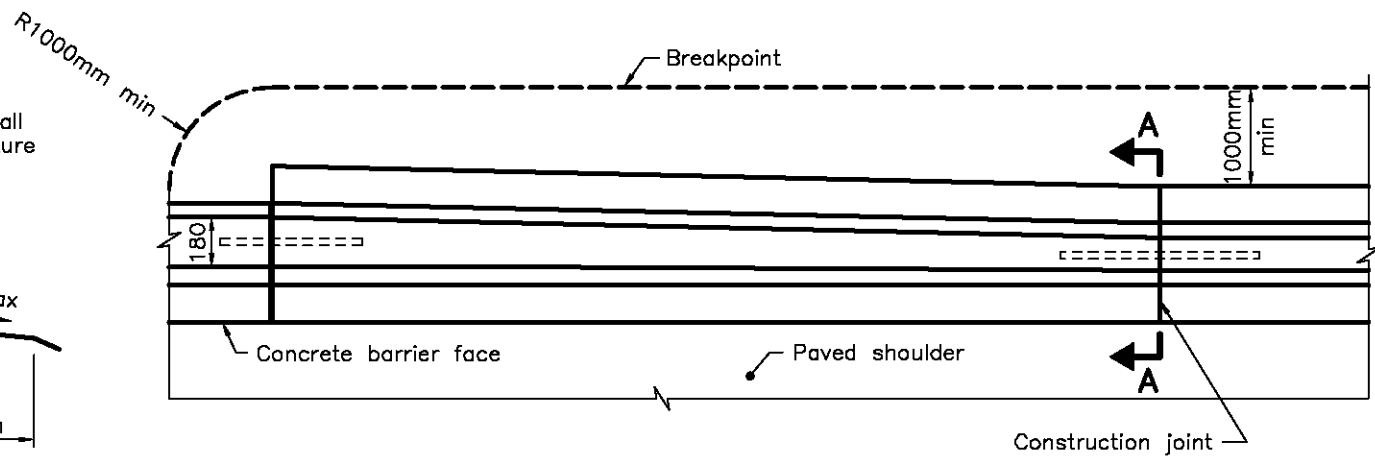
Nov 2013 Rev 0

OPSD 911.340

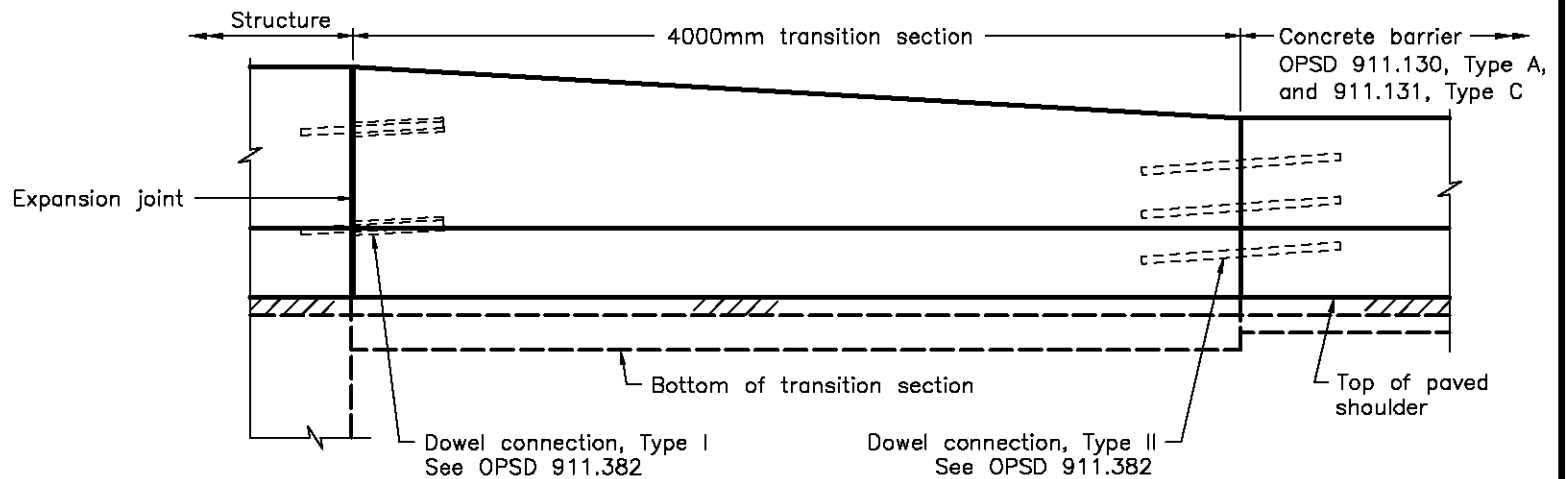




SECTION A-A



PLAN



ELEVATION

NOTES:

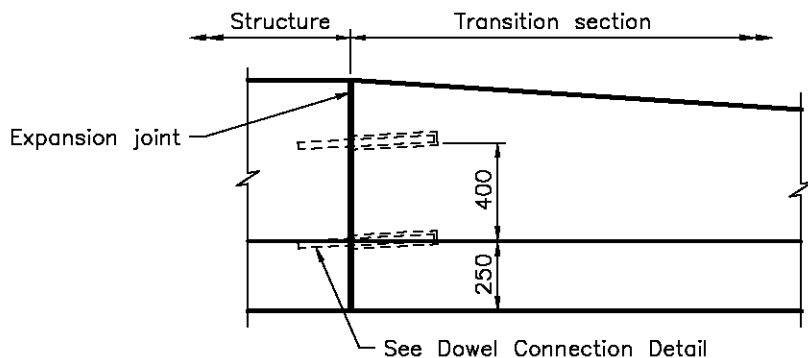
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING
GUIDE RAIL SYSTEM, CONCRETE BARRIER
PERMANENT TRANSITION INSTALLATION
ROADSIDE CONCRETE BARRIER TO STRUCTURE

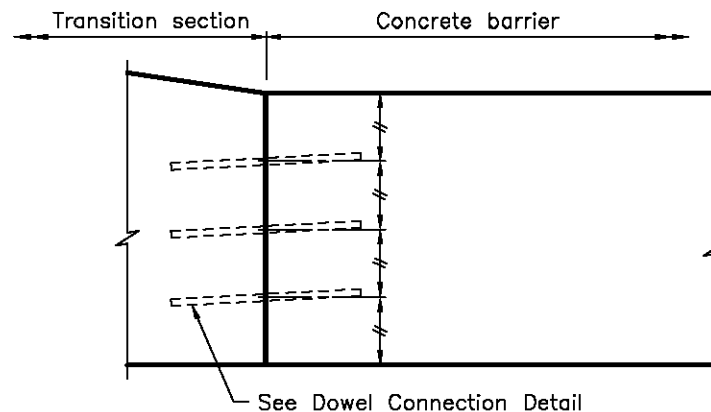
Nov 2015 Rev 2



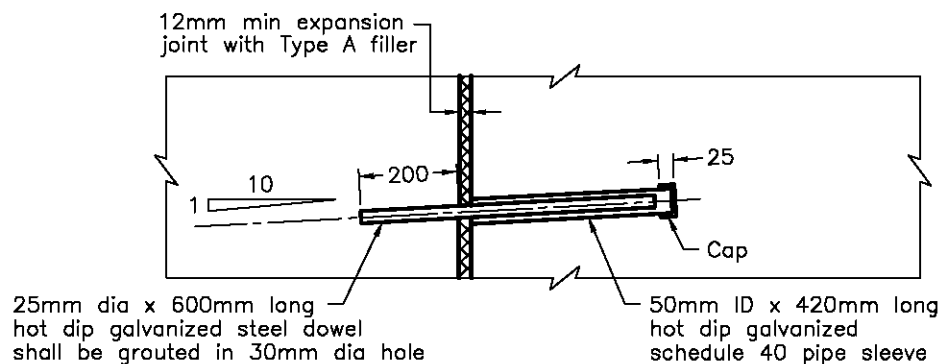
OPSD 911.381



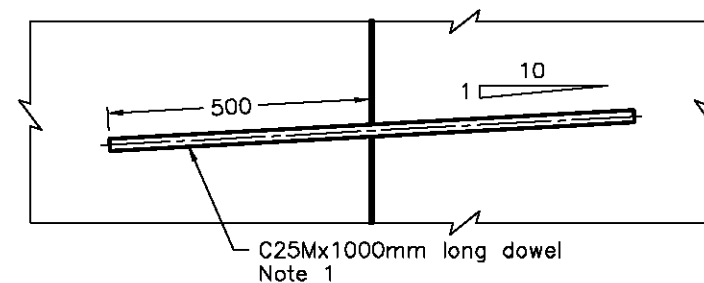
**DOWEL CONNECTION WITH EXPANSION JOINT
TYPE I**



**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

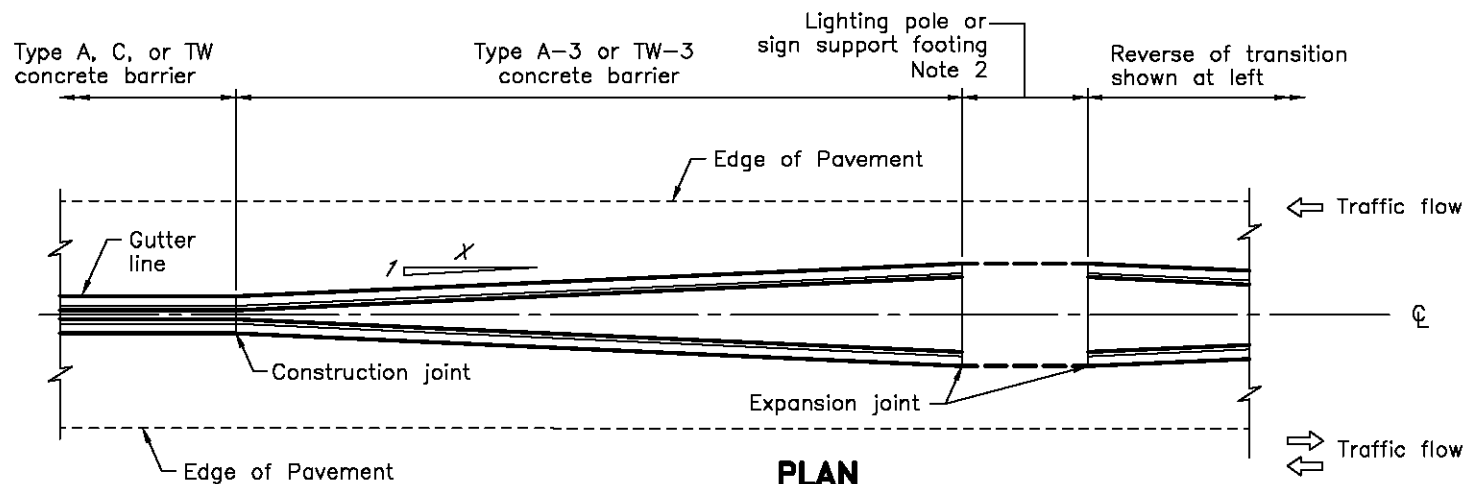
GUIDE RAIL SYSTEM, CONCRETE BARRIER
DOWEL CONNECTION DETAIL

Nov 2015

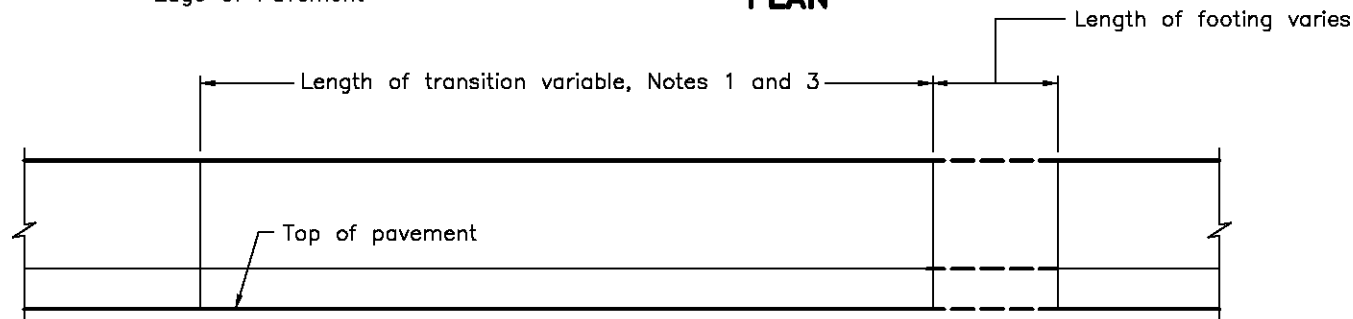
Rev 1



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

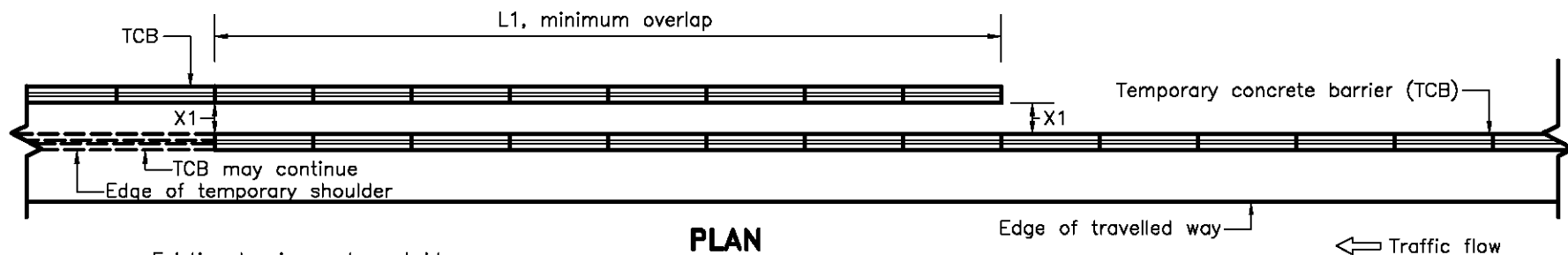
**GUIDE RAIL SYSTEM, CONCRETE BARRIER
PERMANENT TRANSITION INSTALLATION
AT LIGHTING POLE
AND SIGN SUPPORT FOOTINGS**

Nov 2015

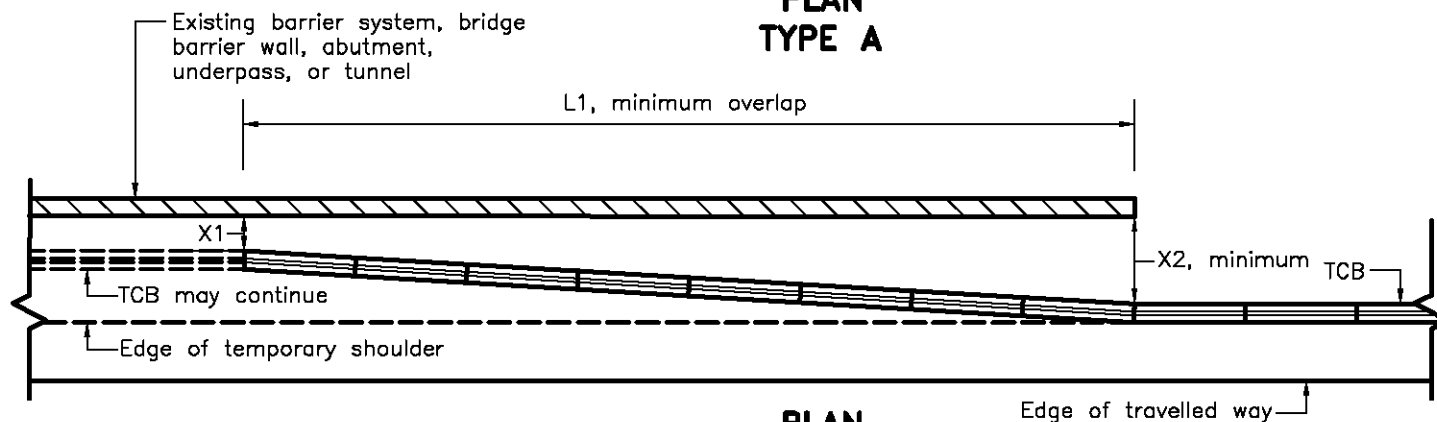
Rev 0



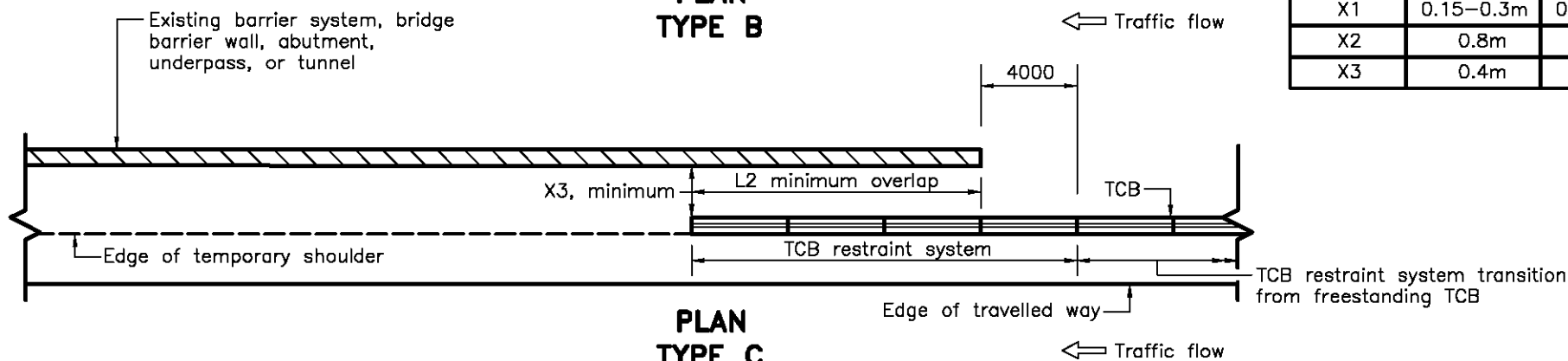
OPSD 911.383



**PLAN
TYPE A**



**PLAN
TYPE B**



**PLAN
TYPE C**

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

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

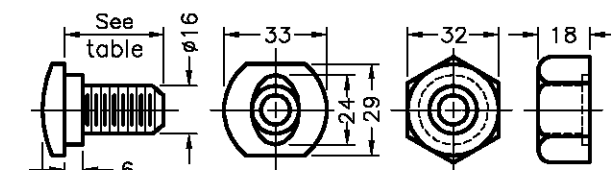
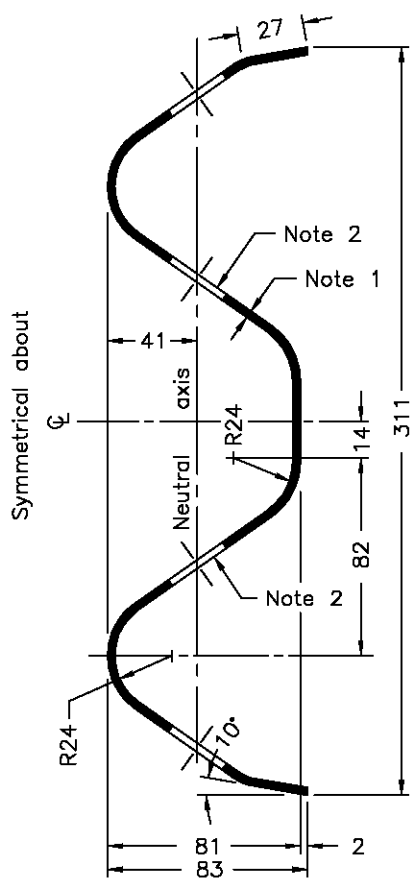
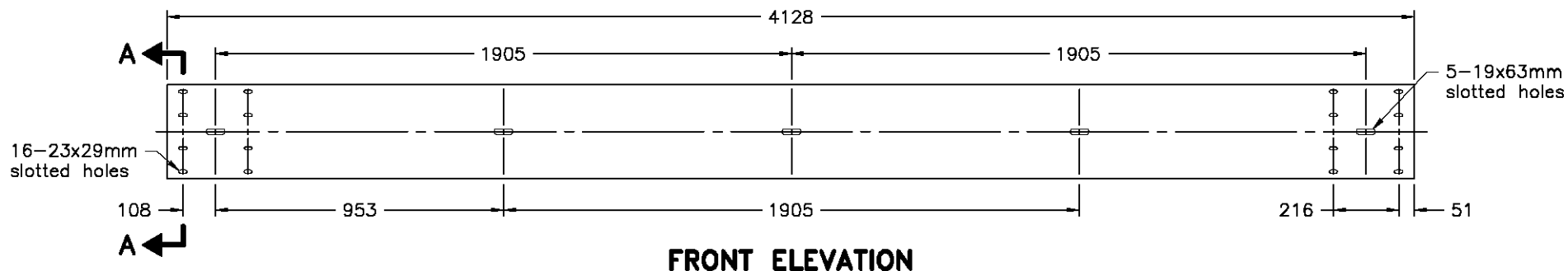
**GUIDE RAIL SYSTEM, CONCRETE BARRIER
TEMPORARY – LEAVING END TREATMENT
INSTALLATION – DIVIDED HIGHWAY**

Nov 2015

Rev 1



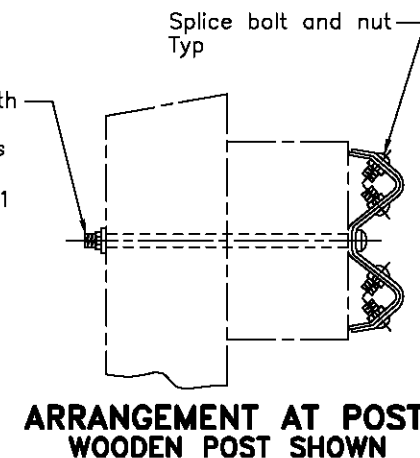
OPSD 911.430



SPLICE BOLT AND NUT

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

Post bolt and nut with washer as specified on assembly drawings OPSD 912.130, 912.140, and 912.141



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

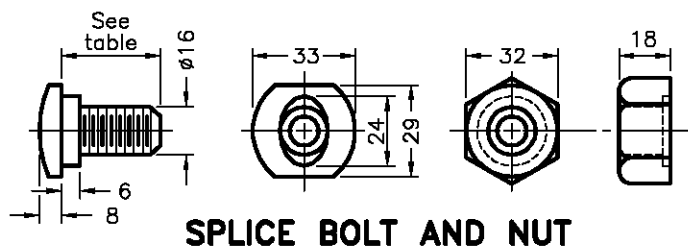
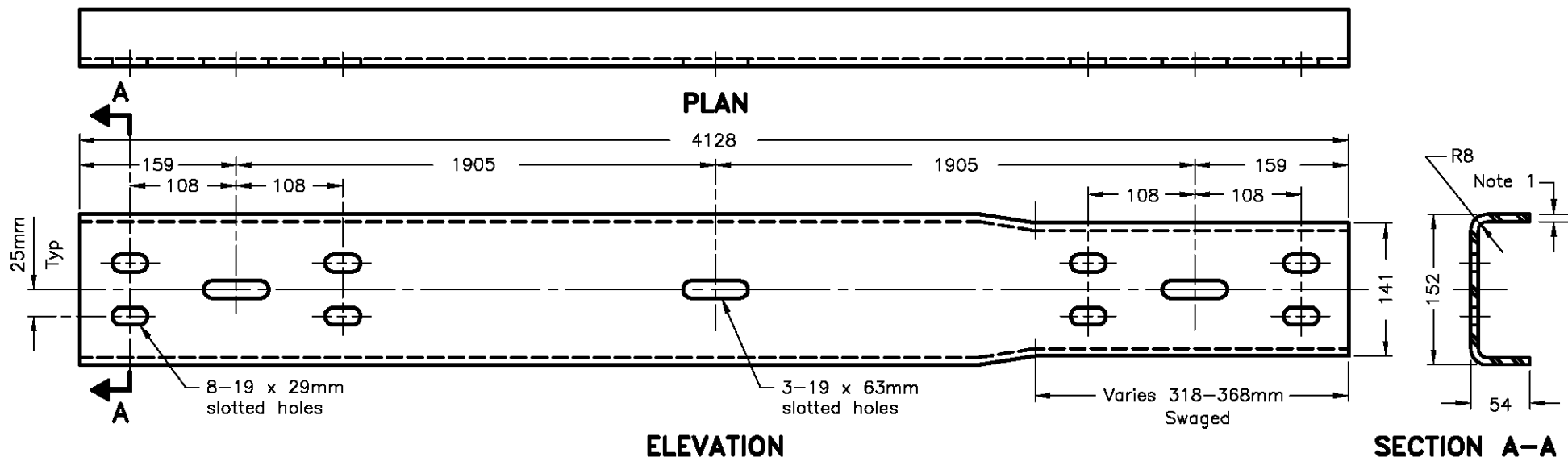
Nov 2016

Rev 3

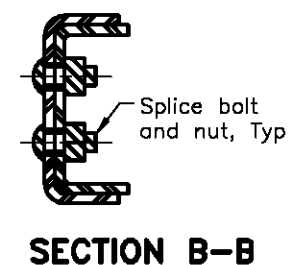
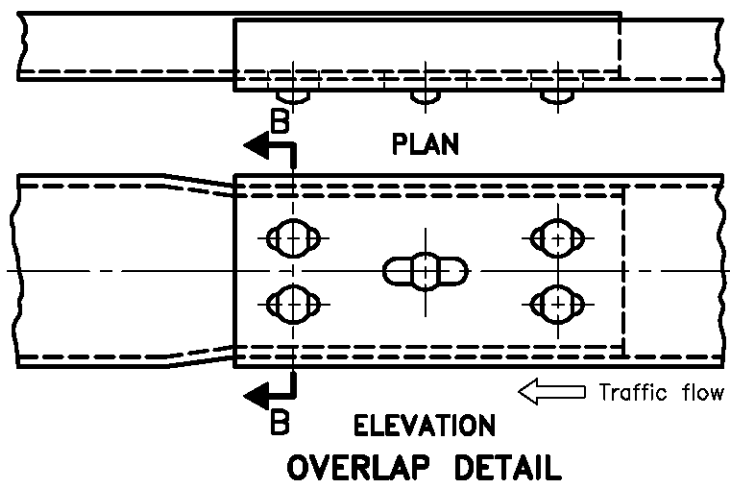
GUIDE RAIL SYSTEM, STEEL BEAM
RAIL
COMPONENT

OPSD 912.101





SPLICE BOLT LENGTH	
LOCATION	LENGTH
At posts	32
At structures	64



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

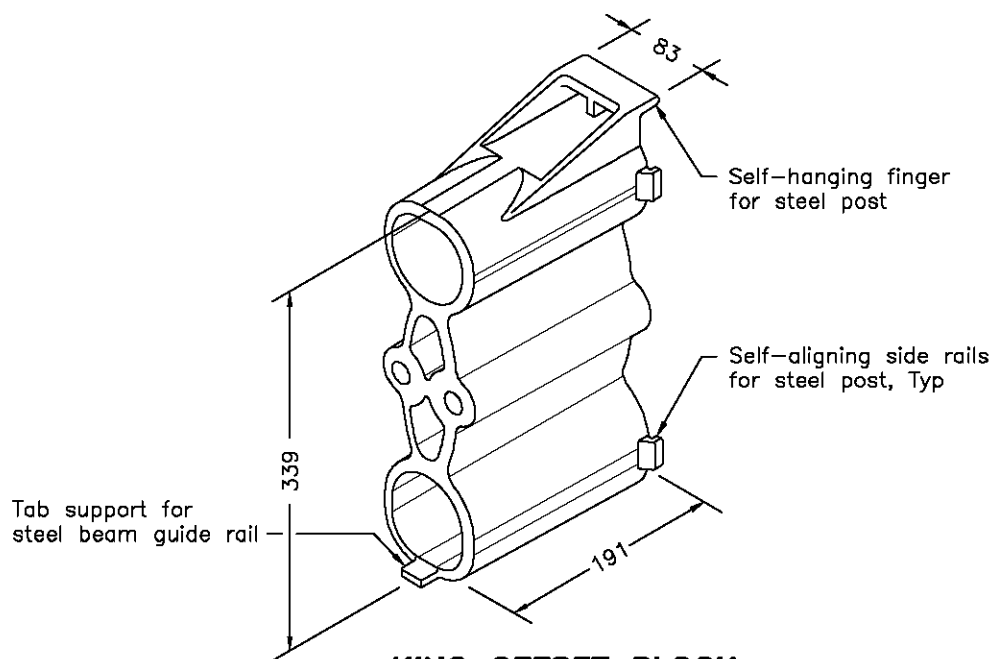
GUIDE RAIL SYSTEM, STEEL BEAM
CHANNEL
COMPONENT

Nov 2016

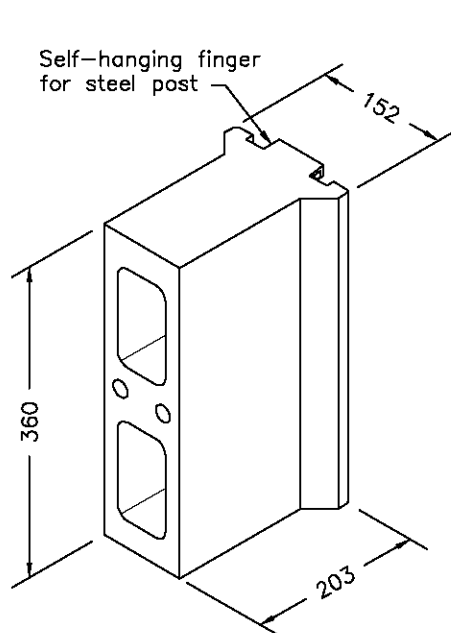
Rev 2



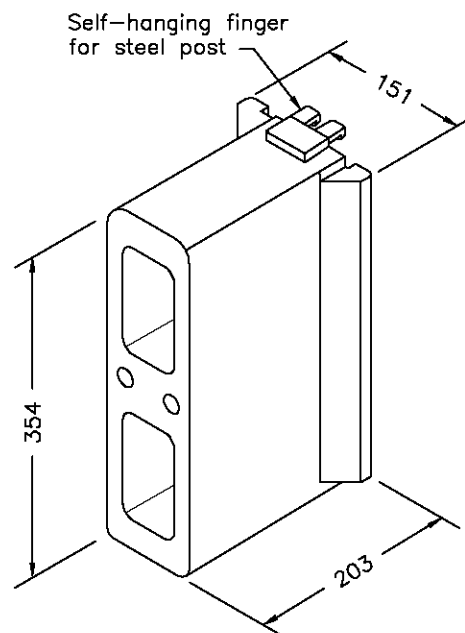
OPSD 912.102



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

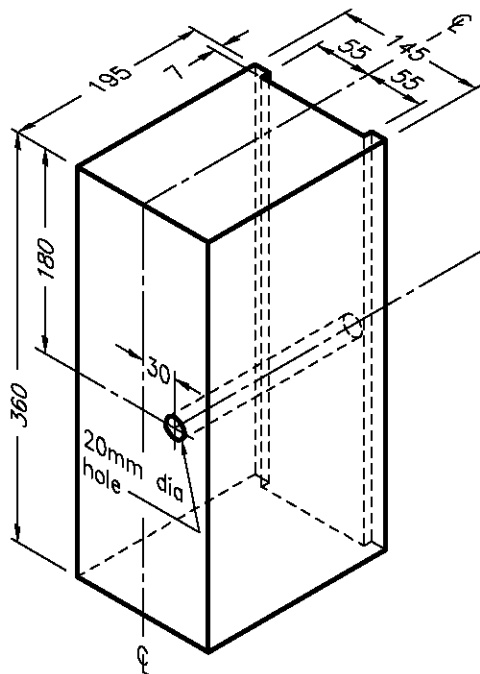
Nov 2016

Rev 2

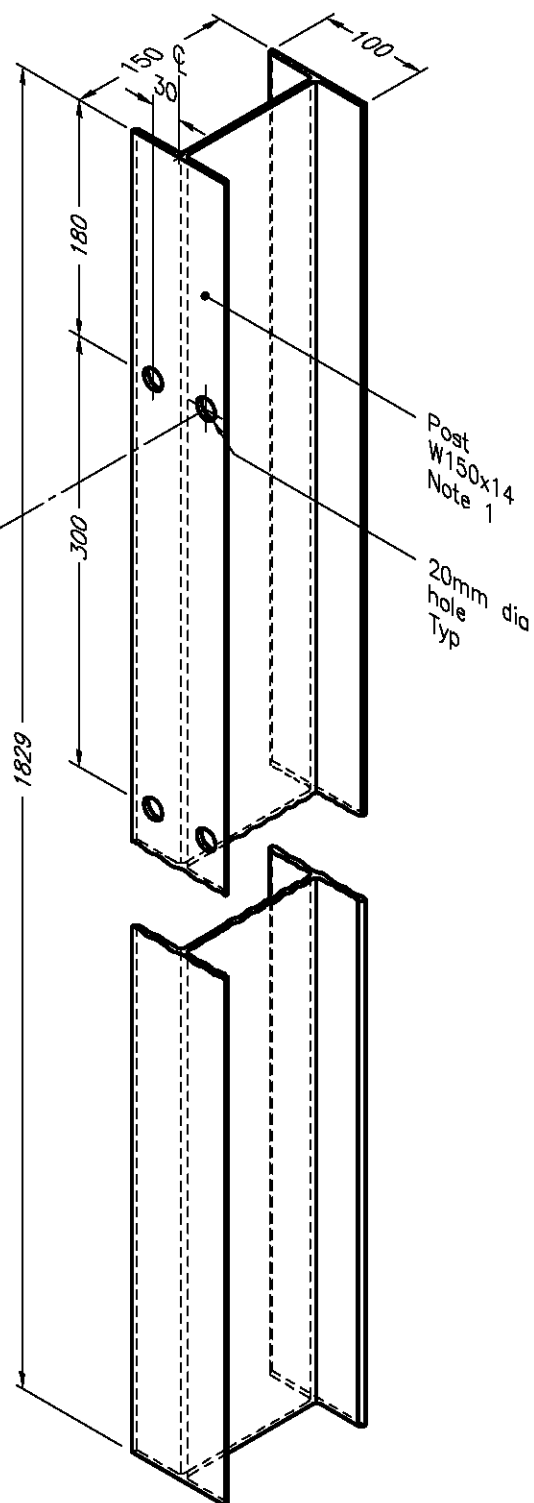
**GUIDE RAIL SYSTEM, STEEL BEAM
PLASTIC OFFSET BLOCKS
COMPONENT**



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

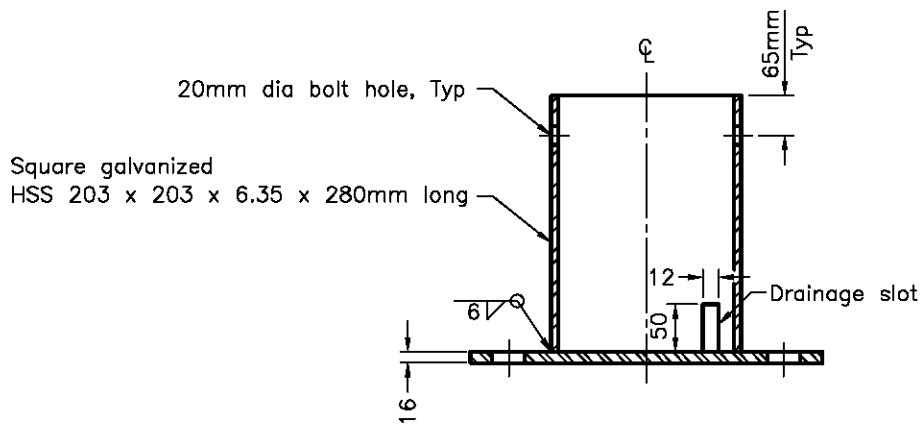
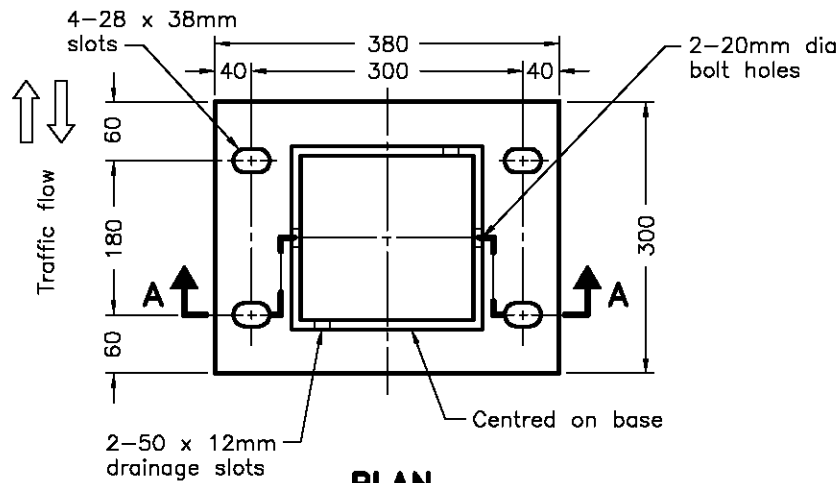
Nov 2016

Rev 3

**GUIDE RAIL SYSTEM, STEEL BEAM
STEEL POST WITH WOODEN OFFSET BLOCK
COMPONENT**



OPSD 912.104



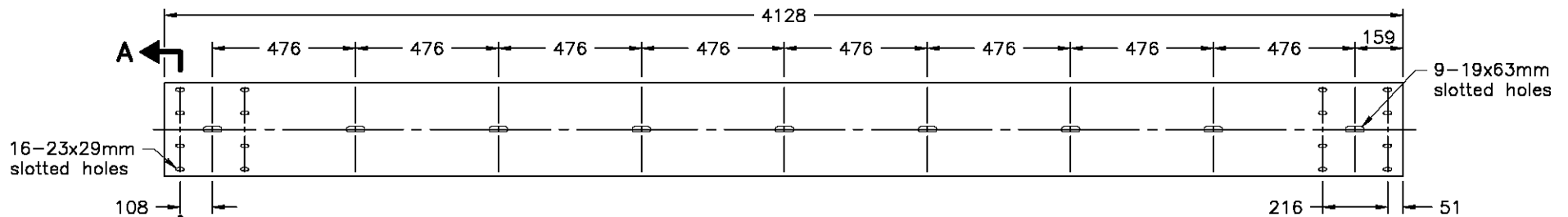
FOR SQUARE WOODEN POST FOR STEEL BEAM GUIDE RAIL

NOTES:

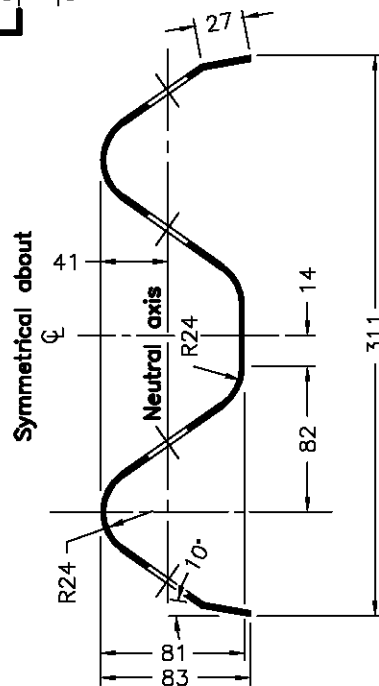
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2016	Rev	2	
GUIDE RAIL SYSTEM, STEEL BEAM BASE PLATE COMPONENT	-----			

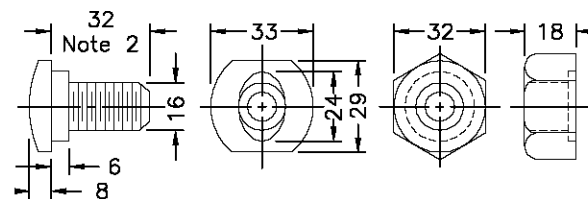
OPSD 912.105				



FRONT ELEVATION

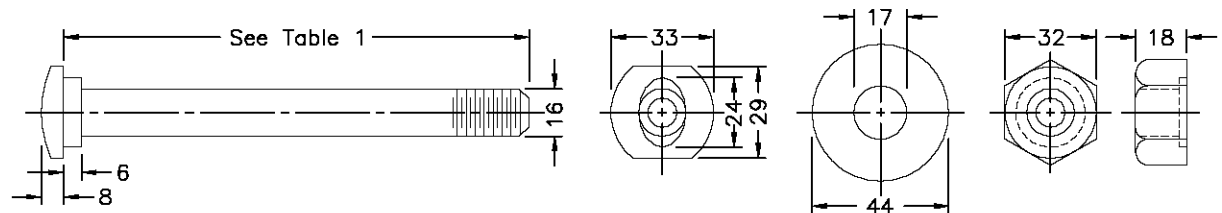


ENLARGED SECTION A-A
Note 1



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

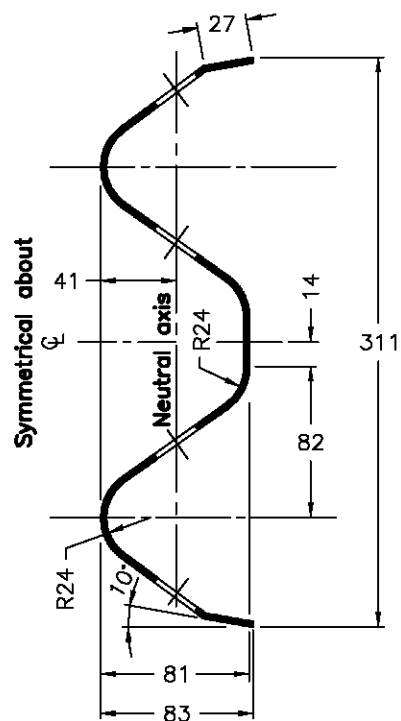
GUIDE RAIL SYSTEM, STEEL BEAM
TYPE M RAIL - 476mm HOLE SPACING
COMPONENT

Nov 2016

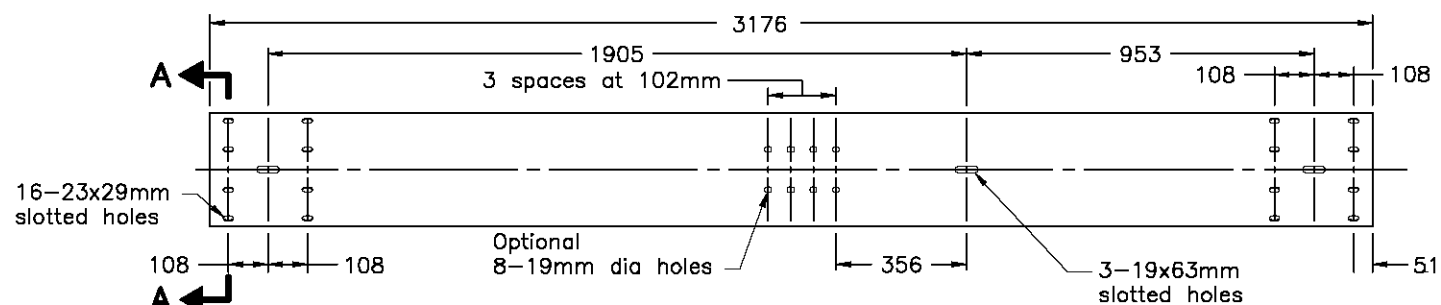
Rev 0



OPSD 912.123



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

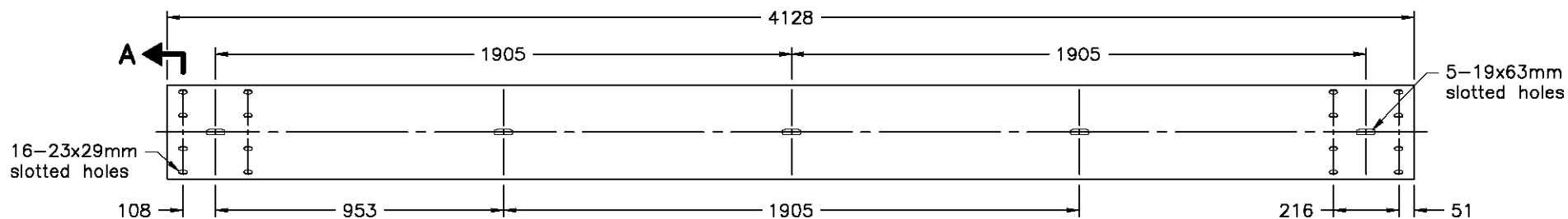
Apr 2016

Rev 0

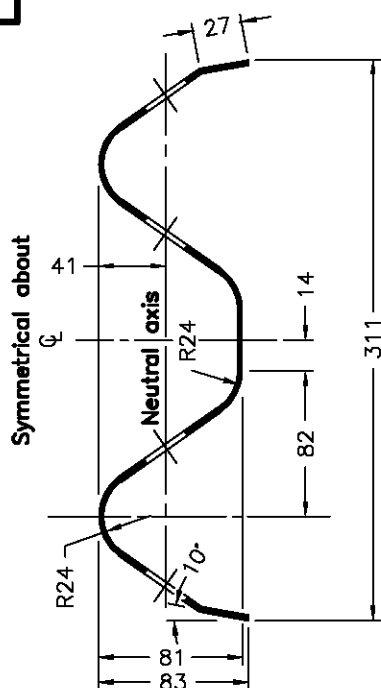
GUIDE RAIL SYSTEM, STEEL BEAM
TYPE M TRANSITION RAIL
COMPONENT

OPSD 912.124

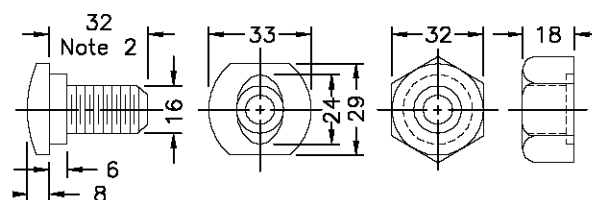




FRONT ELEVATION

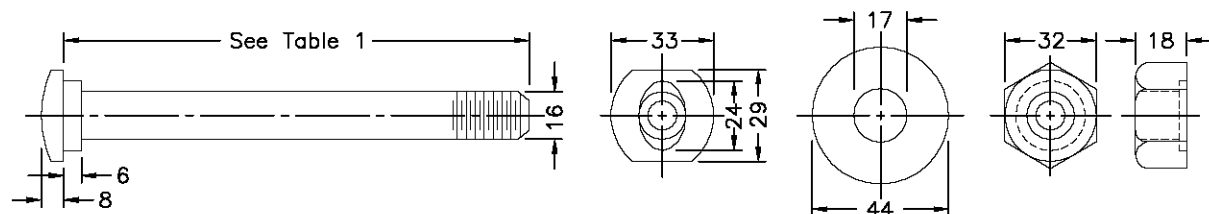


ENLARGED SECTION A-A
NOTE 1



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

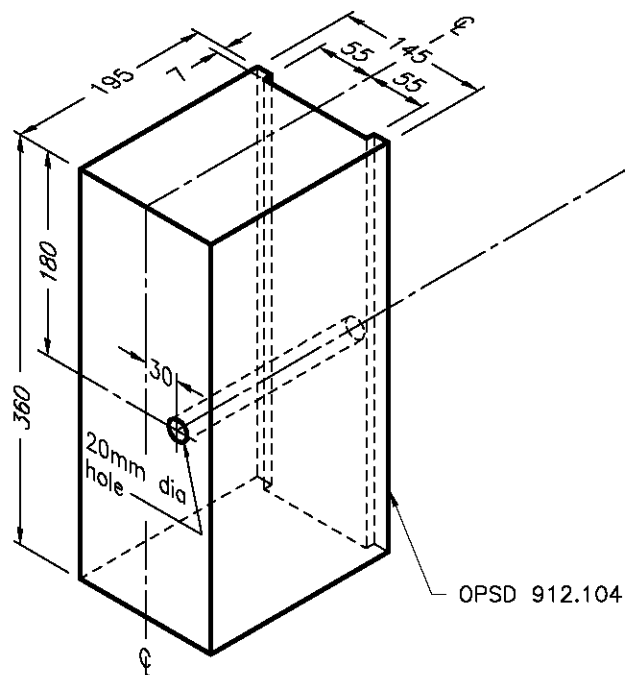
GUIDE RAIL SYSTEM, STEEL BEAM
TYPE M RAIL
COMPONENT

Apr 2016

Rev 0



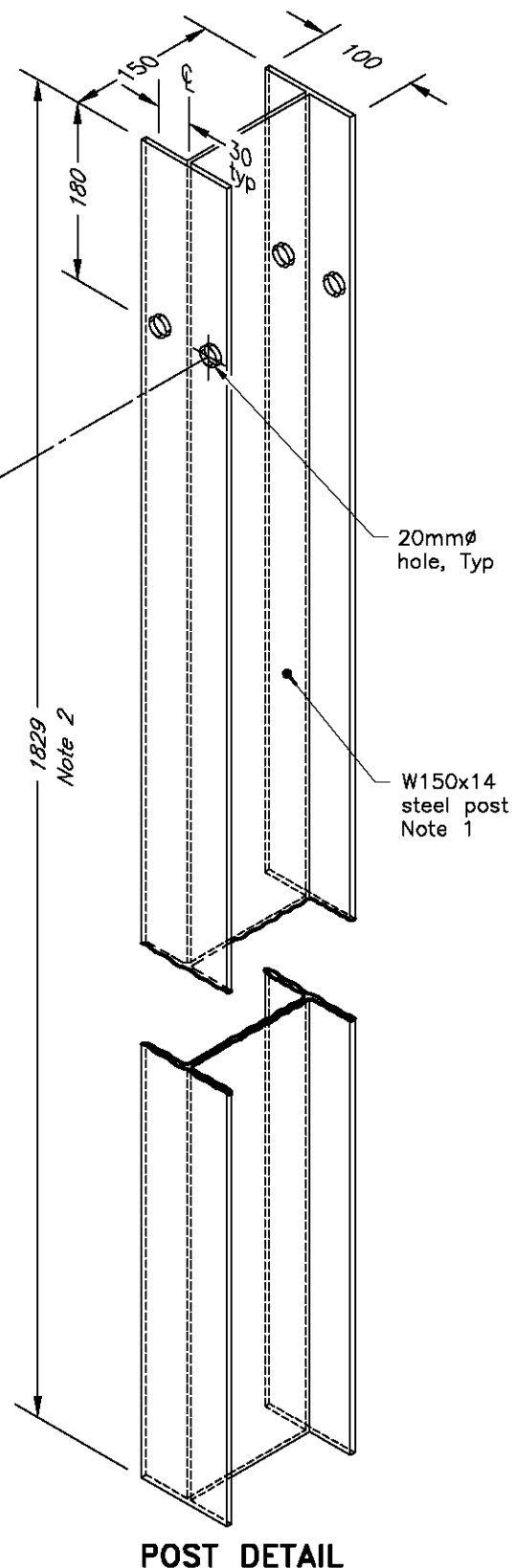
OPSD 912.125



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

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

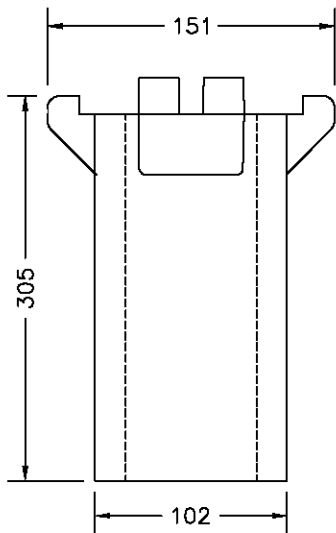
GUIDE RAIL SYSTEM, STEEL BEAM
**M20 STEEL POST
WITH OFFSET BLOCK**
COMPONENT

Apr 2016

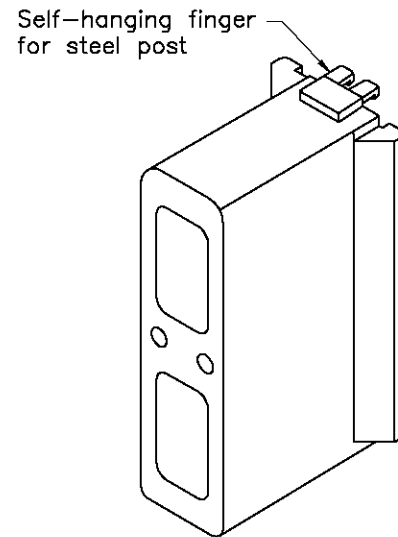
Rev 0



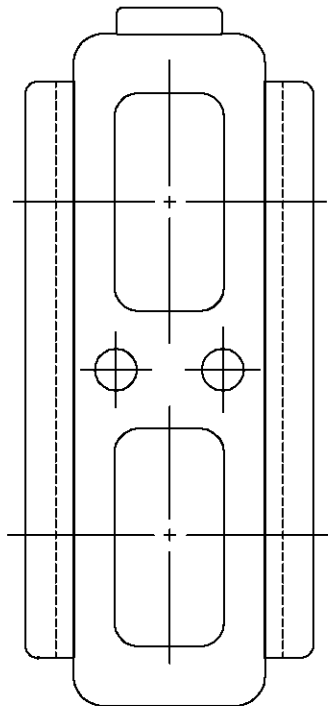
OPSD 912.127



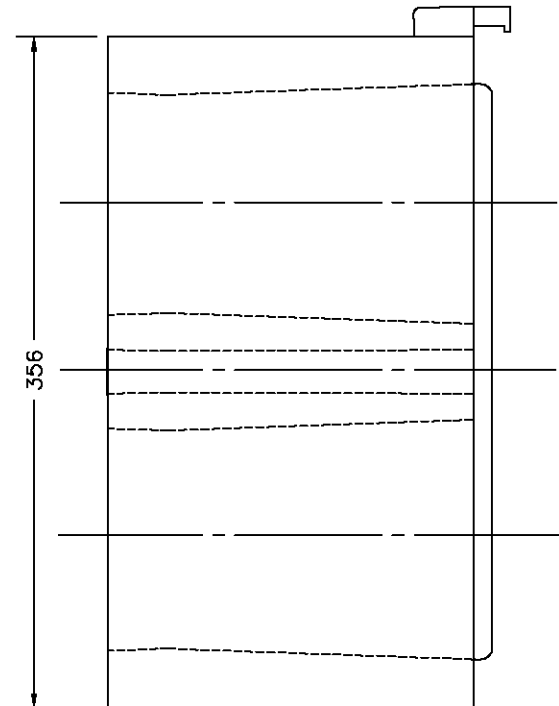
PLAN



ISOMETRIC



ELEVATION

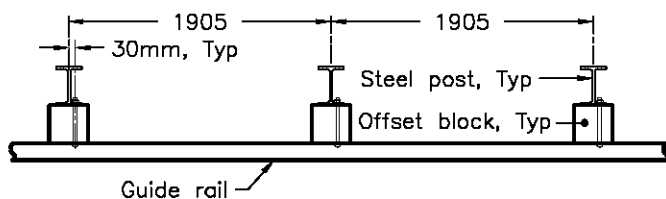


SECTION

NOTES:

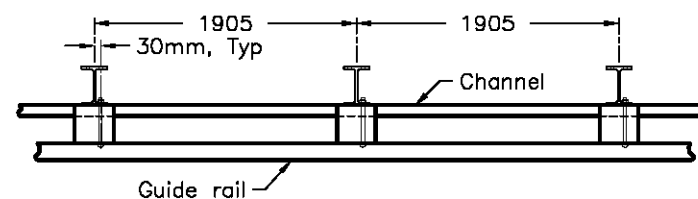
- A The component depicted is proprietary to Monroeville Industrial Molding.
 B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2016	Rev	0	
GUIDE RAIL SYSTEM, STEEL BEAM 30cm POLYMER OFFSET BLOCK – P-BLOCK COMPONENT					
	OPSD 912.129				

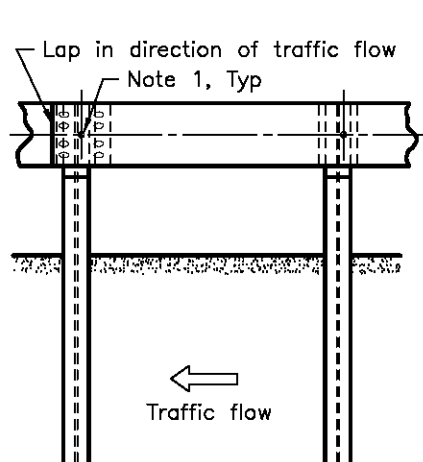


PLAN

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

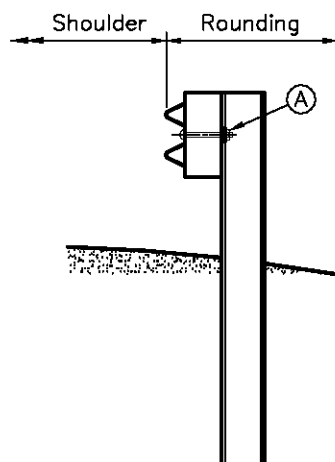


PLAN

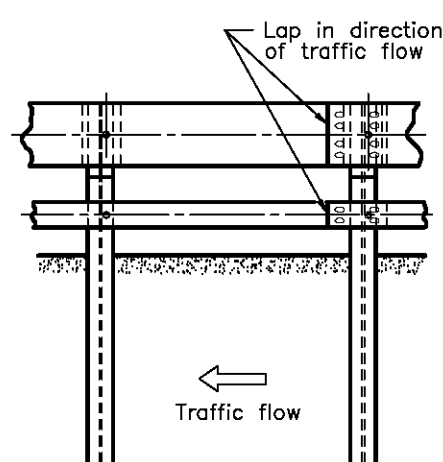


ELEVATION

SINGLE RAIL

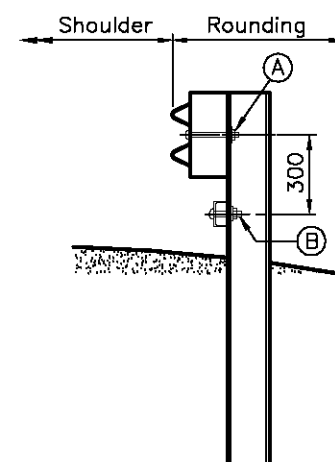


SIDE VIEW



ELEVATION

SINGLE RAIL WITH CHANNEL



SIDE VIEW

NOTES:

1 Washer shall not be installed at front face of rail. One bolt located at centre of steel beam guide rail.

A 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

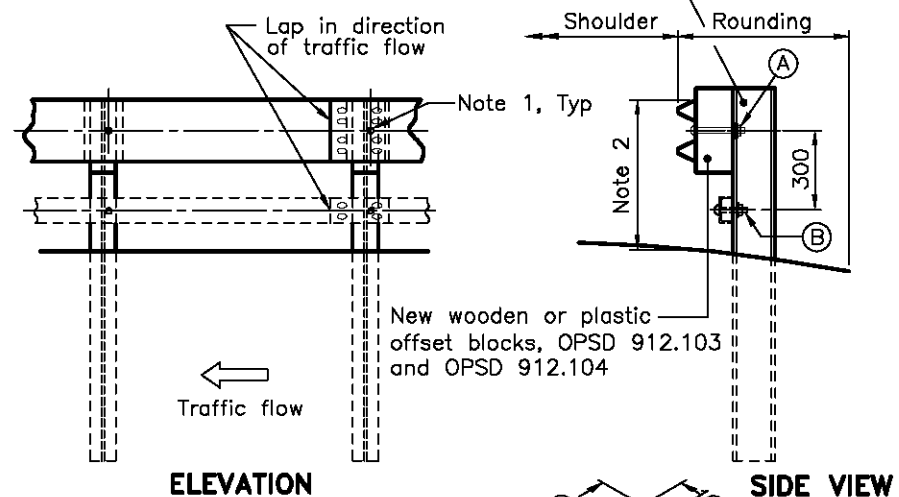
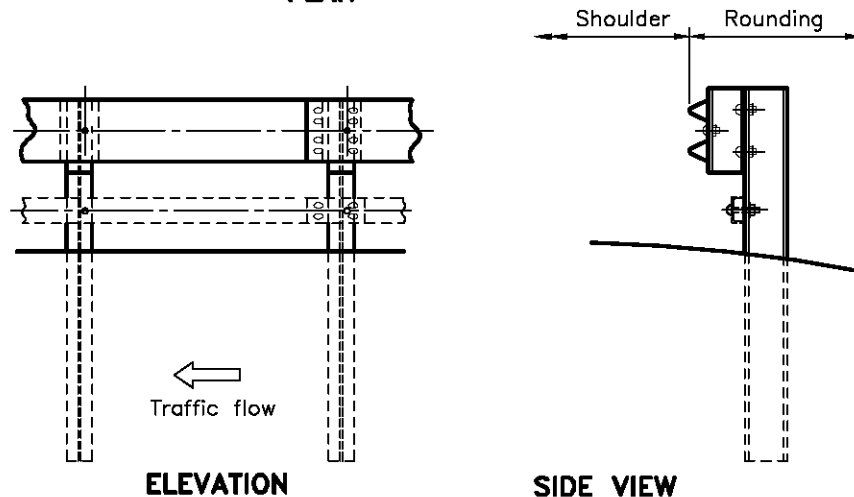
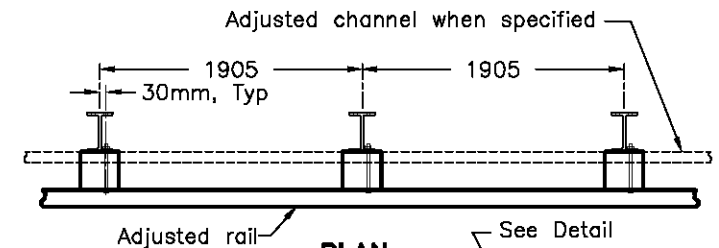
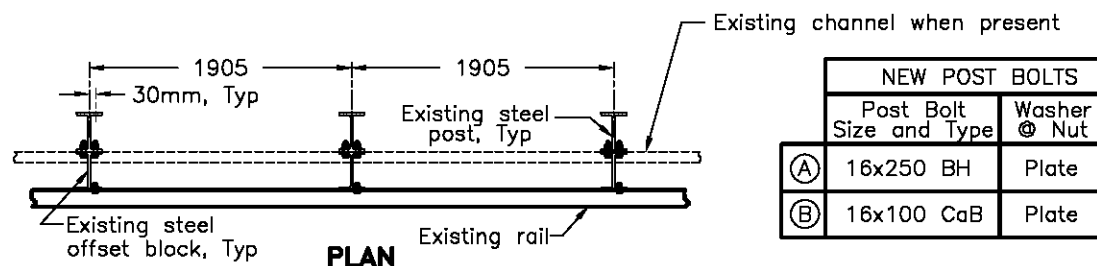
INSTALLATION – SINGLE RAIL

Nov 2016

Rev 3

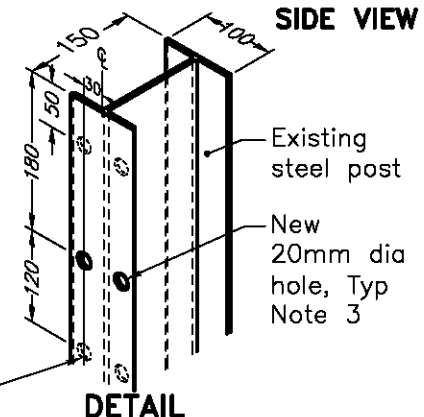


OPSD 912.130



ELEVATION
SIDE VIEW
EXISTING SINGLE RAIL
WITH STEEL OFFSET BLOCK

ELEVATION
SIDE VIEW
ADJUSTED SINGLE RAIL
WITH NEW WOODEN OR
PLASTIC OFFSET BLOCK



NOTES:

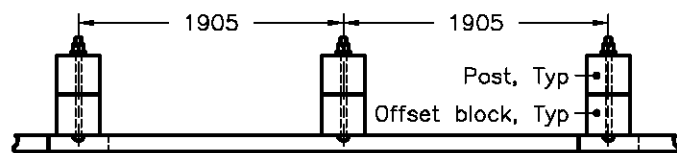
- 1 Washer shall not be installed at front face of rail. Type (A) bolt located at centre of steel beam guide rail.
 - 2 Steel beam guide rail mounting heights shall be as specified.
 - 3 One new hole shall be punched as required to attach new offset block. Punching of second new hole is acceptable. New holes shall be treated according to ASTM A780. New holes shall not be flame cut.
- A This OPSP shall be read in conjunction with OPSP 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 2016 Rev 1

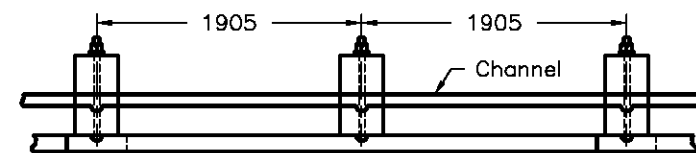


OPSP 912.135

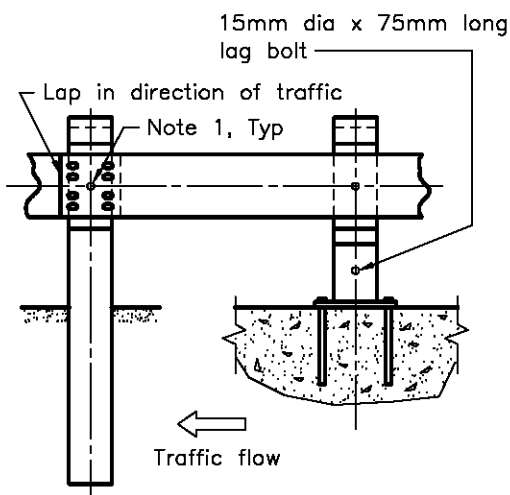


PLAN

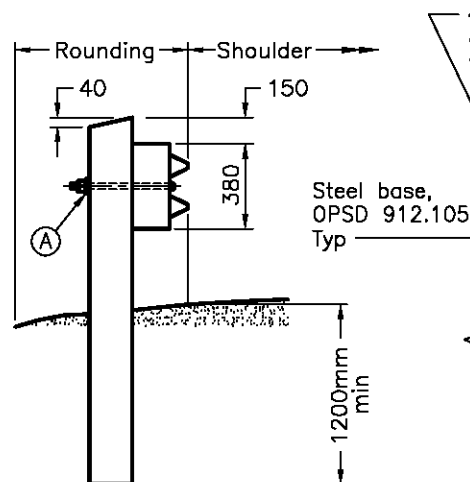
POST BOLT AND HOLE		
	Hole Dia	Post Bolt Size and Type
(A)	18	16x460 BH
(B)	18	16x310 CaB



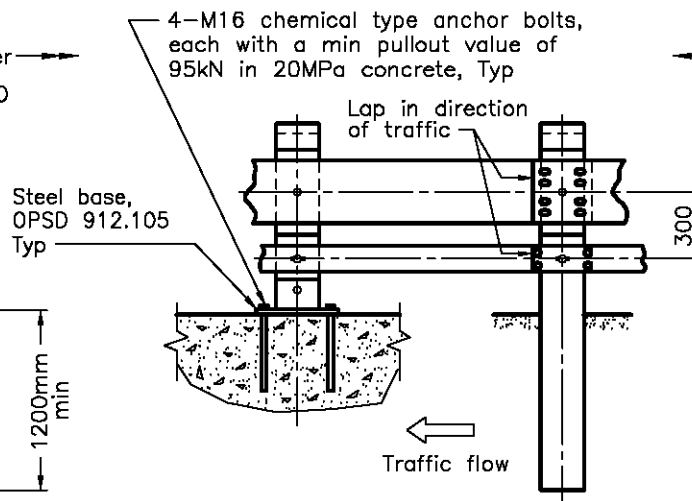
PLAN



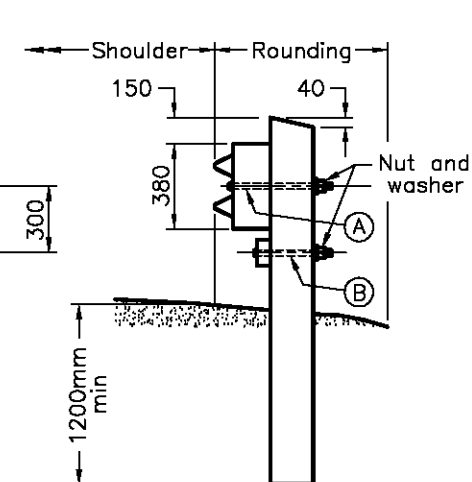
ELEVATION



SIDE VIEW



ELEVATION



SIDE VIEW

SINGLE RAIL

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.

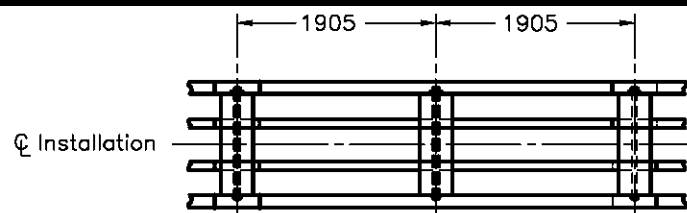
ONTARIO PROVINCIAL STANDARD DRAWING

**GUIDE RAIL SYSTEM, STEEL BEAM
WOODEN POST ASSEMBLY
INSTALLATION - SINGLE RAIL**

Nov 2010 Rev 2

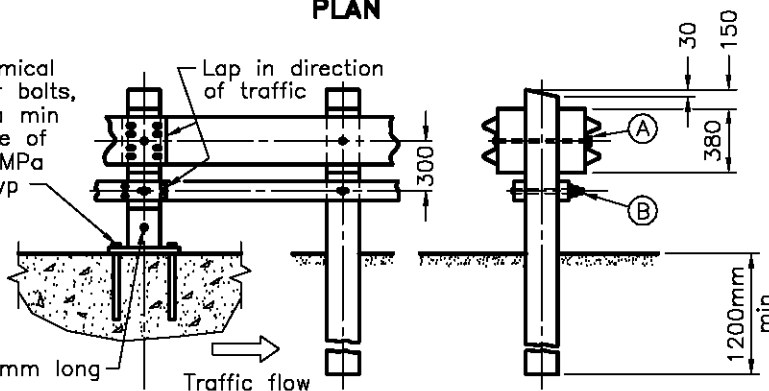


OPSD 912.140



PLAN

4-M16 chemical type anchor bolts, each with a min pullout value of 95kN in 20MPa concrete, Typ

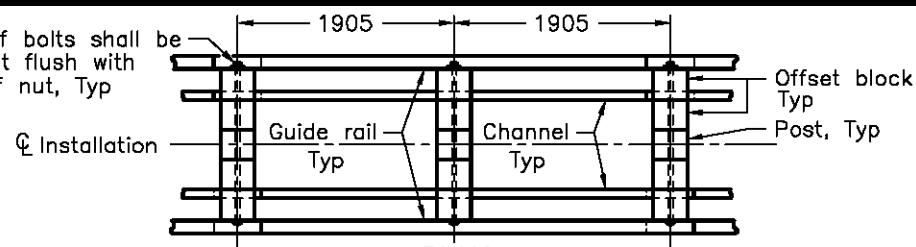


15mm dia x 75mm long lag bolt

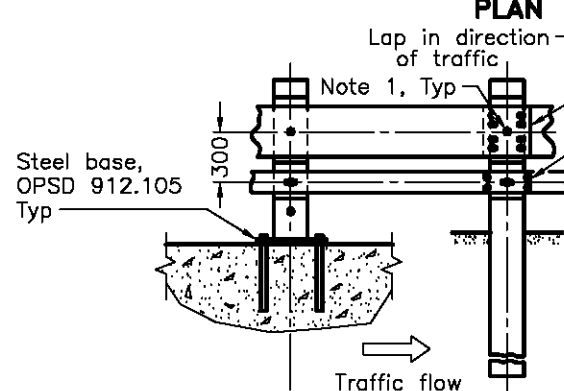
ELEVATION
DOUBLE RAIL WITH CHANNEL

SIDE VIEW

Ends of bolts shall be saw cut flush with face of nut, Typ



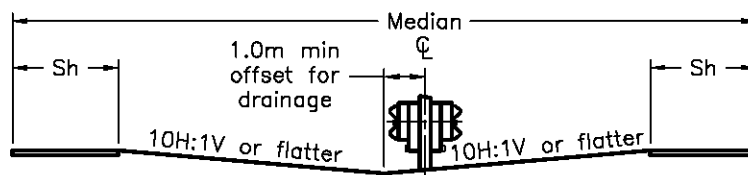
PLAN



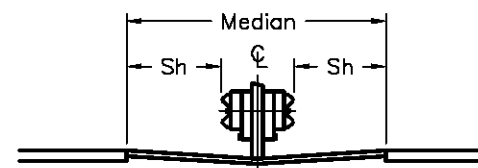
Steel base, OPSD 912.105 Typ

ELEVATION
DOUBLE OFFSET RAIL WITH CHANNEL

SIDE VIEW



WIDE MEDIAN



NARROW MEDIAN

NOTES:

1 Washer shall not be installed at front face of rail. One bolt located at centre of steel beam guide rail.

A For double rail with channel, wooden posts and offset blocks shall be 190x190mm. Tops to have 25mm chamfer.

B For double offset rail with channel, wooden posts shall be 190x190mm and offset blocks shall be 190x140mm. Tops to have 25mm chamfer.

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

D This OPSD to be read in conjunction with OPSD 912.101 and 912.102.

E All dimensions are in millimetres unless otherwise shown.

POST BOLT AND HOLE		
	Hole Dia	Post Bolt Size and Type
(A)	18	16x660 BH
(B)	18	16x355 CaB
(C)	18	16x860 BH
(D)	18	16x660 CaB

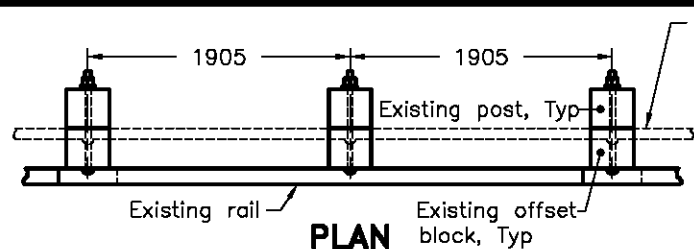
ONTARIO PROVINCIAL STANDARD DRAWING

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

Nov 2010 Rev 2

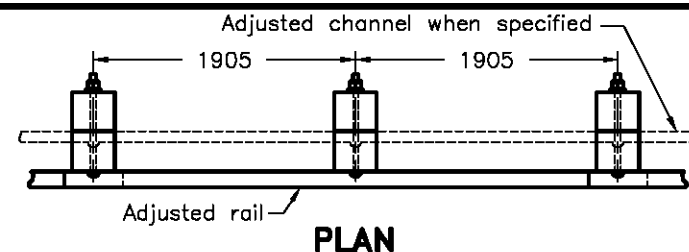


OPSD 912.141

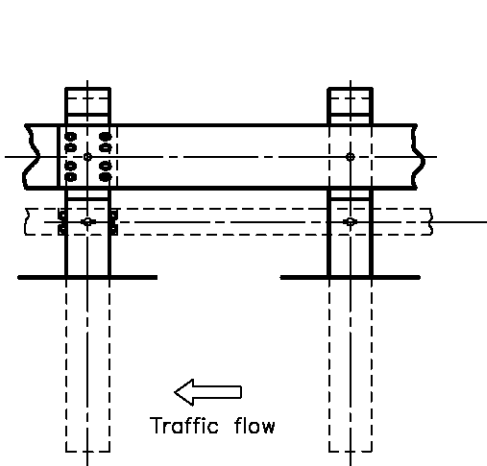


PLAN

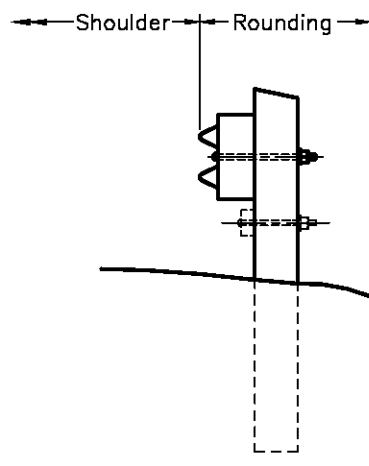
NEW POST BOLT AND HOLE		
	Hole Dia	Post Bolt Size and Type
(A)	18	16x460 BH
(B)	18	16x310 CaB



PLAN

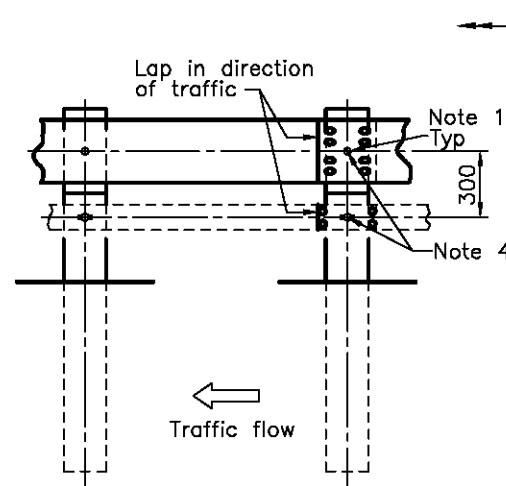


ELEVATION

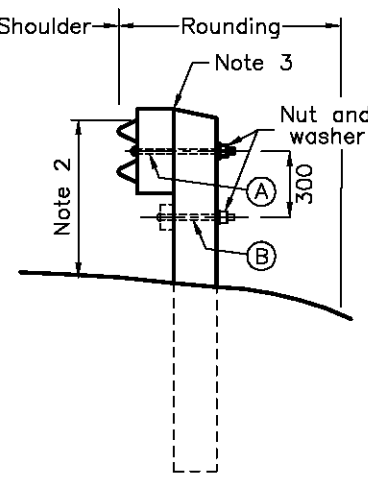


SIDE VIEW

EXISTING SINGLE RAIL



ELEVATION



SIDE VIEW

ADJUSTED SINGLE RAIL

NOTES:

- 1 Washer shall not be installed at front face of rail. Type (A) 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

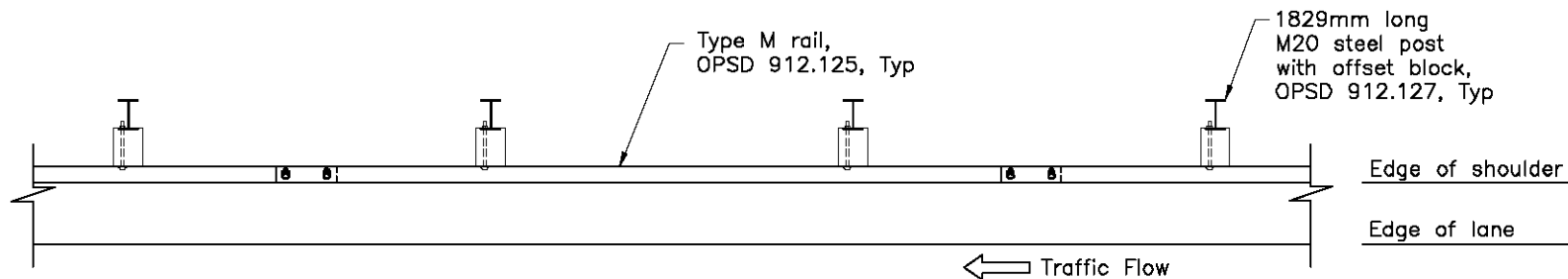
GUIDE RAIL SYSTEM, STEEL BEAM
WOODEN POST ASSEMBLY
ADJUSTMENT – SINGLE RAIL

Nov 2016

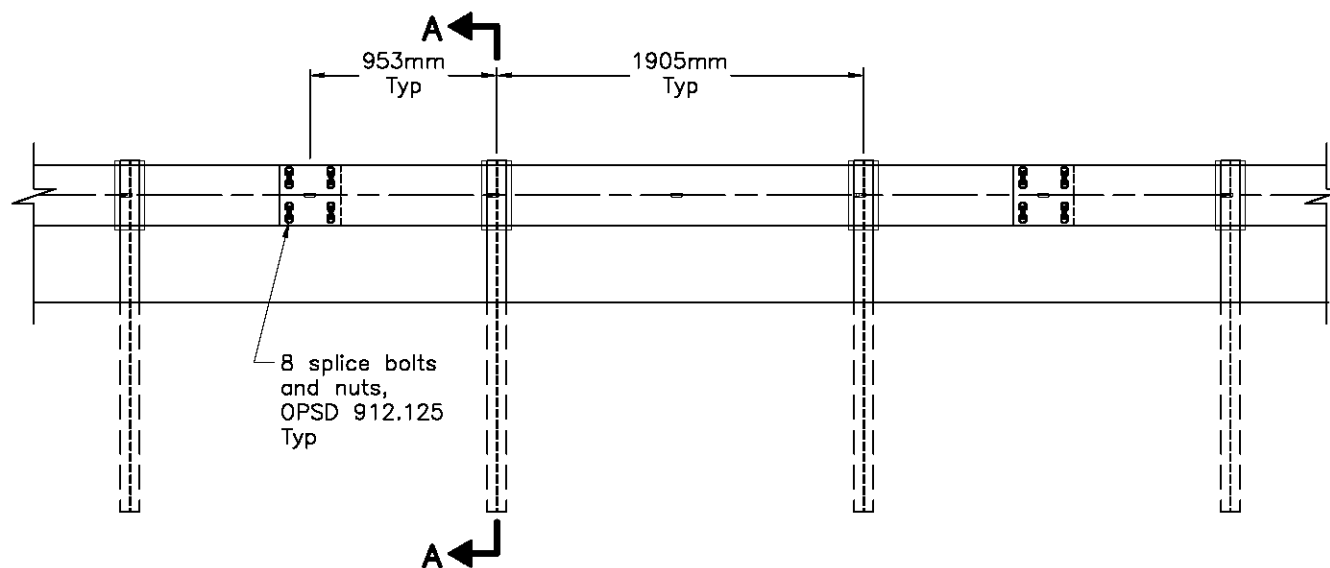
Rev 1



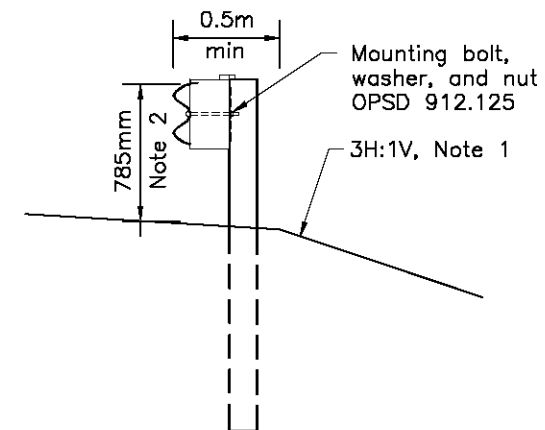
OPSD 912.145



PLAN



ELEVATION



SECTION A-A

NOTES:

- 1 Slope shall be flatter when specified.
- 2 Mounting height to top of steel beam shall be measured vertically at face of rail.
- A System configuration meets AASHTO MASH TL-3.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

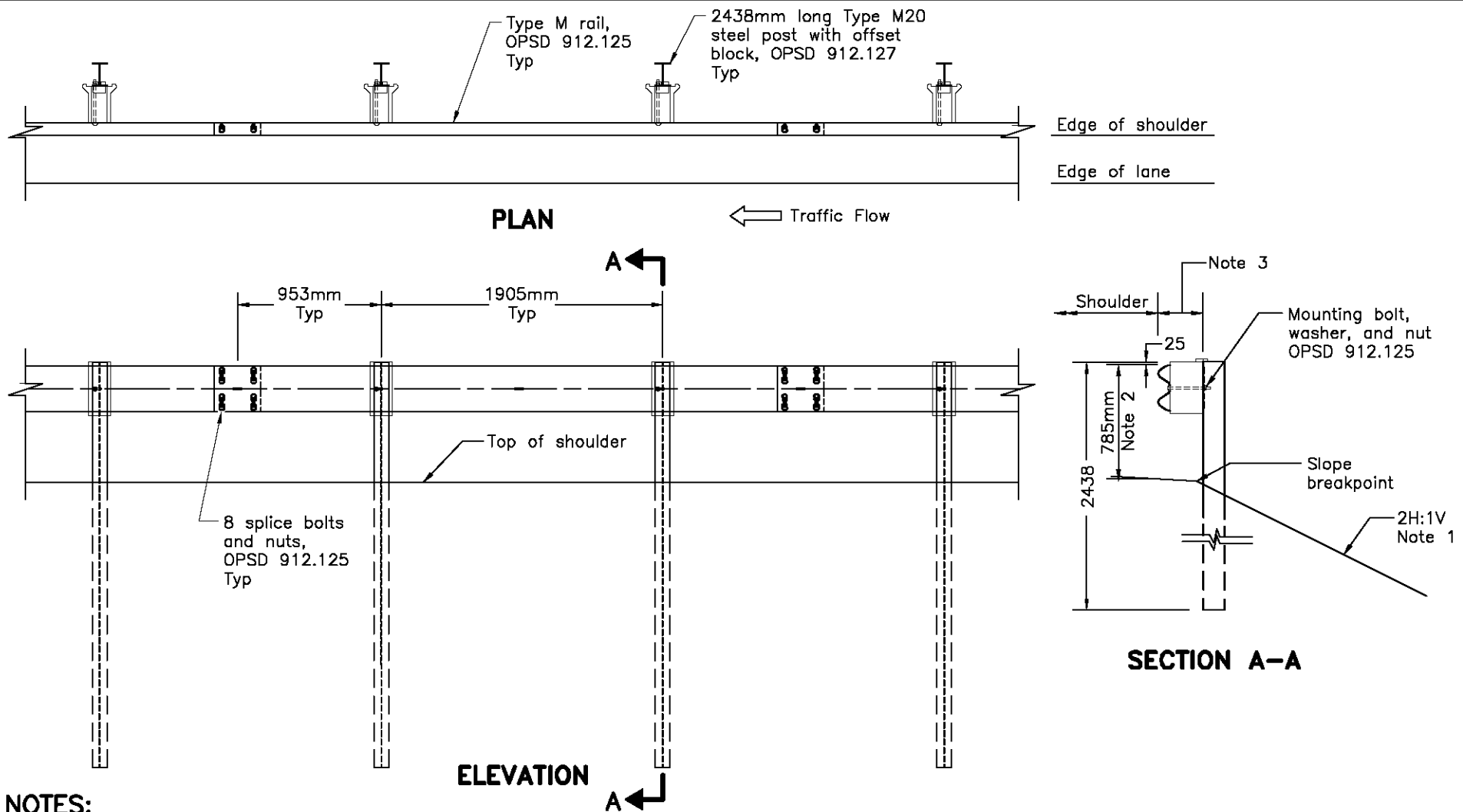
GUIDE RAIL SYSTEM, STEEL BEAM
TYPE M20
INSTALLATION

Nov 2016

Rev 0



OPSD 912.185



NOTES:

- 1 Slope shall be flatter when specified.
 - 2 Mounting height to top of steel beam rail shall be measured vertically at face of rail.
 - 3 Offset from edge of shoulder to traffic side face of post shall be 280mm.
- A System configuration meets AASHTO MASH TL-3.
- B All dimensions are in millimetres unless otherwise shown.

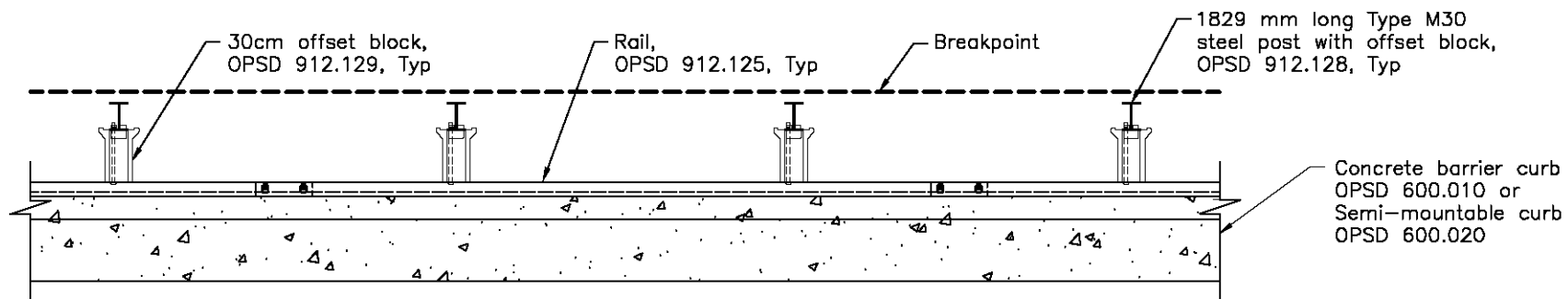
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, STEEL BEAM
TYPE M20 - ADJACENT TO 2H:1V SLOPE
INSTALLATION - RAIL AT SHOULDER

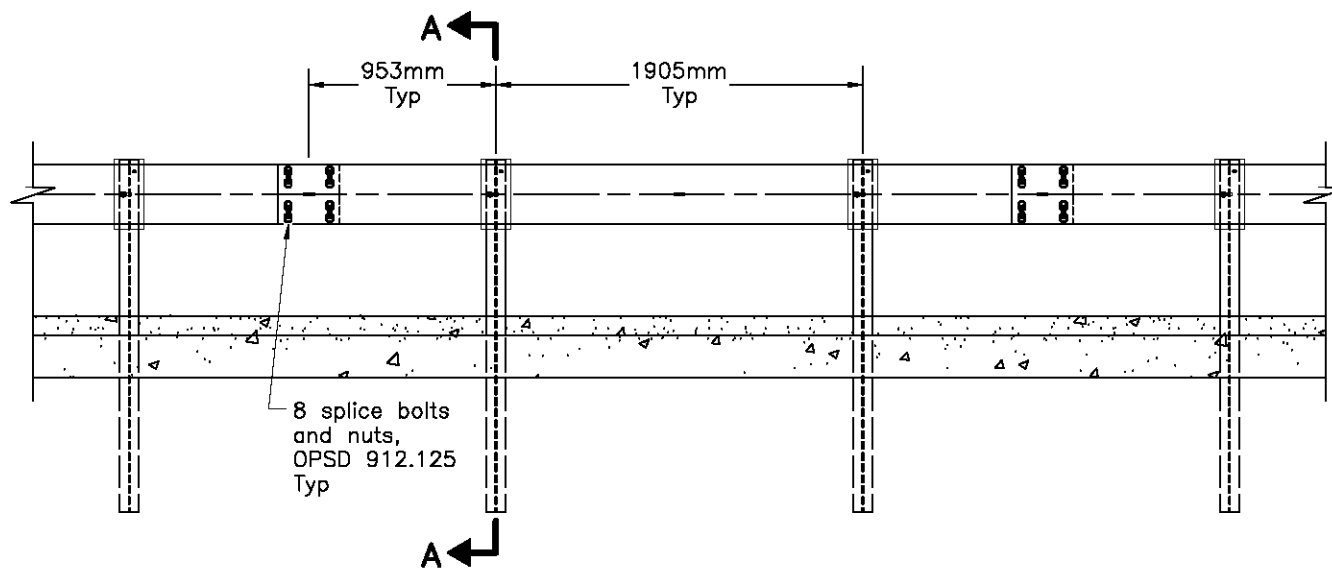
Nov 2016 Rev 0



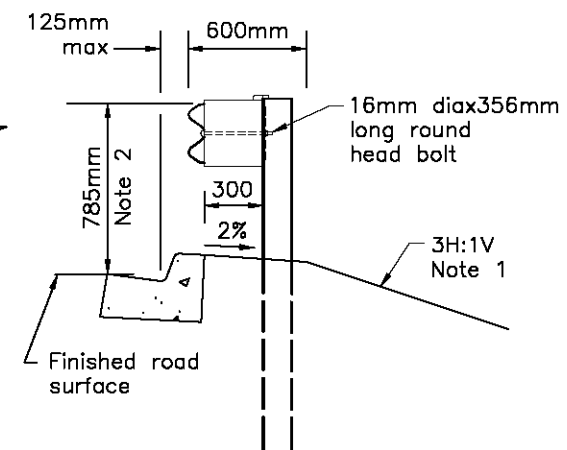
OPSD 912.186



PLAN



ELEVATION

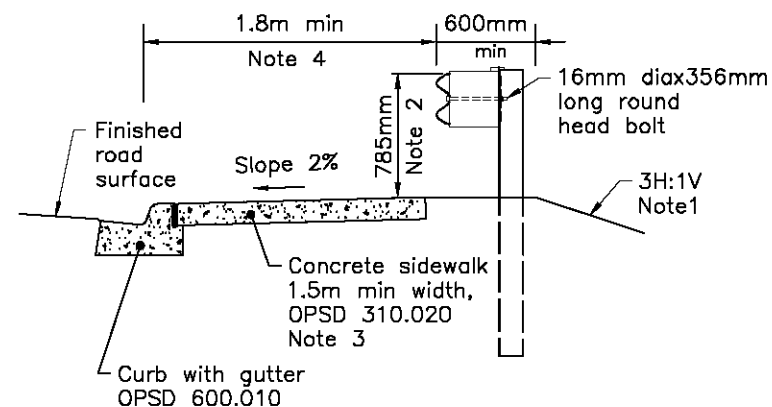
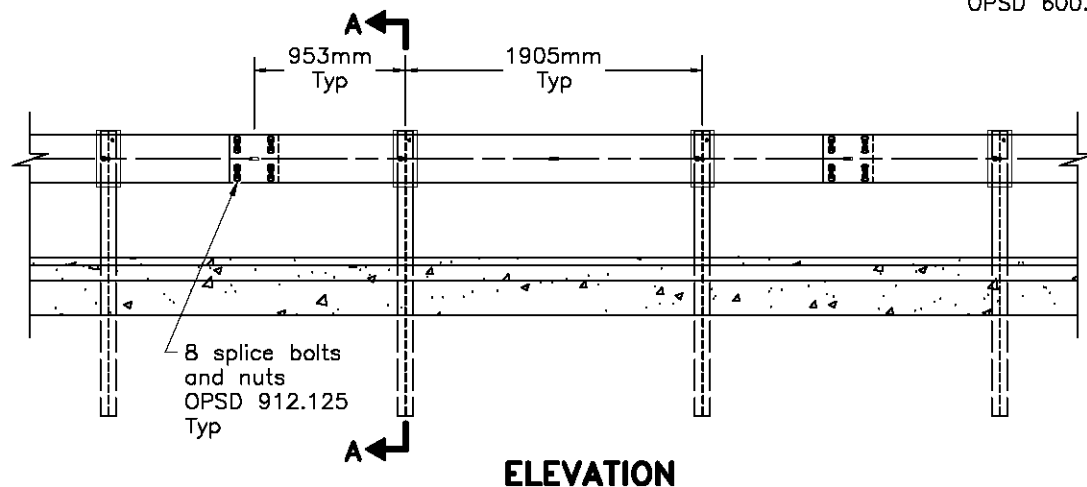
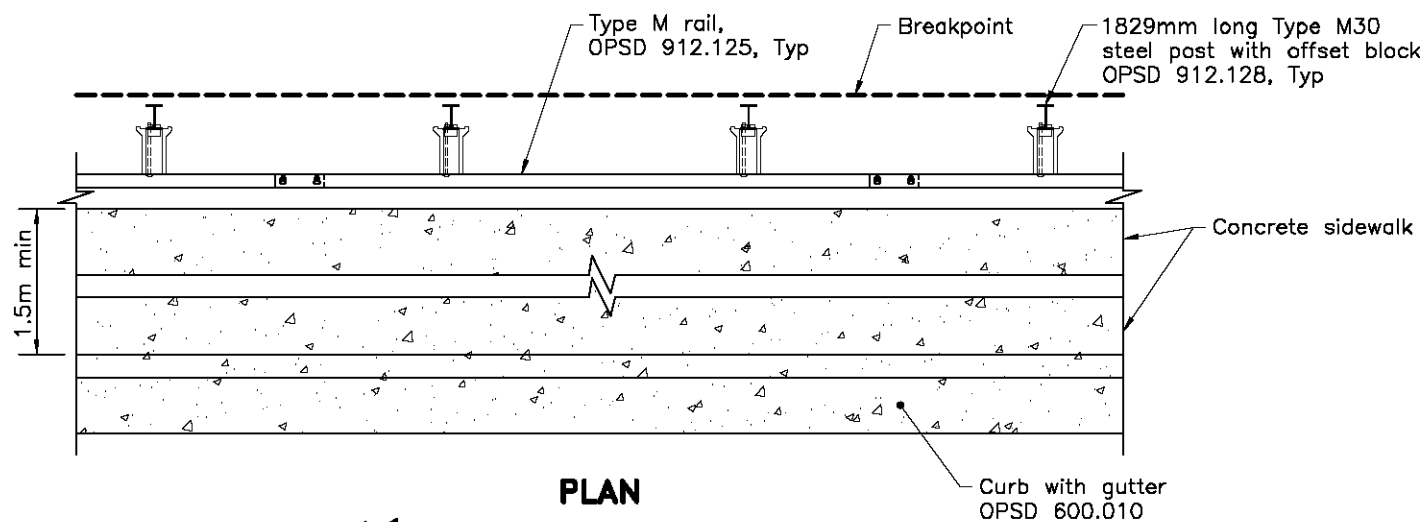


SECTION A-A

NOTES:

- 1 Slope shall be flatter when specified.
 - 2 Mounting height to top of steel beam rail shall be measured vertically at the edge of pavement.
- A System configuration meets AASHTO MASH TL-3.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2016	Rev	0	
GUIDE RAIL SYSTEM, STEEL BEAM TYPE M30 – ADJACENT TO CONCRETE CURB INSTALLATION					
		OPSD 912.188			



NOTES:

- 1 Slope shall be flatter when specified.
- 2 Mounting height to top of steel beam rail shall be measured vertically at the edge of pavement.
- 3 Wider sidewalk when specified.
- 4 2.1m minimum when 1.8m wide sidewalk specified, 2.3m when 2.0m wide sidewalk specified.
- A System configuration meets AASHTO MASH TL-2.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

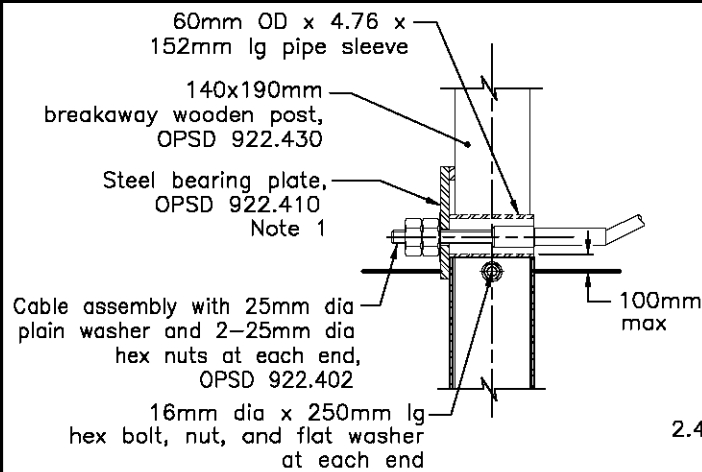
GUIDE RAIL SYSTEM, STEEL BEAM
TYPE M30 - ADJACENT TO SIDEWALK
INSTALLATION

Nov 2016

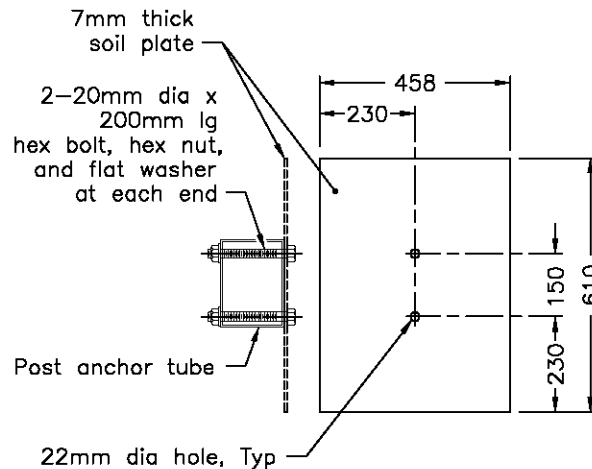
Rev 0



OPSD 912.189



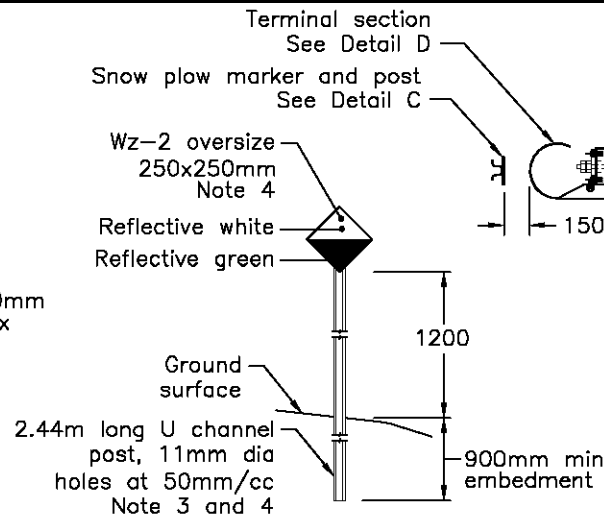
DETAIL A



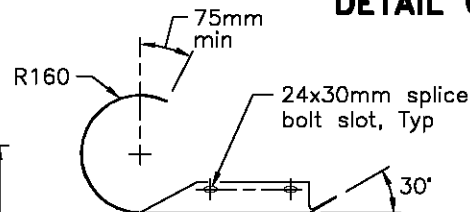
DETAIL B

NOTES:

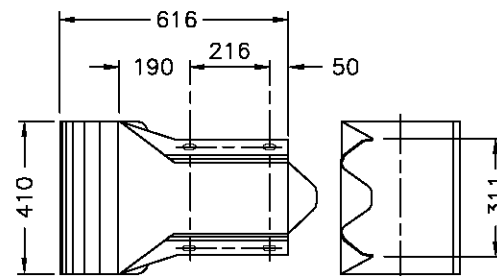
- 1 Steel bearing plate shall be secured against rotation using nails into post.
- 2 When channel specified, channel shall be terminated at post ③.
- 3 Minimum weight of post shall be 4.46kg/m.
- 4 Post and mounting hardware shall be hot dip galvanized according to CSA G164.
- A Steel beam guide rail mounting heights shall be as specified.
- B All dimensions are in millimetres unless otherwise shown.



DETAIL C



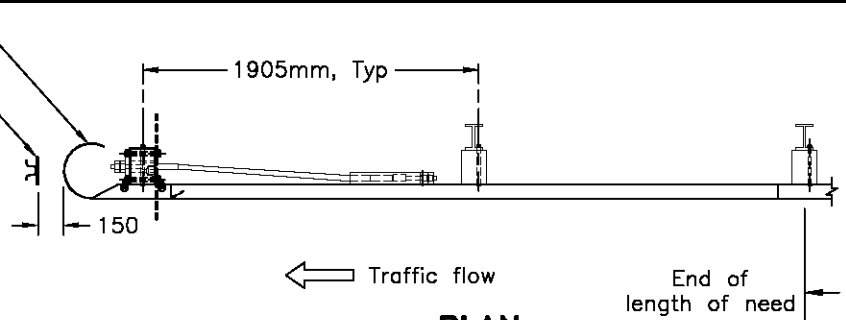
PLAN



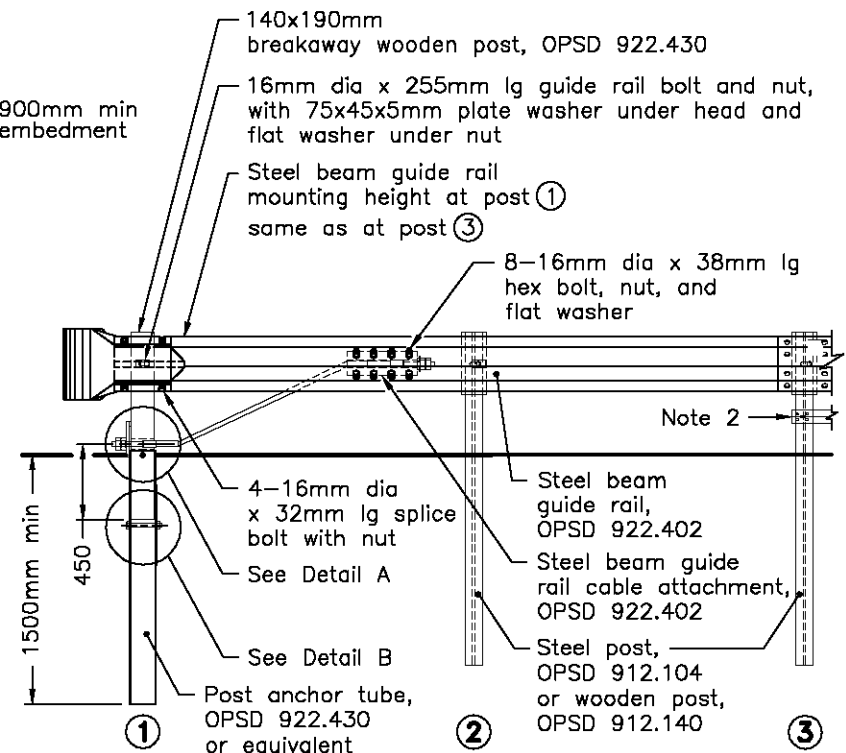
ELEVATION

SIDE VIEW

DETAIL D



PLAN



ELEVATION

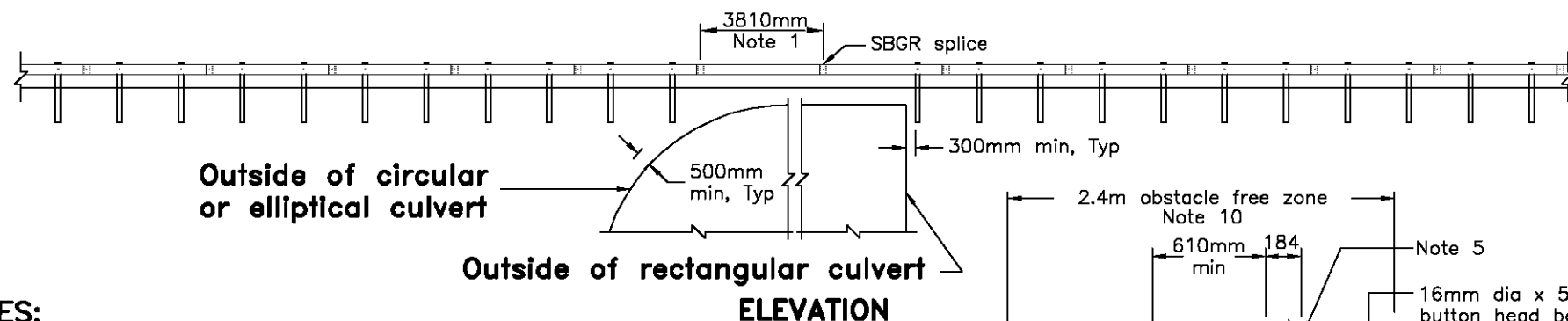
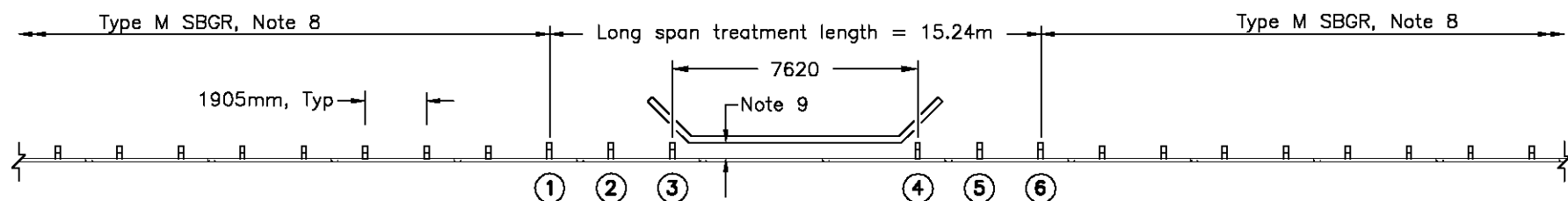
ONTARIO PROVINCIAL STANDARD DRAWING

**GUIDE RAIL SYSTEM, STEEL BEAM
LEAVING END TREATMENT
INSTALLATION**

Nov 2010 Rev 1

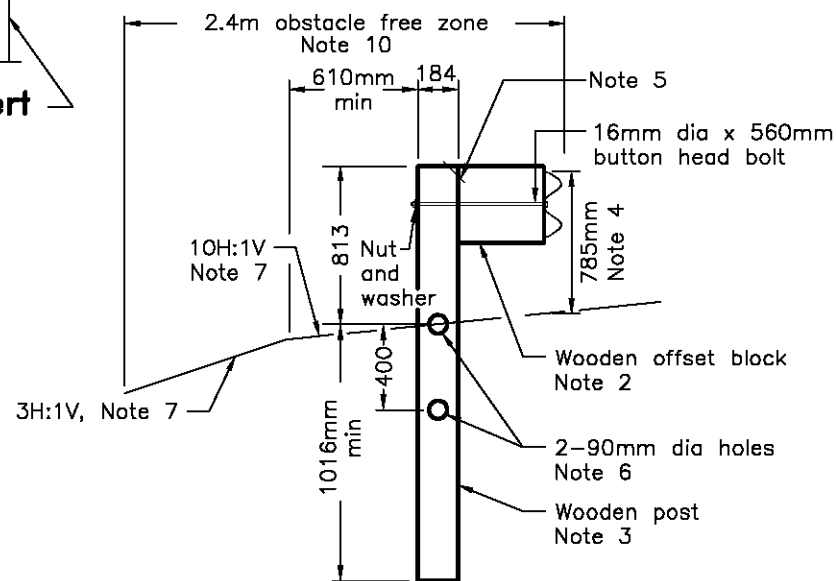
OPSD 912.235





NOTES:

- 1 Type M rail, mounting hardware, and splice hardware shall be according to OPSD 912.125.
 - 2 Wooden offset block dressed dimensions shall be 140mm wide x 360mm long x 305mm deep.
 - 3 Wooden posts dressed dimensions shall be 140mm wide x 1829mm long x 184mm deep.
 - 4 Mounting height to top of steel beam rail shall be measured vertically at face of rail.
 - 5 Drive 16D double head nail through post and offset block.
 - 6 The centre of the top hole shall be in line with the ground surface.
 - 7 Slope shall be flatter when specified.
 - 8 Type M SBGR includes Type M20 and Type M30. The minimum length of Type M SBGR to be installed upstream and downstream of the long span treatment shall be 19.05m.
 - 9 Distance from face of rail to inside face of culvert headwall shall not be less than 900mm.
 - 10 Obstacles shall not protrude more than 50mm above the finished grade.
- A System configuration meets AASHTO MASH TL-3.
- B All dimensions are in millimetres unless otherwise shown.



POSTS ① TO ⑥

ONTARIO PROVINCIAL STANDARD DRAWING

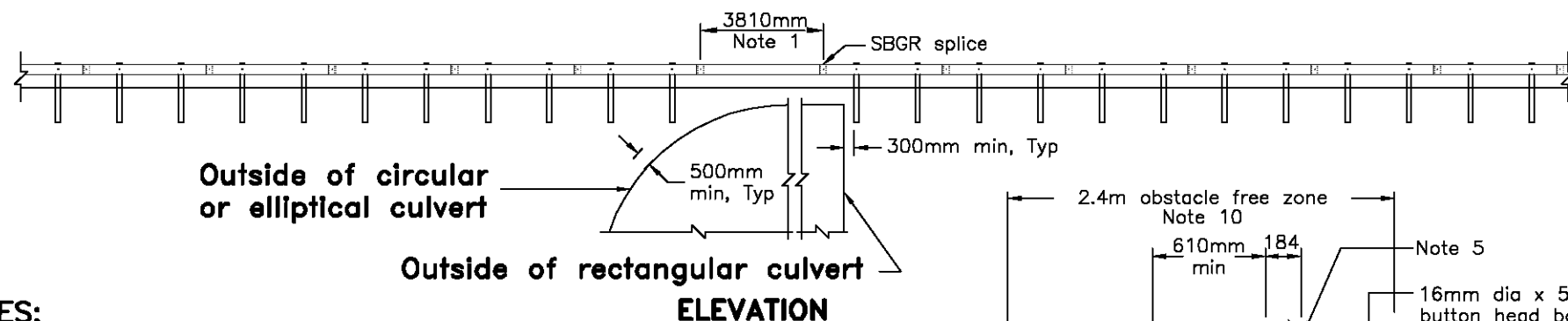
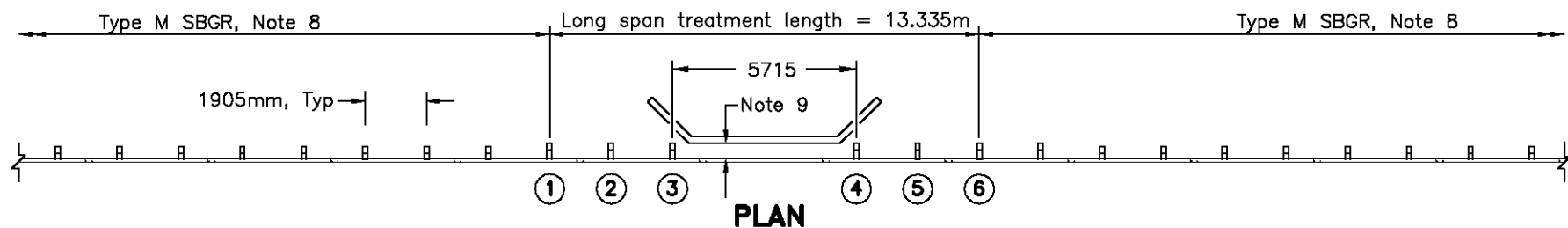
GUIDE RAIL SYSTEM, STEEL BEAM
TYPE M - 7.62m LONG SPAN TREATMENT
INSTALLATION

Nov 2016

Rev 0

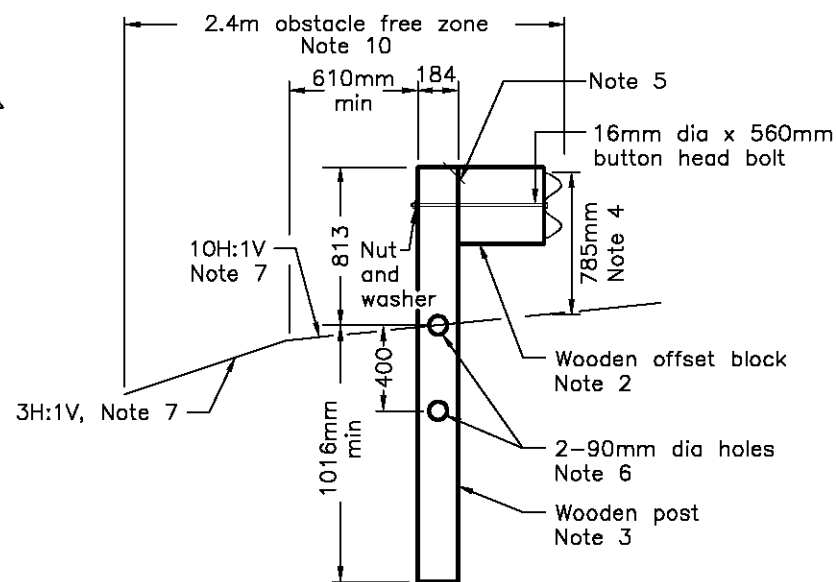


OPSD 912.245



NOTES:

- 1 Type M rail, mounting hardware, and splice hardware shall be according to OPSD 912.125.
 - 2 Wooden offset block dressed dimensions shall be 140mm wide x 360mm long x 305mm deep.
 - 3 Wooden posts dressed dimensions shall be 140mm wide x 1829mm long x 184mm deep.
 - 4 Mounting height to top of steel beam rail shall be measured vertically at face of rail.
 - 5 Drive 16D double head nail through post and offset block.
 - 6 The centre of the top hole shall be in line with the ground surface.
 - 7 Slope shall be flatter when specified.
 - 8 Type M SBGR includes Type M20 and Type M30. The minimum length of Type M SBGR to be installed upstream and downstream of the long span treatment shall be 19.05m.
 - 9 Distance from face of rail to inside face of culvert headwall shall not be less than 900mm.
 - 10 Obstacles shall not protrude more than 50mm above the finished grade.
- A System configuration meets AASHTO MASH TL-3.
- B All dimensions are in millimetres unless otherwise shown.



POSTS ① TO ⑥

ONTARIO PROVINCIAL STANDARD DRAWING

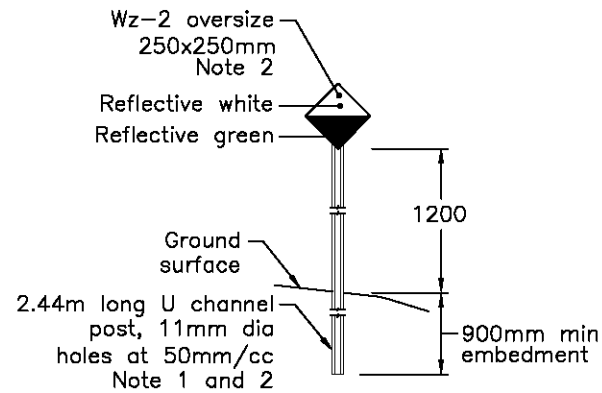
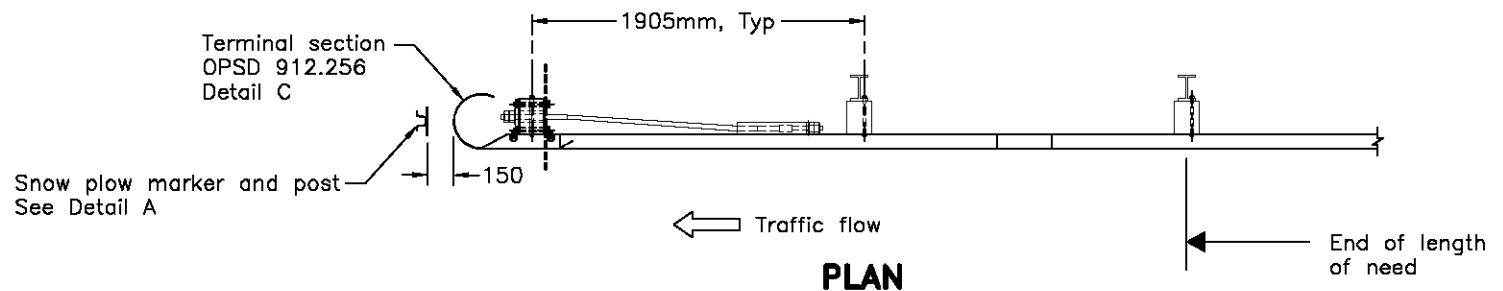
GUIDE RAIL SYSTEM, STEEL BEAM
TYPE M - 5.715m LONG SPAN TREATMENT
INSTALLATION

Nov 2016

Rev 0

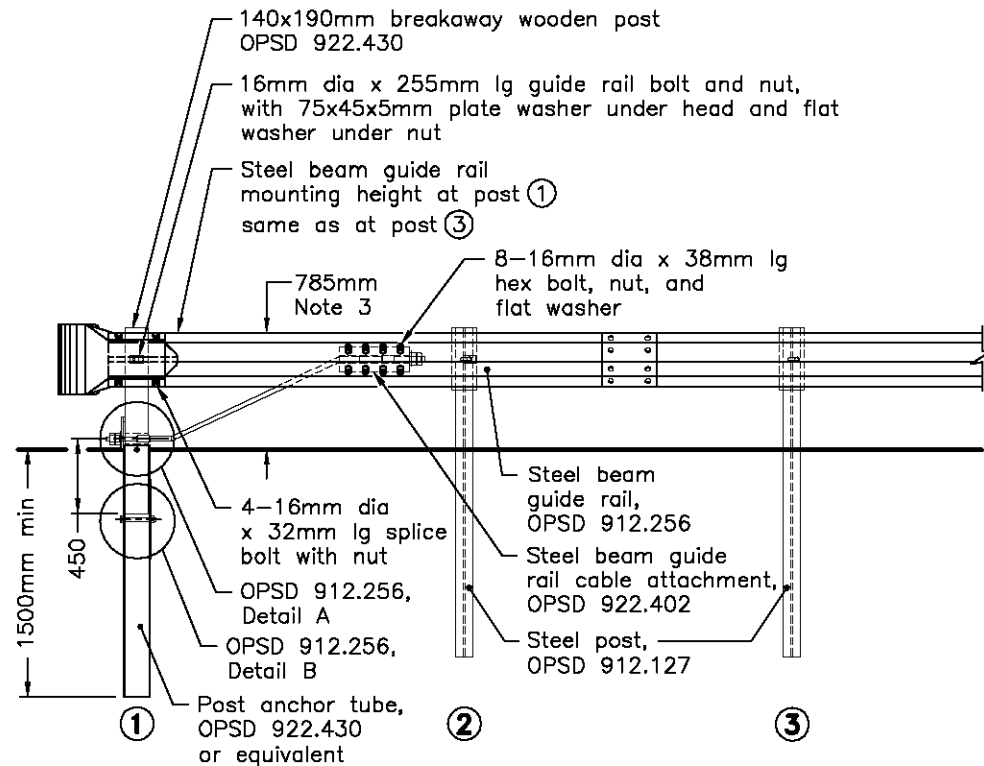


OPSD 912.246



NOTES:

- 1 Minimum weight of post shall be 4.46kg/m.
- 2 Post and mounting hardware shall be hot dip galvanized after fabrication according to ASTM A 123.
- 3 Mounting height to top of steel beam shall be measured vertically at face of rail
- A Splice and mounting hardware shall be according to OPSD 912.125.
- B This OPSD shall be read in conjunction with OPSD 922.430, 912.127, and 912.256.
- C Steel beam guide rail mounting heights shall be as specified.
- D All dimensions are in millimetres unless otherwise shown.



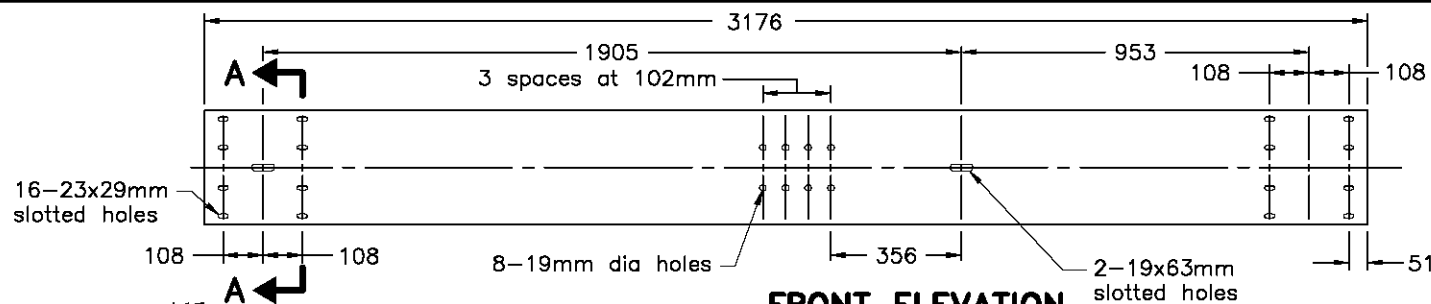
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, STEEL BEAM
TYPE M20 AND M30-LEAVING END
TREATMENT-INSTALLATION

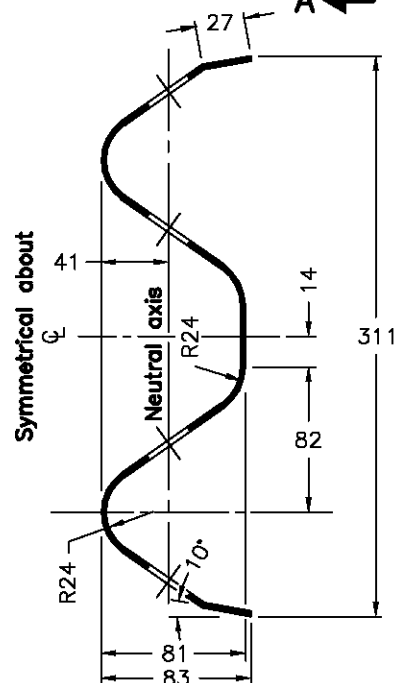
Nov 2016 Rev 0



OPSD 912.255



FRONT ELEVATION

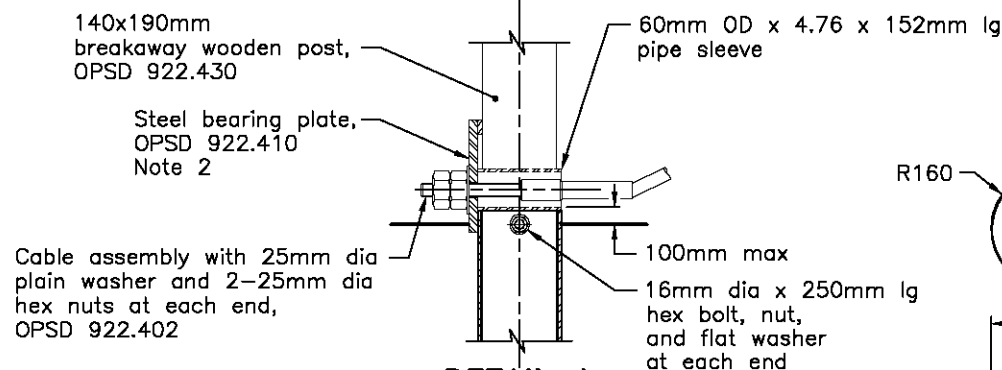


ENLARGED SECTION A-A

Note 1

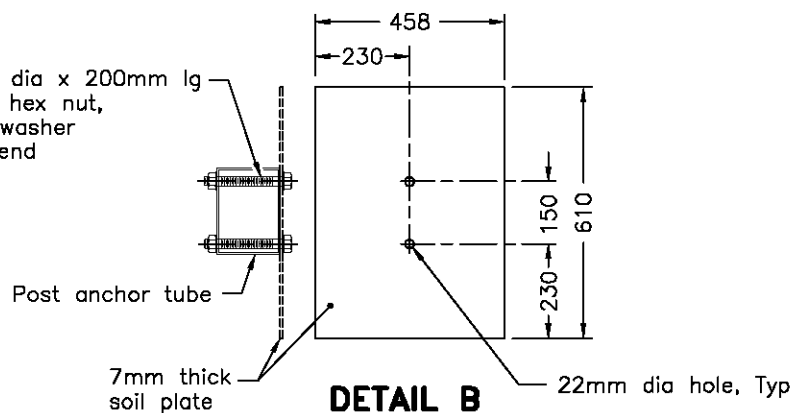
NOTES:

- 1 Base metal thickness of rail shall be 2.67mm nominal and 2.44mm minimum.
- 2 Steel bearing plate shall be secured against rotation using nails into post.
- A All dimensions subject to manufacturing tolerances unless otherwise indicated.
- B All dimensions are in millimetres unless otherwise shown.

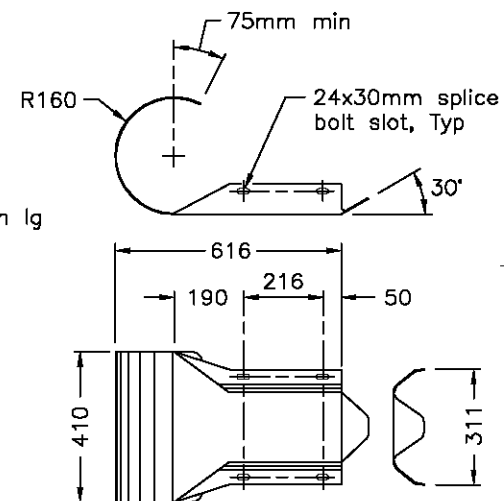


DETAIL A

2-20mm dia x 200mm lg hex bolt, hex nut, and flat washer at each end



DETAIL B



DETAIL C

ONTARIO PROVINCIAL STANDARD DRAWING

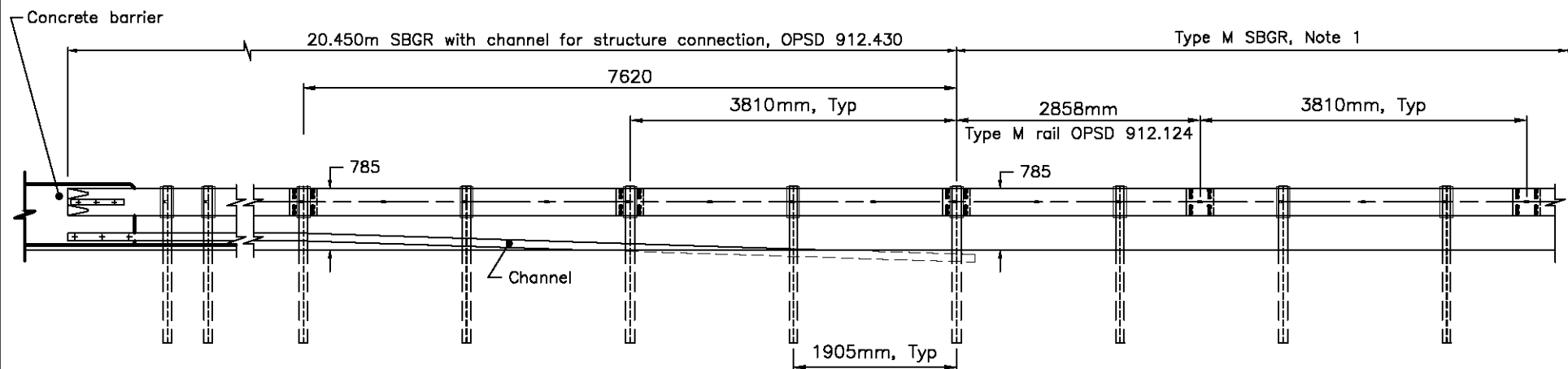
**GUIDE RAIL SYSTEM, STEEL BEAM
TYPE M LEAVING END TREATMENT
COMPONENT - RAIL, TERMINAL SECTION,
AND POST ANCHOR DETAIL**

Nov 2016

Rev 0



OPSD 912.256



ELEVATION

NOTES:

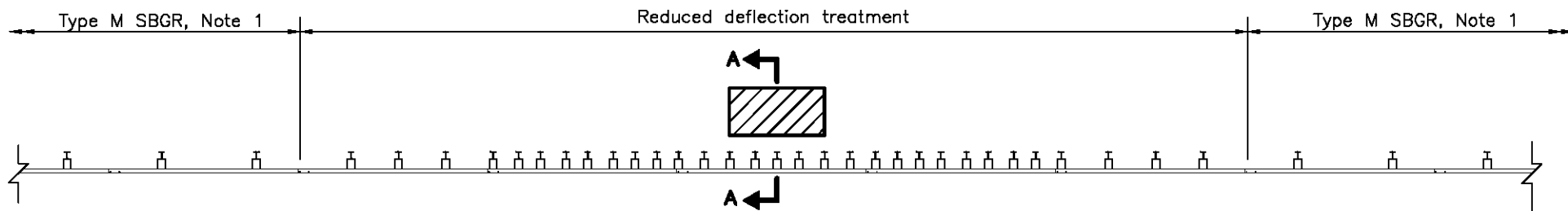
- 1 Type M SBGR includes Type M20 and Type M30.
- A Mounting height to top of steel beam shall be measured vertically at face of rail.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	
GUIDE RAIL SYSTEM, STEEL BEAM TRANSITION FROM TYPE M TO STEEL BEAM GUIDE RAIL WITH CHANNEL FOR STRUCTURE CONNECTION-INSTALLATION	

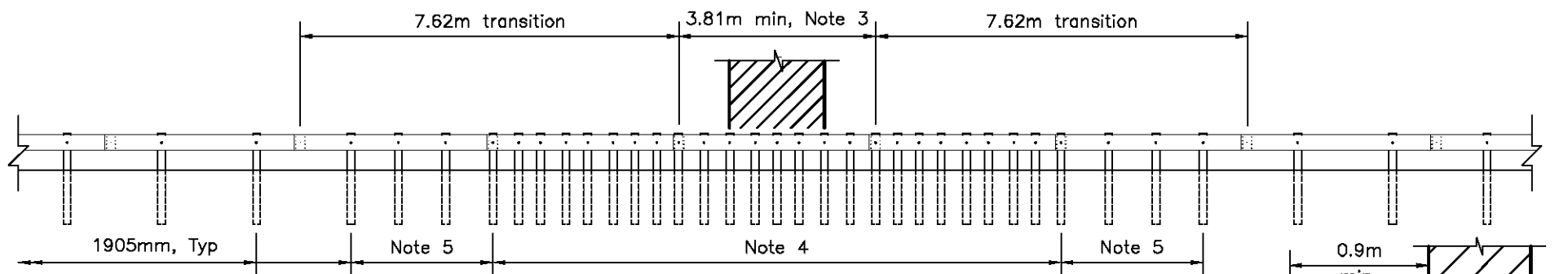
Nov 2016 Rev 0



OPSD 912.315



PLAN



ELEVATION

Rail and mounting bolts,
OPSD 912.123

1829mm long
M20 Steel post
with offset block,
OPSD 912.127, Typ

3H:1V, Note 6

SECTION A-A

NOTES:

- 1 Type M SBGR includes Type M20 and Type M30.
 - 2 Mounting height to top of steel beam shall be measured vertically at face of rail.
 - 3 When rigid obstacle extends beyond centre 3.81m length of rail, additional 3.81m lengths of rail with posts spaced at 476mm c/c shall be provided between 7.62m long transitions.
 - 4 Post spacing at 476mm c/c.
 - 5 Post spacing at 952mm c/c.
 - 6 Slope shall be flatter when specified.
- A Mounting height to top of steel beam rail shall be measured vertically at face of rail.
- B System configuration meets AASHTO MASH TL-3.
- C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

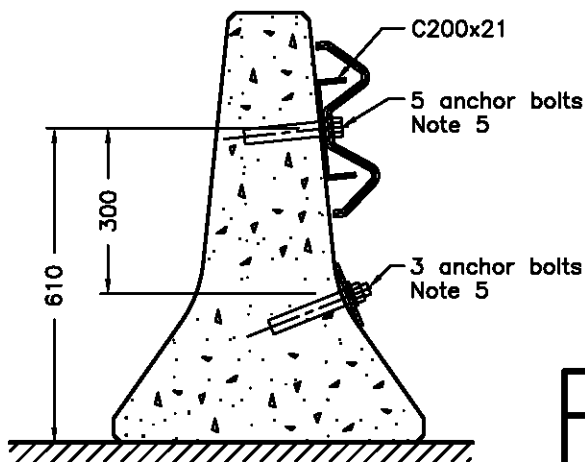
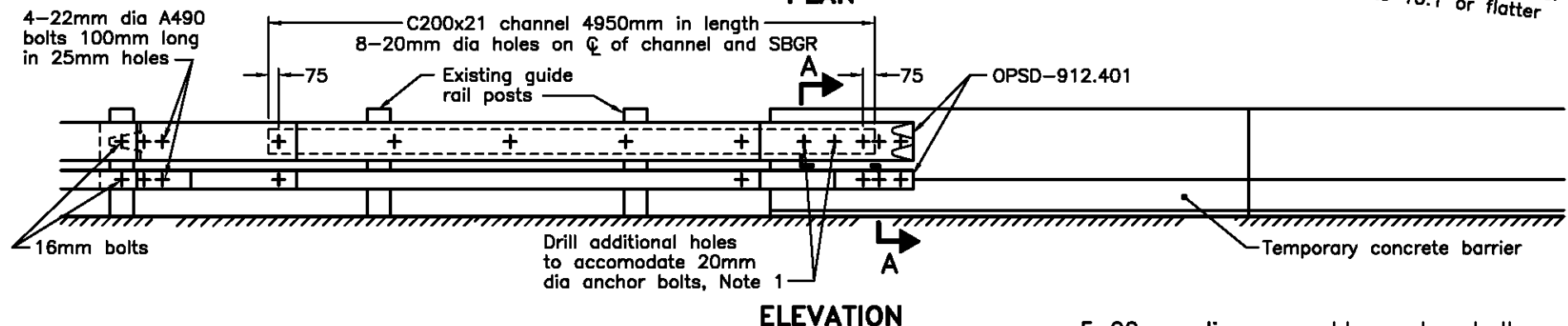
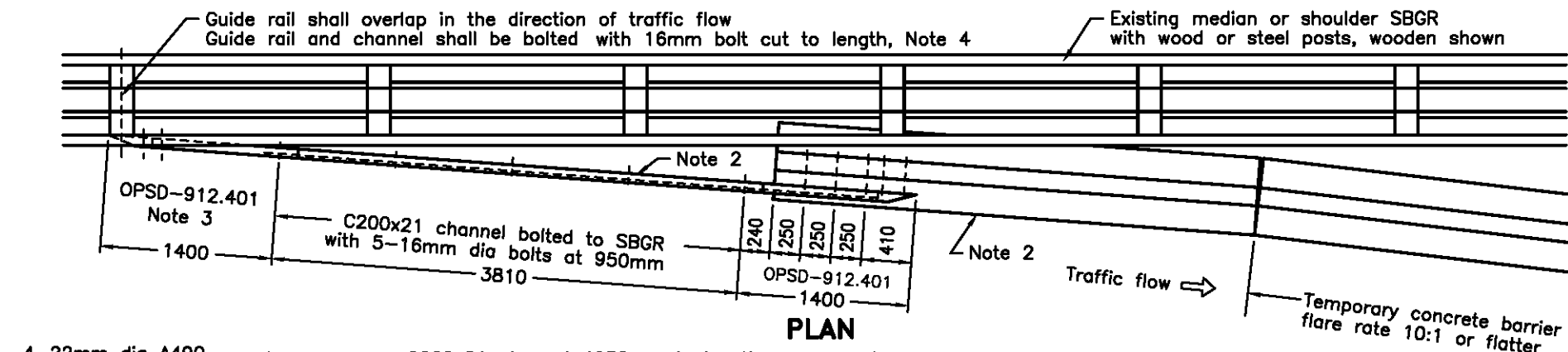
**GUIDE RAIL SYSTEM, STEEL BEAM
TYPE M - REDUCED DEFLECTION TREATMENT
INSTALLATION**

Nov 2016

Rev 0



OPSD 912.316



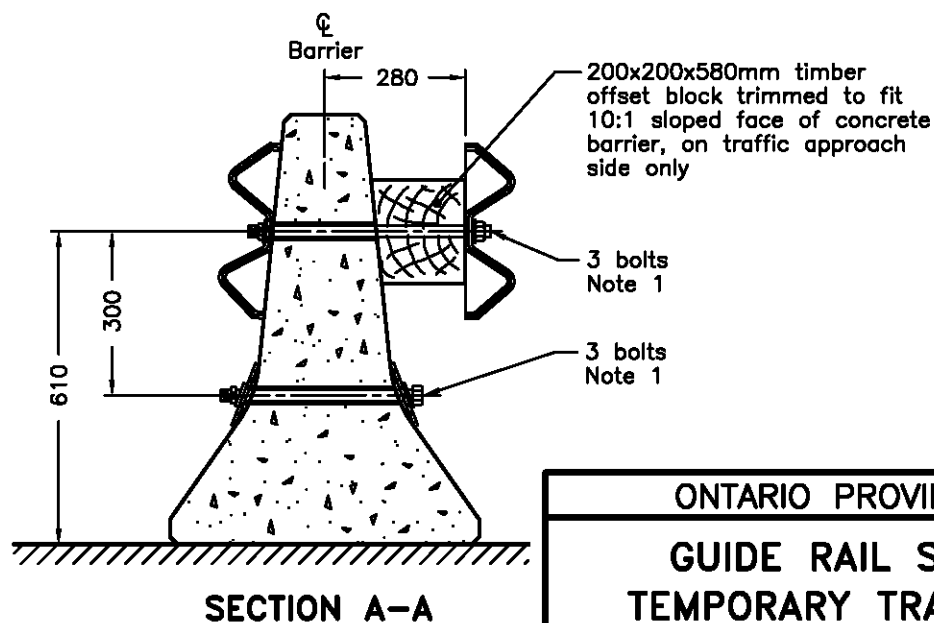
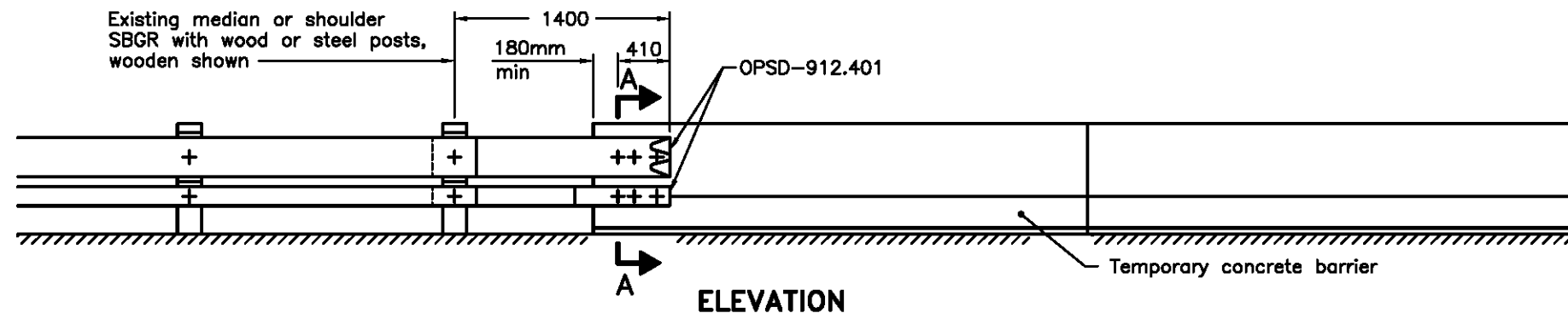
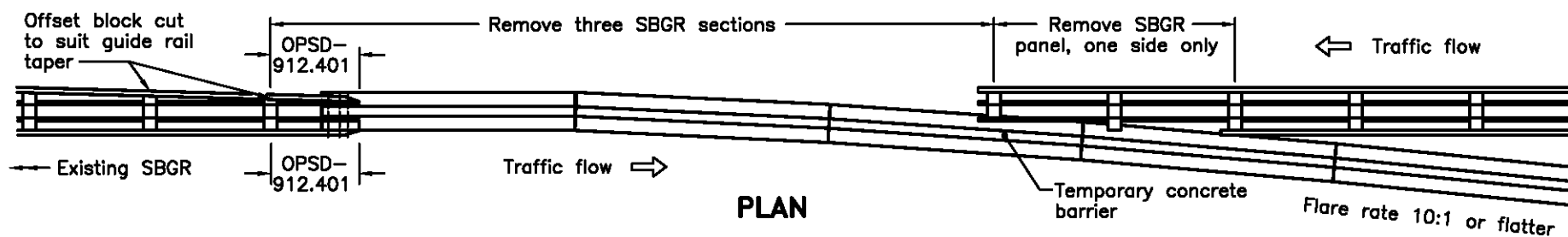
SECTION A-A

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.

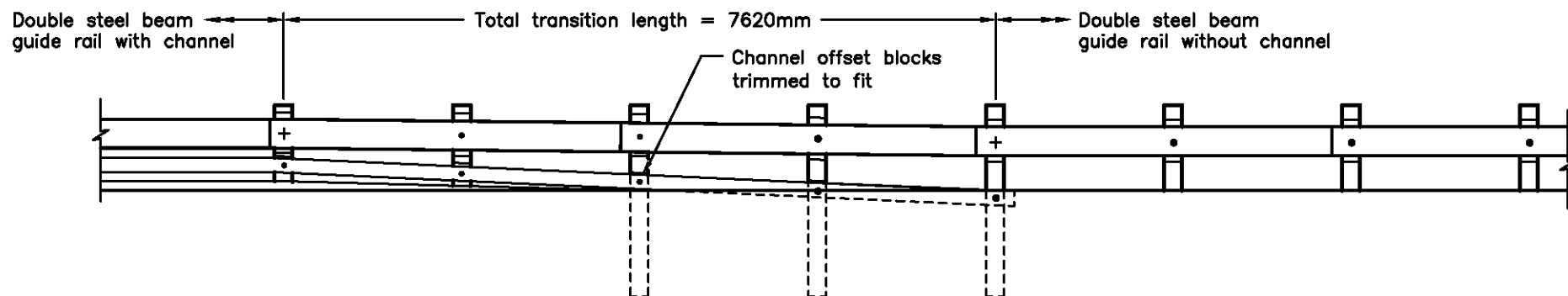
ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2002	Rev	1	
GUIDE RAIL SYSTEM, STEEL BEAM		-----			
TEMPORARY TRANSITION INSTALLATION—RAIL METHOD		-----			
SINGLE STEEL BEAM TO TEMPORARY CONCRETE BARRIER		OPSD — 912.330			



NOTES:

- 1 22mm dia A490 bolts or equivalent strength threaded bar in 25mm dia holes.
- A For Steel Beam Guide Rail detail to be read in conjunction with OPSD-912.130, 912.140, or 912.141.
- B When transitioning from a curb section onto a lower surface the temporary concrete barrier shall be supported to attain a grade of 10% or flatter.
- C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2002	Rev	1	
GUIDE RAIL SYSTEM, STEEL BEAM	-----			
TEMPORARY TRANSITION INSTALLATION	-----			
SINGLE STEEL BEAM TO TEMPORARY CONCRETE BARRIER	OPSD - 912.331			



ELEVATION



PLAN

NOTES:

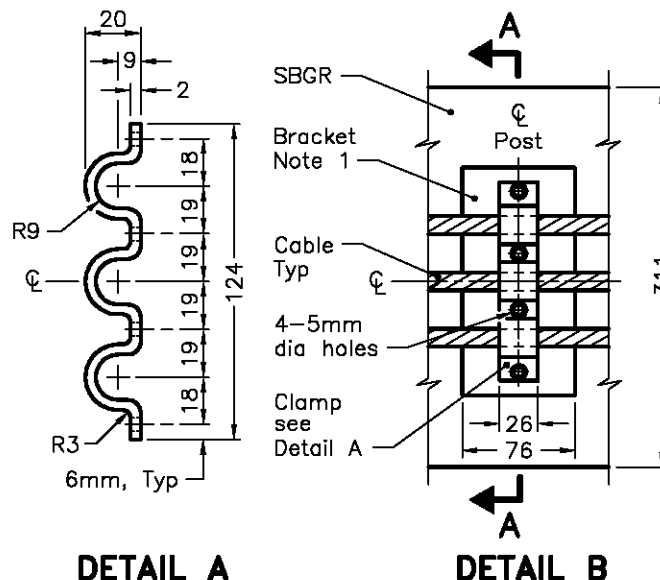
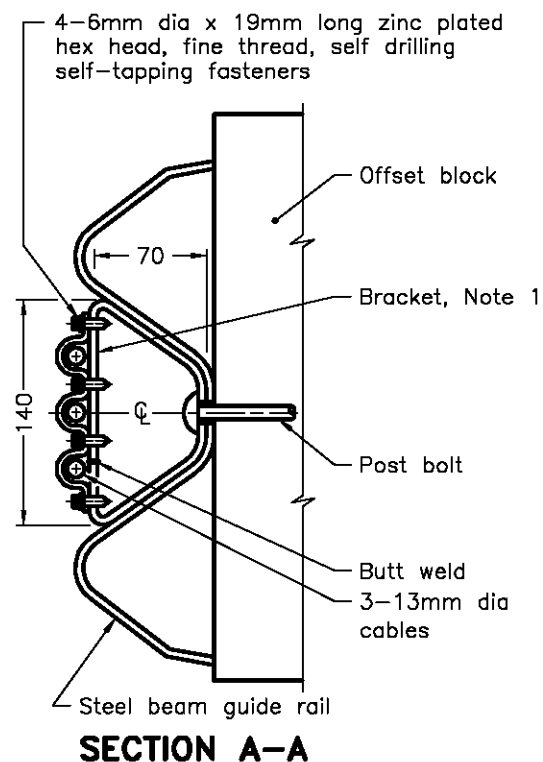
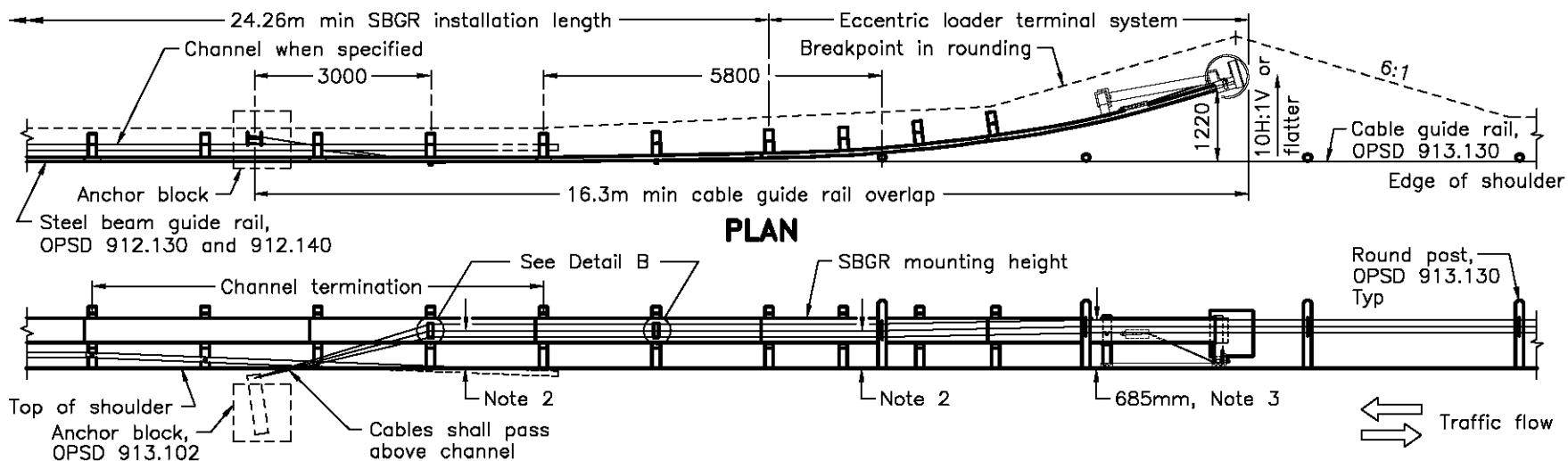
- A Steel beam guide rail mounting heights shall be as specified.
- B This OPSD to be read in conjunction with OPSD 912.141.
- C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING
GUIDE RAIL SYSTEM, STEEL BEAM
PERMANENT TRANSITION INSTALLATION
CHANNEL TERMINATION
MEDIAN

Nov 2008 Rev 1

OPSD 912.380





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

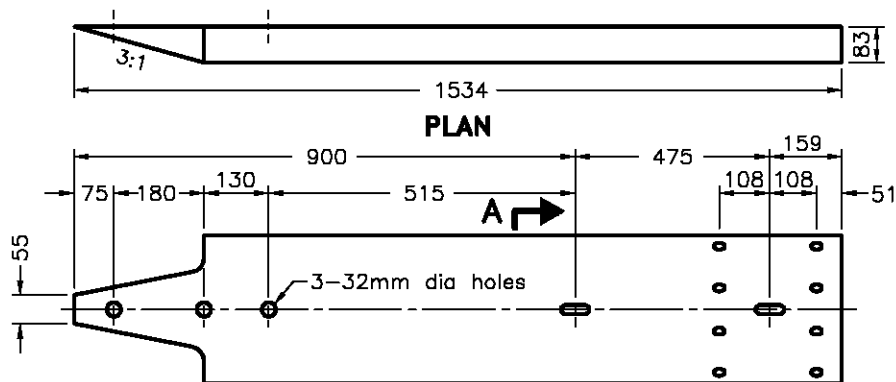
STEEL BEAM WITH ECCENTRIC LOADER TO 3 CABLE

DIVIDED AND UNDIVIDED HIGHWAY

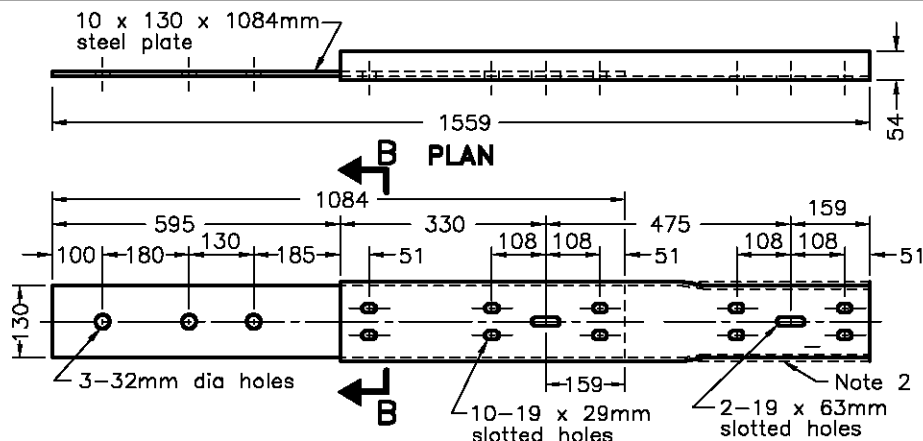
Nov 2009 Rev 3



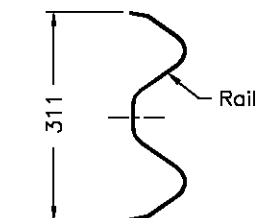
OPSD 912.382



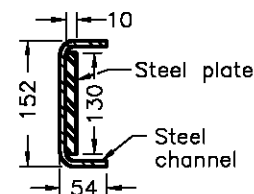
ANCHORAGE BACKUP RAIL



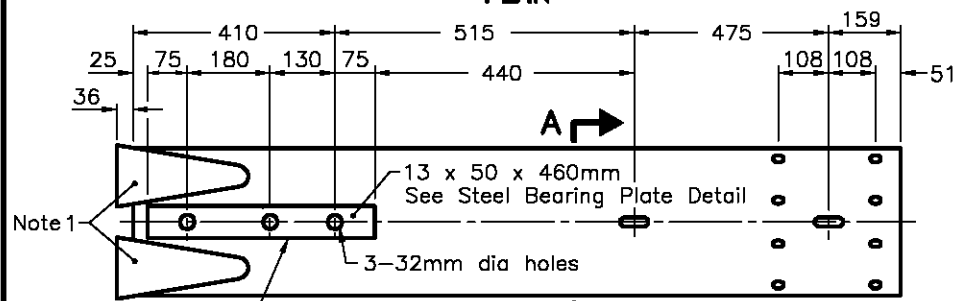
CHANNEL



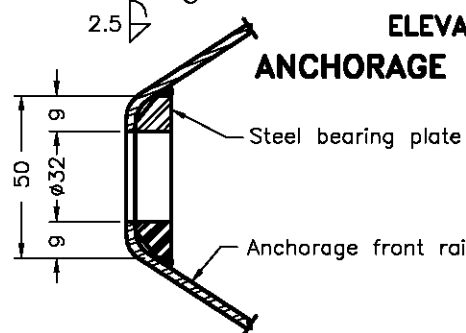
SECTION A-A



SECTION B-B



ANCHORAGE FRONT RAIL



STEEL BEARING PLATE DETAIL

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.

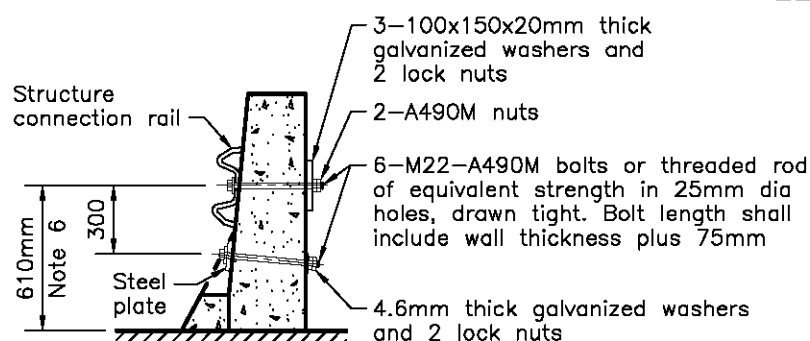
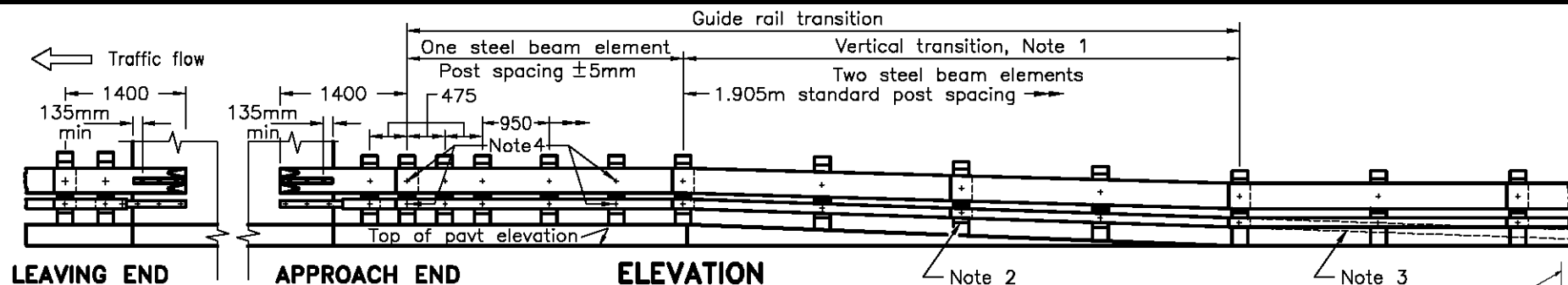
ONTARIO PROVINCIAL STANDARD DRAWING

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

Nov 2010 Rev 1



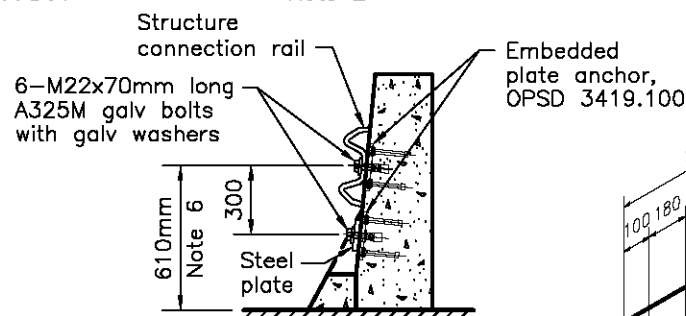
OPSD 912.401



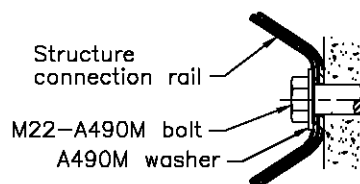
EXISTING CONCRETE BARRIER

NOTES:

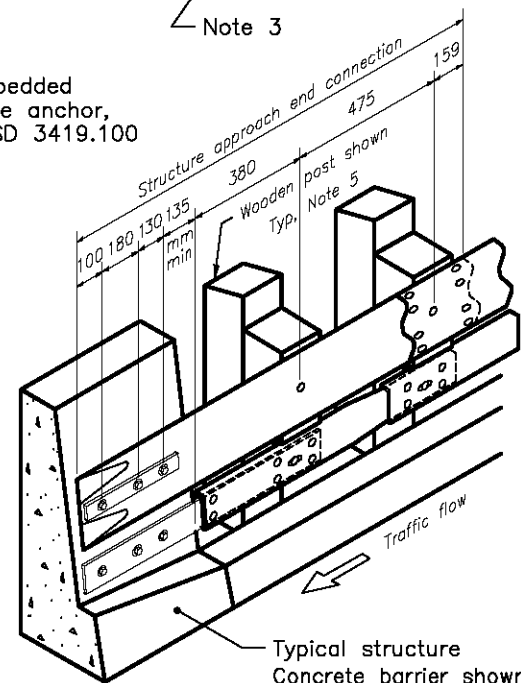
- 1 Horizontal and vertical transitions apply to structure approach and leaving end curb with gutter termination.
- 2 Channel post bolt at offset blocks to be 510mm long. End of bolts to be saw cut, flush with face of nut.
- 3 When channel is to be discontinued, a 7.62m termination shall commence at 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.



EMBEDDED ANCHORAGE NEW CONCRETE BARRIER



BOLT THROUGH ANCHORAGE DETAIL



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.

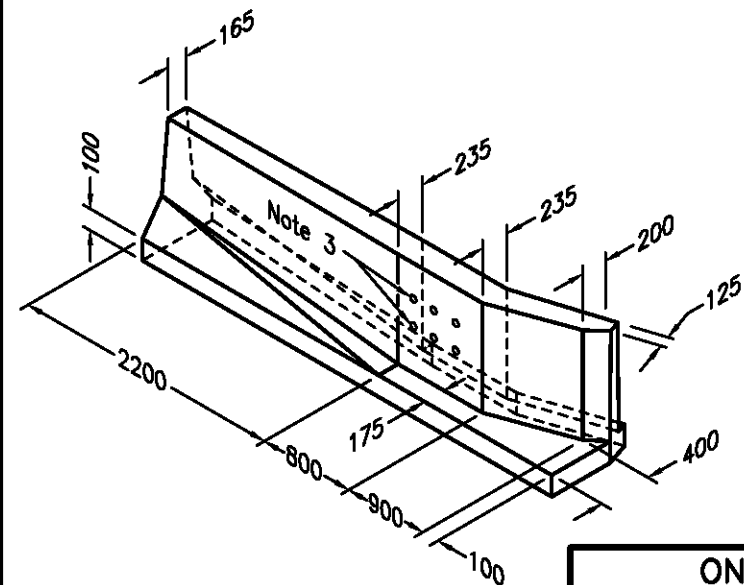
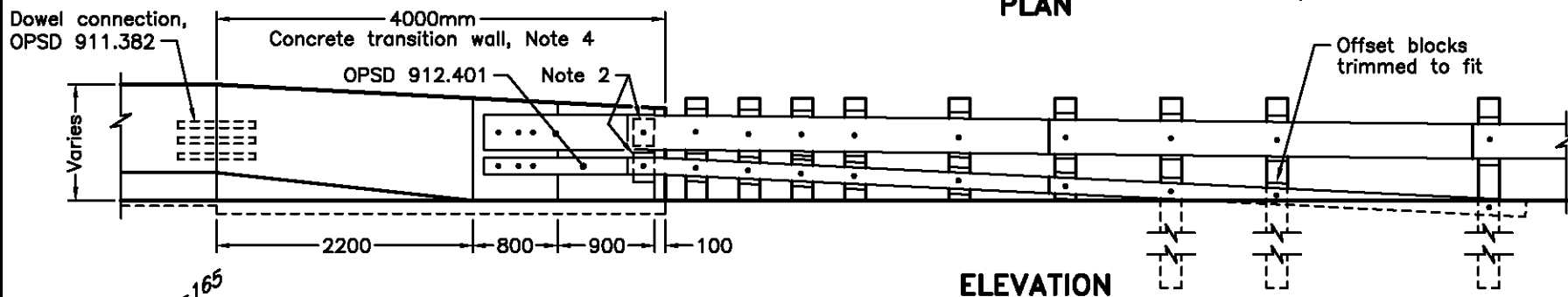
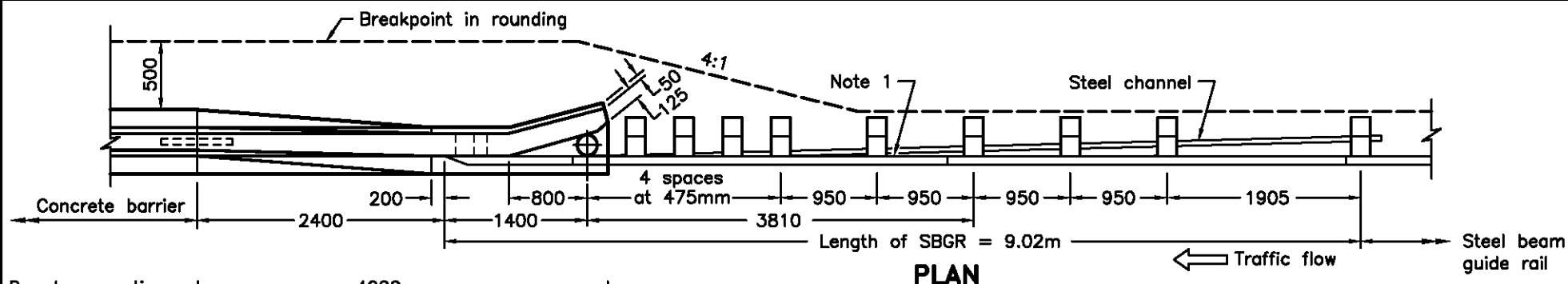
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010 Rev 3

GUIDE RAIL SYSTEM, STEEL BEAM
STRUCTURE CONNECTION

OPSD 912.430





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.

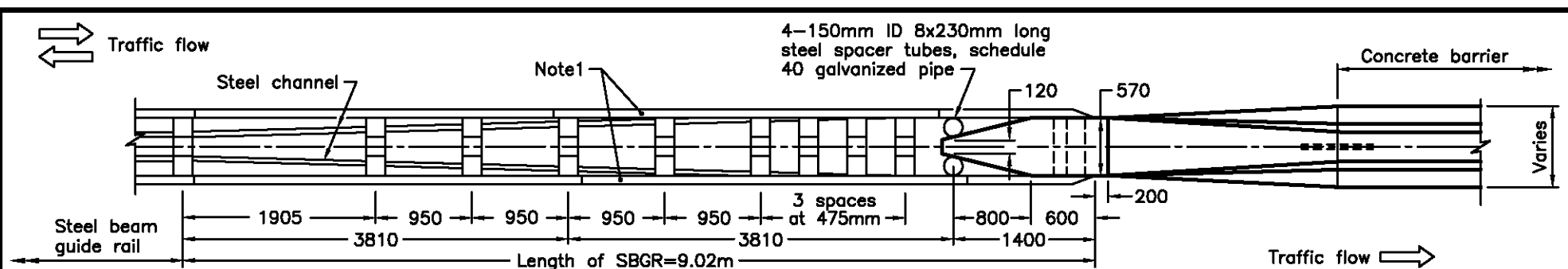
ONTARIO PROVINCIAL STANDARD DRAWING

GUIDE RAIL SYSTEM, STEEL BEAM
 PERMANENT CONNECTION INSTALLATION
 SINGLE STEEL BEAM TO CONCRETE BARRIER

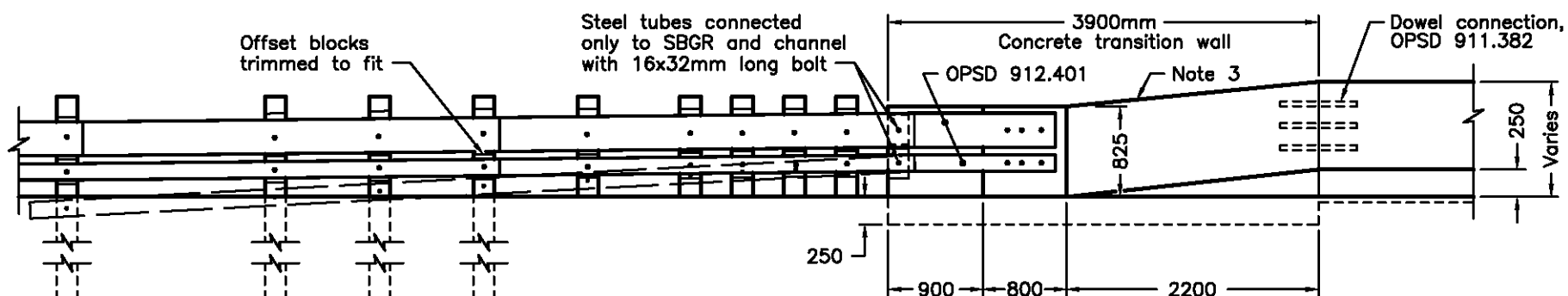
Nov 2008 Rev 2



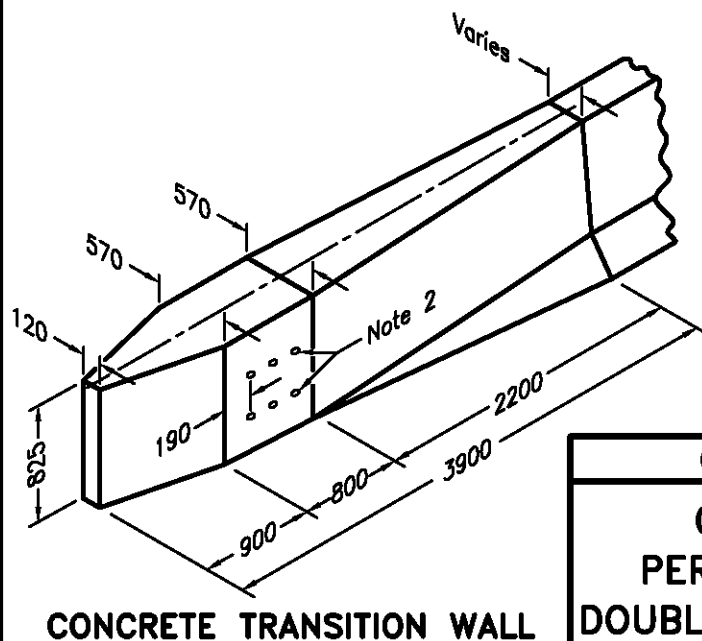
OPSD 912.480



PLAN



ELEVATION



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.

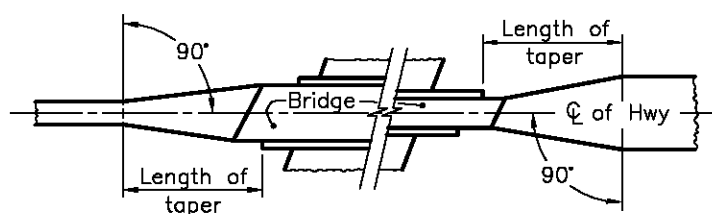
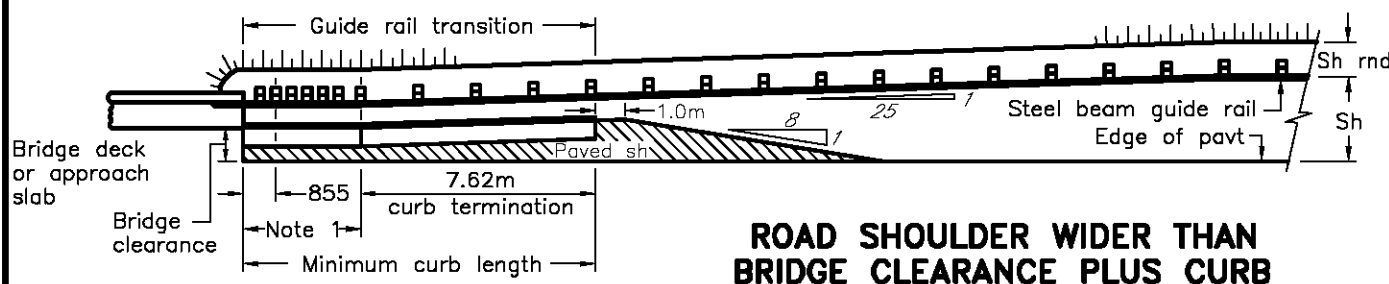
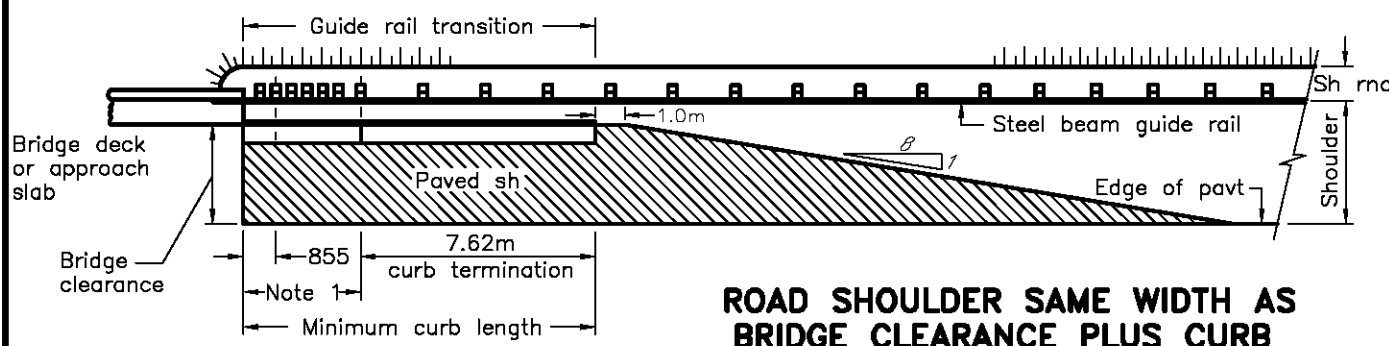
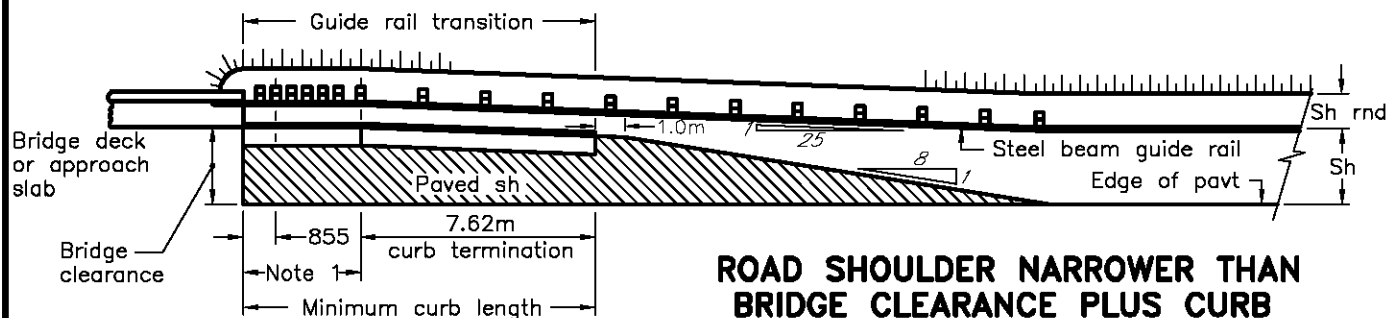
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2008 Rev 2

GUIDE RAIL SYSTEM, STEEL BEAM
 PERMANENT CONNECTION INSTALLATION
 DOUBLE STEEL BEAM TO CONCRETE BARRIER

OPSD 912.481





FOR SKEWED STRUCTURE:

The pavement taper is to end on a line at right angles to C of Hwy , 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

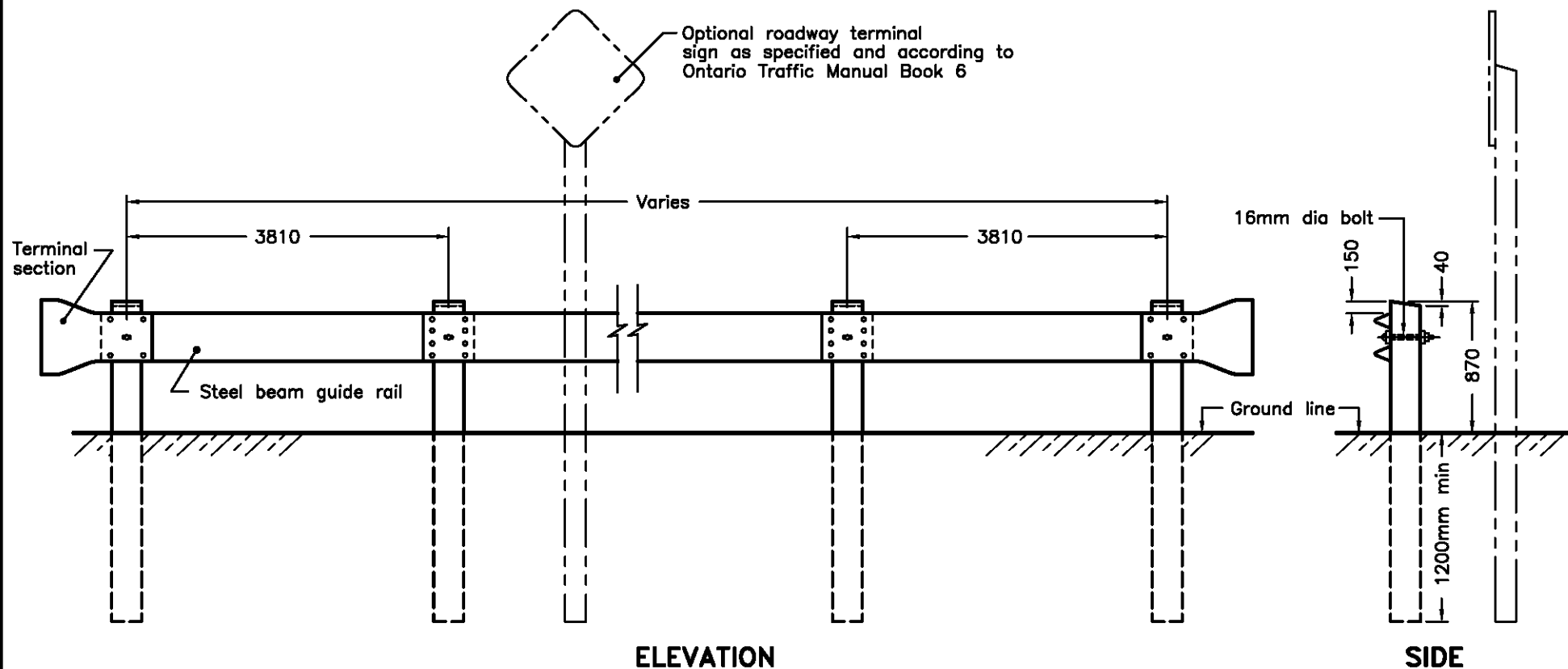
**GUIDE RAIL SYSTEM, STEEL BEAM
STRUCTURE APPROACH TREATMENT
INSTALLATION – RURAL HIGHWAY**

Nov 2016

Rev 2



OPSD 912.530



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 ± 1.5 mm dressed, tops to have 25mm chamfer.
- D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

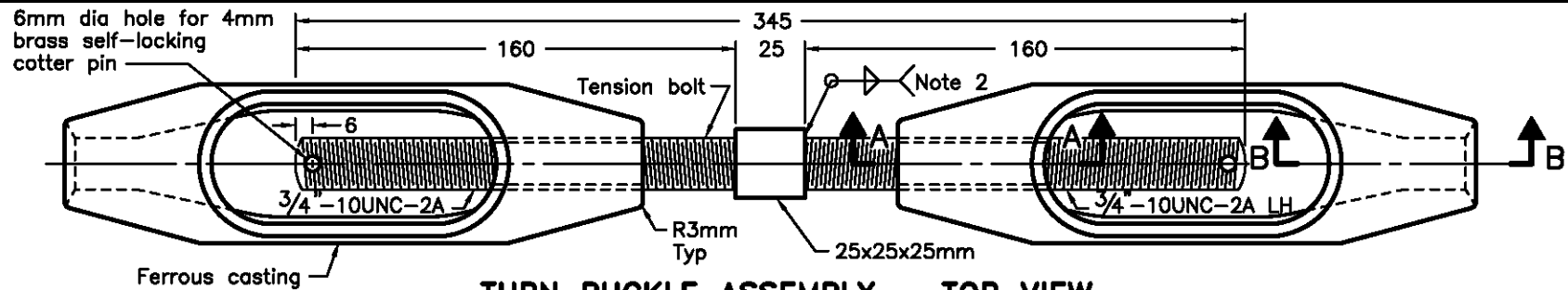
Nov 2008

Rev 1

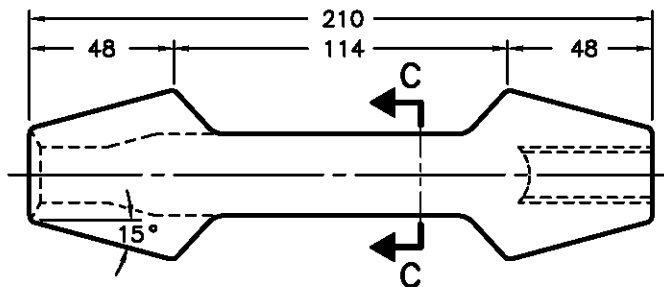
GUIDE RAIL SYSTEM, STEEL BEAM
BARRICADE
INSTALLATION



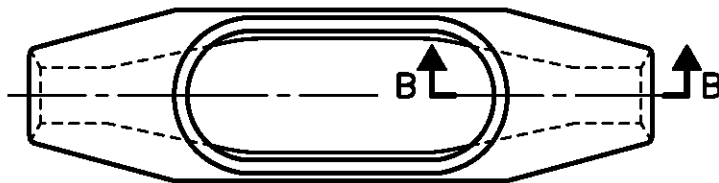
OPSD 912.532



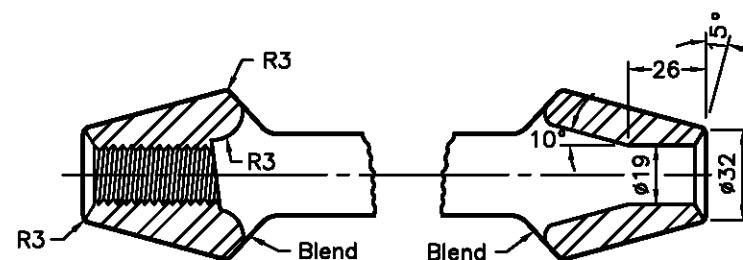
TURN BUCKLE ASSEMBLY - TOP VIEW



END FITTING - SIDE VIEW

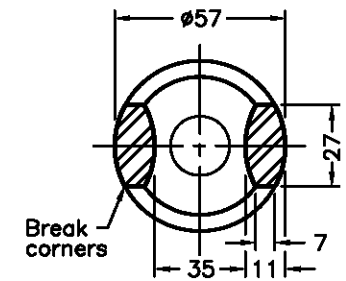


SPLICER - TOP VIEW

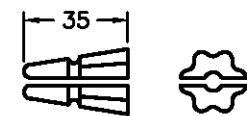


SECTION A-A

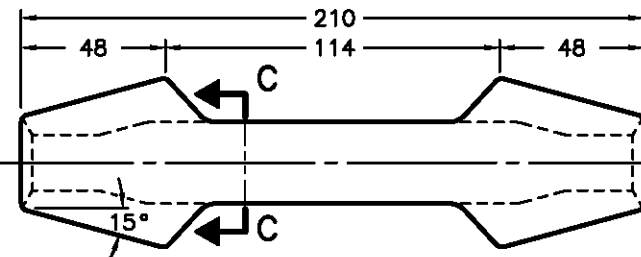
SECTION B-B



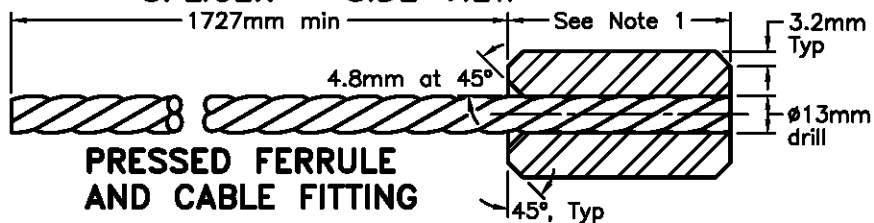
SECTION C-C



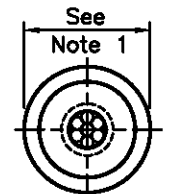
WEDGE



SPLICER - SIDE VIEW



**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 ± 0.7 mm.

- B All dimensions are in millimetres
unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

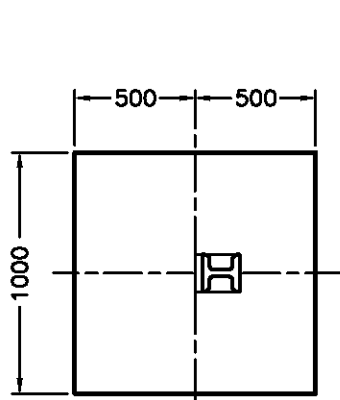
Nov 2008

Rev 1

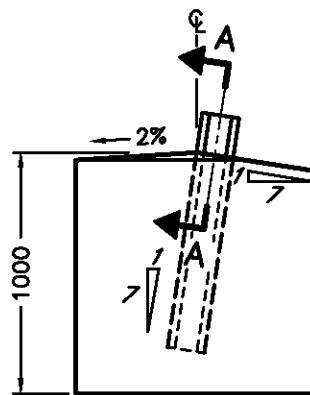
**GUIDE RAIL SYSTEM, CABLE
COMPONENT - CABLE FITTINGS**

OPSD 913.101

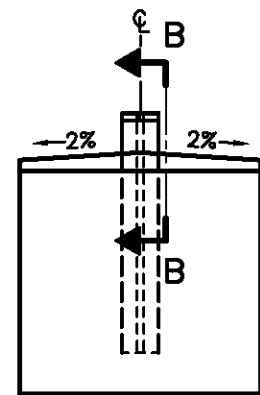




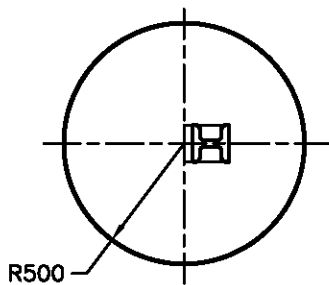
TOP



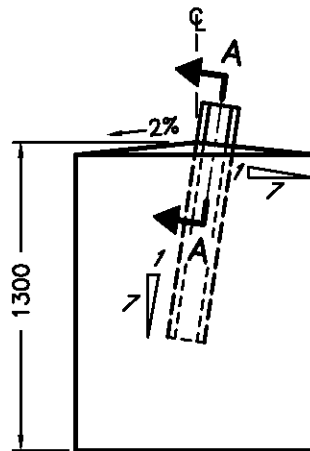
FRONT
CUBICAL ANCHOR BLOCK



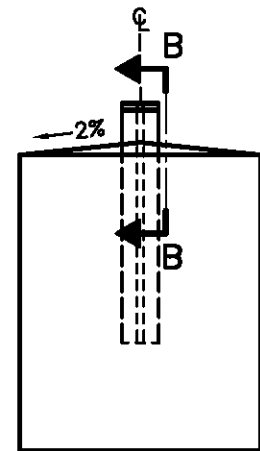
SIDE



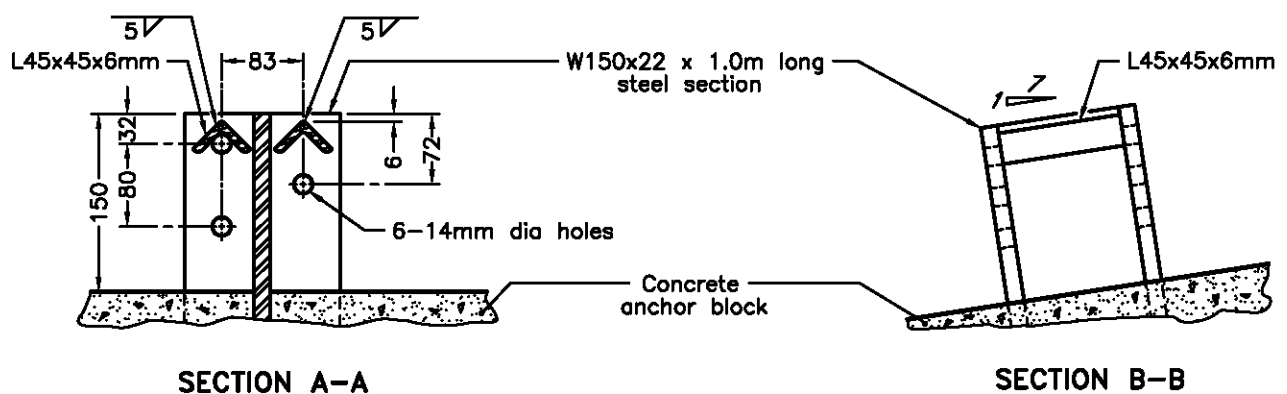
TOP



FRONT
CYLINDRICAL ANCHOR BLOCK



SIDE



NOTES:

A All dimensions are in millimetres unless otherwise shown.

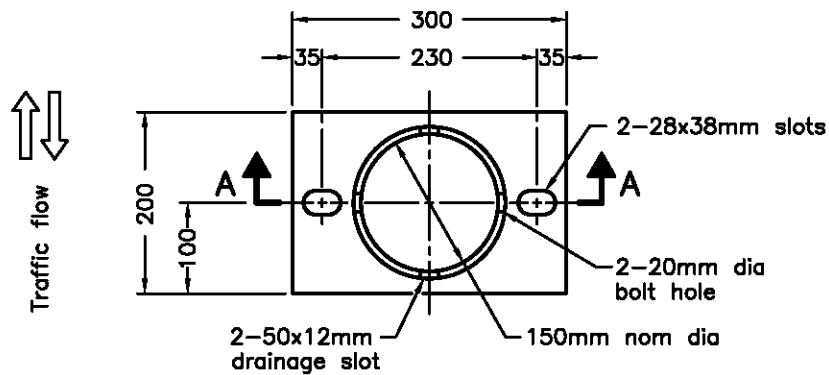
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2008 Rev 1

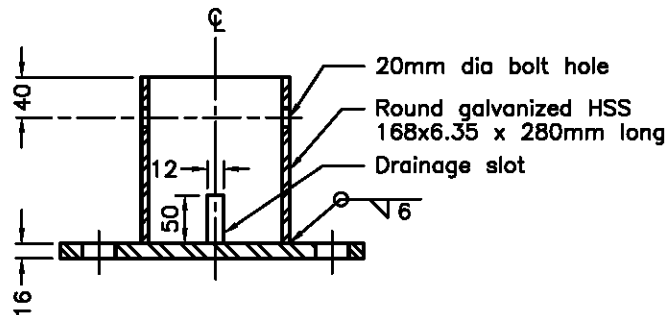
GUIDE RAIL SYSTEM, CABLE
COMPONENT – CONCRETE ANCHOR BLOCKS

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

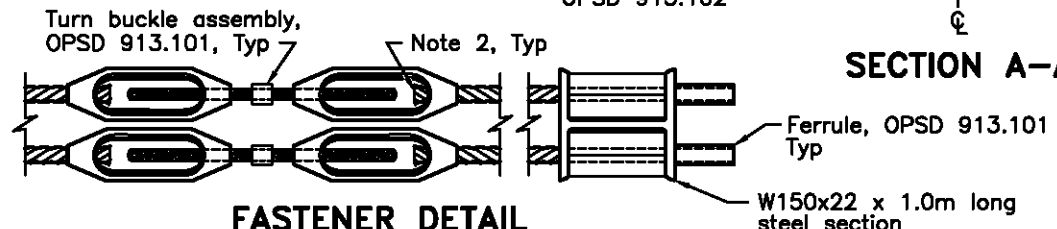
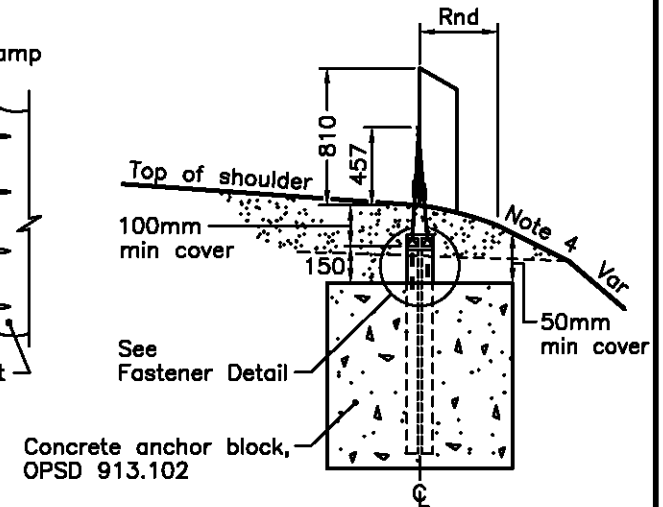
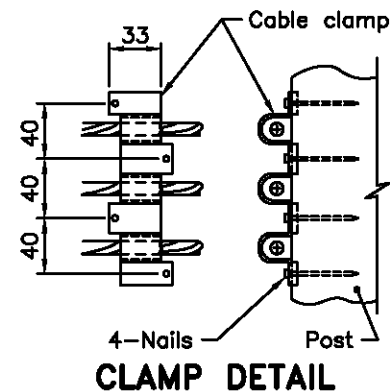
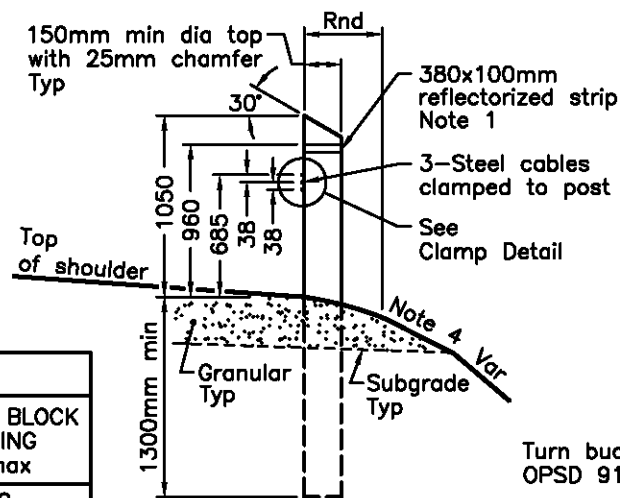
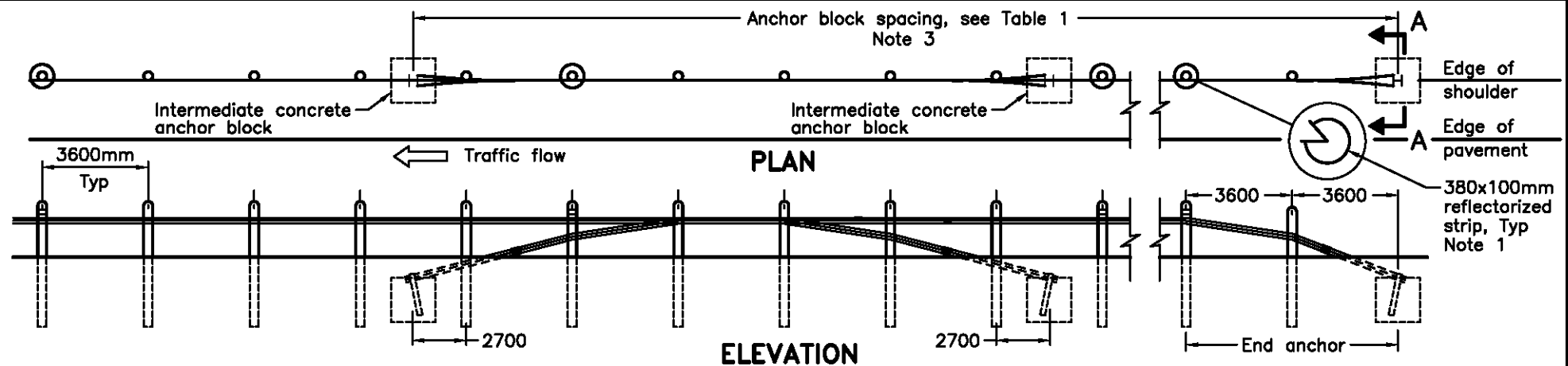


TABLE 1	
RADIUS OF CURVATURE m	ANCHOR BLOCK SPACING m max
Over 600	300
250 to 600	100

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

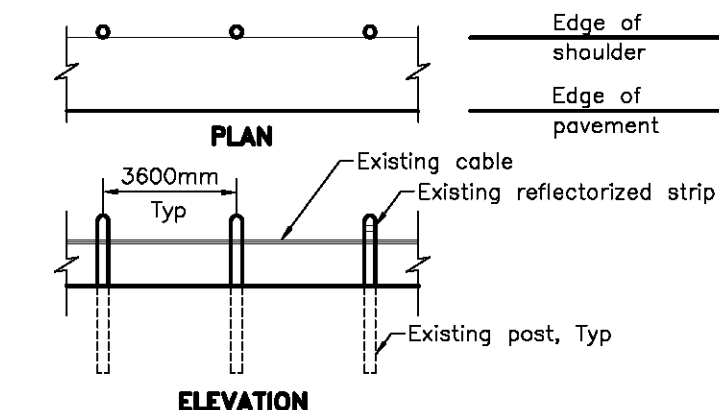
Nov 2008

Rev 1

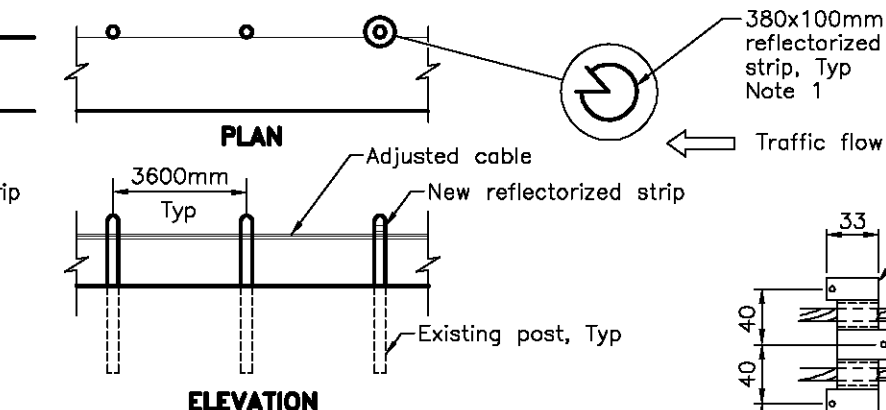


OPSD 913.130

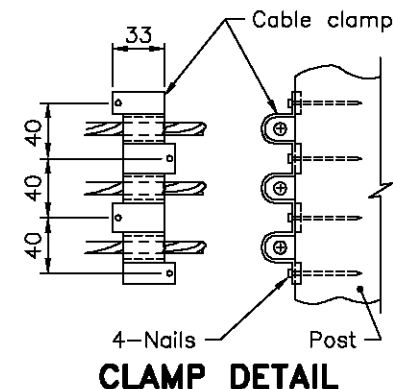




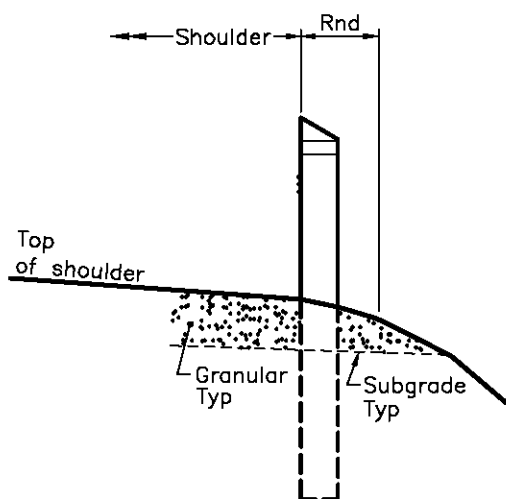
EXISTING CABLE GUIDE RAIL



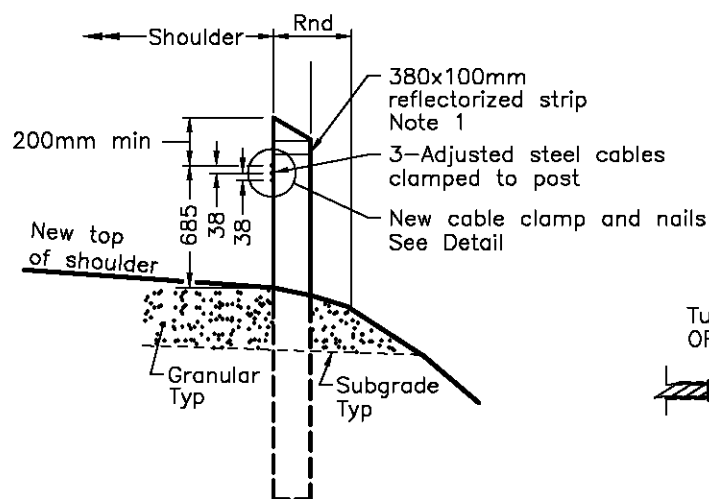
ADJUSTED CABLE GUIDE RAIL



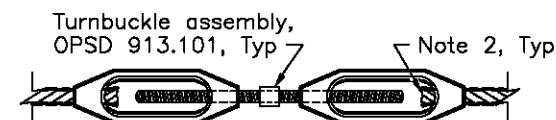
CLAMP DETAIL



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

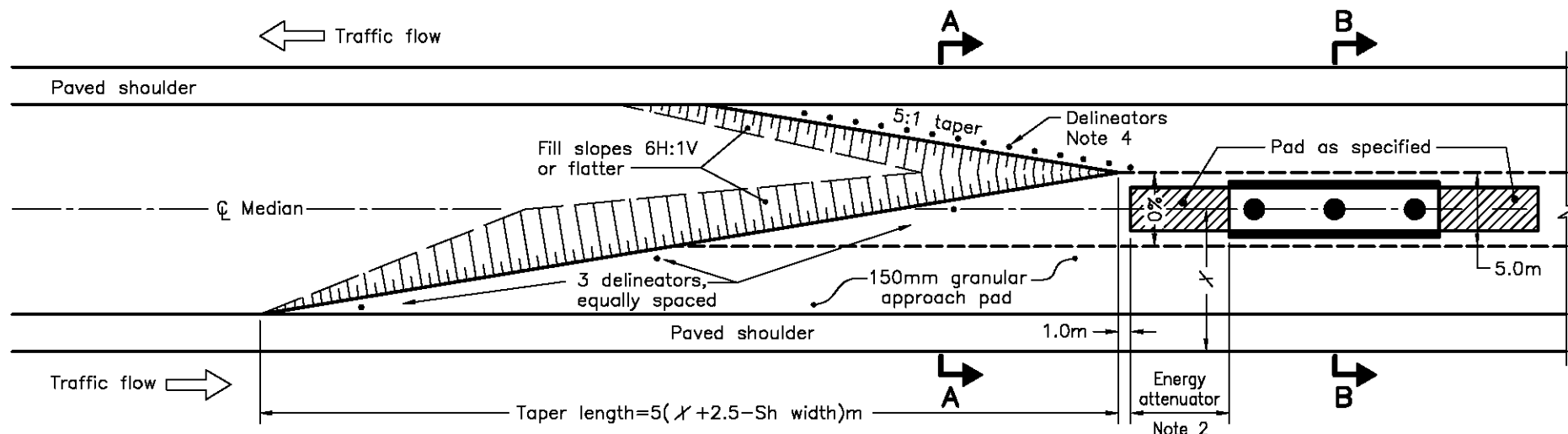
**GUIDE RAIL SYSTEM, CABLE
ADJUSTMENT – SHOULDER**

Nov 2013

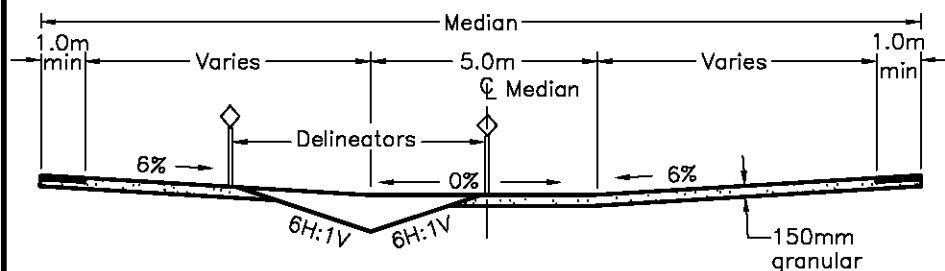
Rev 0



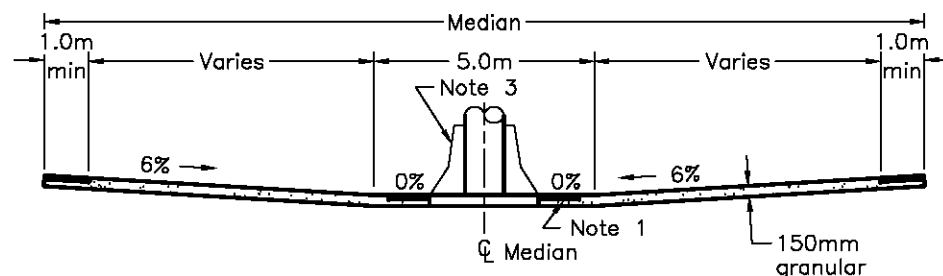
OPSD 913.135



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 Delineation 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 ϕ of energy attenuator

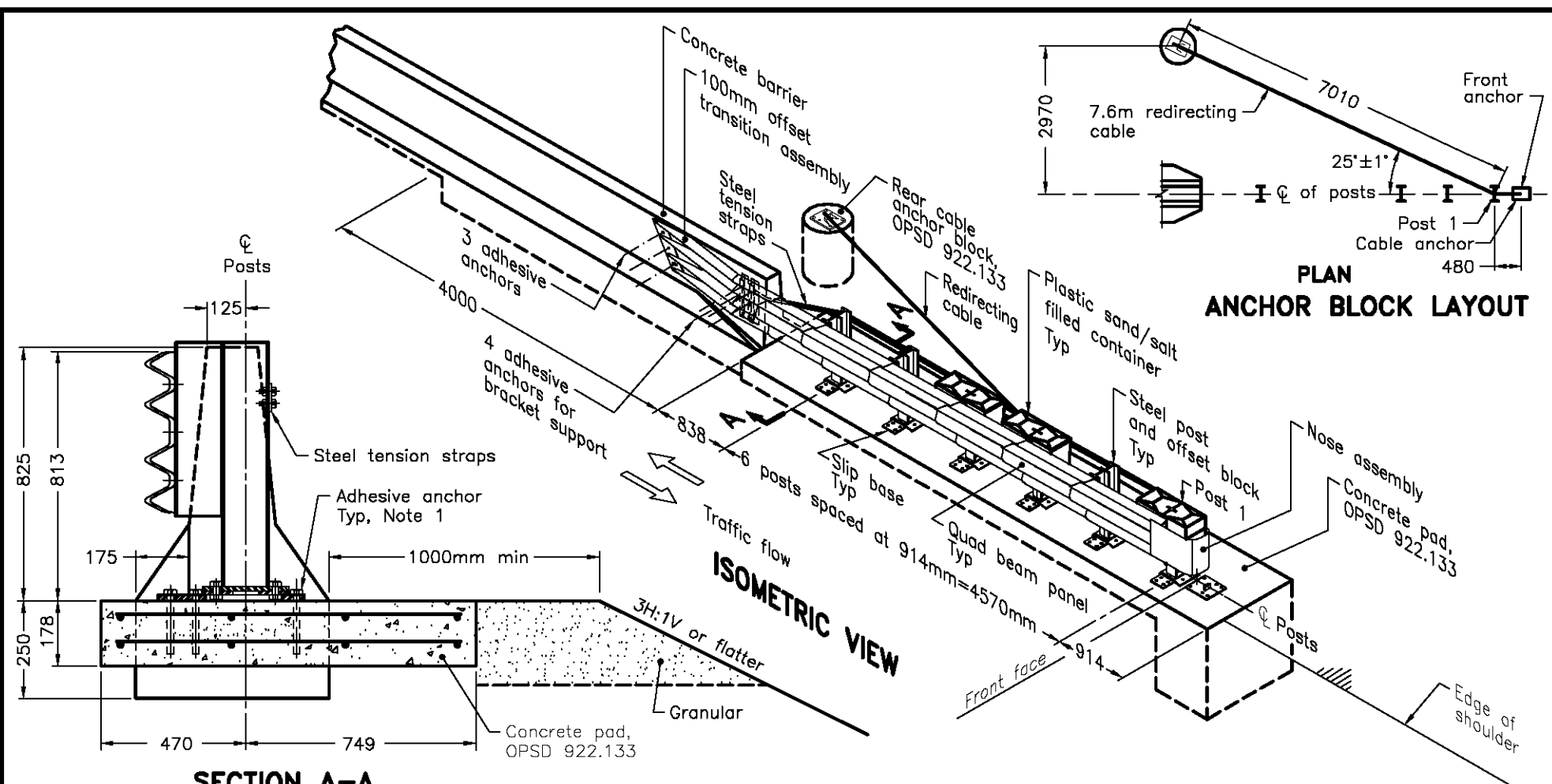
ONTARIO PROVINCIAL STANDARD DRAWING

**ENERGY ATTENUATOR, GENERAL
INSTALLATION-GRANULAR APPROACH PAD, MEDIAN**

Nov 2016 Rev 2



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 OPD 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 OPD 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 OPD shall be read in conjunction with OPD 202.033.

G All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

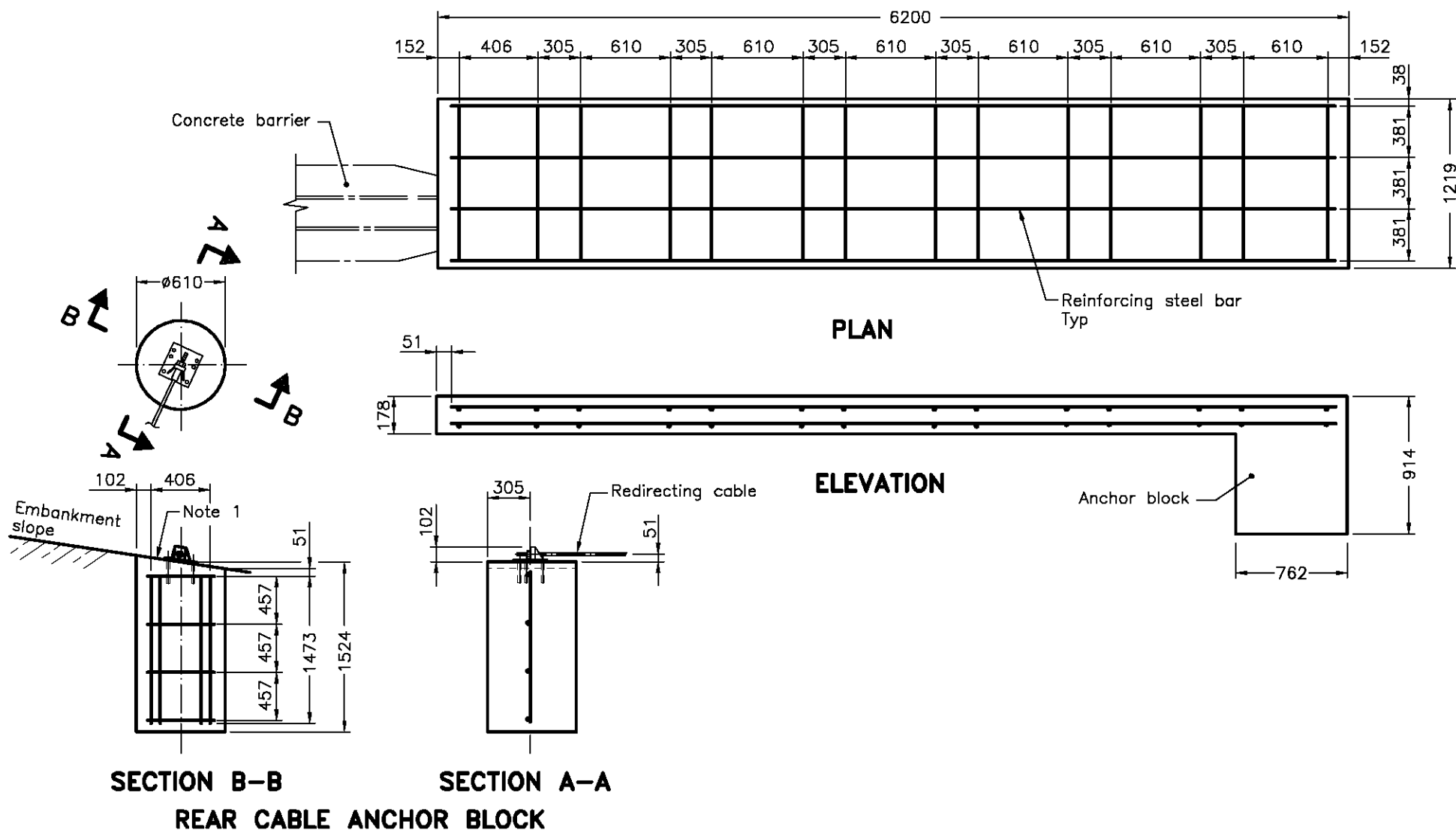
ENERGY ATTENUATOR, CRASH CUSHION
QUADTREND SYSTEM
INSTALLATION – CONCRETE BARRIER

Nov 2011

Rev 2



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

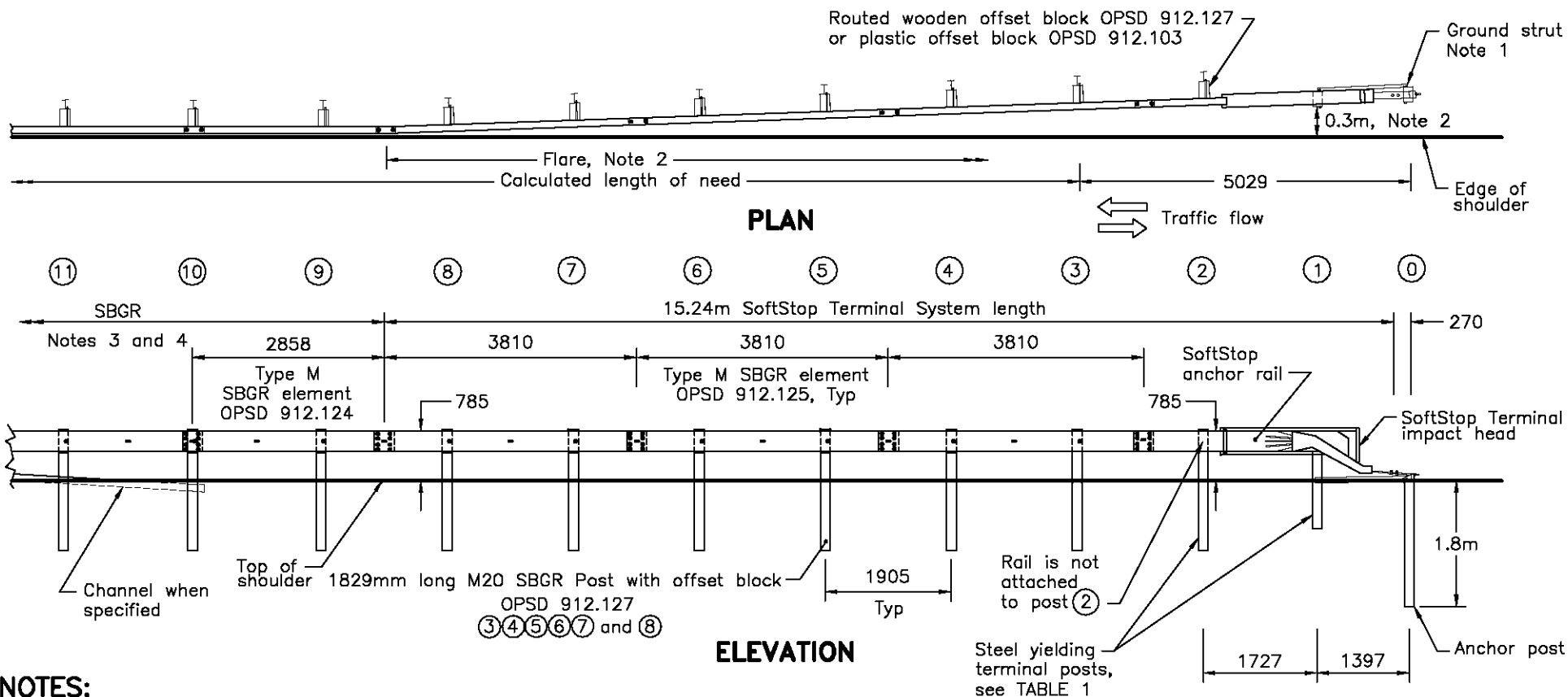
ENERGY ATTENUATOR, CRASH CUSHION
QUADTREND SYSTEM
INSTALLATION – CONCRETE PAD
AND REAR CABLE ANCHOR BLOCK

Nov 2011

Rev 2



OPSD 922.133



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.

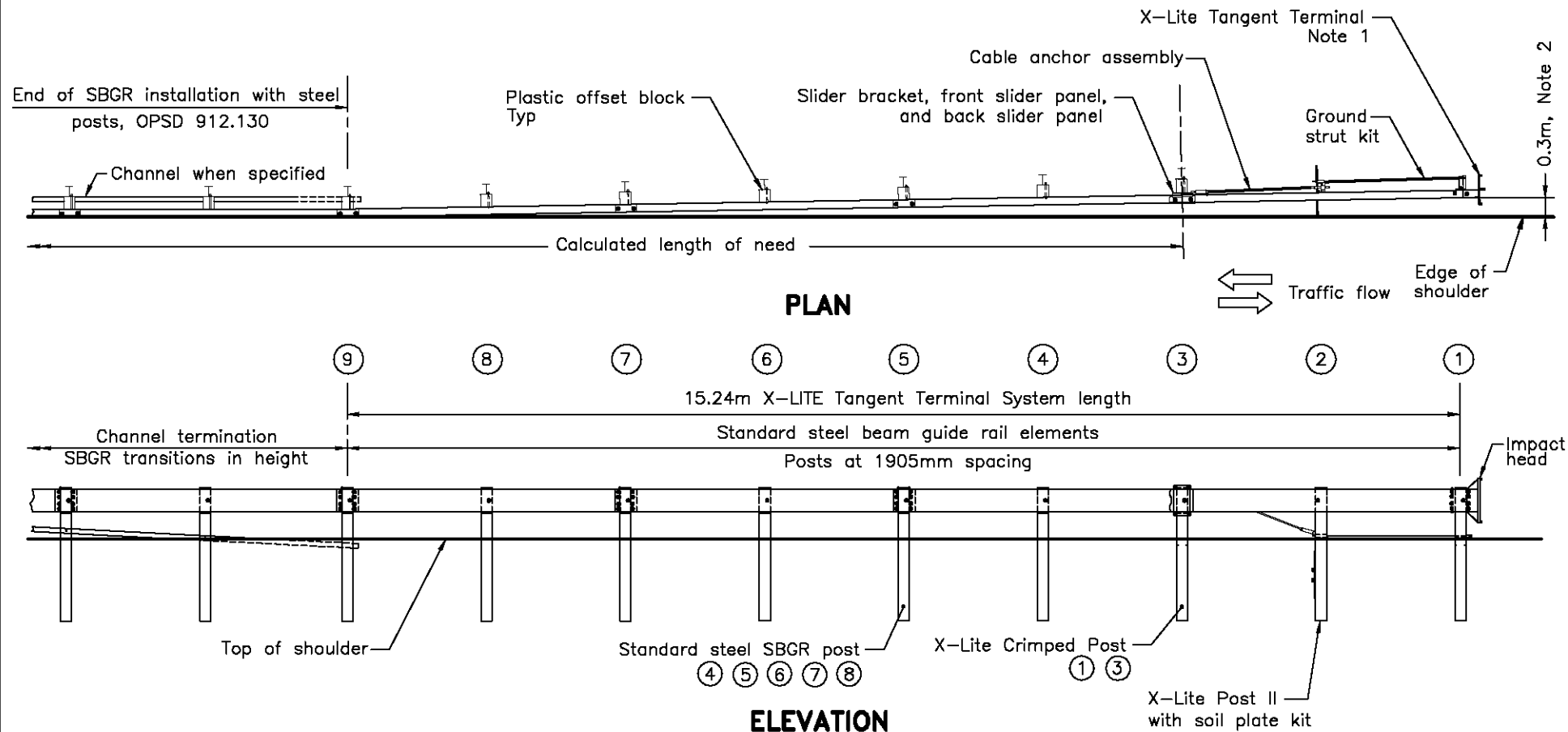
TABLE 1	
Steel Yielding Terminal Post	
Post	Length m
1	1.46
2	1.83

ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, END TREATMENT
STEEL BEAM ENERGY ATTENUATING TERMINAL
SOFTSTOP TERMINAL SYSTEM
INSTALLATION

Apr 2016 Rev 0



OPSD 922.161



NOTES:

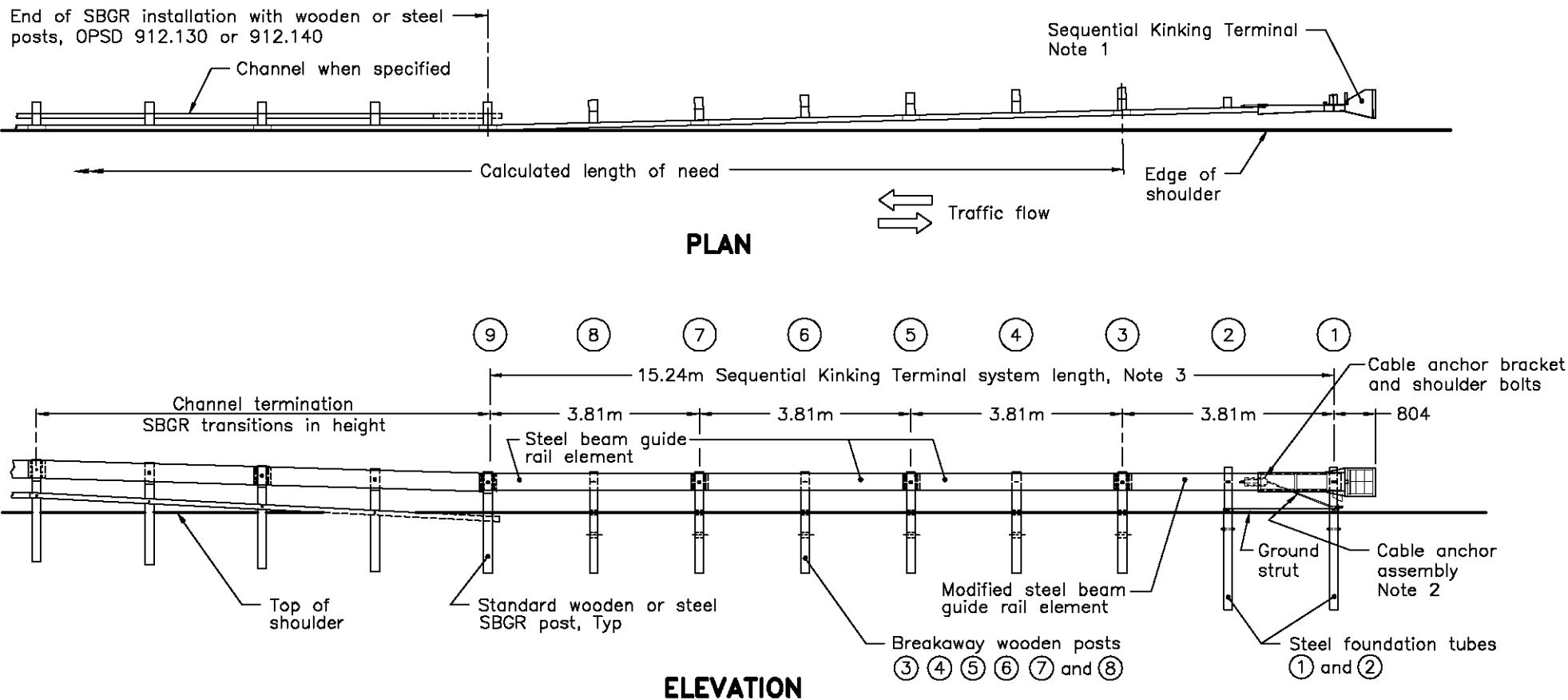
- 1 This OPSD shows right shoulder installation. The X-Lite Tangent Terminal shall be inverted for left shoulder installation.
- 2 The system length shall be installed in a straight line parallel to the roadway, at a 50:1 flare rate or parallel to roadway when specified.
- A Delineation shall be according 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



OPSD 922.170



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.

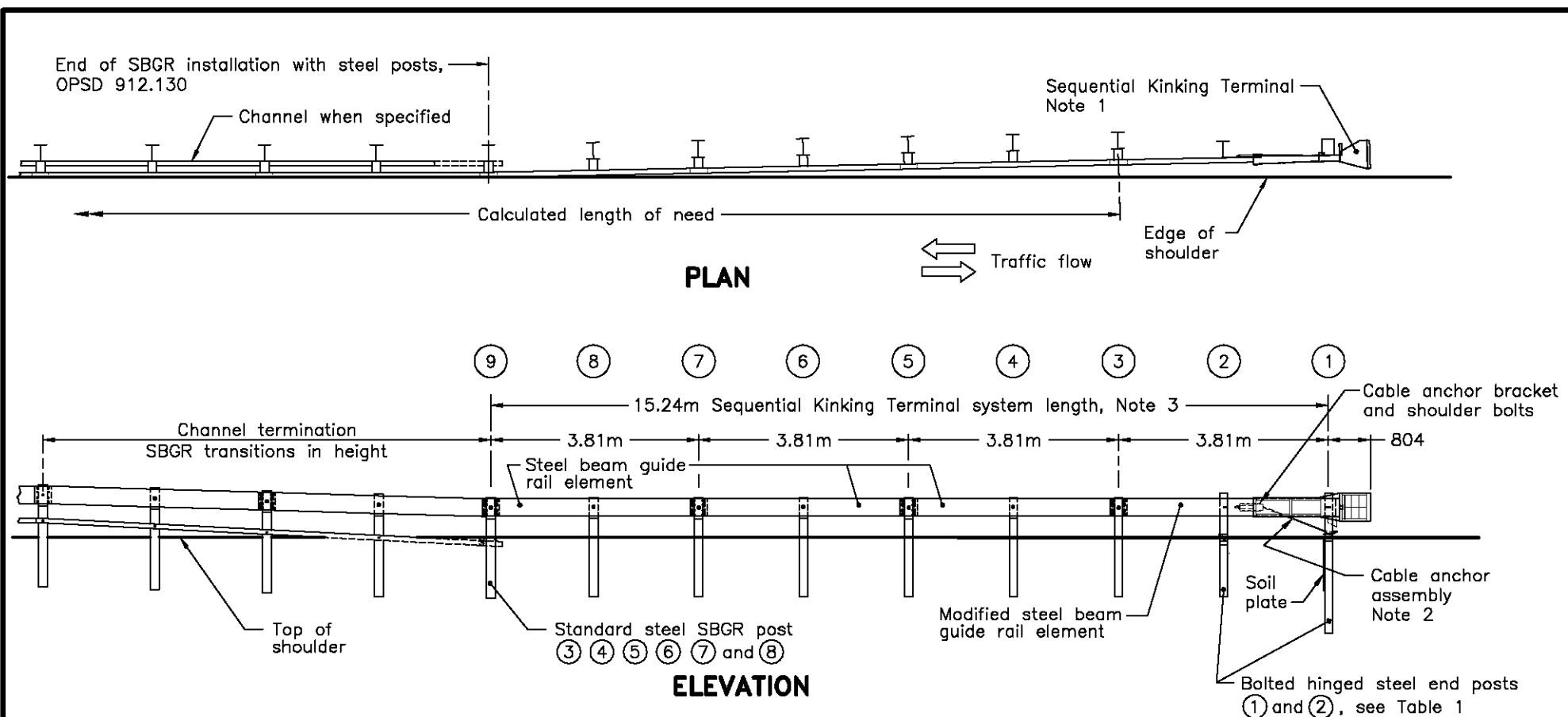
ONTARIO PROVINCIAL STANDARD DRAWING

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

Nov 2010 Rev 2



OPSD 922.180



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

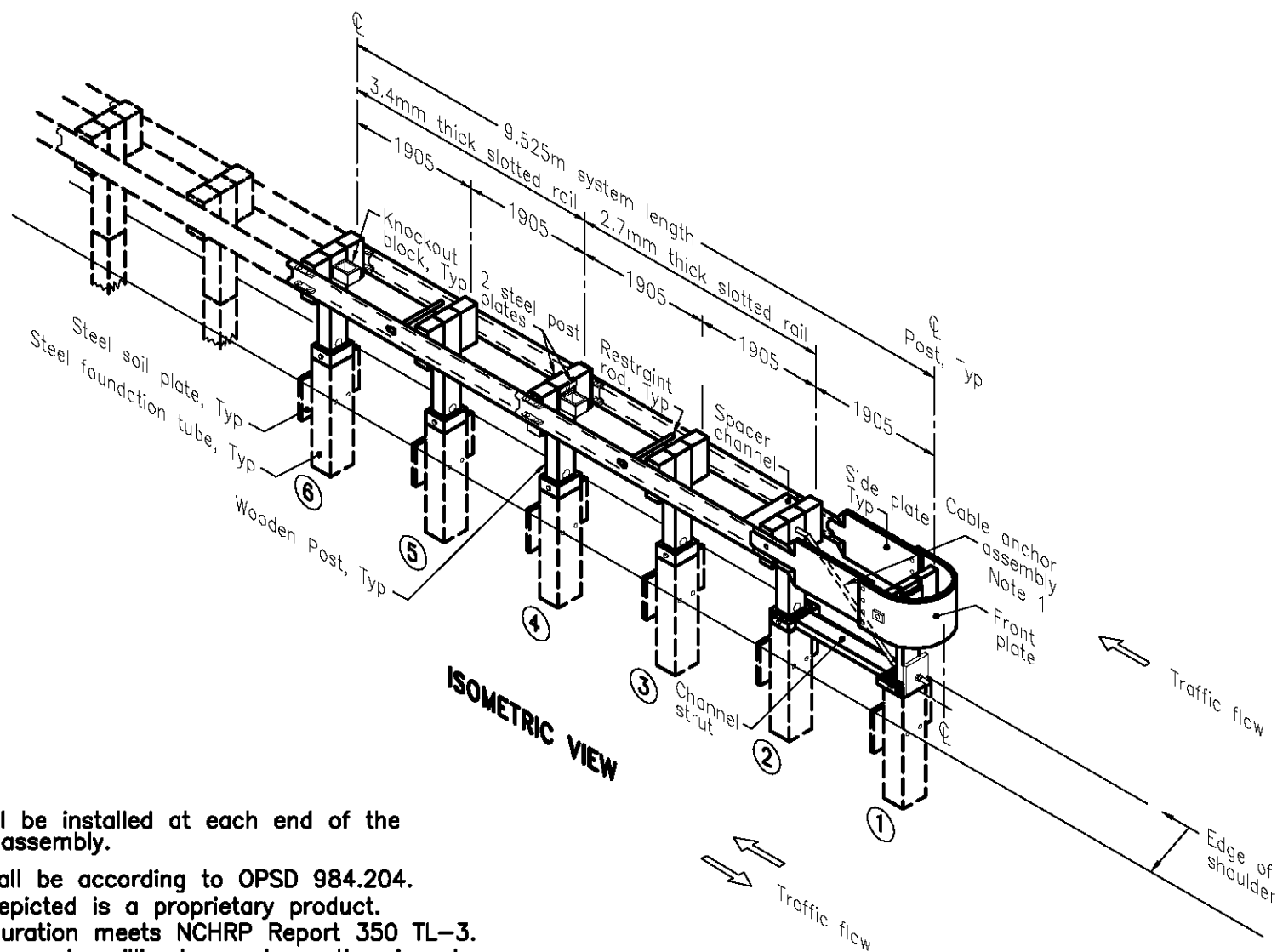
ONTARIO PROVINCIAL STANDARD DRAWING

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

Nov 2010 Rev 2



OPSD 922.181



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.

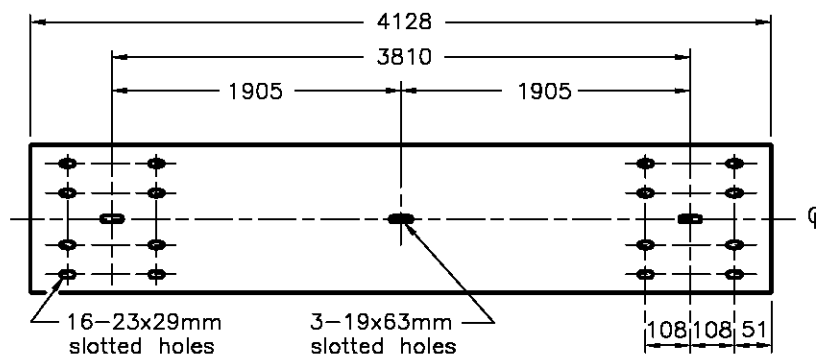
ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, END TREATMENT
CRASH-CUSHION ATTENUATING
TERMINAL (CAT-350) SYSTEM
ASSEMBLY

Nov 2013 Rev 3

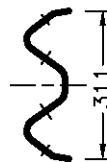


OPSD 922.330

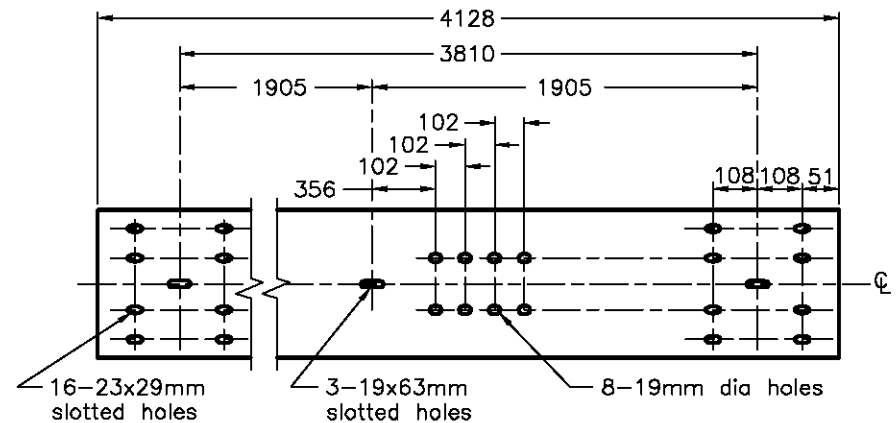
OPSD 922.401



**FRONT ELEVATION
FROM POST ③ TO ⑥**

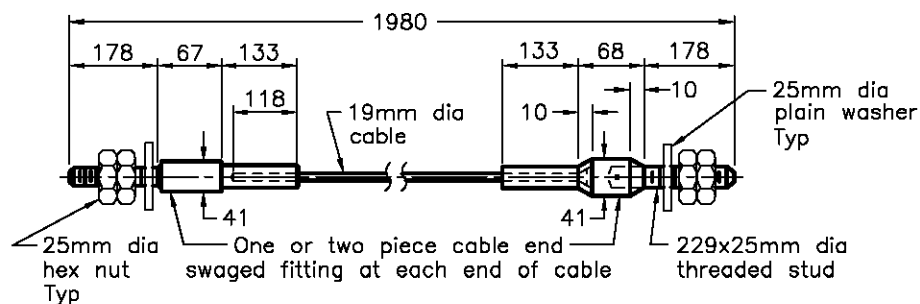


SIDE VIEW



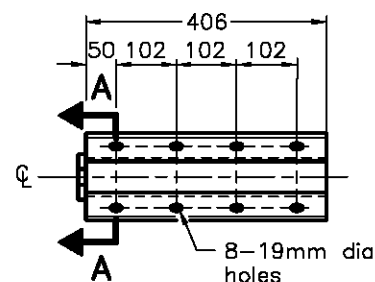
**FRONT ELEVATION
FROM POST ① TO ③**

STEEL BEAM GUIDE RAIL

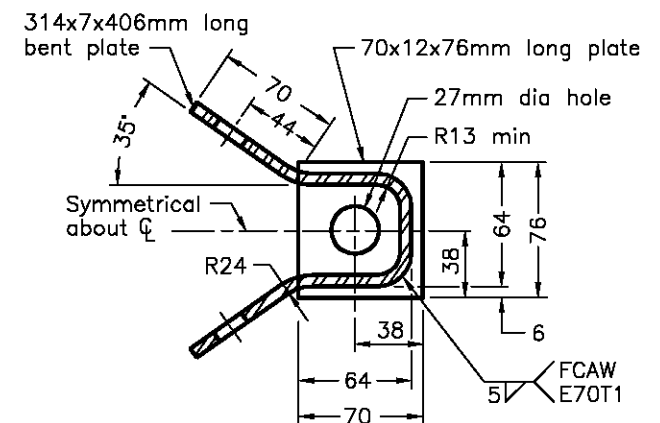


ONE PIECE CABLE END TWO PIECE CABLE END

CABLE ASSEMBLY



**STEEL BEAM GUIDE RAIL
CABLE ATTACHMENT**



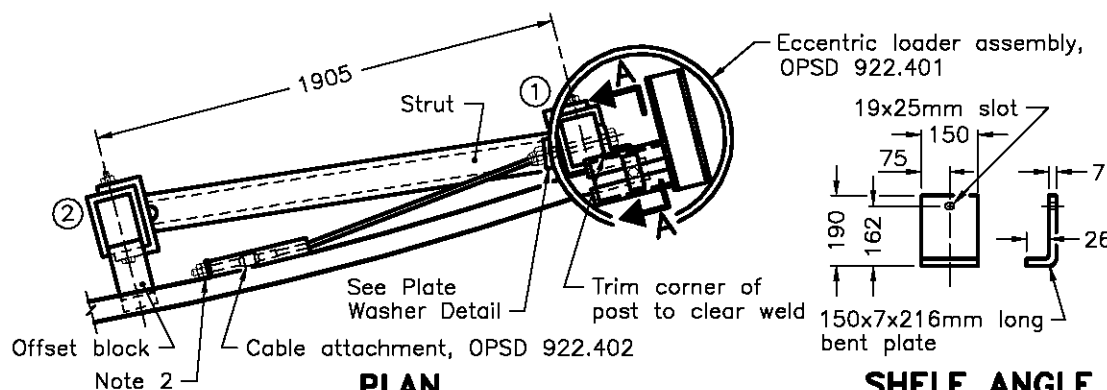
SECTION A-A

NOTES:

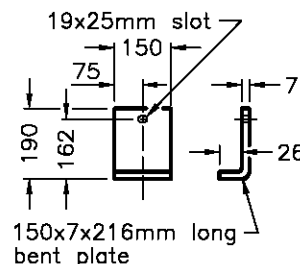
A All dimensions are in millimetres unless otherwise shown.

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

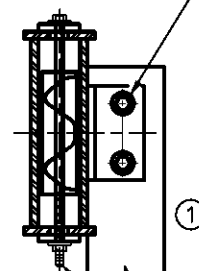
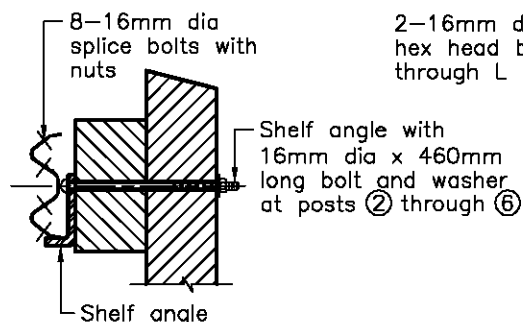




SHELF ANGLE DETAIL



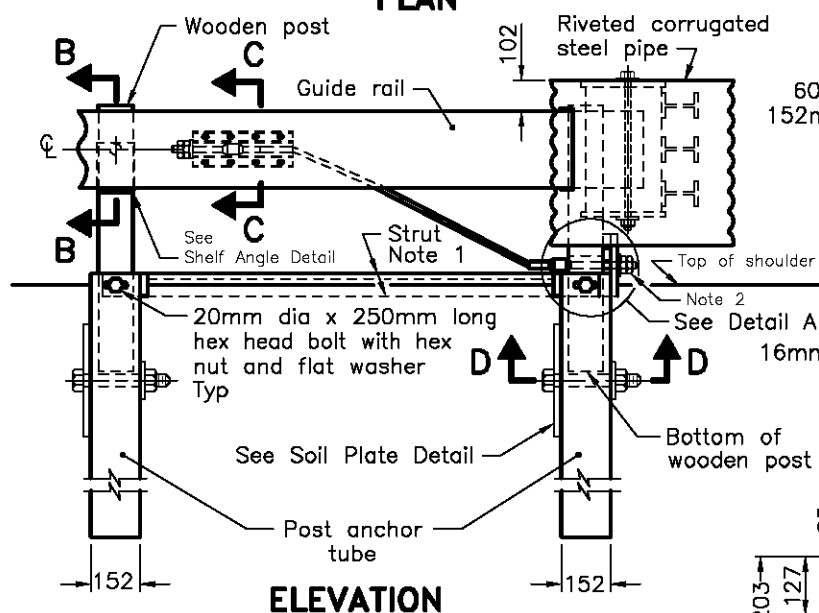
SECTION B-B



SECTION A-A

16mm dia x 560mm long hex head bolt inserted through guide rail with flat rectangular washer at each end
See OPSD 912.101 for flat washers

8-16mm dia x 38mm long hex head bolts with washers. Place washers on face side of rail



DETAIL A

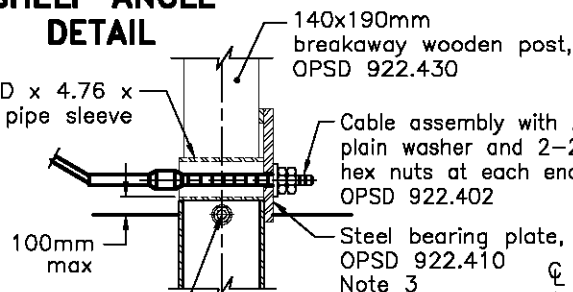
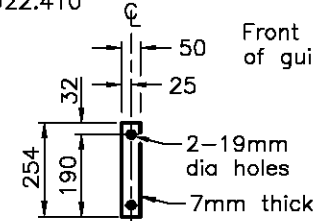
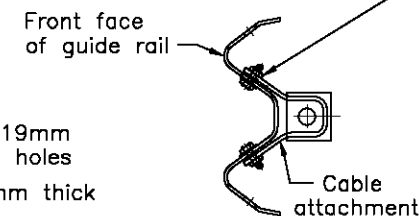


PLATE WASHER DETAIL



SECTION C-C

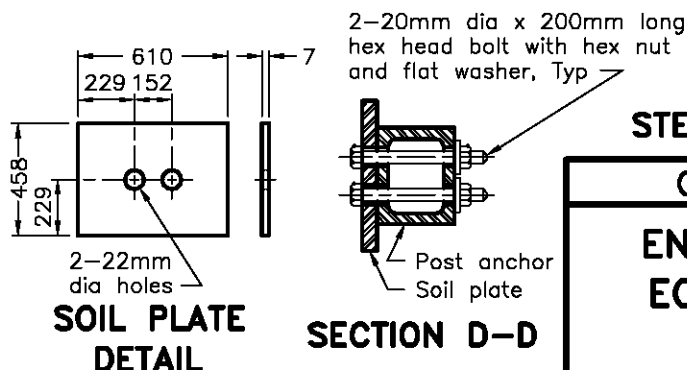
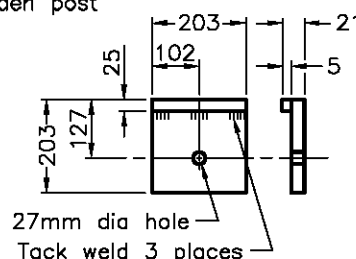


NOTES:

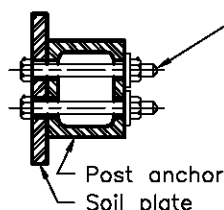
- 1 For right shoulder installations the sides of strut shall face downward and shall face upward on left shoulder installations.
- 2 Two nuts and a washer shall be installed at each end of the cable assembly.
- 3 Steel bearing plate shall be secured against rotation using nails into post.

A All dimensions are in millimetres unless otherwise shown.

STEEL BEARING PLATE DETAIL



SECTION D-D



ONTARIO PROVINCIAL STANDARD DRAWING

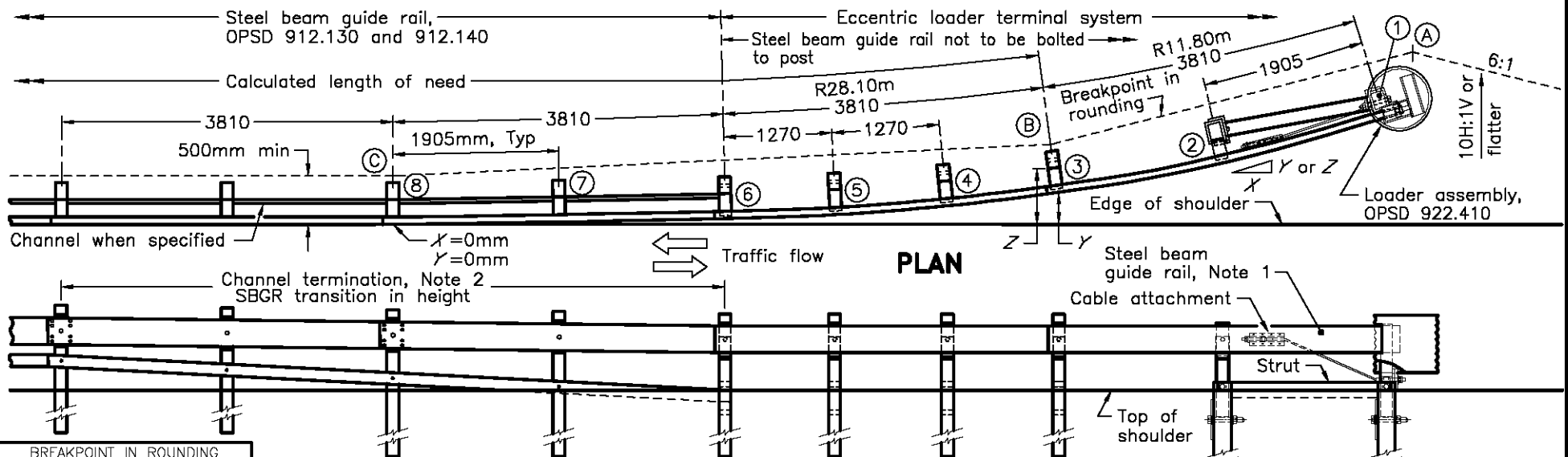
**ENERGY ATTENUATOR, END TREATMENT
ECCENTRIC LOADER TERMINAL SYSTEM
ASSEMBLY - LOADER DETAIL**

Nov 2013

Rev 2



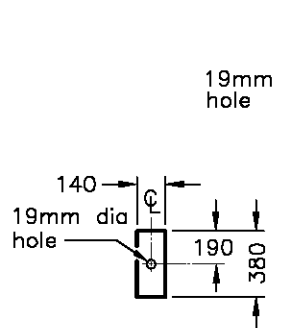
OPSD 922.410



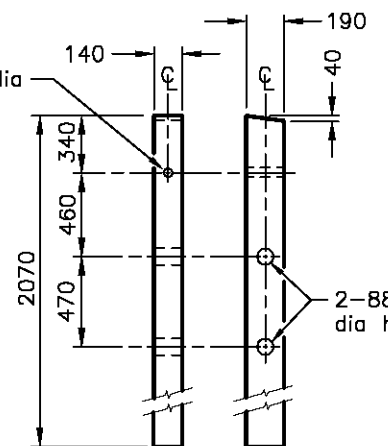
PLAN

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

RAIL AND POST OFFSET			
POSTS	SHOULDER TO FACE OF		
	RAIL	POST	
(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

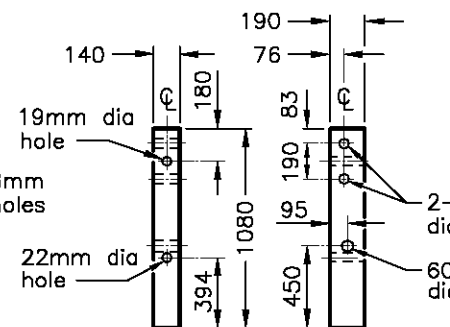


OFFSET BLOCK

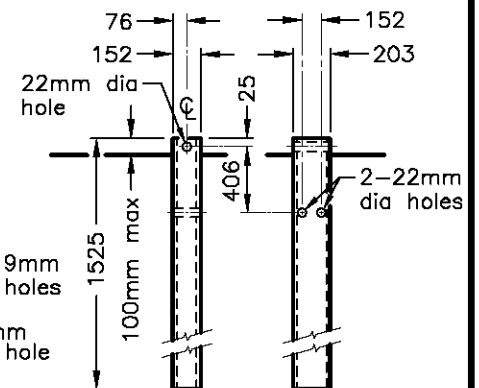


FRONT VIEW
SIDE VIEW
POSTS ③ TO ⑥

ELEVATION



FRONT VIEW
SIDE VIEW
POSTS ① AND ②



FRONT VIEW
SIDE VIEW
POST ANCHOR TUBE DETAIL
HSS 203.2x152.4x4.78
1525mm long

NOTES:

- Curved rail elements shall be shop bent to the specified radius.
- Channel shall not be used within the eccentric loader terminal system.
- Delineation shall be according to OPSD 984.201 and 984.202.
- This OPSD shall be read in conjunction with OPSD 202.030, 922.401, 922.402, and 922.410.
- All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

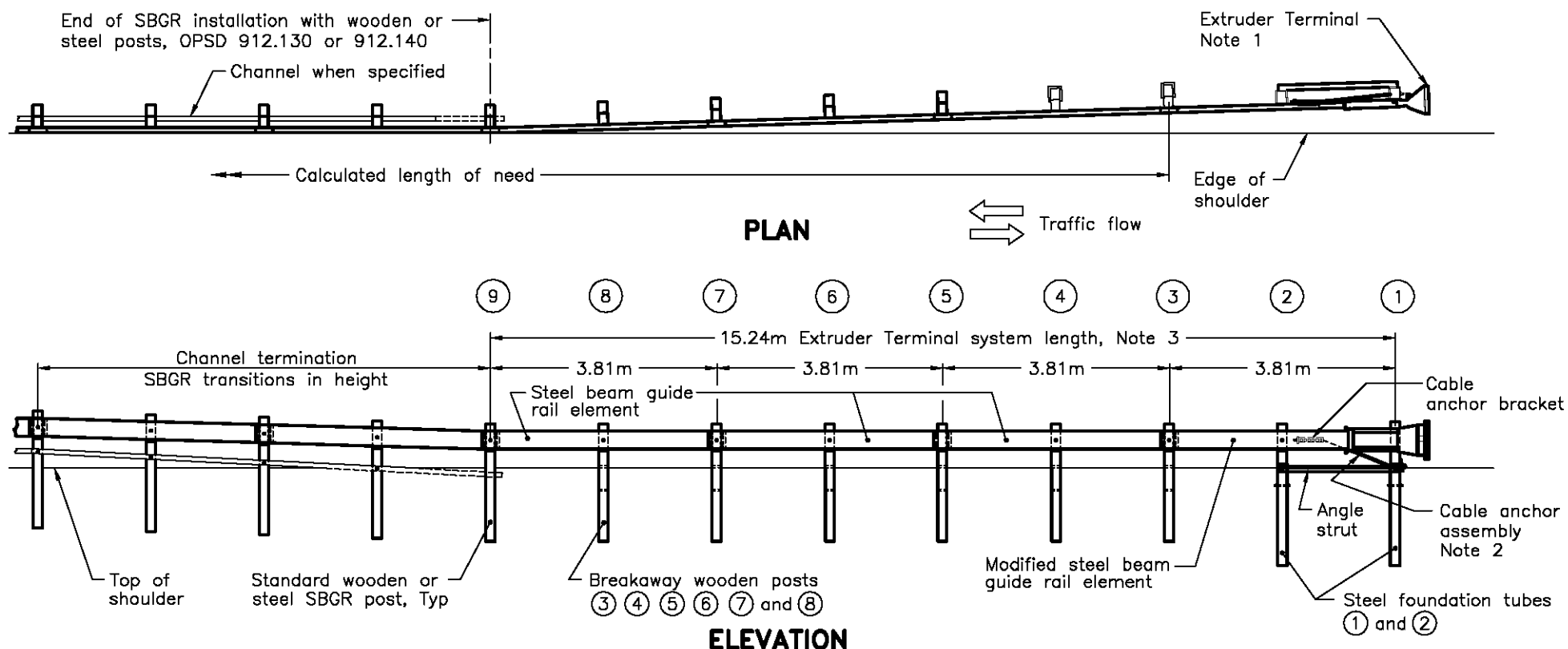
ENERGY ATTENUATOR, END TREATMENT
ECCENTRIC LOADER TERMINAL SYSTEM
INSTALLATION - LAYOUT AND POST

Nov 2013

Rev 7



OPSD 922.430



NOTES:

- 1 This OPSD shows right shoulder installation. The Extruder Terminal shall be inverted for left shoulder installation.
- 2 Two nuts and a washer shall be installed and locked tight at each end of the cable assembly.
- 3 The system length shall be installed in a straight line parallel to the roadway, at a 50:1 flare rate, or at a 25:1 flare rate as specified.

A Delineation shall be according to OPSD 984.201 and 984.202.

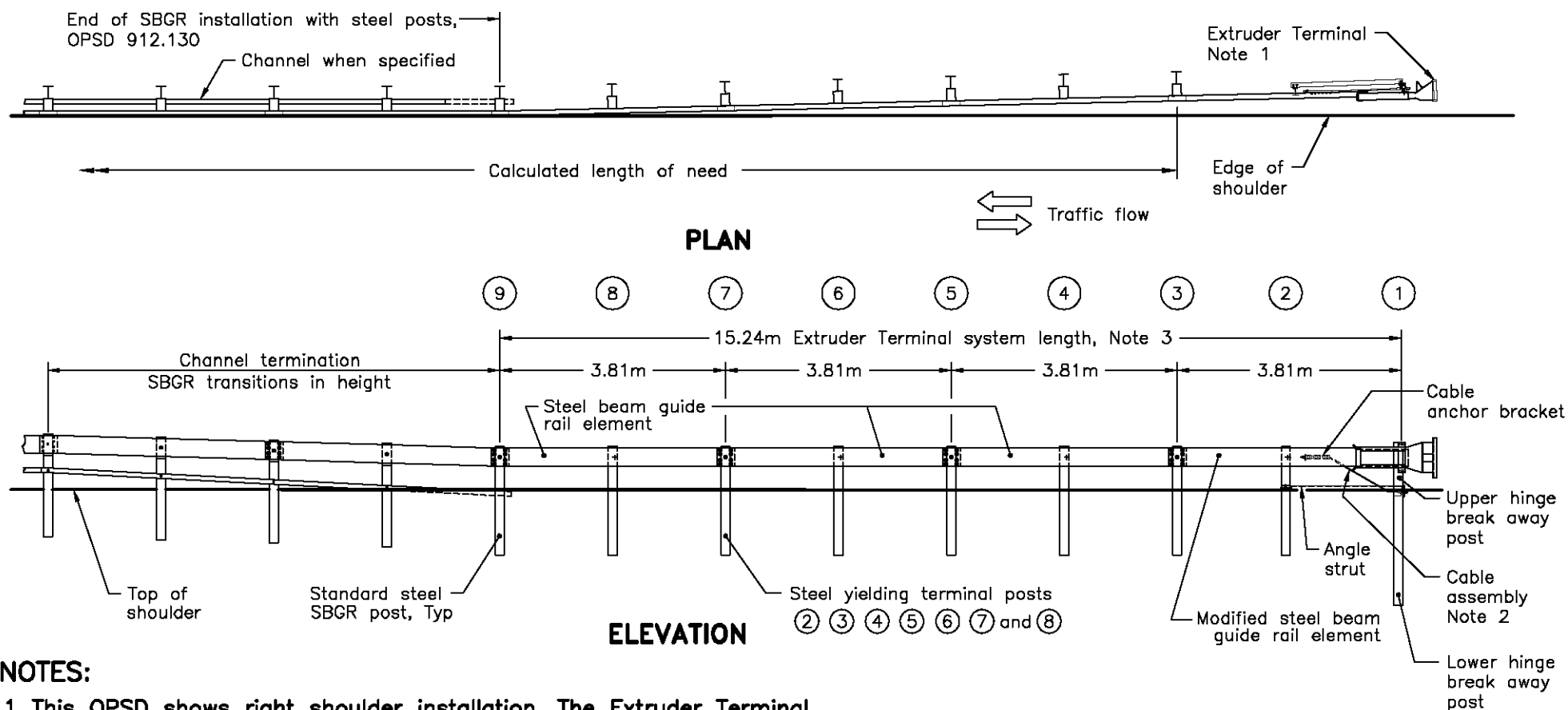
B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 TL-3.

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

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2010	Rev	5
ENERGY ATTENUATOR, END TREATMENT STEEL BEAM ENERGY ATTENUATING TERMINAL EXTRUDER TERMINAL SYSTEM WITH WOODEN POSTS, INSTALLATION				
		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.

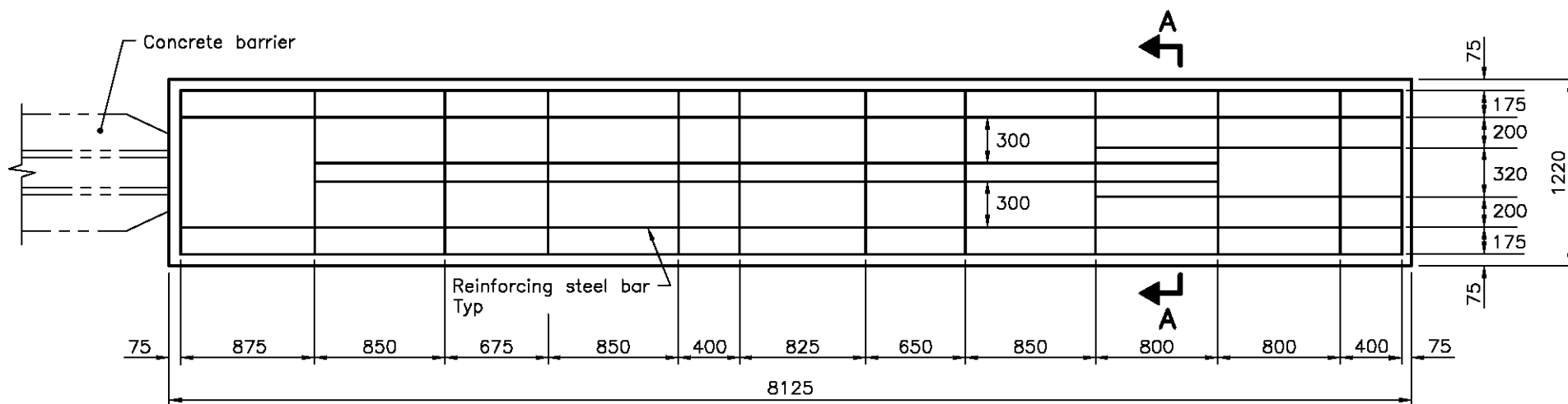
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	
ENERGY ATTENUATOR, END TREATMENT STEEL BEAM ENERGY ATTENUATING TERMINAL EXTRUDER TERMINAL SYSTEM WITH STEEL POSTS, INSTALLATION	

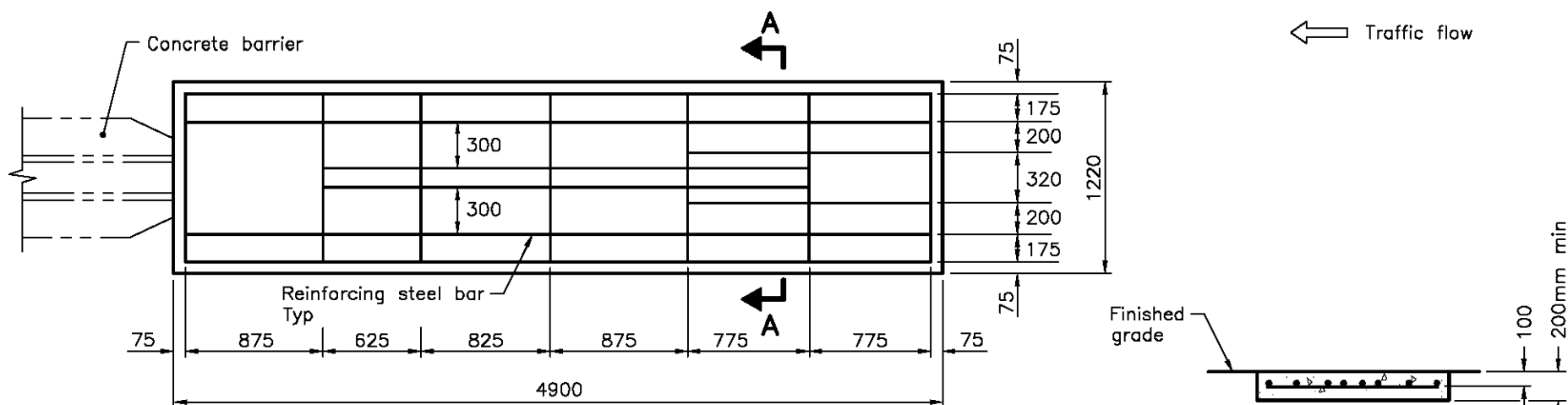
Nov 2010 Rev 2



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.

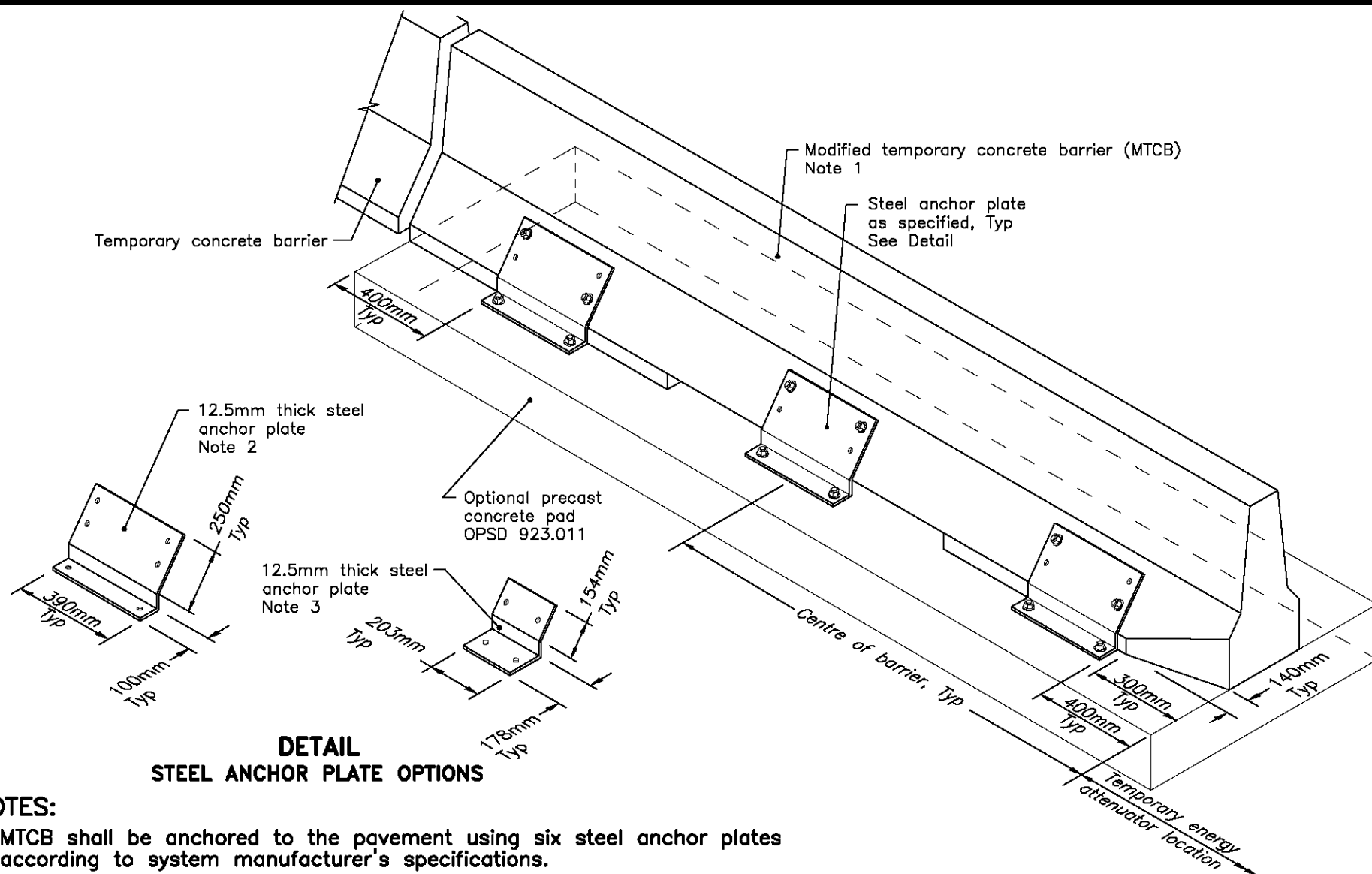
ONTARIO PROVINCIAL STANDARD DRAWING

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 shall 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

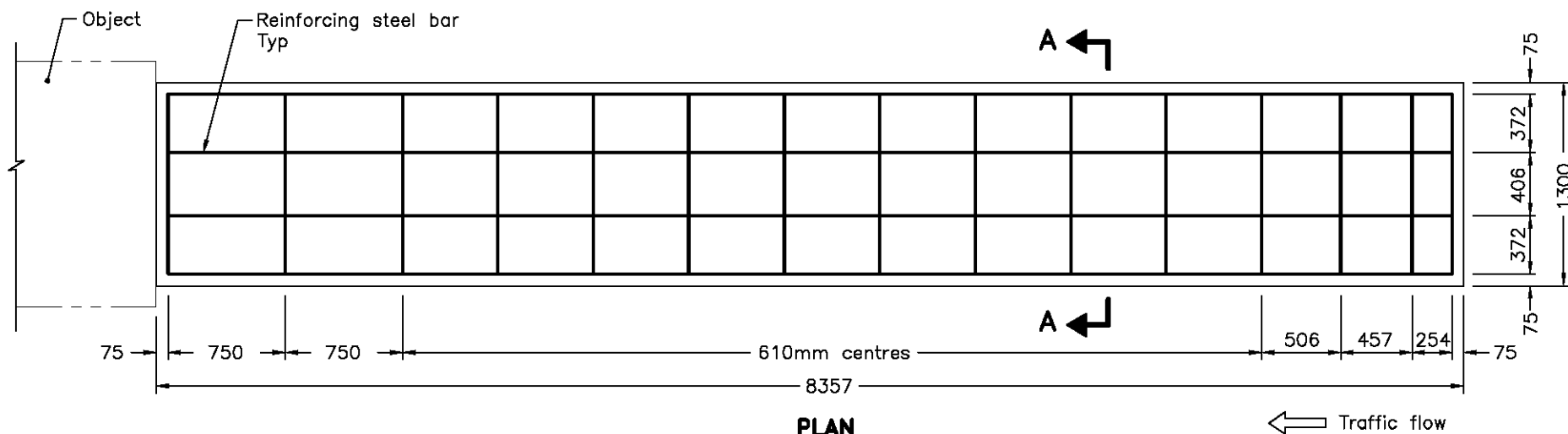
ENERGY ATTENUATOR, CRASH CUSHION
COMPONENT-ANCHOR ASSEMBLY

Nov 2016

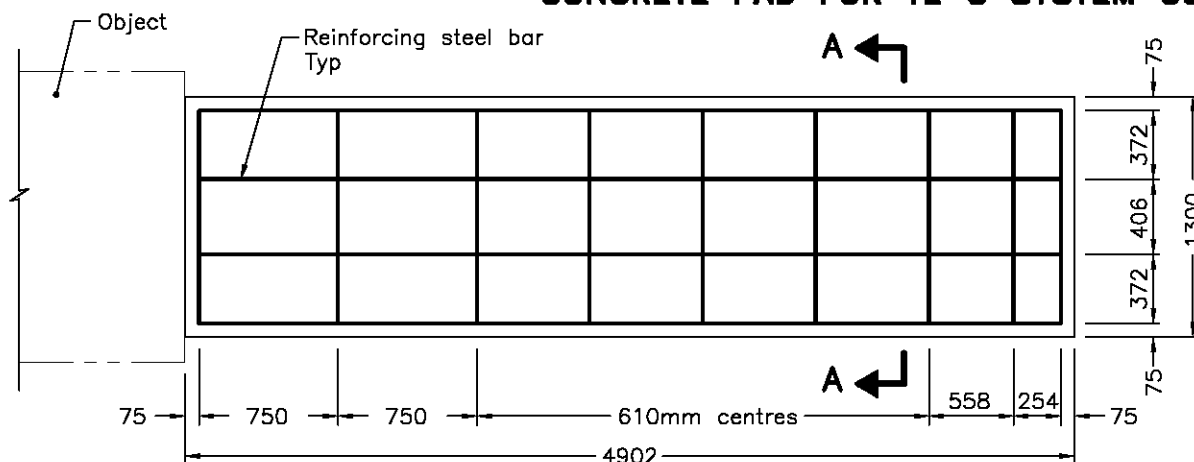
Rev 1



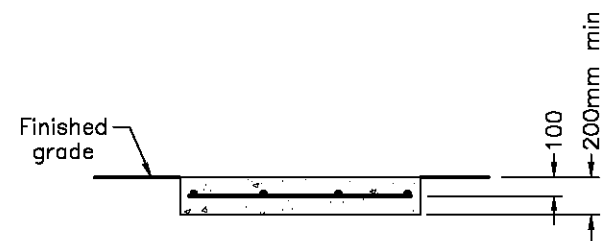
OPSD 923.002



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

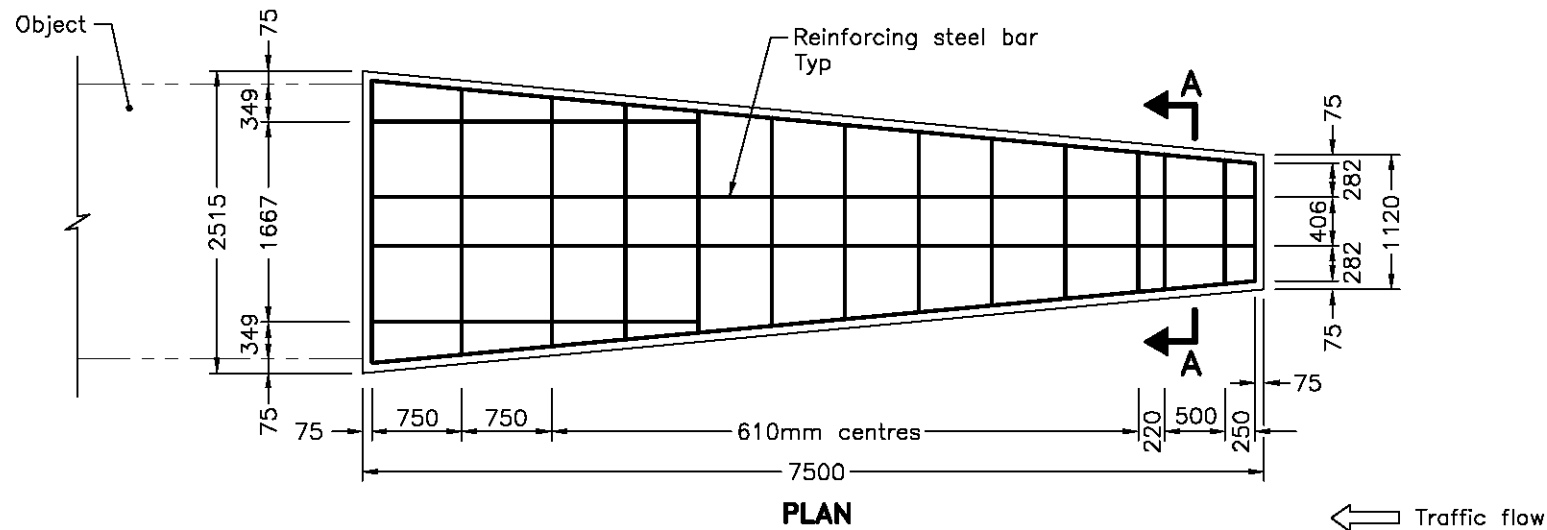
Rev 0

**ENERGY ATTENUATOR, CRASH CUSHION
WIDE SYSTEMS**

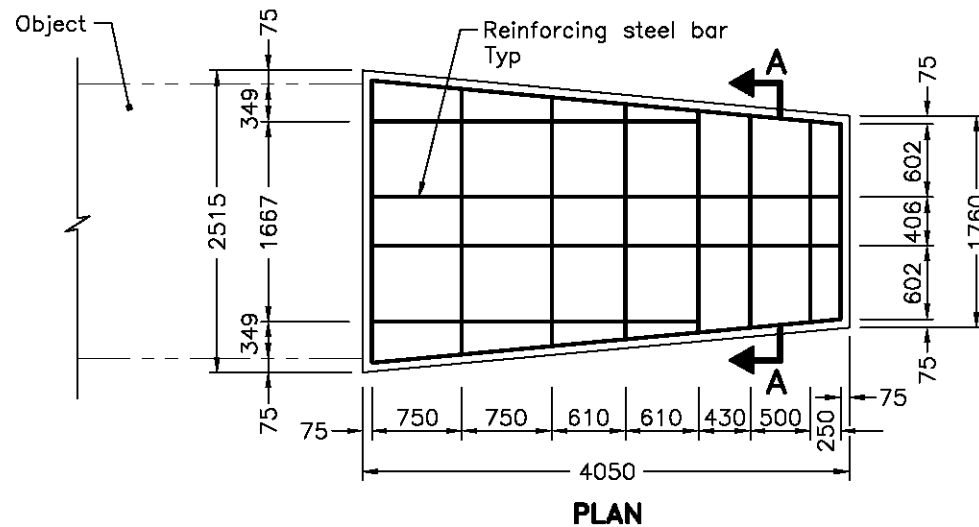
COMPONENT – REINFORCED CONCRETE PAD



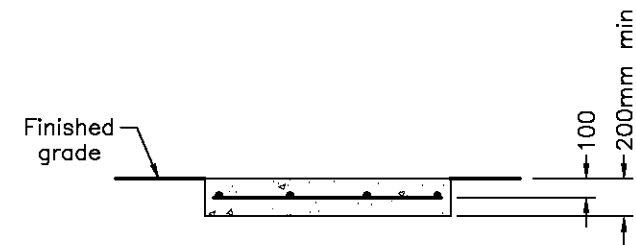
OPSD 923.004



CONCRETE PAD FOR TL-3 SYSTEM CONFIGURATION



CONCRETE PAD FOR TL-2 SYSTEM CONFIGURATION



NOTES:

- A All reinforcing shall be 15M reinforcing steel bars.
- B All dimensions are in millimetres unless otherwise shown.

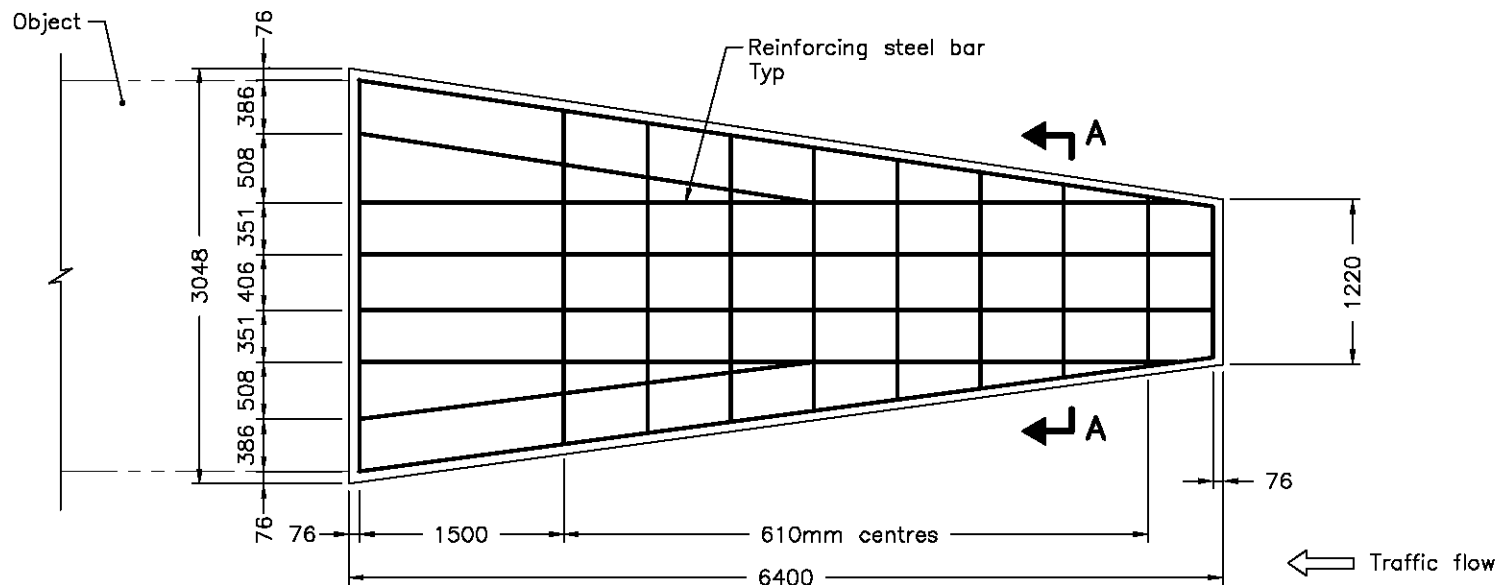
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2011 Rev 0

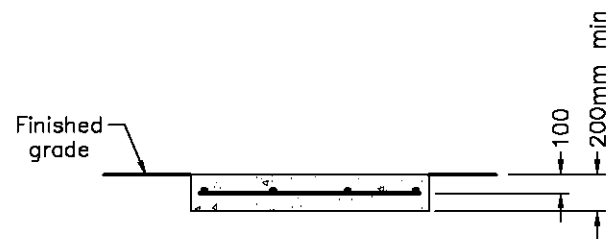
**ENERGY ATTENUATOR, CRASH CUSHION
EXTRA WIDE SYSTEMS
COMPONENT – REINFORCED CONCRETE PAD**

OPSD 923.005





PLAN
CONCRETE PAD FOR TL-3 SYSTEM CONFIGURATION



SECTION A-A

NOTES:

A All reinforcing shall be 15M reinforcing steel bars.

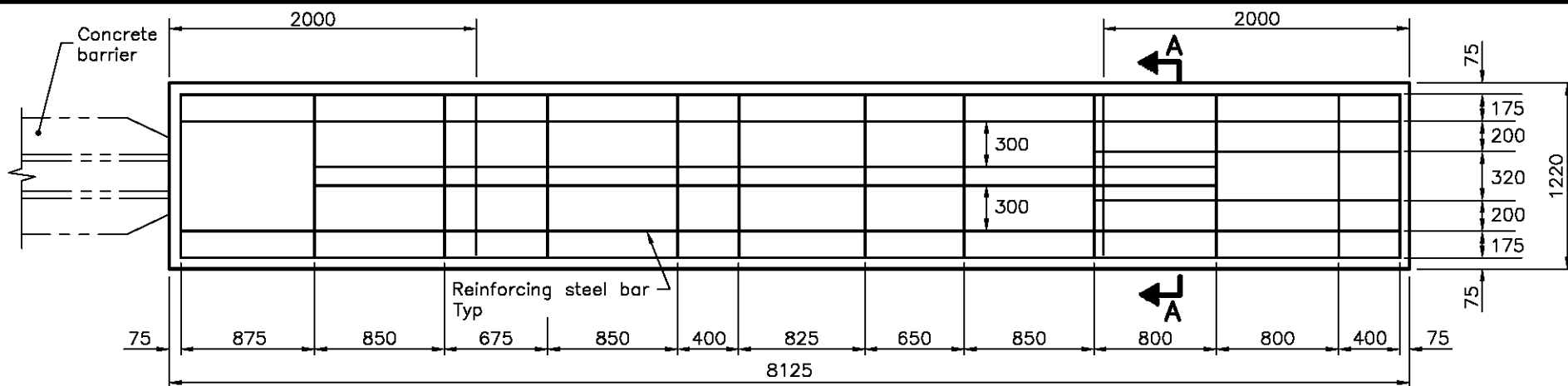
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SUPER WIDE SYSTEM COMPONENT – REINFORCED CONCRETE PAD

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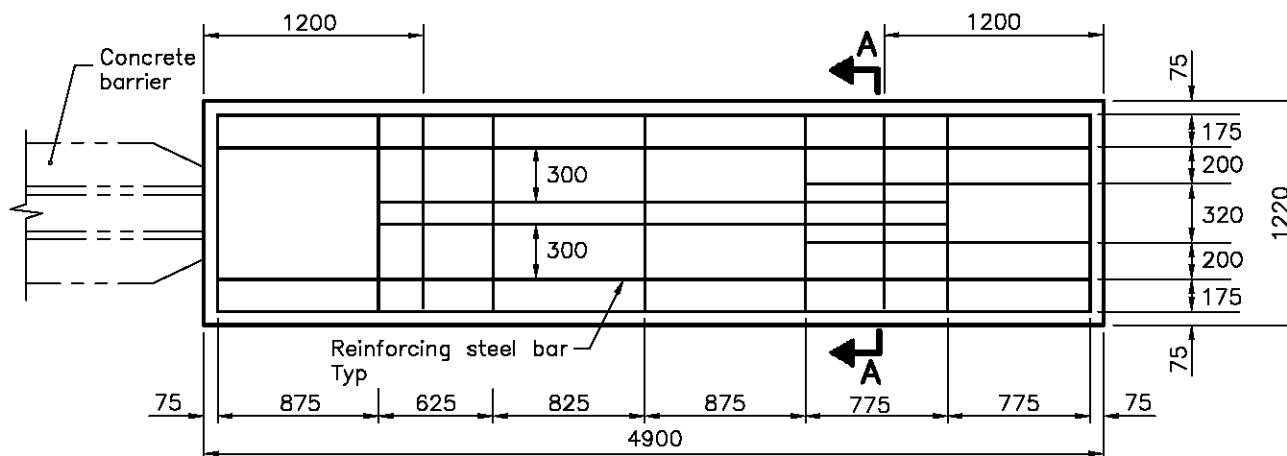


OPSD 923.006

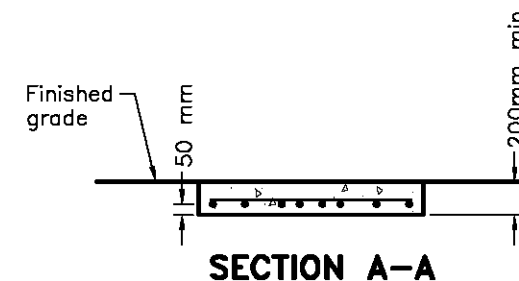


PLAN
CONCRETE PAD FOR TL-3 SYSTEM CONFIGURATION

← Traffic flow



PLAN
CONCRETE PAD FOR TL-2 SYSTEM CONFIGURATION



NOTES:

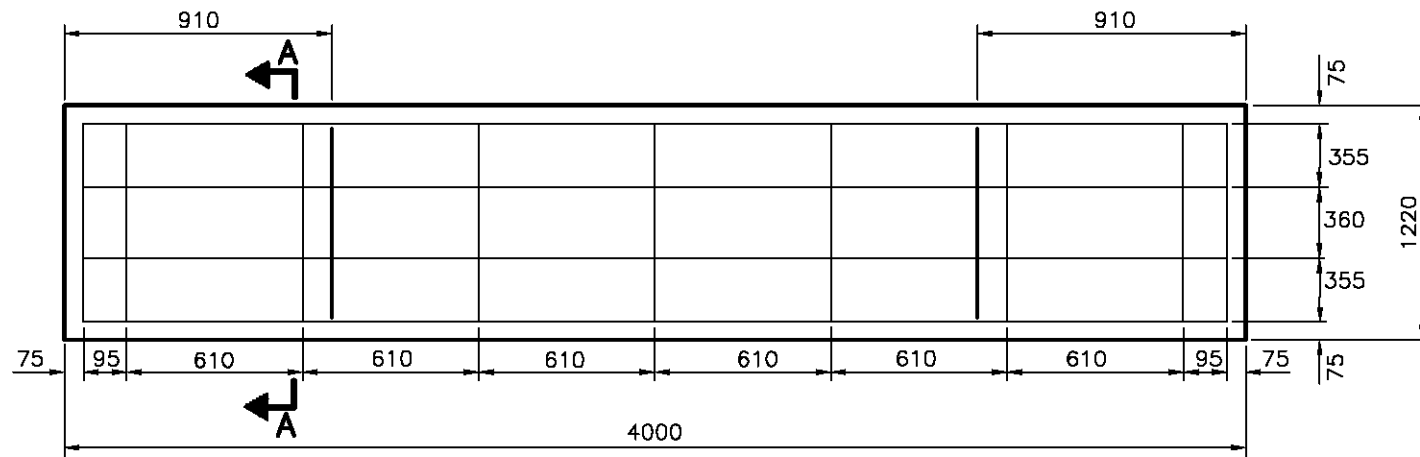
- A All reinforcing steel bar shall be 15M unless otherwise shown.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION
NARROW SYSTEMS
COMPONENT-REINFORCED PRECAST CONCRETE PAD
FOR PERMANENT INSTALLATION

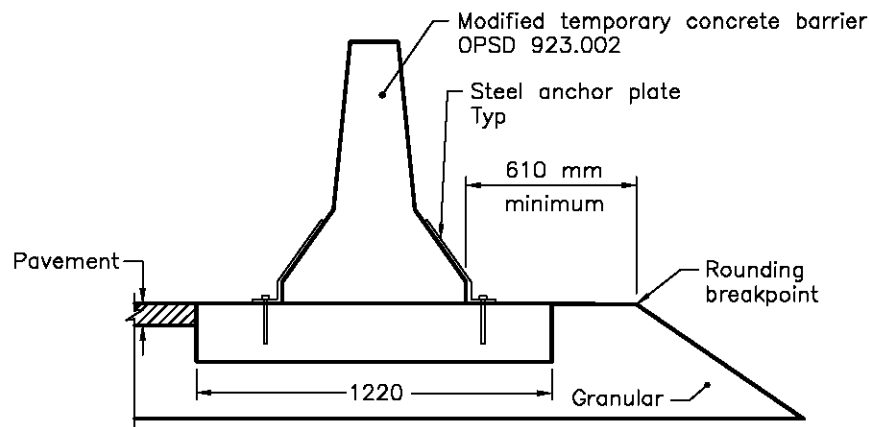
Nov 2016 Rev 0



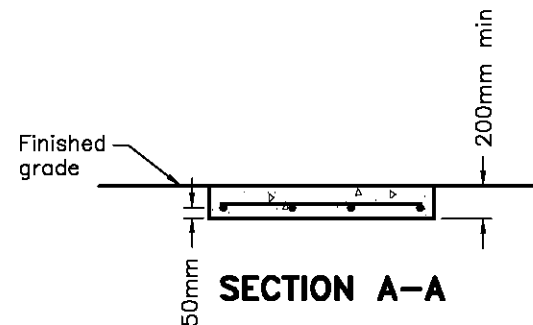
OPSD 923.010



PLAN



INSTALLATION



NOTES:

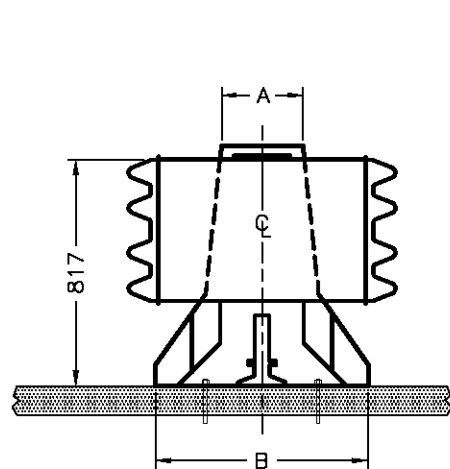
- A All reinforcing steel bar shall be 15M unless otherwise shown.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION COMPONENT-REINFORCED PRECAST CONCRETE PAD FOR MODIFIED TEMPORARY CONCRETE BARRIER

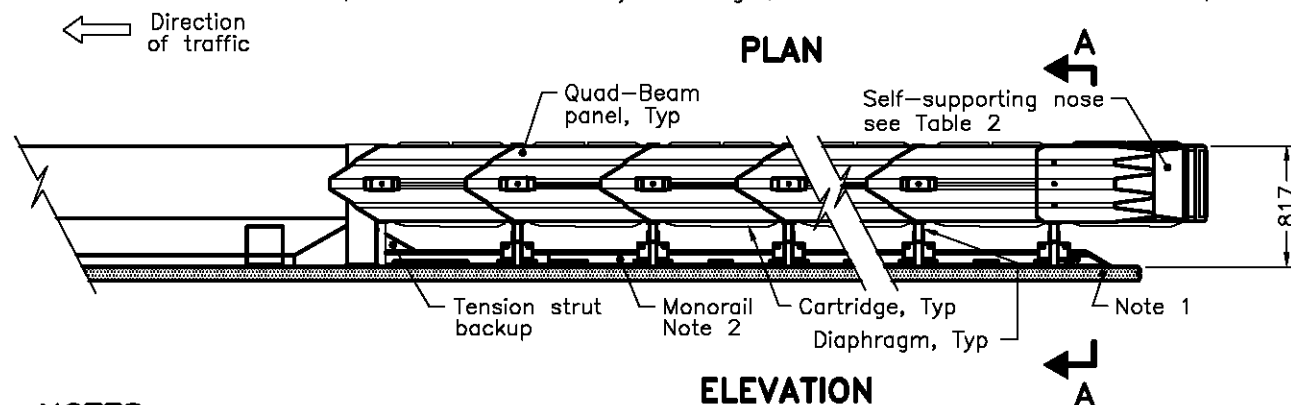
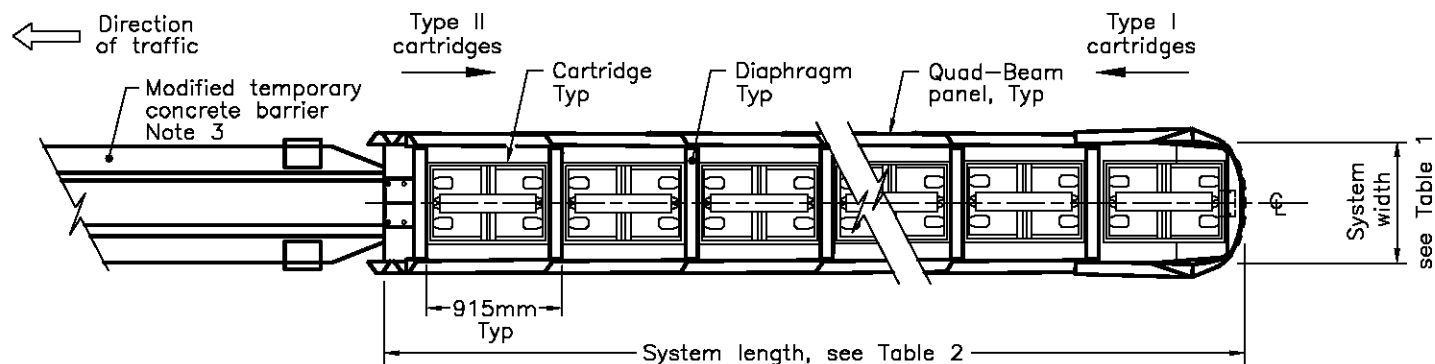
Nov 2016 Rev 0



OPSD 923.011



SECTION A-A



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
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

ONTARIO PROVINCIAL STANDARD DRAWING

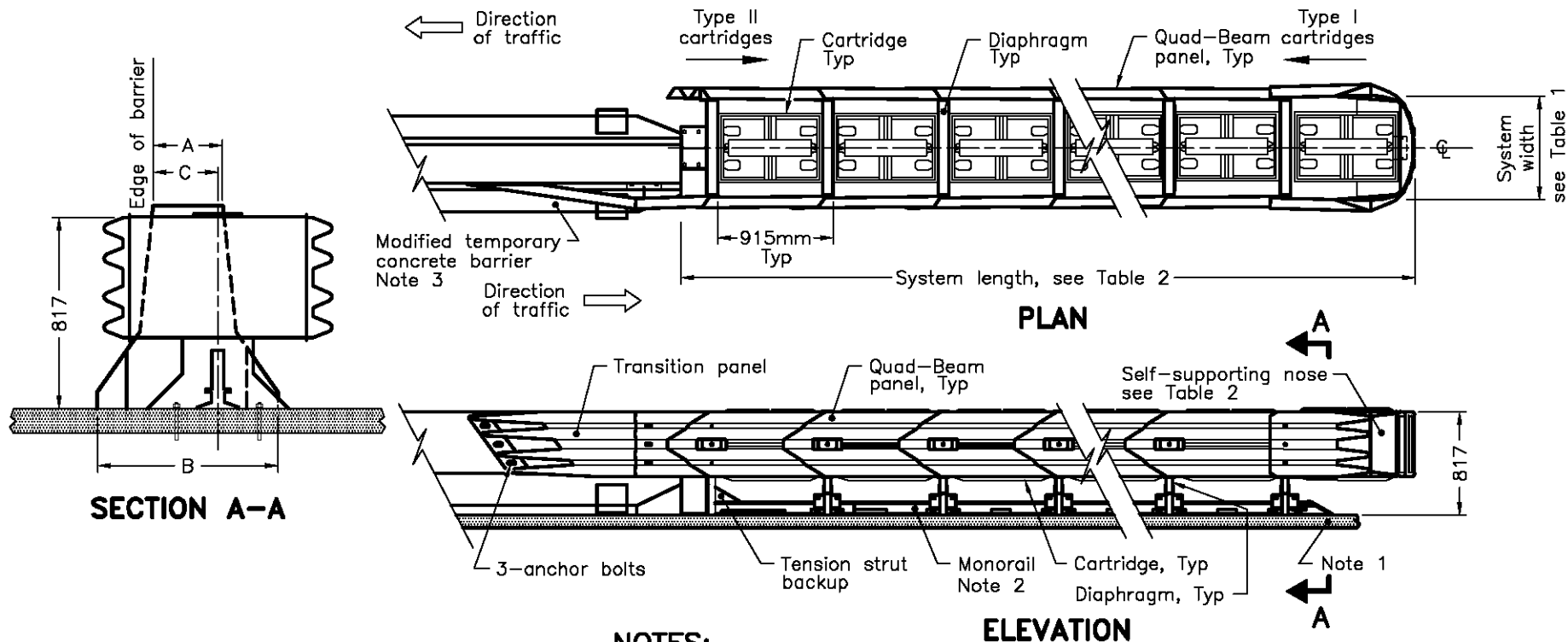
**ENERGY ATTENUATOR, CRASH CUSHION
QUADGUARD SYSTEM
INSTALLATION – TEMPORARY
UNIDIRECTIONAL**

Nov 2011

Rev 1



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

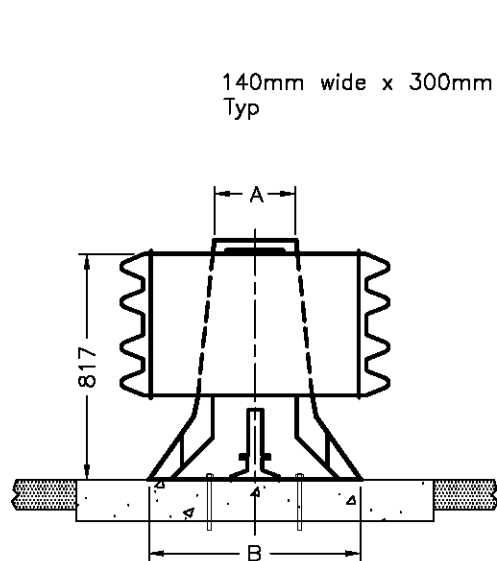
ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SYSTEM INSTALLATION – TEMPORARY BIDIRECTIONAL

Nov 2011

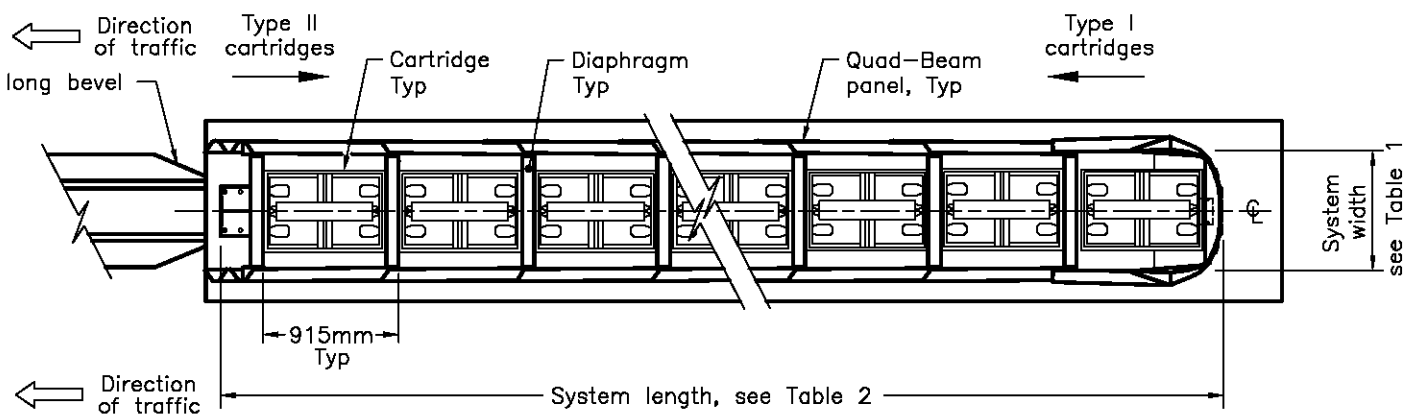
Rev 1



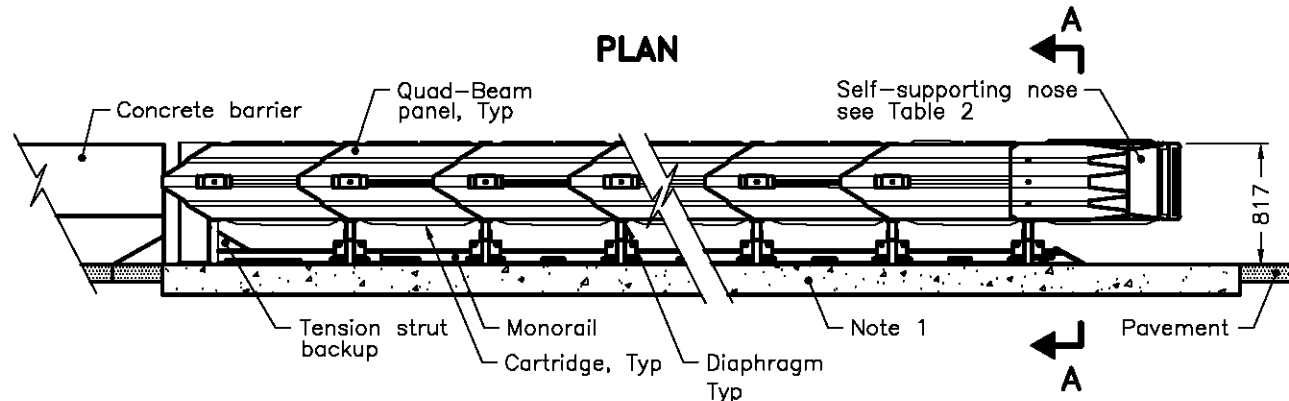
OPSD 923.181



SECTION A-A



PLAN



ELEVATION

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 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

ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION
QUADGUARD SYSTEM
INSTALLATION – PERMANENT
UNIDIRECTIONAL

Nov 2011 Rev 1



OPSD 923.182

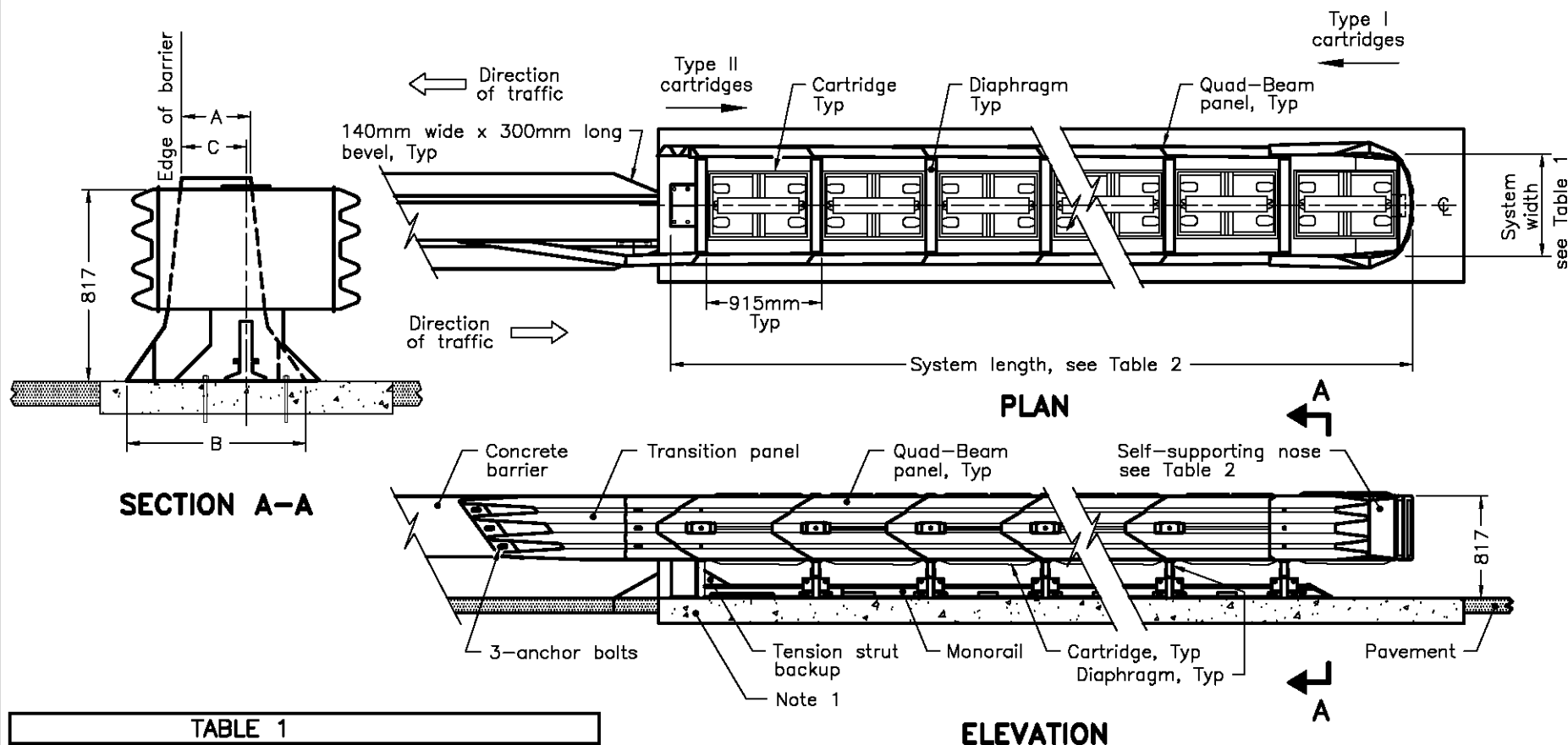


TABLE 1			
SYSTEM WIDTH	A TOP OF CONCRETE BARRIER OR HAZARD WIDTH	B BOTTOM OF CONCRETE BARRIER OR HAZARD WIDTH	C Ø OFFSET
610	≤ 406	≤ 864	205
760	≤ 559	≤ 1016	280
915	≤ 711	≤ 1168	355

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.

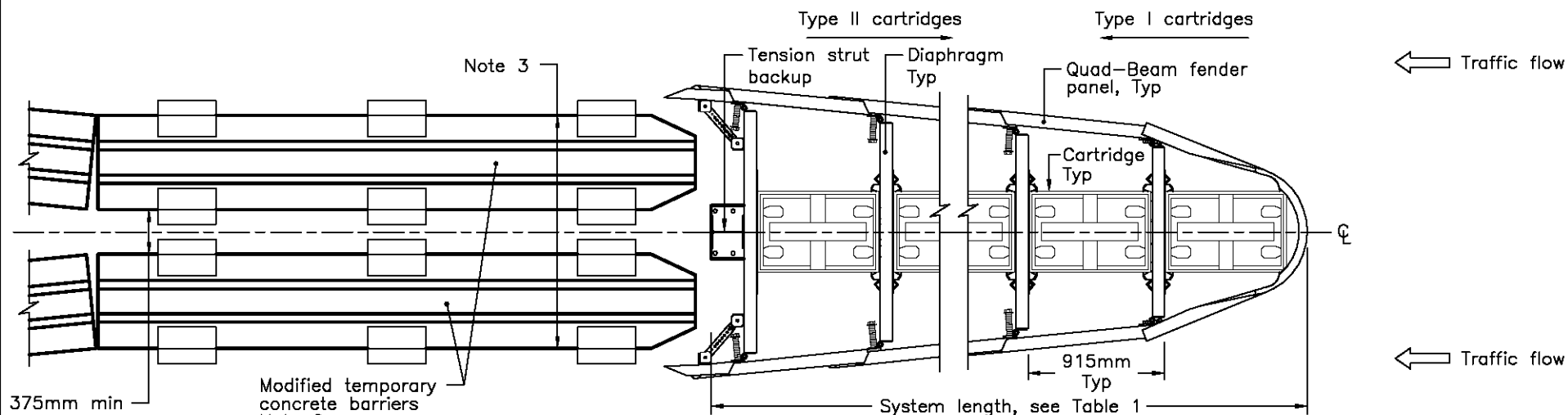
ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

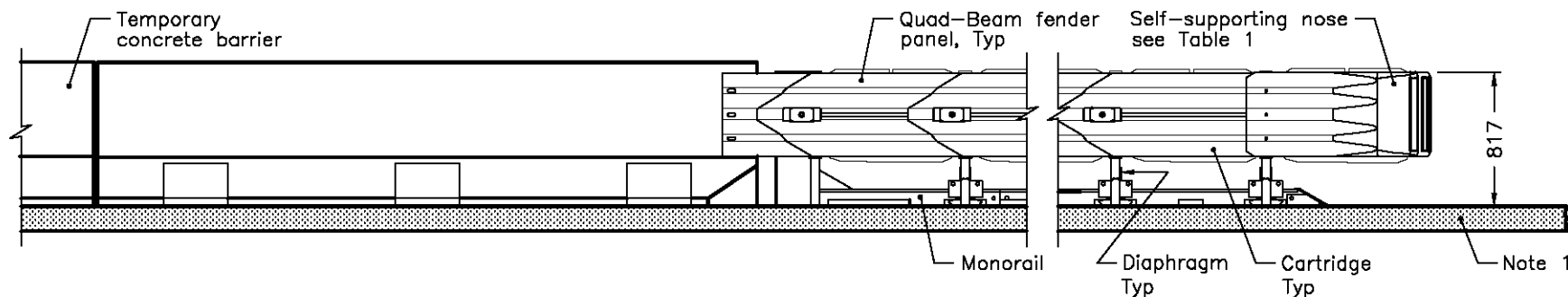
Nov 2011 Rev 1

OPSD 923.183





PLAN



ELEVATION

NOTES:

- 1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.004.
- 2 Adjacent temporary concrete barriers shall be modified and anchored according to OPSD 923.002.
- 3 Maximum width of object shall be 1658mm for the first 762mm behind the rear fender panels.

- A Delineation shall be according to OPSD 984.203.
 B The system depicted here is a proprietary product.
 C System configuration meets NCHRP Report 350 test level.
 D All dimensions are in millimetres unless otherwise shown.

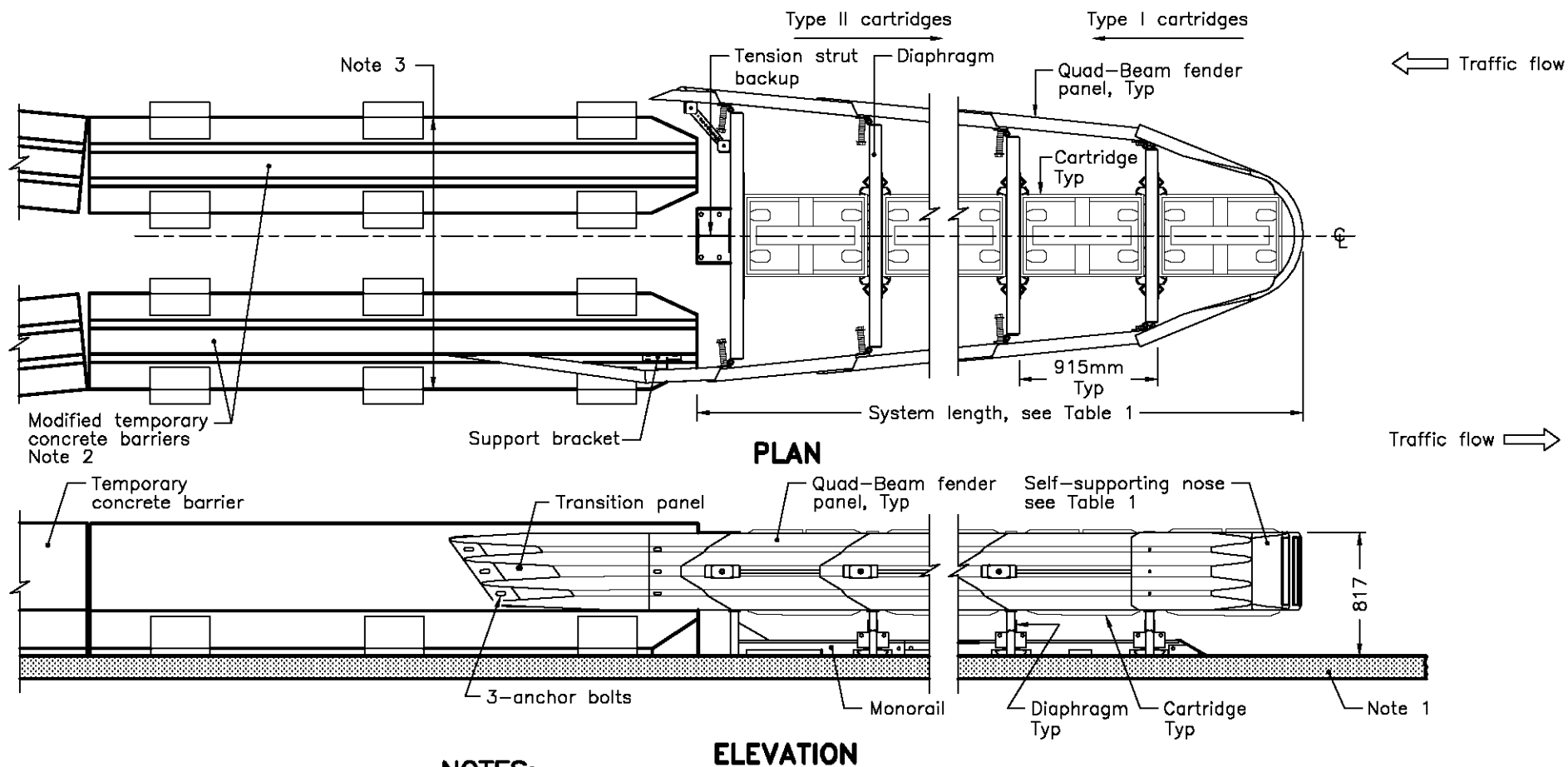
TABLE 1				
SYSTEM CONFIGURATION	PLASTIC NOSE		STEEL NOSE	
	TL-2	TL-3	TL-2	TL-3
TYPE I CARTRIDGES FRONT REQ'D	3	4	3	3
TYPE II CARTRIDGES REAR REQ'D	1	3	1	3
SYSTEM LENGTH	4000	6740	4000	5780
NOMINAL SYSTEM WIDTH	1755	1755	1755	1755

ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION
QUADGUARD WIDE SYSTEM
INSTALLATION – TEMPORARY
UNIDIRECTIONAL

Nov 2011 Rev 0



OPSD 923.184



NOTES:

- 1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.004.
- 2 Adjacent temporary concrete barrier units shall be modified and anchored according to OPSD 923.002.
- 3 Maximum width of object shall be 1658mm for the first 762mm behind the rear fender panels.

- A Delineation shall be according to OPSD 984.203.
- B The system depicted here is a proprietary product.
- C System configuration meets NCHRP Report 350 test level.
- D All dimensions are in millimetres unless otherwise shown.

TABLE 1				
SYSTEM CONFIGURATION	PLASTIC NOSE		STEEL NOSE	
	TL-2	TL-3	TL-2	TL-3
TYPE I CARTRIDGES FRONT REQ'D	3	4	3	3
TYPE II CARTRIDGES REAR REQ'D	1	3	1	3
SYSTEM LENGTH	4000	6740	4000	5780
NOMINAL SYSTEM WIDTH	1755	1755	1755	1755

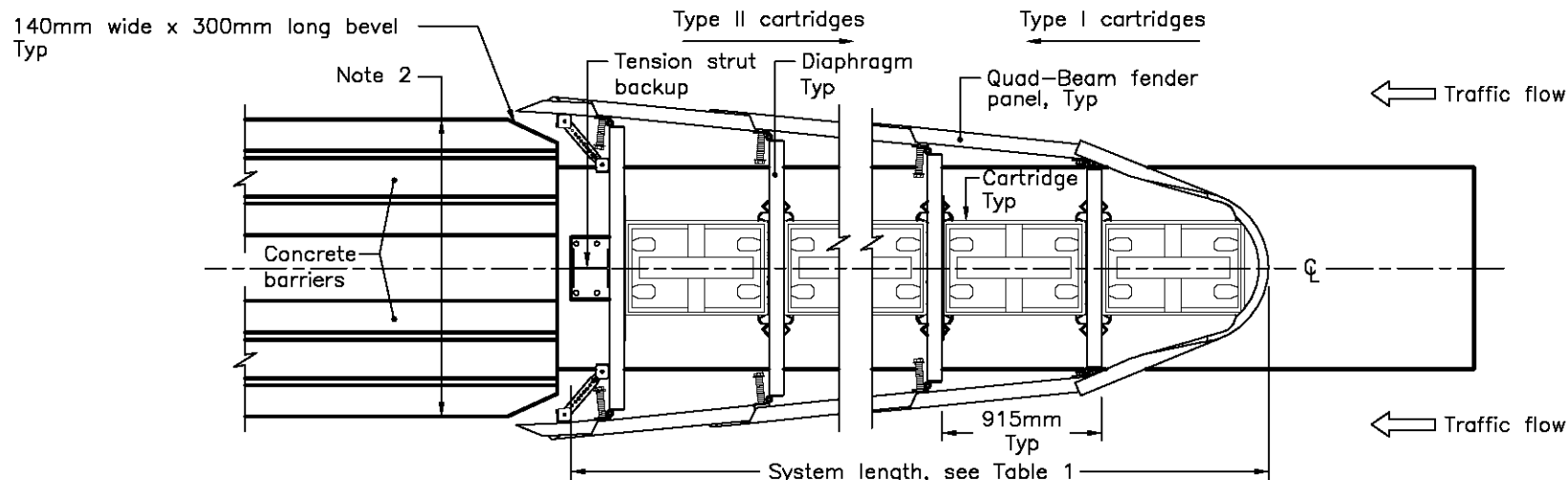
ONTARIO PROVINCIAL STANDARD DRAWING

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

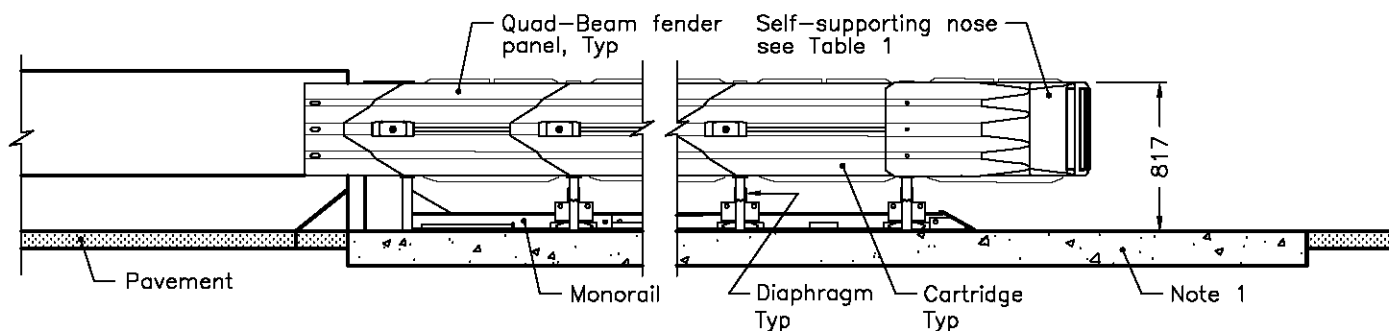
Nov 2011 Rev 0



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

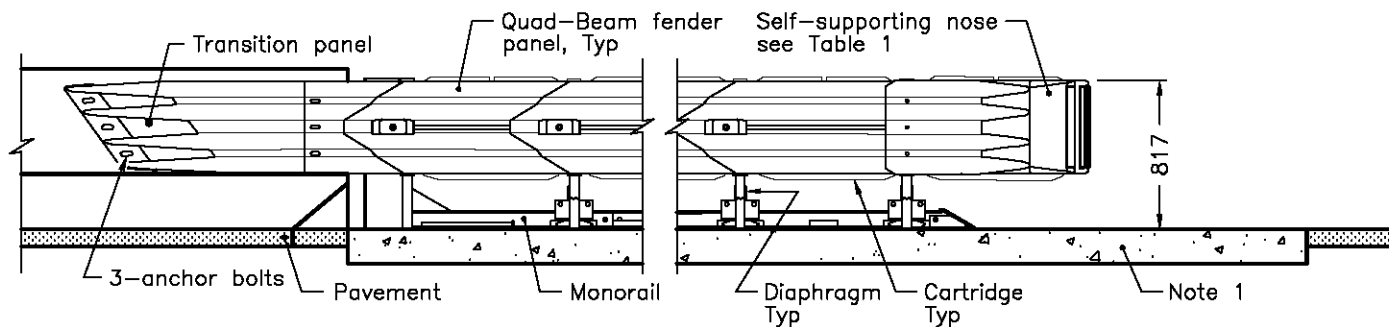
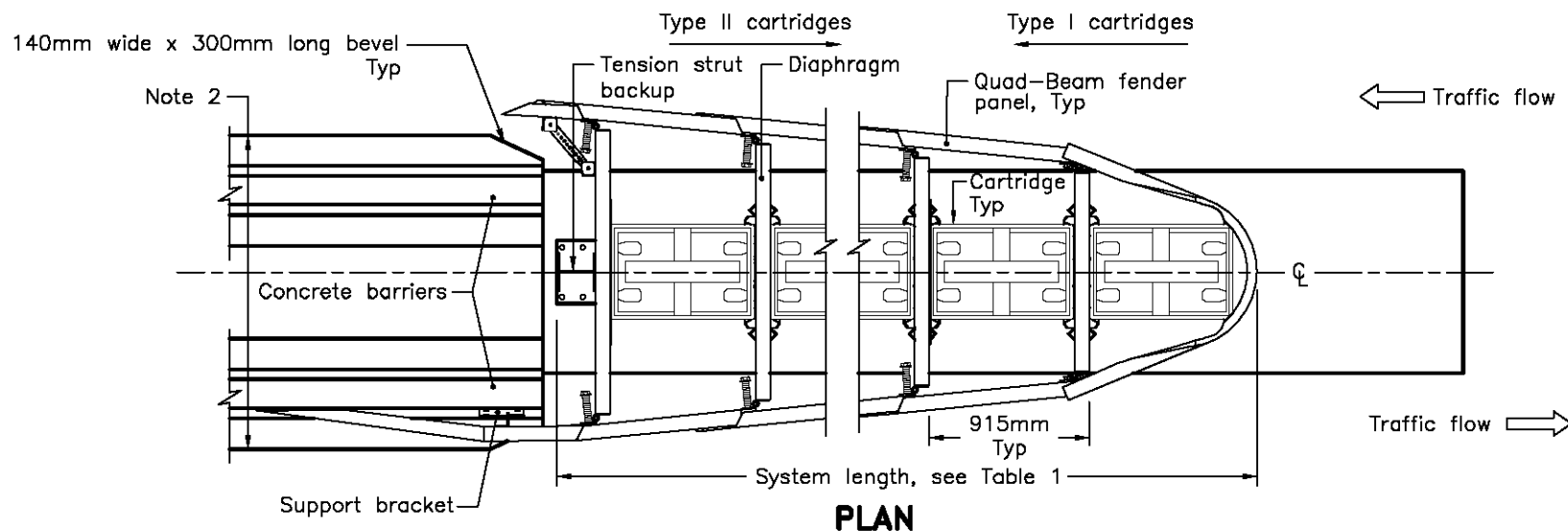
**ENERGY ATTENUATOR, CRASH CUSHION
QUADGUARD WIDE SYSTEM
INSTALLATION – PERMANENT
UNIDIRECTIONAL**

Nov 2011

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OPSD 923.186



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

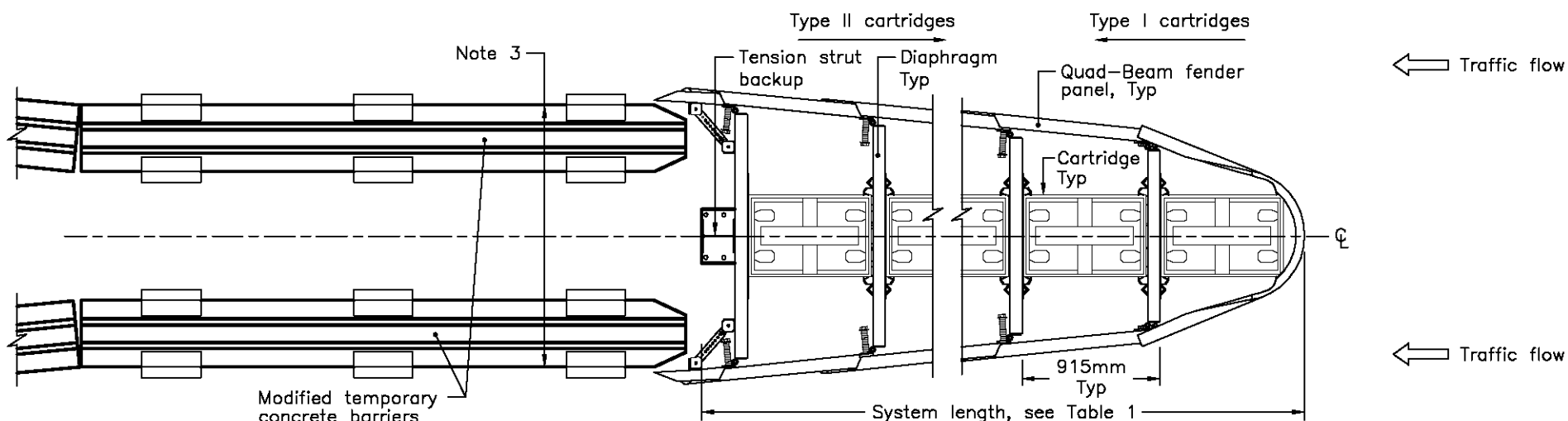
ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD WIDE SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

Nov 2011

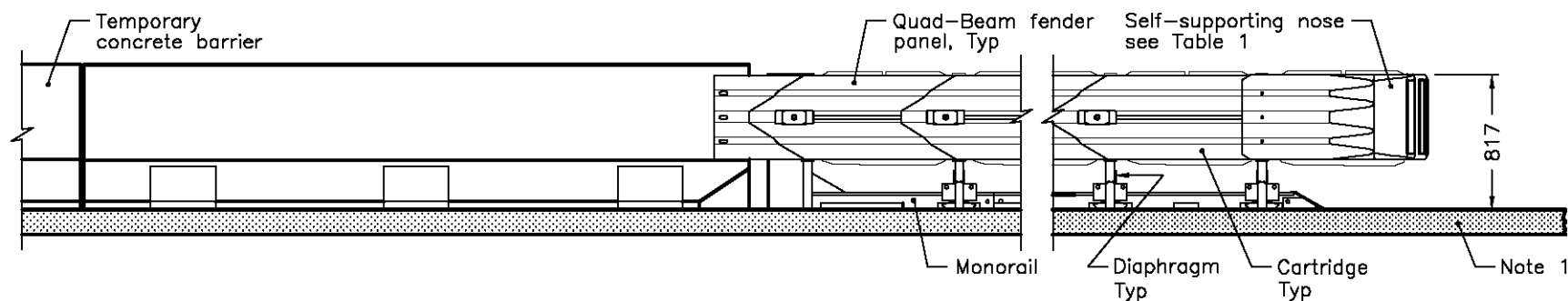
Rev 0



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



OPSD 923.188

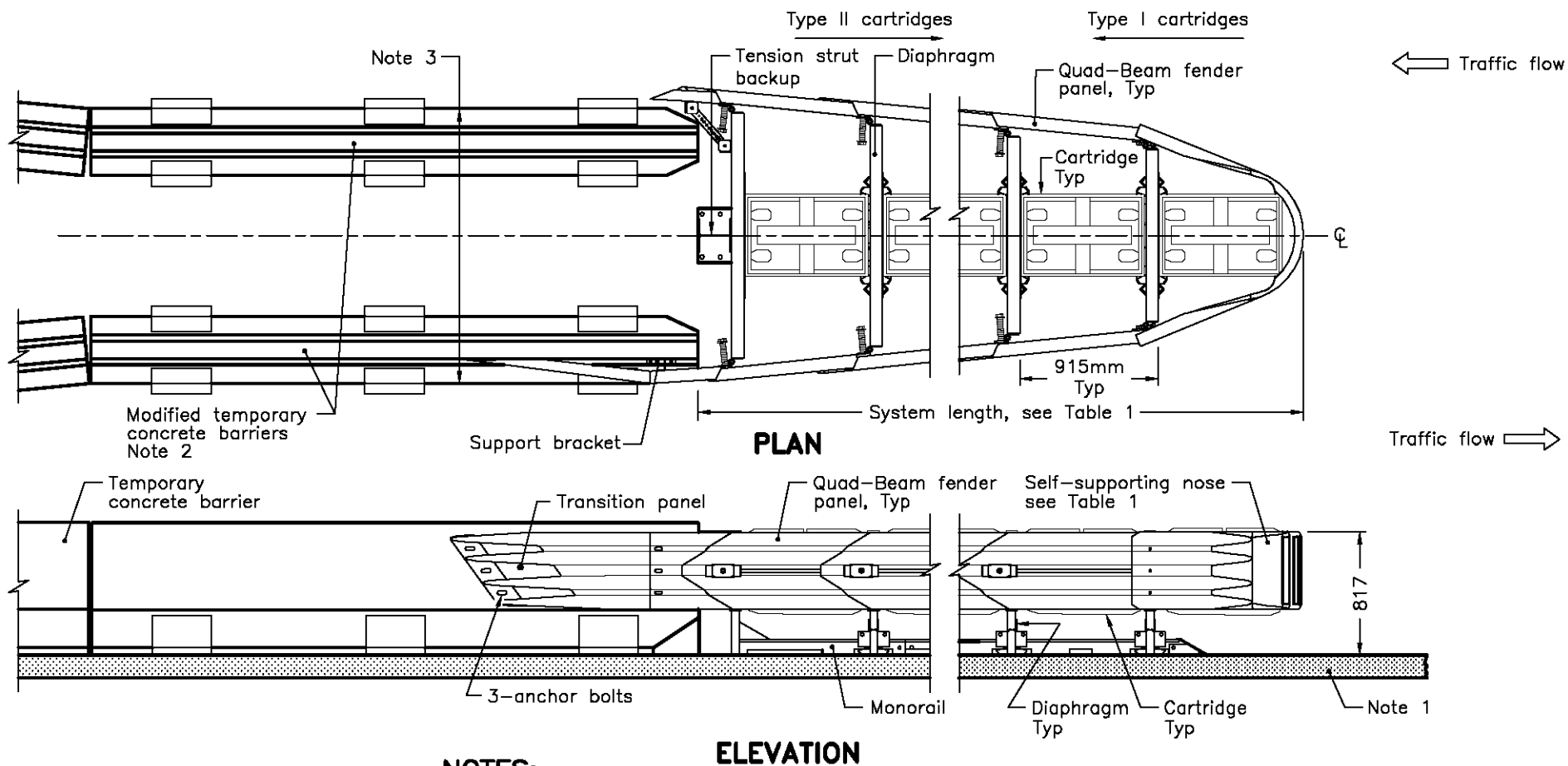


TABLE 1				
SYSTEM CONFIGURATION	PLASTIC NOSE		STEEL NOSE	
	TL-2	TL-3	TL-2	TL-3
TYPE I CARTRIDGES FRONT REQ'D	3	4	3	3
TYPE II CARTRIDGES REAR REQ'D	1	3	1	3
SYSTEM LENGTH	4000	6740	4000	5780
NOMINAL SYSTEM WIDTH	2285	2285	2285	2285

ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION

QUADGUARD EXTRA WIDE SYSTEM

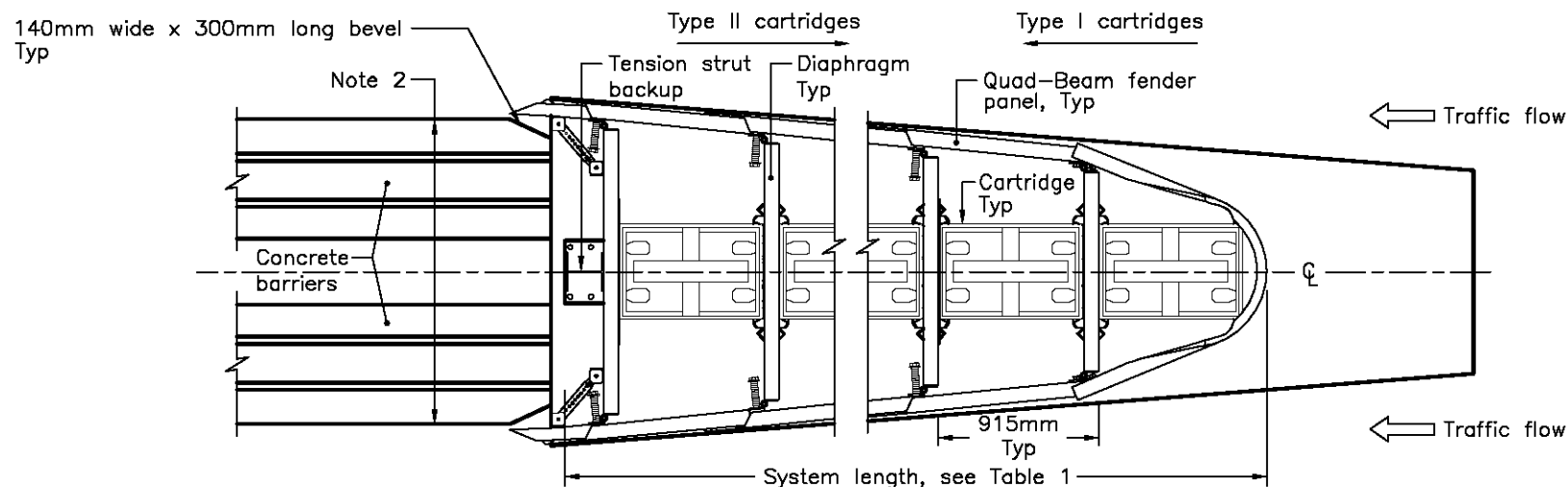
INSTALLATION – TEMPORARY

BIDIRECTIONAL

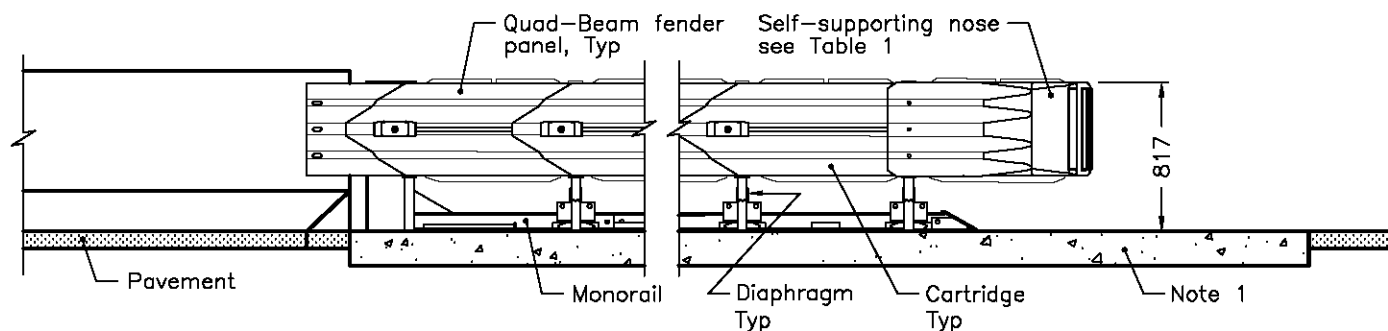
Nov 2011 Rev 0



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

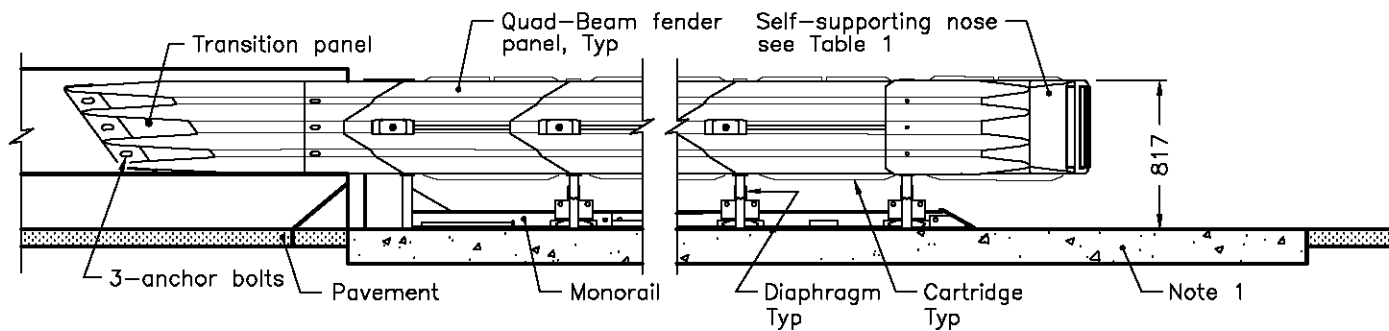
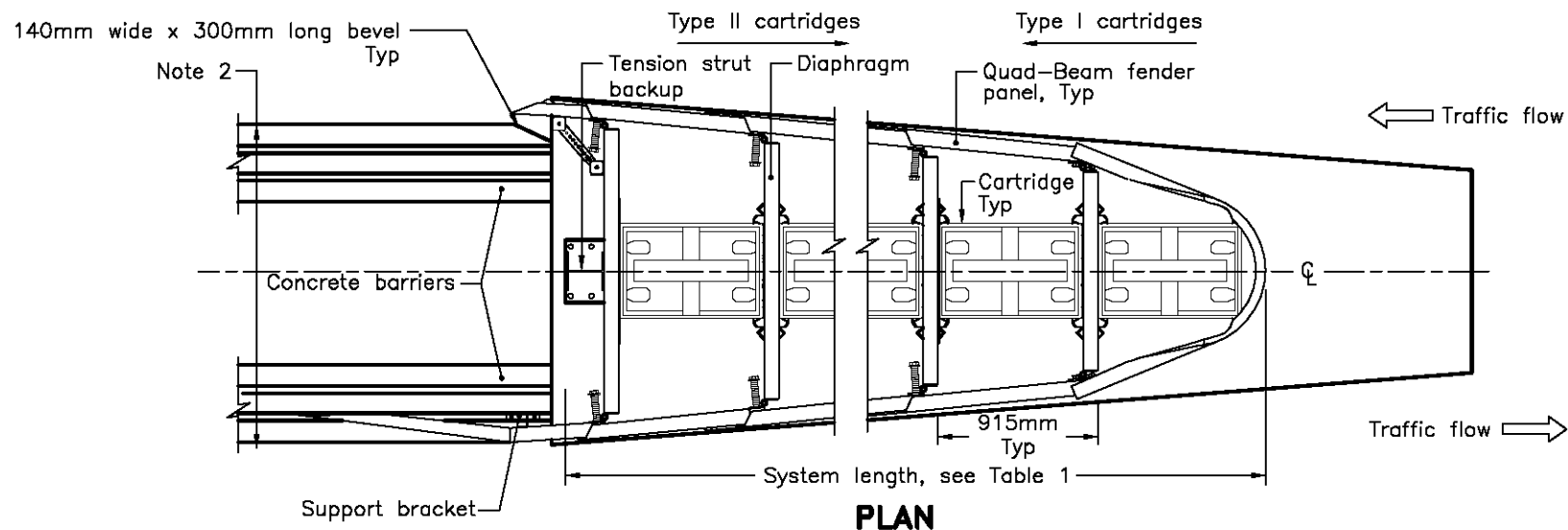
ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD EXTRA WIDE SYSTEM INSTALLATION – PERMANENT UNIDIRECTIONAL

Nov 2011

Rev 0



OPSD 923.190



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

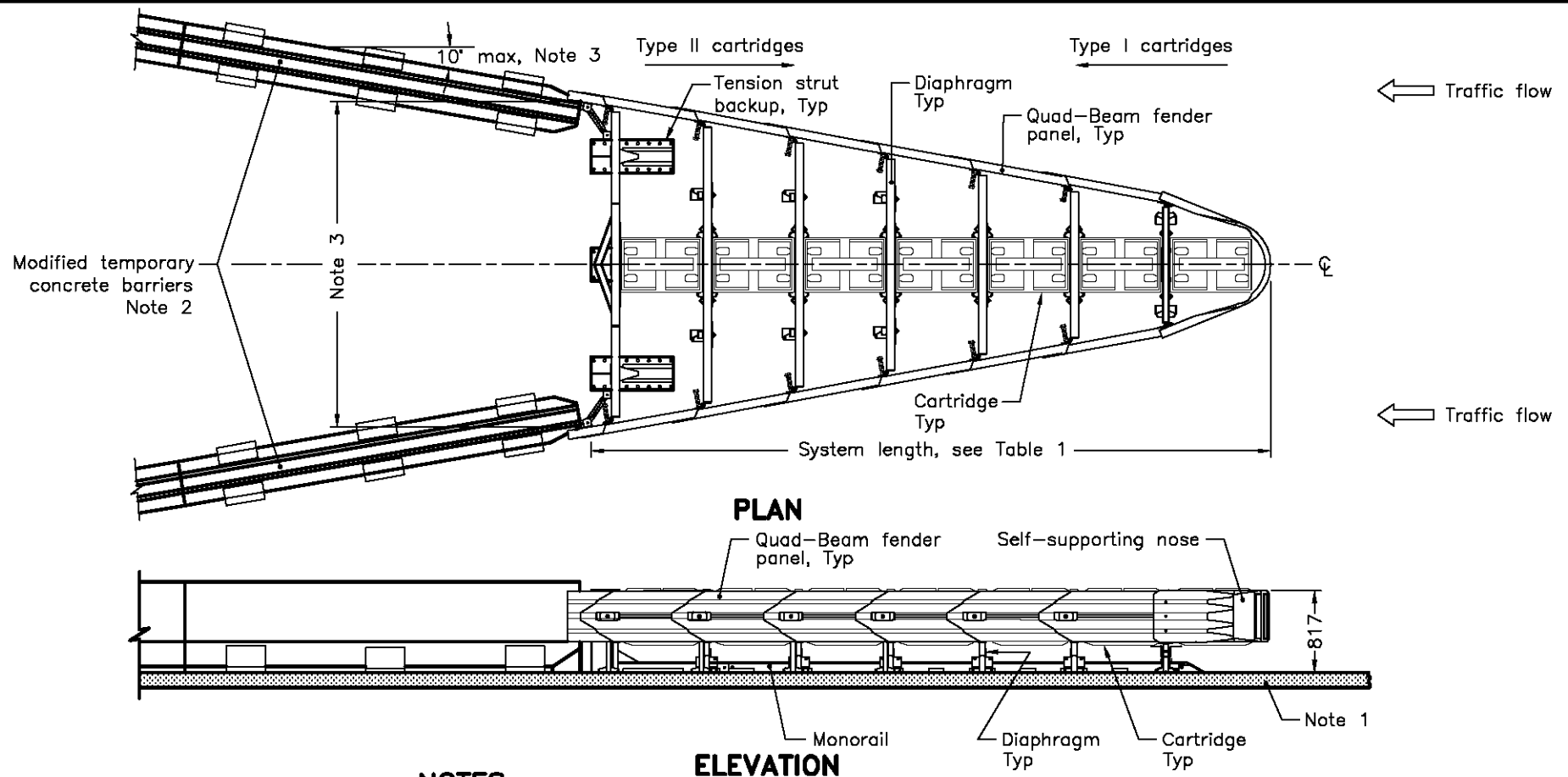
ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD EXTRA WIDE SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

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Rev 0



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

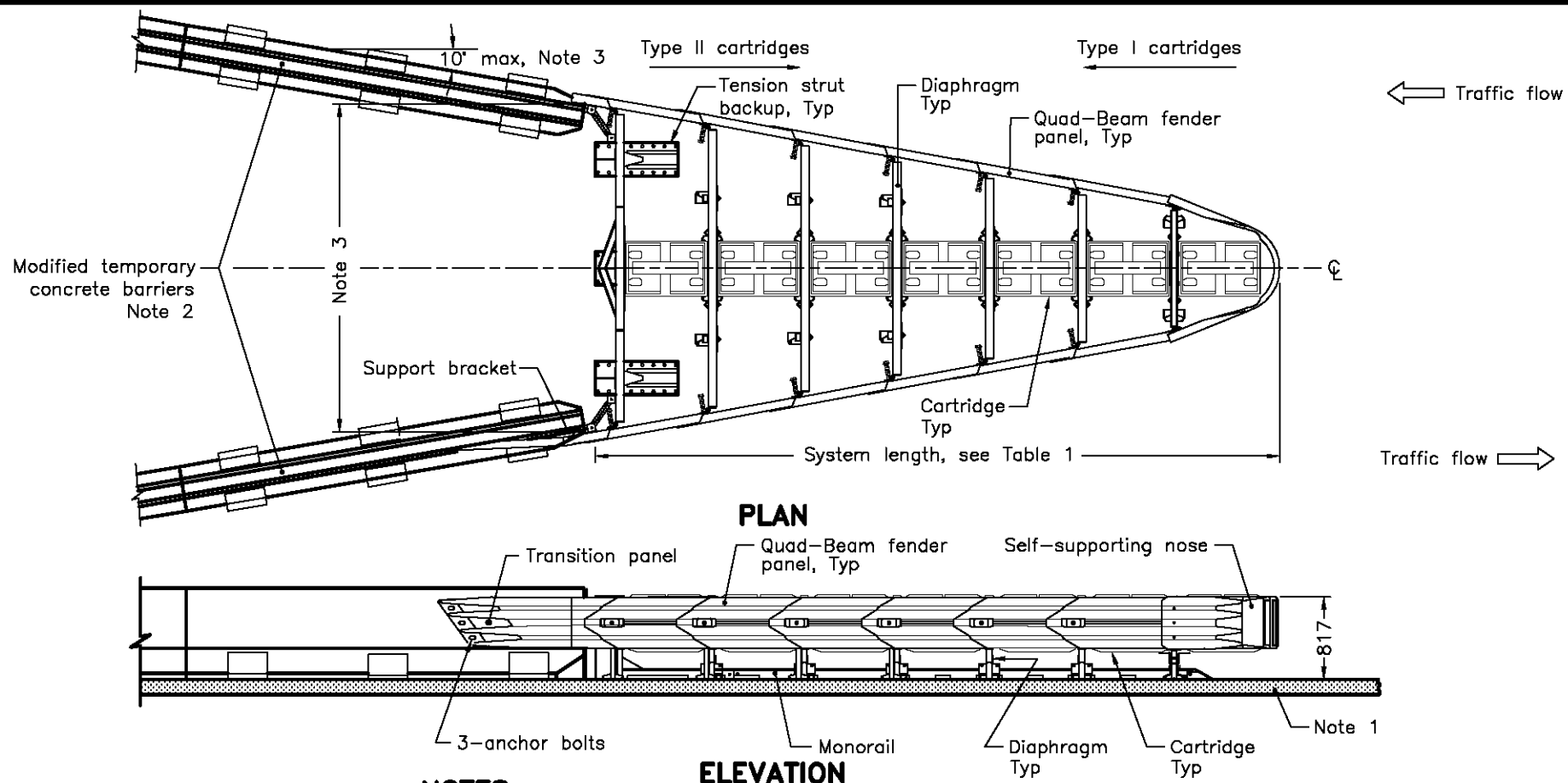
INSTALLATION – TEMPORARY

UNIDIRECTIONAL

Nov 2015 Rev 0



OPSD 923.192



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

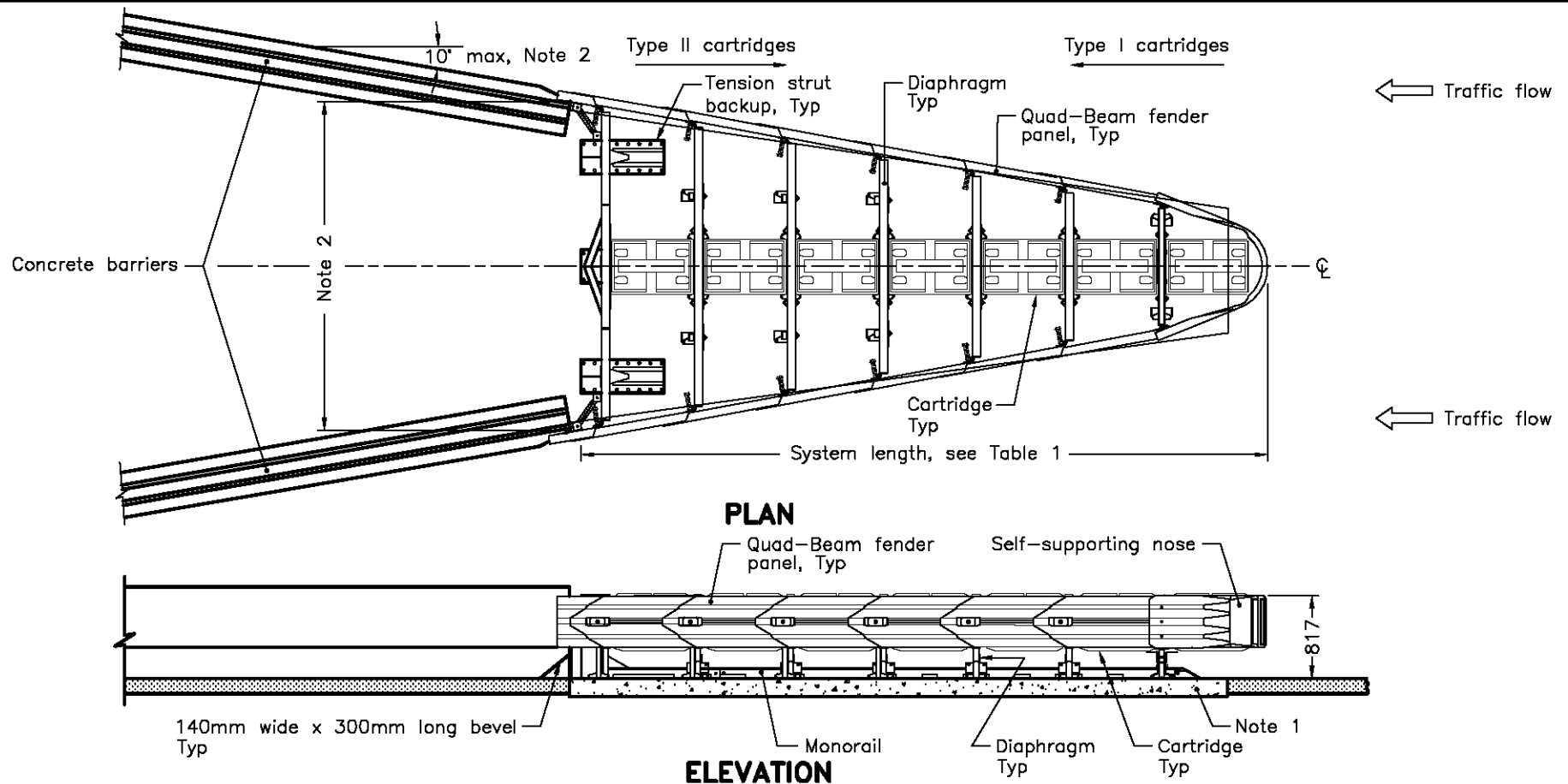
BIDIRECTIONAL

Nov 2015

Rev 0



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

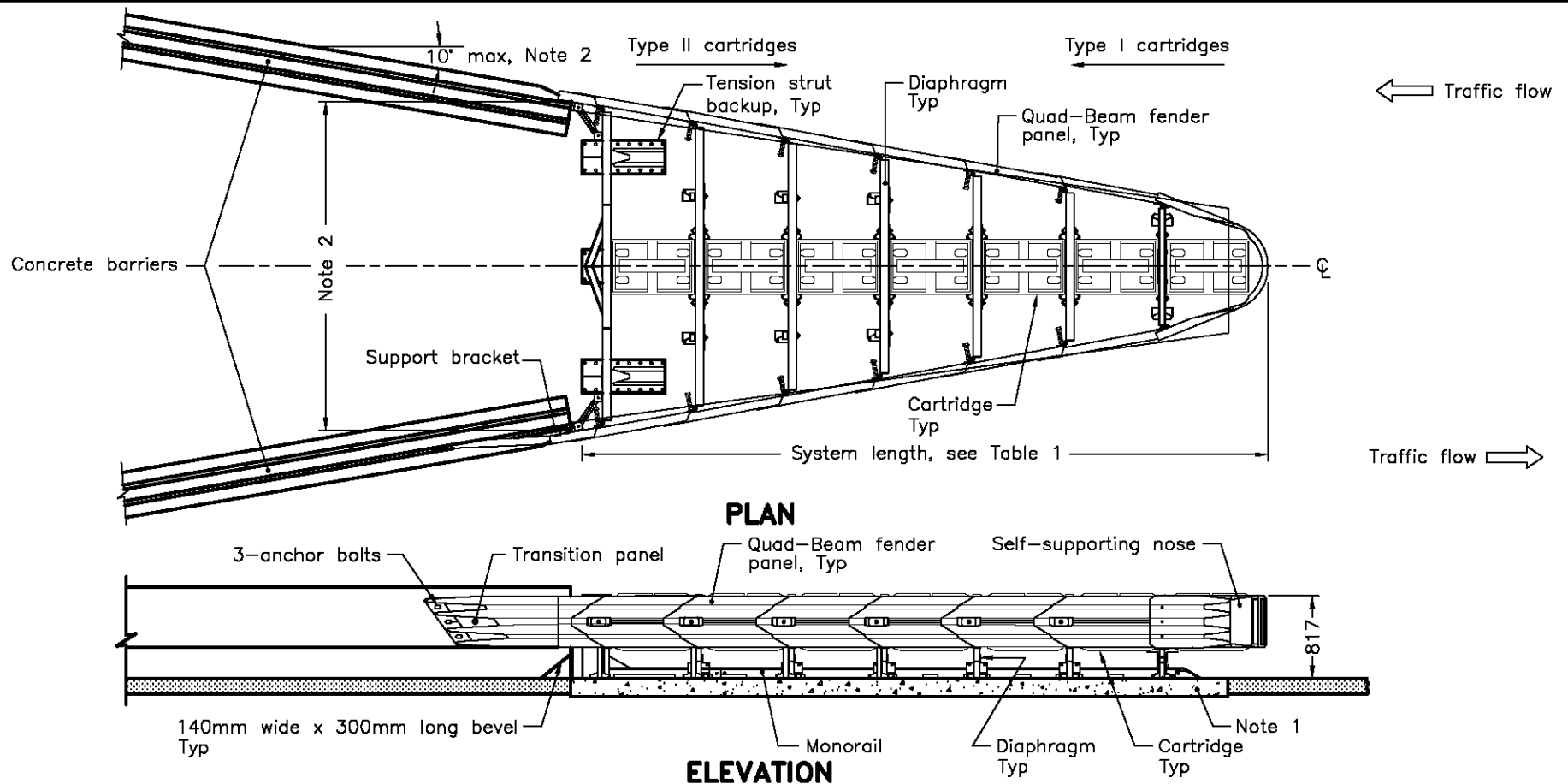
INSTALLATION – PERMANENT

UNIDIRECTIONAL

Nov 2015 Rev 0



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.

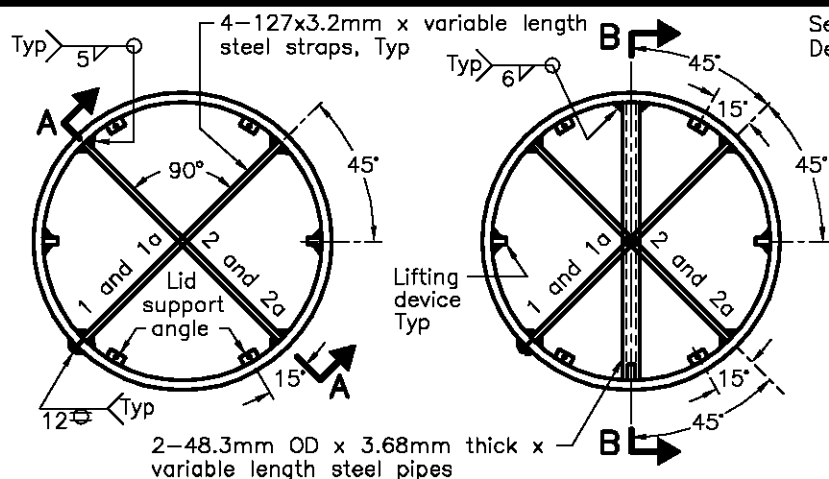
TABLE 1	
SYSTEM CONFIGURATION	TL-3
TYPE I CARTRIDGES FRONT REQ'D	4
TYPE II CARTRIDGES REAR REQ'D	3
SYSTEM LENGTH	6740
NOMINAL SYSTEM WIDTH	3200

ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION
QUADGUARD SUPER WIDE SYSTEM
INSTALLATION – PERMANENT
BIDIRECTIONAL

Nov 2015 Rev 0

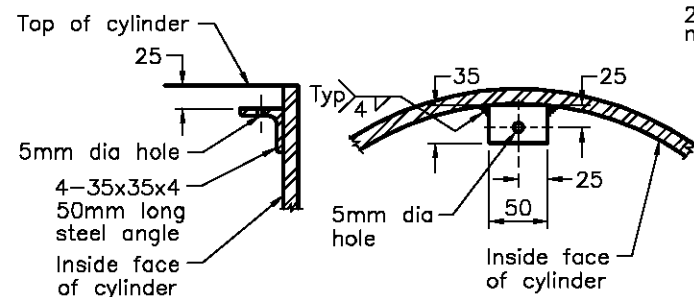


OPSD 923.195

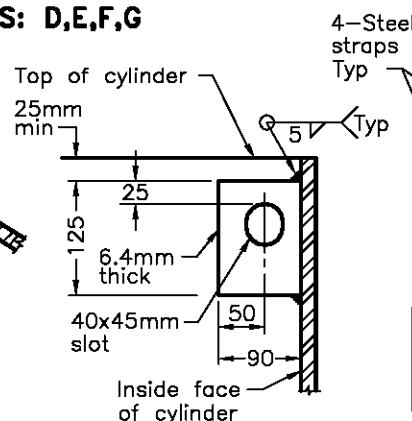


**STEEL CYLINDERS: A,B,C
TOP VIEWS**

STEEL CYLINDERS: D,E,F,G



**SIDE VIEW
LID SUPPORT
TOP VIEW
ANGLE
DETAIL**

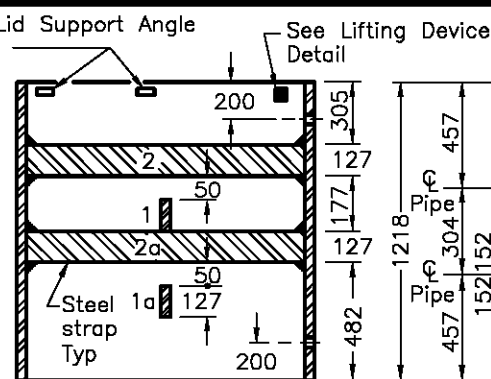


**LIFTING DEVICE
DETAIL**

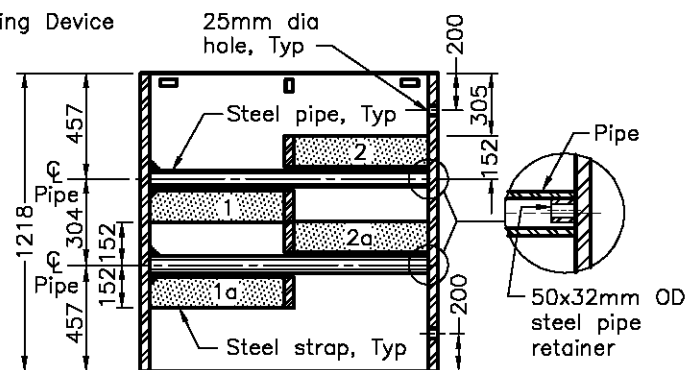
NOTE:

A No internal reinforcing in cylinder types H to N.

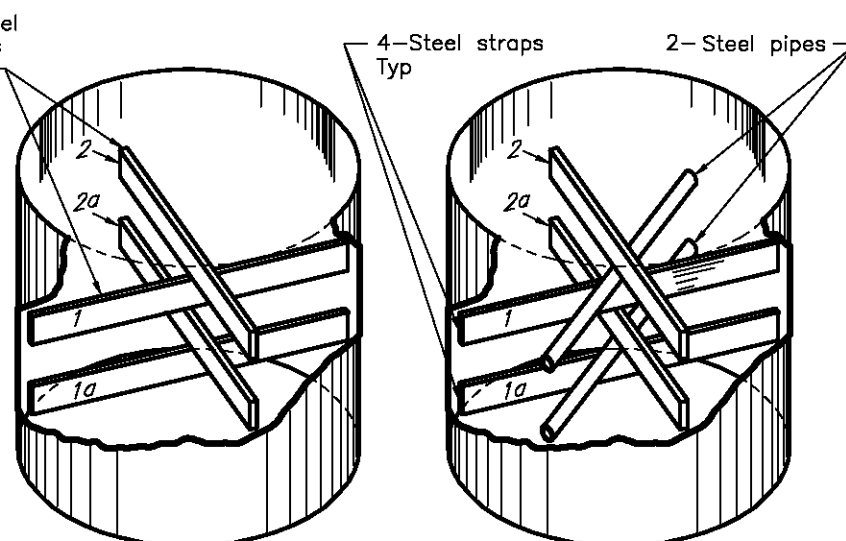
B All dimensions are in millimetres unless otherwise shown.



SECTION A-A



SECTION B-B



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

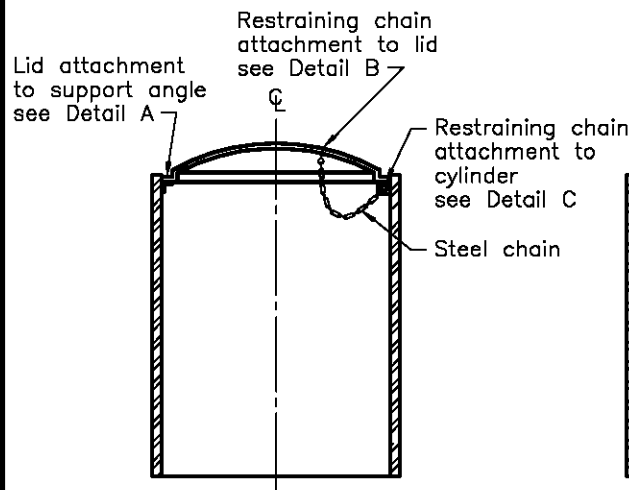
ONTARIO PROVINCIAL STANDARD DRAWING

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

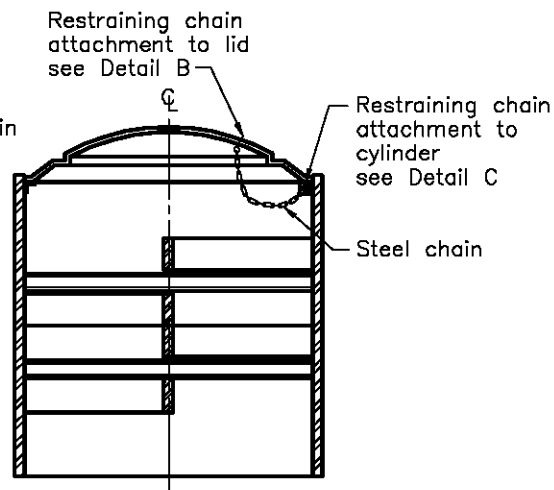
Nov 2013 Rev 2



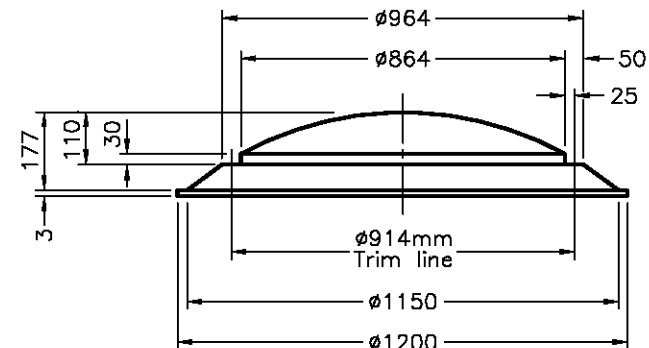
OPSD 923.201



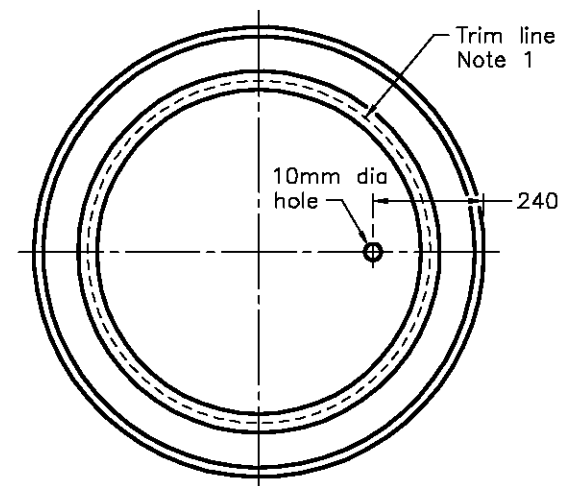
CYLINDERS-914mm DIA



CYLINDERS-1220mm DIA

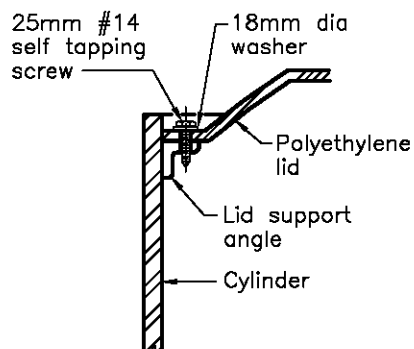


SIDE VIEW

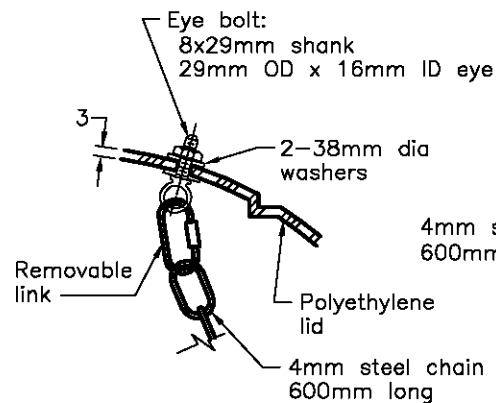


TOP VIEW

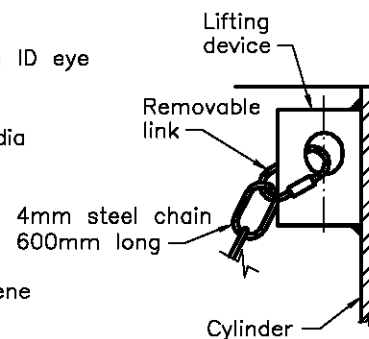
POLYETHYLENE LID



DETAIL A



DETAIL B



DETAIL C

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

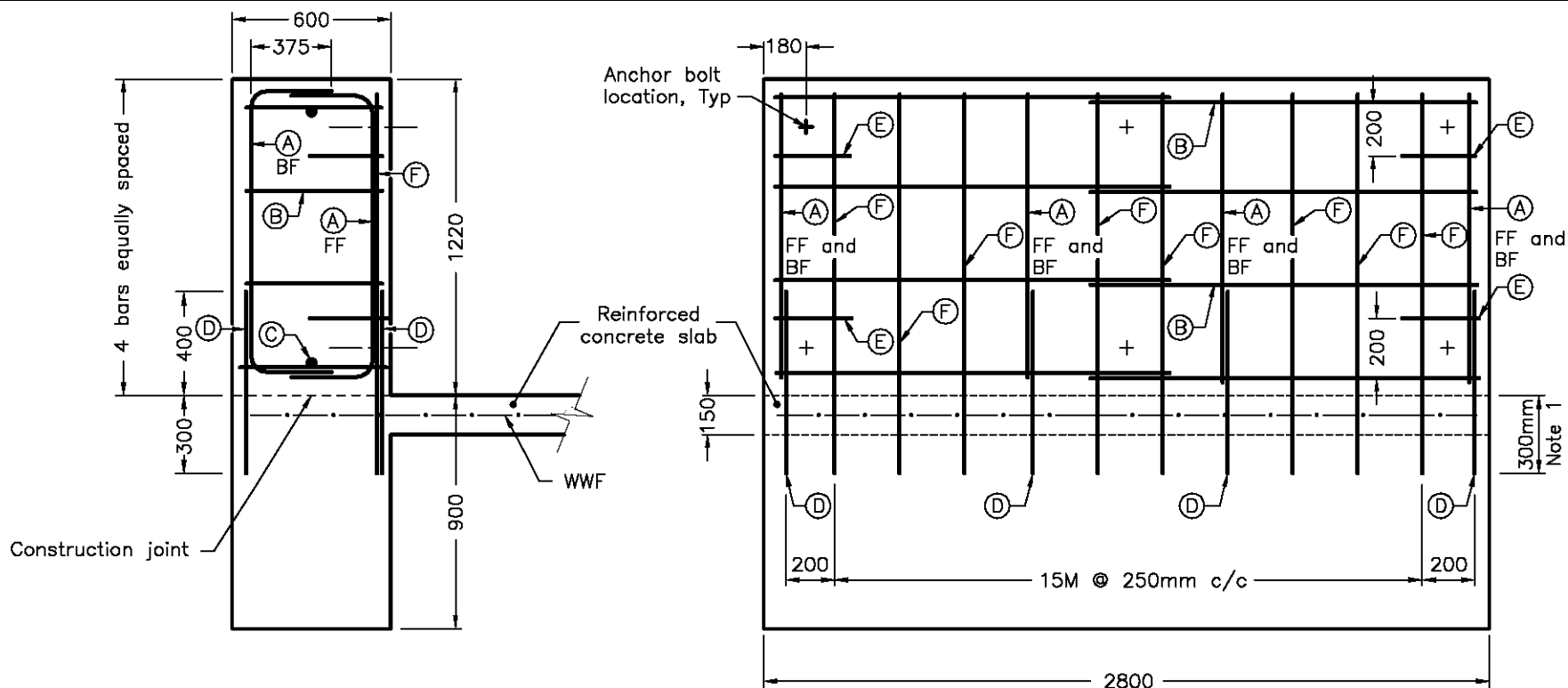
**ENERGY ATTENUATOR, CRASH CUSHION
CONNECTICUT IMPACT ATTENUATION SYSTEM
COMPONENT - POLYETHYLENE LID**

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		8
B	3400		8
C	2670		2
D	700		8
E	500		4
F	1450		8

ONTARIO PROVINCIAL STANDARD DRAWING

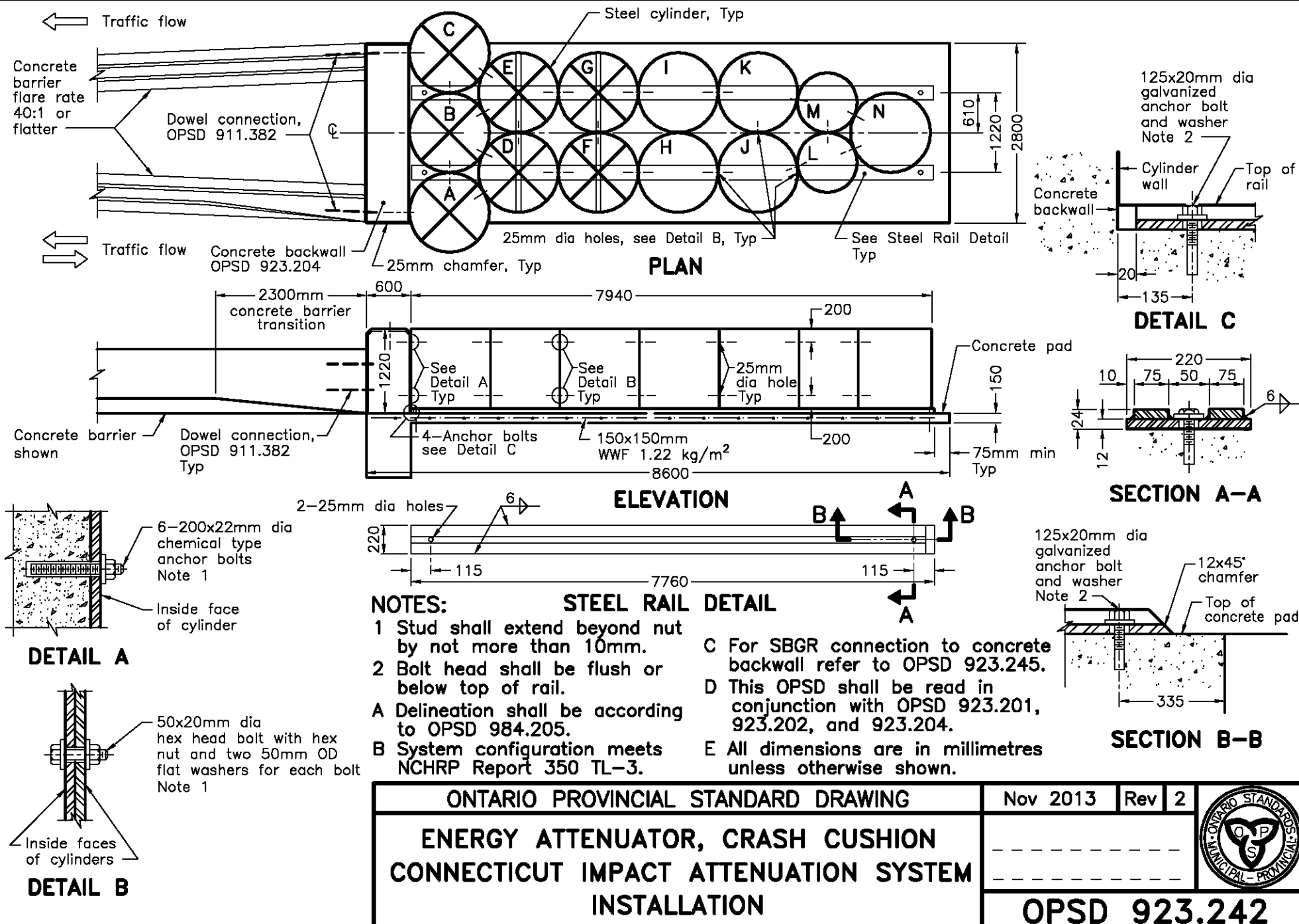
Nov 2013

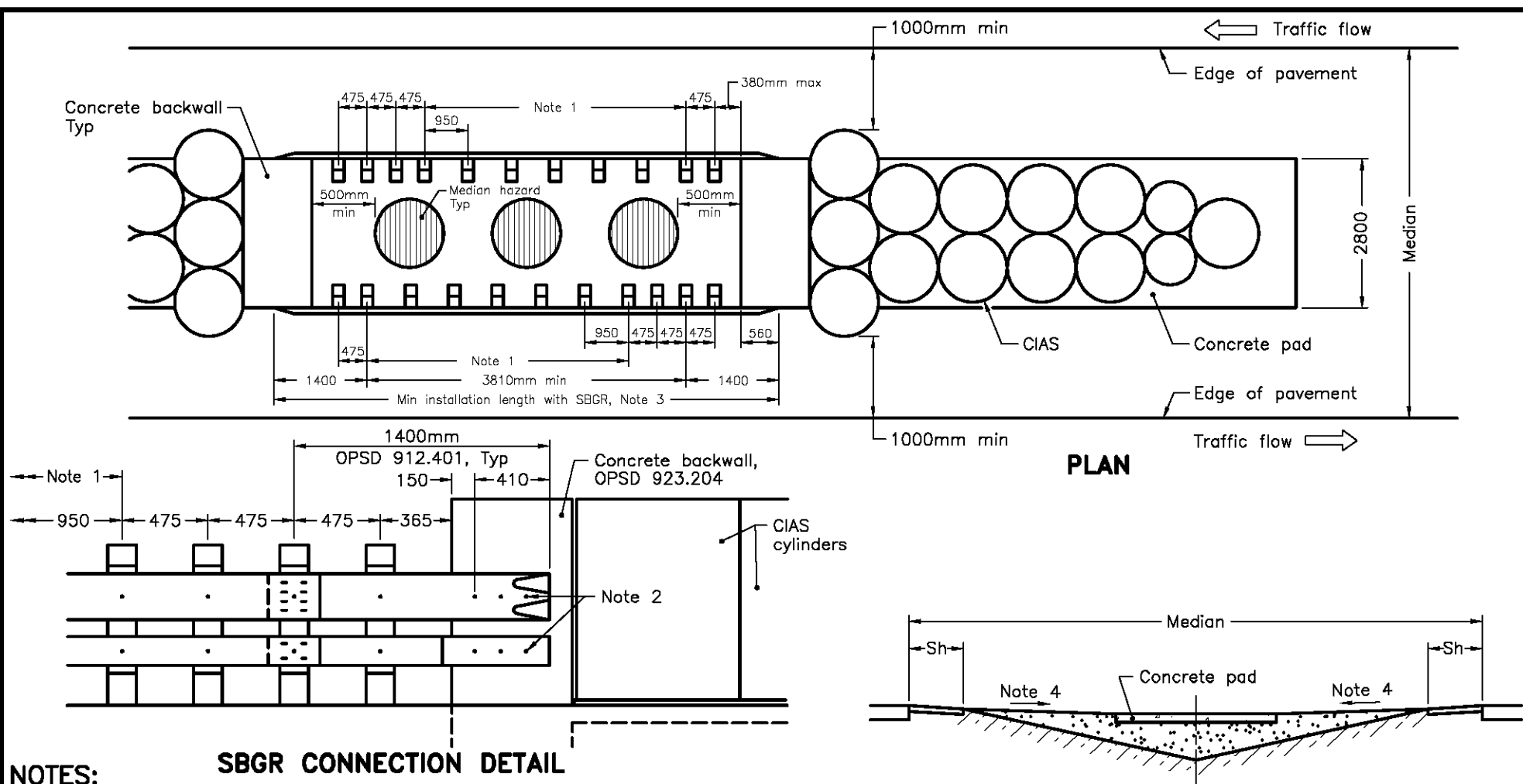
Rev 2

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

OPSD 923.204







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.

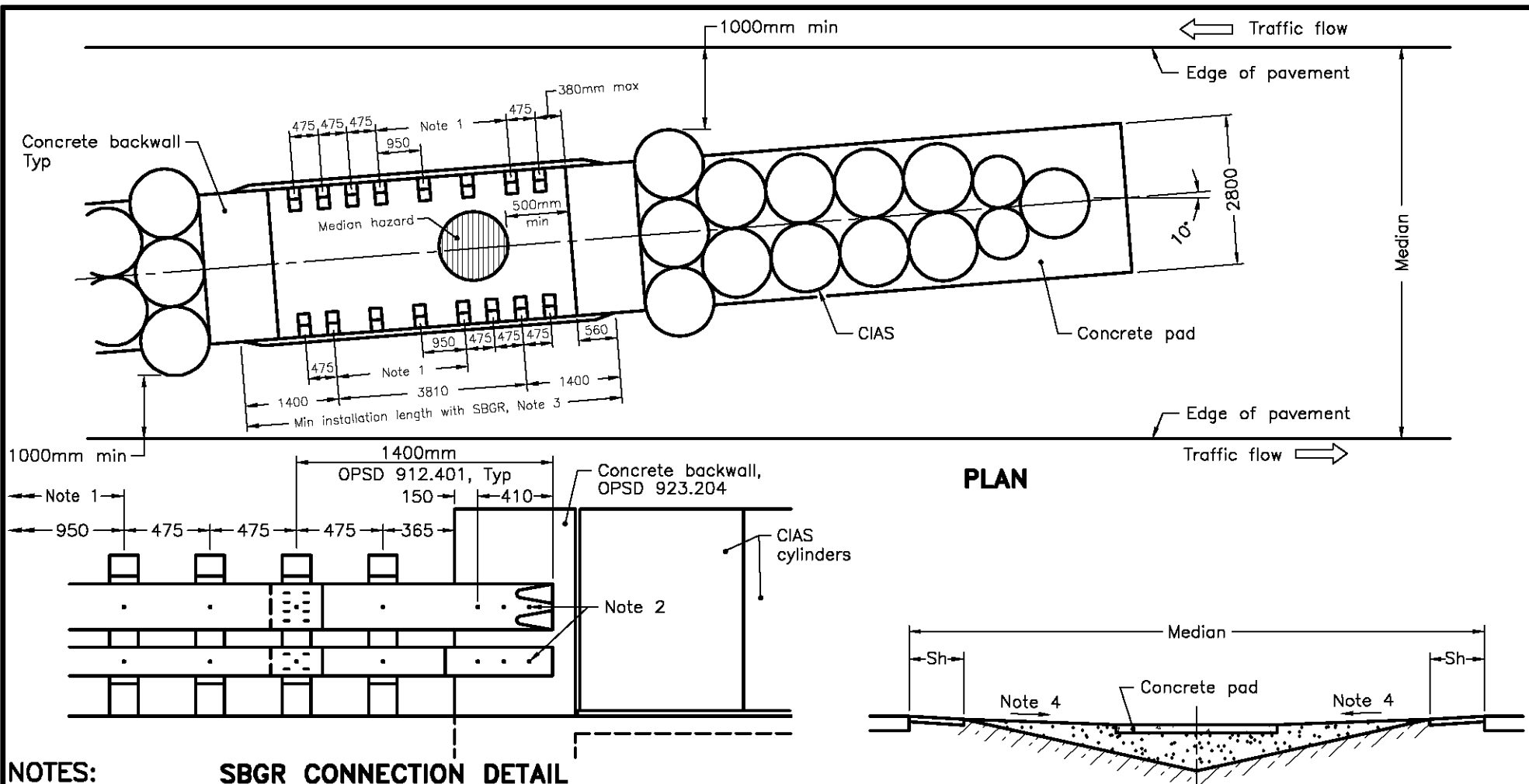
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING ENERGY ATTENUATOR, CRASH CUSHION CONNECTICUT IMPACT ATTENUATION SYSTEM INSTALLATION - LONG MEDIAN HAZARD

Nov 2013 Rev 1

OPSD 923.244





NOTES: SBGR CONNECTION DETAIL

- 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 OPD shall be read in conjunction with OPD 923.242.

B All dimensions are in millimetres unless otherwise shown.

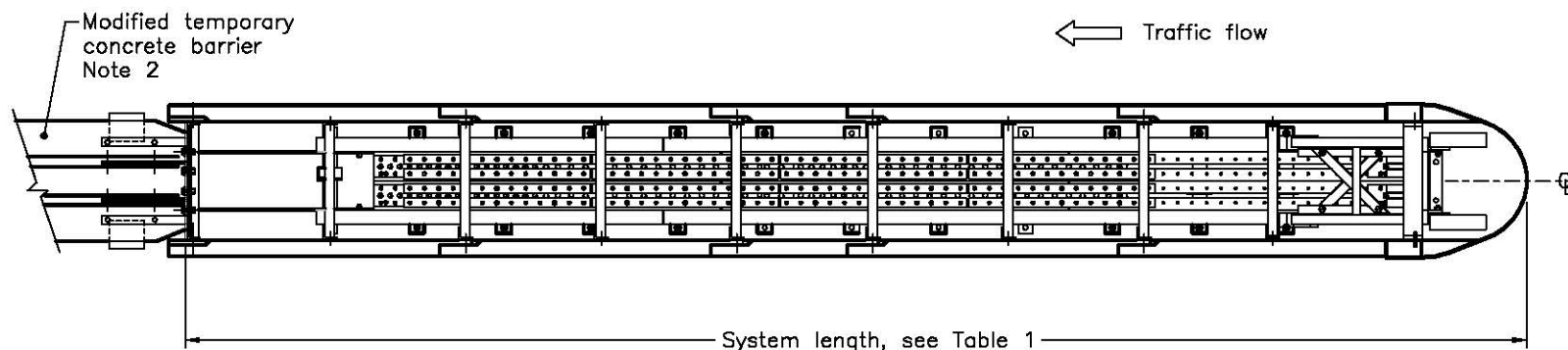
ONTARIO PROVINCIAL STANDARD DRAWING

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

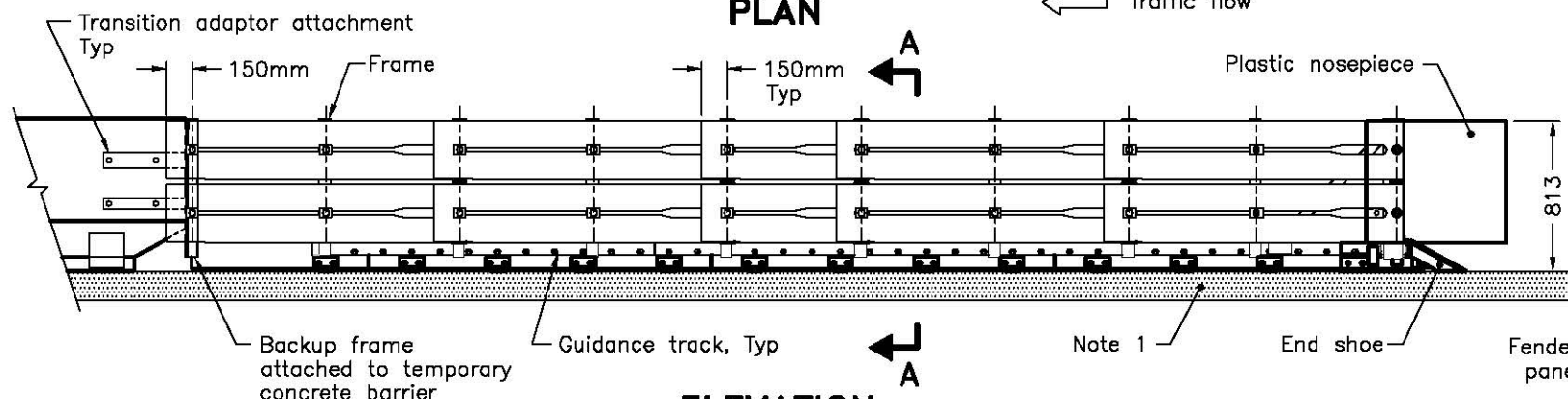
Nov 2013 Rev 2

OPD 923.245





PLAN



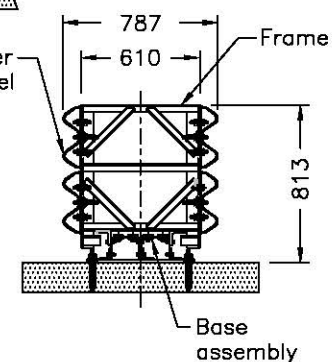
ELEVATION

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.



SECTION A-A

ONTARIO PROVINCIAL STANDARD DRAWING
**ENERGY ATTENUATOR, CRASH CUSHION
 TRACC SYSTEM
 INSTALLATION – TEMPORARY
 UNIDIRECTIONAL**

Nov 2011 Rev 1

OPSD 923.280



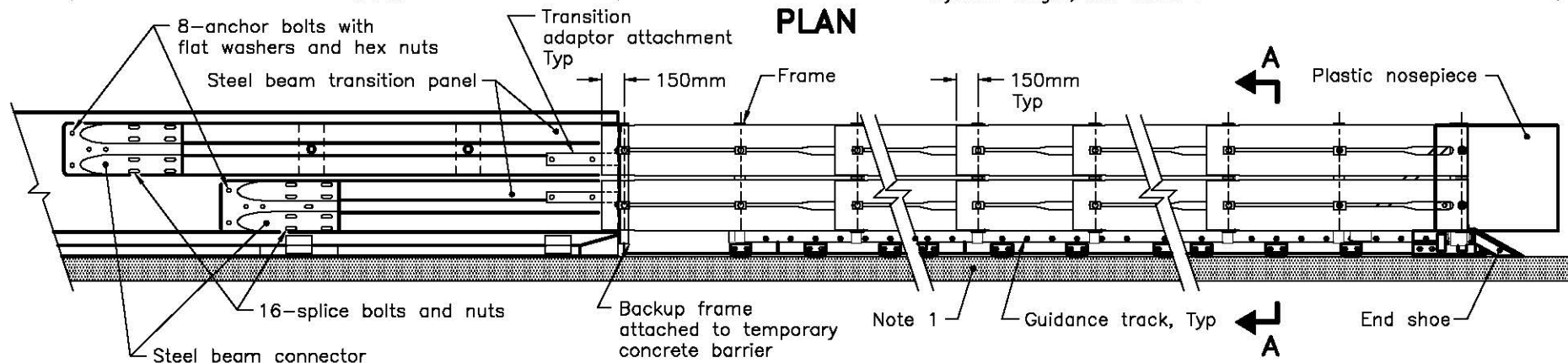
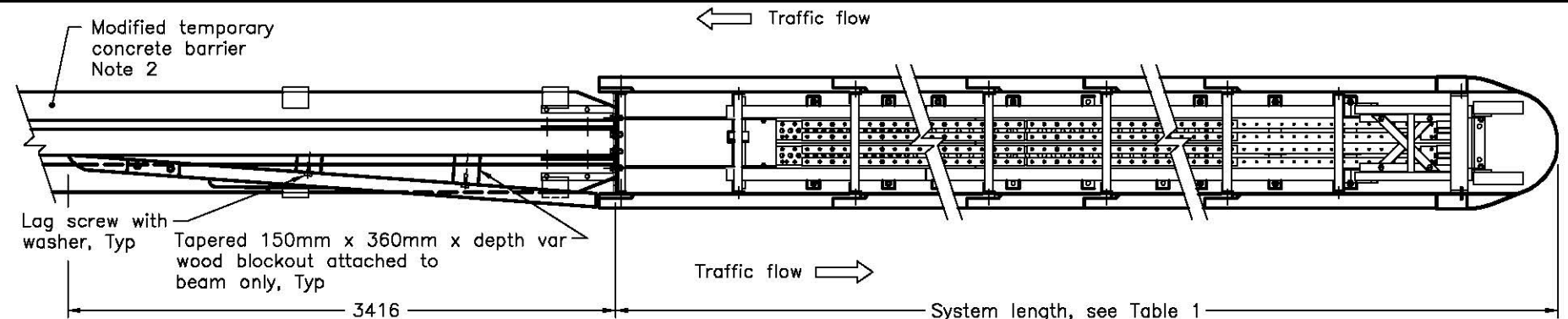
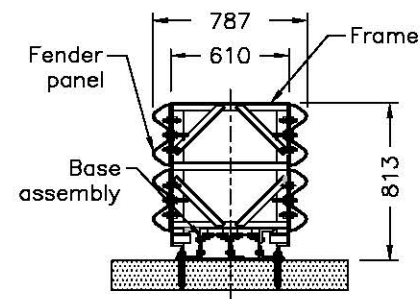


TABLE 1

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.

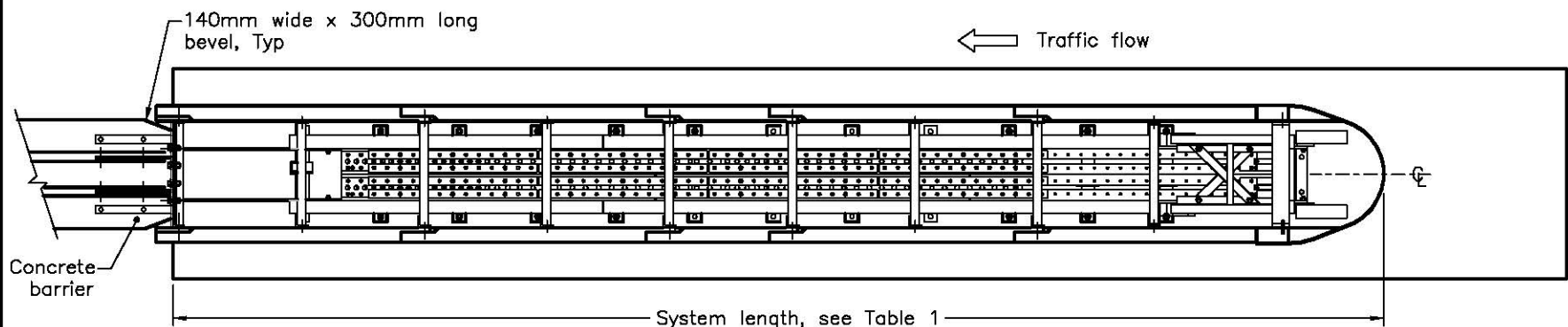


ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION
TRACC SYSTEM
INSTALLATION - TEMPORARY
BIDIRECTIONAL

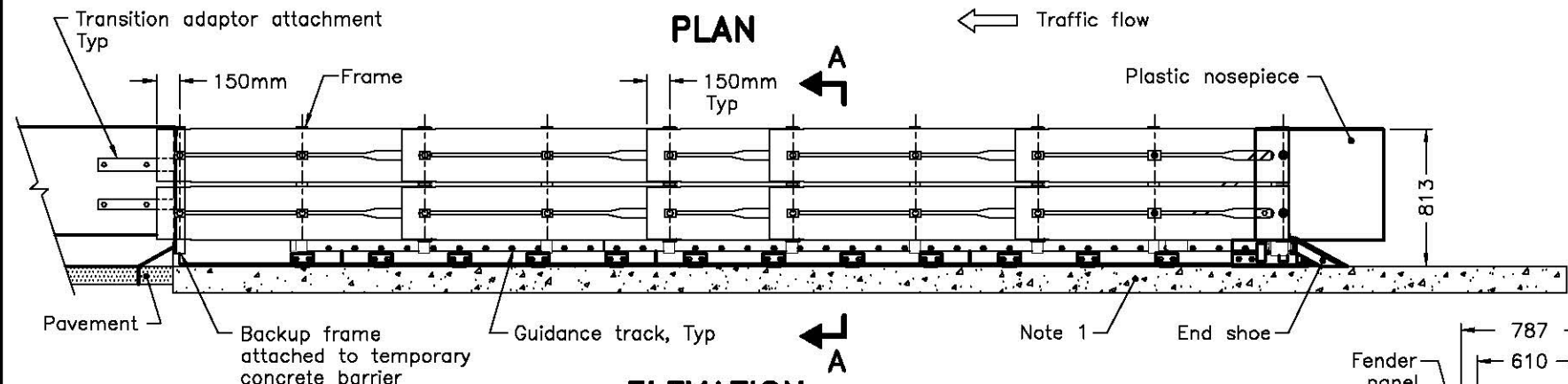
Nov 2011 Rev 1



OPSD 923.281



PLAN



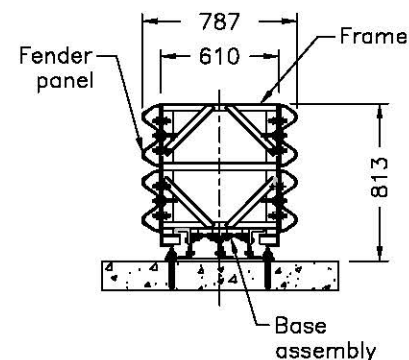
ELEVATION

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.



SECTION A-A

ONTARIO PROVINCIAL STANDARD DRAWING
**ENERGY ATTENUATOR, CRASH CUSHION
 TRACC SYSTEM
 INSTALLATION – PERMANENT
 UNIDIRECTIONAL**

Nov 2011 Rev 1



OPSD 923.282

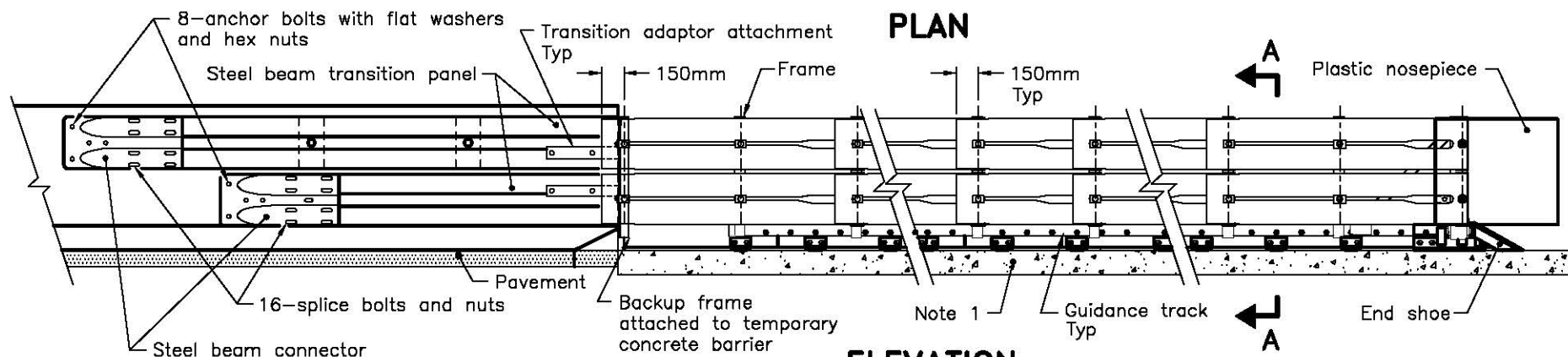
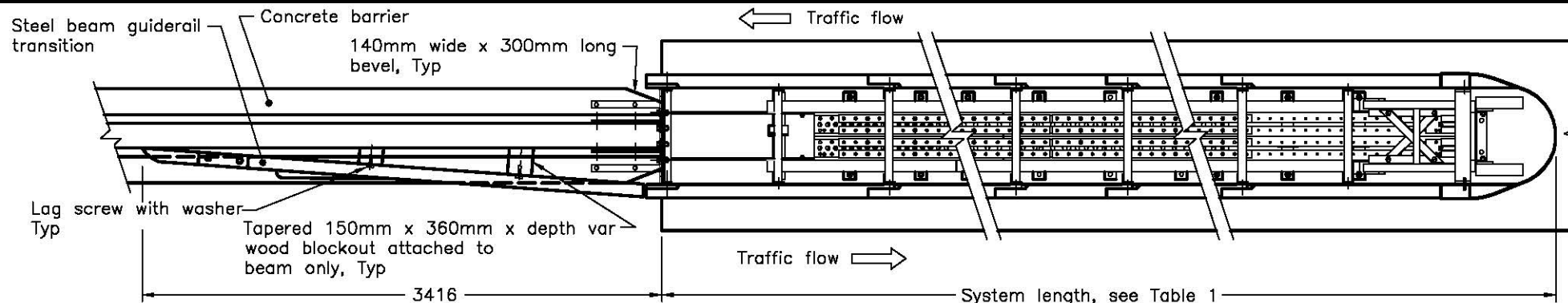


TABLE 1

SYSTEM CONFIGURATION	TL-2	TL-3
SYSTEM LENGTH	4750	6857

NOTES:

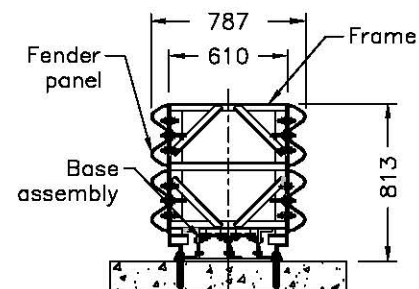
1 The system shall be anchored to concrete pad detailed in OPSD 923.001.

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.



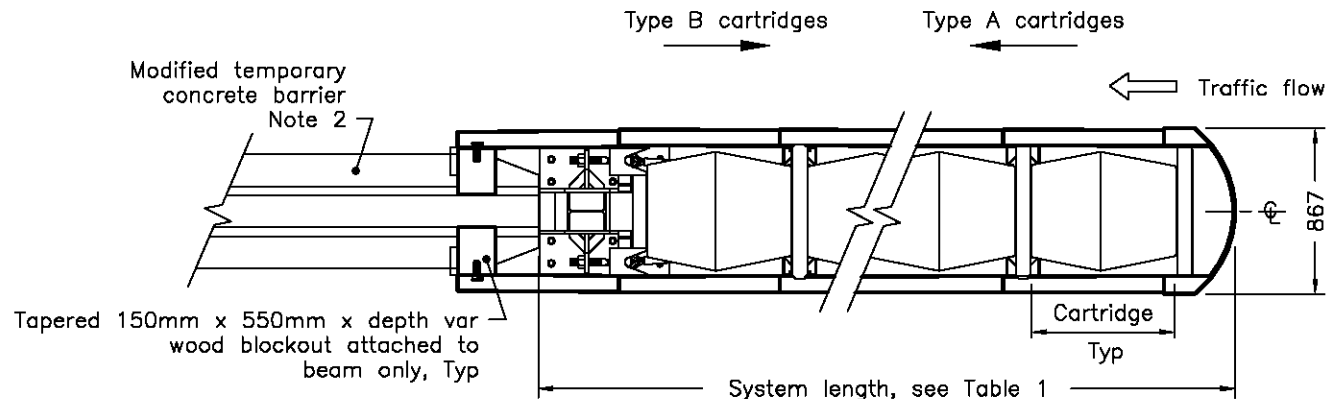
SECTION A-A

ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION
TRACC SYSTEM
INSTALLATION – PERMANENT
BIDIRECTIONAL

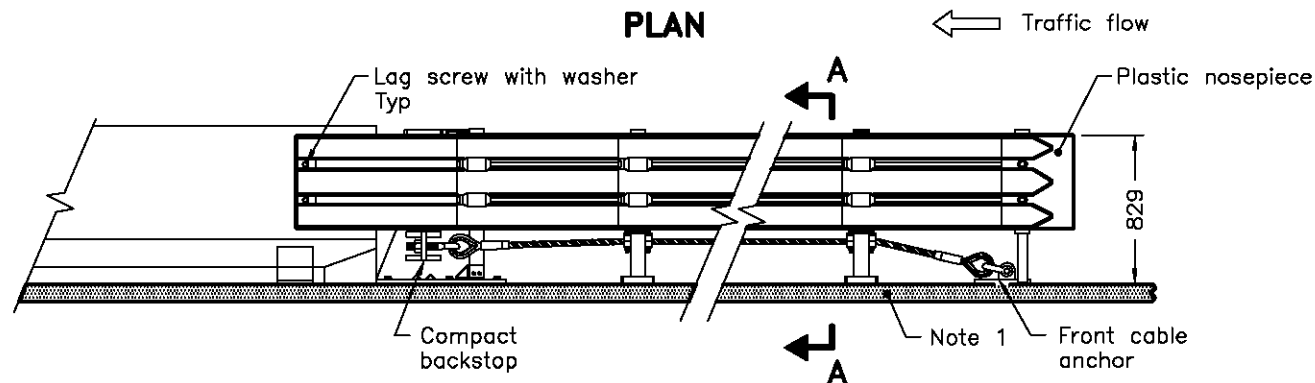
Nov 2011 Rev 1



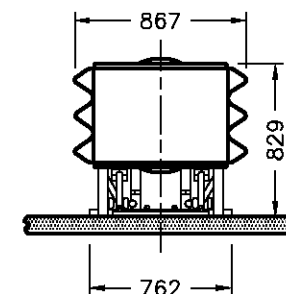
OPSD 923.283



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.

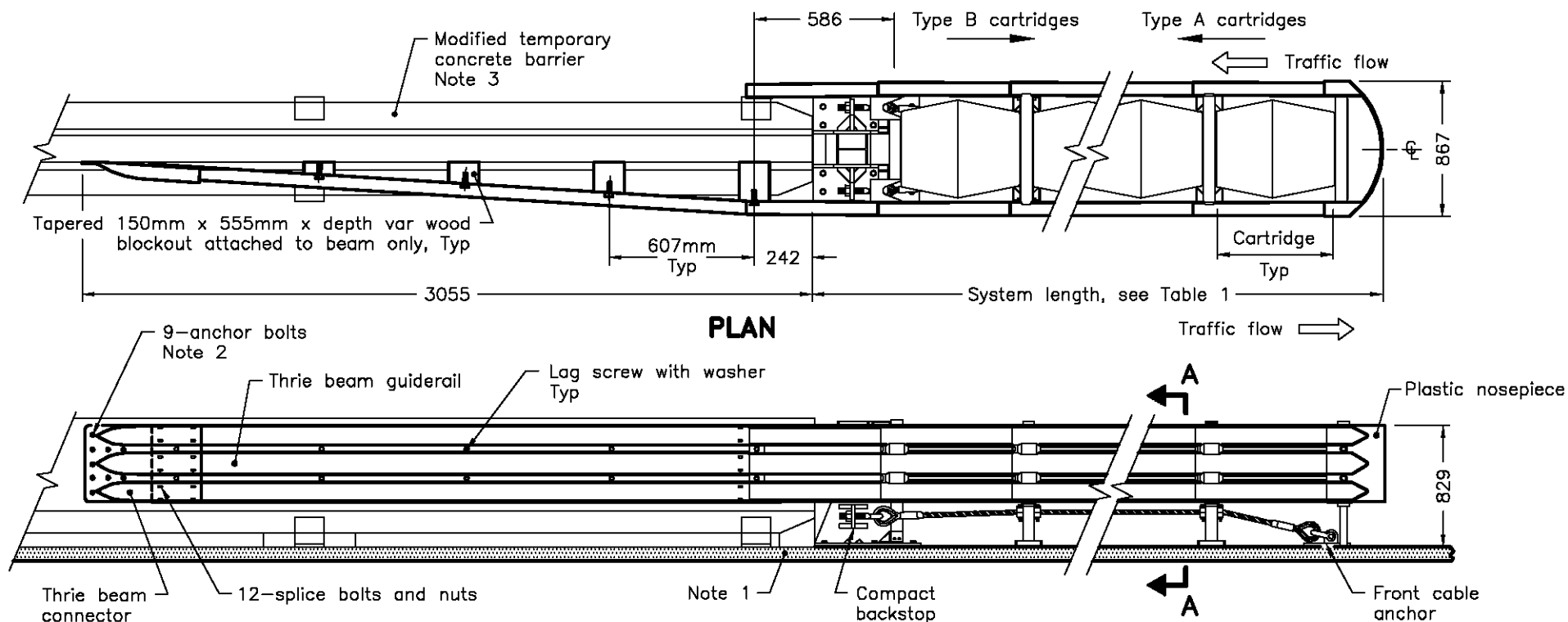
TABLE 1		
SYSTEM CONFIGURATION	TL-2	TL-3
TYPE A CARTRIDGES FRONT REQ'D	1	3
TYPE B CARTRIDGES REAR REQ'D	3	5
SYSTEM LENGTH	3780	7250

ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION
TAU-II SYSTEM
INSTALLATION – TEMPORARY
UNIDIRECTIONAL

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OPSD 923.380

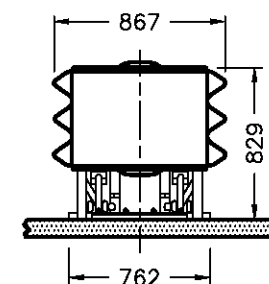


PLAN

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.



SECTION A-A

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

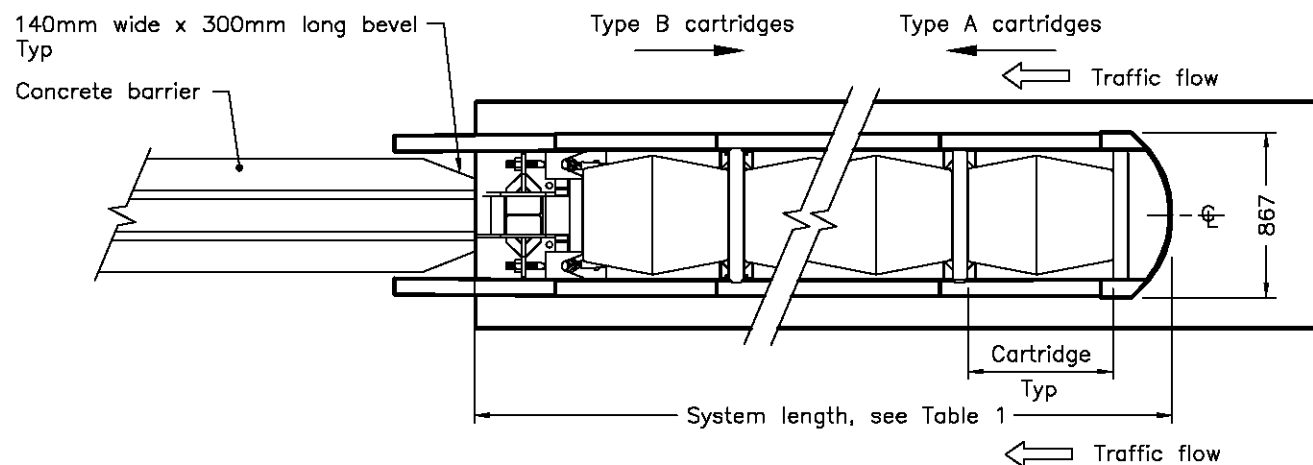
**ENERGY ATTENUATOR, CRASH CUSHION
TAU-II SYSTEM
INSTALLATION - TEMPORARY
BIDIRECTIONAL**

Nov 2011

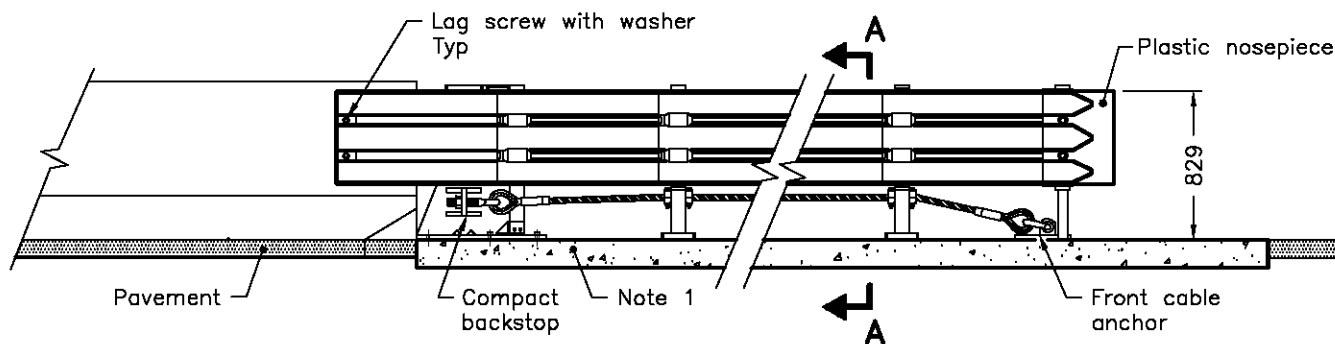
Rev 1



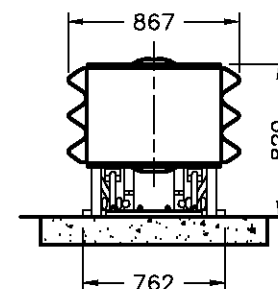
OPSD 923.381



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

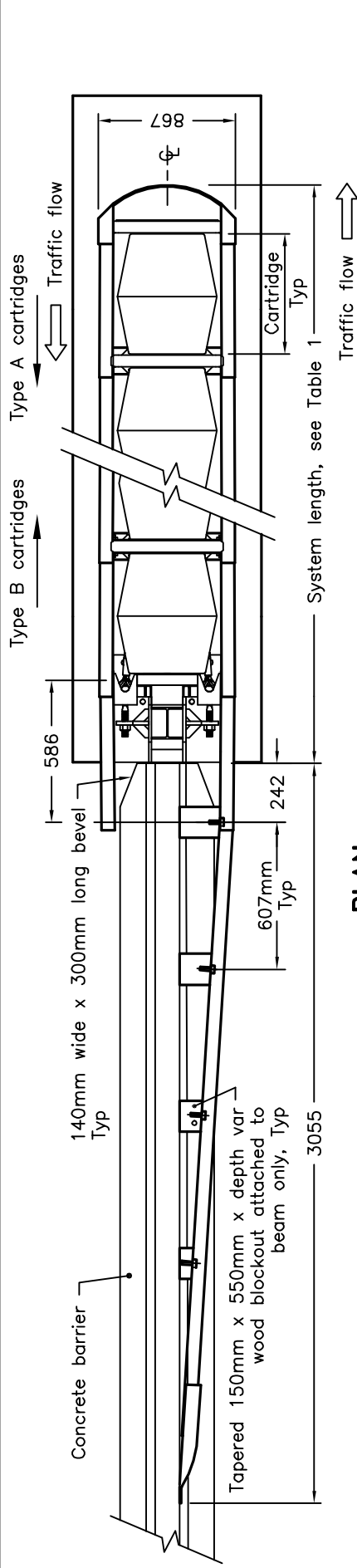
**ENERGY ATTENUATOR, CRASH CUSHION
TAU-II SYSTEM
INSTALLATION – PERMANENT
UNIDIRECTIONAL**

Nov 2011

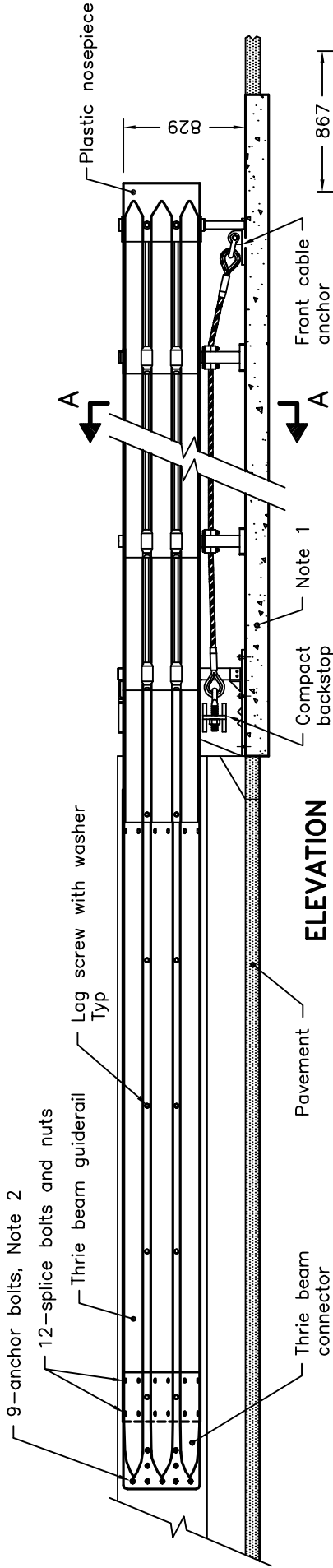
Rev 1



OPSD 923.382



PLAN



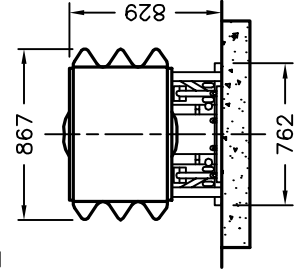
ELEVATION

NOTES:

- 1 The system shall be anchored to concrete pad detailed in OPD 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 OPD 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

SECTION A-A



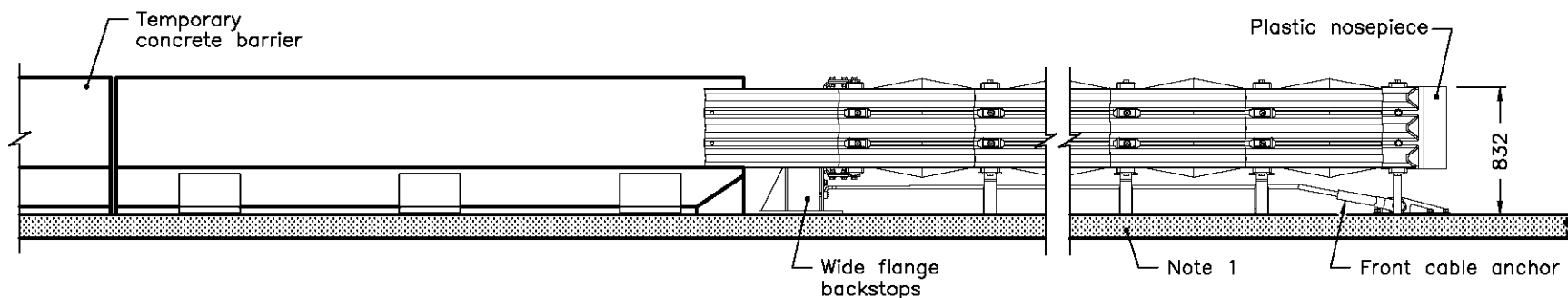
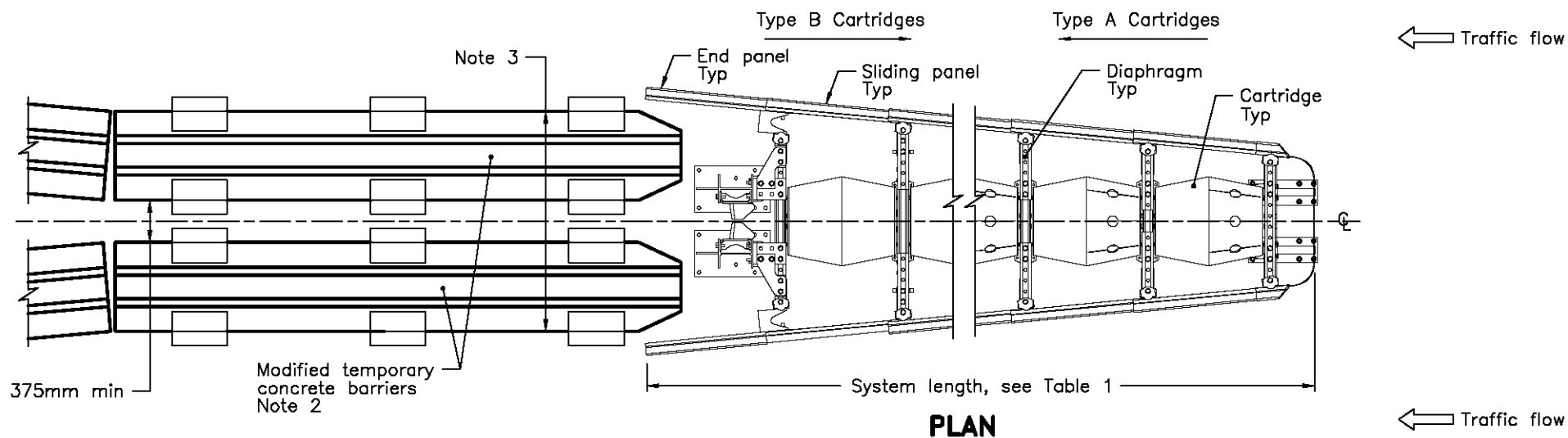
ONTARIO PROVINCIAL STANDARD DRAWING

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

Nov 2011 Rev 1



OPSD 923.383



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.

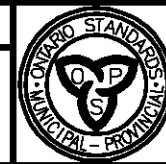
TABLE 1		
SYSTEM CONFIGURATION	TL-2	TL-3
TYPE A CARTRIDGES FRONT REQ'D	1	3
TYPE B CARTRIDGES REAR REQ'D	3	5
SYSTEM LENGTH	4722	8084
NOMINAL SYSTEM WIDTH	1520	1520

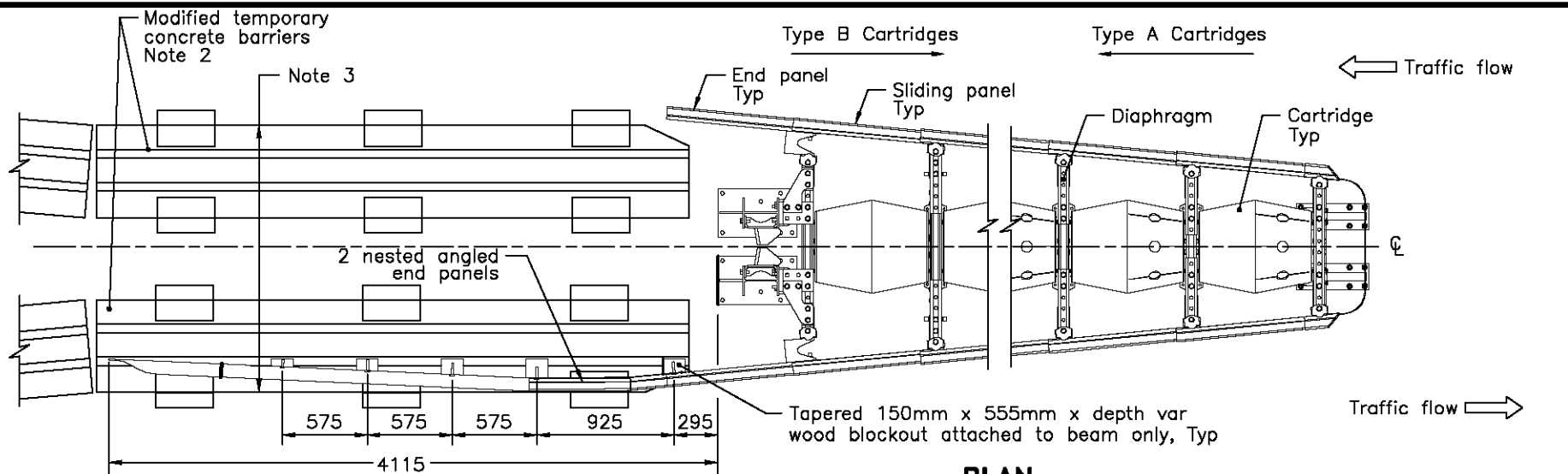
ONTARIO PROVINCIAL STANDARD DRAWING

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

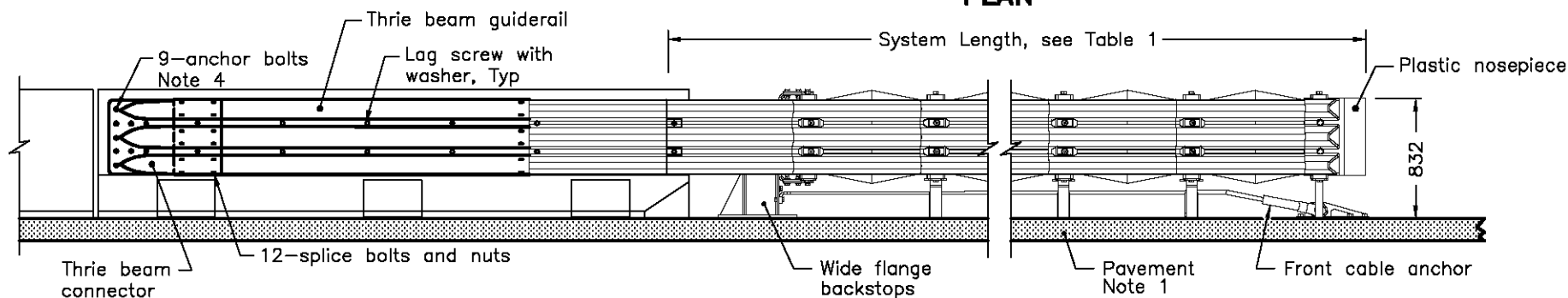
Nov 2011 Rev 0

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

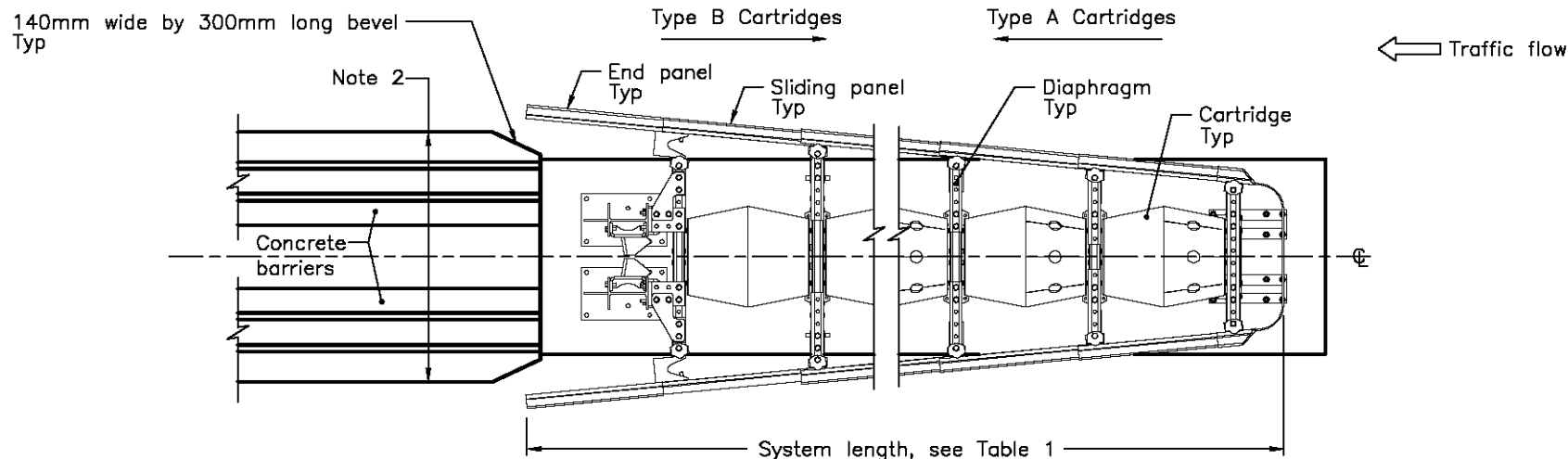
ONTARIO PROVINCIAL STANDARD DRAWING

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

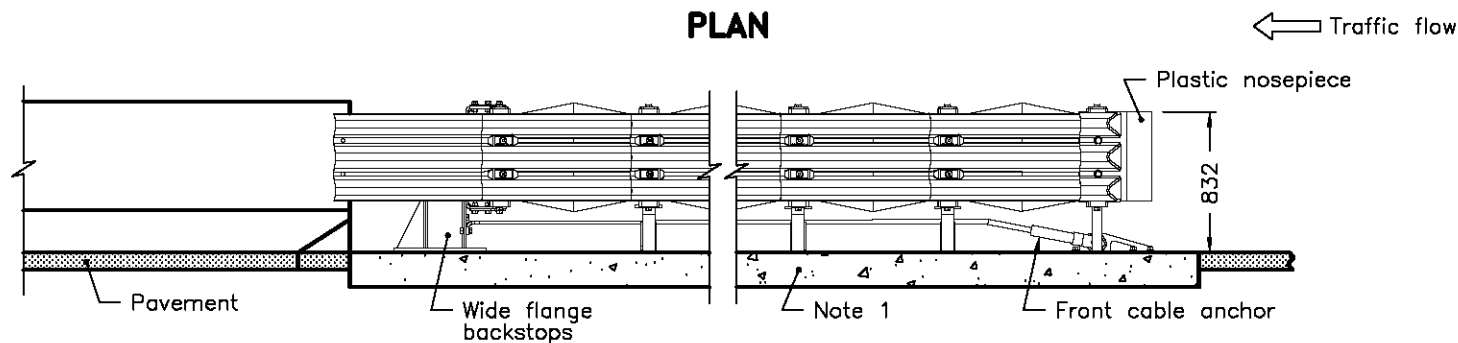
Nov 2011 Rev 0



OPSD 923.385



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	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

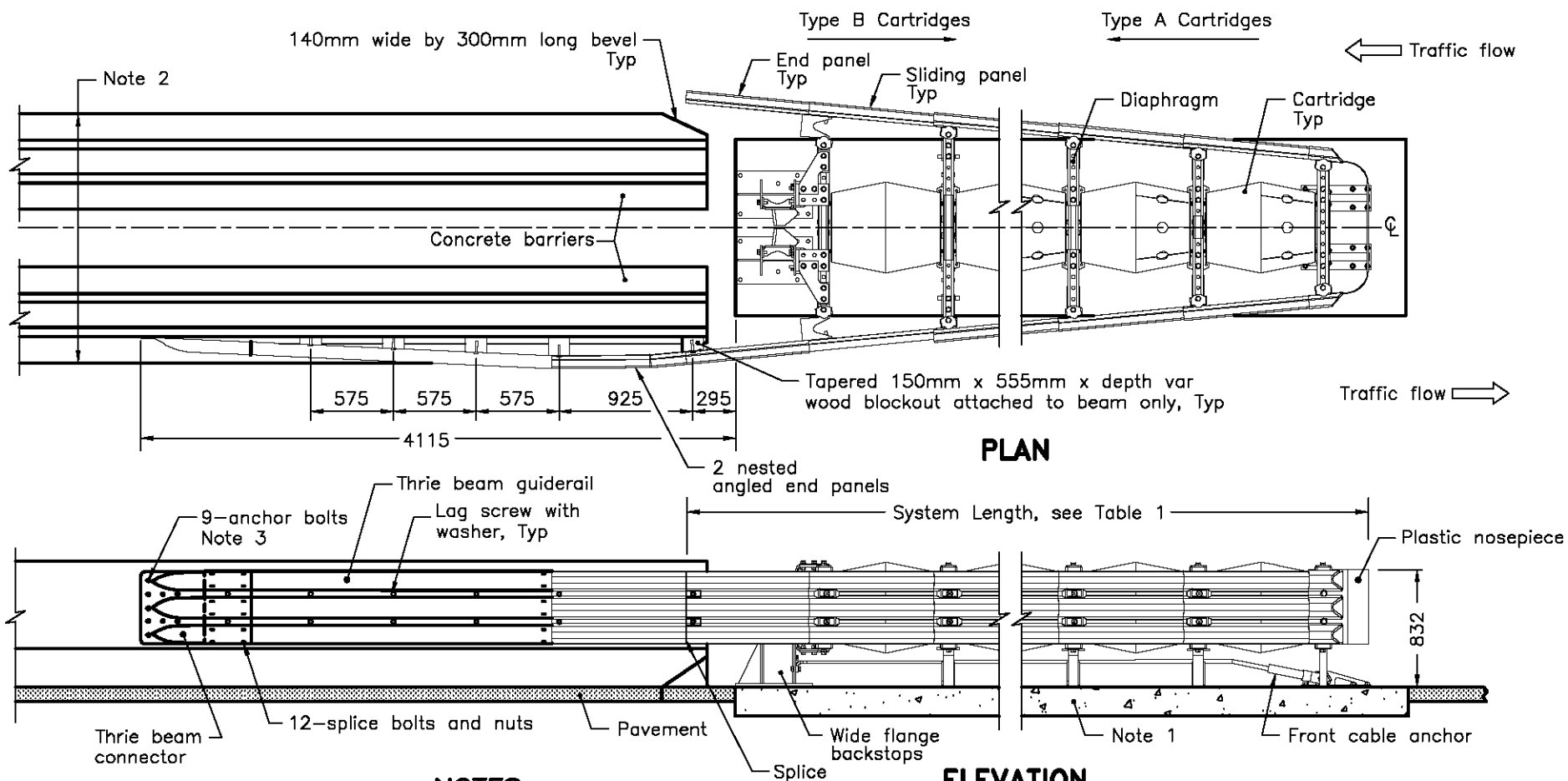
ENERGY ATTENUATOR, CRASH CUSHION TAU-II WIDE SYSTEM INSTALLATION - PERMANENT UNIDIRECTIONAL

Nov 2011

Rev 0



OPSD 923.386



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

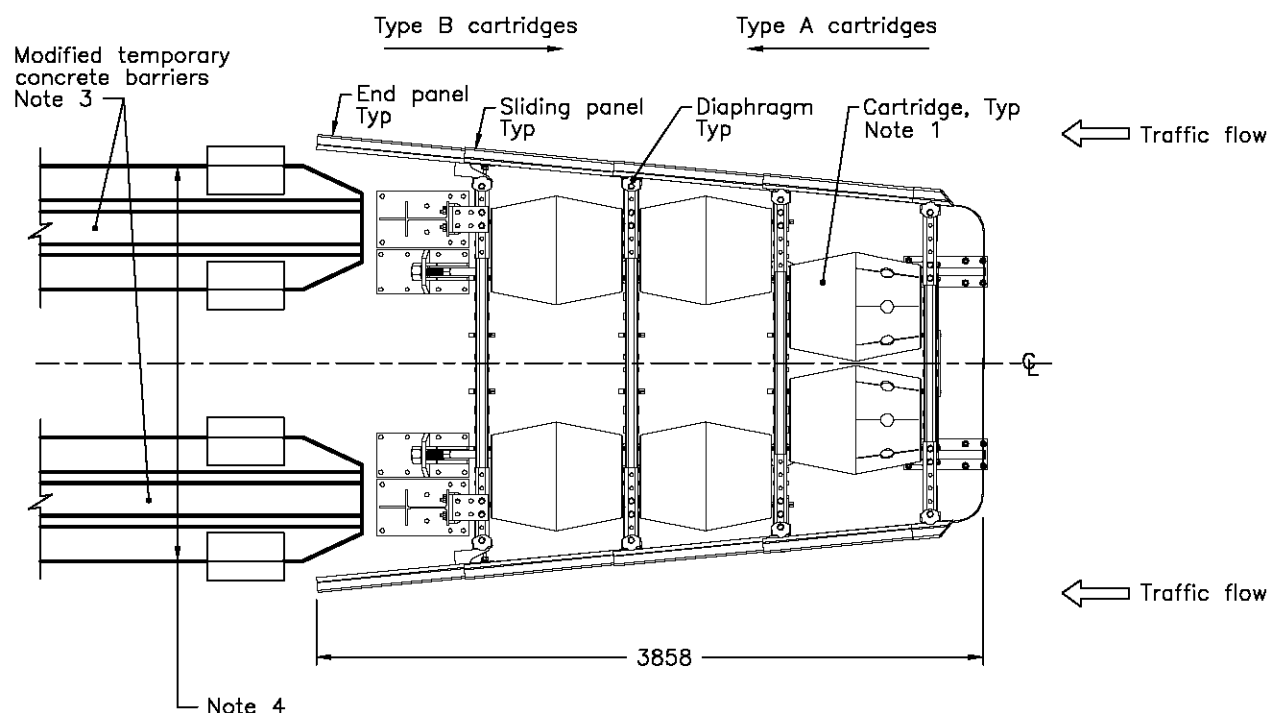
ENERGY ATTENUATOR, CRASH CUSHION TAU-II WIDE SYSTEM INSTALLATION - PERMANENT BIDIRECTIONAL

Nov 2011

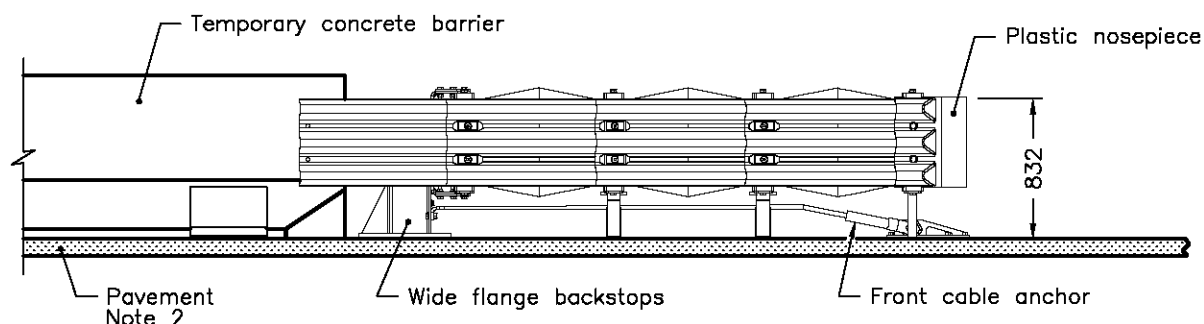
Rev 0



OPSD 923.387



PLAN



ELEVATION

NOTES:

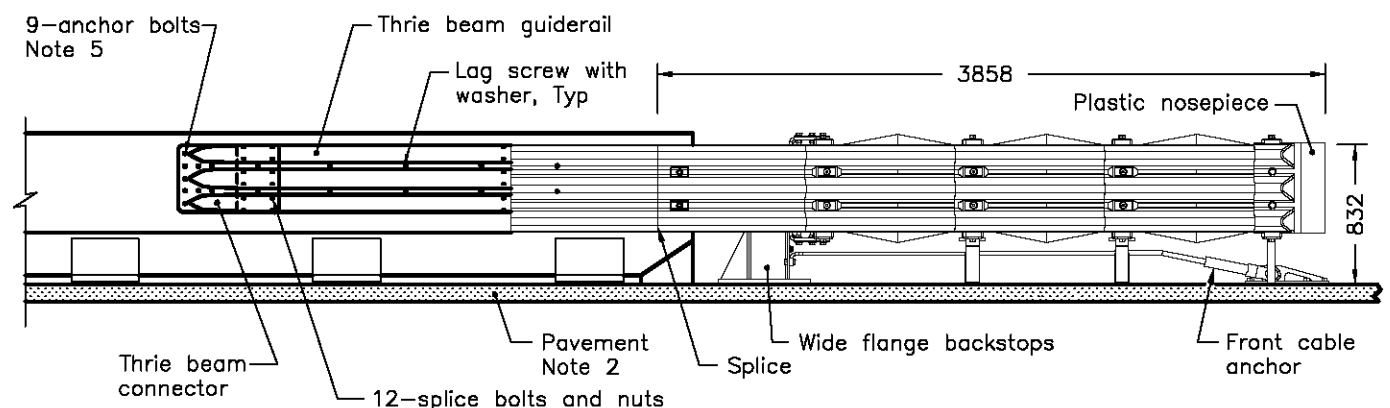
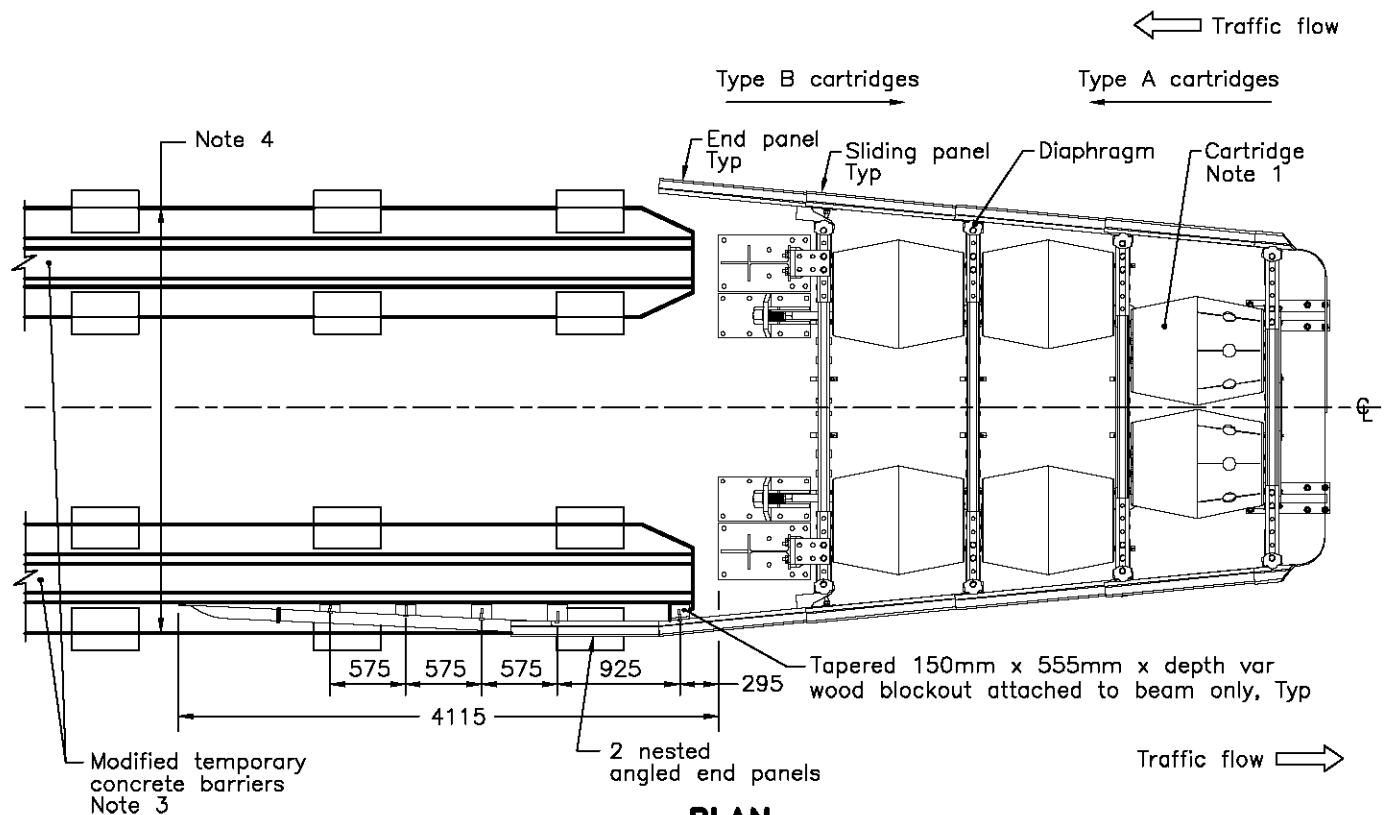
- 1 2 Type A and 4 Type B cartridges.
- 2 When system is placed on a concrete pad, the pad shall be according to OPSD 923.005.
- 3 Adjacent temporary concrete barriers shall be modified and anchored according to OPSD 923.002.
- 4 Maximum width of object shall be 2200mm for the first 762mm behind the 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
ENERGY ATTENUATOR, CRASH CUSHION
TAU-II EXTRA WIDE SYSTEM - TL-2
INSTALLATION - TEMPORARY
UNIDIRECTIONAL

Nov 2011 | Rev | 0



OPSD 923.388



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.

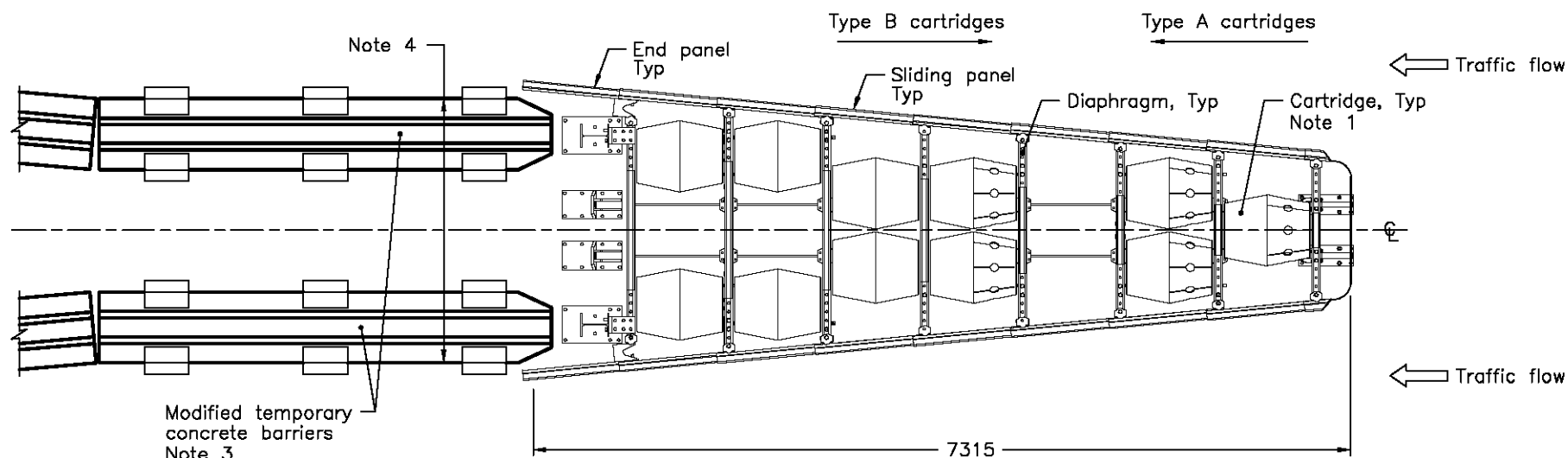
- A Nominal system width is 2290mm.
 B Delineation shall be according to OPSD 984.203.
 C The system depicted here is a proprietary product.
 D System configuration meets NCHRP Report 350 test level.
 E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION
TAU-II EXTRA WIDE SYSTEM - TL-2
INSTALLATION - TEMPORARY
BIDIRECTIONAL

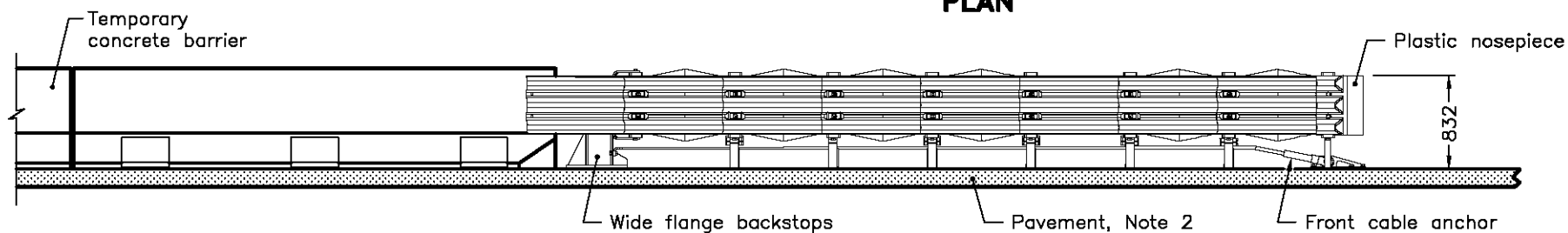
Nov 2011 Rev 0



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

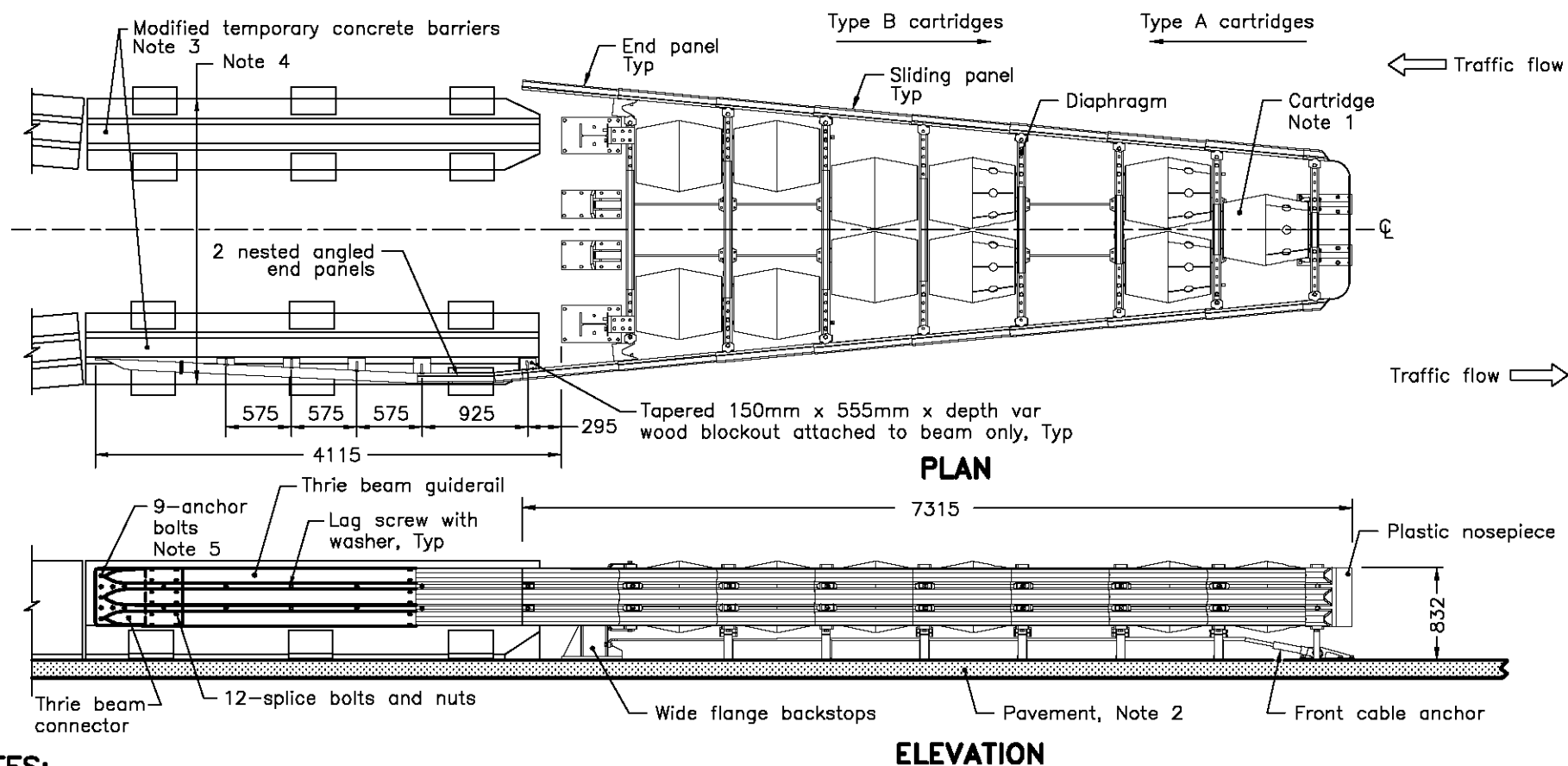
**ENERGY ATTENUATOR, CRASH CUSHION
TAU-II EXTRA WIDE SYSTEM - TL-3
INSTALLATION - TEMPORARY
UNIDIRECTIONAL**

Nov 2011

Rev 0



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

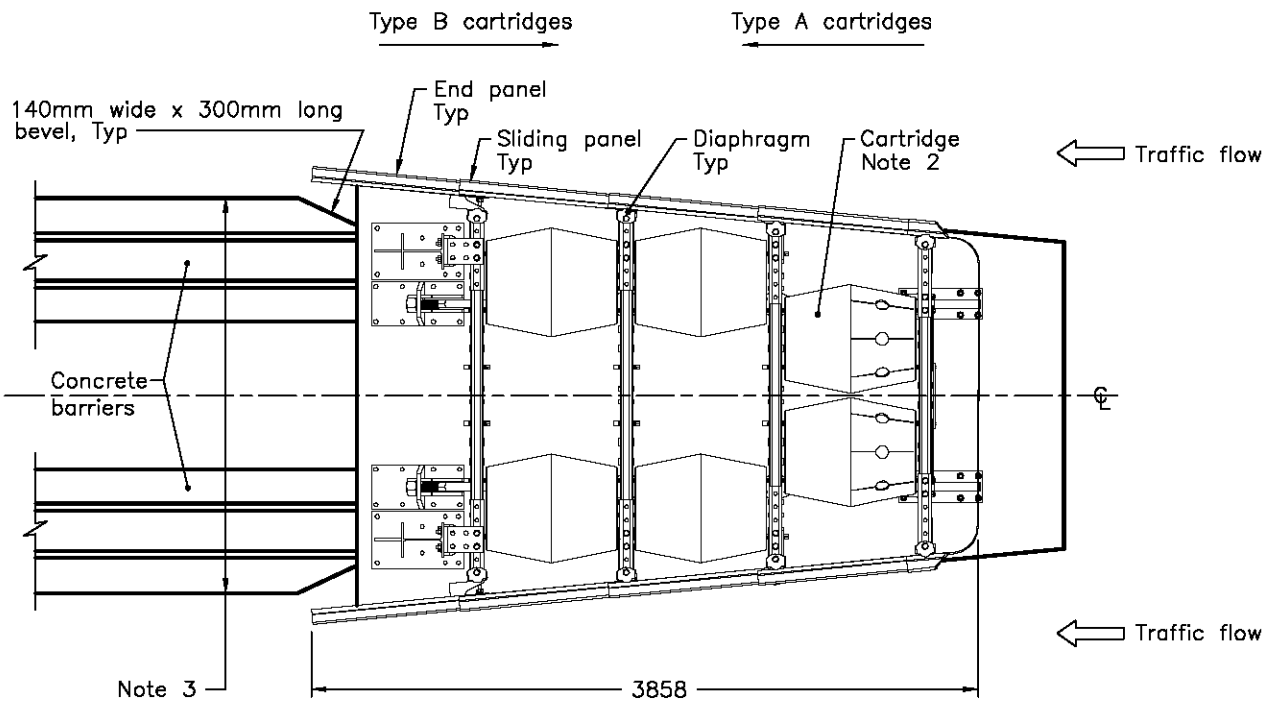
ENERGY ATTENUATOR, CRASH CUSHION TAU-II EXTRA WIDE SYSTEM - TL-3 INSTALLATION - TEMPORARY BIDIRECTIONAL

Nov 2011

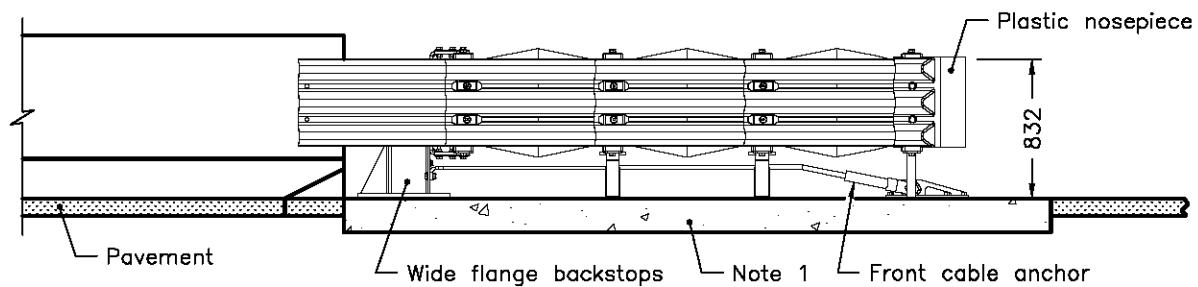
Rev 0



OPSD 923.391



PLAN



ELEVATION

NOTES:

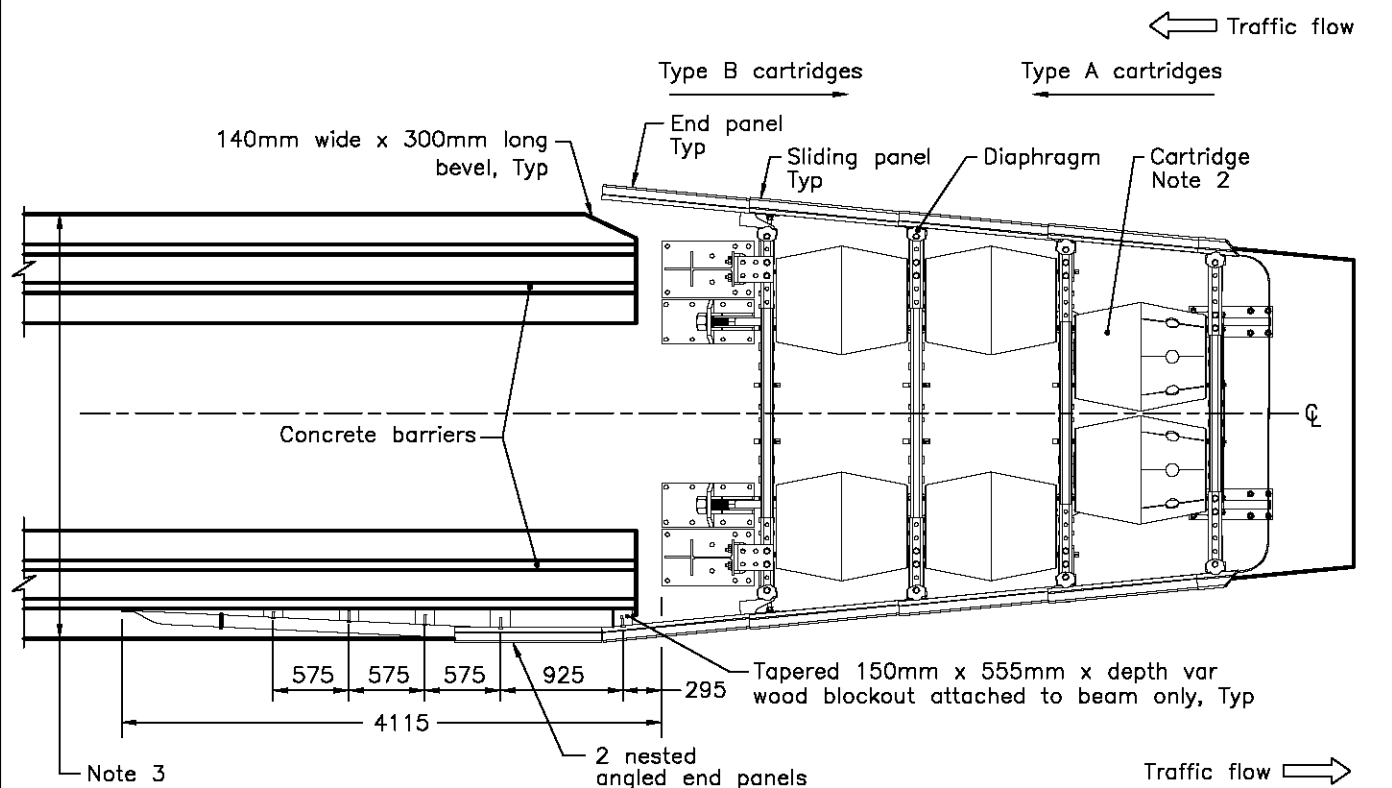
- 1 The system shall be anchored to concrete pad detailed in OPSD 923.005.
- 2 2 Type A and 4 Type B cartridges.
- 3 Maximum width of object shall be 2200mm for the first 762mm behind the rear fender panels.
- A Delineation shall be according to OPSD 984.204.
- B Nominal system width is 2290mm.
- C The 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
ENERGY ATTENUATOR, CRASH CUSHION
TAU-II EXTRA WIDE SYSTEM - TL-2
INSTALLATION - PERMANENT
UNIDIRECTIONAL

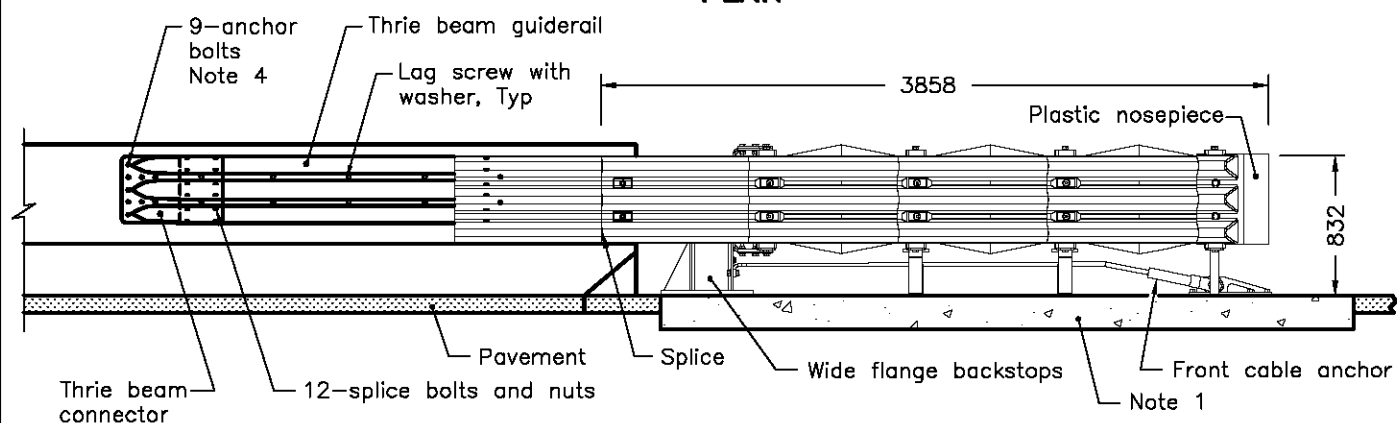
Nov 2011 | Rev | 0



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.

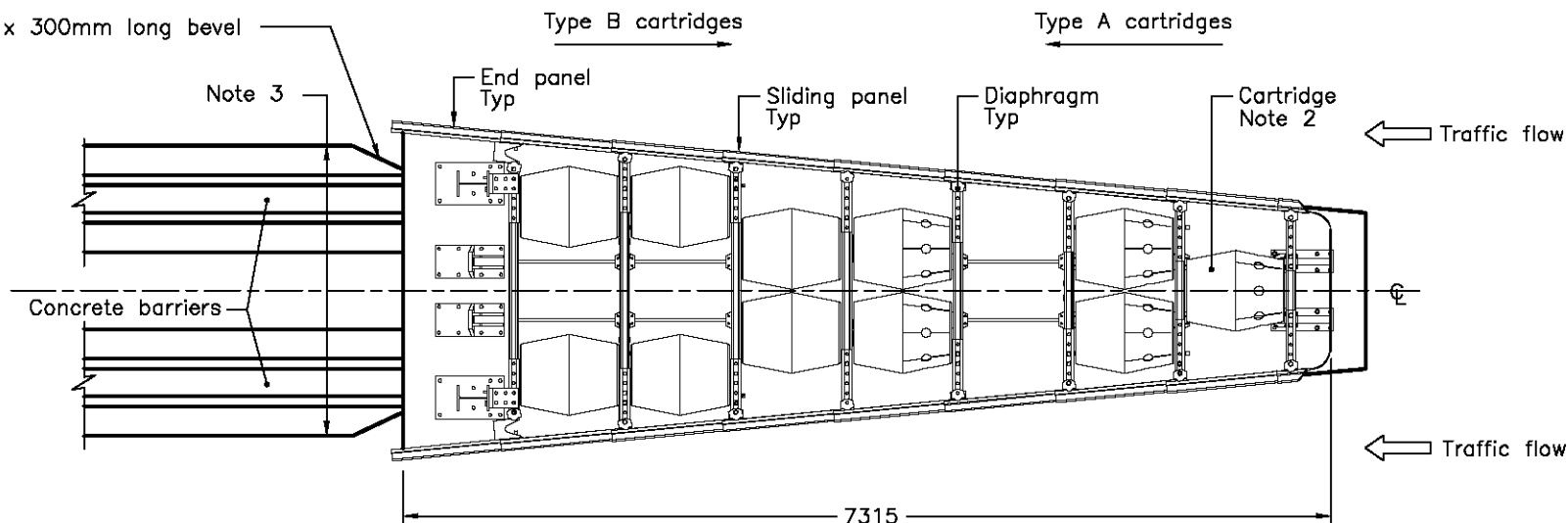
ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION
TAU-II EXTRA WIDE SYSTEM - TL-2
INSTALLATION - PERMANENT
BIDIRECTIONAL

Nov 2011 | Rev | 0

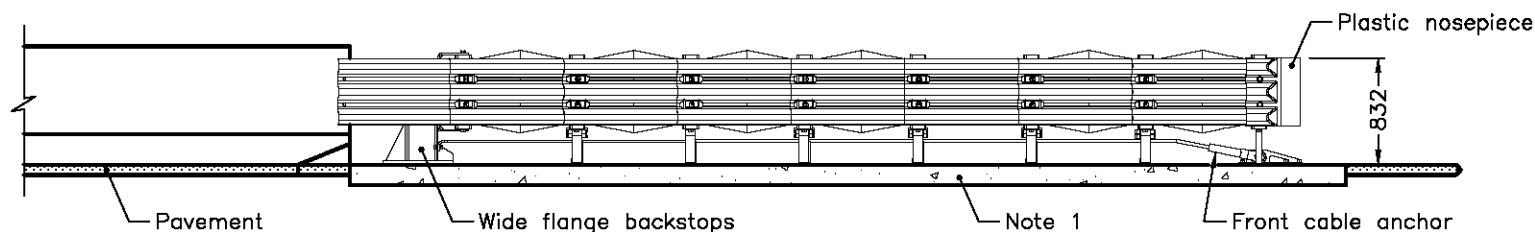


OPSD 923.393

140mm wide x 300mm long bevel
Typ



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

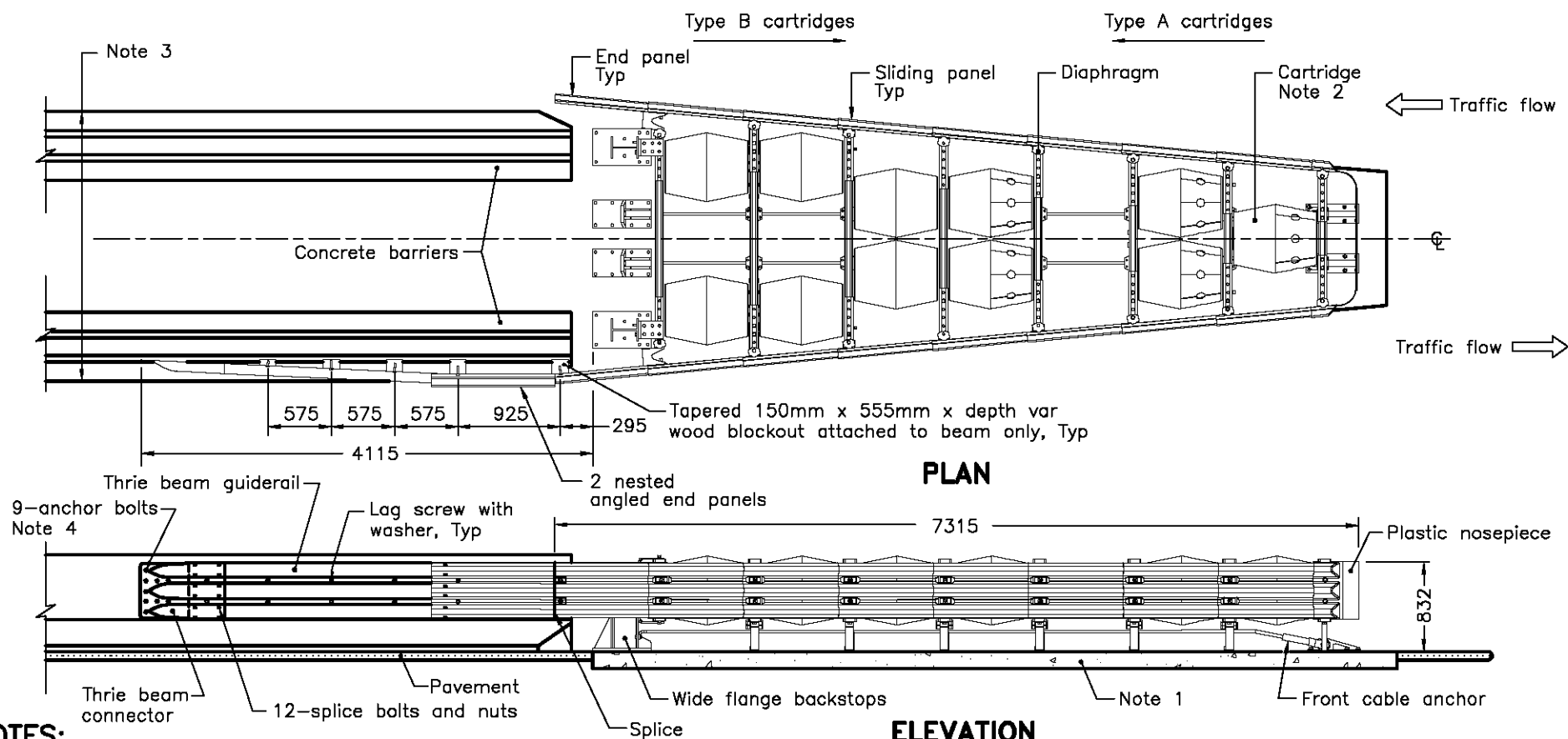
**ENERGY ATTENUATOR, CRASH CUSHION
TAU-II EXTRA WIDE SYSTEM – TL-3
INSTALLATION – PERMANENT
UNIDIRECTIONAL**

Nov 2011

Rev 0



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.

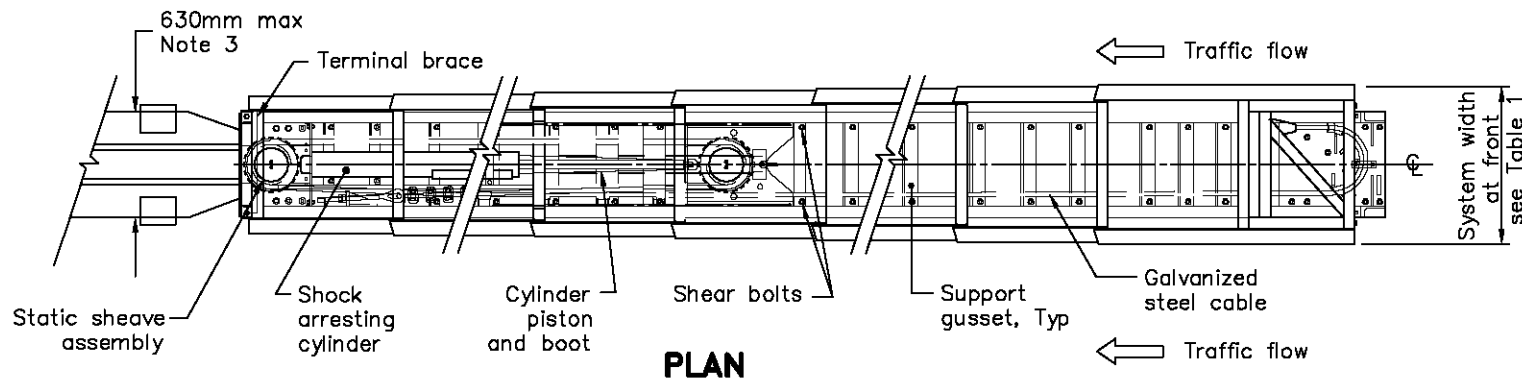
- A Nominal system width is 2290mm.
- B Delineation shall be according to OPSD 984.204.
- C The system depicted here is a proprietary product.
- D System configuration meets NCHRP Report 350 test level.
- E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING ENERGY ATTENUATOR, CRASH CUSHION TAU-II EXTRA WIDE SYSTEM - TL-3 INSTALLATION - PERMANENT BIDIRECTIONAL

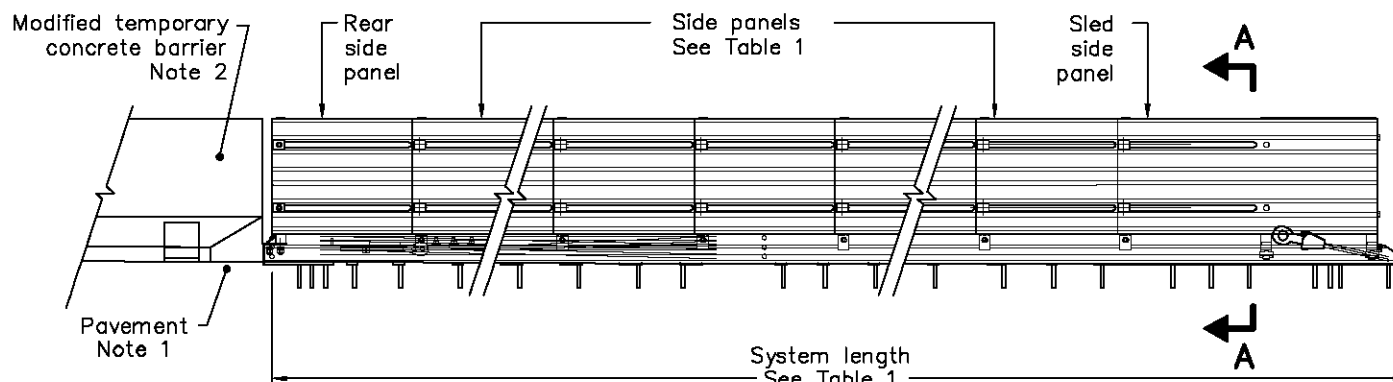
Nov 2011 Rev 0

OPSD 923.395



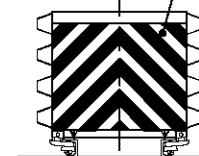


PLAN

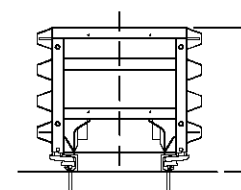


ELEVATION

Delineation plate with alternating 10cm wide Type IV yellow stripes and 10cm wide black stripes sloping down at 45 degrees towards approaching travel lanes.



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.

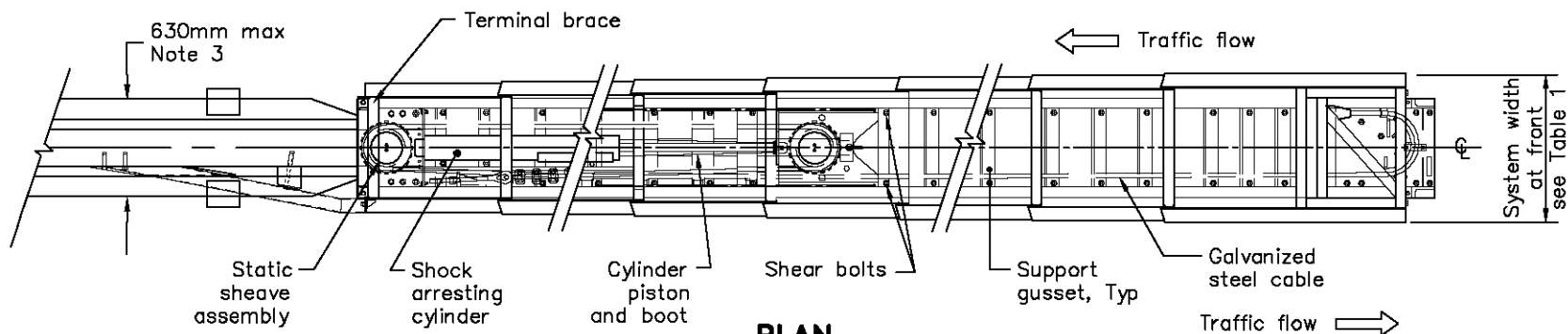
TABLE 1		
SYSTEM CONFIGURATION	TL-2	TL-3
SYSTEM LENGTH	4118	6556
SIDE PANELS PER SIDE	2	5
SYSTEM WIDTH	879	951

ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION
SMART SYSTEM
INSTALLATION-TEMPORARY
UNIDIRECTIONAL

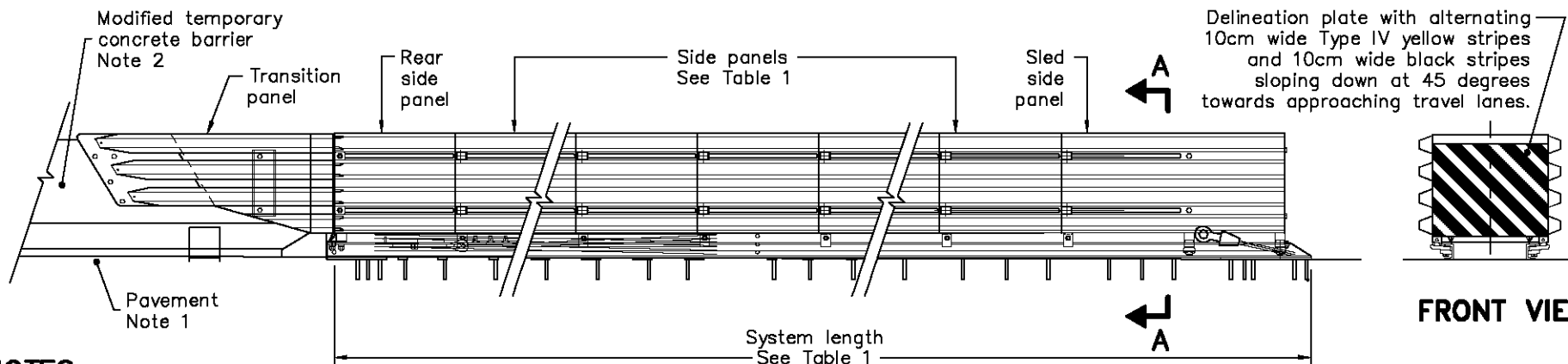
Nov 2010 Rev 0



OPSD 923.480

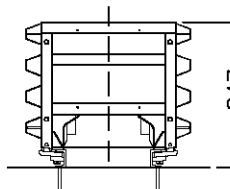


PLAN



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.

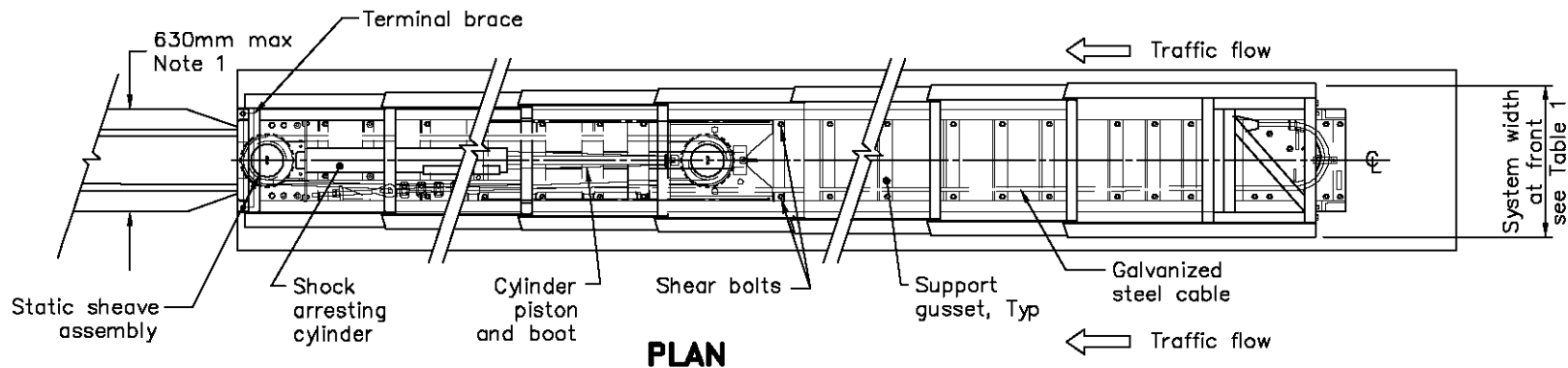
TABLE 1		
SYSTEM CONFIGURATION	TL-2	TL-3
SYSTEM LENGTH	4118	6556
SIDE PANELS PER SIDE	2	5
SYSTEM WIDTH	879	951

ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION
SMART SYSTEM
INSTALLATION-TEMPORARY
BIDIRECTIONAL

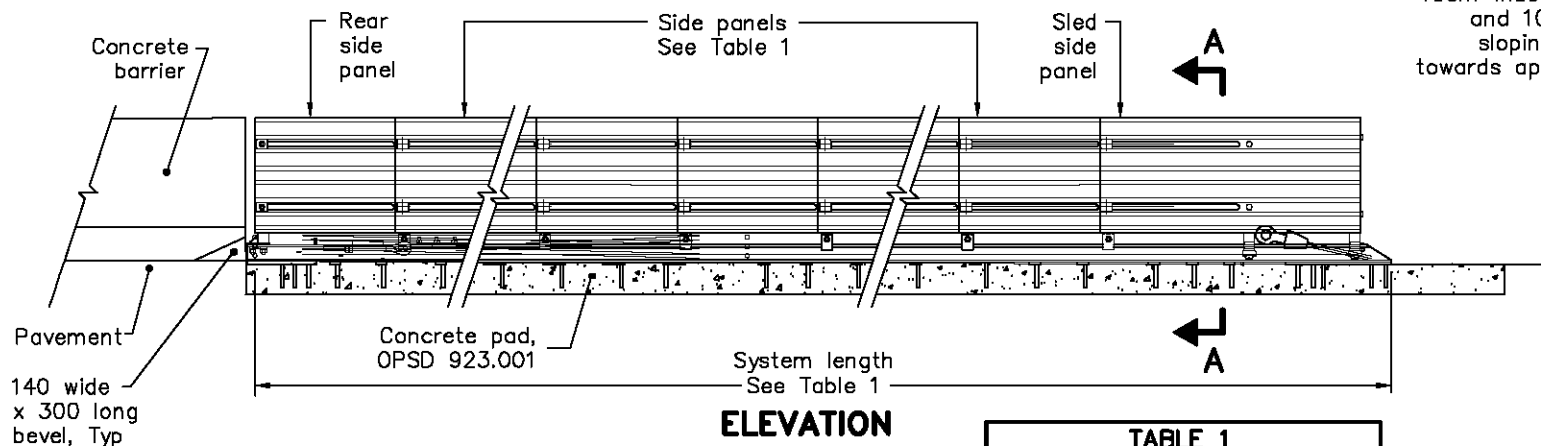
Nov 2010 Rev 0



OPSD 923.481

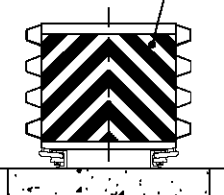


PLAN

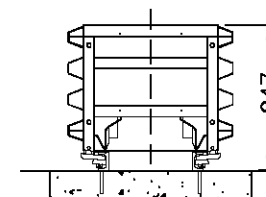


ELEVATION

Delineation plate with alternating 10cm wide Type IV yellow stripes and 10cm wide black stripes sloping down at 45 degrees towards approaching travel lanes.



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.

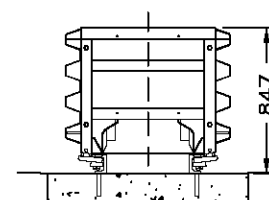
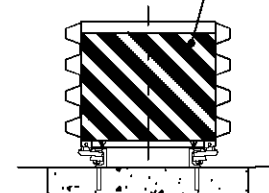
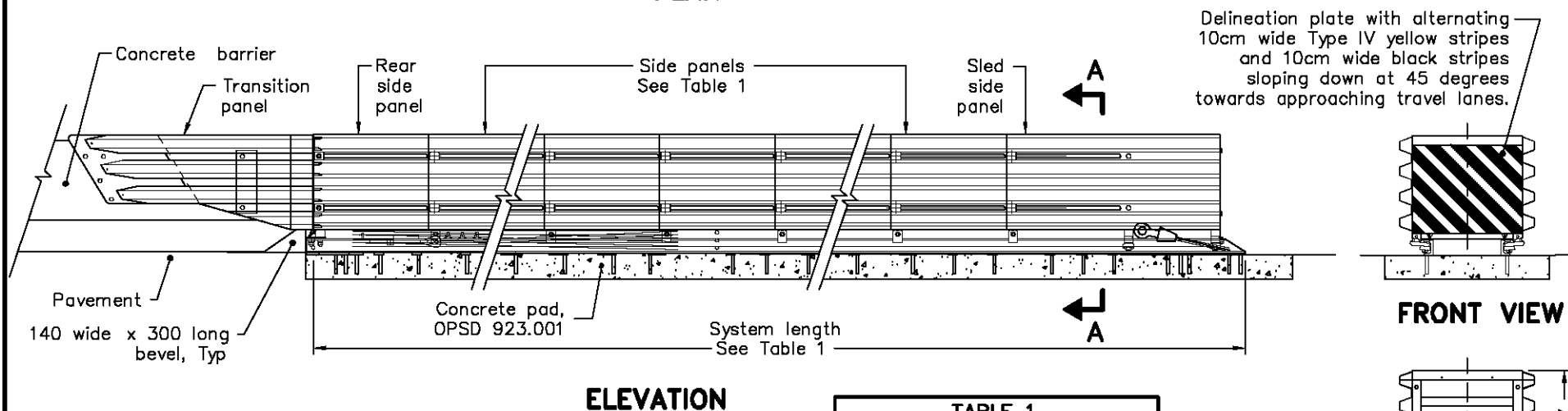
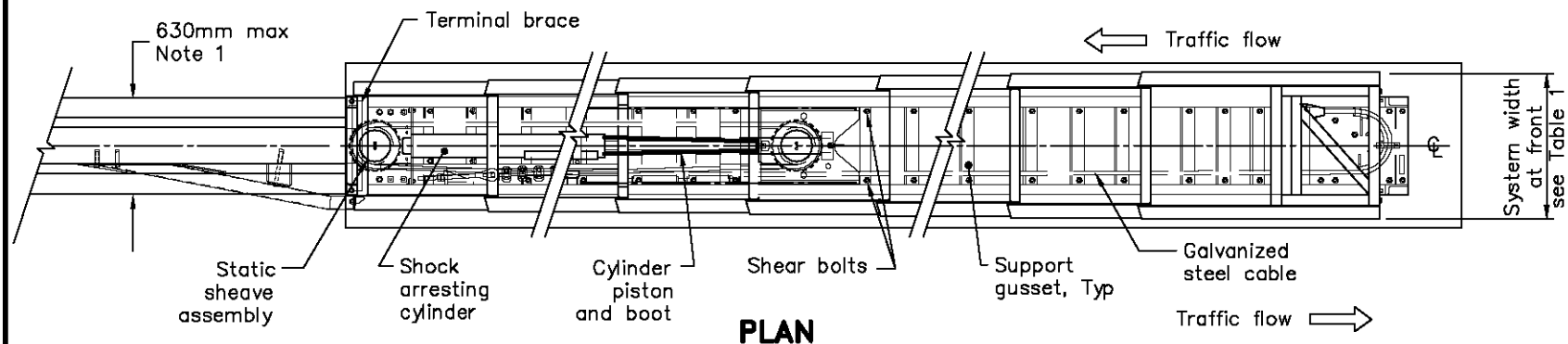
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION
SMART SYSTEM
INSTALLATION-PERMANENT
UNIDIRECTIONAL

Nov 2010 Rev 0



OPSD 923.482



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.

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

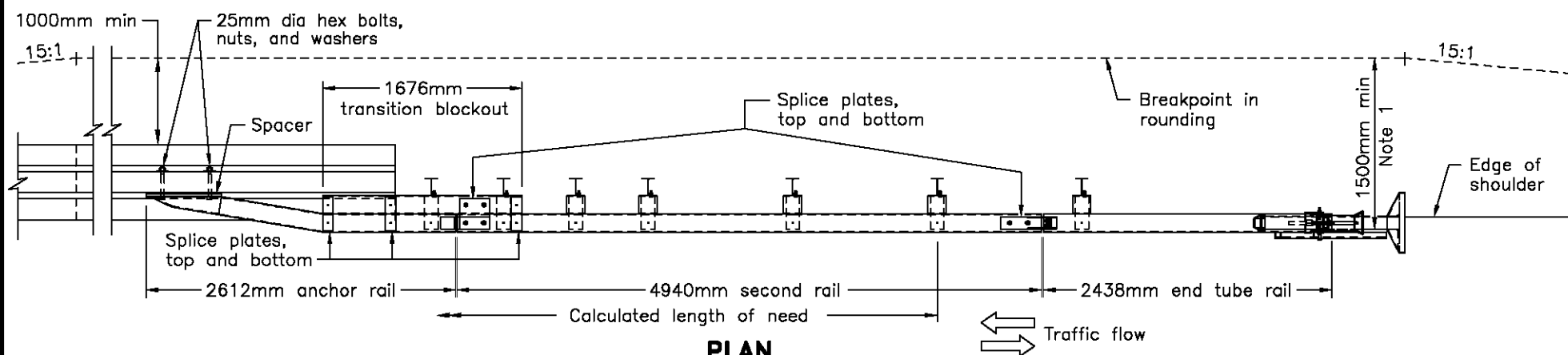
**ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION
SMART SYSTEM
INSTALLATION-PERMANENT
BIDIRECTIONAL**

Nov 2010

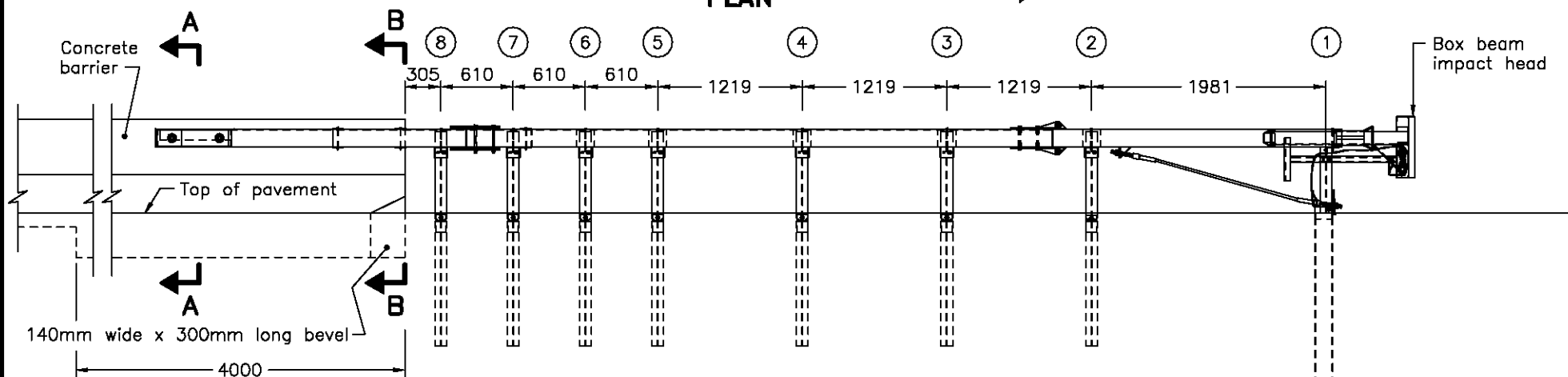
Rev 0



OPSD 923.483



PLAN



ELEVATION

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 conjunction 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

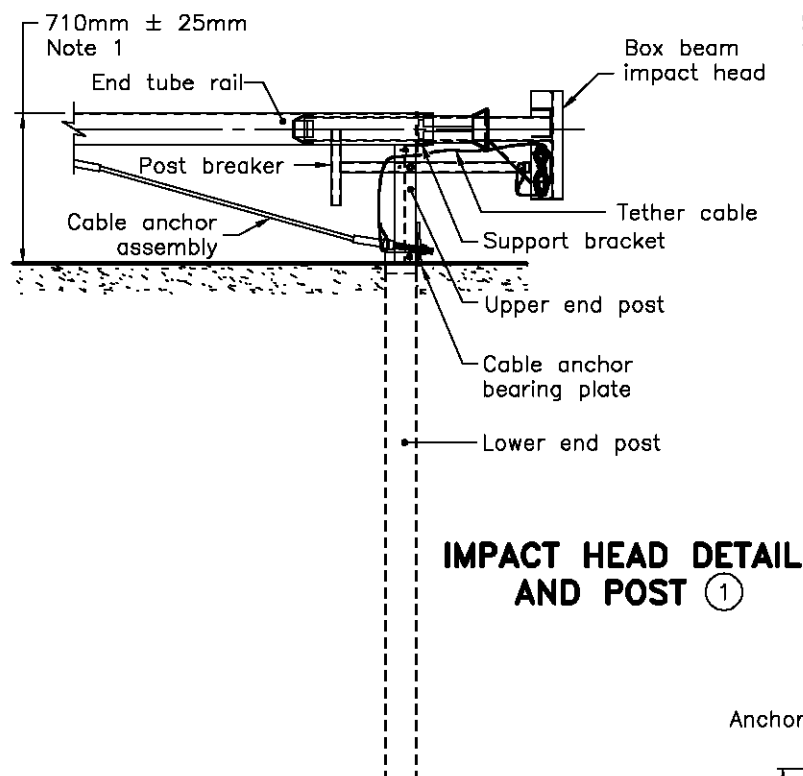
**ENERGY ATTENUATOR, CRASH CUSHION
BOX BEAM BURSTING ENERGY
ABSORBING TERMINAL
INSTALLATION - LAYOUT**

Nov 2011

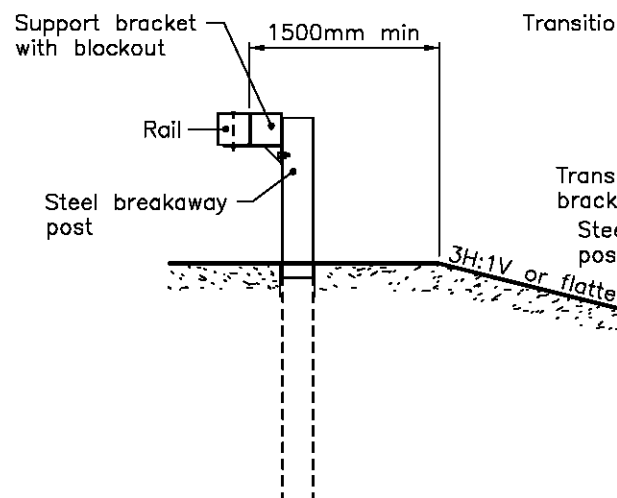
Rev 1



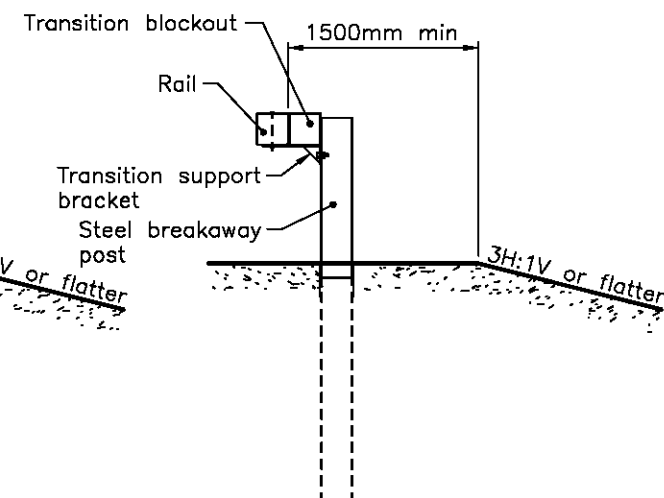
OPSD 923.530



**IMPACT HEAD DETAIL
AND POST ①**



POSTS ② ③ ④ ⑤ ⑥



POSTS ⑦ ⑧

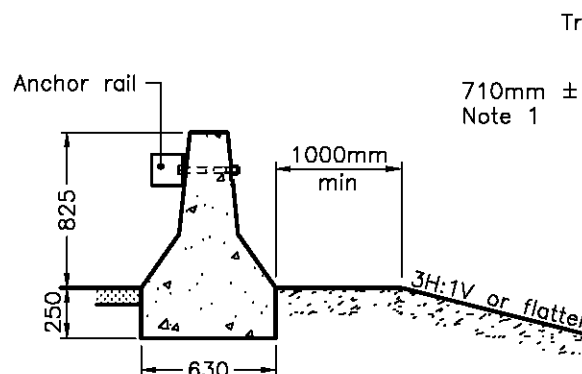
NOTES:

1 Mounting height measured vertically to top of box beam rails.

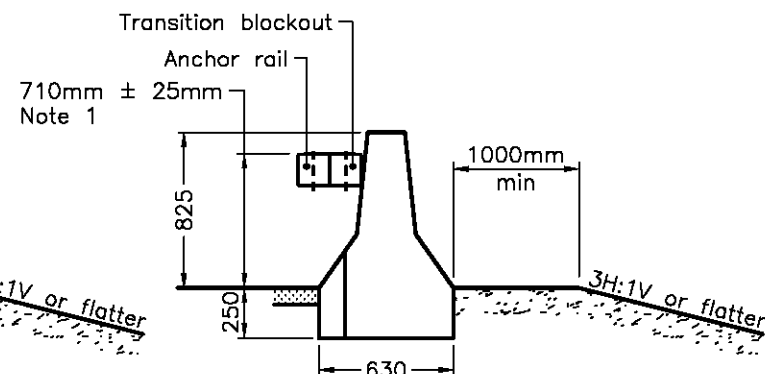
A This OPSD shall be read in conjunction with OPSD 923.530.

B The system depicted here is a proprietary product.

C All dimensions are in millimetres unless otherwise shown.



SECTION A-A



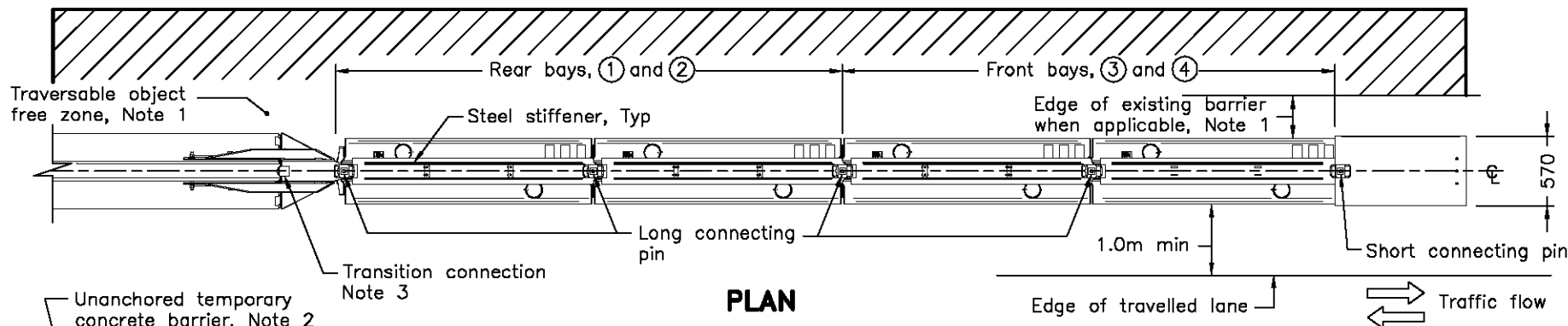
SECTION B-B

**ONTARIO PROVINCIAL STANDARD DRAWING
ENERGY ATTENUATOR, CRASH CUSHION
BOX BEAM BURSTING ENERGY
ABSORBING TERMINAL
INSTALLATION - IMPACT HEAD AND POST**

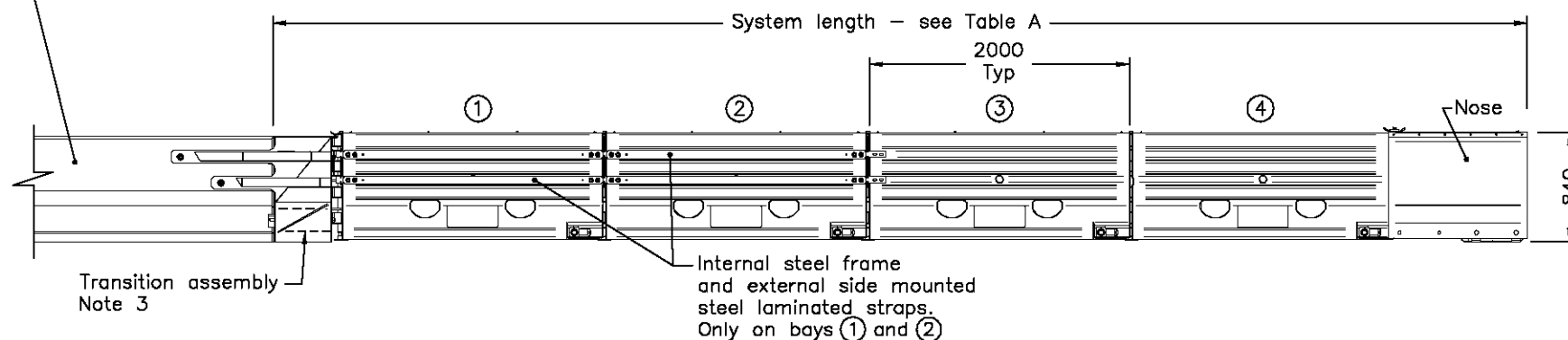
Nov 2011 Rev 1

OPSD 923.531





PLAN



ELEVATION

NOTES:

- 1 When placed adjacent to concrete barrier or steel beam guide rail, clearance shall be $\leq 0.3\text{m}$ or $\geq 3.0\text{m}$, 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.
- 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.

TABLE A

System Configuration	TL-2	TL-3
Bays	① ②	① ② ③ ④
System Length	5620	9620

ONTARIO PROVINCIAL STANDARD DRAWING

**ENERGY ATTENUATOR, CRASH CUSHION
ACZ-350 SYSTEM**

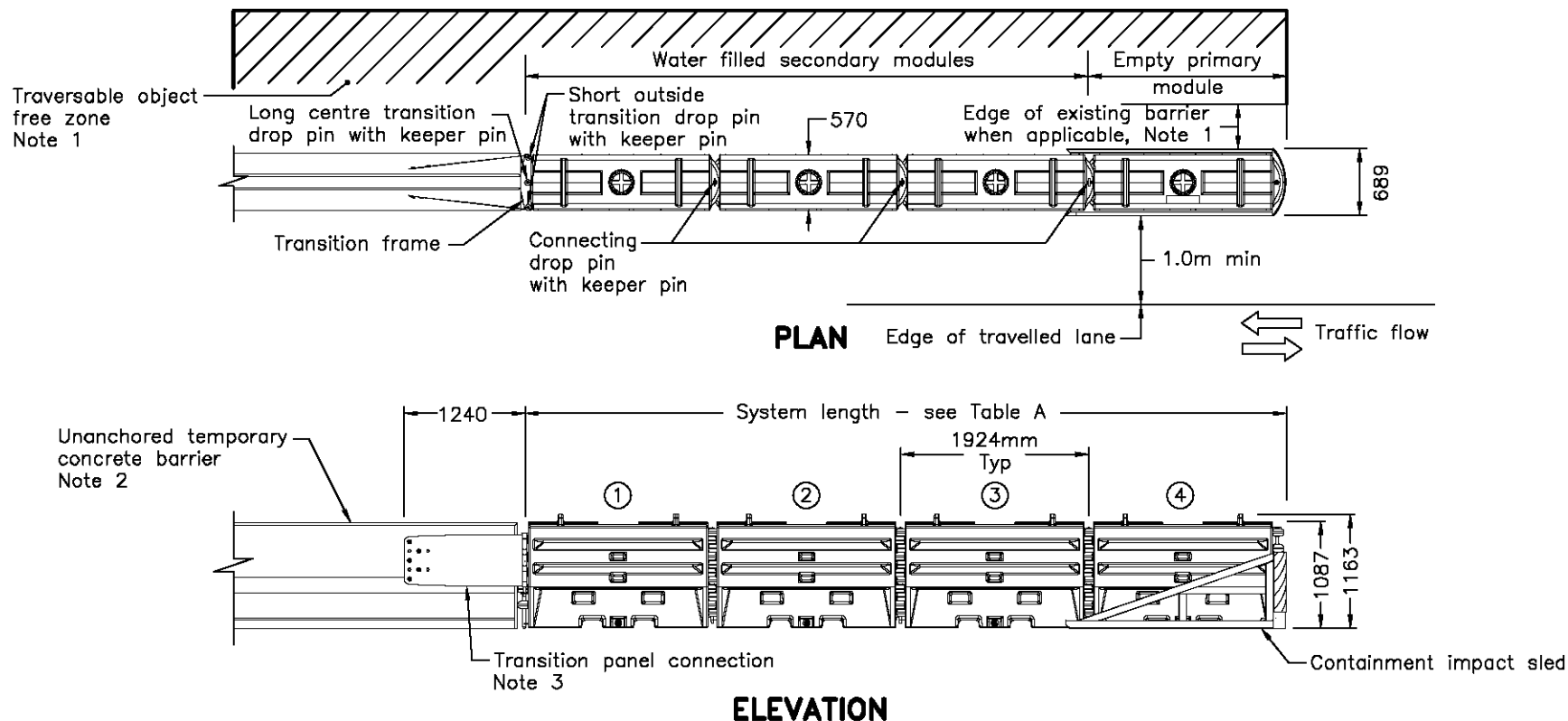
INSTALLATION-TEMPORARY CONCRETE BARRIER

Nov 2016

Rev 2



OPSD 924.135



NOTES:

- 1 When placed adjacent to concrete barrier or steel beam guide rail, clearance shall be $\leq 0.3\text{m}$ or $\geq 3.0\text{m}$, 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 SLED 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.
- C The system depicted here is a proprietary product.
- D All modules (except Module 4) 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.

TABLE A		
System Configuration	TL-2	TL-3
Modules	① ② ④	① ② ③ ④
System Length	5770	7930

ONTARIO PROVINCIAL STANDARD DRAWING

ENERGY ATTENUATOR, CRASH CUSHION
SLED SYSTEM

INSTALLATION-TEMPORARY CONCRETE BARRIER

Nov 2016 Rev 0

OPSD 924.141





**RECTANGULAR
WASHER**
Note 1



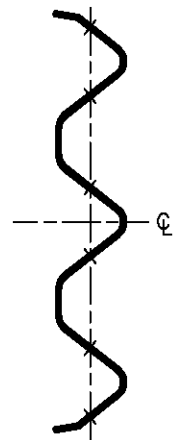
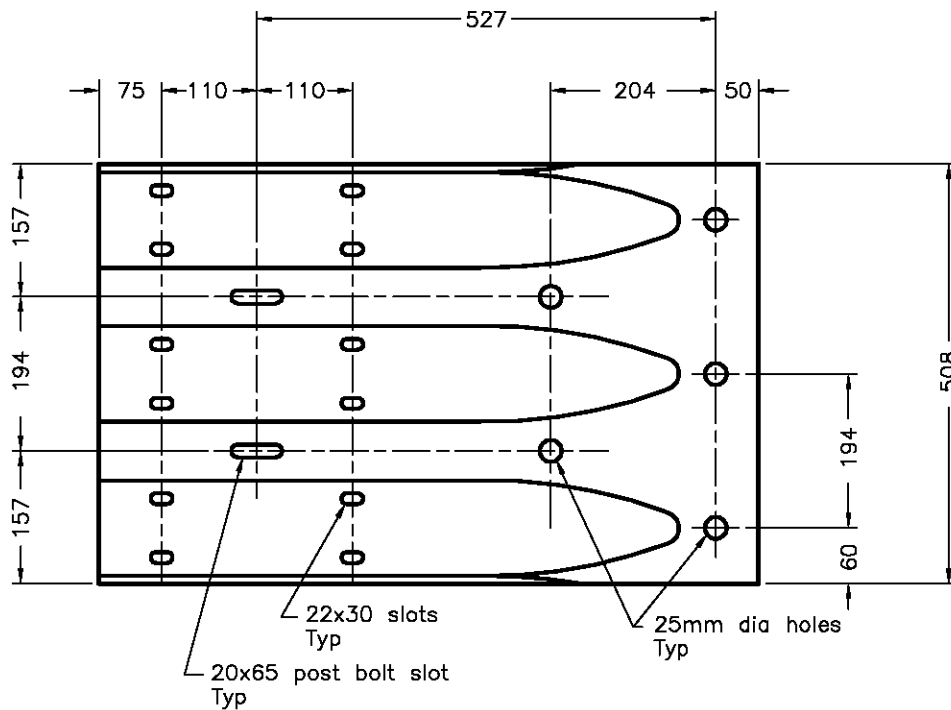
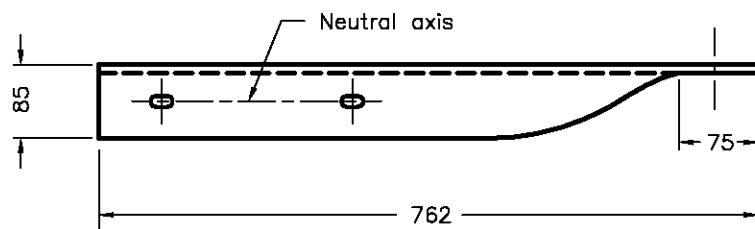
1 Base metal thickness of rail shall be 2.67mm nominal and 2.44mm minimum.

A All dimensions are in millimetres.

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

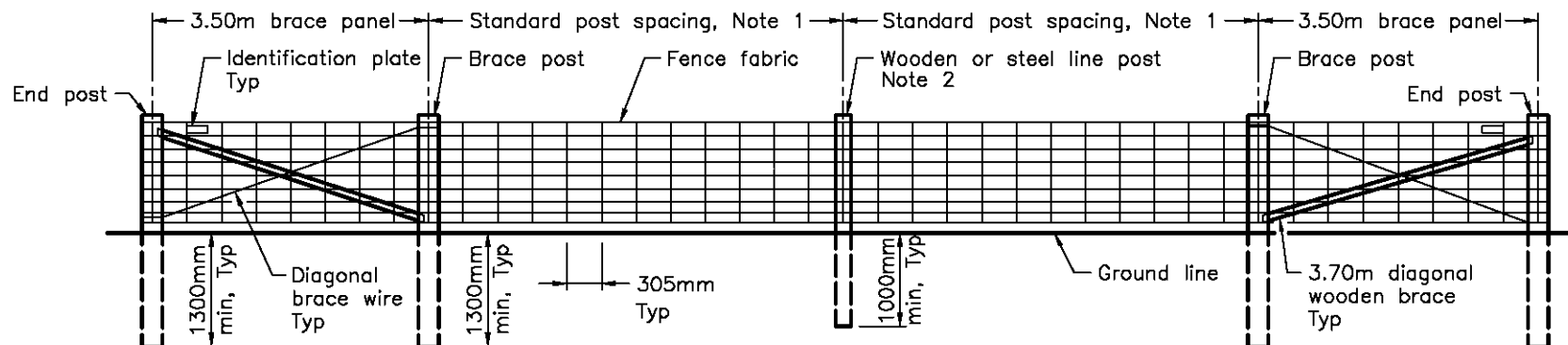
Nov 2013

Rev 0

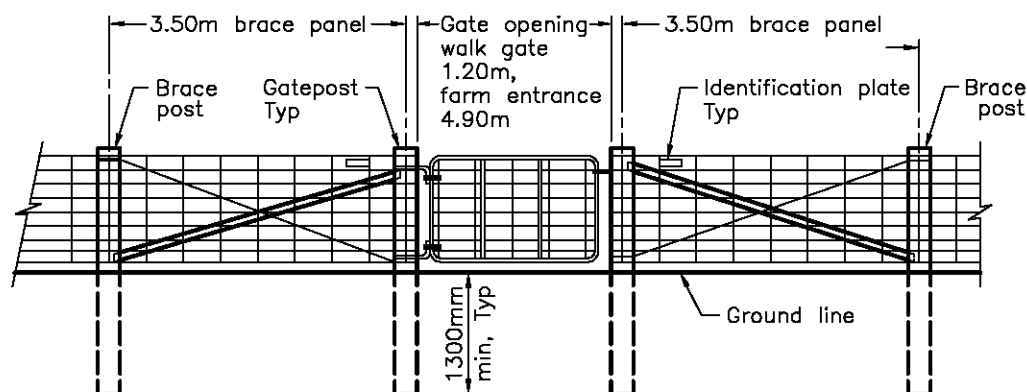
GUIDE RAIL SYSTEM, THRIE BEAM
COMPONENT – TERMINAL CONNECTOR



OPSD 925.030



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



GATE DETAIL

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 This OPSD shall be read in conjunction with OPSD 971.103.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

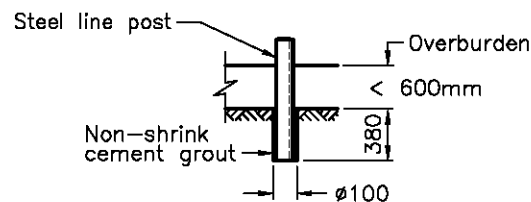
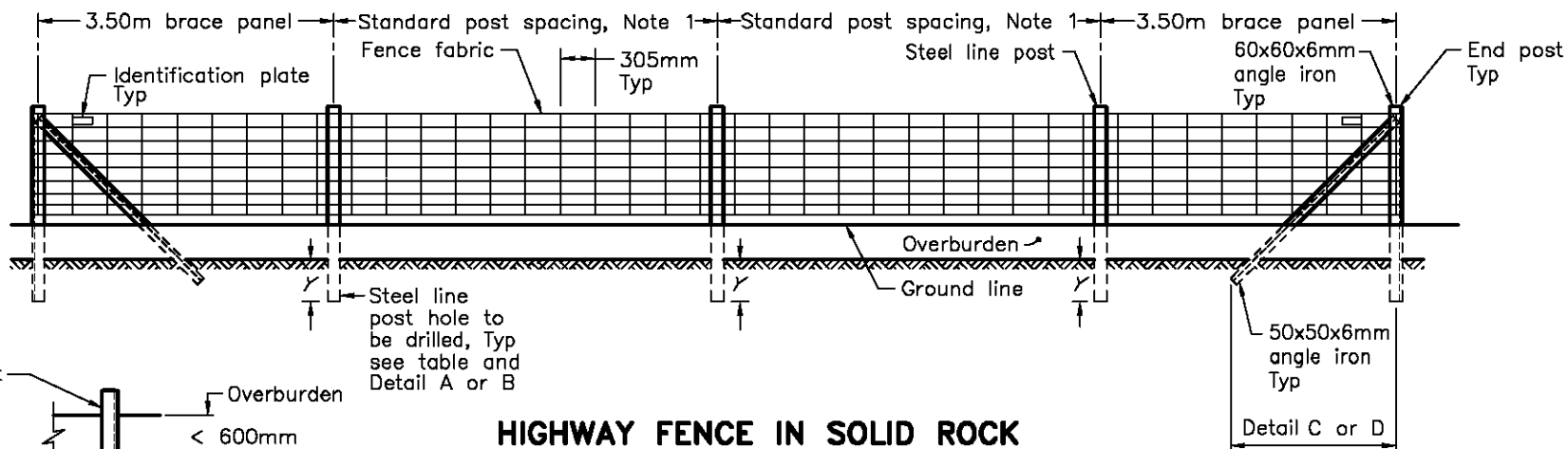
FENCE, HIGHWAY
IN EARTH, SHALE, LOOSE ROCK, OR FRIABLE ROCK
INSTALLATION

Nov 2016

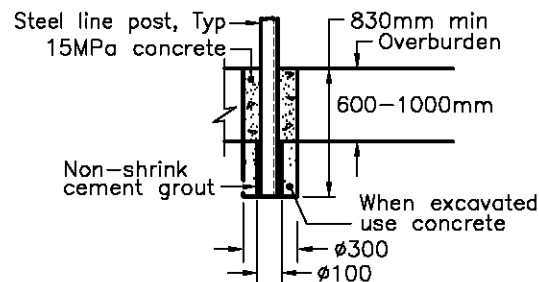
Rev 4



OPSD 971.101

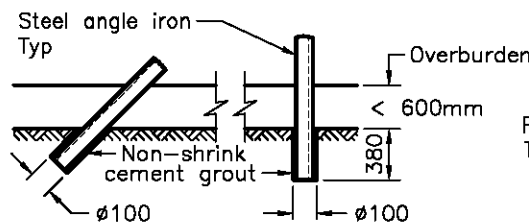


DETAIL A
STEEL LINE POST IN
OVERBURDEN LESS THAN 600mm

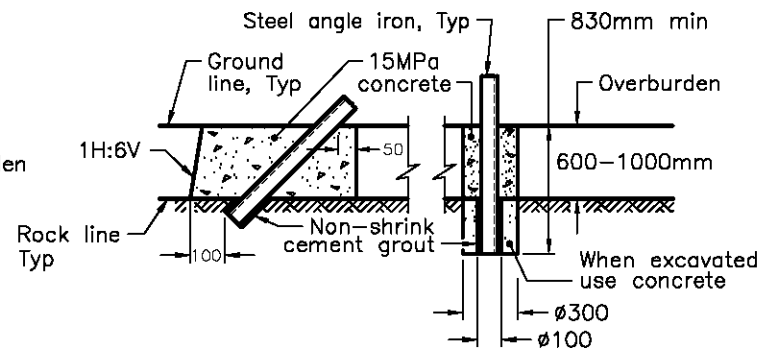


DETAIL B
STEEL LINE POST IN
OVERBURDEN BETWEEN 600mm - 1000mm

STEEL POST DEPTH IN ROCK	
EARTH OVERBURDEN DEPTH	LINE POST DEPTH Min
< 600	380
600-1000	230



DETAIL C
BRACE PANEL IN
OVERBURDEN LESS THAN 600mm



DETAIL D
BRACE PANEL IN
OVERBURDEN BETWEEN 600mm - 1000mm

NOTES:

- 1 Standard line post spacing shall be 5.0m.
- A This OPSD shall be read in conjunction with OPSD 971.103.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

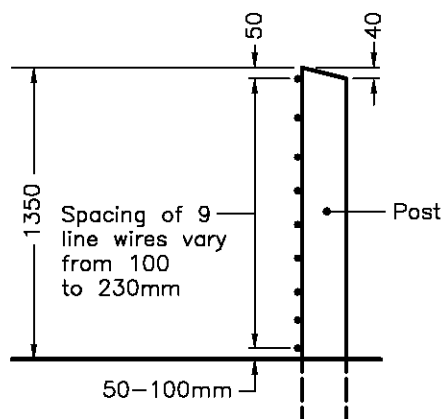
FENCE, HIGHWAY
IN SOLID ROCK
INSTALLATION

Nov 2016

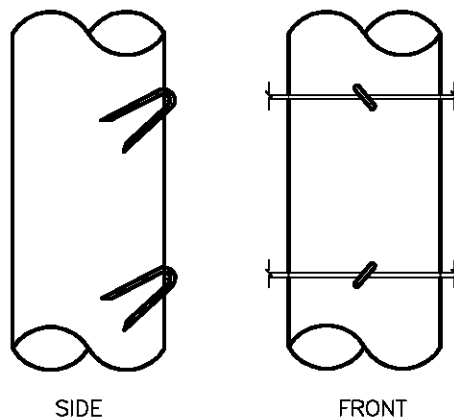
Rev 2



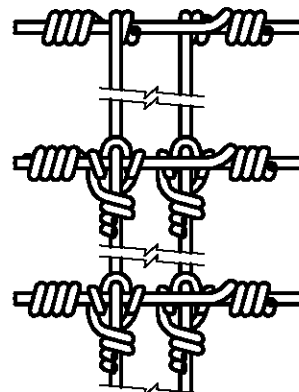
OPSD 971.102



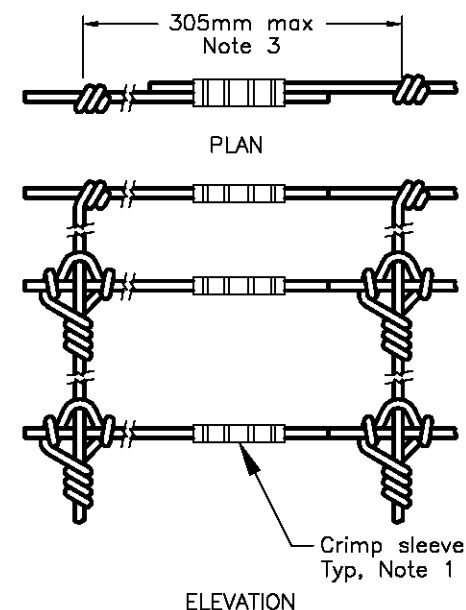
**FENCE FABRIC
WIRE SPACING DETAIL**



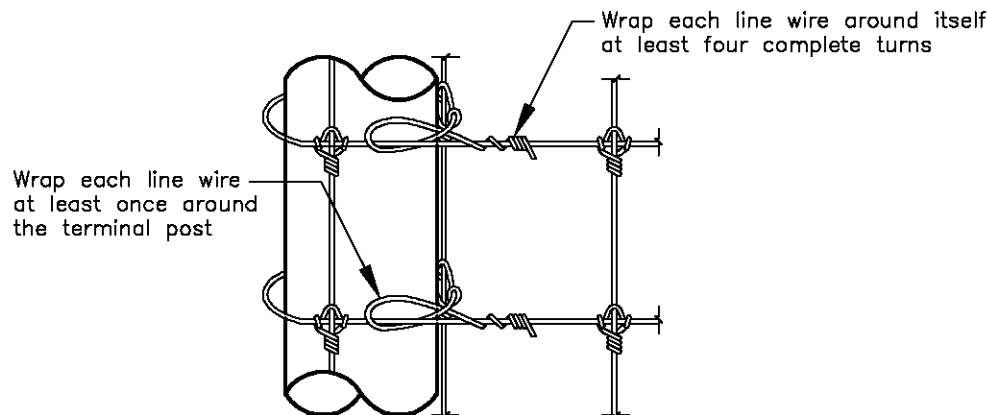
STAPLING DETAIL



**LINE WIRE WRAPPING
SPlicing DETAIL**



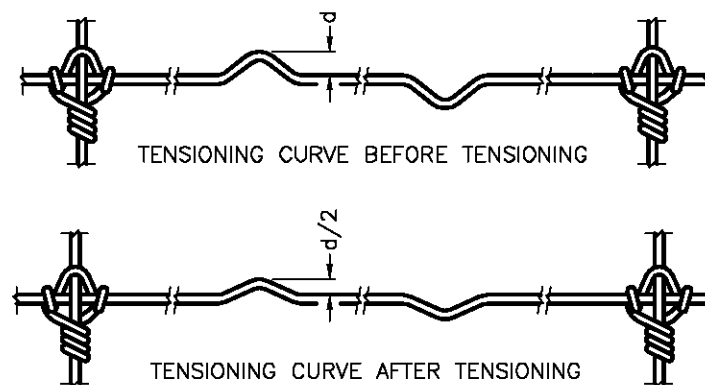
**CRIMP SLEEVE
SPlicing DETAIL**



FENCE TERMINATION DETAIL

NOTES:

- 1 Each of the nine line wires shall be spliced with a crimp sleeve. Crimp sleeves shall be installed according to the manufacturer's instructions for the type of fence fabric installed.
 - 2 The tensioned curves shall be one half the size of the untensioned curves.
 - 3 Both fabric end vertical stay wires shall be within a maximum of 305mm centres.
- A All dimensions are in millimetres unless otherwise shown.



TENSIONING DETAILS, Note 2

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2016

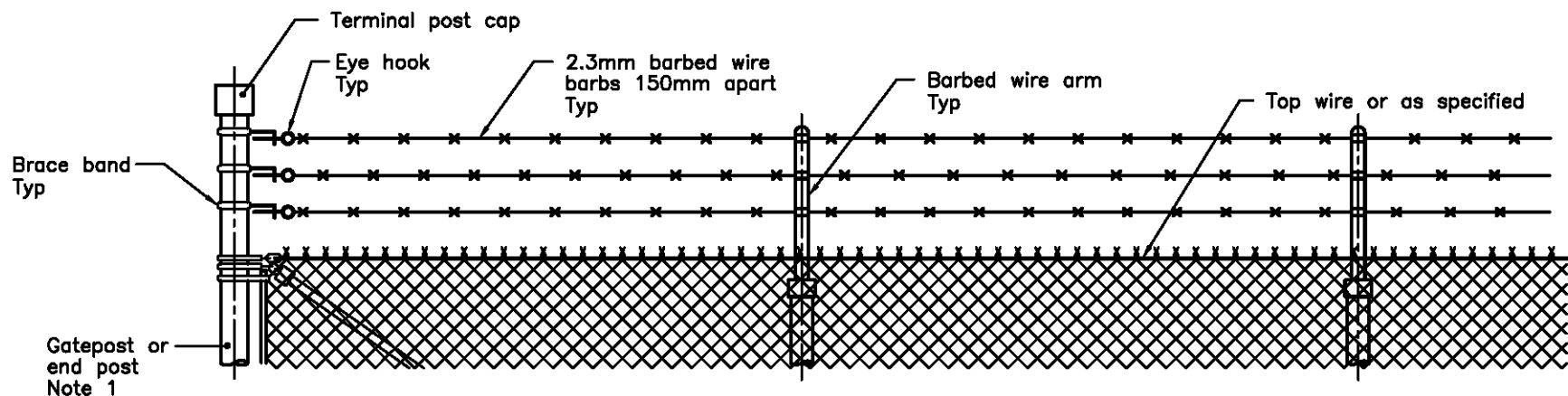
Rev 0

FENCE, HIGHWAY

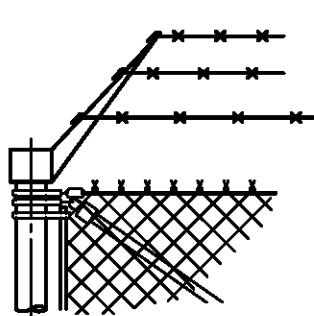
INSTALLATION DETAILS



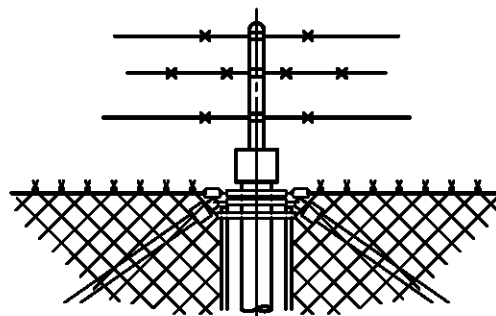
OPSD 971.103



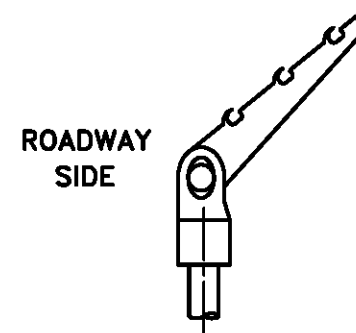
**CORNER POST
WITH BARBED WIRE ARM**



**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.

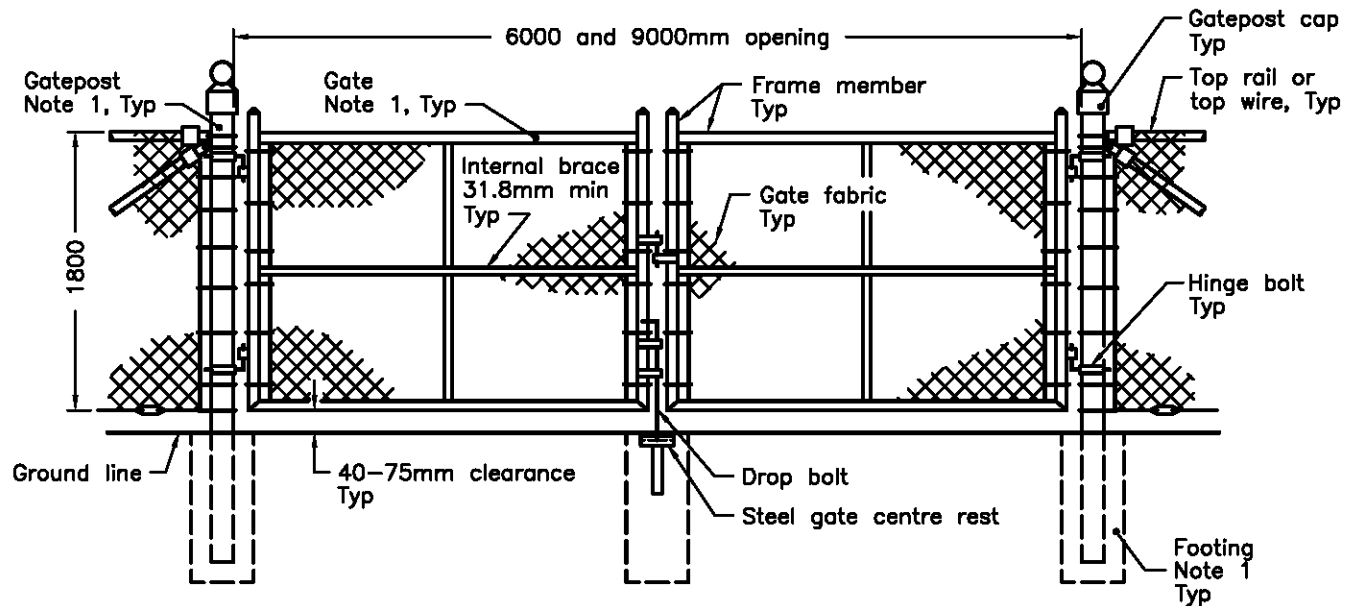
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2

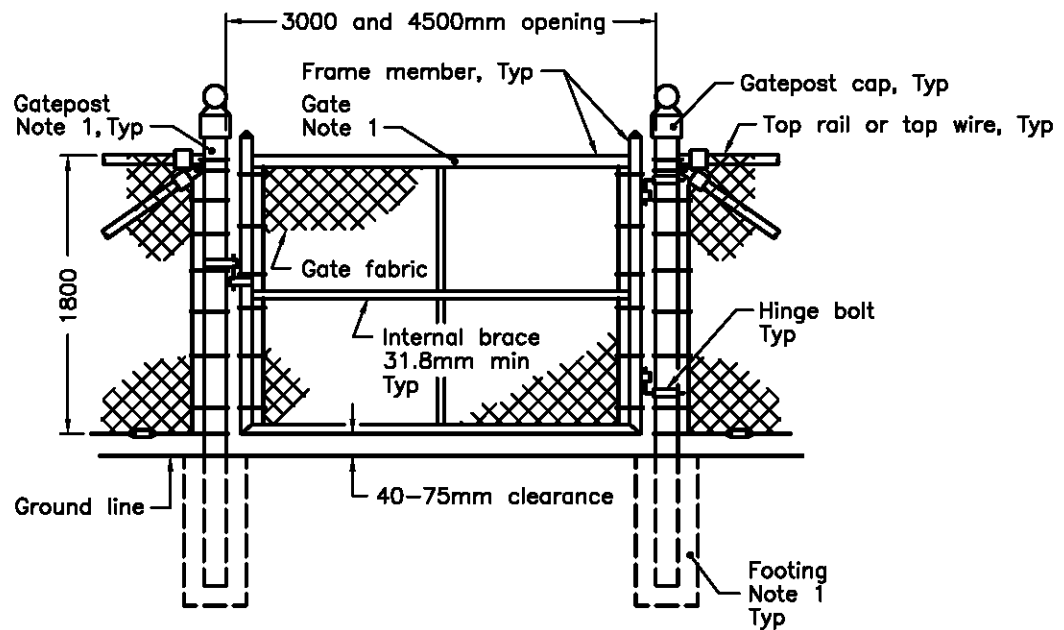
**FENCE, CHAIN-LINK
COMPONENT - BARBED WIRE**



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

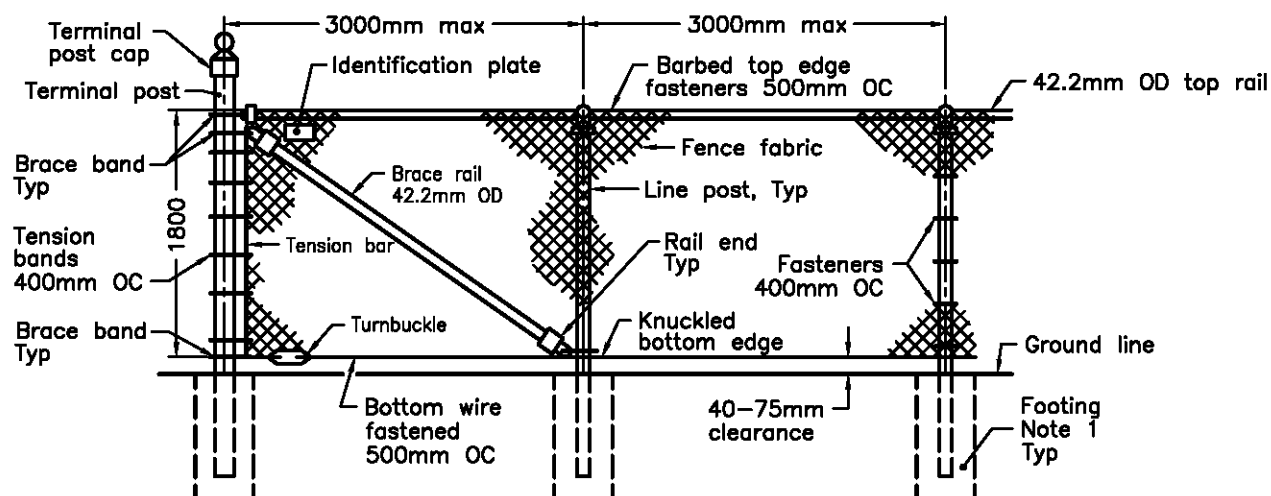
Nov 2012

Rev 2

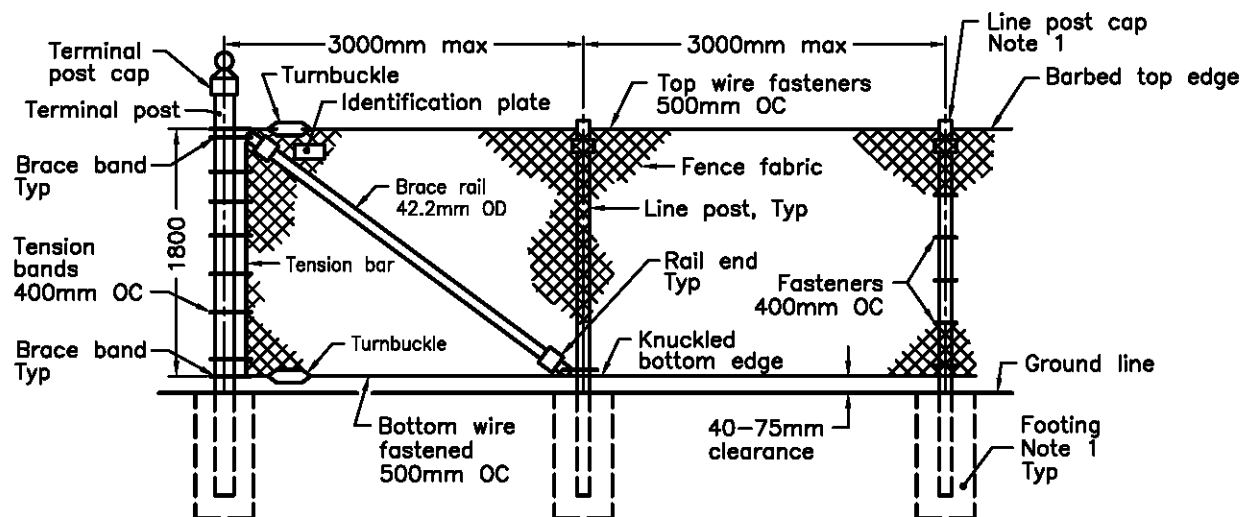
**FENCE, CHAIN-LINK
COMPONENT - GATE**



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

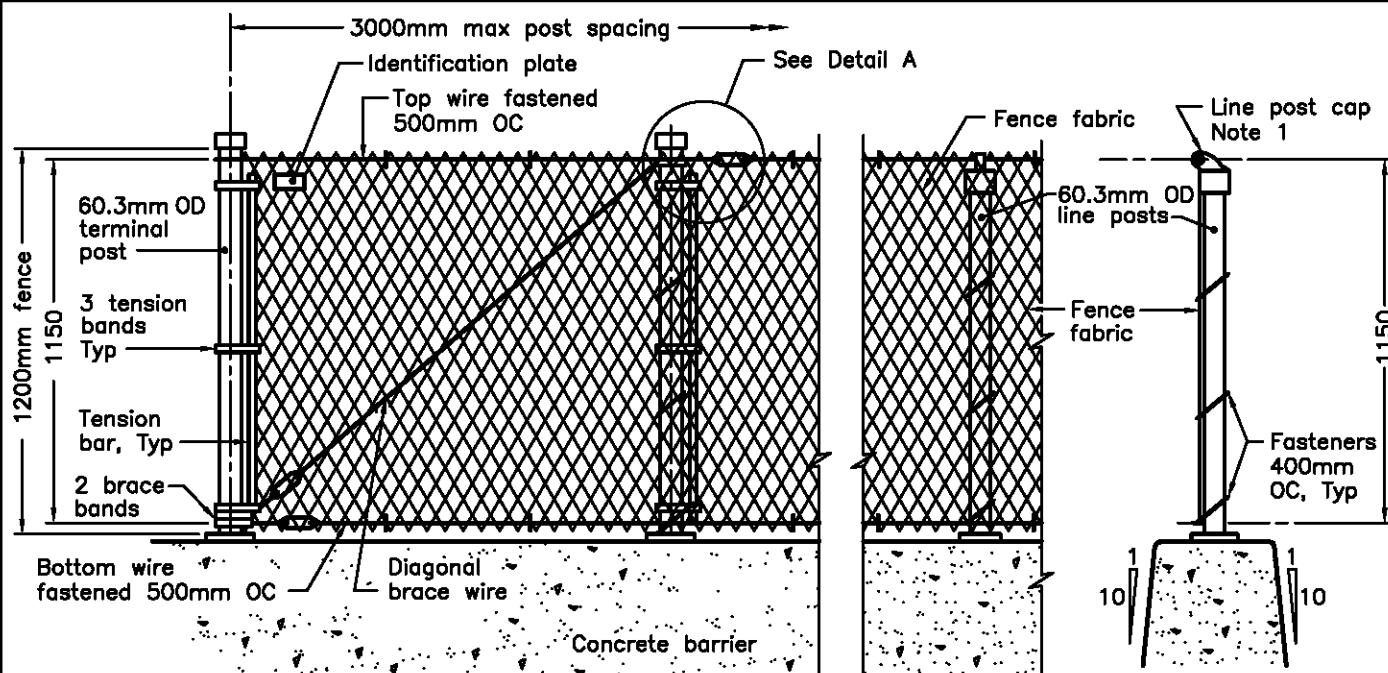
Nov 2012

Rev 2

**FENCE, CHAIN-LINK
INSTALLATION – ROADWAY**

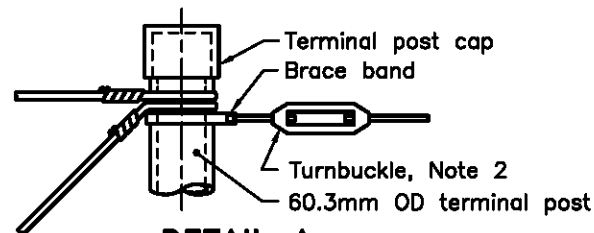
OPSD 972.130



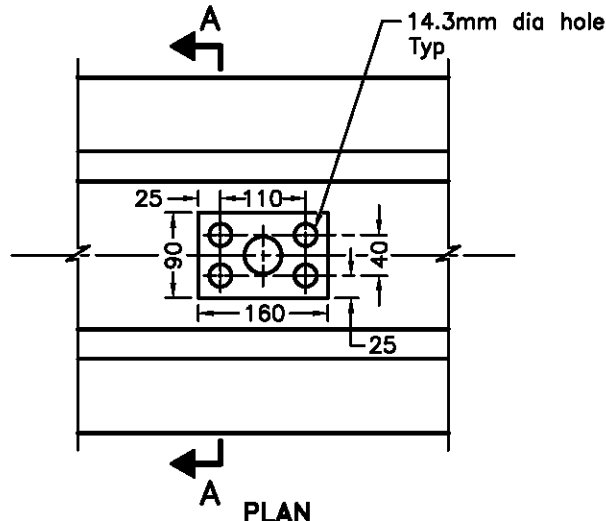


END SECTION DETAIL

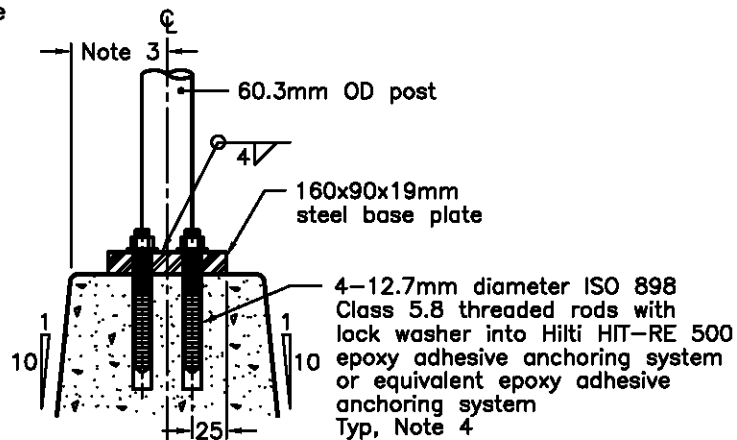
LINE POST DETAIL



DETAIL A



PLAN



SECTION A-A

NOTES:

ANCHORAGE DETAIL

- 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	Retaining Walls		
			m	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

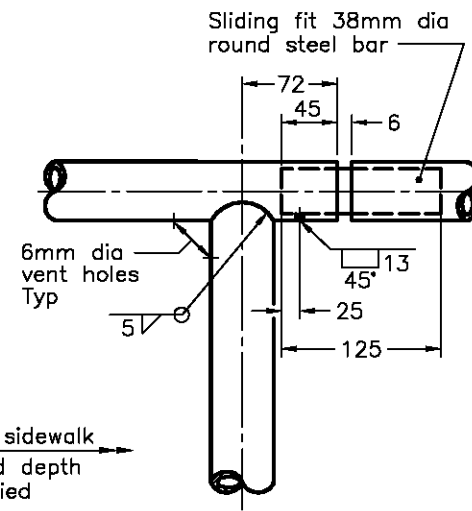
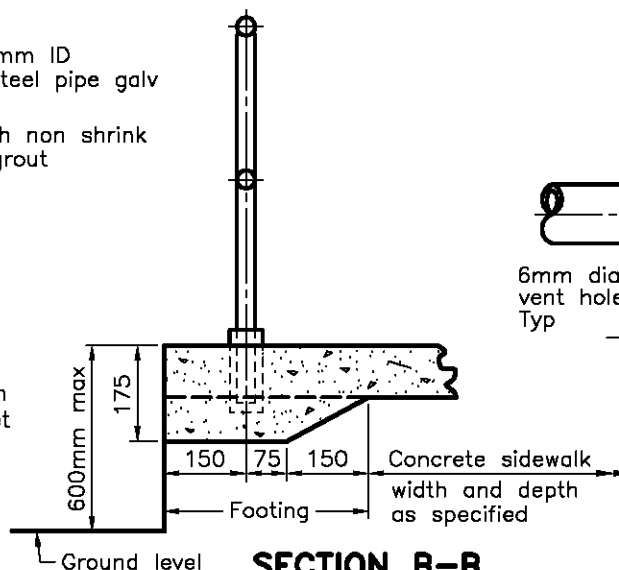
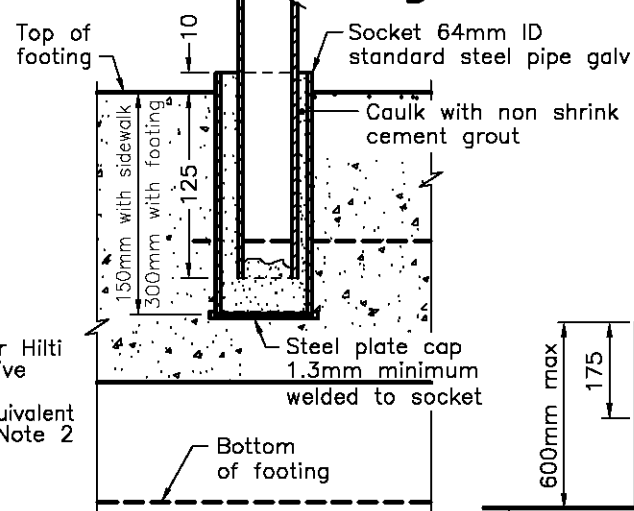
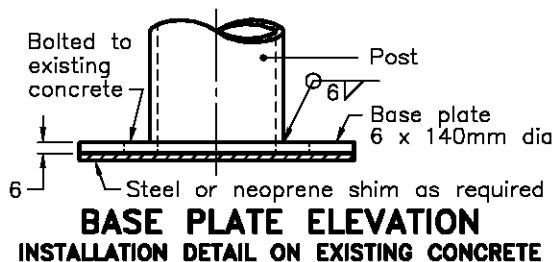
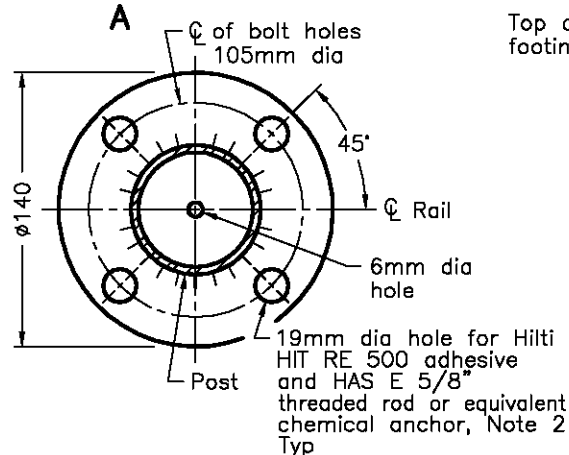
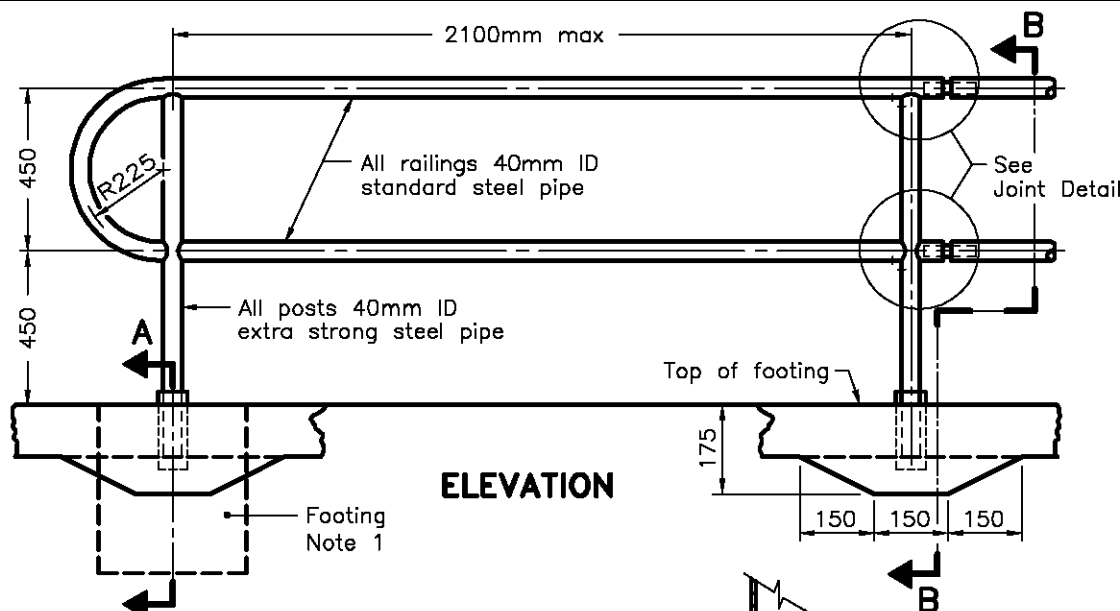
Nov 2012

Rev	0

FENCE, CHAIN-LINK DETAILS AND TABLE

OPSD 972.132





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.

SECTION A-A

SECTION B-B

JOINT DETAIL

ONTARIO PROVINCIAL STANDARD DRAWING

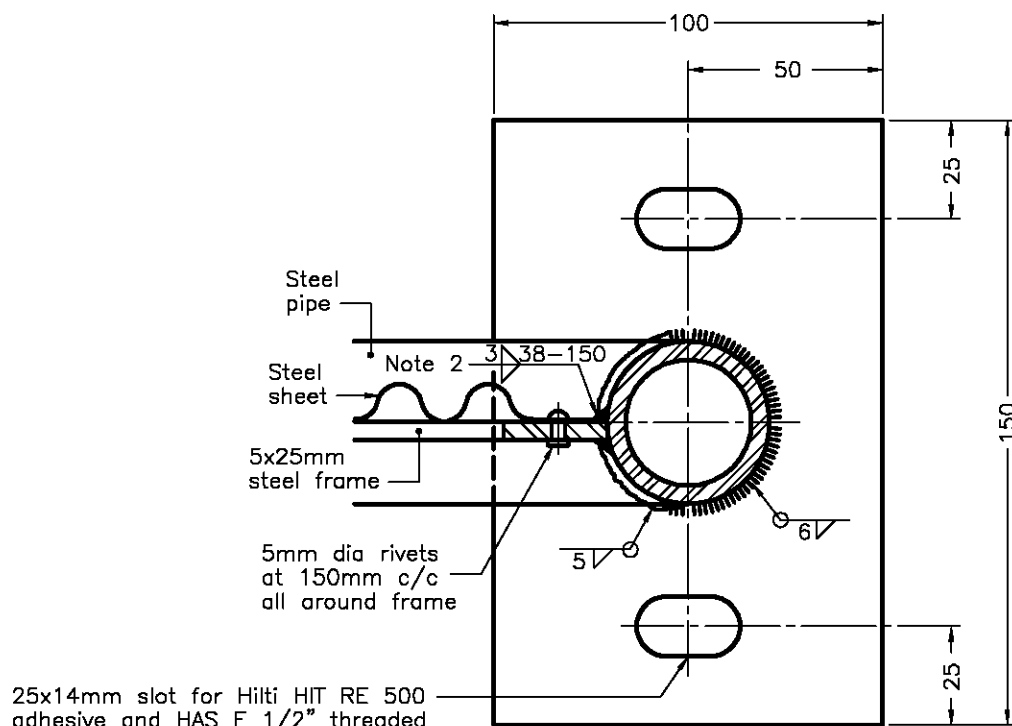
Nov 2009

Rev 2

PEDESTRIAN BARRICADE INSTALLATION

OPSD 980.101

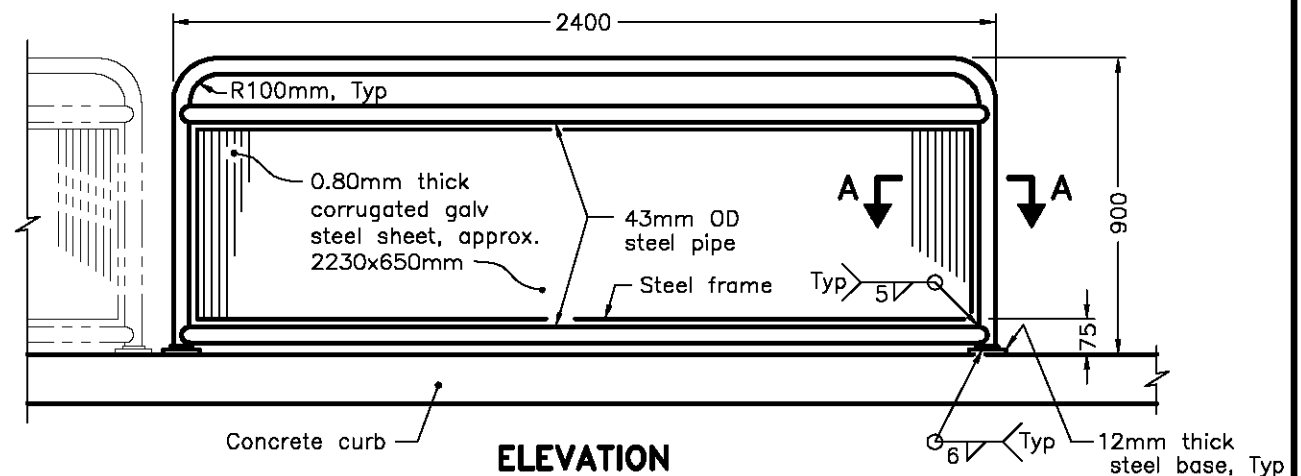




SECTION A-A



PLAN



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

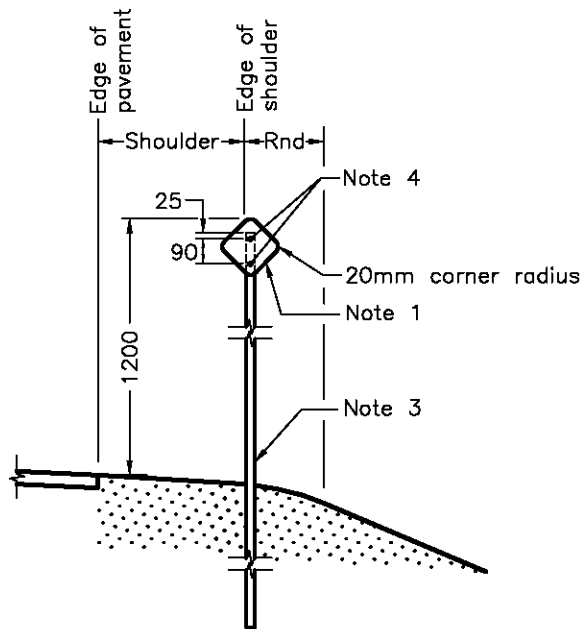
Nov 2009

Rev 1

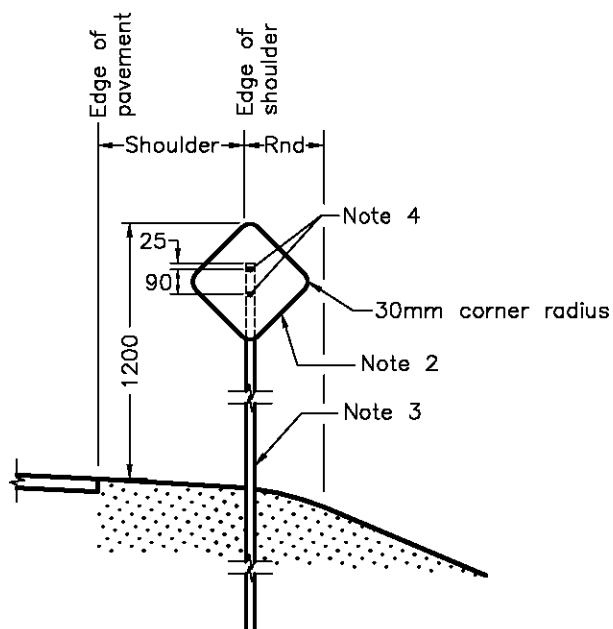
**SPLASH GUARD, PEDESTRIAN
INSTALLATION**



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.

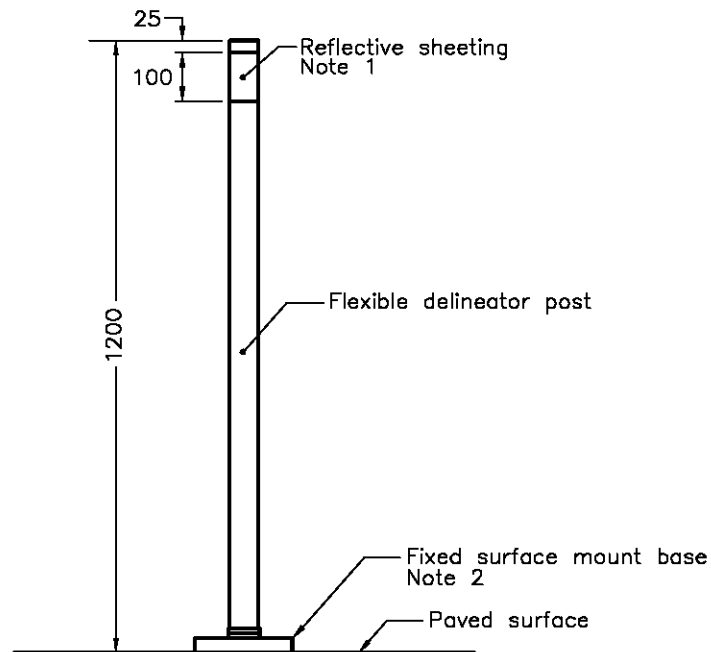
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 Rev 1

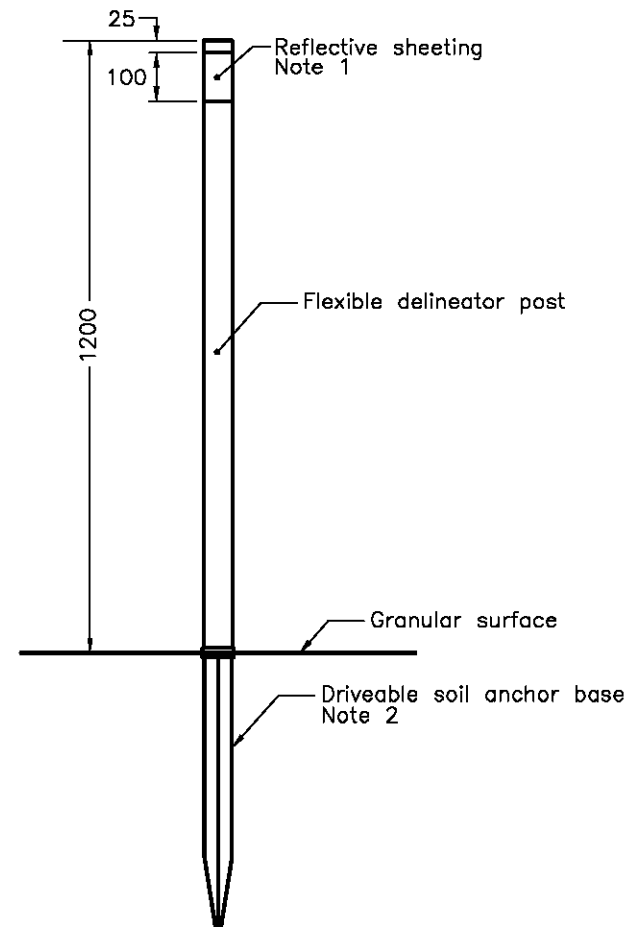
**POST MOUNTED DELINEATOR
INSTALLATION**

OPSD 984.101





**PAVED SURFACE INSTALLATION
TYPE A**



**GRANULAR SURFACE INSTALLATION
TYPE B**

NOTES:

- 1 Reflective sheeting shall be wrapped fully around the post.
 - 2 Base shall be installed according to the manufacturer's specifications and installation instructions.
- A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

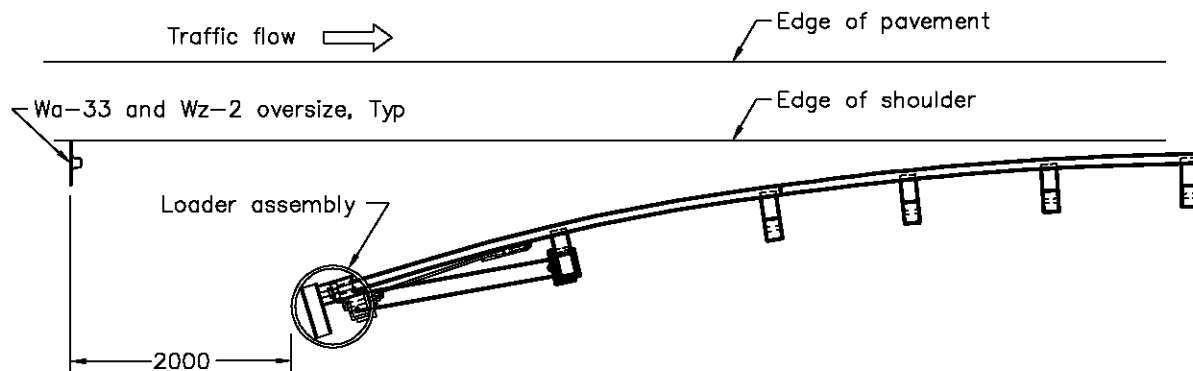
Nov 2016

Rev 0

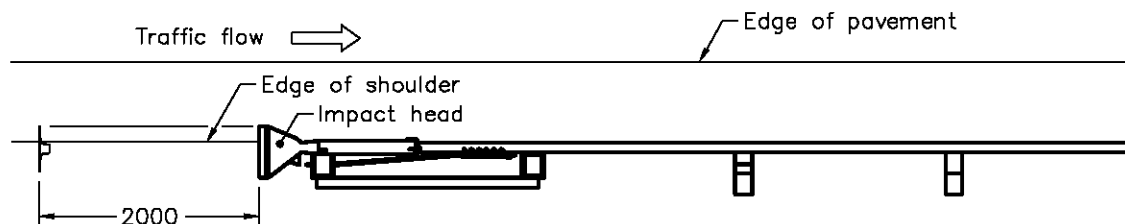
**FLEXIBLE DELINEATOR POST
INSTALLATION – TEMPORARY AND PERMANENT**



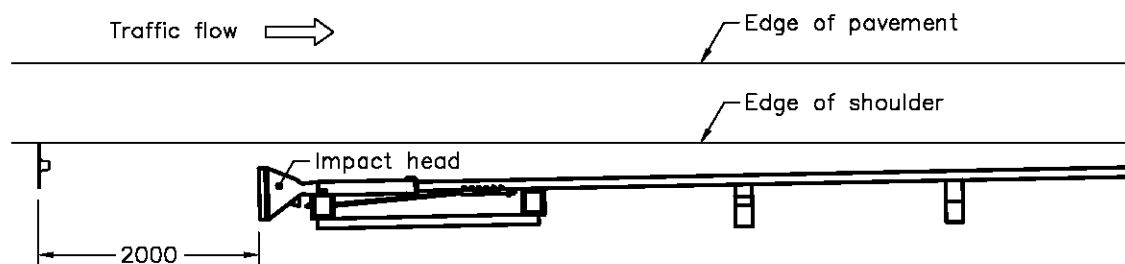
OPSD 984.105



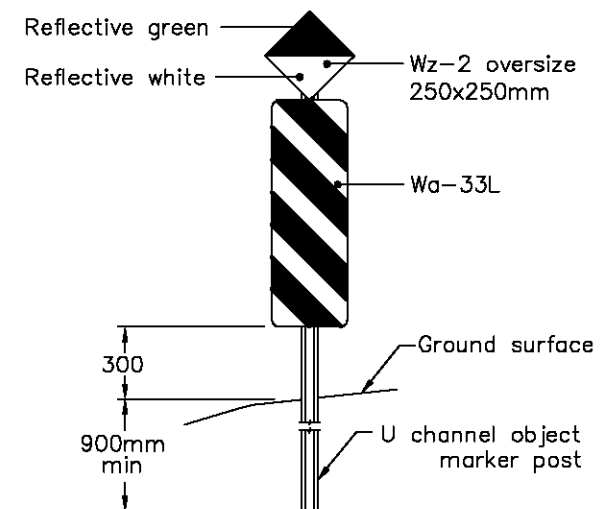
ECCENTRIC LOADER TERMINAL



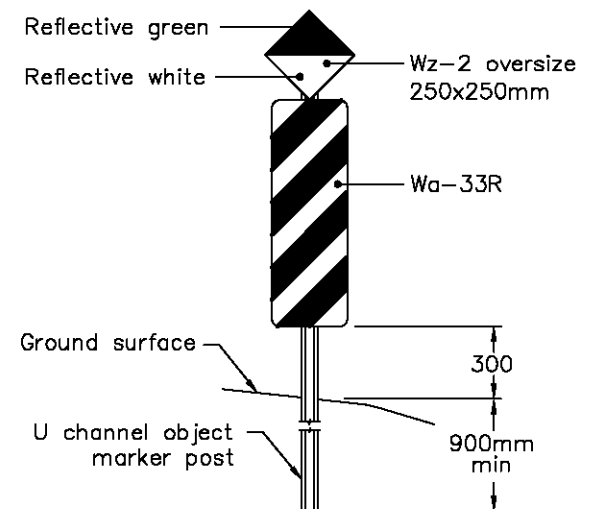
STEEL BEAM ENERGY ATTENUATING TERMINAL - TANGENT



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

ENERGY ATTENUATOR, END TREATMENT
DELINEATION

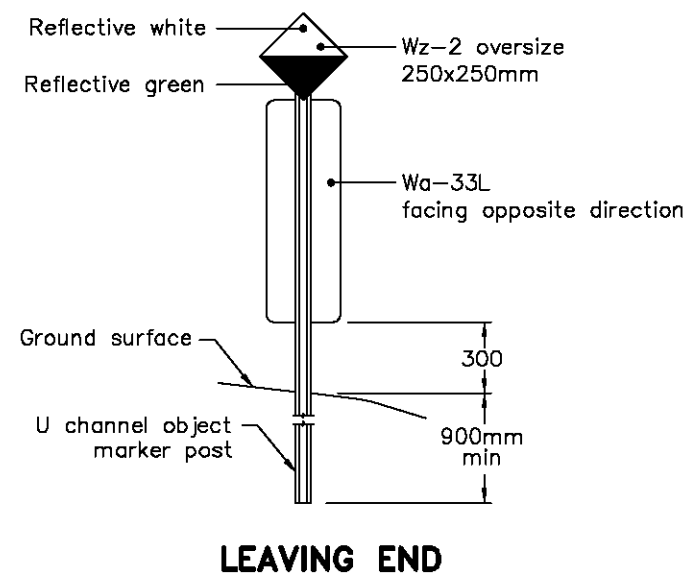
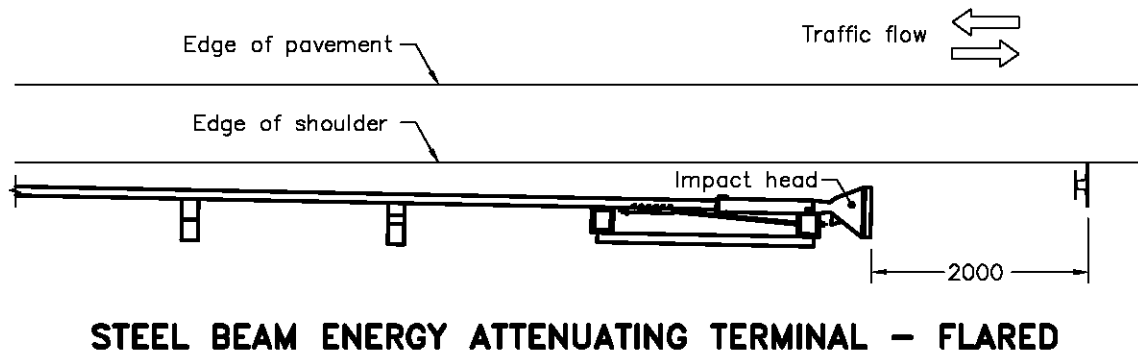
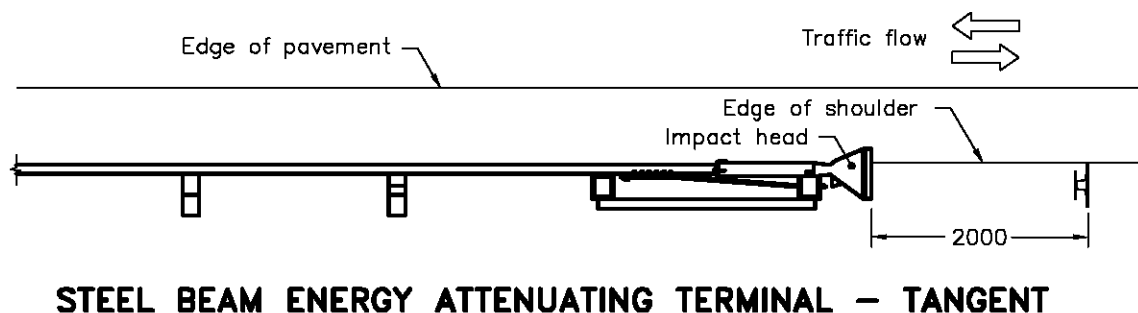
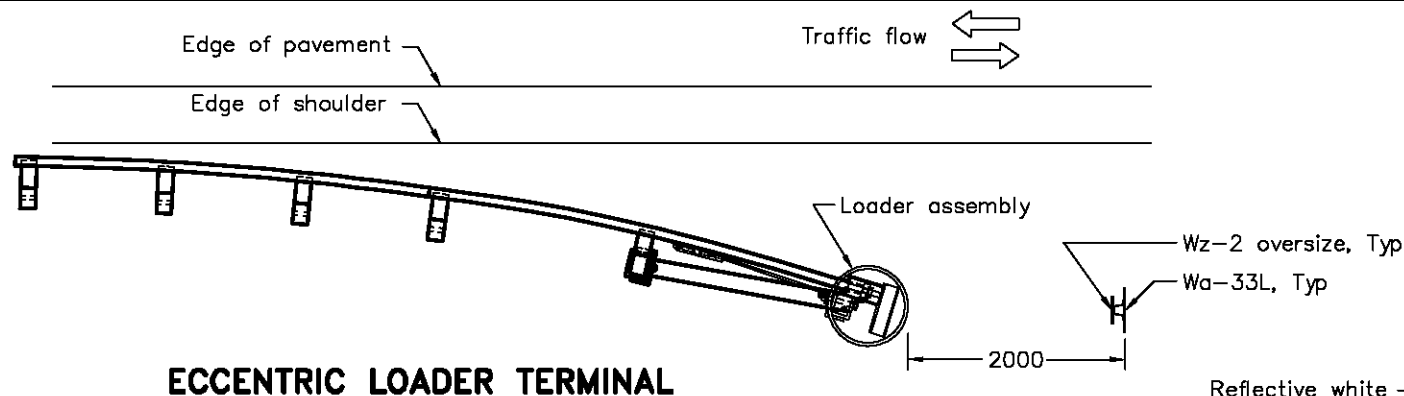
INSTALLATION - APPROACH END

Nov 2010

Rev 0



OPSD 984.201



NOTES:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

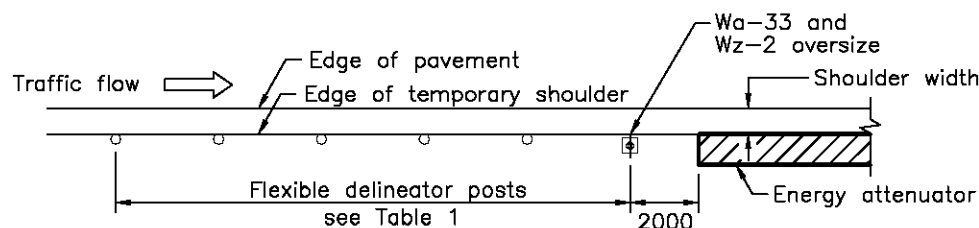
ENERGY ATTENUATOR, END TREATMENT
DELINEATION
INSTALLATION - LEAVING END

Nov 2010

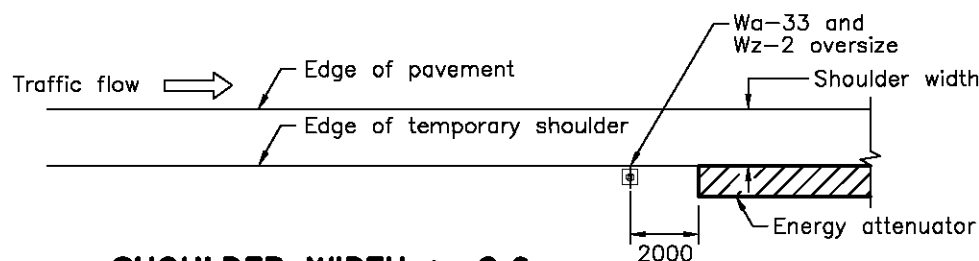
Rev 0



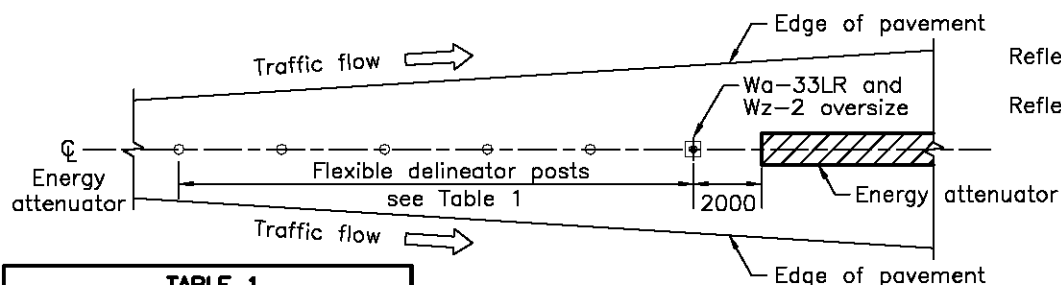
OPSD 984.202



SHOULDER WIDTH < 2.0m



SHOULDER WIDTH ≥ 2.0m

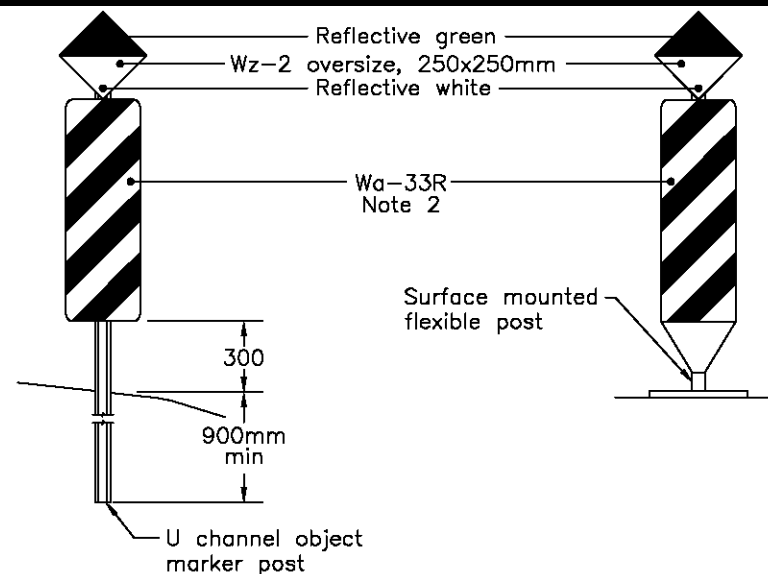


GORE

TABLE 1		
POSTED SPEED km/h	FLEXIBLE DELINEATORS REQUIRED	DELINEATOR SPACING m
<70	3.0	3.0
≥70	5.0	3.0

NOTES:

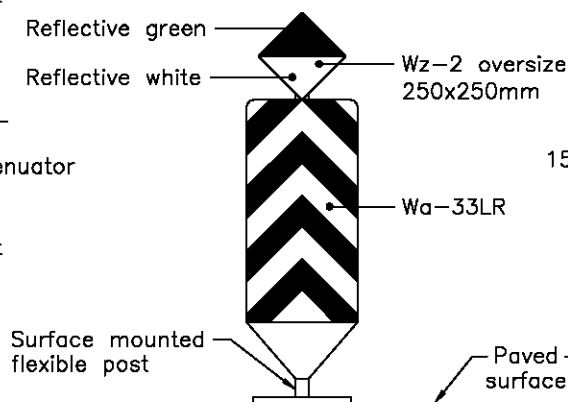
- 1 Type IV reflective sheeting or higher to be wrapped around post.
- 2 Right shoulder installation shown. For left shoulder installation, use Wa-33L.
- A All dimensions are in millimetres unless otherwise shown.



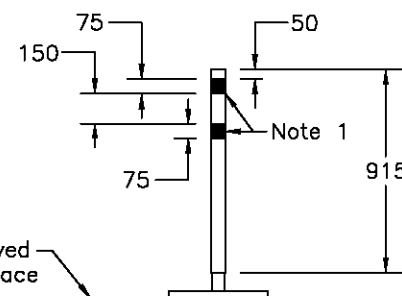
GRANULAR SURFACE

SHOULDER

PAVED SURFACE



GORE



**FLEXIBLE
DELINEATOR POST**

ONTARIO PROVINCIAL STANDARD DRAWING

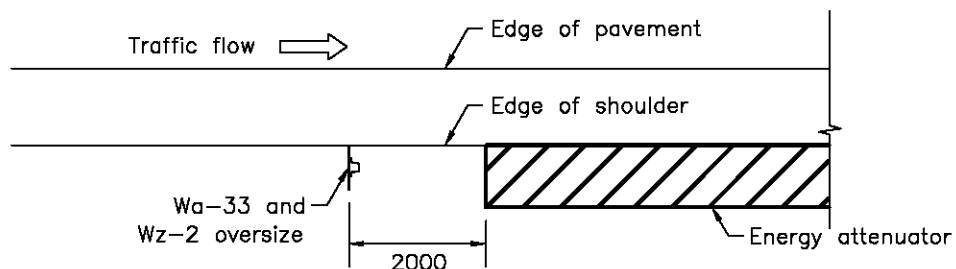
**ENERGY ATTENUATOR, CRASH CUSHION
DELINEATION
INSTALLATION – TEMPORARY**

Nov 2010

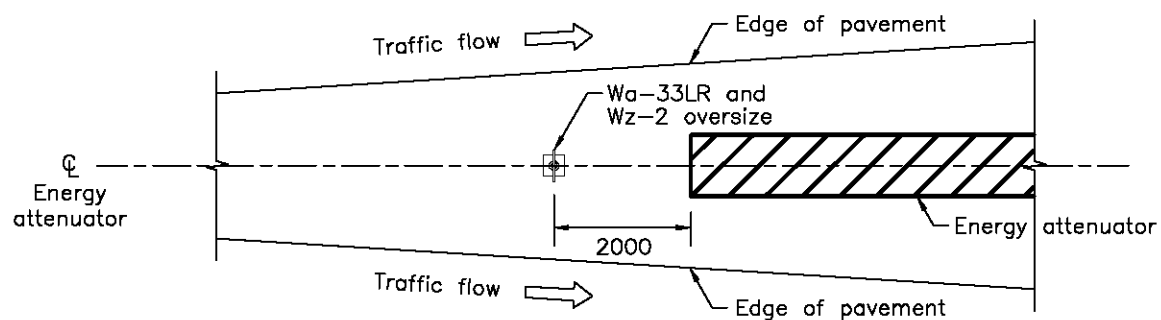
Rev 0



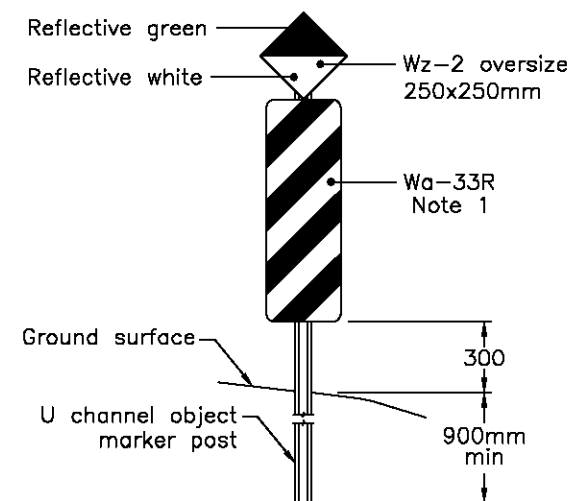
OPSD 984.203



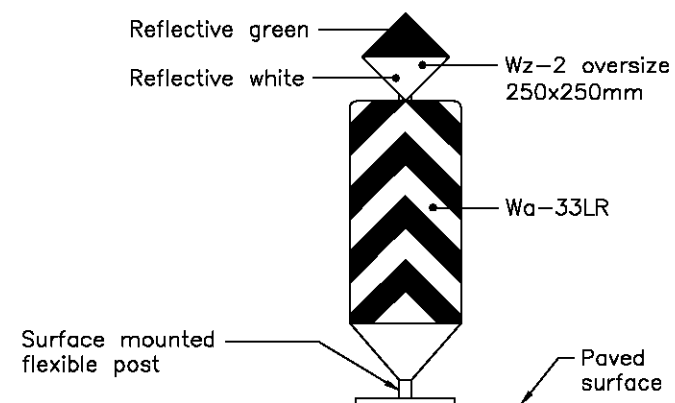
SHOULDER



GORE



SHOULDER



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

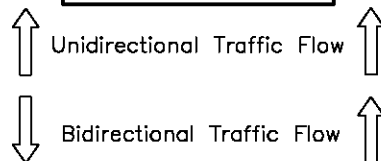
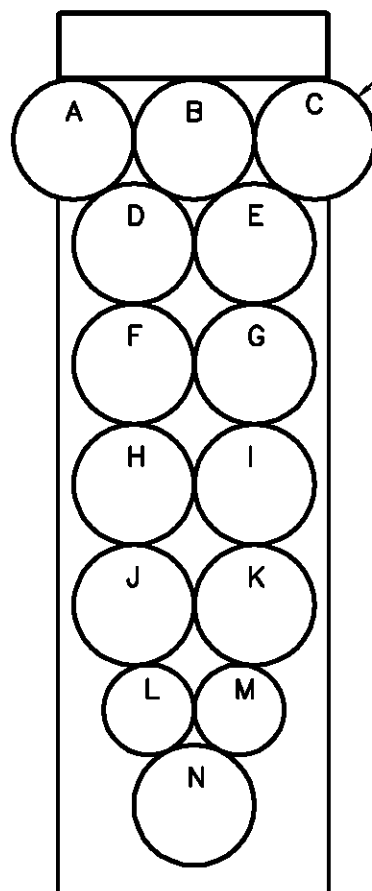
**ENERGY ATTENUATOR, CRASH CUSHION
DELINEATION
INSTALLATION – PERMANENT**

Nov 2010

Rev 0

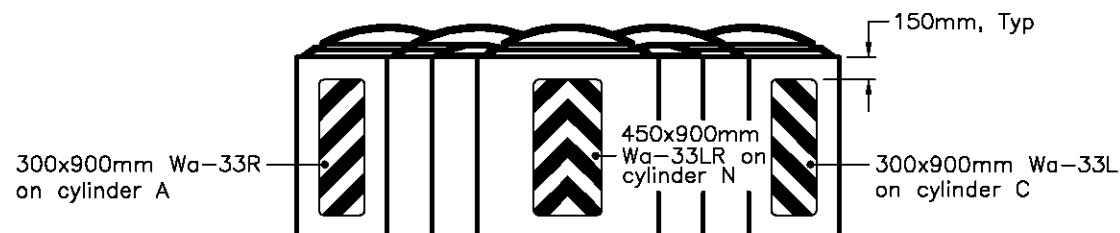


OPSD 984.204

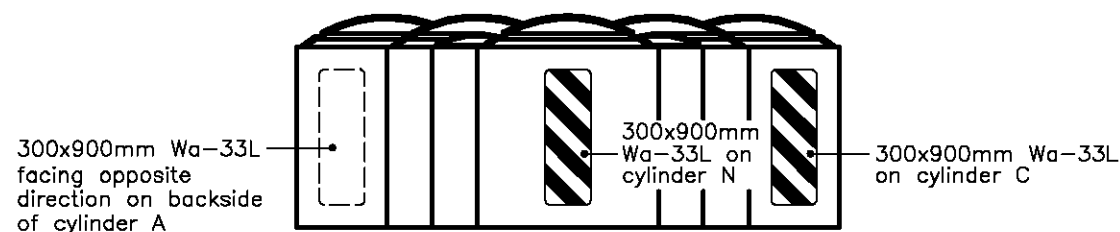


PLAN

Connecticut Impact Attenuation System (CIAS)



**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

**ENERGY ATTENUATOR, CRASH CUSHION
CONNECTICUT IMPACT ATTENUATION SYSTEM
DELINEATION
INSTALLATION – PERMANENT**

Nov 2013

Rev 0



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.

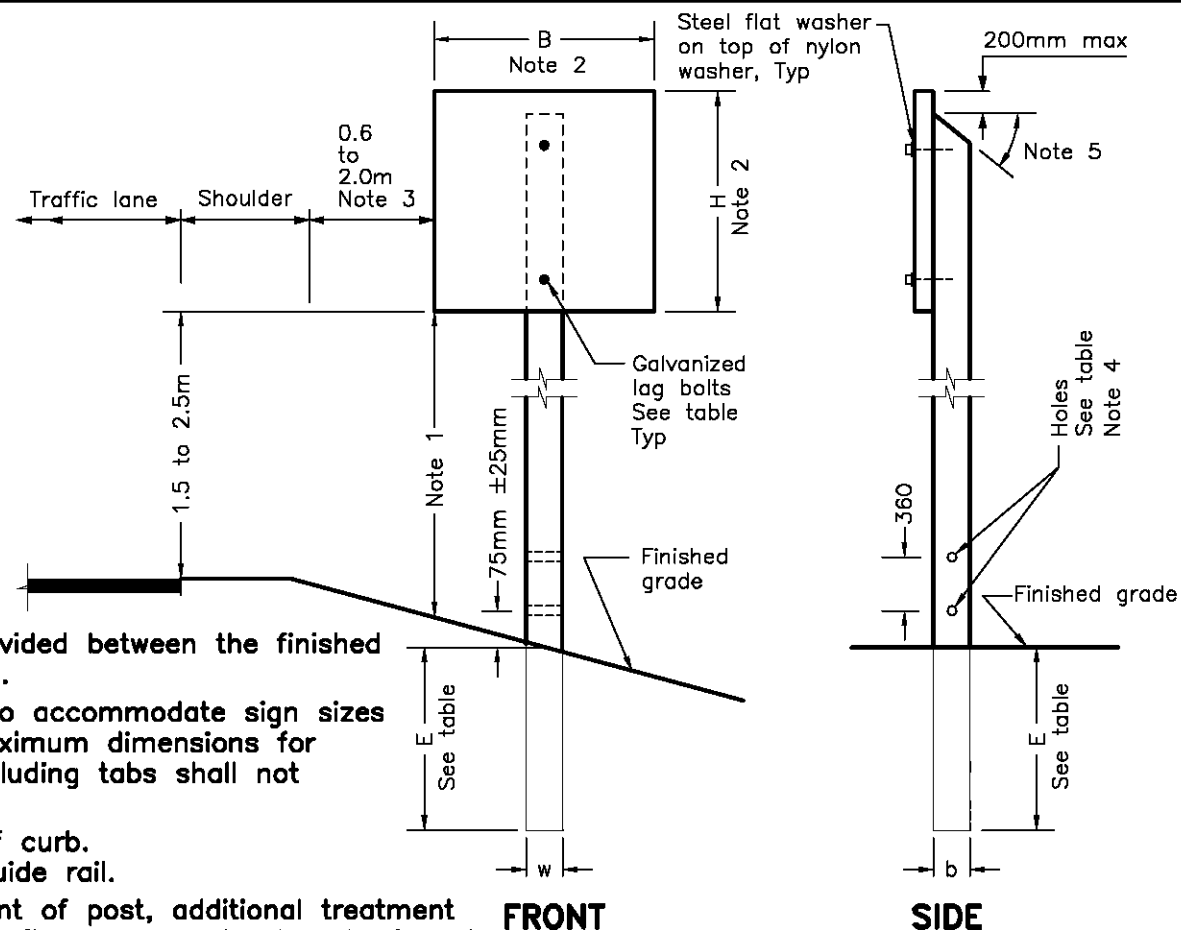
A When Wa-33 is specified below a Rb-125, the bottom of the Wa-33 shall be 1.2m above finished grade.

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

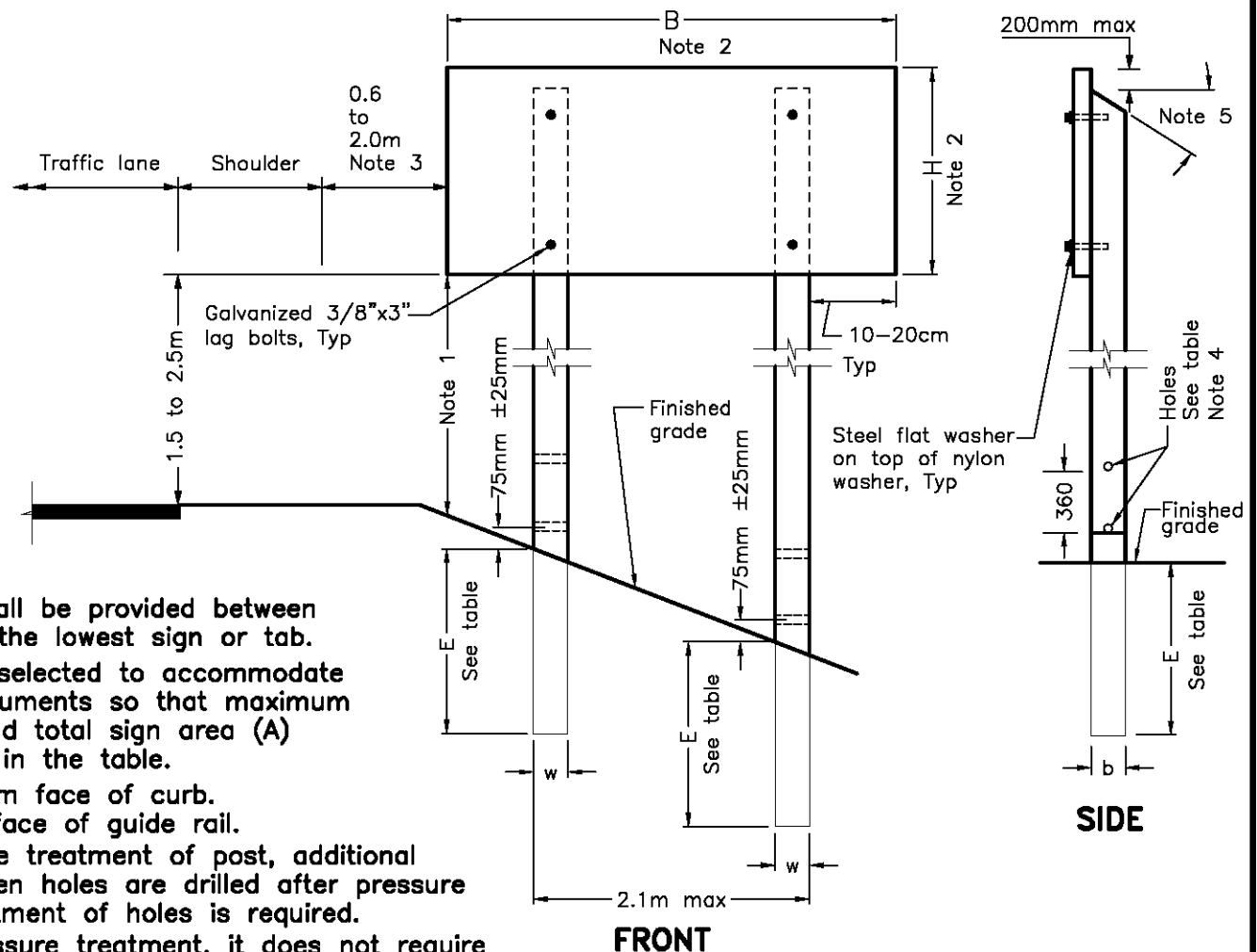
Rev 0



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

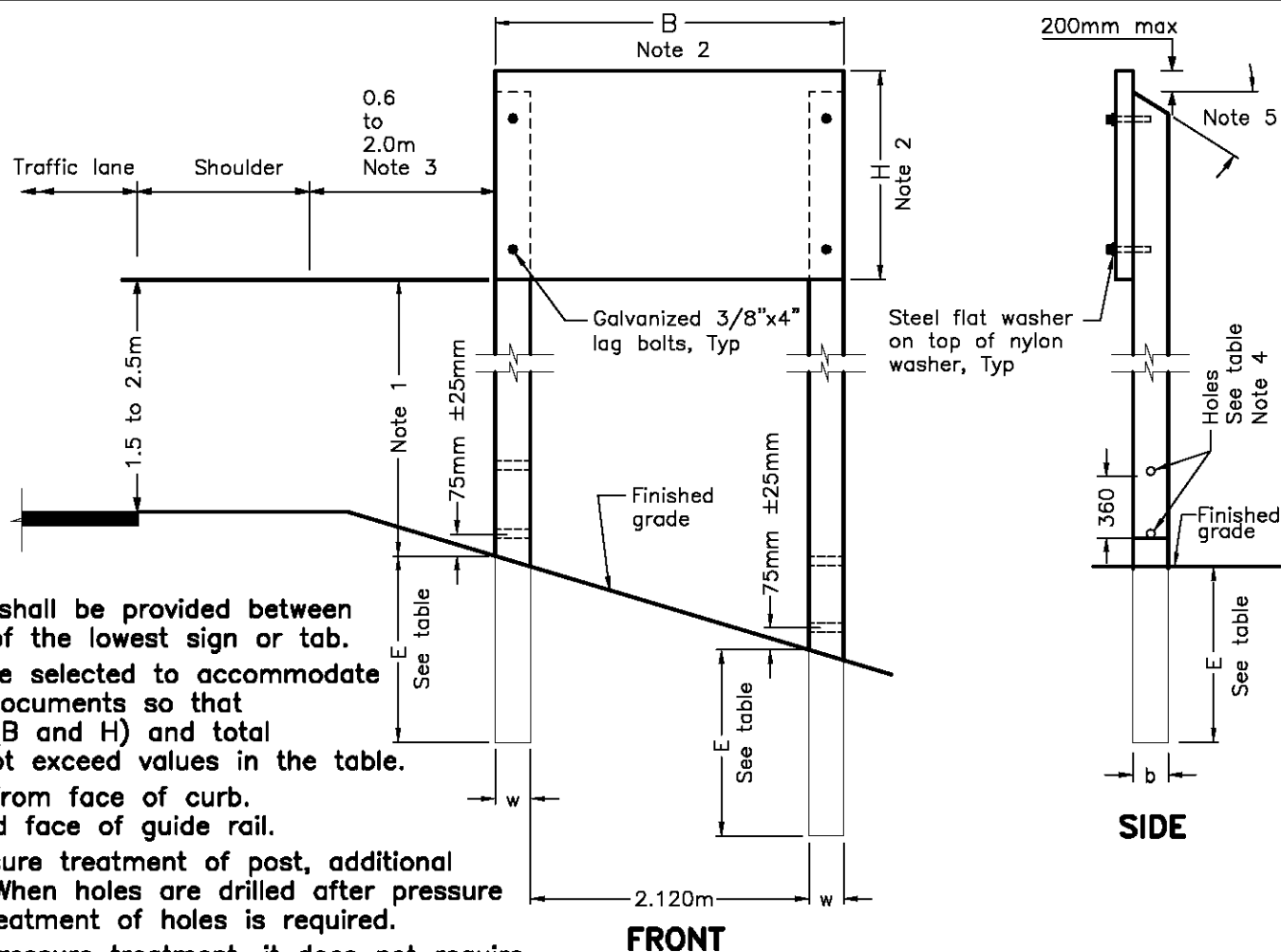
Rev 0



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



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

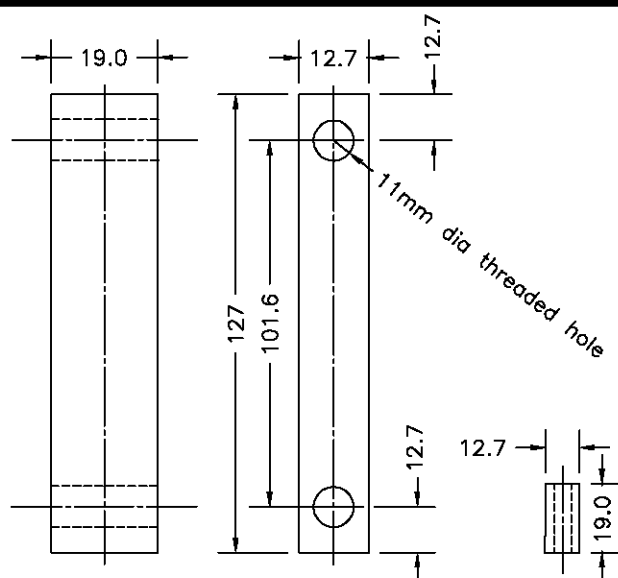
SMALL SIGN SUPPORT SYSTEM
DOUBLE BREAKAWAY WOODEN POST
140x140mm AND 140x184mm
INSTALLATION-DOUBLE POST ASSEMBLY

Nov 2013

Rev 0

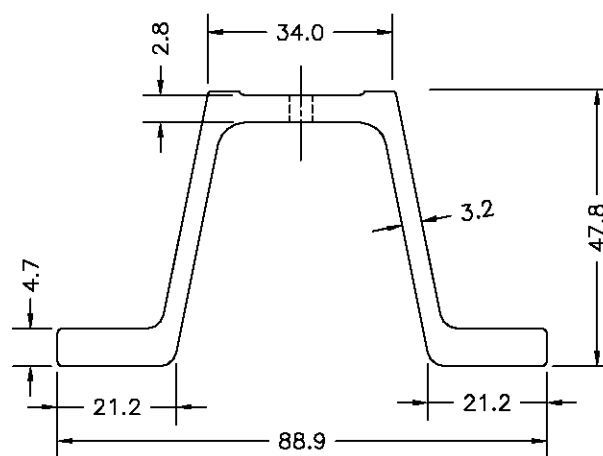


OPSD 985.220

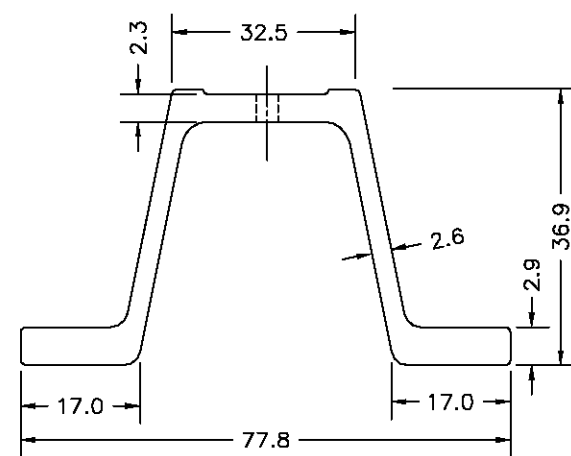


SIDE FRONT TOP

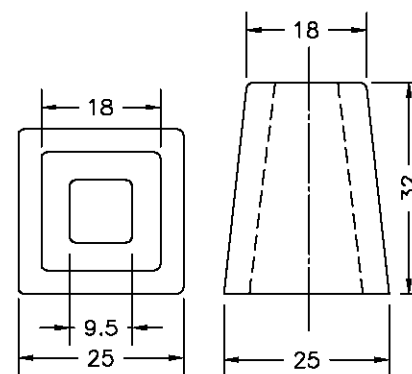
SPACER FOR LAP SPLICE
Gold coloured nickel/steel



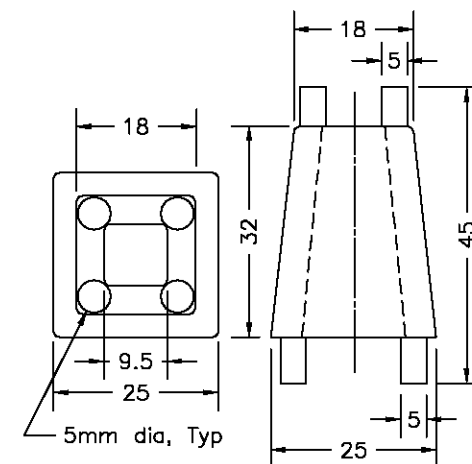
4.46 kg/m RIB-BAK POST



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

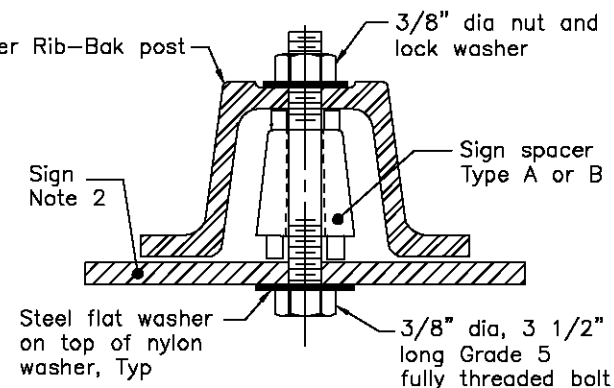
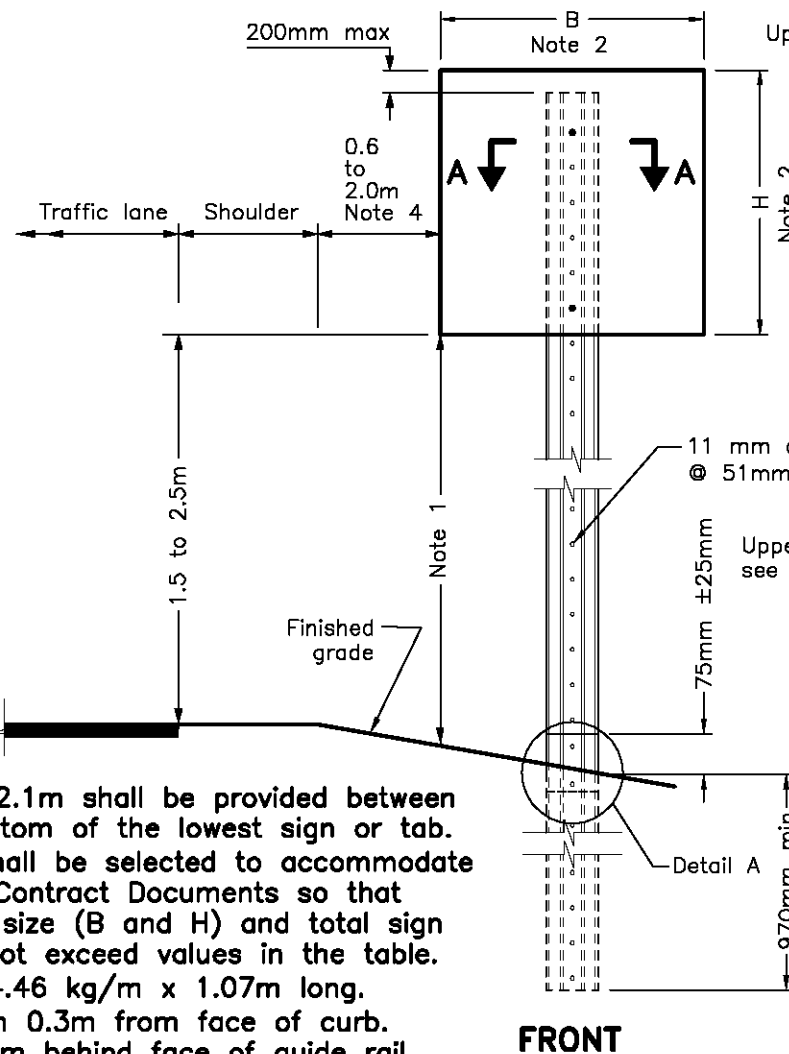
Nov 2013

Rev 0

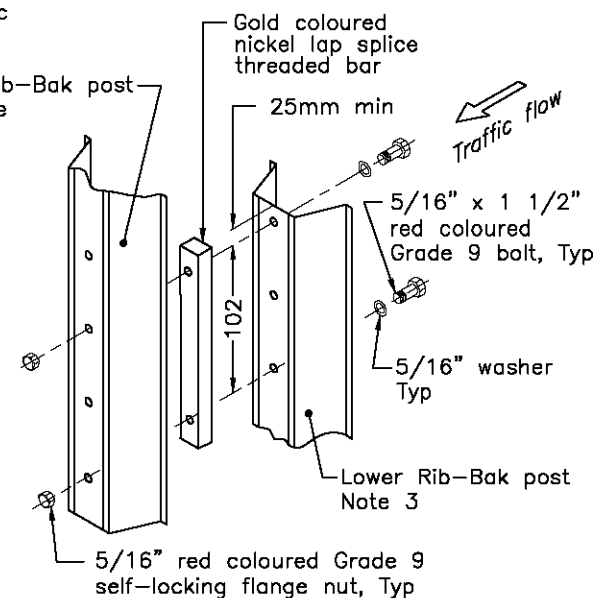


OPSD 987.101

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



**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

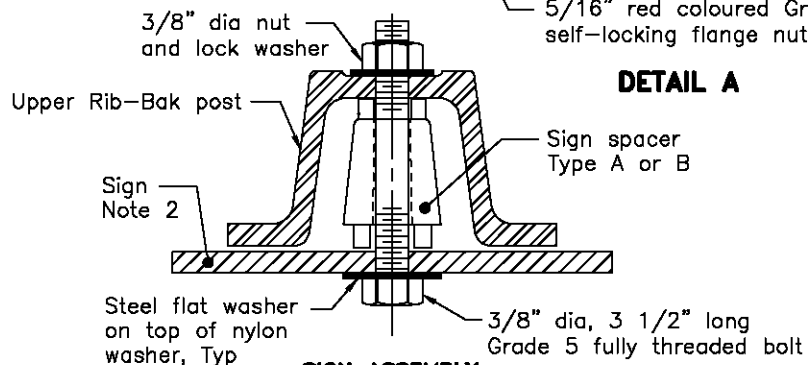
Rev 0



OPSD 987.110

SIGN SUPPORT REQUIREMENTS Note 2

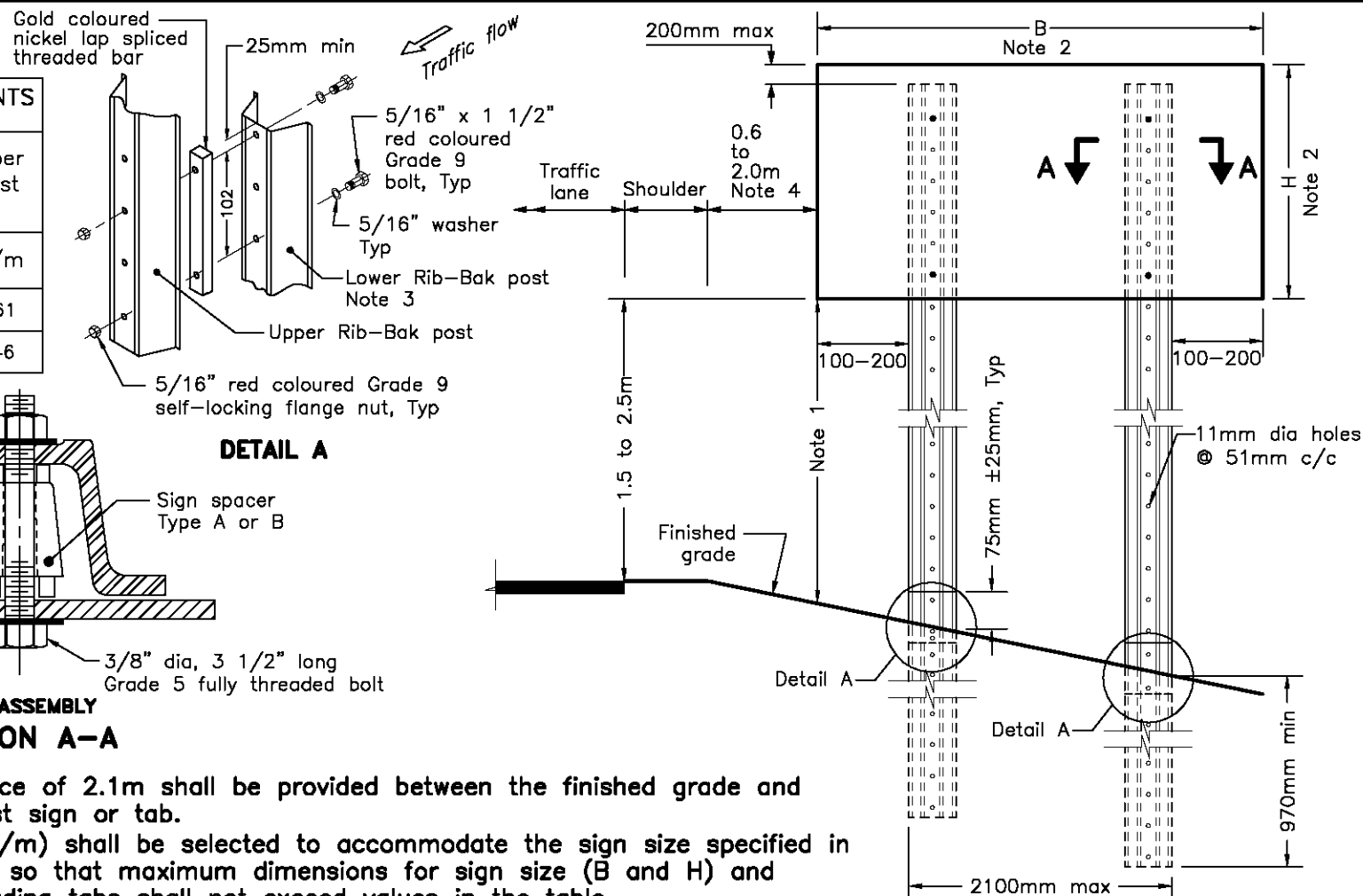
Max. Sign Dimensions		Max. Sign Area	Upper Post
B cm	H cm	A m ²	kg/m
90 to 240	105	1.10	2.61
	150	2.02	4.46



SIGN ASSEMBLY SECTION A-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.



FRONT

ONTARIO PROVINCIAL STANDARD DRAWING

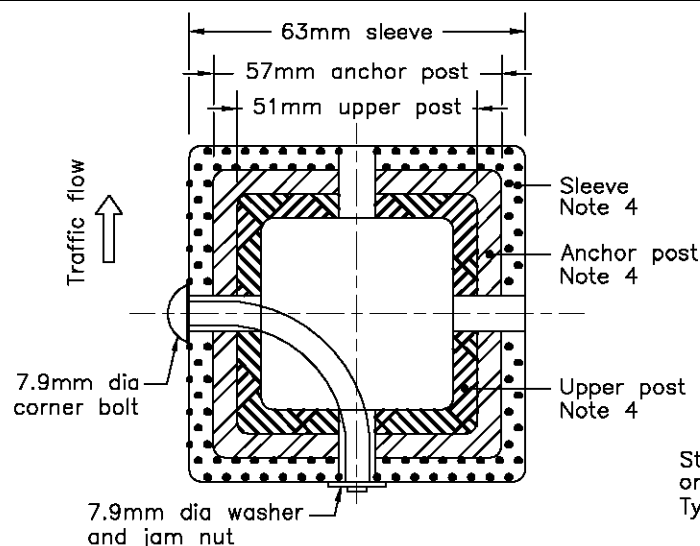
**SMALL SIGN SUPPORT SYSTEM
LAP SPLICE RIB-BAK BREAKAWAY SYSTEM
INSTALLATION-DOUBLE POST ASSEMBLY**

Nov 2013

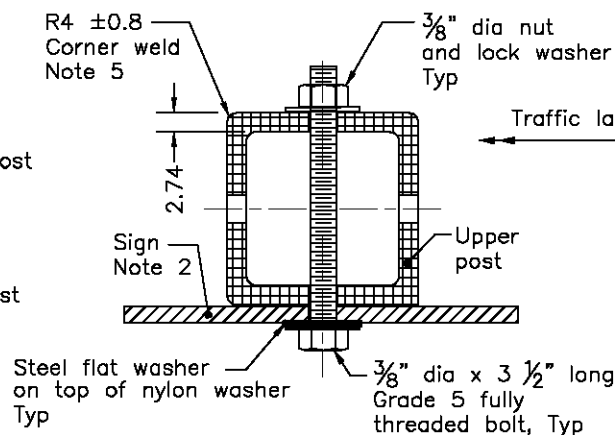
Rev 0



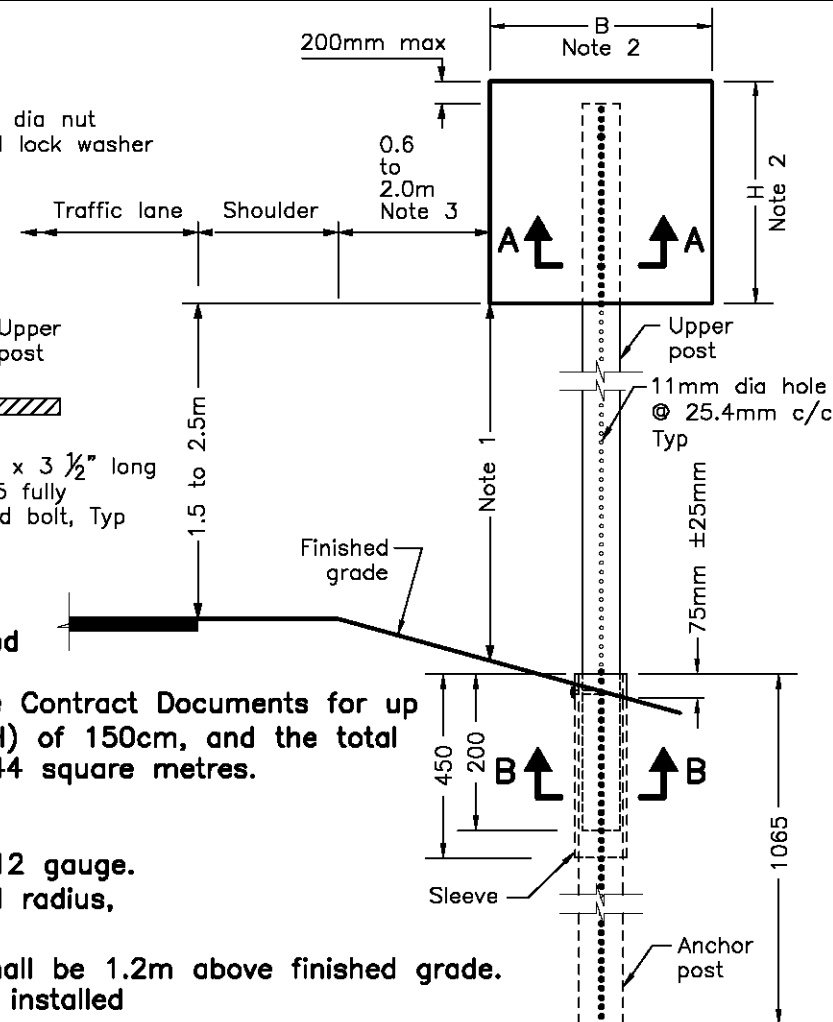
OPSD 987.210



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

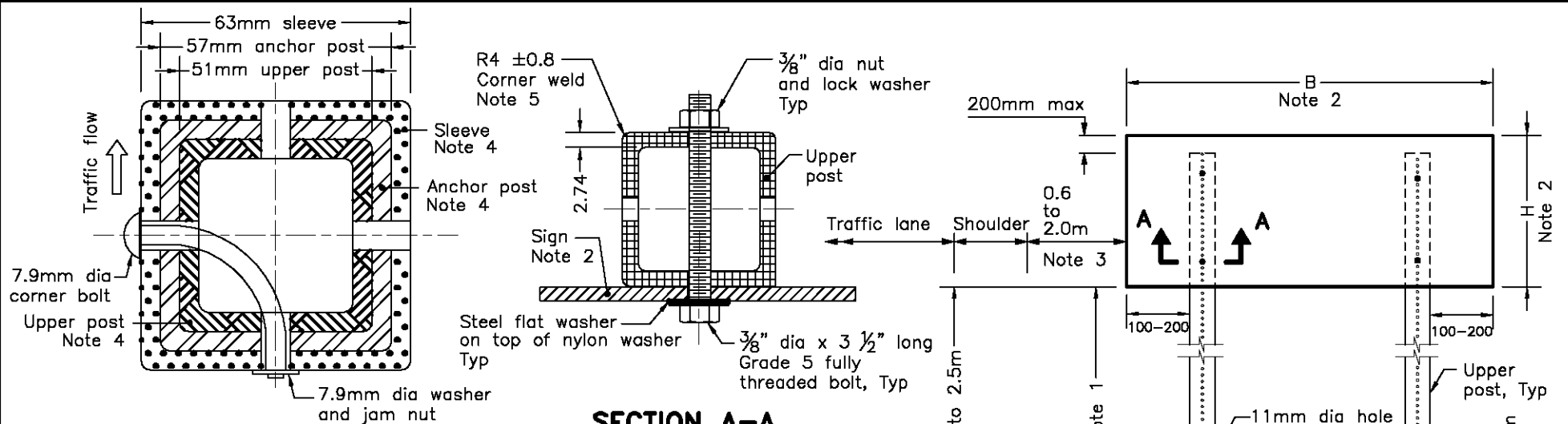
Nov 2013

Rev 0

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

OPSD 989.110





NOTES:

SECTION B-B

- 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.

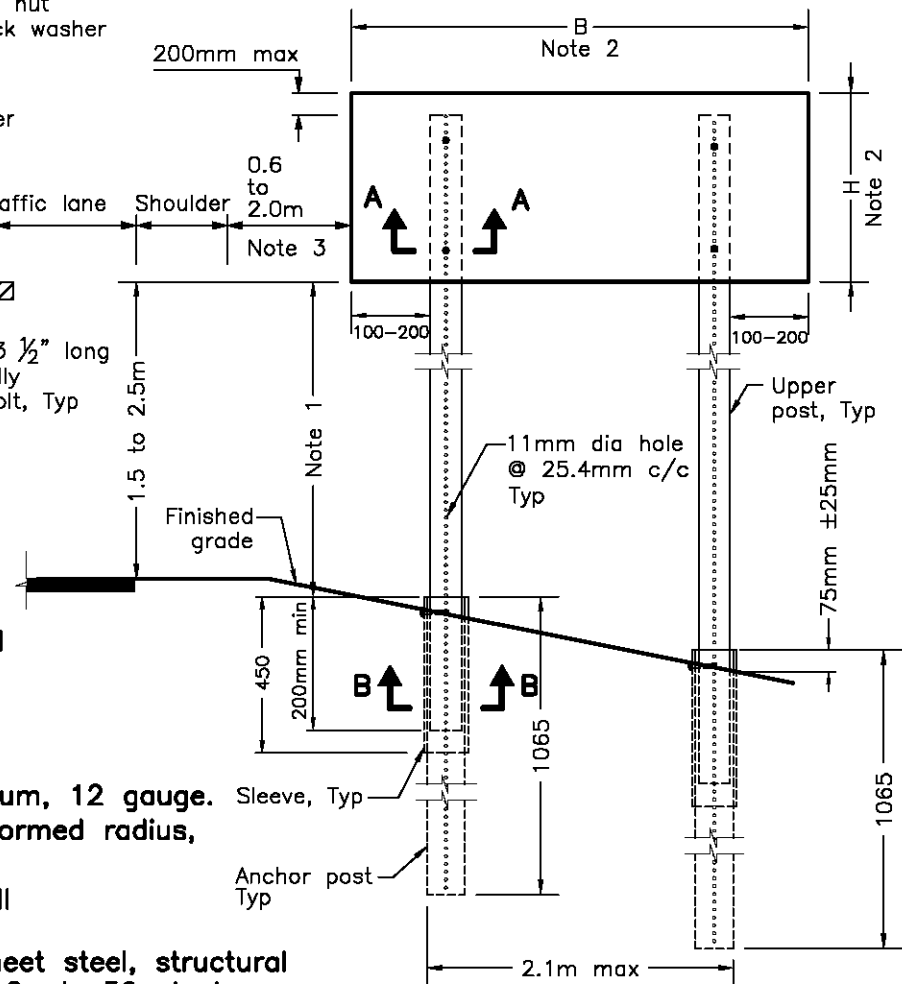
- C Posts and sleeves manufactured from ASTM A 653, Grade 50 steel shall be stripped prior to being hot dip galvanized.

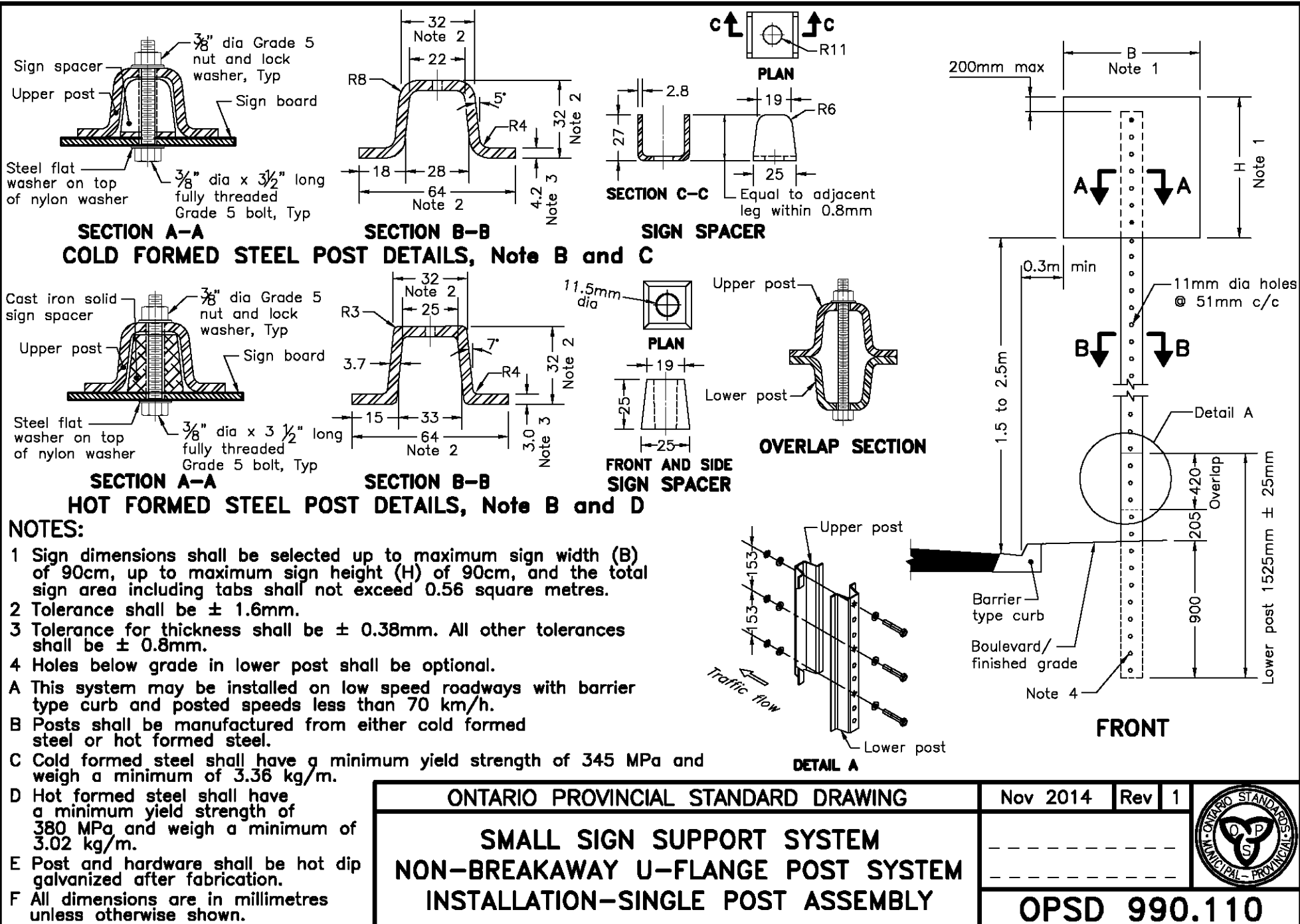
- D Posts and sleeves shall be hot dip galvanized after fabrication. Excess zinc shall be removed to ensure telescoping of posts and sleeves.

- E System configuration meets NCHRP Report 350 TL-3.

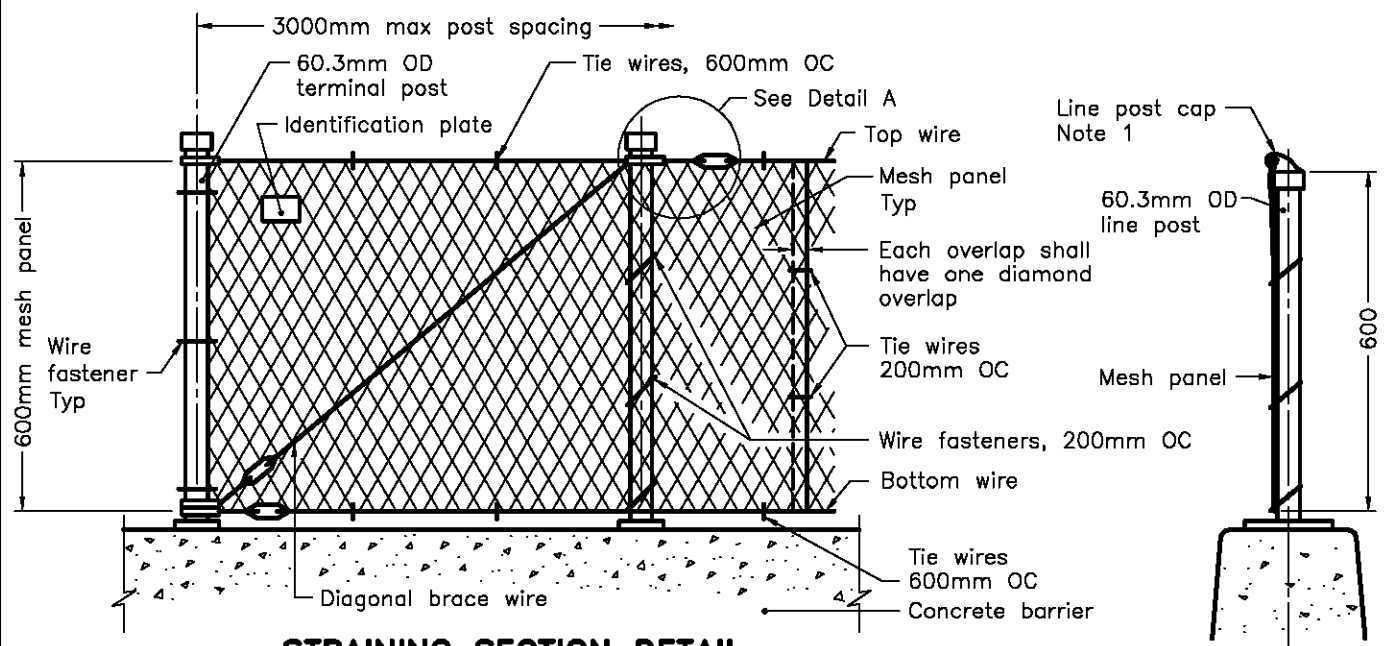
- F All dimensions are in millimetres unless otherwise shown.

SECTION A-A



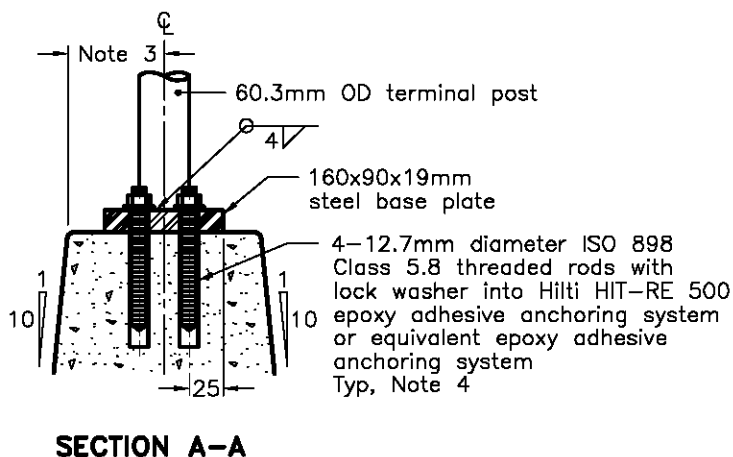
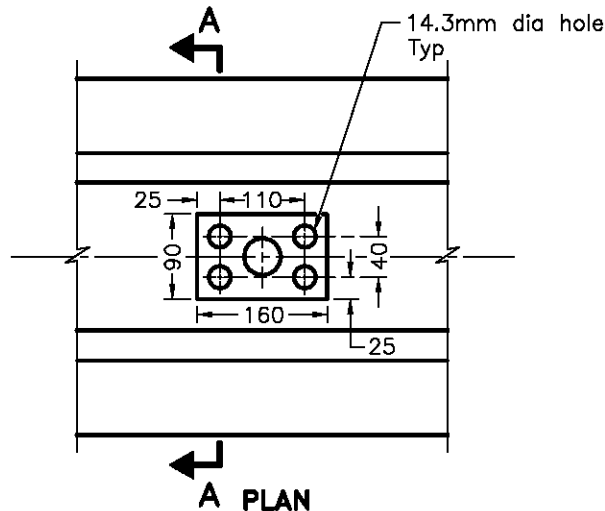
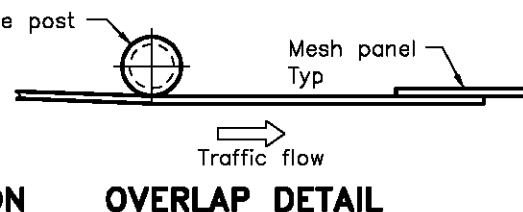
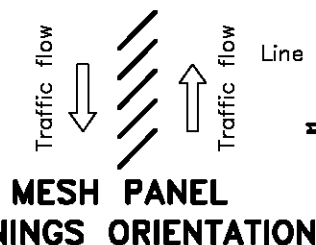
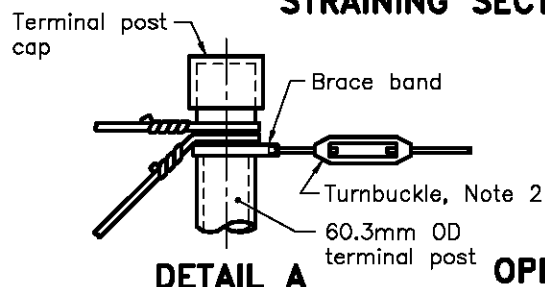


ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 1
SMALL SIGN SUPPORT SYSTEM NON-BREAKAWAY U-FLANGE POST SYSTEM INSTALLATION-SINGLE POST ASSEMBLY		
_____ _____ _____		
OPSD 990.110		



STRAINING SECTION DETAIL

LINE POST DETAIL



NOTES:

ANCHORAGE DETAIL

- 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

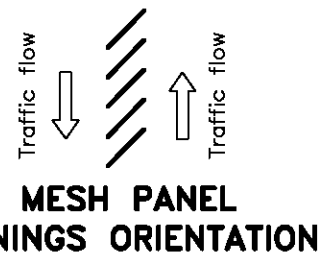
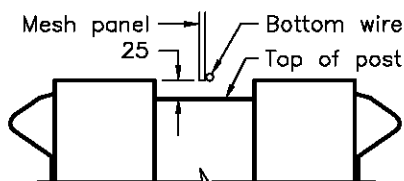
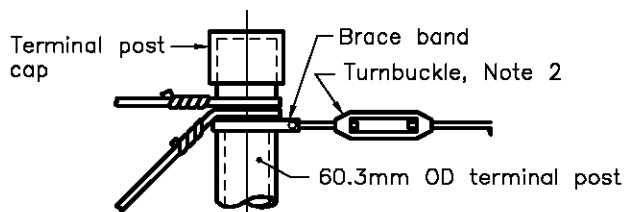
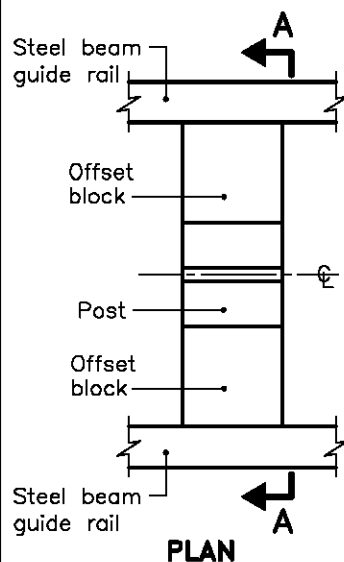
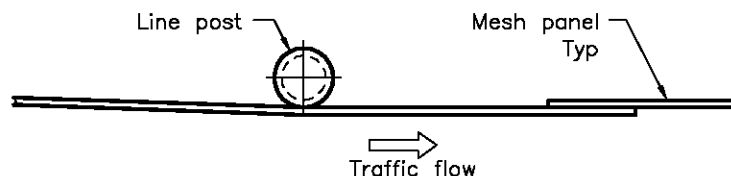
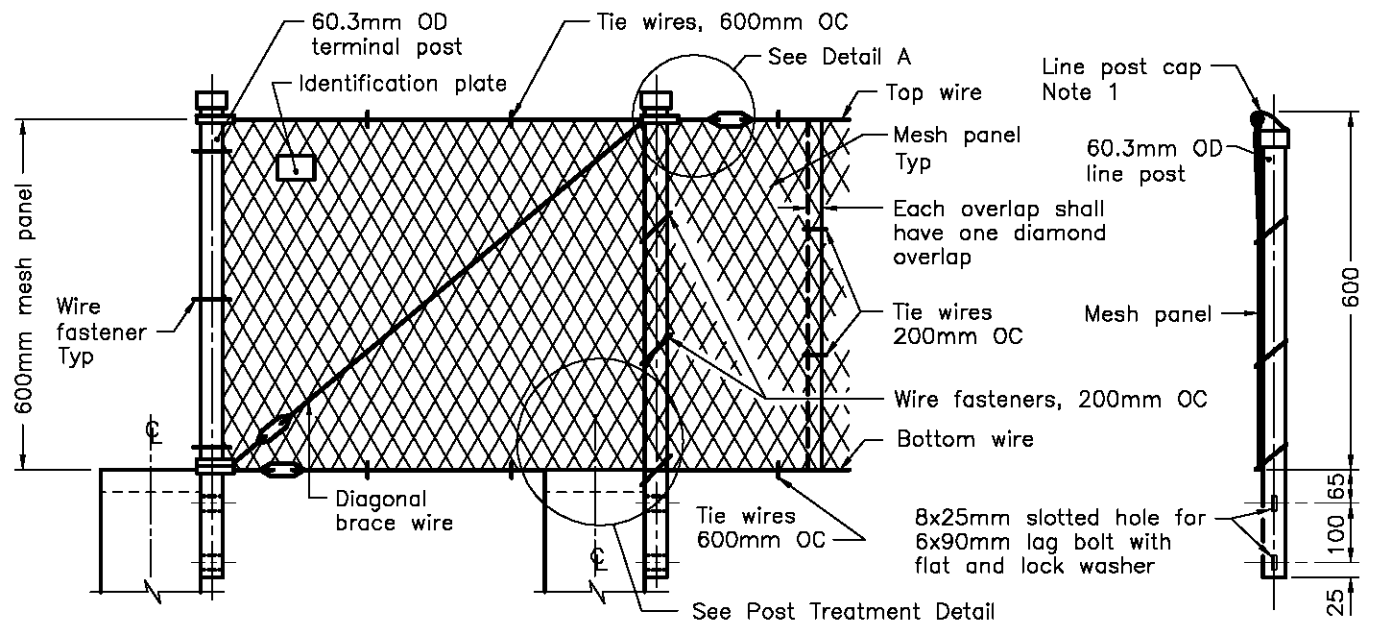
Nov 2014

Rev 3

**EXPANDED METAL ANTI-GLARE SCREEN
INSTALLATION - CONCRETE BARRIER**



OPSD 991.130



NOTES:

- 1 For line post cap detail refer to OPSD 972.132.
- 2 Turnbuckles shall be installed on diagonal brace wires and top and bottom wires, at intervals of 150m maximum and at terminal posts.
- A All dimensions are in millimetres unless otherwise shown.

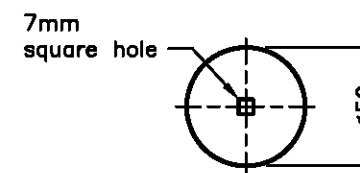
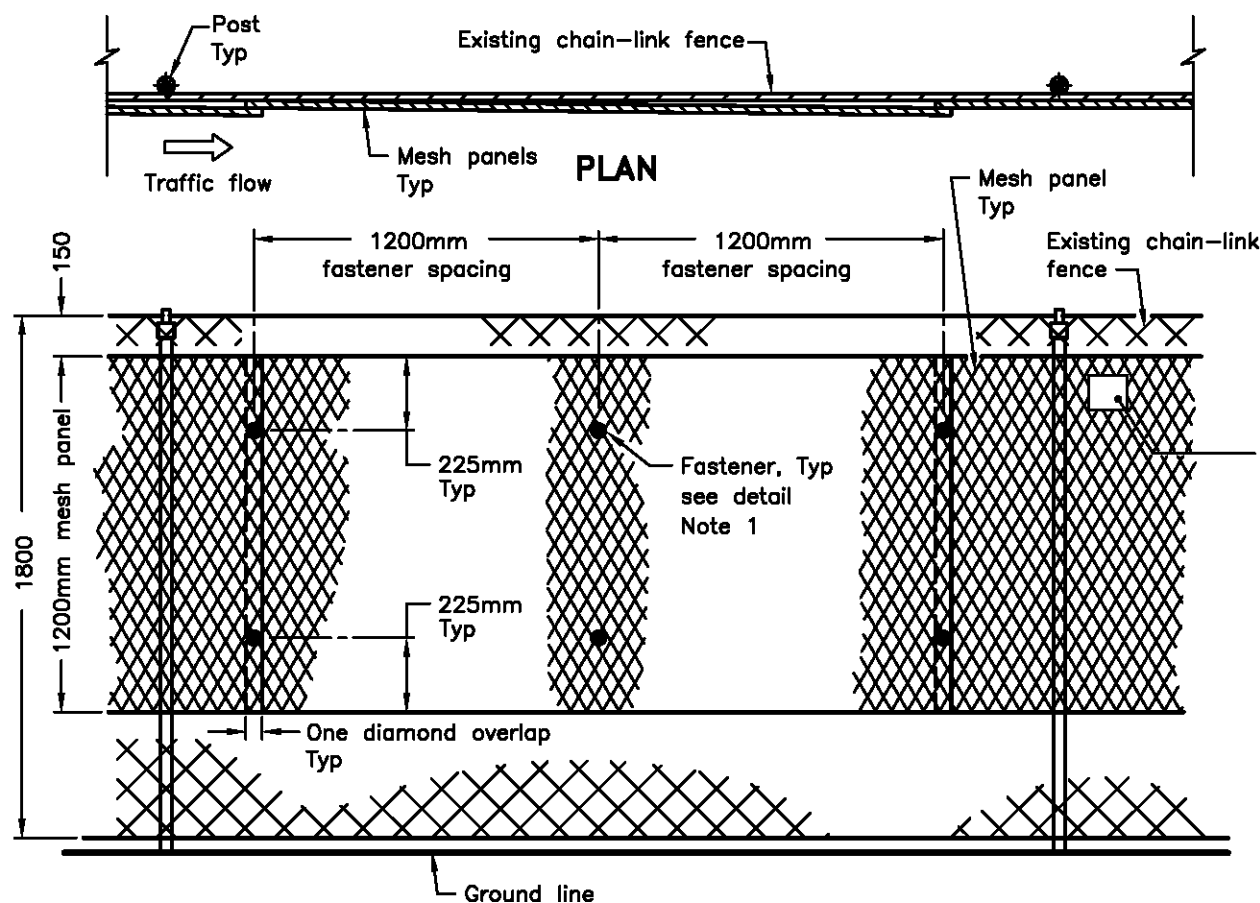
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 Rev 3

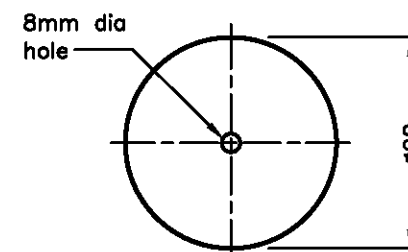
**EXPANDED METAL ANTI-GLARE SCREEN
INSTALLATION – STEEL BEAM GUIDE RAIL
WITH WOODEN POST**



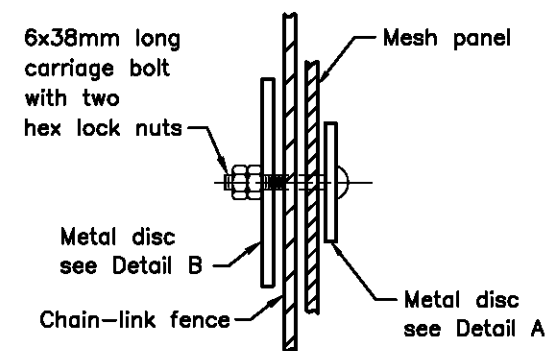
OPSD 991.131



DETAIL A



DETAIL B



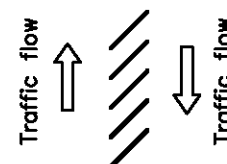
FASTENER DETAIL

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.

**MESH PANEL
OPENINGS ORIENTATION**



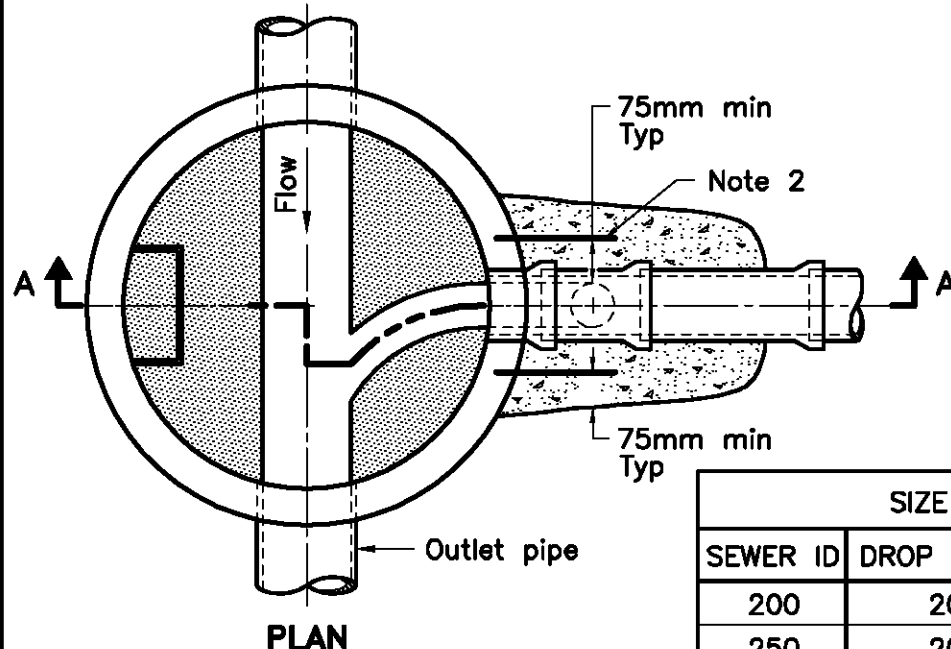
ONTARIO PROVINCIAL STANDARD DRAWING

**EXPANDED METAL ANTI-GLARE SCREEN
INSTALLATION - CHAIN-LINK FENCE**

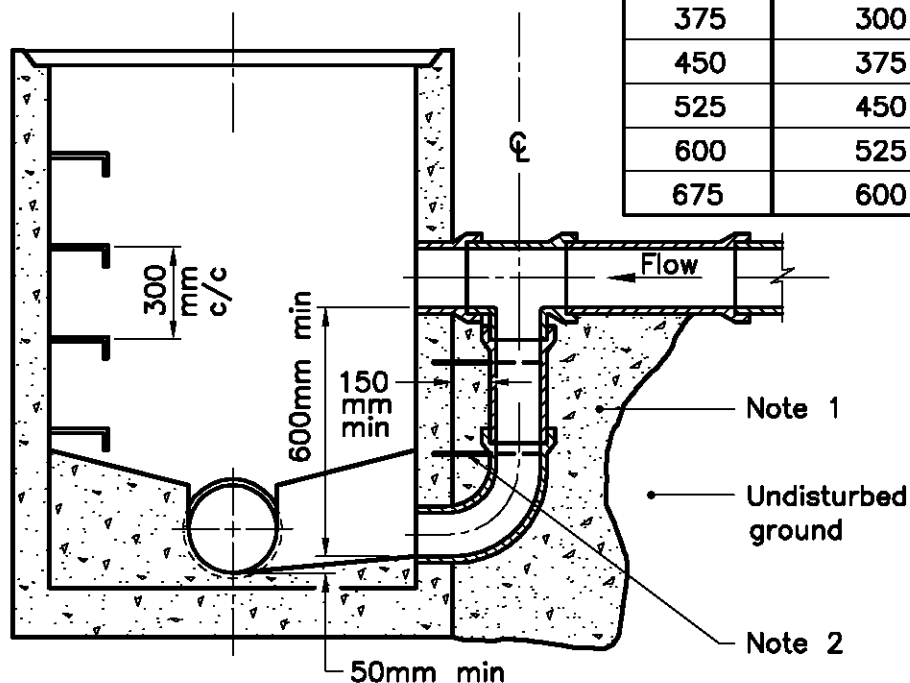
Nov 2012 Rev 2



OPSD 991.132



SIZE OF DROP PIPE		
SEWER ID	DROP PIPE ID	APPLICATION
200	200	Storm and Sanitary
250	200	Storm and Sanitary
300	250	Storm and Sanitary
375	300	Storm and Sanitary
450	375	Storm
525	450	Storm
600	525	Storm
675	600	Storm



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

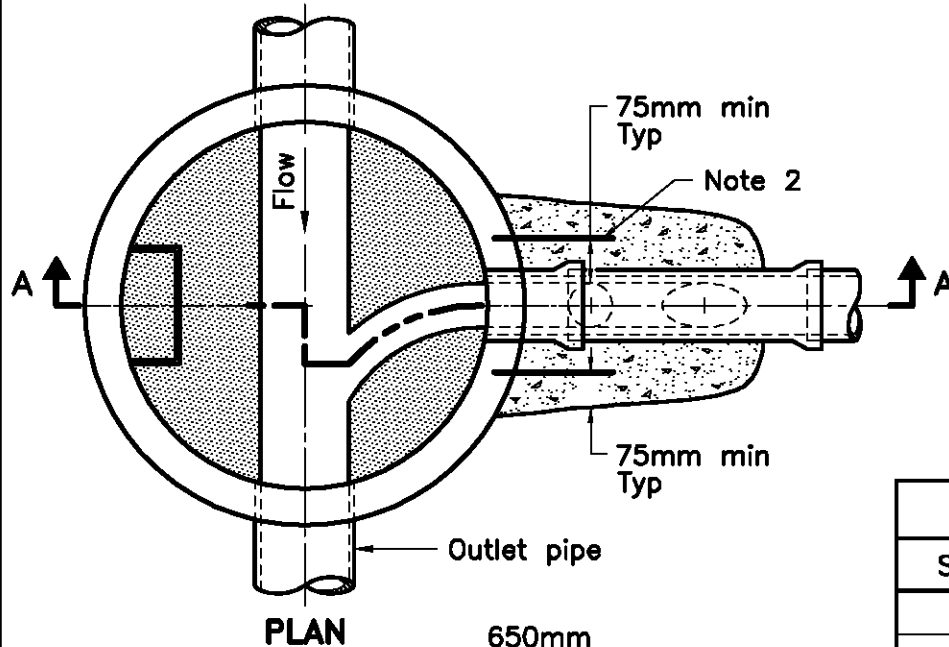
Nov 2016

Rev 3

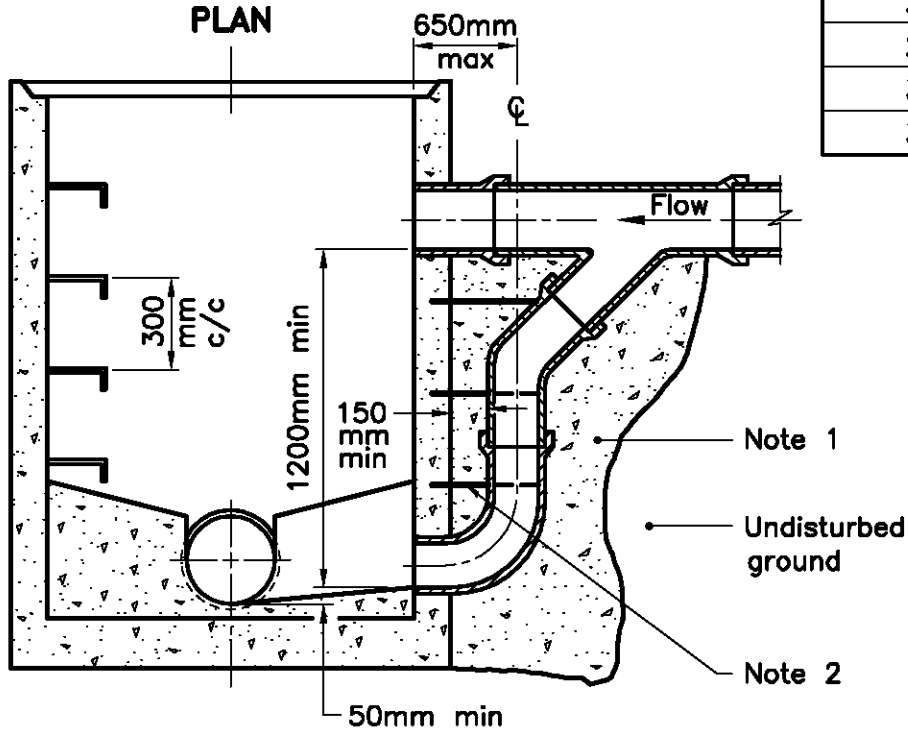
**CAST-IN-PLACE
MAINTENANCE HOLE DROP STRUCTURE TEE**



OPSD 1003.010



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

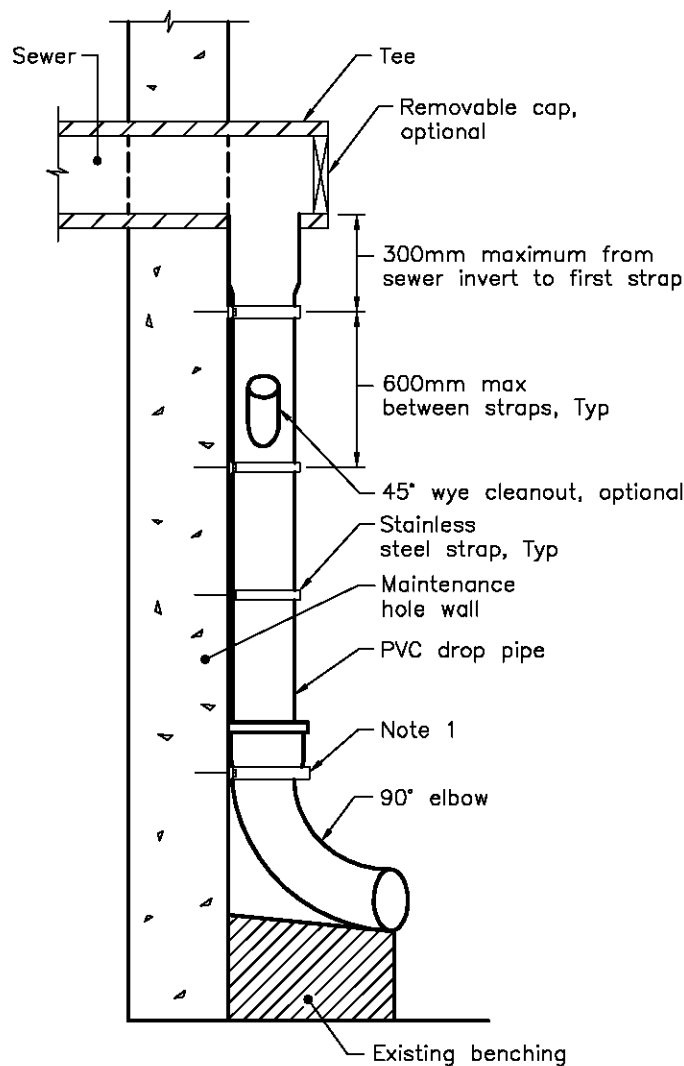
Nov 2016

Rev 3

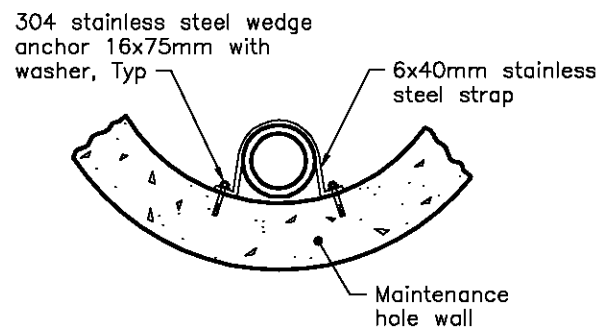
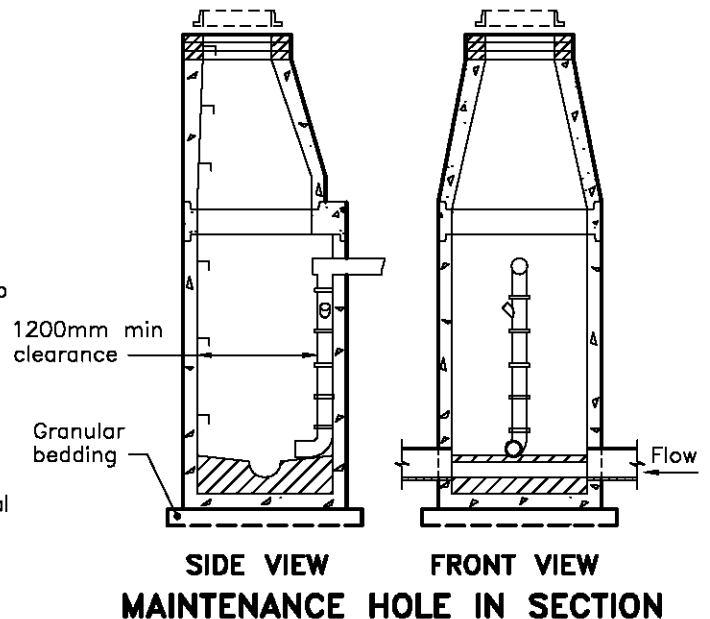
**CAST-IN-PLACE
MAINTENANCE HOLE DROP STRUCTURE WYE**



OPSD 1003.020



INTERNAL DROP STRUCTURE DETAIL

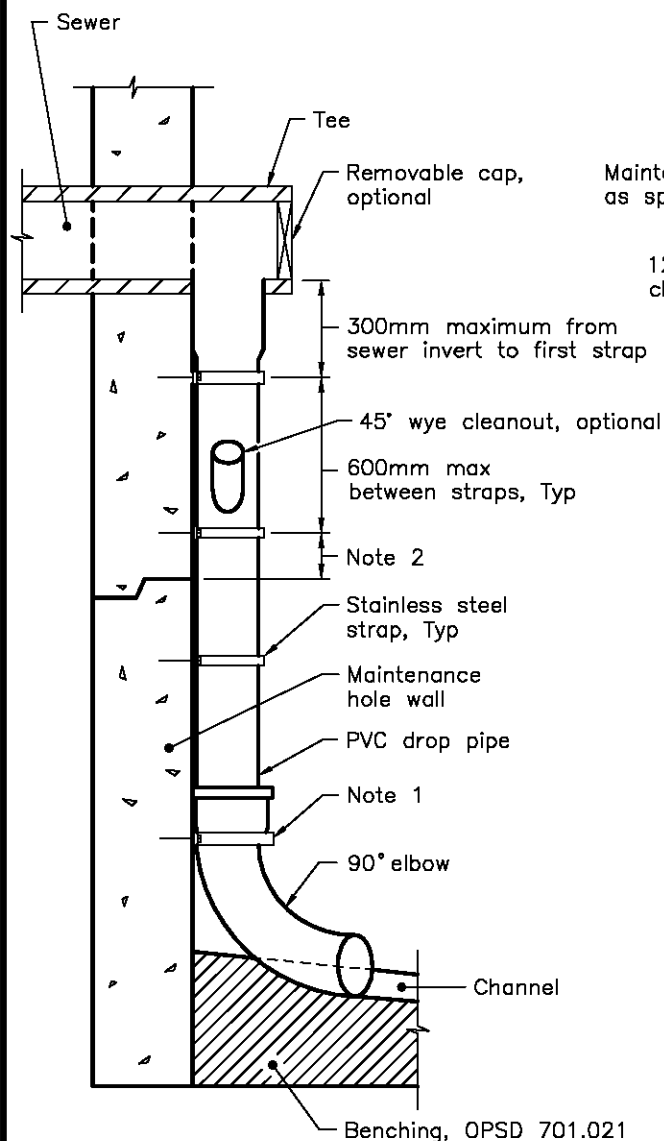


FASTENER DETAIL

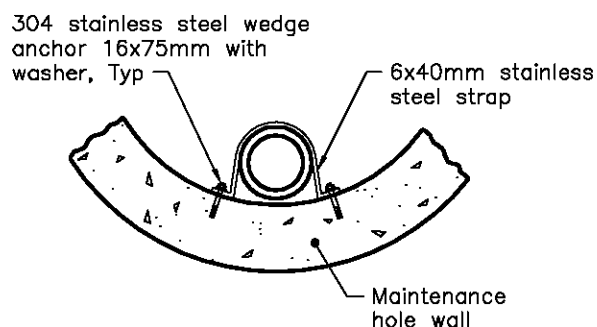
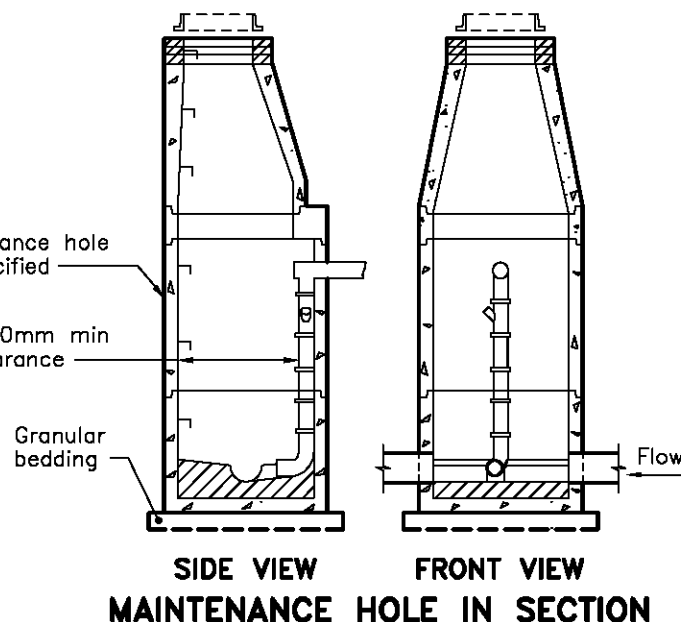
NOTES:

- 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 2016	Rev	4	
INTERNAL DROP STRUCTURE FOR EXISTING MAINTENANCE HOLES				
	OPSD 1003.030			



INTERNAL DROP STRUCTURE DETAIL



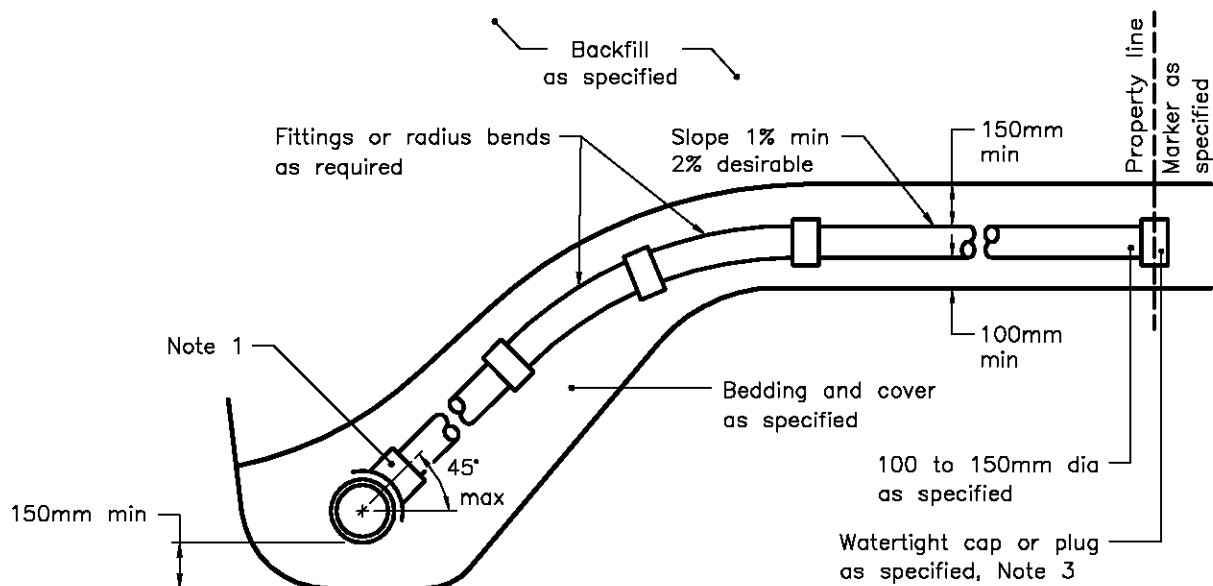
FASTENER DETAIL

NOTES:

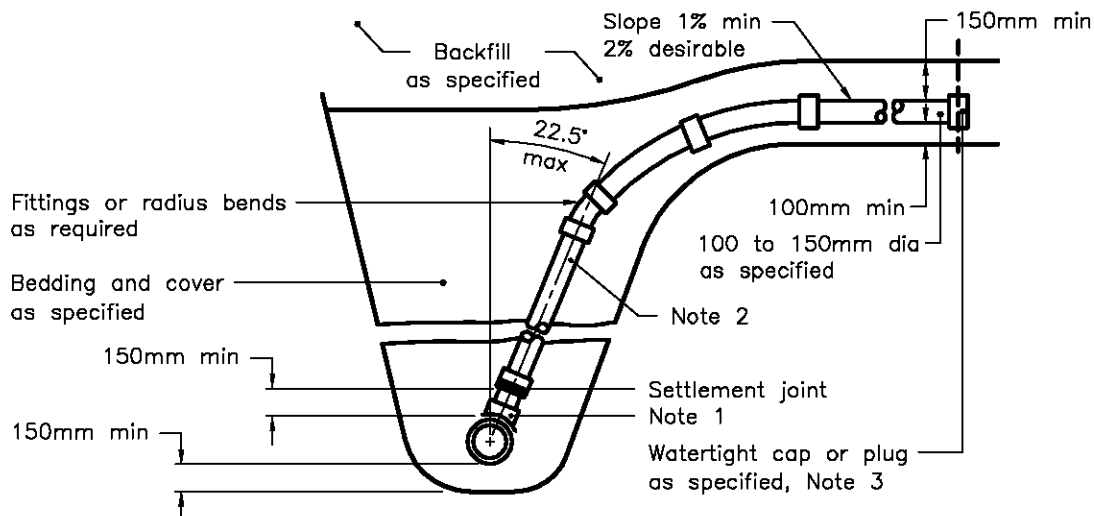
- 1 At the elbow, a stainless steel strap is required at bottom of bell.
- 2 Straps shall not be placed within 150mm of any maintenance hole section joint.
- A Internal drop structure shall be used in maintenance holes 1500mm diameter and larger with a minimum height of 600mm from the inlet pipe invert 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 2016	Rev	3	
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 2016

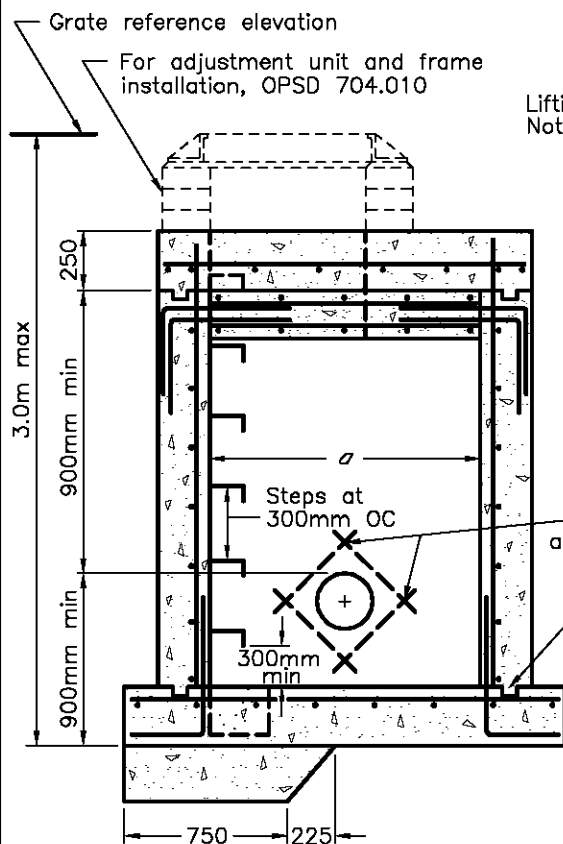
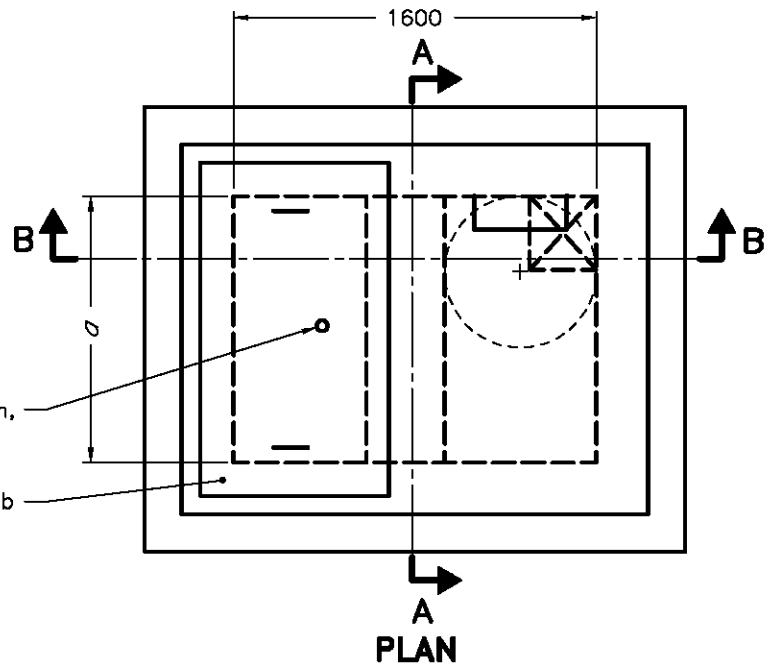
Rev 3

SEWER SERVICE CONNECTIONS
FOR MAIN PIPE SEWER

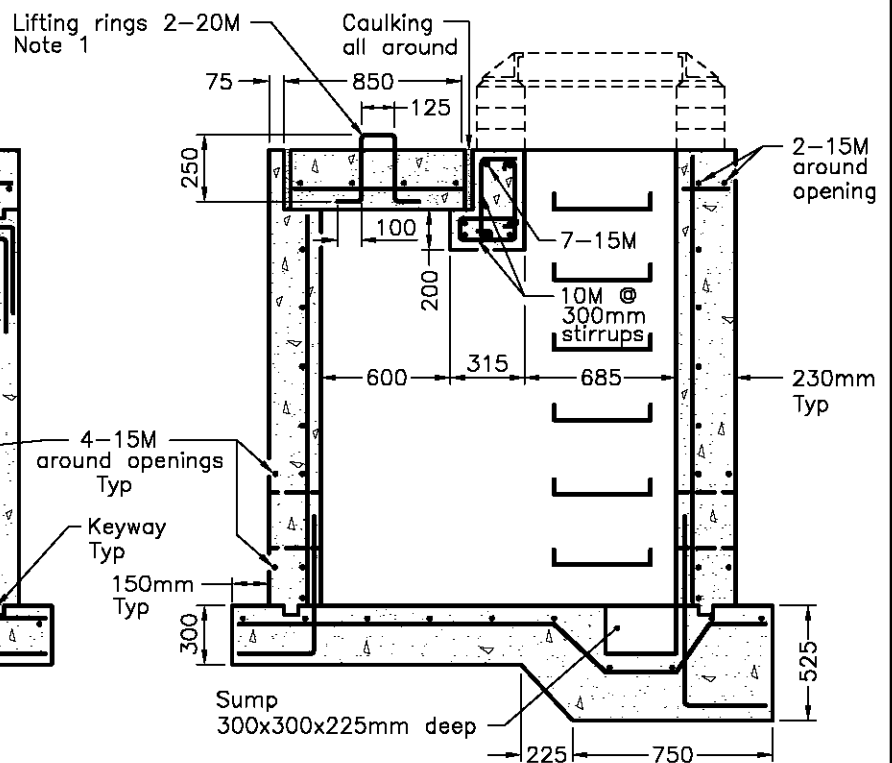
OPSD 1006.010



	100 to 250mm WATERMAIN	300 to 350mm WATERMAIN
ϕ	1100	1300



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.

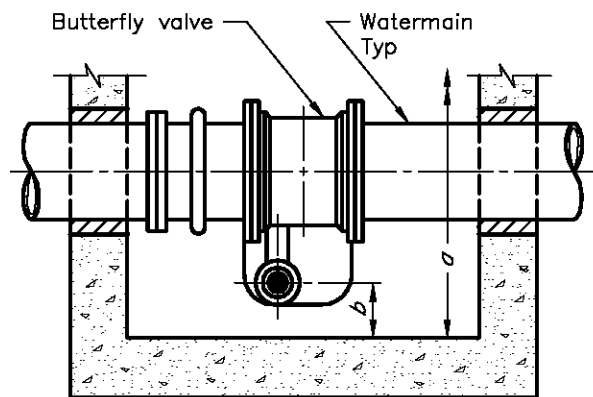
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 Rev 3

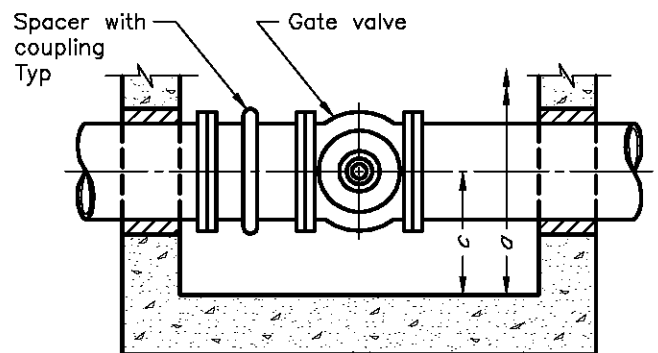
**CAST-IN-PLACE CHAMBER
FOR VALVES UP TO
350mm DIAMETER**



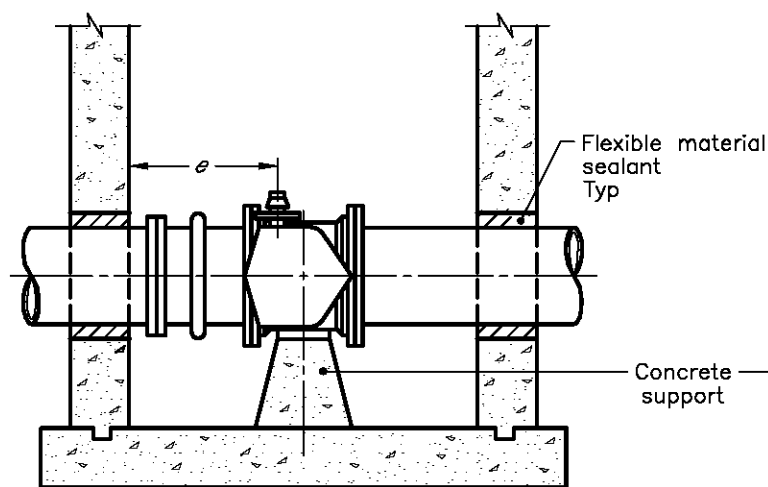
OPSD 1100.010



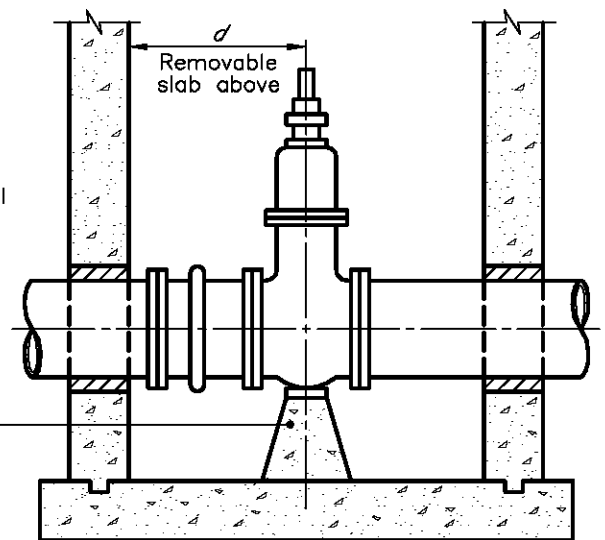
PLAN



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.

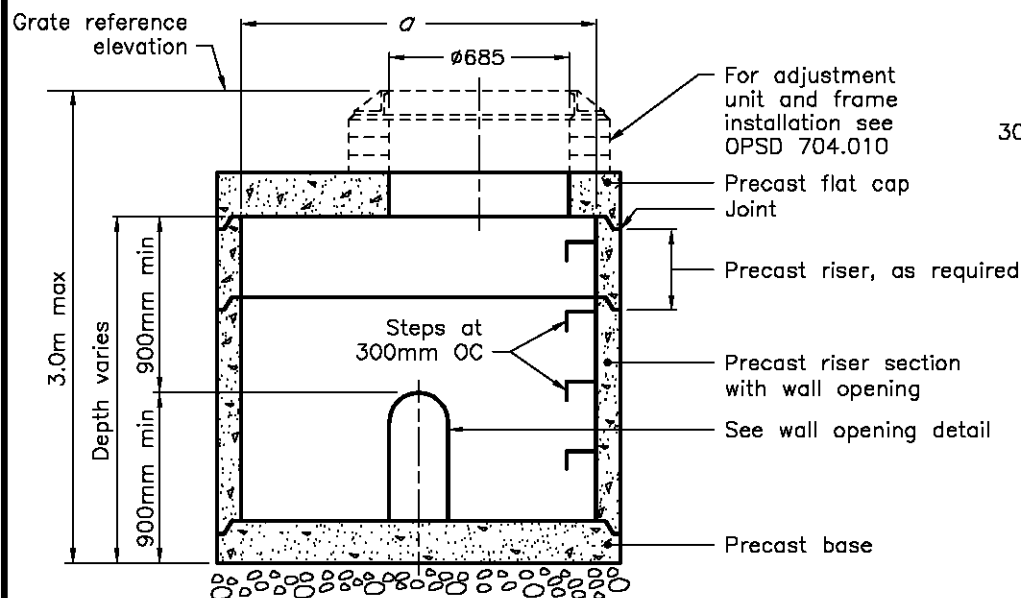
ONTARIO PROVINCIAL STANDARD DRAWING

PIPING LAYOUT FOR
BUTTERFLY AND GATE VALVES
UP TO 350mm DIAMETER
IN CAST-IN-PLACE CHAMBERS

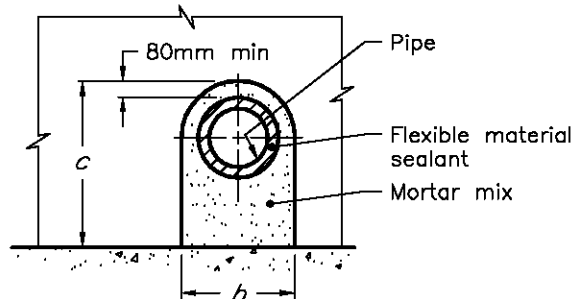
Nov 2014 Rev 2



OPSD 1100.011



CROSS SECTION



WALL OPENING DETAIL

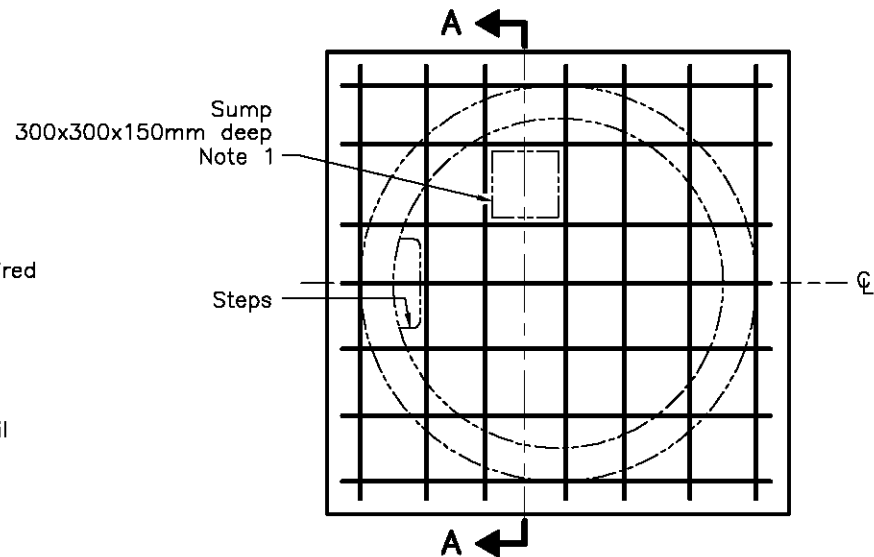
NOTES:

1 Sump shall be placed to avoid associated appurtenances and step landing. Position steel reinforcement to maintain minimum 50mm cover at sump.

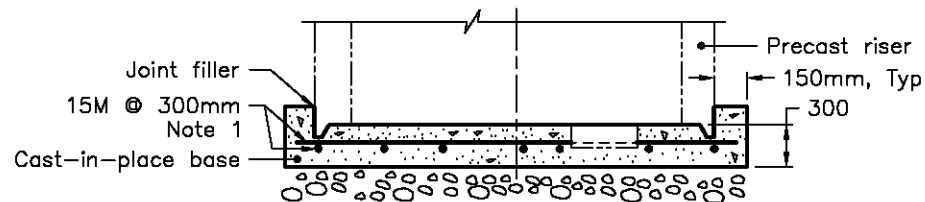
A This OPSP shall be read in conjunction with OPSP 701.030, 701.031, 701.032, 701.041, and 703.011.

B Bond breaker shall be used between the concrete and the fittings and appurtenances.

C All dimensions are in millimetres unless otherwise shown.



**PLAN
CAST-IN-PLACE BASE**



SECTION A-A

Dimension	Pipe diameter	
	100 to 250mm	300 to 350mm
<i>a</i>	Ø1200	Ø1500
<i>b</i>	400	550
<i>c</i>	600	750

ONTARIO PROVINCIAL STANDARD DRAWING

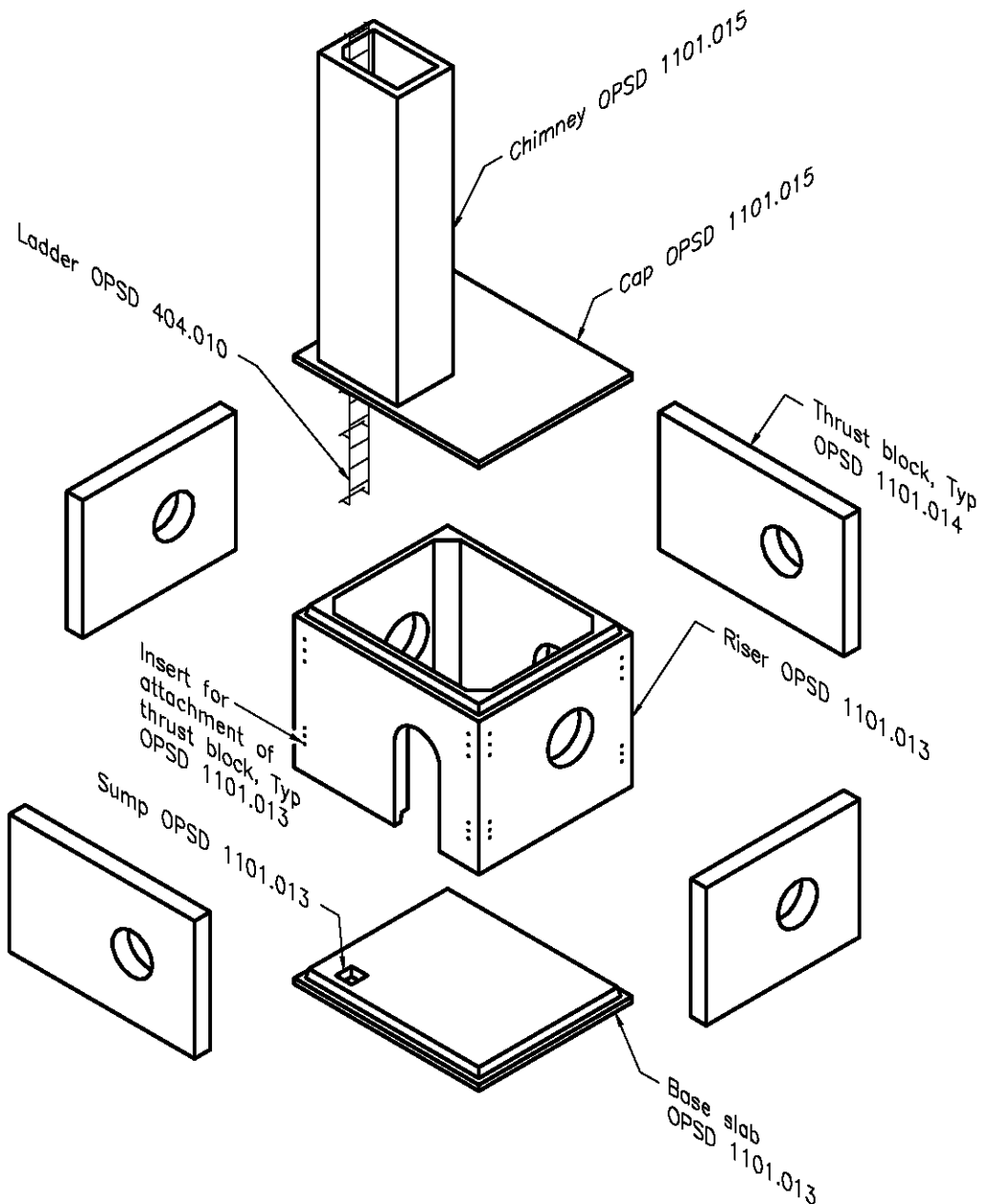
PRECAST VALVE CHAMBER
1200mm AND 1500mm DIAMETER

Nov 2015

Rev 4



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

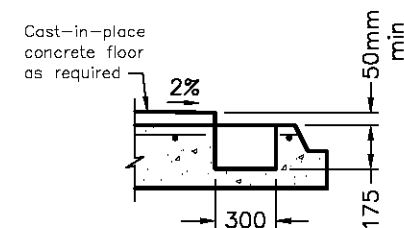
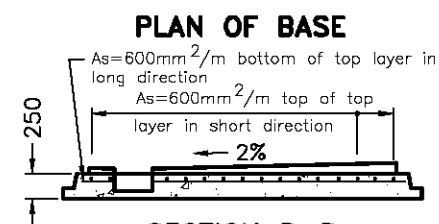
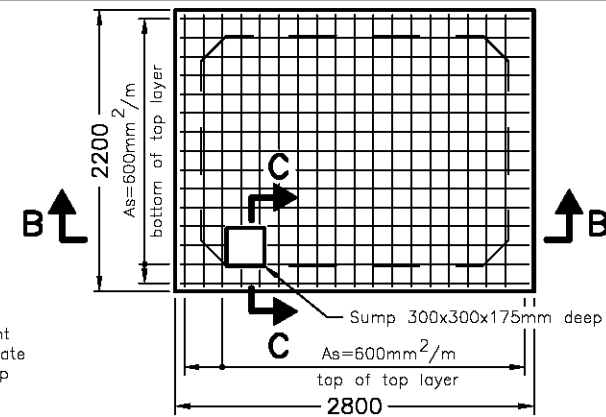
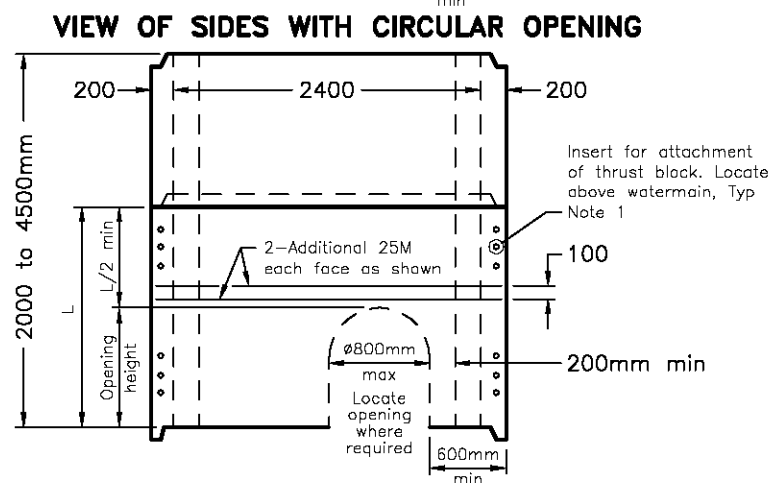
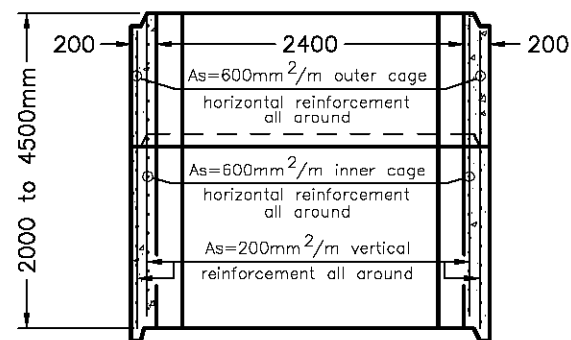
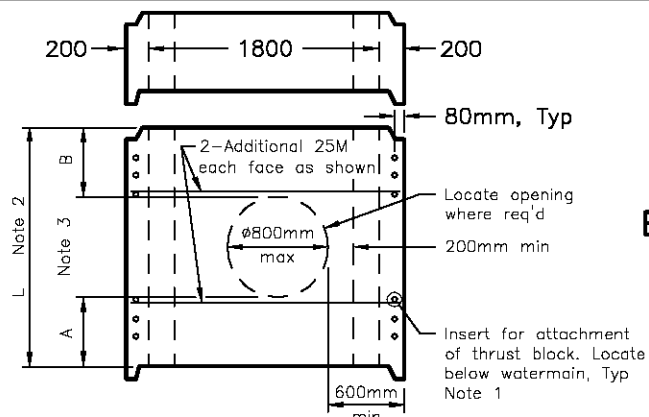
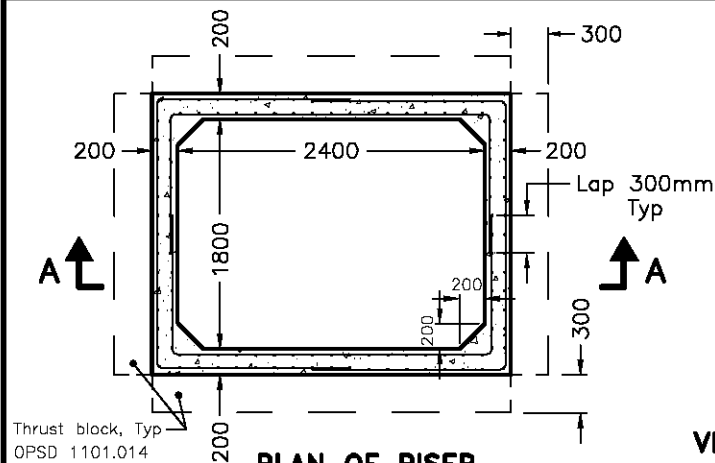
Nov 2013

Rev 2

**PRECAST CONCRETE VALVE CHAMBER
WITH POURED-IN-PLACE THRUST BLOCKS
1800 x 2400mm
COMPONENTS**

OPSD 1101.012





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, $f_y=500\text{MPa}$, 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

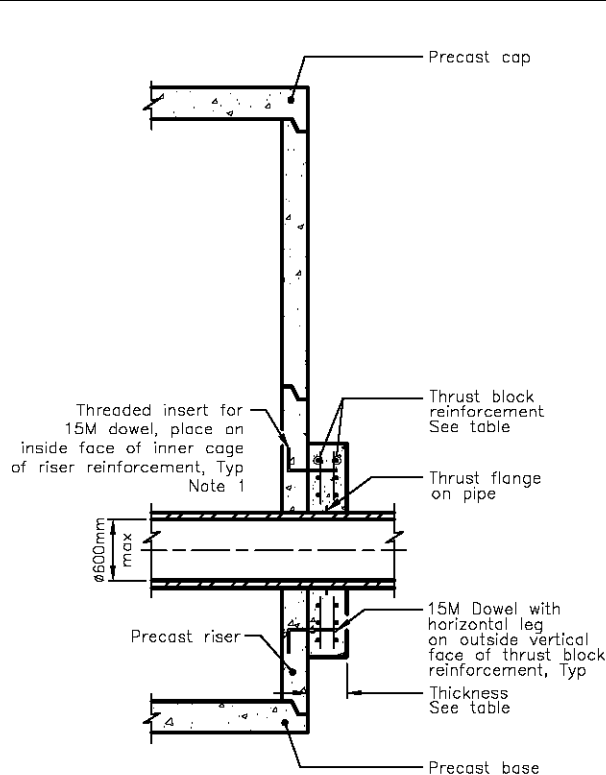
PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS

1800 x 2400mm RISER AND BASE

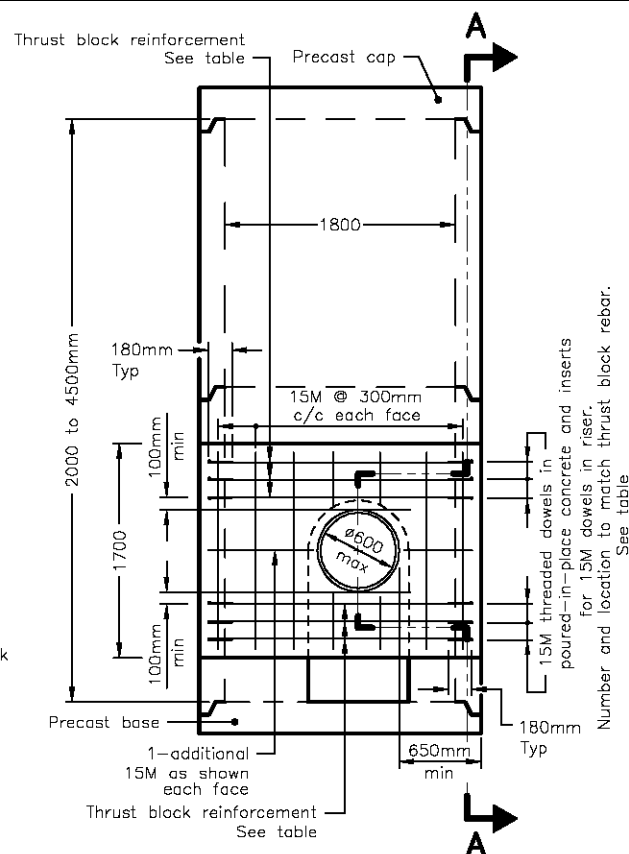
Nov 2013 Rev 2



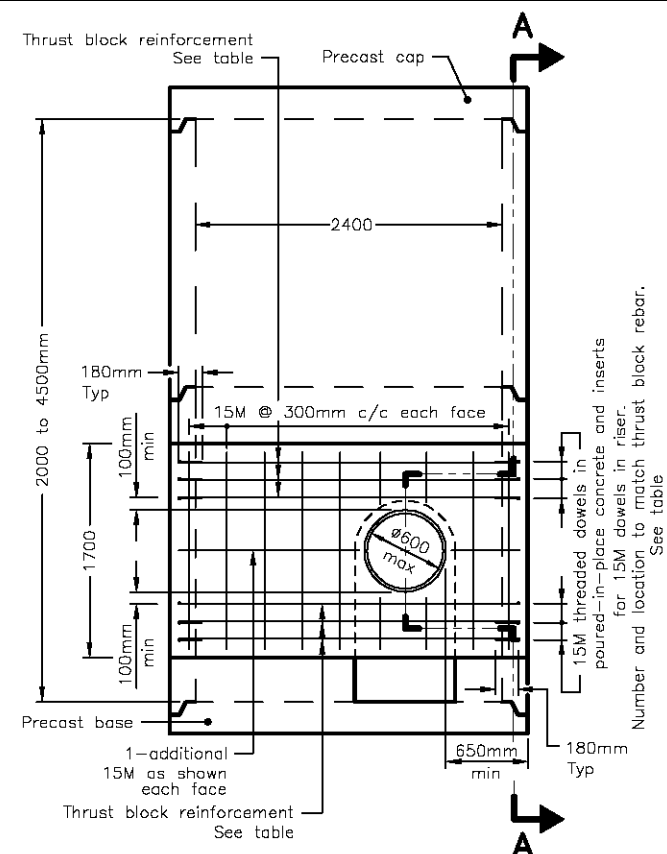
OPSD 1101.013



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 $\pm$ 20mm.
- D Clear cover to reinforcing steel:
-100mm $\pm$ 25mm to bottom of thrust block
-70mm $\pm$ 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	$\leq \phi 600$	400	8-20M each face*
Short Wall	$\leq \phi 600$	350	6-20M each face*

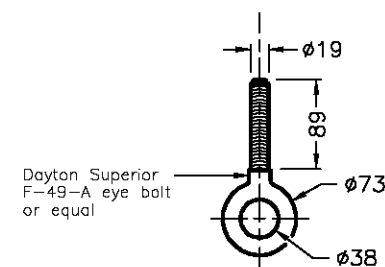
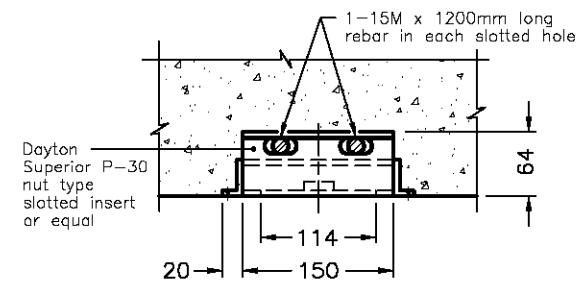
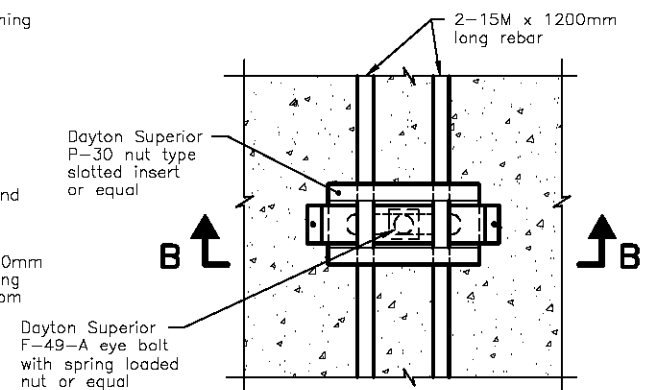
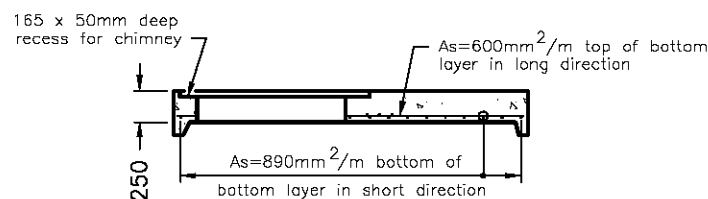
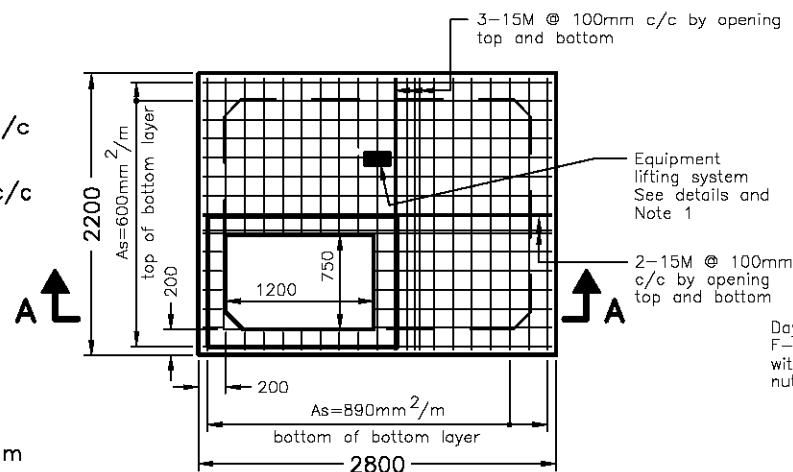
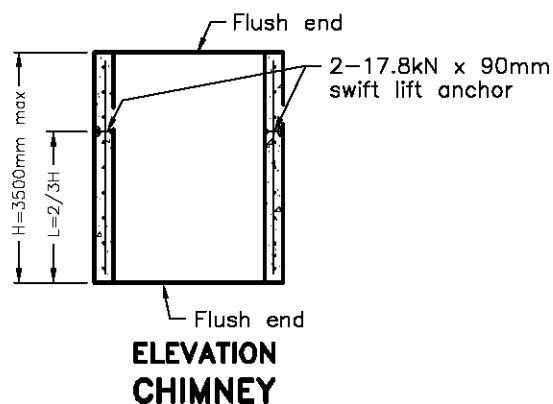
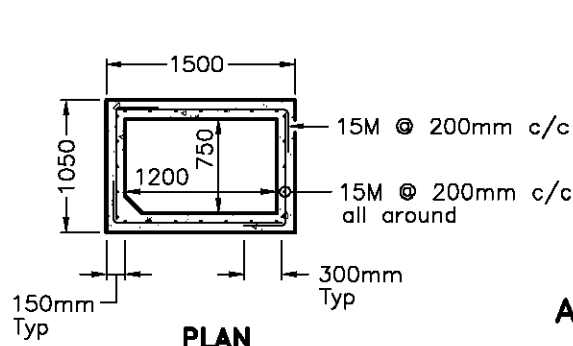
* Other reinforcement as shown

ONTARIO PROVINCIAL STANDARD DRAWING
PRECAST CONCRETE VALVE CHAMBER
WITH POURED-IN-PLACE THRUST BLOCKS
1800 x 2400mm
THRUST BLOCKS

Nov 2013 Rev 2



OPSD 1101.014



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, $f_y=500\text{Mpa}$, 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

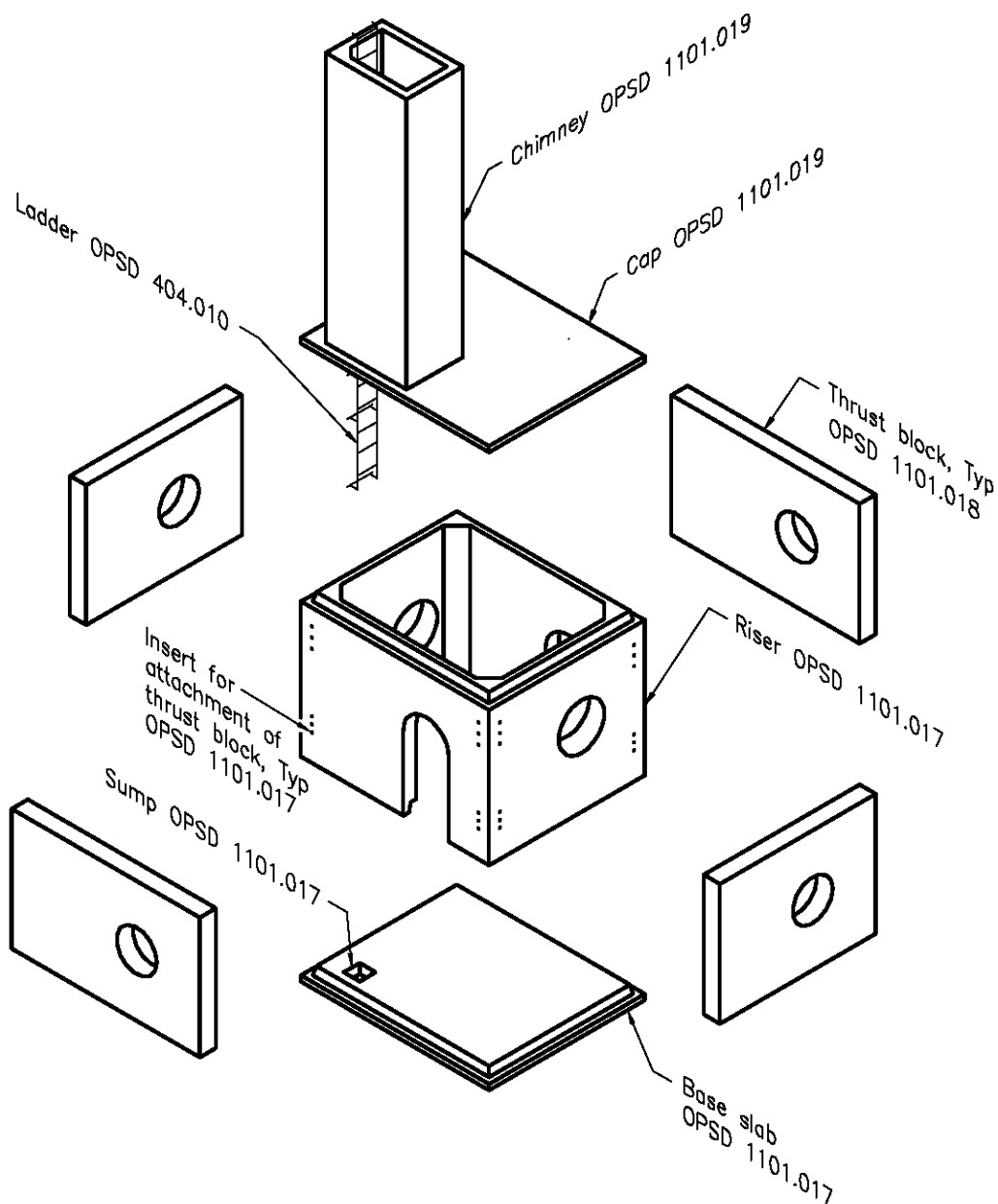
**PRECAST CONCRETE VALVE CHAMBER
WITH POURED-IN-PLACE THRUST BLOCKS**

**1800 x 2400mm
CHIMNEY AND CAP**

Nov 2013 Rev 2



OPSD 1101.015



NOTES:

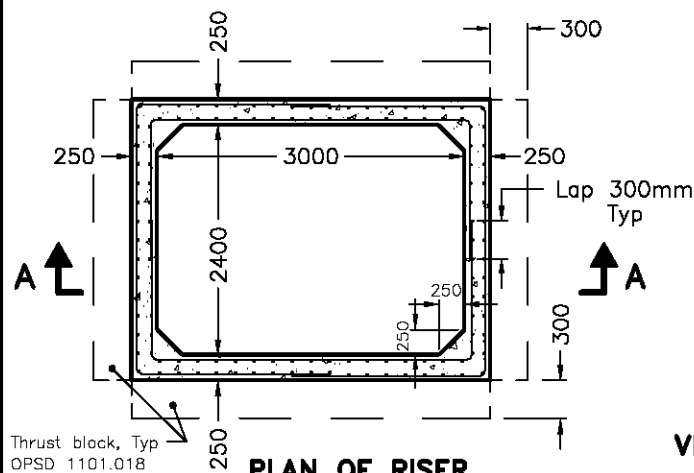
- A Design according to CAN/CSA S6 and Ministry of Transportation of Ontario Structural Manual, Division 1, for maximum 4.0m of earth cover.
- B The valve chamber may be buoyant. Measures required to counteract buoyancy shall be as specified.
- C When the combined height of chamber and chimney is 5.0m 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
PRECAST CONCRETE VALVE CHAMBER
WITH POURED-IN-PLACE THRUST BLOCKS
2400 x 3000mm
COMPONENTS

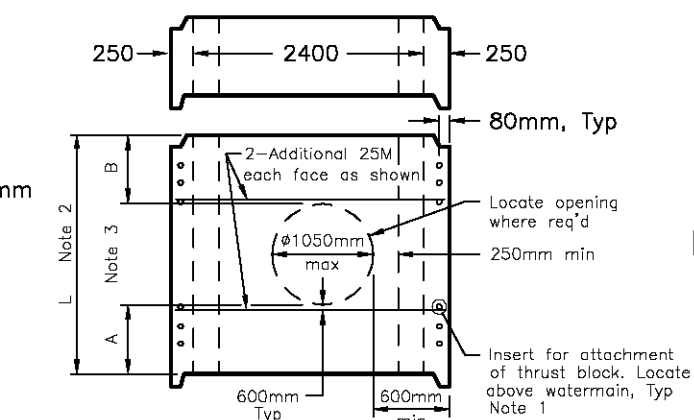
Nov 2013 | Rev | 2



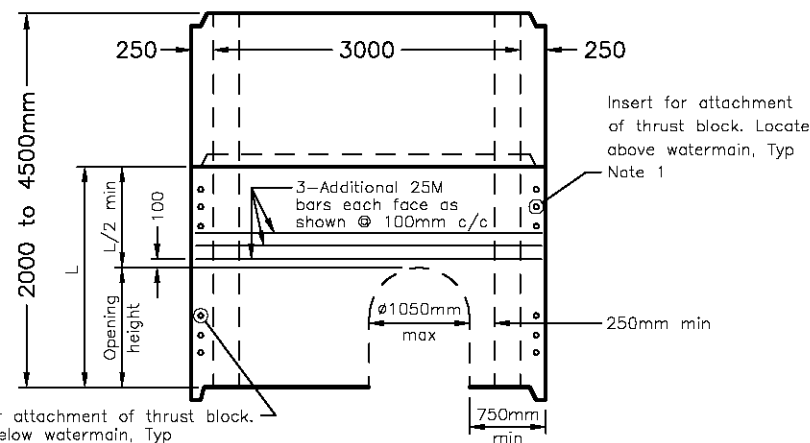
OPSD 1101.016



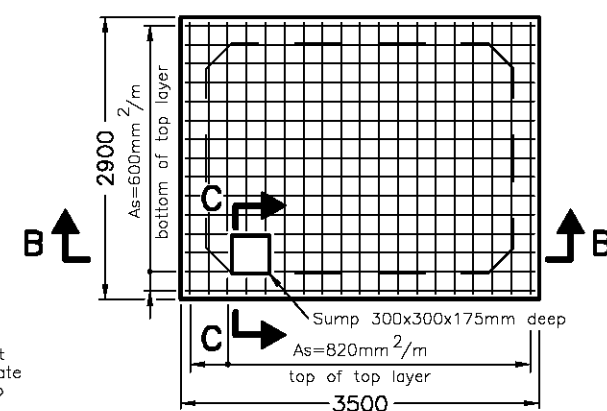
PLAN OF RISER



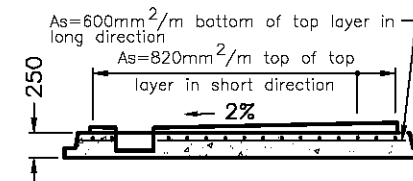
VIEW OF SIDES WITH CIRCULAR OPENING



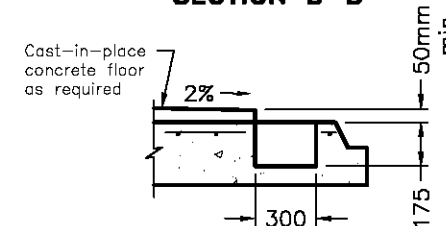
VIEW OF SIDES WITH SLOTTED OPENING



PLAN OF BASE



SECTION B-B



SECTION C-C

NOTES:

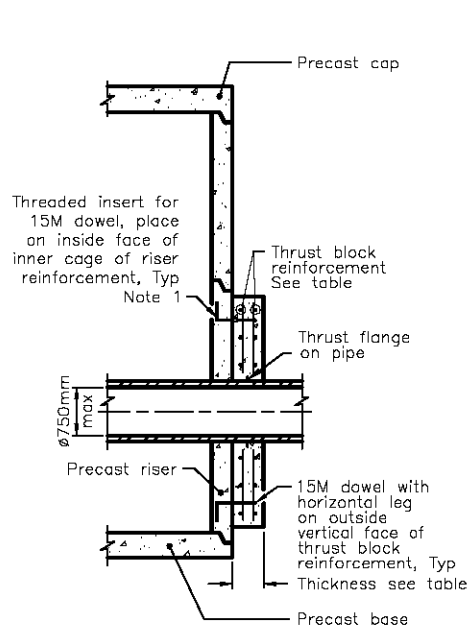
- 1 Threaded inserts for the attachment of thrust blocks shall be 15M equivalent and Dayton Superior DBR system or equal with strength of 125% of yield strength of coupled rebar. For location and number of inserts see OPSD 1101.018.
- 2 If no opening in a single riser, the height of that riser may be 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, $f_y=500\text{MPa}$, 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

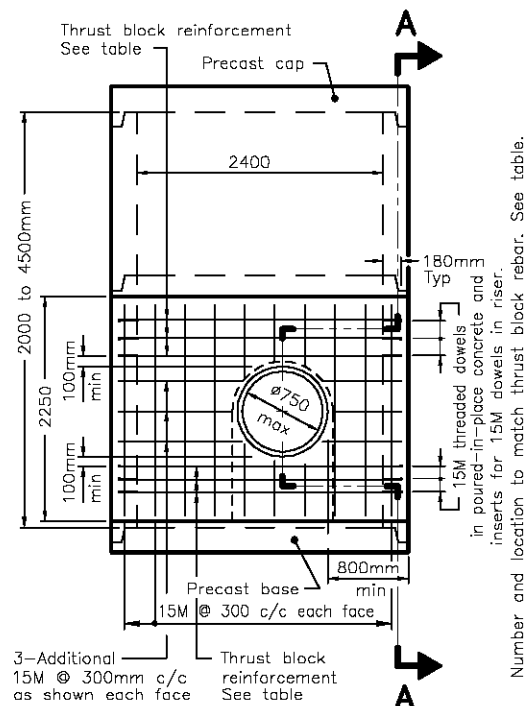
Nov 2013 Rev 2



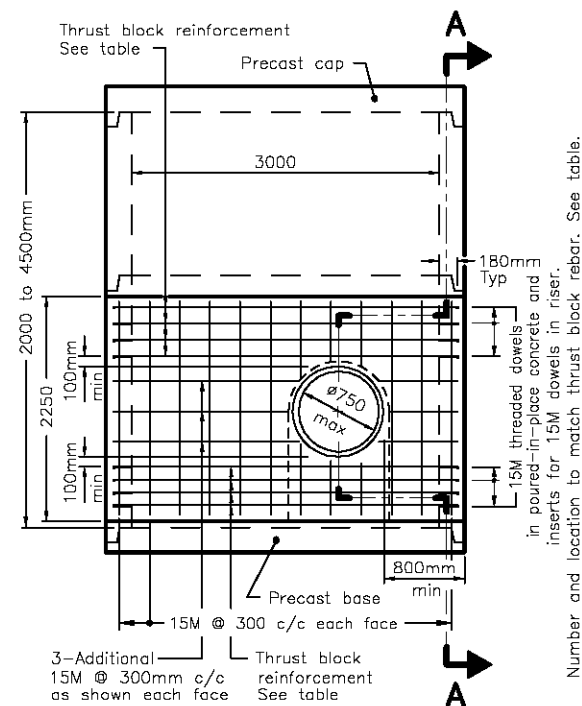
OPSD 1101.017



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 $\pm$ 20mm.
- D Clear cover to reinforcing steel:
-100mm $\pm$ 25mm to bottom of thrust block
-70mm $\pm$ 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	$\leq \phi 750$	450	8-25M each face*
Short Wall	$\leq \phi 750$	400	6-25M each face*

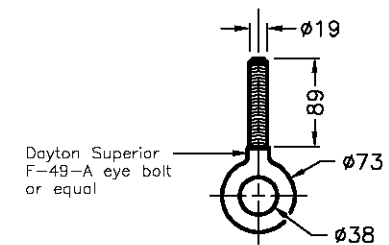
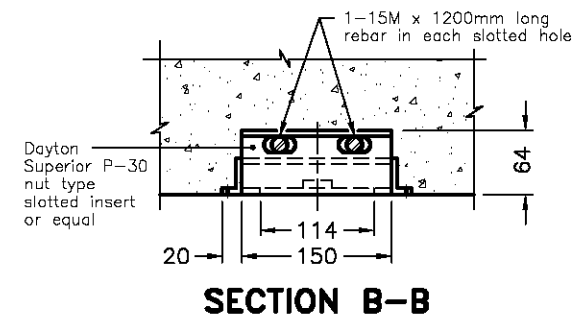
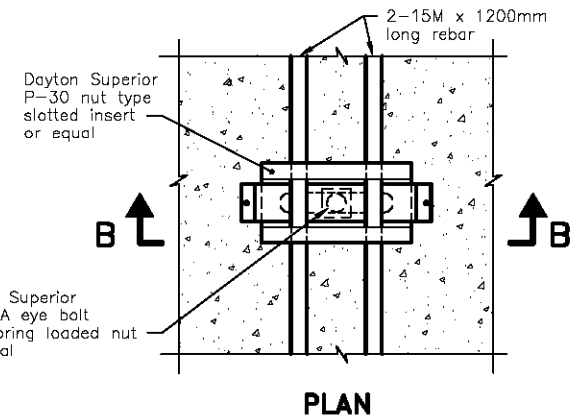
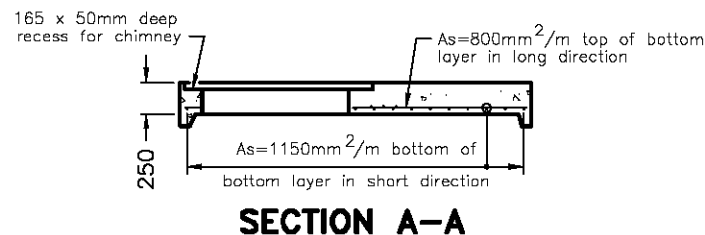
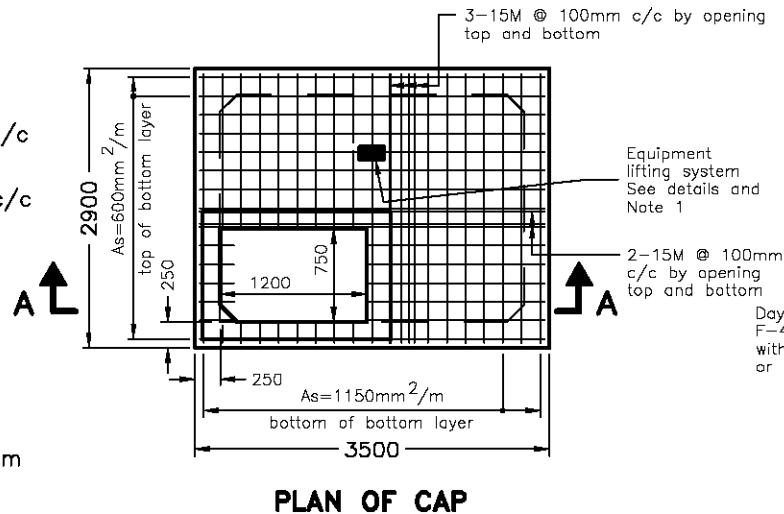
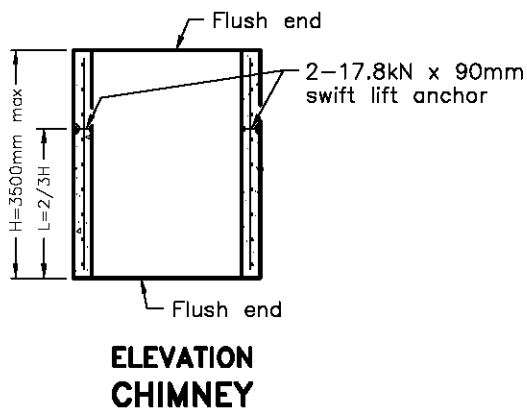
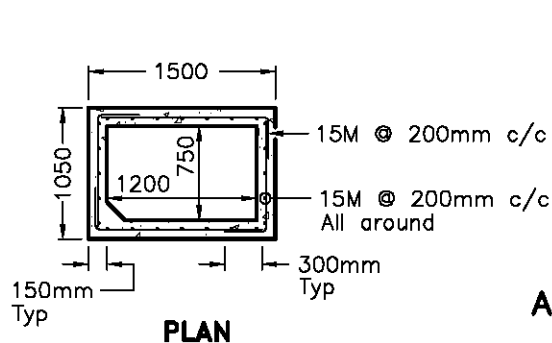
* Other reinforcement as shown

ONTARIO PROVINCIAL STANDARD DRAWING
PRECAST CONCRETE VALVE CHAMBER
WITH POURED-IN-PLACE THRUST BLOCKS
2400 x 3000mm
THRUST BLOCKS

Nov 2013 Rev 3



OPSD 1101.018



NOTES:

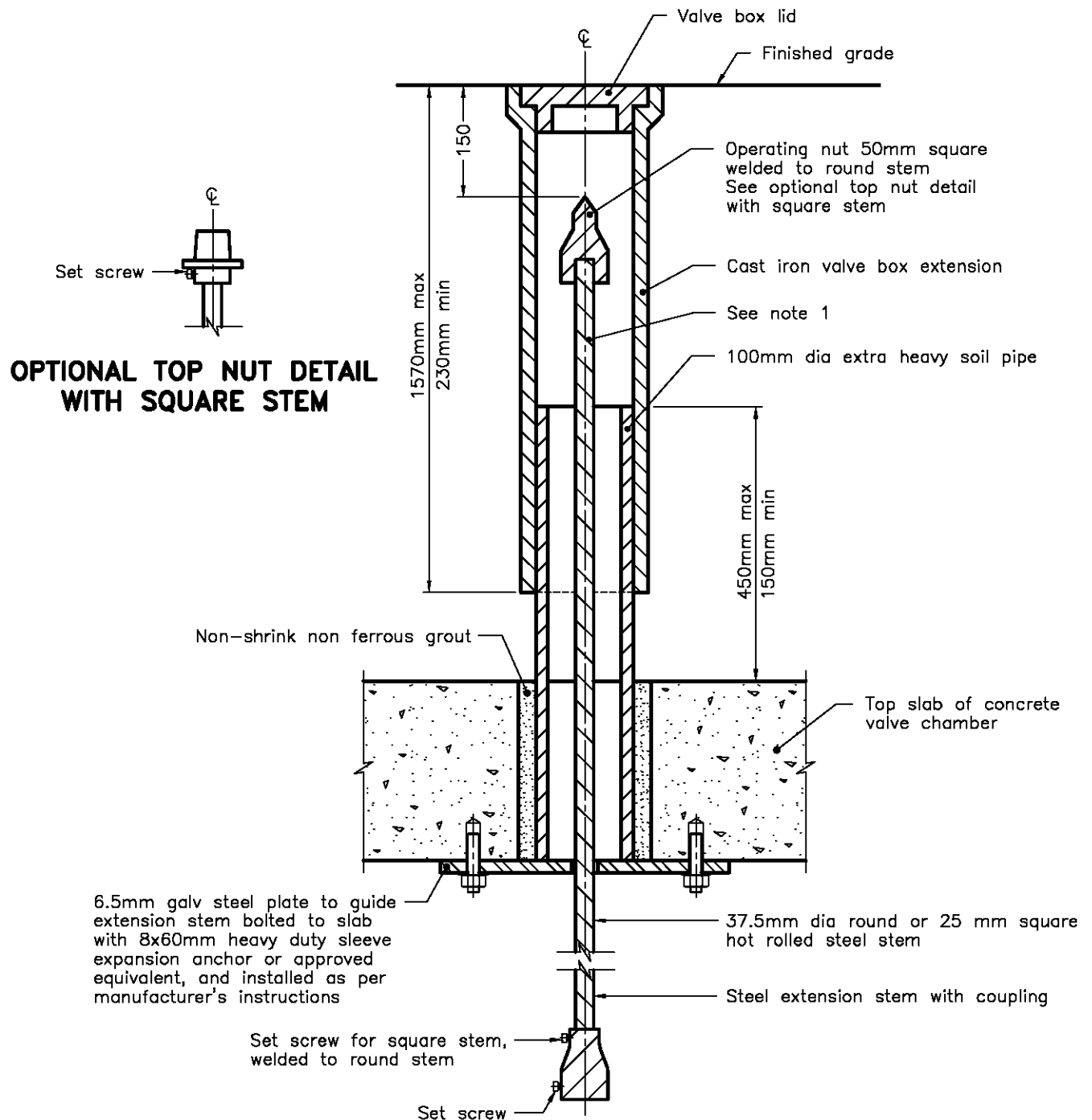
- 1 Equipment lifting system shall be installed on underside of precast concrete cap, where required.
- A Precast concrete strength shall be 40MPa.
- B Reinforcing steel shall be according to CSA G30.18, Grade 400W. Inside diameter of bends shall equal six bar diameters. Additional reinforcing shall be rebar Grade 400W.
- C Main reinforcing shall be welded wire fabric, $f_y=500\text{MPa}$, 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



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

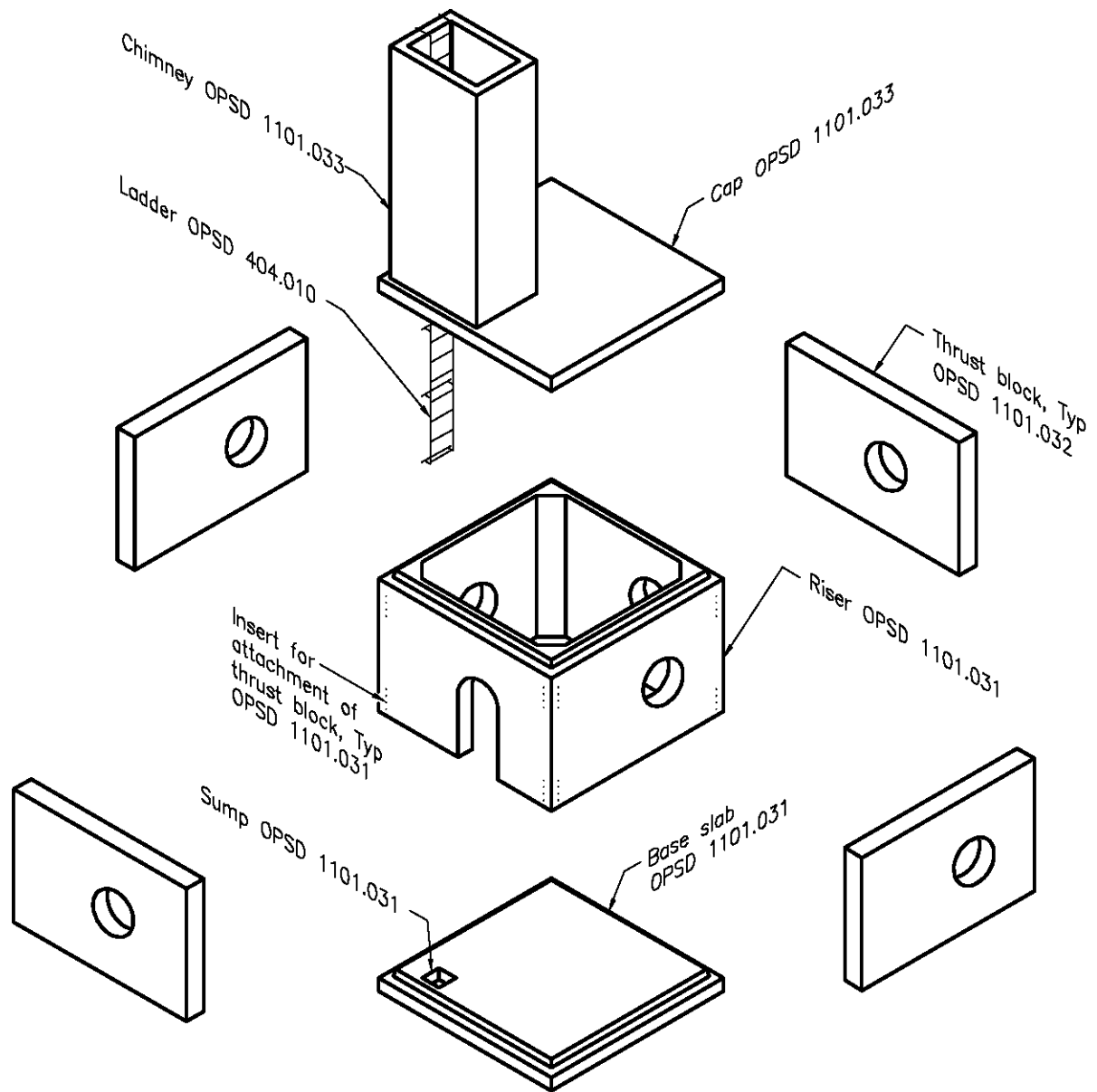
Nov 2013

Rev 3

VALVE OPERATOR

OPSD 1101.020

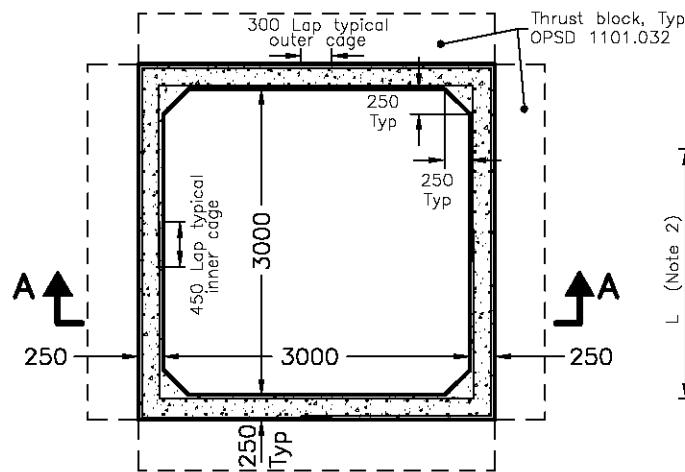




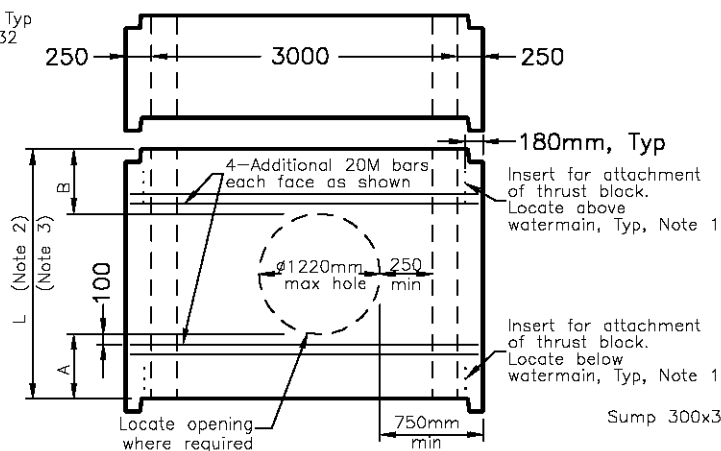
NOTES:

- 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.

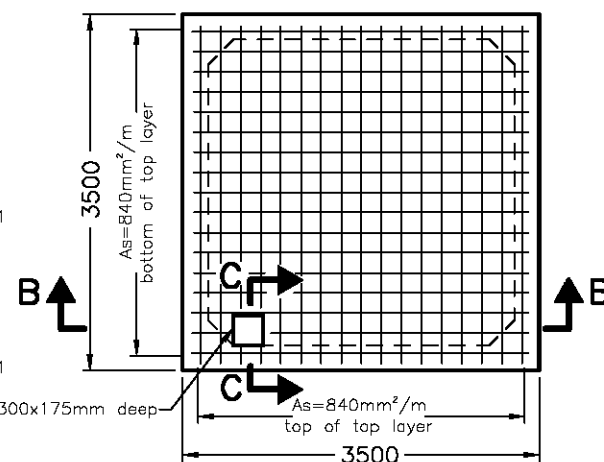
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	0	
PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 3000 x 3000mm COMPONENTS				
	OPSD 1101.030			



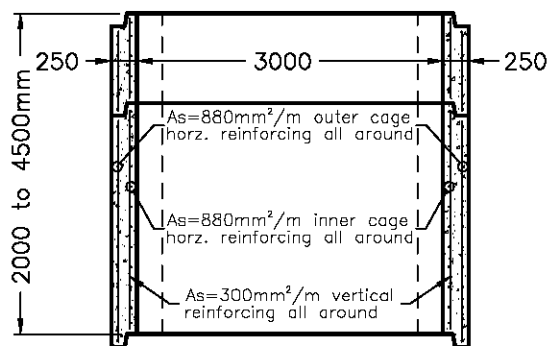
PLAN OF RISER



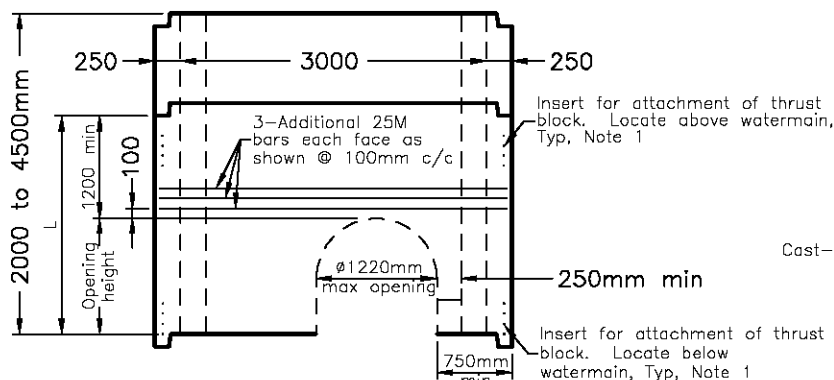
VIEW OF SIDES WITH CIRCULAR OPENING



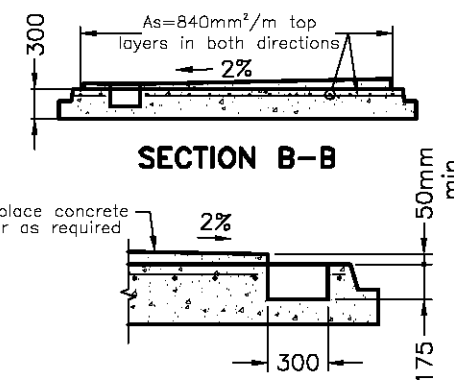
PLAN OF BASE



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, $f_y=500\text{MPa}$, 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

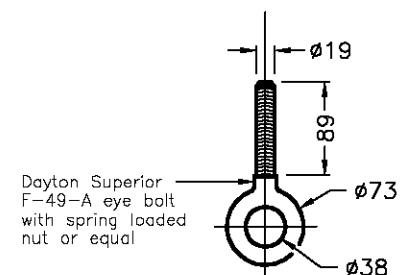
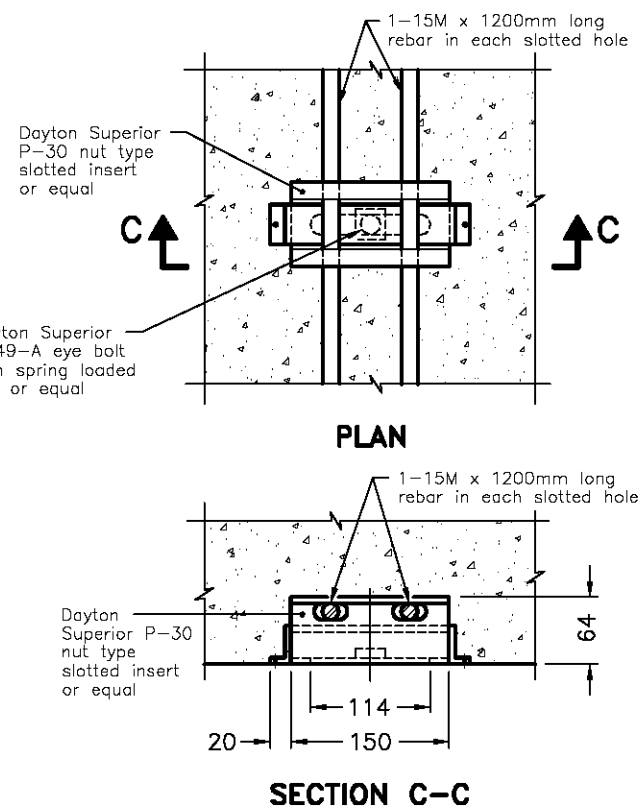
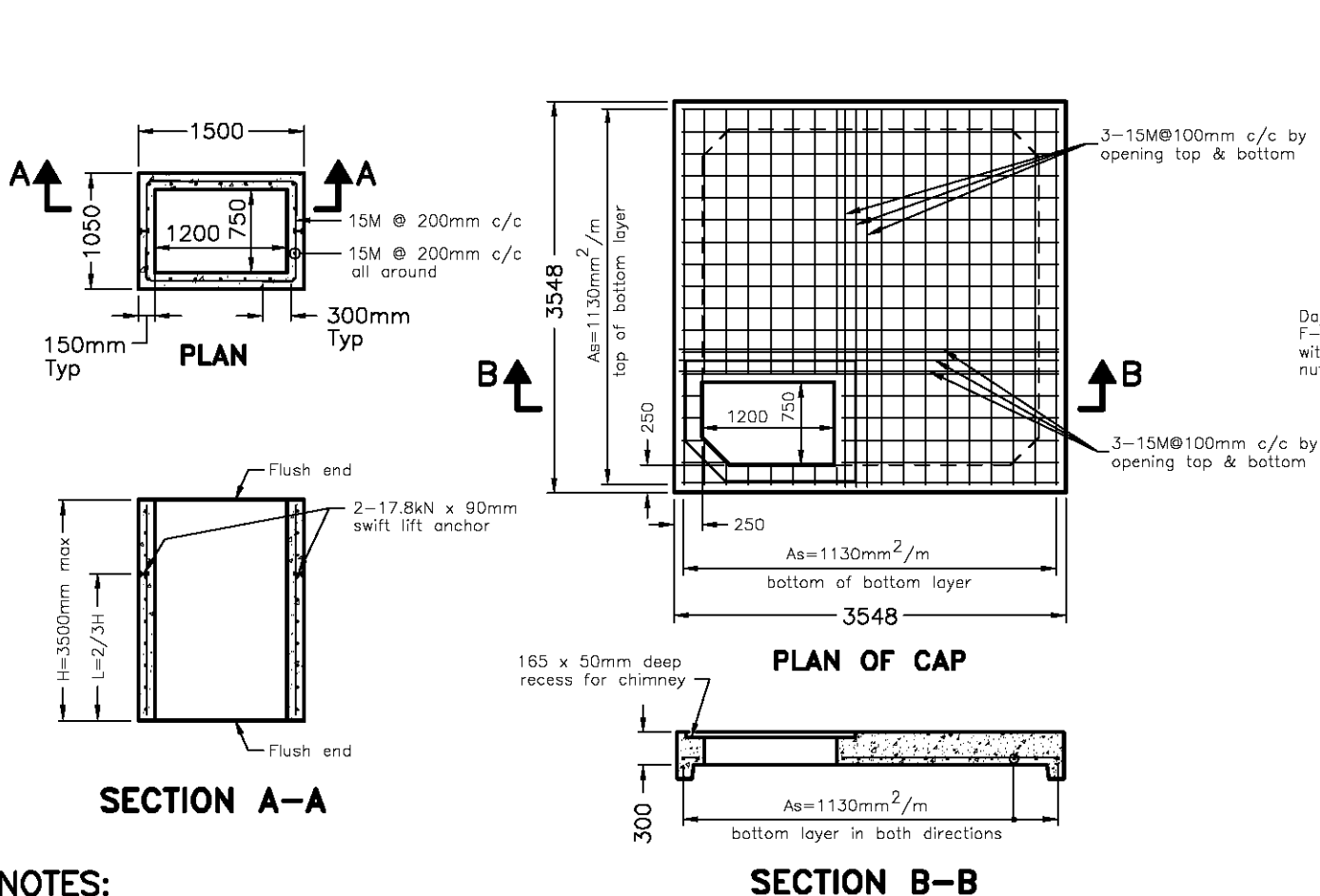
**PRECAST CONCRETE VALVE CHAMBER
WITH POURED-IN-PLACE THRUST BLOCKS
3000 x 3000mm
RISER AND BASE**

Nov 2013

Rev 0



OPSD 1101.031



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, $f_y=500\text{Mpa}$, 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

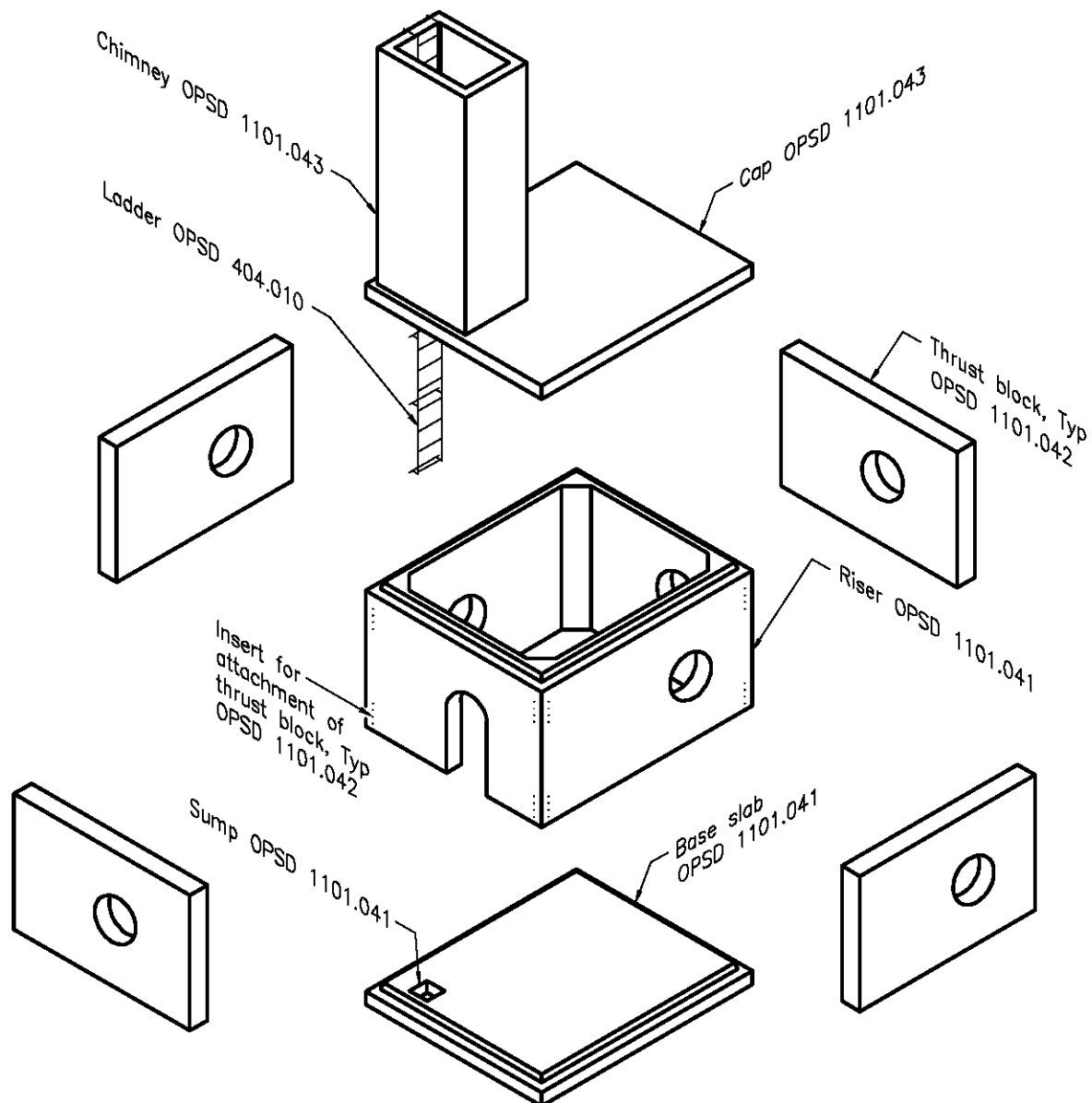
3000 x 3000mm CHIMNEY AND CAP

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

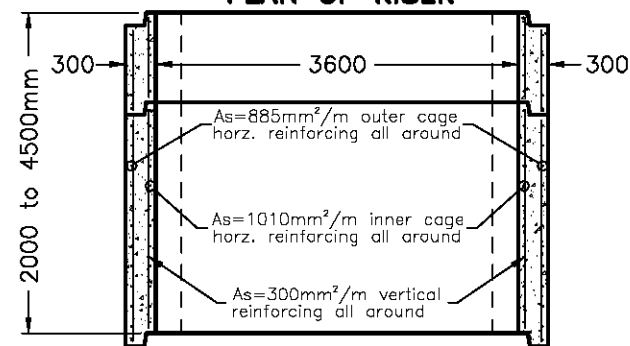
Nov 2013

Rev 0

**PRECAST CONCRETE VALVE CHAMBER
WITH POURED-IN-PLACE THRUST BLOCKS
3600 x 3000mm
COMPONENTS**

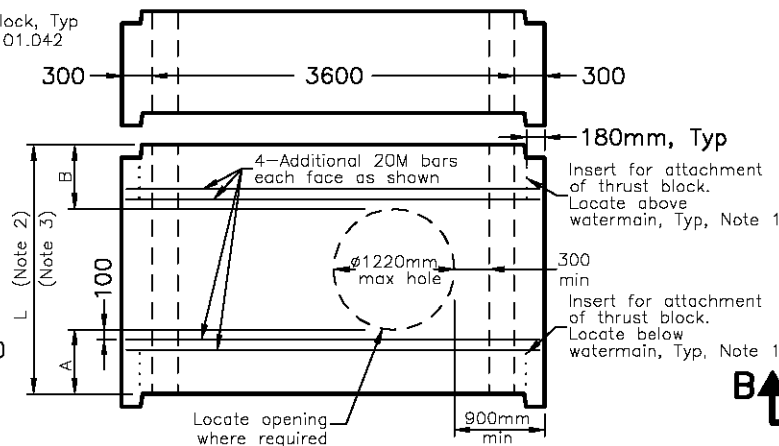


OPSD 1101.040

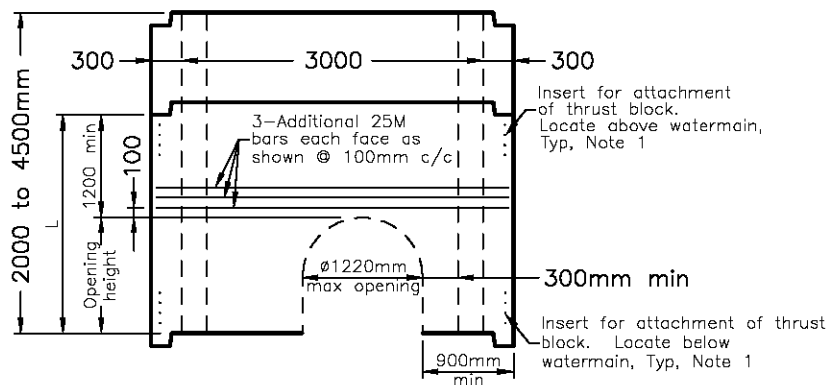


PLAN OF RISER

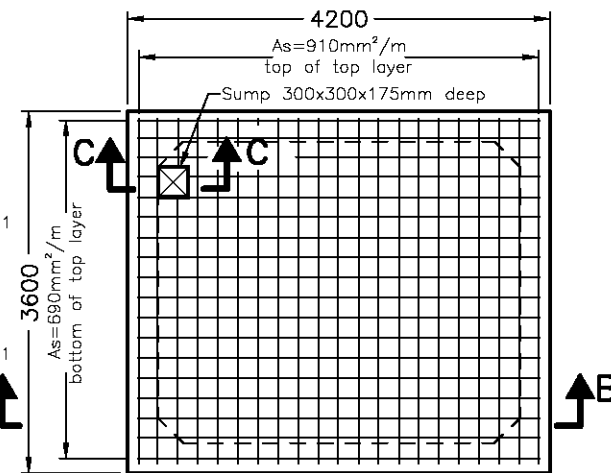
SECTION A-A



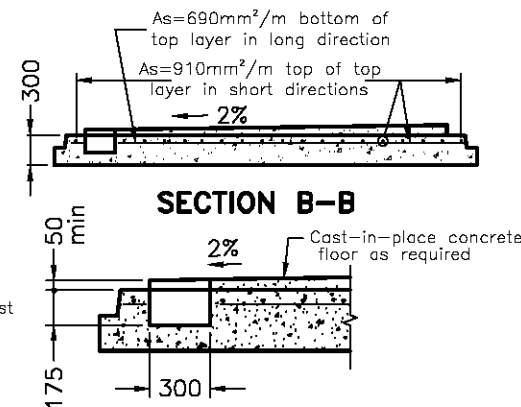
VIEW OF SIDES WITH CIRCULAR OPENING



VIEW OF SIDES WITH SLOTTED OPENING



PLAN OF BASE



SECTION B-B

SECTION C-C

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.	<table> <tr> <th>ONTARIO PROVINCIAL STANDARD DRAWING</th><th>Nov 2013</th></tr> <tr> <td> <table> <tr> <th> PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 3600 x 3000mm RISER AND BASE </th></tr></table> <th data-kind="parent" data-rs="2"> <table> <tr> <td>-----</td></tr> <tr> <td>OPSD</td></tr> </table> </th></td></tr> <tr> <td colspan="2"></td></tr> </table>	ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	<table> <tr> <th> PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 3600 x 3000mm RISER AND BASE </th></tr></table> <th data-kind="parent" data-rs="2"> <table> <tr> <td>-----</td></tr> <tr> <td>OPSD</td></tr> </table> </th>	PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 3600 x 3000mm RISER AND BASE	<table> <tr> <td>-----</td></tr> <tr> <td>OPSD</td></tr> </table>	-----	OPSD			
ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2013									
<table> <tr> <th> PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 3600 x 3000mm RISER AND BASE </th></tr></table> <th data-kind="parent" data-rs="2"> <table> <tr> <td>-----</td></tr> <tr> <td>OPSD</td></tr> </table> </th>	PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 3600 x 3000mm RISER AND BASE	<table> <tr> <td>-----</td></tr> <tr> <td>OPSD</td></tr> </table>	-----	OPSD							
PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 3600 x 3000mm RISER AND BASE											

OPSD											
B Main reinforcing shall be welded wire fabric, $f_y=500\text{MPa}$, 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

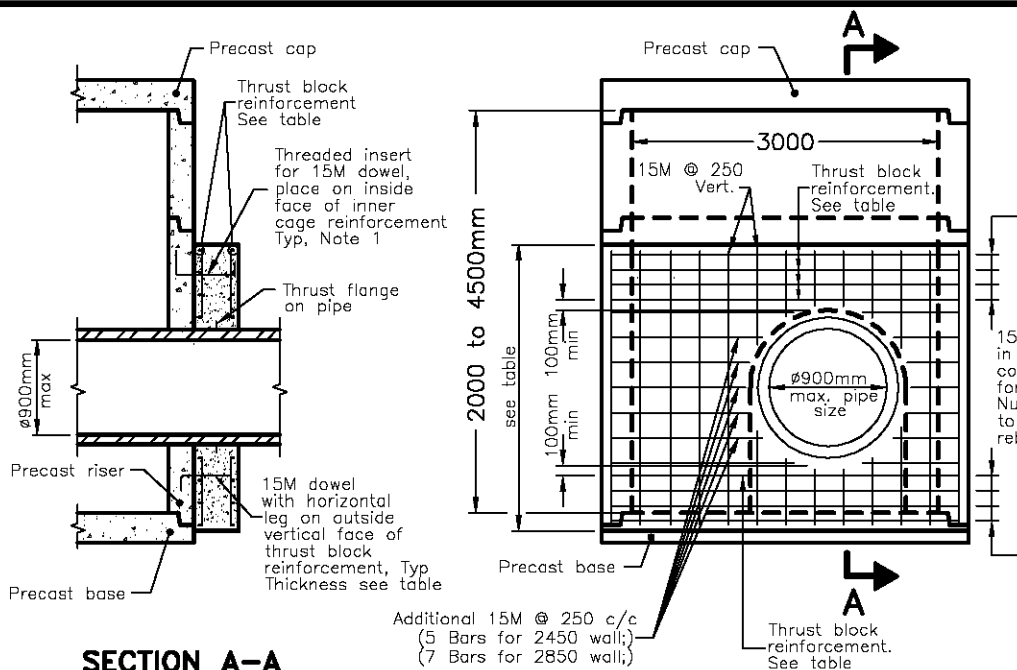
**3600 x 3000mm
RISER AND BASE**

Nov 2013

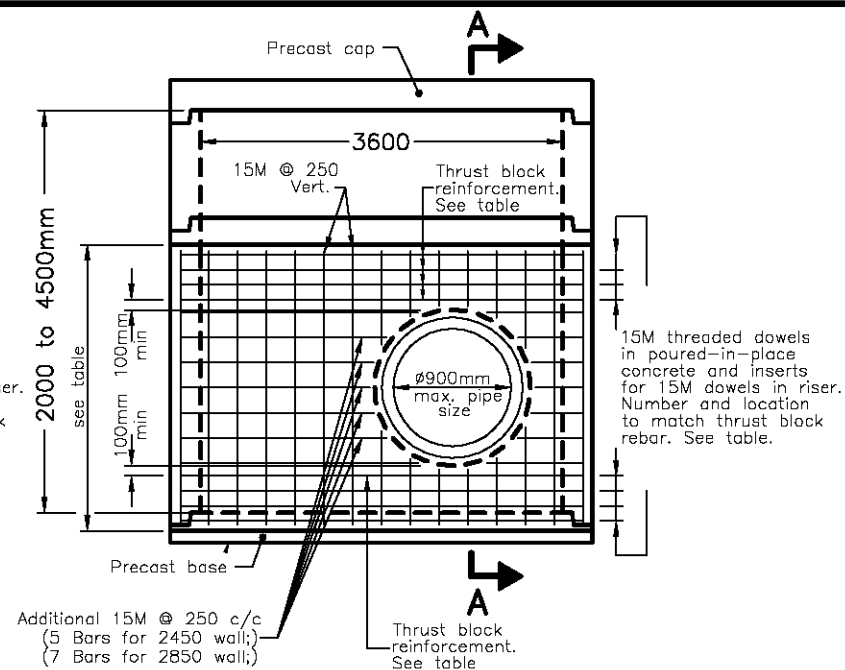
Rev	0



OPSD 1101.041



ELEVATION OF SHORT WALL THRUST BLOCK



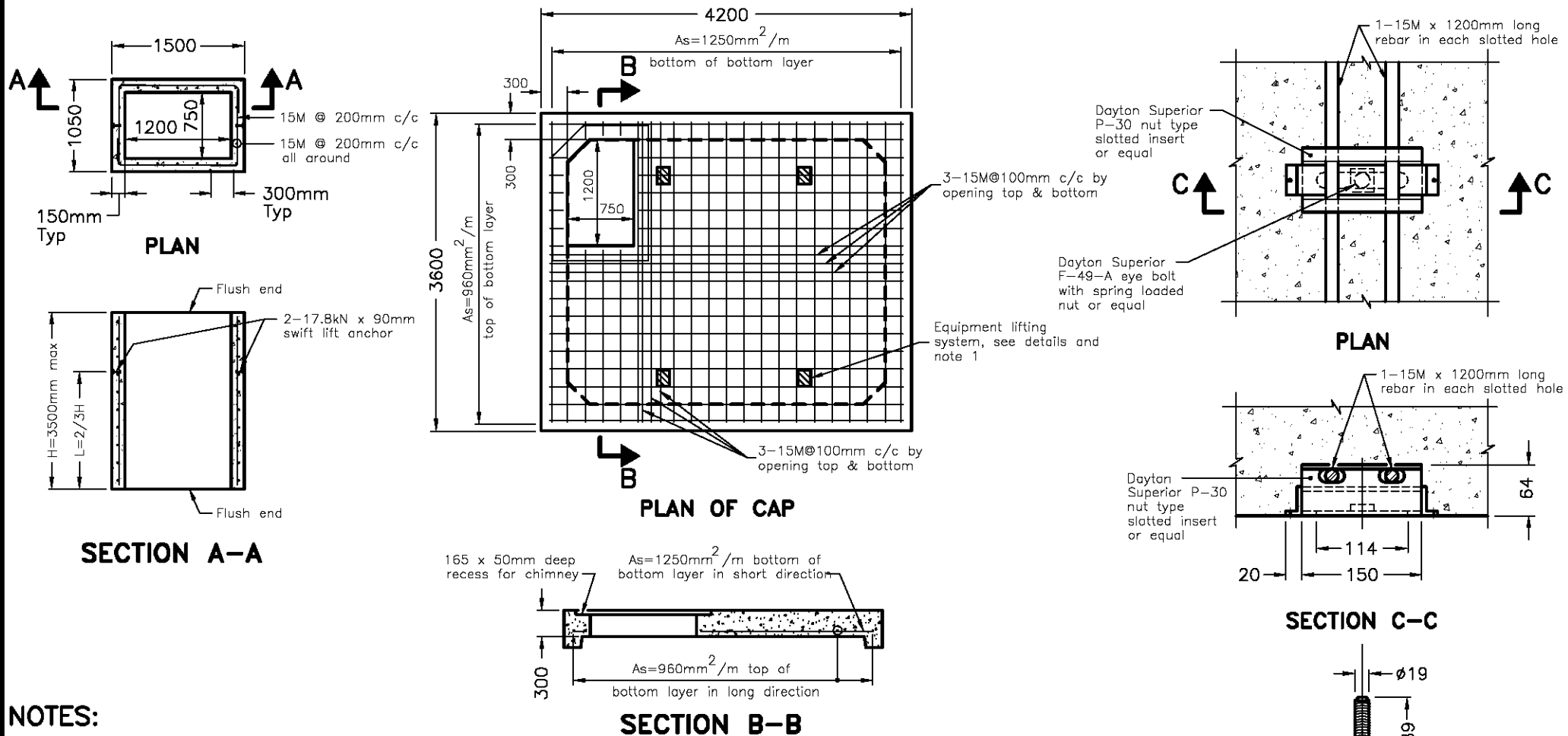
ELEVATION OF LONG WALL THRUST BLOCK

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.

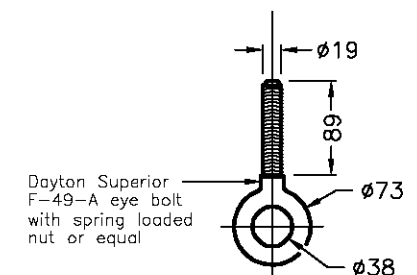
ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2013	Rev 0	
PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS		-----	-----	
3600 x 3000mm THRUST BLOCKS		-----	-----	
OPSD 1101.042				



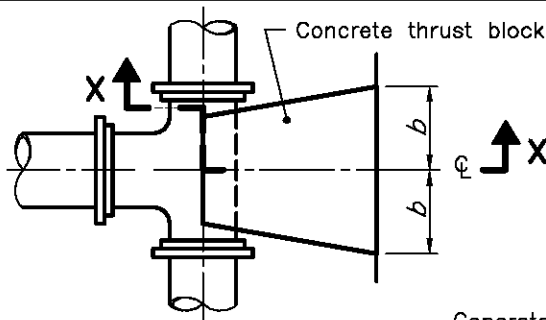
NOTES:

- 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, $f_y=500\text{Mpa}$, 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.

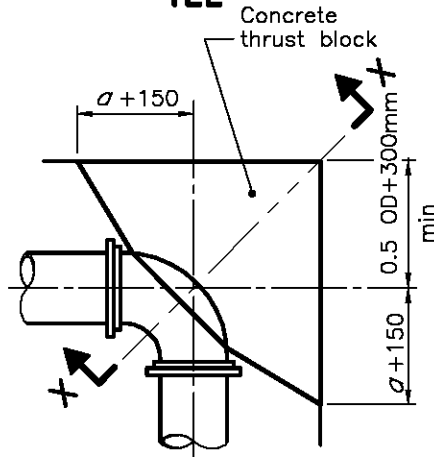
EQUIPMENT LIFTING SYSTEM



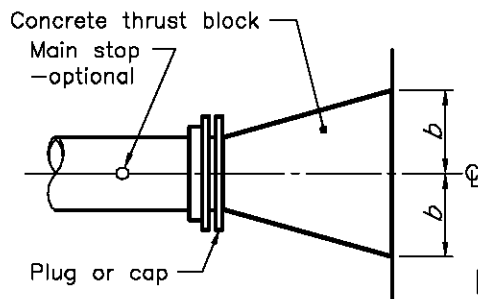
ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2013	Rev 0
PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 3600 x 3000mm CHIMNEY AND CAP			
		OPSD 1101.043	



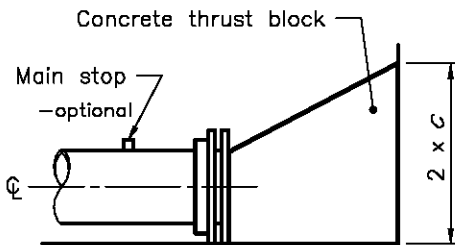
**PLAN
TEE**



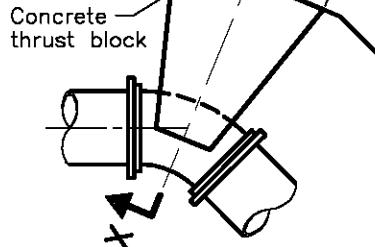
**PLAN
90 BEND**



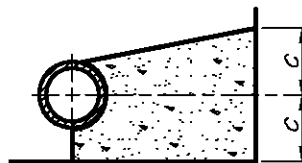
**PLAN
DEAD END**



**ELEVATION
DEAD END**



**PLAN
TYPICAL BEND**



SECTION X-X

**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

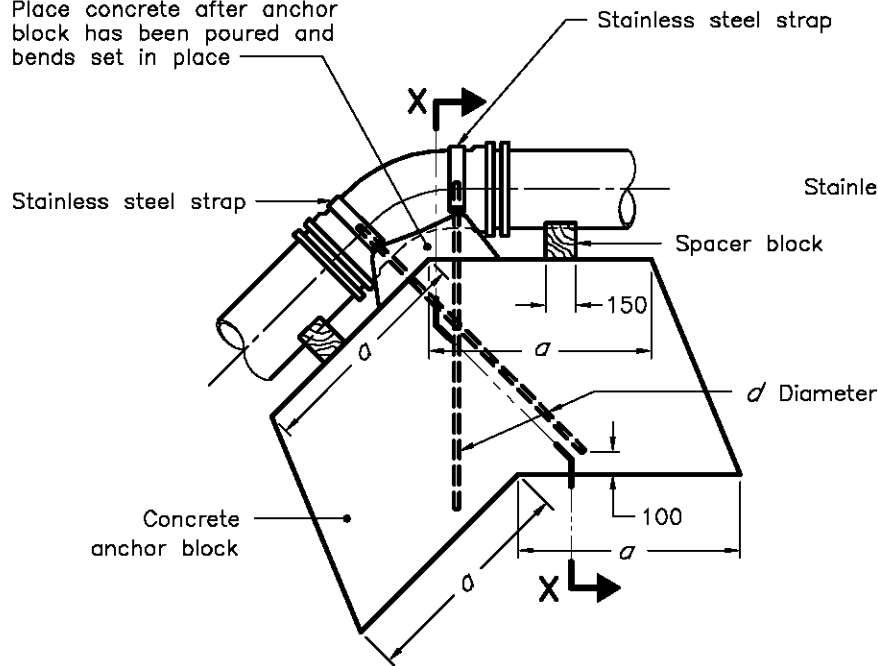
Rev 2

**CONCRETE THRUST BLOCKS
FOR TEES, PLUGS, AND
HORIZONTAL BENDS**

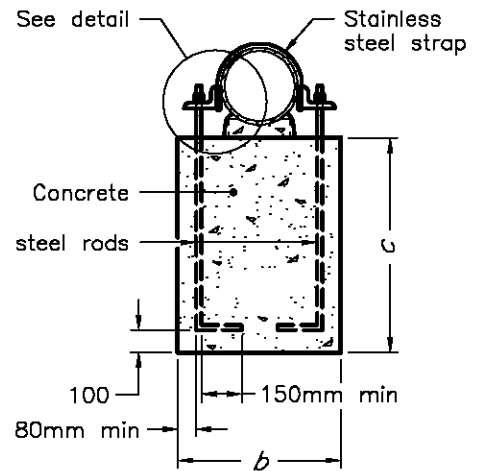
OPSD 1103.010



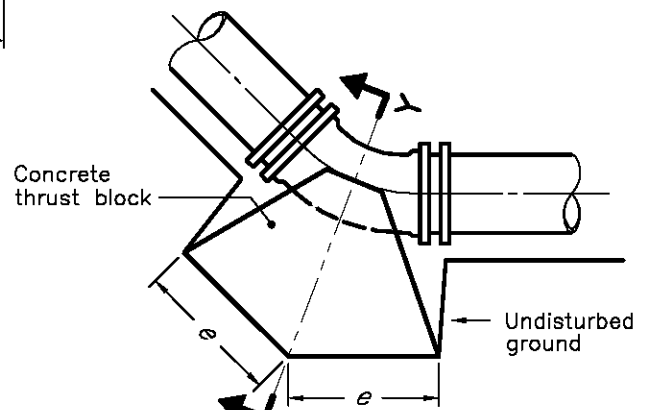
Place concrete after anchor block has been poured and bends set in place



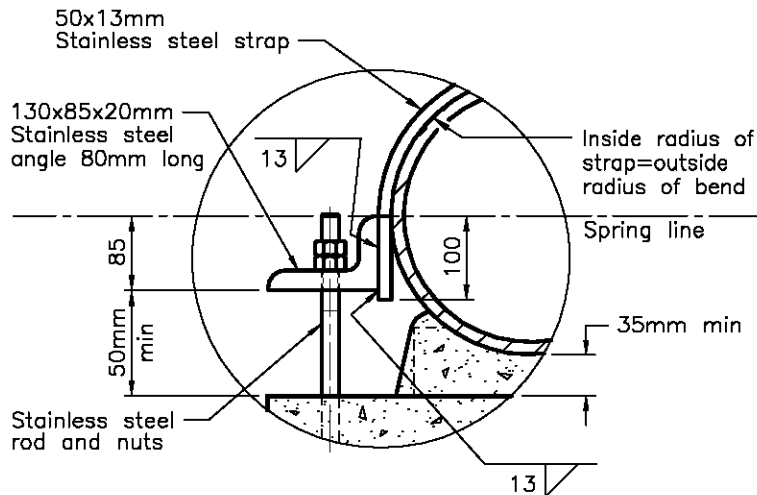
UP-THRUST BLOCK ELEVATION



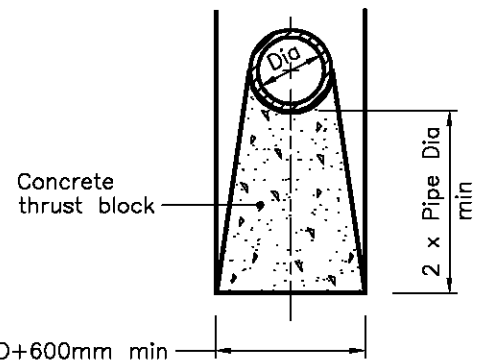
UP-THRUST BLOCK SECTION X-X



DOWN-THRUST BLOCK ELEVATION



DETAIL



DOWN-THRUST BLOCK SECTION Y-Y

NOTES:

A Concrete shall be placed to within 50mm of the face of the bell.

B Bond breaker shall be used between concrete and fittings.

C This blocking is for bends up to 45° for up-thrust and 90° for down-thrust.

D This OPSD shall be read in conjunction with OPSD 1103.021.

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013

Rev 3

**CONCRETE THRUST BLOCKS
FOR VERTICAL BENDS**

OPSD 1103.020



**SOILS WITH TYPICAL BEARING STRENGTH
OF 100 TO 199 kPa**

PIPE DIA	Note 1				
	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>
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				
	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>
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				
	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>
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.

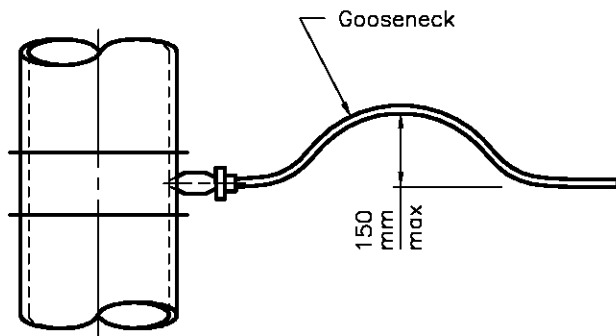
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 | Rev | 0

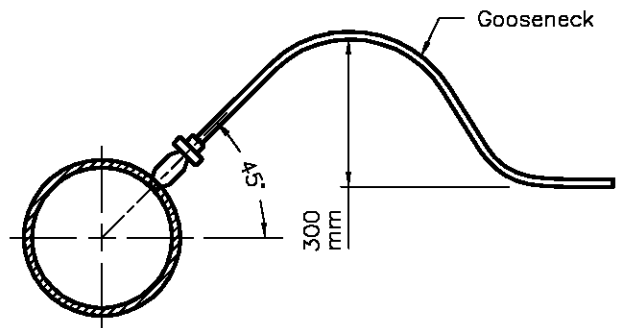
**DIMENSION TABLES FOR
CONCRETE THRUST BLOCKS
FOR VERTICAL BENDS**

OPSD 1103.021

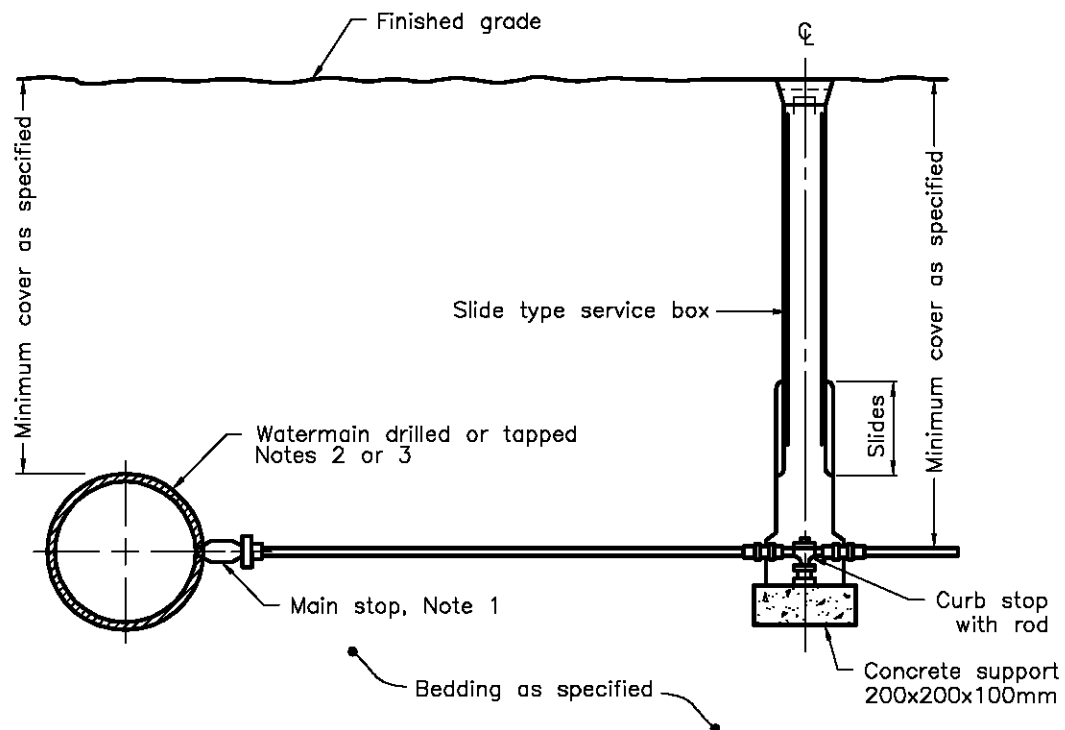




HORIZONTAL GOOSENECK



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

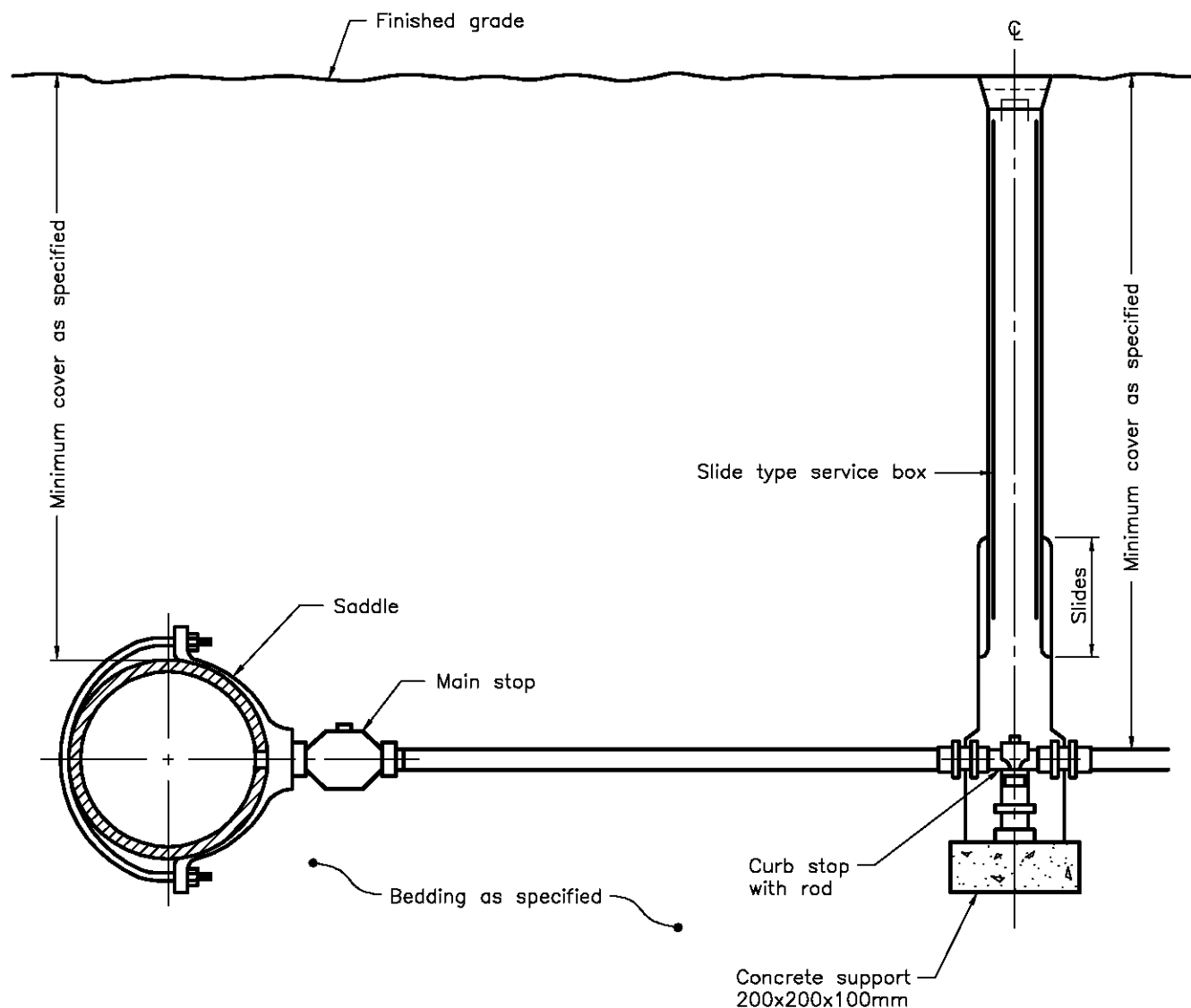
Rev 3

**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

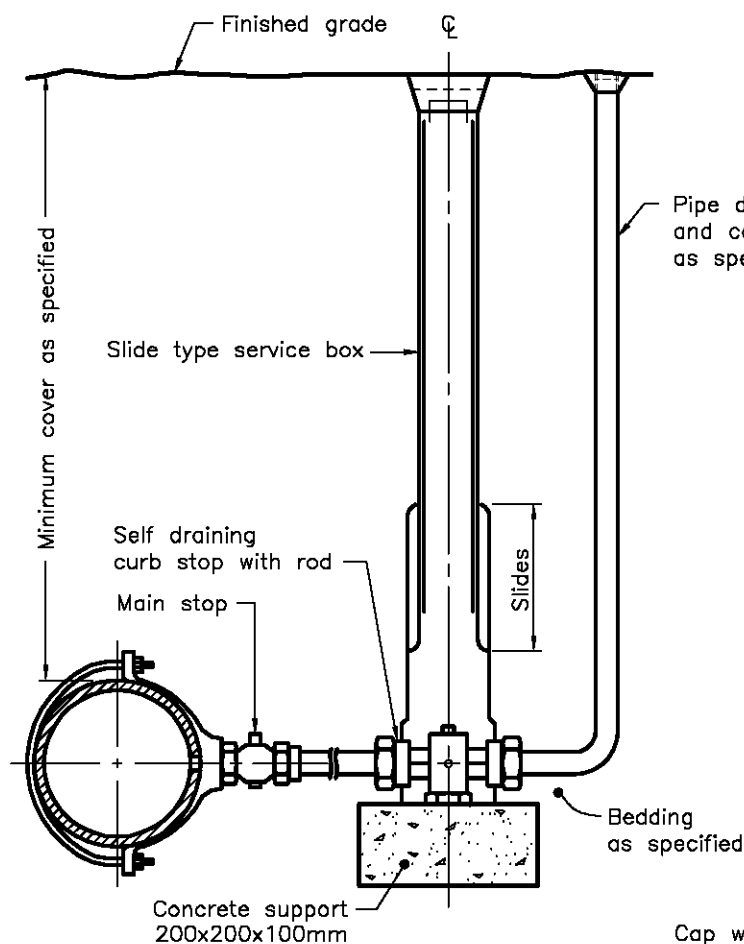
Rev 2

WATER SERVICE CONNECTION

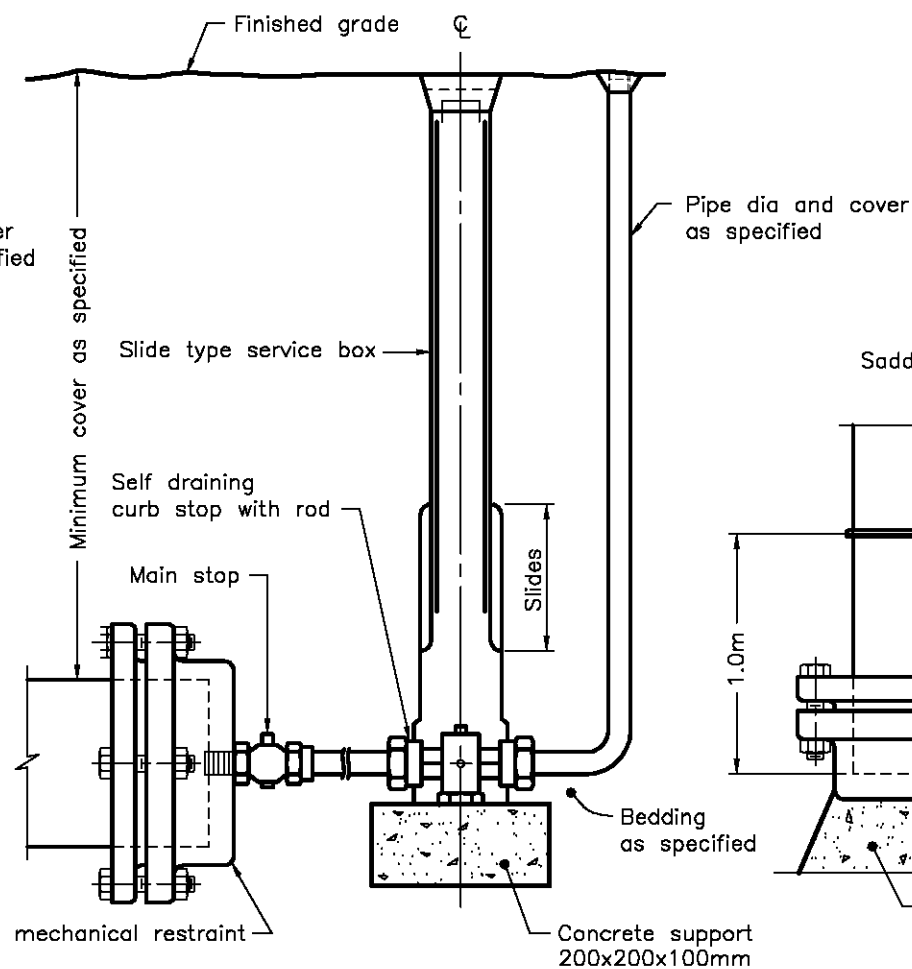
32, 38, and 50mm DIAMETER SIZES



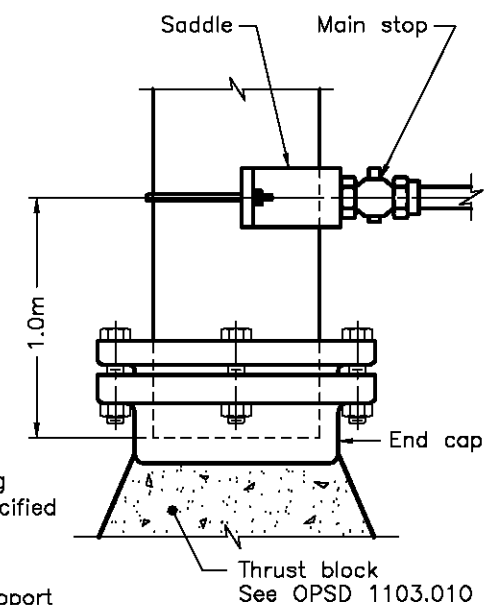
OPSD 1104.020



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.

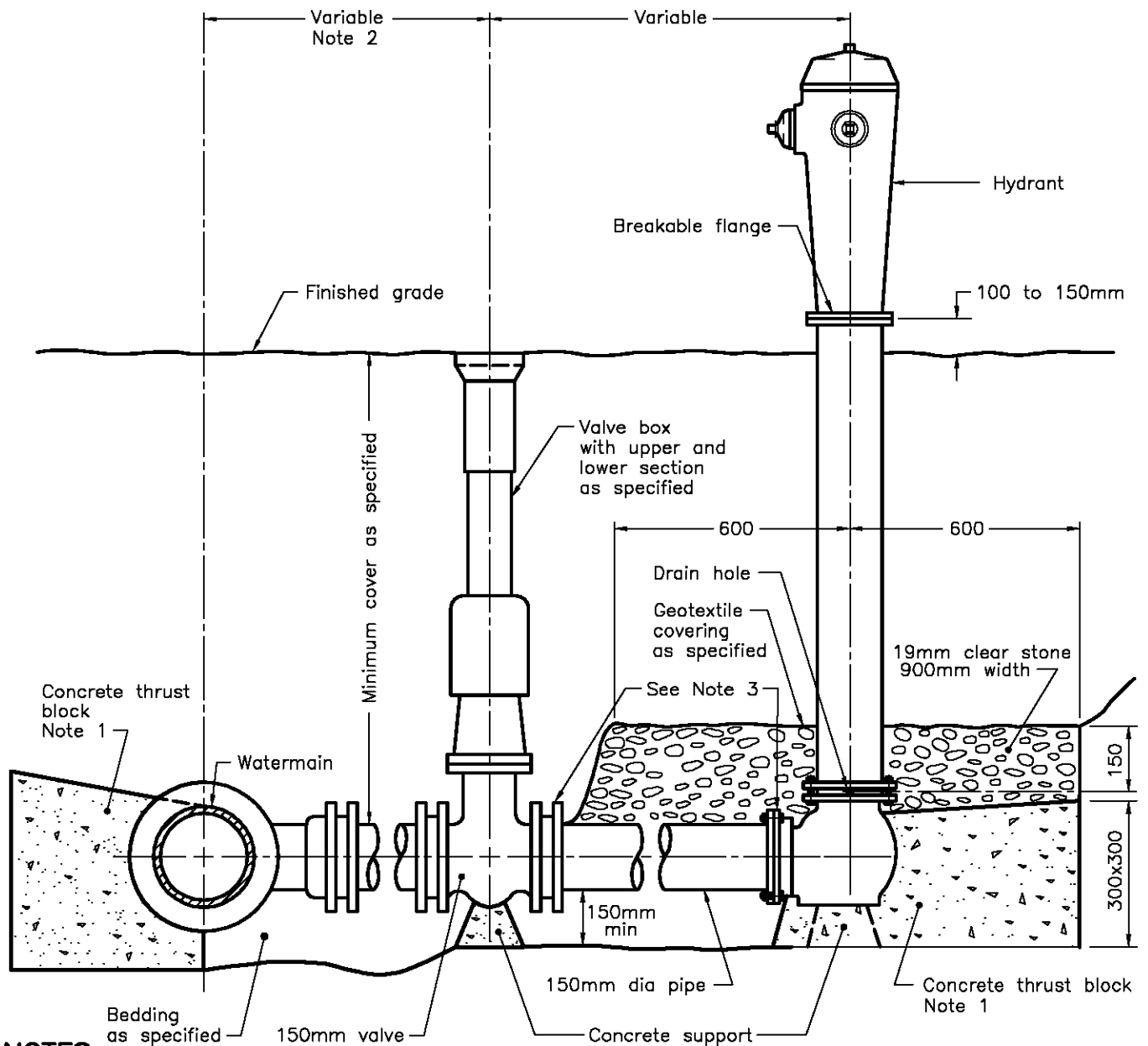
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 Rev 2

BLOW OFF INSTALLATION

OPSD 1104.030





NOTES:

- 1 All concrete thrust blocks shall be poured against undisturbed ground.
 - 2 When specified, for watermain 400mm and less, locate valve within 1.0m of centreline of watermain. Retaining and restraining devices shall be utilized. For watermain 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

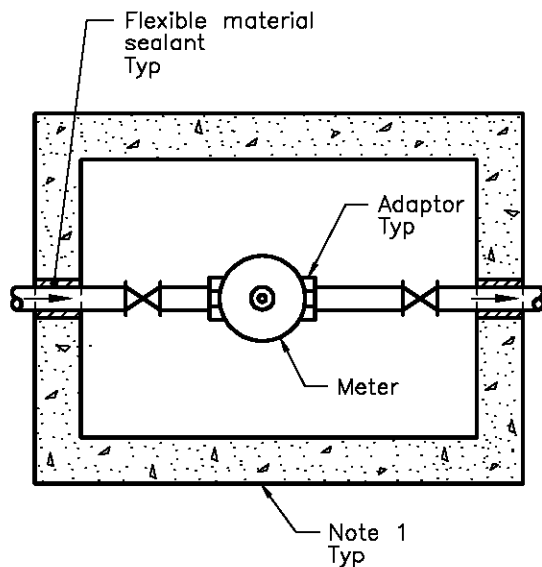
Nov 2013

Rev 2

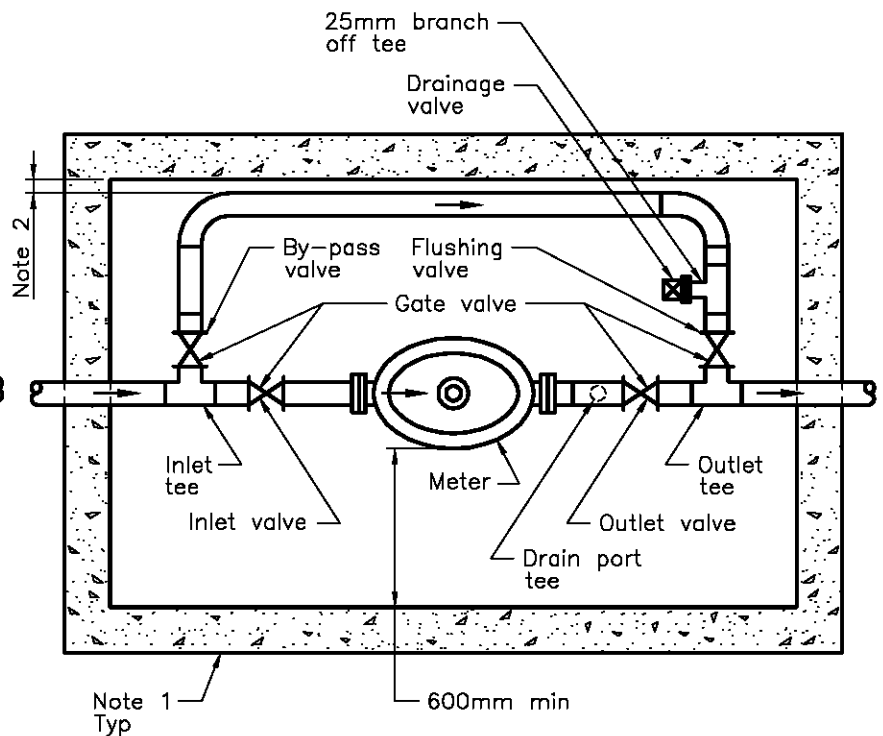
HYDRANT INSTALLATION

OPSD 1105.010

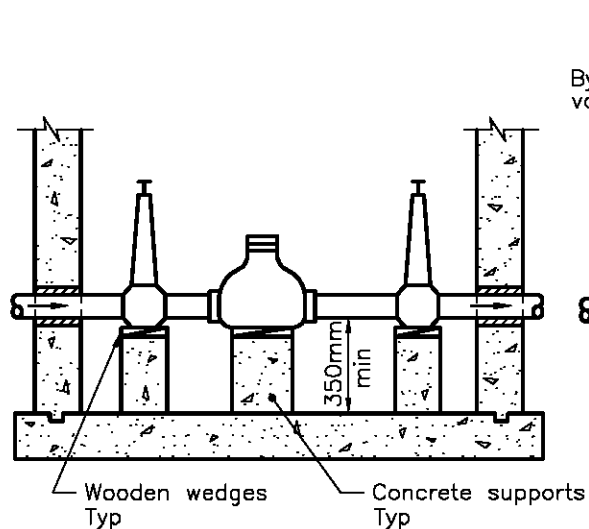




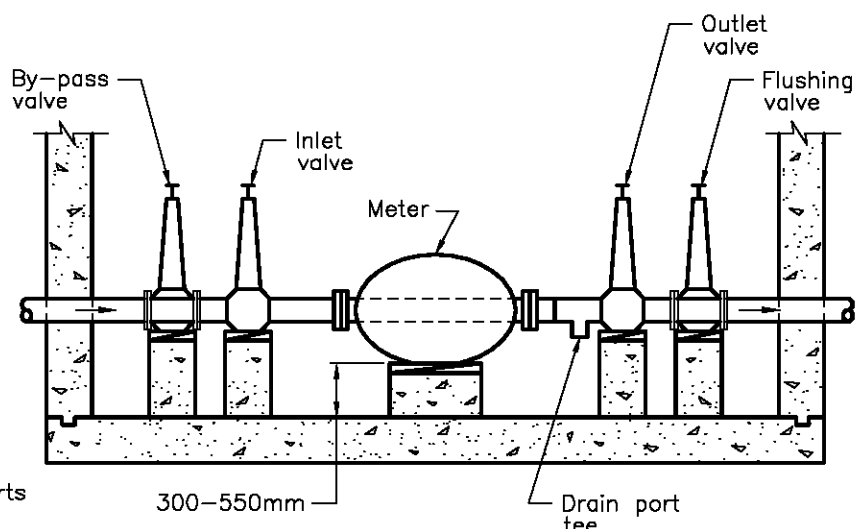
**PLAN
NO BY-PASS**



**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

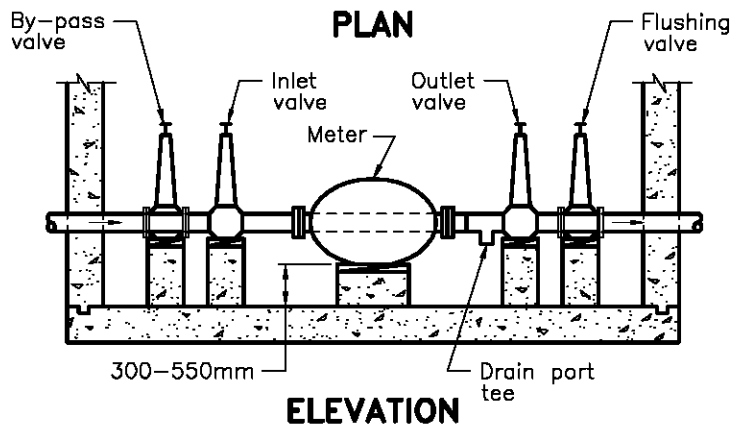
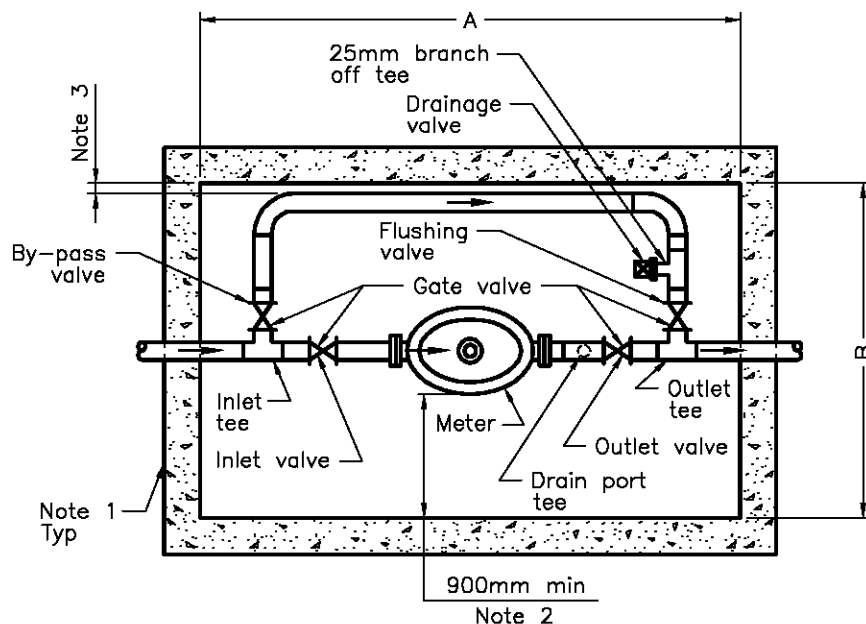
Nov 2014

Rev 2

**PIPING LAYOUT FOR
WATER METERS 50mm AND
SMALLER IN CHAMBERS**



OPSD 1107.010



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.

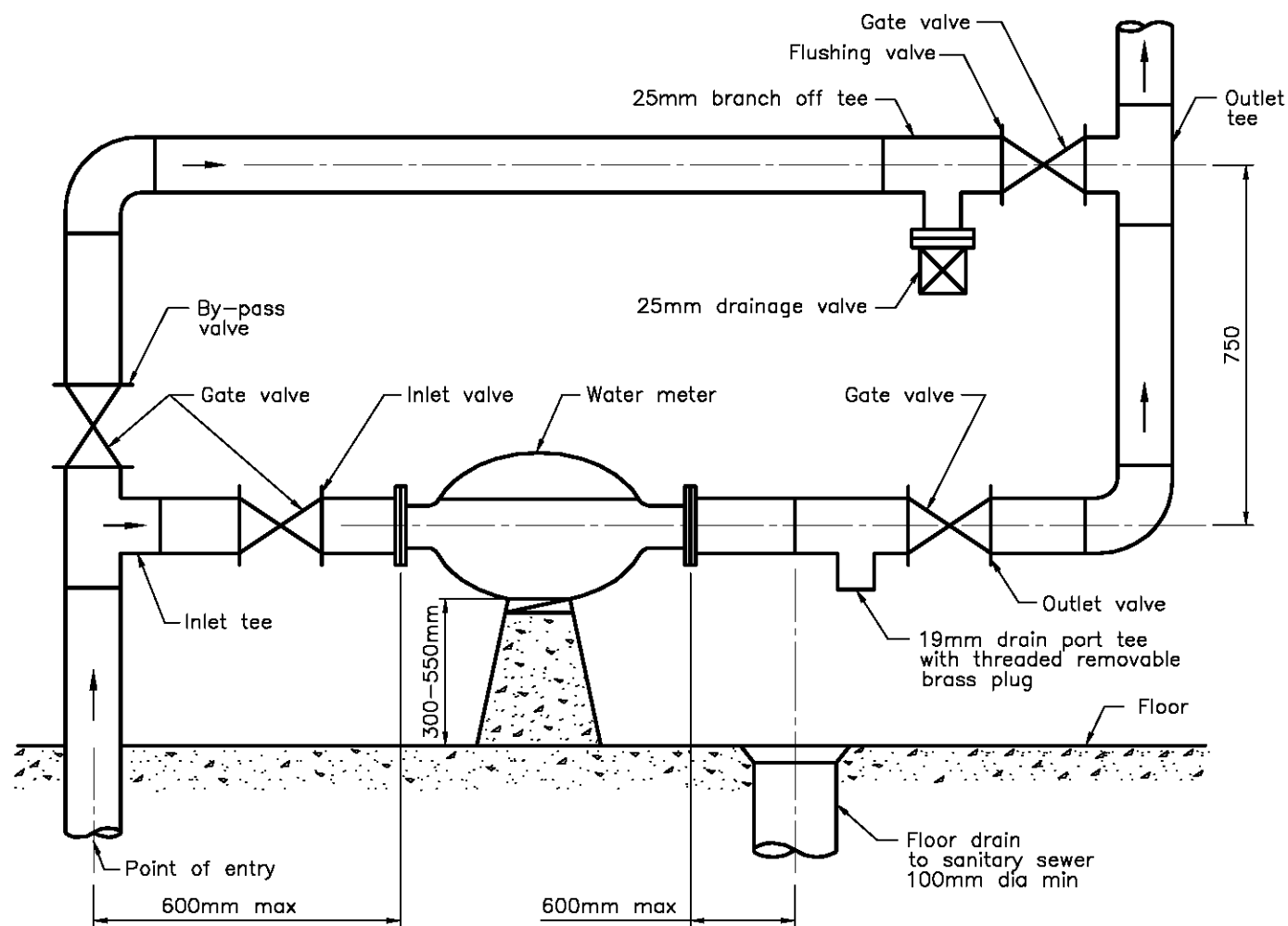
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 Rev 2

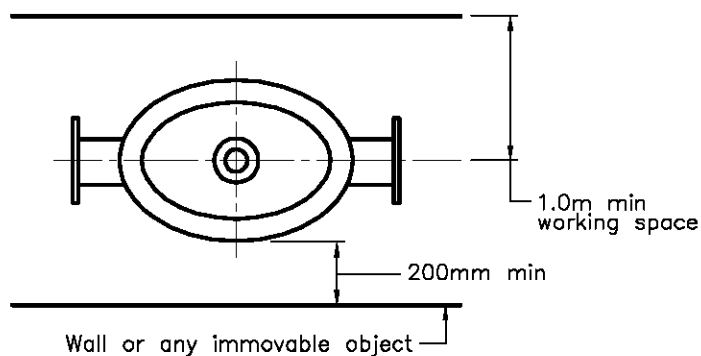
PIPING LAYOUT FOR
WATER METERS 75 TO 250mm
IN CHAMBERS WITH BY-PASS



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.

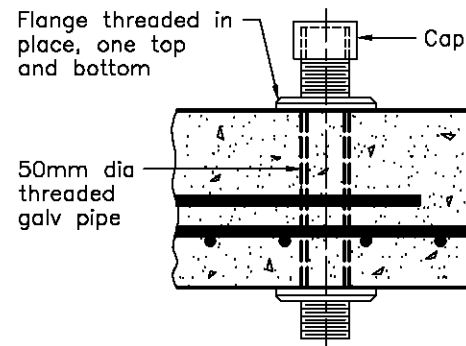
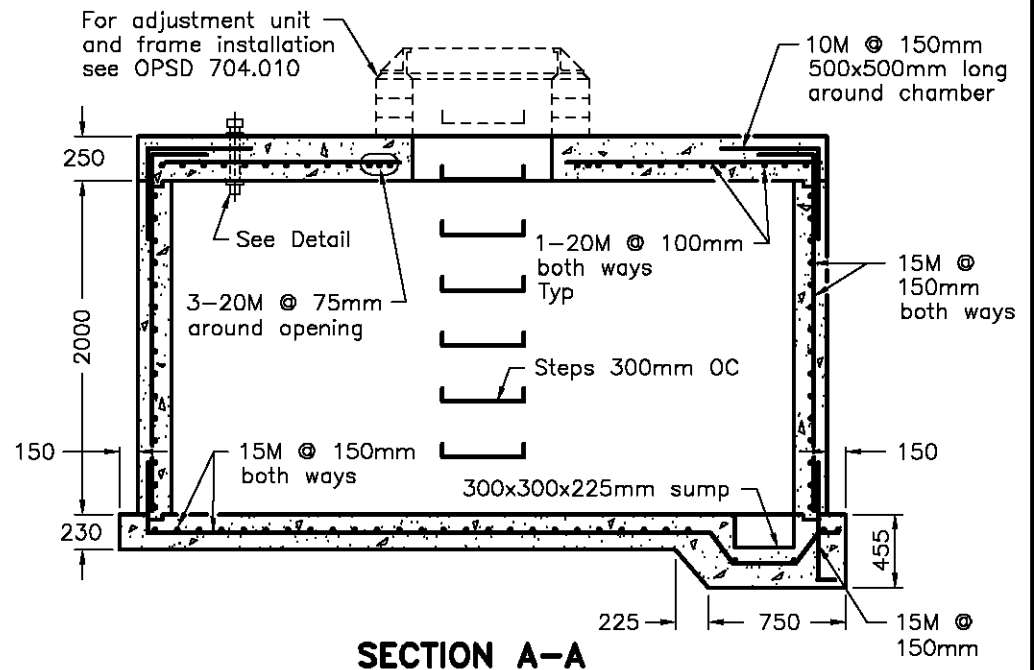
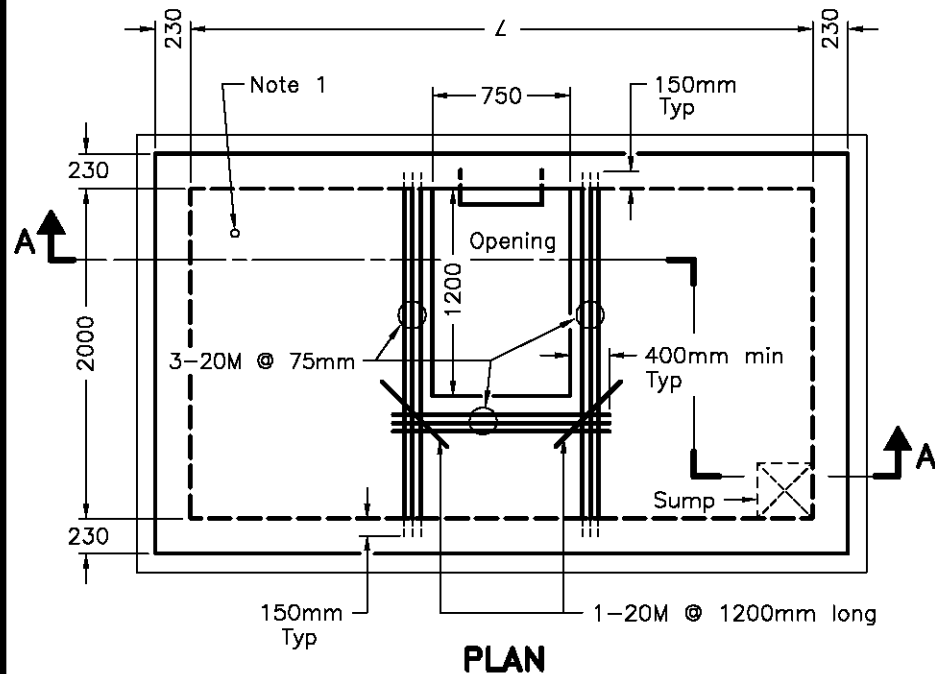
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 | Rev | 2

**PIPING LAYOUT
FOR WATER METERS
IN BUILDING WITH BY-PASS**



OPSD 1107.030



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

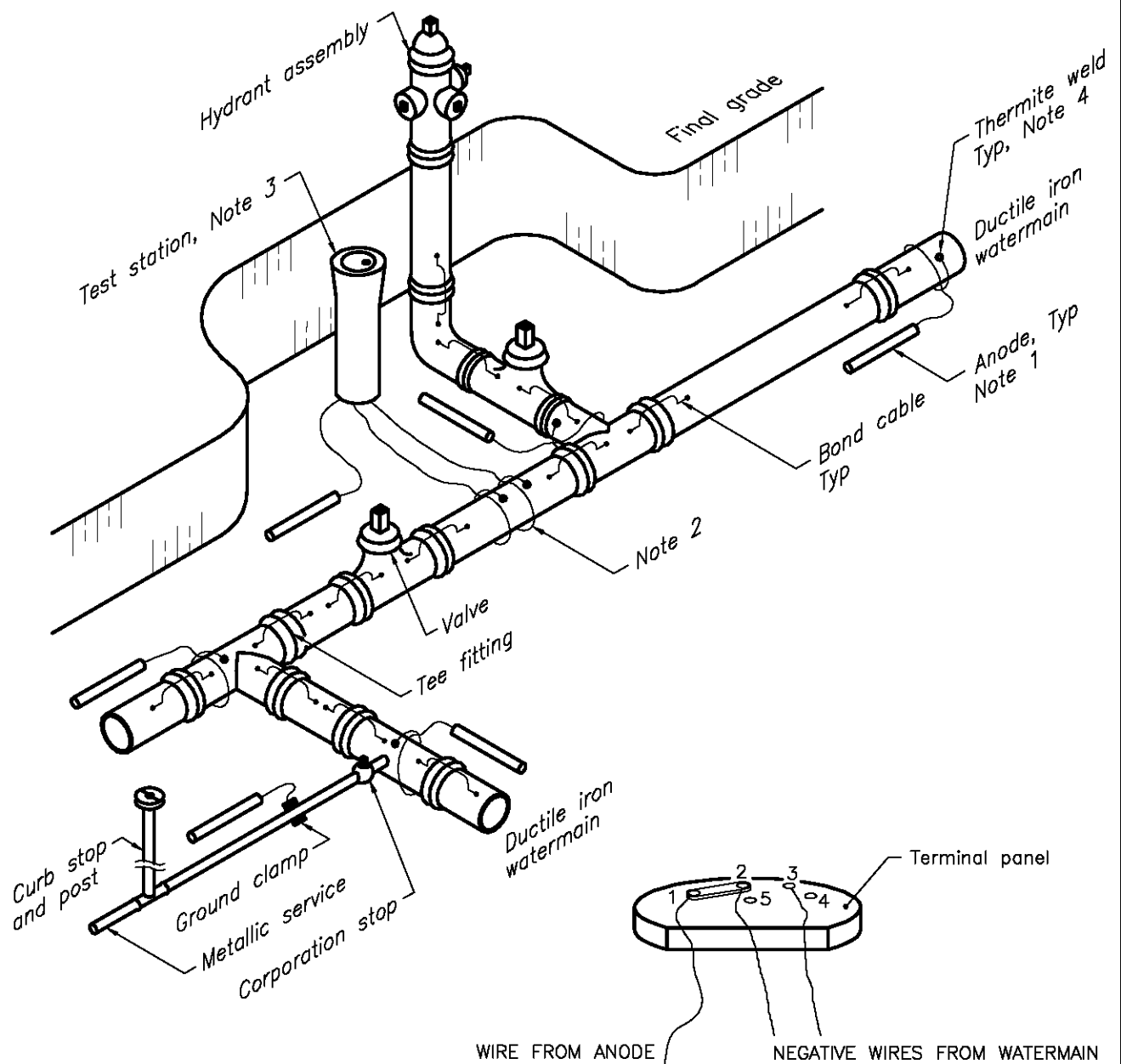
Nov 2013

Rev 2

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

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

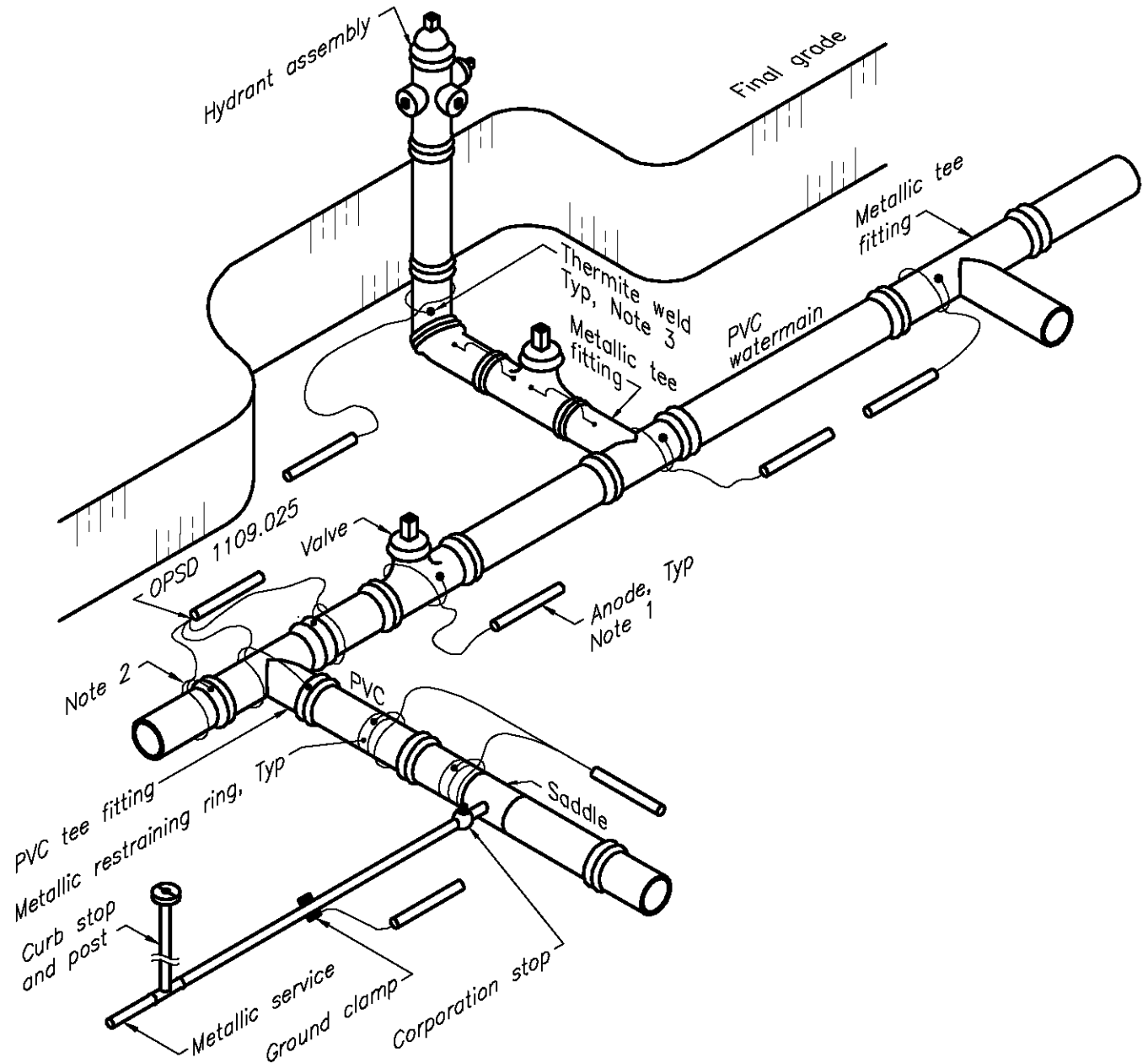
Nov 2015

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.

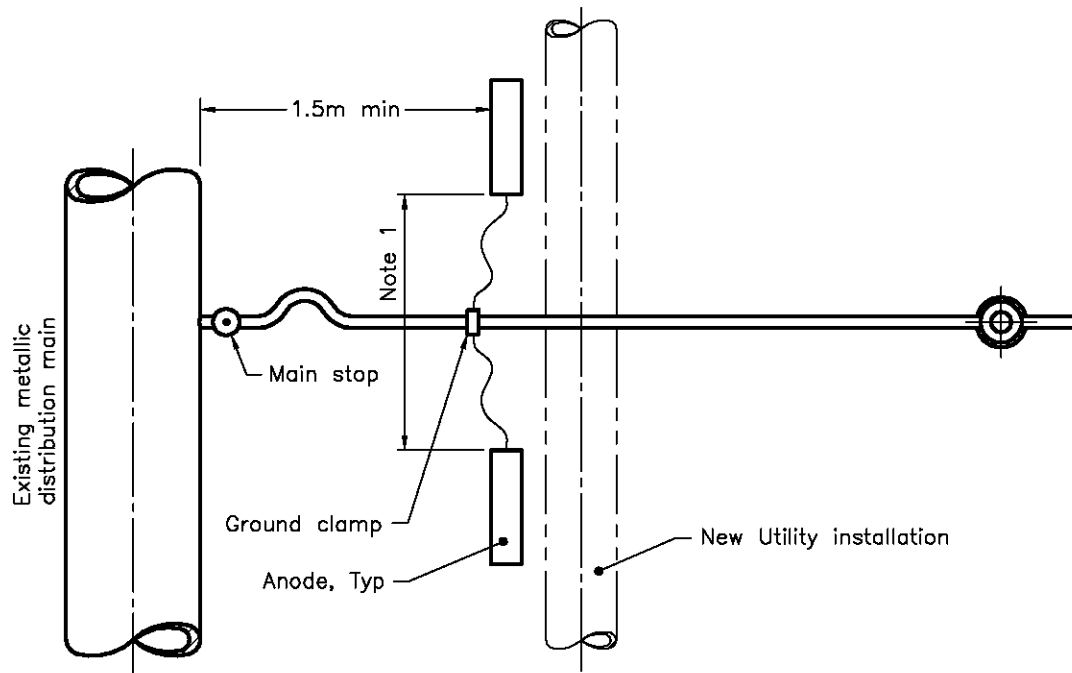
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2015 Rev 2

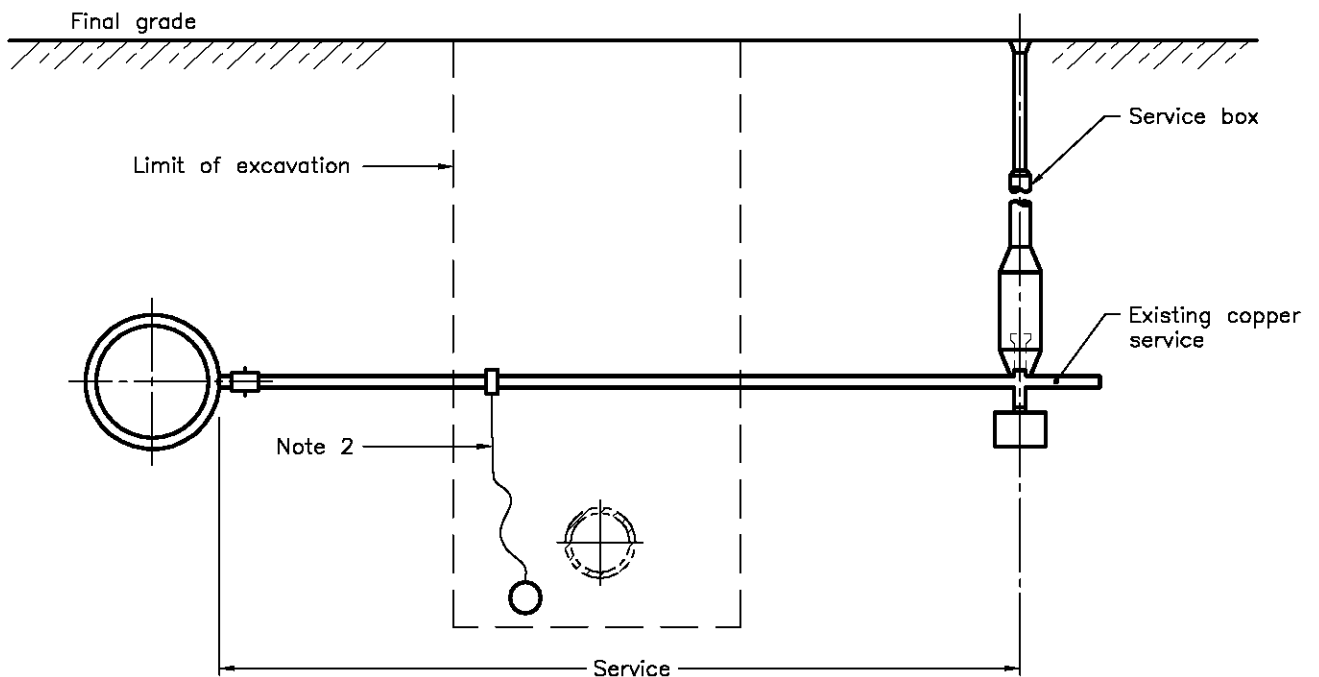
CATHODIC PROTECTION FOR PVC WATERMAIN SYSTEMS



OPSD 1109.011



PLAN



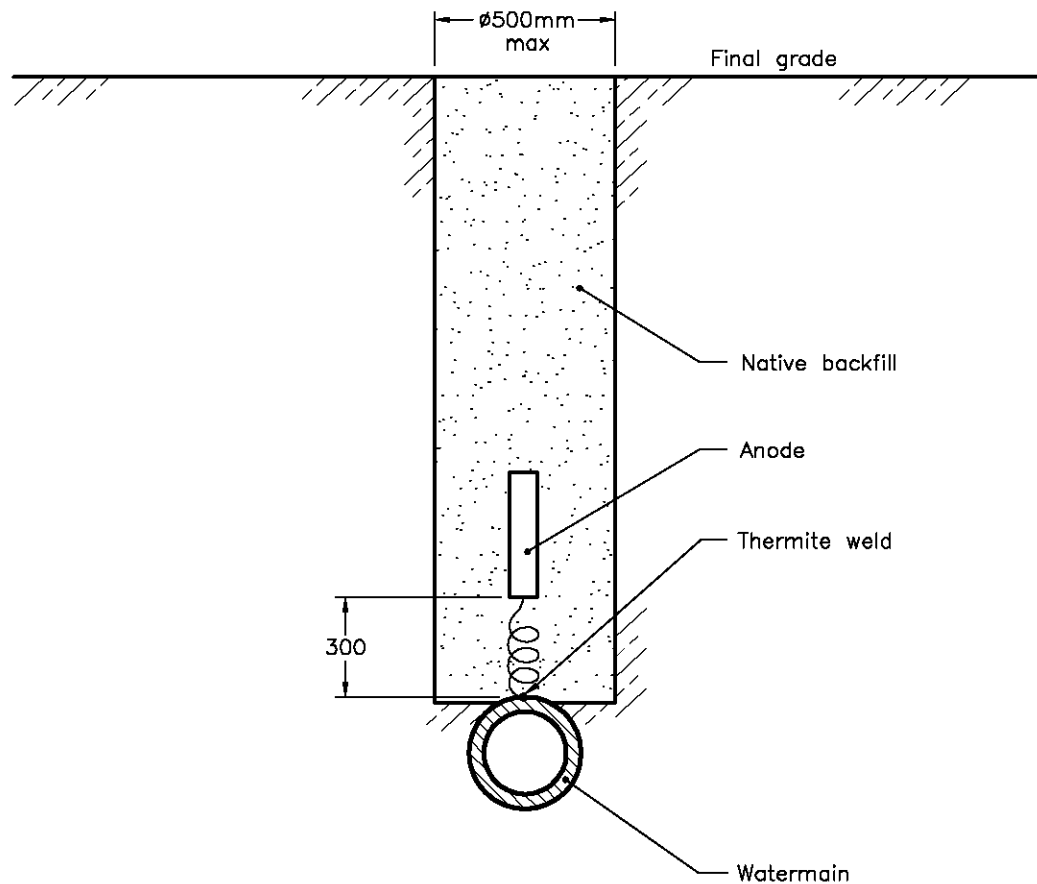
ELEVATION

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.

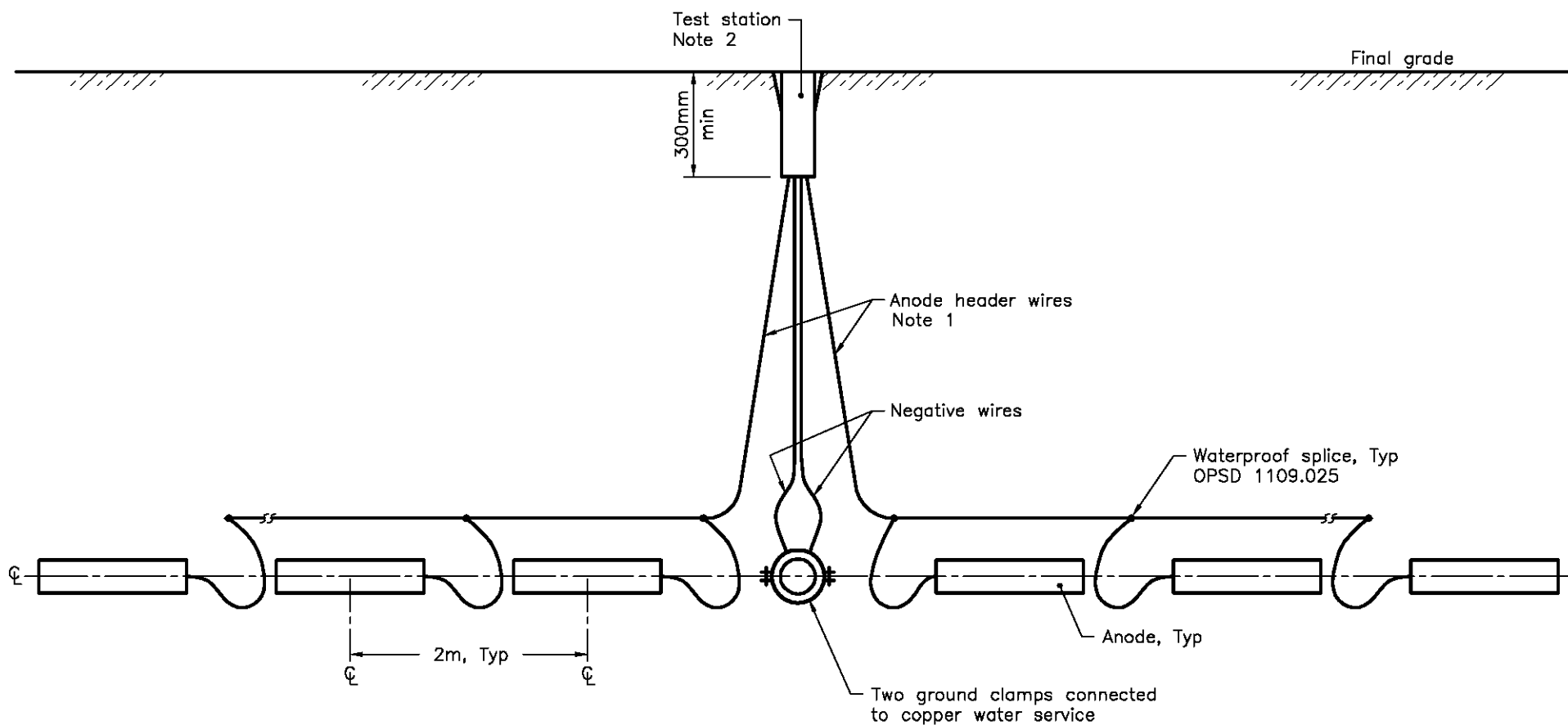
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	1	
CATHODIC PROTECTION OF EXISTING METALLIC WATERMAINS EXPOSED SERVICE OR PIPE METHOD				
	OPSD 1109.012			



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

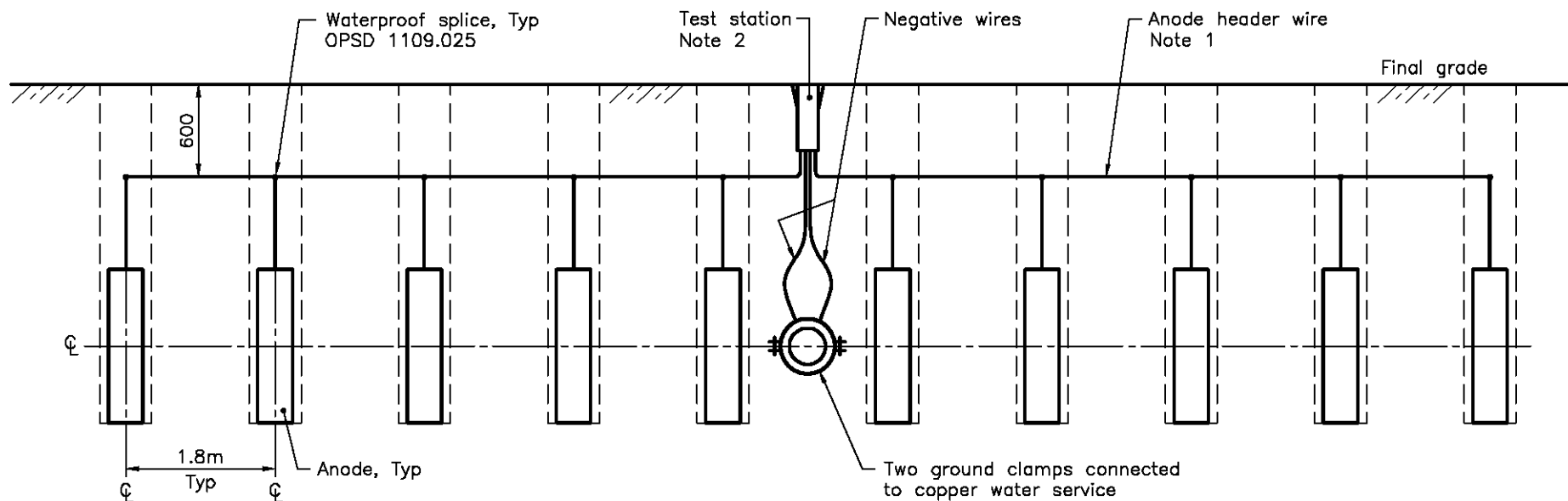
**HORIZONTAL ANODE
BANK AT SERVICE**

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

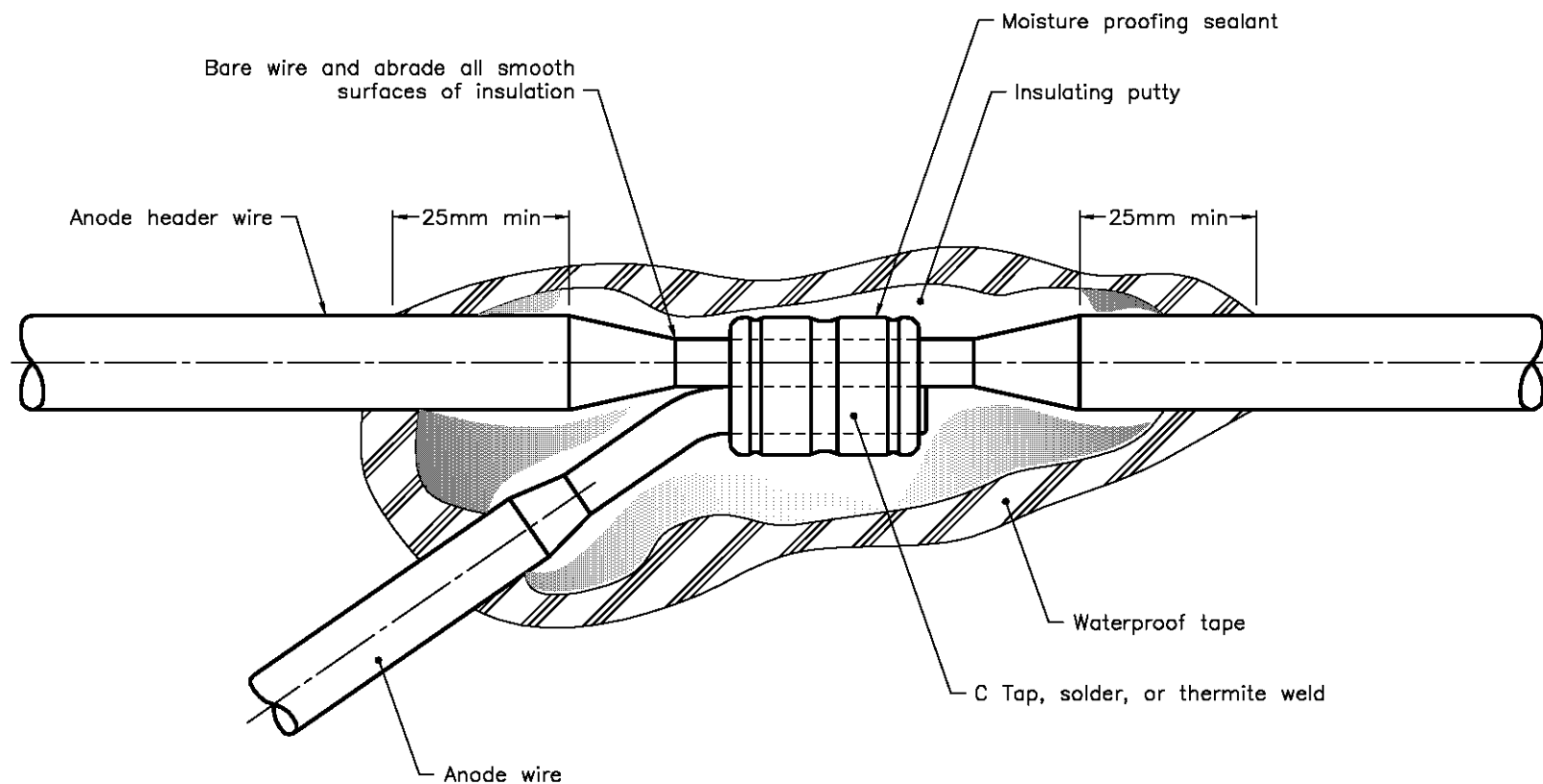
Nov 2015

Rev 1

**VERTICAL ANODE
BANK AT SERVICE**



OPSD 1109.015



NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

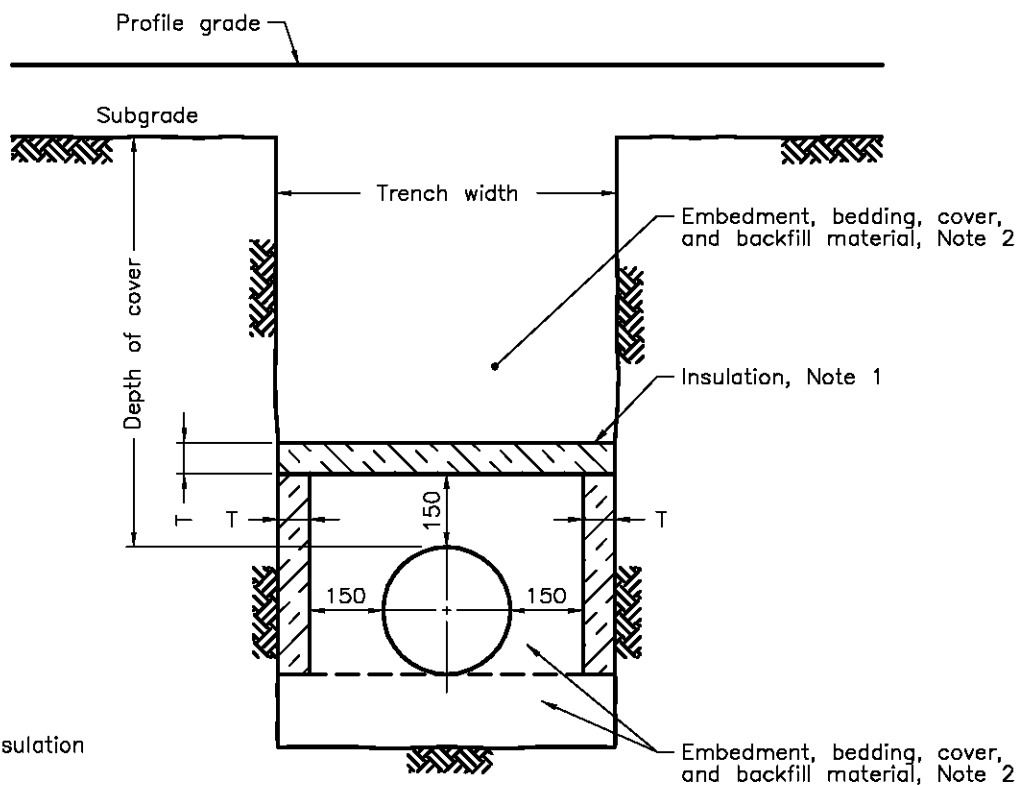
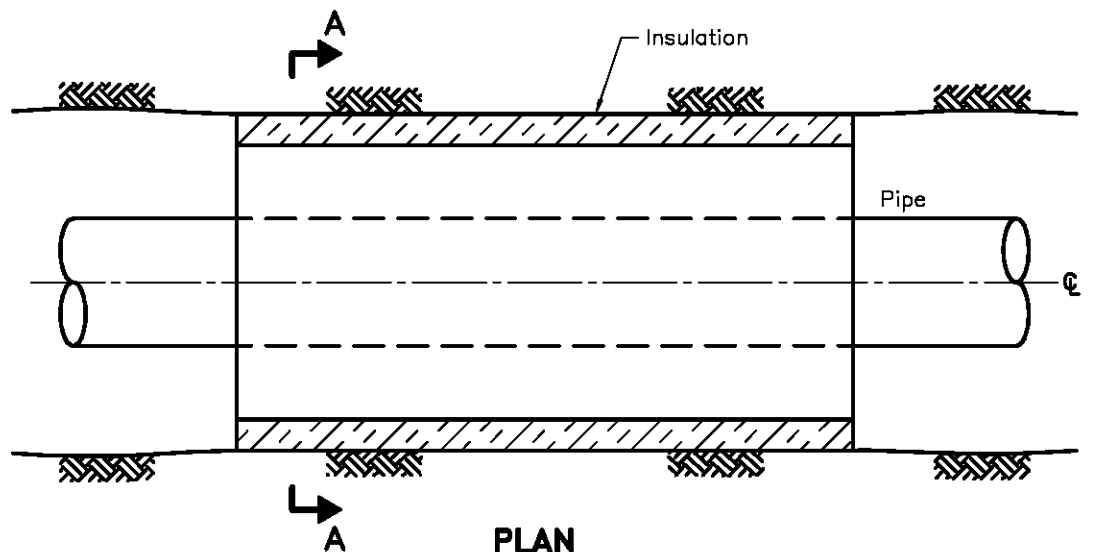
**WATERPROOFING
OF SPLICES**

Nov 2015

Rev 1



OPSD 1109.025



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 OPSS 802.010, 802.013, 802.020, and 802.023.
 - b) Rigid - OPSS 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

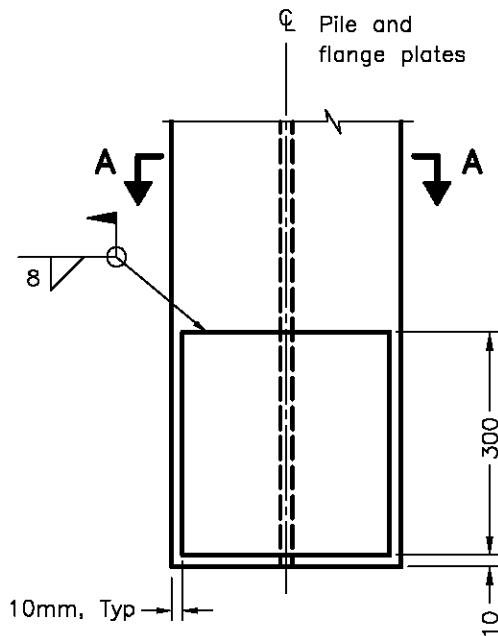
Nov 2015

Rev 0

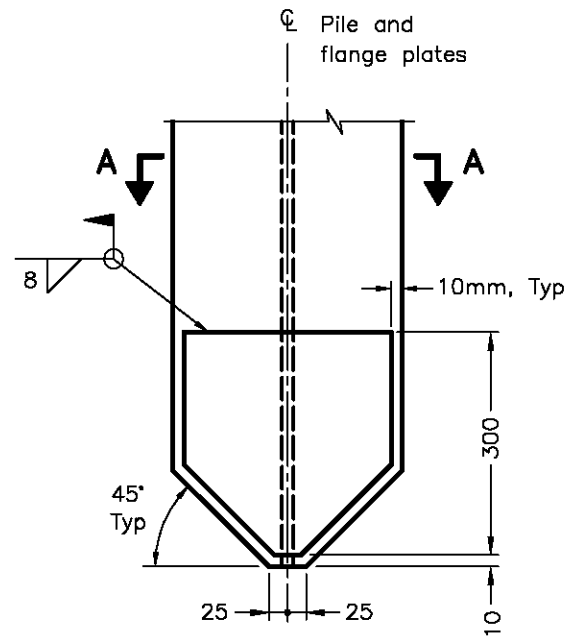
INSULATION FOR
SEWERS AND WATERMAINS
IN SHALLOW TRENCHES

OPSD 1109.030



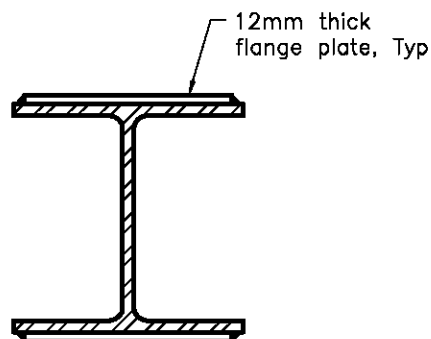


TYPE I



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

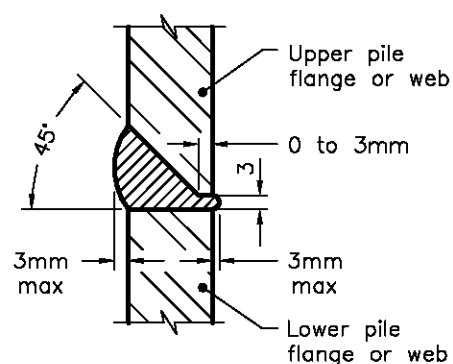
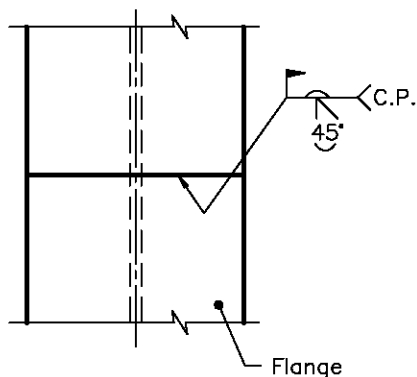
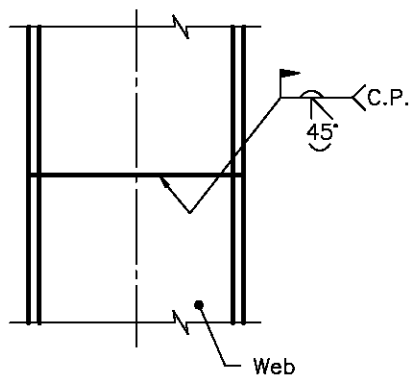
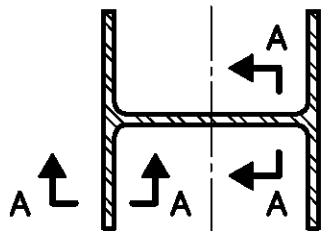
Rev 2

FOUNDATION
PILES

STEEL H-PILE DRIVING SHOE

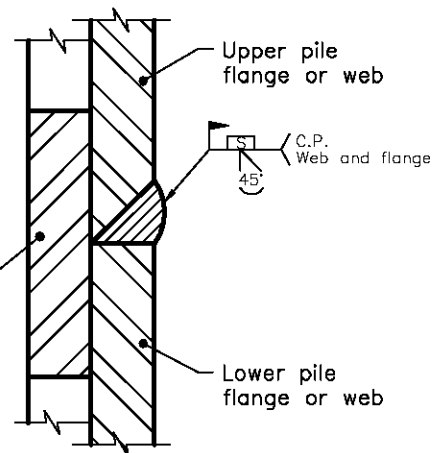
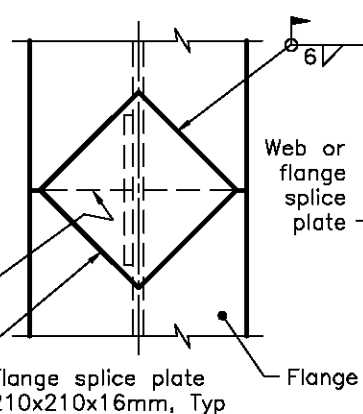
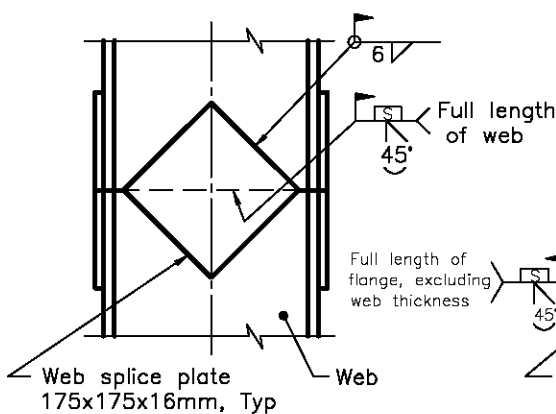
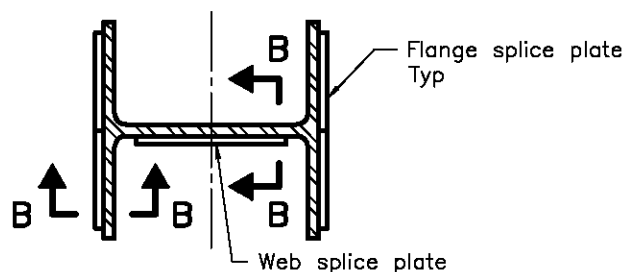


OPSD 3000.100



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

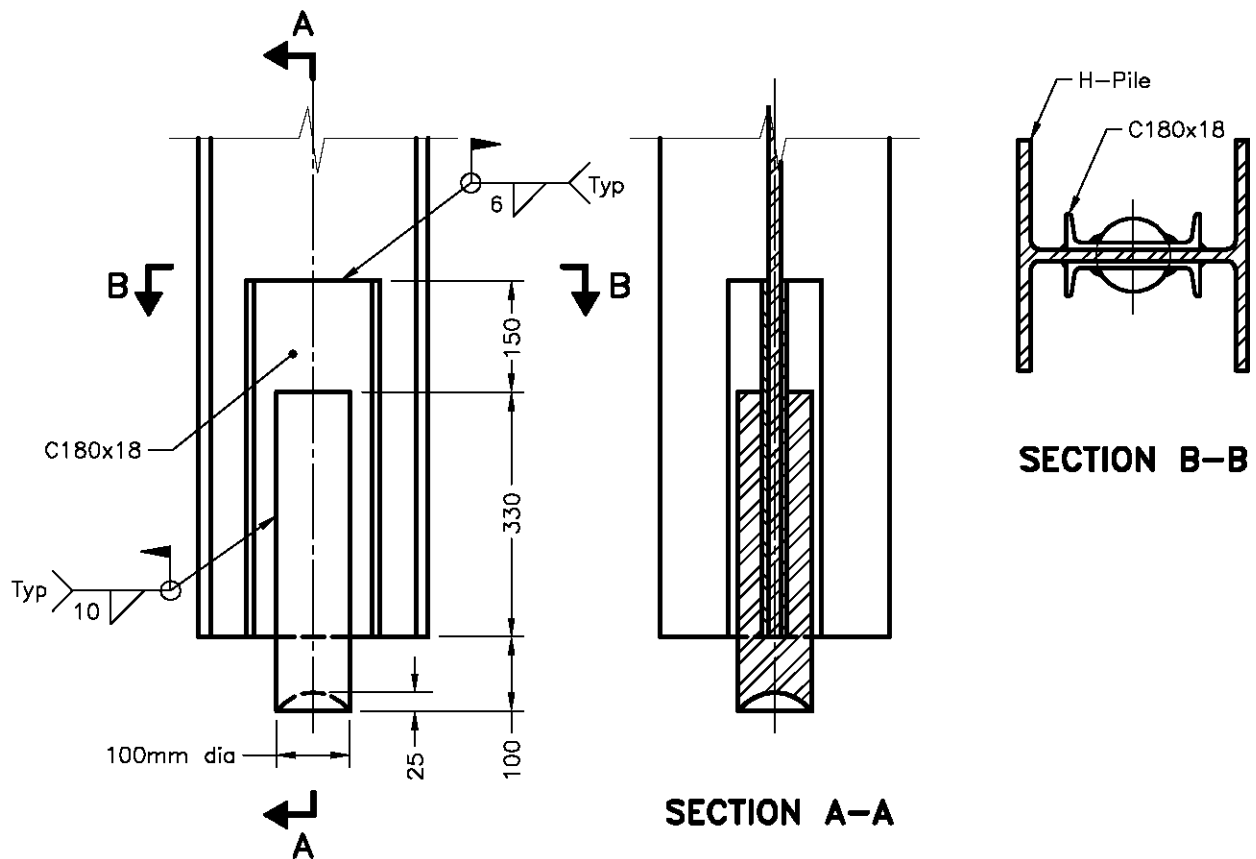
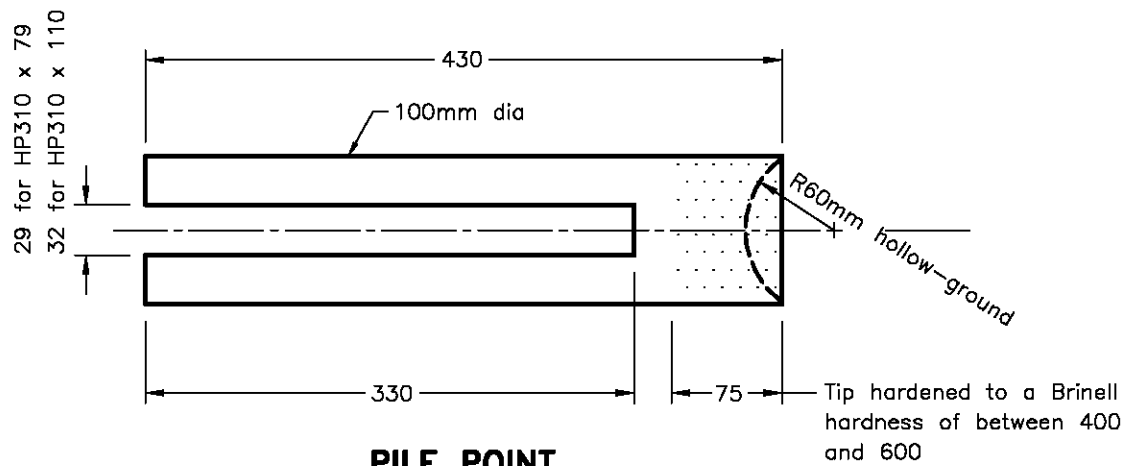
Rev

1

**FOUNDATION
PILES
STEEL H-PILE SPLICE**

OPSD 3000.150





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

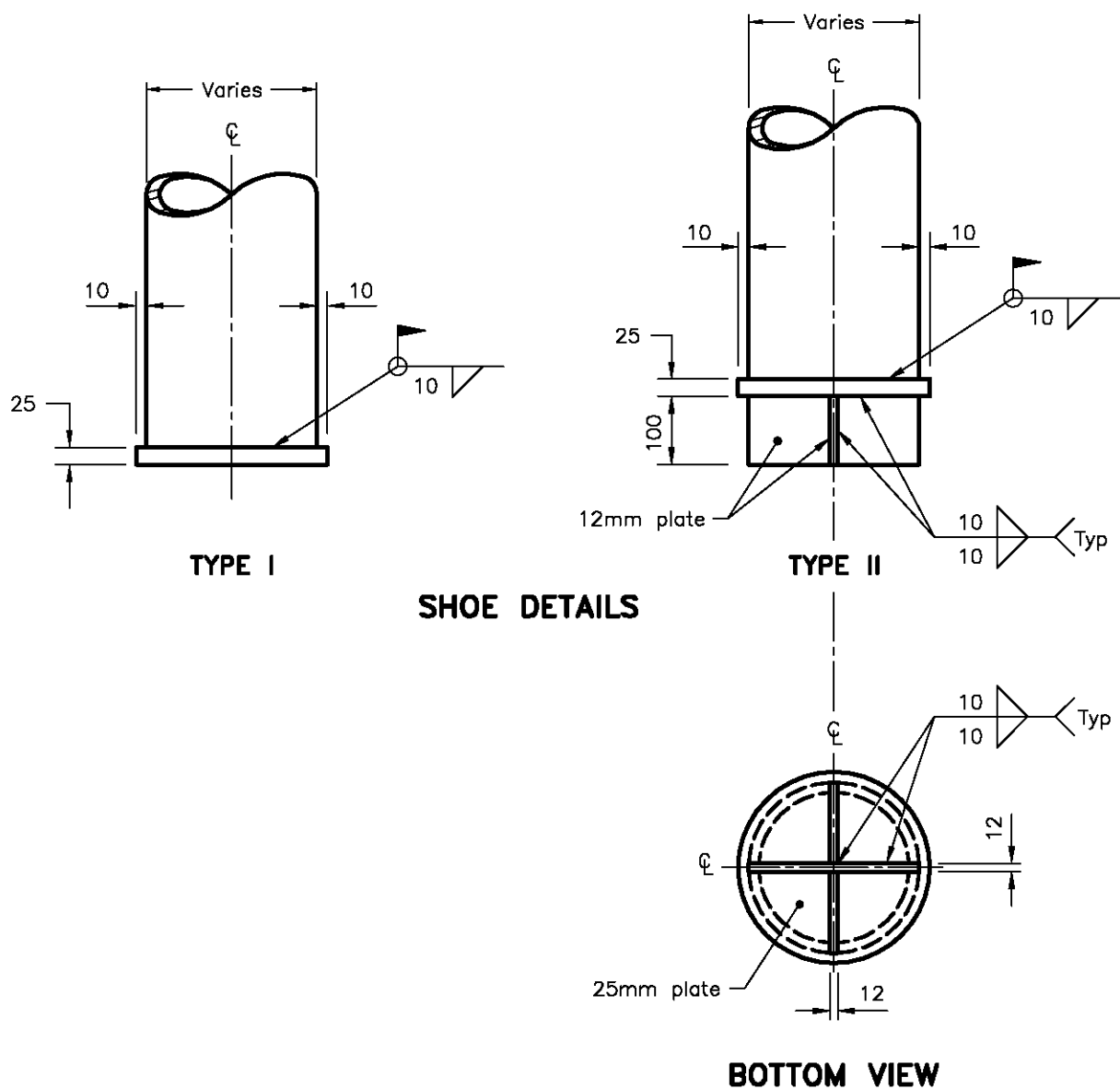
Nov 2010

Rev 1

FOUNDATION
PILES
STEEL HP 310 OSLO POINT

OPSD 3000.201





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

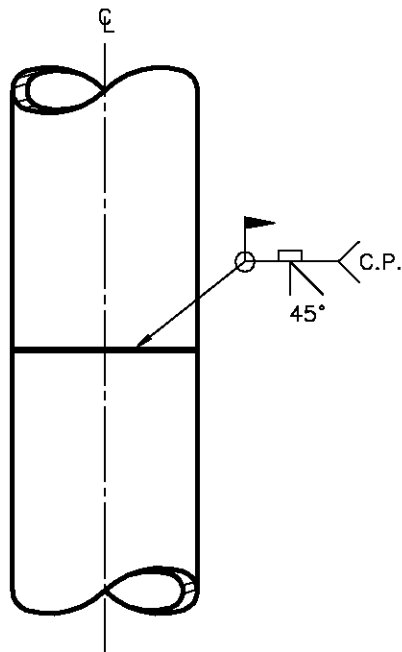
Rev 1

FOUNDATION
PILES

STEEL TUBE PILE DRIVING SHOE



OPSD 3001.100

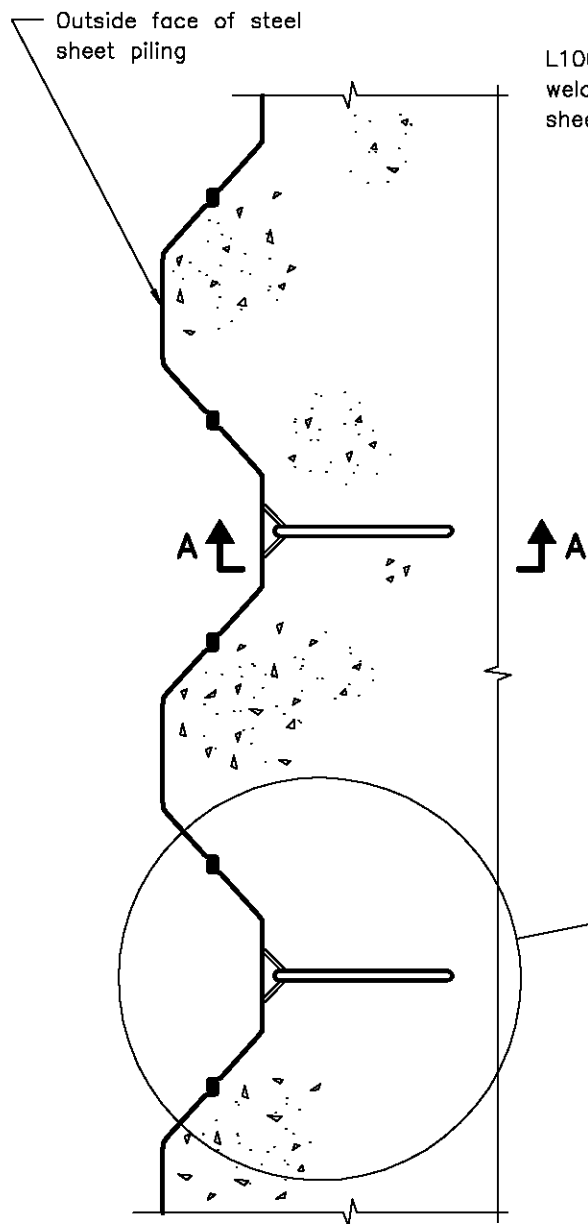


SPLICE DETAILS

NOTES:

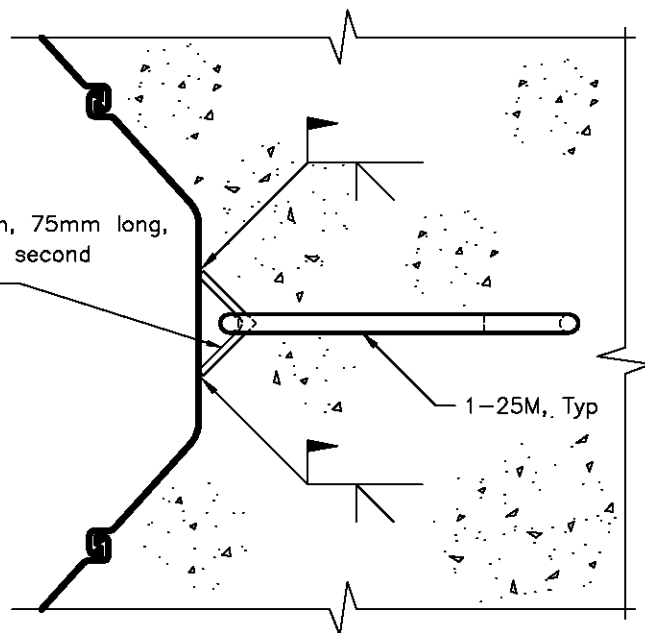
A Splice weld shall be full penetration butt weld perpendicular to centreline of pile.

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

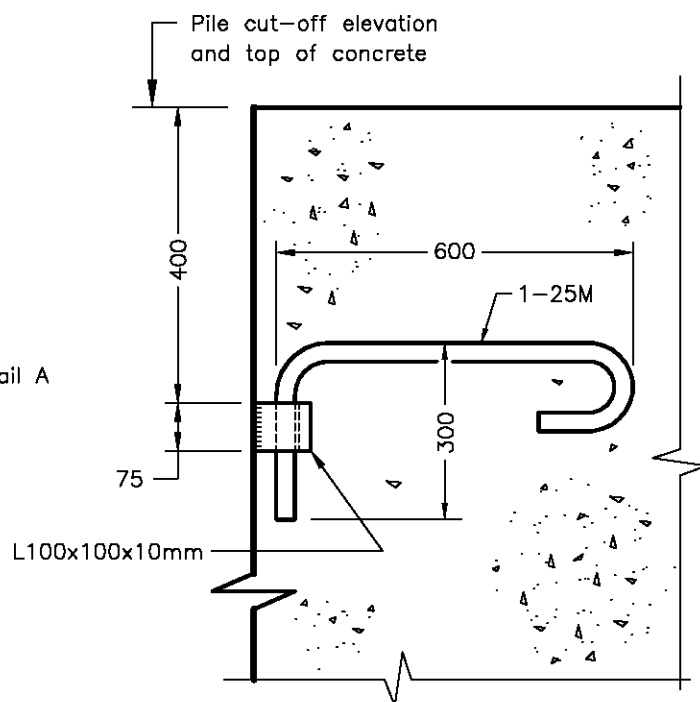


PLAN

L100x100x10mm, 75mm long, welded to every second sheet pile, Typ



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

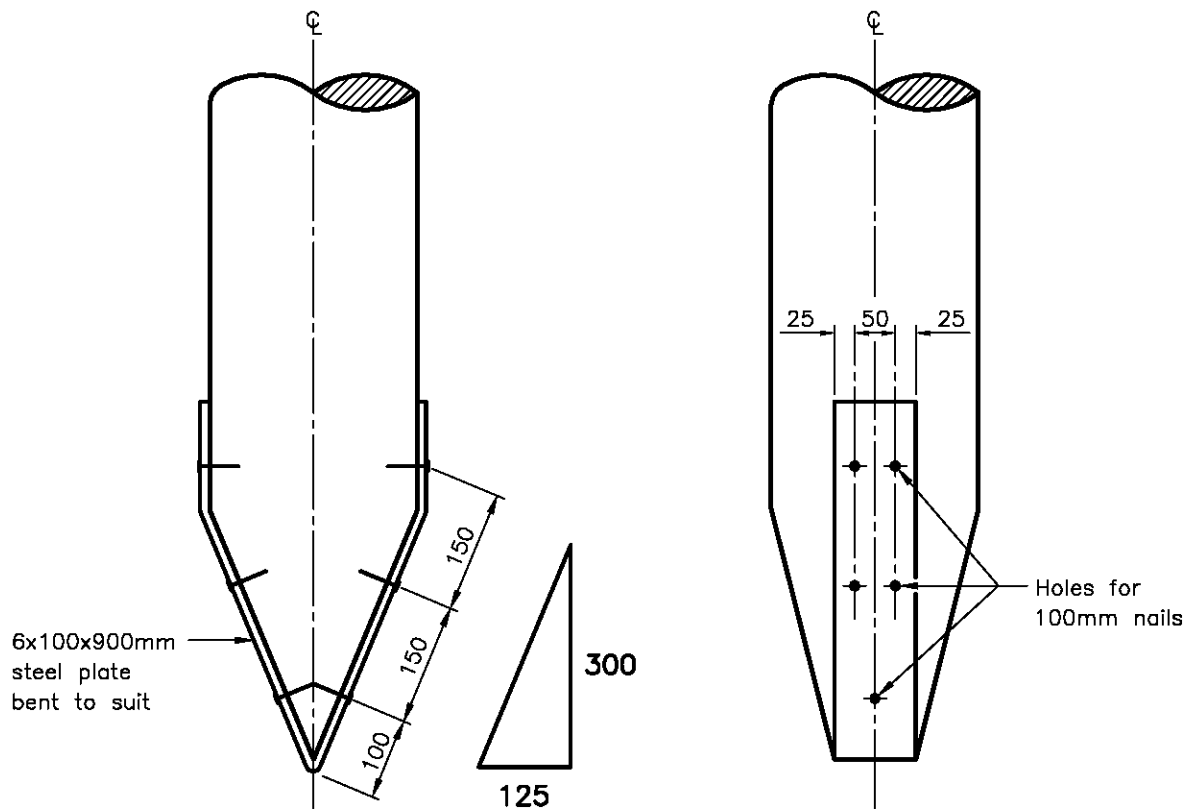
Rev 1

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

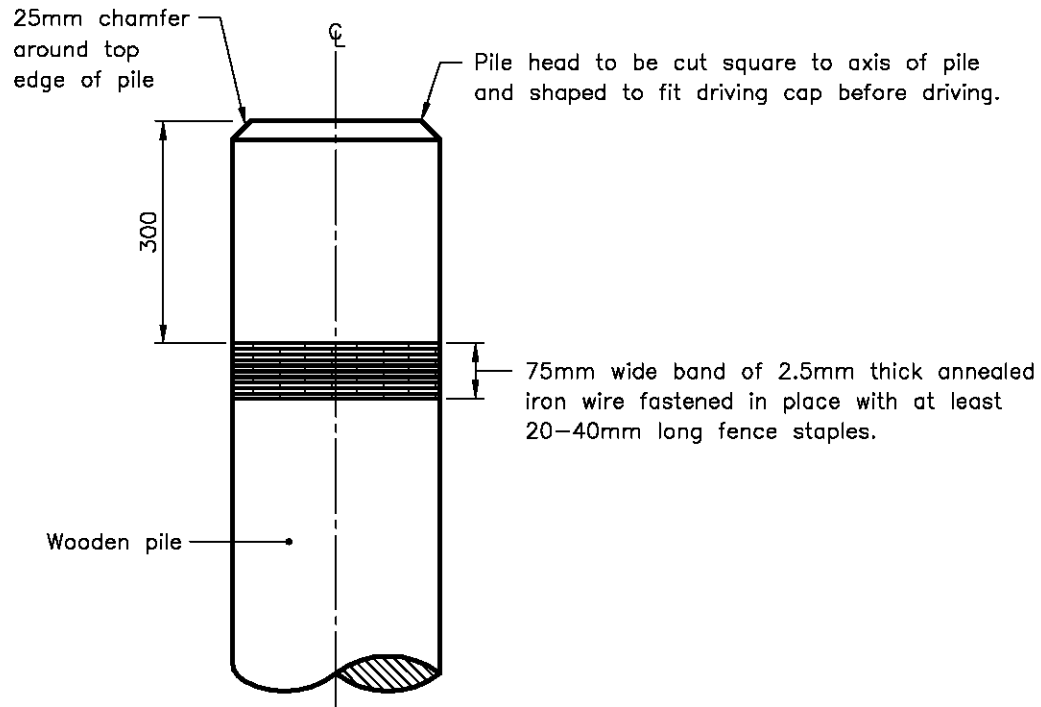
Rev 1

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

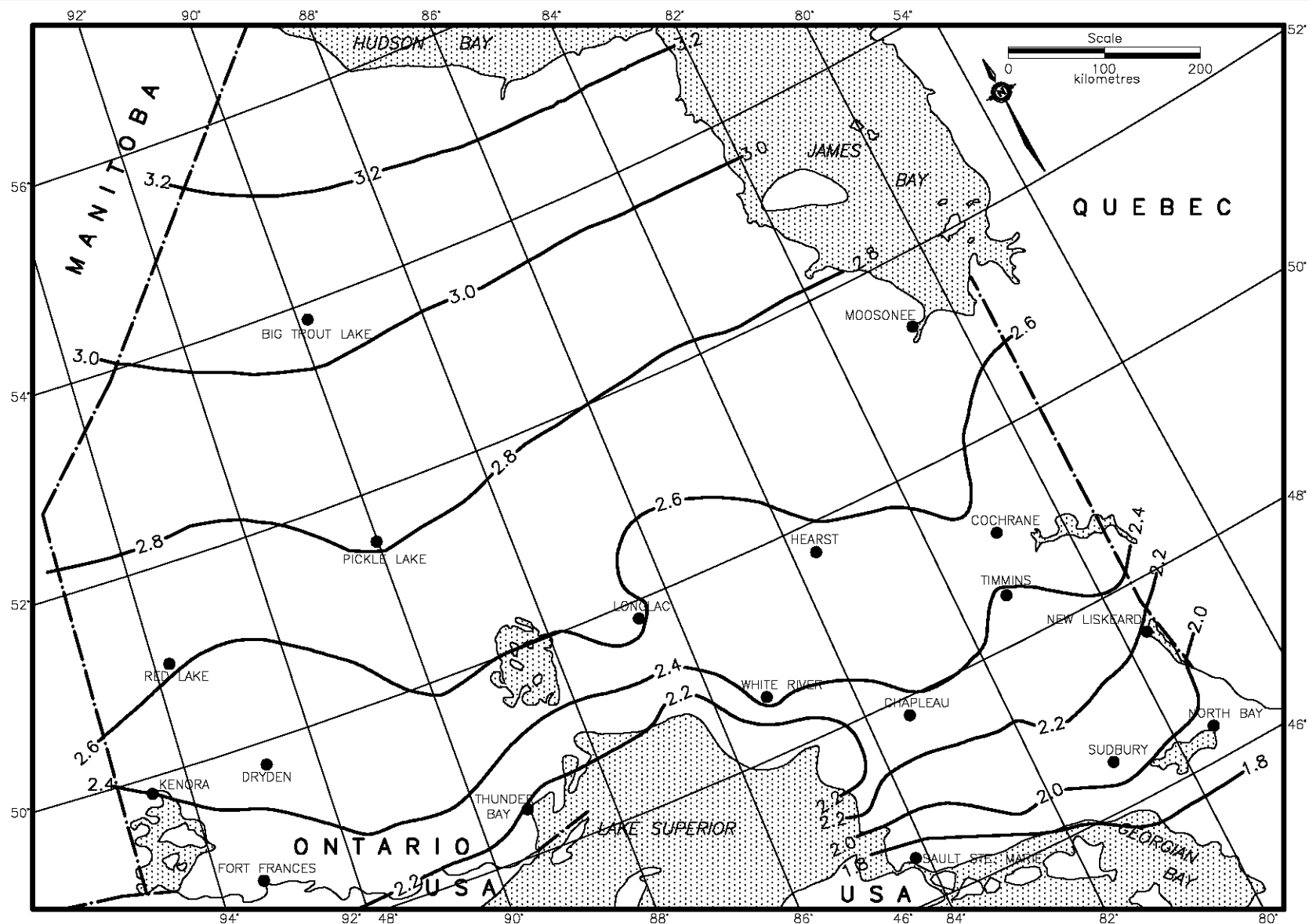


FOUNDATION FROST PENETRATION DEPTHS FOR NORTHERN ONTARIO

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010 Rev 1

OPSD 3090.100



NOTES:

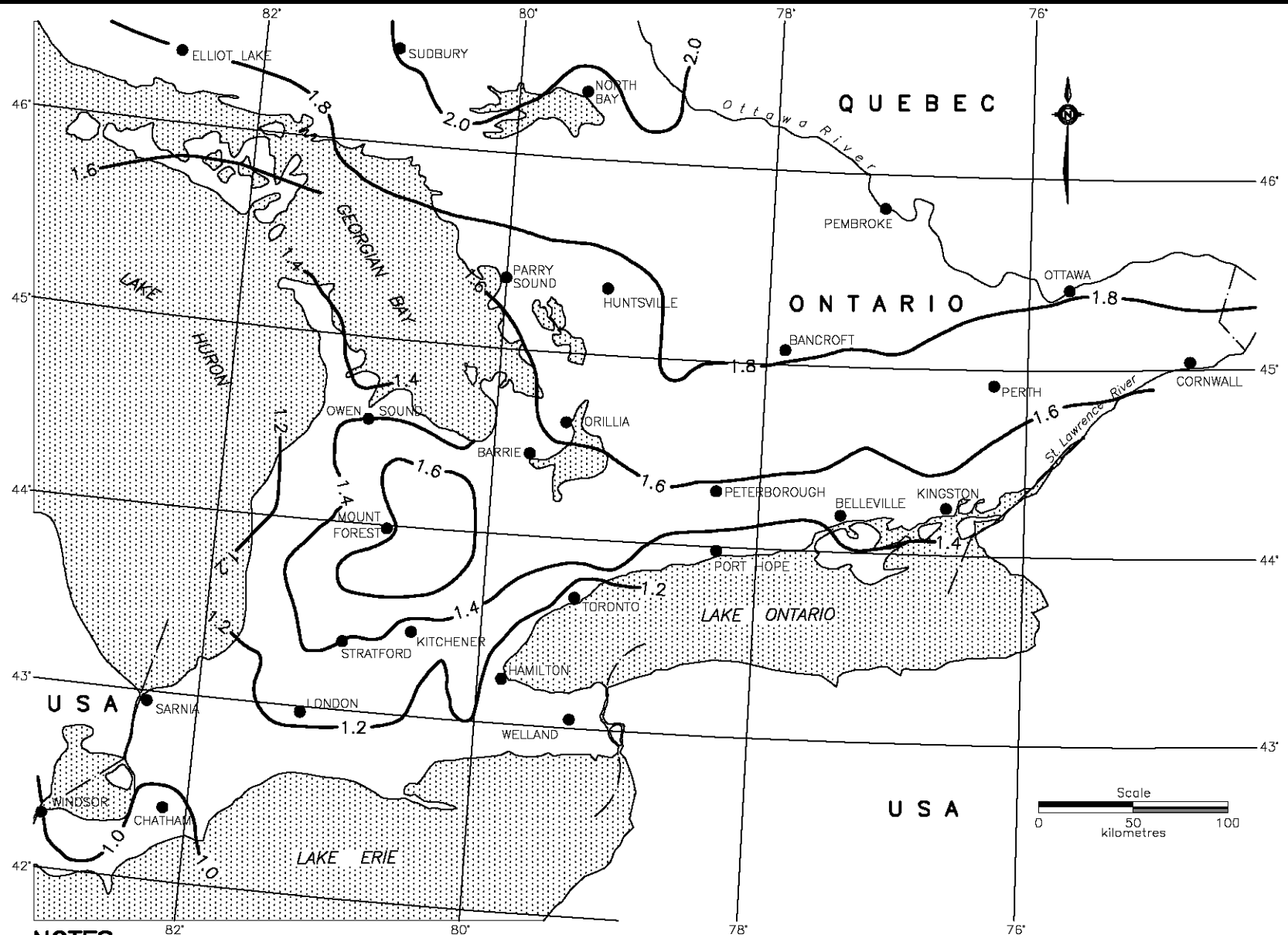
- These values are approximate and should only be used where the recommendations of a geotechnical engineer are not available.
- This information is based on the Ministry of Transportation and Communications Research Publication RR225 "Aspects of Prolonged Exposure of Pavements to Sub-Zero Temperatures" dated December 1981.
- Values between contours should be interpolated. If interpolation is not possible, use the adjacent contour with the greater depth.
- Frost penetration depths are in metres.

FOUNDATION FROST PENETRATION DEPTHS FOR SOUTHERN ONTARIO

ONTARIO PROVINCIAL STANDARD DRAWING

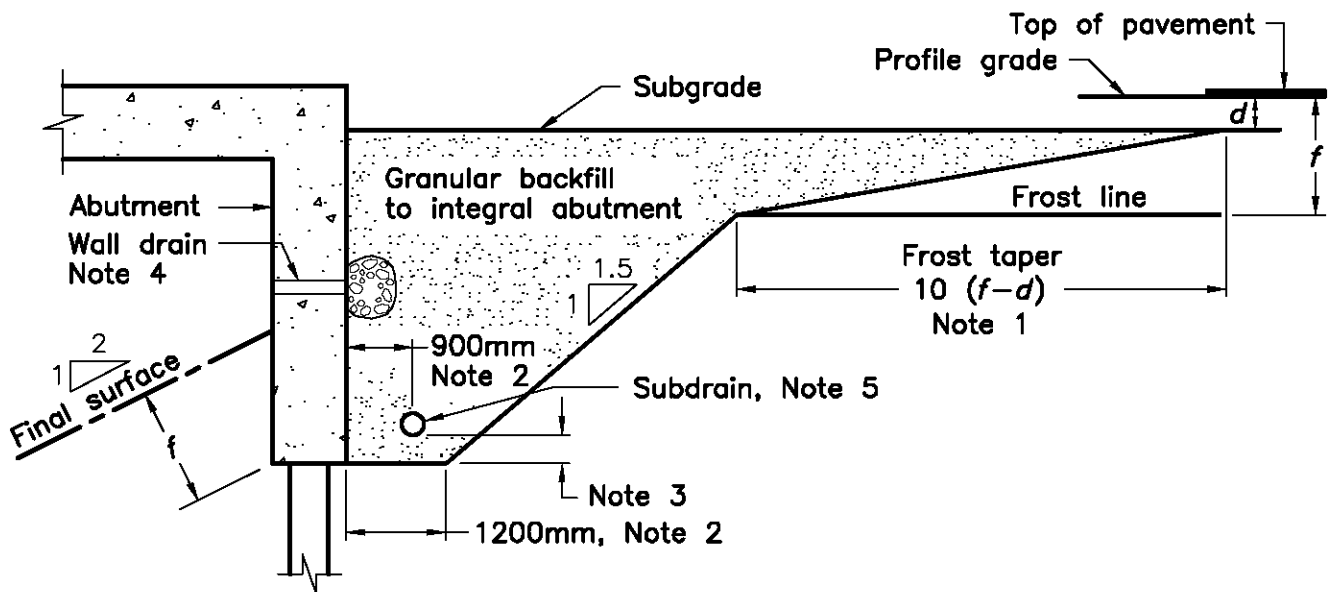
Nov 2010 Rev 1

OPSD 3090.101

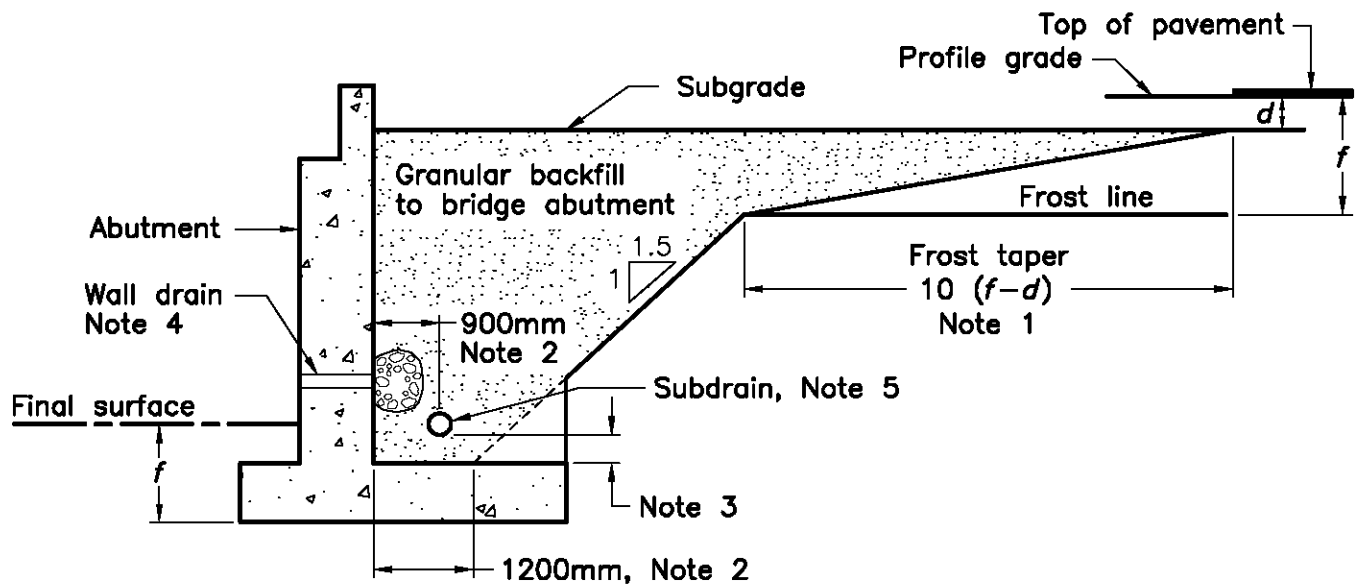


NOTES:

- 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

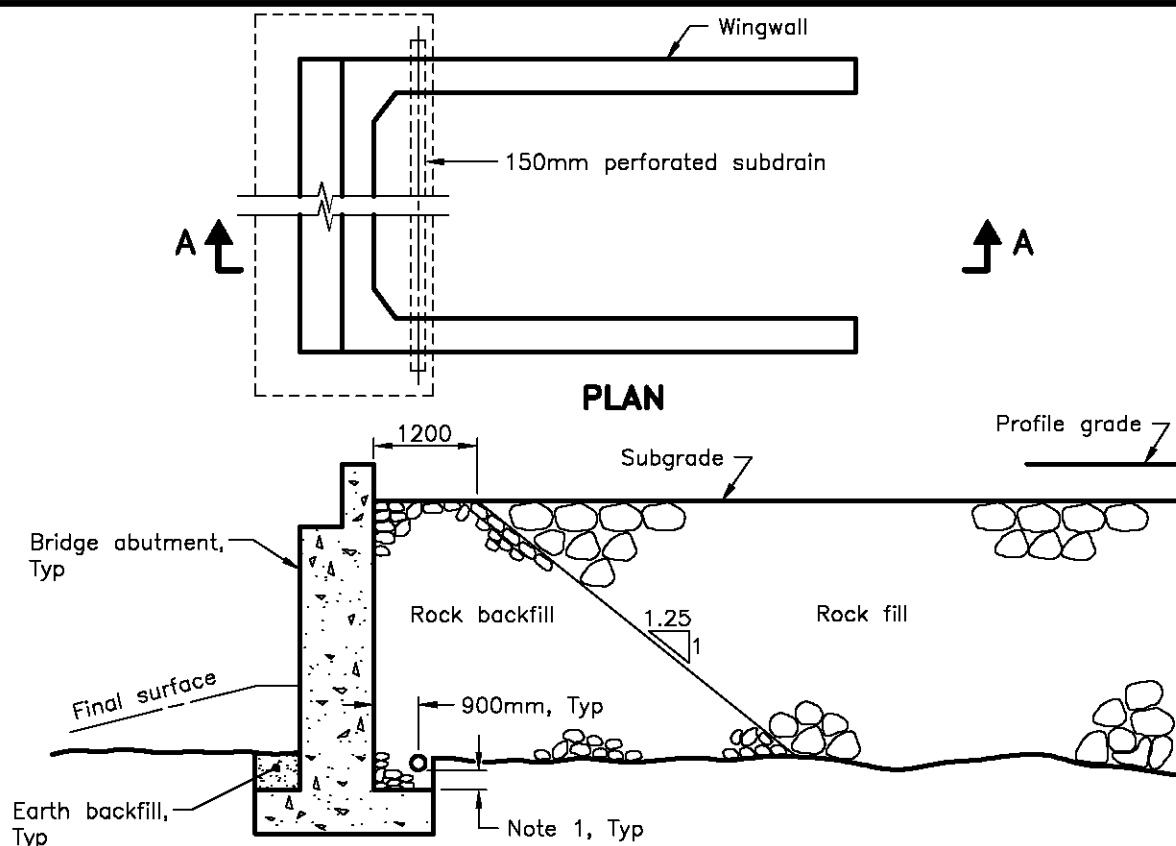
Nov 2010

Rev 1



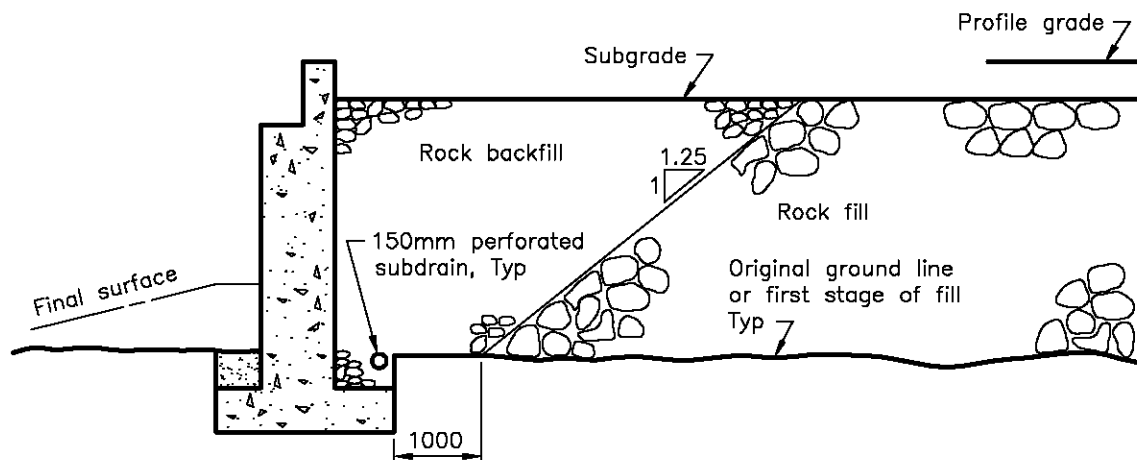
WALLS
ABUTMENT, BACKFILL
MINIMUM GRANULAR REQUIREMENT

OPSD 3101.150



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

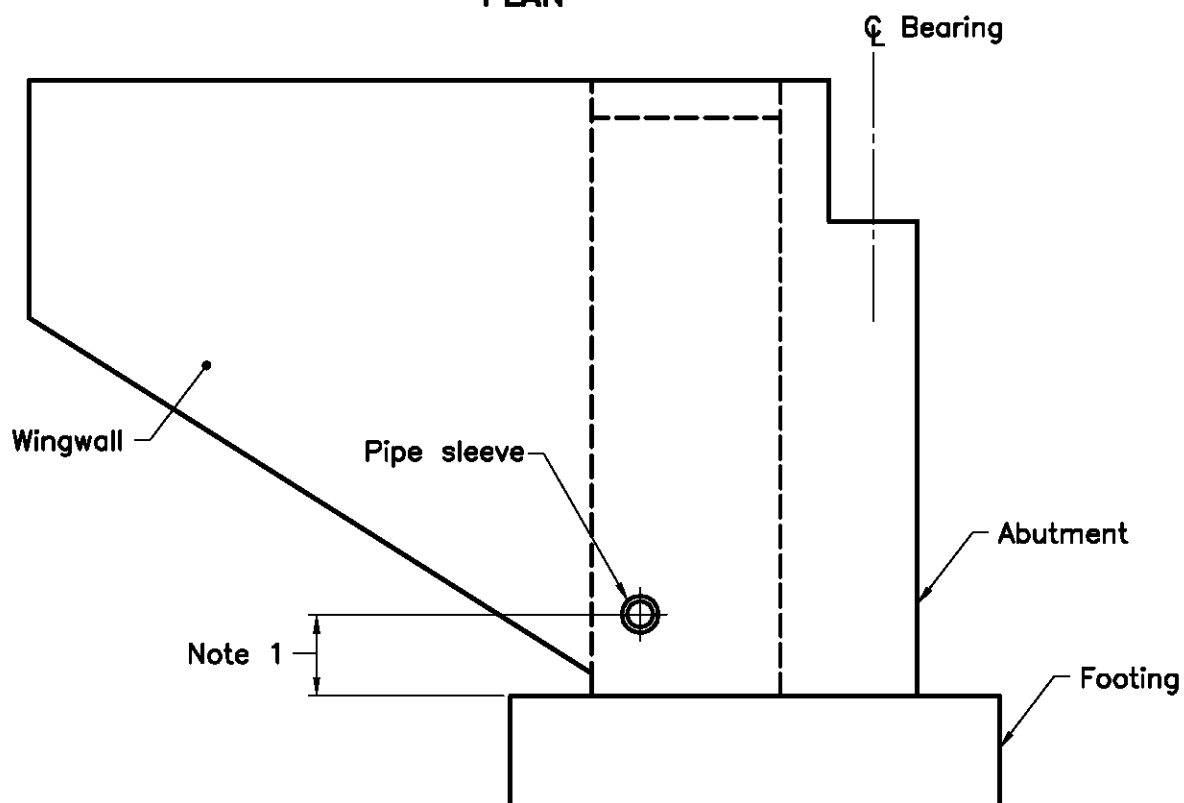
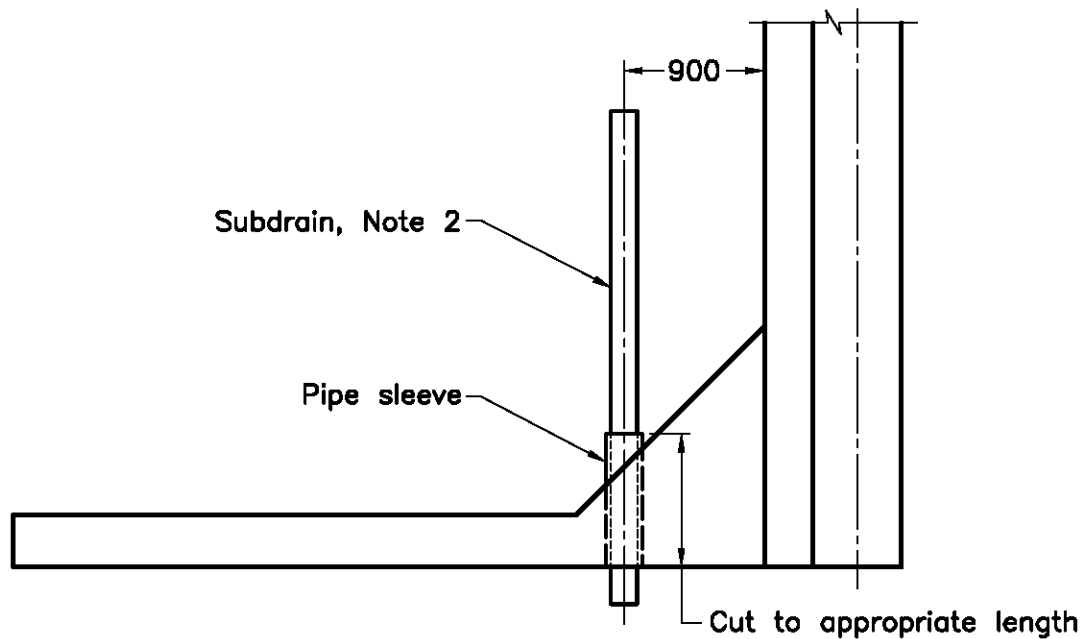
Nov 2010

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WALLS
ABUTMENT, BACKFILL
ROCK



OPSD 3101.200



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

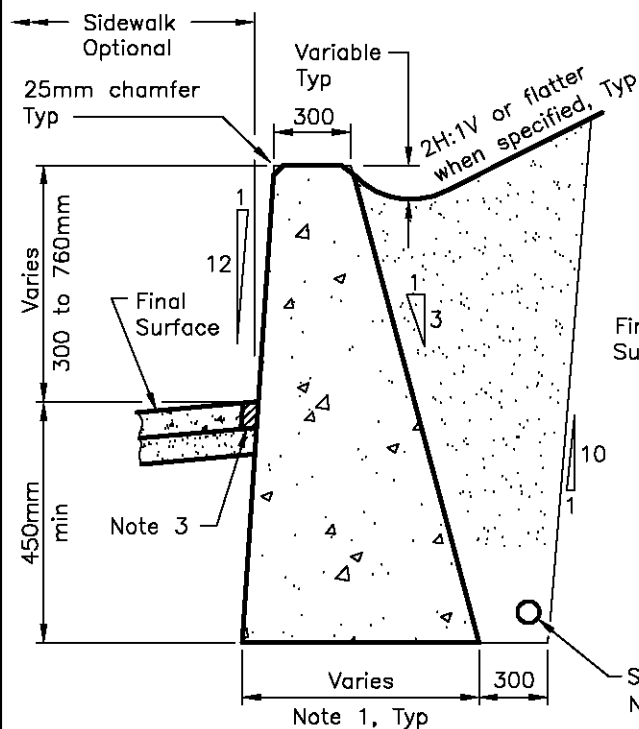
Nov 2010

Rev 1

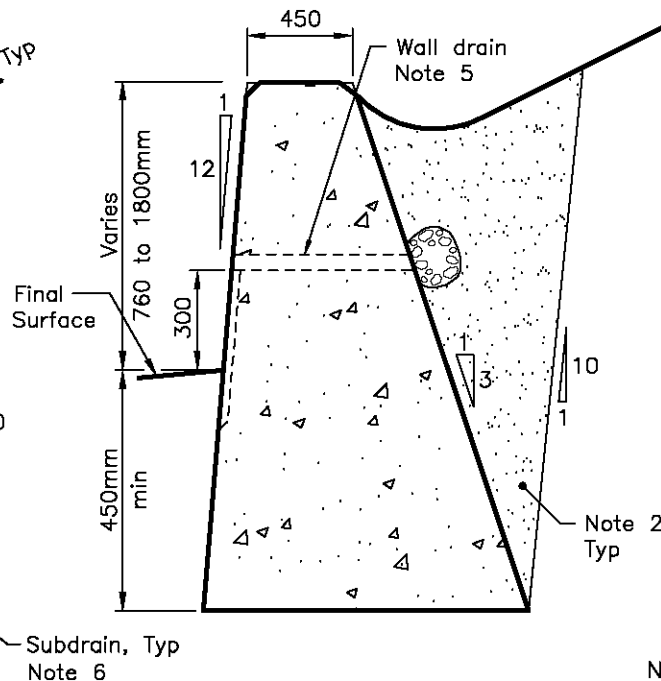
**WALLS
ABUTMENT
BACKFILL DRAIN**

OPSD 3102.100

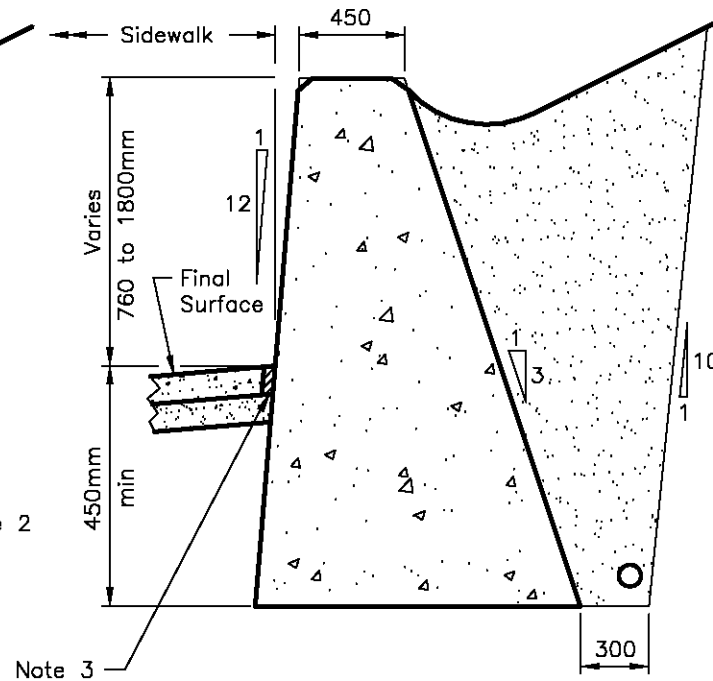




TYPE I



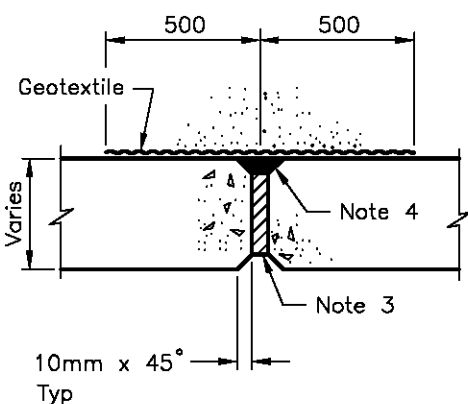
TYPE II



TYPE III

NOTES:

- 1 Walls shall be founded on undisturbed soil having a minimum bearing capacity at ultimate limit states of 200kPa for Type I and 300kPa for Type II and Type III.
 - 2 Excavation for toe walls shall be backfilled with free draining granular material.
 - 3 10mm preformed joint filler, Type A, non-extruding and resilient bituminous type as specified.
 - 4 Cold applied rubber asphalt joint sealing compound.
 - 5 Where specified, wall drains shall be installed as per OPSD 3190.100.
 - 6 150mm dia perforated pipe subdrain wrapped in geotextile.
- A Maximum height of slope above top of wall is 4m.
B Concrete for toe walls shall be 30MPa.
C All dimensions are in millimetres unless otherwise shown.



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

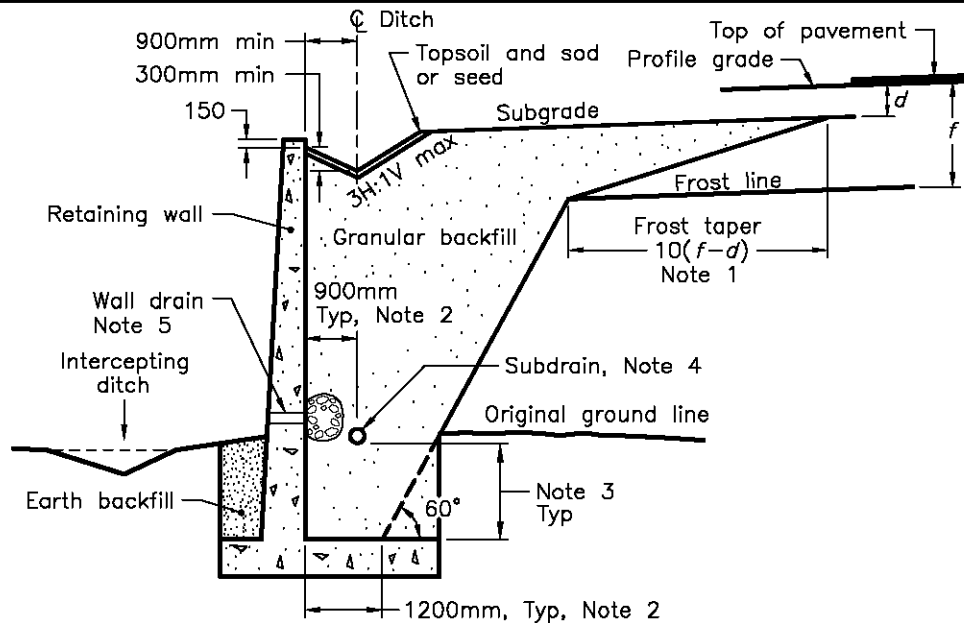
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010 Rev 2

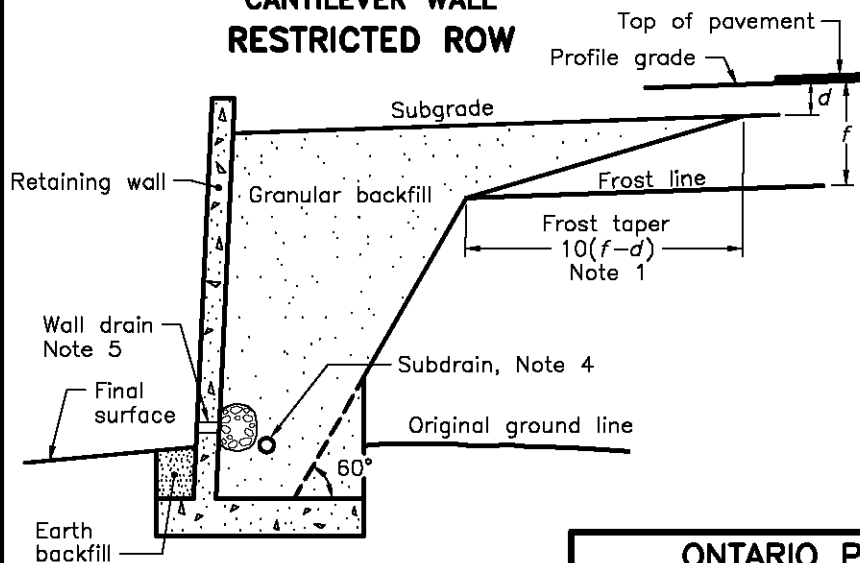
**WALLS
RETAINING
CONCRETE TOE WALL**

OPSD 3120.100

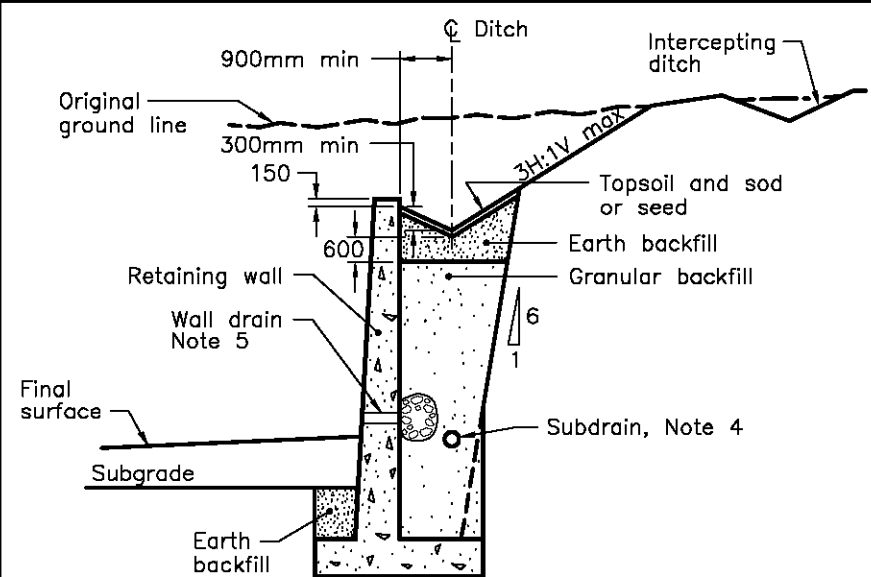




**CANTILEVER WALL
RESTRICTED ROW**



**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.

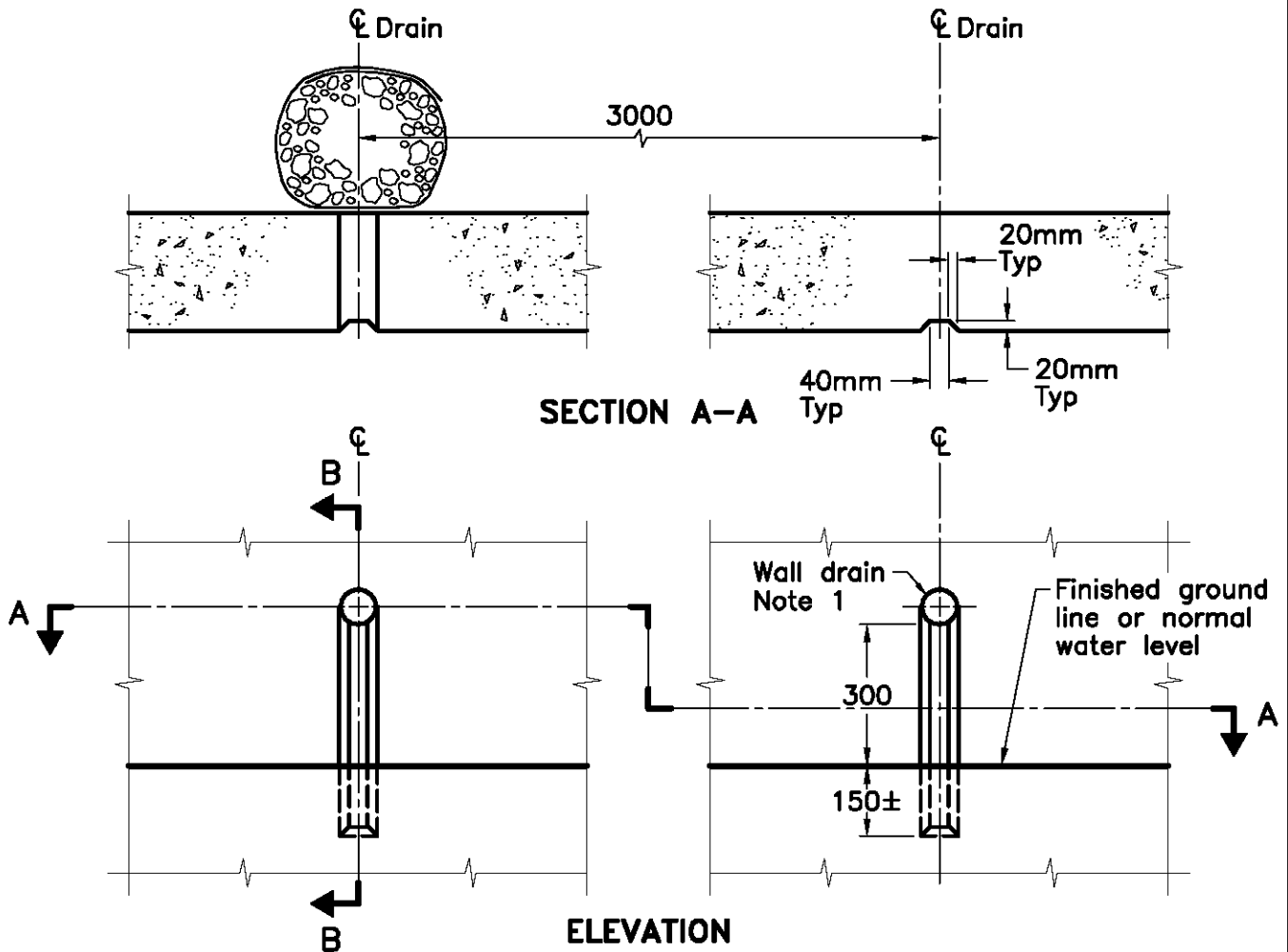
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010 Rev 1

**WALLS
RETAINING, BACKFILL
MINIMUM GRANULAR REQUIREMENT**

OPSD 3121.150





75mm dia wall drain at 3,000mm C/C
formed with non-metallic material

Finished ground line or
normal water level

300
Front
face

0.05m³ of 19.0mm clear stone for
each drain completely wrapped with
geotextile and securely tied, Note 2

NOTES:

SECTION B-B

- 1 Bottom half of drain to be contoured to shape of vertical groove after removal of formwork.
 - 2 Geotextile shall be non-woven, Class II, with an FOS of 125–250 μ m.
- A Minimum cover to reinforcing bars shall be measured from the base of the groove.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

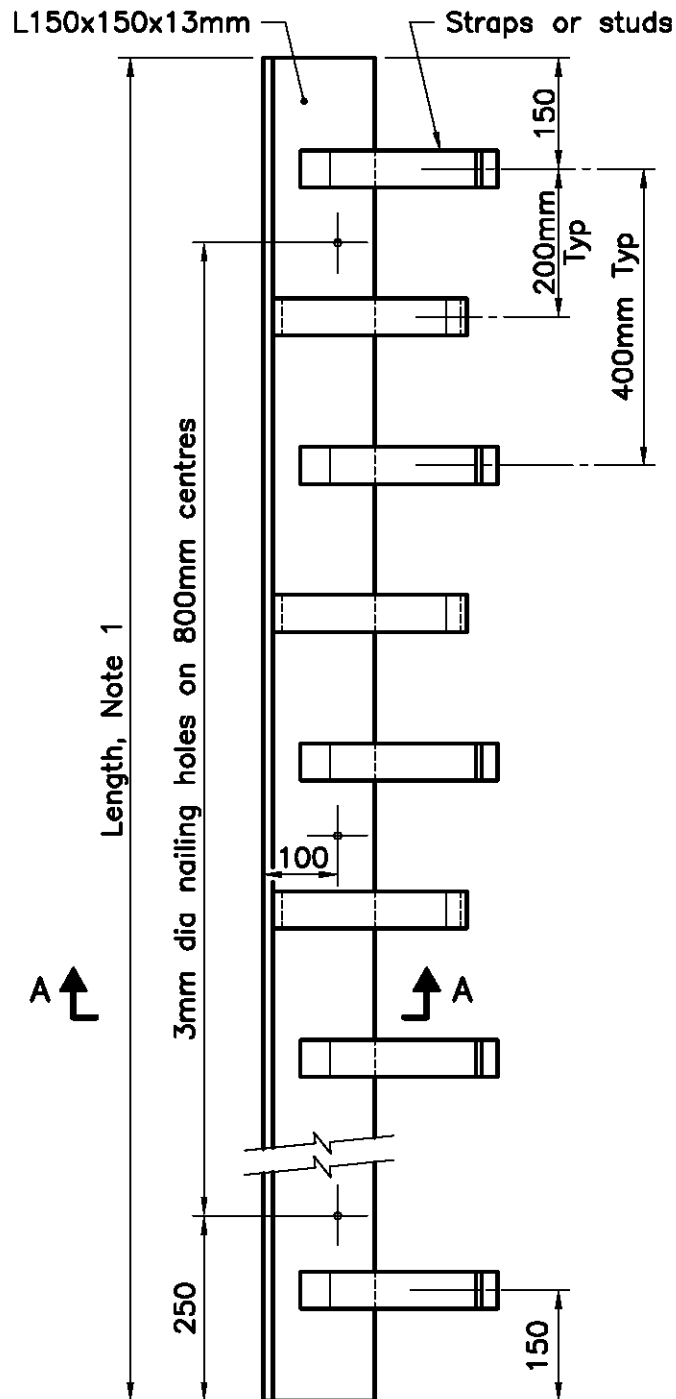
Apr 2011

Rev 2

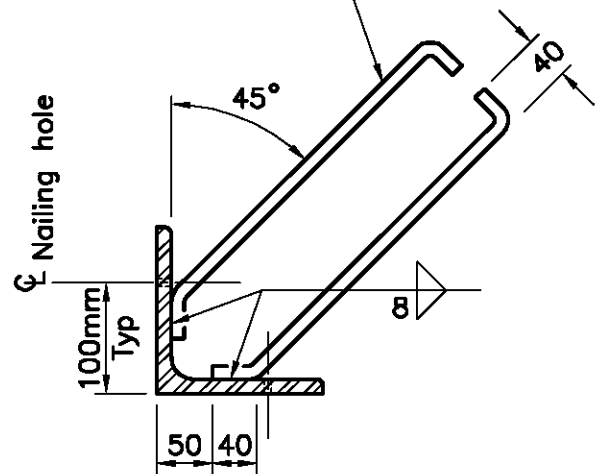
**WALLS
RETAINING AND ABUTMENT
WALL DRAIN**



OPSD 3190.100

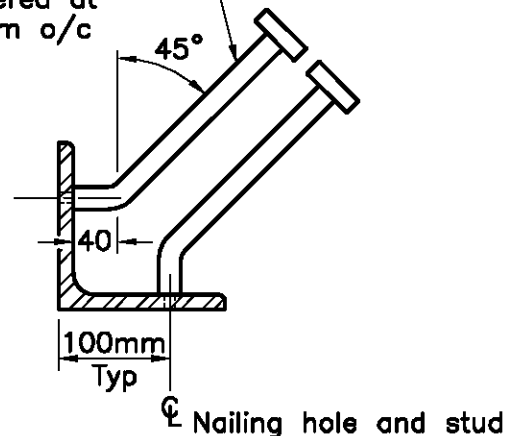


PL 12x50x330mm long
anchor straps welded
to angle staggered
at 400mm o/c



**ANCHORAGE DETAIL
SECTION A-A**

M20x200mm long
anchor studs
staggered at
400mm o/c



**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

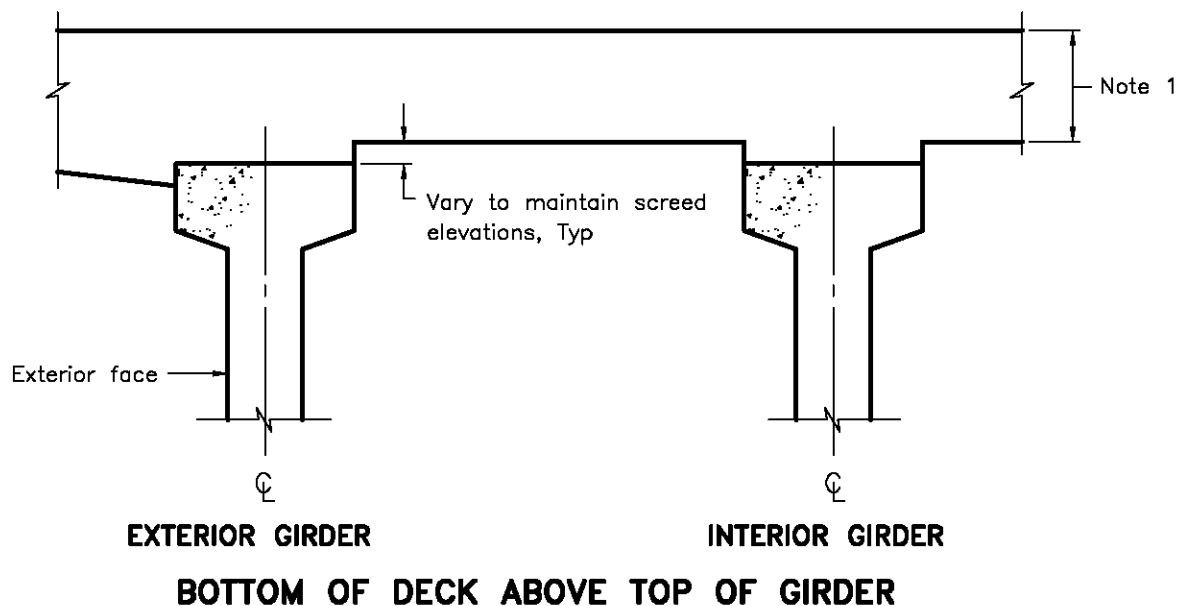
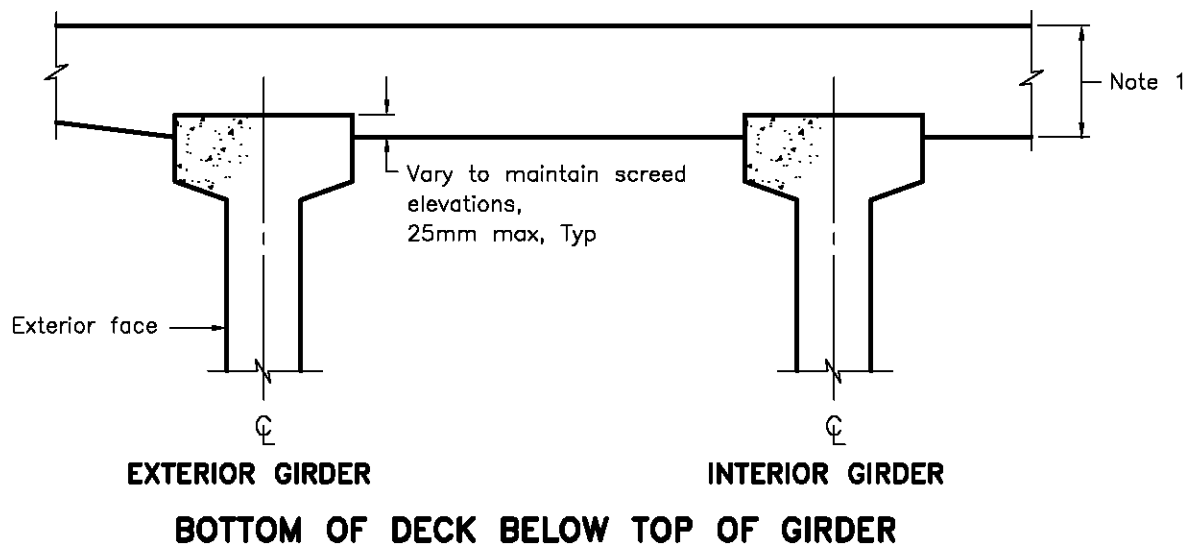
Rev 1

PIERS

CUTWATER ASSEMBLY



OPSD 3290.100



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

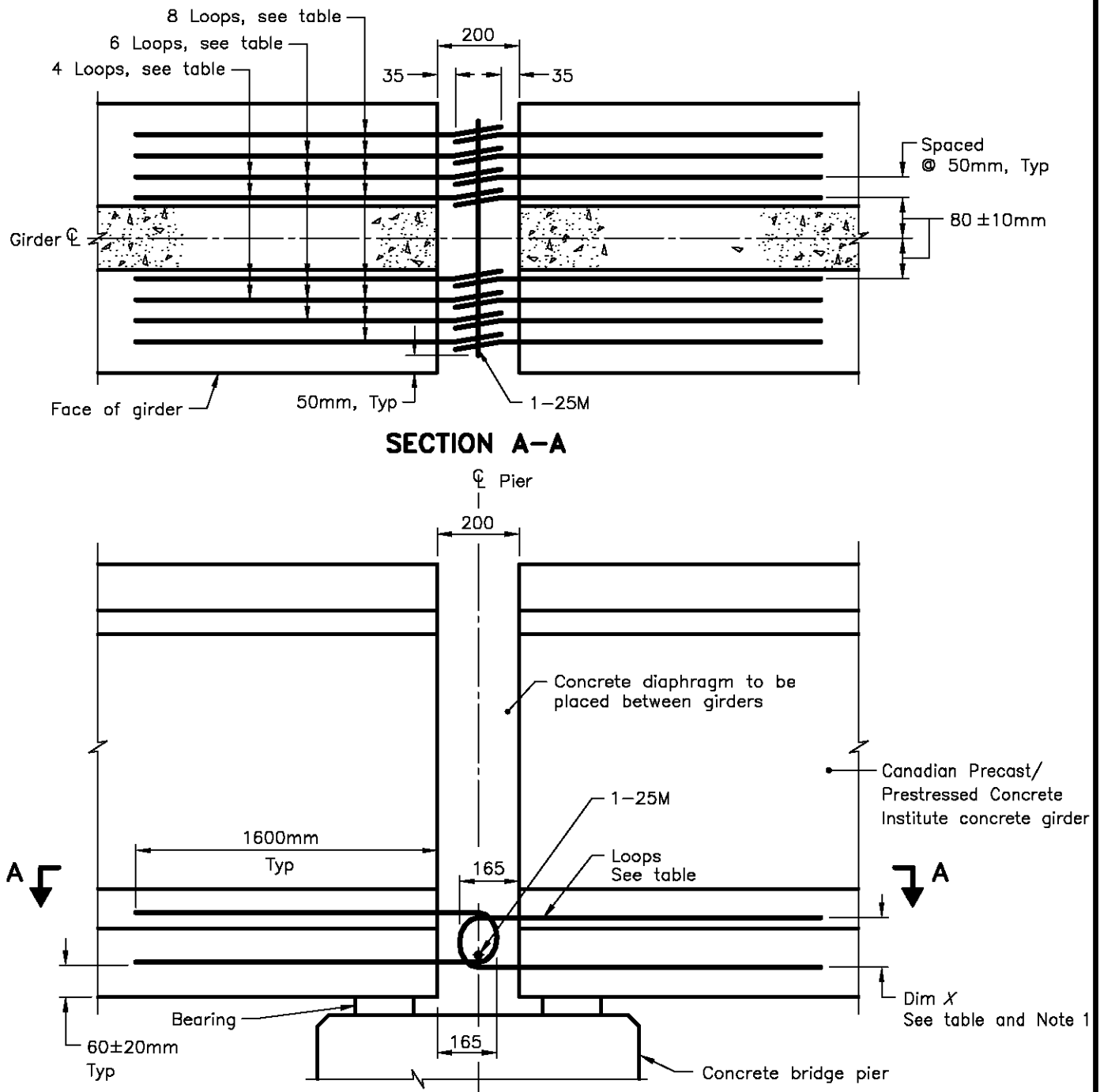
Nov 2010

Rev 1



**DECK
GIRDERS, CONCRETE
METHOD OF OBTAINING SCREED ELEVATIONS**

OPSD 3310.100



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.

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

ONTARIO PROVINCIAL STANDARD DRAWING

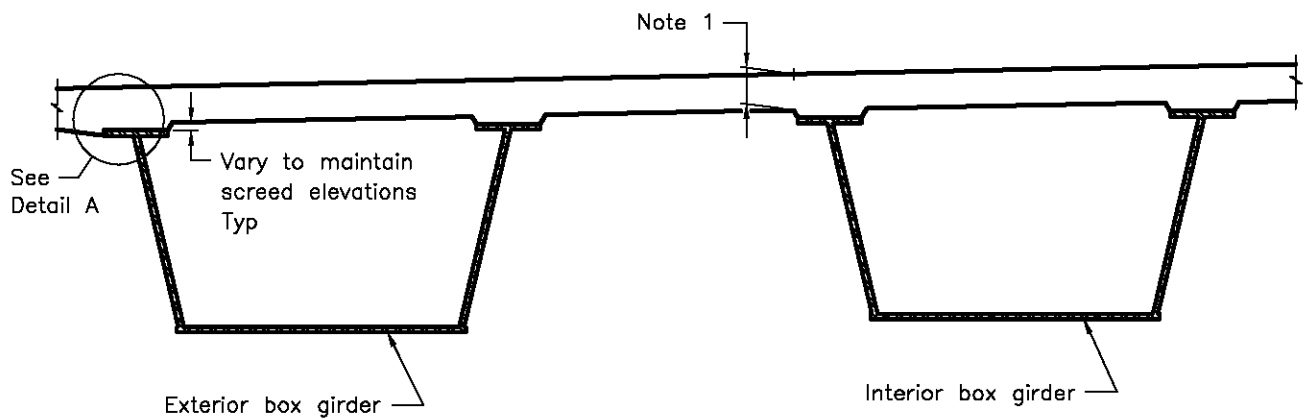
Nov 2011

Rev 1

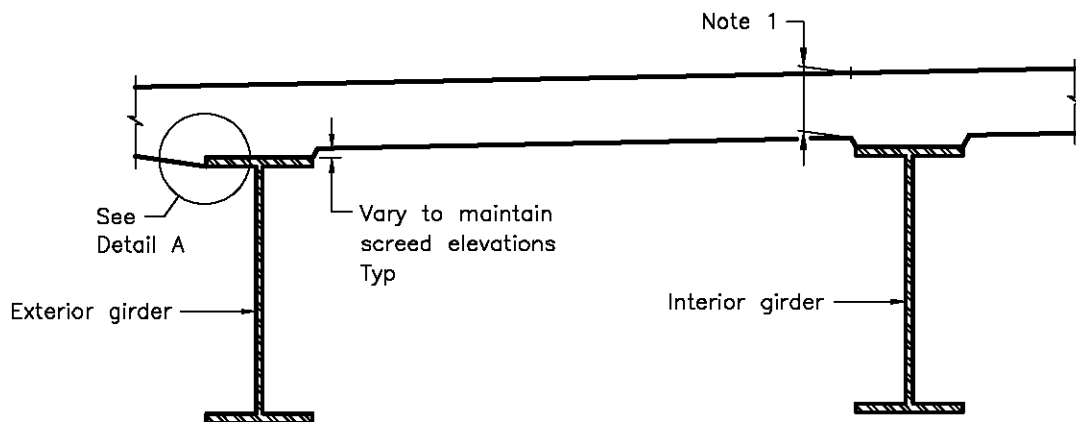
**DECK
GIRDERS, CONCRETE
POSITIVE MOMENT CONNECTION AT PIERS**

OPSD 3310.150

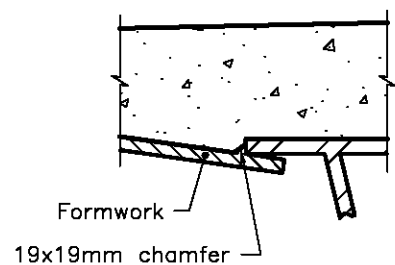




STEEL BOX GIRDER



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

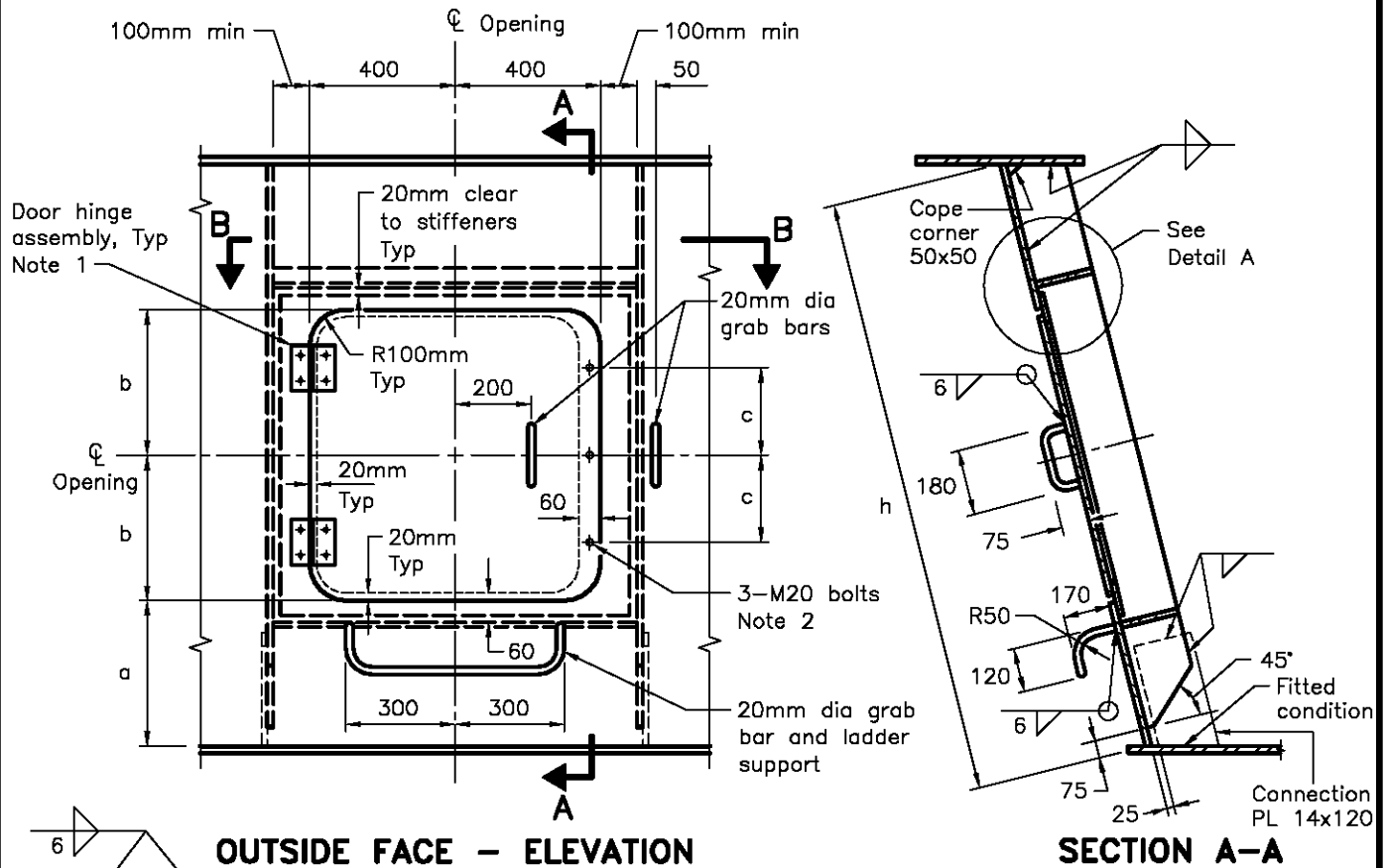
Nov 2010

Rev 1

**DECK
GIRDERS, STEEL
METHOD OF OBTAINING SCREED ELEVATIONS**

OPSD 3311.100





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.

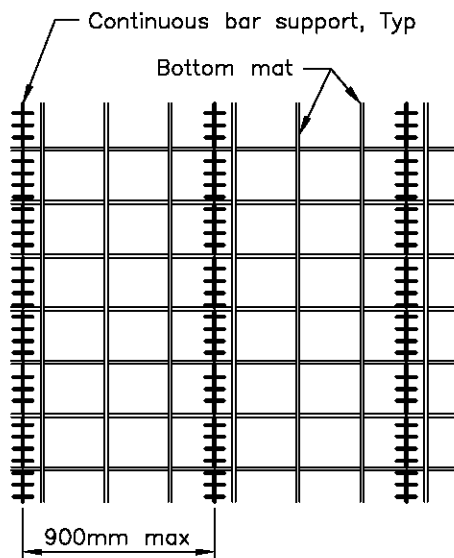
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2015 Rev 2

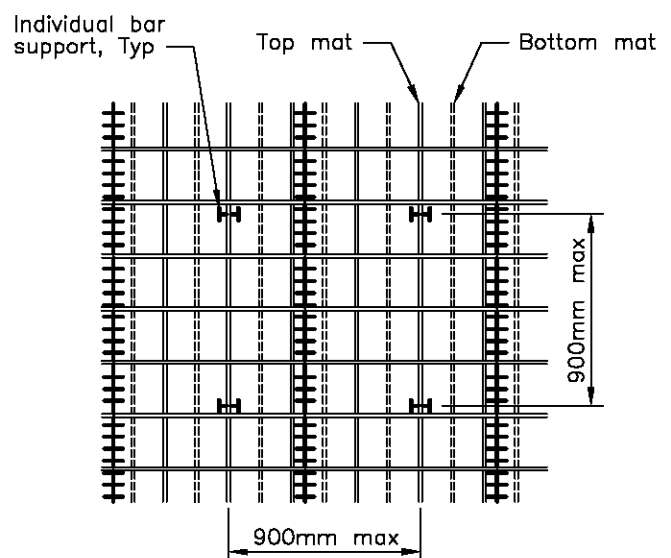
DECK
 GIRDERS, STEEL BOX
 ACCESS HATCH

OPSD 3311.900

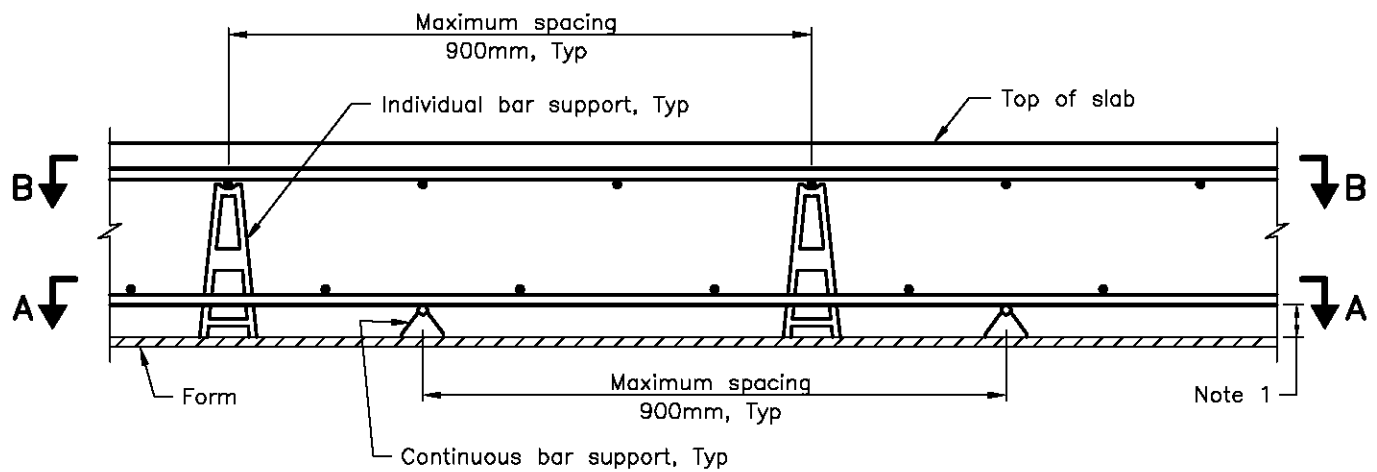




SECTION A-A



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

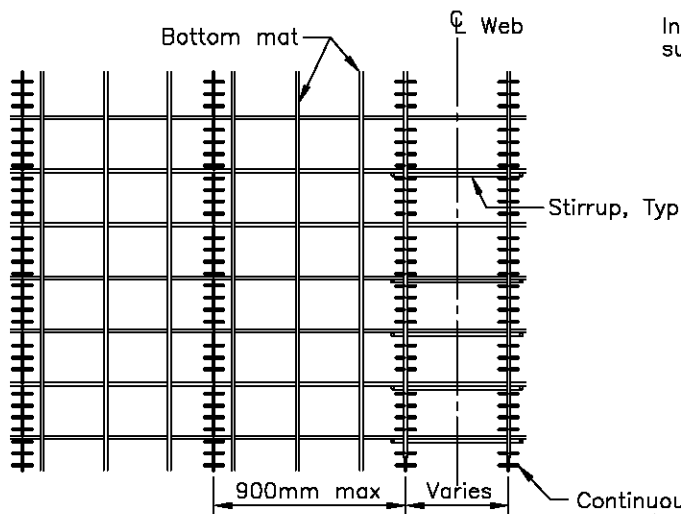
Nov 2011

Rev 1

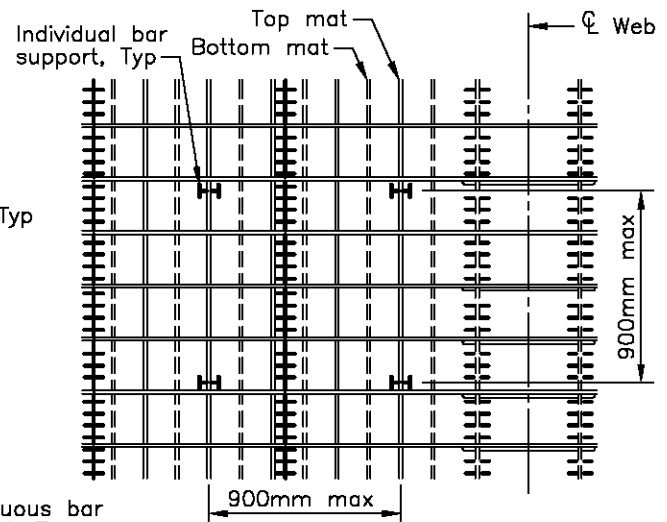
**DECK, REINFORCEMENT
SUPPORTS FOR REINFORCING STEEL
FOR SLAB DEPTHS 300mm OR LESS**

OPSD 3329.100

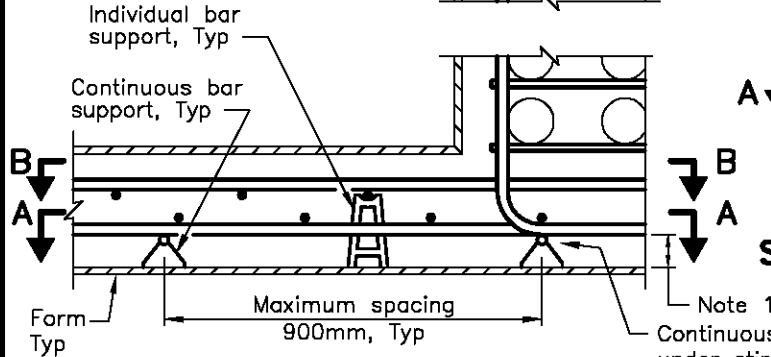
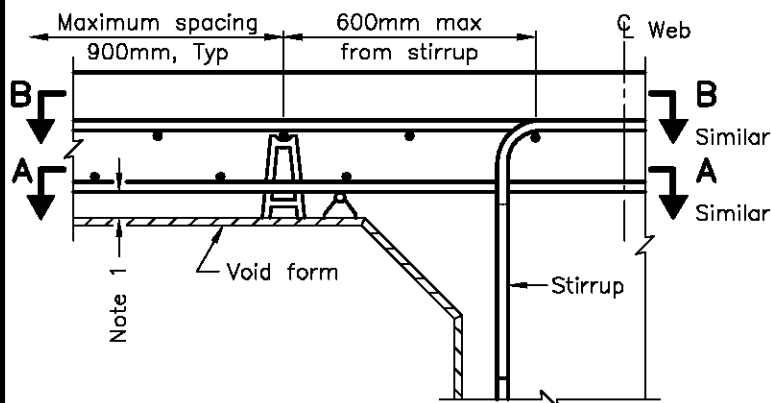




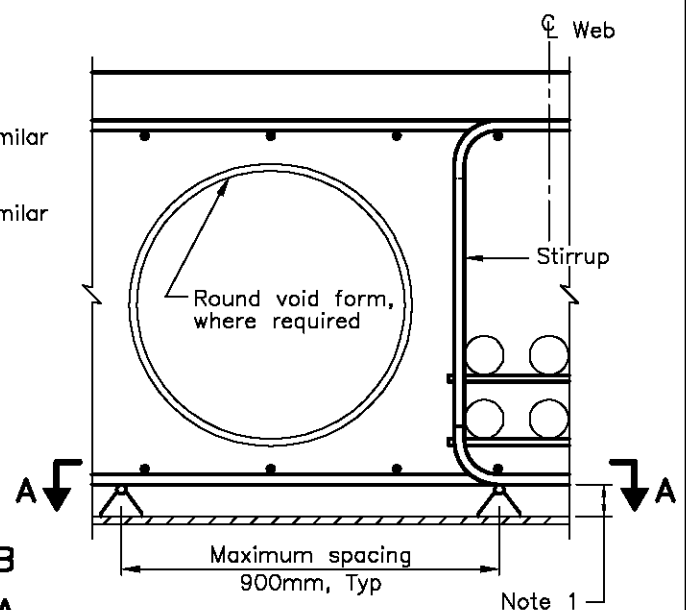
SECTION A-A



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.

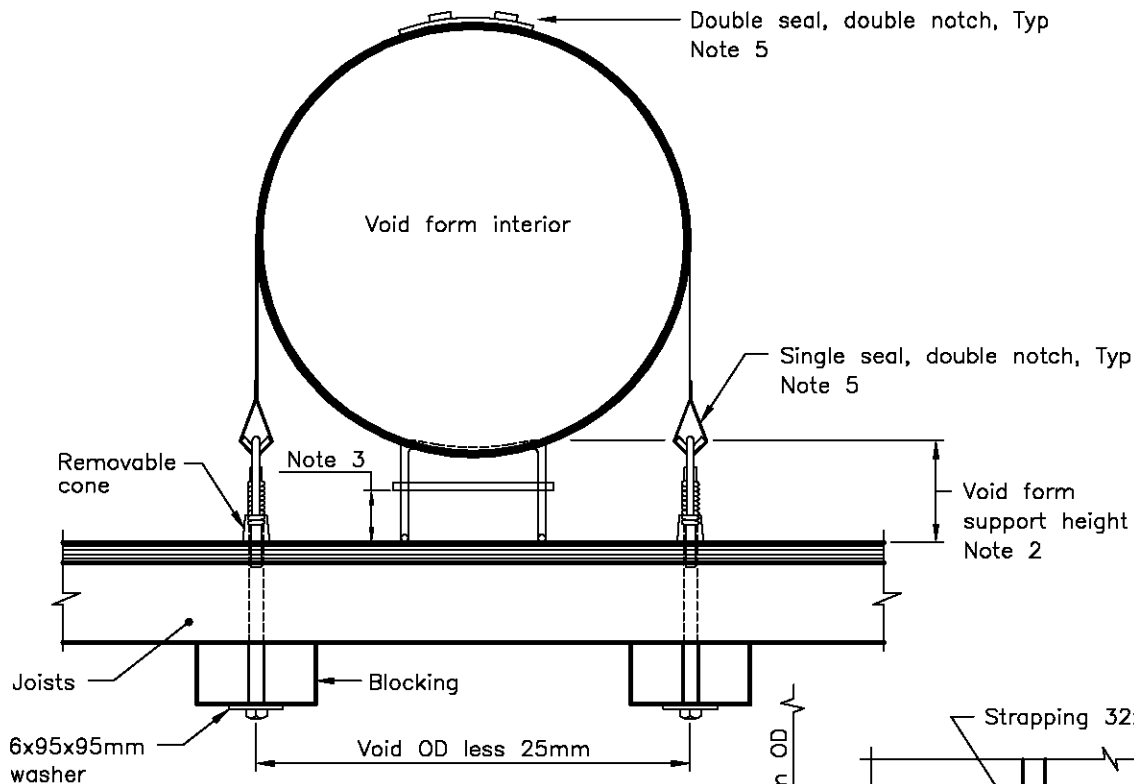
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2011 Rev 1

**DECK, REINFORCEMENT
SUPPORTS FOR REINFORCING STEEL
FOR SLAB DEPTHS GREATER THAN 300mm**

OPSD 3329.101



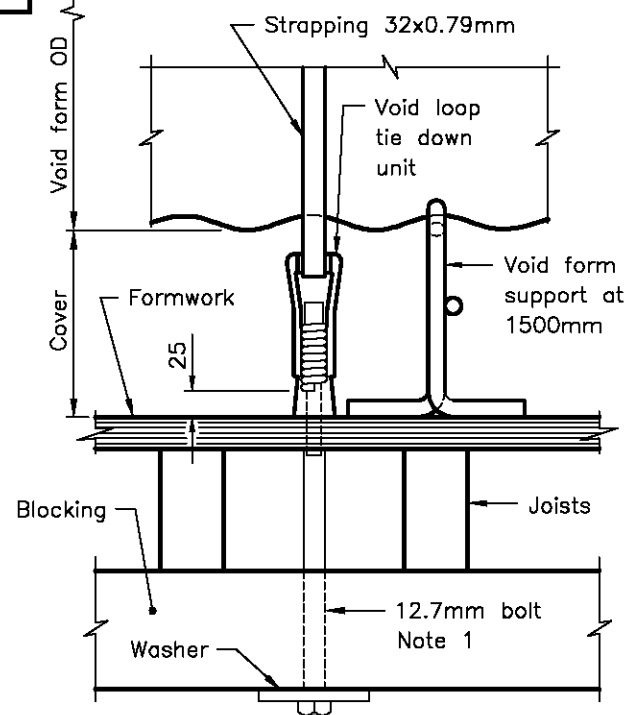


SECTION

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.



SIDE VIEW

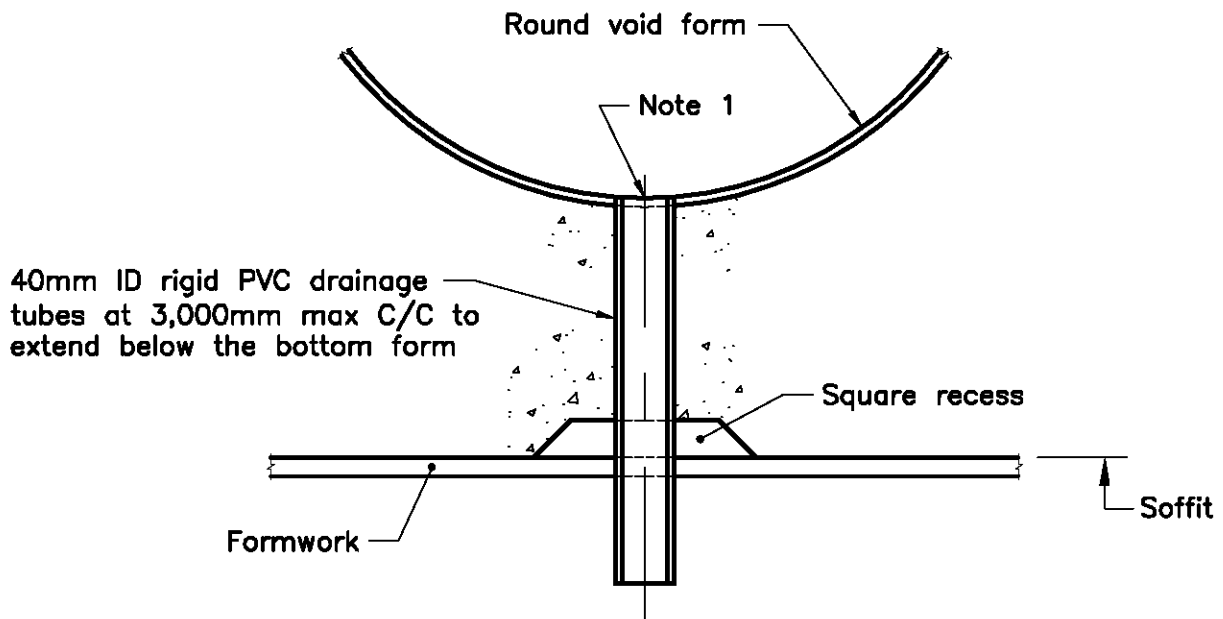
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2011 Rev 1

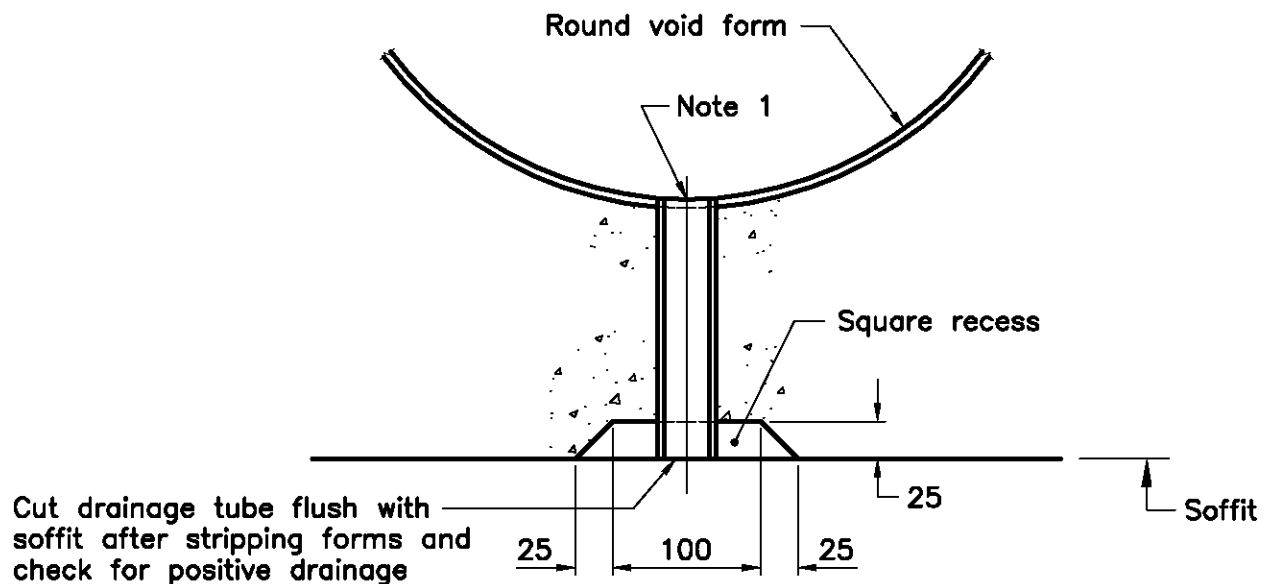
**DECK
ROUND VOIDS
FORM SUPPORTS AND TIE-DOWNS**

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

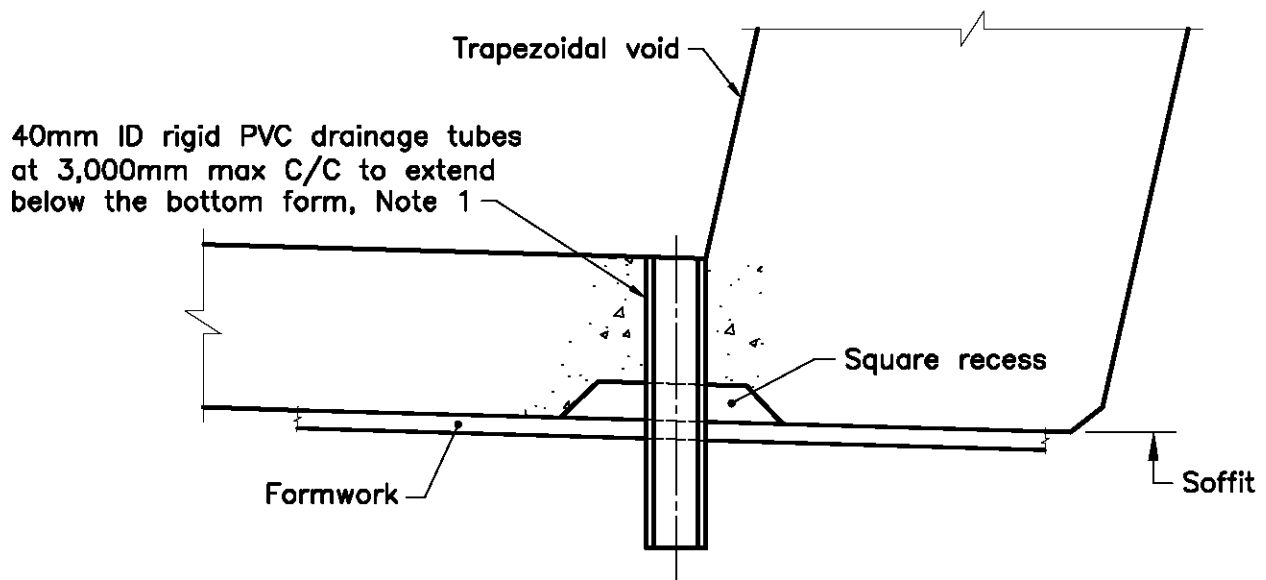
Nov 2010

Rev 1

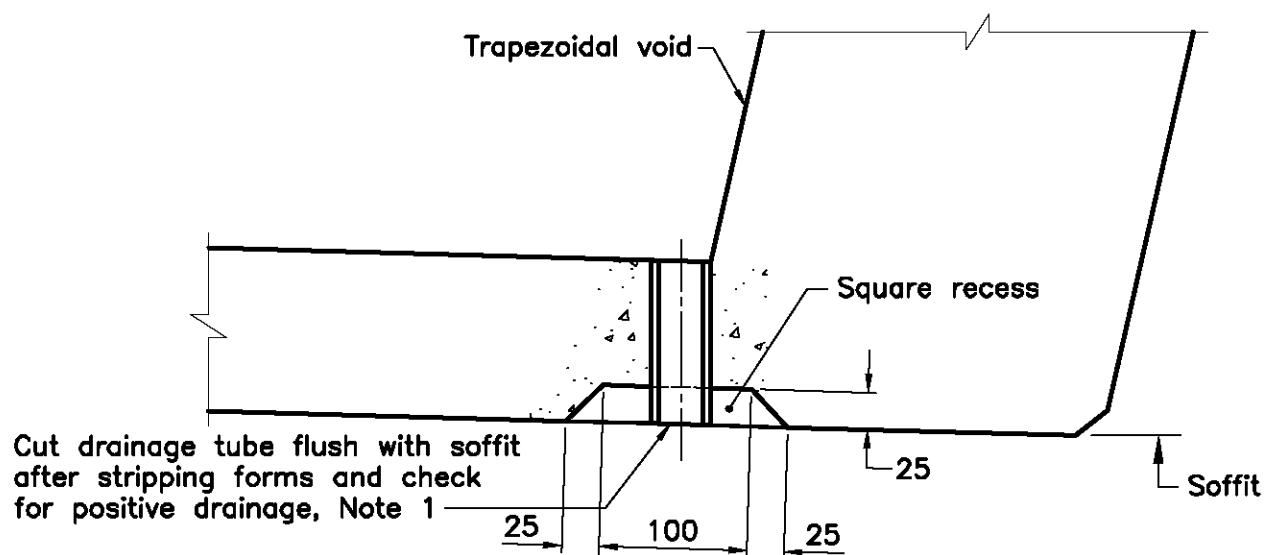
**DECK
ROUND VOIDS
DRAINS**

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

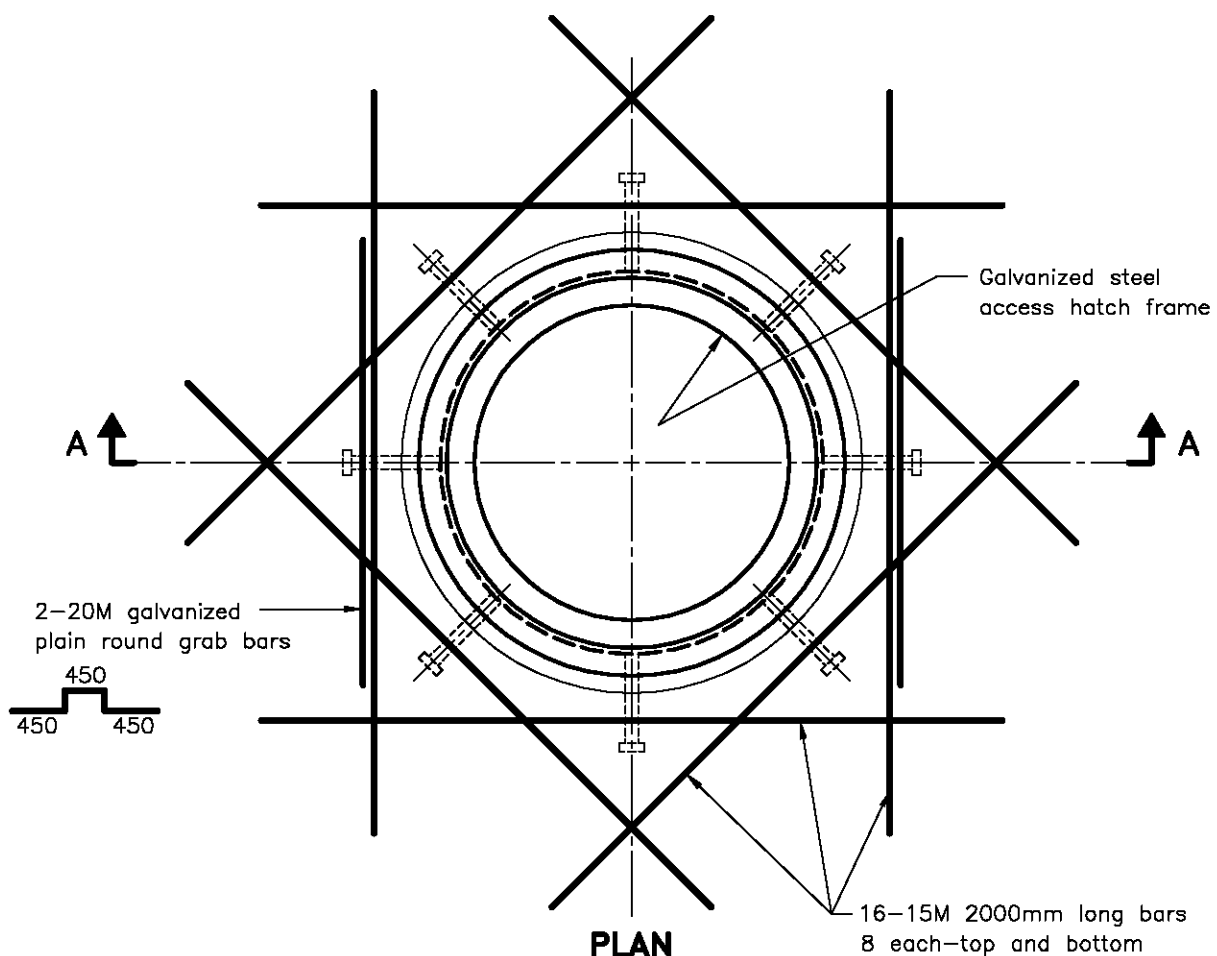
Nov 2010

Rev 1

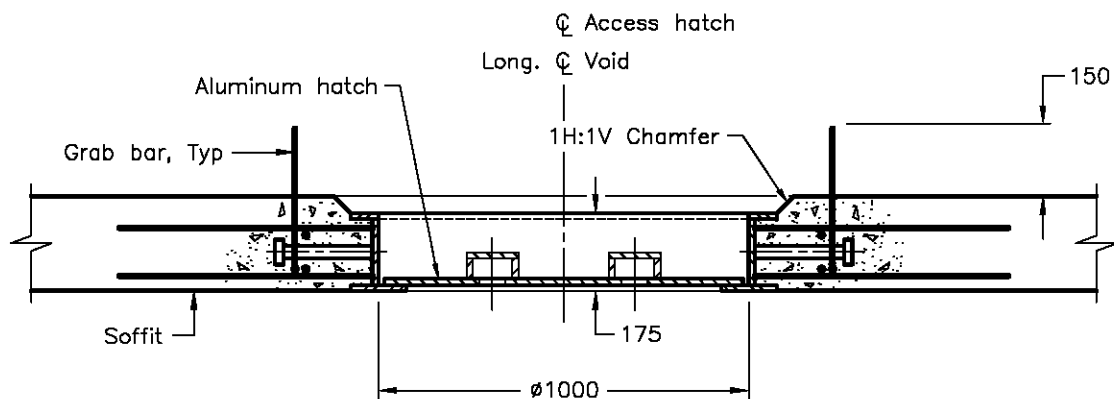
**DECK
TRAPEZOIDAL VOID
DRAINS**



OPSD 3333.101



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

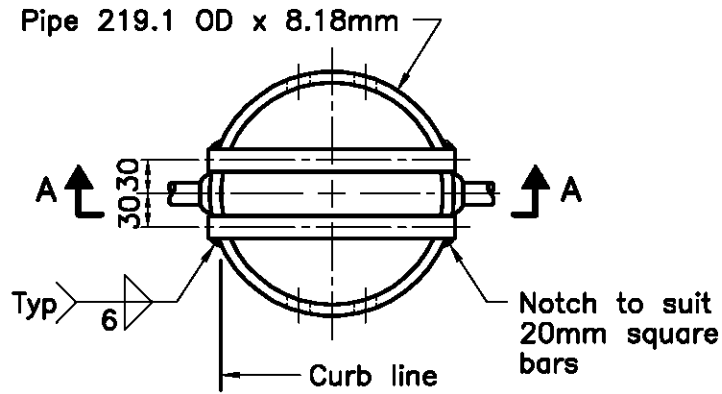
Nov 2011

Rev 1

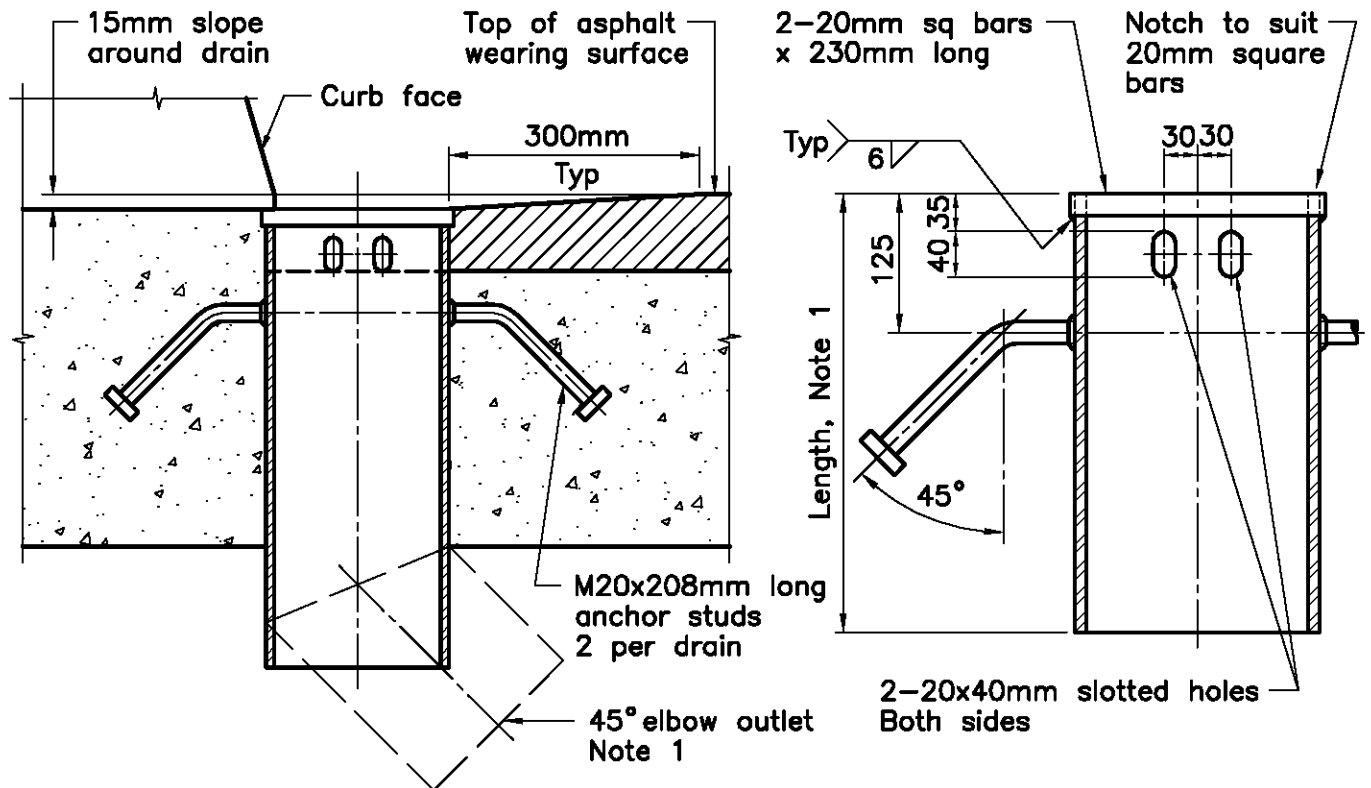
**DECK, VOIDS
ACCESS HATCH FOR CONCRETE BRIDGES
INSTALLATION**



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

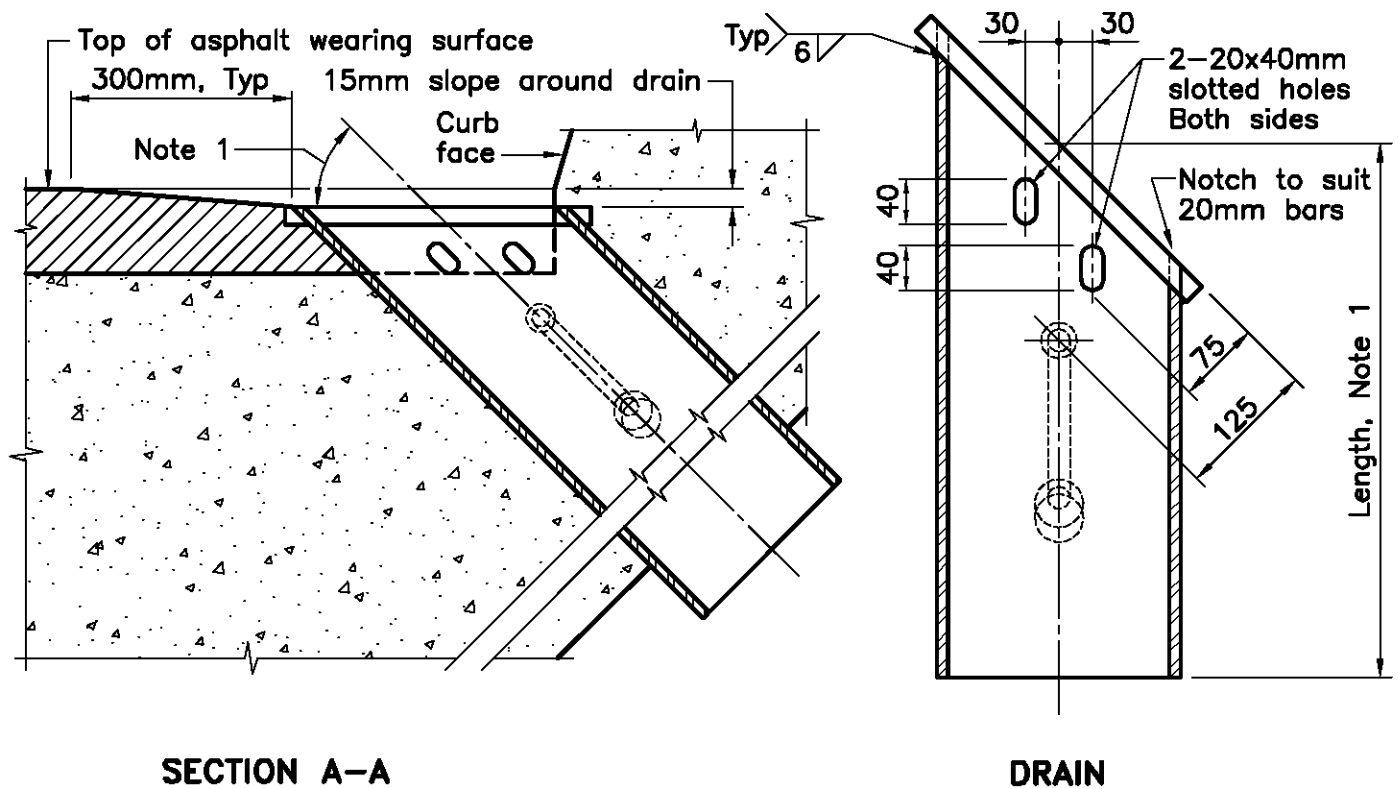
Rev 2

DECK
DRAINS

WITH DOWNSPOUT



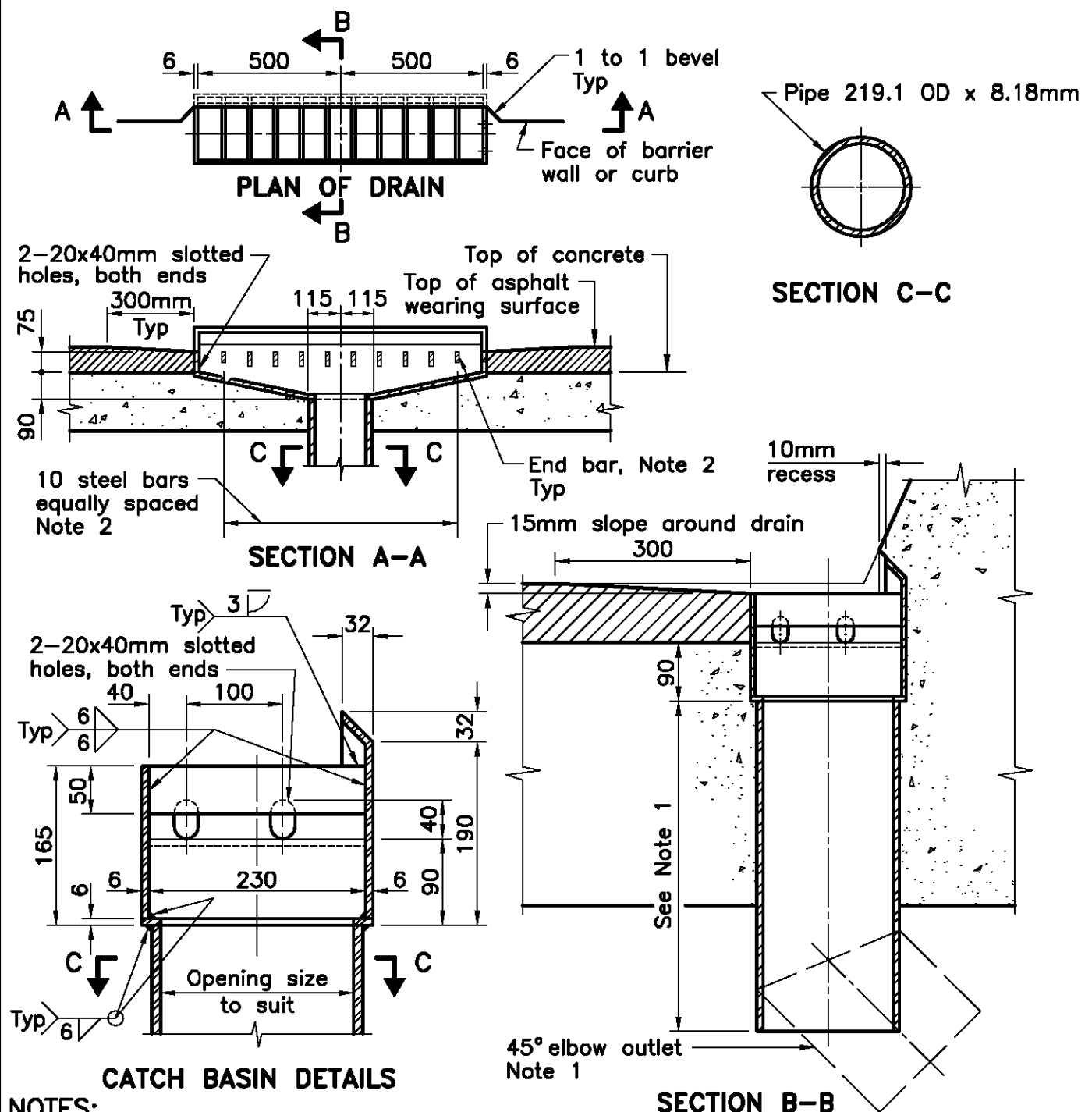
OPSD 3340.100



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			



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.

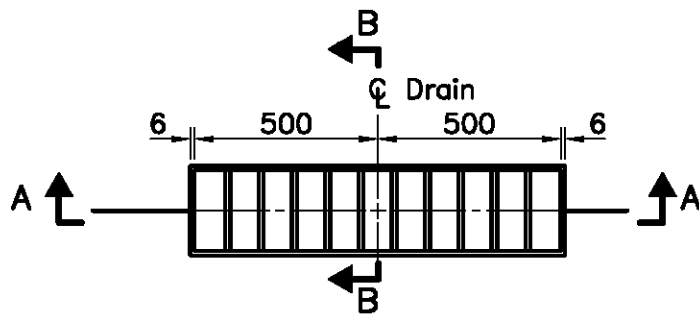
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2

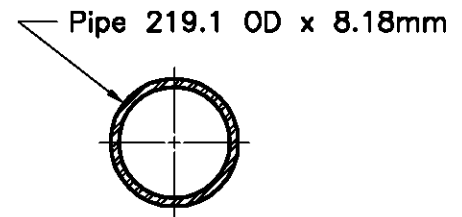


**DECK
DRAINS
WITH TRANSVERSE BAR OPENINGS**

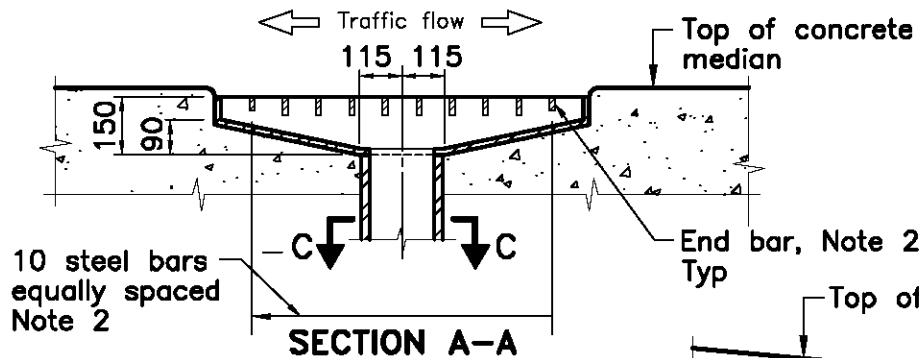
OPSD 3340.150



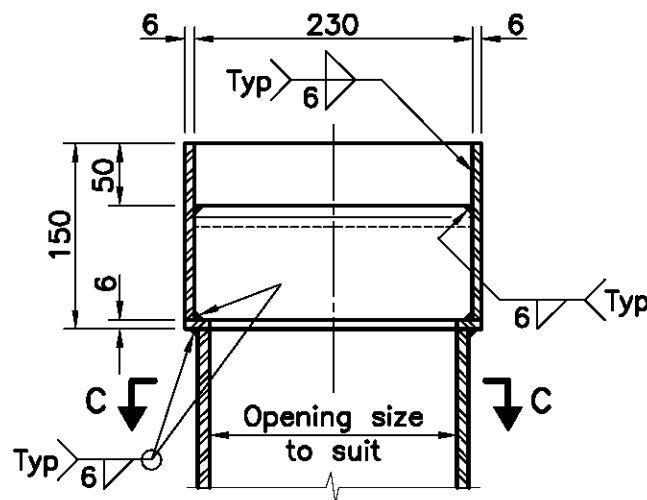
PLAN OF DRAIN



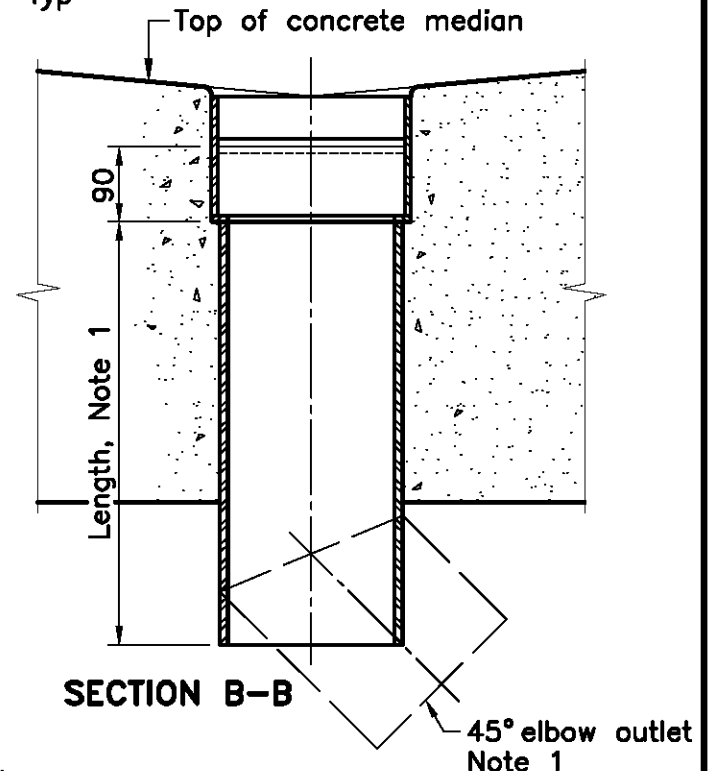
SECTION C-C



SECTION A-A



CATCH BASIN DETAILS



SECTION B-B

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.

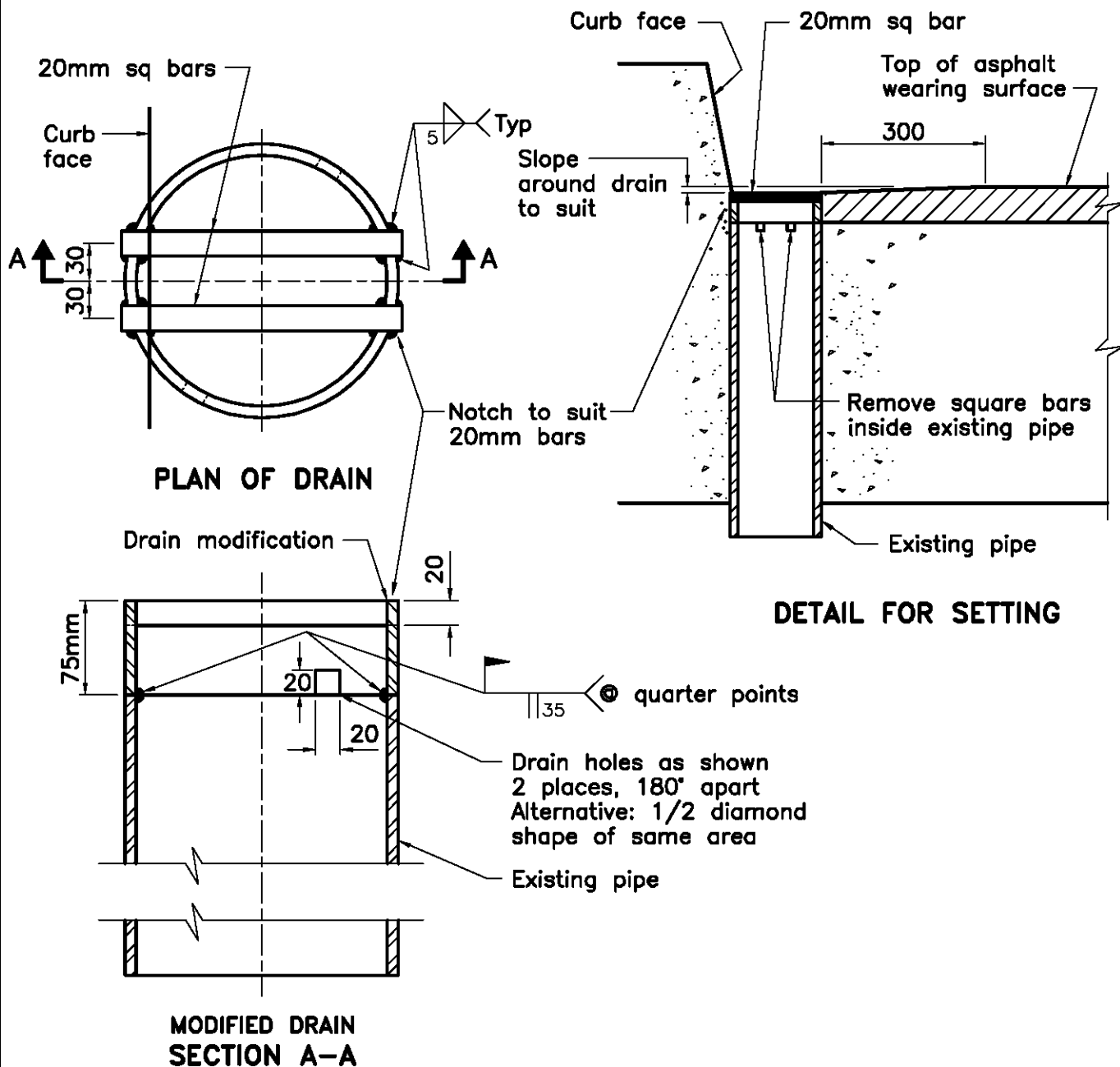
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2



**DECK
DRAINS**
MEDIAN WITH TRANSVERSE BAR OPENINGS

OPSD 3340.153



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.

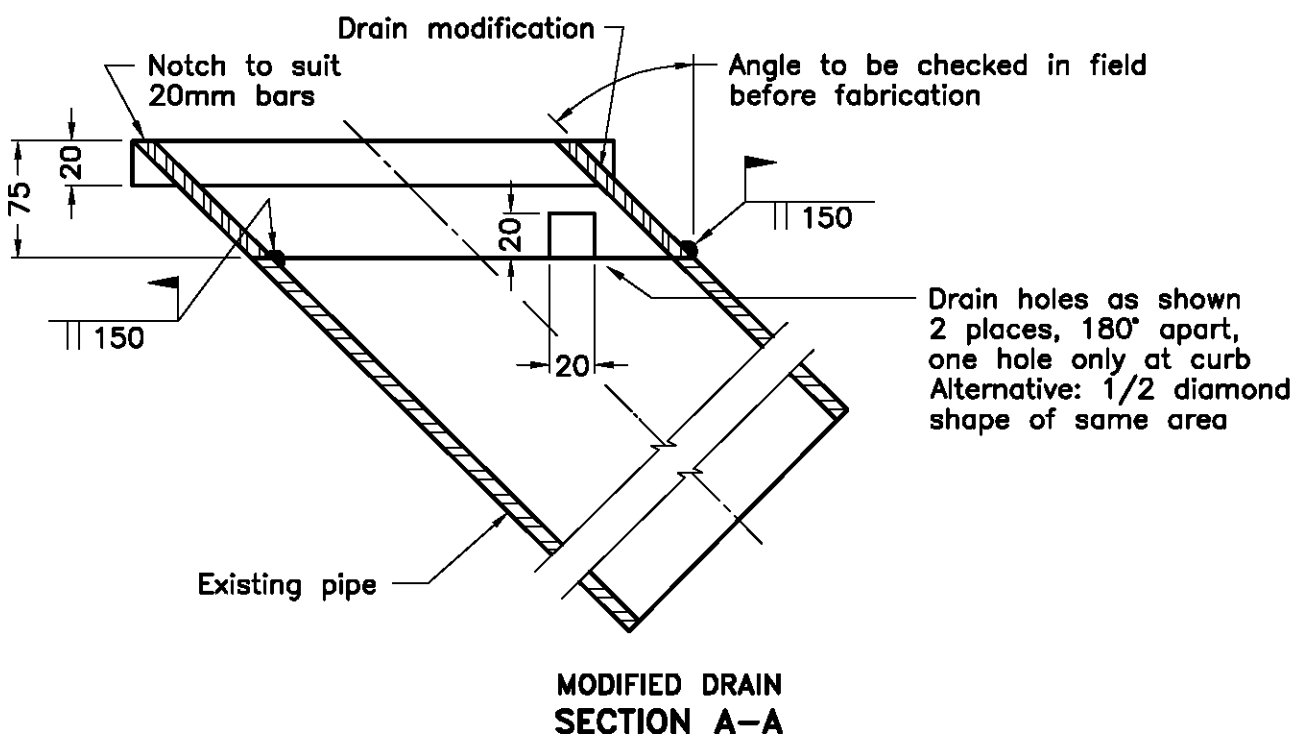
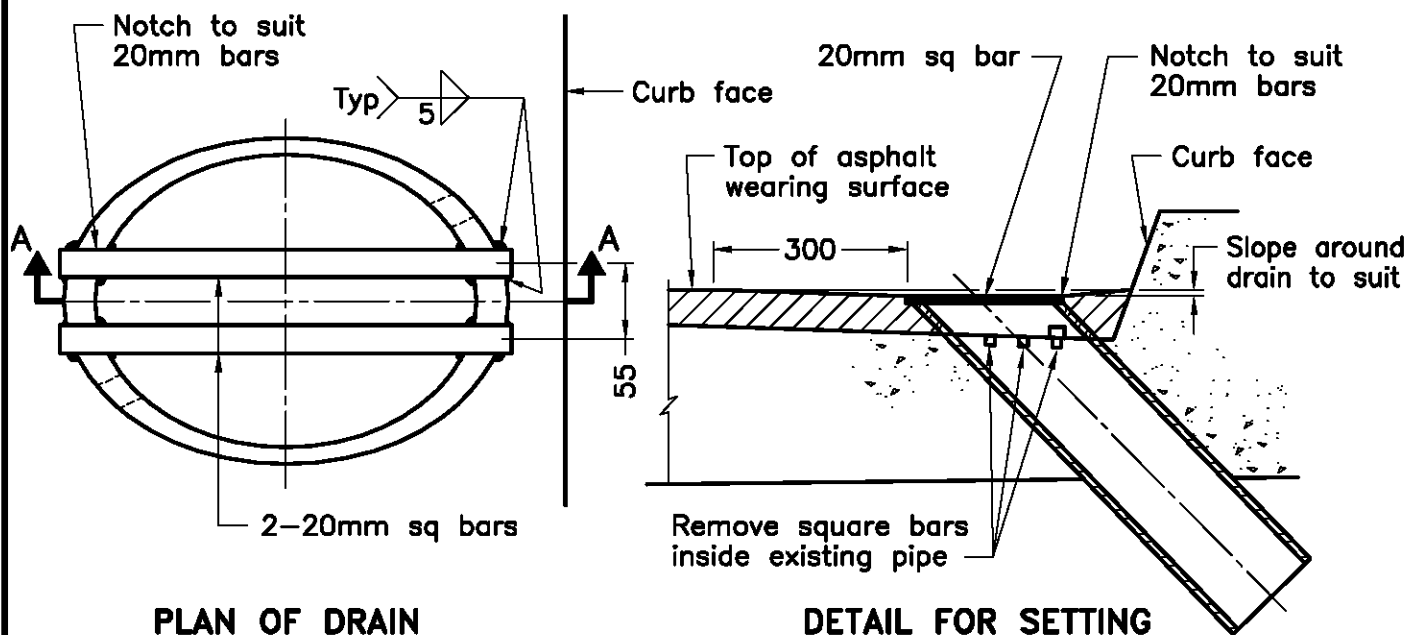
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2



**DECK
DRAINS**
WITH DOWNSPOUT MODIFICATION FOR ADDITION
OF ASPHALT TO EXISTING STRUCTURE

OPSD 3340.200



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

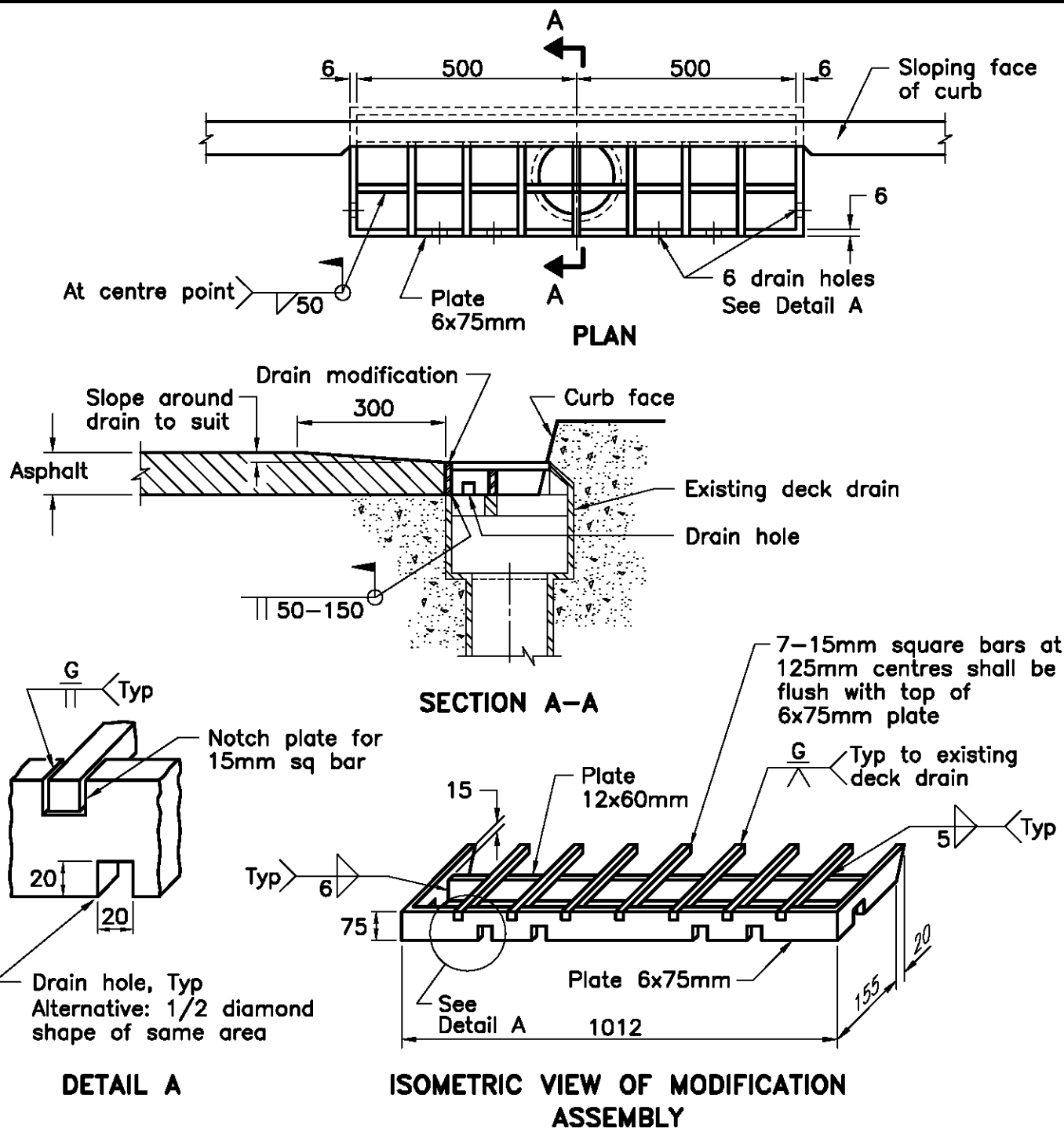
Nov 2012 Rev 2

DECK DRAINS

WITH SLOPED DOWNSPOUT MODIFICATION FOR
ADDITION OF ASPHALT TO EXISTING STRUCTURE



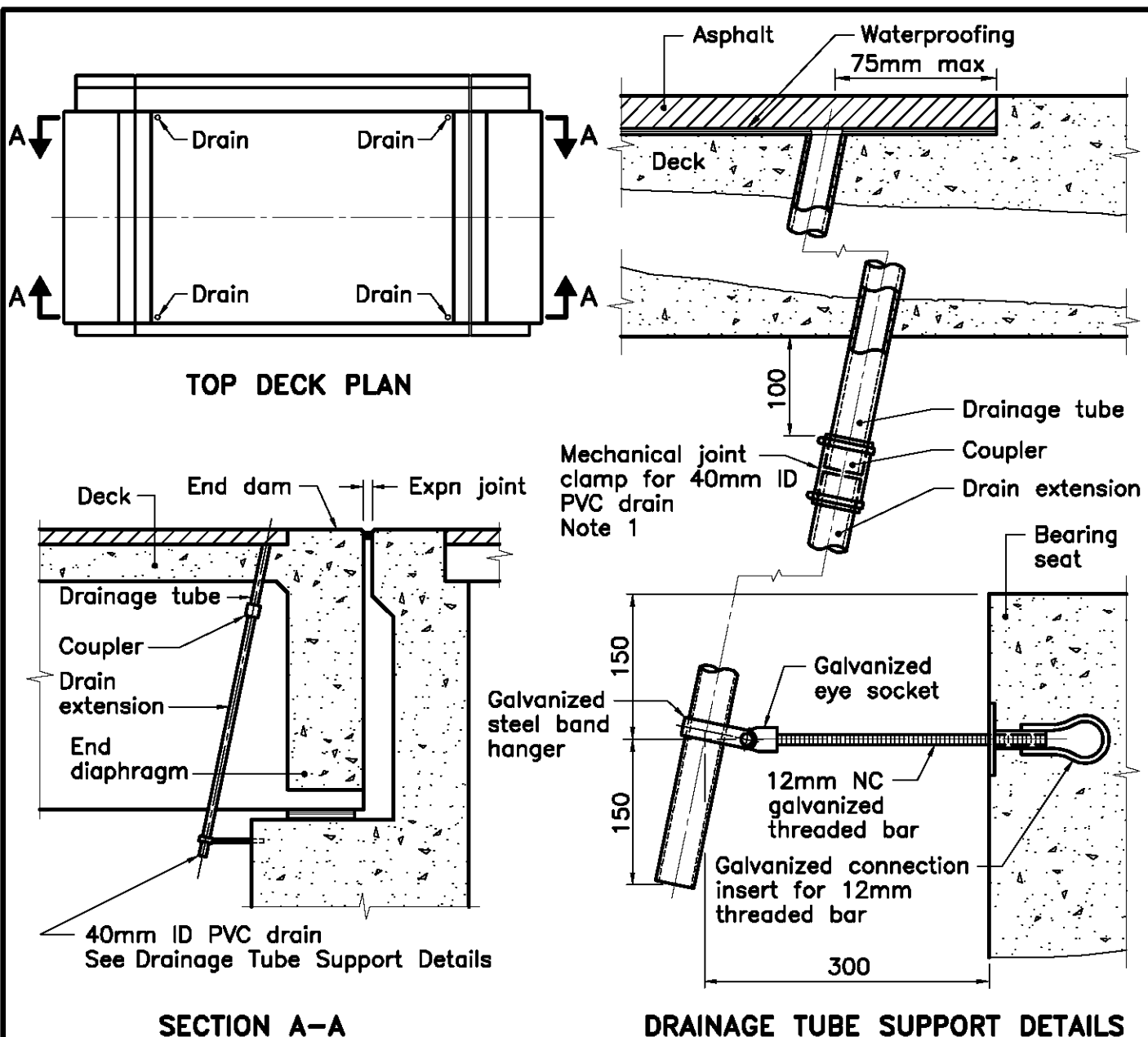
OPSD 3340.201



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			



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.

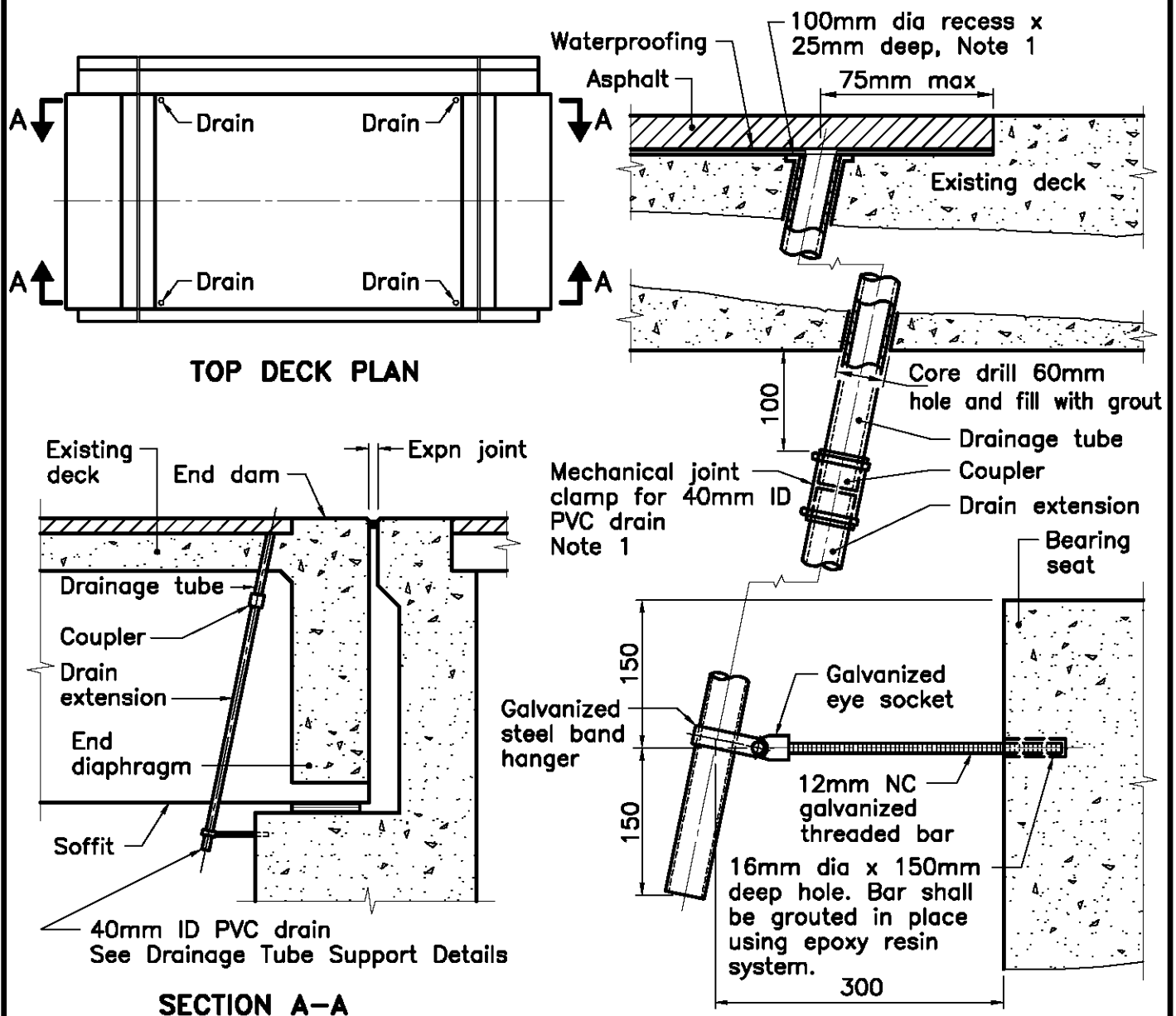
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2

**DECK, DRAINS
DRAINAGE OF NEW DECK
BELOW ASPHALT WEARING SURFACE**

OPSD 3349.100





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

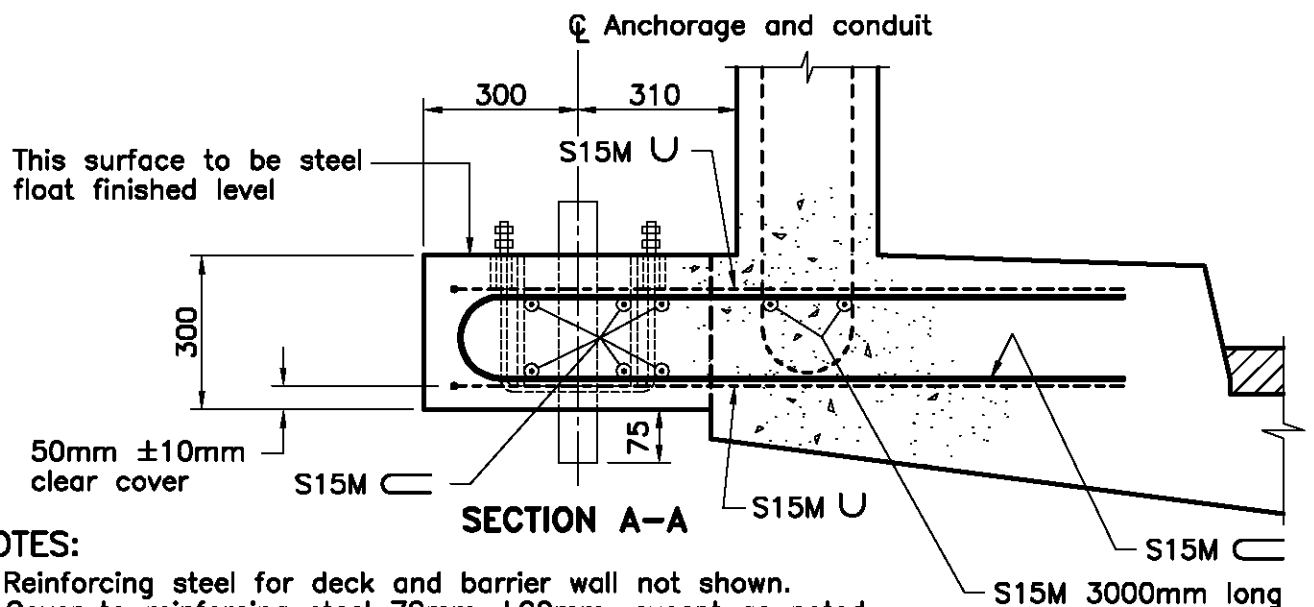
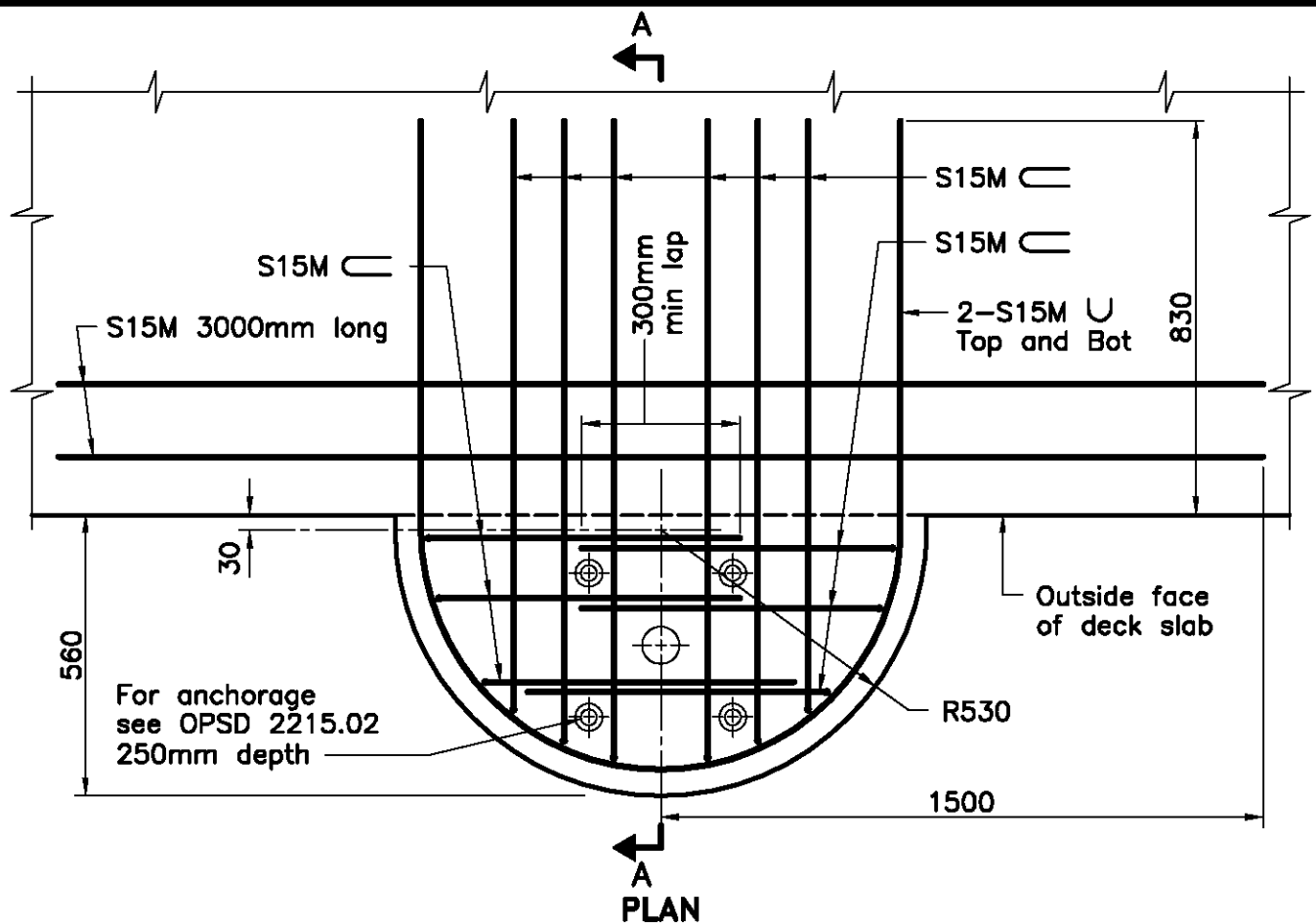
Nov 2012 Rev 2

**DECK, DRAINS
DRAINAGE OF EXISTING DECK
BELOW ASPHALT WEARING SURFACE**



OPSD 3349.101





NOTES:

- A Reinforcing steel for deck and barrier wall not shown.
- B Cover to reinforcing steel 70mm $\pm$ 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

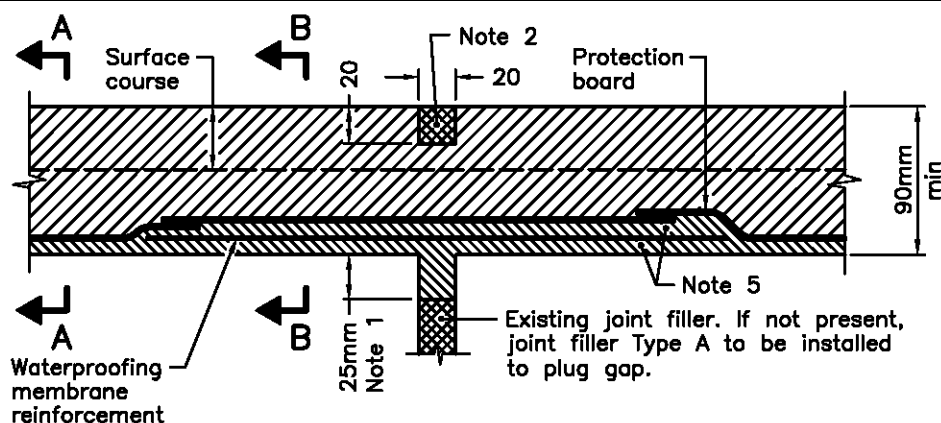
Apr 2016

Rev 2

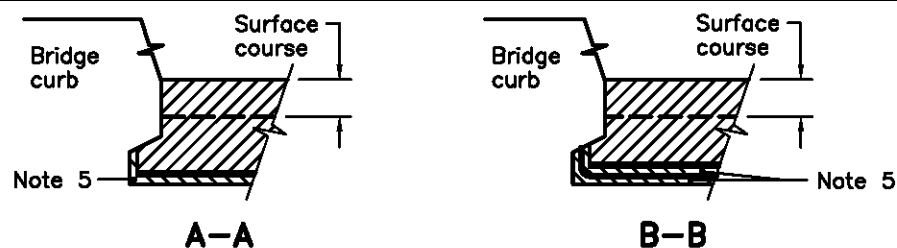
**DECK
LIGHT POLE BASES
STRUCTURES WITH PARAPET WALLS**

OPSD 3360.200

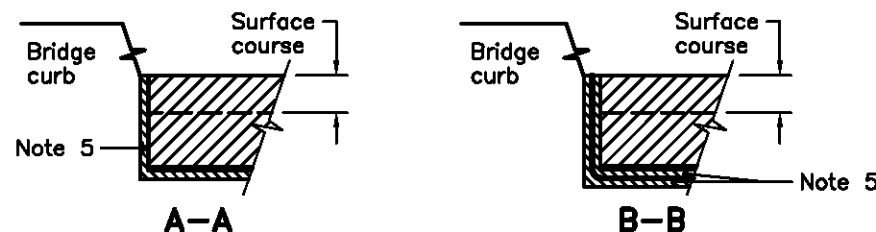




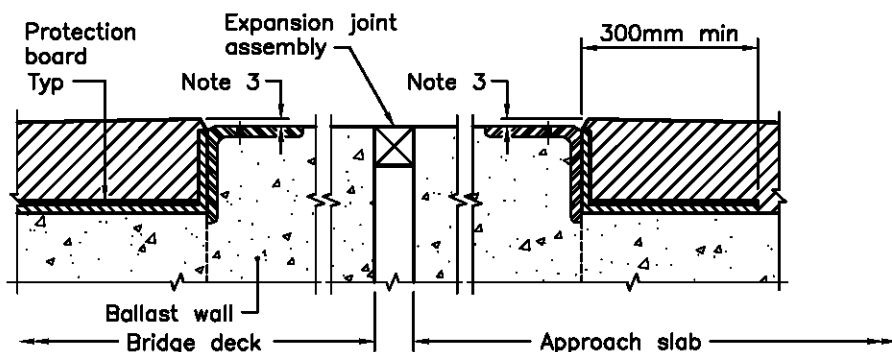
**SECTION AT JOINTS
EXCEPT AT EXPANSION JOINT ASSEMBLIES**



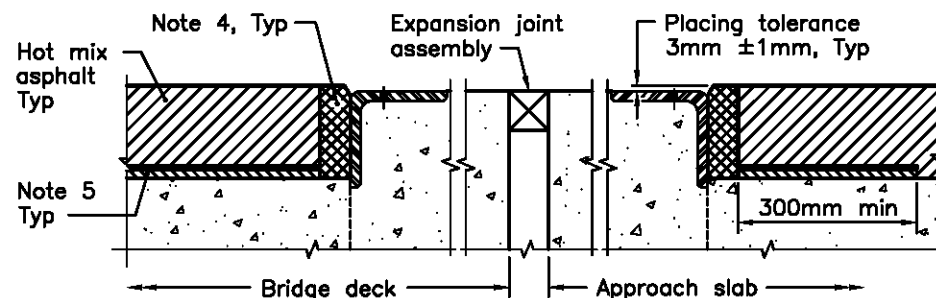
SECTIONS WITH CHASE



SECTIONS WITHOUT CHASE



**SECTION AT EXPANSION JOINT ASSEMBLY
INSTALLED BEFORE PAVING**



**SECTION AT EXPANSION JOINT ASSEMBLY
INSTALLED AFTER PAVING**

NOTES:

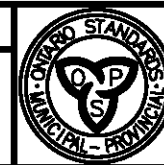
- 1 Existing joint filler to be removed as shown. Depth may vary when removing a neoprene joint filler at expansion joint.
- 2 Saw cut groove in pavement to be centred over joint and filled with hot-poured rubberized asphalt joint sealing compound.
- 3 5mm $\pm$ 1mm thickness of asphalt to be tapered 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 $\pm$ 1mm hot applied asphalt membrane.

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

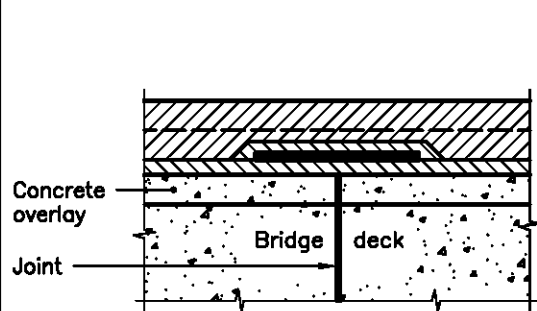
ONTARIO PROVINCIAL STANDARD DRAWING

**DECK, WATERPROOFING
HOT APPLIED ASPHALT MEMBRANE
WITH PROTECTION BOARD**

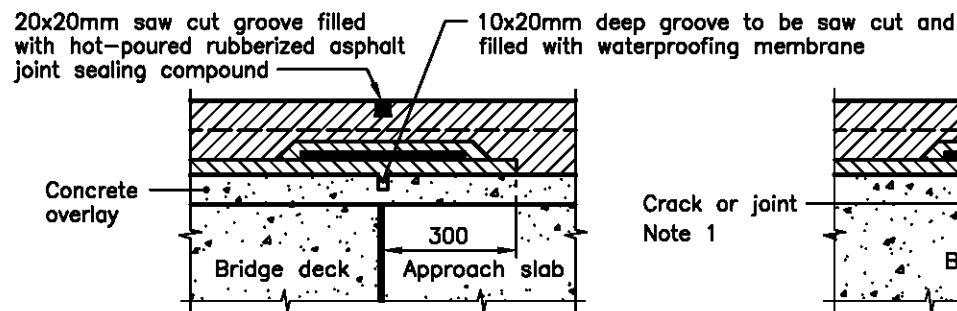
Nov 2008 Rev 2



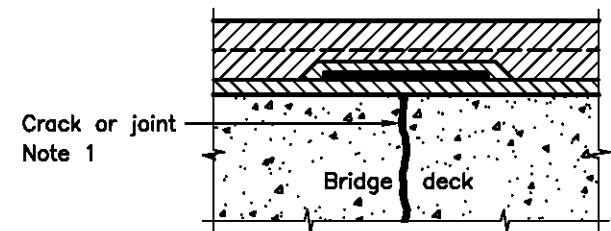
OPSD 3370.100



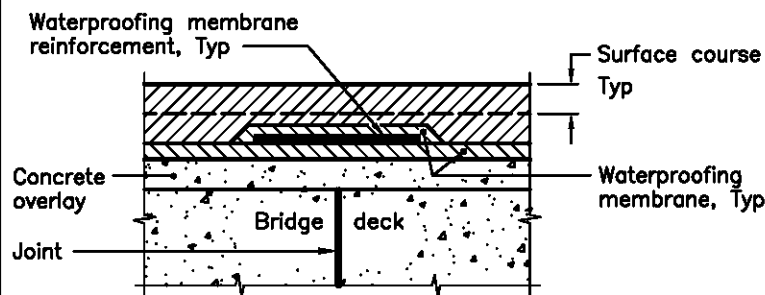
**JOINT IN CONCRETE OVERLAY
DIRECTLY ABOVE JOINT
IN BRIDGE DECK**



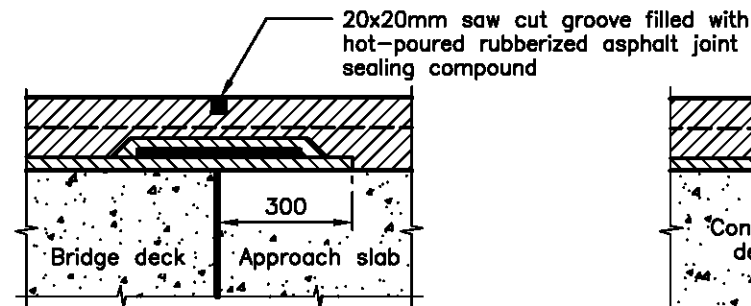
**JOINT BETWEEN BRIDGE DECK
AND APPROACH SLAB
WITH CONCRETE OVERLAY**



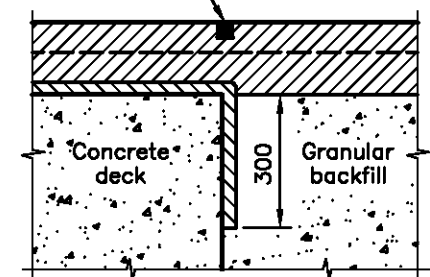
**JOINT OR ACTIVE WIDE CRACK
IN BRIDGE DECK**



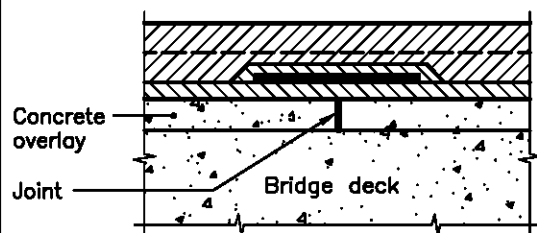
**NO JOINT IN CONCRETE OVERLAY
JOINT IN BRIDGE DECK**



**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

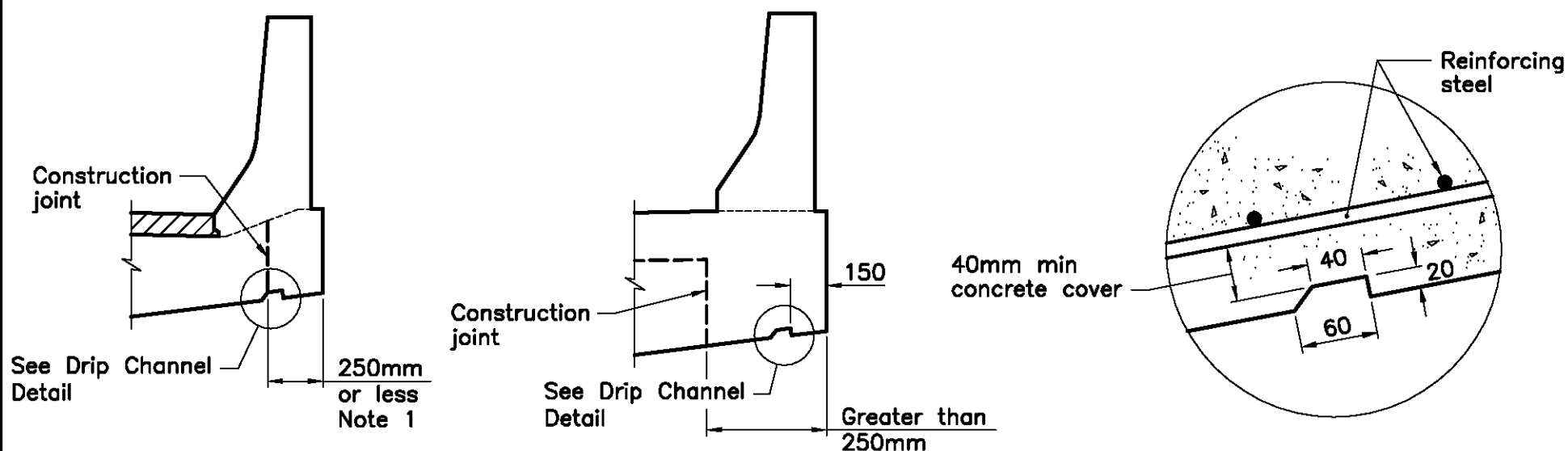
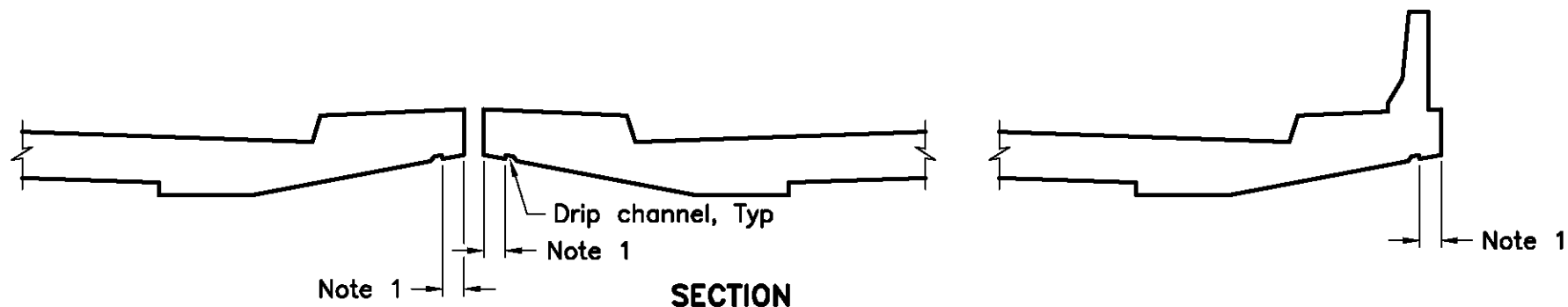
Nov 2008

Rev 2

**DECK, WATERPROOFING
HOT APPLIED ASPHALT MEMBRANE
AT ACTIVE CRACKS GREATER THAN 2mm
WIDE AND CONSTRUCTION JOINTS**

OPSD 3370.101





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.

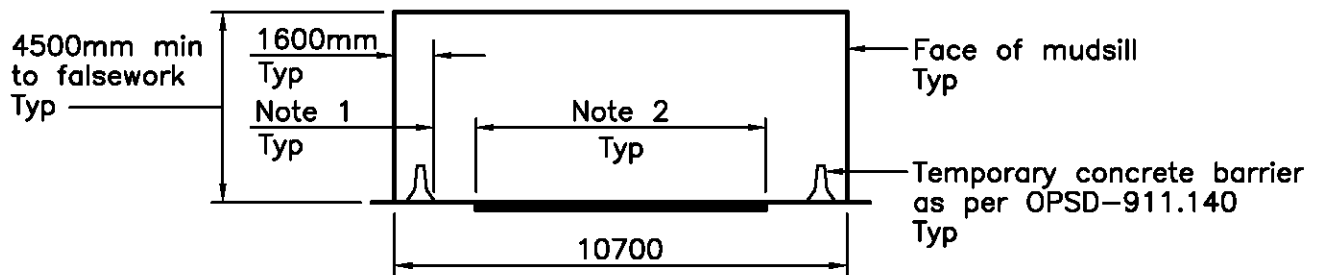
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2

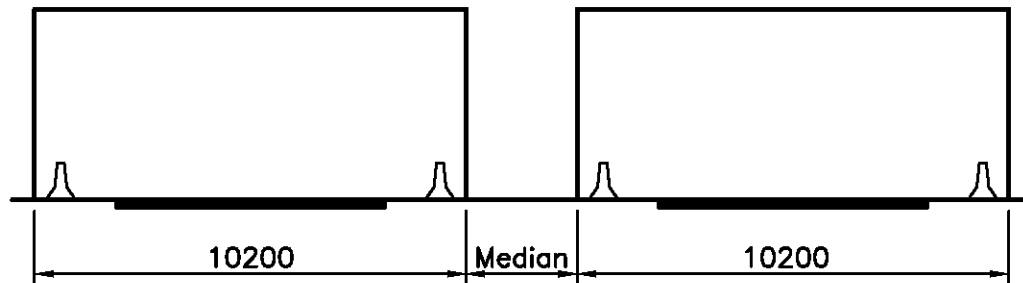
**DECK
DRIP CHANNEL**

OPSD 3390.100

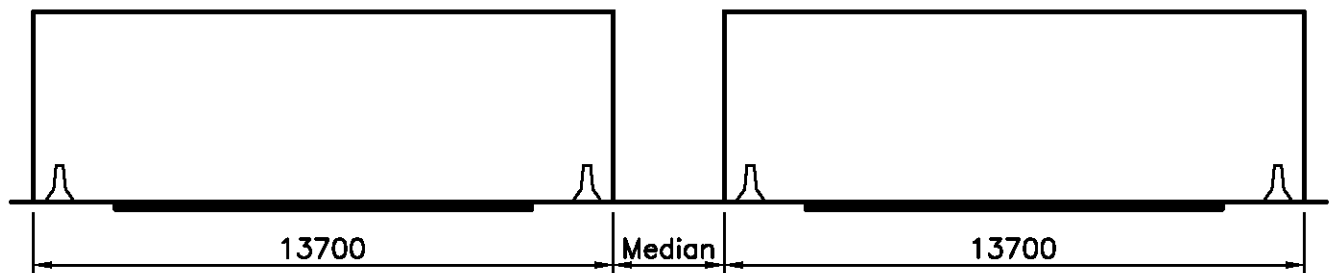




**2 LANE FACILITY
1 LANE IN EACH DIRECTION**



**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

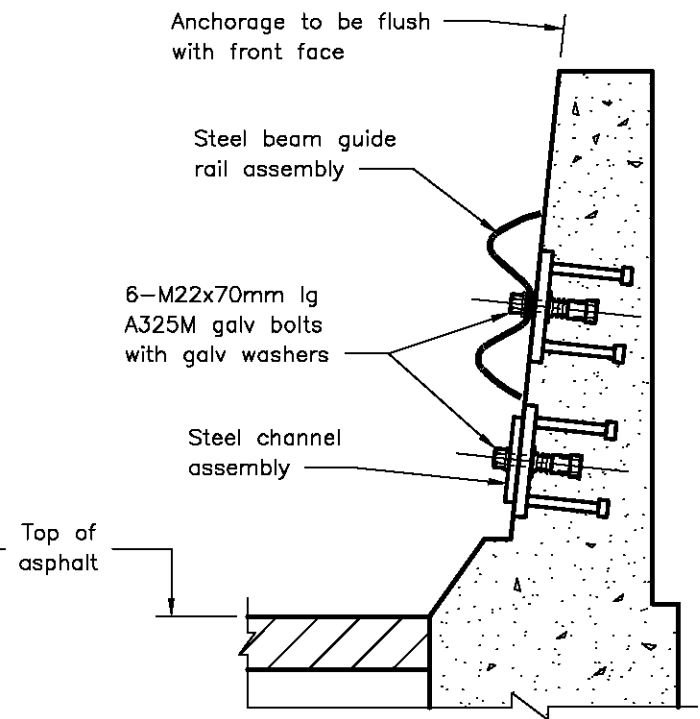
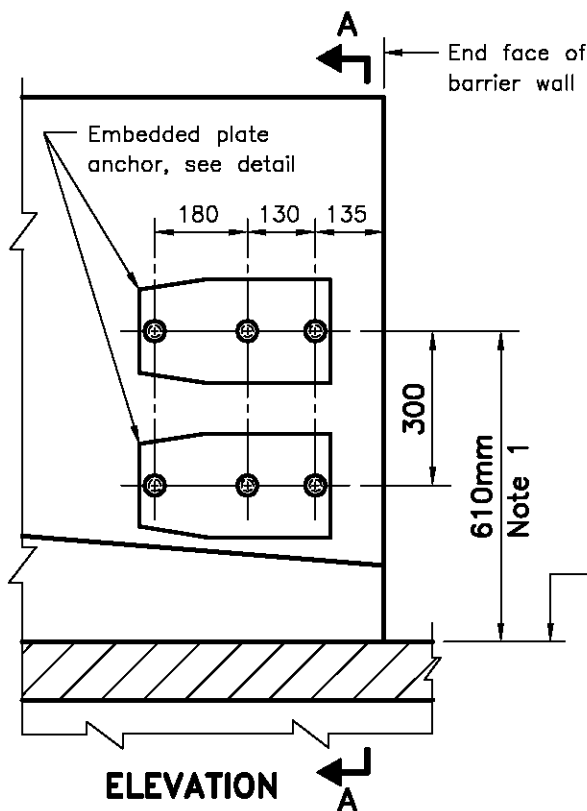
Nov 2005

Rev 0

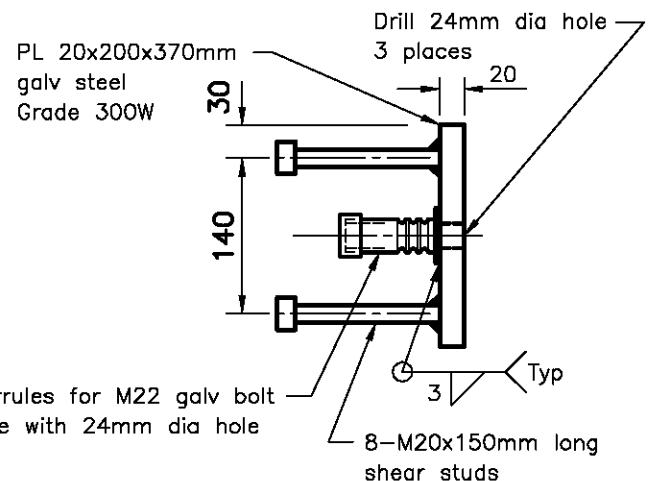
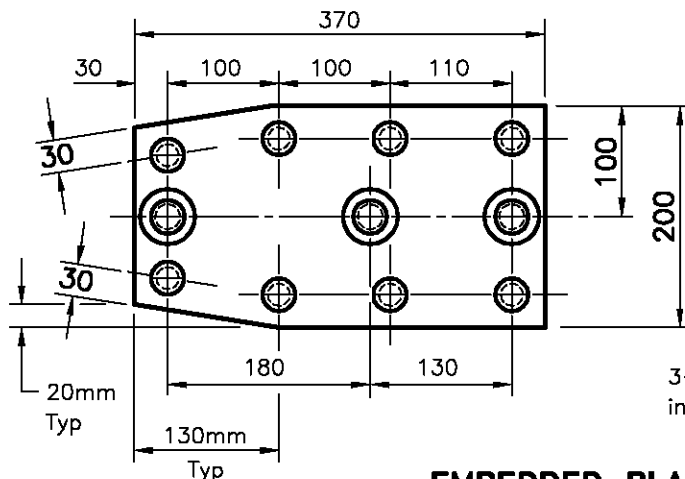
**FALSEWORK CLEARANCE
TO TRAFFIC LANES**



OPSD – 3390.150



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

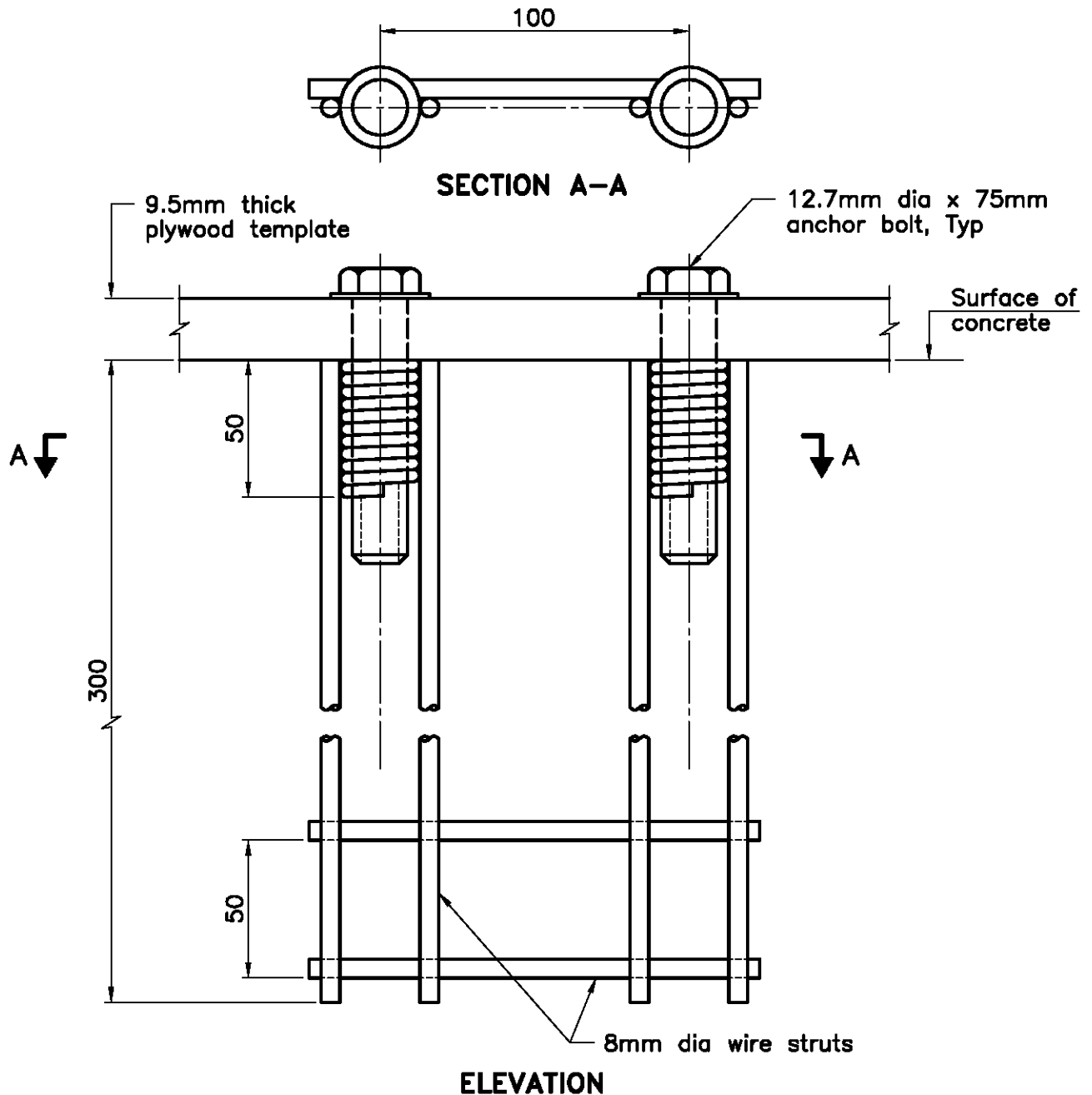
Rev 1

**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

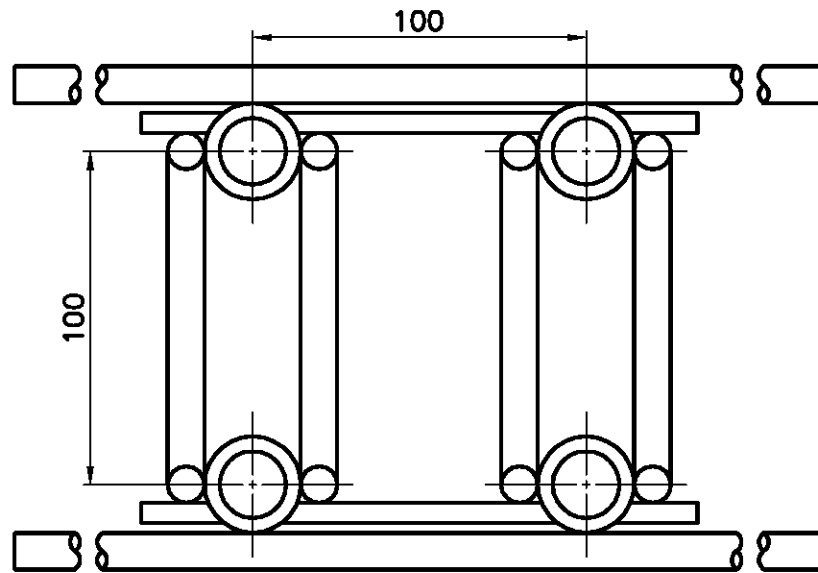
Nov 2010

Rev 1

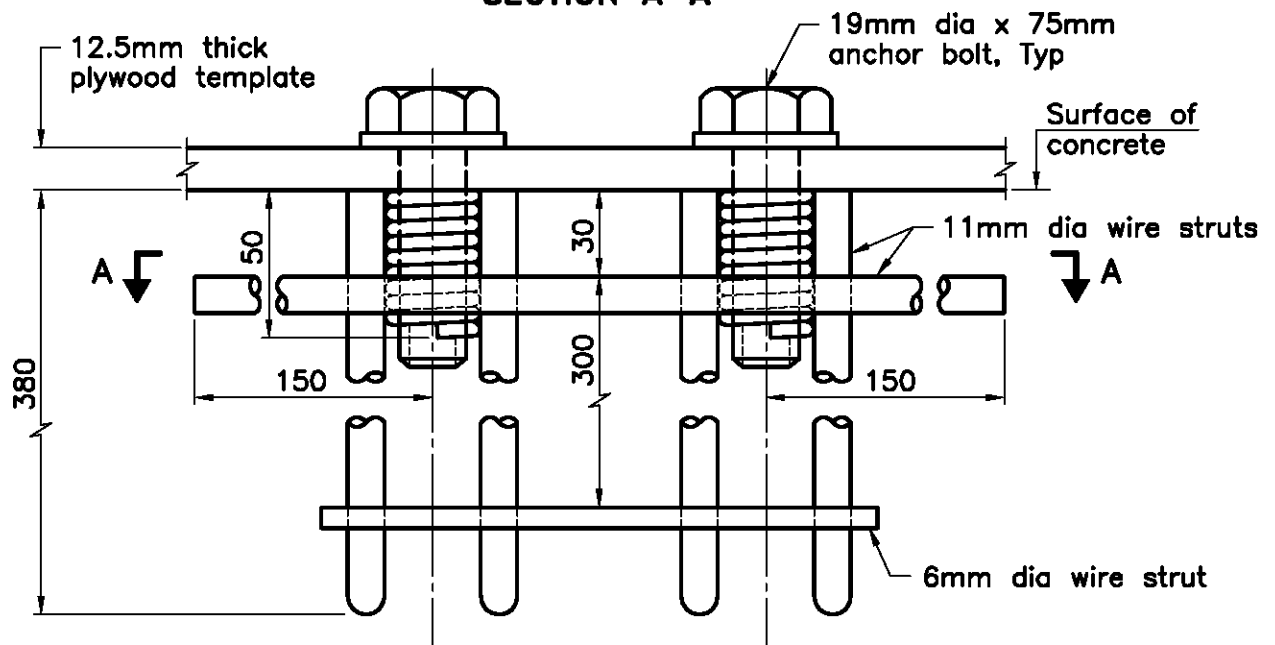
**BARRIERS AND RAILINGS
STEEL
SINGLE RAILING ANCHORAGE**

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

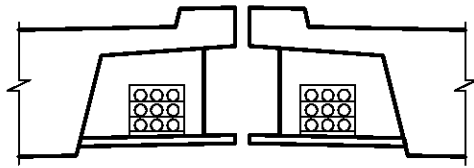
Nov 2010 Rev 1

**BARRIERS AND RAILINGS
STEEL**

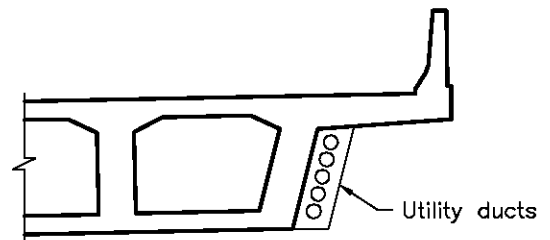
DOUBLE RAILING ANCHORAGE



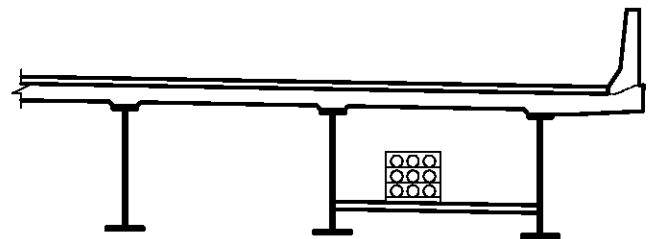
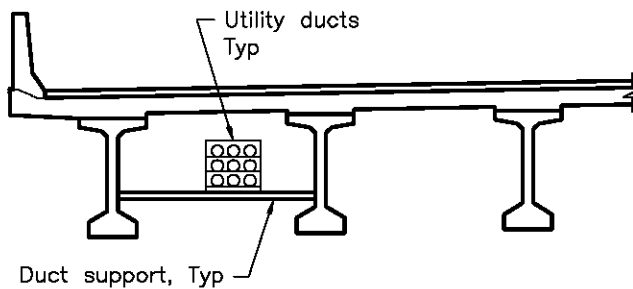
OPSD 3419.155



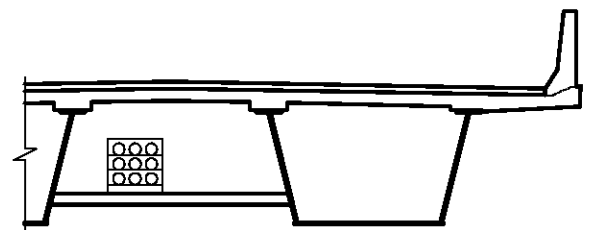
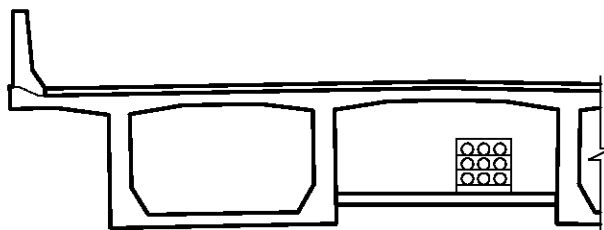
**TWINNED CONCRETE VOIDED
POST-TENSIONED DECKS**



**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

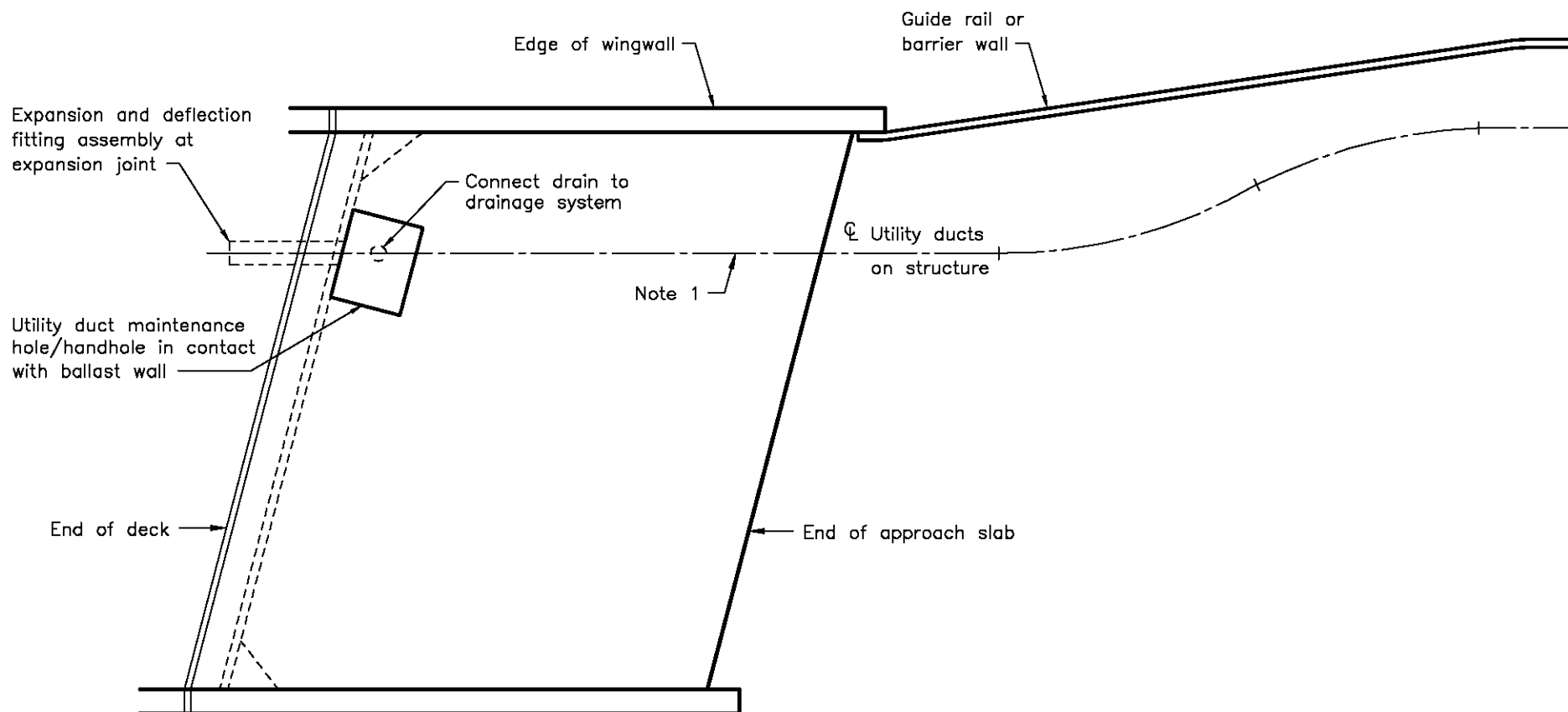
Rev

1

**UTILITIES
DUCT LOCATION**



OPSD 3900.100



PLAN

NOTE:

1 Duct layout shall be as specified.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2011

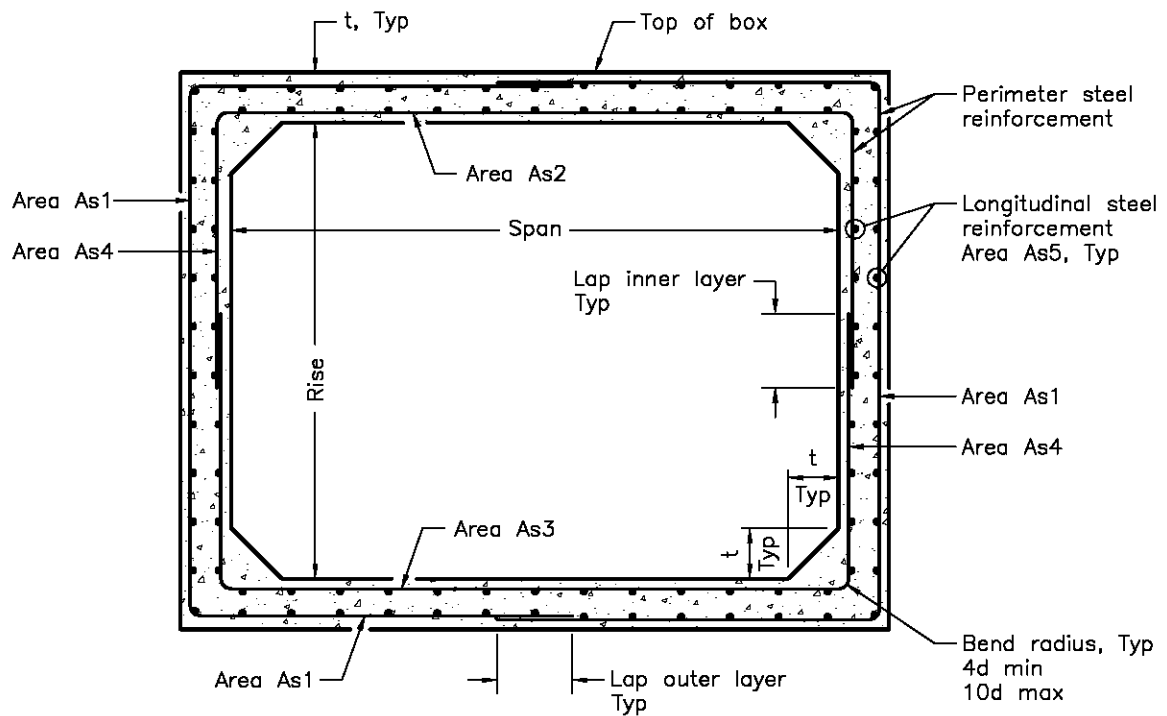
Rev 1

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

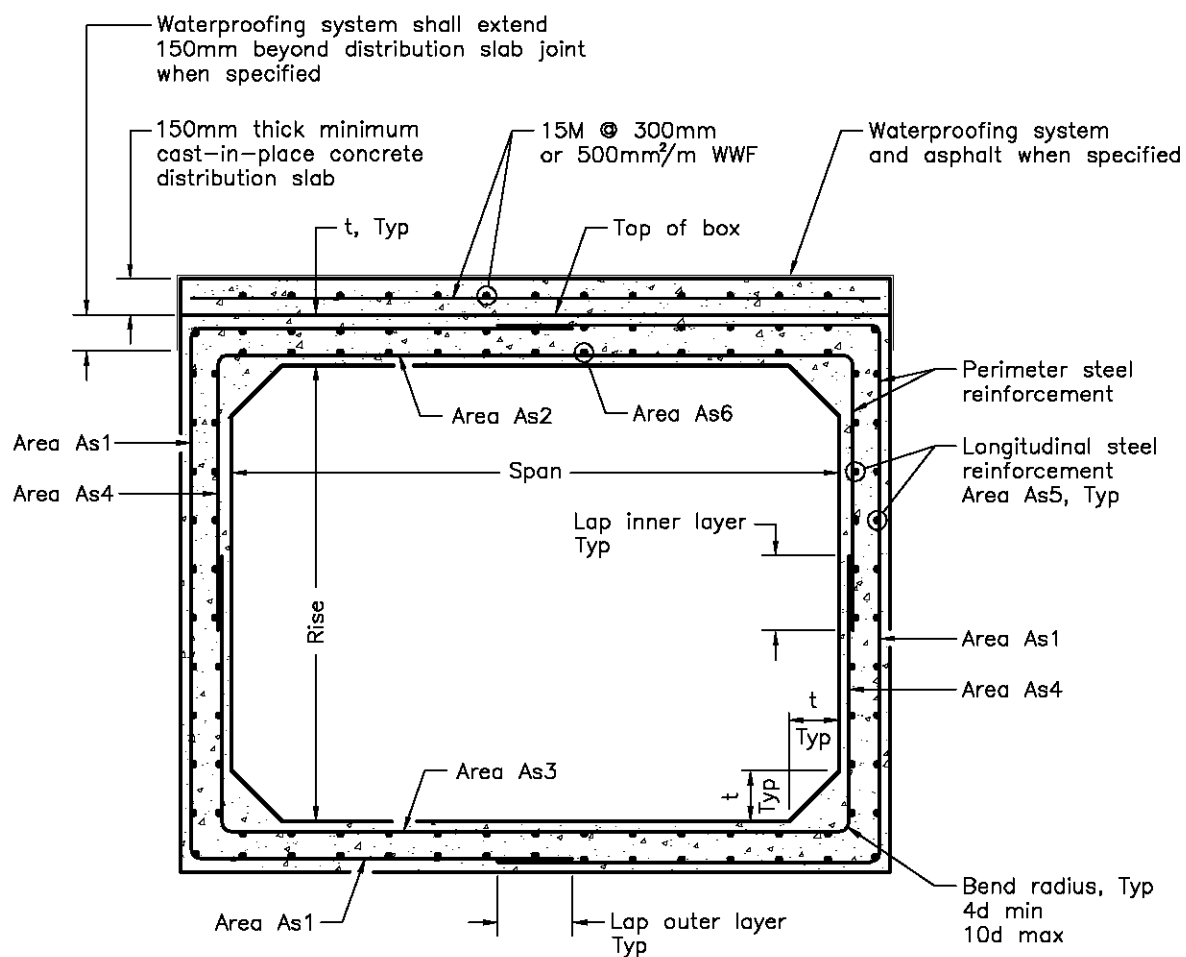
Nov 2015

Rev 0

**PRECAST REINFORCED CONCRETE
BOX CULVERT
WITH HEIGHT OF FILL $\geq 0.6M$**

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

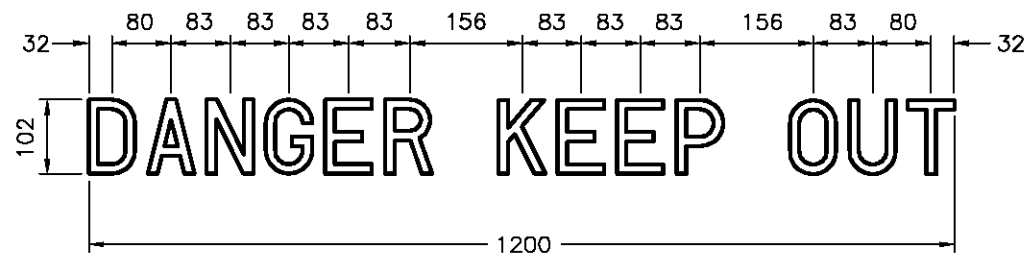
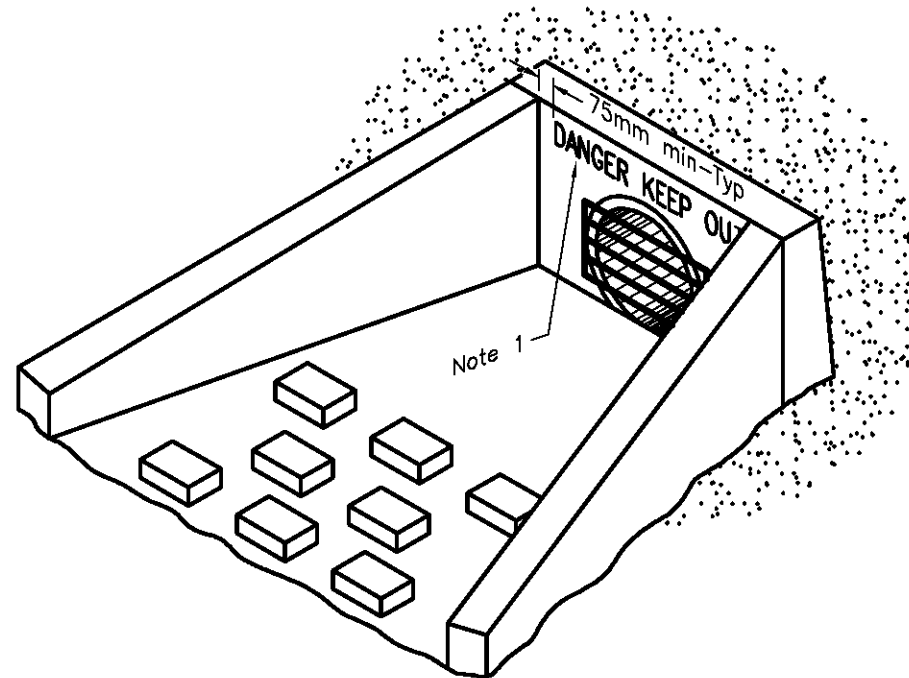
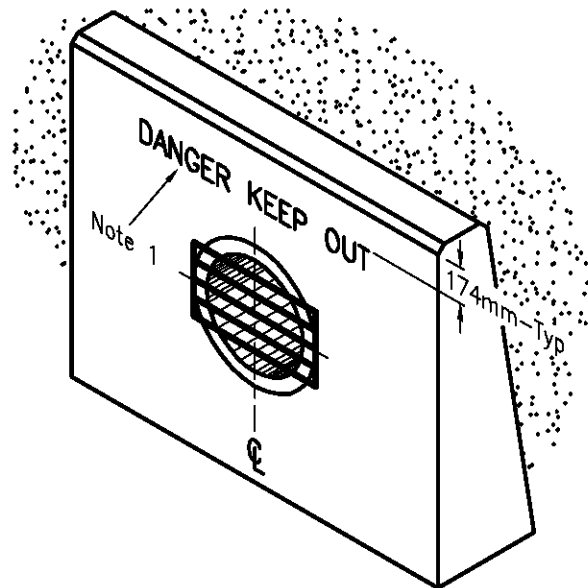
Apr 2016

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

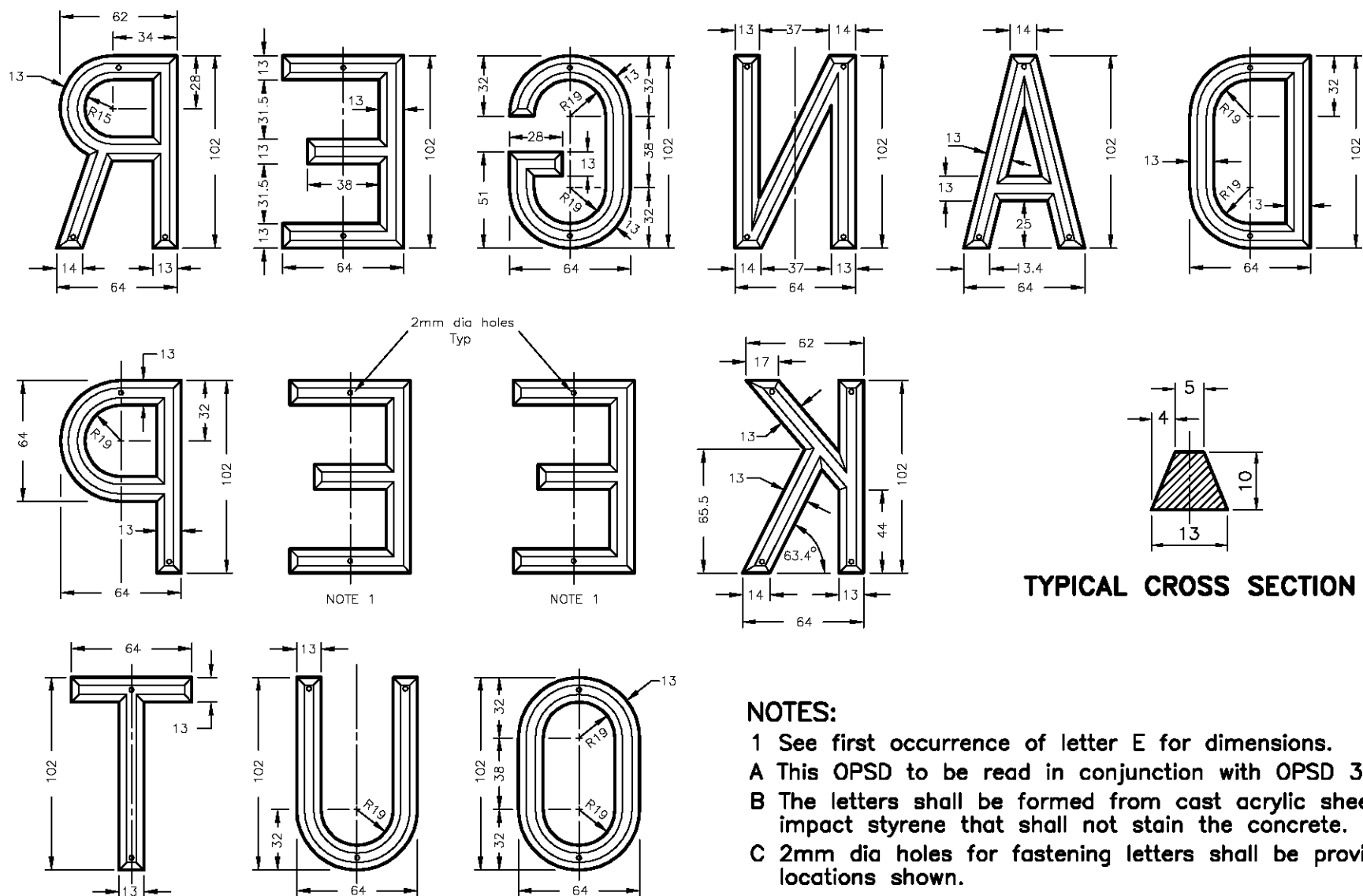
Nov 2010

Rev 2

FIGURES IN CONCRETE
WARNING MESSAGE
LAYOUT

OPSD 3940.150





ONTARIO PROVINCIAL STANDARD DRAWING

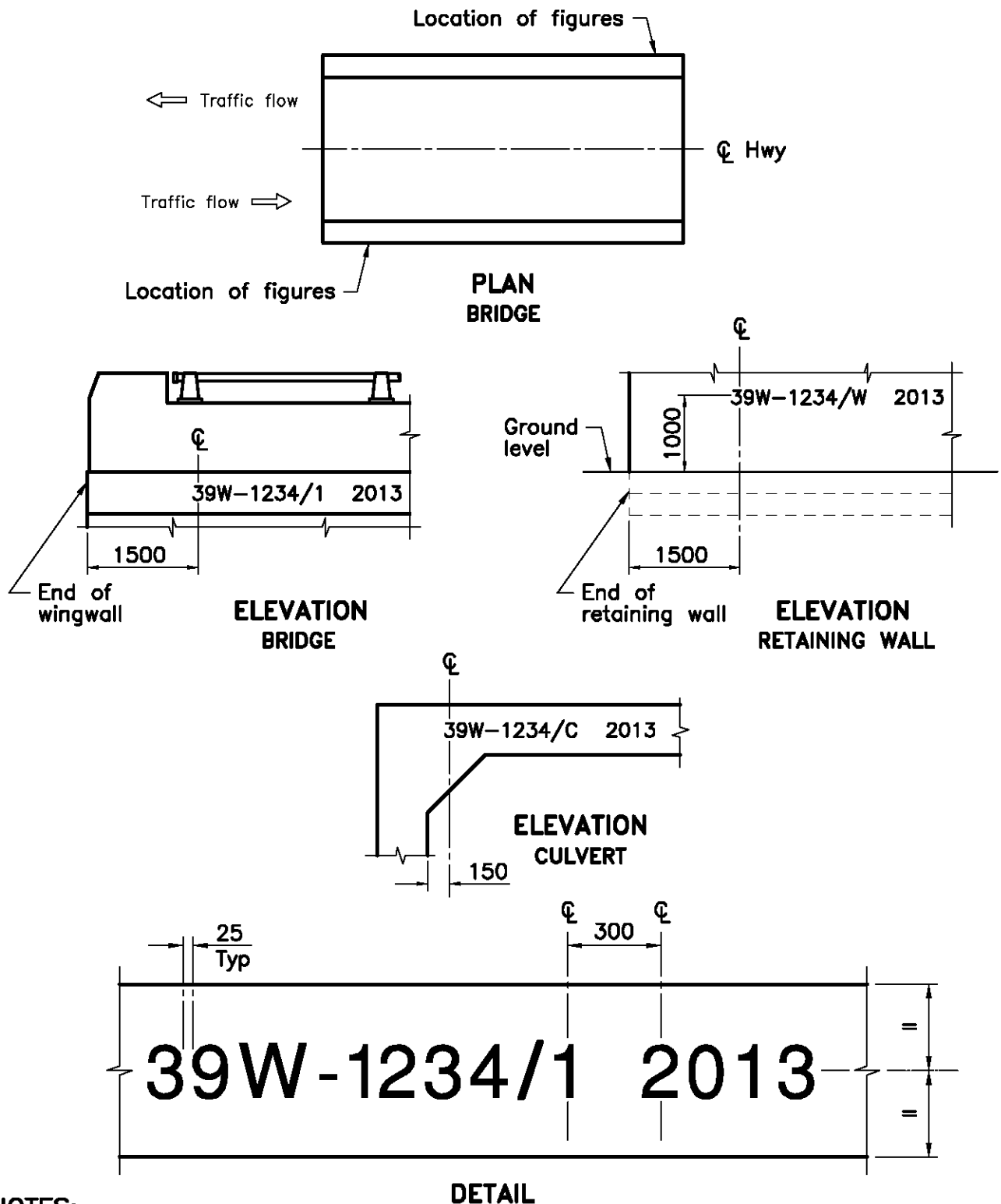
Nov 2010

Rev 2

FIGURES IN CONCRETE
WARNING MESSAGE
LETTERS

OPSD 3940.151



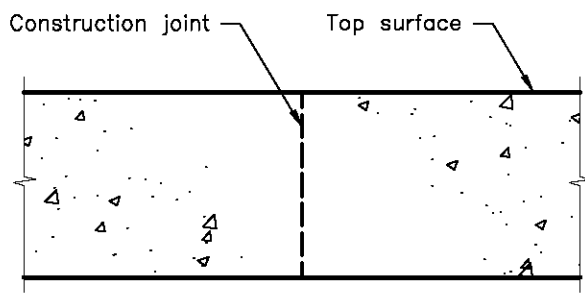


NOTES:

- 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.

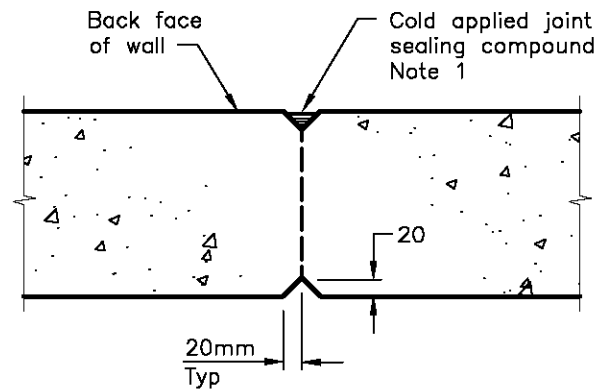
ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2013	Rev	2	
FIGURES IN CONCRETE SITE NUMBER AND DATE LAYOUT		_____			

		OPSD 3941.200			



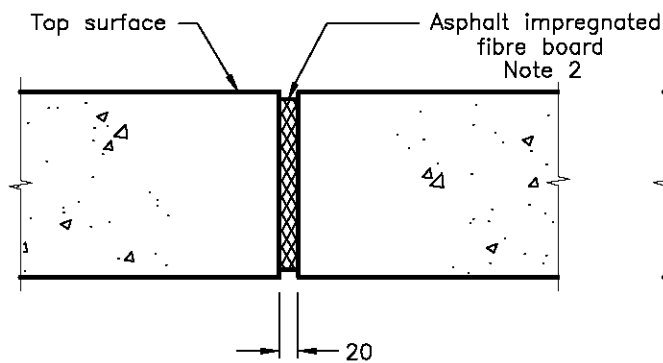
ELEVATION

CONSTRUCTION JOINT IN DECK



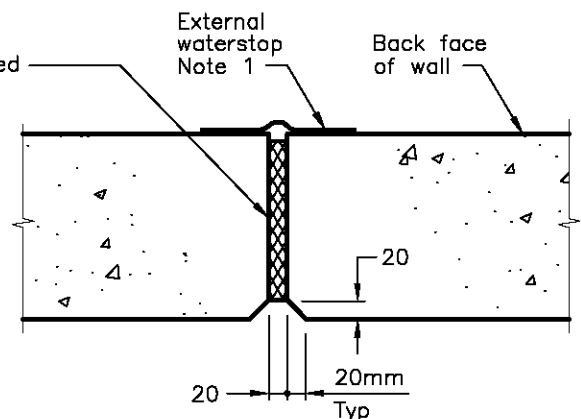
PLAN

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



