STATE OF MAINE

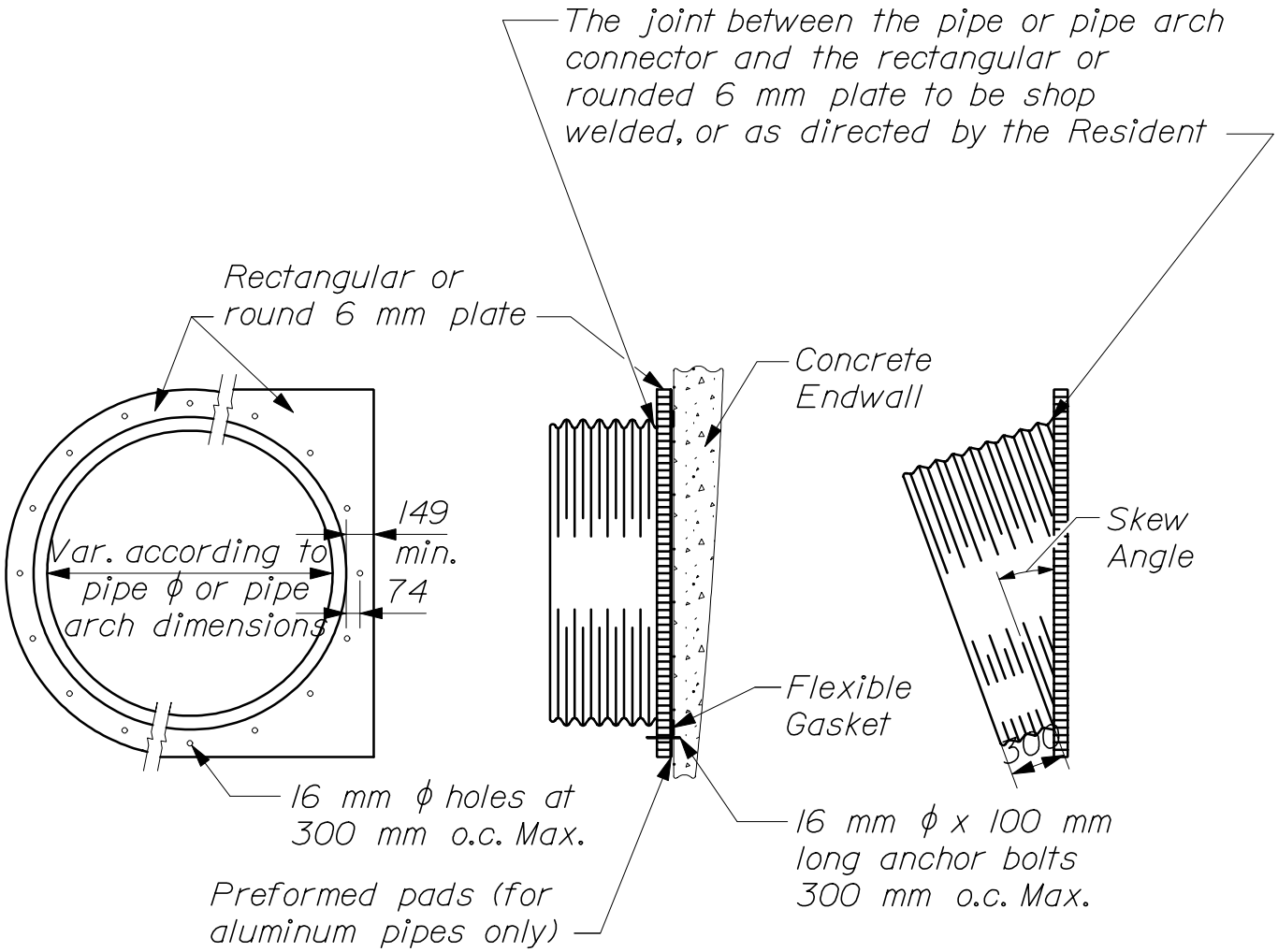
Department of Transportation

Standard Details

Revision of December 2002

DIVISION 600

MISCELLANEOUS CONSTRUCTION

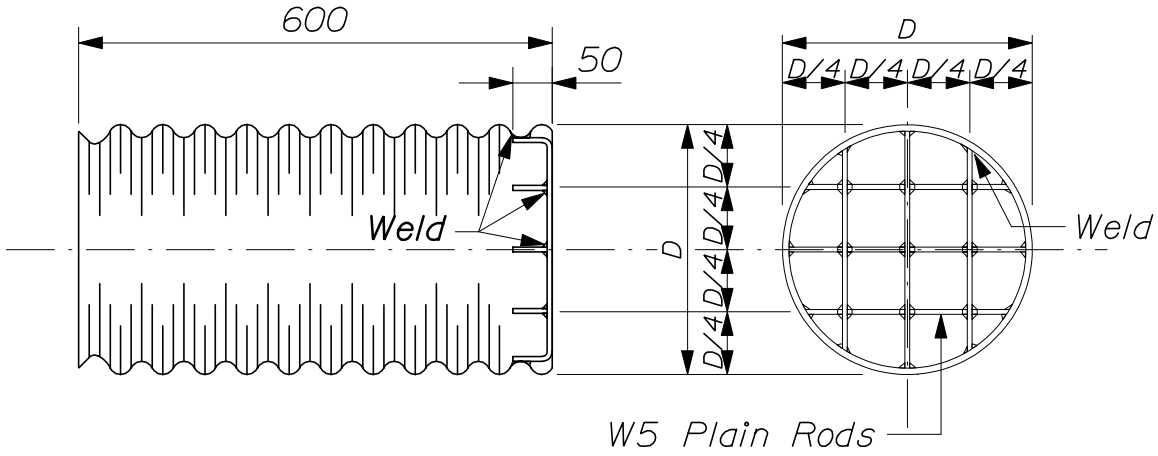


METAL CULVERT CONNECTOR

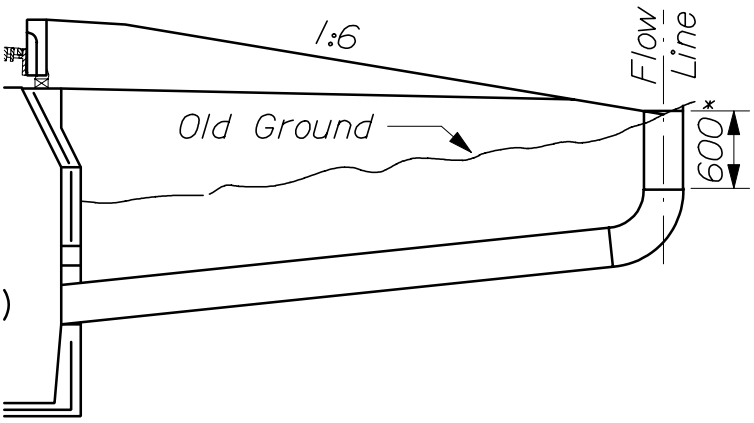
CONNECTOR FOR SKEWED PIPE

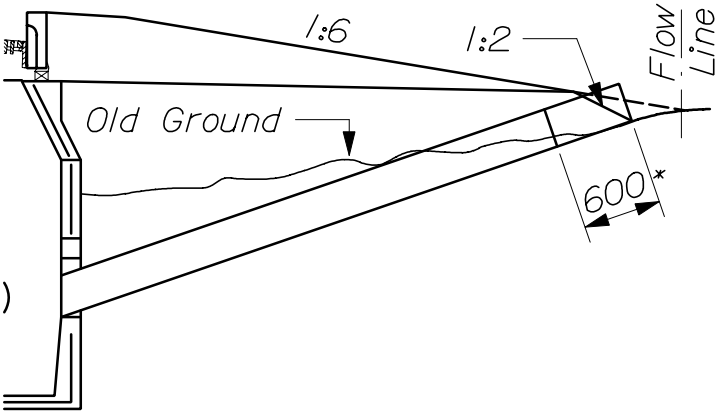
CONCRETE BOX CULVERT EXTENSION USING CORRUGATED METAL PIPE & PIPE ARCHES

603(01)



INLET GRATE UNIT





Notes:

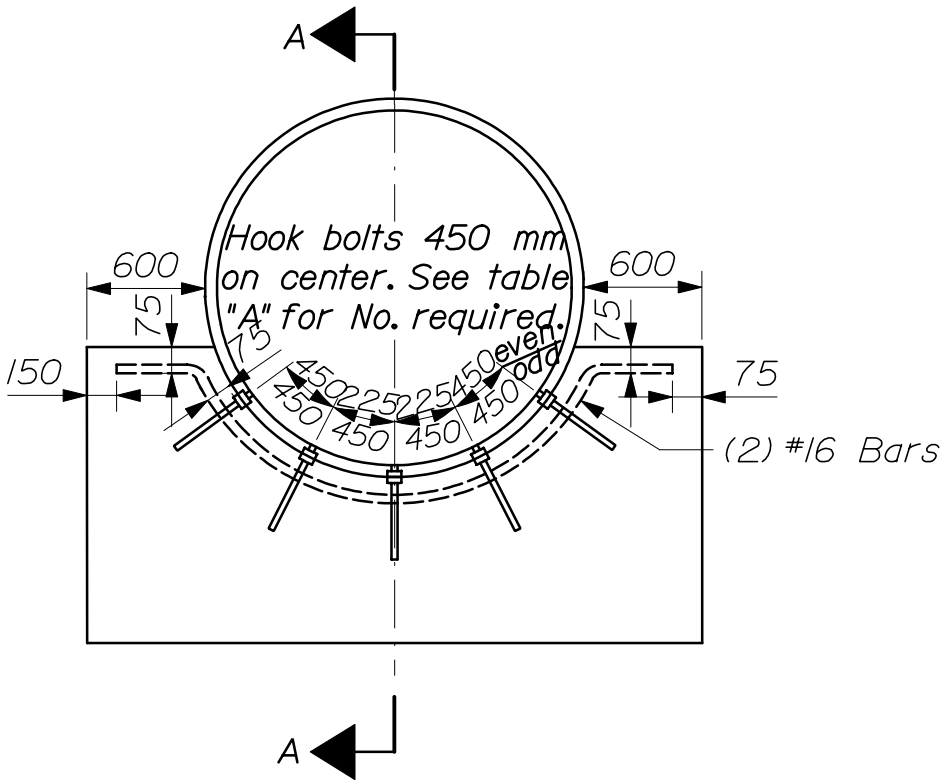
1. All units to be complete shop assembly.
2. All units to have one shop coat of approved aluminum paint.
3. An elbow shall be installed if directed by the Resident to provide a horizontal grate, and shall be paid for as 1 additional meter of the type and size of pipe involved.
4. Rods shall conform to the requirements of Section 709.01 of the Standard Specifications.
5. Pipe for inlet grate unit shall be the same type that is used to connect into the catch basin.

* 600 mm Inlet Grate Unit.

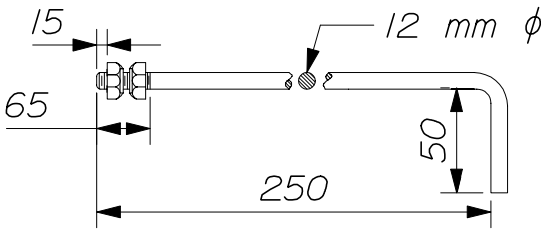
INLET UNITS IN FILL AREAS

INLETS

603(02)

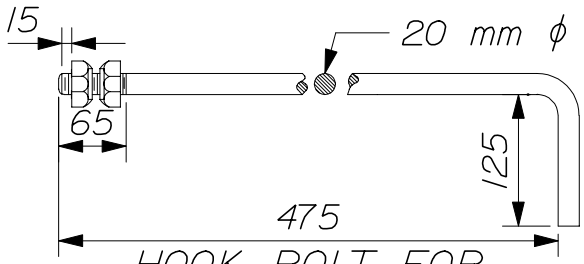


Projection after installation



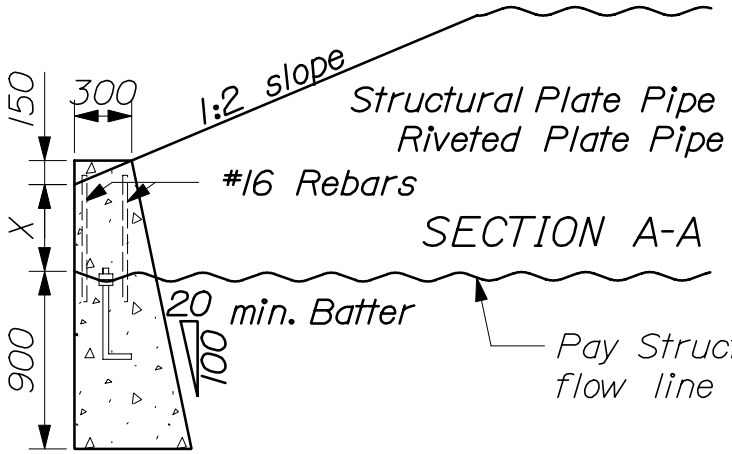
HOOK BOLT FOR RIVETED PLATE PIPES

Projection after installation



HOOK BOLT FOR STRUCTURAL PLATE PIPES

For alternate bolt see notes.



Notes:

1. For riveted pipe, hook bolt shall be placed in the second valley.
2. See Table "A" for "X" dimension.

CONCRETE INLET ENDWALL

603(03)

RIVETED PIPES		
SIZE	NO. OF BOLTS REQUIRED	"X" DIMENSION
1500	4	450
1650	4	450
1800	4	450
1950	5	450
2100	5	450
STRUCTURAL PLATE PIPE		
SIZE	NO. OF BOLTS REQUIRED	"X" DIMENSION
1800	4	450
1950	5	500
2100	5	525
2250	5	575
2400	6	600
2550	6	650
2700	6	675
2850	7	725
3000	7	750
3150	7	800
3300	8	850
3450	8	875
3600	9	925
3750	9	950
3900	9	1000
4050	10	1025
4200	10	1050
4350	10	1100
4500	11	1150

Notes:

1. Culverts installed under 1:2 slopes shall have Riprap laid on 1:2 slope with no ditch transitions.

2. Excavation required to grade culvert inlets and outlets as shown will not be paid separately, but will be incidental to the culvert.

3. Hook bolts will be incidental to the concrete items.

4. Concrete endwall shall be structural concrete class "A" and shall be paid for as Item 502.32 or Item 502.329, Structural Concrete Culvert Endwall. Reinforcing steel will not be paid for separately but will be considered incidental to Item 502.32 or Item 502.329.

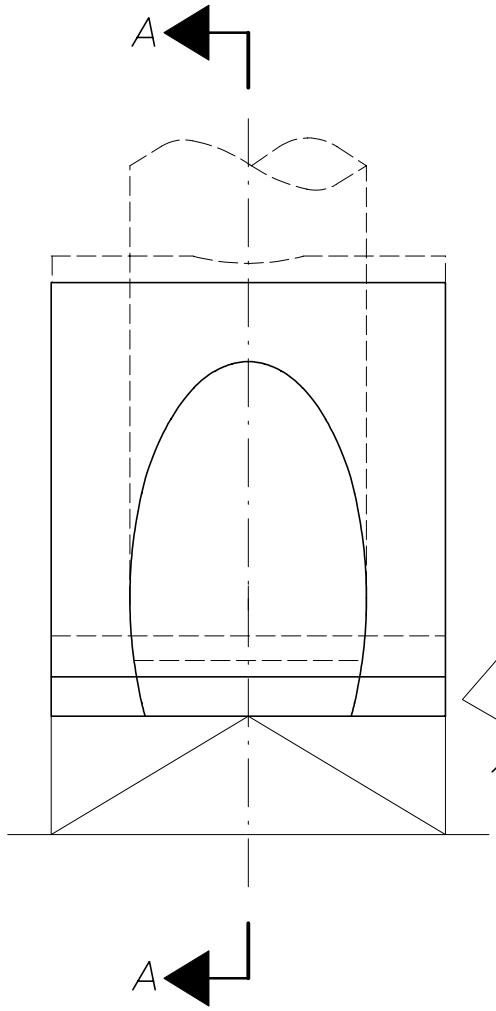
5. Standard galvanized carriage or machine bolts 12 mm x 200 mm long or 20 mm x 150 mm long with minimum 50 mm thread may be furnished in place of hook bolts. Washers shall be furnished at the head of each bolt.

6. Bolt material shall conform to ASTM F568 Class 4.6. Nuts shall conform to ASTM A563M. Bolts, nuts, and washers shall be hot dip galvanized after fabrication to meet ASTM A153.

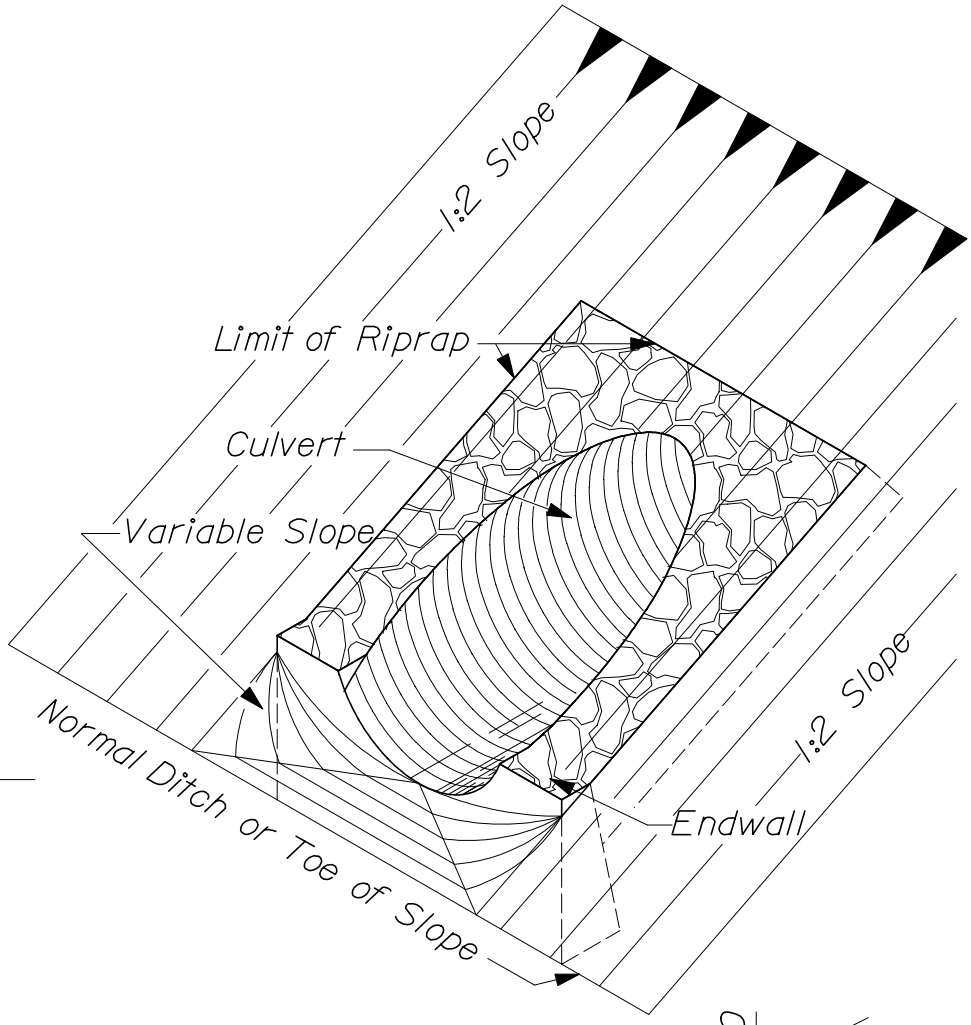
TABLE A

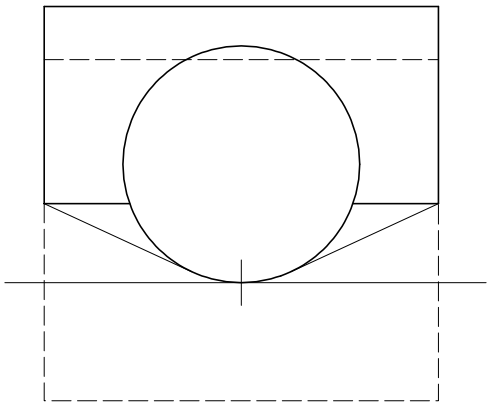
CONCRETE INLET ENDWALL

603(04)

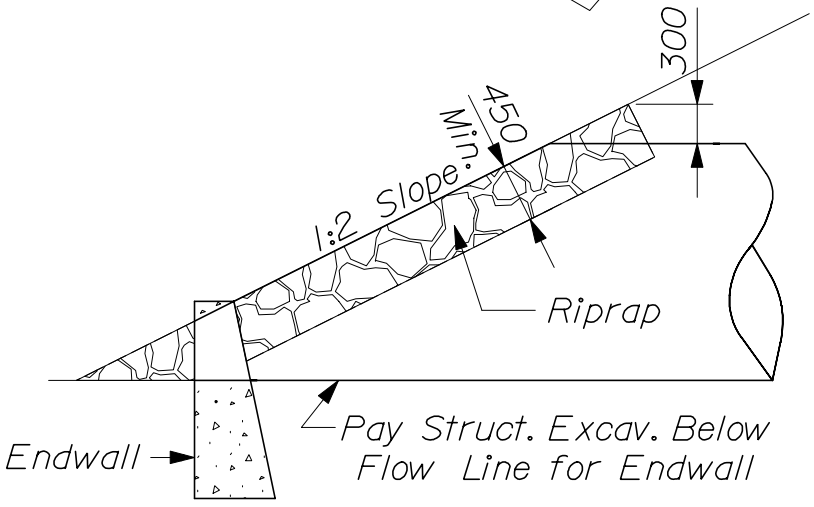


PLAN VIEW





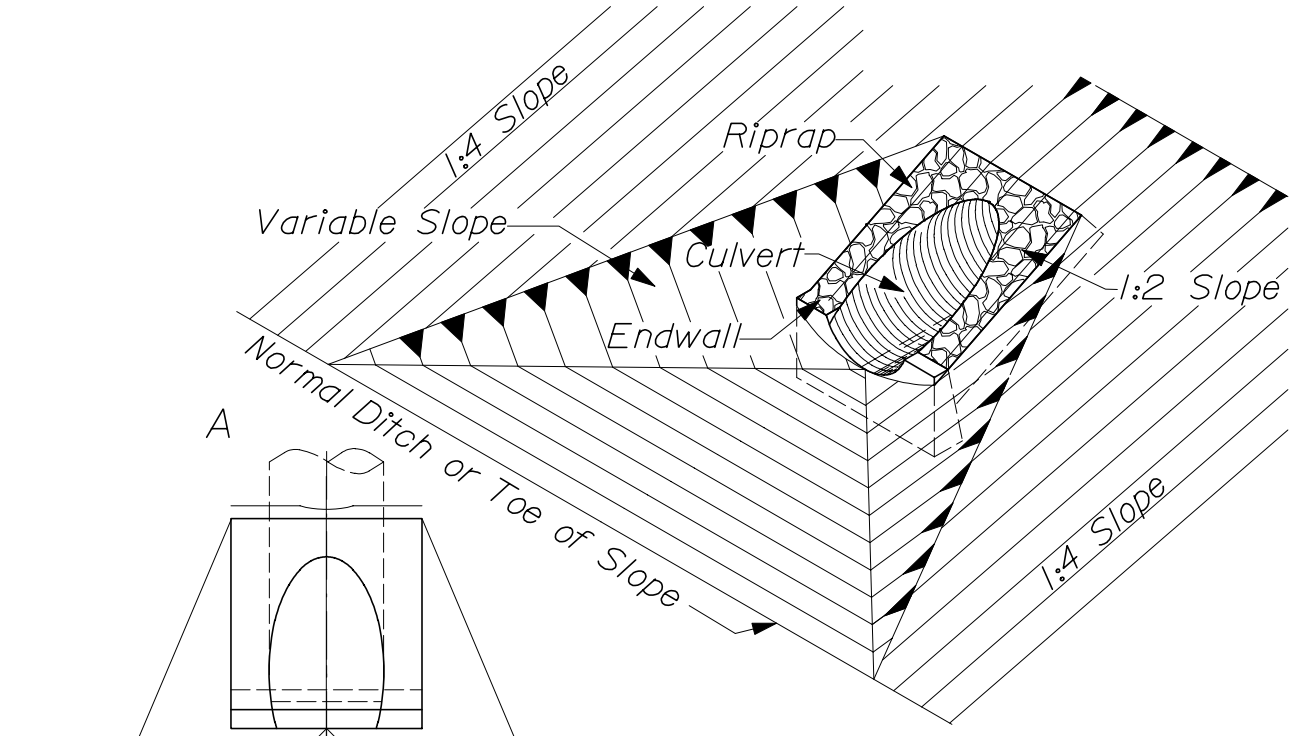
END VIEW



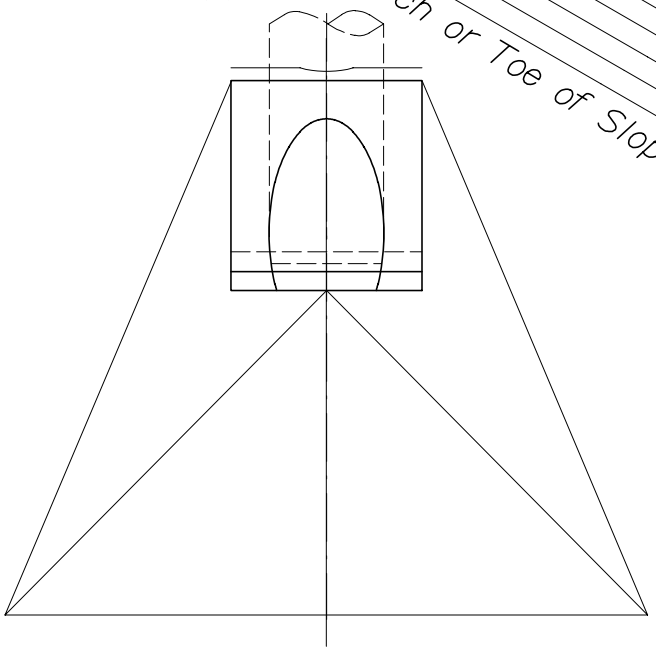
SECTION A-A

CONCRETE INLET ENDWALLS FOR RIVETED AND STRUCTURAL PLATE PIPES 1 500 mm TO 4 500 mm IN 1:2 SLOPES

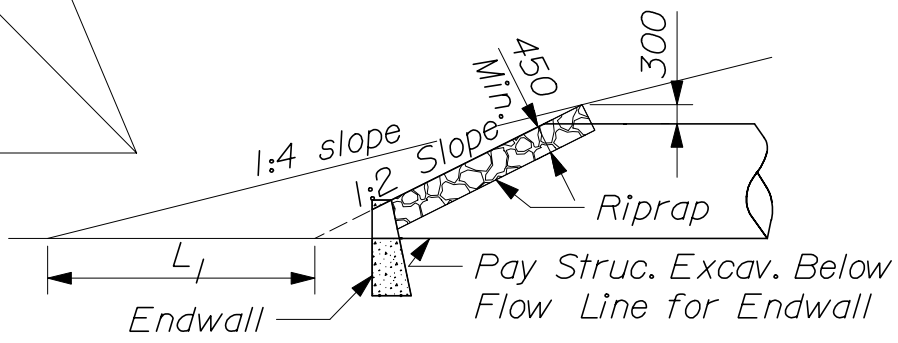
603(05)



ISOMETRIC VIEW

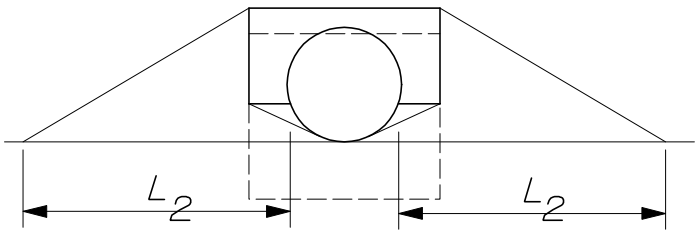


PLAN VIEW



SECTION A-A

Note: $L_1 = L_2$



END VIEW

CONCRETE INLET ENDWALLS FOR RIVETED AND STRUCTURAL PLATE PIPES 1 500 mm TO 4 500 mm IN 1:4 SLOPES

603(06)

PIPE ARCH CULVERT (NOMINAL WALL THICKNESS IN MILLIMETERS)		
	CORRUGATED METAL PIPE ARCH OPTION III	
NOMINAL SIZE IN MILLIMETERS SPAN x RISE	M 246 & FIBER BONDED	M 197
525 x 375	2.0	1.9
600 x 450	2.0	1.9
700 x 500	2.0	2.7
875 x 600	2.8	2.7
1000 x 775(1) 1050 x 725(2)	2.0 2.8	1.9
1150 x 900(1) 1225 x 825(2)	2.0 3.5	2.7
1325 x 1025(1) 1425 x 950(2)	2.0 3.5	2.7
1500 x 1150(1) 1600 x 1075(2)	2.8 4.3	3.4
1650 x 1275(1)	2.8	3.4
1825 x 1375(1)	2.8	4.2
2025 x 1475(1)	2.8	4.2

Metal Pipe Values are for 68 mm x 13 mm corrugations unless size is followed by a (1) which denotes 76 mm x 25 mm corrugations.

M 246 = Polymer Pre-coated Galvanized Corrugated Steel Pipe

M 197 = Corrugated Aluminum Alloy Pipe

Fiber Bonded = M.D.O.T. Spec. 707.04

Minimum cover is 900 mm

(2) Either size is acceptable

CULVERT WALL THICKNESS

603(07)

COUPLING BAND WIDTH REQUIREMENTS					
NOMINAL CORRUGATIONS	NOMINAL PIPE INSIDE DIAMETER	COUPLING BAND WIDTH			
		ANNULAR CORRUGATED BANDS		HELICALLY CORRUGATED BANDS	
		M 196	M 36	M 196	M 36
38x6	150	265	265	180	180
68x13	300 - 600	265	265		
76x25	750 - 2 100	300	300		
125x25	900 - 2 100		500		

Helically Corrugated Metal Pipe 300 mm in diameter and larger shall have the ends rerolled to provide at least two annular corrugations. Pipe with spiral corrugations shall have continuous helical lock seams.
M 196 = Corrugated Aluminum Alloy Pipe
M 36 = Corrugated Steel Pipe

CULVERT WALL THICKNESS

603(08)

CULVERT PIPE

603(09)

CIRCULAR CULVERT PIPE (NOMINAL WALL THICKNESS IN MILLIMETERS)

DIAMETER	CORRUGATED METAL PIPE				SPIRAL RIB (TYPE IR)(B)		PLASTIC PIPE		REINFORCED CONCRETE PIPE		
	OPTION I		OPTION I/III		OPTION I	OPTION I/III	OPTION I / III	OPTION III	OPTION I/III		
	M218	M274 (A)	M246 & FIBER BONDED	M197	M274 (A)	M197	M294 DAUL-WALL PIPE STIFFNESS @5% DEFL.	M278	M170 CLASS III WALL A	M170 CLASS III WALL B	M170 CLASS III WALL C
300	2.0	1.6	1.6	1.9			344	9.09	44	51	
375	2.0	1.6	1.6	1.9			289	11.13	48	57	
450	2.8	1.6	2.0	1.9	2.0	2.7	276		51	64	
525	2.8	1.6	2.0	1.9	2.0	2.7			57	70	
600	2.8	1.6	2.0	1.9	2.0	2.7	234		64	76	95
675	2.8	1.6	2.0	2.7					67	83	102
750	2.8	2.0	2.0	2.7	2.8	3.4	193		70	89	108
825	2.8	2.0	2.0	2.7					73	95	114
900	2.8	2.8	2.0		2.8	3.4	151		76	102	121
900 (I)		1.6	2.0	1.9							
1050	3.5	4.3	2.8				140		89	114	133
1050 (I)		2.0	2.0	2.7	2.8						
1200	3.5	4.3	2.8				125		102	127	146
1200 (I)		2.0	2.0	2.7	2.8						
1350	4.3	4.3	3.5						114	140	159
1350 (I)		2.0	2.0	2.7	2.8						
1500	4.3	4.3	3.5						127	152	171
1500 (I)		2.0	2.0	2.7	2.8						
1650 (I)		2.8	2.0	3.4					140	165	184
1800 (I)		2.8	2.8	3.4					152	178	197
1950 (I)		3.5	2.8	4.2						190	210
2100 (I)		3.5	2.8	4.2						203	222

Metal Pipe values are for 68 mm x 13 mm Corrugations unless diameter is followed by (I) which requires 76 mm x 25 mm Corrugations for Aluminum Pipes and 76 mm x 25 mm or 125 mm x 25 mm Corrugations for Steel Pipes.
Option I Pipes shall only be used for entrances.
Fill heights over 4.5 m may require larger metal gages.

M218 = zinc coated (galvanized) corrugated steel pipe
M274 = aluminum coated (tpye 2) corrugated steel pipe
M246 = polymer pre-coated galvenized corrugated steel pipe
Fiber Bonded = M.D.O.T. Spec. 707.04

M197 = Corrugated Aluminum Alloy Pipe
M278 = Polyvinyl Chloride Pipe
M170 = Reinforced Concrete Pipe
M294 = High Density Polyethylene Pipe

(A) Option I, M274 can be used for closed drainage Option III Pipe
(B) Spiral Rib Type IR can be used for Smoothlined Pipe

GENERAL NOTES

1. Catch basins in excess of 2 400 mm in depth shall, if directed, be provided with steps similar to those detailed for manholes.

2. Drain holes in precast sumps shall be not over 75 mm in diameter and shall be plugged with mortar when constructed.

3. All precast sections of less than 204 mm wall thickness shall have tongue and groove joints.

4. Cone and ring sections shall have a wall thickness of 100 mm minimum to 204 mm maximum.

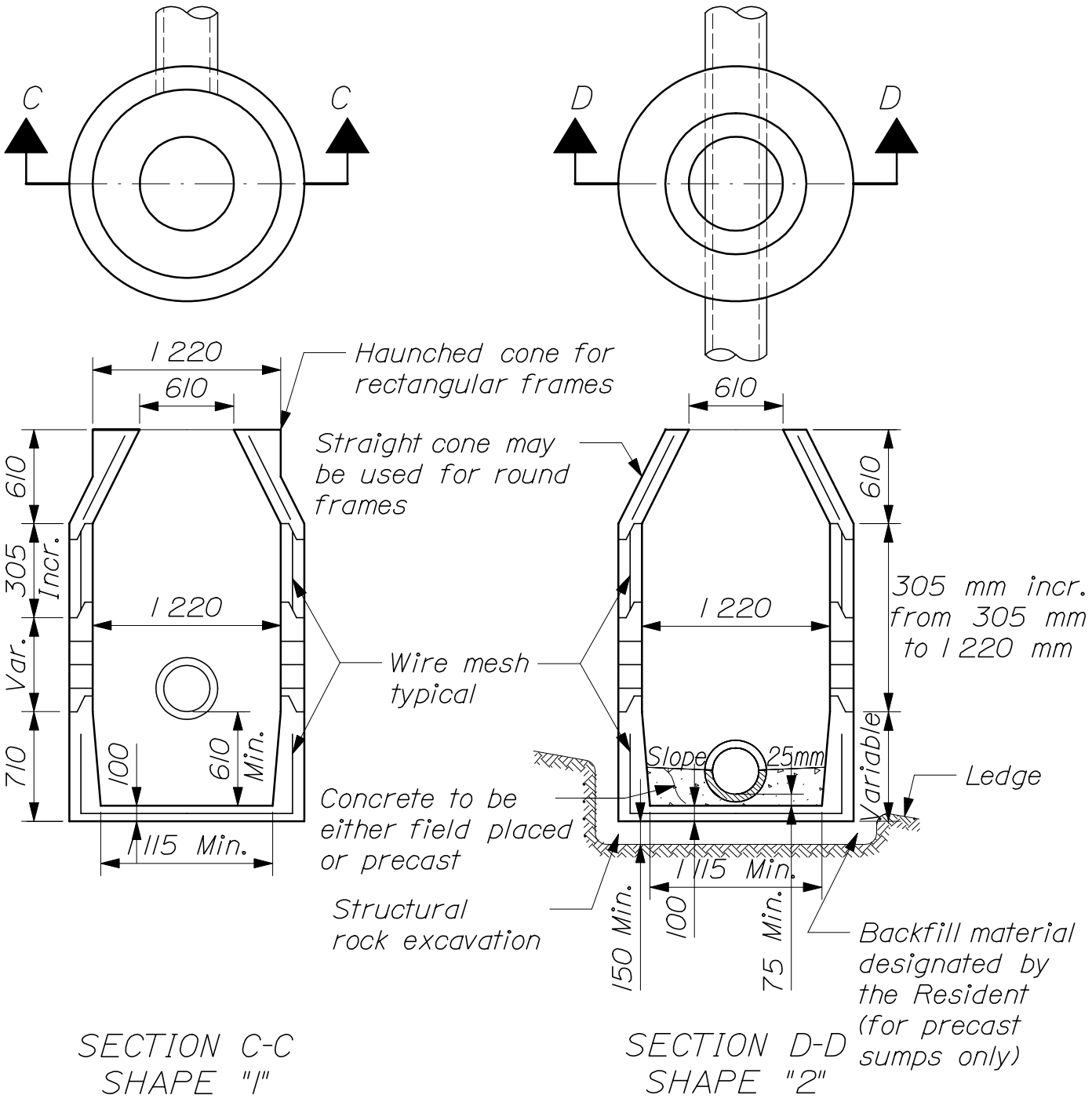
5. Minimum wall thickness at the sump shall be 100 mm as specified in A.S.T.M. C478M.

6. The wall around inlet and outlet pipes shall be a precast ring with an opening 50 mm larger than the outside diameter of the pipe.

7. Lift holes shall be provided.

CATCH BASINS

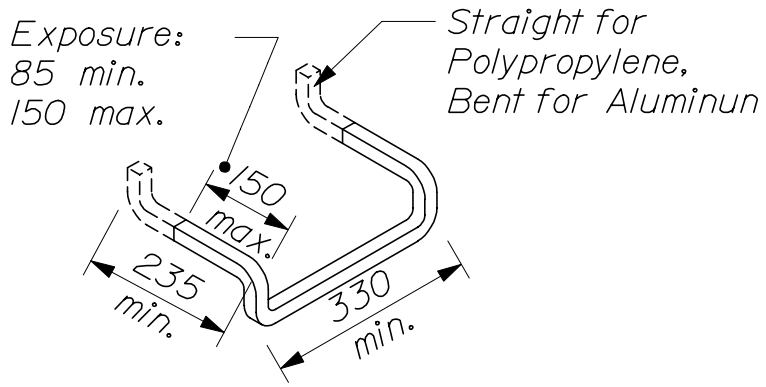
604(01)



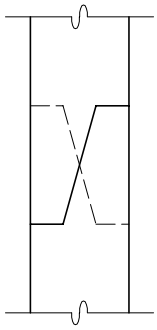
Dimensions are intended to be nominal

CATCH BASIN (PRECAST UNITS)

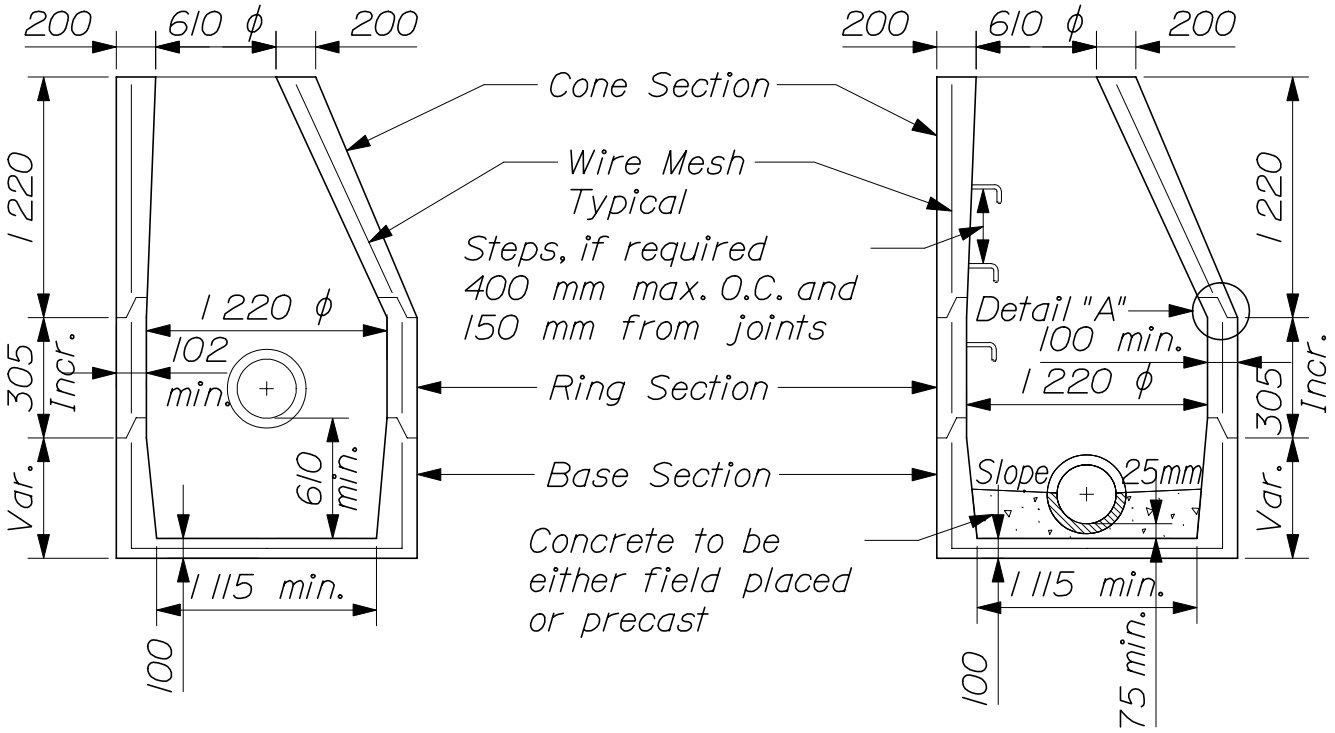
604(02)



STEP



DETAIL "A"
Alternate Joint



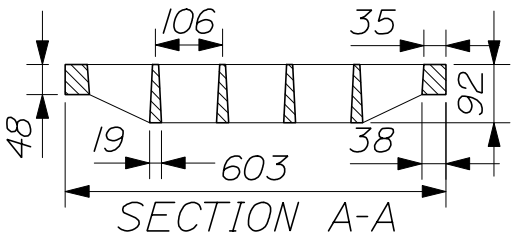
SHAPE "5"

SHAPE "6"

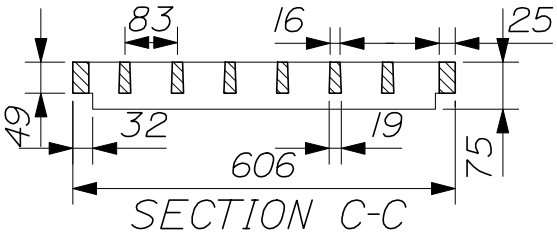
Dimensions are intended to be nominal.

CATCH BASIN OR MANHOLE

604(03)

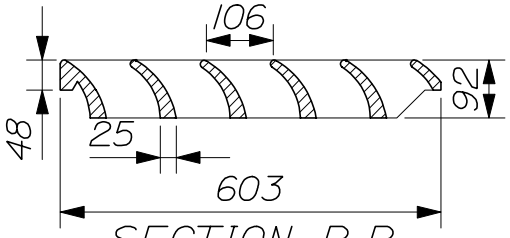


SECTION A-A



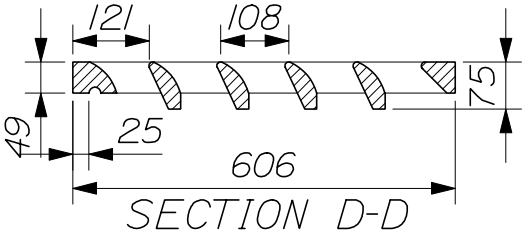
SECTION C-C

Flow Direction

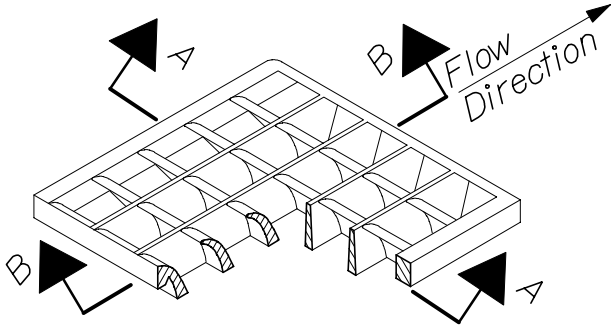


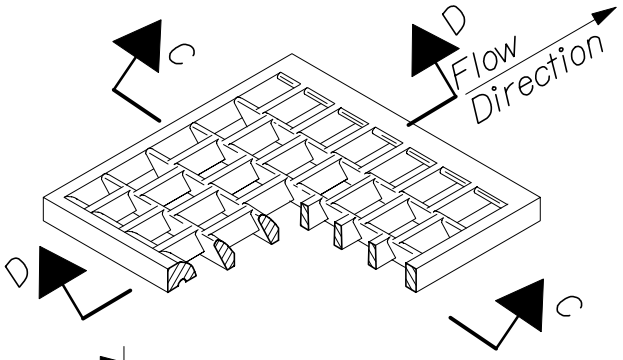
SECTION B-B

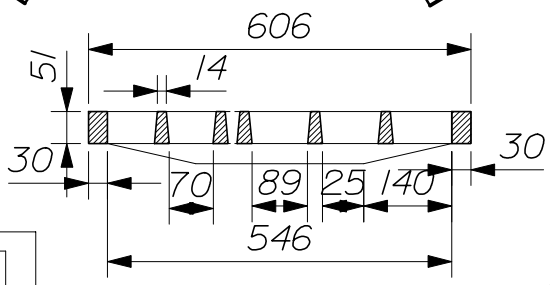
Flow Direction



SECTION D-D

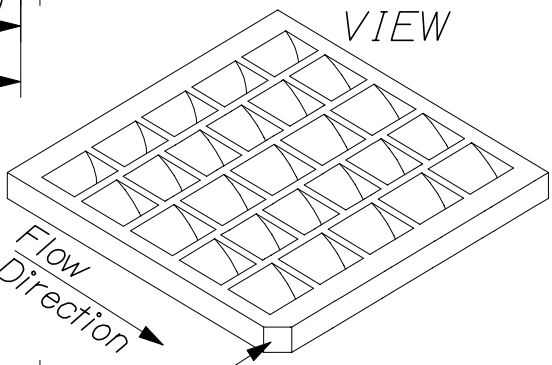


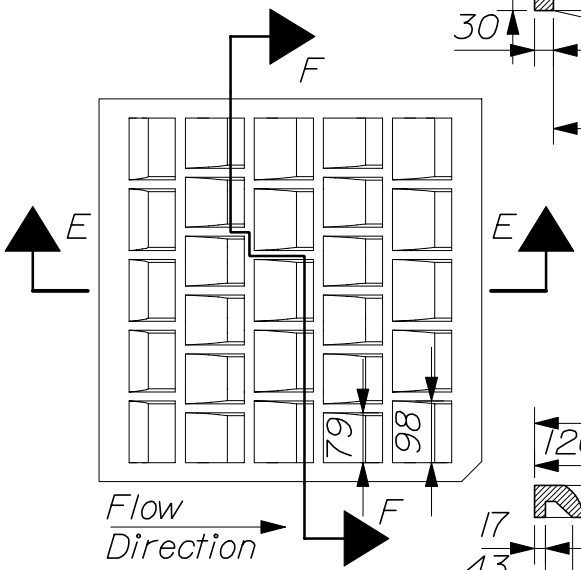




SECTION F-F

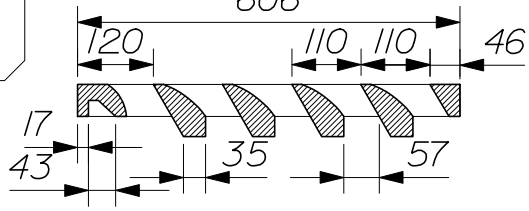
PERSPECTIVE VIEW





TOP VIEW

Flow Direction



SECTION E-E

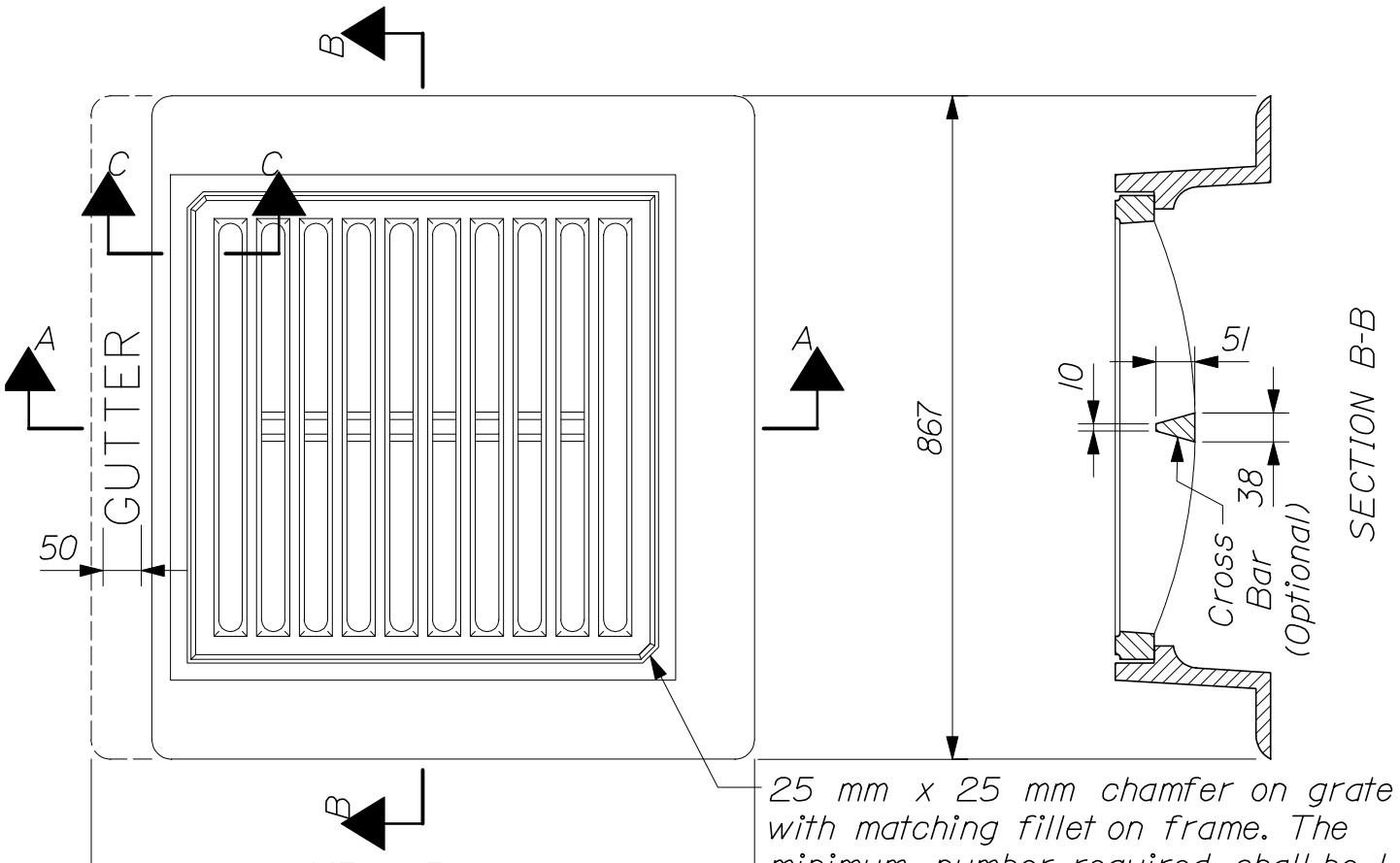
This corner left off for "right" grate. Diagonally opposite corner for "left" grate to fit in keyed frames.

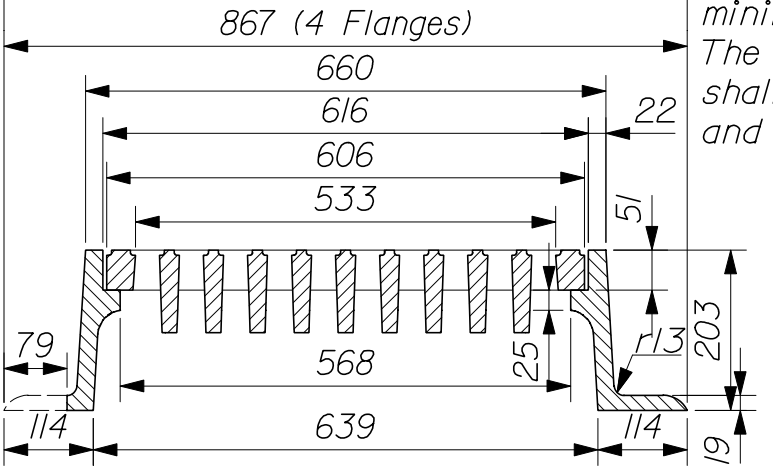
Notes:

1. To be used where parallel bar grates would present a hazard to bicycle traffic.
2. For use on catch basin types: A1-C, A2-C, A5-C, B1-C, B2-C, B5-C, F3-C, F4-C, F5-C, F6-C.

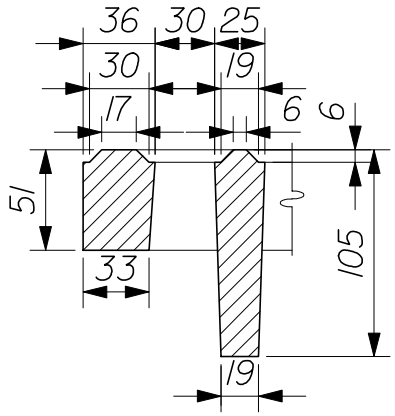
"CASCADE - TYPE" GRATES

604(04)





SECTION A-A



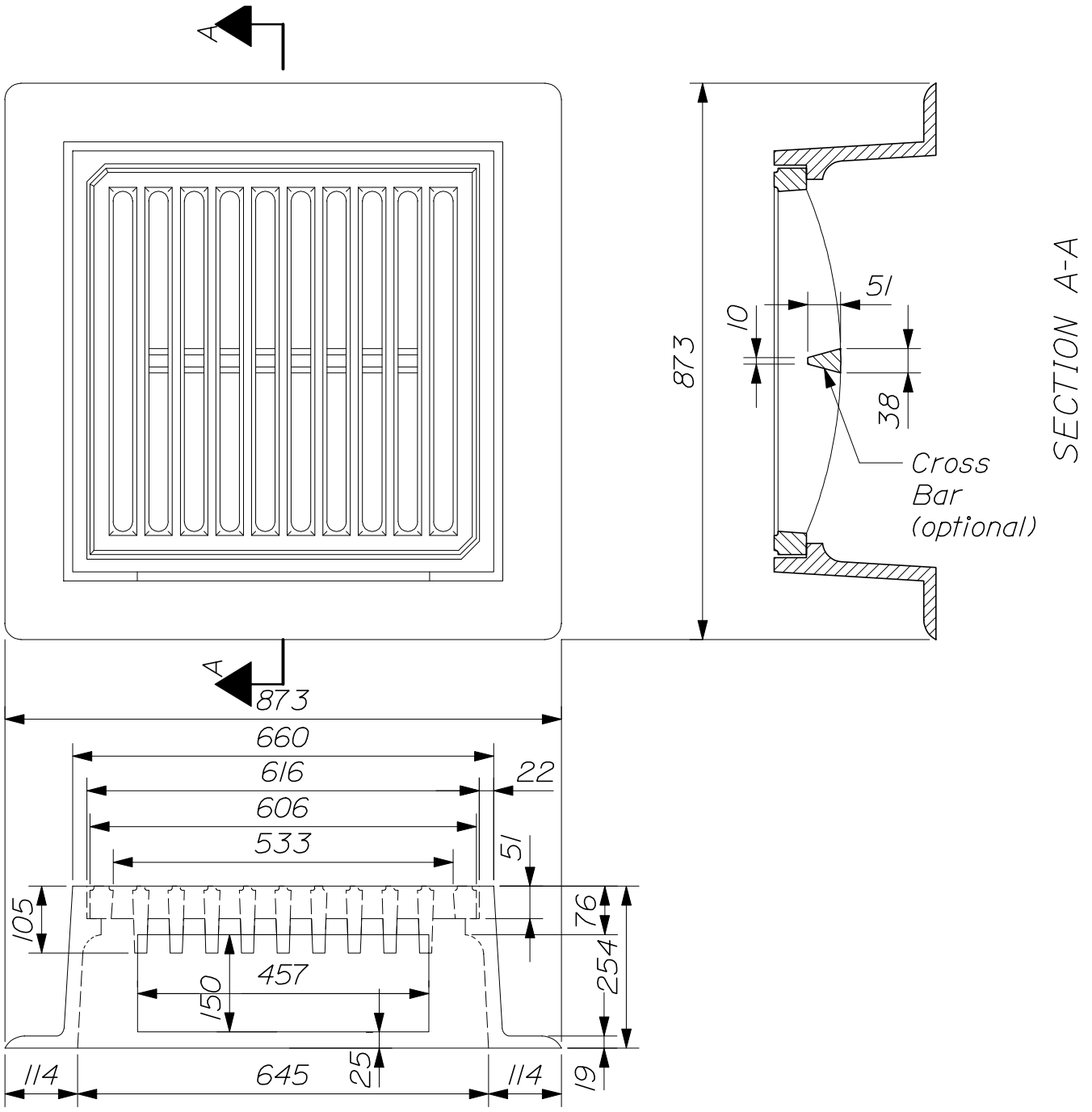
SECTION C-C

Notes:

1. Type "A" frames are to have 3 flanges.
2. Type "B" frames are to have 4 flanges.
3. The word "gutter" is to be molded into the back flange - type "B" only.
4. Frames and grates are to be of gray cast iron conforming to AASHTO M105, Class 30.
5. Dimensions are nominal.

TYPE "A" & "B" CATCH BASIN TOPS

604(05)



Notes:

1. Open throat shall be constructed on the side away from the direction of traffic. All other sides shall be graded flush with the top of the catch basin grate.

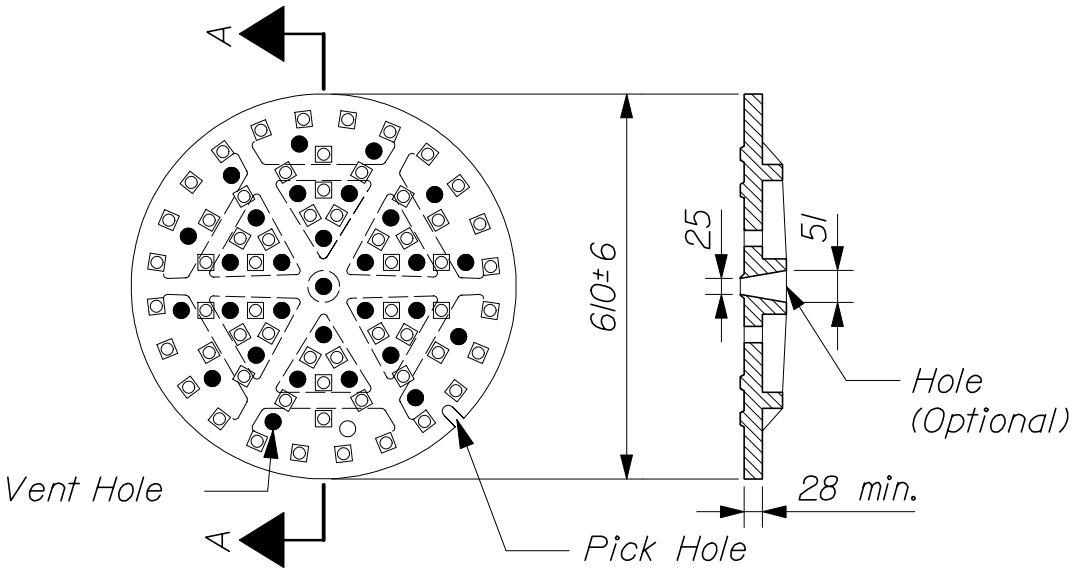
2. The frame shall be gray cast iron.

3. The grate shall be the same as Types "A" & "B".

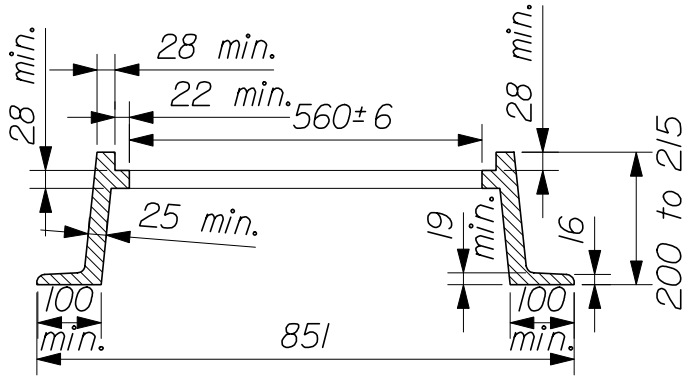
4. Dimensions are intended to be nominal.

TYPE "C" CATCH BASIN TOPS

604(06)



COVER SECTION A-A



FRAME

Notes:

1. Manhole frames and covers are to be machined to a smooth fit and shall be of gray cast iron.

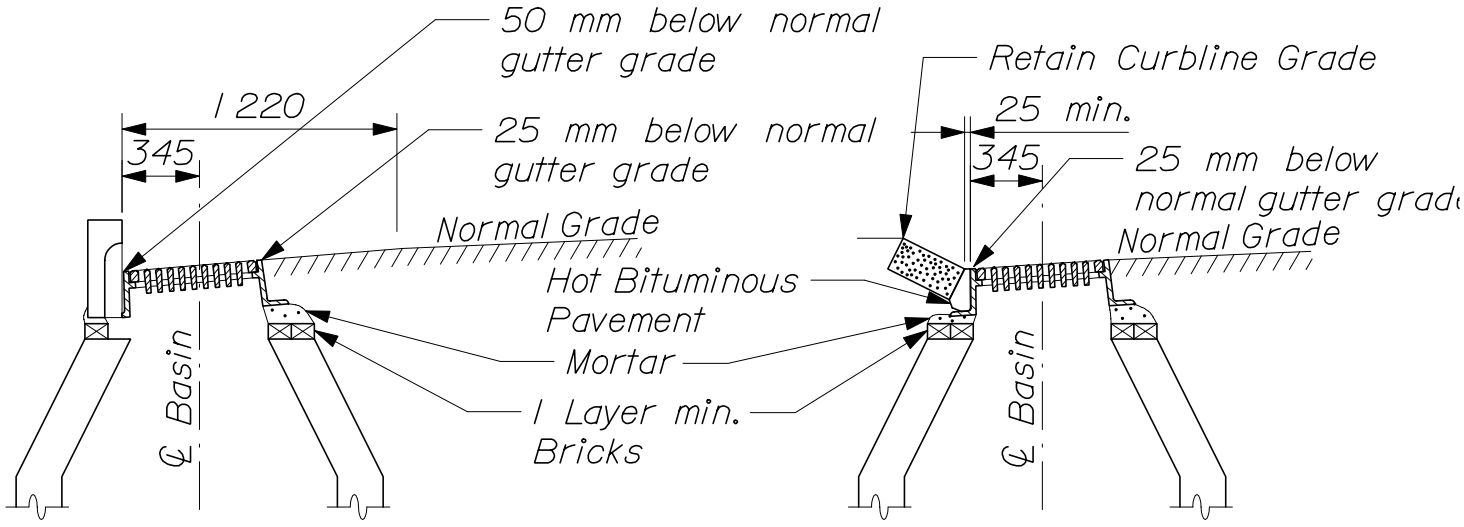
2. Diamond top surface is optional.

MANHOLE TOP "D"

604(07)

Structure	Top				Shape			
Catch Basin	A	B	C	D	1	2	5	6
Type A1	■				■		■	
Type A2	■					■		■
Type B1		■			■		■	
Type B2		■				■		■
Type C1			■		■		■	
Type C2			■			■		■
Manhole				■		■		■

TABLE OF CATCH BASIN TYPES
(combinations of tops and types)
For Type "E" & "F" Catch Basins see HD-2



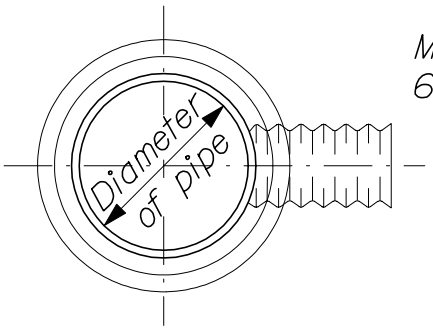
TYPE "A"
For use with
Curb Type 1 or 2

TYPE "B"
For use with
Curb Type 3 or 5

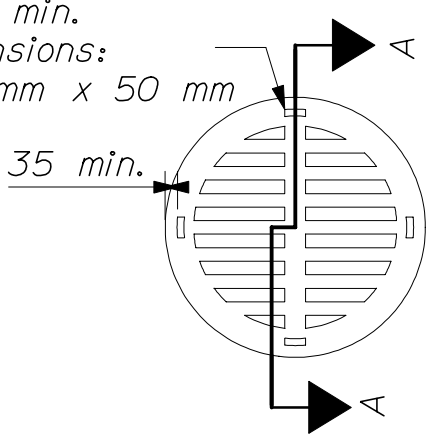
Dimensions are intended to be nominal.

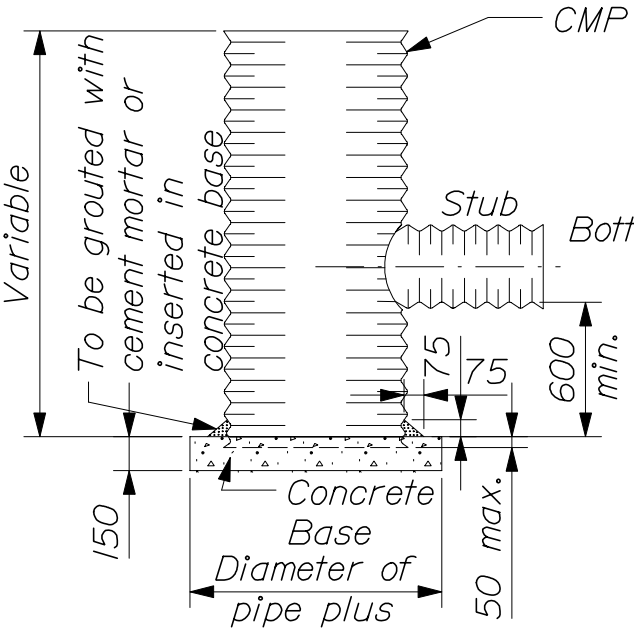
CATCH BASIN TOP INSTALLATION

604(08)

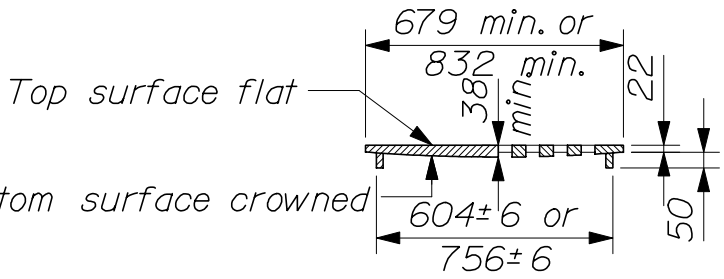


PLAN (WITHOUT COVER)





ELEVATION



SECTION A-A

Notes:

1. Excess pipe to be cut and folded against the inside wall of catch basin. Joints to be caulked with with Oakum and Asphalt Cement. Joints may be shop welded.

2. Stubs to be made from 600 mm length of pipe. Cost shall be incidental to the Catch Basin item.

3. Grate to be Gray Cast Iron.

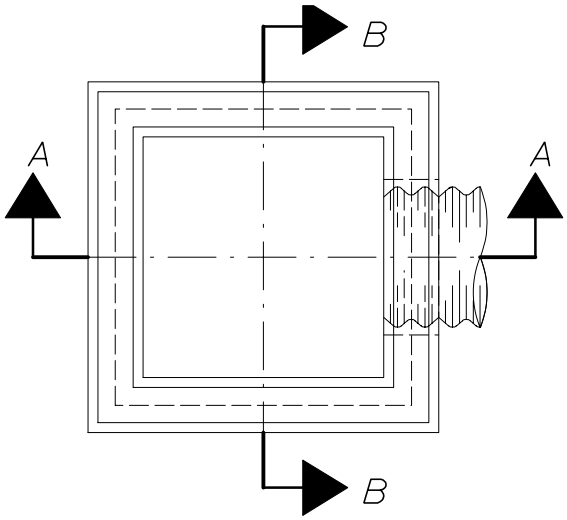
4. Bars of grate to be placed parallel with flow.

5. Grate for 762 mm Catch Basins Type "E" shall have a total cumulative width of openings of 350 mm min. Grate for 610 mm Catch Basins Type "E" shall have a total cumulative width of openings of 200 mm min.

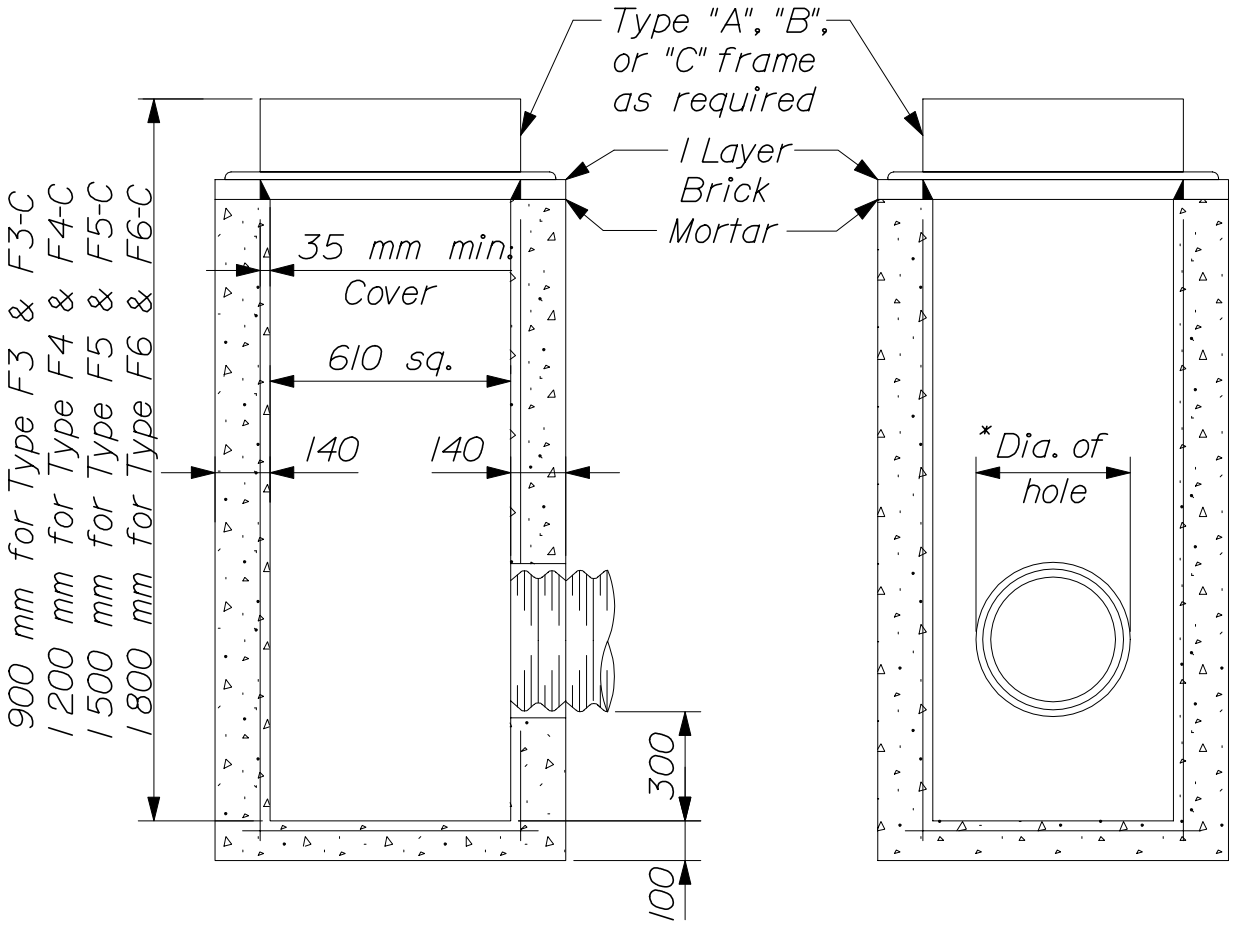
6. Corrugated Metal Pipe shall conform to Section 712.08 of the Standard Specifications.

CATCH BASIN TYPE "E"

604(09)



Note:
Entire Catch Basin with exception of leveling brick frame and grate to be precast as a single Portland Cement concrete unit.



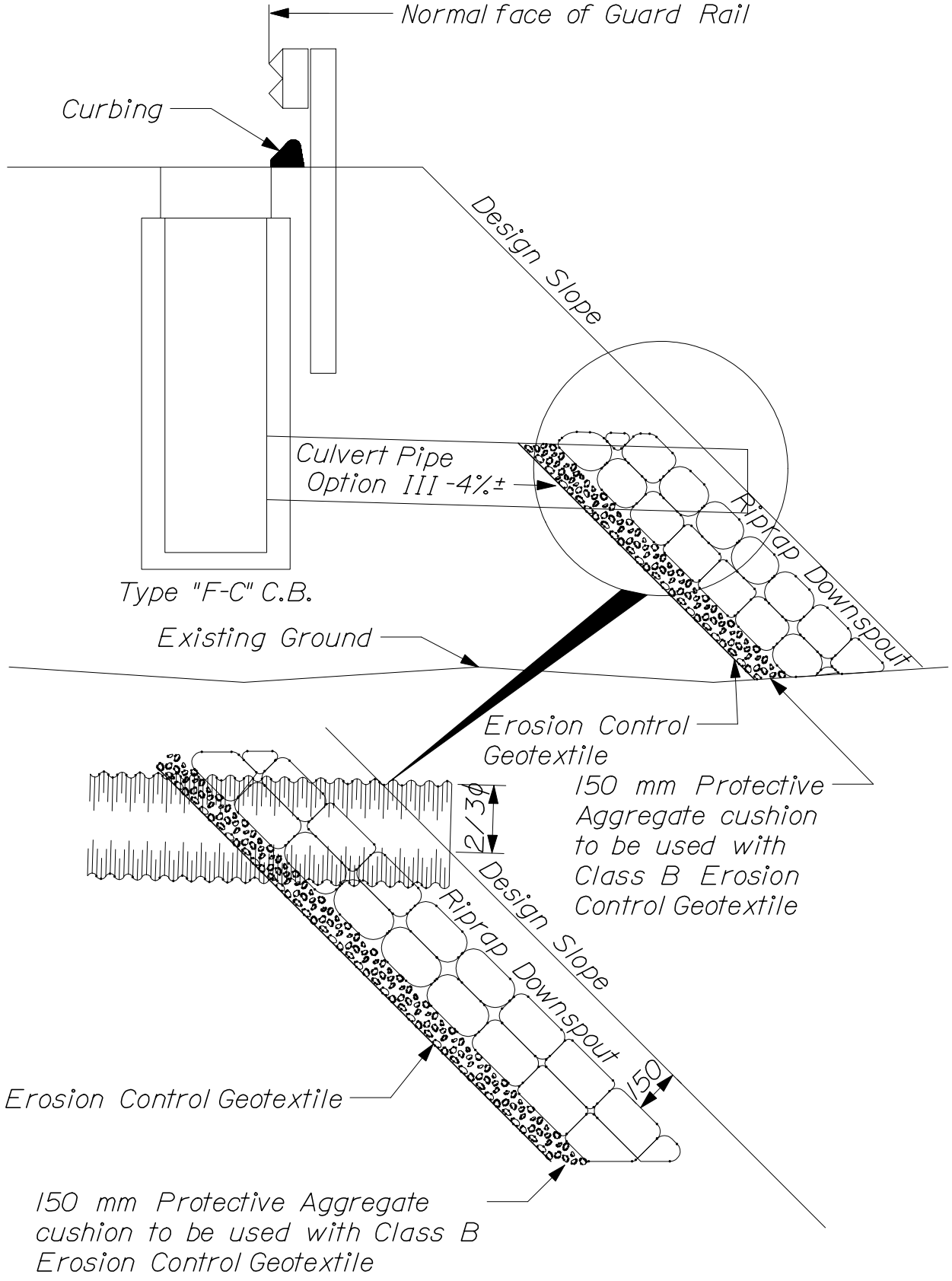
SECTION A-A

SECTION B-B

*Diameter of hole to be 75 mm larger than the inside diameter of flexible pipe or the outside diameter of rigid pipe.

CATCH BASIN TYPE "F"

604(10)



TYPE "F" CATCH BASIN WITH OUTLET PIPE AND RIPRAP

604(11)

General Notes

1. If reinforced concrete barrel - manufacturer - per ASTM Standard Specification #C-478-70.

2. Sewer bricks to conform to ASTM Standard Specification Design #C 32-69, Grade S.M. or S.S.

3. Casting shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage, distortion, or other defects. They shall be smooth and well cleaned, trimmed and inspected, and approved asphalt paint. Material to be designated in ASTM Standard Specifications.48-Class 35.

4. Catch basins constructed of brick masonry, plaster with mortar 10 mm thick, full depth as shown on plans, and apply two (2) coats of waterproofing.

5. All concrete shall be class "A" having a minimum ultimate compressive strength of 20 700 kpa at the end of 28 days unless otherwise noted.

6. Forged aluminum safety-type manhole steps, if designated, shall be alloy 6061, Temper +6.

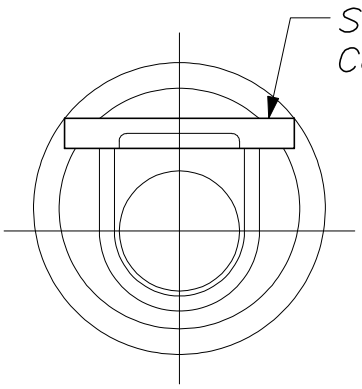
7. Manholes constructed of poured concrete masonry, apply (see general note #8) bituminous waterproofing to exterior surface. If constructed of brick masonry plaster with mortar 10 mm thick and apply (see genreal note #8) waterproofing.

8. Waterproofing - the outside surface of catch basins and manhole cones shall be given two coats of bituminous waterproofing material after the plaster or mortar in the joints has become suitably hardened. The material shall be Minwax Fibrous Brush Coat made by The Minwax Company, New York, NY; Tremco 121 foundation coating made by the Tremco manufacturing company, Cleveland, OH; Interoi No.7 made by Interoi Company, Newark, NJ: or approved equal. The waterproofing material shall be applied by brush or spray and in accordance with the instructions of the manufacturer. Time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.

9. Catch basins not in a system that connects into existing City of Portland drainage system may be constructed without flexible plastic gaskets and will have a minimum 610 mm sump.

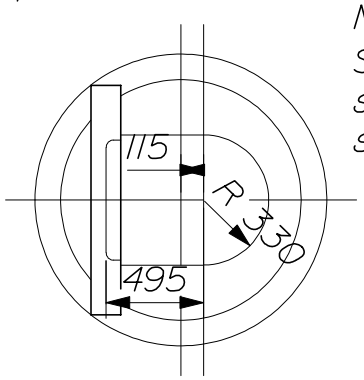
REINFORCED CONCRETE CATCH BASIN TYPE A-1-P & TYPE B-1-P

604(12)



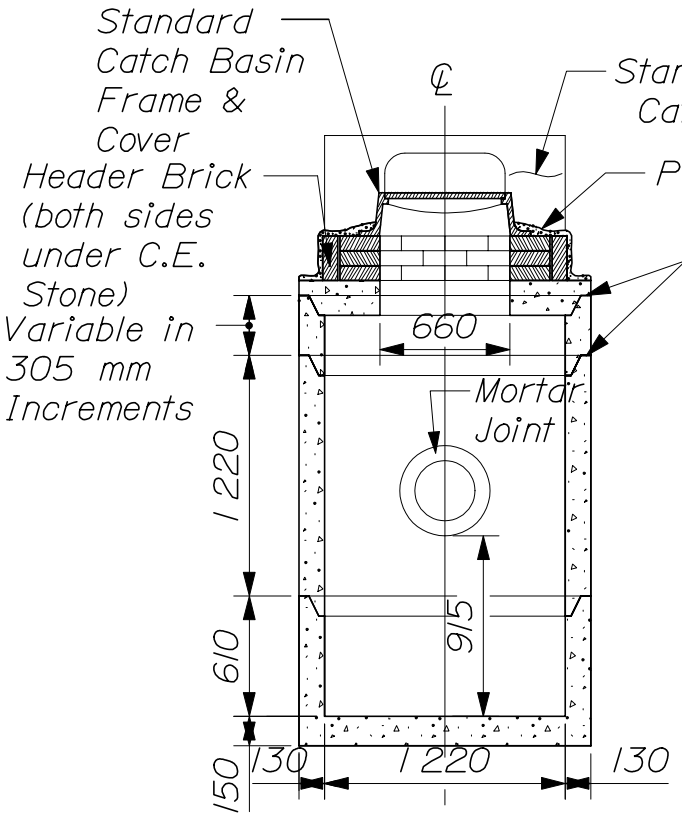
PLAN
COVER-FRAME-STONE

Type A-I-P

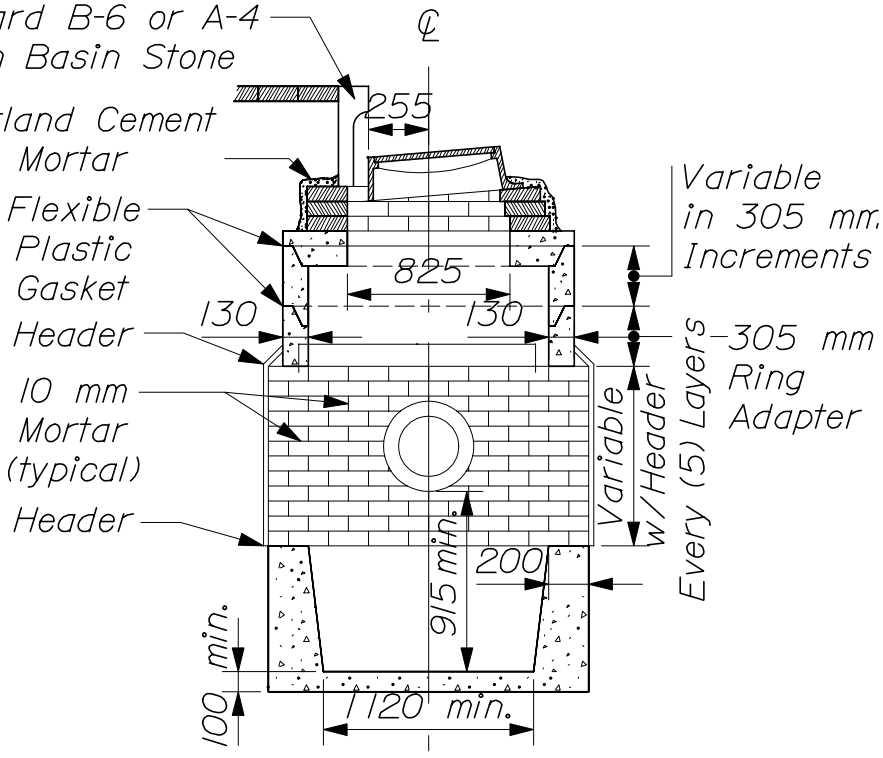


PLAN
TOP SLAB

Note:
See top slab detail sheet???



Construction Alternate "A"

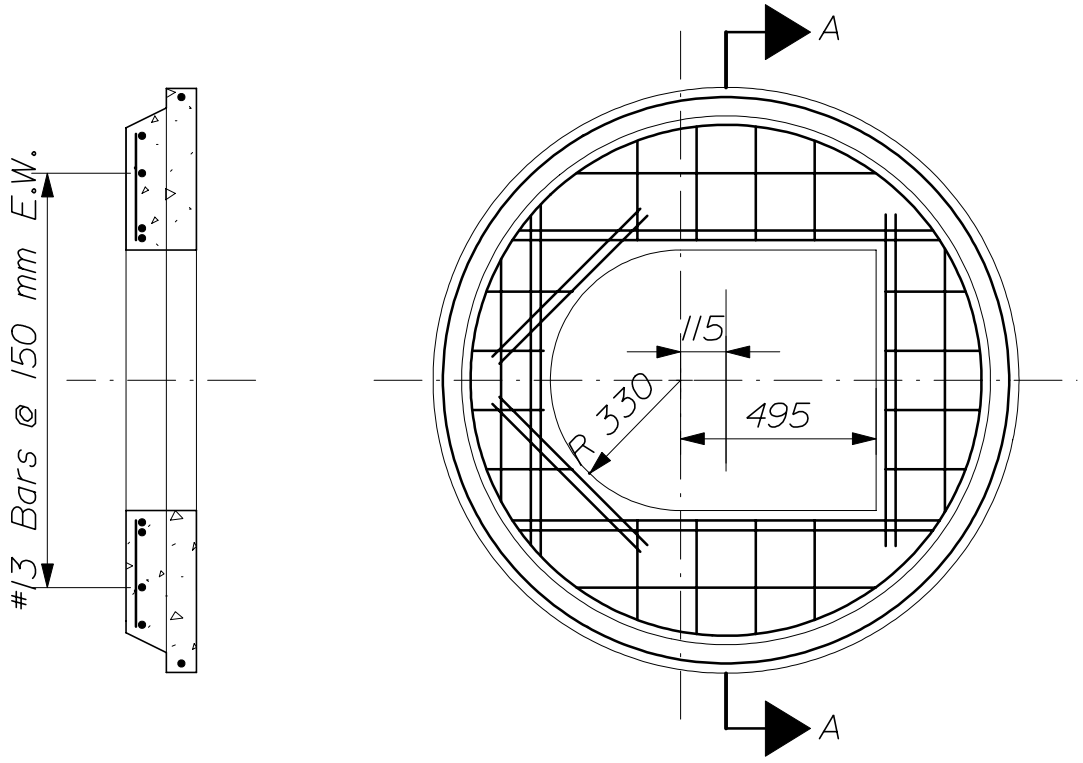


Construction Alternate "B"

REINFORCED CONCRETE CATCH BASIN

REINFORCED CONCRETE CATCH BASIN TYPE A-I-P & TYPE B-I-P

604(13)



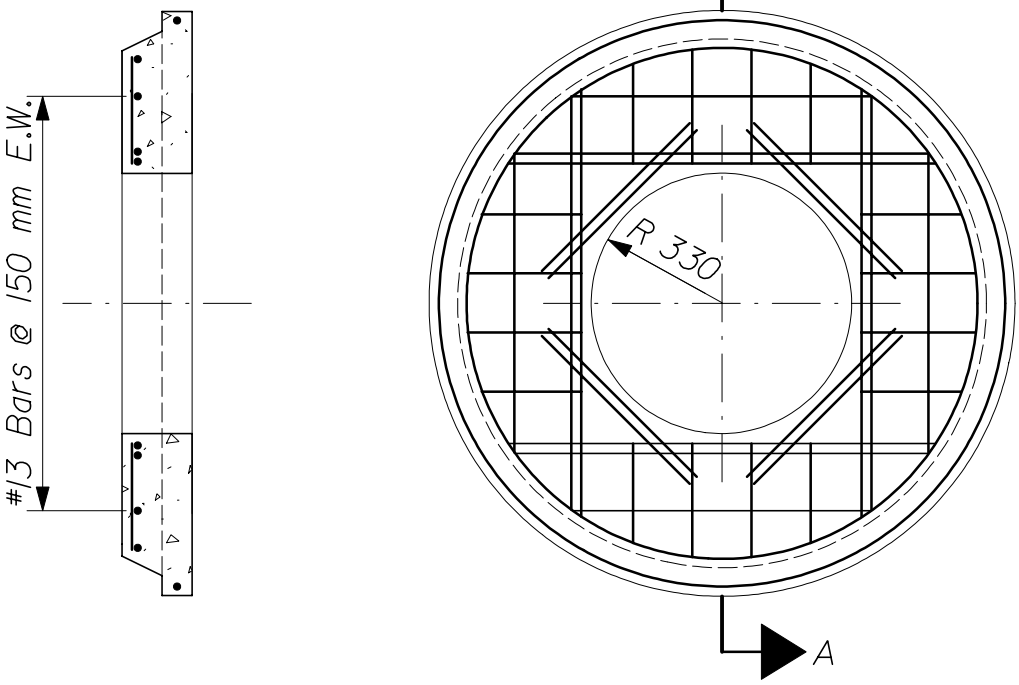
SECTION A-A PLAN

TOP SLAB DETAIL FOR TYPE A-I-P

(not to scale)

REINFORCED CONCRETE CATCH BASIN TYPE A-I-P TOP SLAB DETAIL

604(14)



SECTION A-A PLAN

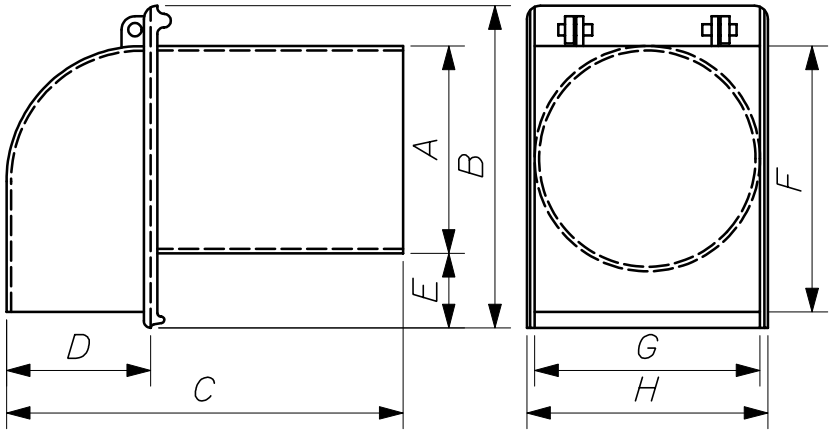
TOP SLAB DETAIL FOR TYPE B-I-P

(NOT TO SCALE)

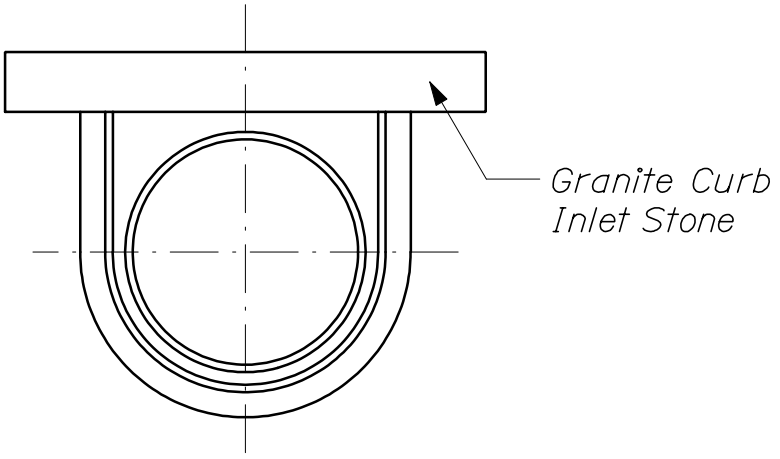
REINFORCED CONCRETE CATCH BASIN TYPE B-I-P TOP SLAB DETAIL

604(15)

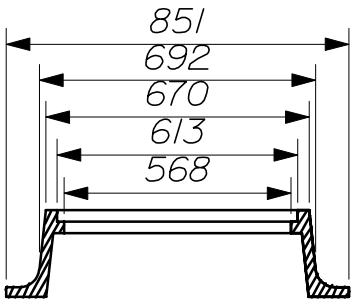
Size	150	200	250	300	375
A	140	191	241	292	Similar to Designs at Left
B	340	381	406	432	
C	349	391	413	559	
D	137	140	152	203	
E	149	137	114	83	
F	295	349	359	394	
G	165	222	292	318	
H	184	238	314	340	



TRAP DETAIL

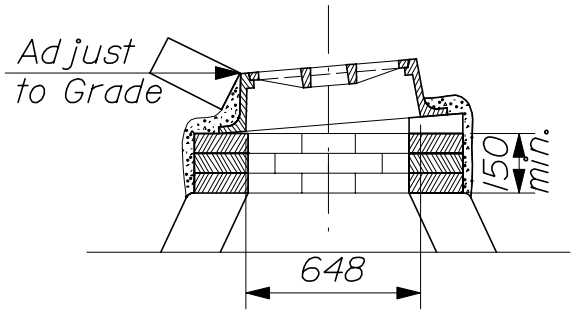


TYPE 'A' INLET

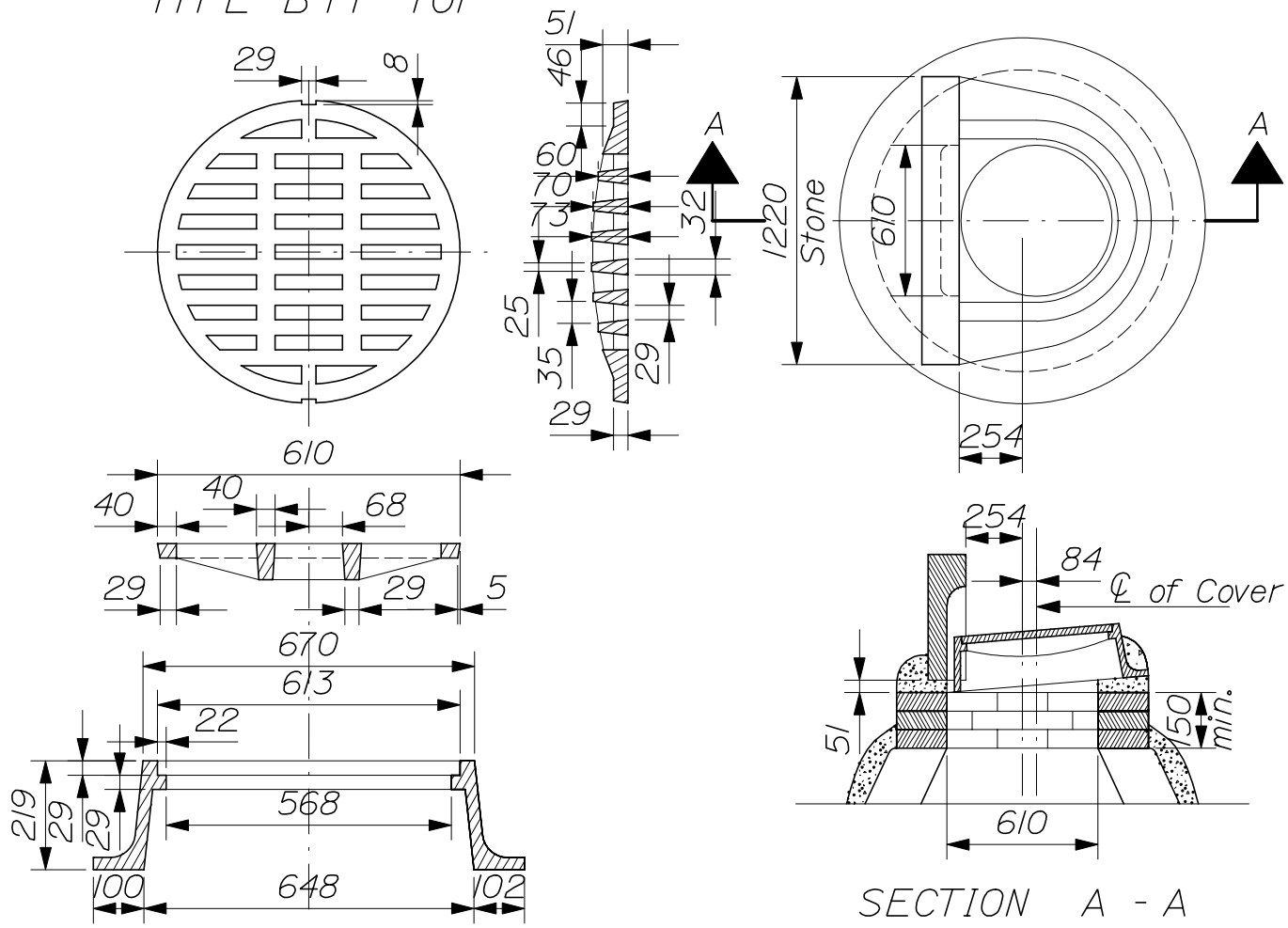


REINFORCED CONCRETE CATCH BASIN TYPE A-I-P

604(16)



TYPE B-I-P TOP

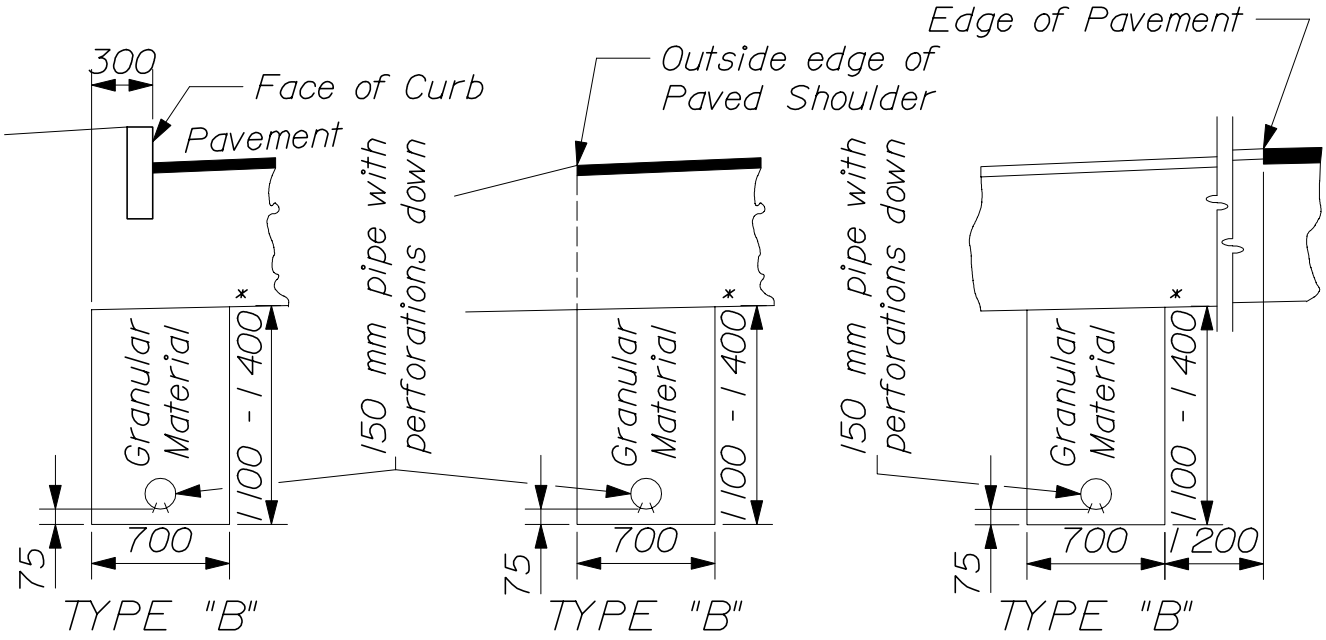


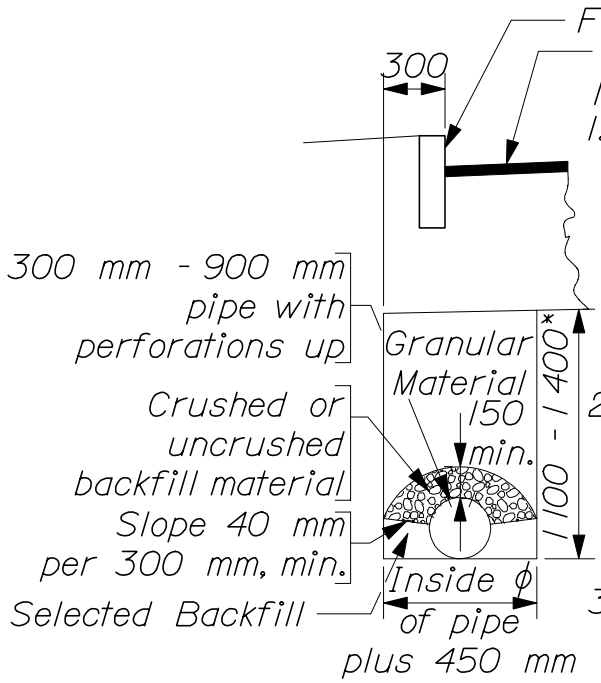
BARRED COVER & FRAME

SECTION A - A

REINFORCED CONCRETE CATCH BASIN
TYPE B-I-P DETAILS

604(17)





Notes:

1. The maximum vertical measurement of depth for payment of Structural Rock Excavation will be to a horizontal plane located 300 mm below the bottom of the invert of the pipe for Underdrain Type "B" and Underdrain Type "C".
2. The material for Elbows, Tees, & Wyes for Underdrain Types "B" and "C" shall be atleast as thick as the largest size pipe being connected.
3. The invert elevation of Underdrain Type "B" outlets shall be a minimum of 150 mm above the flow line of a ditch or the original ground.
4. Width of the trench for underdrain outlet will be the same as the underdrain trench.
5. No allowance for payment will be made for excavating or material excavated beyond the horizontal dimensions shown for Types "B" or "C" Underdrain.
6. In "Box Sections" the edge of the trench shall be in line with the edge of box section.

* Unless otherwise shown on the plans

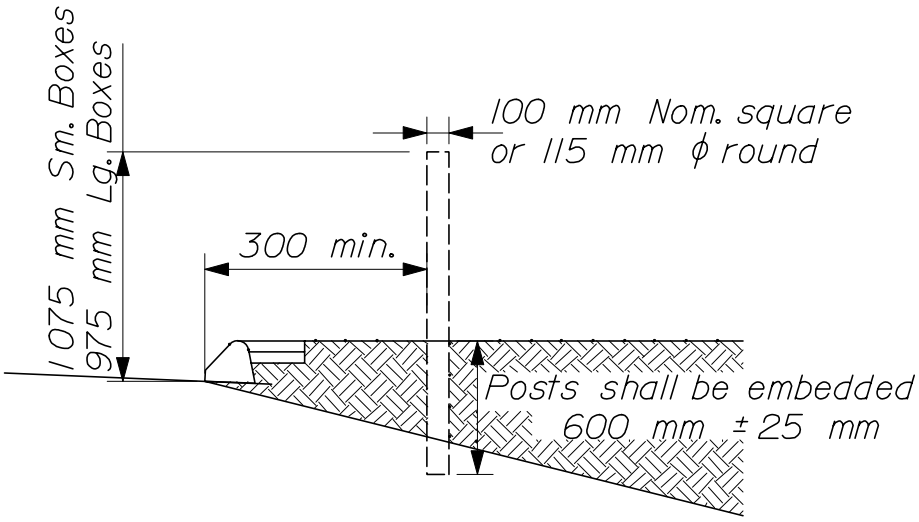
UNDERDRAIN

605(01)

UNDERDRAIN
605(02)

Type "B" and Type "C" Underdrain Pipe									
Metal Pipe (Nominal Wall Thickness)				Metal Pipe		Plastic Pipe Stiffness @ 5% Deflection			
Corrugated				Type IR 19 x 19 x 190		PVC Pipe		Polyethylene Pipe	
Diameter	M 218	M 274 & M 246	M 197	M 274	M 197	M 278	ASTM F 949	M 294 SP Dual-wall Unanchored	M 252 SP Dual-wall Unanchored
Type "B" Underdrain Pipe									
150	1.6	1.3	1.2			320	344		344
Type "C" Underdrain Pipe									
300	2.0	1.6	1.9			320		344	
375	2.0	1.6	1.9			320		289	
450	2.0	1.6	1.9	2.0	2.7			276	
525	2.0	1.6	1.9	2.0	2.7				
600	2.0	1.6	1.9	2.0	2.7			234	
750	2.8	1.6	2.7	2.0	2.7			193	
900	2.8	1.6	2.7	2.0	2.7			151	

M 218 = Zinc Coated (Galvanized) Corrugated Steel Pipe
M 274 = Aluminum Coated (Type 2) Corrugated Steel Pipe
M 246 = Polymer Pre-coated Galvanized Corrugated Steel Pipe
M 197 = Corrugated Aluminum Alloy Pipe
M 278 = Smoothwall PVC pipe
ASTM F 949 = PVC Corrugated Sewer Pipe with smooth interior
M 294 SP = Corrugated Polyethylene Pipe with smooth inner liner
M 252 SP = Corrugated Polyethylene Drainage Tubing with smooth inner liner



SINGLE WOOD POST

Notes:

1. A post shall be provided for each mailbox.

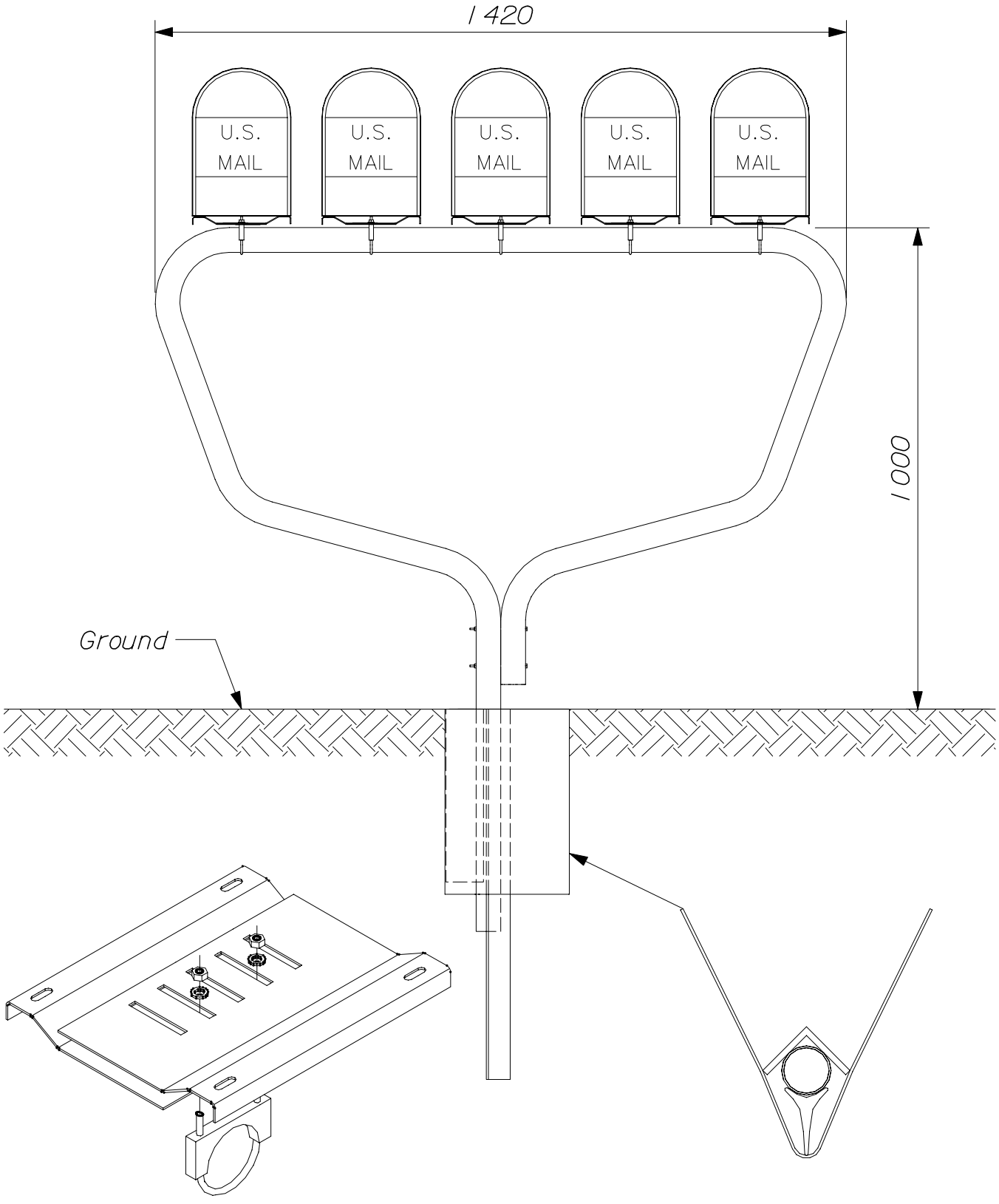
2. Posts shall not be spaced closer than 750 mm.

3. Posts should not be placed closer than 60 m from an intersecting road.

4. When single wood posts exceed 115 mm diameter or square dimension, two 19 mm holes shall be drilled through the post at 90 degrees to each other, 100 mm above the finish grade.

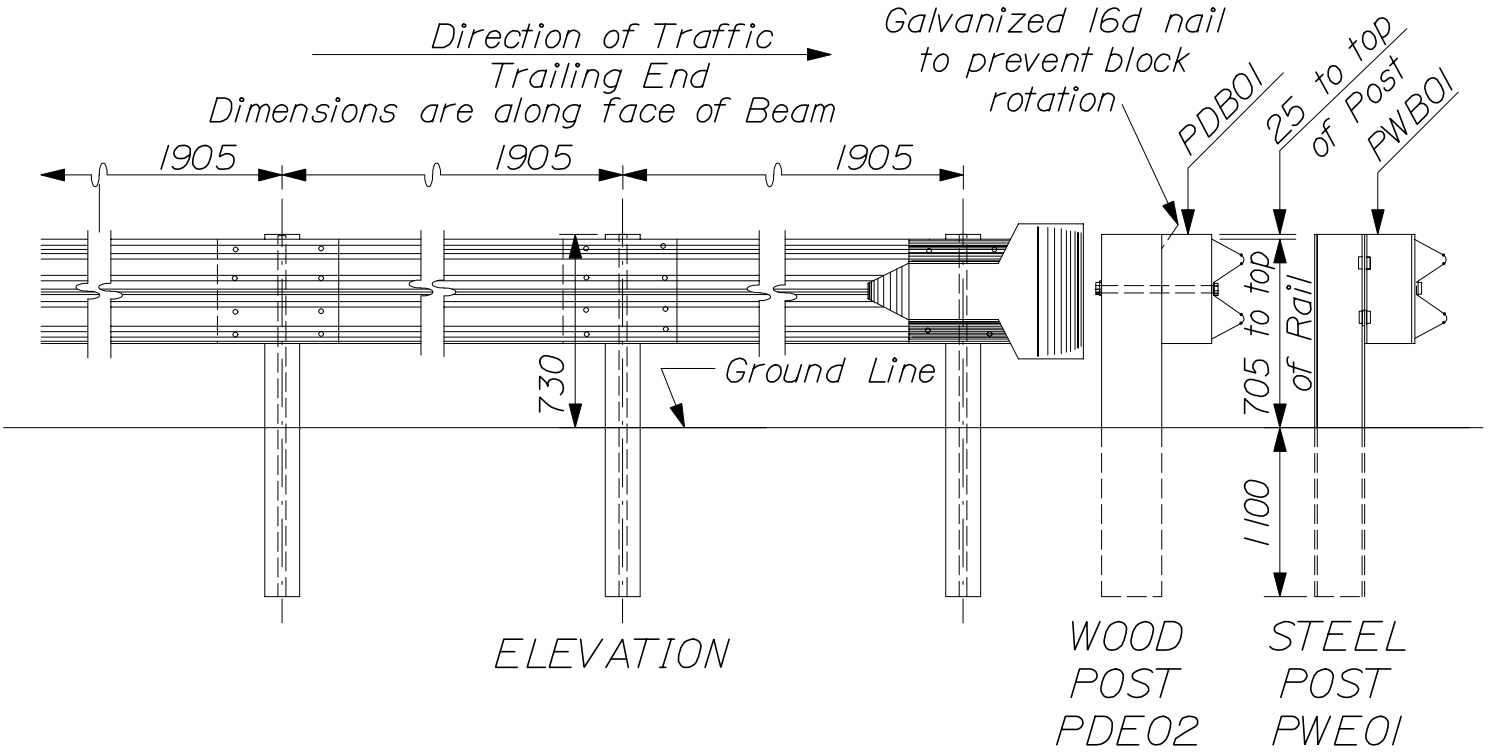
MAILBOX POSTS

606(01)



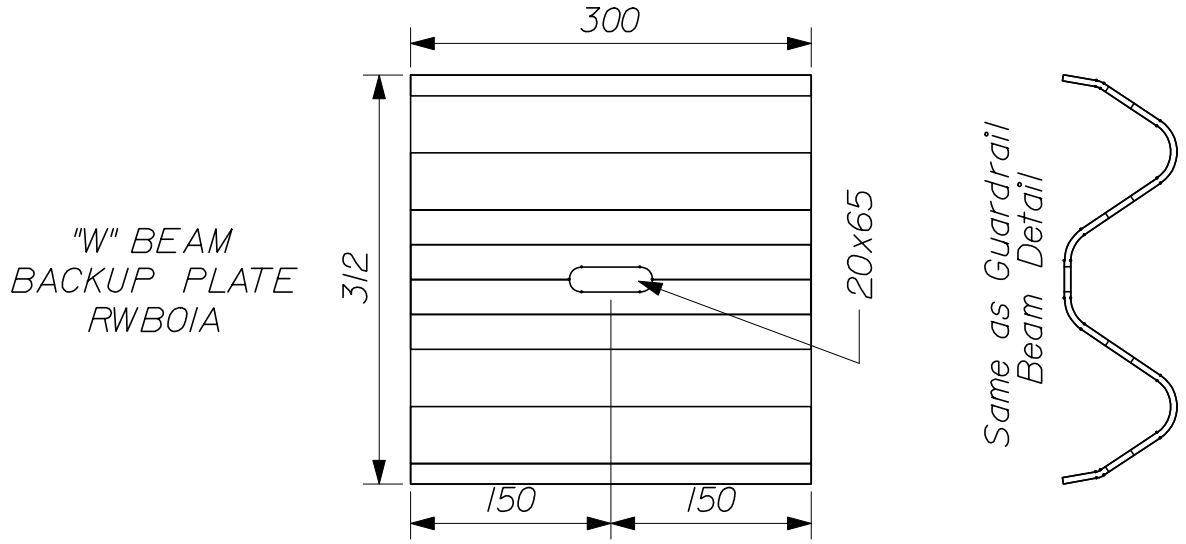
MULTIPLE MAILBOX SUPPORT

606(02)



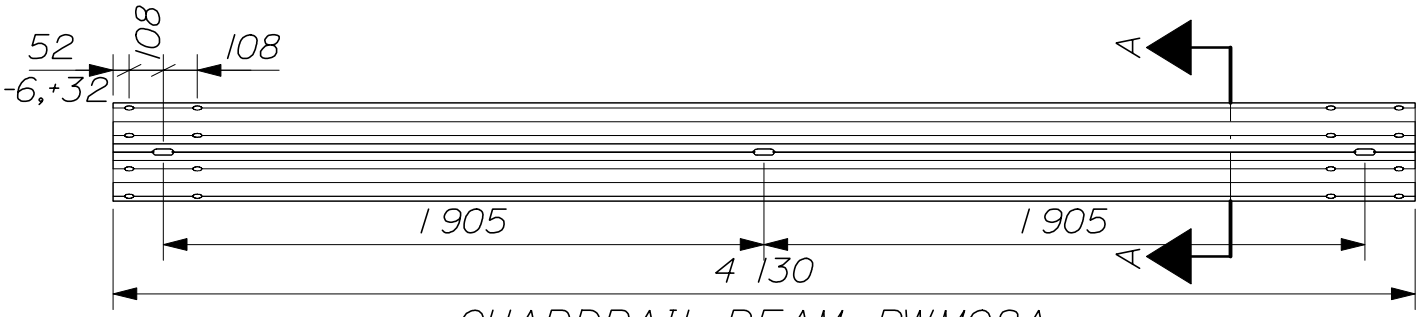
Notes:

1. Intermediate post spacing shall be 1905 mm unless otherwise shown.
2. Wood posts for Guardrail shall be 150 mm nom. (140 mm min.) x 200 mm nom. (190 mm min.) and offset blocks shall be 150 x 200 nom. (140 x 190 min.).
3. Steel posts and wood offset brackets for Guardrail shall be W150 x 13.5.
4. Steel posts punched with holes in addition to those specified to accommodate other types of Guardrail, will be accepted subject to the approval of the Resident.
5. "W" beam backup plates shall be placed behind rail elements at intermediate steel posts (non-splice posts), for Type 3b only.
6. Beam type Guardrail set on a radius of 45 m or less shall be circular Guardrail.
7. Offset bracket shall be installed on all posts.
8. Guardrail Terminal End (RWE03A) to be used only on trailing end of Guardrail on divided highway. Washers (FWR03) shall be installed on the last 9 posts.
9. Identification letters and numbers on drawings refer to the standard detail drawings shown in "A guide to Standardized Highway Barrier Hardware" by AASHTO-AGC-ARTBA Joint Committee.

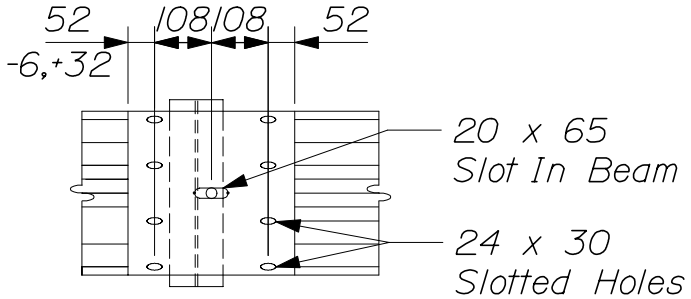


GUARDRAIL

606(03)

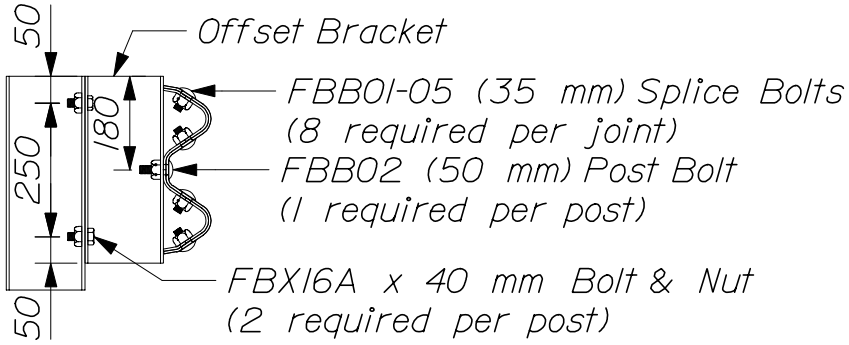


GUARDRAIL BEAM RWM02A
Minimum thickness 2.67 mm

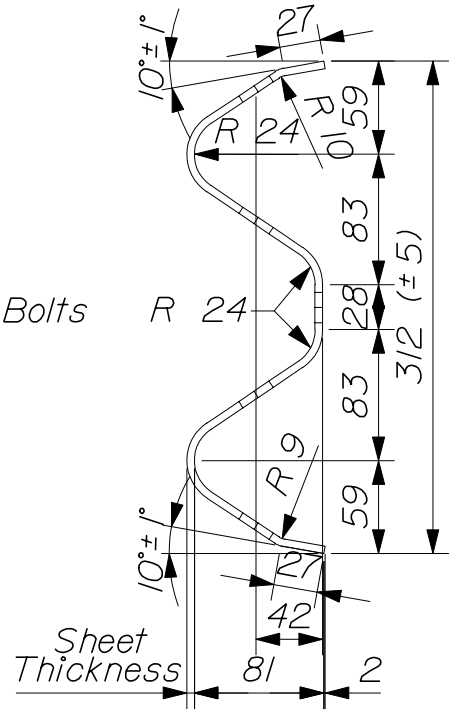


GUARDRAIL SPLICE
AT POST

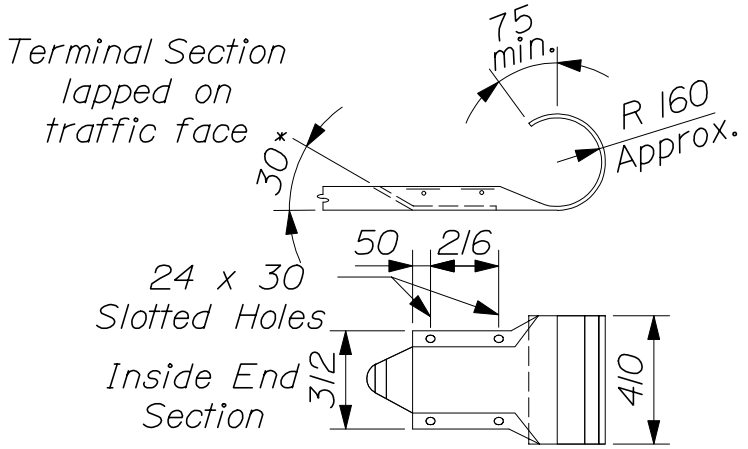
Note:
All dimensions subject to manufacturing tolerances



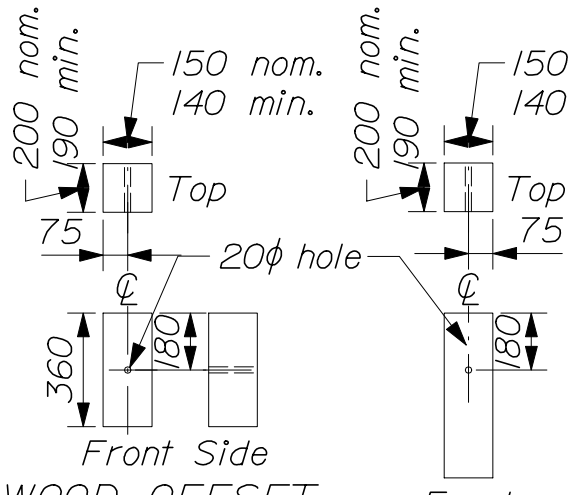
CROSS SECTION THROUGH
GUARDRAIL SPLICE



SECTION A - A
GUARDRAIL BEAM
DETAIL RWM02A



GUARDRAIL TERMINAL END - RWE03A
(See 606(03) Note #8)

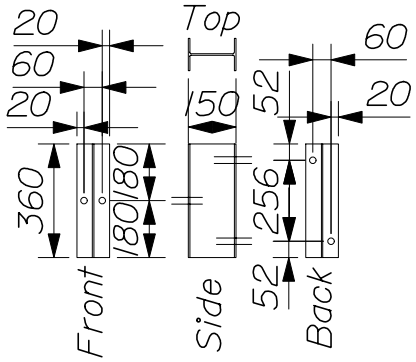


WOOD OFFSET BRACKET PDB01

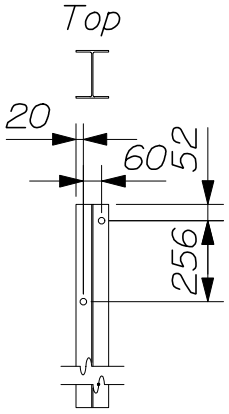
WOOD POST PDE02

Wood Post, Offset Bracket, and G.R. Beam shall be bolted with one Bolt FBB04 and Washer FWC16A under nut.

Location of hole for attaching Wood Offset Bracket to Wood Post



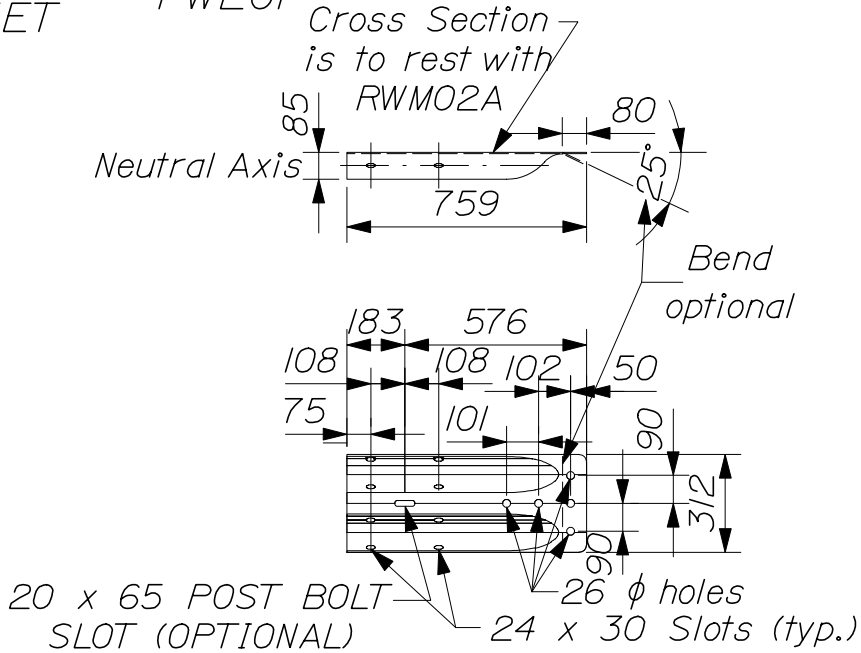
STEEL OFFSET BRACKET PWB01



STEEL POST PWE01

Steel Offset Bracket and Post shall be bolted with (2) FBX16A Bolts and Nuts. Holes to be 20 ϕ.

Location of holes for attaching bracket to Steel Post

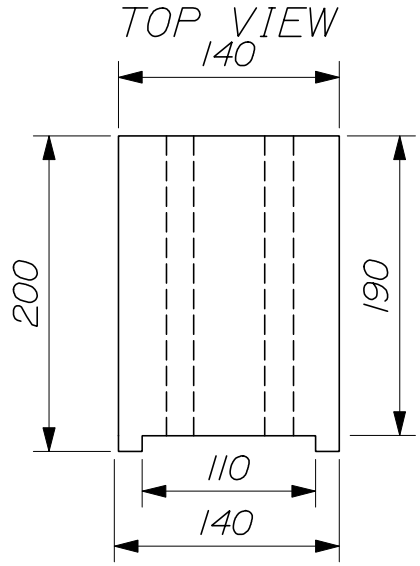


W-BEAM TERMINAL CONNECTOR RWE02A

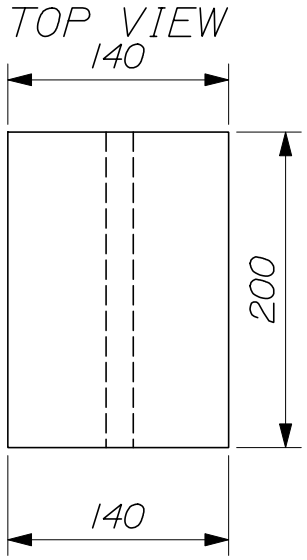
GUARDRAIL

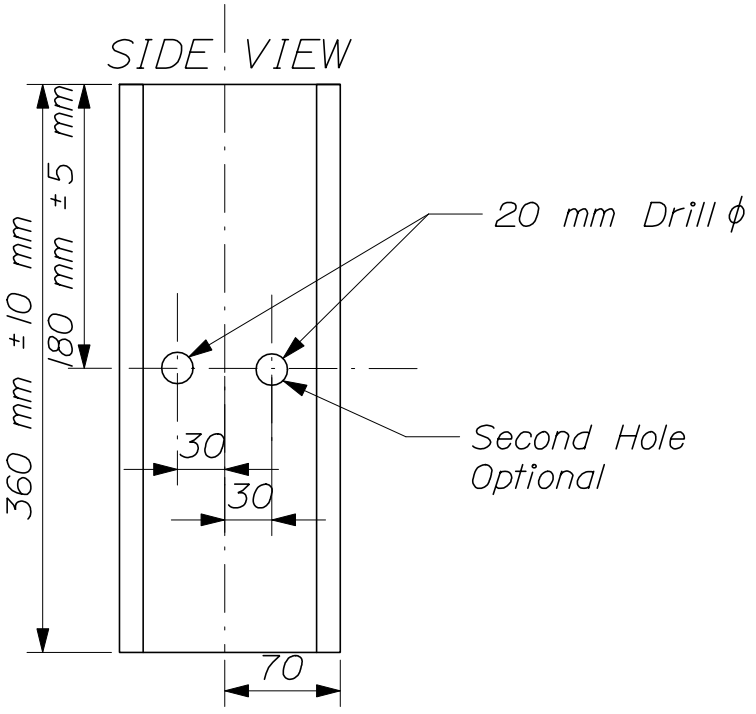
606(05)

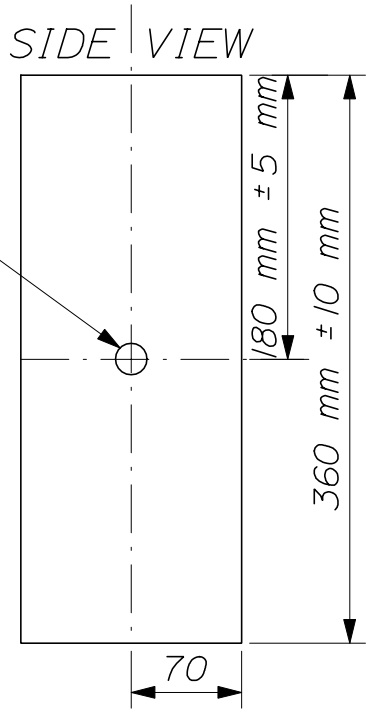
WOOD BLOCK DETAIL
FOR STEEL POST



WOOD BLOCK DETAIL
FOR WOOD POST



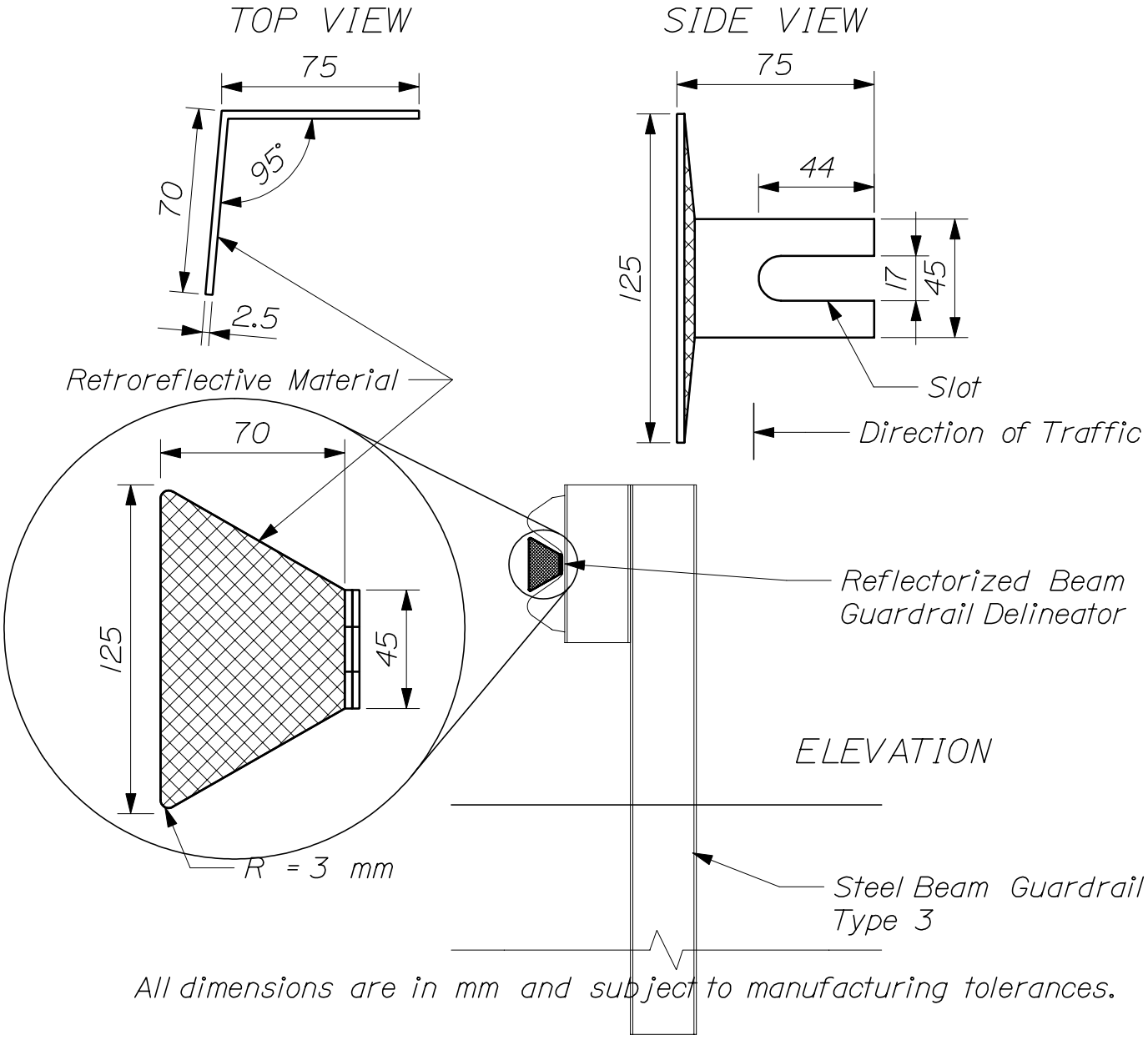




WOOD BLOCK DETAIL FOR STEEL OR WOOD POST

606(06)

Reflectorized Beam Guardrail Delineators shall be mounted on all guardrails. The delineators shall be mounted on the guardrail beam at guardrail posts. Delineators shall be placed at approximately 20 m intervals or every tenth post on tangents and at approximately 10 m intervals or every fifth post on curves. On divided highways, the left hand delineators should be yellow and the right hand delineators should be silver-white. On two directional highways, both sides shall be silver. Reflectorized Beam Guardrail Delineators shall meet the requirements of Standard Specification Section 719.01. Delineators shall be fabricated with steel conforming to ASTM A 635/A 635 M, galvanized in accordance with AASTHO M111 (ASTM A 123) with a minimum thickness of 2.8 mm (12 guage). Beam Guardrail Delineators will not be paid for directly, but will be considered incidental to the guardrail items. Exact locations of the delineators shall be as directed by the Resident.



All dimensions are in mm and subject to manufacturing tolerances.

REFLECTORIZED BEAM GUARDRAIL DELINEATOR DETAILS

606(07)

M.E.L.T. NOTES

1. For description and specification of part identified "ARTBA..." see report prepared and approved by the AASHTO-AGC-ARTBA Joint Cooperative Committee, "A Guide to Standardized Highway Barrier Hardware".

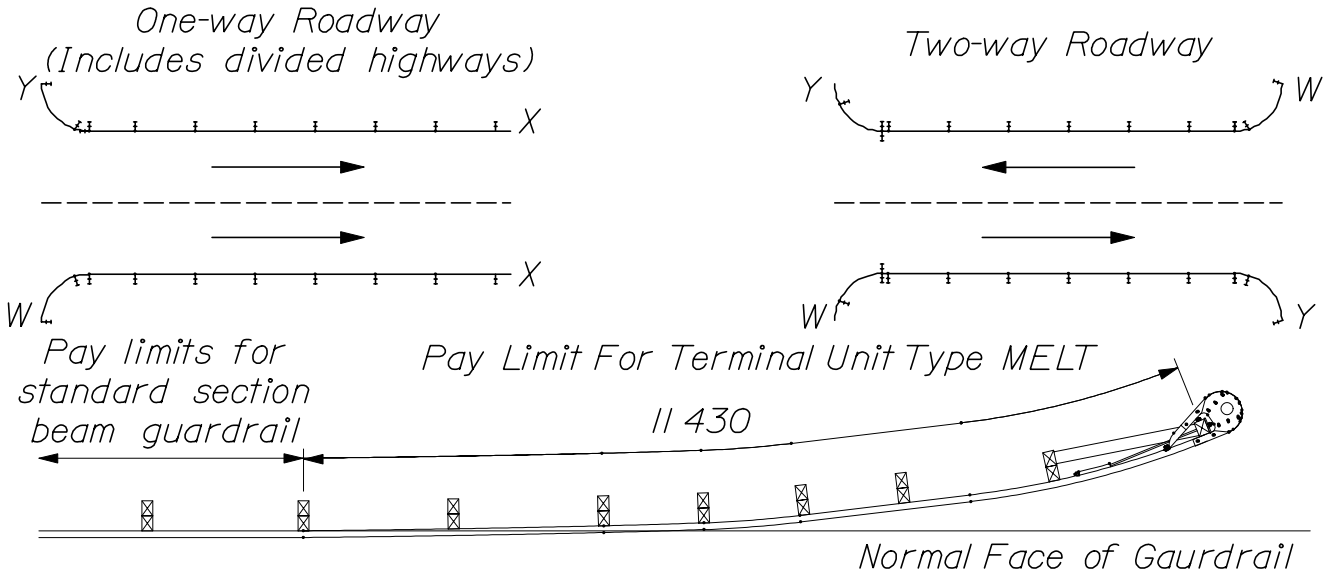
2. All angles, channels, and plates shall conform to the requirements of A.S.T.M. A36 and structural tubing to A.S.T.M. A500 or A.S.T.M. A513, Grade 1008. Diaphragm Plate shall conform to A.S.T.M. A36 or AASHTO M-180. Welding shall meet the current requirements of the American Welding Society Structural Welding Code ANSI/AASHTO/ AWS D1.5. All structural steel shall be galvanized in accordance with A.S.T.M. A123. No punching, drilling, cutting, or welding will be permitted after galvanizing.

3. Short wooden breakaway post shall be made of S4S Timber with a stress grade of 8 MPa and shall be grade marked or certified by a recognized association or agency which is certified by the Board of Review, American Lumber Standards Committee, to grade the species. It shall receive a preservative treatment in accordance with AASHTO designation M-133.

4. Optional holes are for insertion of Nose Expansion Block when required.

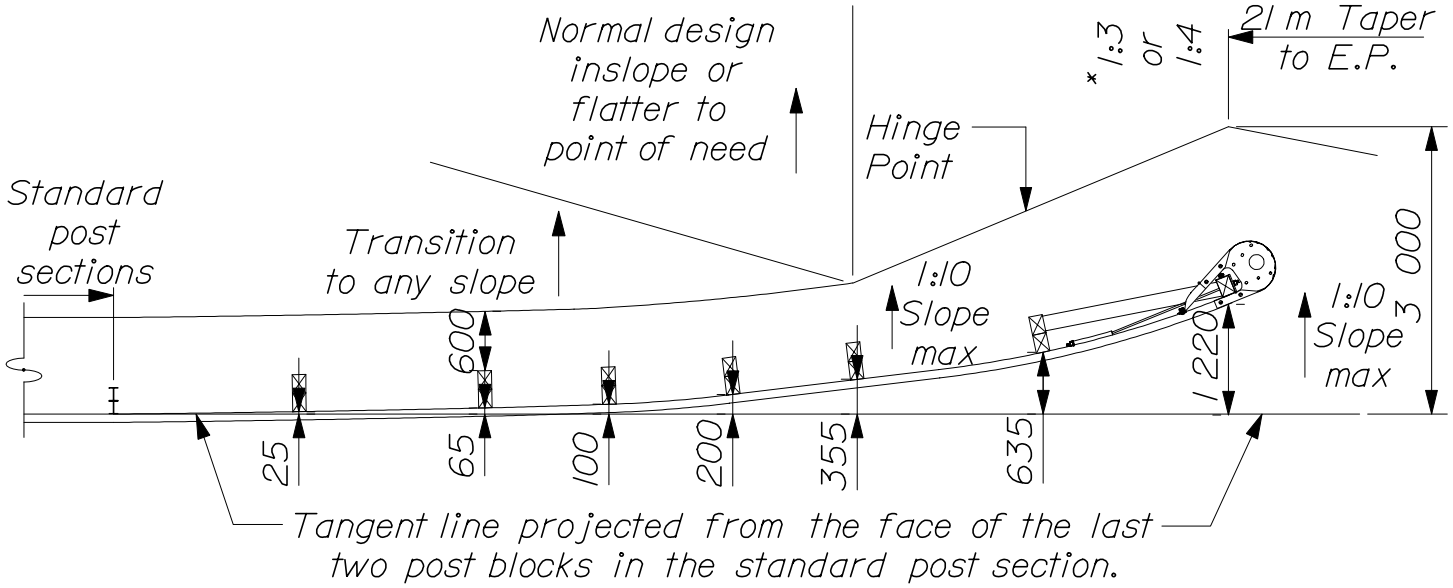
5. The post offset dimensions are given to the center of the traffic face of the blockouts, except at the first post where the dimension is to the center of the traffic face of the post. Offset points are to be located by chord measurements at the back of rail equal to the nominal post spacing shown. Posts are to be set approximately radial to the railing at each post location.

6. 300 mm x 900 mm Type III Retroreflective Adhesive Sheeting shall be applied to the approach Buffer End Section after curving, but prior to the installation of Button Head bolts as follows: W = White Sheeting, Y = Yellow Sheeting, X = No Sheeting.

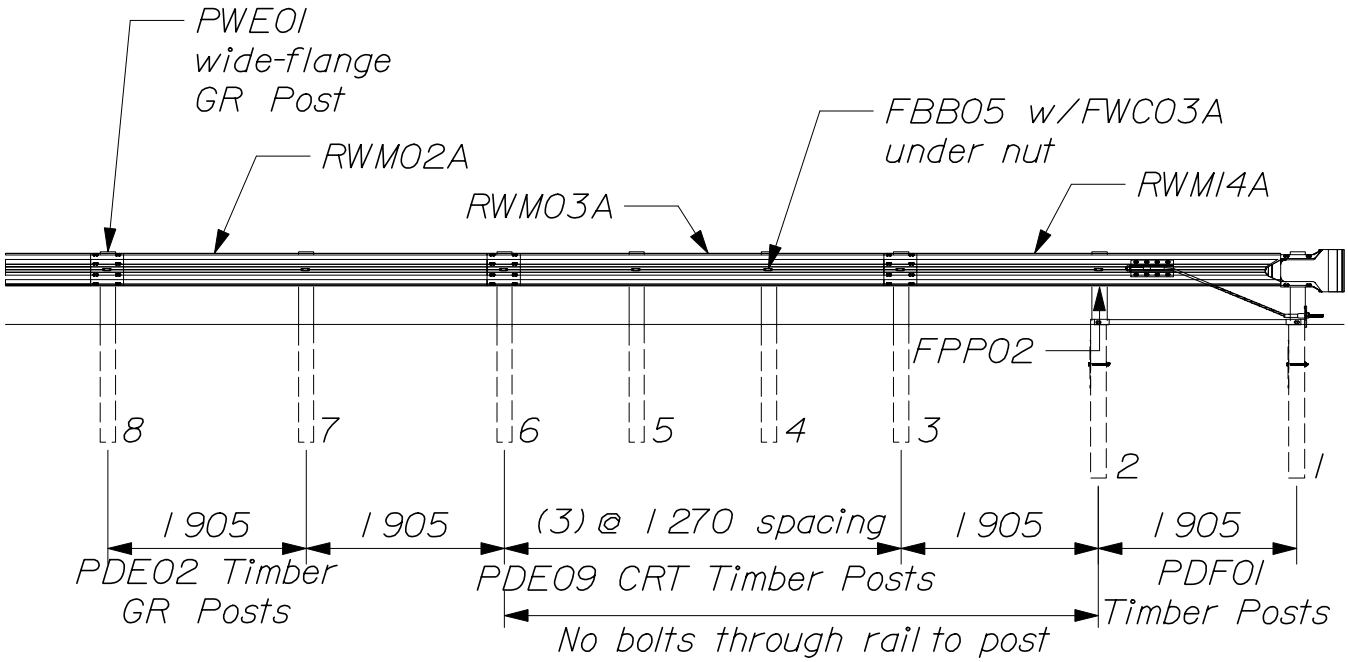


MODIFIED ECCENTRIC LOADER TERMINAL

606(08)

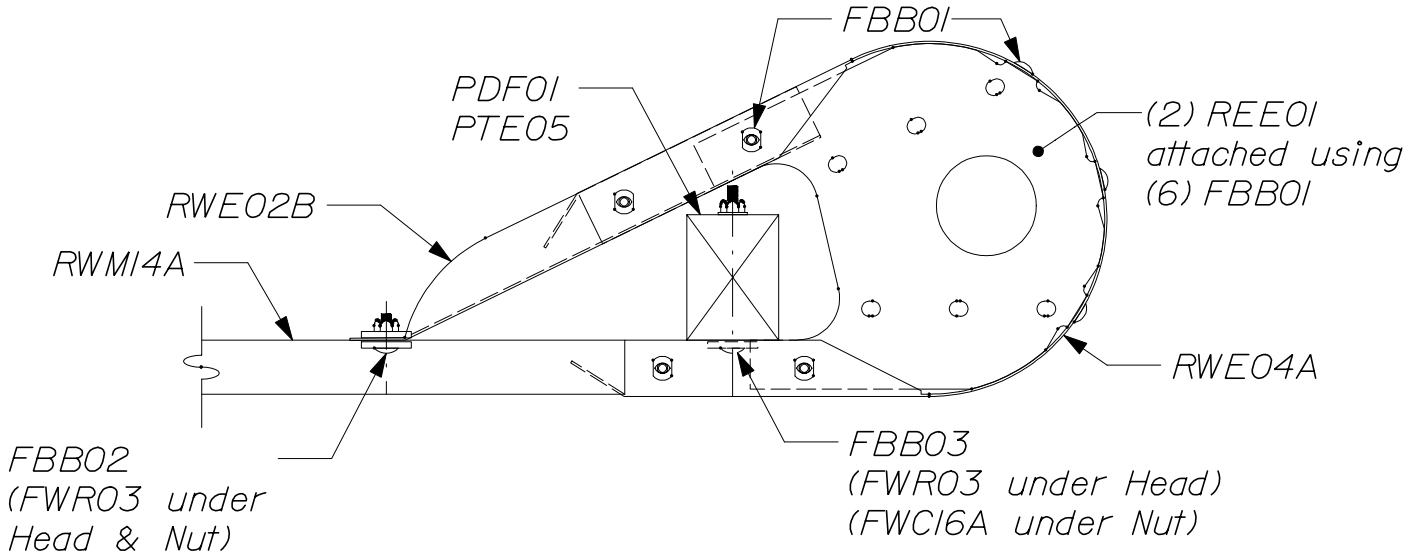


* Match normal design inslope

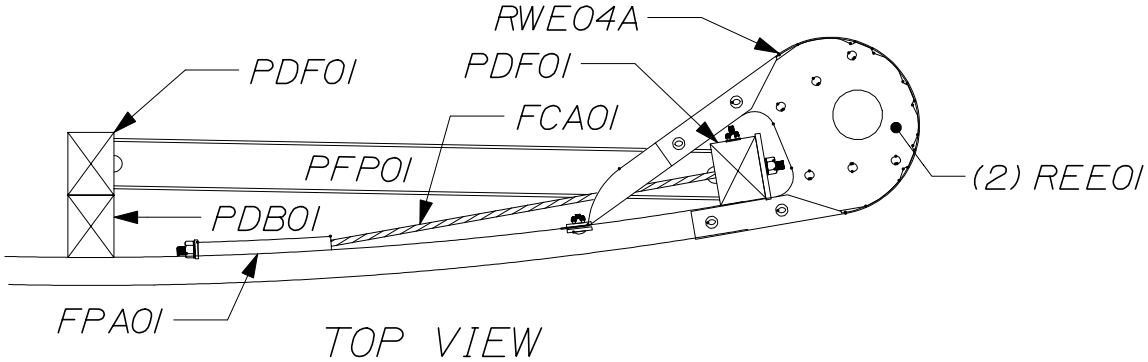


M.E.L.T. POST LAYOUT

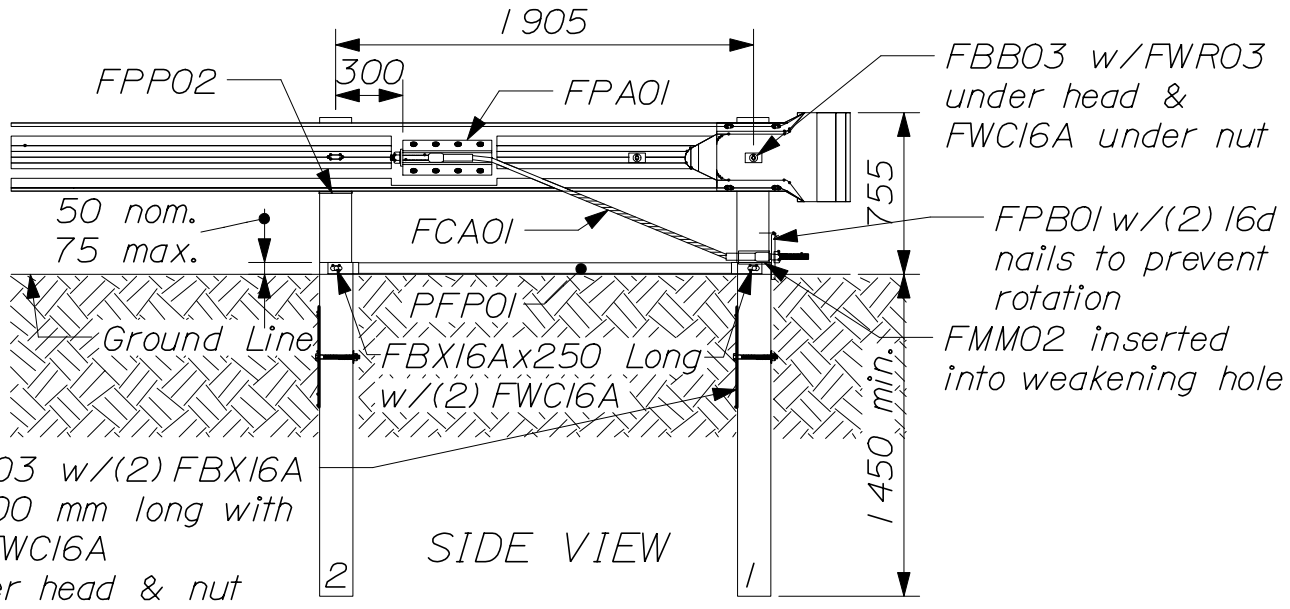
606(09)



BUFFERED END ASSEMBLY



TOP VIEW



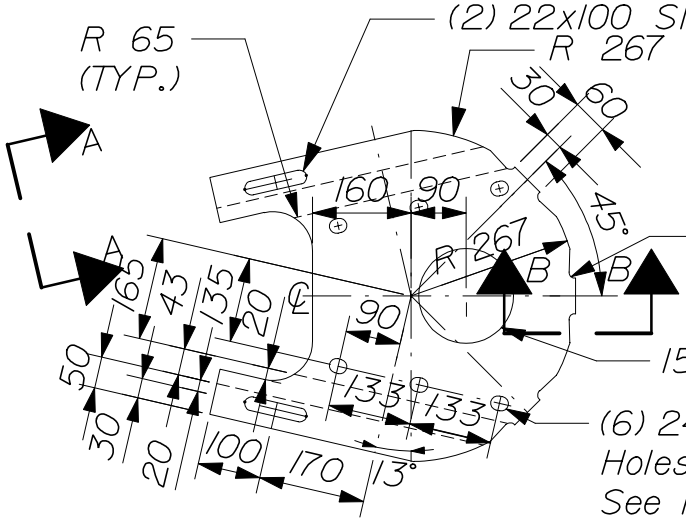
SIDE VIEW

PDF01 Timber Post inserted into PTE05 Foundation Tube Posts No. 1 & 2. Post edges may require beveling below the 22 mm hole to allow the post to fit into the steel foundation tube.

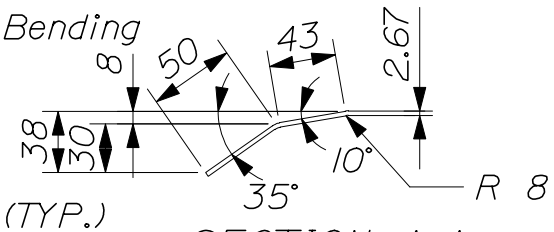
*The PLS03 Soil Plates at Posts 1 & 2 may be eliminated if 1 830 mm (6') foundation tubes are used at Post 1 & 2.

M.E.L.T. TERMINAL

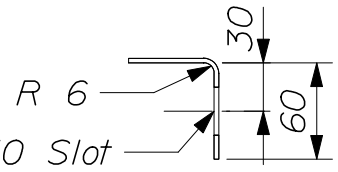
606(10)



REE01 DIAPHRAGM PLATE
(2 REQUIRED EACH TERMINAL)

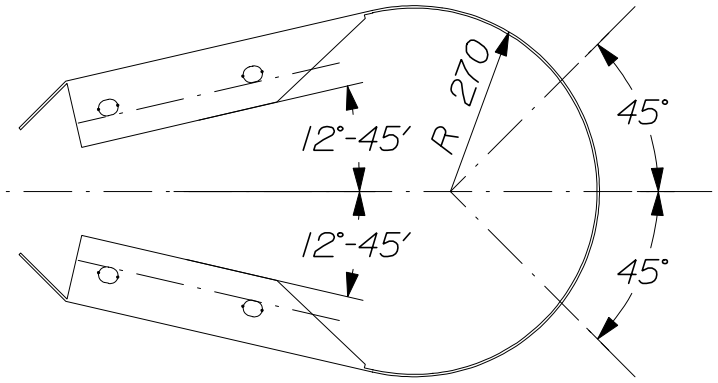


SECTION A-A
DIAPHRAGM PLATE DETAIL

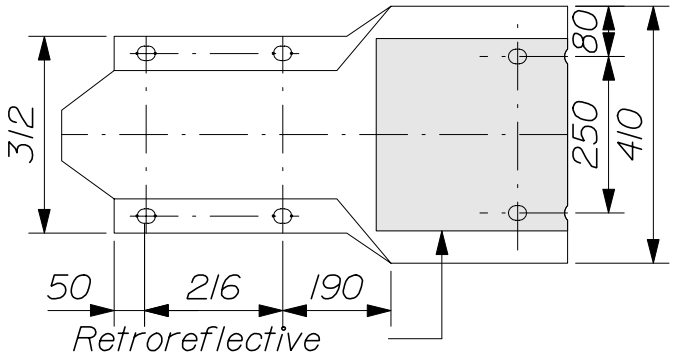


SECTION B-B
DIAPHRAGM PLATE DETAIL
ELEVATION

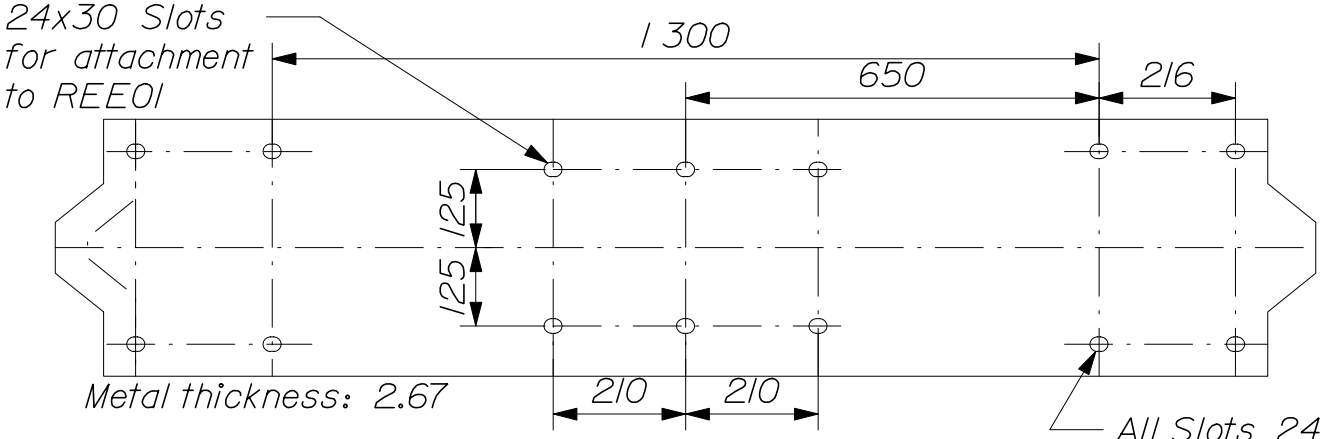
PLAN



RWE04A
W-BEAM END SECTION



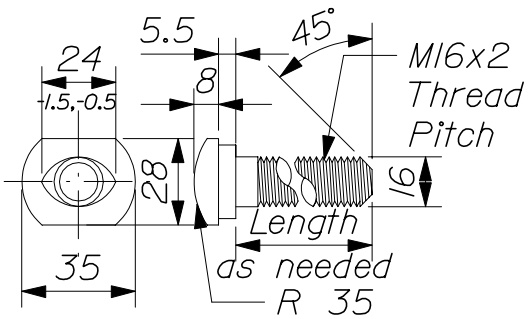
RWE04A
W-BEAM END SECTION



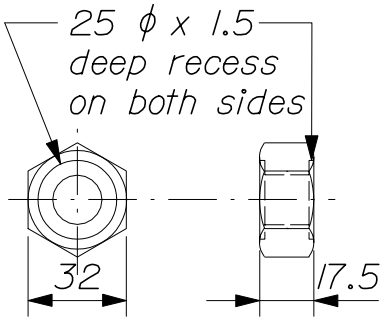
RWE04A W-BEAM END SECTION
FLAT PLATE LAYOUT

BUFFERED END ASSEMBLY

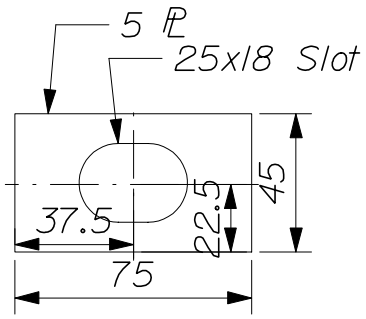
606(11)



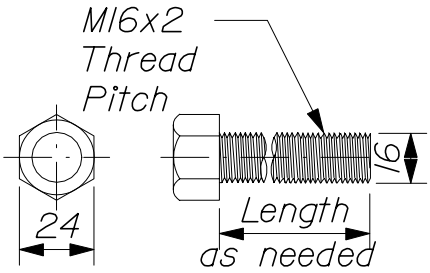
FBB01-05 BOLT



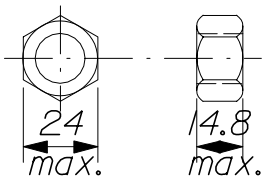
NUT FOR FBB01-05



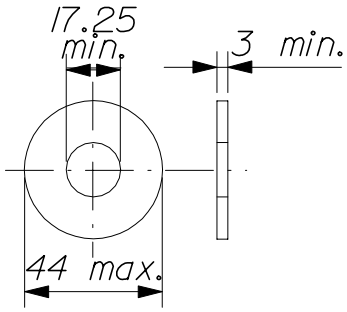
FWR03 WASHER



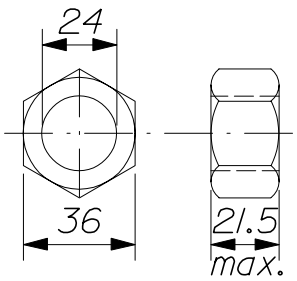
FBX16A BOLT



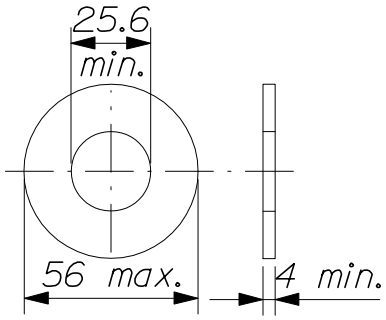
NUT FOR FBX16A



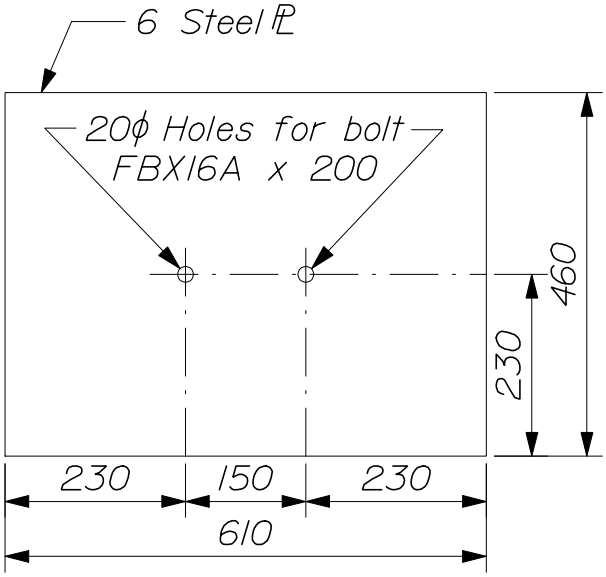
FWC16A WASHER



FNX24A NUT

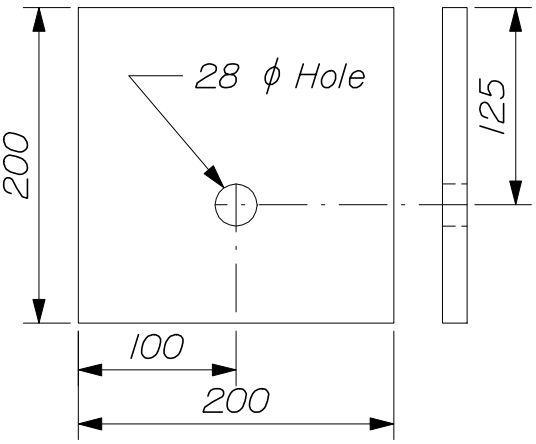


FWC24A WASHER



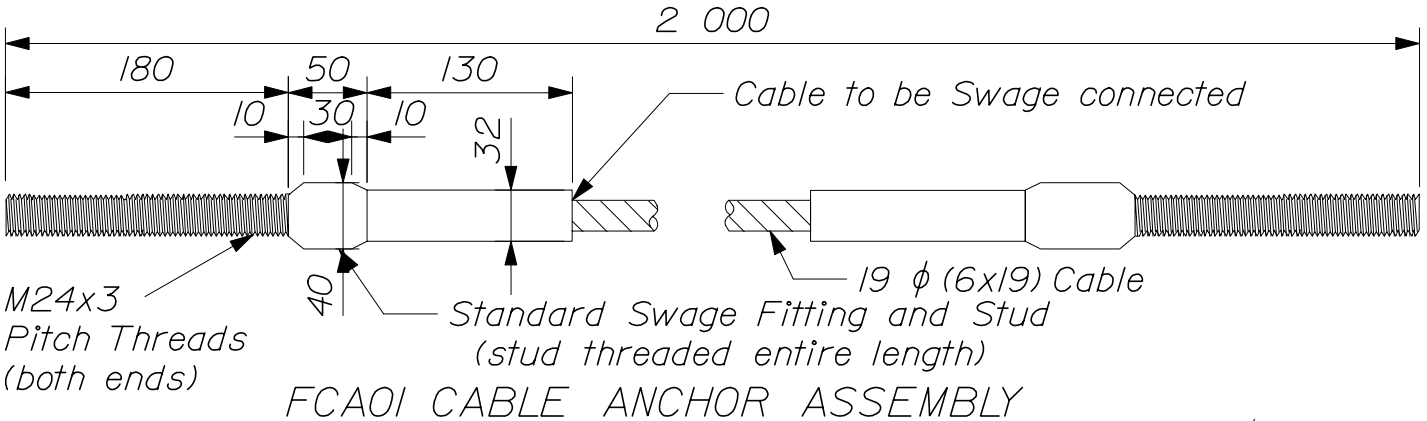
PLS03 SOIL PLATE
POSTS 1 & 2 (2 REQ.)

FPB01
BEARING
PLATE

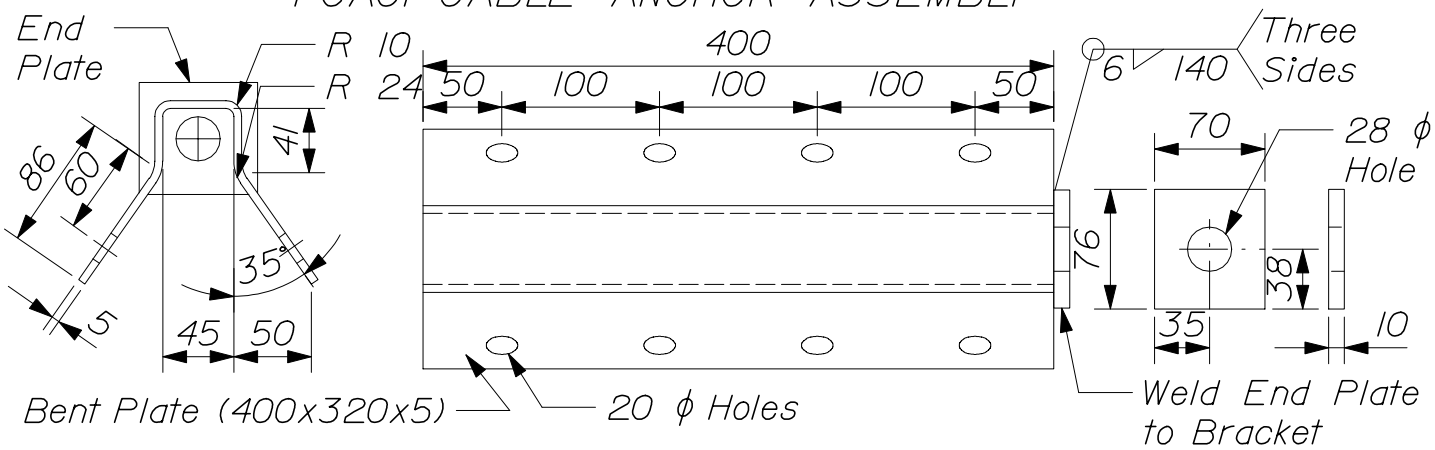


M.E.L.T. HARDWARE

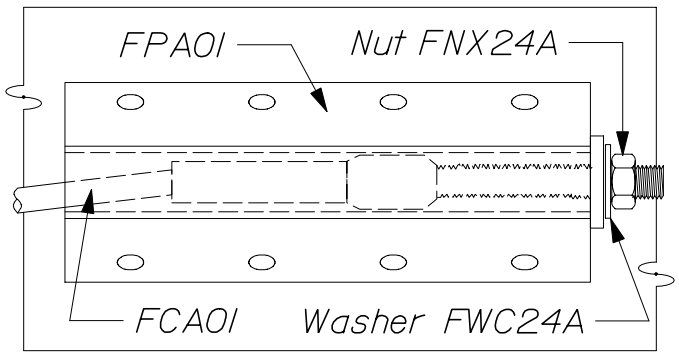
606(12)



FCA01 CABLE ANCHOR ASSEMBLY

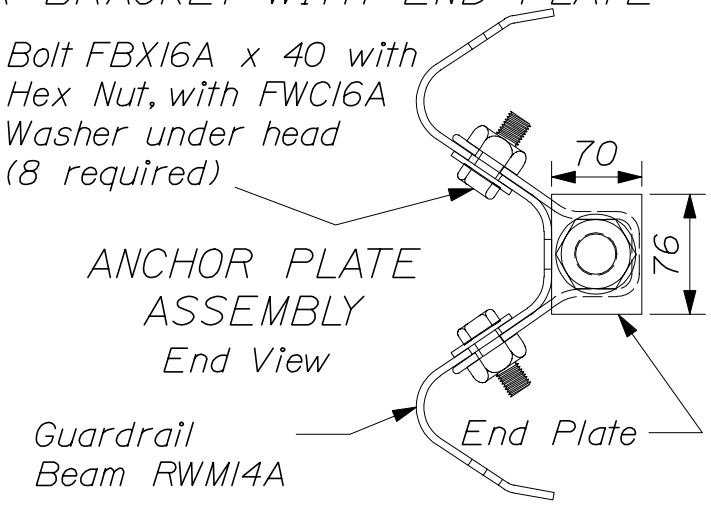


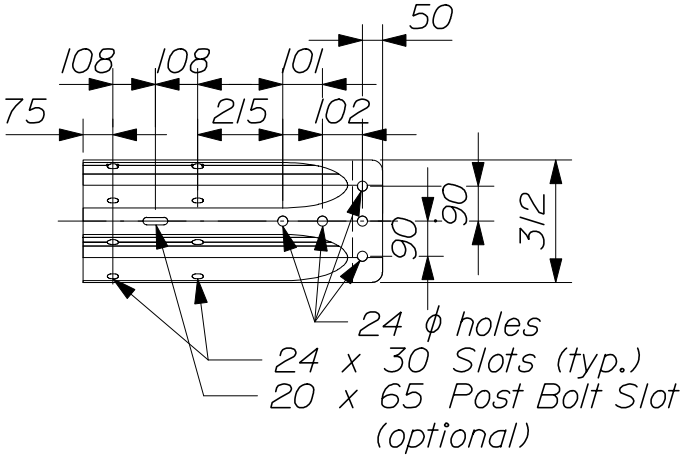
FPA01 GUARDRAIL ANCHOR BRACKET WITH END PLATE

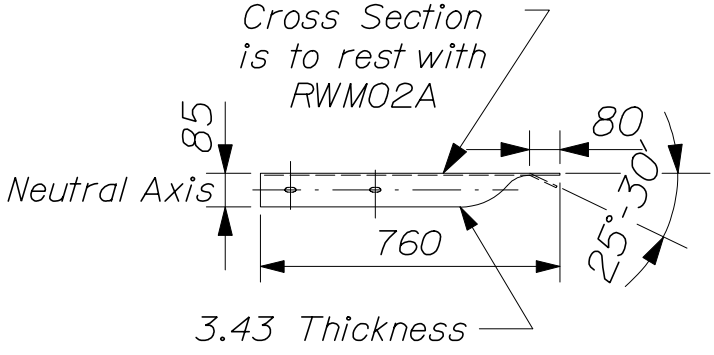


Side View

ANCHOR PLATE ASSEMBLY



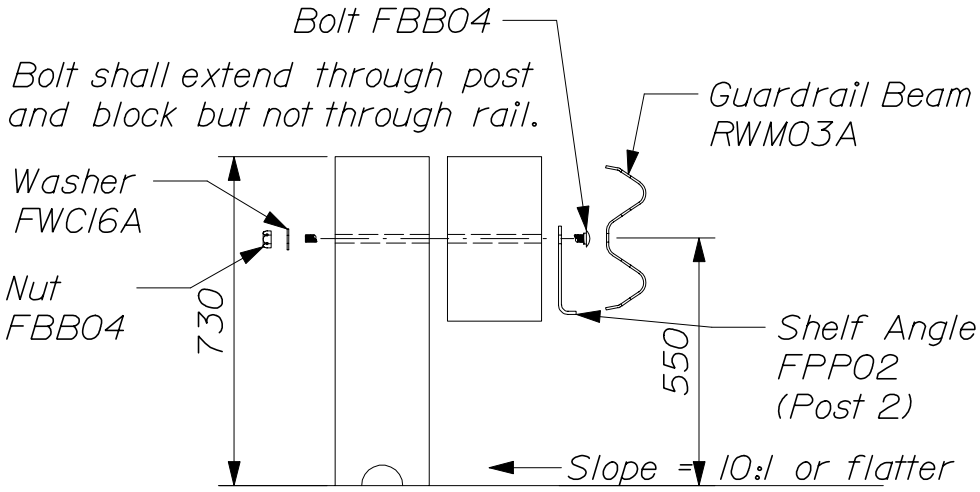




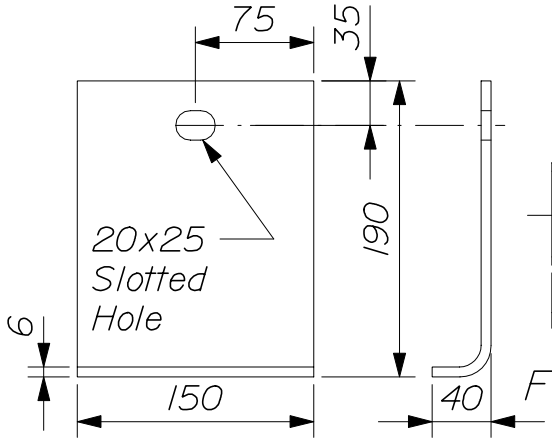
W-BEAM TERMINAL CONNECTOR RWE02B

M.E.L.T. HARDWARE

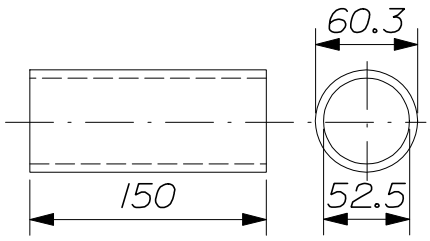
606(13)



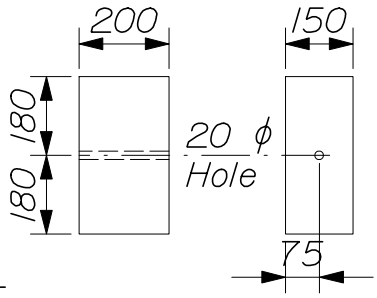
BREAKAWAY LINE POST AND BLOCK
PDE09 (4 required)



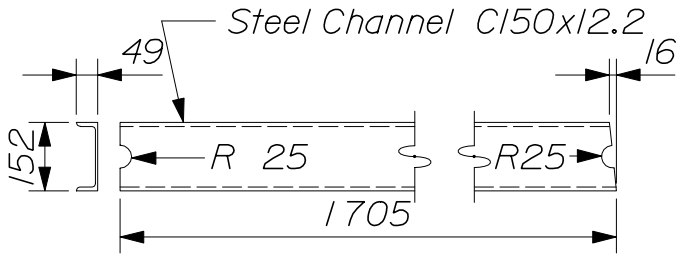
FPP02 SHELF ANGLE BRACKET AT POST #2
(1 required)



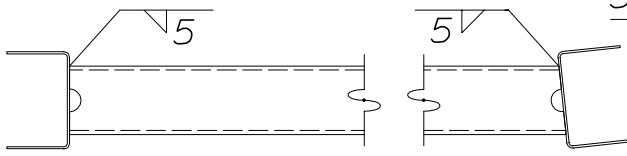
FMM02 POST SLEEVE
(post 1 only)



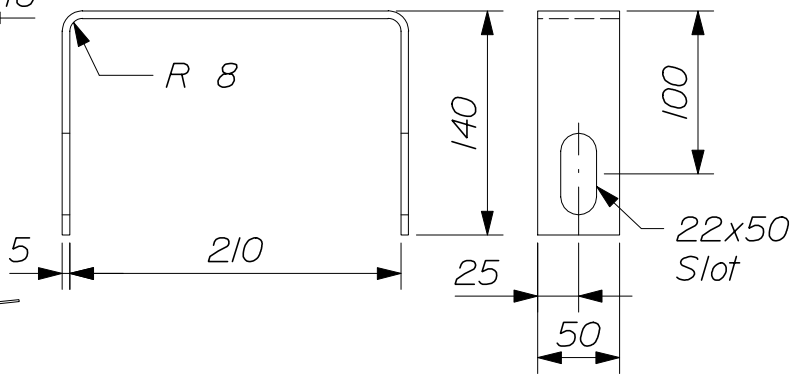
PDB01 W-BEAM TIMBER BLOCKOUT
(7 required)



STRUT DETAILS



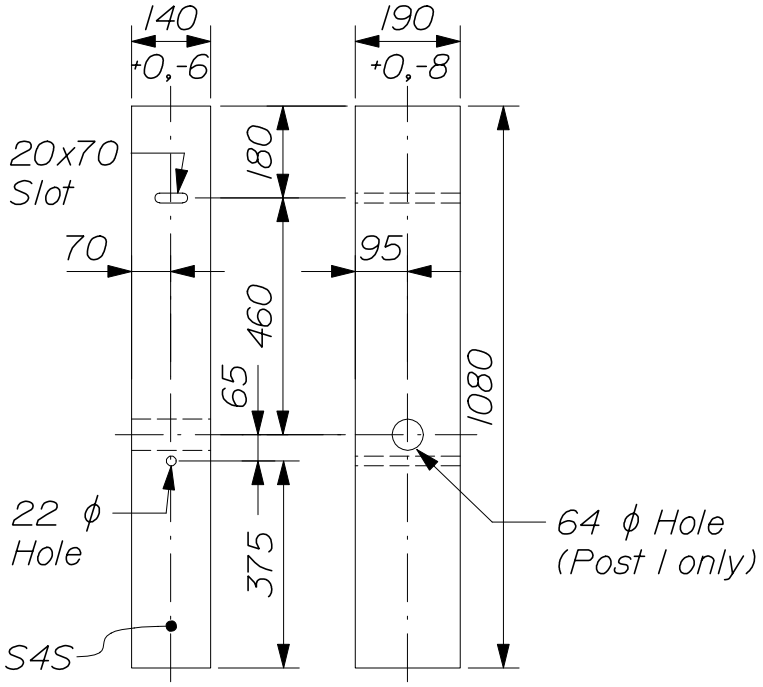
PFP01 STRUT & YOKE ASSEMBLY
Shown legs up. For opposite hand, install legs down.



YOKE DETAILS
(2 required)

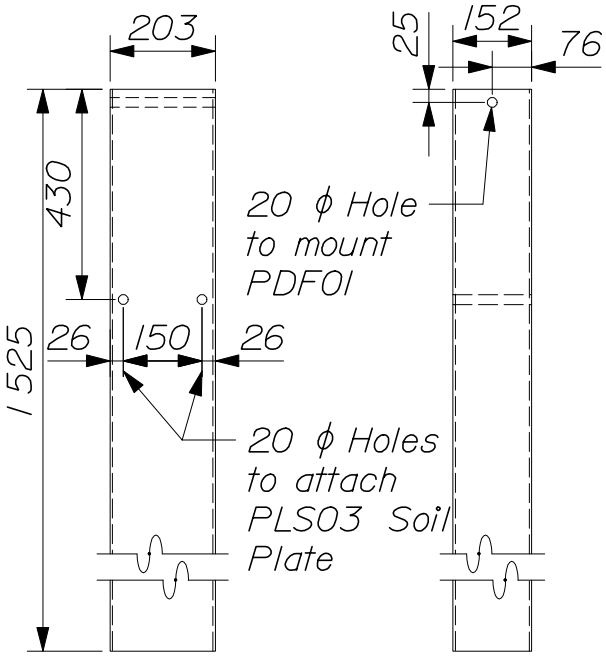
POST, YOKE & STRUT ASSEMBLY

606(14)



PDF01 TIMBER POST

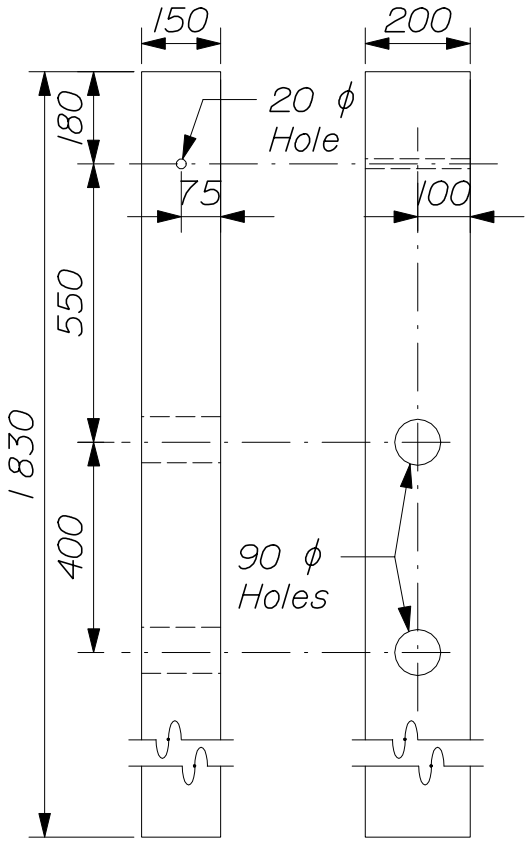
Posts 1 & 2 (2 req.)



PTE05 FOUNDATION TUBE

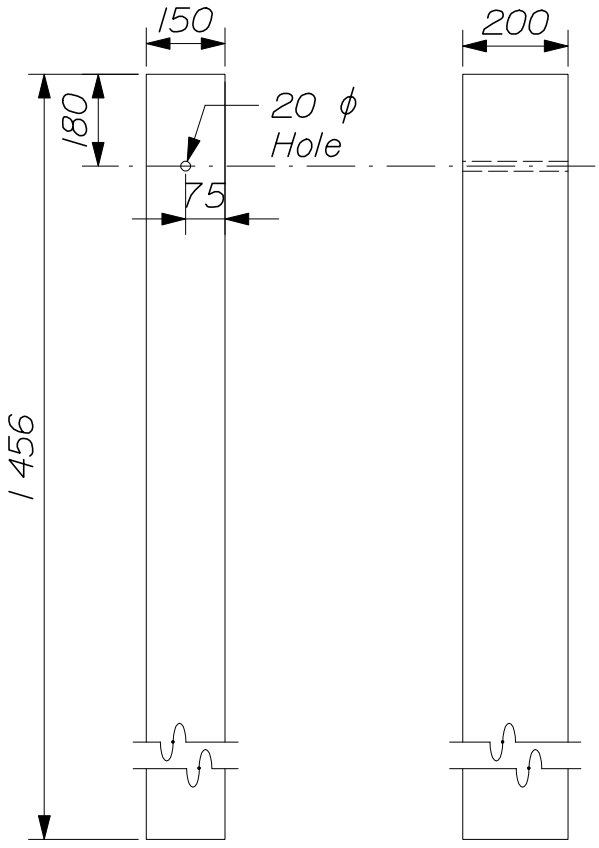
For Posts No. 1 & No. 2

TS-203x152x4.8 (2 req.)



PDE09 CRT TIMBER POST

(4 required)

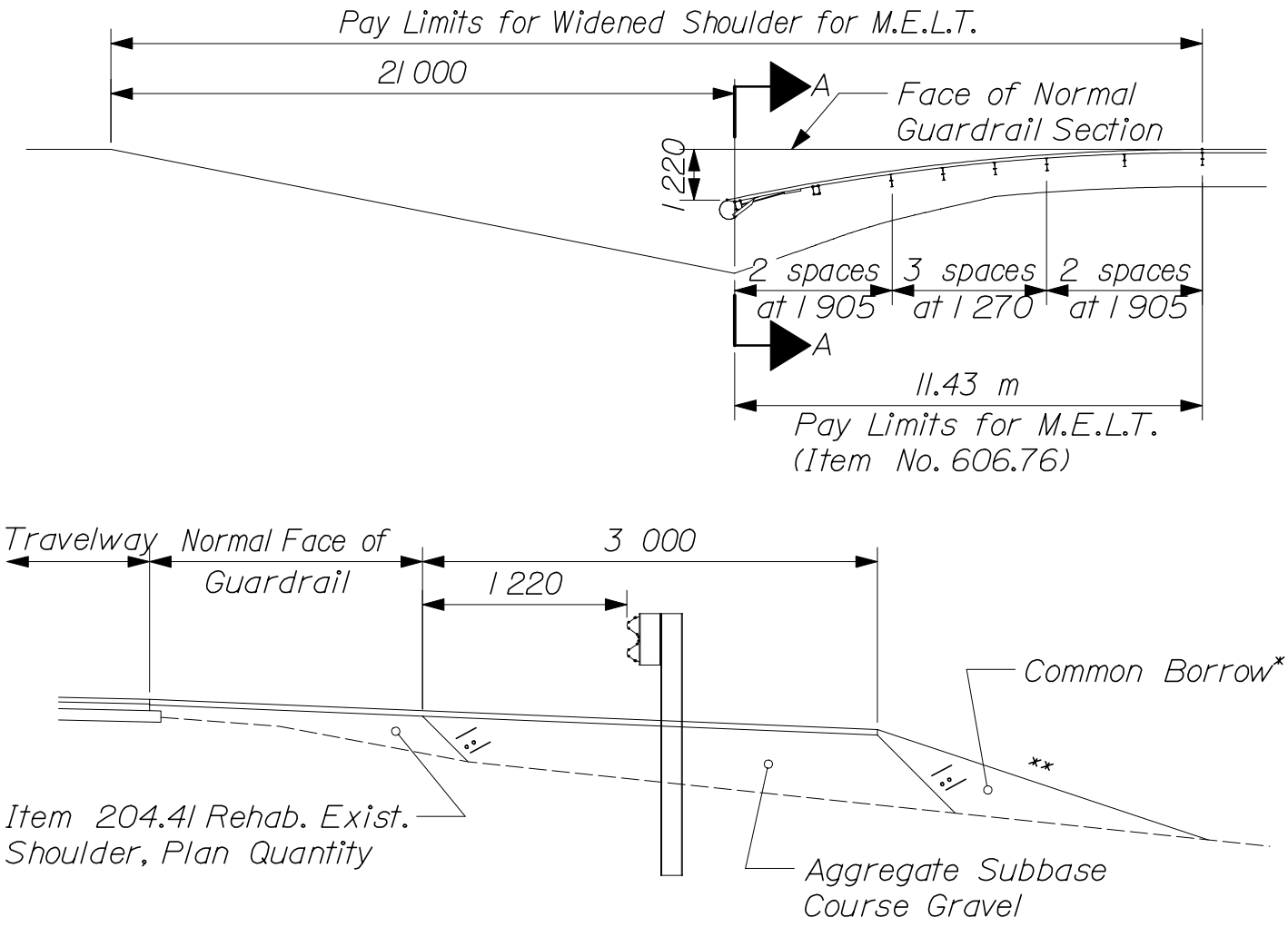


PDE02 TIMBER GR POST

(1 required)

M.E.L.T. POST DETAILS

606(15)



SECTION A-A

* Adjacent or available excavation shall be used instead of Common Borrow unless otherwise directed by the Resident.

** This shall be a 1:4 slope in areas that are presently 1:6. The steepest slope shall be 1:3 in all other areas.

Note:

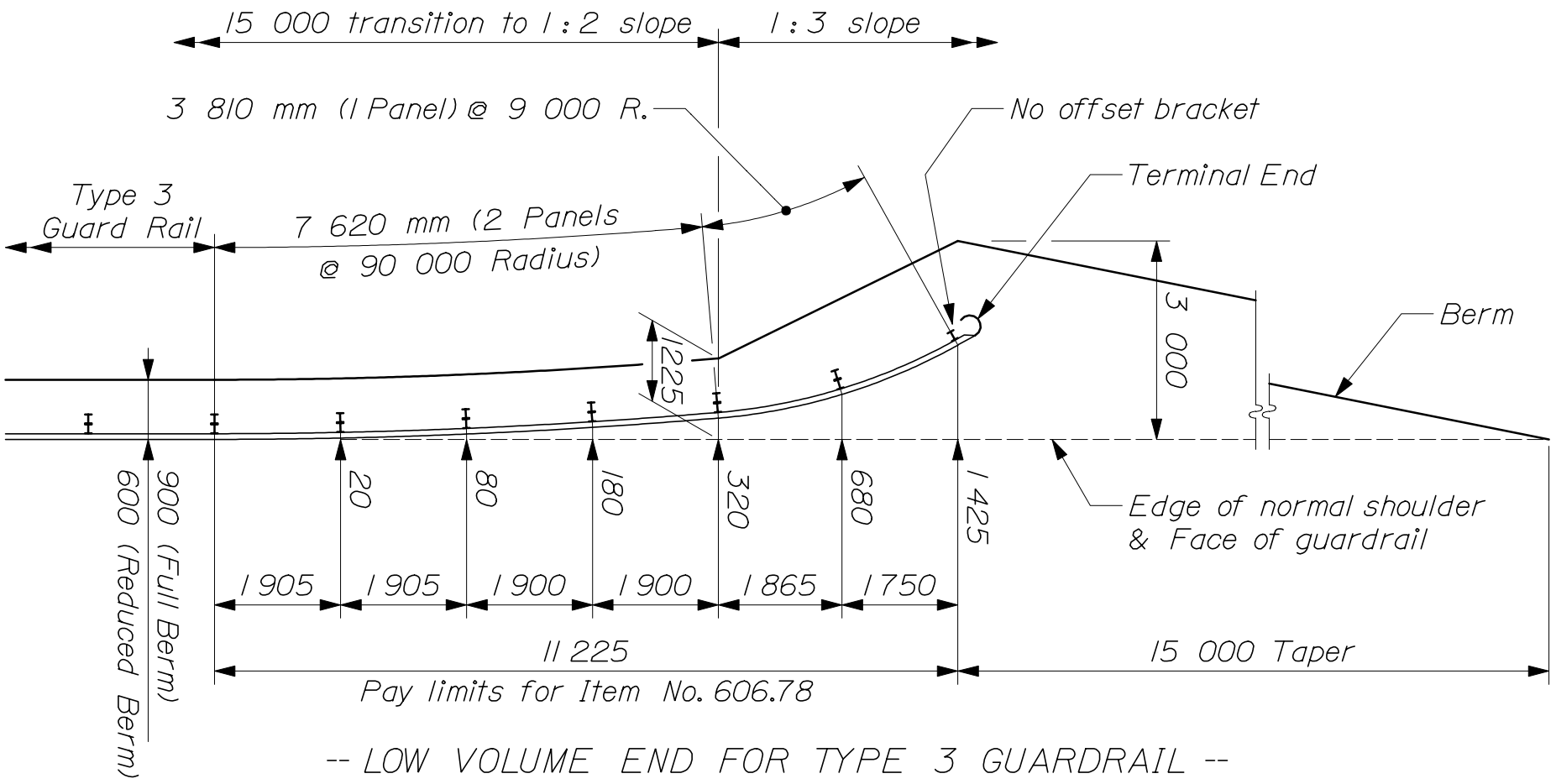
Widened Shoulder for M.E.L.T., when required, will be paid for under Item 606.752, complete in place, which price shall be full payment for furnishing, placing, grading, and compaction of aggregate subbase. Common Borrow, seed, mulch, loam, and Hot Bituminous Pavement will be paid for under the applicable items.

SHOULDER WIDENING FOR M.E.L.T.

606(16)

LOW VOLUME GUARDRAIL END

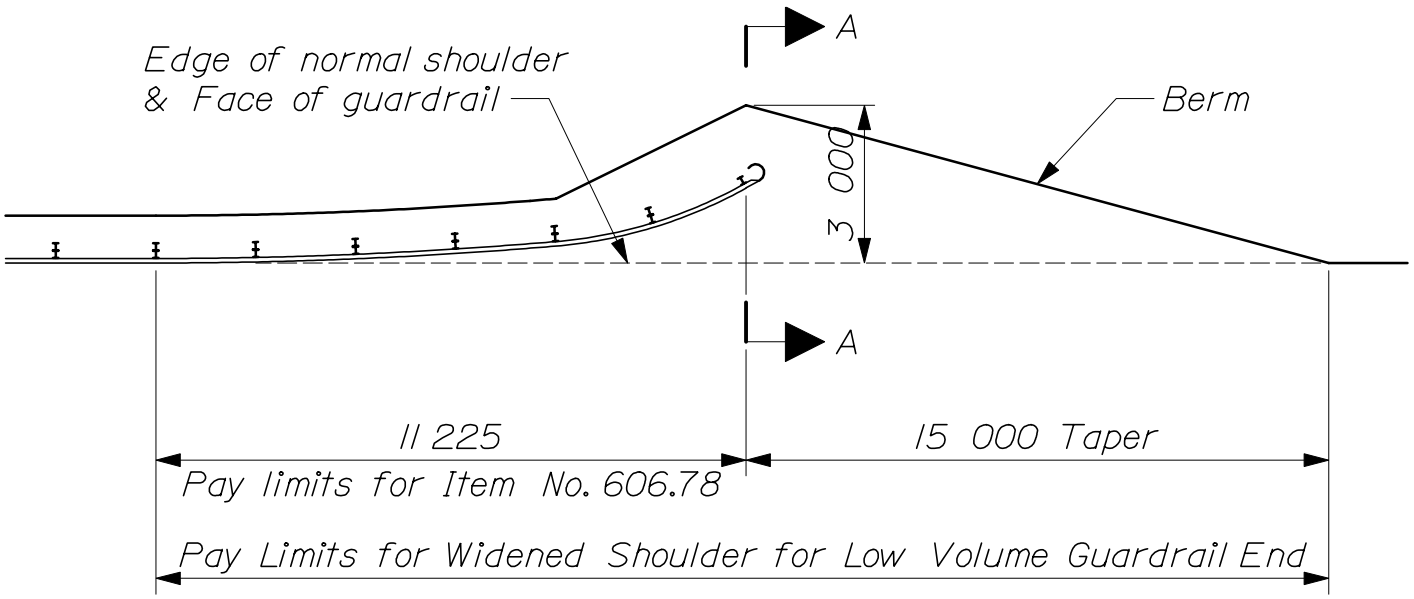
606(17)



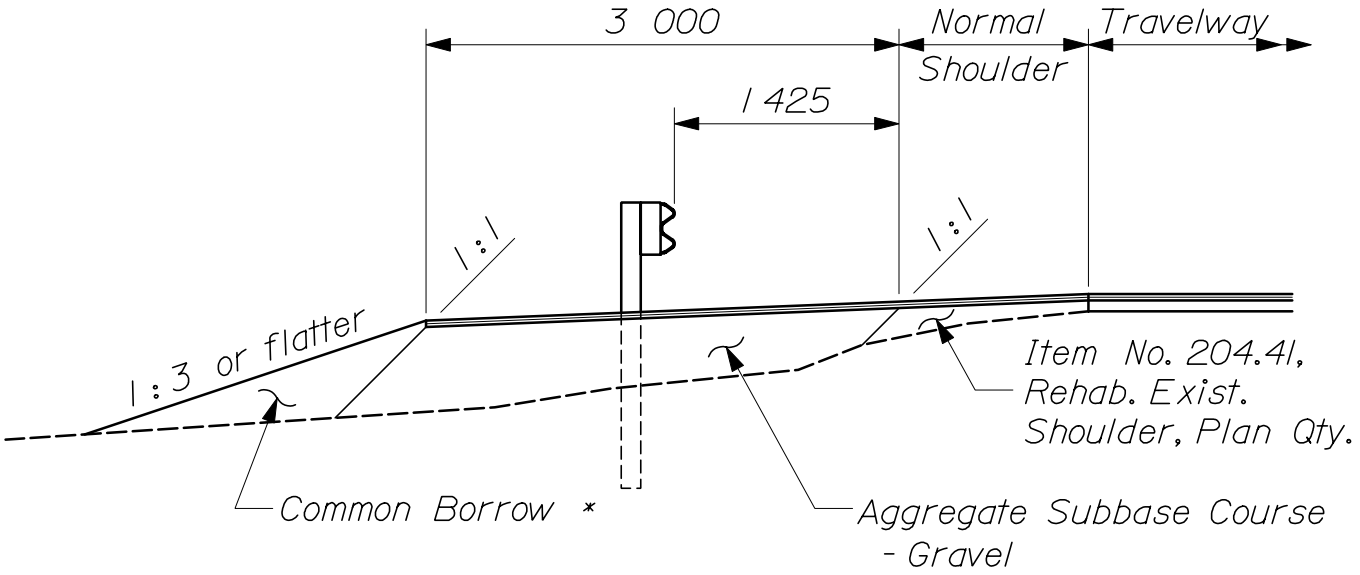
-- LOW VOLUME END FOR TYPE 3 GUARDRAIL --

NOTES:

1. Layout dimensions are measured to the face of the guardrail beam.
2. Provide plate washers FWR03 for the beam - to - post connections at the last seven (7) posts.



-- PLAN --



-- SECTION A - A --

* Use adjacent or available excavation in place of Common Borrow unless otherwise directed by the Engineer.

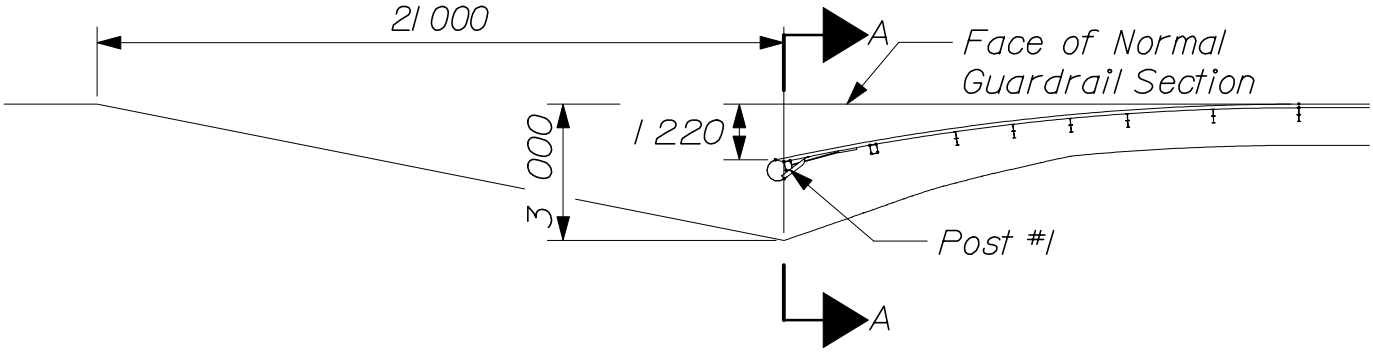
NOTE:

Widened Shoulder for Low Volume Guardrail End, when required, will be paid for under Item No. 606.753, complete in place, which price shall be full payment for furnishing, placing, grading and compacting of aggregate subbase. Common borrow, seed, mulch, loam and hot bituminous pavement will be paid for under the applicable pay items.

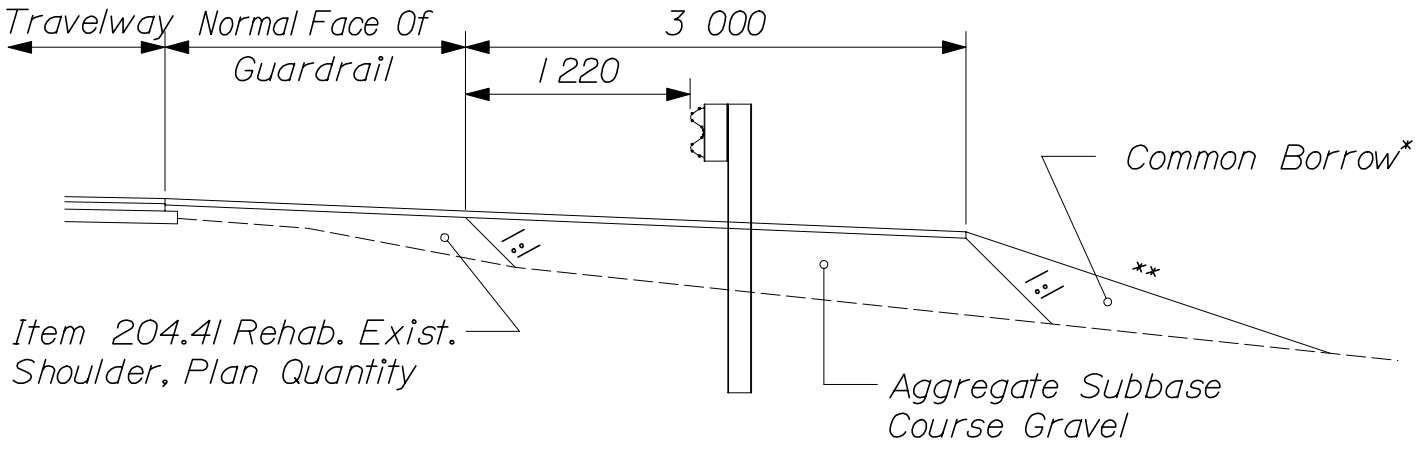
SHOULDER WIDENING FOR LOW VOLUME GUARDRAIL END

606(18)

Use manufacturing installation guidelines for flare offset at each post *



*Only a 1 220 mm offset may be used at Post #1



SECTION A-A

* Adjacent or available excavation shall be used instead of Common Borrow unless otherwise directed by the Resident.

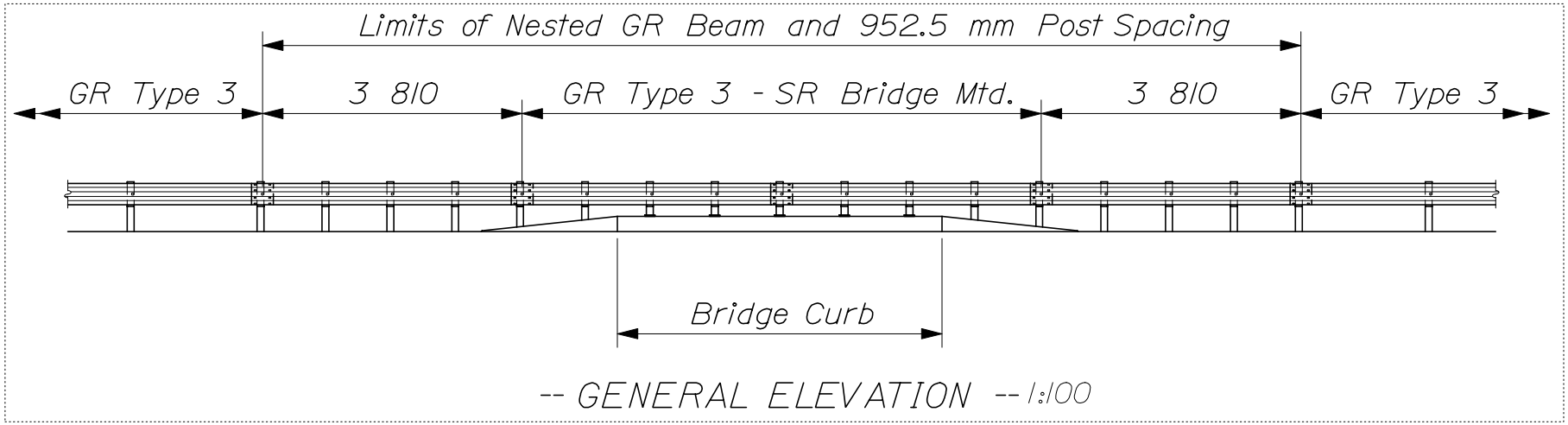
** This shall be a 1:4 slope in areas that are presently 1:6. The steepest slope shall be 1:3 in all other areas.

SHOULDER WIDENING FOR GUARDRAIL 350 TERMINAL

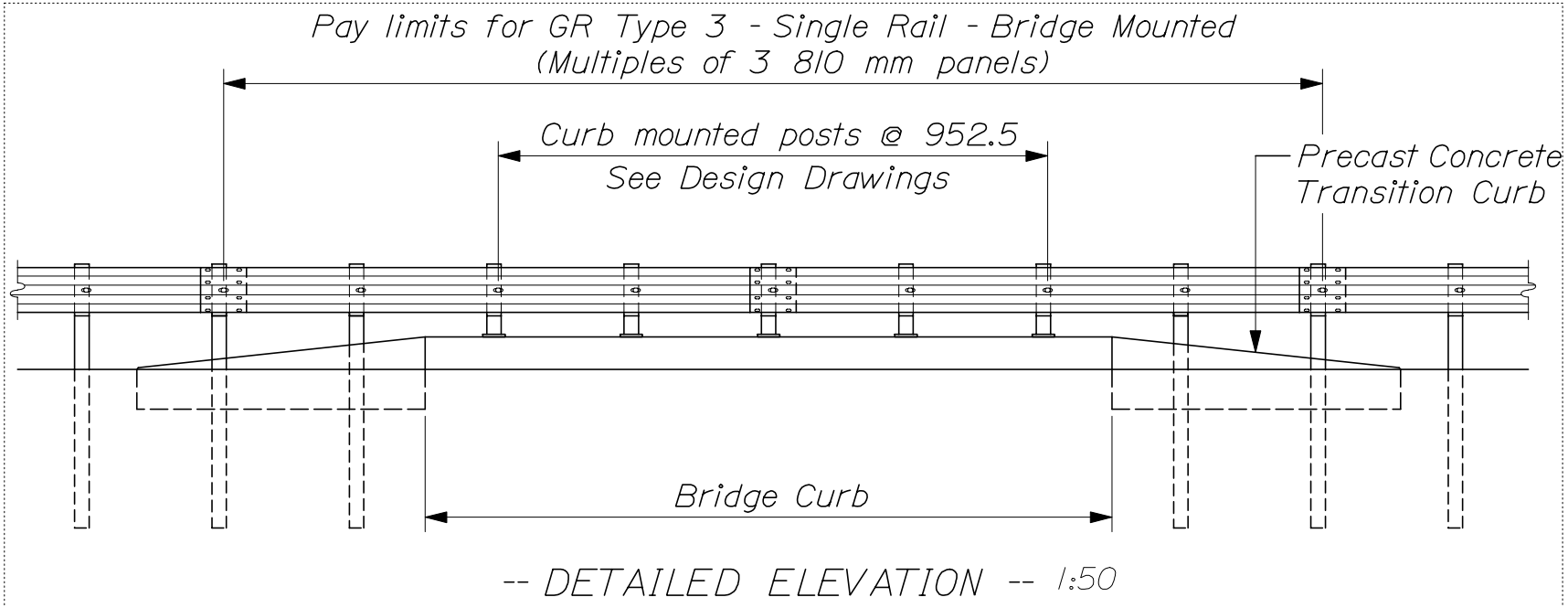
606(19)

GUARDRAIL TYPE 3 - SINGLE RAIL BRIDGE MOUNTED

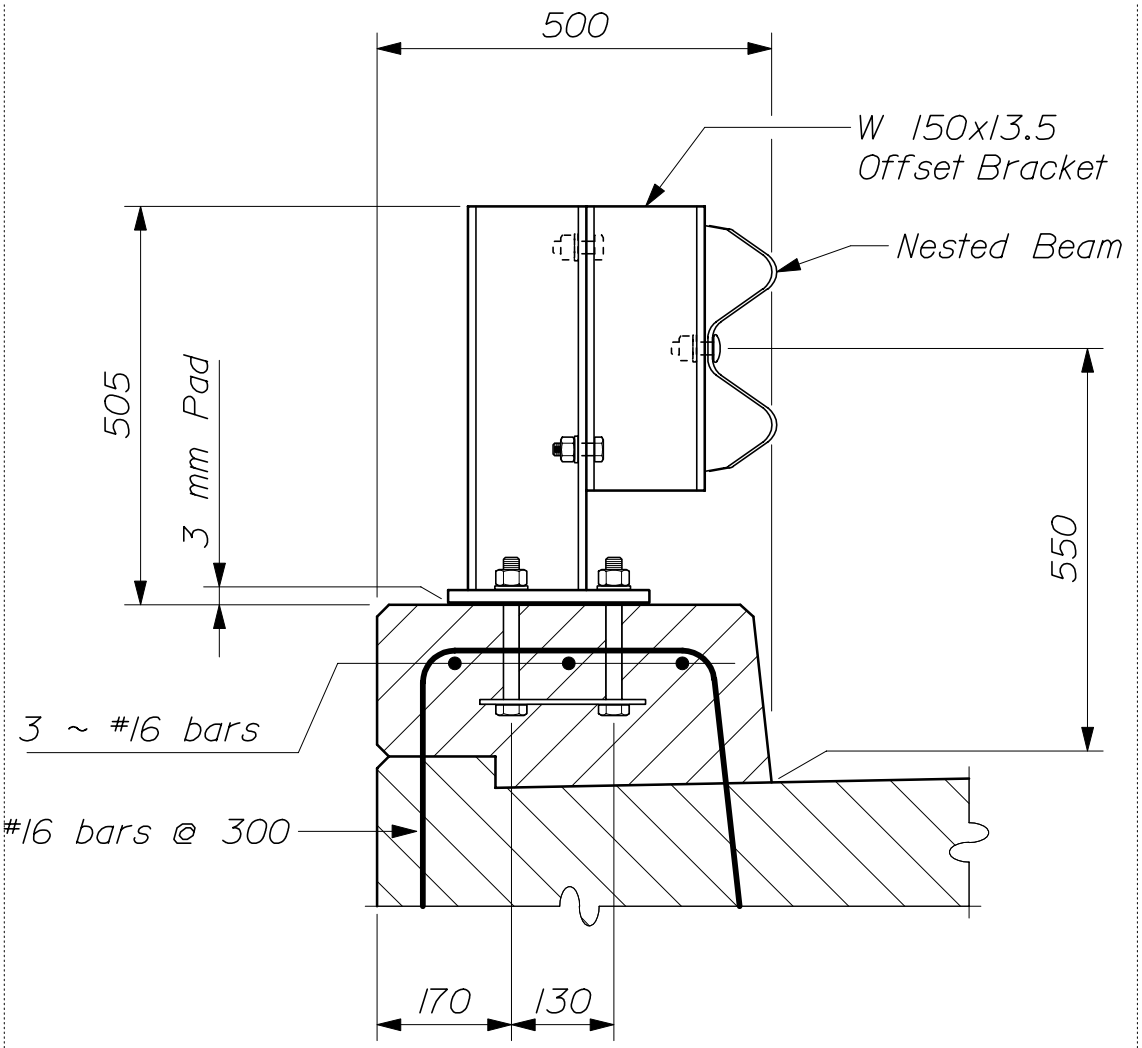
606(20)



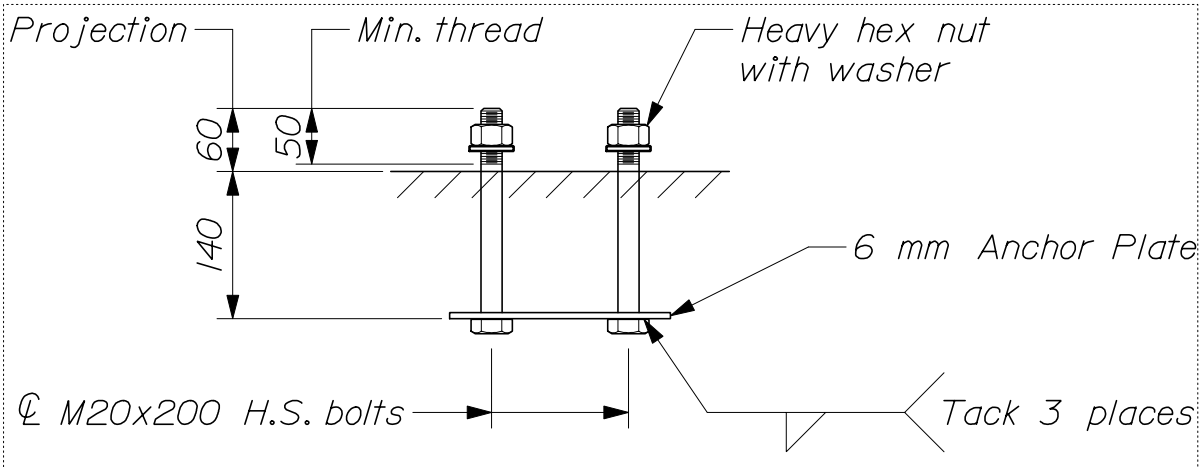
-- GENERAL ELEVATION -- 1:100



-- DETAILED ELEVATION -- 1:50



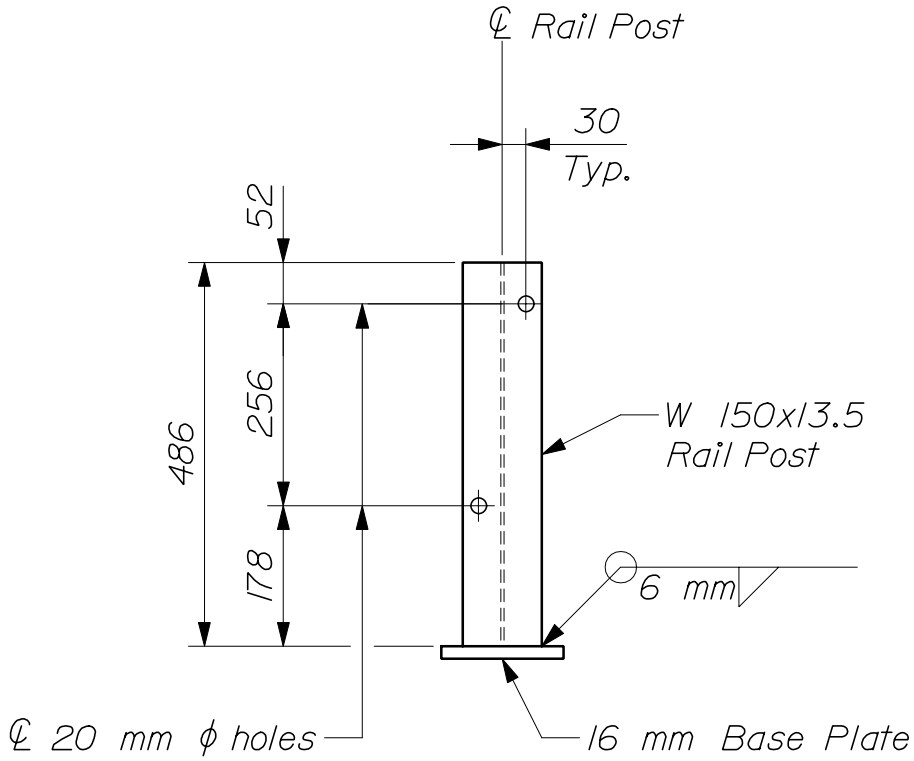
-- TYPICAL RAIL SECTION -- 1:10



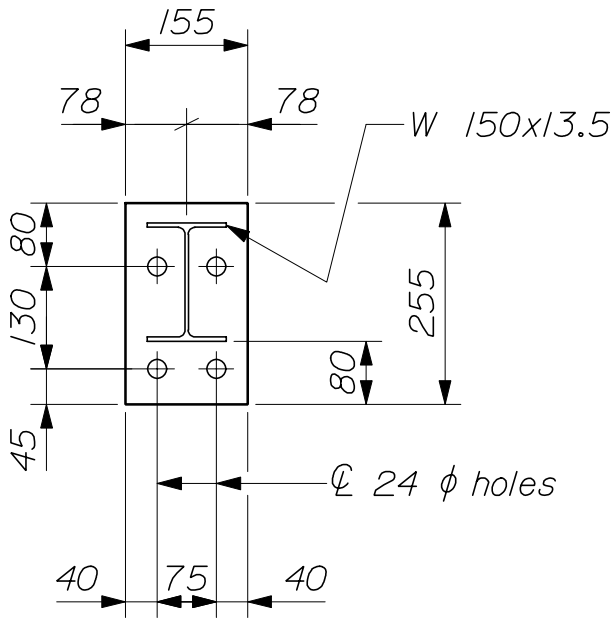
-- ANCHOR BOLT DETAIL -- 1:7.5

GUARDRAIL TYPE 3 - SINGLE RAIL BRIDGE MOUNTED

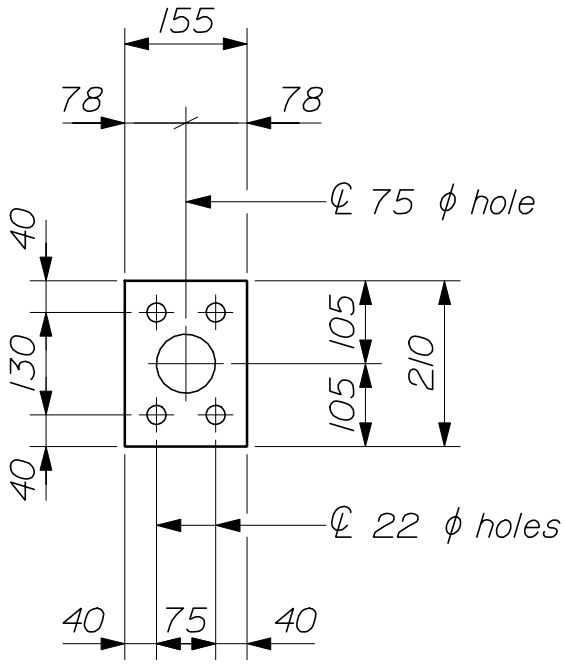
606(21)



-- RAIL POST ELEVATION --



-- BASE PLATE PLAN --



-- ANCHOR PLATE PLAN -- 1:10

GUARDRAIL TYPE 3 - SINGLE RAIL BRIDGE MOUNTED

606(22)

NOTES:

1. All work and materials shall conform to the provisions of Section 507 - Railings and Section 606 - Guardrail of the Standard Specifications, as applicable.

2. All exposed cut or sheared edges shall be broken and free of burrs.

3. Curb mounted posts shall be set normal to grade unless otherwise shown.

4. Twenty - five percent of the post - to - base welds in a production lot shall be tested by the Magnetic Particle Method. If rejectable discontinuities are found, another twenty - five percent of that production lot shall be tested. If rejectable discontinuities are found in the second twenty - five percent, all post - to - base welds in that lot shall be tested. Acceptance criteria shall be in accordance with the latest editon of the AWS D1.5 Bridge Welding Code.

5. All non - stock parts shall be galvanized after fabrication in accordance with ASTM A 123, except that hardware shall meet the requirements of either ASTM A 153 or ASTM B 695, Class 50, Type I. Parts except hardware shall be blast - cleaned prior to galvanizing in accordance with SSPC - SP6.

6. Anchor bolts shall be set with a template. Nuts securing the post base shall be tightened to a snug fit and given an additional 1/8 turn.

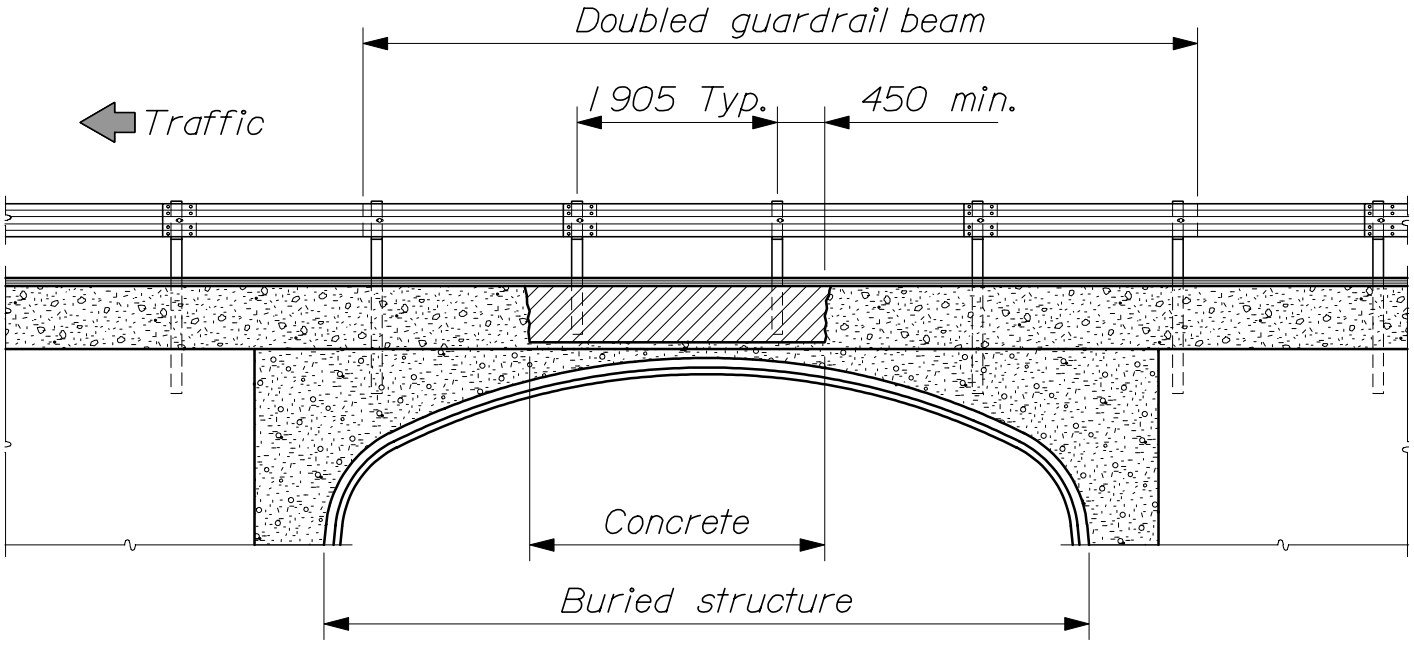
7. Nested guardrail beam and extra posts beyond the pay limits of the Bridge - Mounted Guardrail will be paid for as twice the required length of Guardrail Type 3 - Single Rail.

8. For details of the Concrete Transition Curb, refer to Standard Details Section 526, Concrete Transition Barrier. Payment for Concrete Transition Curb will be made under Item No. 609.247, Terminal Curb Type 2 - 2.1 m.

MATERIALS:

Guardrail Beam, Offset Brackets and Posts.....See Standard Spec.'s Section 710
Base Plate & Anchor Plate.....AASHTO M 183M/M 183 (ASTM A 36/A 36M)
Anchor bolts, washers & nuts.....ASTM F 568, Class 8.8

# GUARDRAIL TYPE 3 - SINGLE RAIL
# BRIDGE MOUNTED
606(23)



-- ELEVATION --

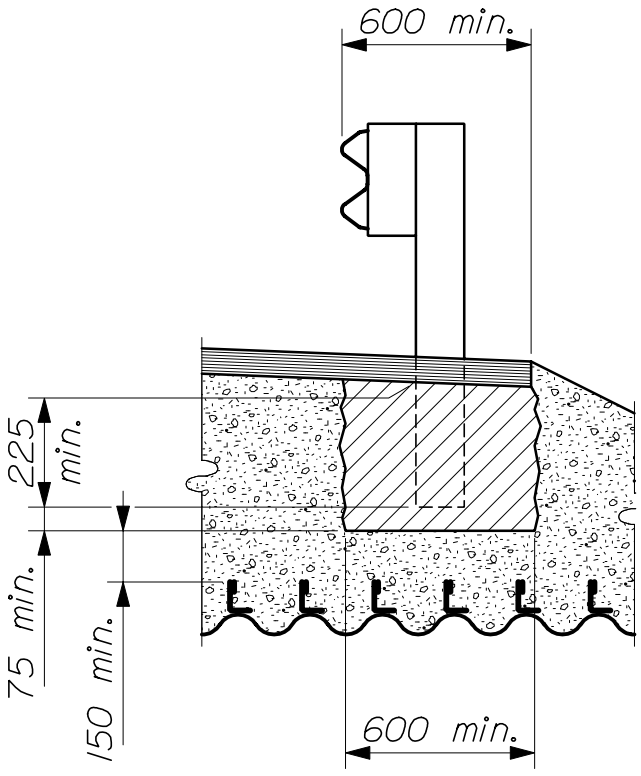
NOTES:

1. Guardrail posts interfering with a buried structure shall be cut to length in the field and cast into a concrete base as shown. The concrete may be placed directly into a trench excavated in the subbase material. The concrete mix shall be Class "A". Payment will be considered incidental to the guardrail pay items.

2. Only galvanized steel posts are to be used for this application.

3. The guardrail beam shall be doubled at least one space beyond the limits of the cut posts. Any extra beam length shall be installed toward the leading end of the guardrail. Payment will be considered incidental to the guardrail pay items.

4. Payment for any hand work required to place pavement in this area will be considered incidental to the paving items.



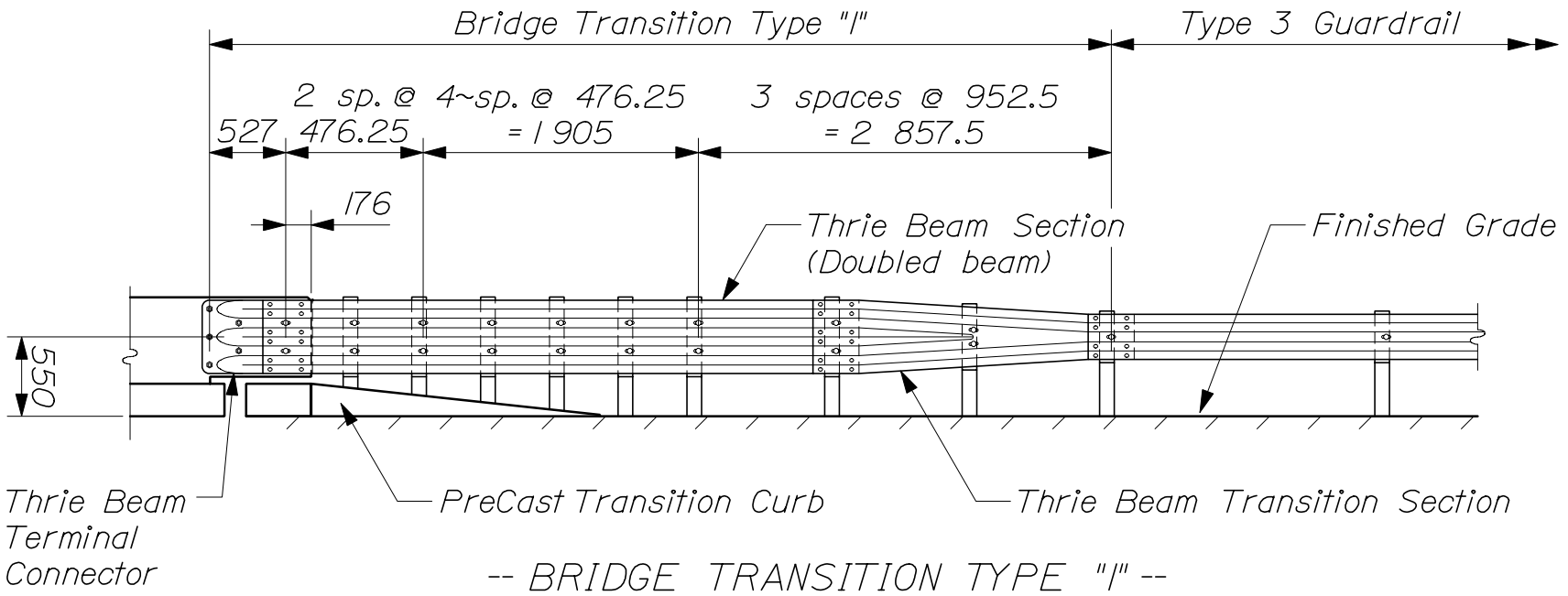
-- GUARDRAIL SECTION --

GUARDRAIL TREATMENT OVER BURIED STRUCTURES

606(24)

BRIDGE TRANSITION TYPE "I"

606(25)



-- BRIDGE TRANSITION TYPE "I" --

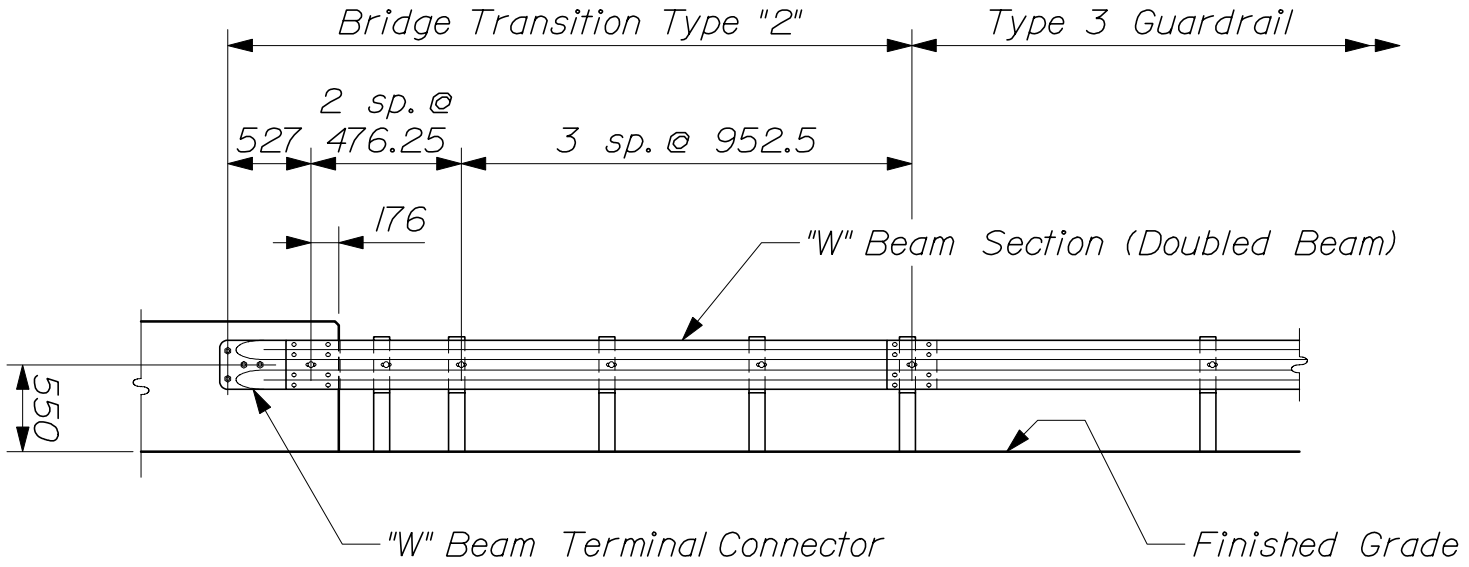
PARTS LIST:

Thrie Beam Section (2)	RTM04a (Modified)
Thrie Beam Transition Section (1)	RWT01a
Thrie Beam Terminal Connector (1)	RTE01b
Thrie Beam Steel Post & Offset Block (8)	PWE03, PWB02
or	
Thrie Beam Timber Post & Offset Block (8)	PDE03, PDB02

Note: Part designations refer to details shown in "A Guide to Standardized Highway Barrier Hardware" as prepared and approved by the AASHTO - AGC - ARTBA Joint Committee, Task Force 13 Report.

BRIDGE TRANSITION TYPE "2"

606(26)



-- BRIDGE TRANSITION TYPE "2" --

PARTS LIST:

"W" Beam Section (2)	RWM04a
"W" Beam Terminal Connector (1)	RWE02a
"W" Beam Steel Post & Offset Block (4)	PWE01, PWB01
or	
"W" Beam Timber Post & Offset Block (4)	PDE02, PDB01

Note: Part designations refer to details shown in "A Guide to Standardized Highway Barrier Hardware" as prepared and approved by the AASHTO - AGC - ARTBA Joint Committee, Task Force 13 Report.

TERMINAL CONNECTOR NOTES

1. Nuts, washers, 22 mm ϕ bolts, and Bearing Plate shall be incidental to Item 606.25. Nuts shall conform to A.S.T.M. A563, Grade DH, galvanized in accordanced with A.S.T.M. A153. Bolts shall be heavy hex structural bolt A.S.T.M. A325, Type 1 or 3, and galvanized in accordance with A.S.T.M. 153 - Nuts shall also be heavy hex.

2. Terminal Connector anchorage shall be installed on the trailing end.

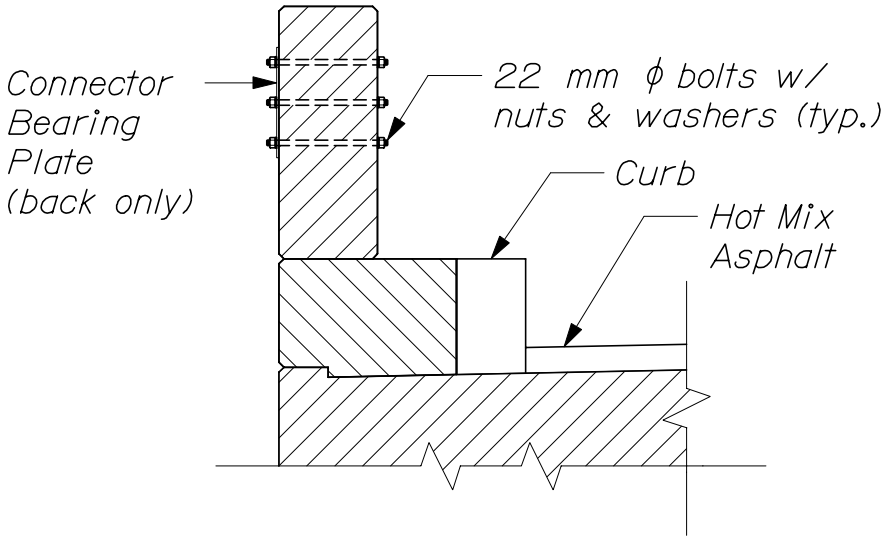
3. After installation of Guardrail is complete, upset threads on anchor bolts in three places around each bolt at the junction of the nut and the exposed thread with a center punch or similar tool.

4. Terminal Connector anchorage shall be paid under Item 606.25.

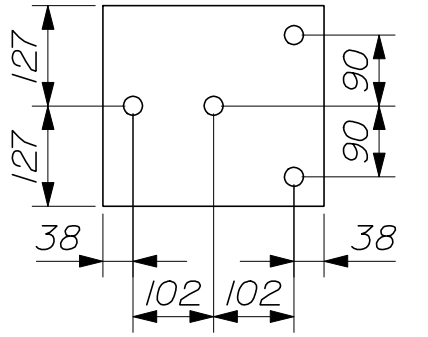
5. All accessories (posts, bolts. nuts, etc.) shall be as detailed for standard Type 3 Guardrail, except as otherwise detailed.

6. Field drilling for Terminal Connector, blockouts, and all hardware shall be considered incidental to Item 606.25, Terminal Connector.

CROSS SECTION
OF END POST



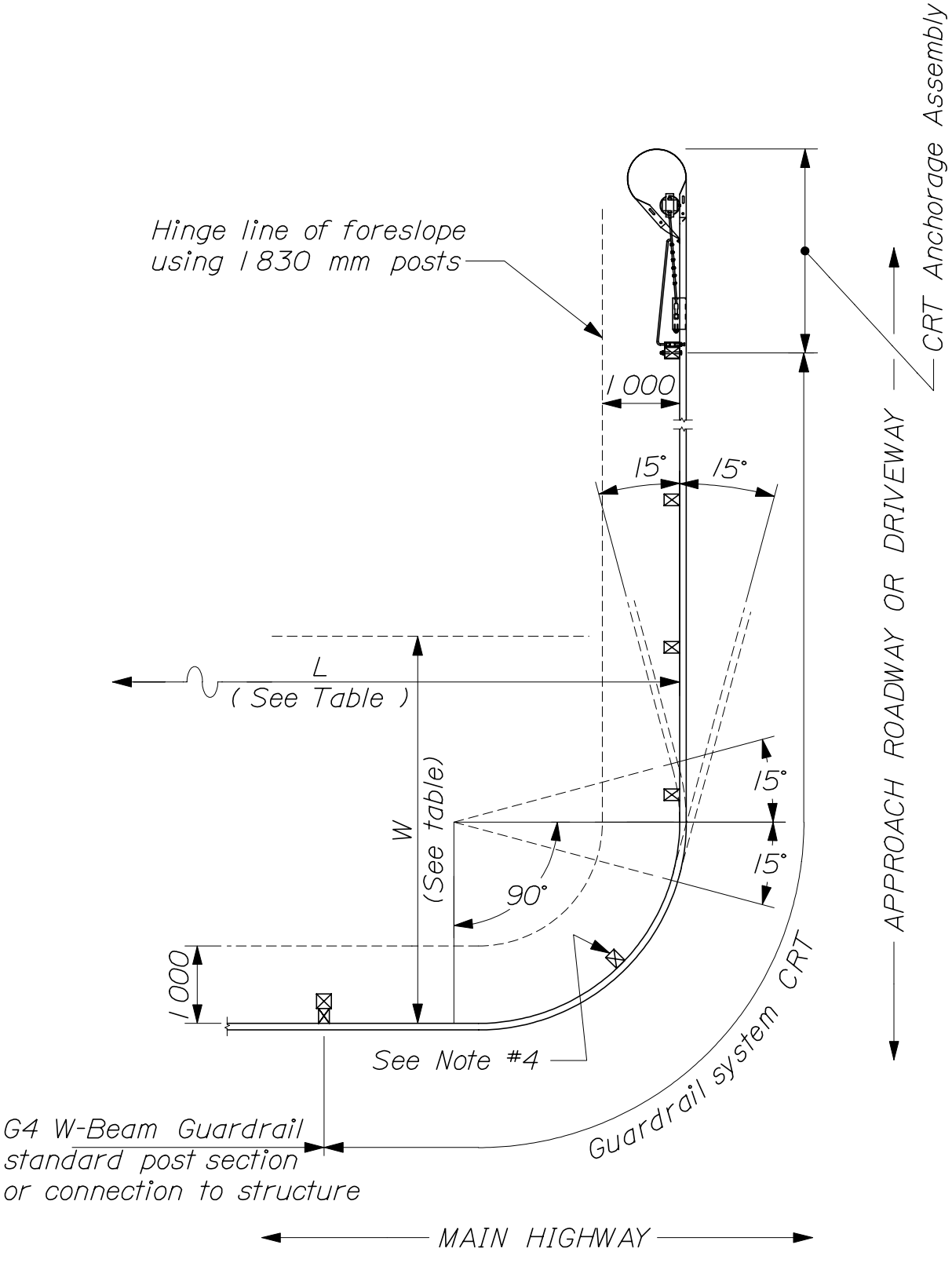
TERMINAL CONNECTOR
BEARING PLATE



HOLES 24 mm ϕ (TYP.)

TERMINAL CONNECTOR PLATE & NOTES

606(27)

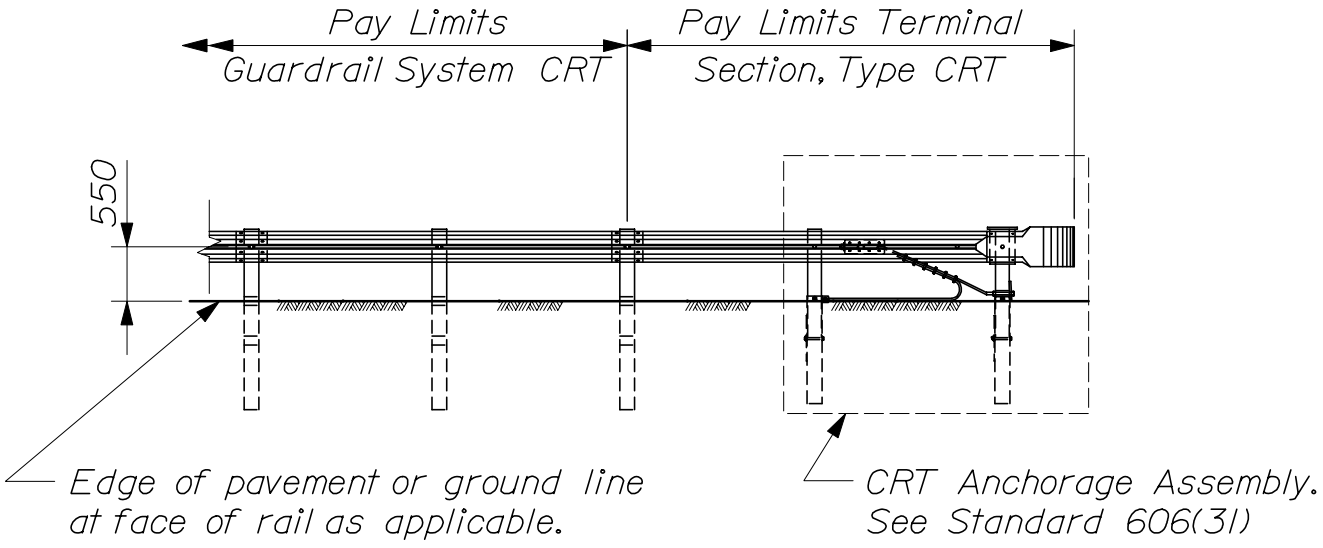


~ PLAN ~

CABLE RELEASING TERMINAL
CURVED W BEAM GUARDRAIL SYSTEM

606(28)

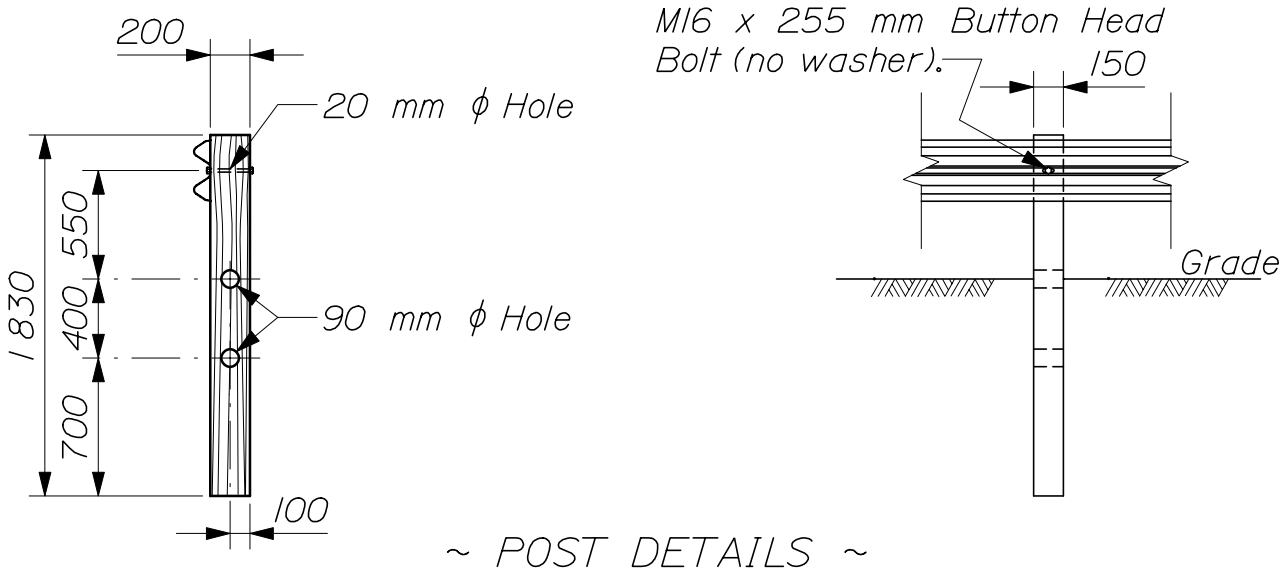
RADIUS METERS	ANGLE	NUMBER OF CRT POSTS	AREA FREE OF FIXED OBJECTS METERS	
			L	W
2.6	75°-105°	5	8.0	5.0
5.0	75°-90°	6	9.0	5.0
	90°-105°	7		
8.0	75°	7	12.0	6.0
	90°	8		
	105°	9		
10.0	75°	9	15.0	6.0
	90°	11		
	105°	12		



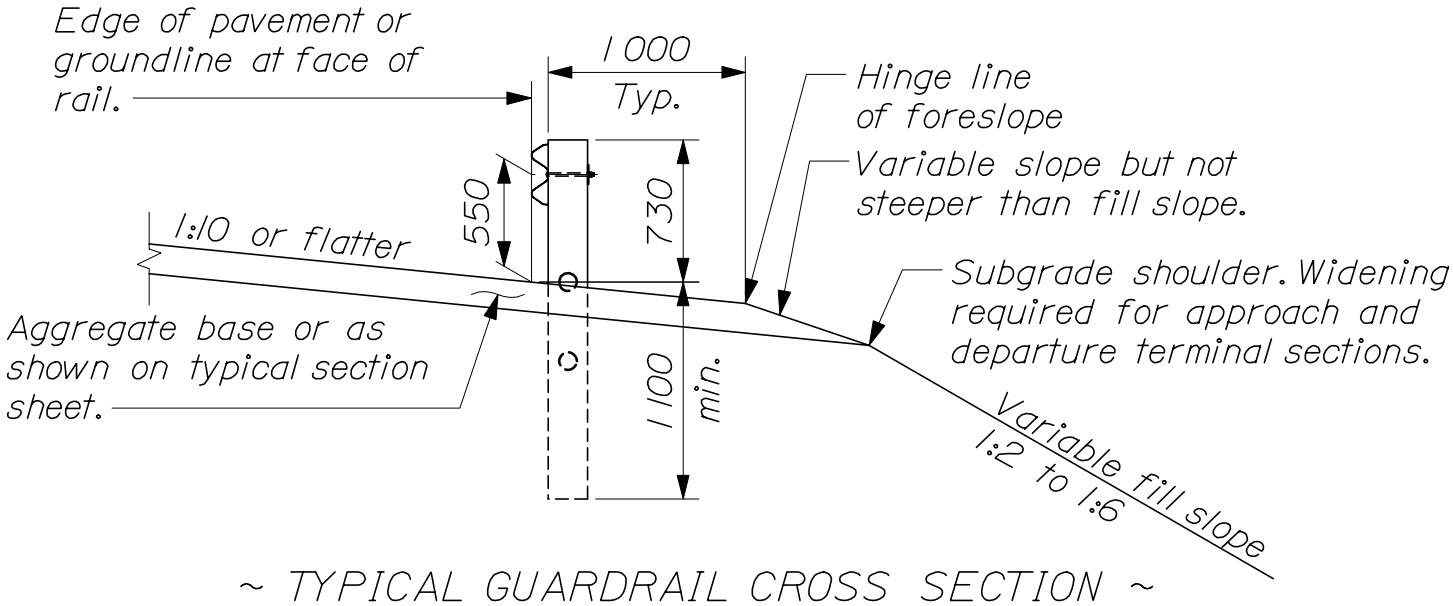
~ ELEVATION ~

CABLE RELEASING TERMINAL
CURVED W BEAM GUARDRAIL SYSTEM

606(29)



~ POST DETAILS ~



~ TYPICAL GUARDRAIL CROSS SECTION ~

NOTES:

1. Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.

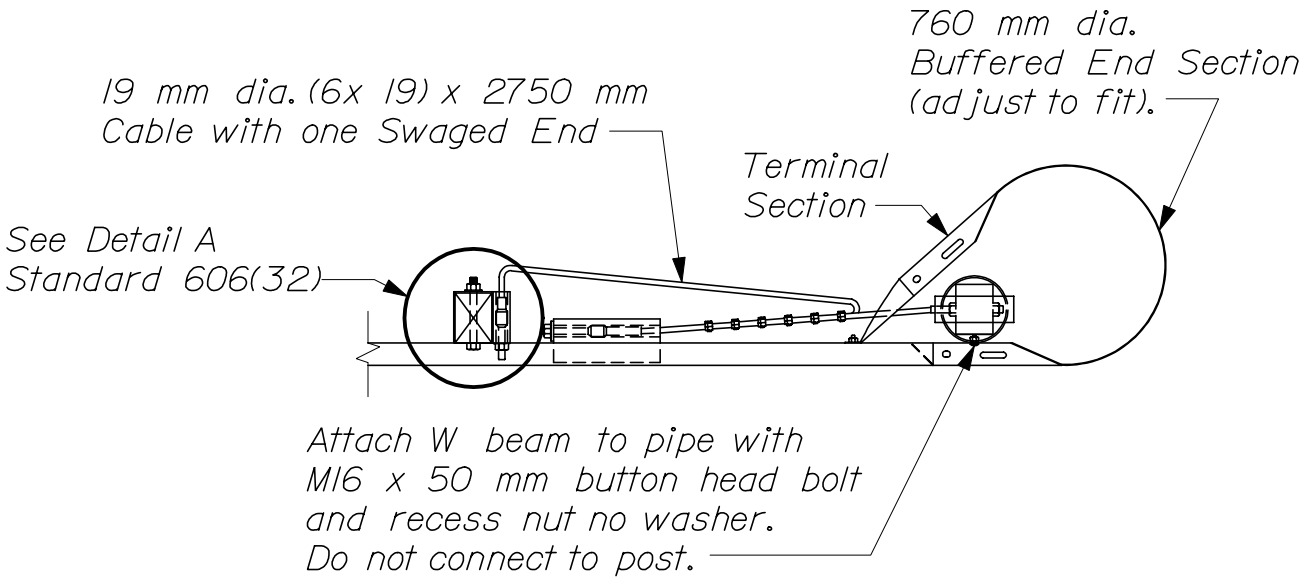
2. The use of terminal section, Type CRT, is limited to driveways, road approaches and low speed minor road connections. Do not use on mainline roadways.

3. Do not bolt post to W beam for 2.6 m radius only.

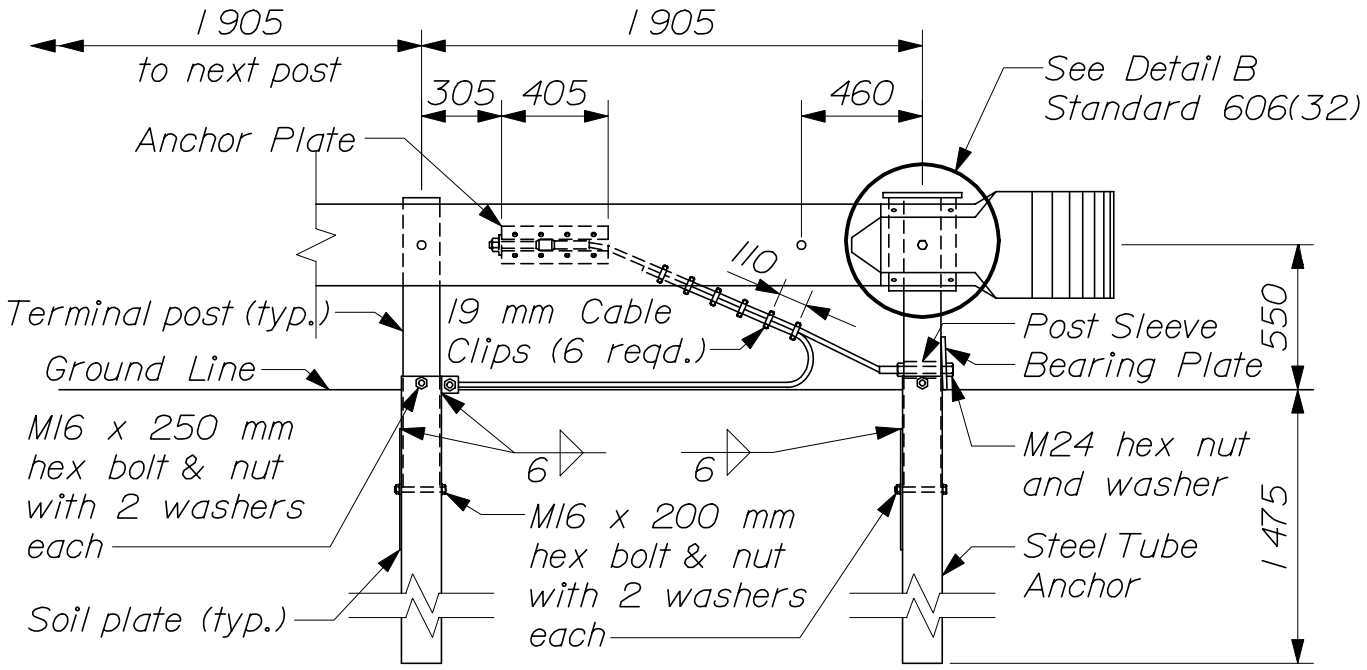
4. Furnish hardware in the metric sizes shown. Equivalent imperial sizes may be used when metric sizes are not available.

CABLE RELEASING TERMINAL
CURVED W BEAM GUARDRAIL SYSTEM

606(30)



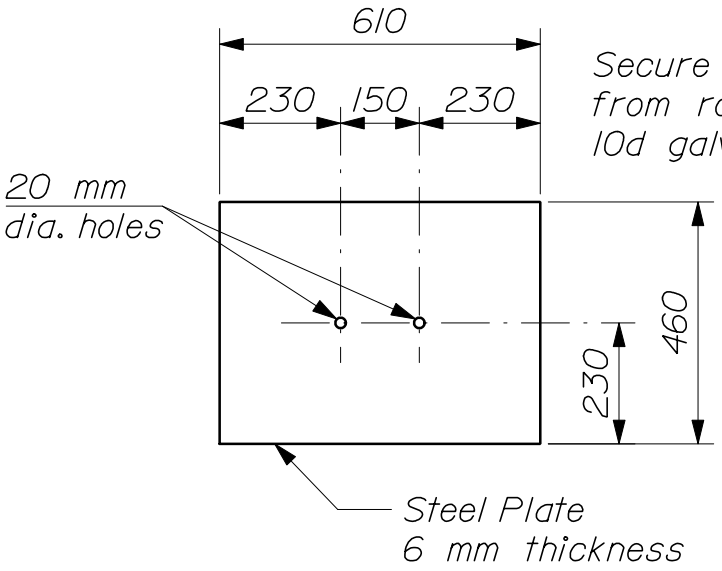
PLAN



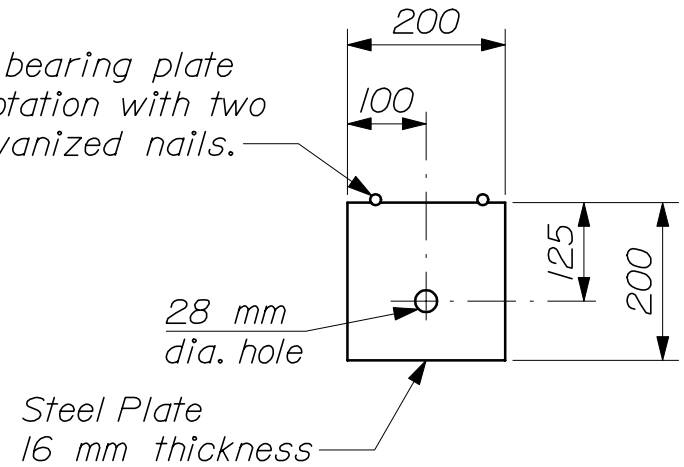
ELEVATION

CABLE RELEASING TERMINAL ANCHORAGE ASSEMBLY

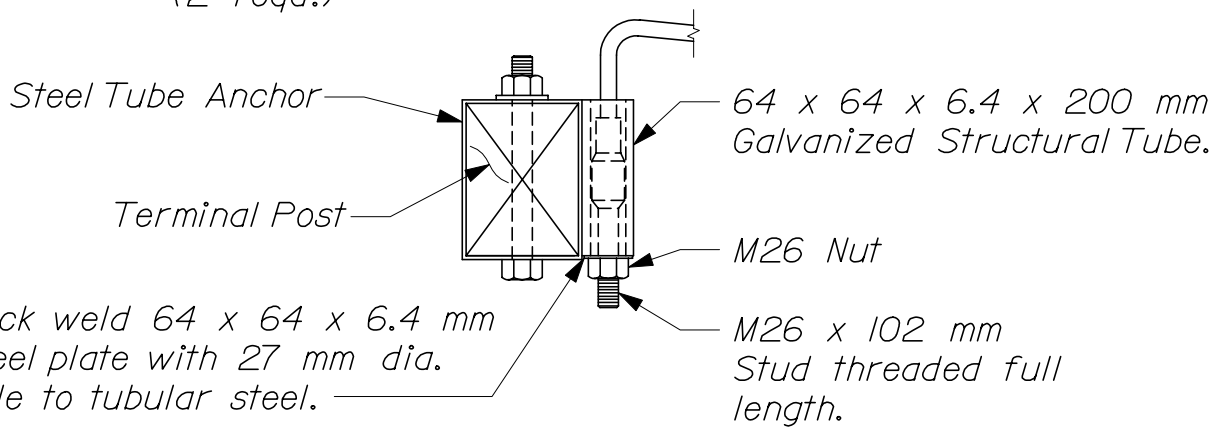
606(31)



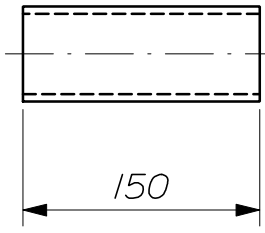
~ SOIL PLATE ~
(2 reqd.)

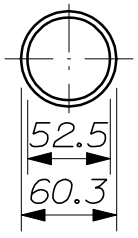


~ BEARING PLATE ~

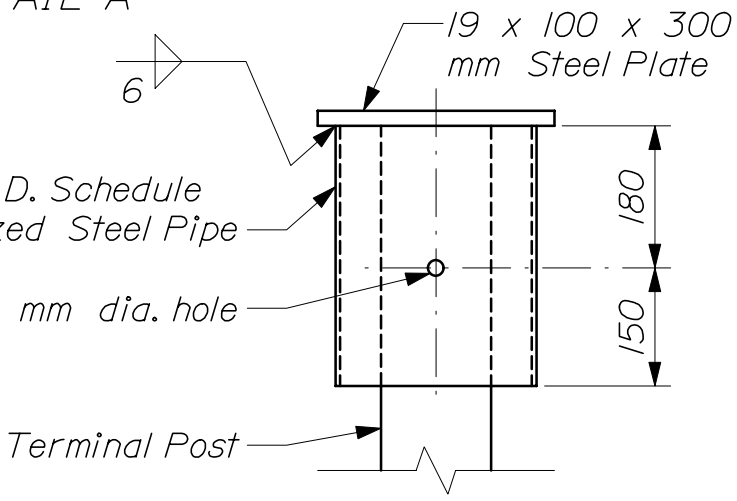


~ DETAIL A ~





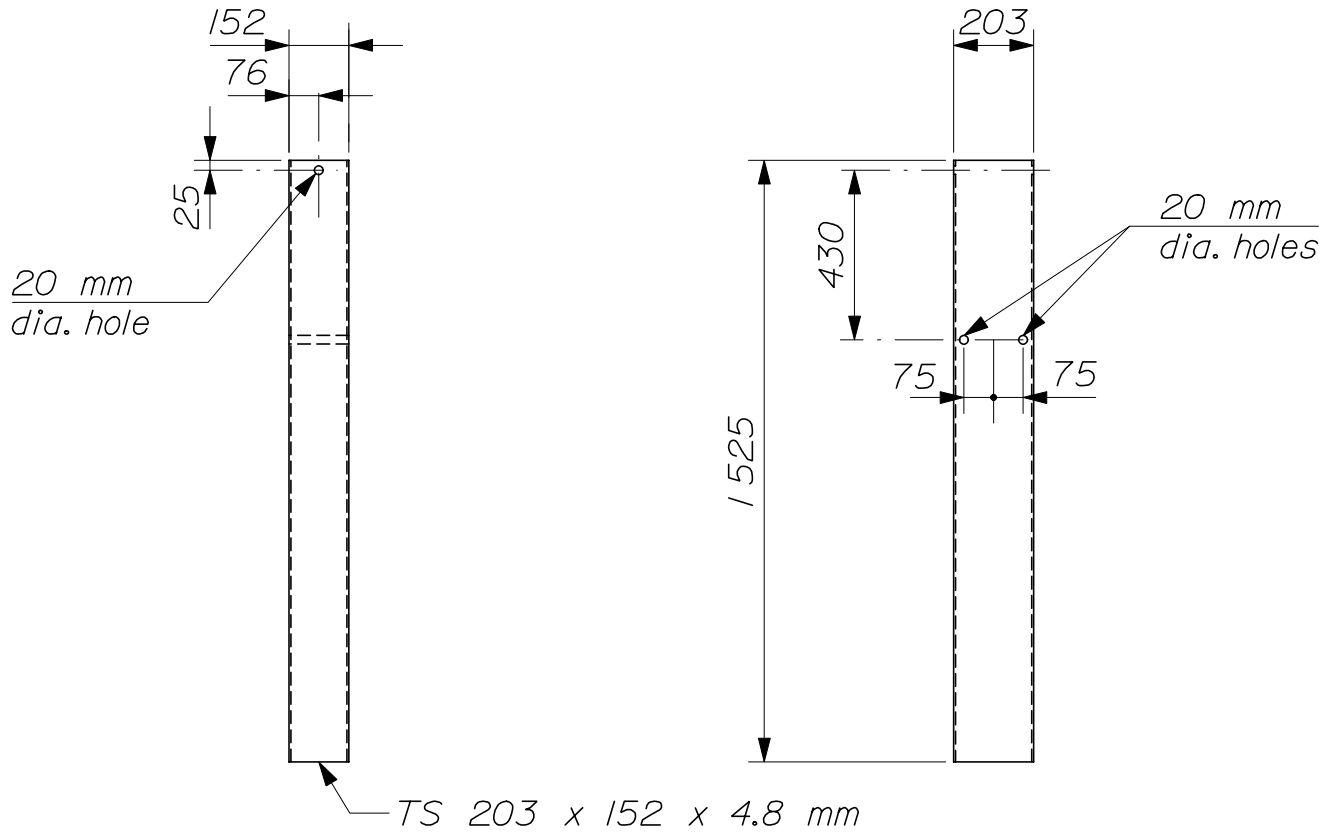
~ GALVANIZED STANDARD ~
PIPE POST SLEEVE



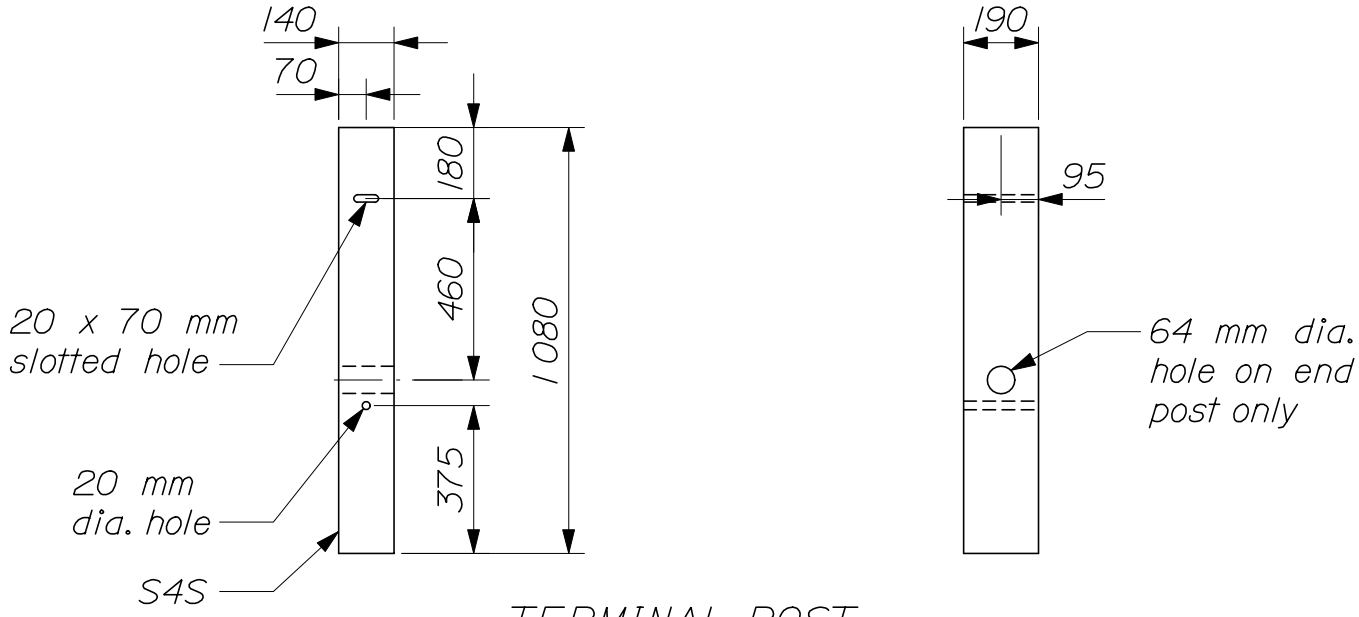
~ DETAIL B ~

CABLE RELEASING TERMINAL HARDWARE

606(32)



~ STEEL TUBE ANCHOR ~



~ TERMINAL POST ~

NOTE:

1. Dimensional tolerances not shown or implied are intended to be those consistent with the proper functioning of the part, including its appearance, and accepted manufacturing practices.

2. Furnish hardware in the metric sizes shown. Equivalent imperial sizes may be used when metric sizes are not available.

CABLE RELEASING TERMINAL HARDWARE

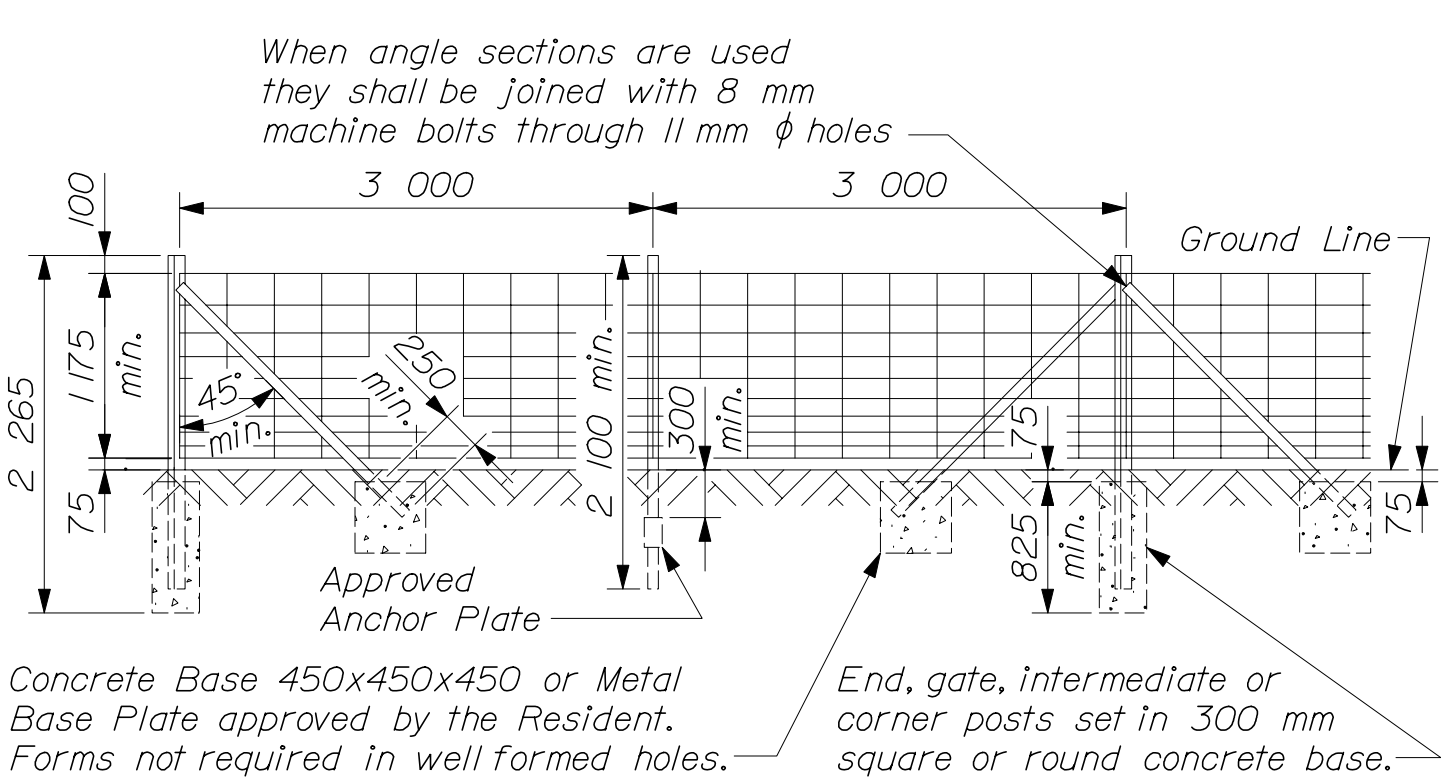
606(33)

WOVEN WIRE FENCE	NOMINAL SIZE (millimeters)	SHAPE	WEIGHT (kg/m)	COMMENTS
End, Intermediate, & Corner Posts	64x64x6.4	∠	6.101	
	51	ϕ	5.432	Grade 1* w/Top Cap
	51	ϕ	4.639	Grade 2* w/Top Cap
Gate Posts	89x89x7.9	∠	10.7	
	64	ϕ	8.616	Grade 1* w/Top Cap
	64	ϕ	8.616	Grade 2* w/Top Cap
Line Posts	----	T	1.979	Studded
	32	ϕ	3.378	Grade 1* w/Top Cap
	32	ϕ	2.732	Grade 2* w/Top Cap
Braces	44x44x6.4		4.122	
	32	ϕ	3.378	
	32	ϕ	2.732	
CHAIN LINK FENCE	**NOMINAL SIZE (millimeters)**	**SHAPE**	**WEIGHT (kg/m)**	**COMMENTS**
End & Corner Posts	51 I.D.	ϕ	5.432	Grade 1*
	51 I.D.	ϕ	4.639	Grade 2*
	64x51	H	6.101	
	90x90	∠	7.649	Integral Loops
Line Posts	38 I.D.	ϕ	4.048	Grade 1*
	38 I.D.	ϕ	3.394	Grade 2*
	48x41	H	4.018	
	48x41	C	3.393	
Top & Brace Rails	32 I.D.	ϕ	3.378	Grade 1*
	32 I.D.	ϕ	2.738	Grade 2*
	41x32	⊏		

* AASHTO M 181 Par. 29.1

FENCE POST, RAIL, AND BRACE OPTIONS

607(01)

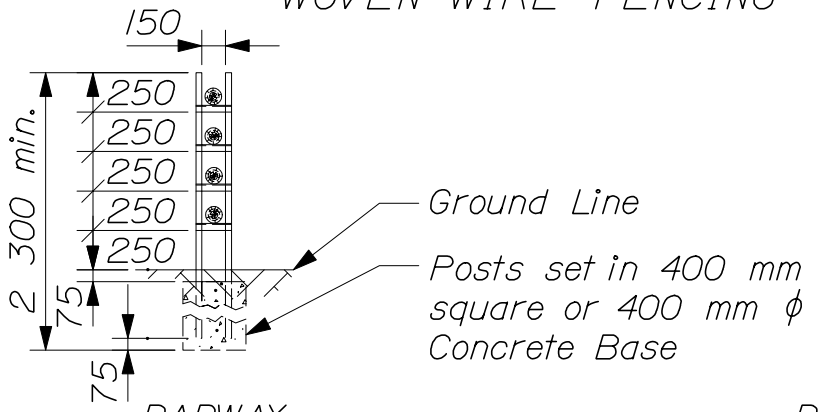


END OR GATE POST

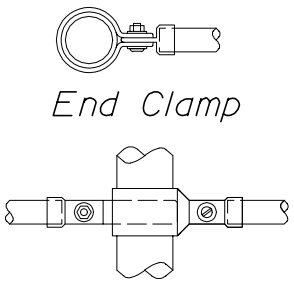
LINE POST

INTERMEDIATE OR CORNER POST

~ WOVEN WIRE FENCING - METAL POSTS ~



BARWAY

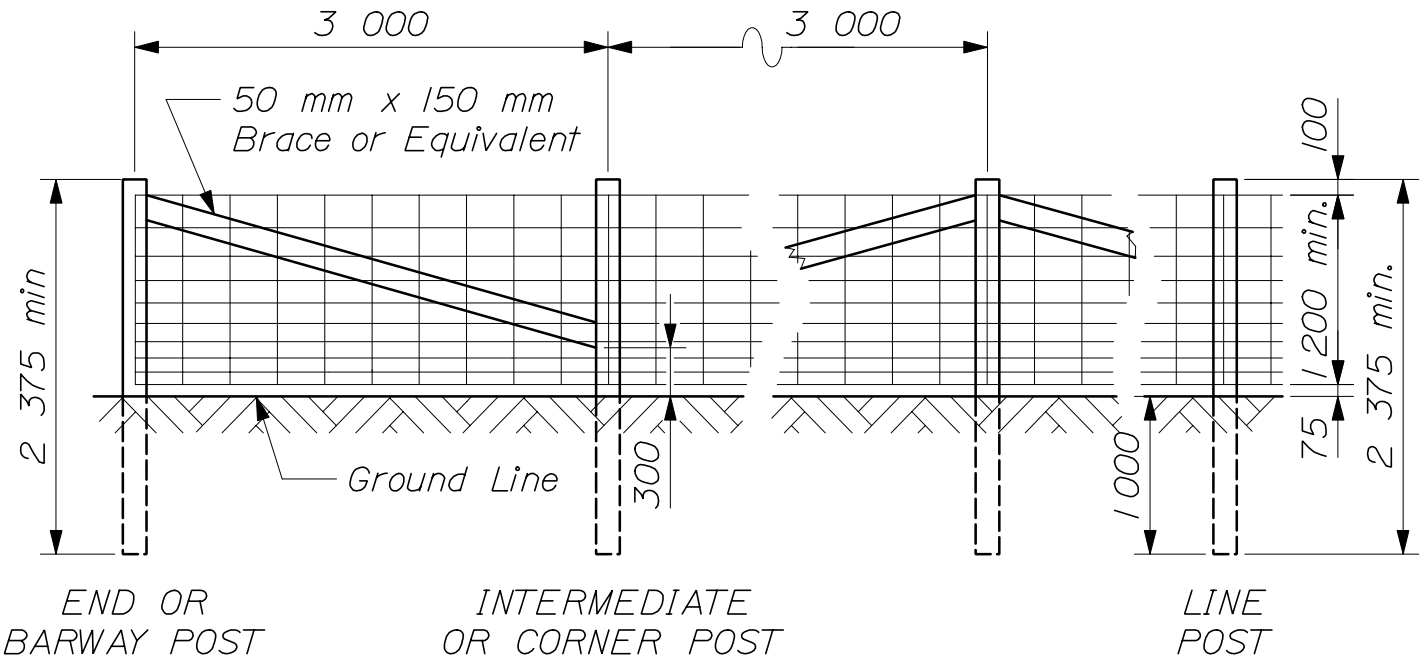


BRACE CLAMPS - PIPE POSTS

NOTE:

Metal posts shall be installed for a 5.0 m opening. Barway posts and braces shall conform to the requirements of "Gate Posts" and "Braces" under "Woven Wire Fencing - Metal Posts". Cross bar supports for barways shall be 44 mm x 44 mm x 6.4 mm rolled angle section. When round gate posts are used, the length of the cross bar supports shall equal the center-to-center of the posts plus 50 mm and they shall be attached to the barway post with 8 mm x 110 mm machine bolts. When angle section gate posts are used, the length of the cross bar supports shall be equal to the out-to-out dimensions of the angle sections and shall be attached with 8 mm x 25 mm machine bolts. All bracing shall conform to the requirements of "Woven Wire Fencing - Metal Posts". Cross bars shall be as required for "Barways - Wood Posts".

~ BARWAYS - METAL POSTS ~

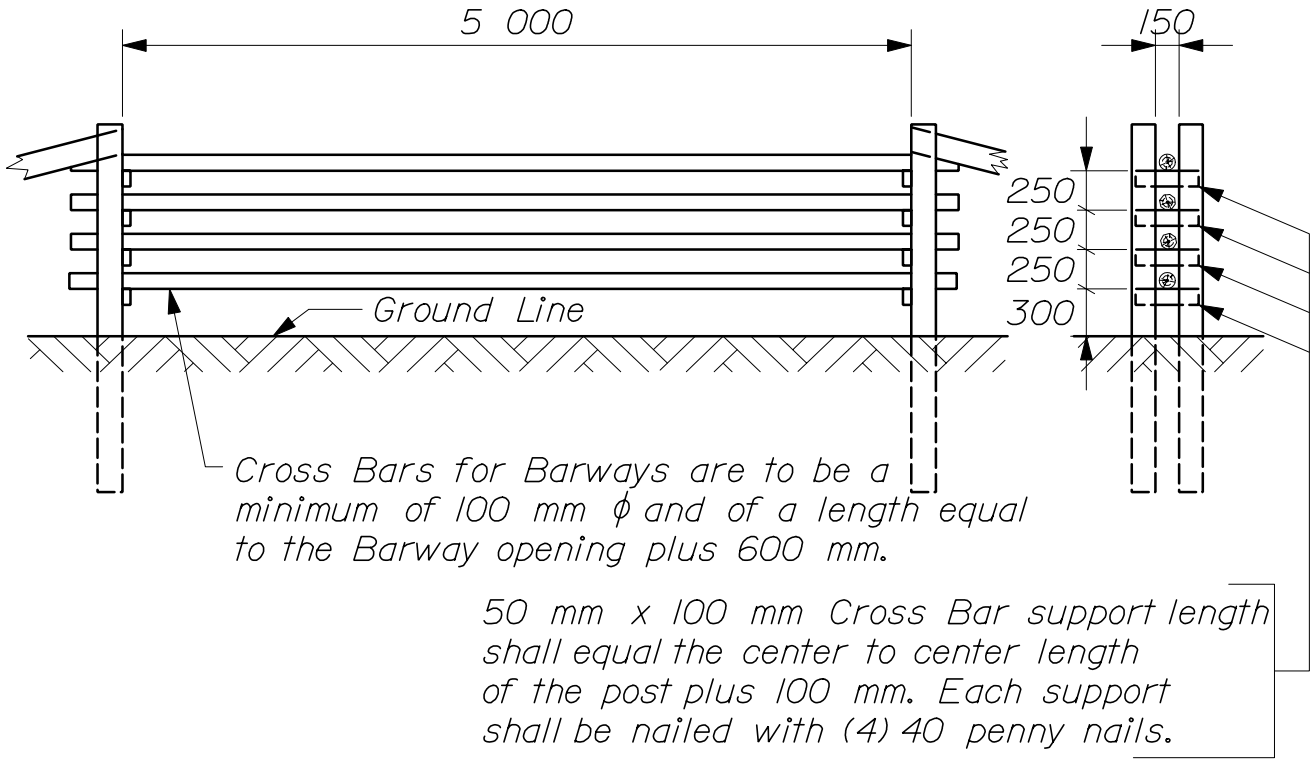


NOTES:

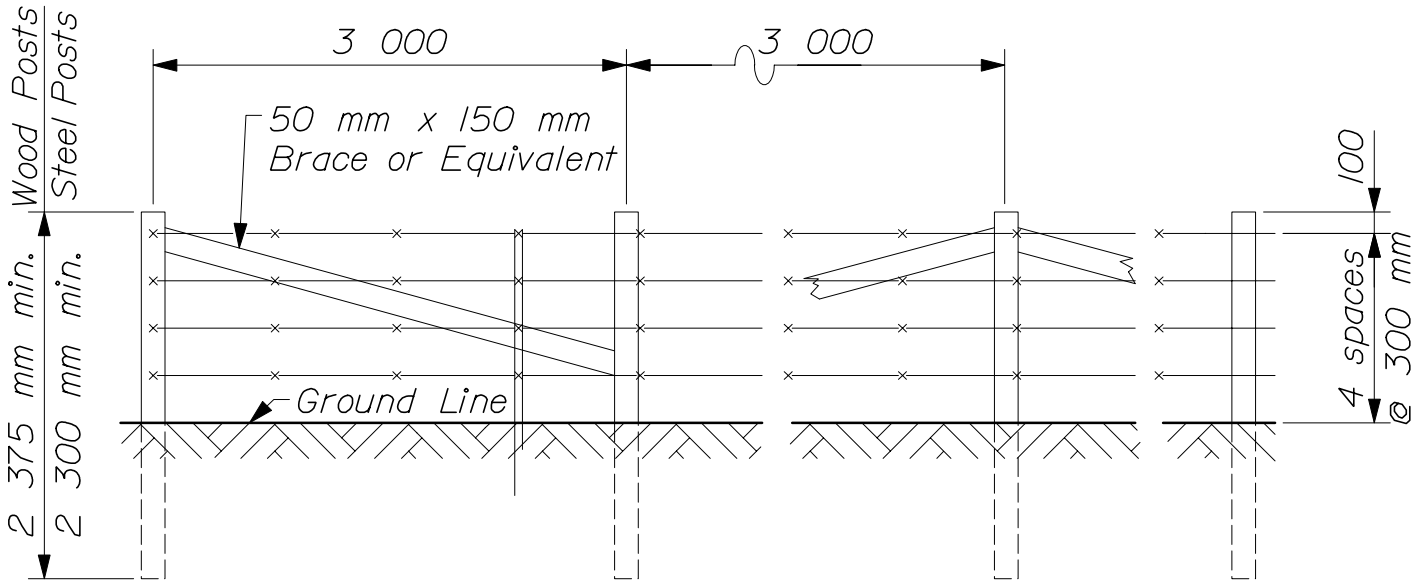
1. Staples for wood posts are to be 4 mm x 40 mm placed according to the Standard Specifications.

2. All end, corner, barway, and intermediate posts shall be braced as shown.

~ WOVEN WIRE FENCING - WOOD POSTS ~

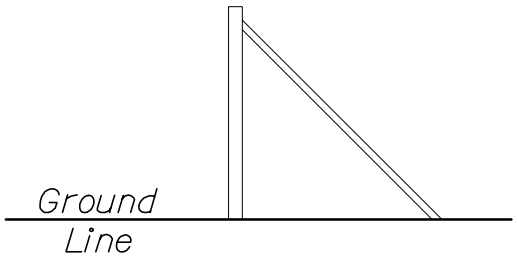


~ BARWAYS - WOOD POSTS ~

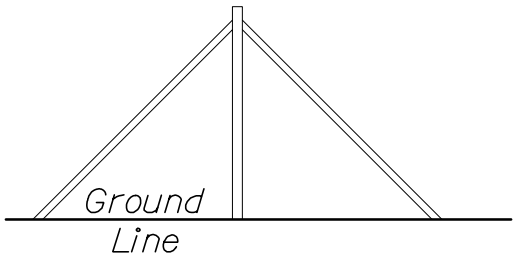


NOTE:
"Barbed Wire - Metal Posts" shall be constructed with the post and wire spacing shown above. Metal posts and braces shall conform to all of the requirements noted and shown for "Woven Wire Fencing - Metal Posts", including concrete bases.

BARBED WIRE FENCING - WOOD POSTS AND BARBED WIRE FENCING - METAL POSTS



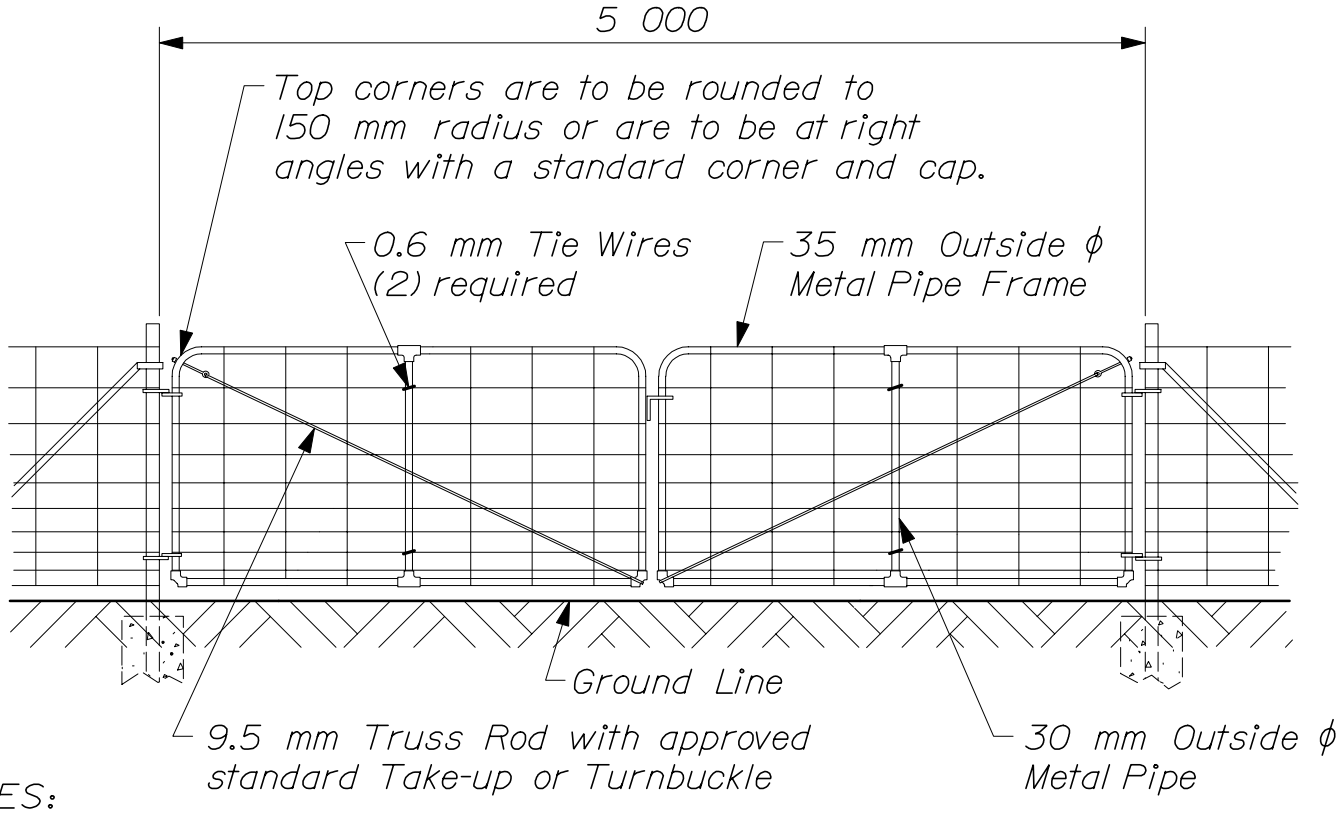
~ BRACING - TYPE I ~
used at gates, barways, and terminals



~ BRACING - TYPE II ~
used at corners, intermediate points, and changes in vertical alignment

BRACING ASSEMBLIES FOR WOVEN WIRE AND BARBED WIRE FENCING

607(04)



NOTES:

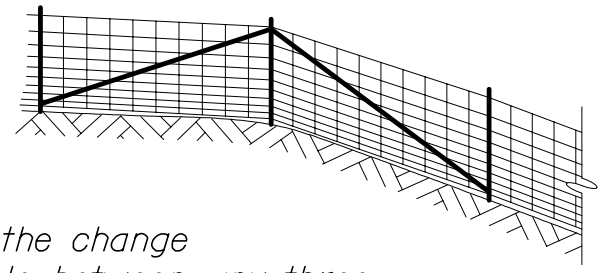
1. Gate posts, braces and anchorages to be as specified under "Woven Wire Fencing - Metal Posts".

2. All gates shall be installed with the top hinge point pointing down.

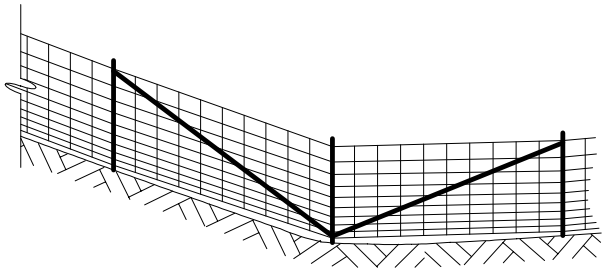
3. Wire for gates shall conform to A.S.T.M. A116, Class 1, Design No. 1047-12-11.

4. The required fittings for fence and gates shall be steel or malleable iron of an approved standard type.

5. Gates shall be furnished with a standard fork latch and one piece of 5 mm straight link alloy steel chain, 600 mm long. One end shall be attached to the gate frame and attached to the other end shall be a snap lock or other approved fastening device.

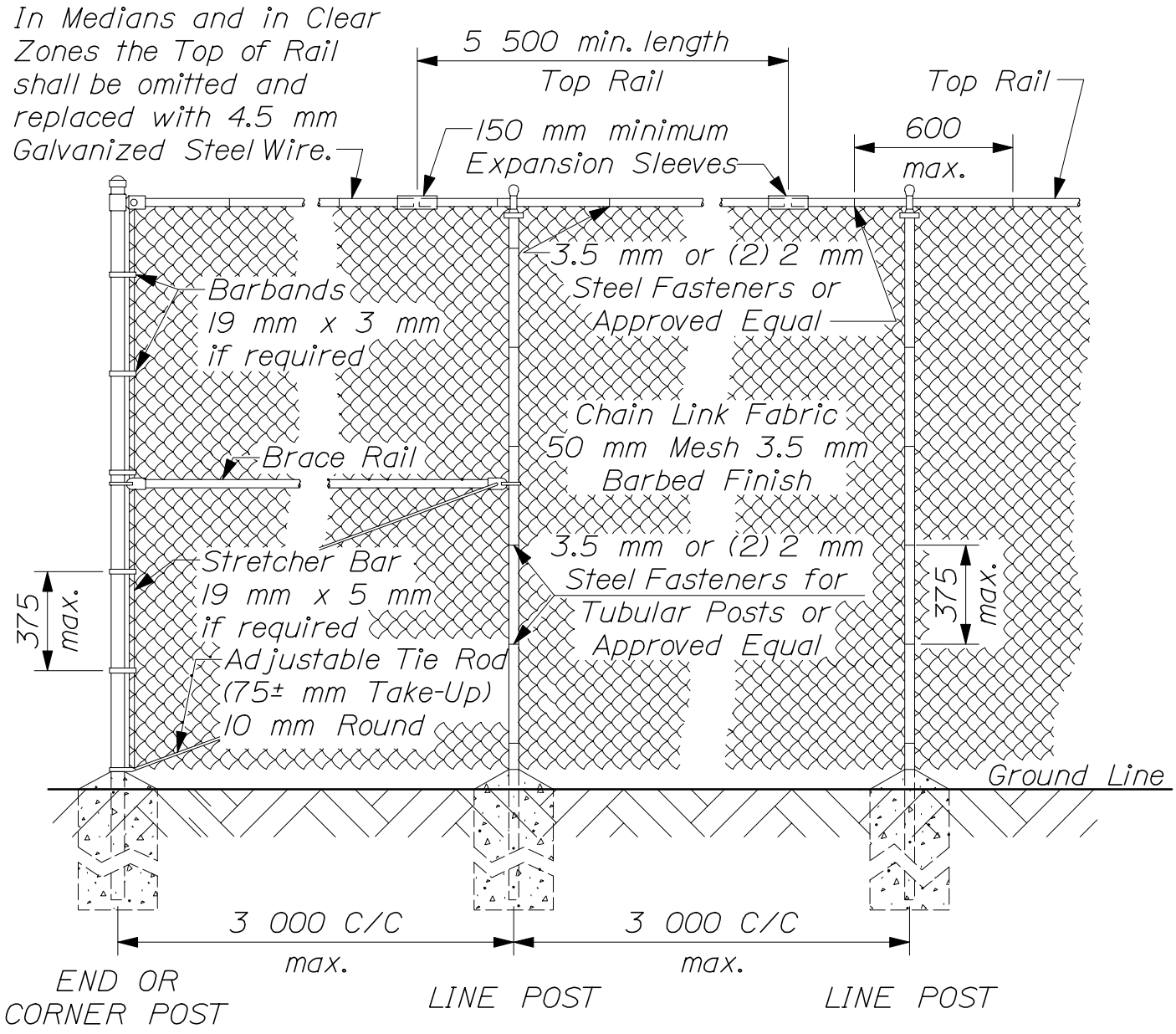


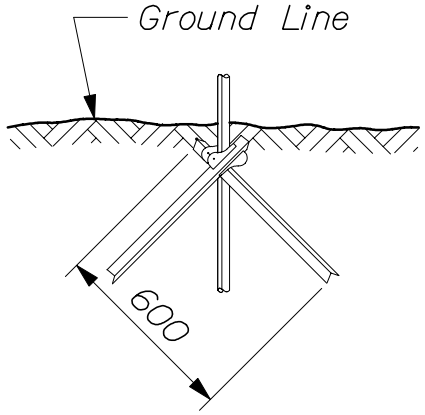
Where the change in grade between any three fence posts exceeds 15%, additional intermediate bracing shall be provided.



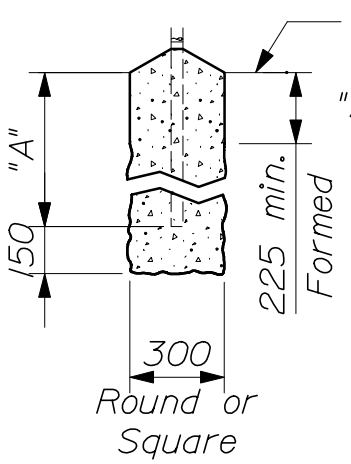
DRIVE GATEWAYS (5 METERS) & INTERMEDIATE BRACING

607(05)





~ DRIVE ANCHOR ~
(90° to Fence Line)

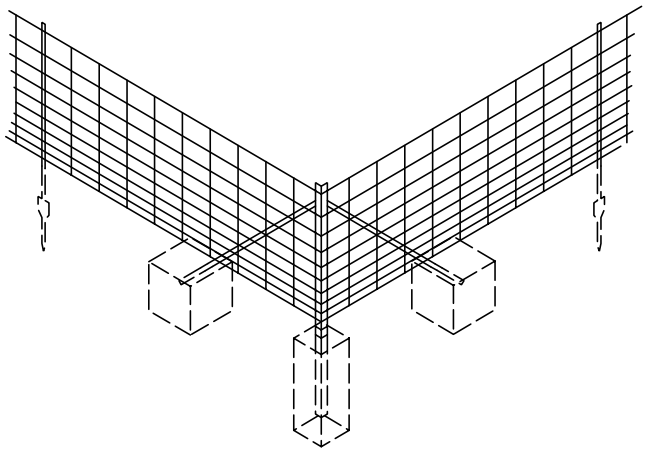


"A" = 800 mm for 1 220 mm Fence.
1 000 mm for 1 830 mm and 2 440 mm Fences.
1 500 mm for all end and Gate Posts.

~ LINE, CORNER, AND ~
END POST BASE

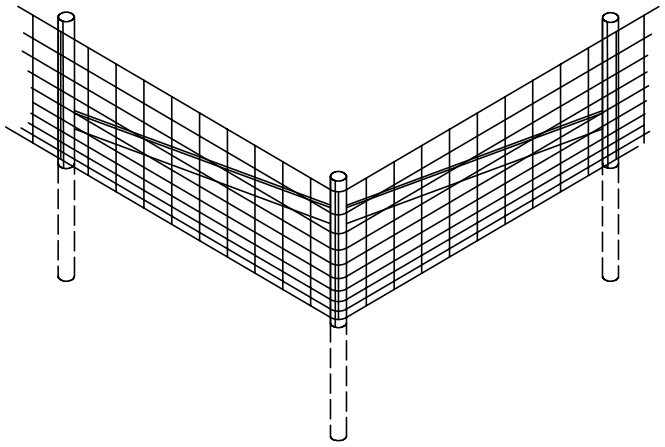
CHAIN LINK FENCE

607(06)



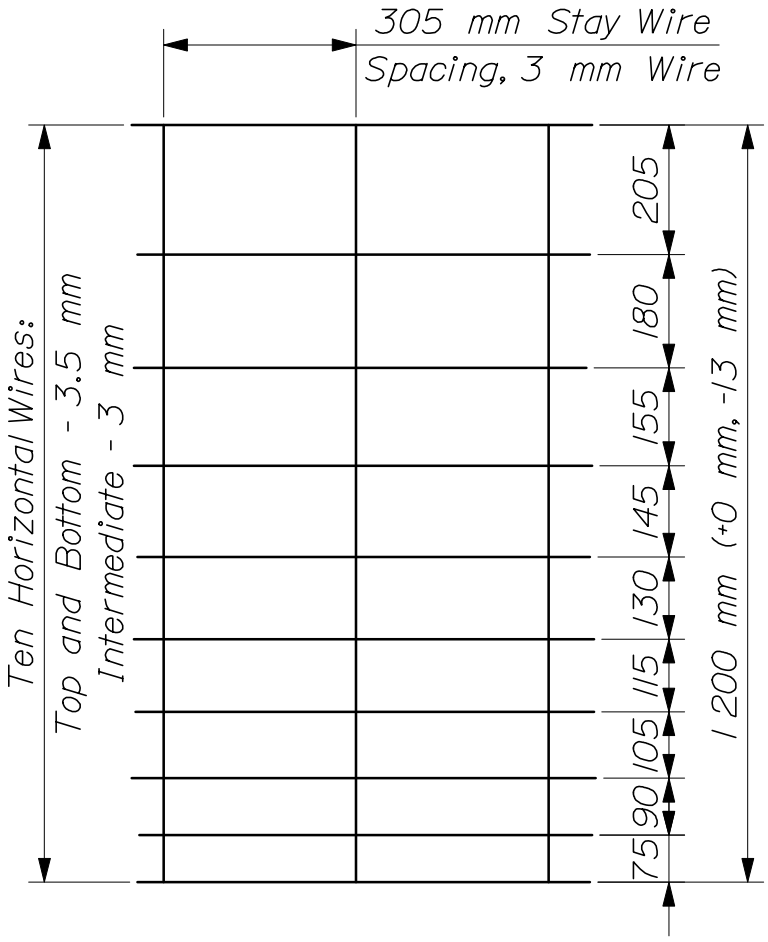
Corner Post

~ BRACING ASSEMBLY ~
FOR METAL POSTS

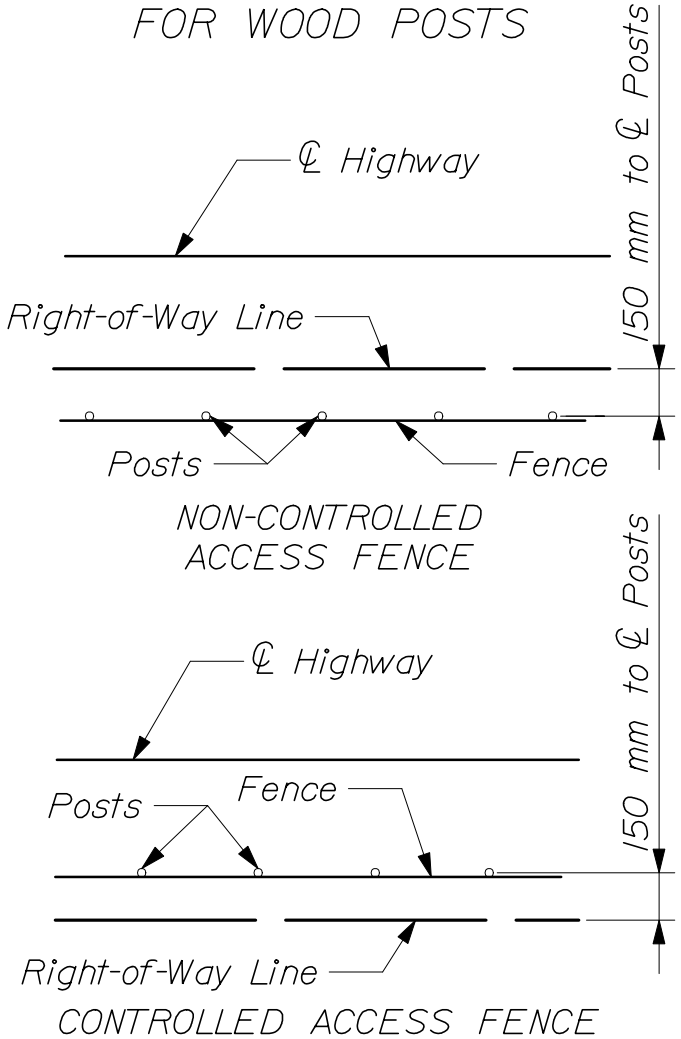


Corner Post

~ BRACING ASSEMBLY ~
FOR WOOD POSTS



~ WOVEN WIRE FENCE ~



FENCE LOCATION
~ WITH RESPECT TO ~
RIGHT OF WAY LINE

# FENCING
607(07)

GENERAL NOTES

1. When ledge is encountered, steel posts shall be set and grouted 300 mm deep unless the posts penetrate the ground to the depth indicated on the drawings.

2. When wood posts are used, braces shall be attached to the posts with a minimum of (4) 40 penny nails per attachment.

3. When the word "Standard" is used, it shall be interpreted as if it were followed by the expression "To The Fence Industry".

4. Woven wire and barbed wire fencing shall be attached to wood posts with 4 mm x 40 mm galvanized staples.

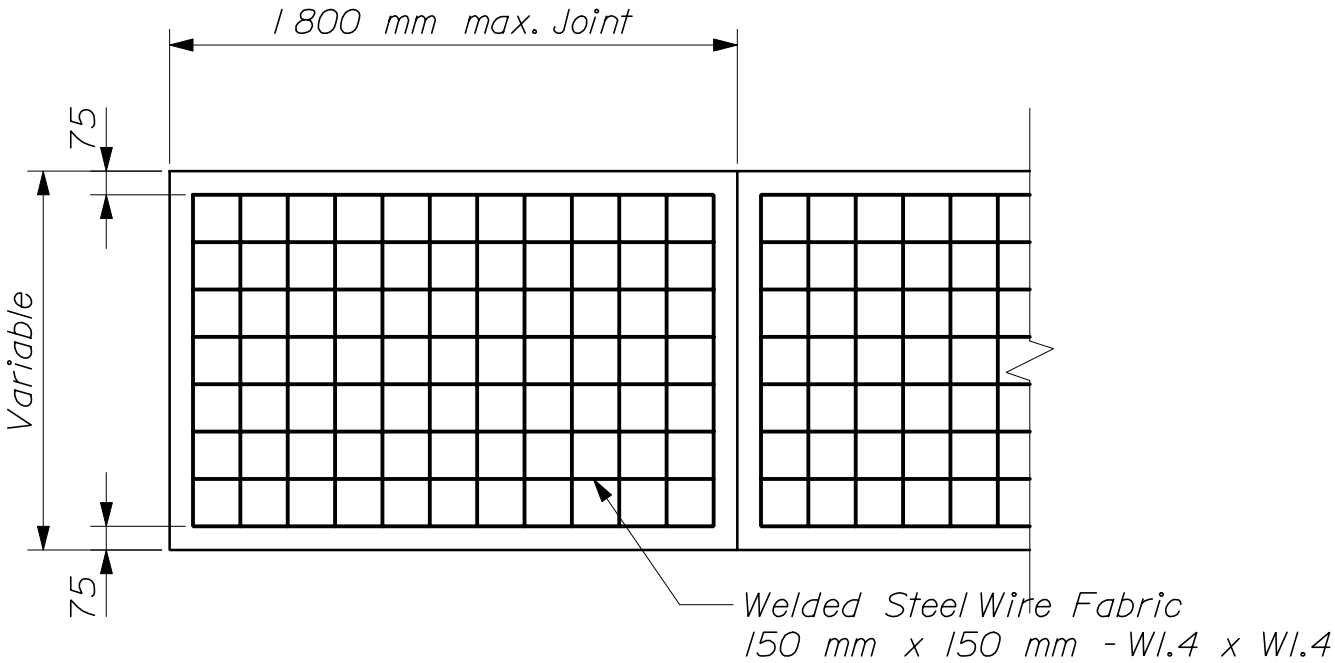
5. Concrete for post foundations shall be Class B.

6. In well formed holes with vertical walls, forms will be required only at the top 225 mm. Holes which cannot be well formed shall have forms for the full depth of the base.

SPACING OF FENCE POSTS ON CURVES

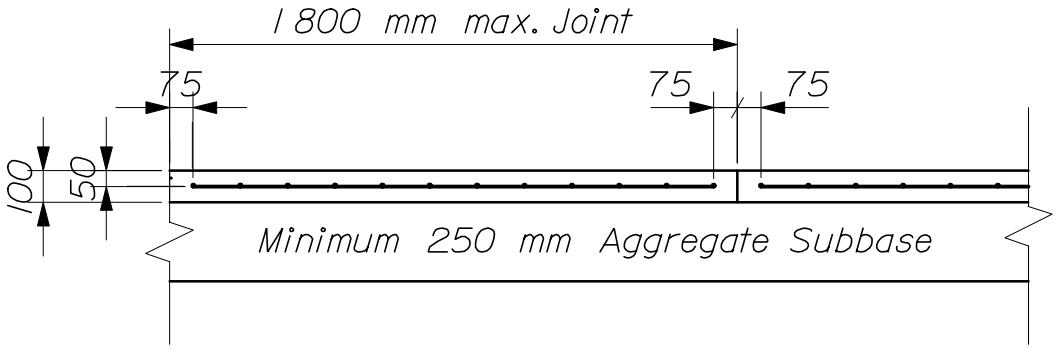
RADIUS OF CURVE AT FENCE LOCATION	NORMAL POST SPACING
Over 150 m	3.0 m
Over 60 m to 150 m	2.5 m
Over 30 m to 60 m	2.0 m
30 m and Less	1.5 m

# FENCING
607(08)



~ PLAN ~

NOTE:
Sidewalk shall conform to Standard Specifications Section 608.

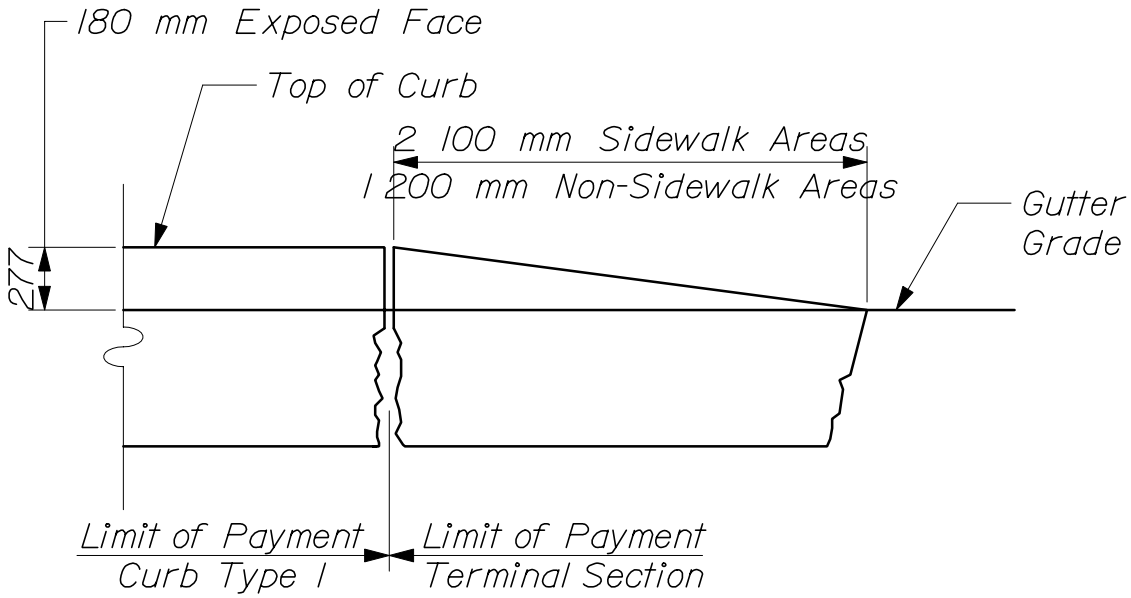


~ ELEVATION ~

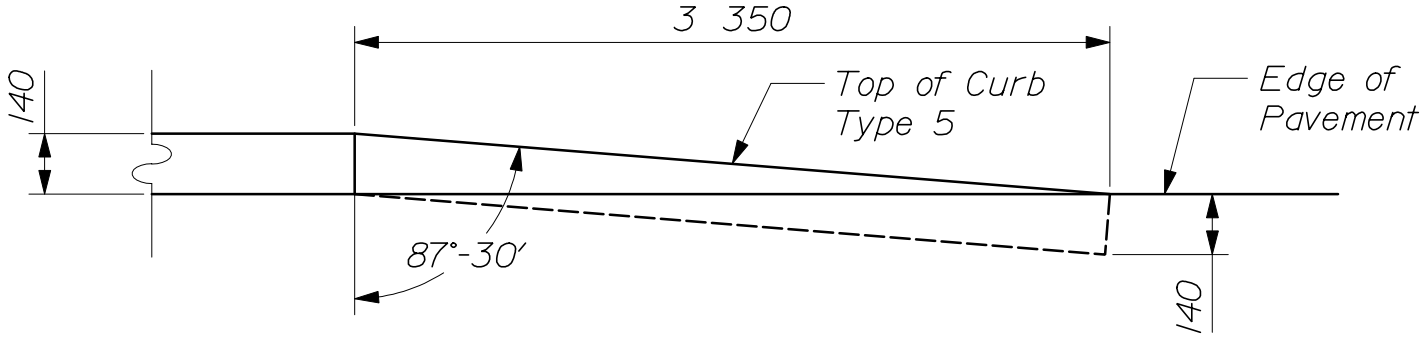
REINFORCED PORTLAND CEMENT CONCRETE SIDEWALK

608(01)

CURB TYPES 1, 2 & 5 ON CURVES				
TYPE	RADIUS OF CURVE	LENGTH	PAID FOR AS	STONE IS CUT OR CAST
1 & 2	0 to 20 m incl.	1 200 min.	Circular	Arc to Fit Curve
	20 m to 50 m	1 200 to 1 800	Straight	Straight Pieces
5	0 to 2.5 m incl.	600 min.	Circular	To Fit Curve
	2.5 m to 10 m incl.	300 min. Chord	Circular	Str. Pieces, Radial Ends
	10 m to 50 m incl.	600 to 1 000	Straight	Straight Pieces
	50 m and over	1 000 to 1 800	Straight	Straight Pieces



~ TERMINAL SECTION TYPE "1" ~

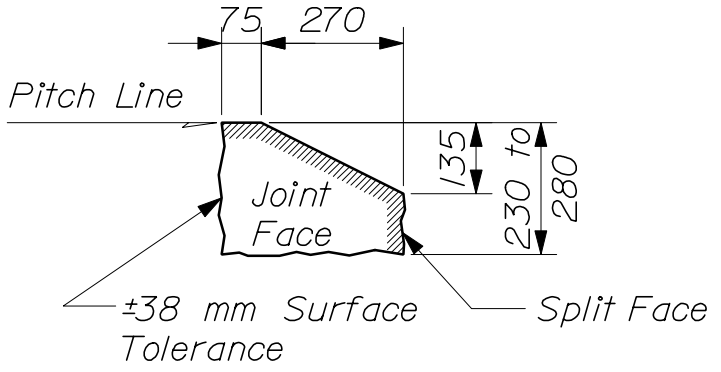


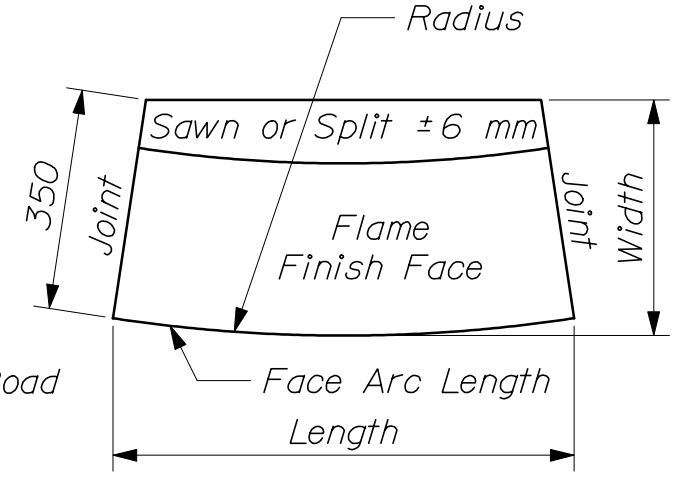
~ TERMINAL SECTION TYPE "5" ~

(use when shown on plans only)

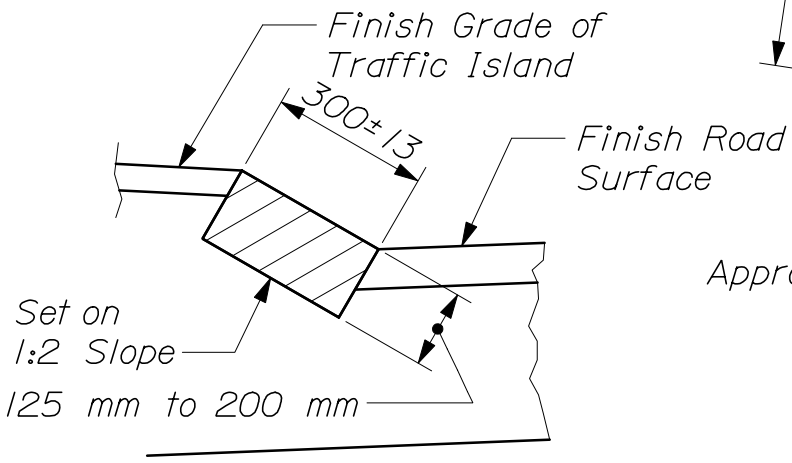
TERMINAL CURB SECTION

609(01)



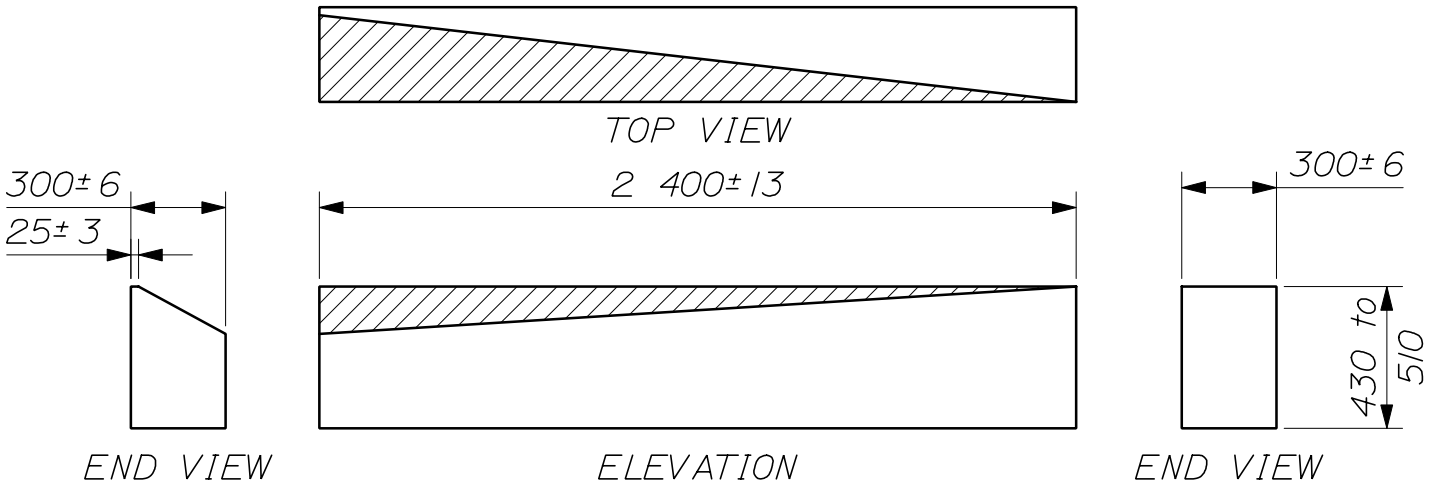


Approved Alternate Circular Curb Type 5
600 mm to 2 500 mm Radius



1 000 mm min. Length

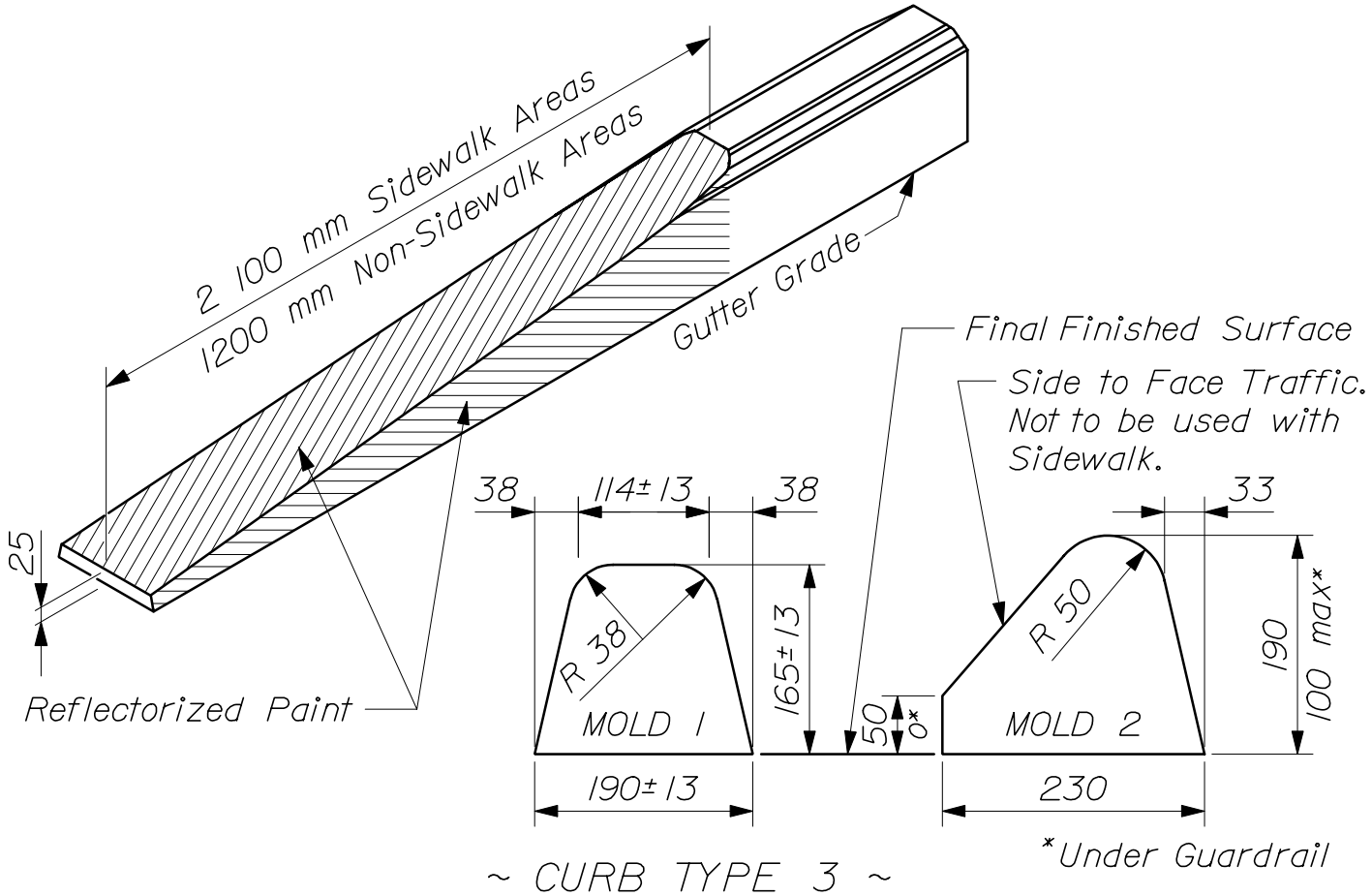
~ CURB TYPE 5 ~



Transition Section "B"
Curb Type "5" to Vertical Curb Type "1" & Type "2"

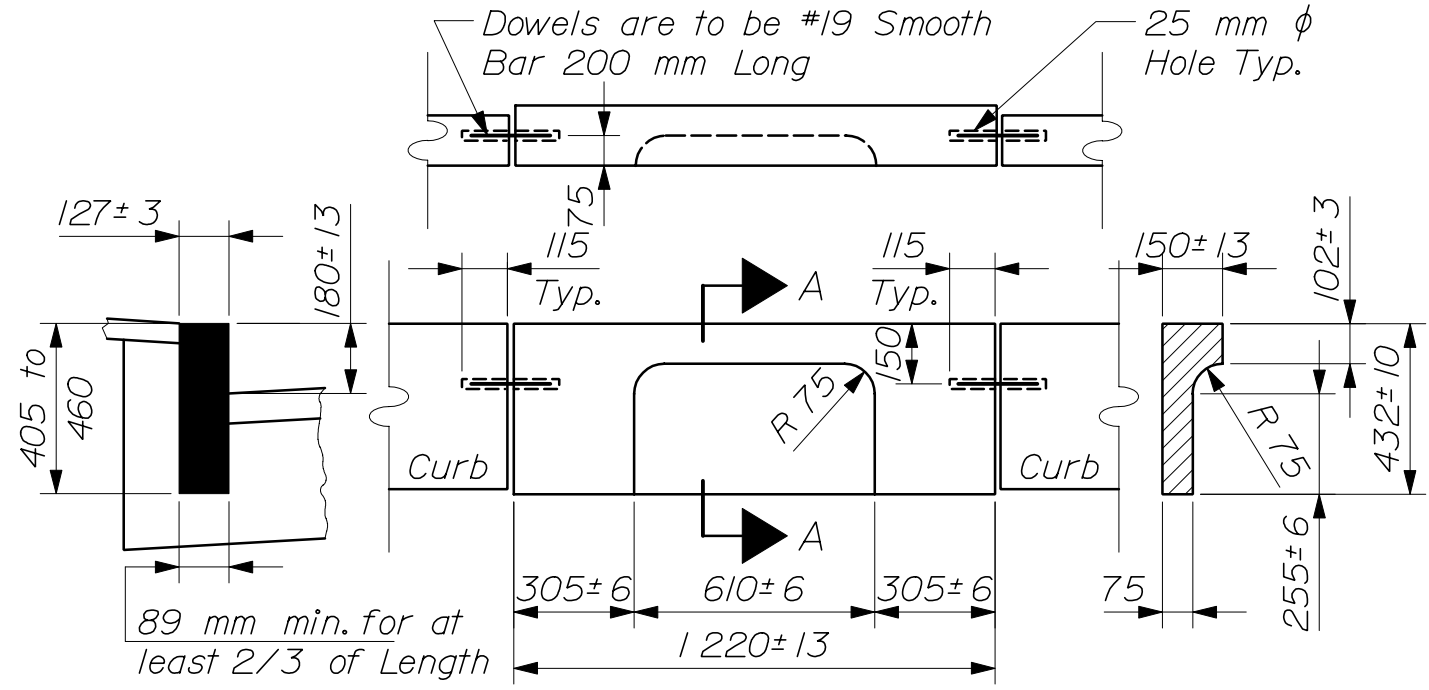
~ CURB TRANSITION ~

# CURB
609(02)



~ CURB TYPE 3 ~

Curb Mold 2 will be used in all situations except for where the curb forms the edge of the sidewalk. Mold 1 shall be used in conjunction with sidewalks or where there is a potential for sidewalks.

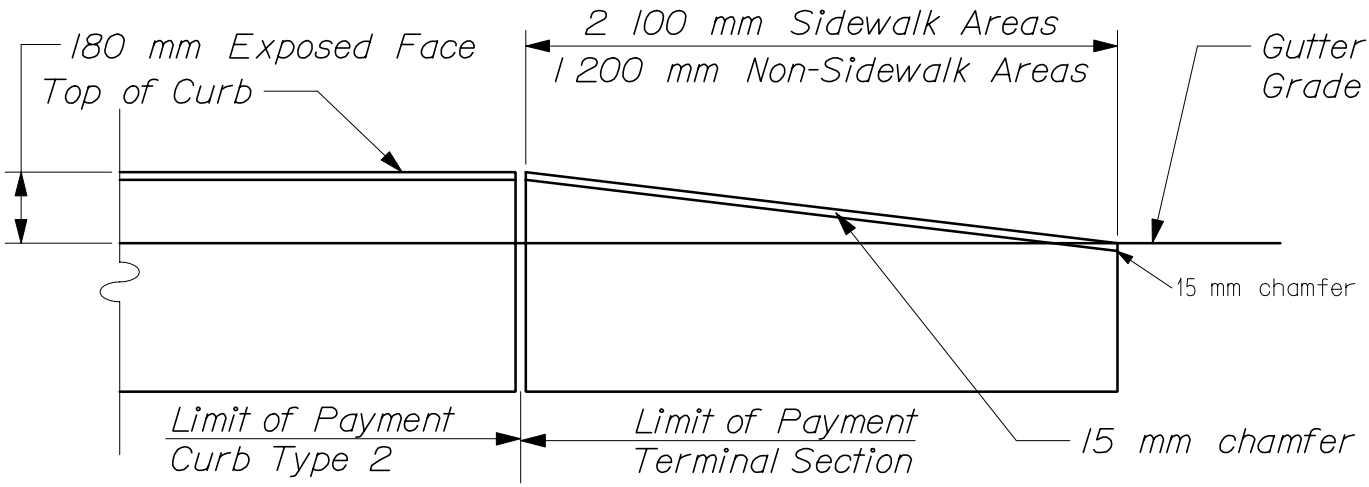


~ VERTICAL CURB ~
TYPE 1

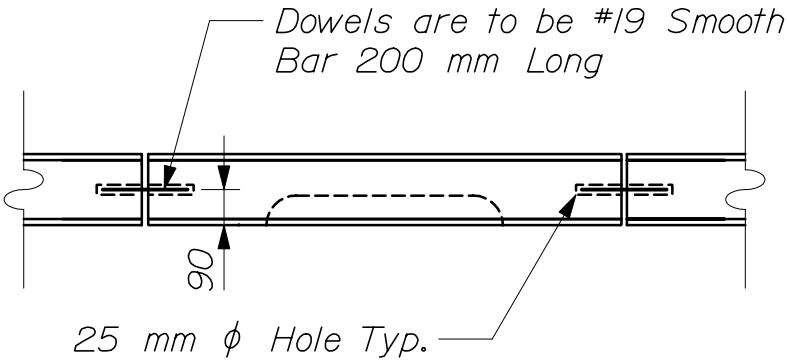
~ SECTION A-A ~

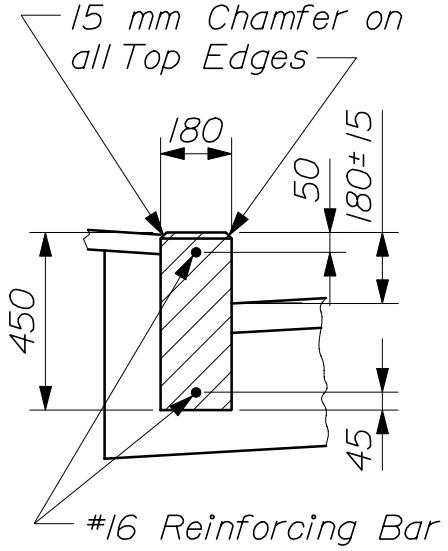
~ CURB INLET TYPE 1 ~

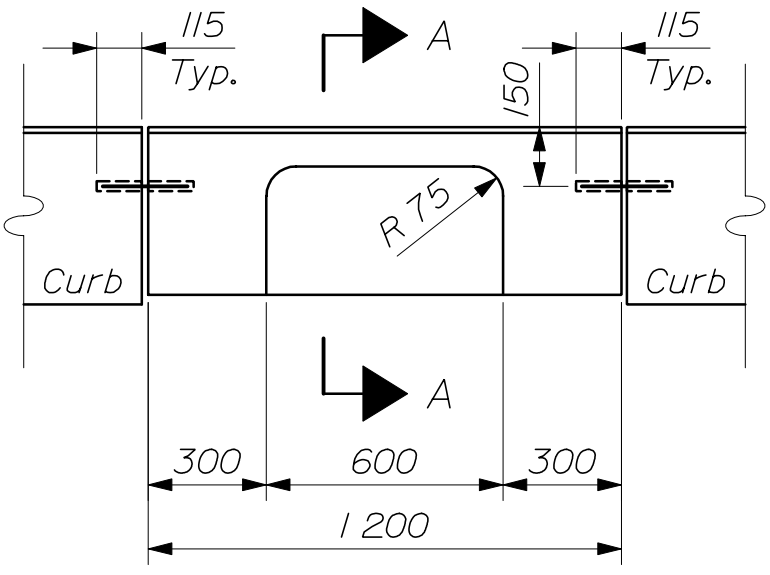
# CURB
609(03)



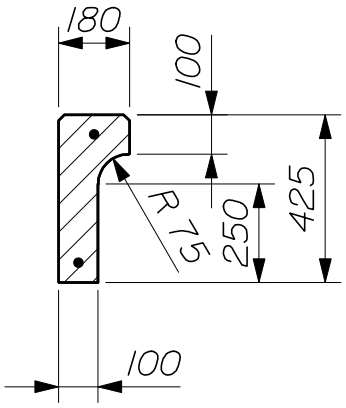
~ TERMINAL SECTION TYPE 2 ~







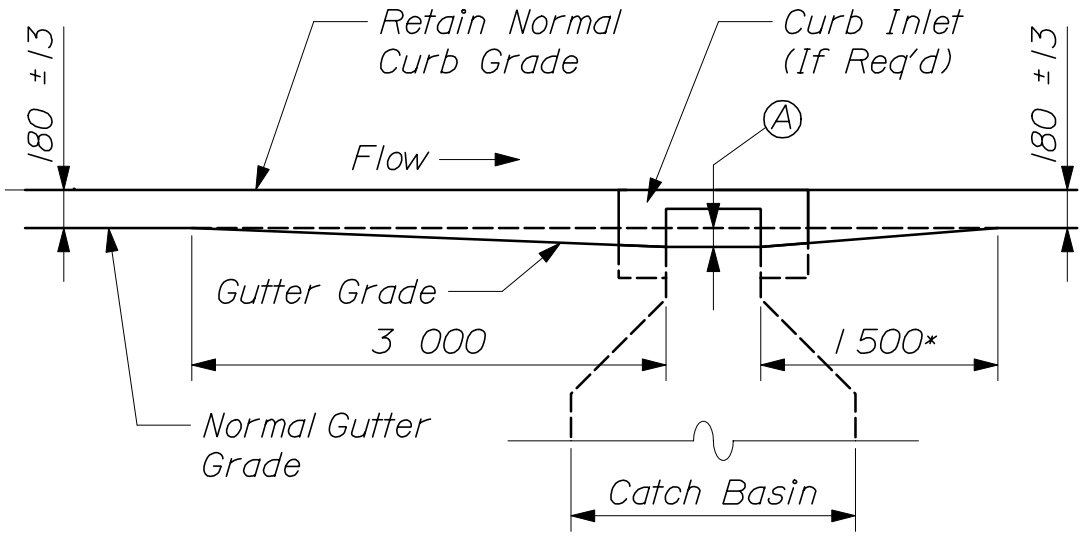
~ VERTICAL CURB ~
TYPE 2



~ CURB INLET TYPE 2 ~

~ SECTION A - A ~

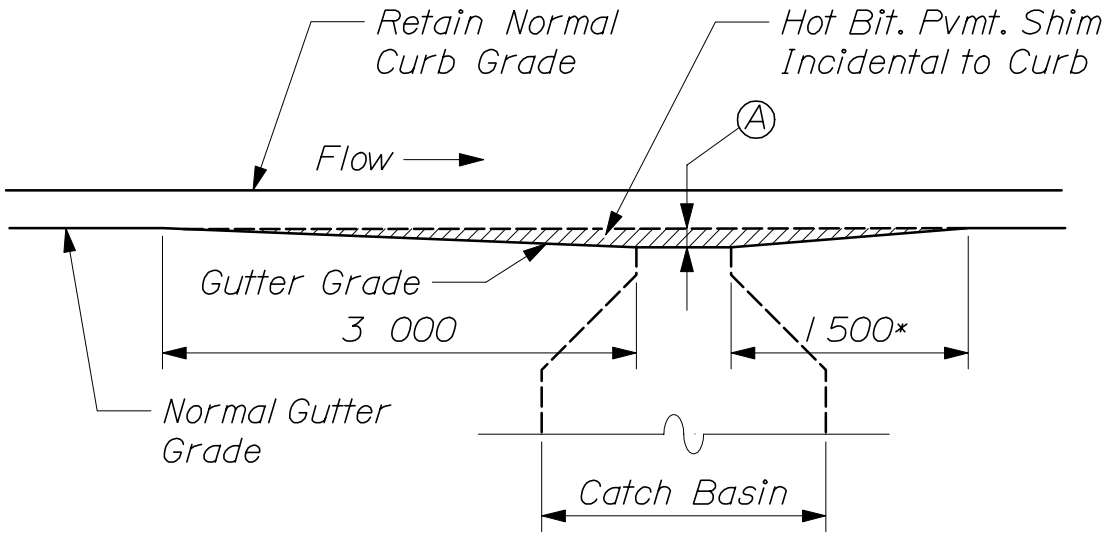
# CURB
609(04)



~ AT CURB INLETS ~

Ⓐ For Parking Lane = 50 mm
Adjacent to Travel Lane = 0 mm

* Dimension to be 3 000 mm if at bottom of a sag.

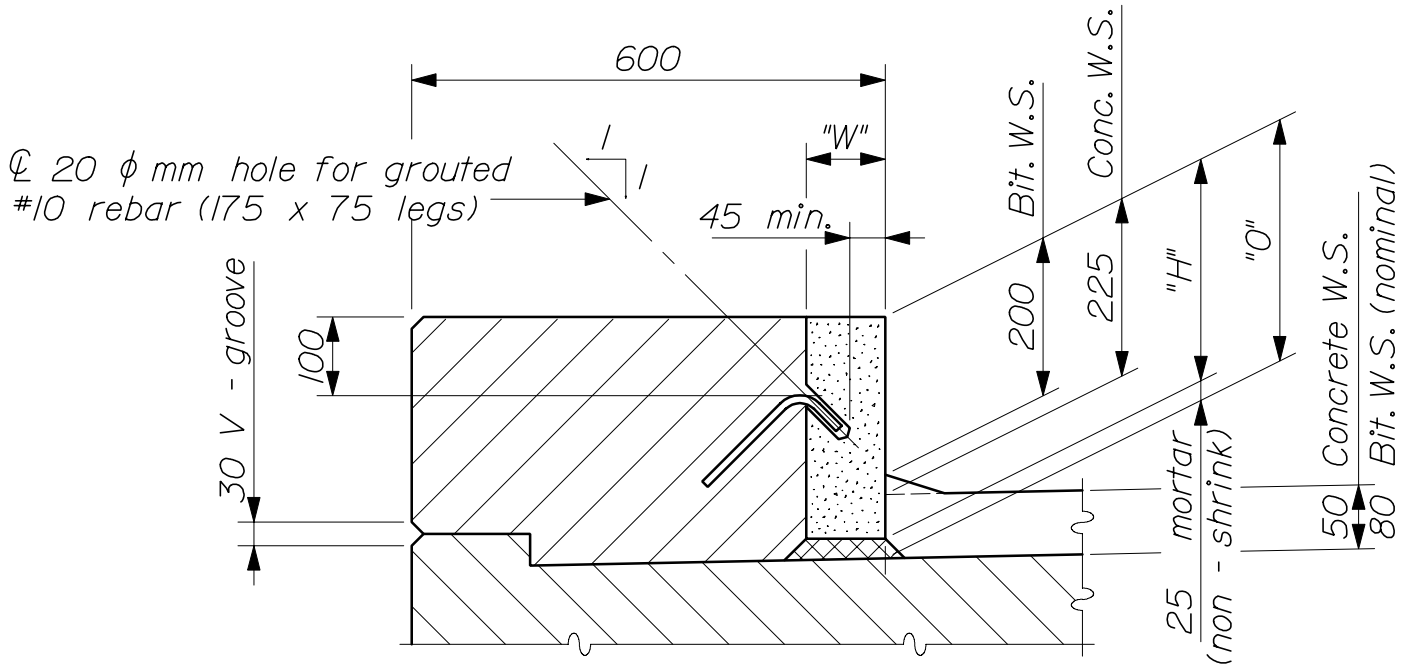


~ AT CURB WITHOUT INLET STONES ~

NOTE:
Grates shall be installed on gradient of the gutter and be depressed 50 mm below the normal gutter grade unless this depression interferes with traffic.

GUTTER GRADE TRANSITION AT CATCH BASIN

609(05)



-- VERTICAL BRIDGE CURB DETAIL --

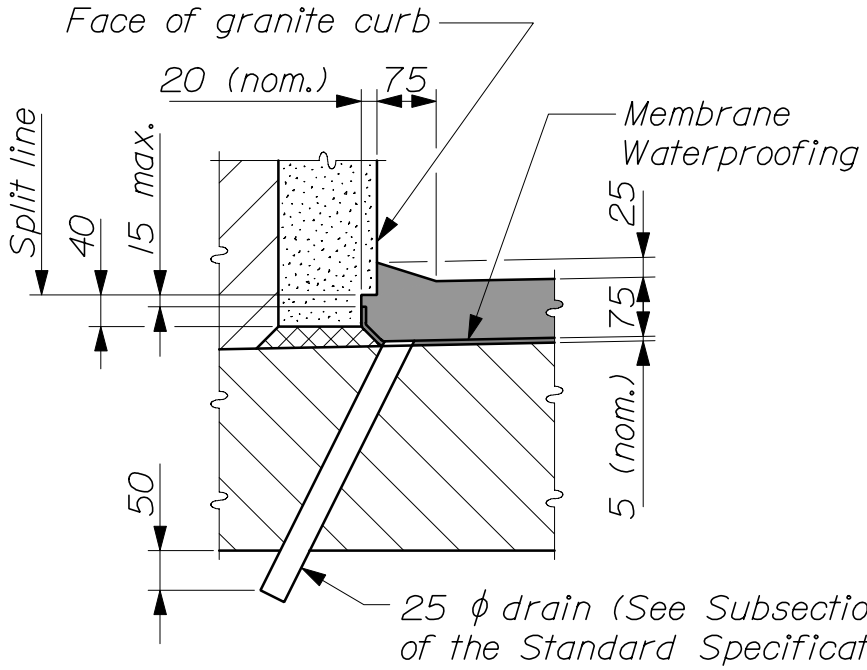


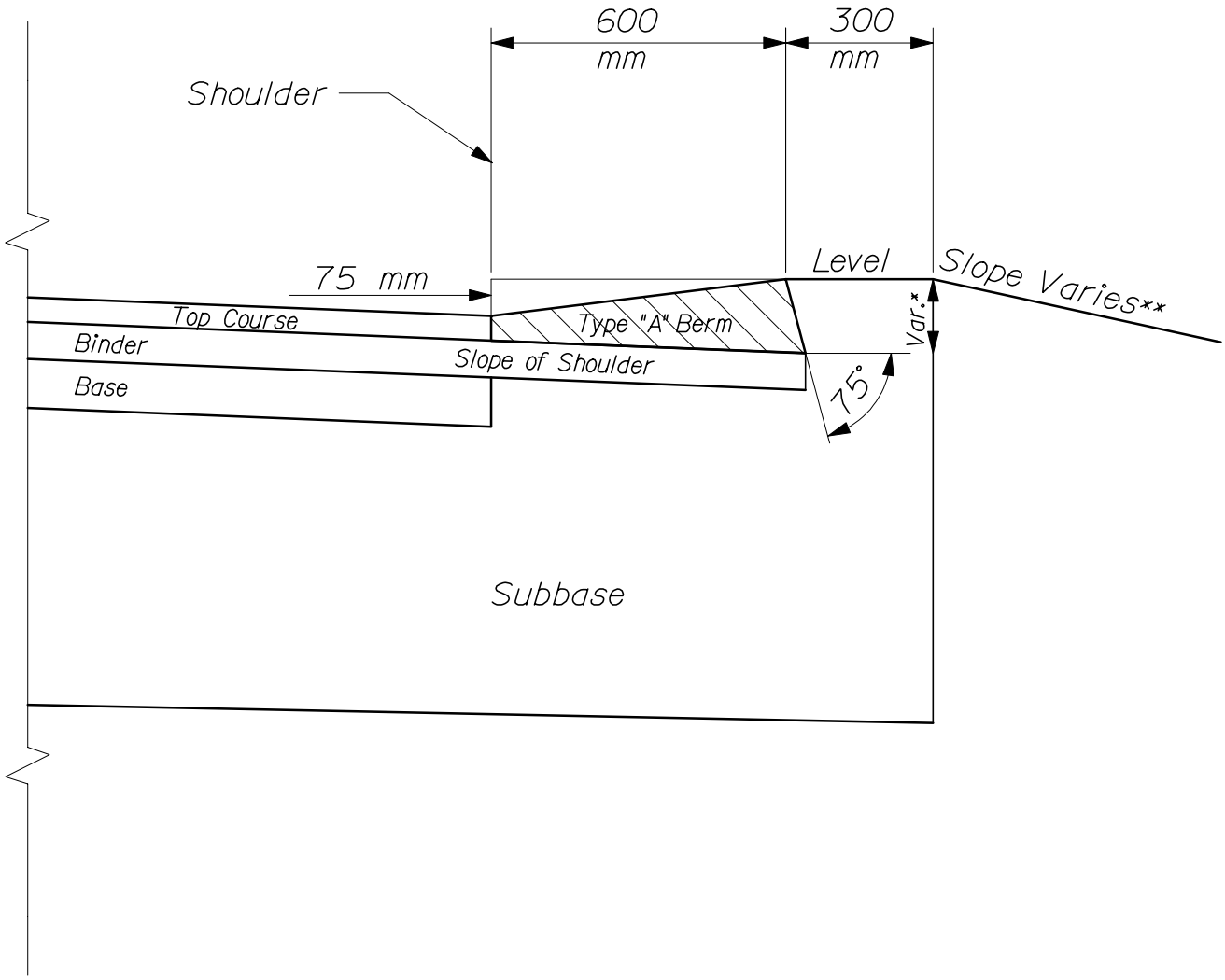
TABLE OF DIMENSIONS	
Type IA (Concrete W.S.)	
"W"	100 5
"H"	250 5
"O"	275
Type IB (Bituminous W.S.)	
"W"	125 5
"H"	280 5
"O"	305

-- TYPE IB NOTCH DETAIL --

VERTICAL BRIDGE CURB

609(06)

BITUMINOUS CONCRETE BERM - TYPE "A"

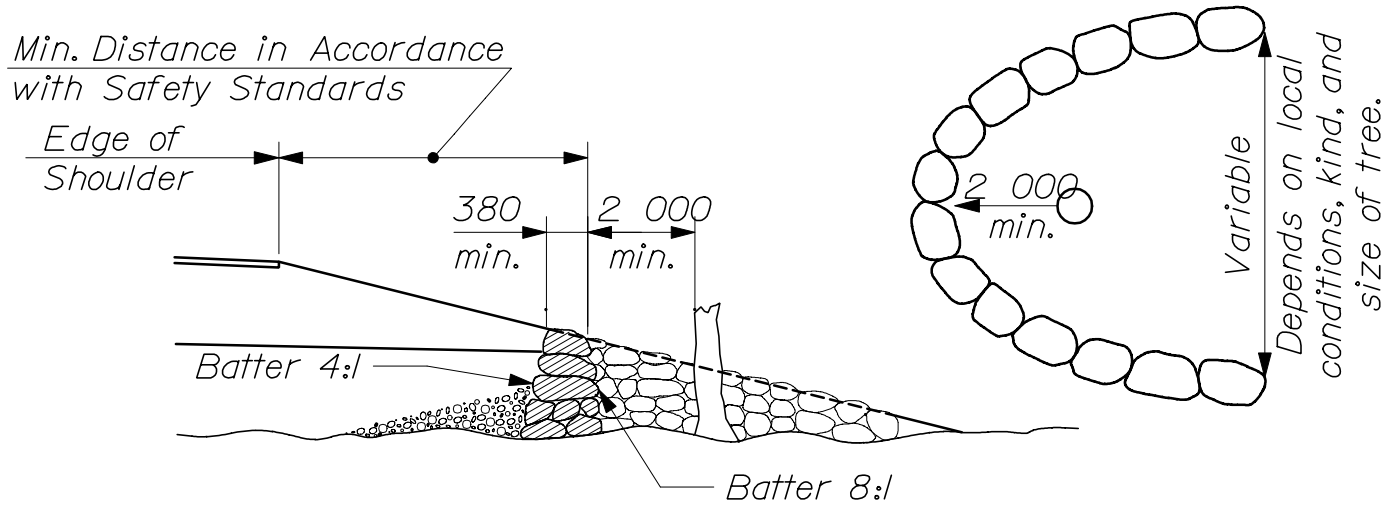


* This dimension varies with the thickness of the top course and slope of shoulder.

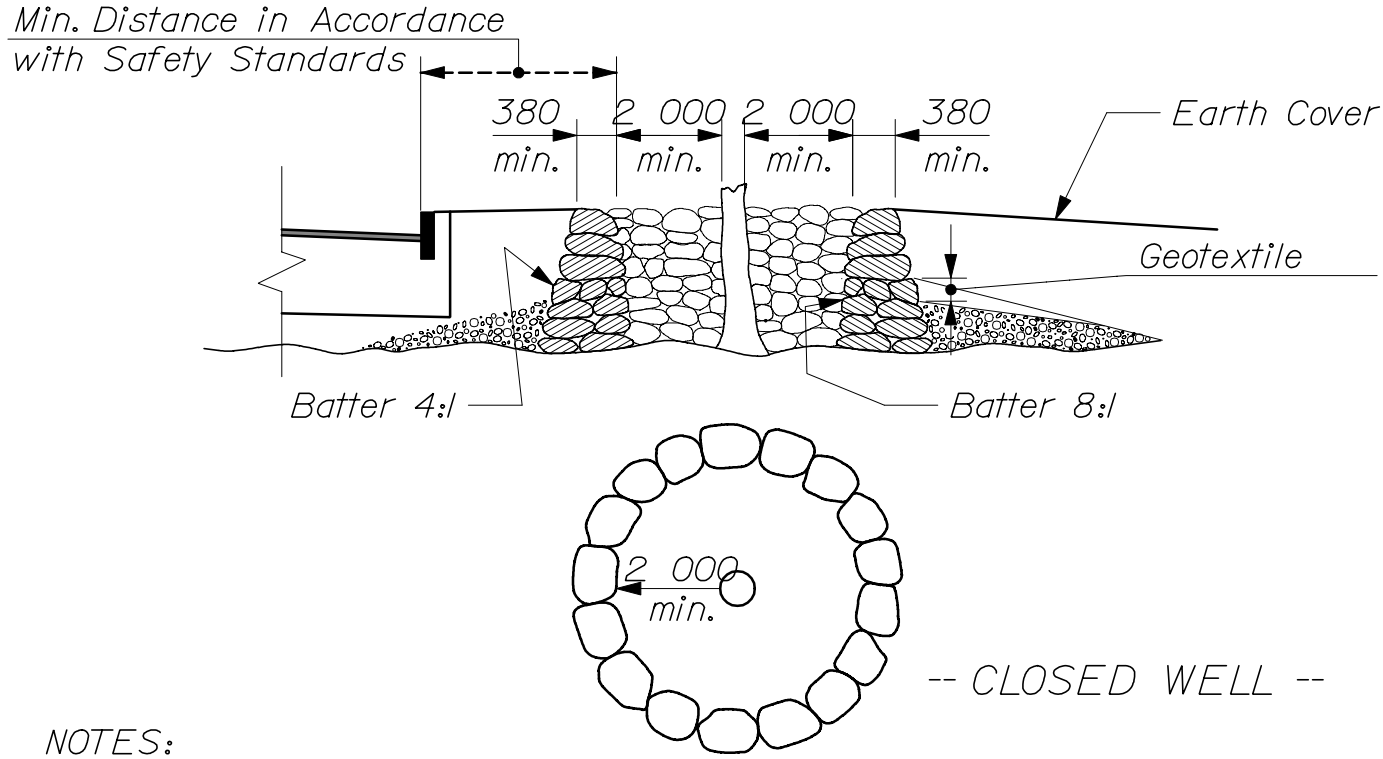
** See typical sections for project.

SPECIAL CURB - CAPE COD DESIGN

609(07)



-- OPEN WELL --



-- CLOSED WELL --

NOTES:

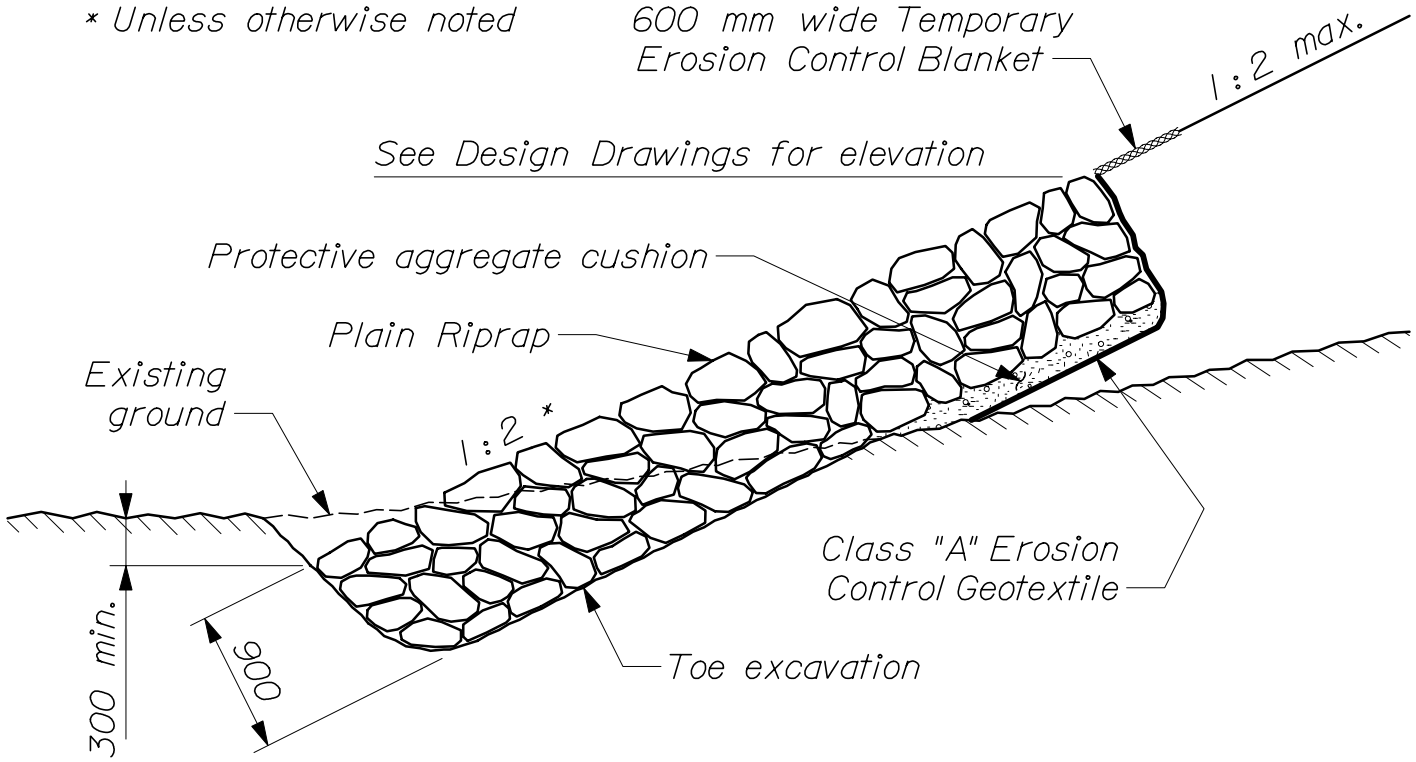
1. Selected ledge excavation, crushed stone or other porous material shall be used to fill around the old ground area of the tree from the tree well to the perimeter of the branches.

2. A Geotextile to prevent infiltration of fines shall be placed over the rock fill.

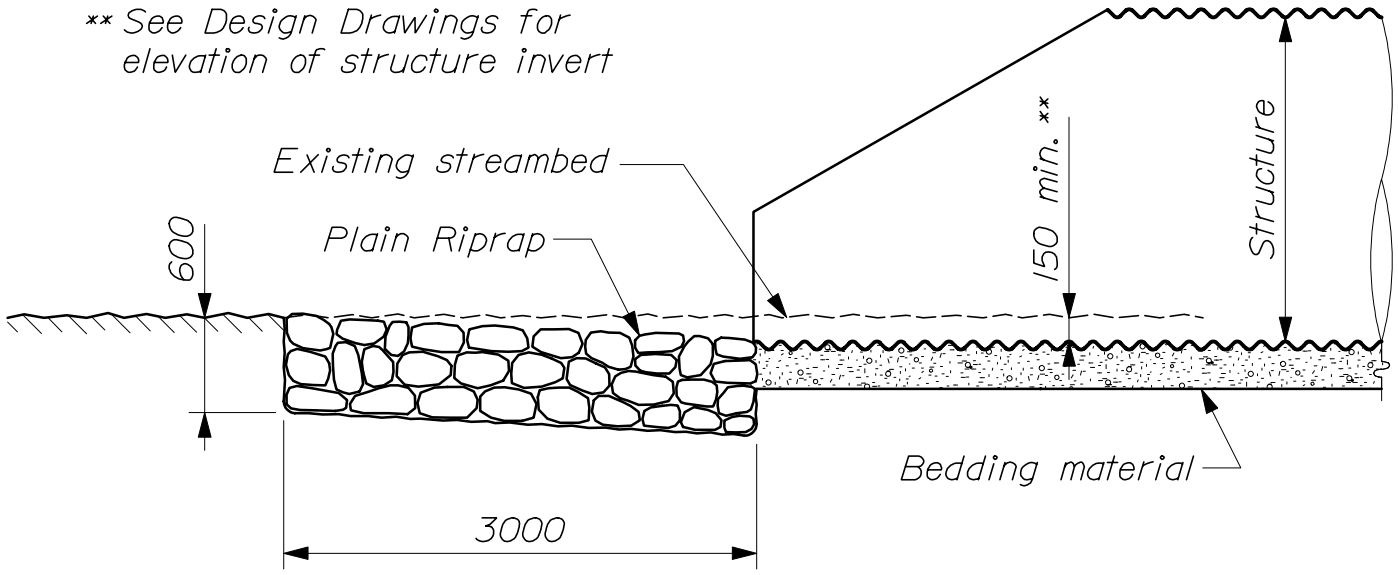
3. If drainage away from the tree well is necessary, Underdrain Outlet Pipe shall be used, and will be paid for under Item 605.10 150 mm Underdrain Outlet.

4. The Tree Wells shall be paid for under Item 610.09 Hand Laid Riprap.

# TREE WELLS
610(01)



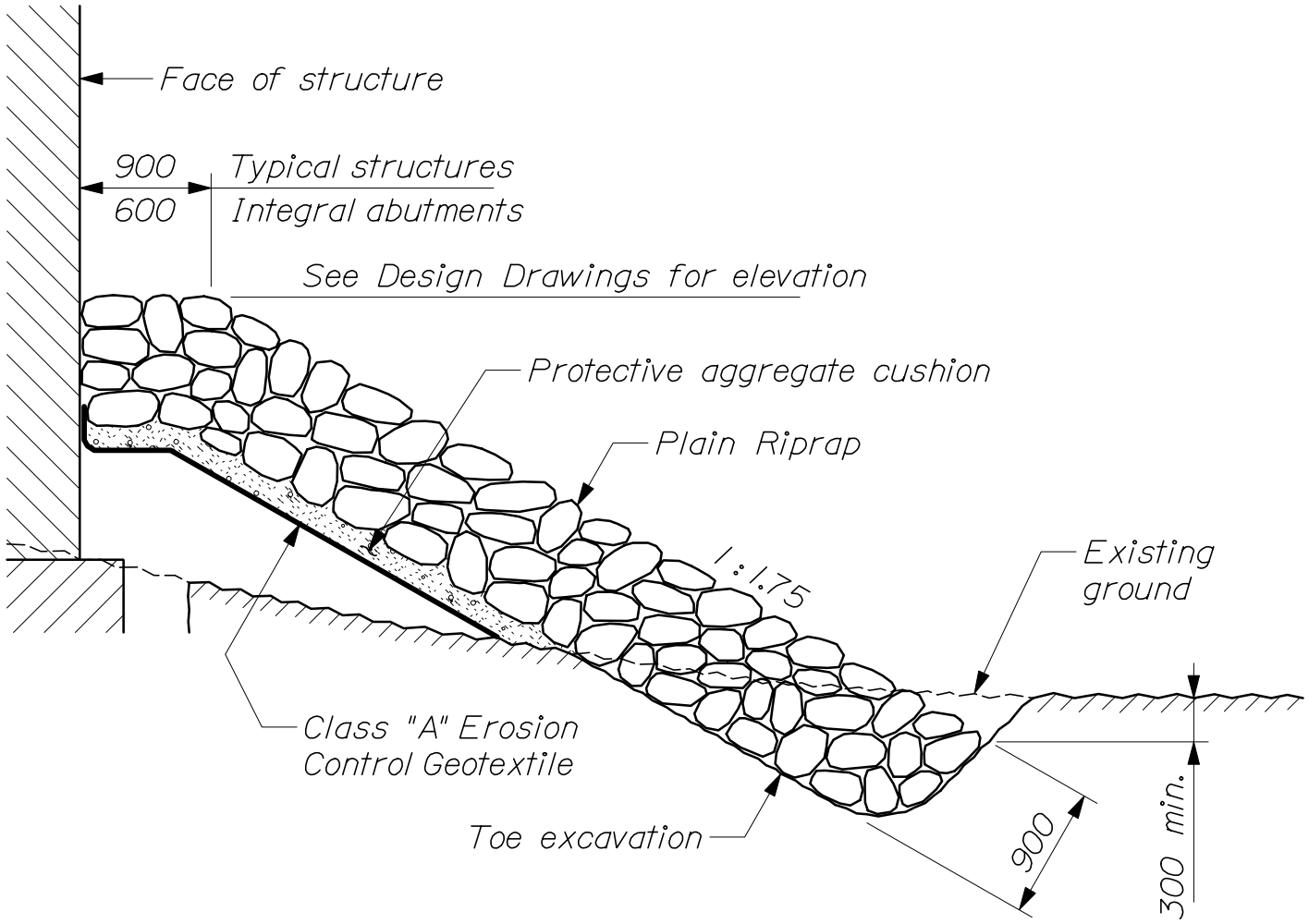
-- PLAIN RIPRAP SIDE SLOPE --
(Refer to Page 620(05) for specific details on geotextile placement)



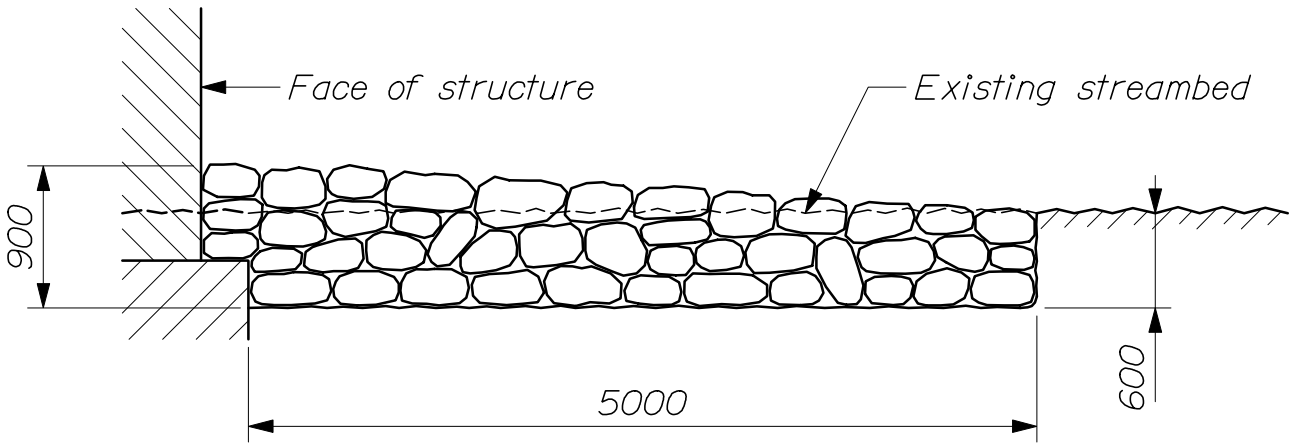
-- PLAIN RIPRAP APRON --

STONE SCOUR PROTECTION

610(02)



-- PLAIN RIPRAP SLOPE AT STRUCTURES --
Refer to Page 620(05) for specific details on geotextile placement



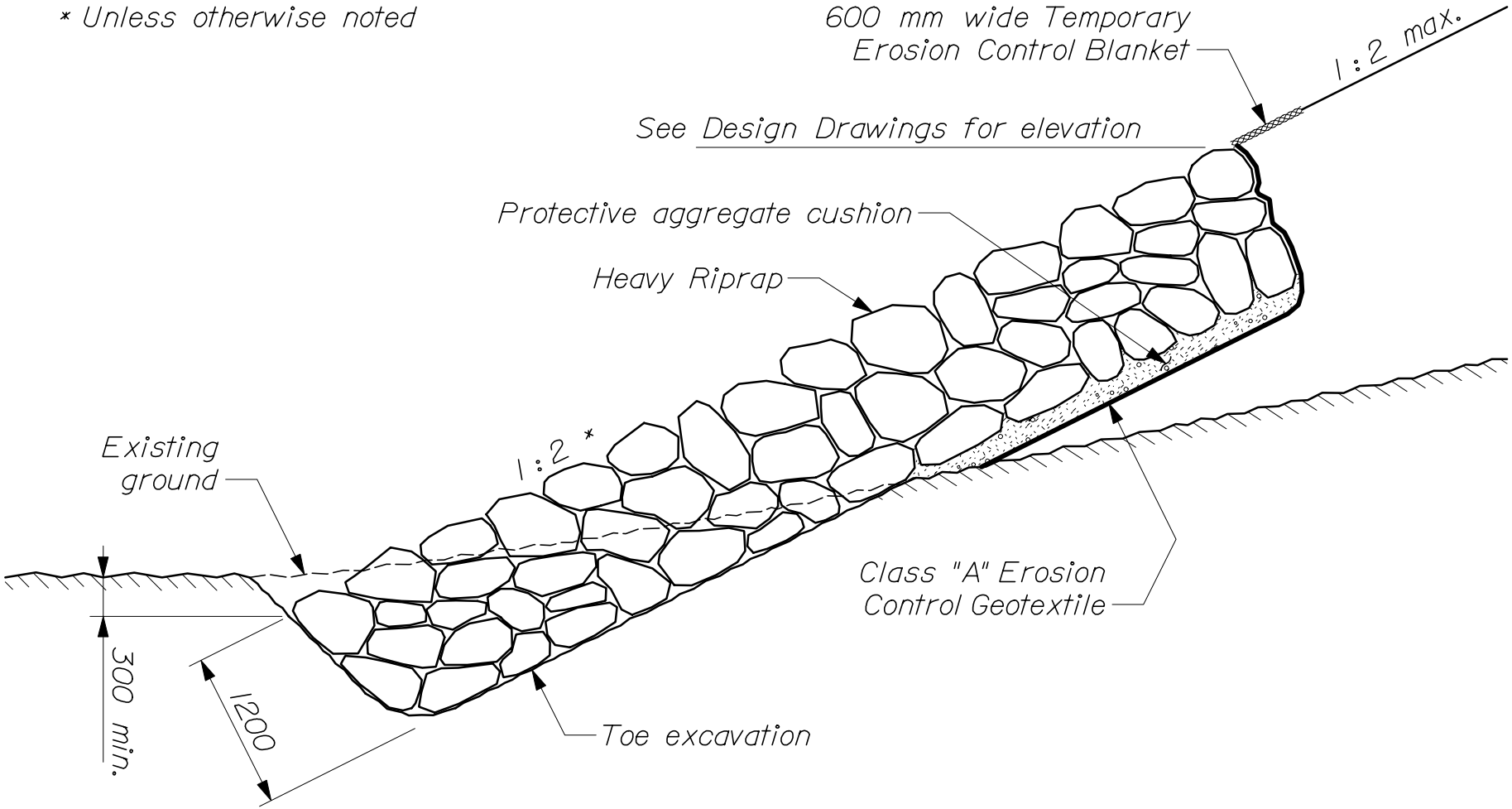
-- STONE BLANKET --

STONE SCOUR PROTECTION

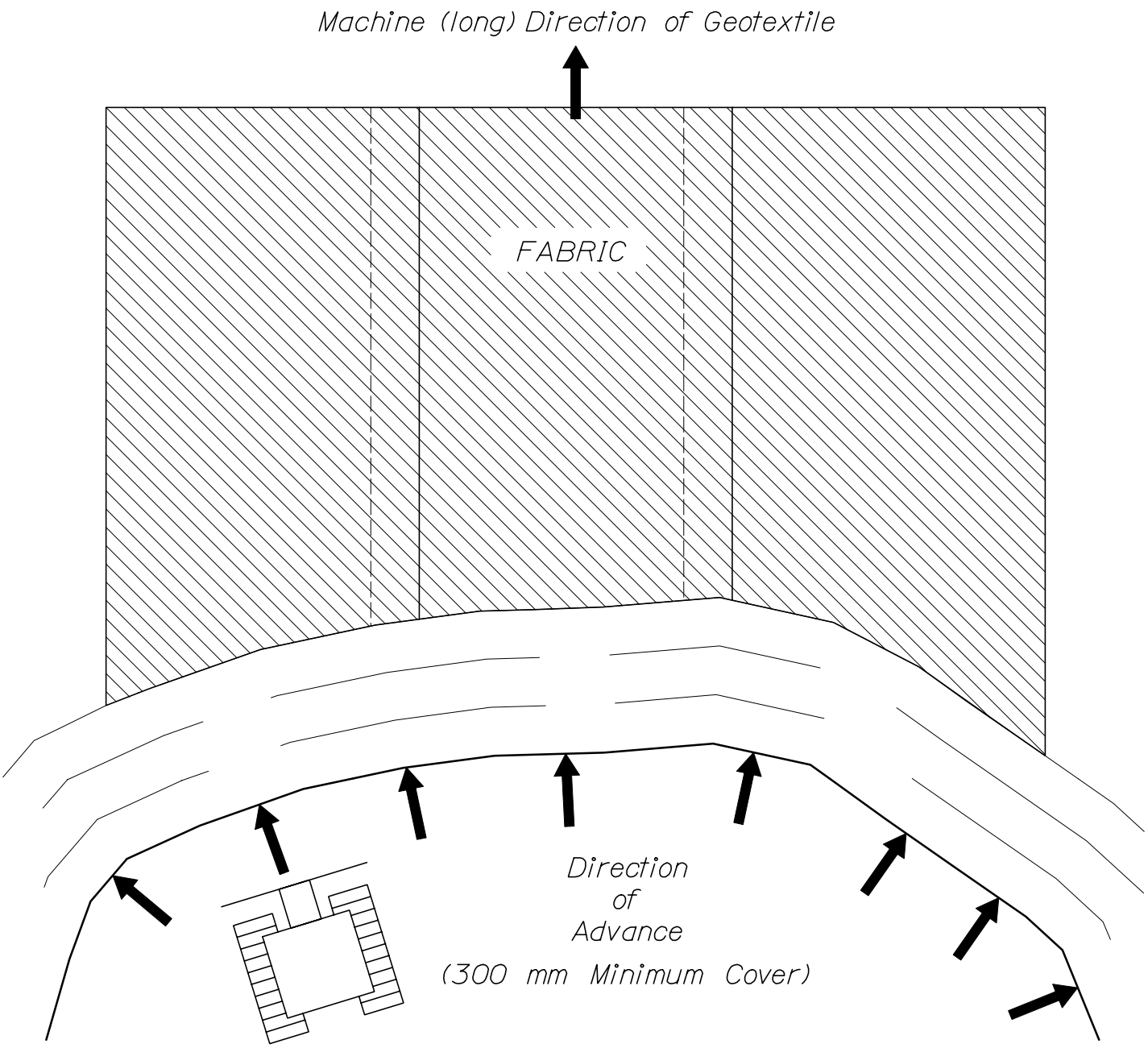
610(03)

STONE SCOUR PROTECTION

610(04)



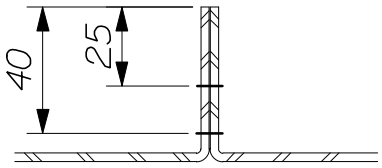
-- HEAVY RIPRAP SIDE SLOPE --
(Refer to Page 620(05) for specific details on geotextile placement)



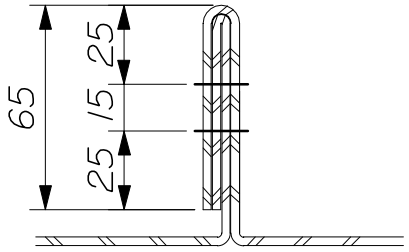
PLACEMENT OF FIRST LIFT OF COVER MATERIAL TO
~ TENSION GEOTEXTILE ON MODERATE GROUND CONDITIONS ~
(NO MUD WAVE).

GEOTEXTILE PLACEMENT

620(01)

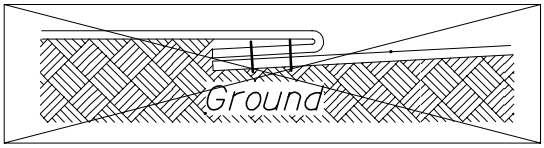


FLAT or PRAYER Seam
Type SSA-2

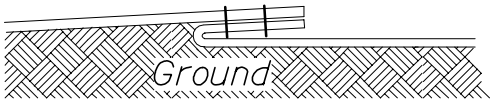


J Seam
Type SSN-I

~ TYPES OF SEAMS ~

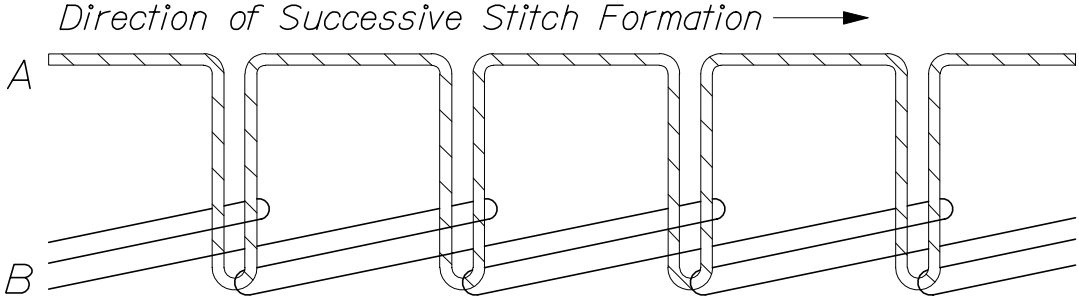


Improper Placement
(cannot inspect or repair)



Proper Placement
(seam up)

~ SEAM PLACEMENT ~

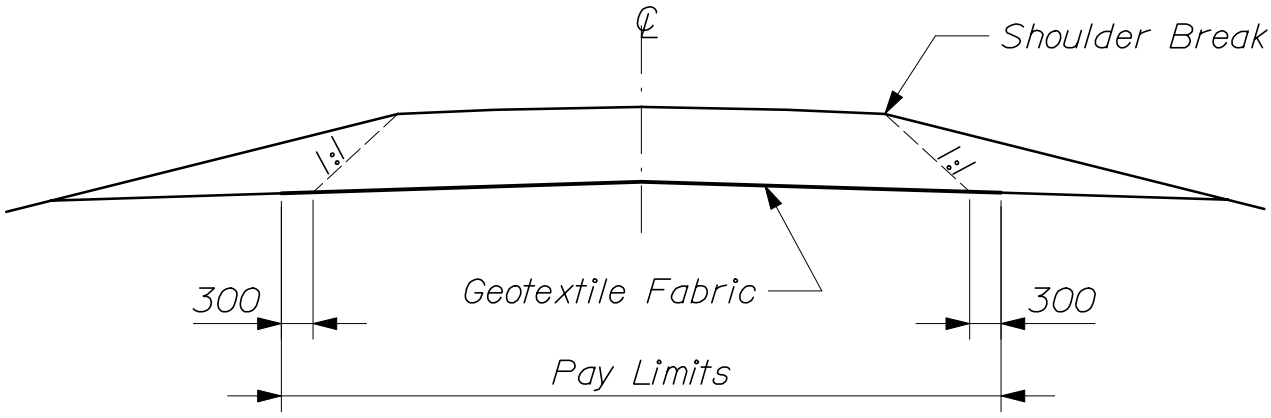


~ CLASS 401 TYPE STITCH ~

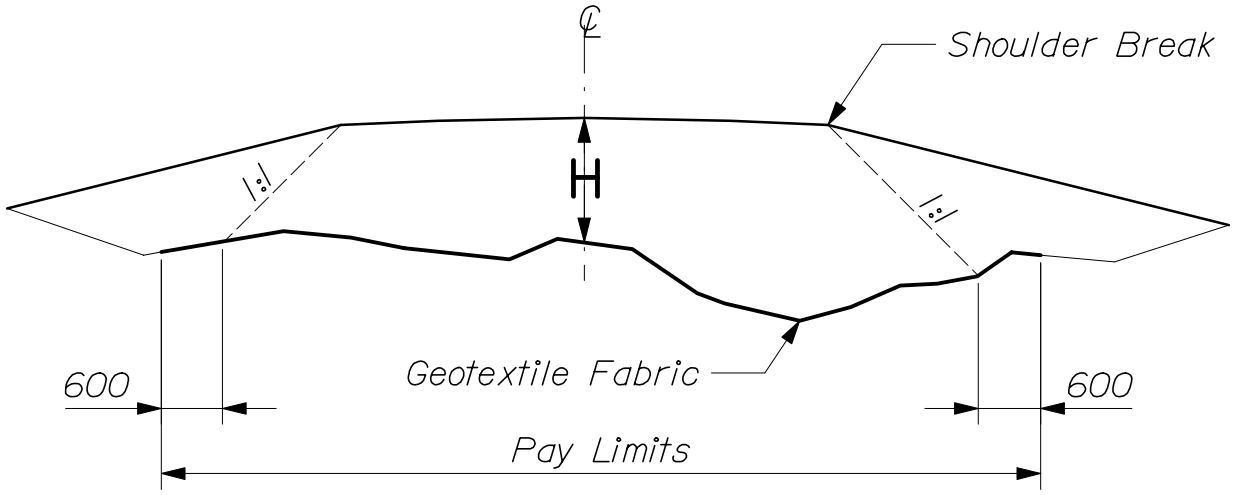
NOTE:
This type of stitch shall be formed with two threads: one needle thread "A", and one looper thread, "B". loops of thread "A" shall be passed through the material and interlaced and interlooped with loops of thread "B". The interloopings shall be drawn against the underside of the bottom ply of material.

GEOTEXTILE SEAMING

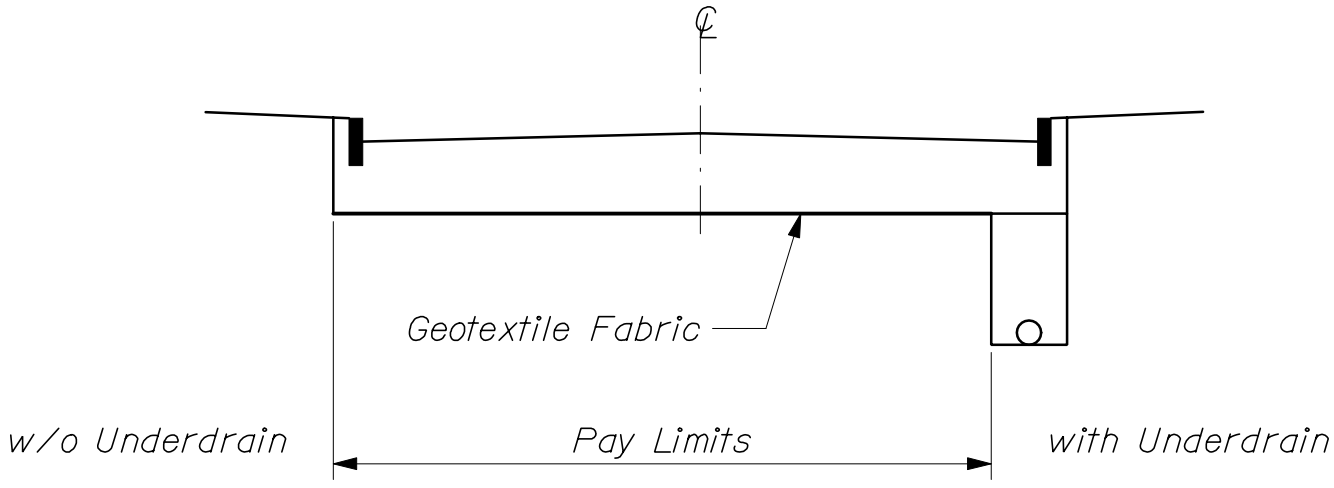
620(02)



~ GEOTEXTILE AT SUBGRADE ~



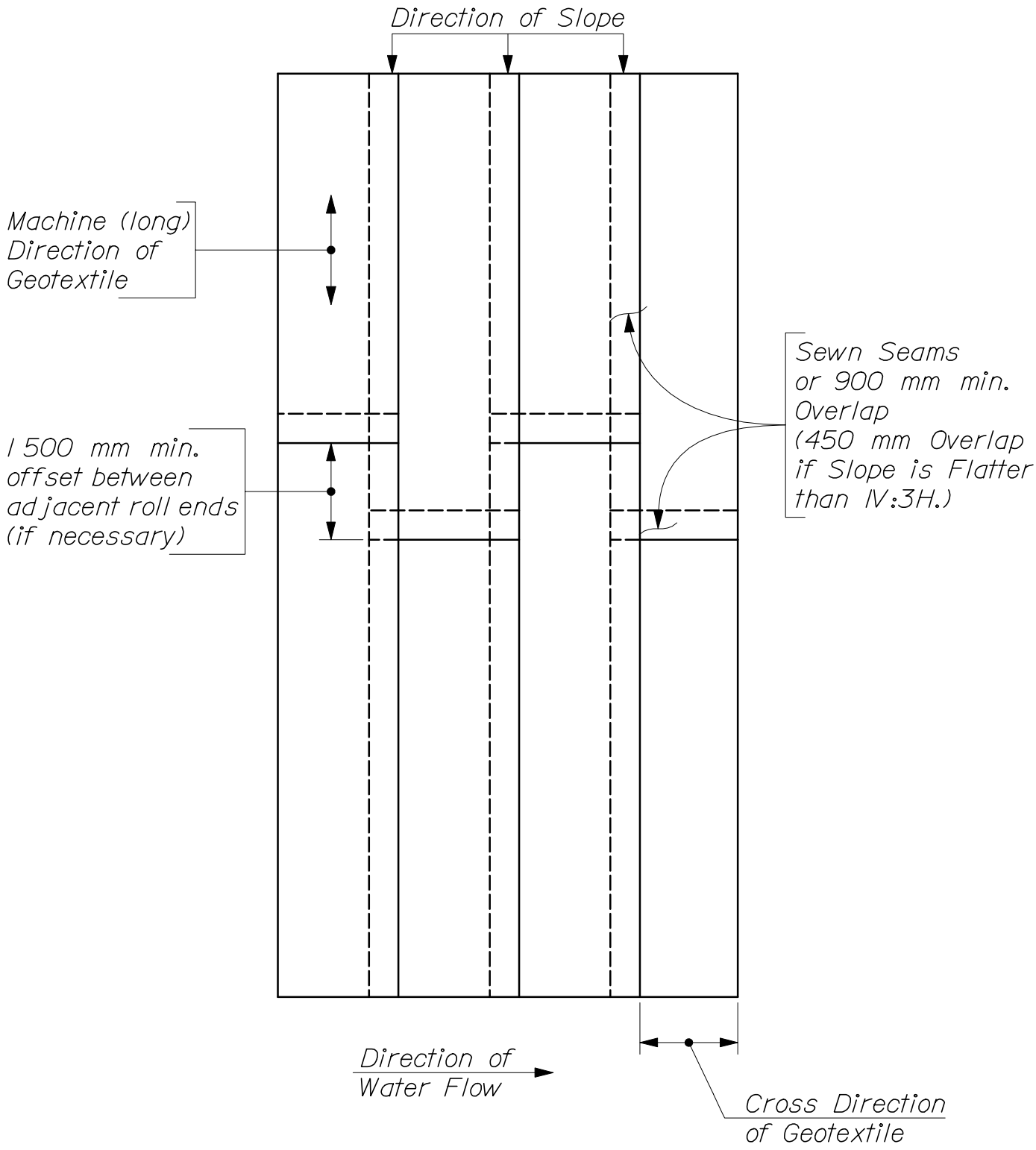
~ GEOTEXTILE ON OLD GROUND ~



~ BOX SECTION ~

LATERAL LIMITS IN A ROADWAY

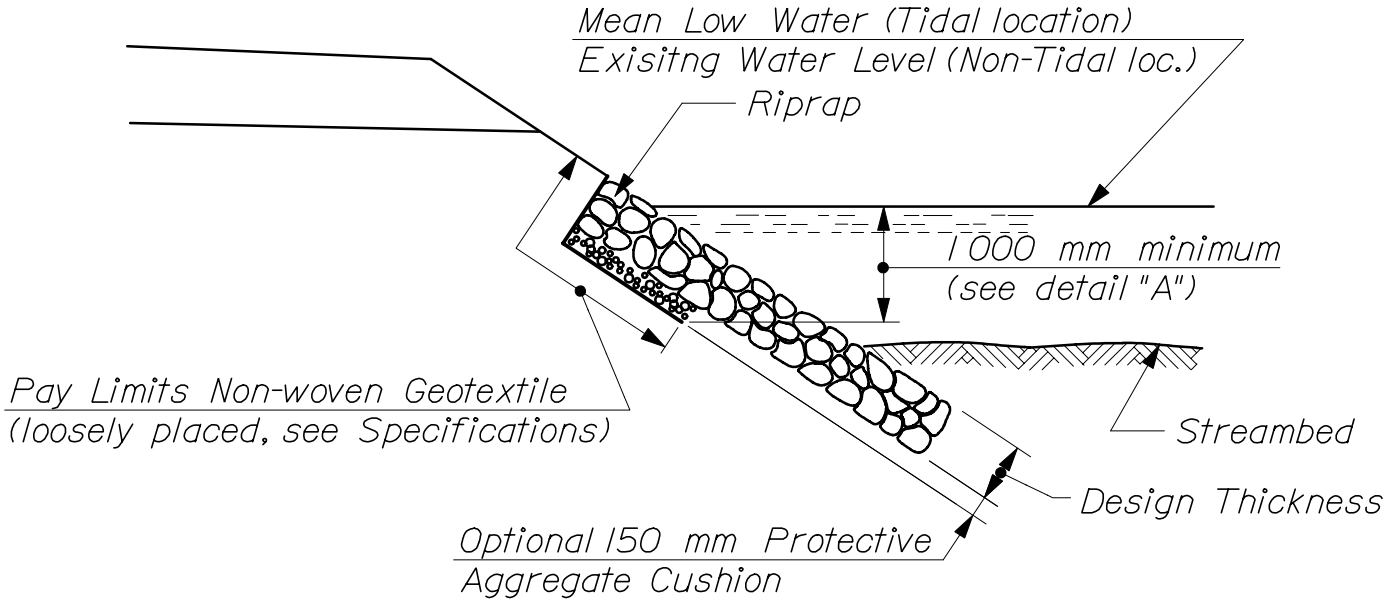
620(03)



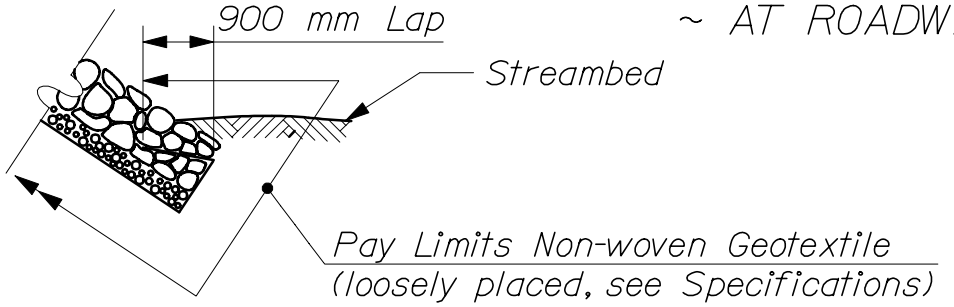
~ PLAN VIEW ~

GEOTEXTILE PLACEMENT FOR PROTECTION OF SLOPES ADJACENT TO STREAMS & TIDAL AREAS

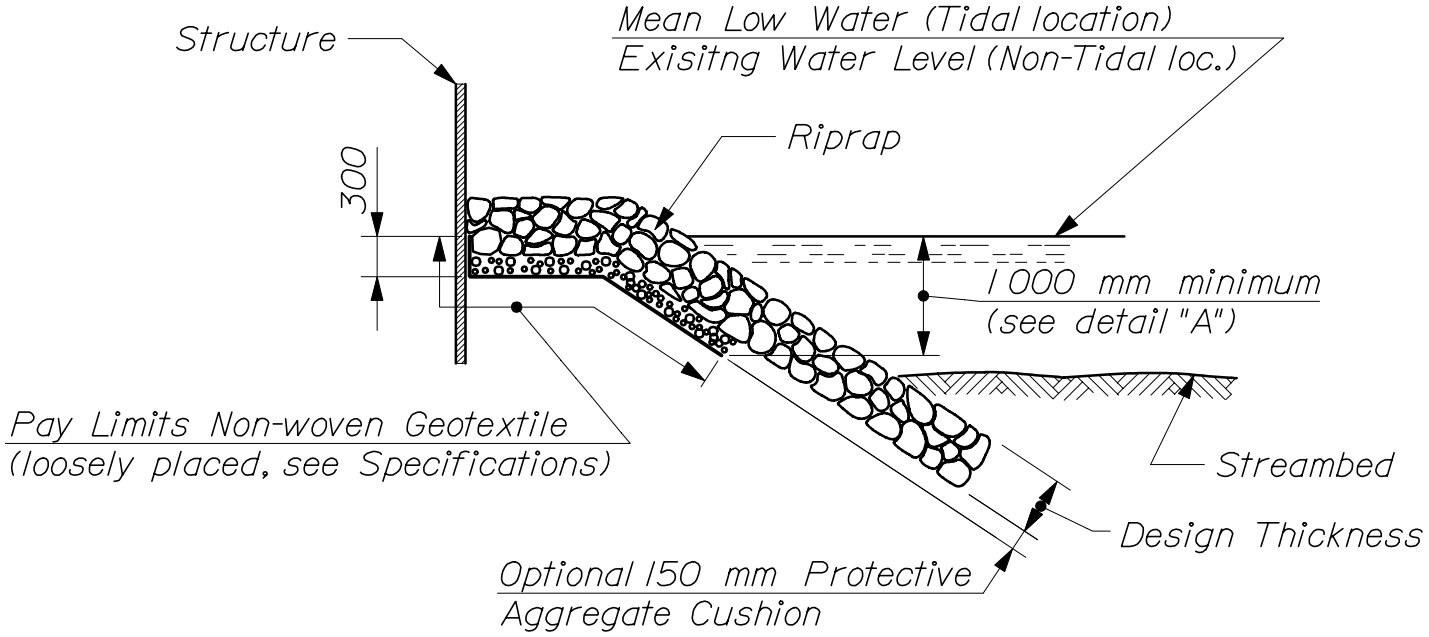
620(04)



~ AT ROADWAY SLOPES ~



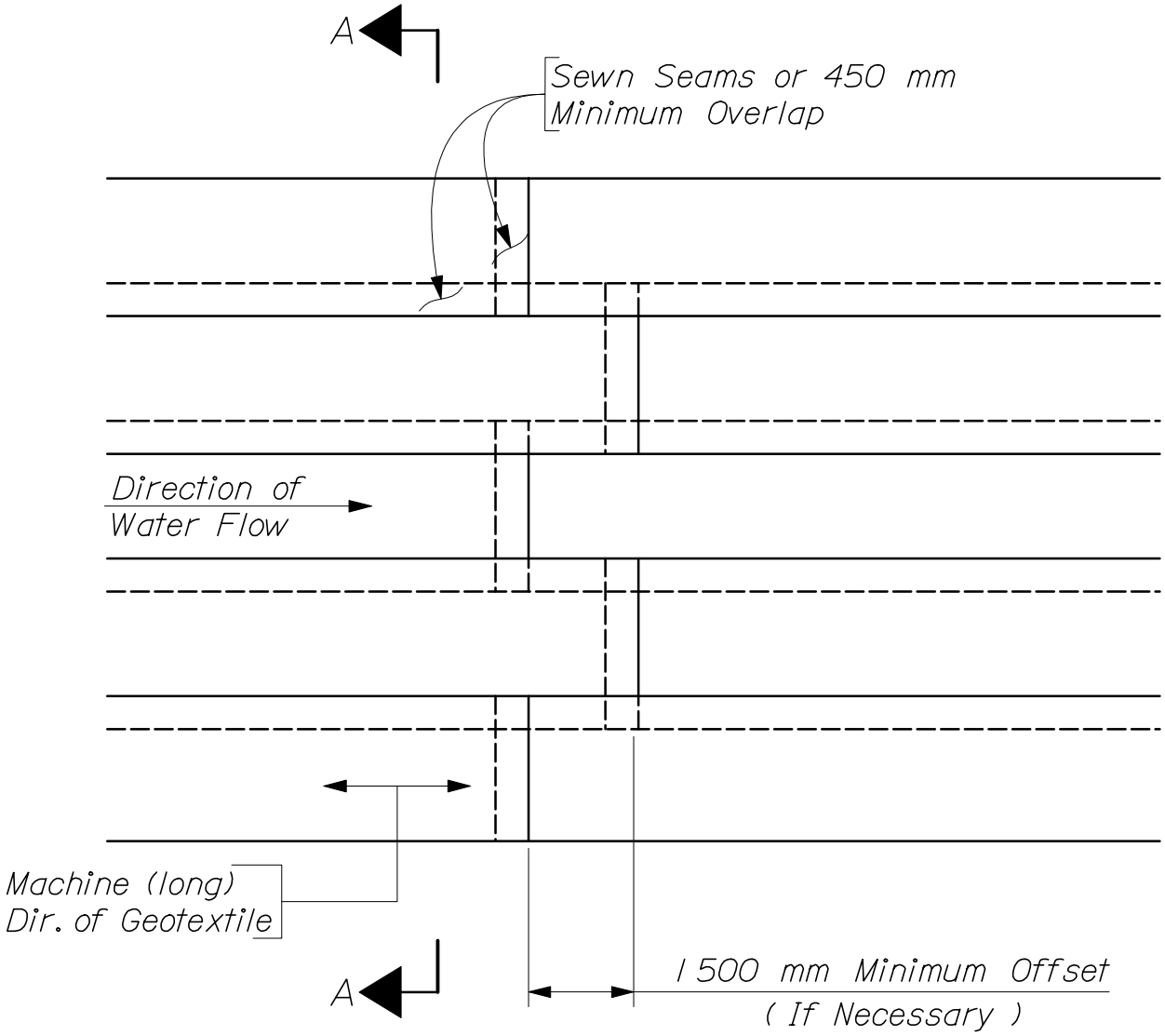
~ DETAIL "A" ~
(For use where water depth
is less than 1 000 mm.)

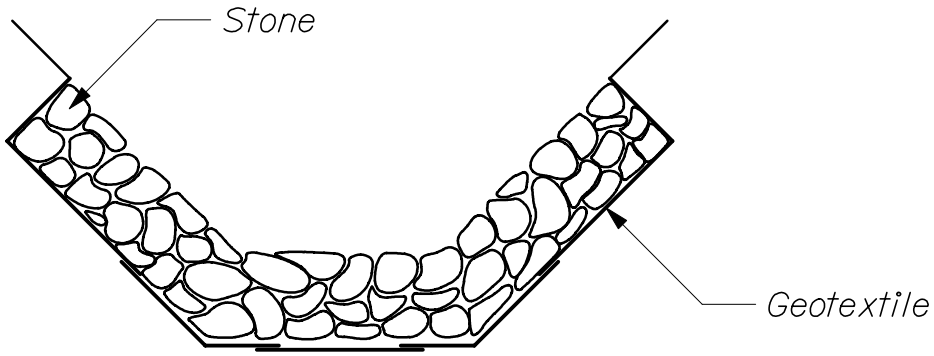


~ AT STRUCTURE ~

GEOTEXTILE PLACEMENT FOR PROTECTION OF SLOPES ADJACENT TO STREAMS & TIDAL AREAS

620(05)





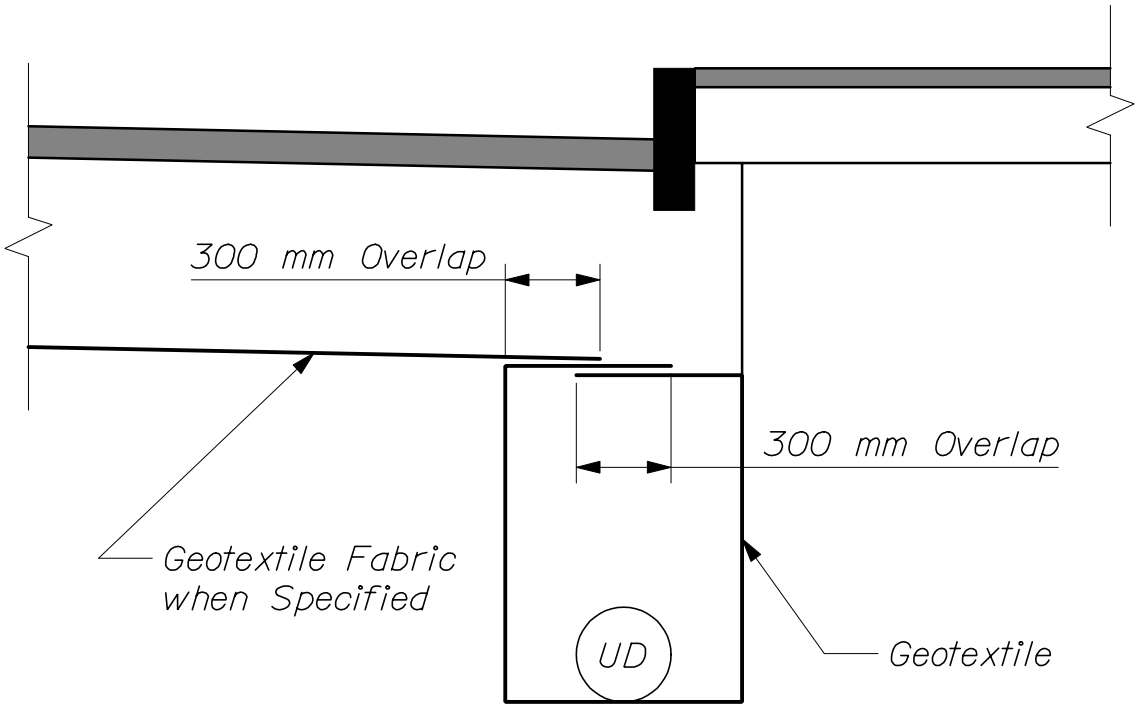
~ SECTION A - A ~

GEOTEXTILE PLACEMENT SCHEME FOR PROTECTION OF DITCHES, SHALLOW CHANNELS, ETC.

620(06)

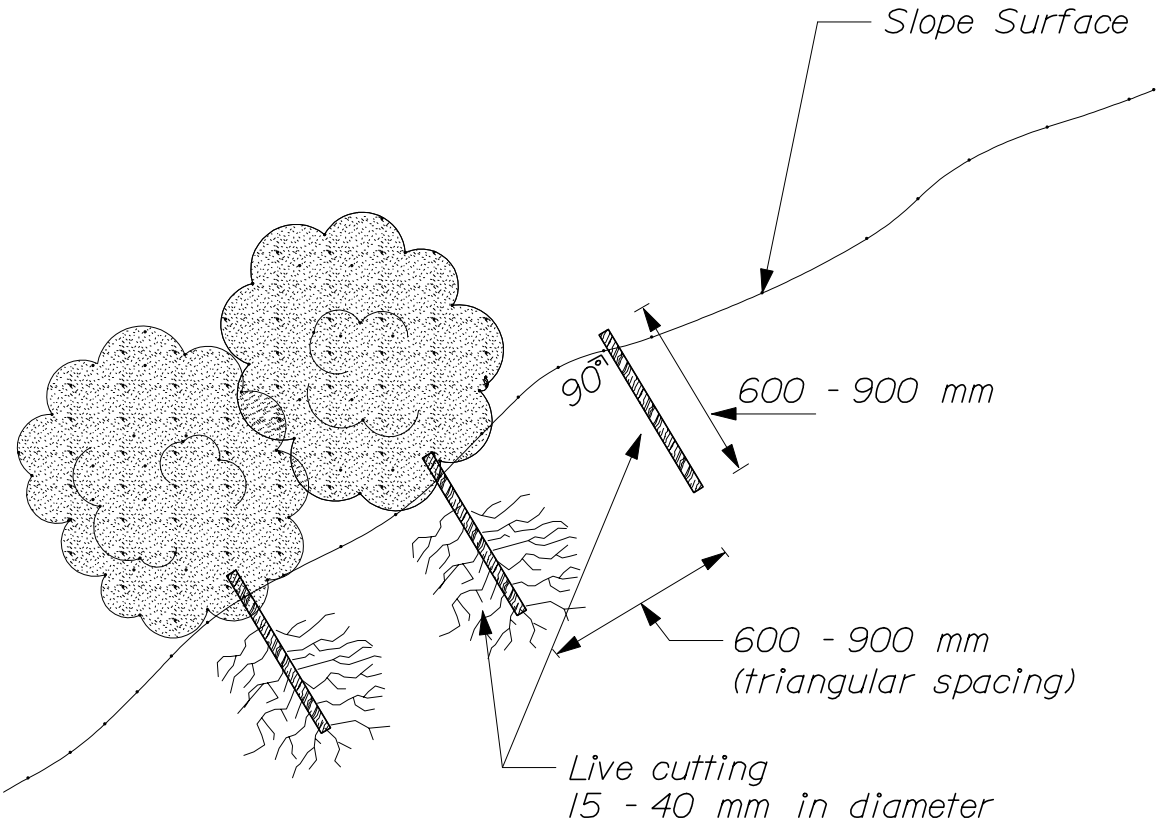
SLOPE VERTICAL:HORIZONTAL	PIN SPACING ALONG OVERLAPS (CENTER TO CENTER)
1:3 TO 1:4	1000 mm
1:4 OR FLATTER	1200 mm

PIN SPACING FOR OVERLAPPED GEOTEXTILE ON SLOPES FLATTER THAN IV:3H (OPTIONAL)



GEOTEXTILE LINED UNDERDRAIN TRENCH

CROSS SECTION
Not to scale



NOTE:
Rooted/leafed condition of the living plant material is not representative of the time of installation.

LIVE STAKING

621(01)

CONSTRUCTION GUIDELINES

Live material sizes - The cuttings are usually 15 to 40 mm in diameter and 600 to 900 mm long as shown in the detail above. For final size determination, refer to the available cutting source.

LIVE MATERIAL PREPARATION

1. *The materials must have side branches cleanly removed and the bark intact.*

2. *The basal ends should be cut at an angle for easy insertion into the soil. The top should be cut square.*

3. *Materials should be installed the same day that they are prepared.*

INSTALLATION

1. *Tamp the live stake into the ground at right angles to the slope. The installation may be started at any point on the slope face.*

2. *The live stakes should be installed 600 to 900 mm apart using triangular spacing. The density of the installation will range from 2 to 4 stakes per square yard.*

3. *The buds should be oriented up.*

4. *Four-fifths of the length of the live stake should be installed into the ground and soil firmly packed around it after installation.*

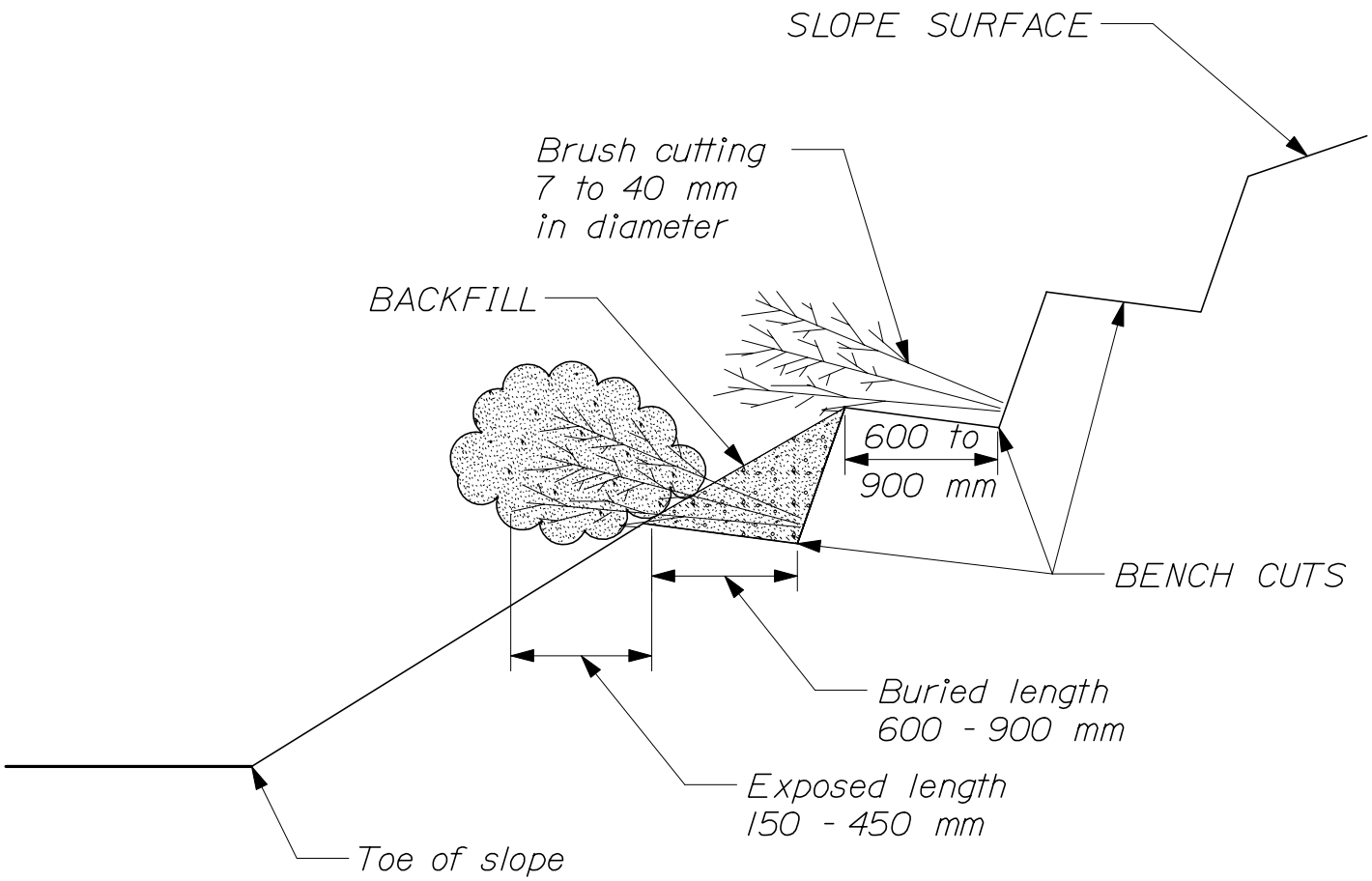
5. *Do not split the stakes during installation. Stakes that split should be removed and replaced.*

6. *An iron bar can be used to make a pilot hole in firm soil. Drive the stake into the ground with a dead blow hammer (hammer head filled with shot or sand).*

LIVE STAKING
CONSTRUCTION & INSTALLATION NOTES

621(02)

CROSS SECTION
not to scale



NOTE:
Rooted/leafed condition of living plant material is not representative of the time of installation.

BRUSH LAYERING

621(03)

CONSTRUCTION GUIDELINES

Live Material Sizes - Branch cuttings should be 7 to 40 mm in diameter and long enough to reach the back of the bench. Side branches should remain intact for installation.

INSTALLATION

1. *Starting at the toe of the slope, benches should be excavated horizontally, on the contour, or angled slightly down the slope, if needed to aid drainage. The bench should be constructed 600 to 900 mm wide.*

2. *The surface of the bench should be sloped so that the outside edge is higher than the inside.*

3. *Branch growing tips shoud be aligned toward the outside of the bench.*

4. *Backfill is placed on top of the branches, compacted, and watered-in to eliminate air spaces.*

5. *The brush tips should extend slightly beyond the fill to filter sediment.*

6. *Long straw or similar mulching material with seeding should be placed between rows on 1:3 or flatter slopes. Side slopes steeper than 1:3 should have temporary erosion control blanket or Erosion Control Mix placed.*

7. *The brushlayer rows should vary from 900 to 1500 mm apart depending upon the slope angle and stability.*

BRUSHLAYER INSTALLATION GUIDELINES

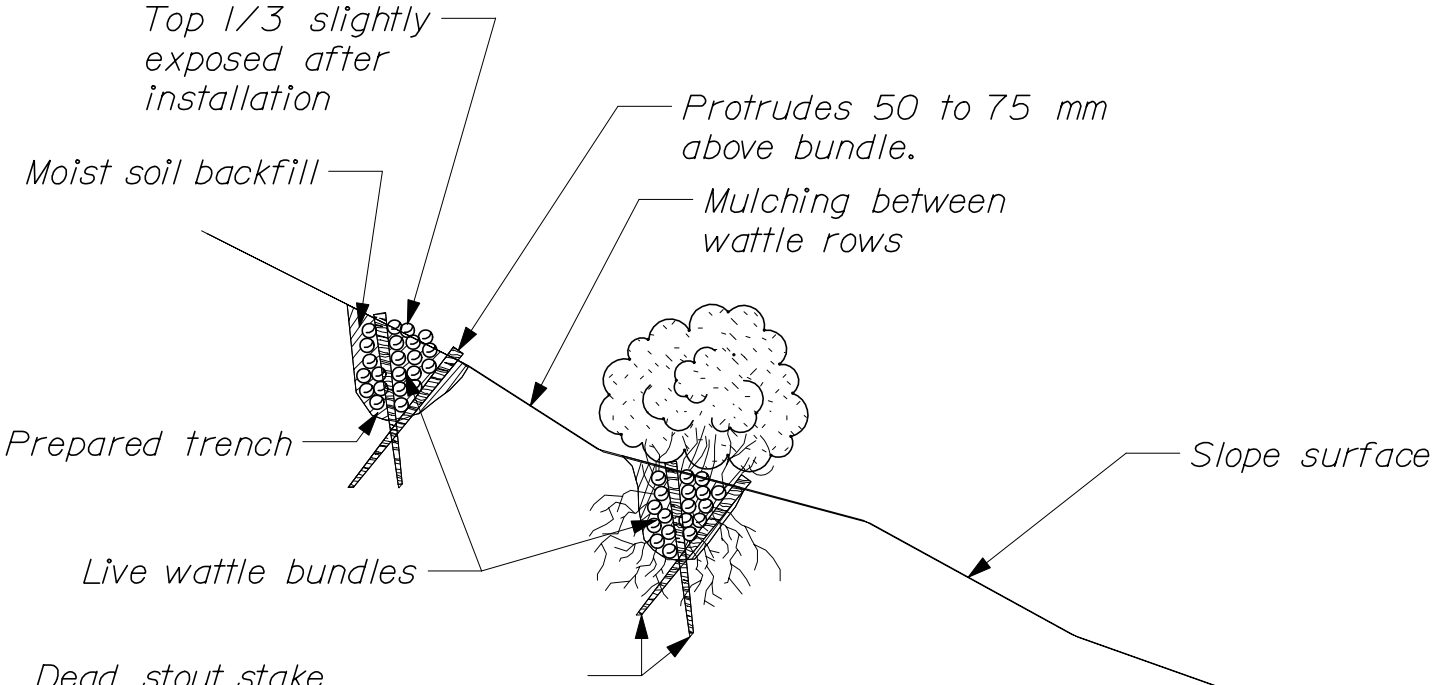
SLOPE DISTANCE BETWEEN BENCHES		
Slope	Wet slopes (mm)	Dry slopes (mm)
2:1 to 2.5:1	900	900
2.5:1 to 3:1	900	1200
3.5:1 to 4:1	1200	1500

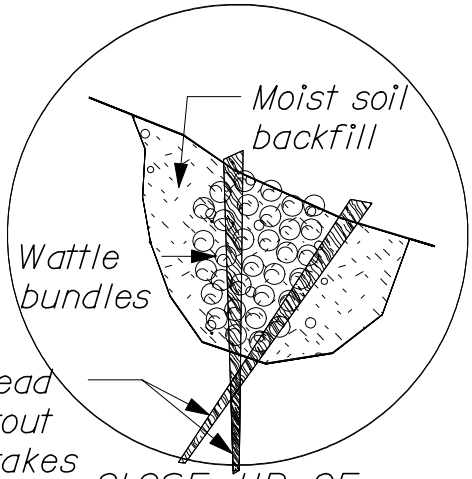
BRUSH LAYERING CONSTRUCTION & INSTALLATION NOTES

621(04)

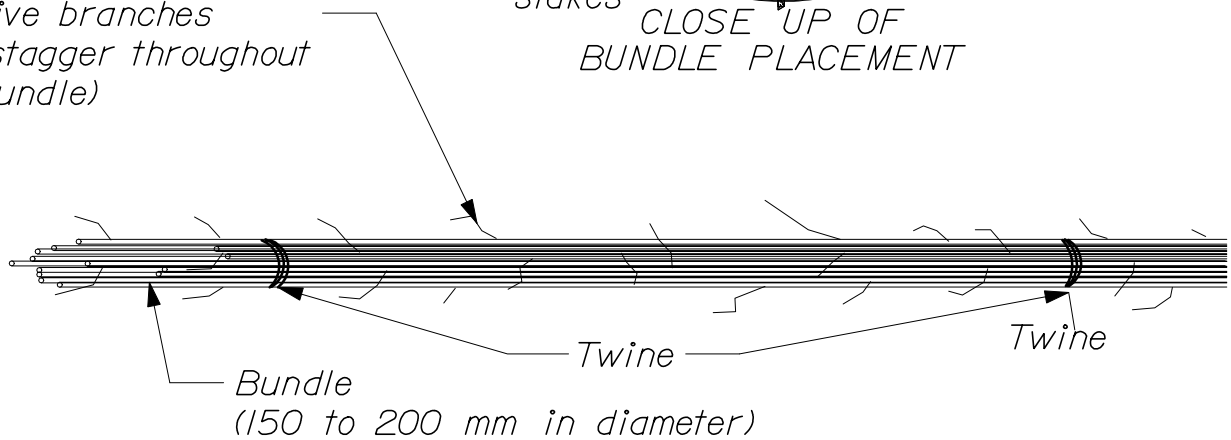
CROSS SECTION
not to scale

NOTE:
Rooted/leafed condition of the living plant material is not representative of the time of installation.





CLOSE UP OF BUNDLE PLACEMENT



LIVE WATTLES

621(05)

CONSTRUCTION GUIDELINES

Live materials - Cuttings must be from species, such as young willow or shrub dogwoods, that root easily and have long, straight branches 7 to 25 mm diameter. (See Bioengineering Plant Material list.)

LIVE MATERIAL SIZES AND PREPARATION

1. Cuttings tied together to form live wattle bundles vary on length from 1500 to 9 000 mm or longer, depending on site conditions and limitations in handling.

2. The completed bundles should be 150 to 200 mm in diameter with all the growing tips oriented in the same direction. Stagger the cuttings in bundles so that tops are evenly distributed throughout the length of the uniformly sized live wattle. (12 to 15 cuttings per bundle)

3. Inert materials - String used for bundling should be untreated twine.

4. Dead stout stakes used to secure the live wattles should be 750 mm long, untreated 50 x 100 mm lumber. Each length should be cut again diagonally across the 100 mm face and make two stakes from each length. Only new, sound, unused lumber should be used, and any stakes that split upon installation should be discarded.

INSTALLATION

1. Prepare the live wattle bundles immediately before installation.

2. Beginning at the base of the slope, dig a trench on the contour just large enough to contain the live wattle. The trench will vary in width from 300 to 450 mm depending on the angle of the slope to be treated. The depth will be 150 to 200 mm depending the size of individual bundles.

3 Place the live wattle into the trench. Minimum 300 mm overlap.

4. Drive the dead stout stakes directly through the live wattle every 600-900 mm along its length.

5. Extra stakes should be used at connection or bundle overlaps. Leave the top of the stakes flush with the installed bundle. Min of 2 stakes per bundle.

6. Place moist soil along the sides of the live wattles. The top of the wattle should be slightly visible when the installation is completed.

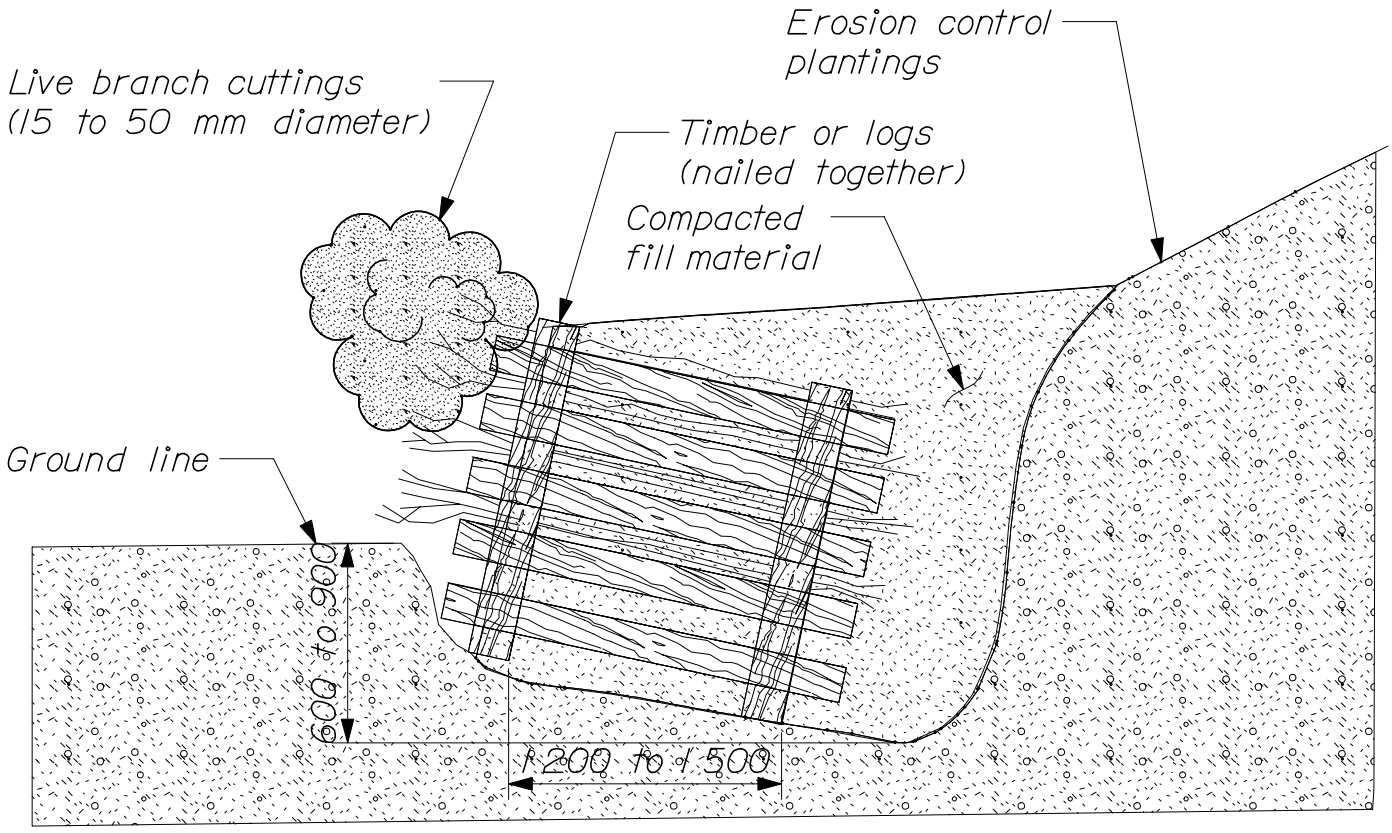
7. Next, at intervals on contour or at an angle up the face of the bank, repeat the above steps to the top of slope. When possible, place one or two rows over the top of slope.

8. Long straw or similar mulching material should be placed between rows on 2.5:1 or flatter slopes, while slopes steeper than 1:2.5 should have temporary erosion control blanket placed in addition to the mulch.

LIVE WATTLES
CONSTRUCTION & INSTALLATION NOTES

621(06)

CROSS SECTION
not to scale



NOTE:
Rooted/leafed condition of the living plant material is not representative of the time of installation.

LIVE CRIBWALL

621(07)

CONSTRUCTION GUIDELINES

1. Live material sizes - Live branch cuttings should be 15 to 50 mm in diameter and long enough to reach the back of the wooden crib structure.

2. Inert materials - Logs or timbers should range from 100 to 150 mm in diameter or dimension. The lengths will vary with the size of the crib structure.

3. Large nails or rebar are required to secure the logs or timbers together.

INSTALLATION

1. Starting at the lowest point of the slope, excavate loose material 600-900 mm below the ground elevation until a stable foundation is reached.

2. Excavate the back of the stable foundation (closest to the slope) slightly deeper than the front to add stability to the structure.

3. Place the first course of logs or timbers at the front and back of the excavated foundation, parallel to the slope contour.

4. Place the next course of logs or timbers at right angles (perpendicular to the slope) on top of the previous course to overhang the front and back of the previous course by 75 to 150 mm.

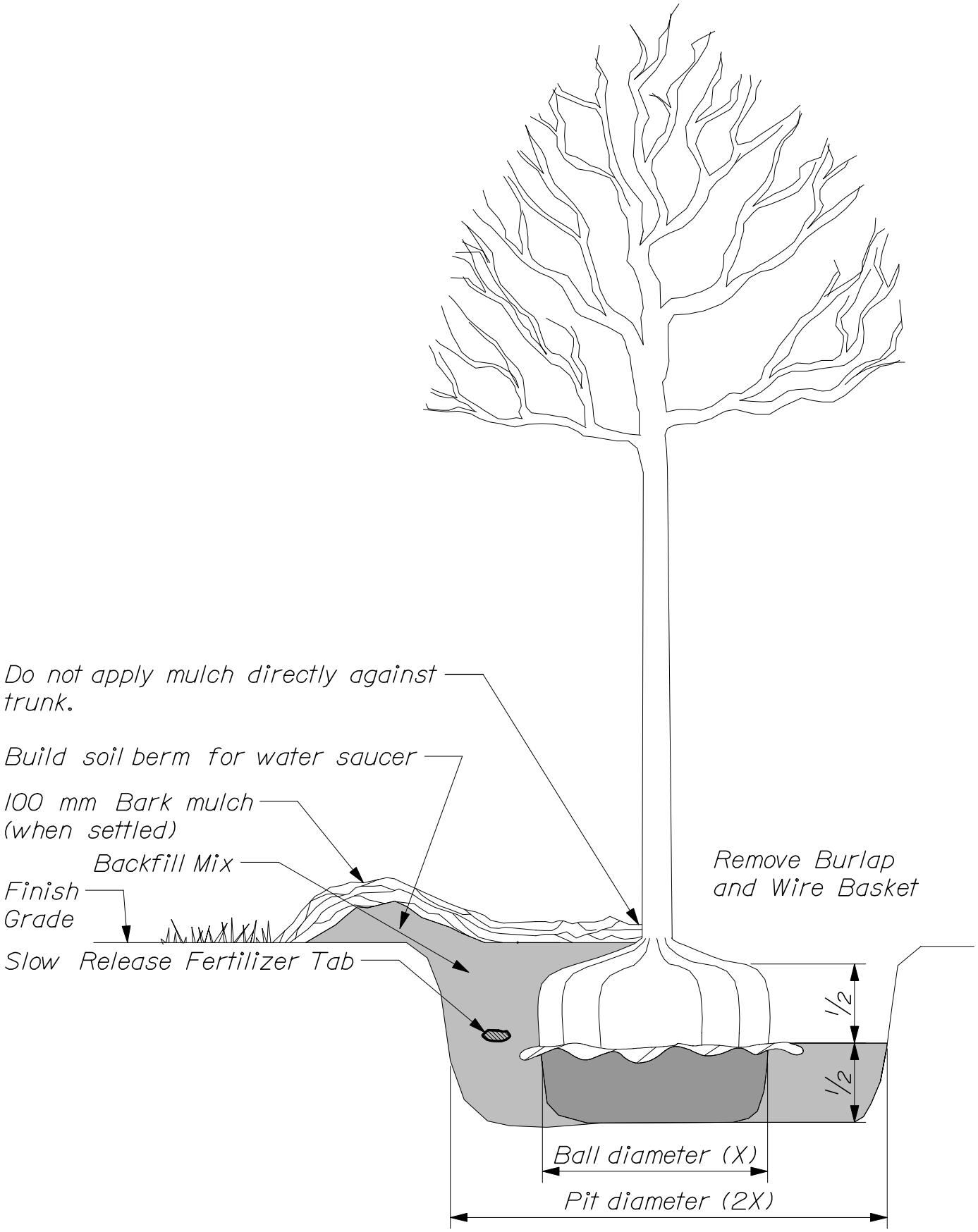
5. Each course of the live cribwall is placed in the same manner and secured to the preceding course. (See Cribwall Special Provisions installation guidelines)

6. When the cribwall structure reaches the existing ground elevation, place live branch cuttings on the backfill perpendicular to the slope then cover the cuttings with backfill and compact.

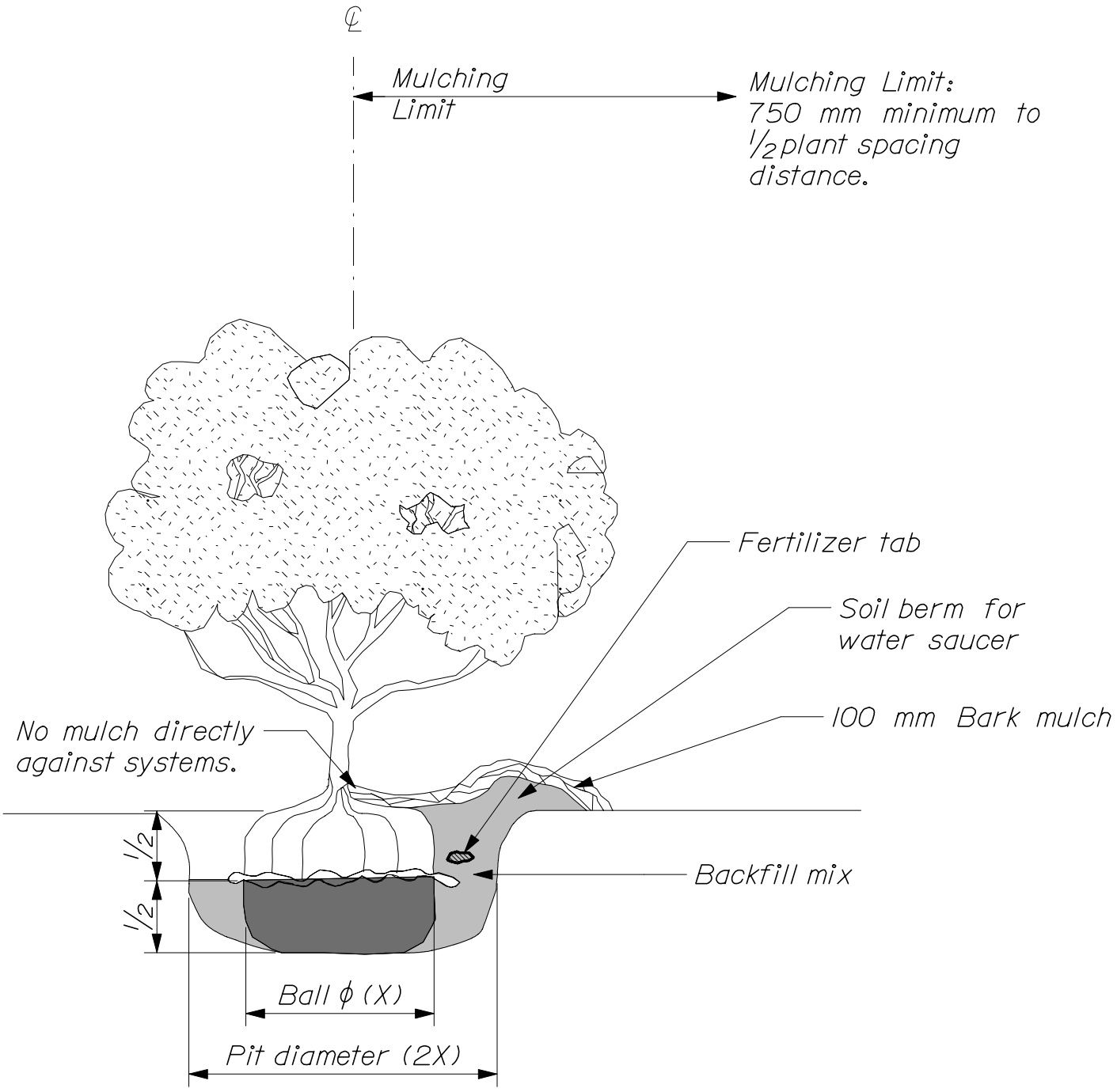
7. Live branch cuttings should be placed at each course to the top of the cribwall structure with growing tips oriented toward the slope face. Follow each layer of branches with a layer of compacted fill to ensure soil contact with the live branch cuttings. The basal ends of the live branch cutting should reach the soil at the back of the cribwall with growing tips protruding slightly beyond the front of the cribwall.

LIVE CRIBWALL
CONSTRUCTION & INSTALLATION NOTES

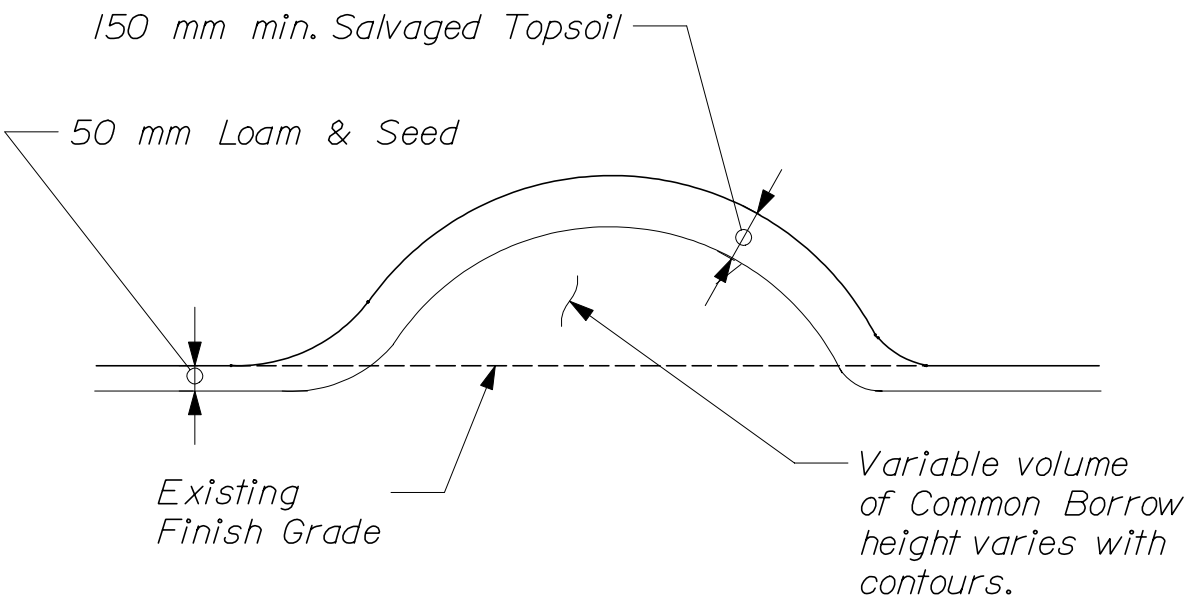
621(08)



# TREE PLANTING
# PLANTING DETAILS
621(09)



# SHRUB PLANTING
# PLANTING DETAILS
621(10)



PLANTING NOTES

Backfill in 100 mm lifts and tamp to half the depth of the ball. Loosen and spread out burlap- cut out excessive bulk. Remove top half of wire basket.

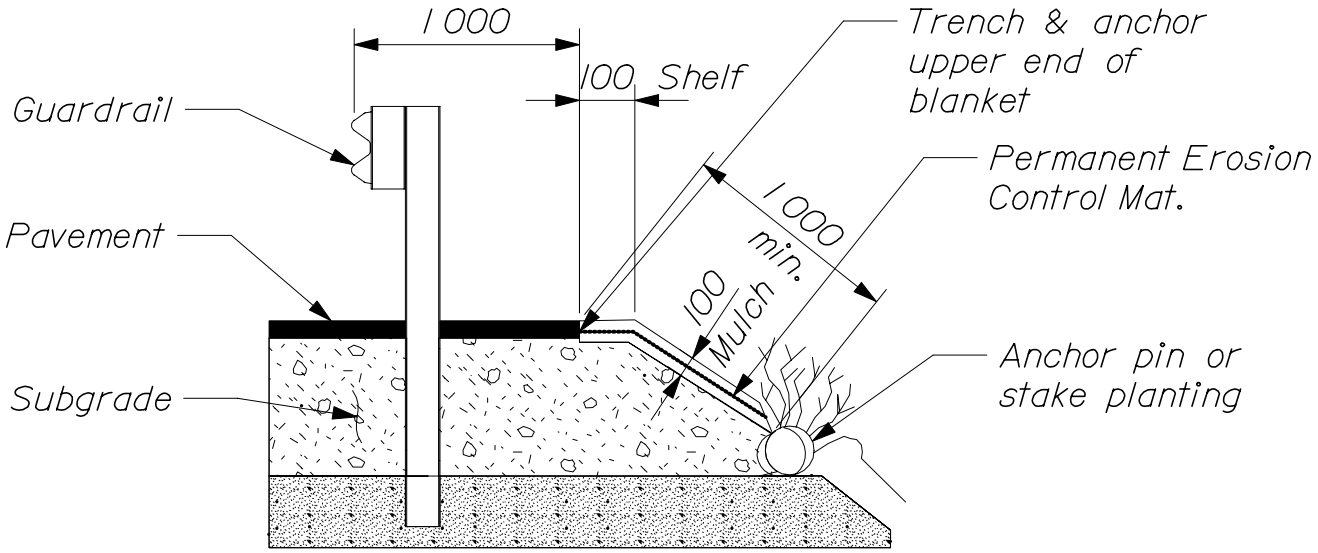
HERBICIDE NOTE

Plant beds that have been treated with Round Up herbicide for weed control shall not be disturbed for a min. of 7 days.

BACKFILL MIX

3 parts Loam to 1 part approved compost.

# PLANTING DETAILS
# LANDSCAPE MOUND DETAIL
621(11)

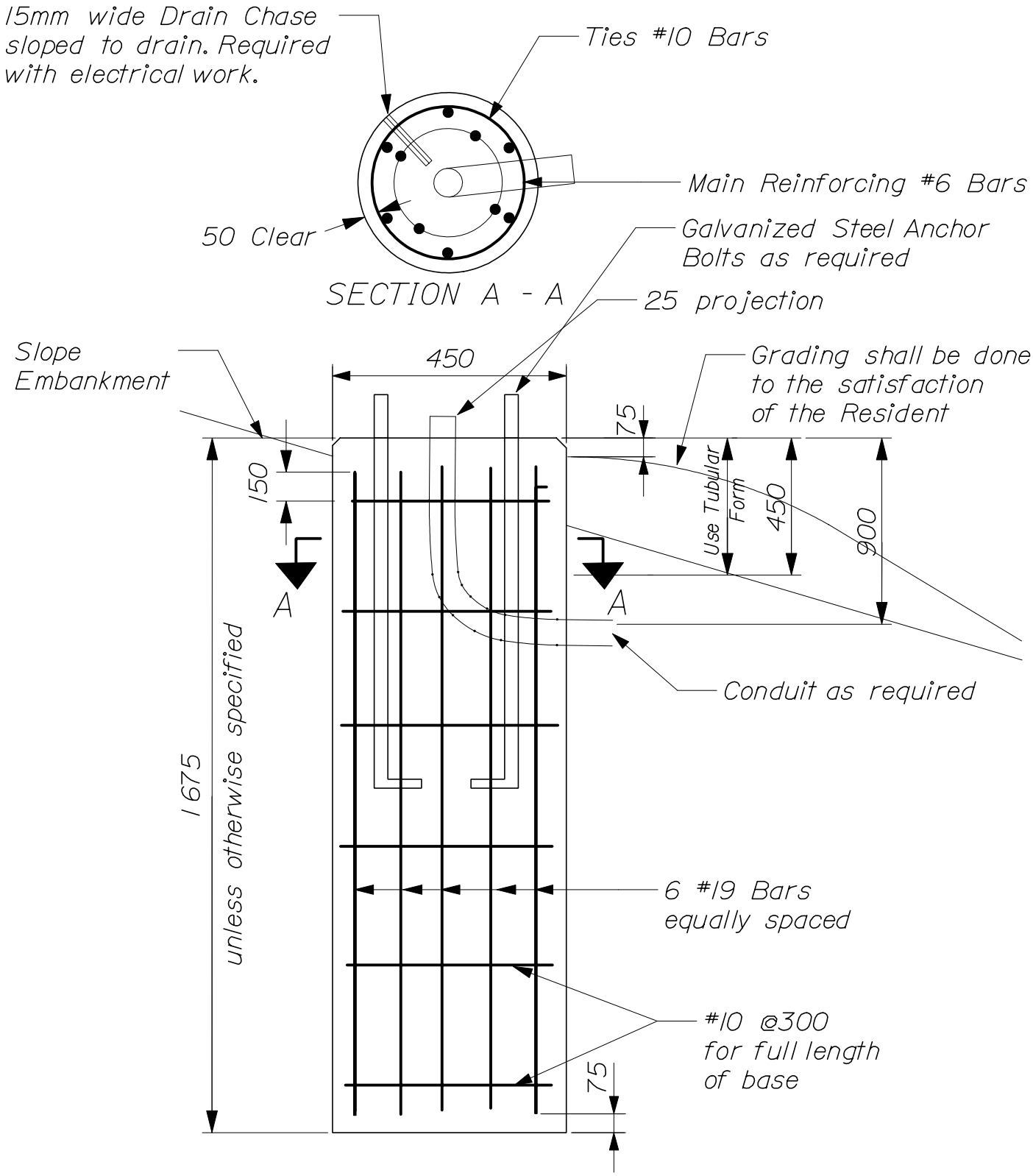


NOTES:

1. Level existing surface to recieve mat. Cut 100 mm wide shelf into top edge of installation area.
2. Lay matting pealed side down. Stretch mat approximately 5% before staking.
3. Stake top edge, then throughout the remainder of the mat at 1 m to 1.5 m intervals.
4. Backfill shelf with original material and tamp firmly.
5. Cover mat with mulch as in plant bed. Mulch shall be level with pavement surfaces.

EROSION CONTROL MAT PLANTING DETAILS

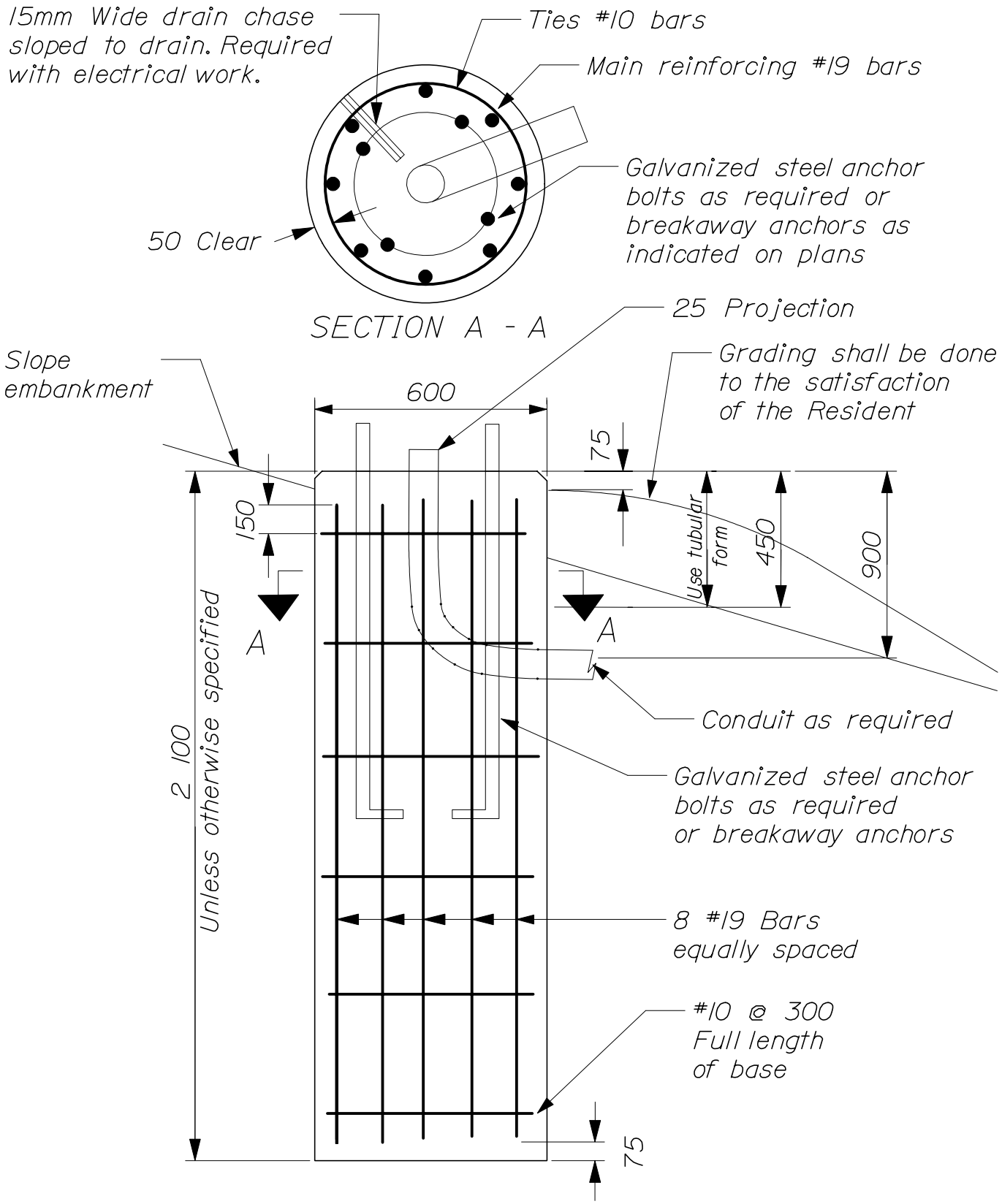
621(12)



450mm FOUNDATION
ITEM NO. 626.31

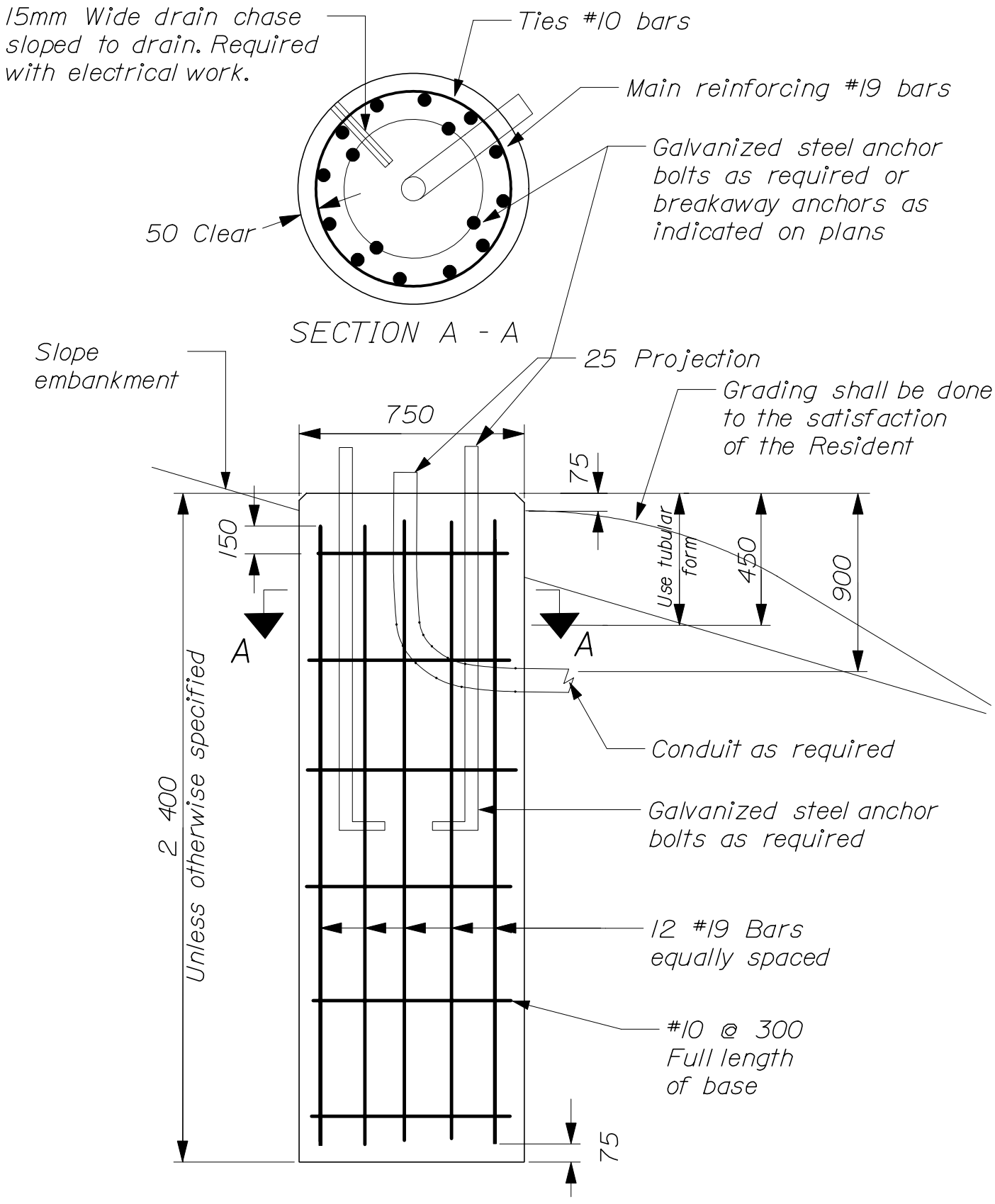
FOUNDATIONS FOR TRAFFIC SIGNALS, HIGHWAY SIGNING AND LIGHTING

626(01)



FOUNDATIONS FOR TRAFFIC SIGNALS, HIGHWAY SIGNING AND LIGHTING

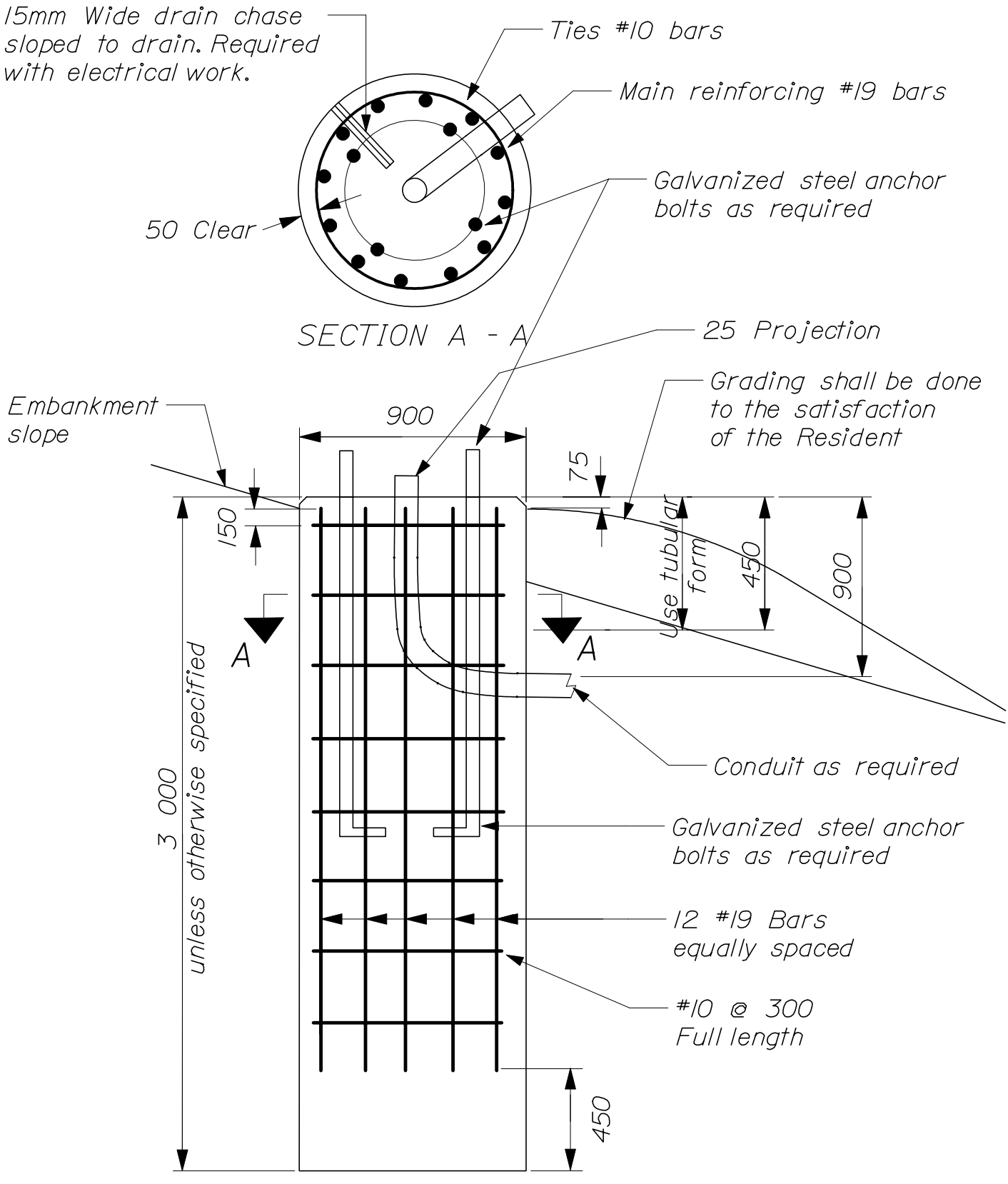
626(02)



750mm FOUNDATION
ITEM NO. 626.33

FOUNDATIONS FOR TRAFFIC SIGNALS, HIGHWAY SIGNING AND LIGHTING

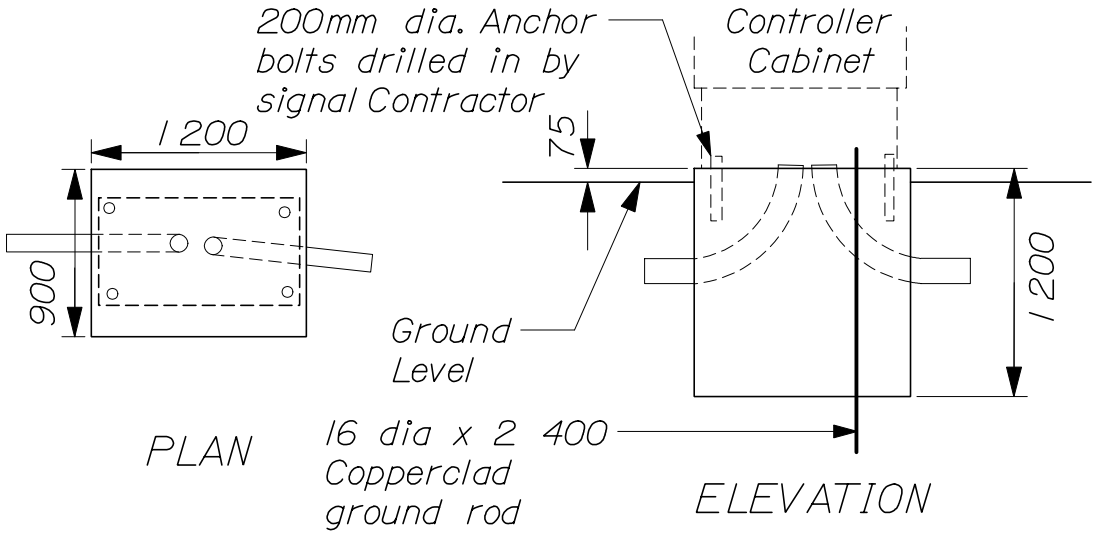
626(03)



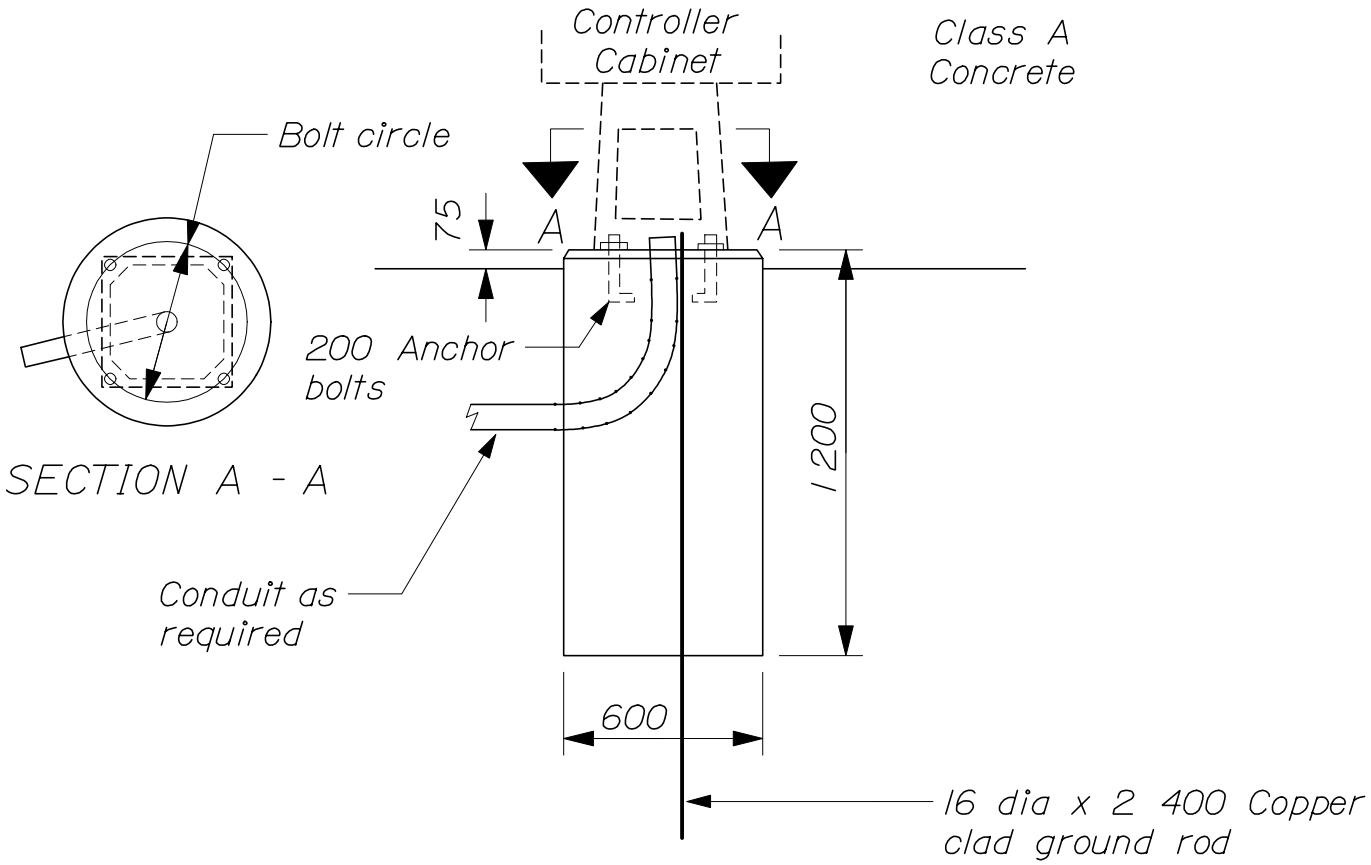
900mm FOUNDATION
ITEM NO. 626.37

FOUNDATIONS FOR TRAFFIC SIGNALS, HIGHWAY SIGNING AND LIGHTING

626(04)



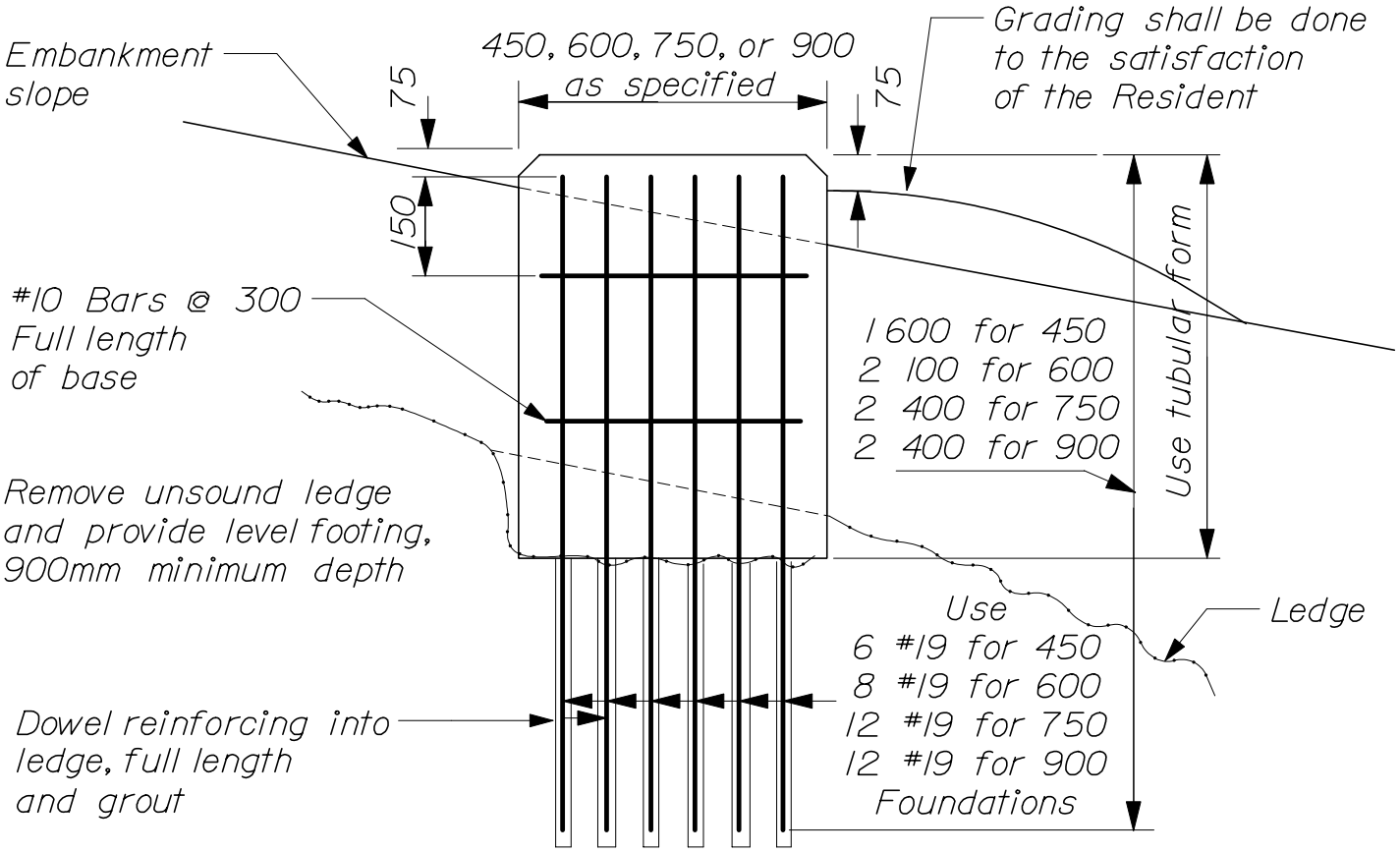
GROUND MOUNTED CONTROLLER CABINET FOUNDATION



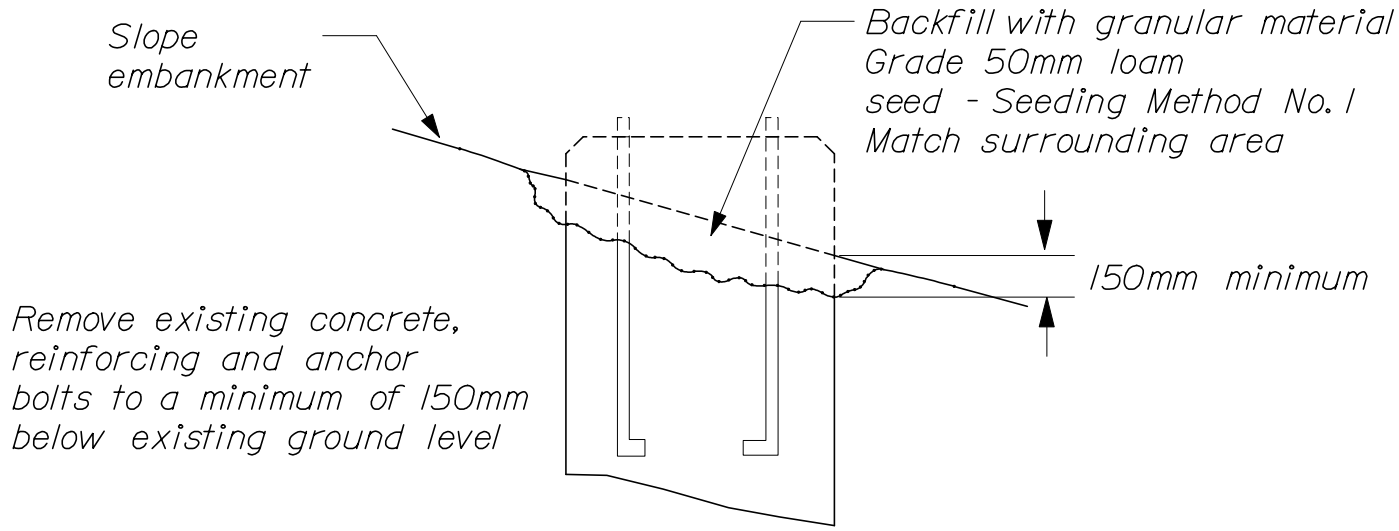
CONTROLLER CABINET FOUNDATION
ITEM NO. 626.35

FOUNDATIONS FOR TRAFFIC SIGNALS, HIGHWAY SIGNING AND LIGHTING

626(05)



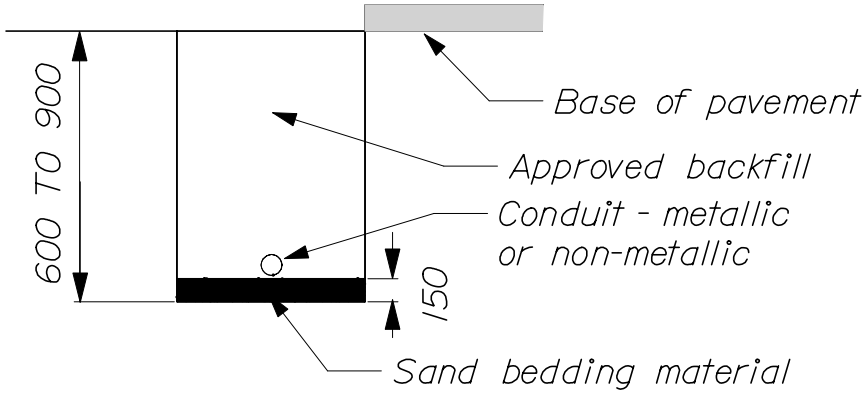
450, 600, 750, 900MM FOUNDATIONS
WHERE SOLID ROCK IS ENCOUNTERED AT LESS THAN
THE REQUIRED DISTANCE BELOW GROUND LEVEL



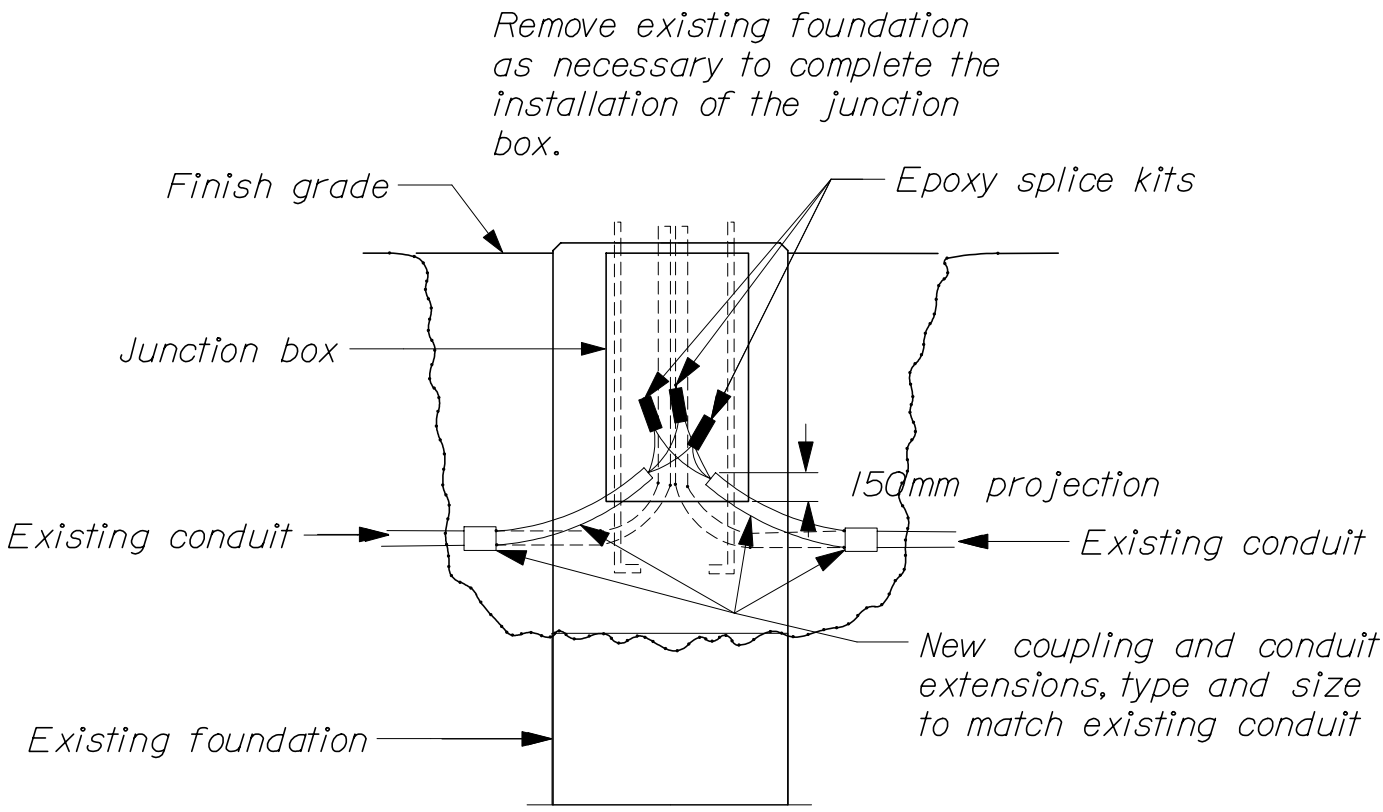
REMOVAL OF CONCRETE FOUNDATIONS
ITEM NO. 626.36

FOUNDATIONS FOR TRAFFIC SIGNALS, HIGHWAY SIGNING AND LIGHTING

626(06)



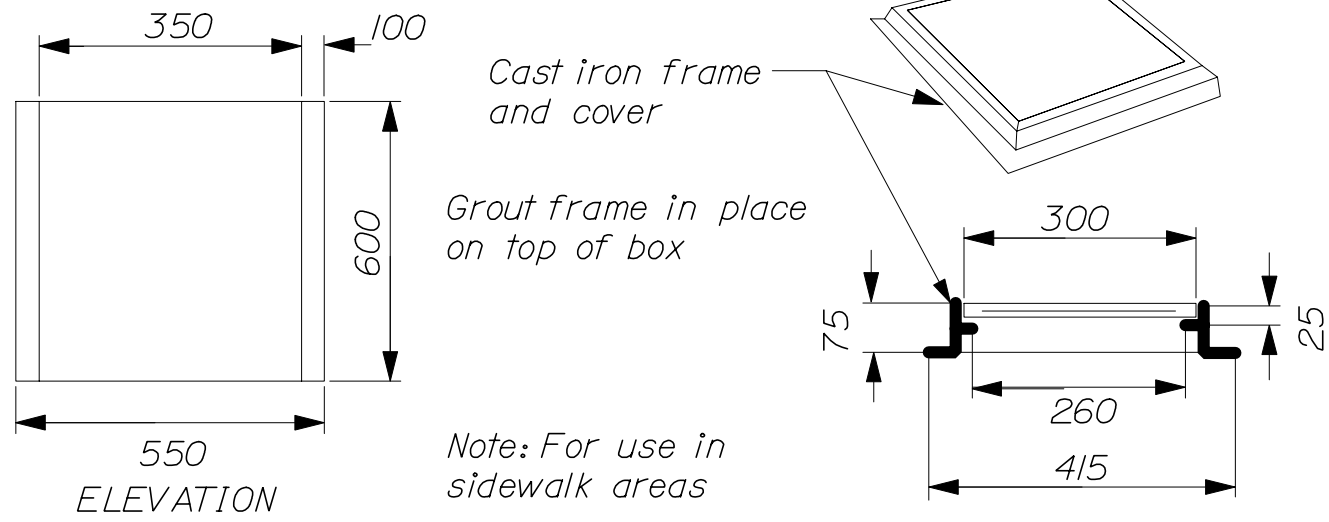
CONDUIT TRENCH

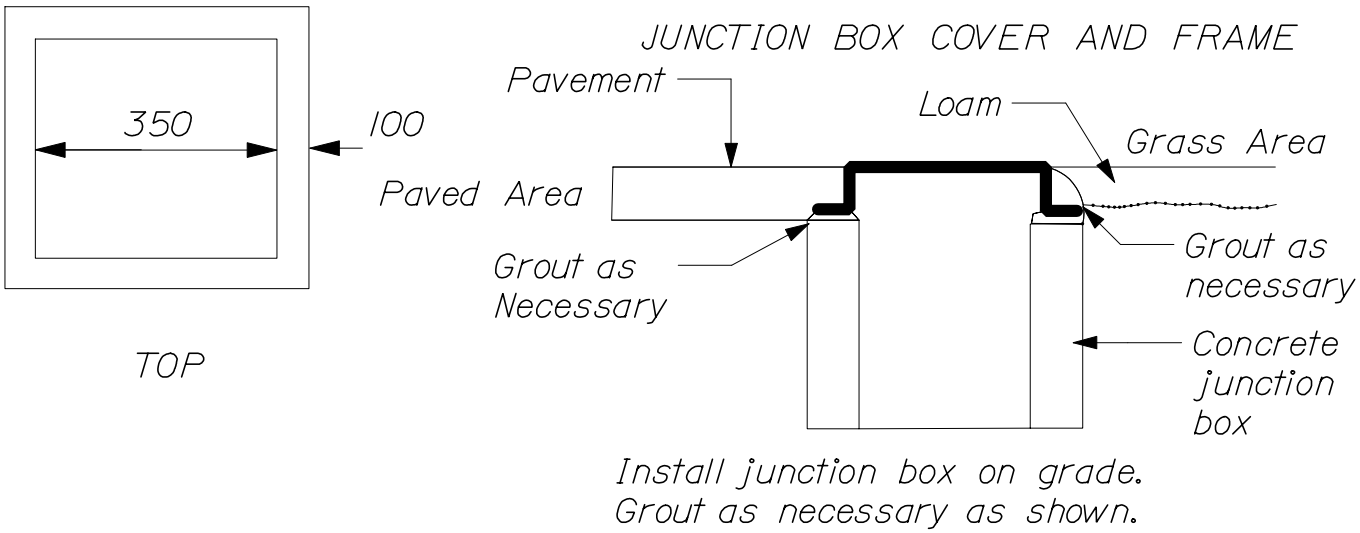


MODIFICATION OF CONCRETE FOUNDATION
ITEM NO. 626.36

FOUNDATIONS FOR TRAFFIC SIGNALS, HIGHWAY SIGNING AND LIGHTING

626(07)

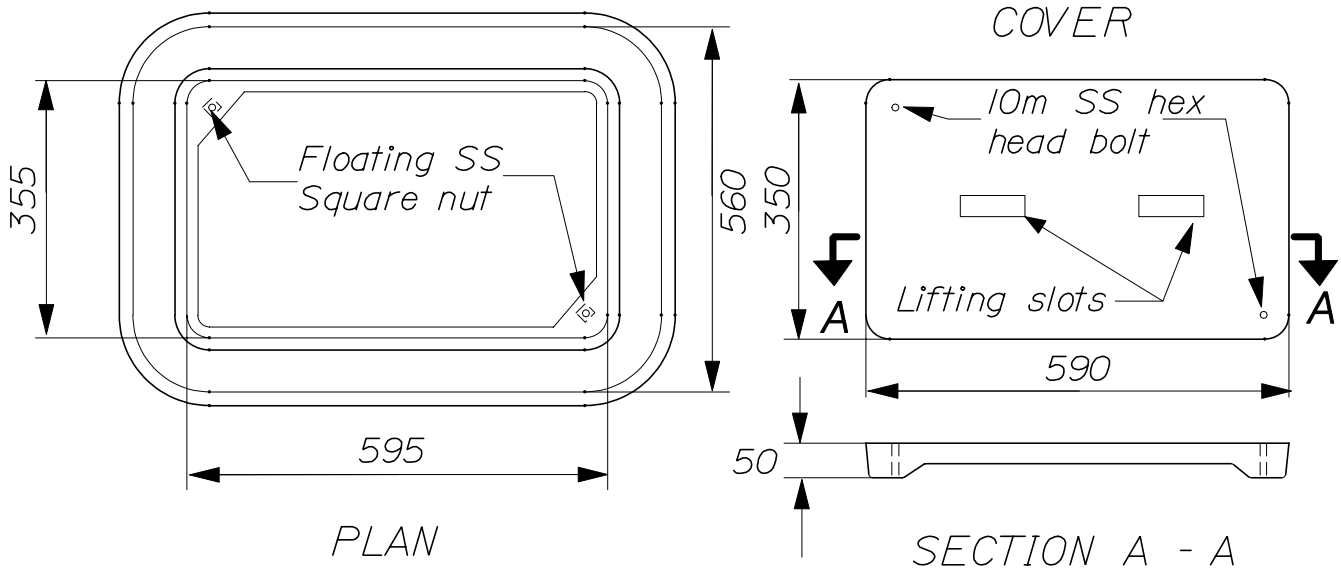




PRECAST CONCRETE JUNCTION BOX
ITEM NO. 626.111

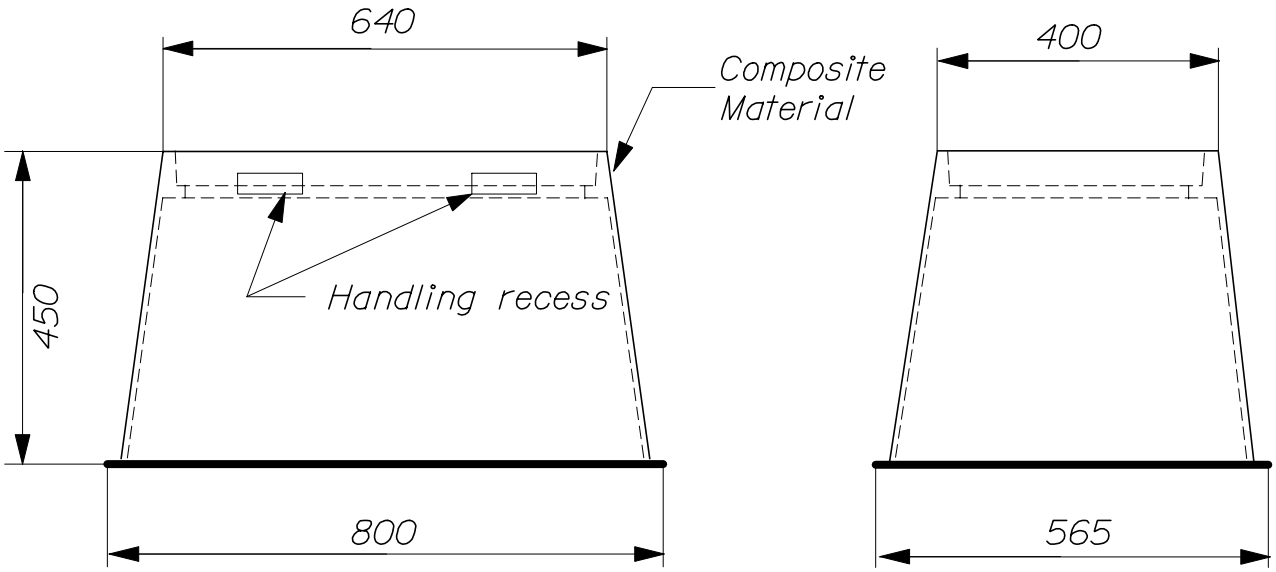
ELECTRICAL JUNCTION BOX FOR TRAFFIC SIGNALS, AND LIGHTING

626(08)



PLAN

SECTION A - A



ELEVATION

END

PRECAST JUNCTION BOX
ITEM NO. 626.11

Note
Junction box shall be CDR Systems Corp, A12-1324-18 or approved equal.

ELECTRICAL JUNCTION BOX FOR TRAFFIC SIGNALS, AND LIGHTING

626(09)

GENERAL NOTES

All pavement markings shall be in conformance with the "Manual on Uniform Traffic Control Devices for Streets and Highways", U.S. DOT, FHWA, 1988.

SYMBOLS AND ARROWS

Stroke width and line width variance shall be no more than ± 6 mm from dimensions shown.

Square meter dimensions shown are pay dimensions, paid by Item No. 627.65.

Grid is marked in 100 mm intervals except as noted. Symbols and letters shall be proportioned according to grid as shown.

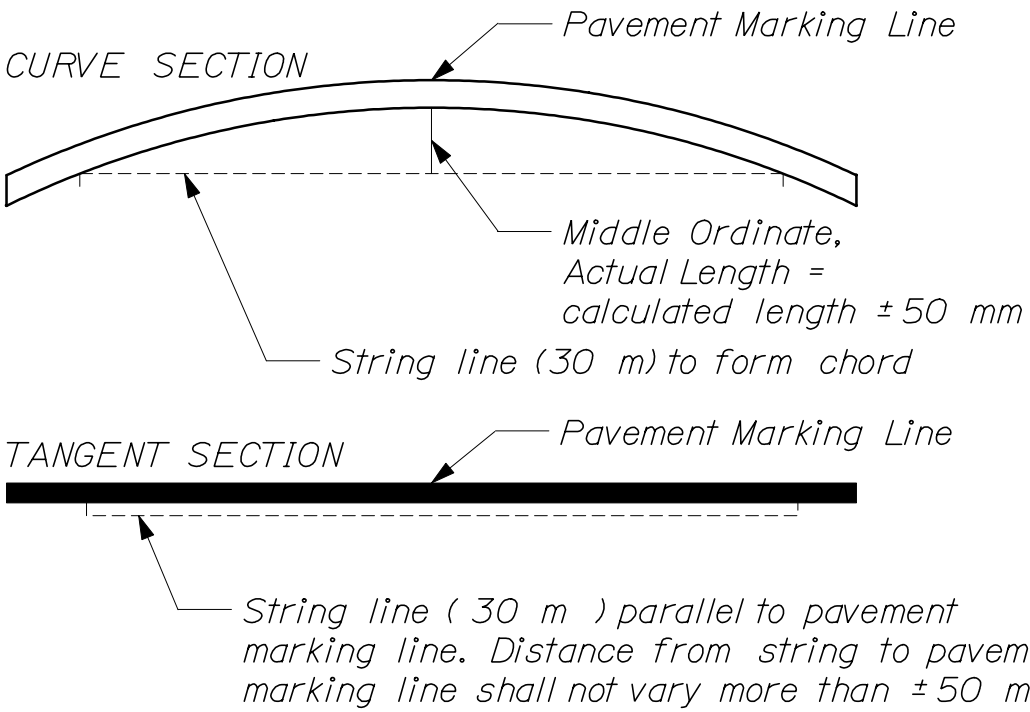
Spacing between characters shall be one unit, but visual spacing may be used.

Spacing between symbol and stop line shall be a minimum of 6 m. Spacing between symbol and symbol shall be a minimum of 16 m or as directed by the Resident.

Pavement marking lines on interstates shall be 150 mm in width.

150 mm crosswalk lines shall be paid for by Item No. 627.65.

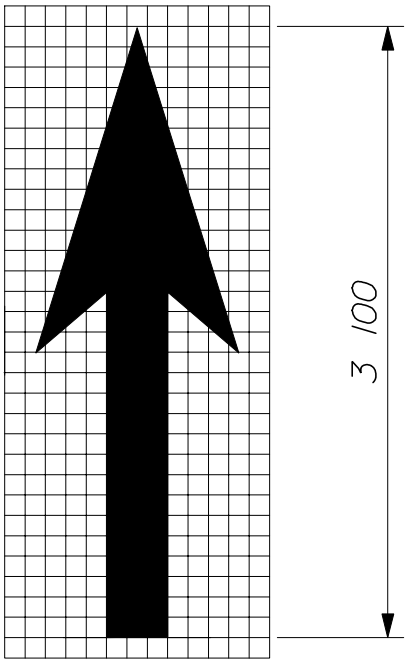
100 mm lines for parking spaces shall be paid for by Item No. 627.65.



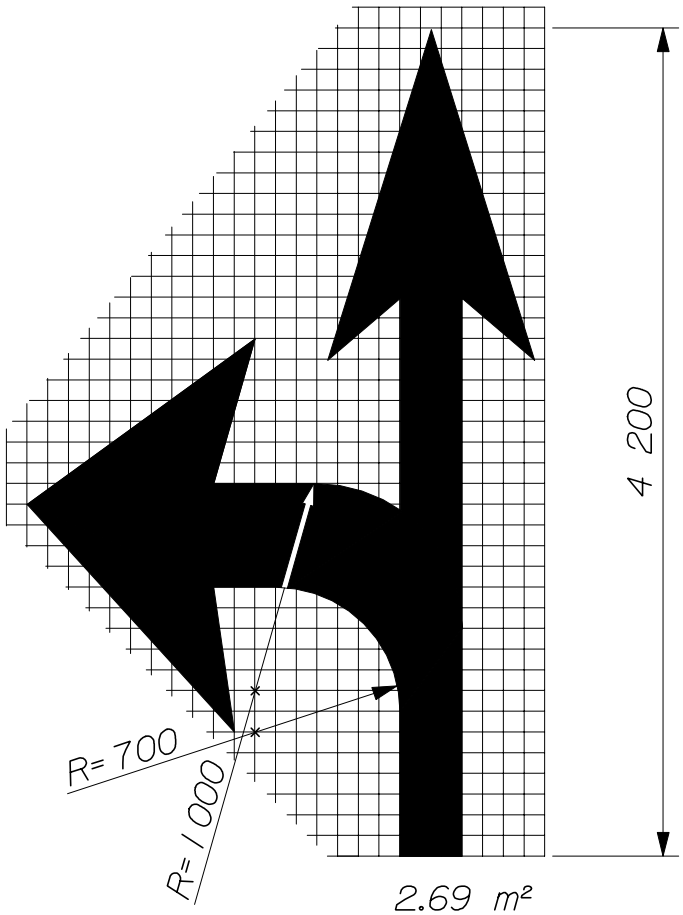
-- TOLERANCE FOR PAVEMENT MARKING LINES --

PAVEMENT MARKING

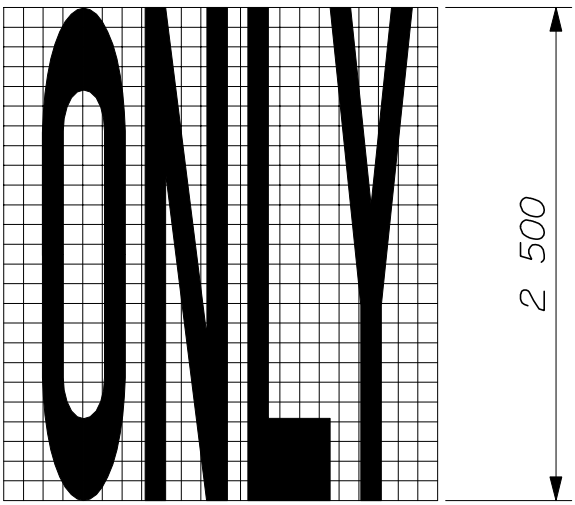
627(01)



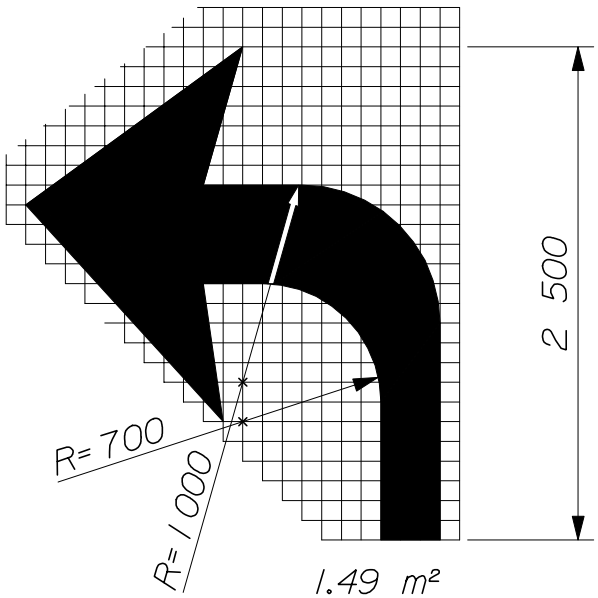
1.21 m²



2.69 m²



2.04 m²

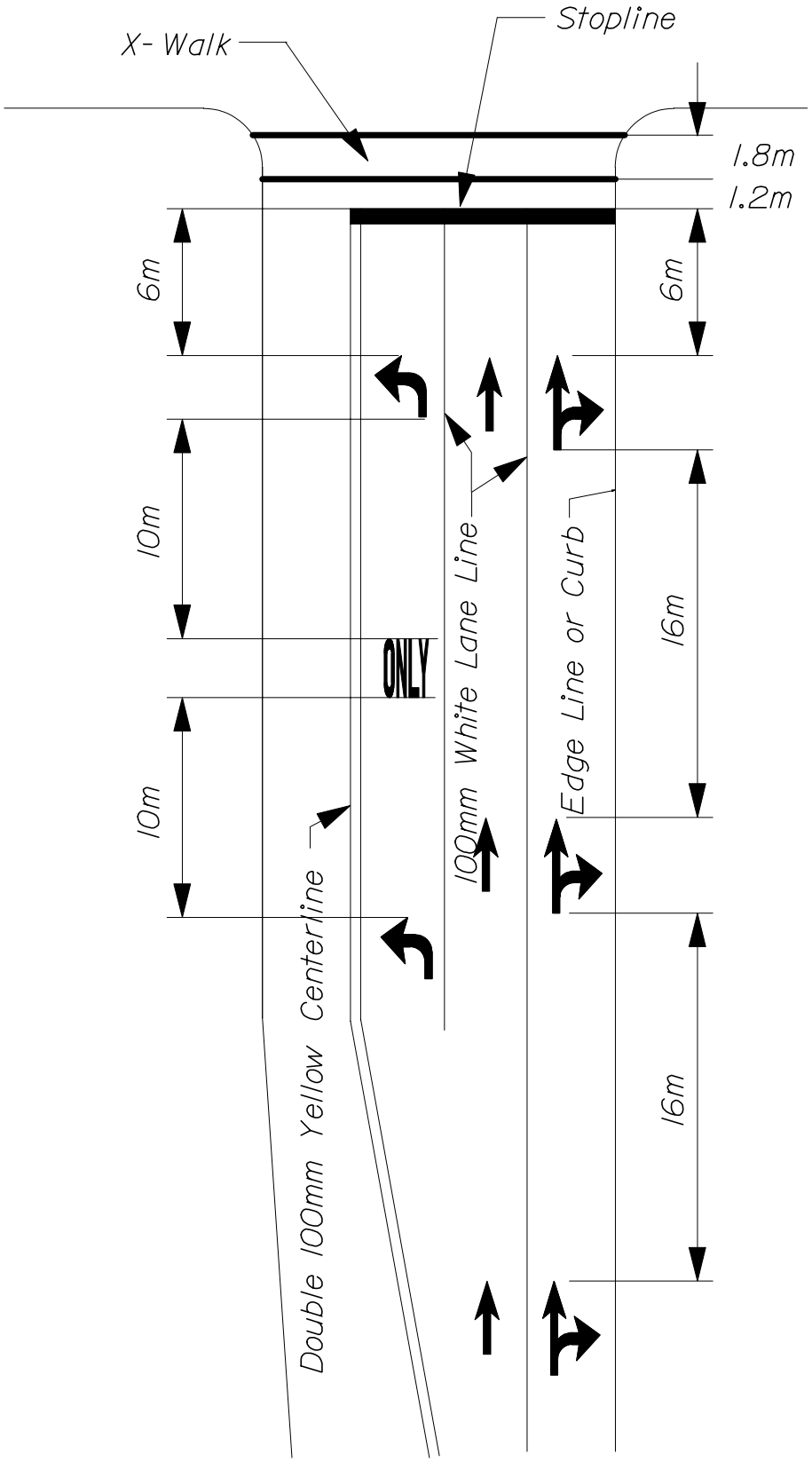


1.49 m²

NOTE: See page 627(01) for general notes on pavement markings.

PAVEMENT MARKING

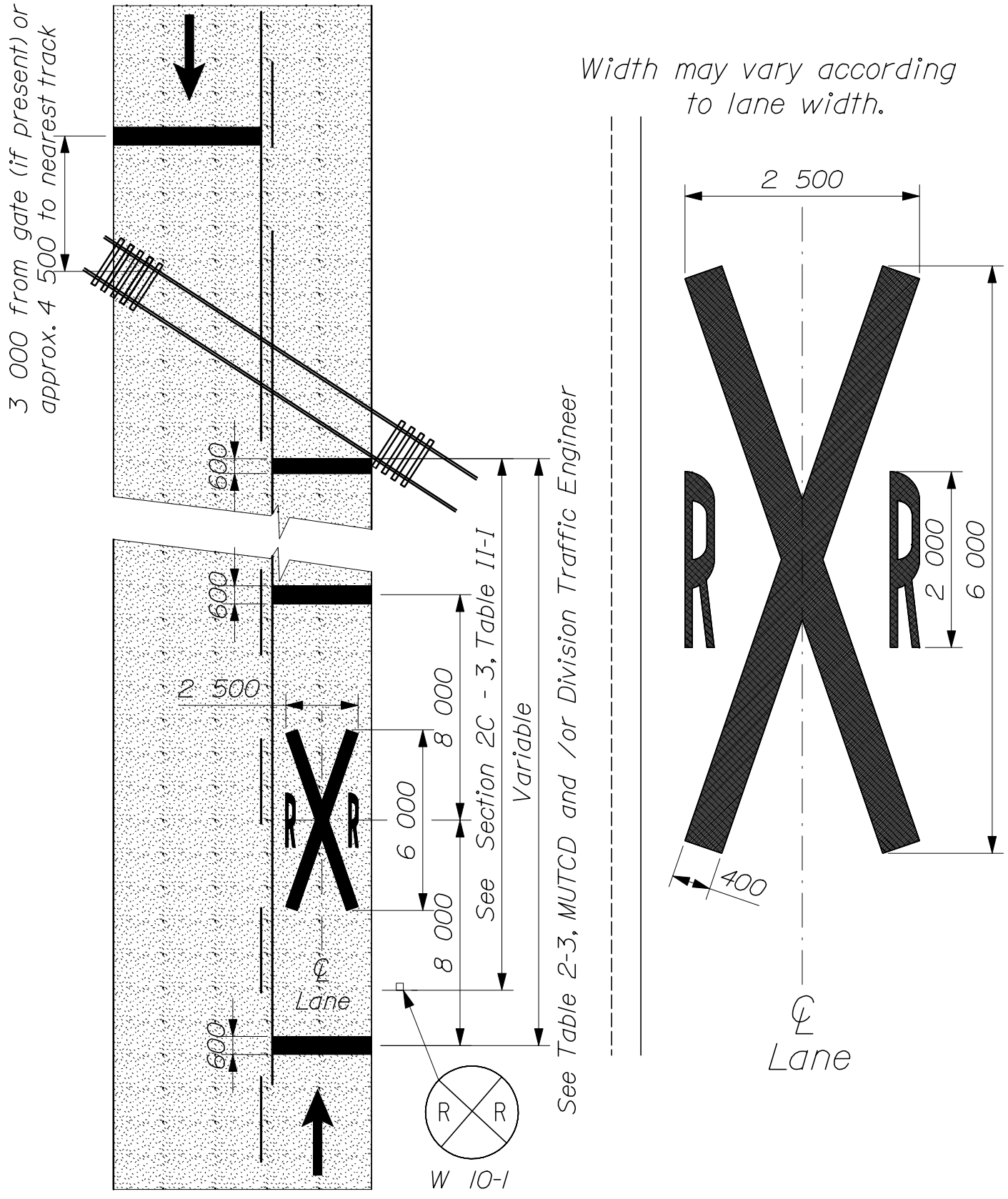
627(02)



TYPICAL PLACEMENT OF PAVEMENT MARKING SYMBOLS AT SIGNALIZED INTERSECTIONS

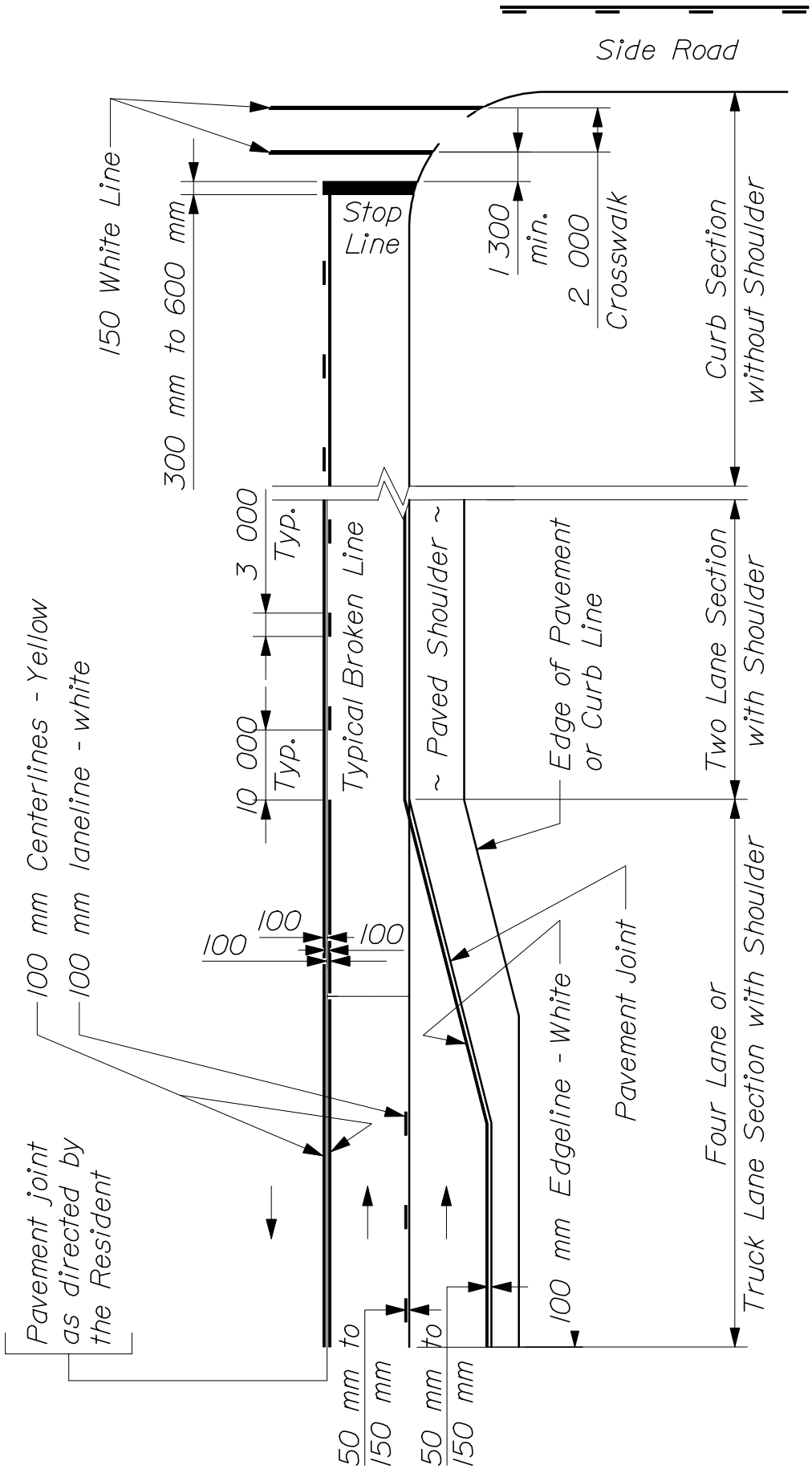
PAVEMENT MARKING

627(03)



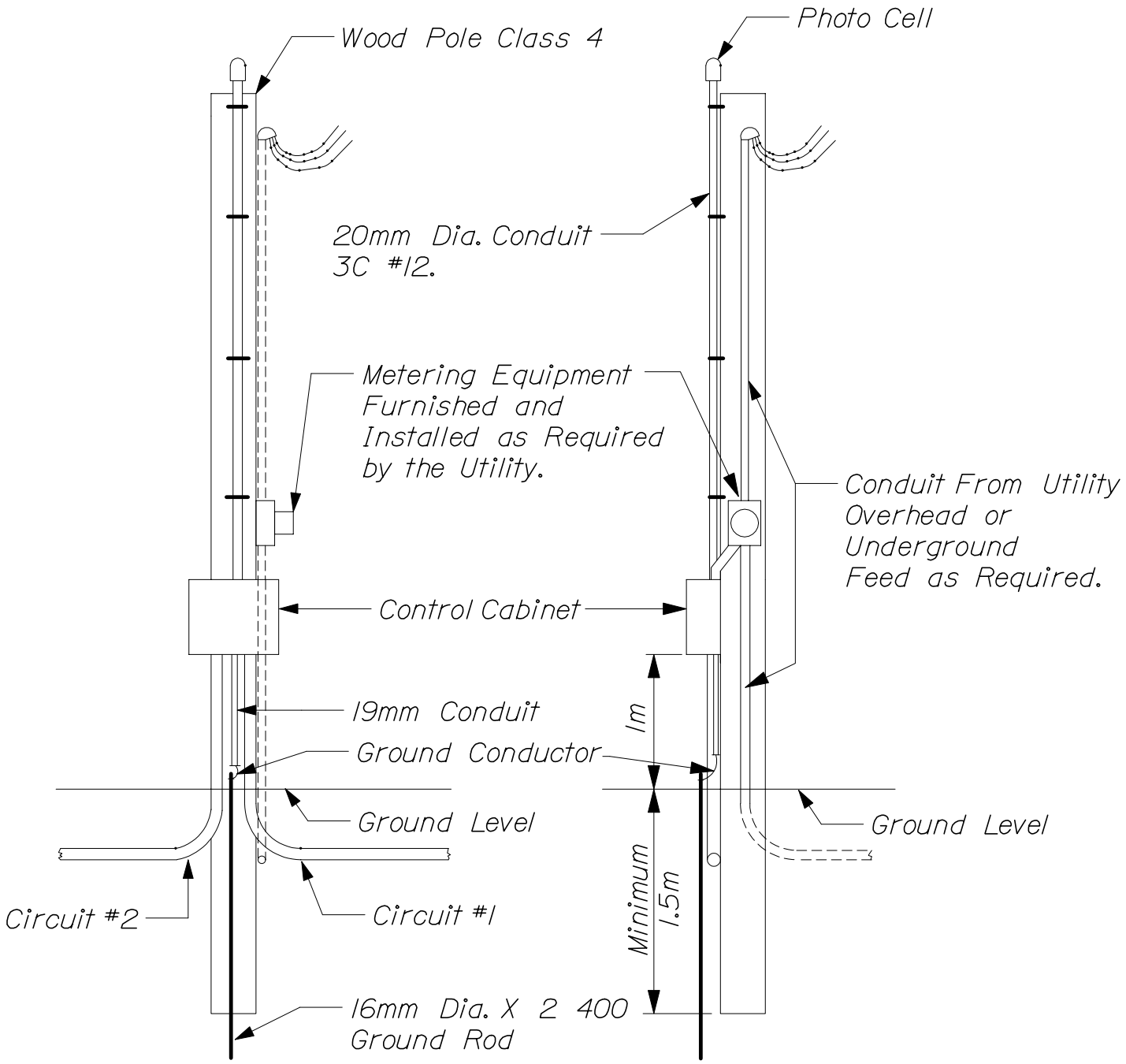
PAVEMENT MARKINGS AT RAILROAD GRADE CROSSINGS

627(04)



PAVEMENT MARKING
TYPICAL TWO - WAY ROADWAY

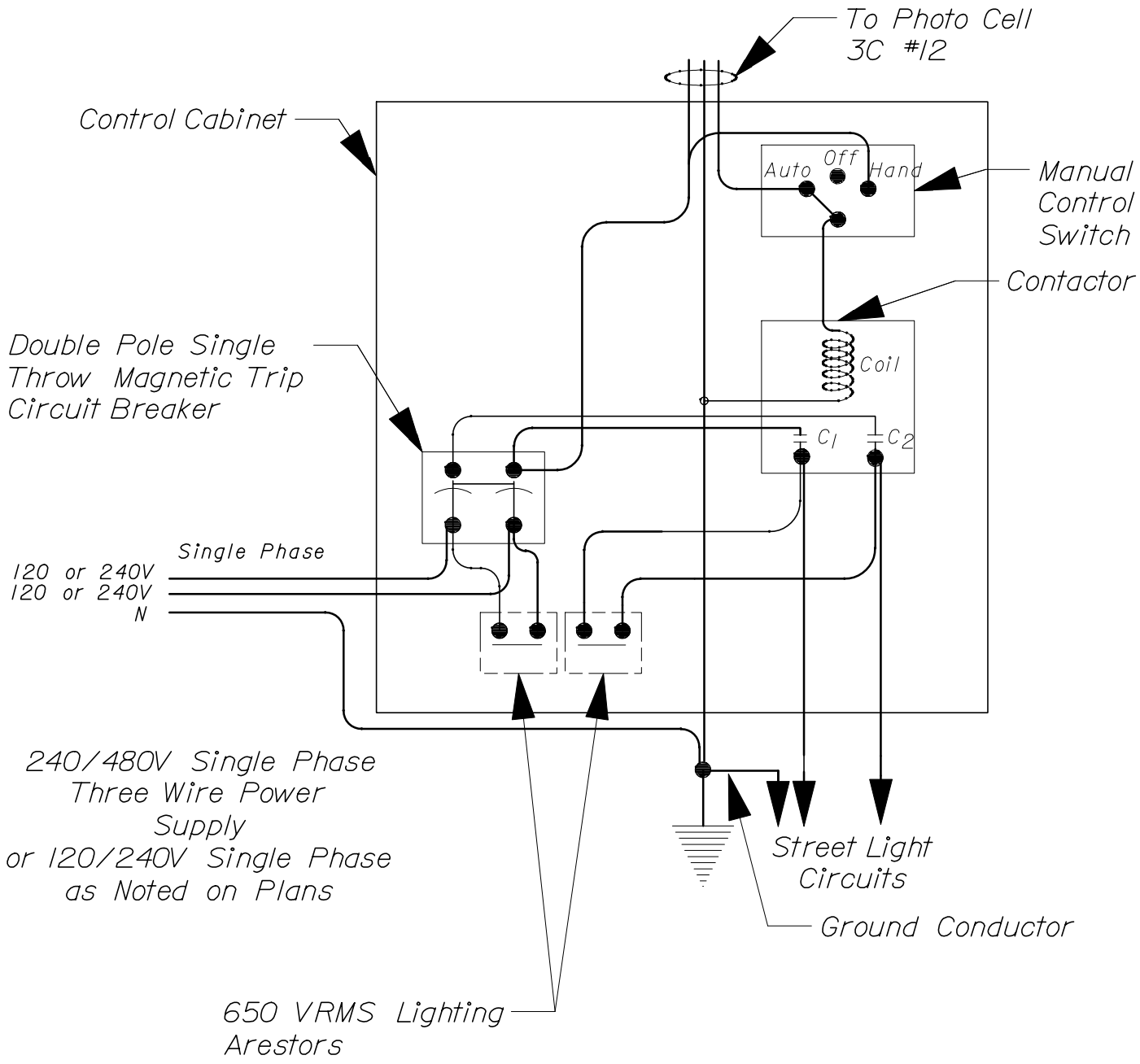
627(05)



SERVICE POLE

HIGHWAY LIGHTING

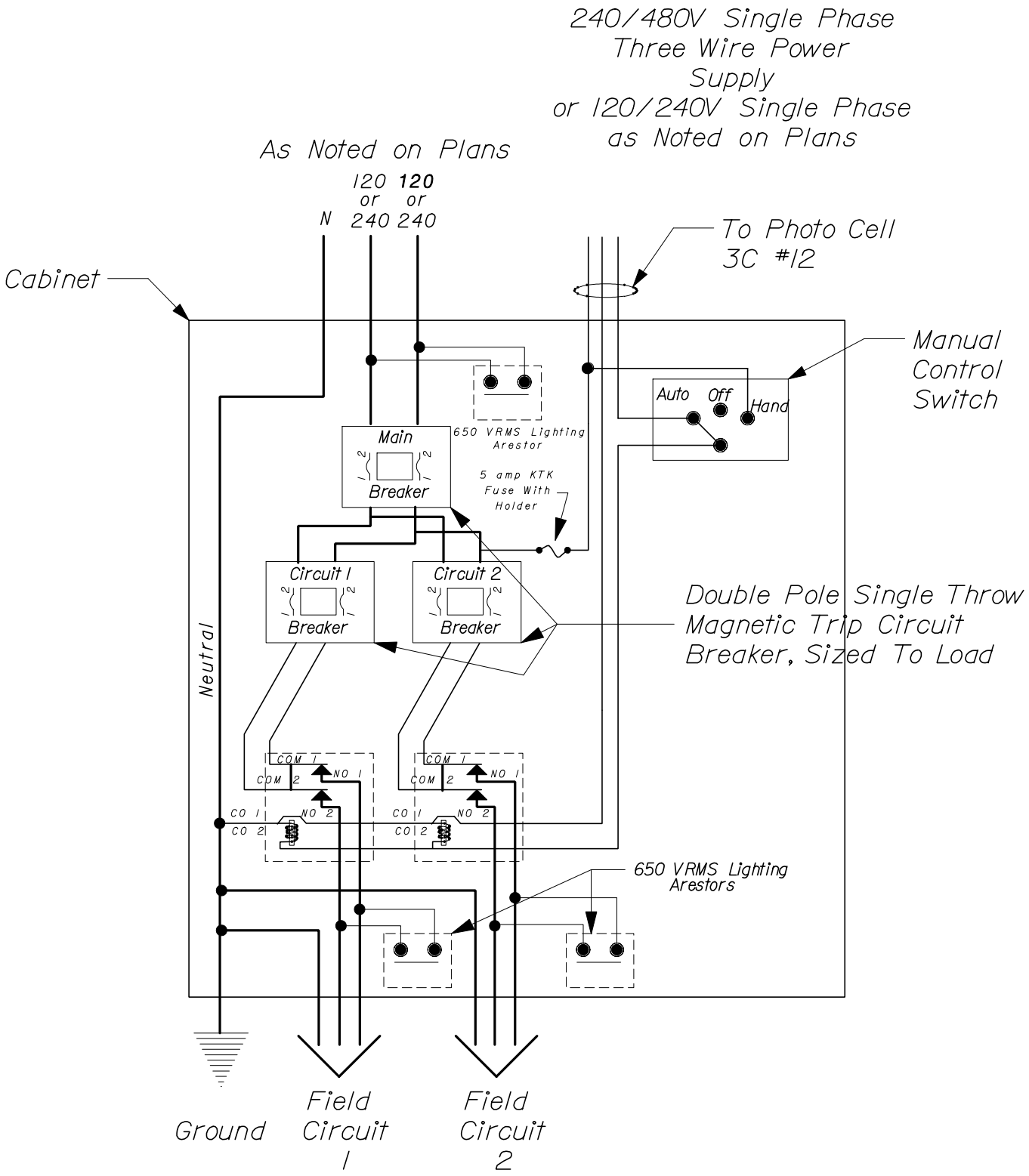
634(01)



SCHEMATIC FOR STREET LIGHTING
CONTROL CABINET
ONE CIRCUIT

HIGHWAY LIGHTING

634(02)



SCHEMATIC FOR STREET LIGHTING
CONTROL CABINET
MULTI CIRCUIT

HIGHWAY LIGHTING

634(03)

150 mm RISE / 300 mm TREAD (1:2 SLOPE)

REINFORCING STEEL

MARK	SIZE	NUMBER	LENGTH (EACH)
R	#16 1.570 kg/m	(2) each parapet (1) each 300 mm of width	275 mm for "A" +335 mm for each "B" +300 mm for "C"
S	#16 1.570 kg/m	(2) for "A" (2) for each "B" (2) for "C"	100 mm each parapet +300 mm per 300 mm of width

CONCRETE CLASS "A"

SECTION	STEPS PER 305 mm OF WIDTH	PARAPET EACH WALL
"A" header "B" each inter. Step "C" footer	0.020 m^3 0.023 m^3 0.025 m^3	0.010 m^3 0.016 m^3 0.017 m^3

200 mm RISE / 300 mm TREAD (1:1.5 SLOPE)

REINFORCING STEEL

MARK	SIZE	NUMBER	LENGTH (EACH)
R	#16 1.570 kg/m	(2) each parapet (1) each 300 mm of width	275 mm for "A" +363 mm for each "B" +300 mm for "C"
S	#16 1.570 kg/m	(2) for "A" (2) for each "B" (2) for "C"	100 mm each parapet +300 mm per 300 mm of width

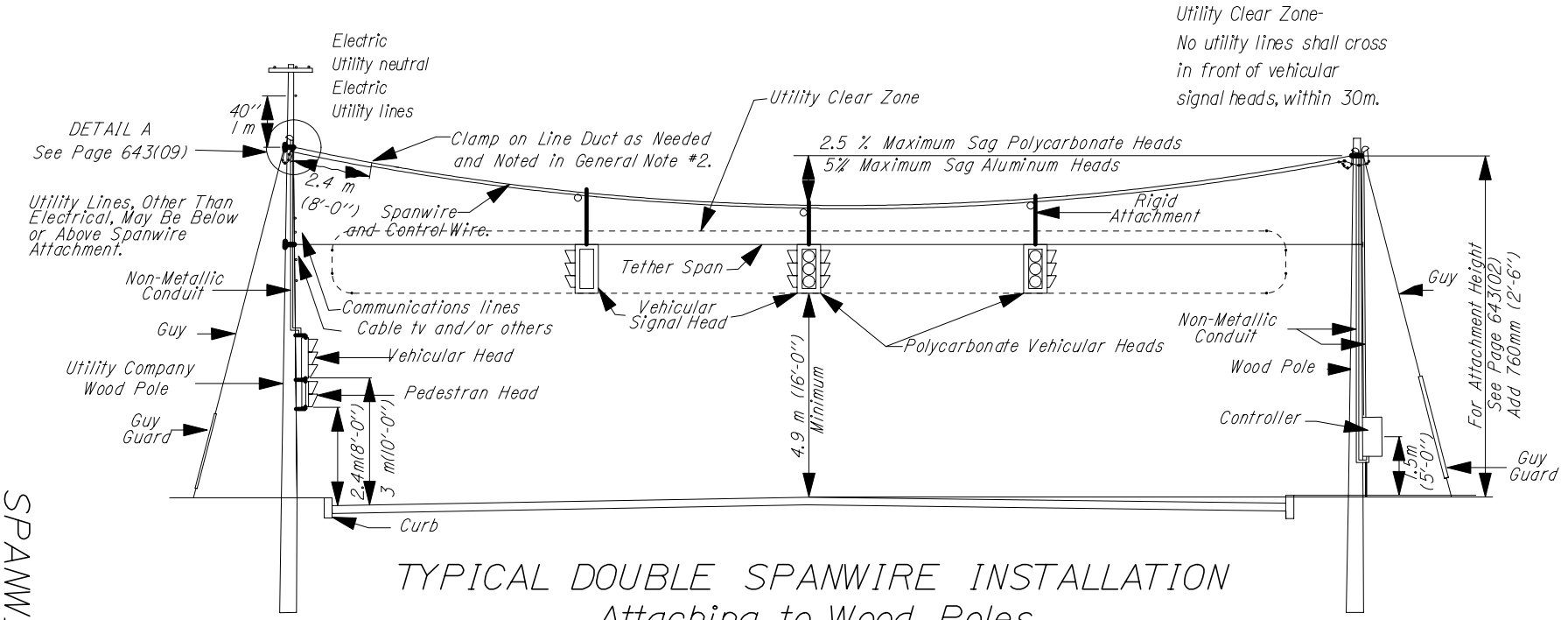
CONCRETE CLASS "A"

SECTION	STEPS PER 305 mm OF WIDTH	PARAPET EACH WALL
"A" header "B" each inter. Step "C" footer	0.025 m^3 0.027 m^3 0.028 m^3	0.012 m^3 0.019 m^3 0.020 m^3

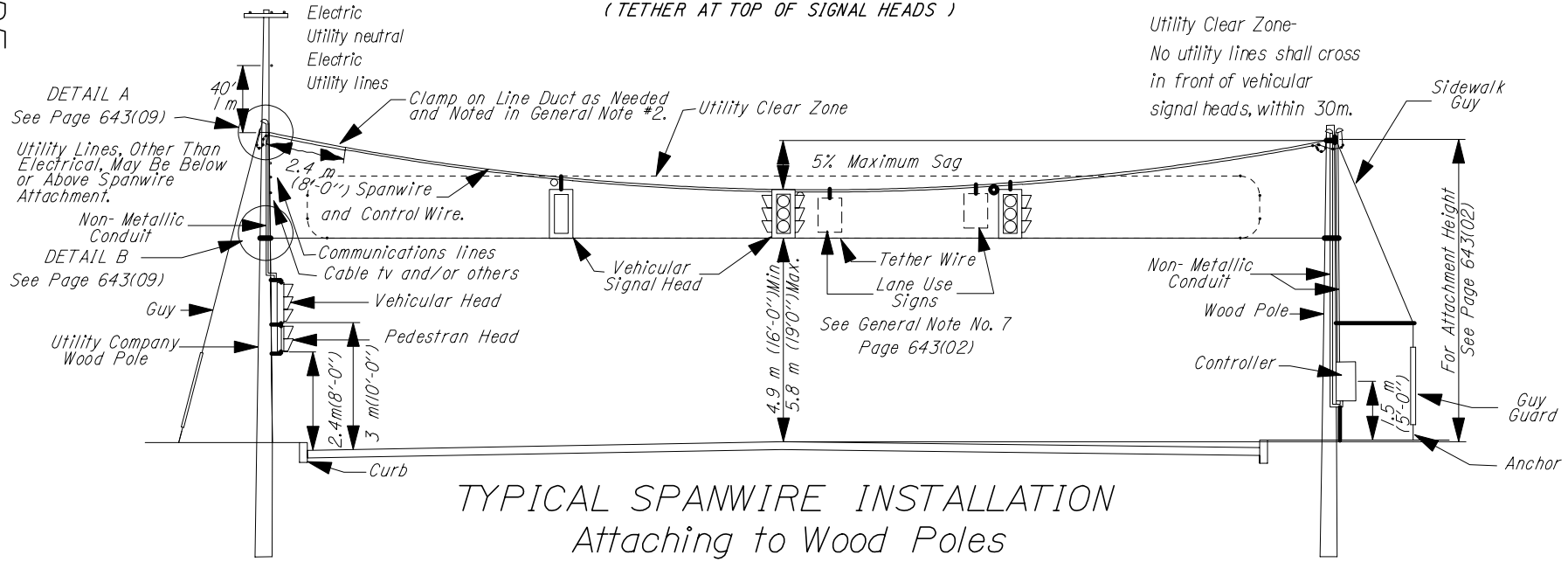
QUANTITIES FOR CONCRETE STEPS

642(01)

SPANWIRE



TYPICAL DOUBLE SPANWIRE INSTALLATION
Attaching to Wood Poles
(TETHER AT TOP OF SIGNAL HEADS)



TYPICAL SPANWIRE INSTALLATION
Attaching to Wood Poles
(TETHER AT BOTTOM OF SIGNAL HEADS)

HEIGHT OF SPANWIRE ATTACHMENT

HORIZONTAL SPAN WIDTH	HEIGHT OF SPANWIRE ATTACHMENT- 5% Sag Aluminum Heads	HEIGHT OF TOP ATTACHMENT- 2.5% Sag DOUBLE SPANWIRE Polycarbonate Heads
UP TO 11.6m (38ft)	6.70m (22'-0'')	7.11m (23'-4'')
12.2m (40ft)	6.86m (22'-6'')	7.16m (23'-6'')
13.7m (45ft)	6.93m (22'-9'')	
15.2m (50ft)	7.01m (23'-0'')	7.24m (23'-9'')
16.8m (55ft)	7.08m (23'-3'')	
18.3m (60ft)	7.16m (23'-6'')	7.31m (24'-0'')
19.8m (65ft)	7.24m (23'-9'')	
21.3m (70ft)	7.31m (24'-0'')	7.39m (24'-3'')
22.9m (75ft)	7.39m (24'-3'')	
24.4m (80ft)	7.47m (24'-6'')	7.46m (24'-6'')
26.0m (85ft)	7.54m (24'-9'')	
27.4m (90ft)	7.62m (25'-0'')	7.54m (24'-9'')
29.0m (95ft)	7.69m (25'-3'')	
30.5m (100ft)	7.77m (25'-6'')	7.62m (25'-0'')
32.0m (105ft)	7.84m (25'-9'')	
33.5m (110ft)	7.92m (26'-0'')	7.69m (25'-3'')
35.0m (115ft)	8.00m (26'-3'')	
36.5m (120ft)	8.07m (26'-6'')	7.77m (25'-6'')
38.0m (125ft)	8.15m (26'-9'')	
39.6m (130ft)	8.23m (27'-0'')	7.85m (25'-9'')
41.0m (135ft)	8.31m (27'-3'')	
42.7m (140ft)	8.38m (27'-6'')	7.92m (26'-0'')
44.2m (145ft)	8.45m (27'-9'')	
45.7m (150ft)	8.53m (28'-0'')	8.00m (26'-3'')
47.2m (155ft)	8.61m (28'-3'')	
48.7m (160ft)	8.68m (28'-6'')	8.08m (26'-6'')
50.0m (165ft)	8.86m (28'-9'')	

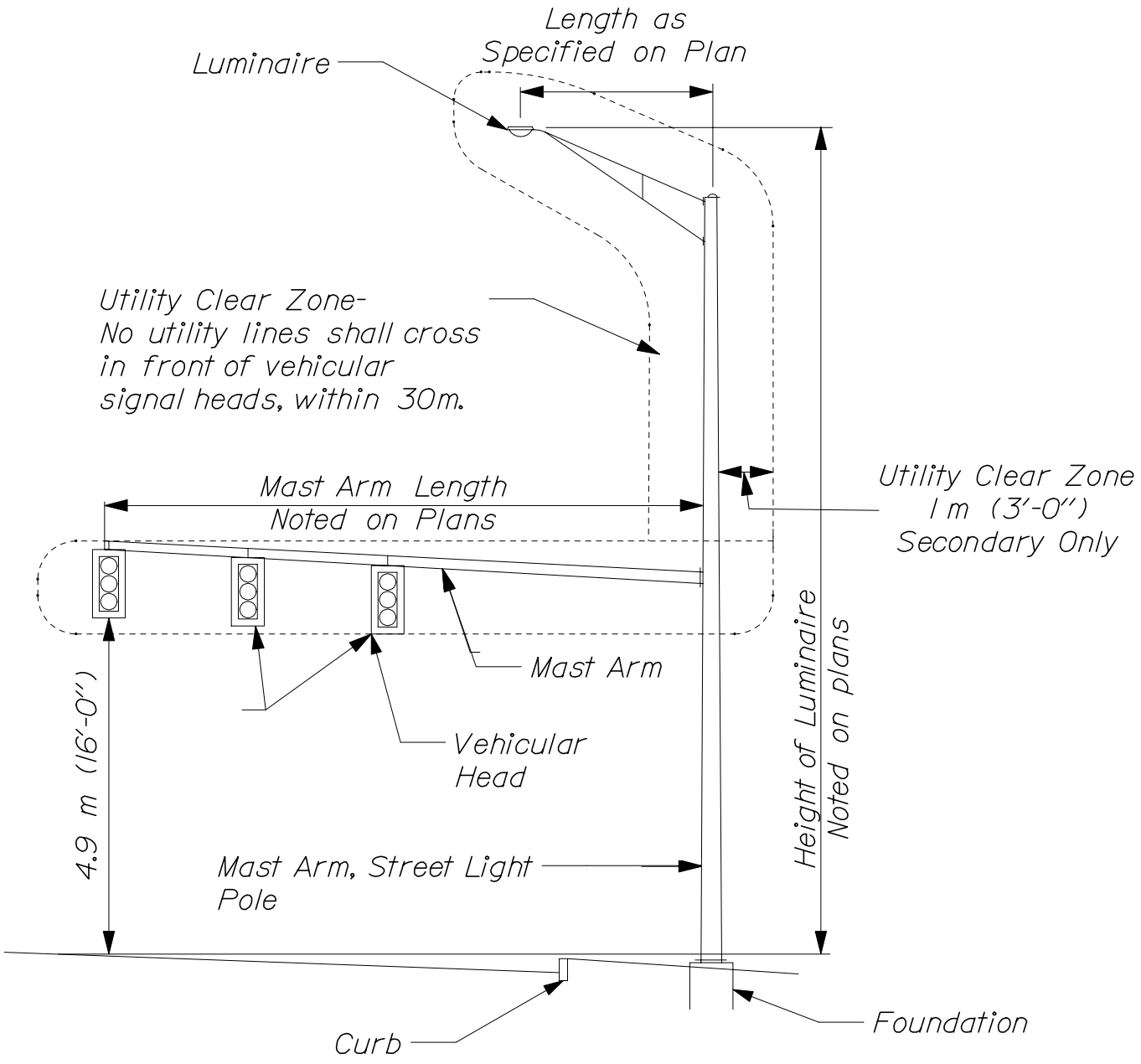
GENERAL NOTES for TRAFFIC SIGNAL SPANWIRE

1. HEIGHT OF SPANWIRE ATTACHMENT IS SHOWN ON CHART ABOVE. WHEN ATTACHING TO UTILITY CO. OWNED POLES THE CONTRACTOR SHALL CHECK WITH RESPECTIVE UTILITY COMPANIES TO DETERMINE IF ALL ADJUSTMENTS HAVE BEEN MADE.
2. WHEN UTILITY POLE CLEARANCES CANNOT BE MET, THE SIGNAL SPANWIRE SHALL BE PROTECTED BY FLEXIBLE SCHEDULE 40 LINE DUCT.
3. THE UTILITY COMPANIES SHALL BE RESPONSIBLE FOR AVOIDING THE TRAFFIC SIGNAL CLEAR ZONE AS SHOWN BELOW. AT THE PRE-CONSTRUCTION UTILITY MEETING CONFLICTS, IF ANY, WILL BE RESOLVED.
4. CONDUITS INSTALLED ON UTILITY COMPANY OWNED POLES WILL BE INSTALLED BY THE RESPECTIVE UTILITY. THE CONDUIT WILL BE PROVIDED BY THE SIGNAL CONTRACTOR.
5. UTILITIES WILL BE NO LOWER THAN 5.9m AT MID SPAN.
6. THE LOCATION OF ALL SIGNAL EQUIPMENT AND RELATED ITEMS SHALL BE IN CONFORMITY WITH 'AMERICANS WITH DISABILITIES ACT' (ADA) ACCESSIBILITY STANDARDS. USE OF SIDEWALKS AND PEDESTRIAN RAMPS SHALL NOT BE OBSTRUCTED.
7. LANE USE SHALL BE HUNG USING "PELCO" ASSEMBLY PART NO. SE-5111 OR EQUAL. VEHICULAR HEADS SHALL BE HANG USING 'PELCO' ASSEMBLY PART NO. SE-5024 OR SE-5073, OR EQUAL.

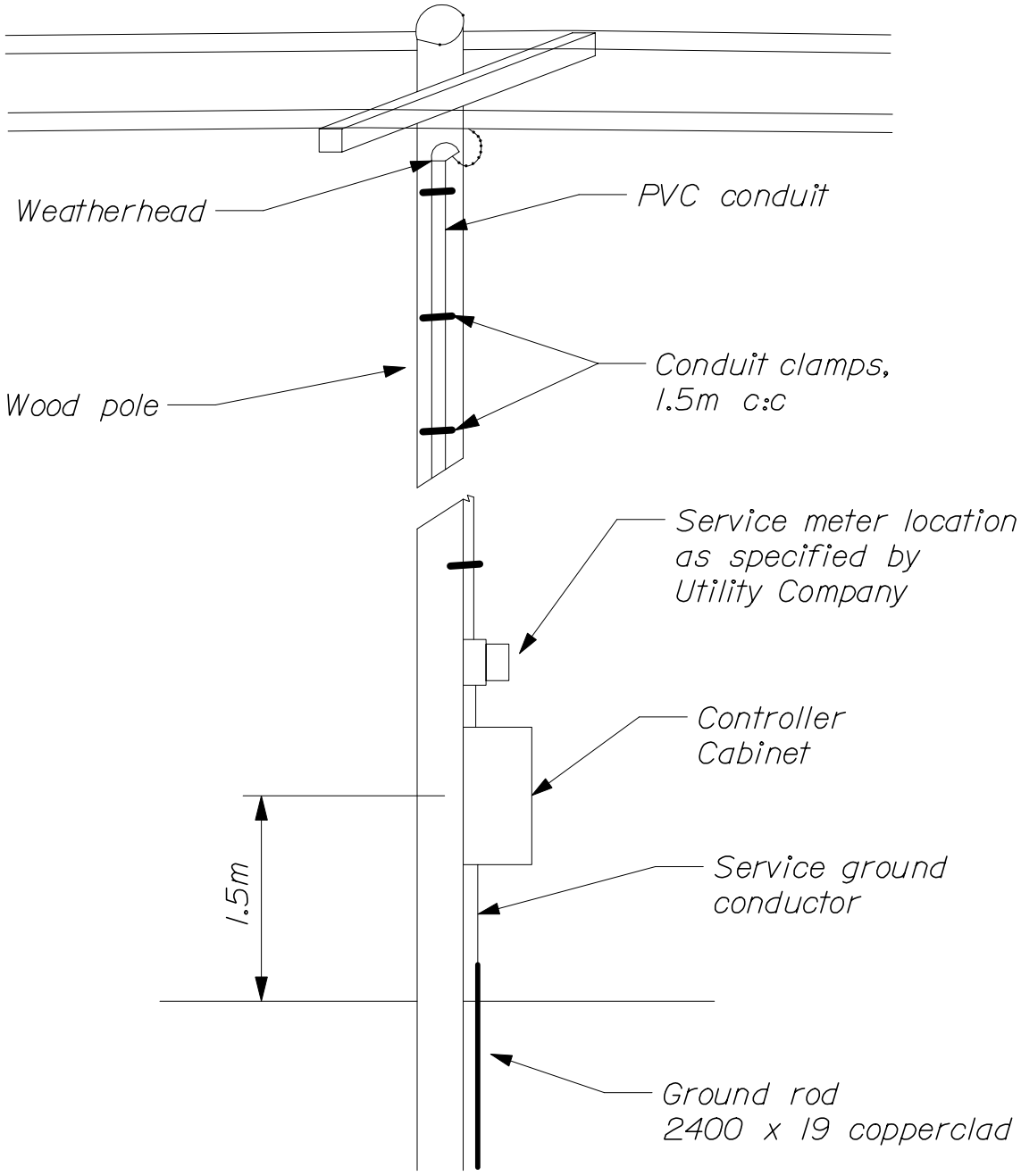
SPANWIRE

TRAFFIC SIGNALS

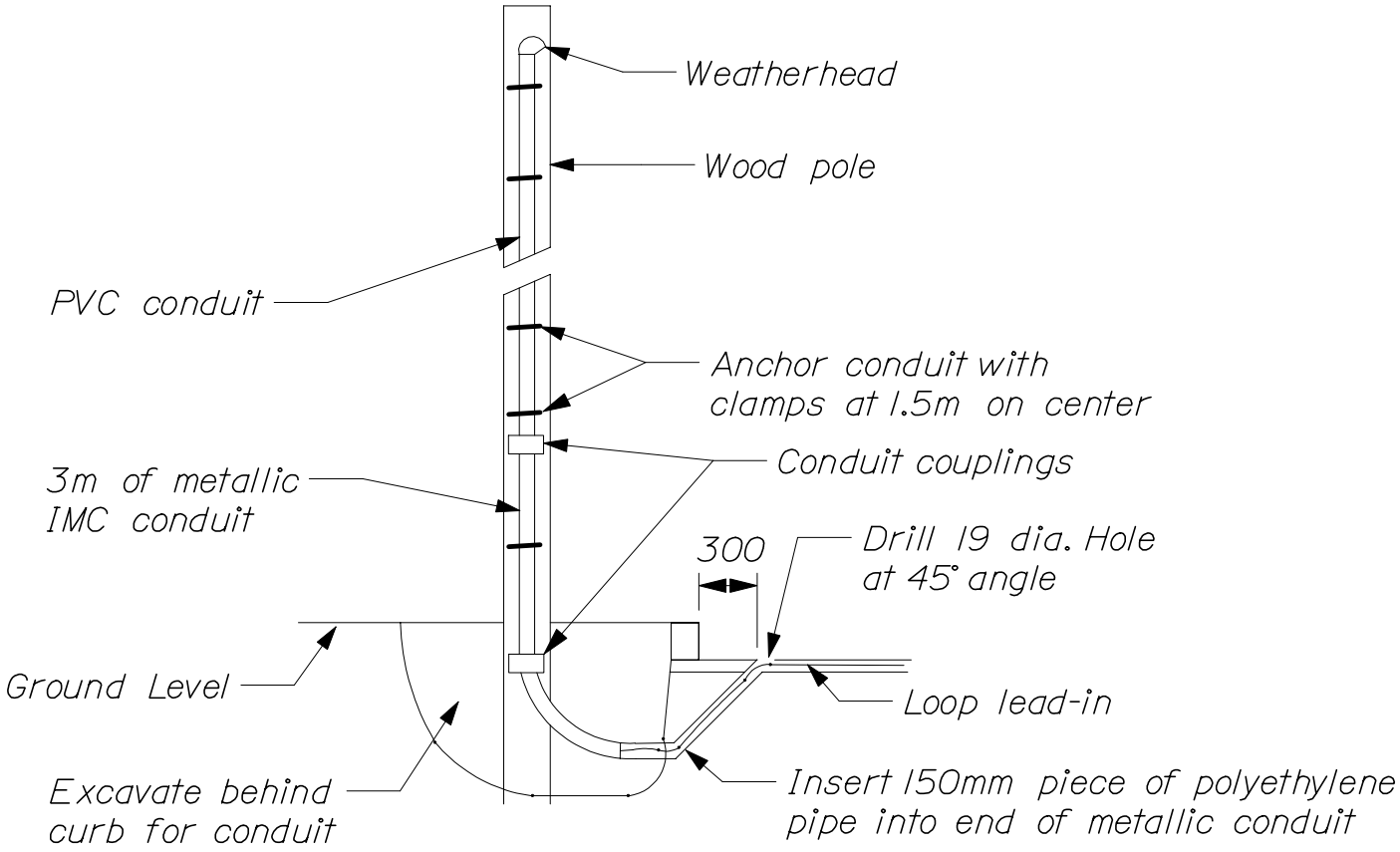
643(02)



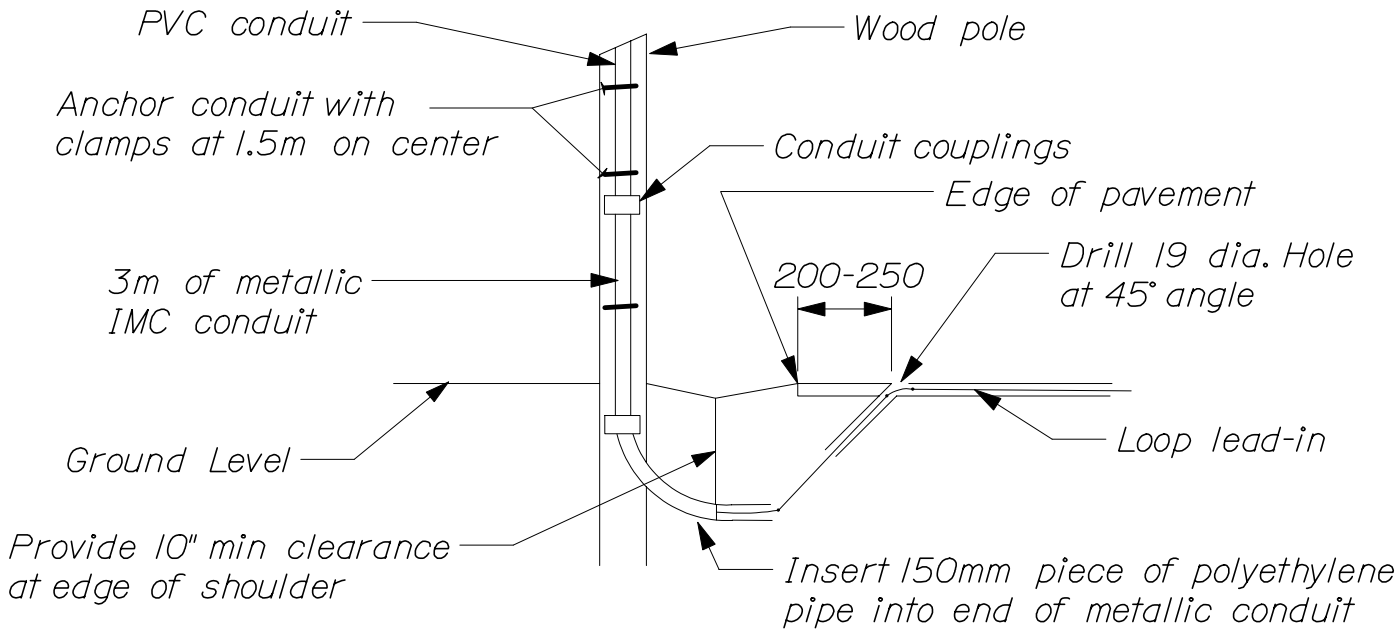
TYPICAL MAST ARM, STREET LIGHT INSTALLATION



SERVICE CONNECTION



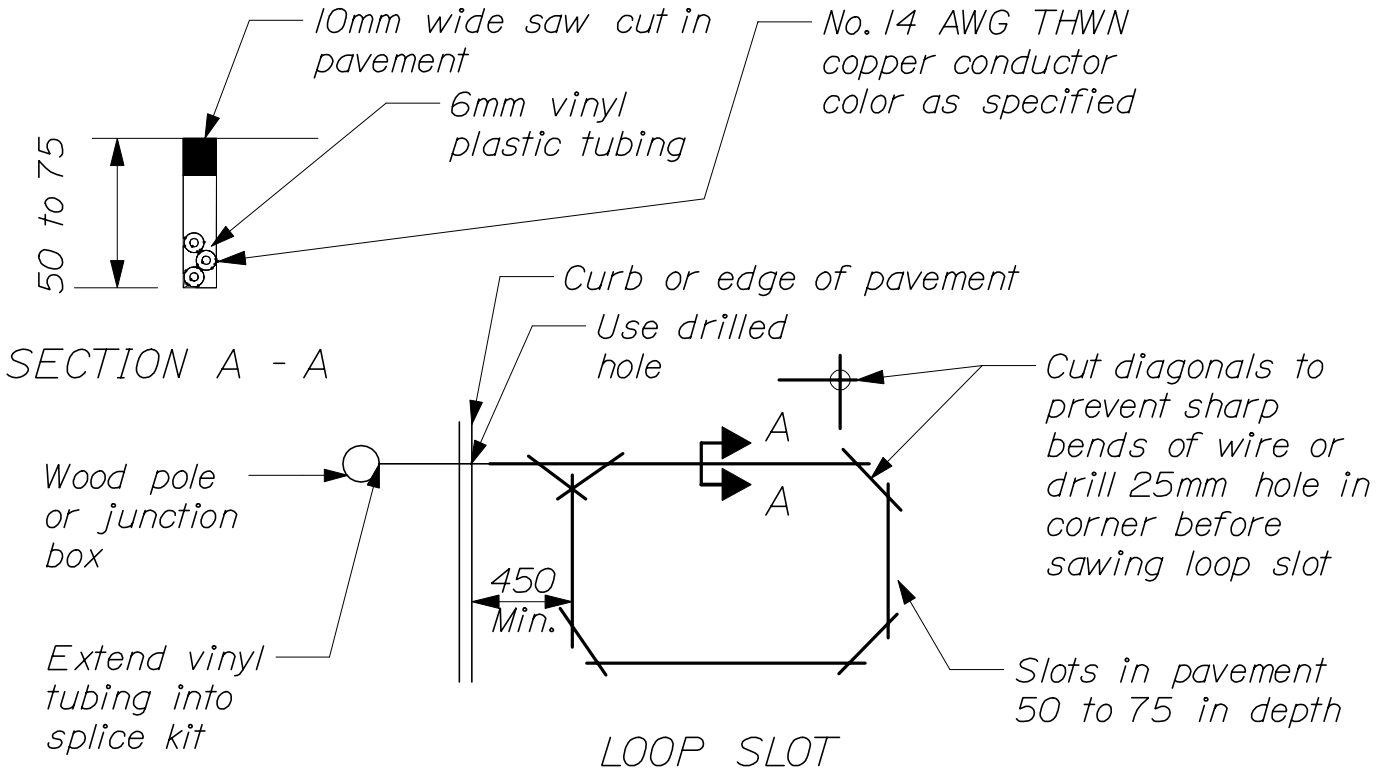
CURB SECTION

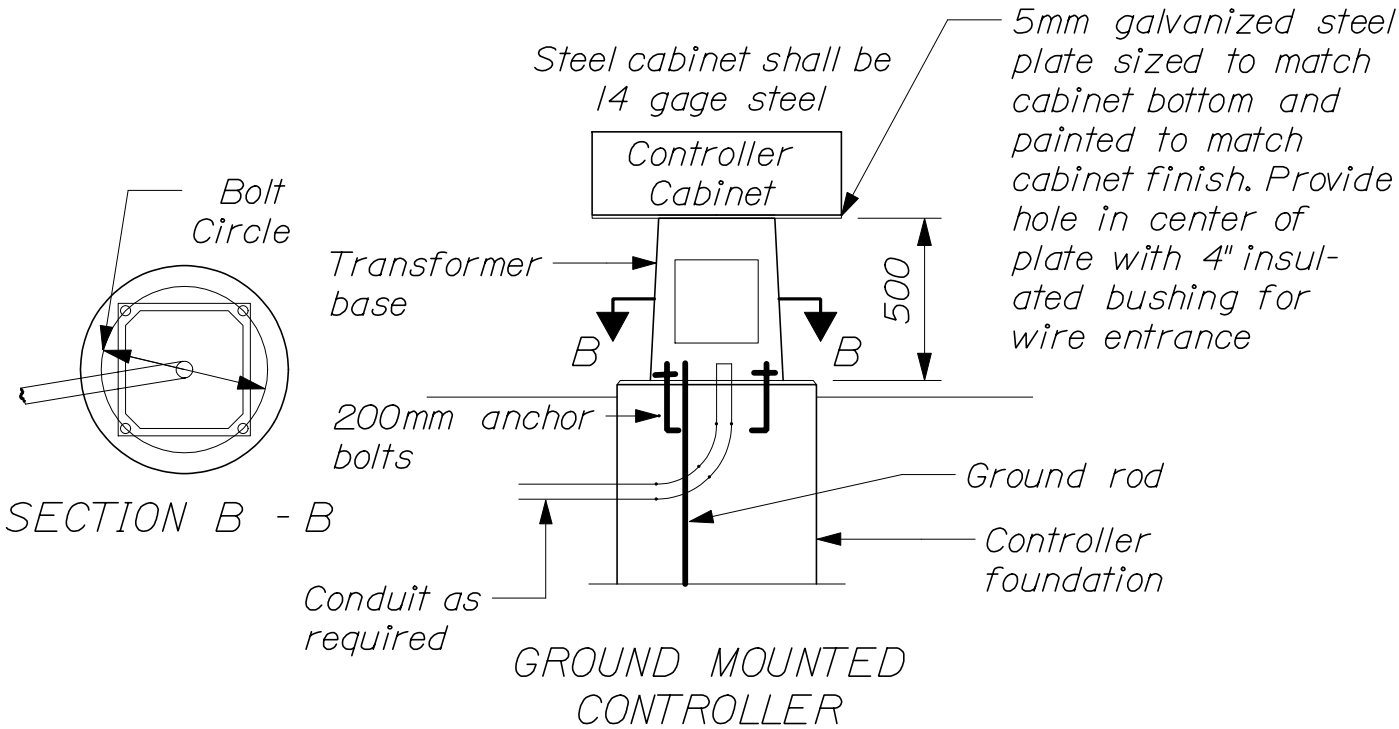


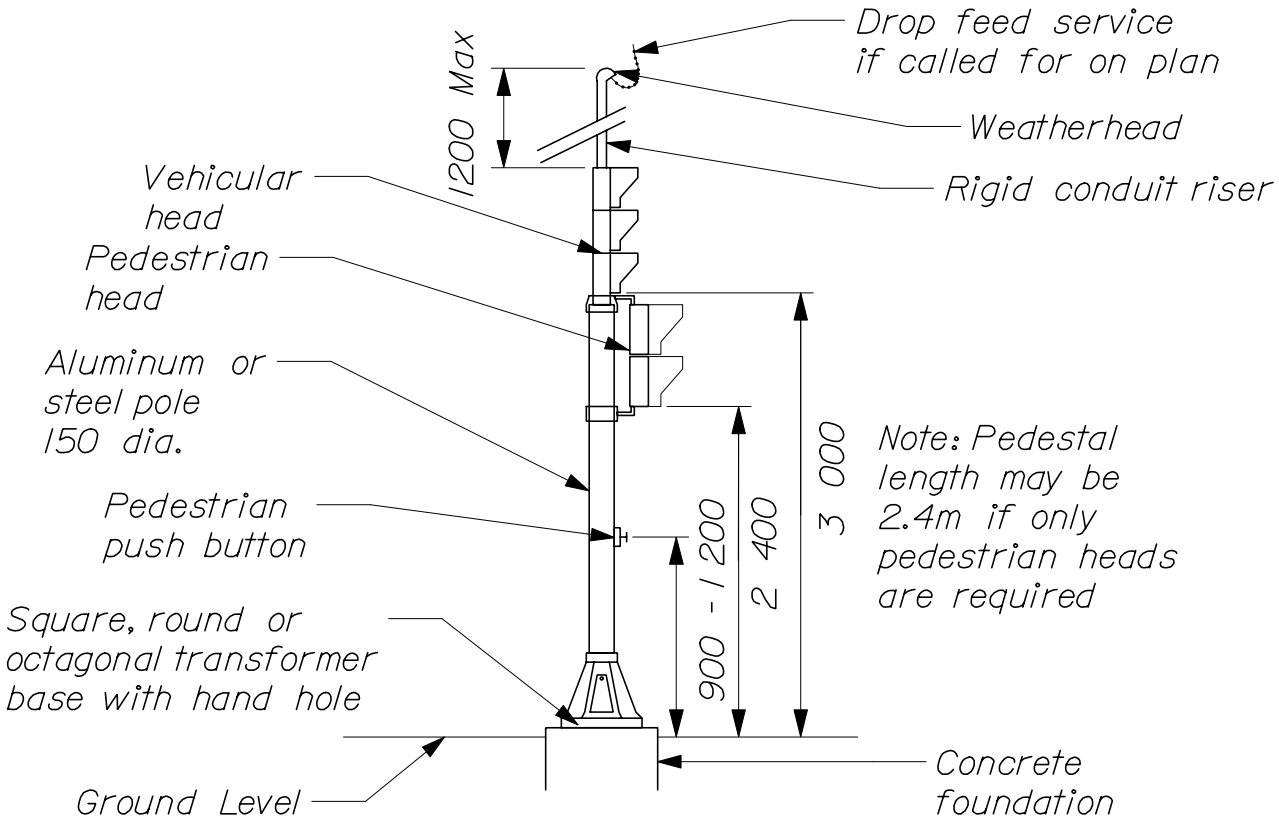
SHOULDER SECTION

DETECTOR LEAD-IN INSTALLATION

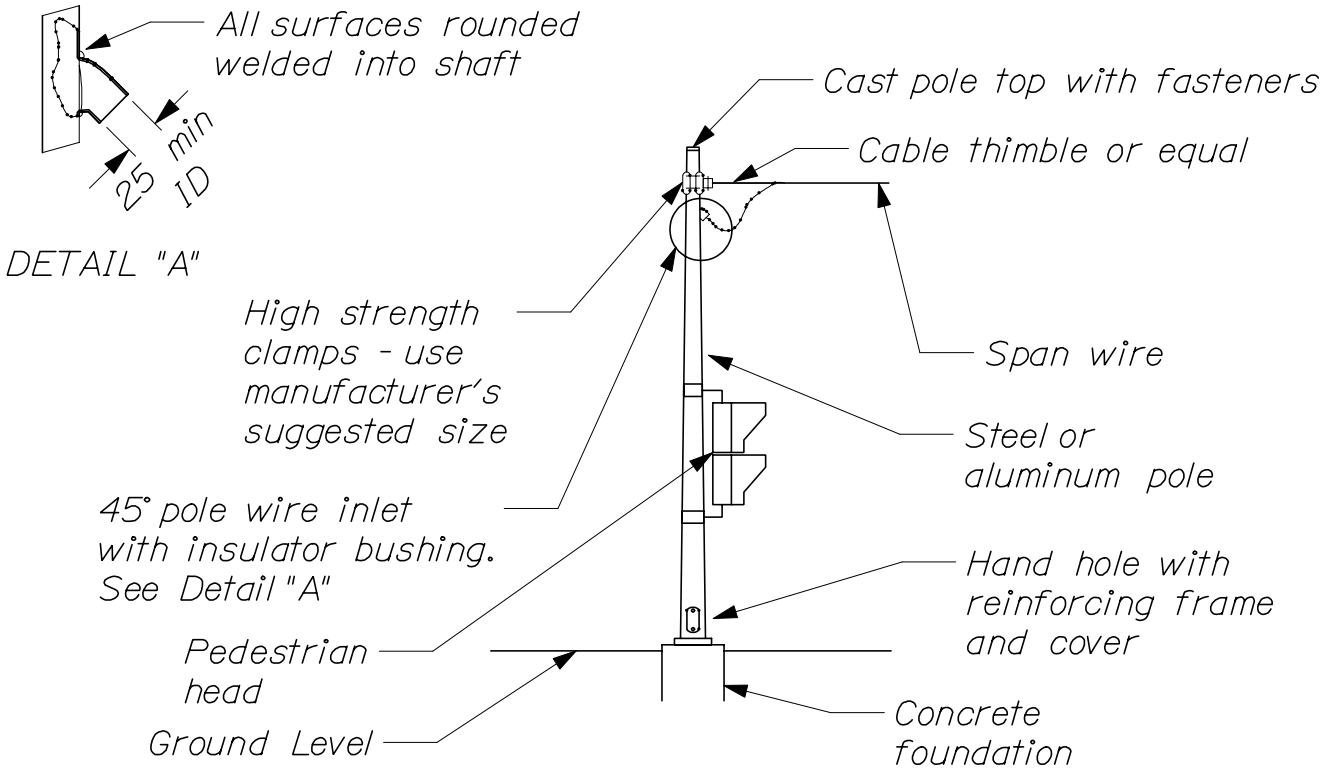
NOTES:
Location and configuration of loops are subject to approval of the Resident in the field. Number of turns of wire in loops and number of loops per amplifier shall be in accordance with the manufacturer's recommendations. Loop slots shall be filled with an approved two-component epoxy embedding sealer.



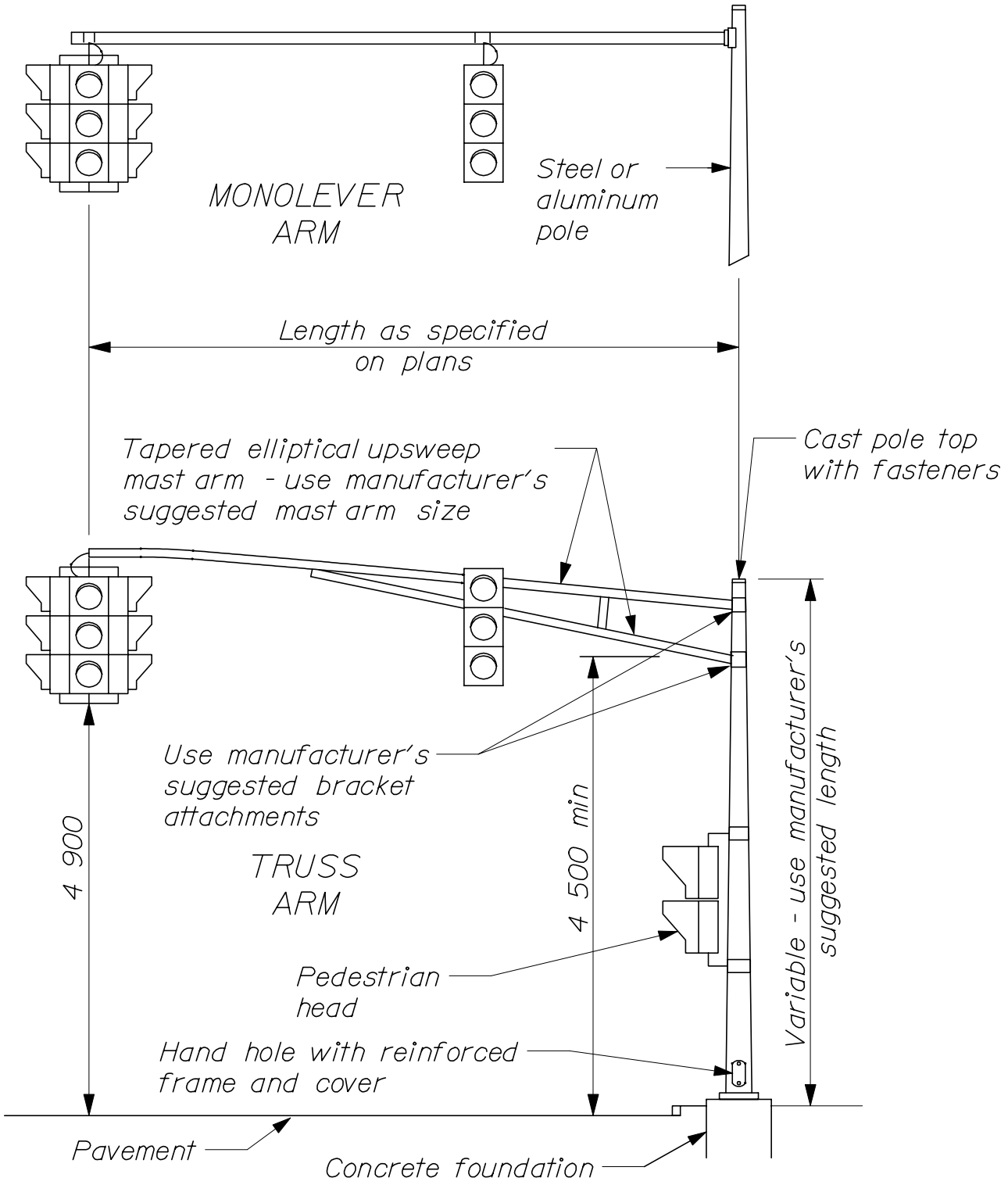




PEDESTAL



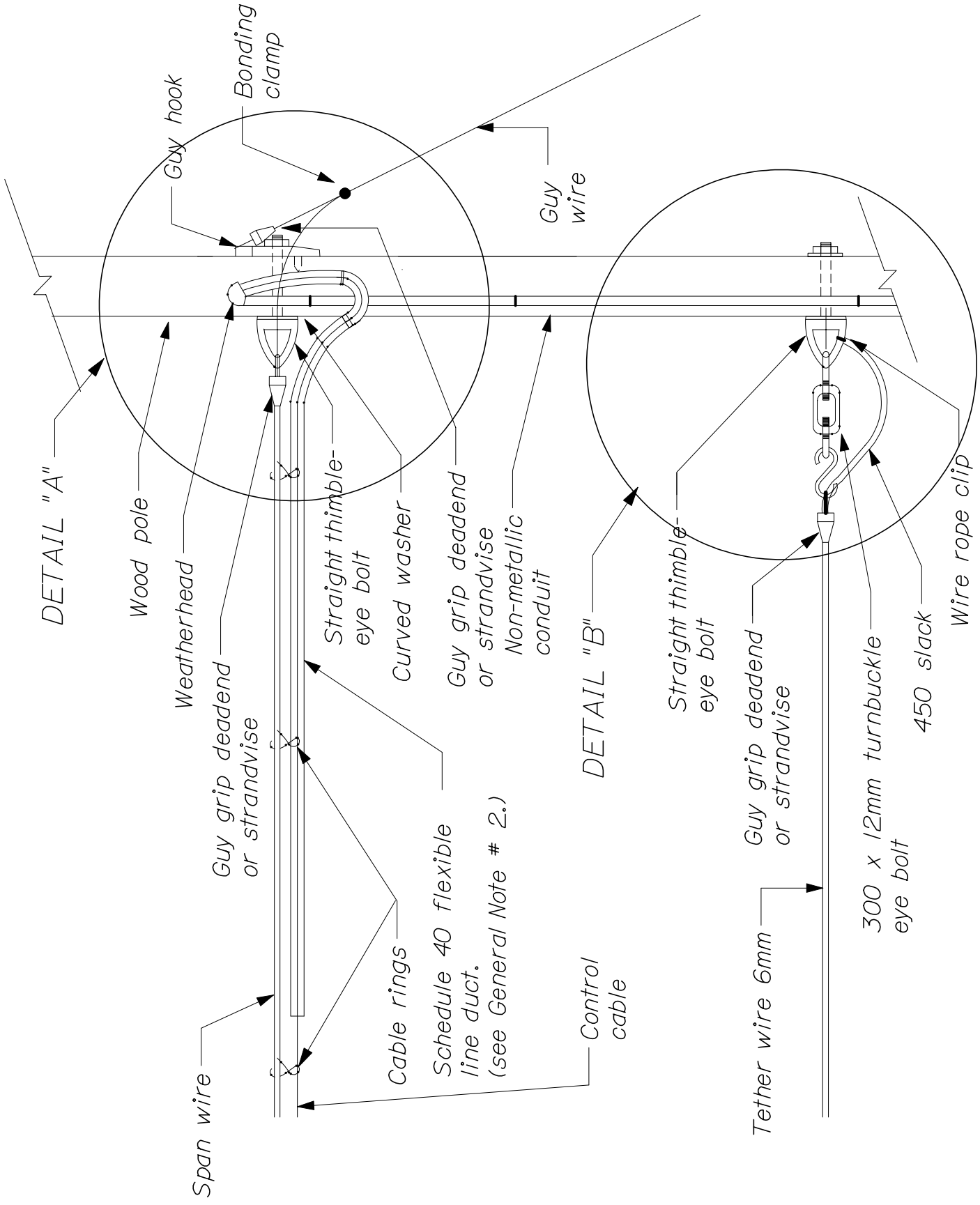
ORNAMENTAL STRAIN POLE



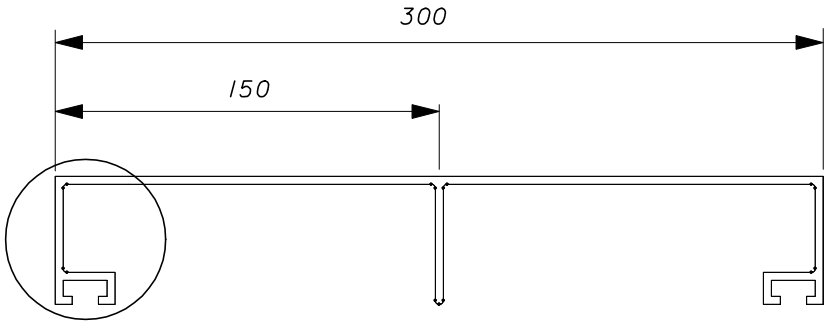
ORNAMENTAL MAST ARM POLE

TRAFFIC SIGNALS

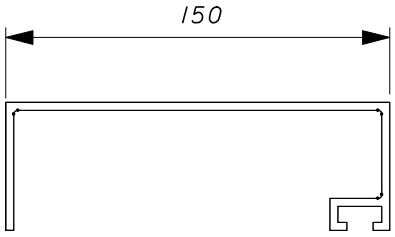
643(08)



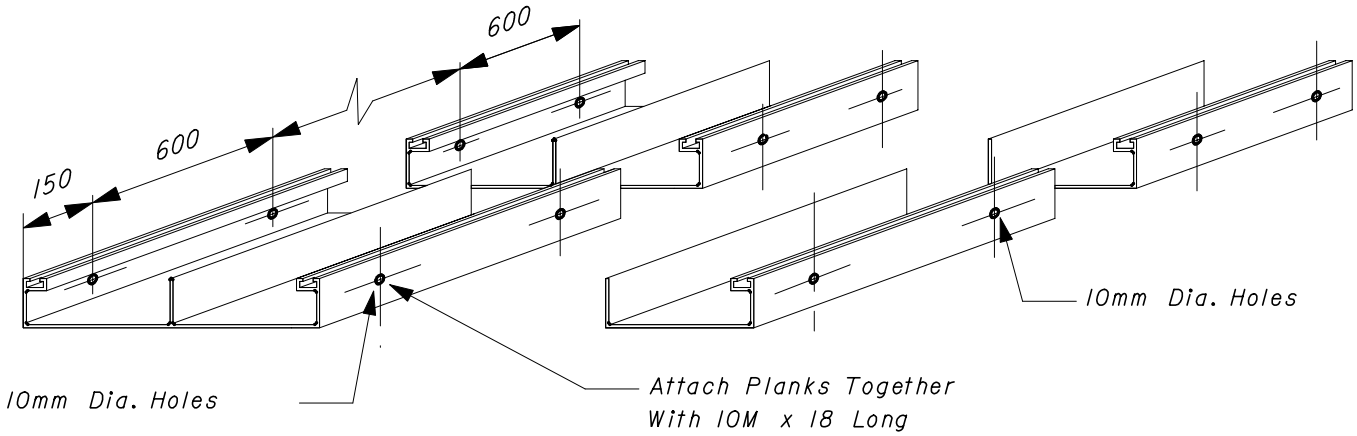
TYPICAL SPANWIRE INSTALLATION
Attaching to Wood Poles



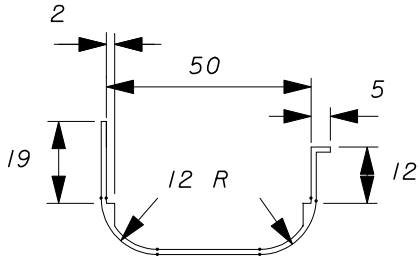
300mm EXTRUDED ALUMINUM PLANK



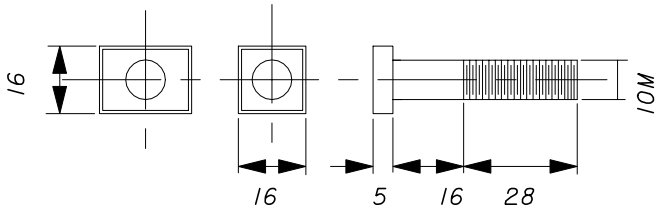
150mm EXTRUDED ALUMINUM PLANK



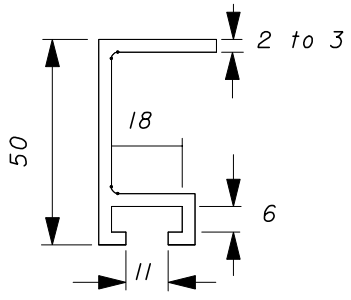
BOLT HOLE PUNCHING PLAN
FOR EXTRUDED ALUMINUM PLANKS



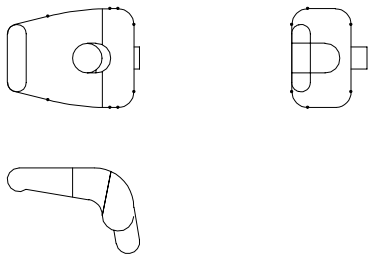
SIDE TRIM
MOLDING



POST CLIP BOLT



Detail A

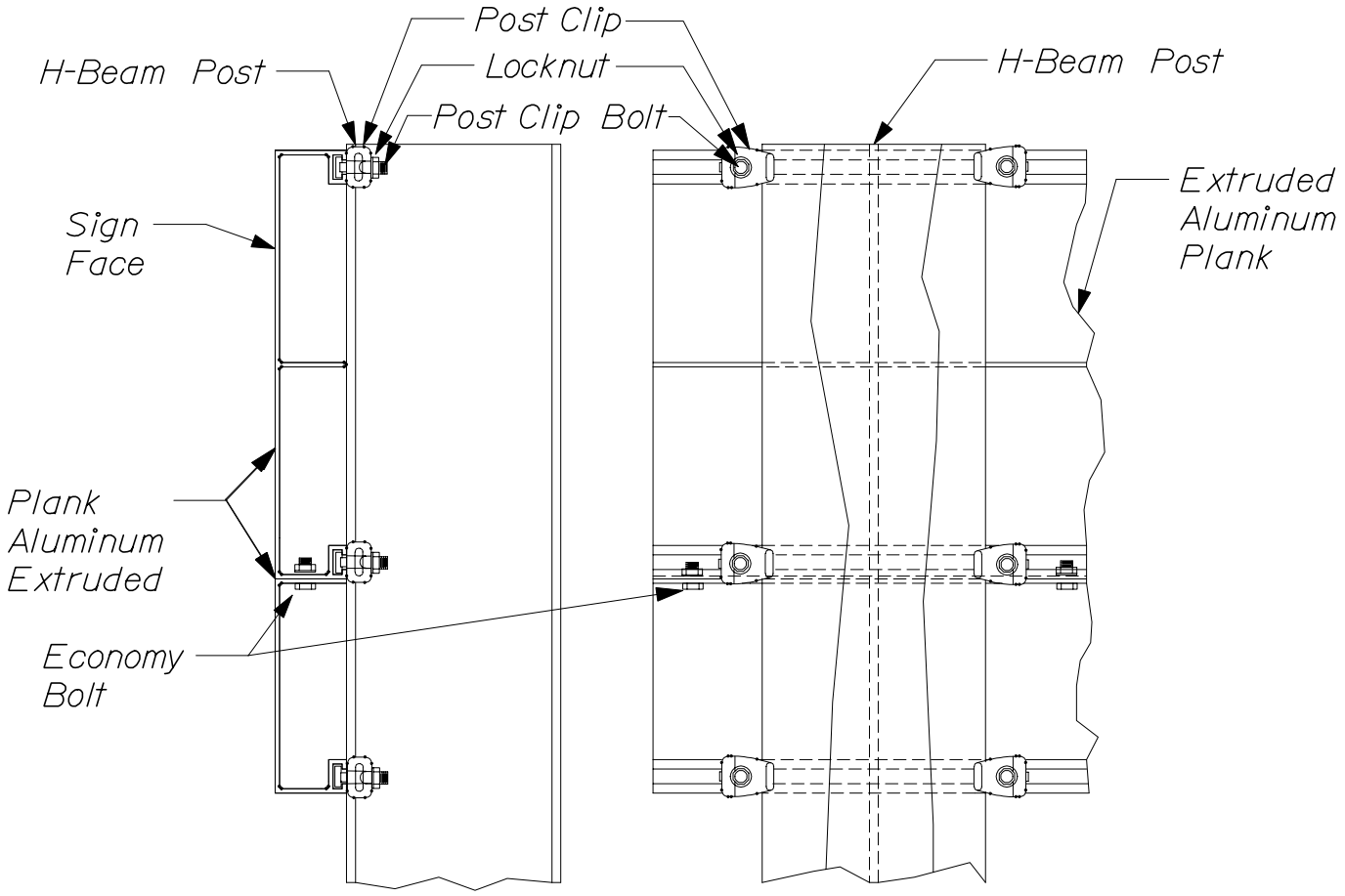


POST CLIP

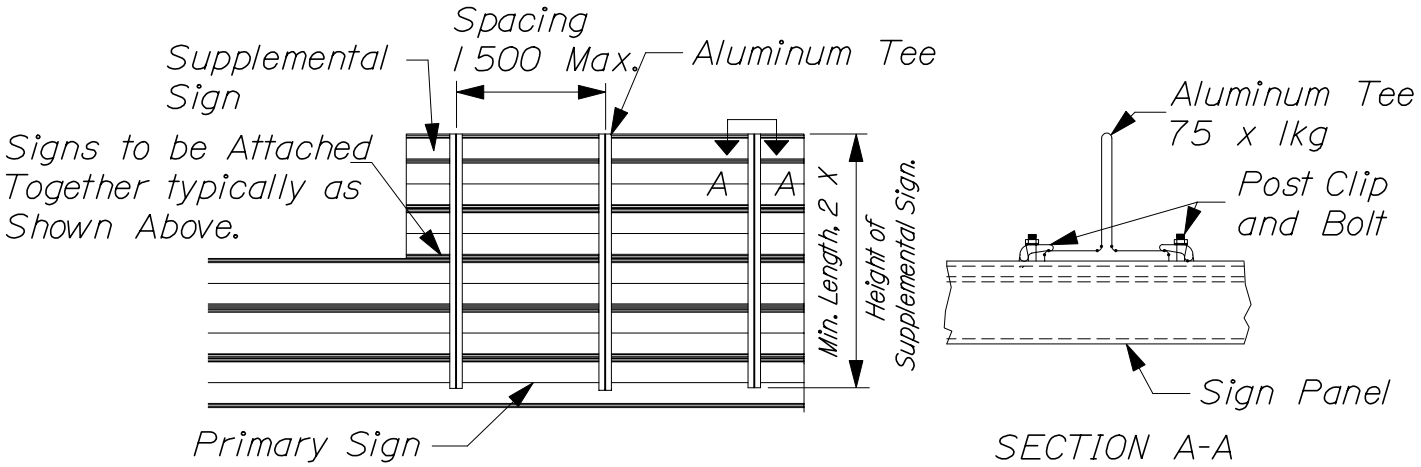
ITEM NO. 645.251

TYPE I SIGNS
HIGHWAY SIGNING

645(01)



ATTACHMENT OF EXTRUDED ALUMINUM PLANKS TO H-BEAM POSTS

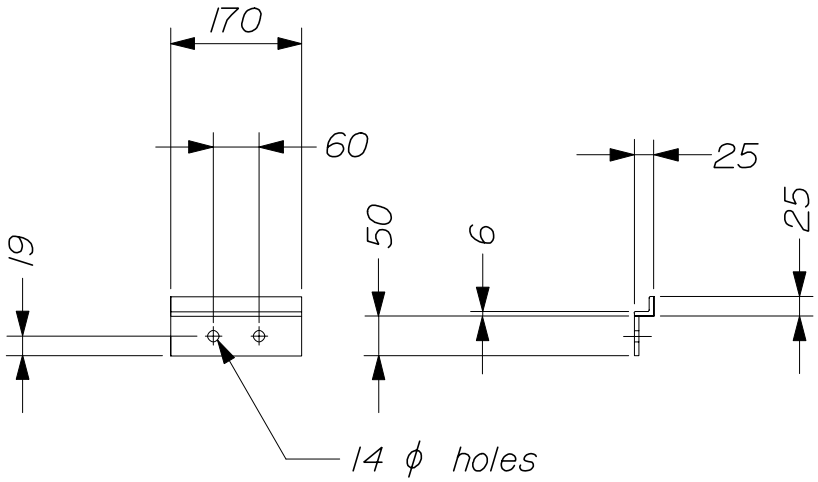


ATTACHMENT OF SUPPLEMENTAL SIGNS (Exit Panels)

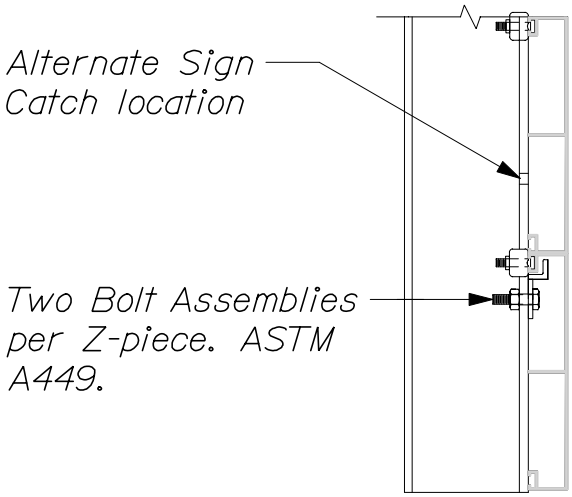
ITEM NO. 645.251

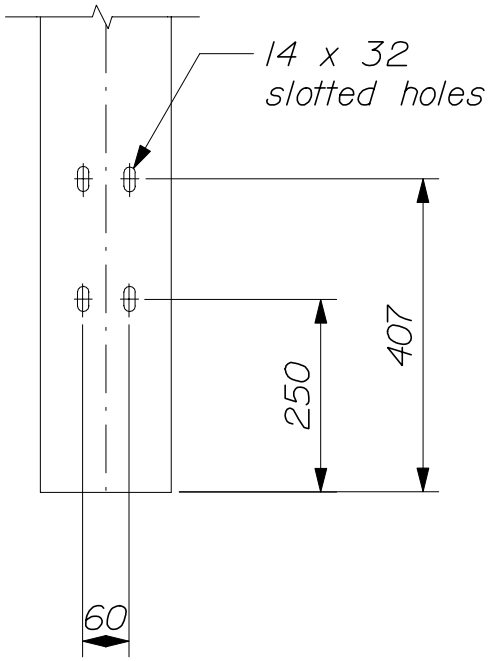
TYPE I SIGNS
HIGHWAY SIGNING

645(02)



Shipped location of Z-piece, one per W-shape





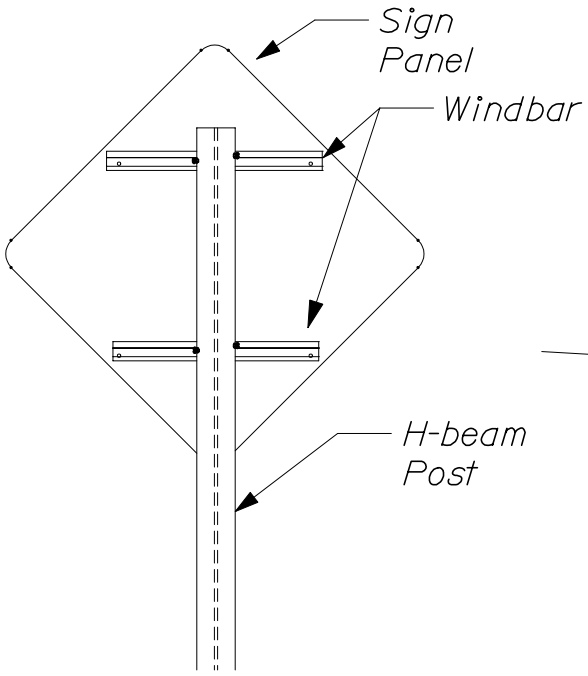
Z-Piece may be fabricated.

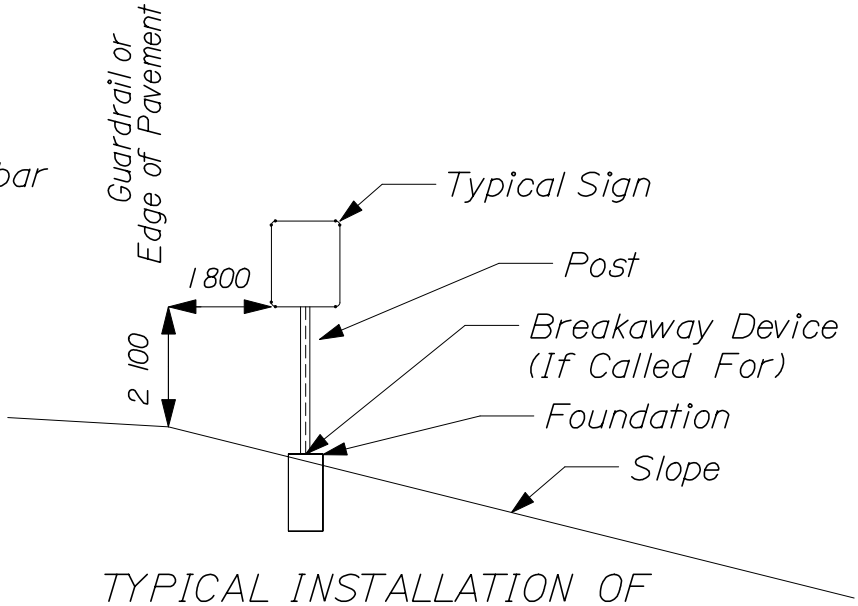
ATTACHMENT OF EXTRUDED ALUMINUM PLANKS TO OVERHEAD AND OVERPASS SIGN SUPPORT STRUCTURES

HIGHWAY SIGNING

OVERPASS MOUNTED SIGN SUPPORT

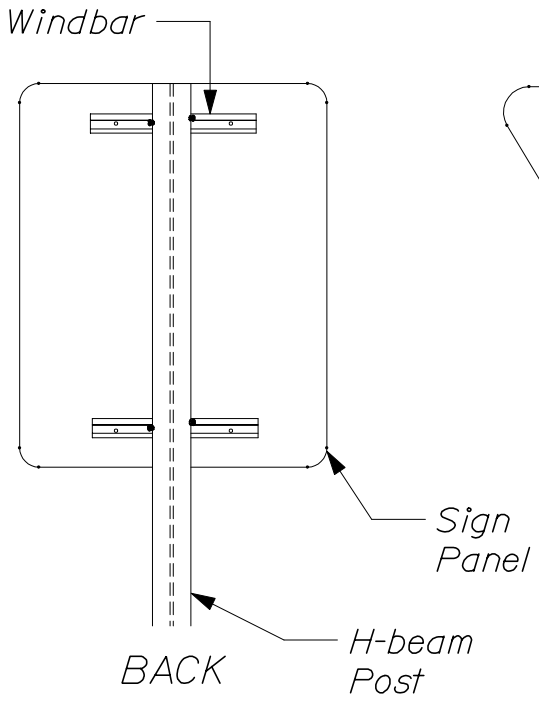
645(3)

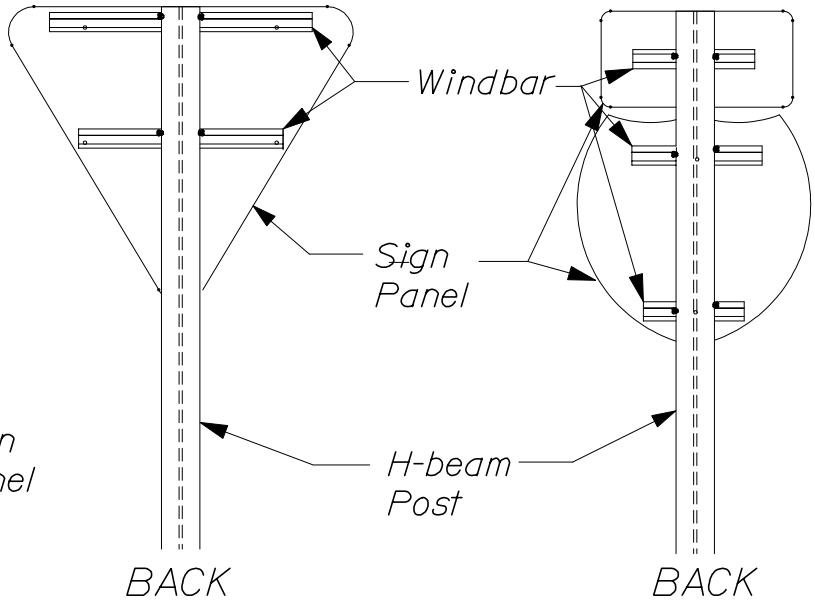




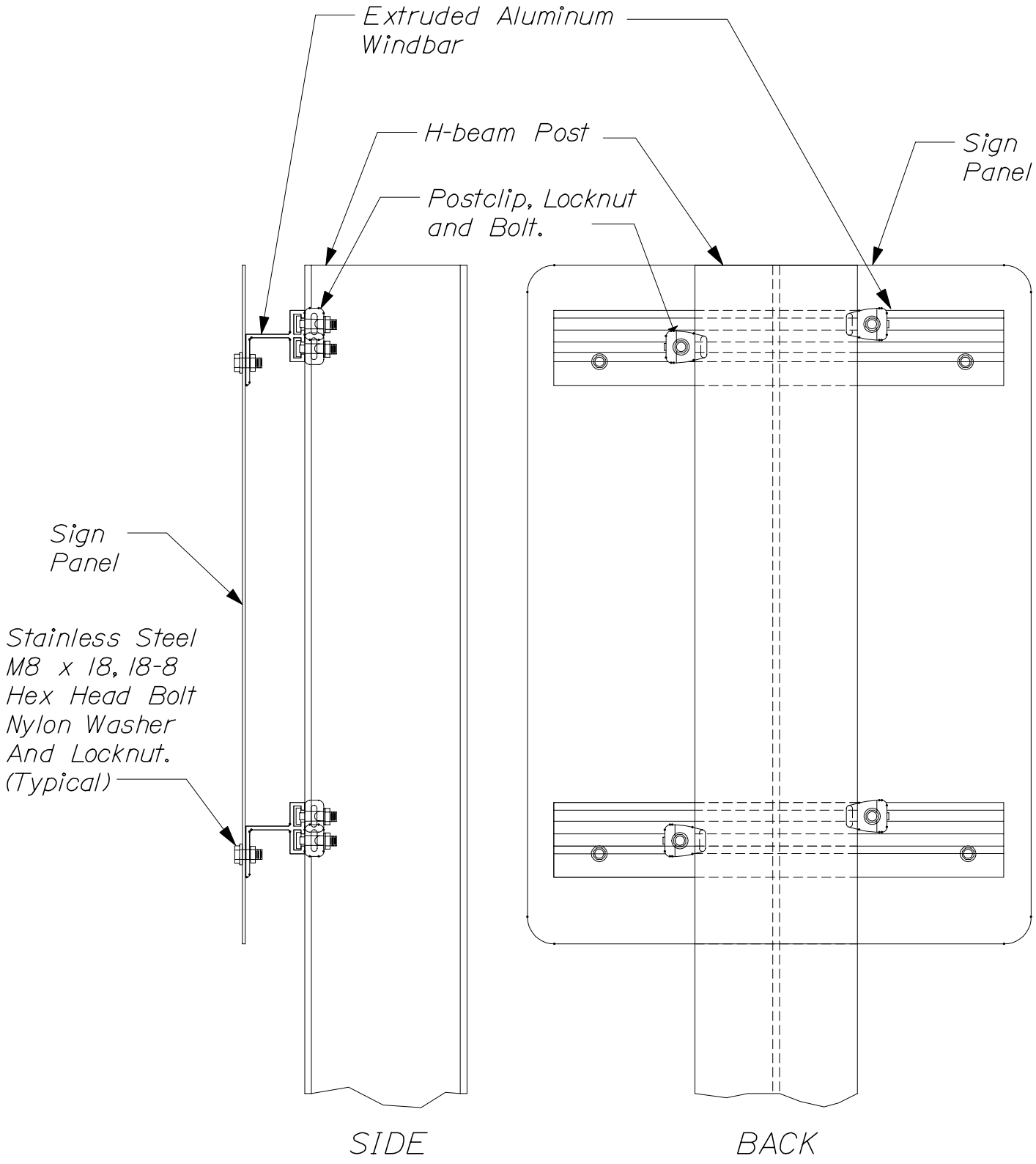
TYPICAL INSTALLATION OF
TYPE I SIGNS
(Not shown on the Cross Sections.)

NOTE-
Bolt holes in sign panels
shall be located as shown
in "Standard Highway Signs".





ATTACHMENT OF SIGNS,
REGULATORY, WARNING, AND ROUTE
MARKER ASSEMBLY SIGNS, TYPE I
TO H-BEAM POSTS
ITEM NO. 645.271



ATTACHMENT OF SIGNS, REGULATORY, WARNING, AND ROUTE MARKER ASSEMBLY SIGNS, TYPE I TO H-BEAM POSTS
ITEM NO. 645.271

HIGHWAY SIGNING

645(05)

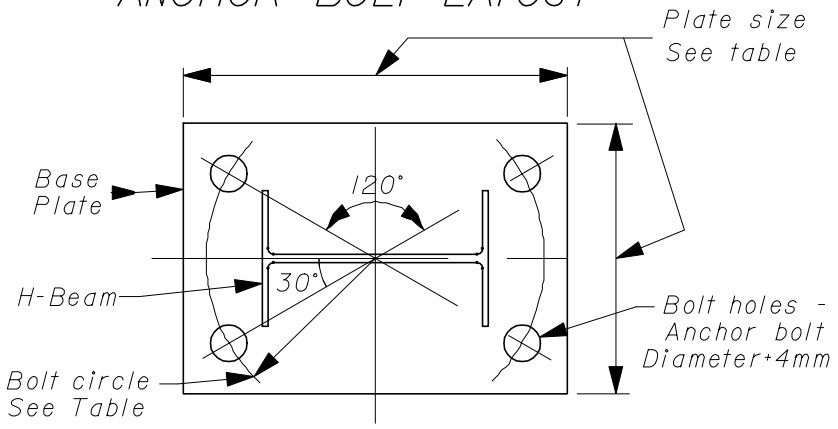
STANDARD H-BEAM POSTS for TYPE I SIGNS

Foundation Size	Sign Area (A)	Sign Width (W)	Post Size	Base Plate (1), (3)	Material	Anchor Bolts (2)	Bolt Circle	Maximum Mounting Height
SINGLE SUPPORT SIGNS								
	$0 - 1m^2$	Use Wood Posts			A709 Grade 250			4m to Center of Sign
450	$1 < A \leq 1.5m^2$	W = 1 200 Max. But includes 1 500 Yield Sign	W150X14	300X300X25 18kg		24M X 900'	300	
450	$1.5 < A \leq 2.3m^2$	W = 1 500 Max.	W150X22	300X300X25 18kg		24M X 900	300	
600	$2.3 < A \leq 3.9m^2$	W = 2 100 Max.	W200X36	350X350X25 25kg		30M X 1 050	350	
MULTIPLE SUPPORT SIGNS								
600	To $5.5m^2$/Post	Varible	W200X27	350X350X25 25kg	A709 Grade 250	30M X 1 050	350	6m to Center of Sign
600	$5.5 - 7.9m^2$/Post		W250X33	300X430X32 33kg		30M X 1 050	375	
750	$7.9 - 10.2m^2$/Post		W300X39	330X480X32 40kg		36M X 1 200	425	
750	$10.2 - 12.5m^2$/Post		W350X44	350X530X32 47kg		36M X 1 200	475	

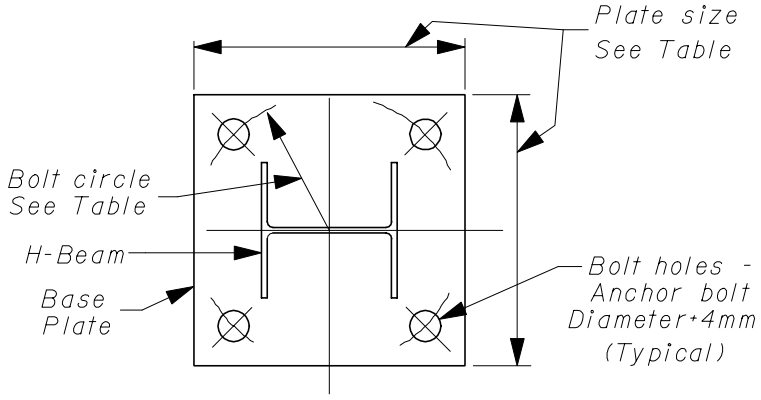
NOTES-

(1) Bolts to be 50,000 PSI minimum yield strength.
(2) Post to base plate weld shall be fillet weld.
(3) Base plates and H-Beams shall be hot dipped galvanized after fabrication in accordance with section 7.20.06.
(4) Payment for the weight of base plate shall be incidental to ITEM NO. 645.289.
(5) Posts to be equipped with breakaway devices shall have holes drilled or punched before galvanizing.
Posts equipped with breakaway devices shall have the post size die stamped, before galvanizing, near the bottom end of beam.
(6) W - Shapes utilized with Breakaway Devices shall be in strict conformance with ASTM A6, Table 16, A, Depth.

ANCHOR BOLT LAYOUT

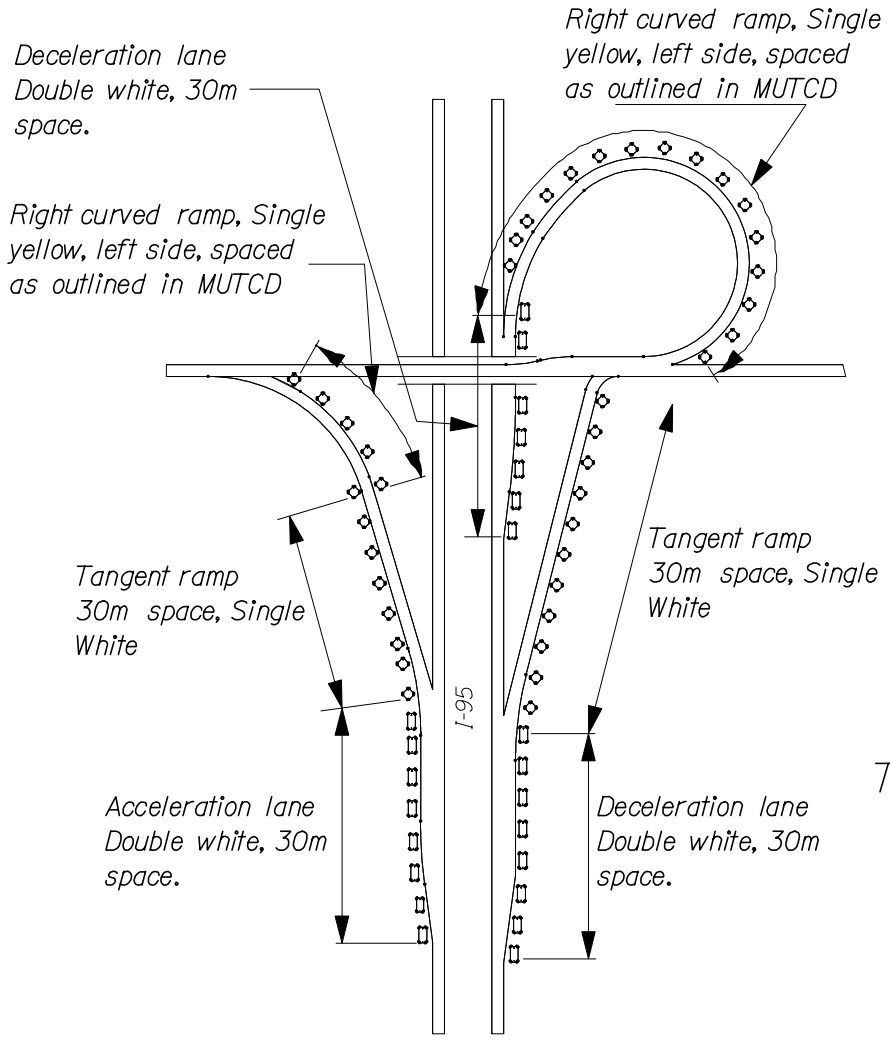


W250X33, W300X39, W350X44



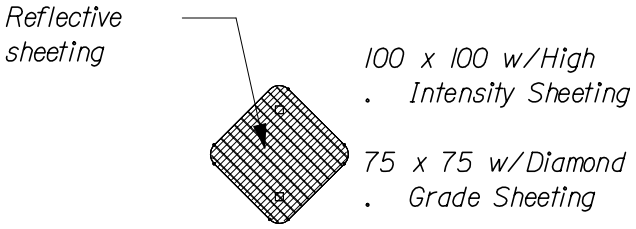
W150X14, W150X22, W200X27, W200X36

# H-BEAM POSTS
# HIGHWAY SIGNING
645(06)

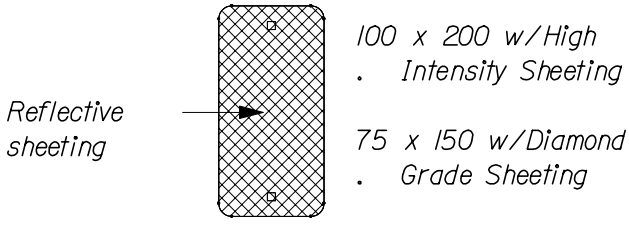


NOTE-
Locations of Delineators shall be 80.4672m (264 ft), 20/mile on mainline, subject to approval of the Resident. Delineators on ramps shall be placed as shown above and in the MUTCD.
When placing delineators in the area of any Highway Lighting, the contractor shall contact MDOT Electrical Foreman, at 287-2818, to determine locations of conduit.

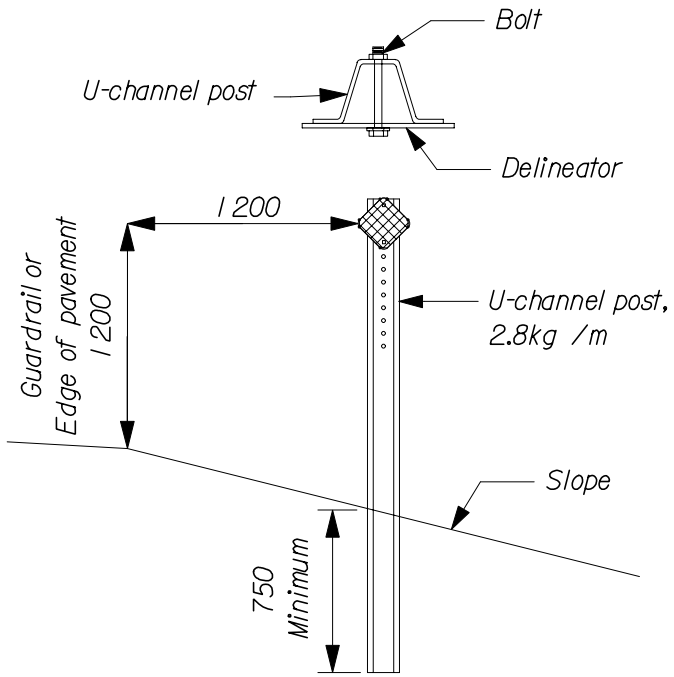
TYPICAL PLACEMENT OF DELINEATORS AT INTERCHANGES



SINGLE DELINEATOR



DOUBLE DELINEATOR

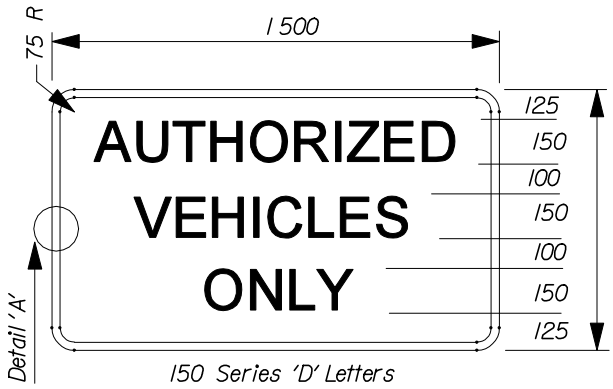


DELINEATORS

ITEM NO. 645.3011
ITEM NO. 645.3021

DELINEATORS HIGHWAY SIGNING

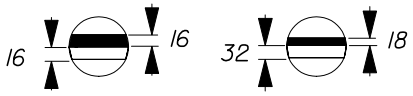
645(07)



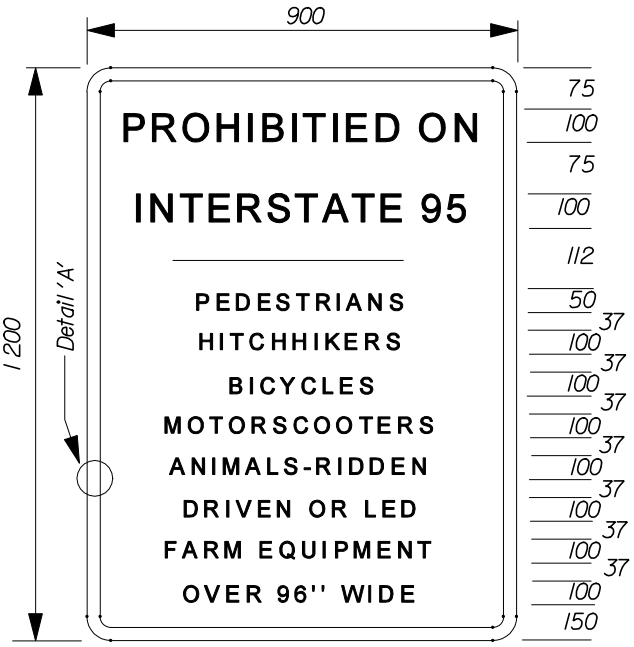
AVO

White Background
Black Letters and
Legend

Borders

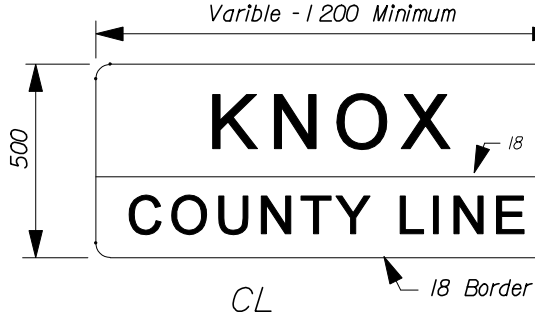


Detail B Detail A



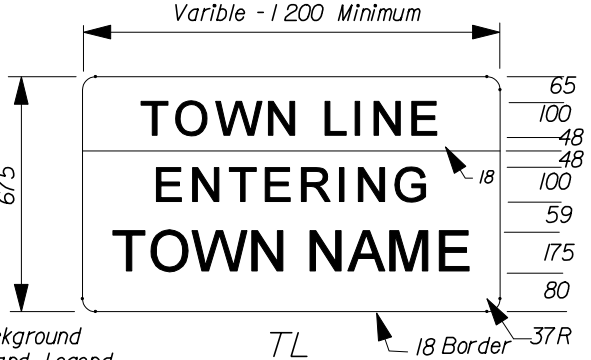
White Background
Black Letters and
Legend

Figure
51

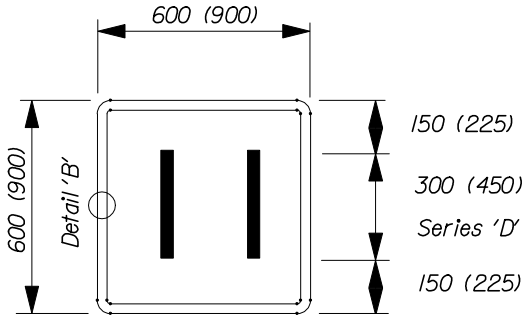


CL
COUNTY LINE SIGN

Green Background
White Border and Legend

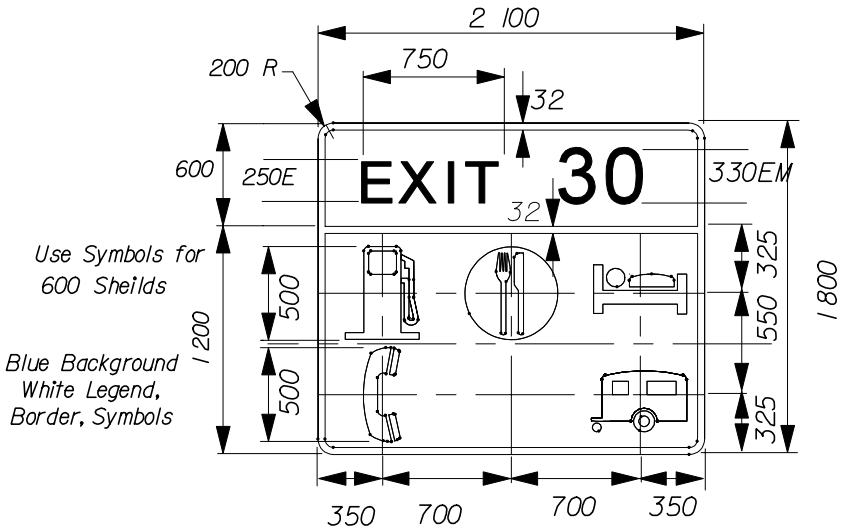


TL
TOWNLINE SIGN



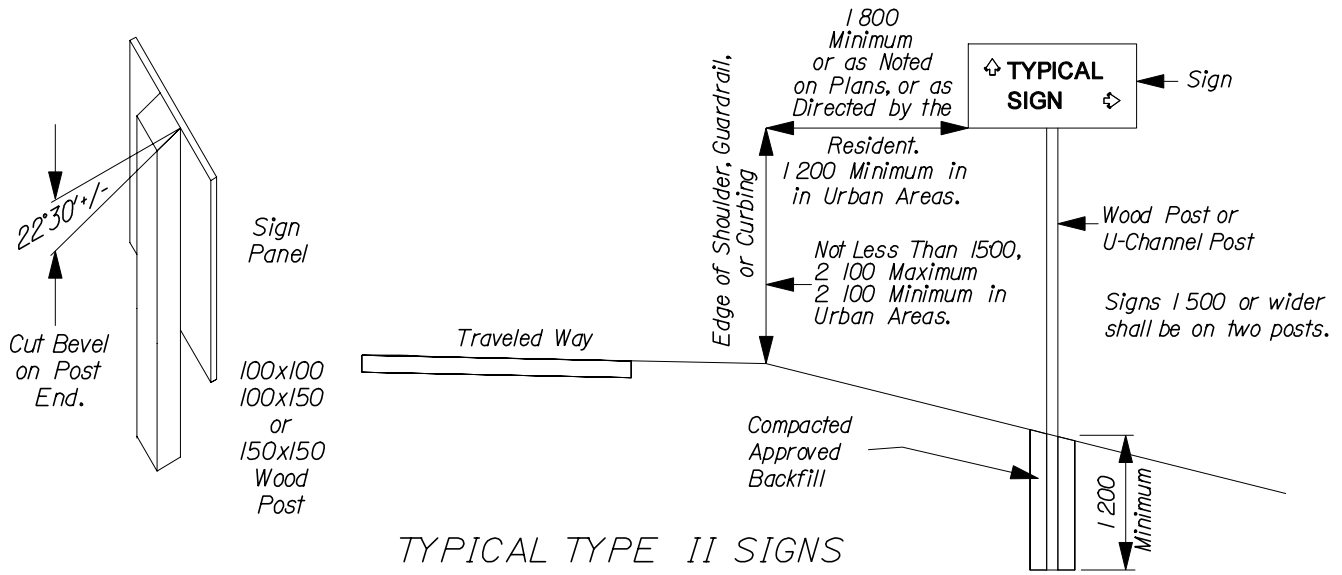
MI-5

600 X 750 For 3 Digit Rte Number
900 X 1125 For 3 Digit Rte Number
When Using MI-5 on Guide Signs
Omit the Border.
White Background, Black Legend
and Border.

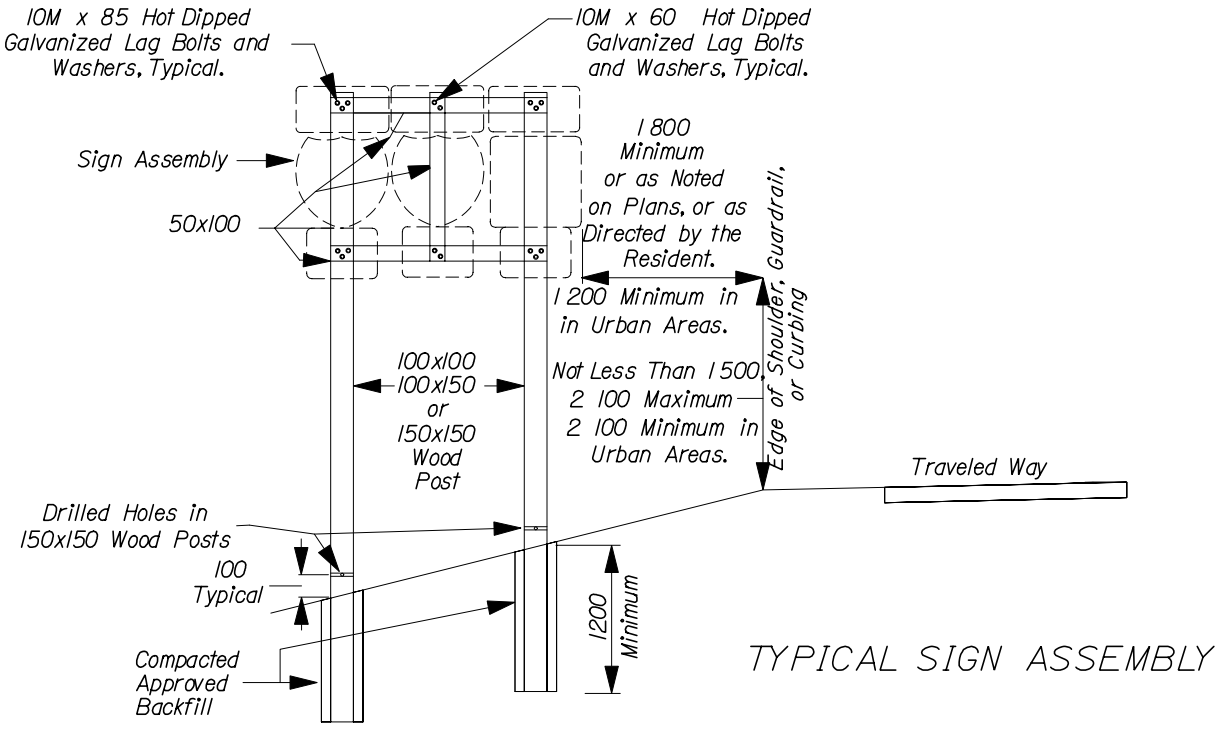


Services Sign
For Interstate

# STATE OF MAINE SIGNS
# HIGHWAY SIGNING
645(08)



TYPICAL TYPE II SIGNS



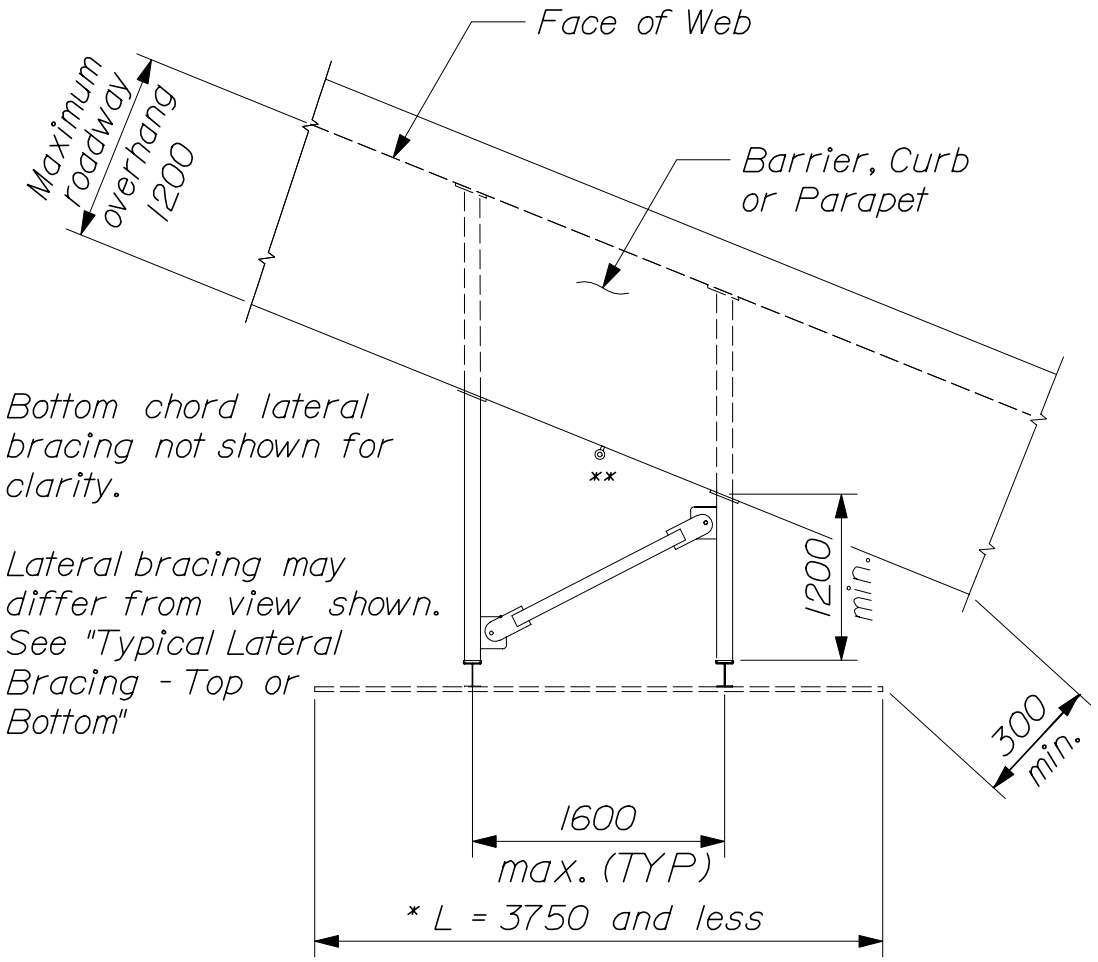
TYPICAL SIGN ASSEMBLY

NOTES:
Refer to Section 645.061 of the Standard Specifications to determine the size of wood posts. All wood posts and brackets shall be pressure treated to CCA 40.
On 150x150 wood posts only, drill 18mm diameter holes at right angles to one another 100mm above ground level. to meet breakaway standards.

ITEM NO. 645.291
ITEM NO. 645.292

INSTALLATION OF TYPE II SIGNS
HIGHWAY SIGNING

645(09)



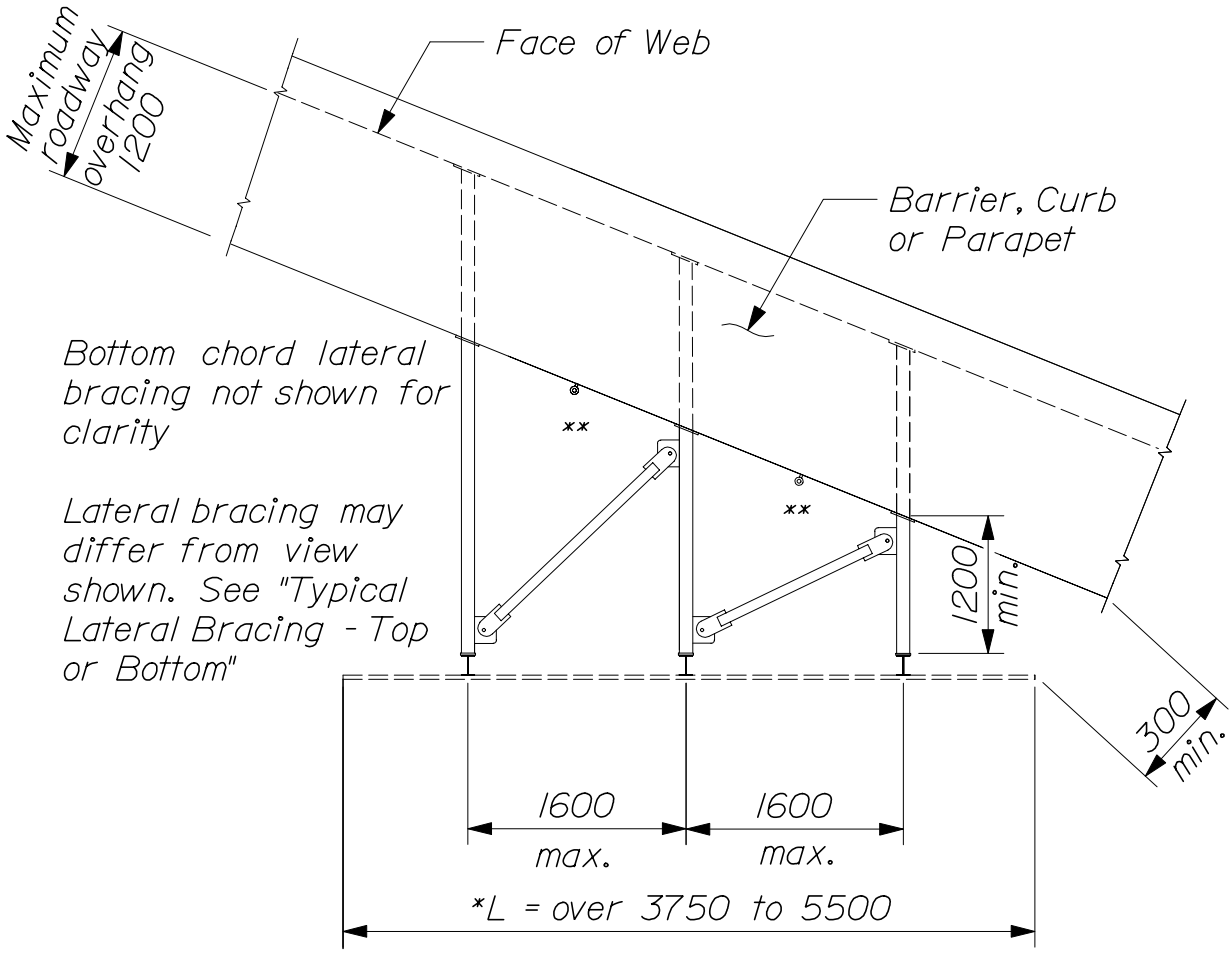
PLAN - SMALL SIGN PANEL SUPPORT LAYOUT

Max. skew permitted: 50 degrees
Max. height of sign permitted: 4250

* Note: L = Width of sign

** Anchoring eyelet for barriers only
(See Anchorage Eyelet Detail)

# HIGHWAY SIGNING
# OVERPASS MOUNTED SIGN SUPPORT
645(10)



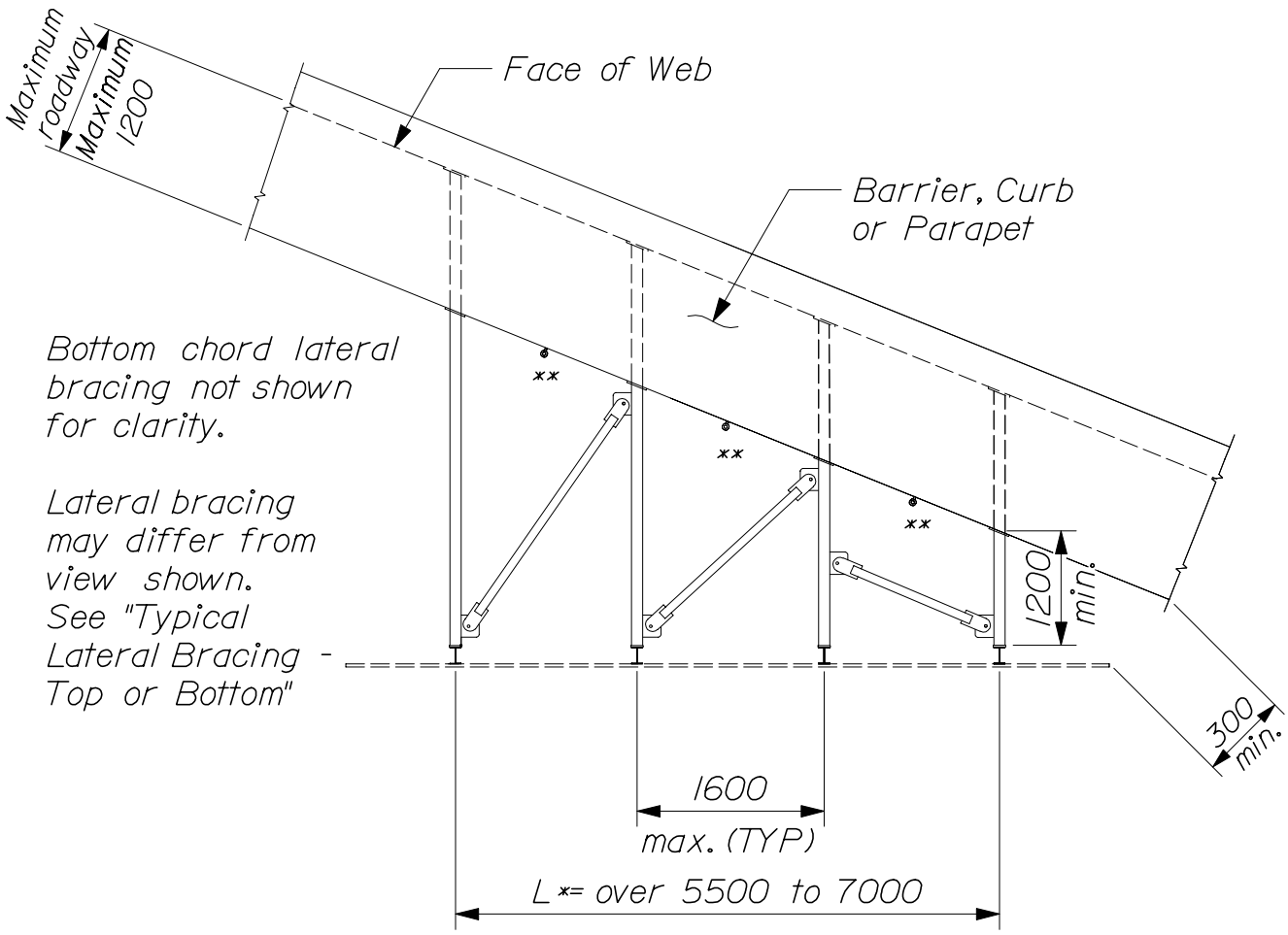
PLAN - MEDIUM SIGN PANEL SUPPORT LAYOUT

Max. skew permitted: 30 degrees
Max. height of sign permitted: 4250

* Note: L = width of sign

** Anchoring eyelet for barriers only.
(See Anchorage Eyelet Detail)

# HIGHWAY SIGNING
# OVERPASS MOUNTED SIGN SUPPORT
645(11)



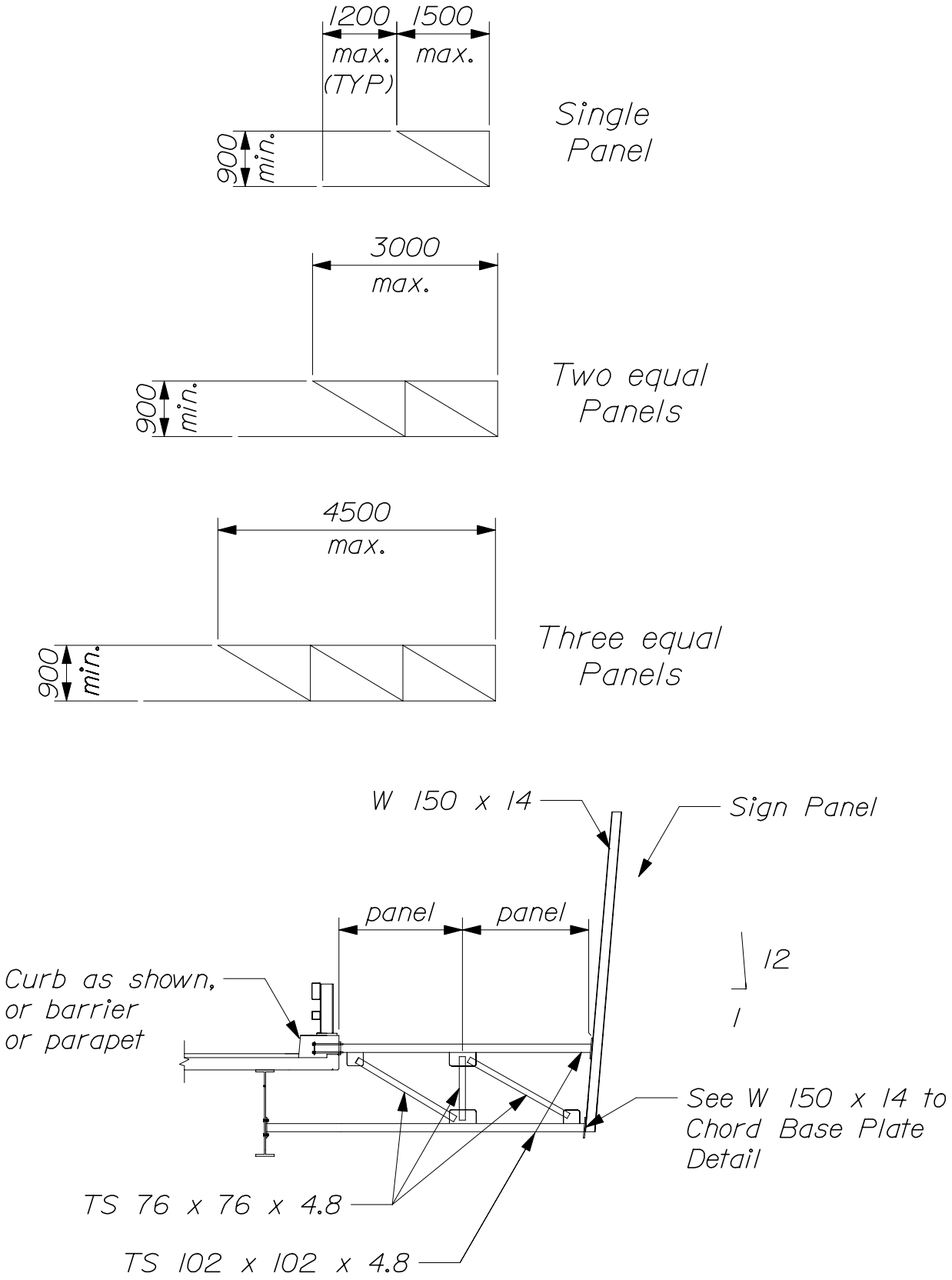
PLAN - LARGE SIGN PANEL SUPPORT LAYOUT

Max. skew permitted: 30 degrees
Max. height of sign permitted: 4250

* Note: L = Width of sign

** Anchoring eyelet for barriers only. (See Anchorage Eyelet Detail)

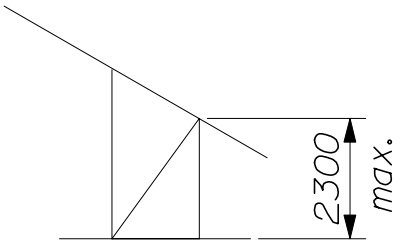
# HIGHWAY SIGNING
# OVERPASS MOUNTED SIGN SUPPORT
645(12)



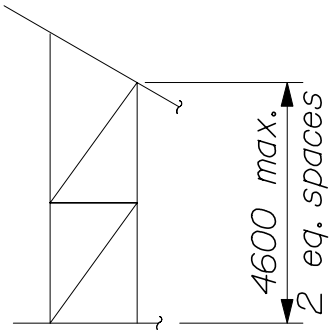
TYPICAL ELEVATION - VERTICAL BRACING

HIGHWAY SIGNING
OVERPASS MOUNTED SIGN SUPPORT

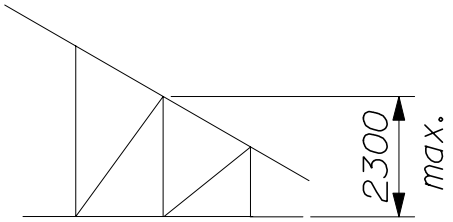
645(13)



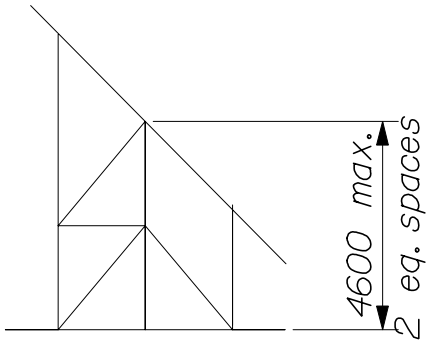
PLAN VIEW
2 - BRACKET



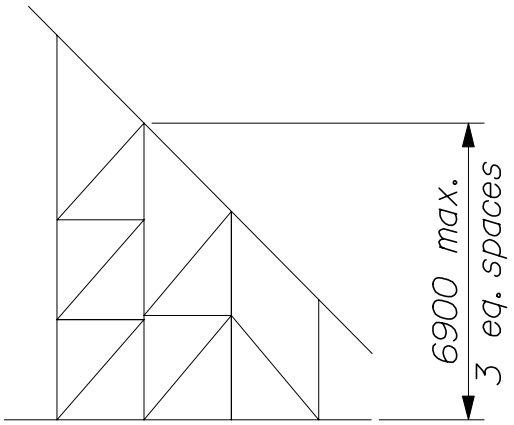
PLAN VIEW
2 - BRACKET



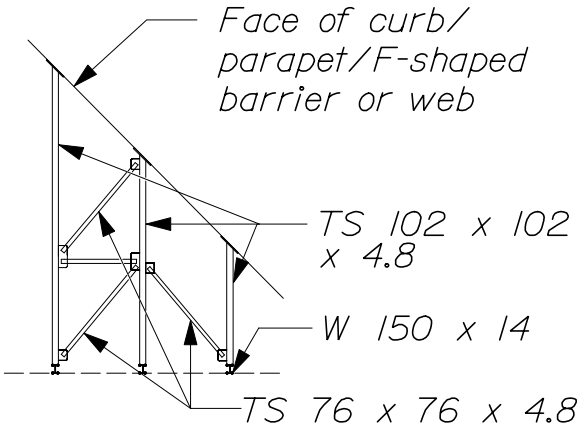
PLAN VIEW
3 - BRACKET



PLAN VIEW
3 - BRACKET



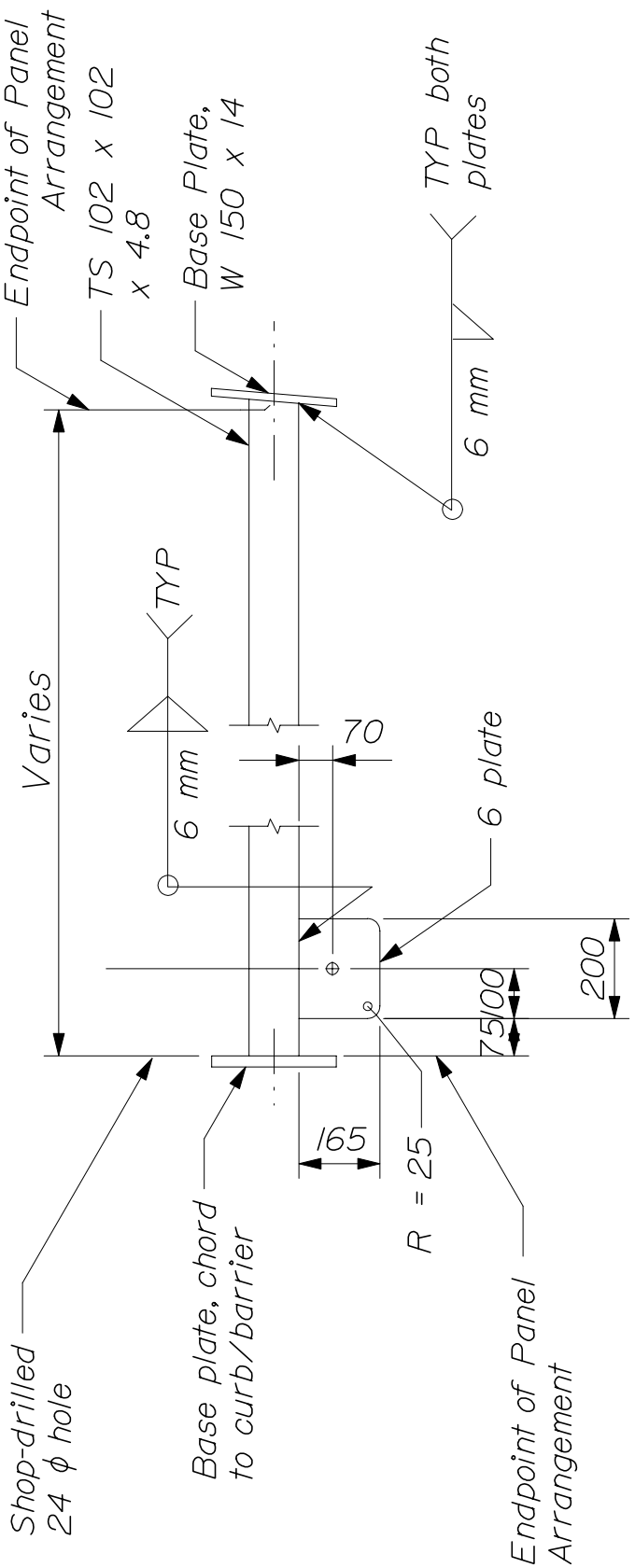
PLAN VIEW
4 - BRACKET



TYPICAL LATERAL
BRACING

TYPICAL LATERAL BRACING
TOP OR BOTTOM

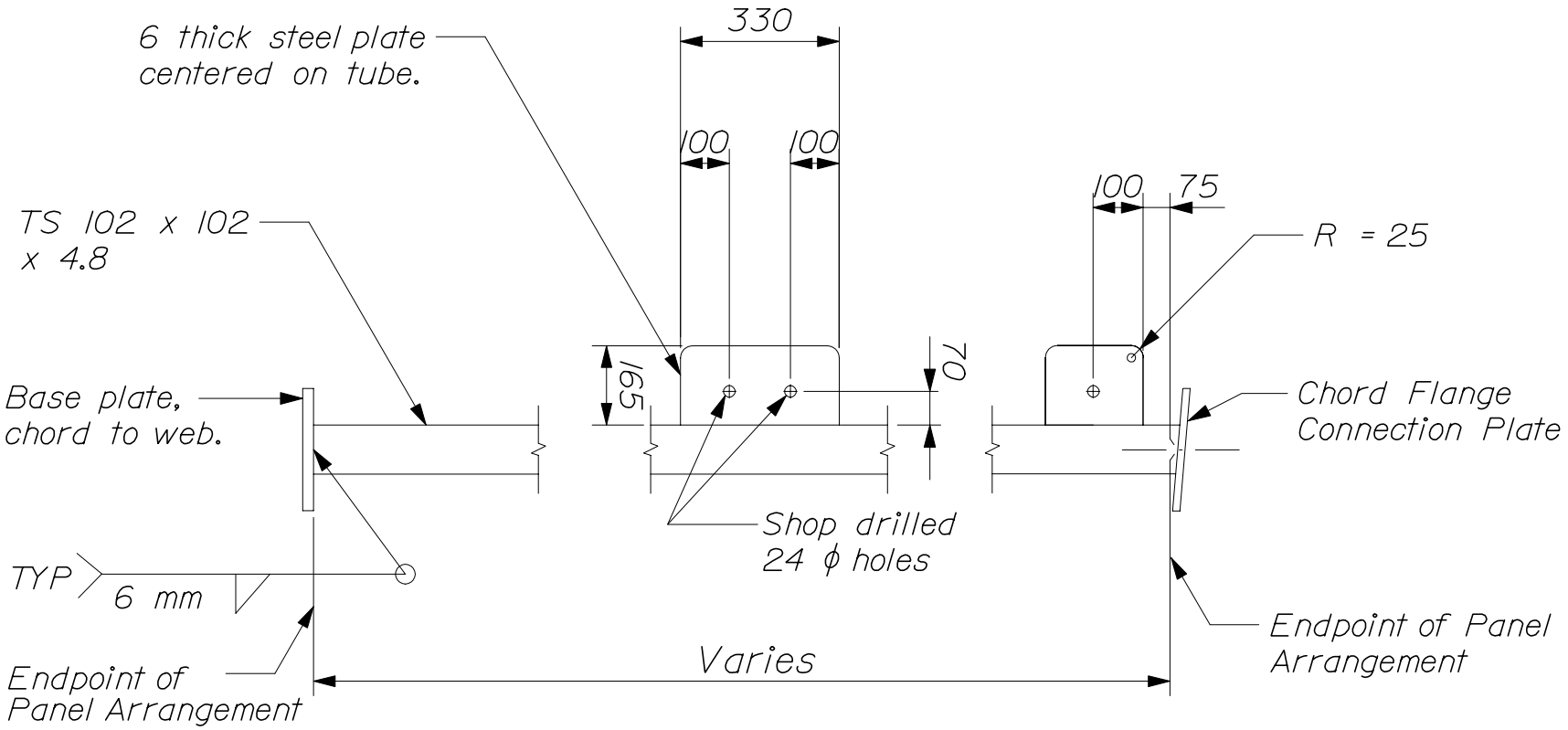
# HIGHWAY SIGNING
# OVERPASS MOUNTED SIGN SUPPORT
645(14)



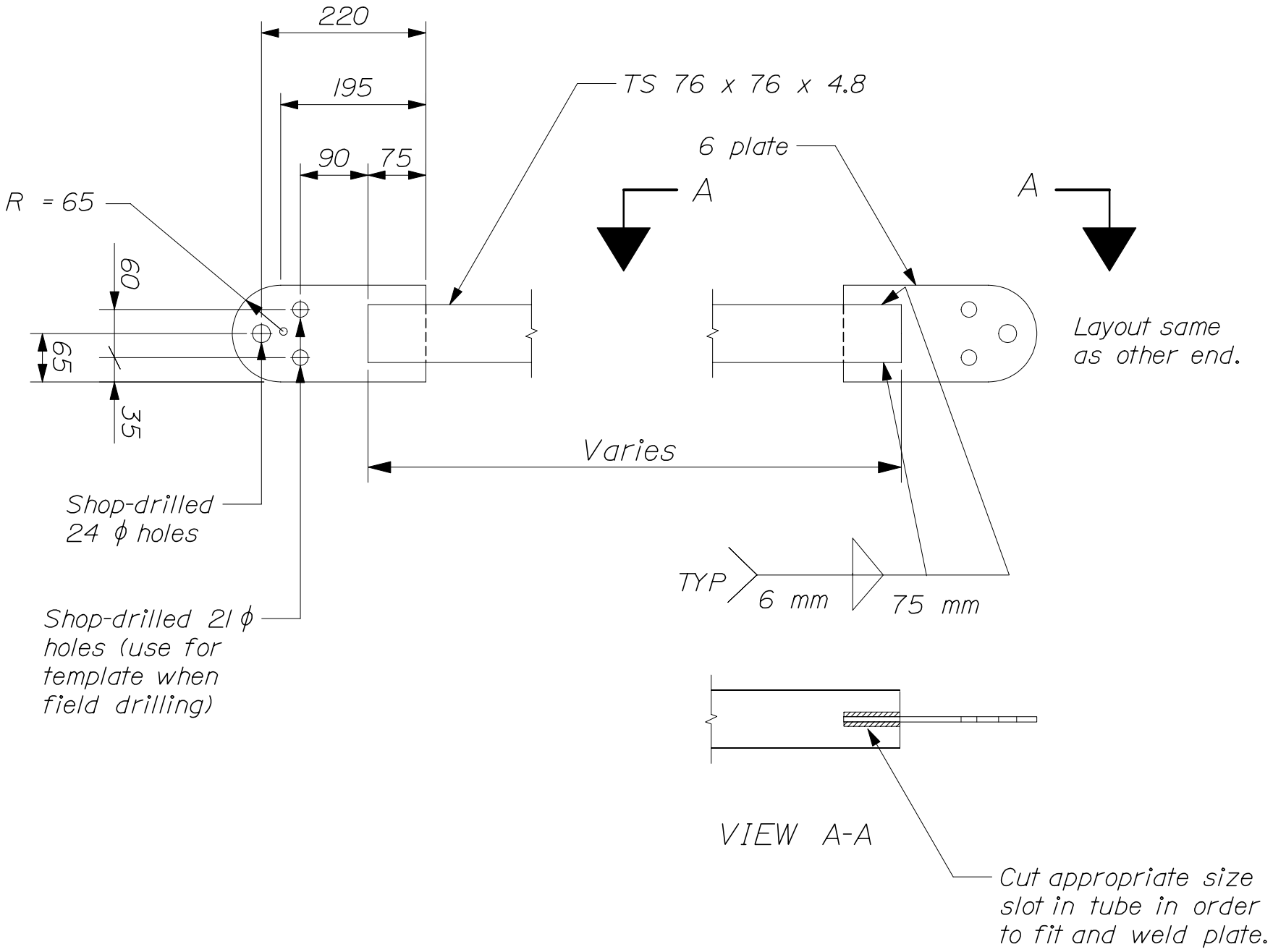
TYPICAL TOP CHORD

HIGHWAY SIGNING
OVERPASS MOUNTED SIGN SUPPORT

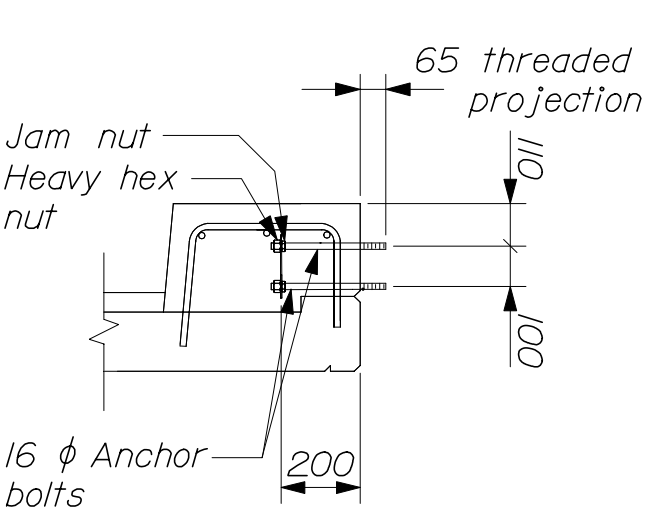
645(15)

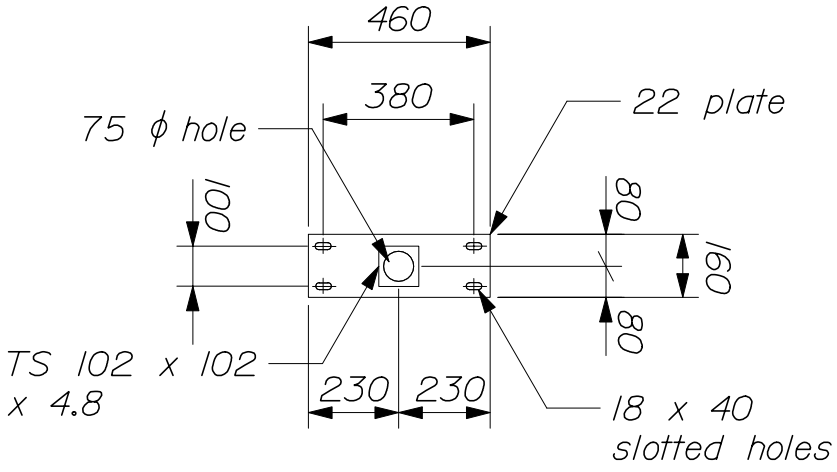


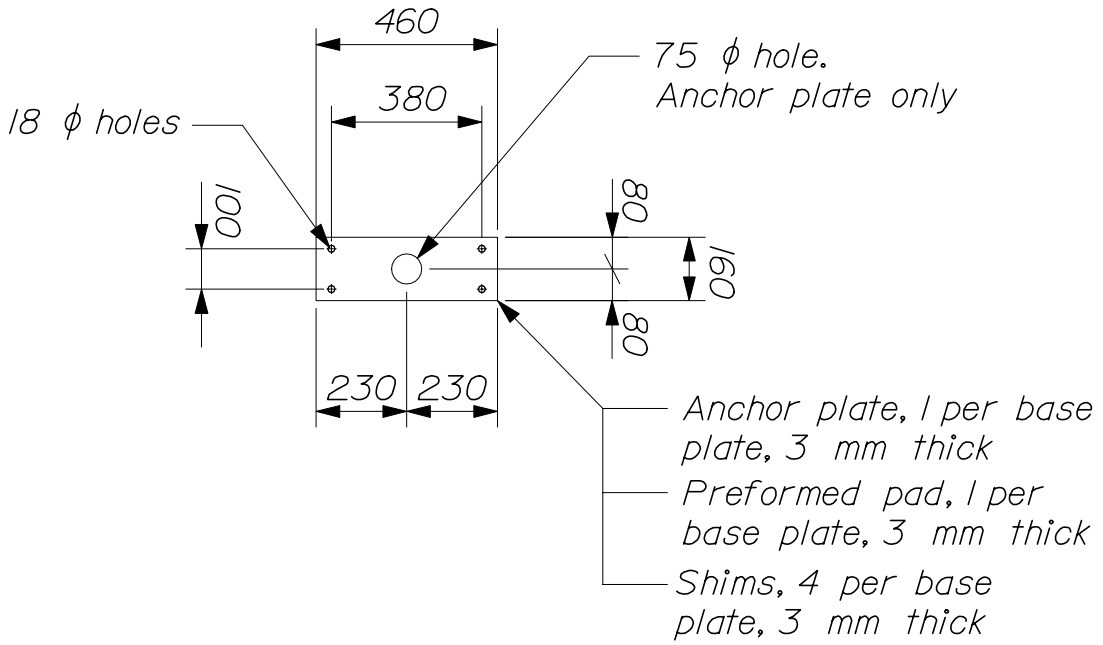
TYPICAL BOTTOM CHORD



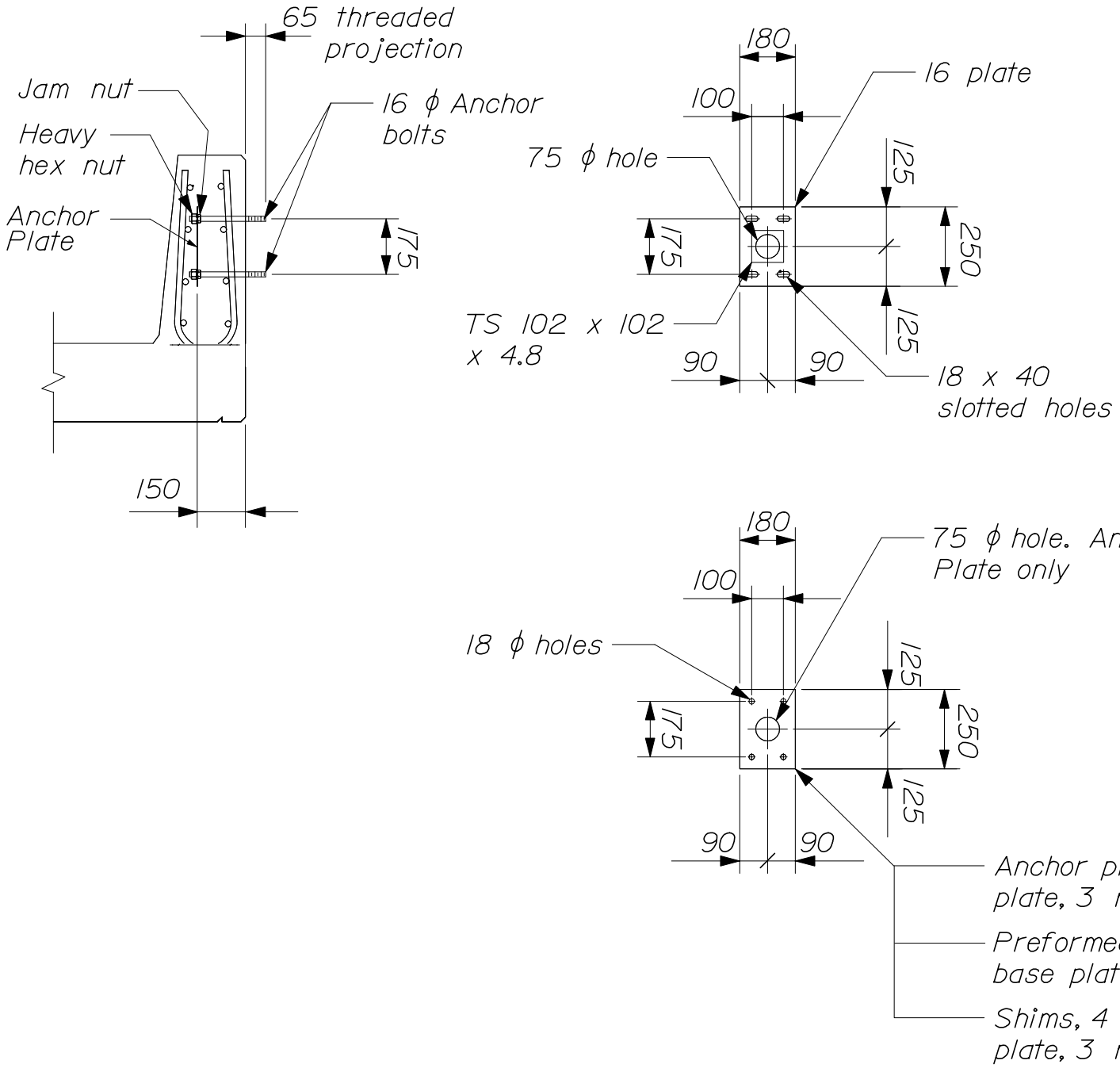
TYPICAL LATERAL AND VERTICAL BRACE



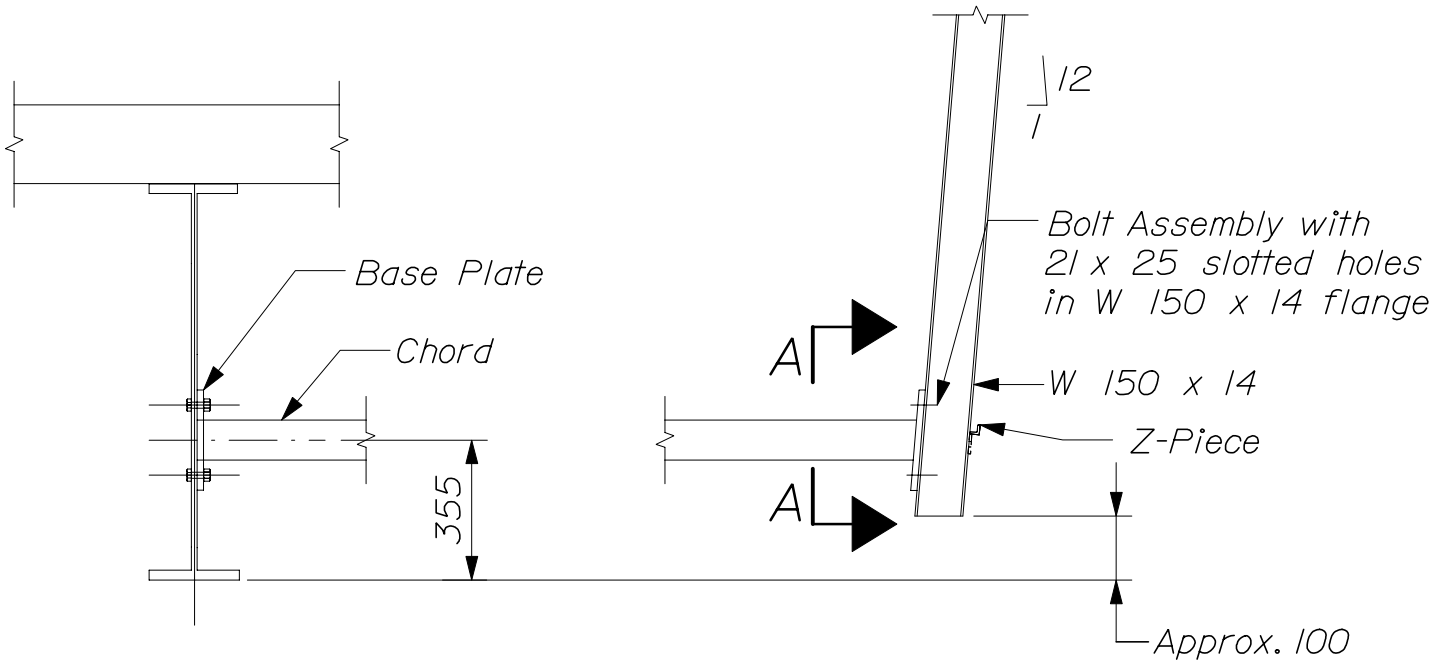


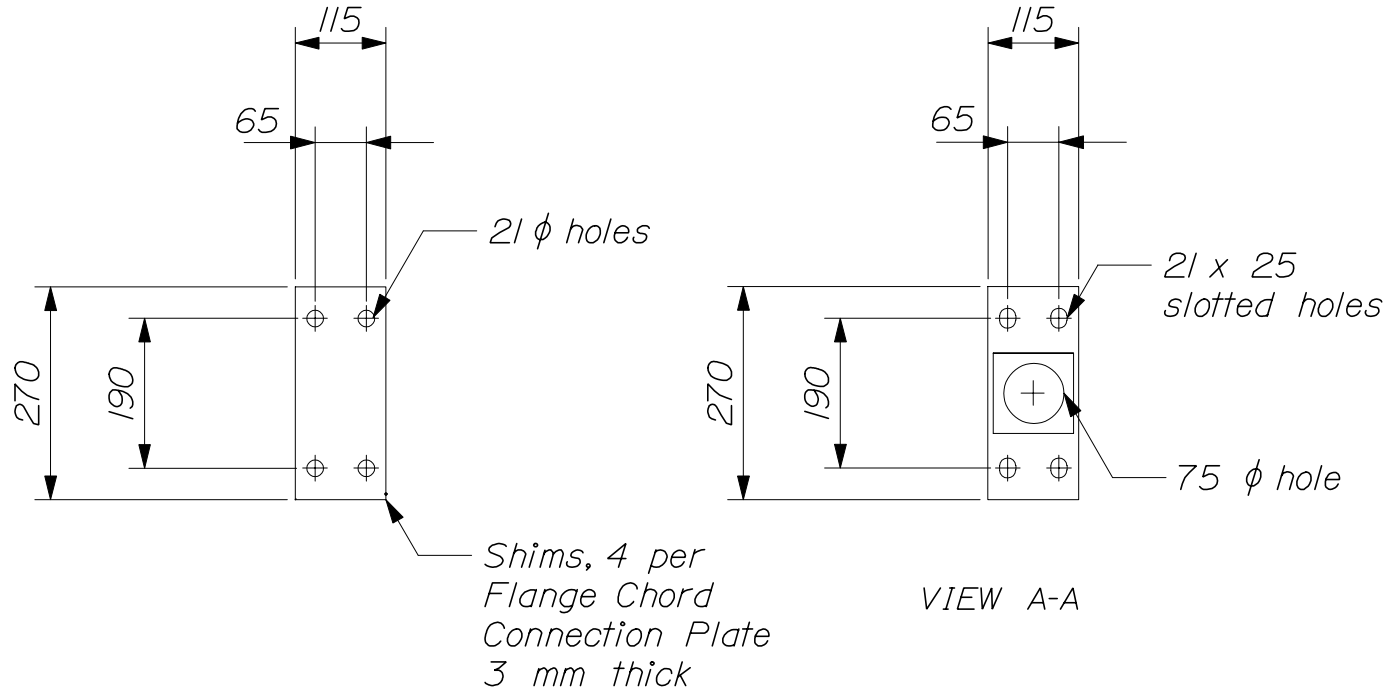


CURB TO CHORD BASE PLATE AND ANCHOR BOLT SYSTEM



BARRIER/STEEL BEAM TO CHORD BASE PLATE AND ANCHOR BOLT SYSTEM





# HIGHWAY SIGNING
# OVERPASS MOUNTED SIGN SUPPORT
645(20)

* Anchorage Eyelet shall be attached so that it is capable of supporting a dead weight load of 2400 kN (5400 lbs.).

Anchorage Eyelet shall be galvanized to the requirments of ASTM A153 or shall be Stainless Steel.

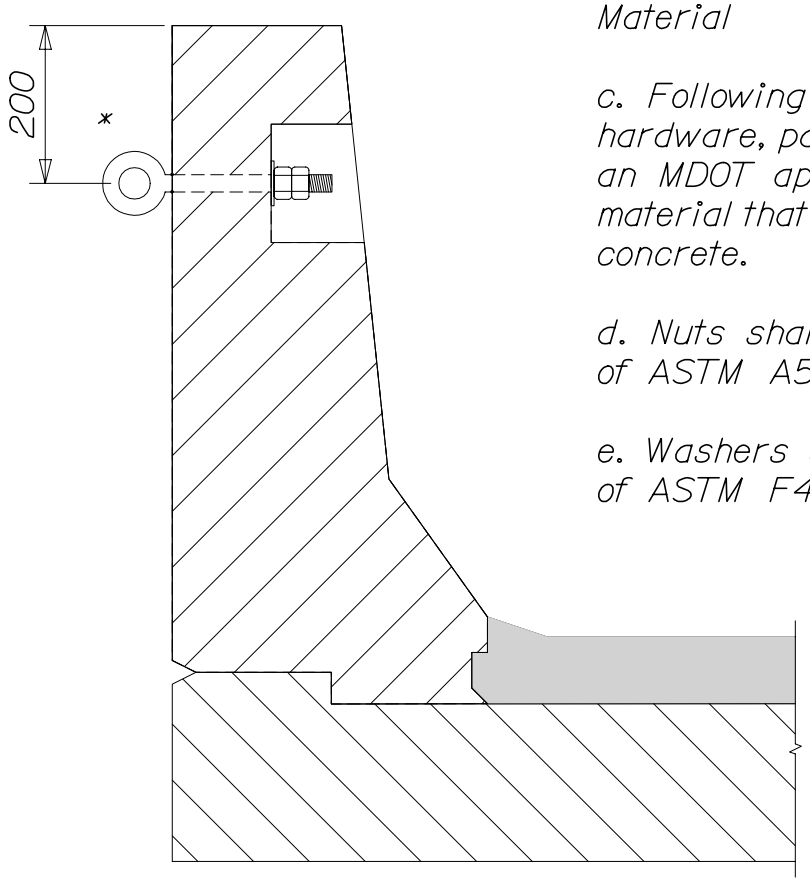
a. Block-out opening is 150 high by 150 wide.

b. Drill hole for eyelet shank 6 mm larger than shank diameter and fill void with grout selected from MDOT Prequalified List of Anchoring Material

c. Following installation of eyelet hardware, patch block-out with an MDOT approved patching material that matches the barrier concrete.

d. Nuts shall meet the requirements of ASTM A563.

e. Washers shall meet the requirements of ASTM F436.



ANCHORAGE EYELET DETAIL

# HIGHWAY SIGNING
# OVERPASS MOUNTED SIGN SUPPORT
645(21)

NOTES:

1. The support frame dimensions shall be determined by the Contractor. These shall be based on the sign size, bridge skew angle, and cross-sectional geometry. Field verification of these parameters is the responsibility of the Contractor. The Contractor shall consider the possibility of interferences such as splice plates, drains, stiffeners, etc. in developing the shop drawings.

2. The Contractor shall select an appropriate layout using the views in these Standards as a guide in order to determine the number of brackets, the configuration of the vertical bracing and the configuration of the lateral bracing.

3. The support frame is designed such that the Contractor may fasten chords, vertical and horizontal bracing using a single bolt per connection in an over-sized hole for erection purposes. When the frame is in final desired position, adjustments may be accomplished and remaining bolt holes may be drilled in the field using the connected components as a template.

4. The Contractor shall select an appropriate chord base plate for attaching to a concrete barrier, curb or parapet, using the views in these Standards as a guide. An accommodating anchor bolt system shall be selected from this Standard.

5. All work and materials shall conform to the applicable provisions of Section 504, Structural Steel, of the Standard Specification Highways and Bridges.

6. All Steel components shall be galvanized after fabrication in accordance with ASTM A123, except that hardware used in the connections of the structural frame shall meet the requirements of either ASTM A153 or ASTM B695, Class 50, Type I. Parts except hardware shall be blast-cleaned prior to galvanizing in accordance with SSPC-SP6.

7. Materials:

   Hollow steel sections shall meet the requirements of ASTM A500, Grade B.

   Steel plate shall meet the requirements of AASHTO M223M/M223, Grade 345/50 (ASTM A572/A572M, Grade 50/345). Steel shapes shall meet the requirements of ASTM A992/A992M.

   Steel shim plates shall meet the requirements of ASTM A36/A36M.

# HIGHWAY SIGNING
# OVERPASS MOUNTED SIGN SUPPORT
645(22)

Bolting assemblies used in the connections of the structural frame shall be Heavy Hex Head M20 (3/4 ") and meet the requirements of ASTM A325M (ASTM A325). The Contractor shall select appropriate bolt lengths.

Anchor bolt assemlies used to fasten the structural frame to a concrete curb, barrier or parapet shall meet the requirements of ASTM A449, Type I with a minimum yield strength of 380 MPA (55 KSI).

Remaining materials used shall be as specified elsewhere in these Standards or in the Contract Documents.

8. Fastener nuts in anchor and bolt assemblies shall be tightened to a snug fit and given an extra 1/8 turn. Fastener assemblies in oversized holes shall have washers under bolt heads and nuts.

9. Holes that are field drilled shall be coated with an approved zinc-rich primer prior to final erection.

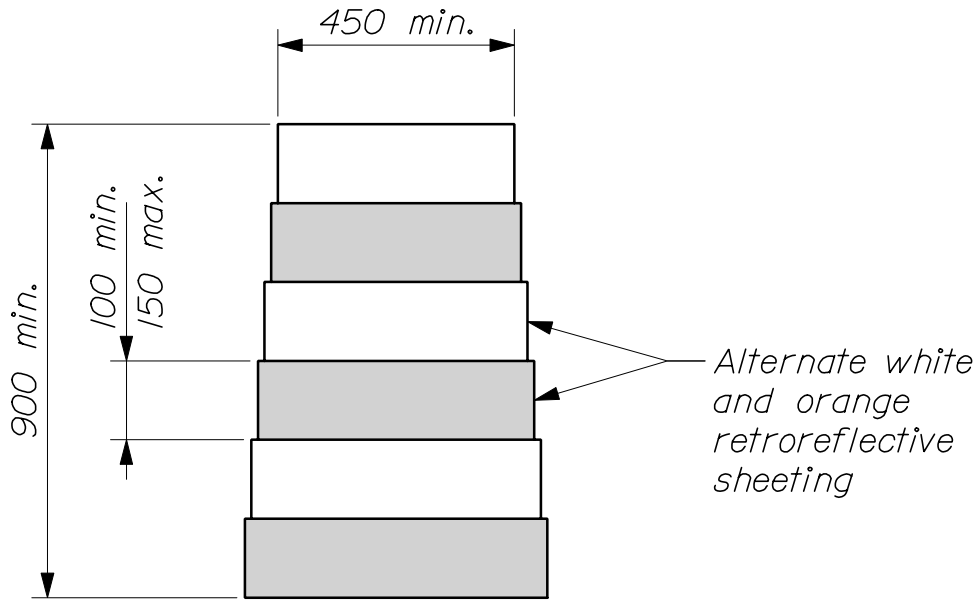
10. A random 25% of all base plate to chord welds and chord to Flange Connection Plate welds shall be MT inspected. Only a one-time repair is allowed on these welds without written permission of the Engineer. All other welds shall be subject to VT inspection.

11. Anchor bolts shall be installed with misalignments of less than 1:40 from theoretical location.

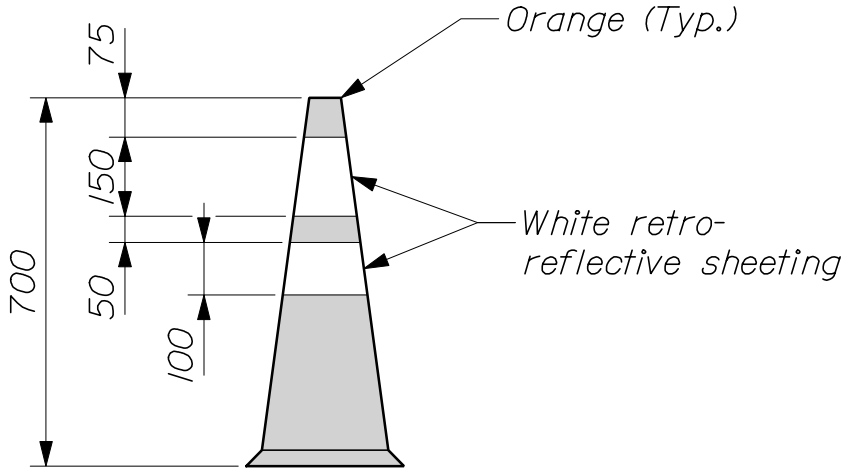
12. An anchorage eyelet shall be installed approximately midpoint between each bracket when a concrete barrier is utilized as the top chord attachment.

13. Preformed pads, specified in Section 713, Structural Steel and Related Material, of the Standard Specifications Highways and Bridges, shall be placed between each chord base plate and concrete surface.

14. The Contractor may use shim plates, as provided by this Standard, beneath all base plates and Flange Connection Plates as necessary, up to an adjustment of 12 mm.

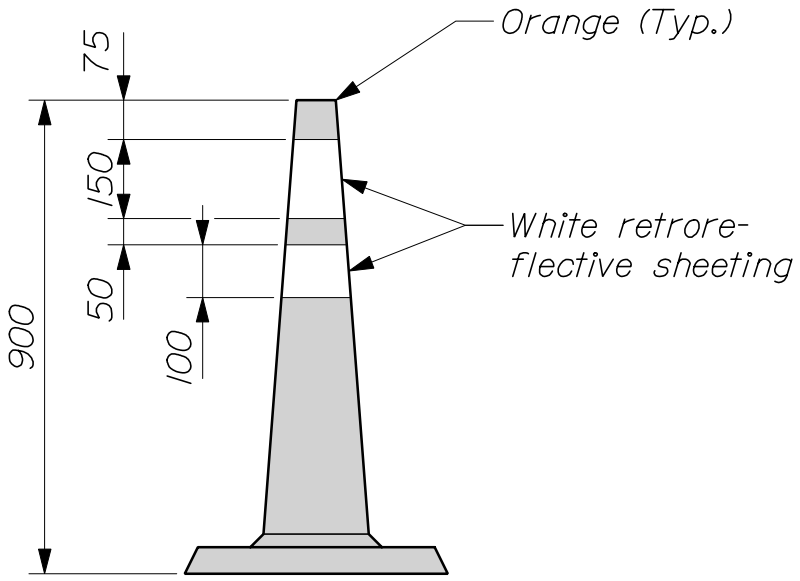


-- DRUM TYPE "B" --
(Non - metal)

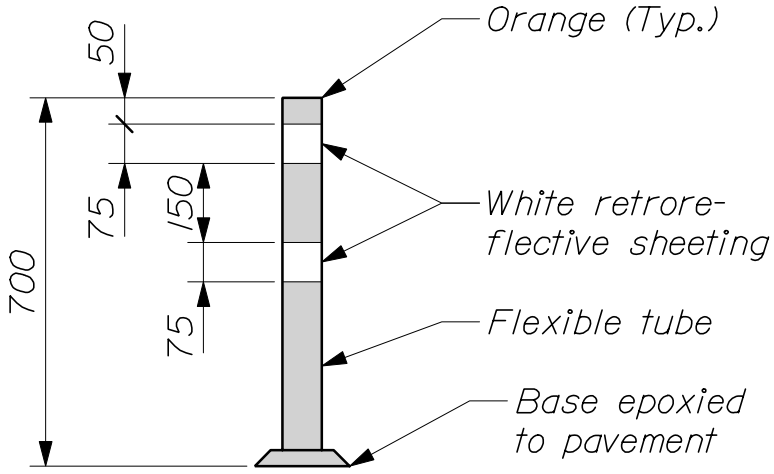


-- CONE TYPE "A" --
(Standard)

# CHANNELIZING DEVICES
652(01)

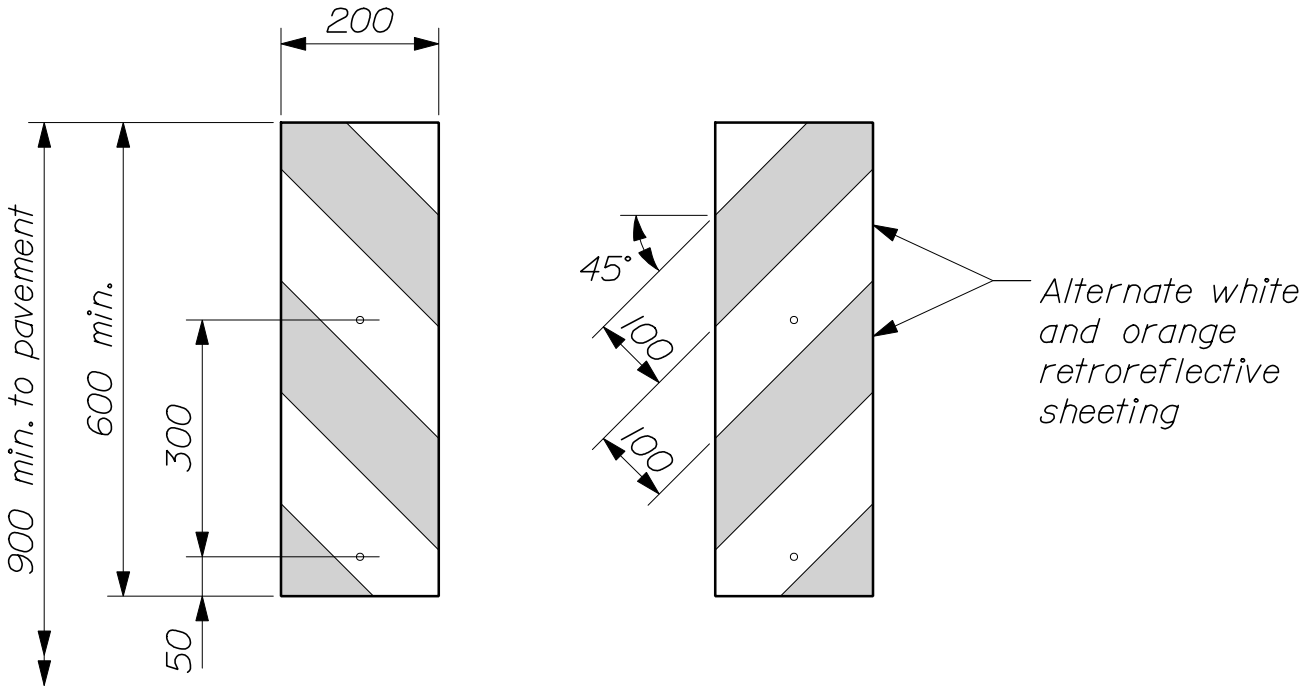


-- CONE TYPE "B" --
(High Ballasted)

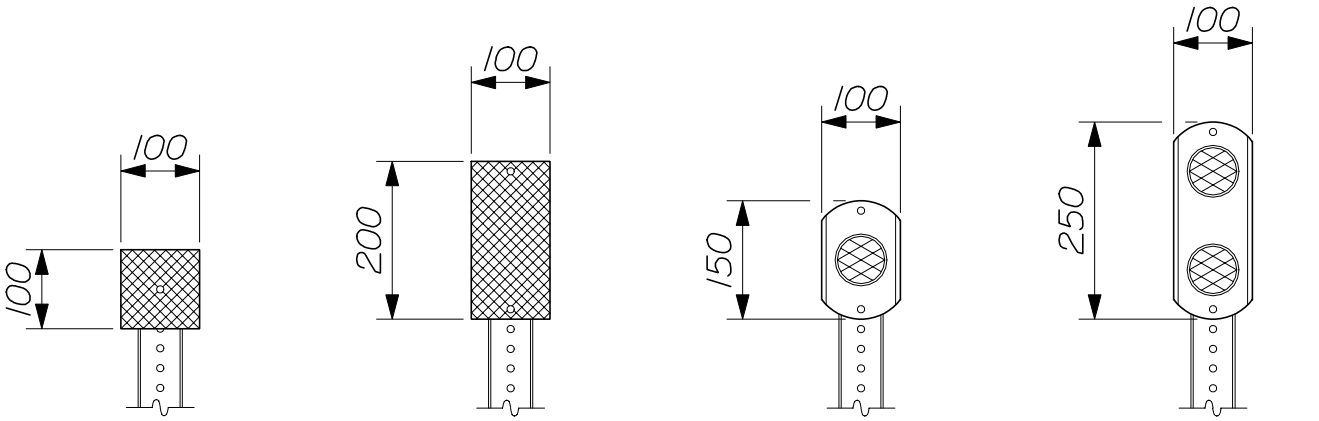


-- CONE TYPE "C" --
(Flexible)

# CHANNELIZING DEVICES
652(02)



-- VERTICAL PANELS --



Retroreflective Sheeting

75 mm Diameter Reflector

-- DELINEATORS --

CHANNELIZING DEVICES

652(03)

NOTES:

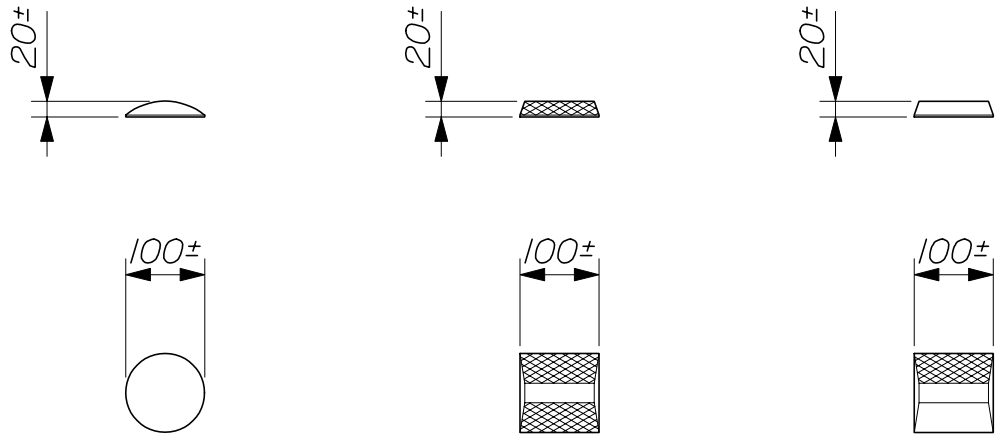
1. Reflectorize vertical panels with alternate orange and white stripes as shown.

2. Mount delineators 1200 mm (measured to center) above the pavement surface.

3. Drums may be weighted with a maximum of 10 kg of dry sand.

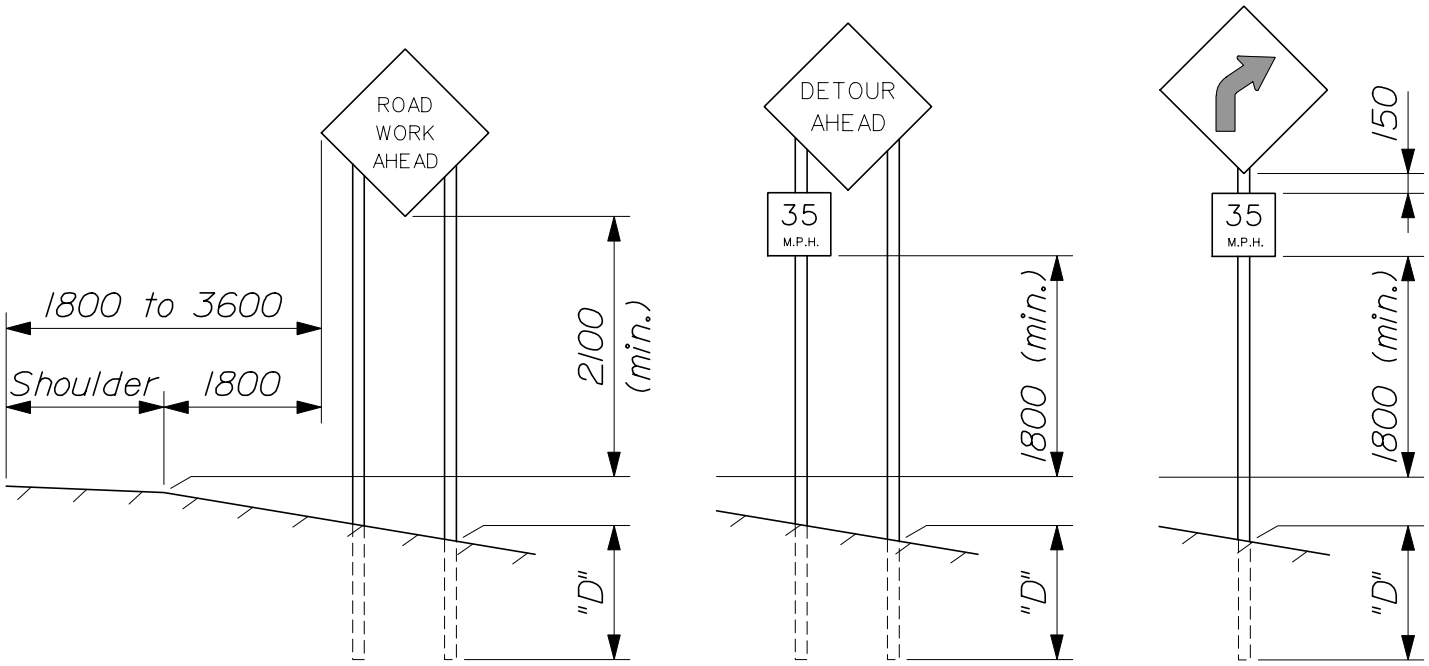
4. Temporary raised pavement marker color shall match the corresponding pavement striping color: clear markers for white striping and amber markers for yellow striping.

5. Cones Type "A" may be ballasted with weighted rings.

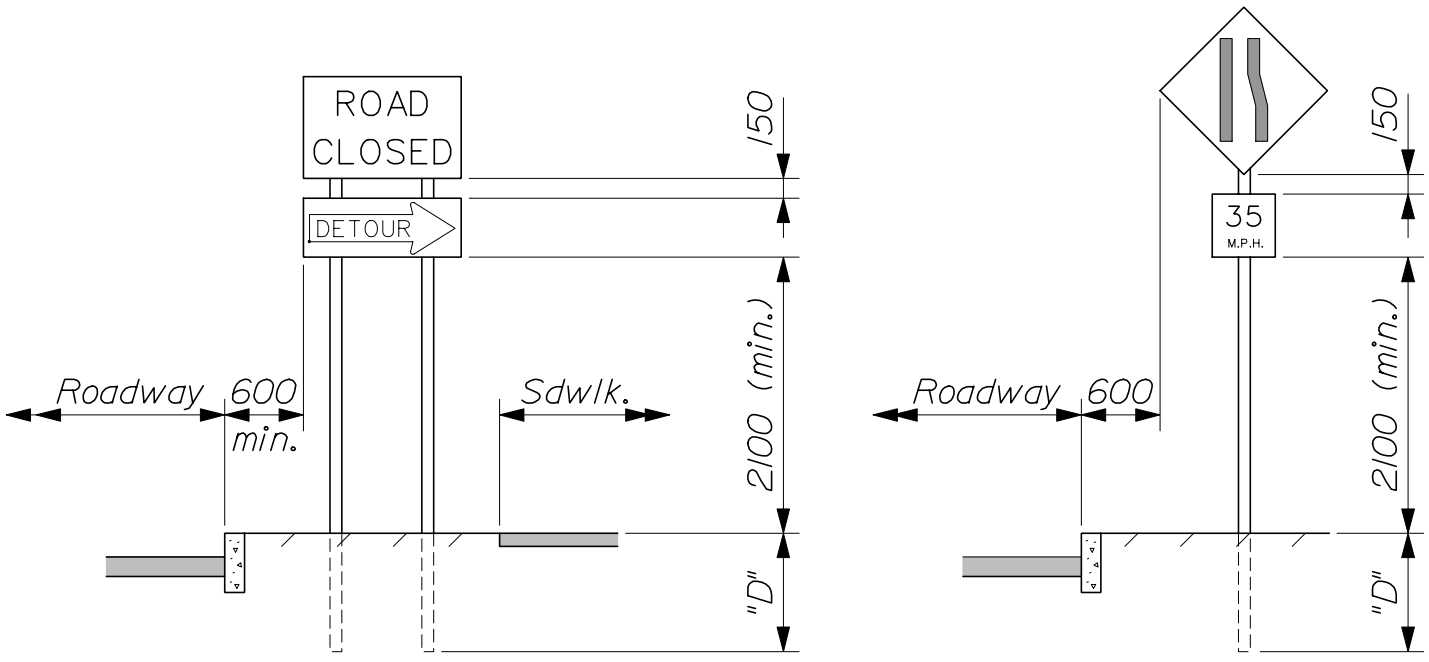


Type "A" Type "B" Type "C"

-- TEMPORARY RAISED PAVEMENT MARKERS --



-- RURAL AREA --
(Fixed signs)



-- URBAN AREA --
(Fixed signs)

# CONSTRUCTION SIGNS
652(05)

NOTES;

1. All signs shall conform to the applicable provisions of the current edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways", FHWA; and to "Standard Highway Signs", FHWA, 2000. Refer to MUTCD, Part VI for any information not shown in these details.

2. Steel U-channels are required as sign posts.

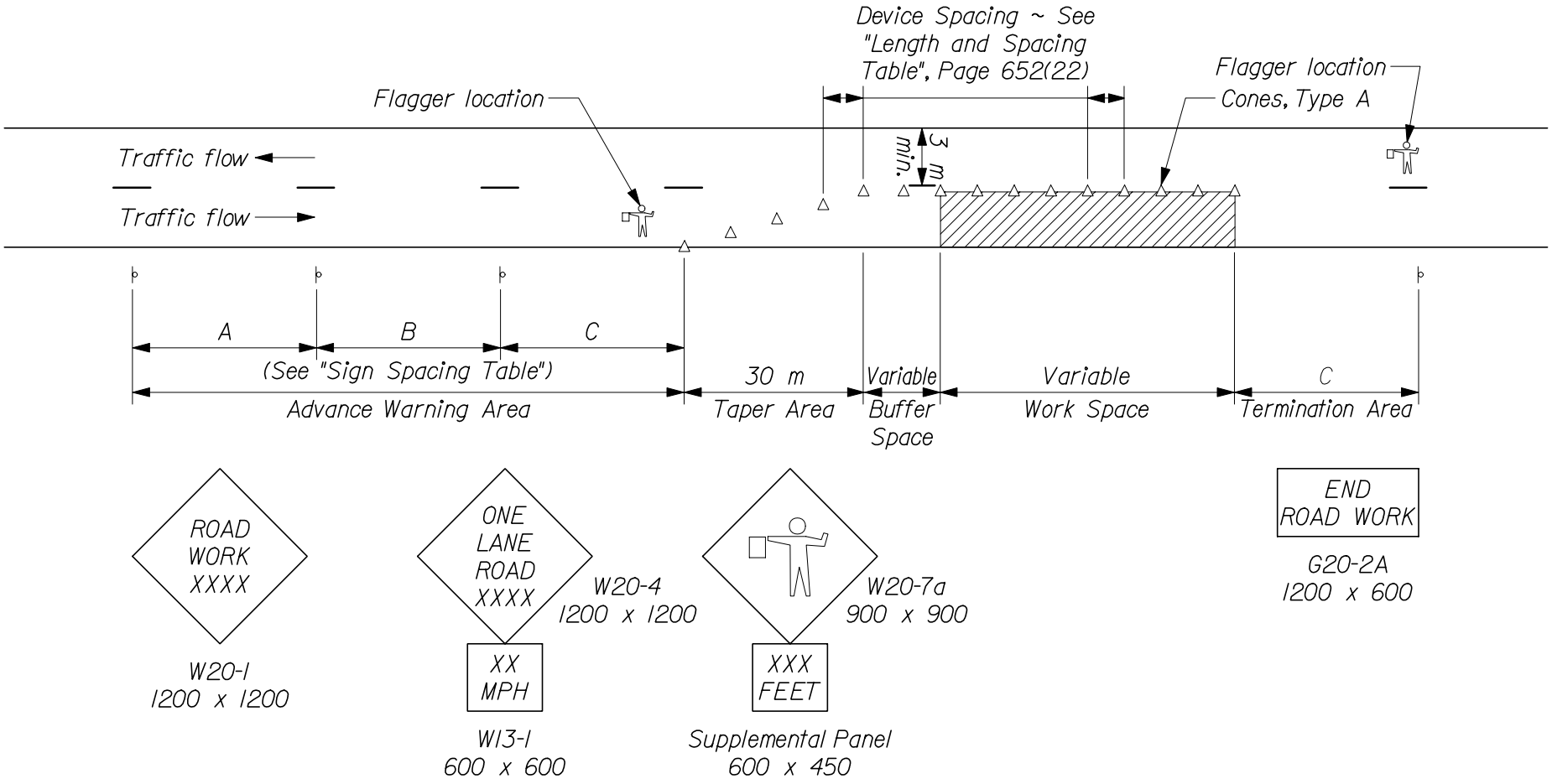
3. Mount signs that are wider than 900 mm or larger than one square meter in area on two or more posts.

4. When parking is permitted within 60 meters of the sign, mount the sign a minimum of 2100 mm above the pavement surface.

# CONSTRUCTION SIGNS
652(06)

NOTES:

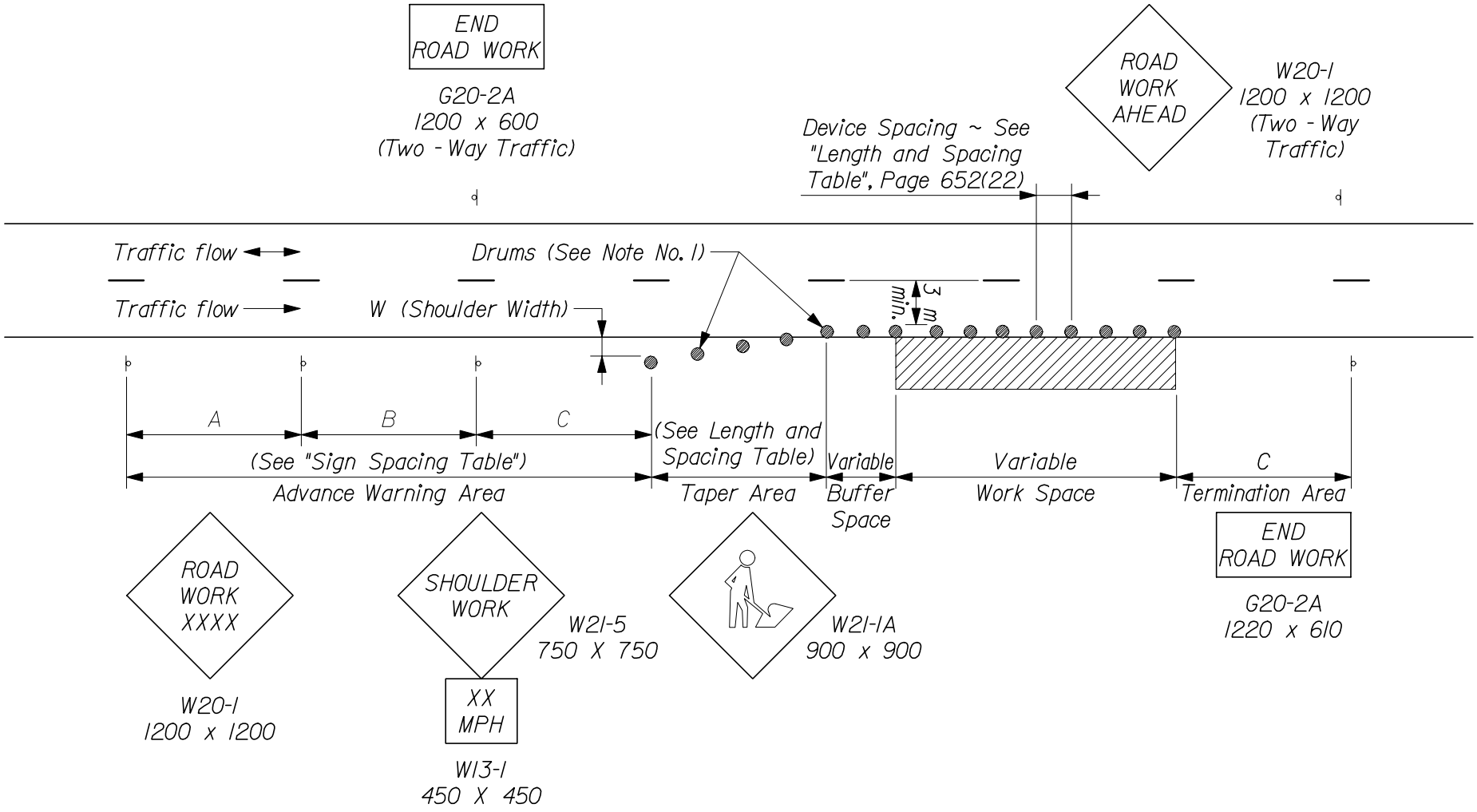
1. Signs shown are for one direction only. Repeat the signing for the opposite direction.



TYPICAL APPLICATION: TWO - WAY, TWO LANE ROADWAY,
CLOSING ONE LANE USING FLAGGERS

NOTES:

1. For operations that require a shoulder closure for a day or less, drums may be replaced with Type "A" Cones.

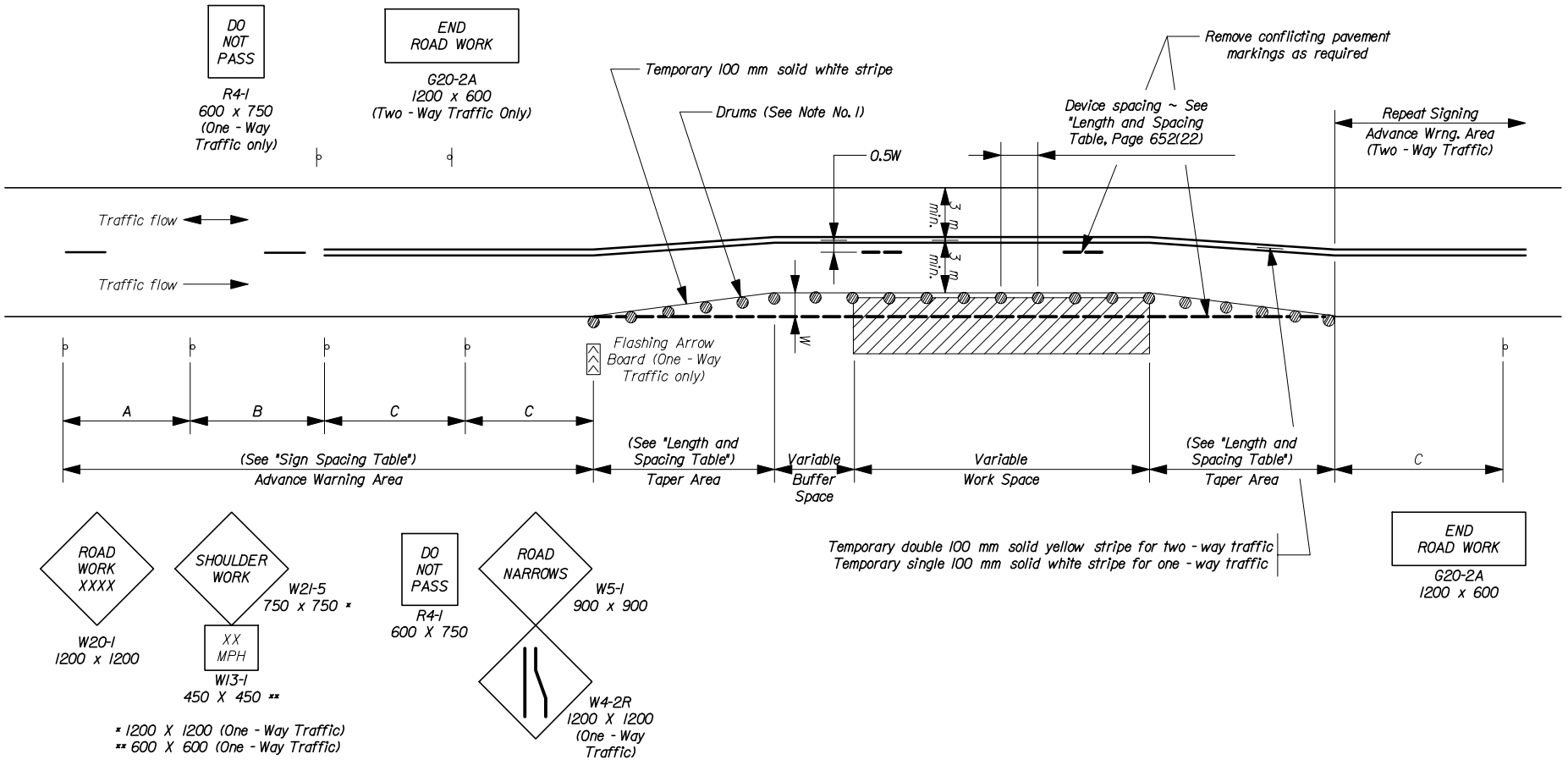


TYPICAL APPLICATION: ONE - WAY OR TWO - WAY,
TWO LANE ROADWAY, CLOSING SHOULDER

NOTES:

1. For operations that require a shoulder closure for a day or less, drums may be replaced with Type "A" Cones.

2. For one - way traffic, repeat signs on both sides of the roadway.

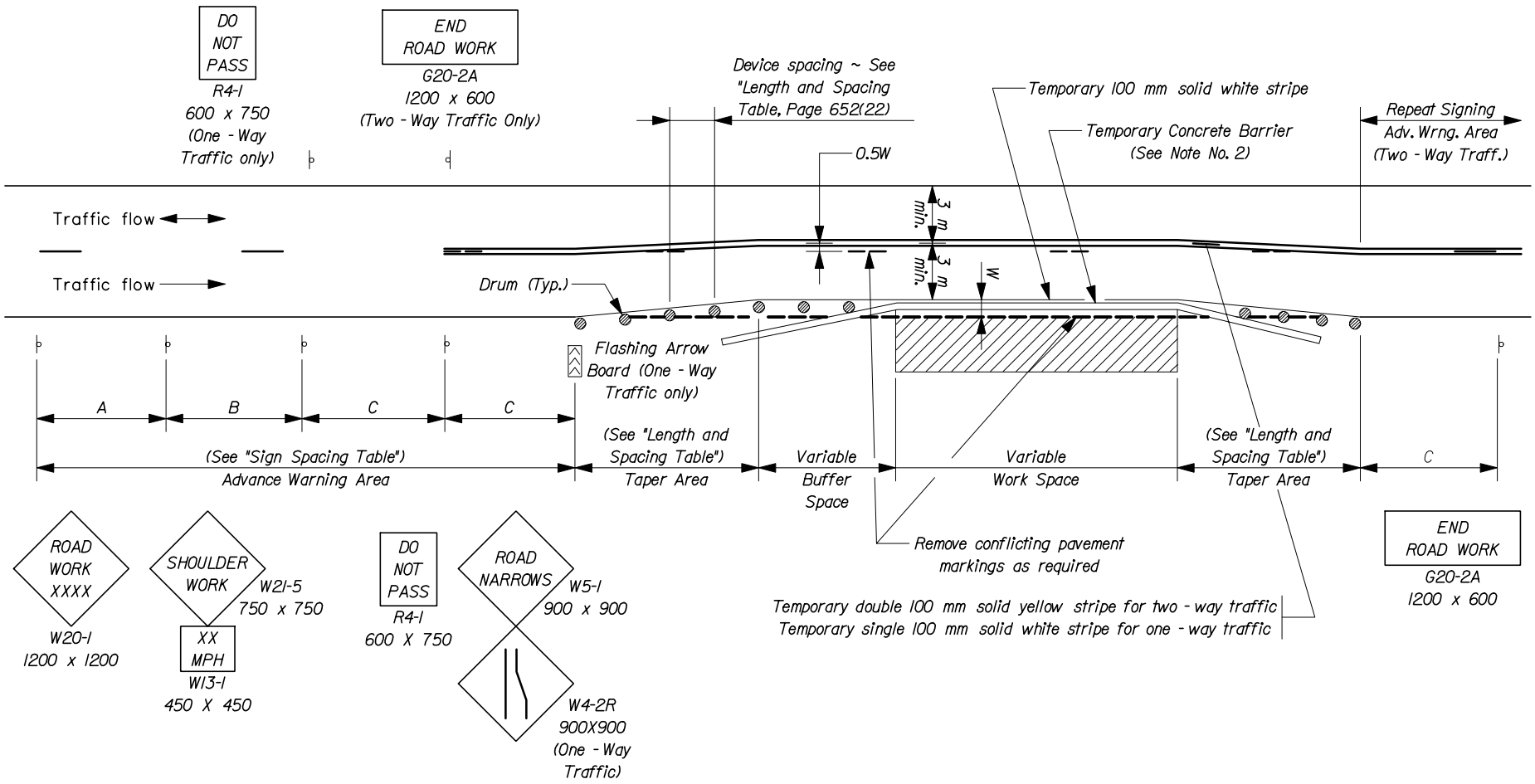


TYPICAL APPLICATION: ONE - WAY OR TWO - WAY, TWO LANE ROADWAY, CLOSING PARTIAL LANE WIDTH AND SHOULDER

NOTES:

1. For one - way traffic, repeat signs on both sides of the roadway.

2. Barrier placement is in accordance with the AASHTO Roadside Design Guide of January 1996. Terminate barrier ends outside the clear zone or protect the ends with an impact attenuator.

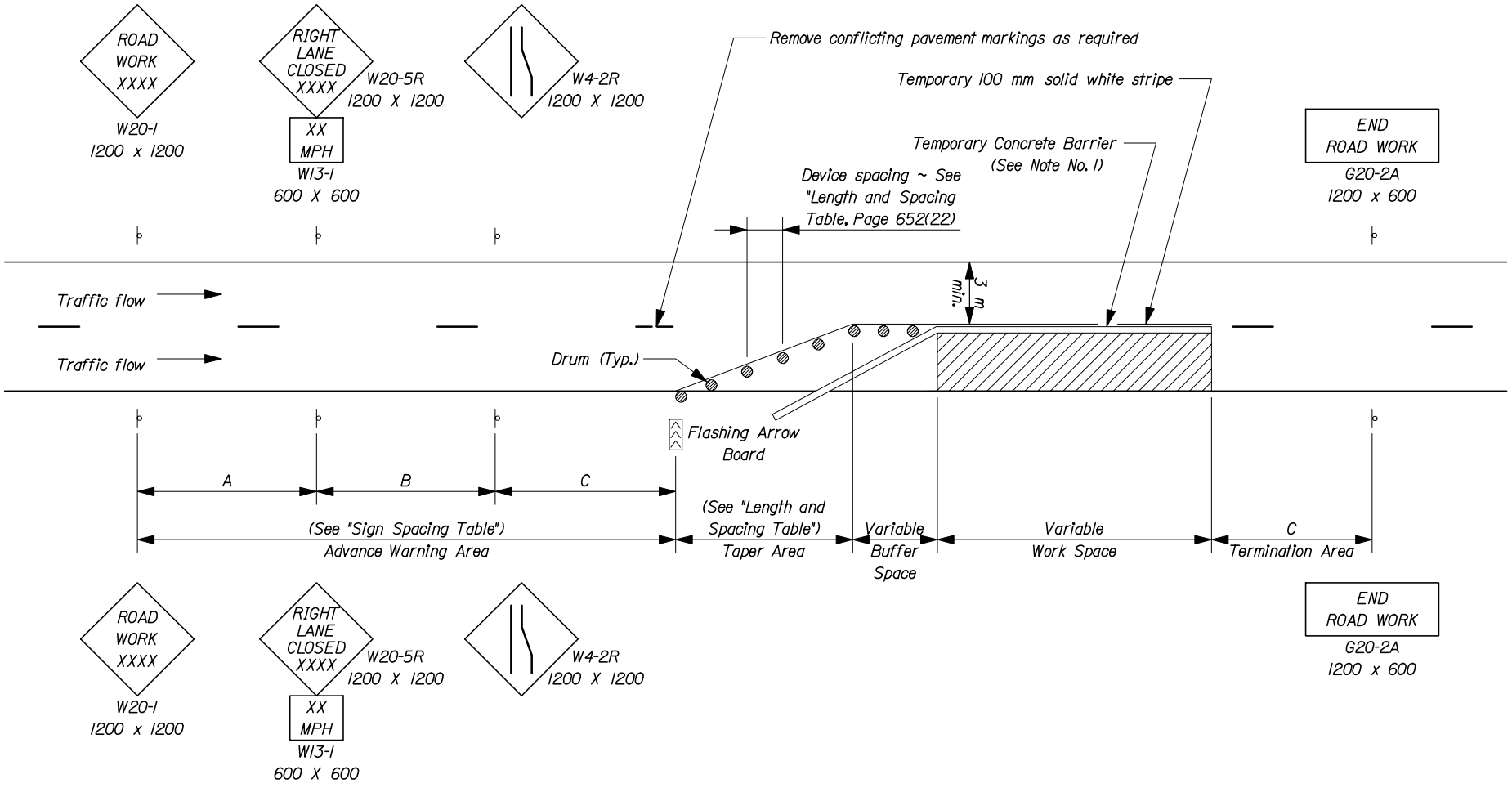


TYPICAL APPLICATION: ONE - WAY OR TWO - WAY, TWO LANE ROADWAY, CLOSING PARTIAL LANE AND SHOULDER USING TEMPORARY CONCRETE BARRIER

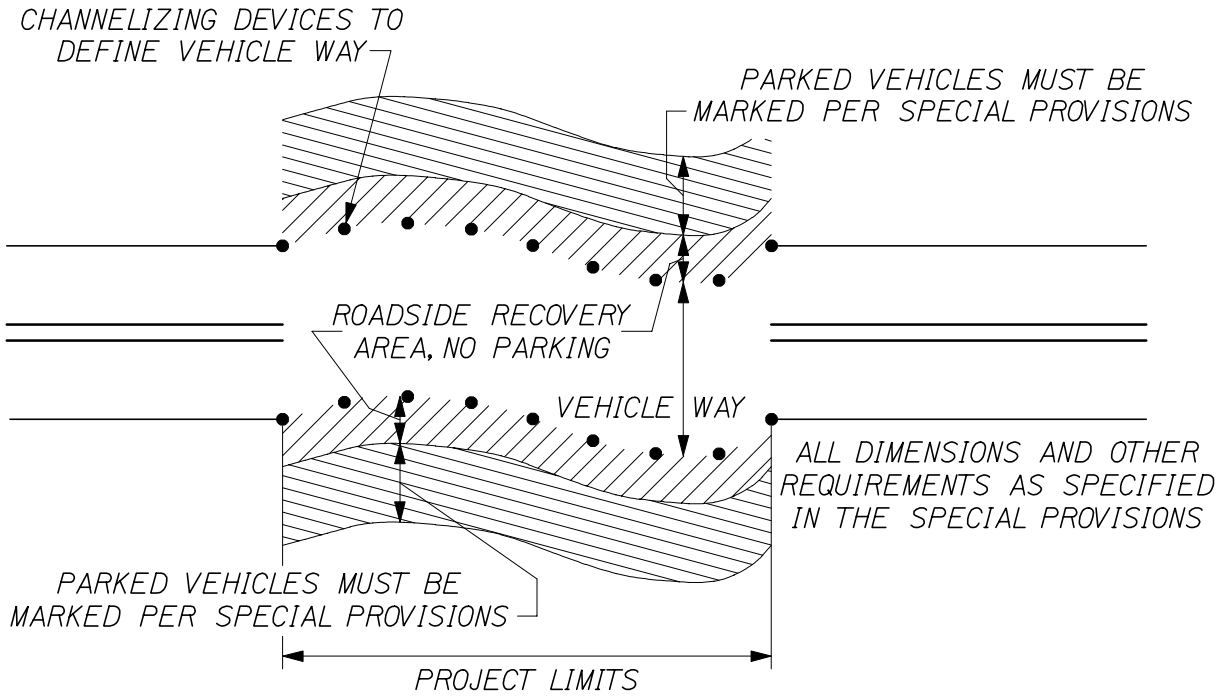
NOTES:

1. Barrier placement is in accordance with the AASHTO Roadside Design Guide of January 1996. Terminate barrier ends outside the clear zone or protect the ends with an impact attenuator.

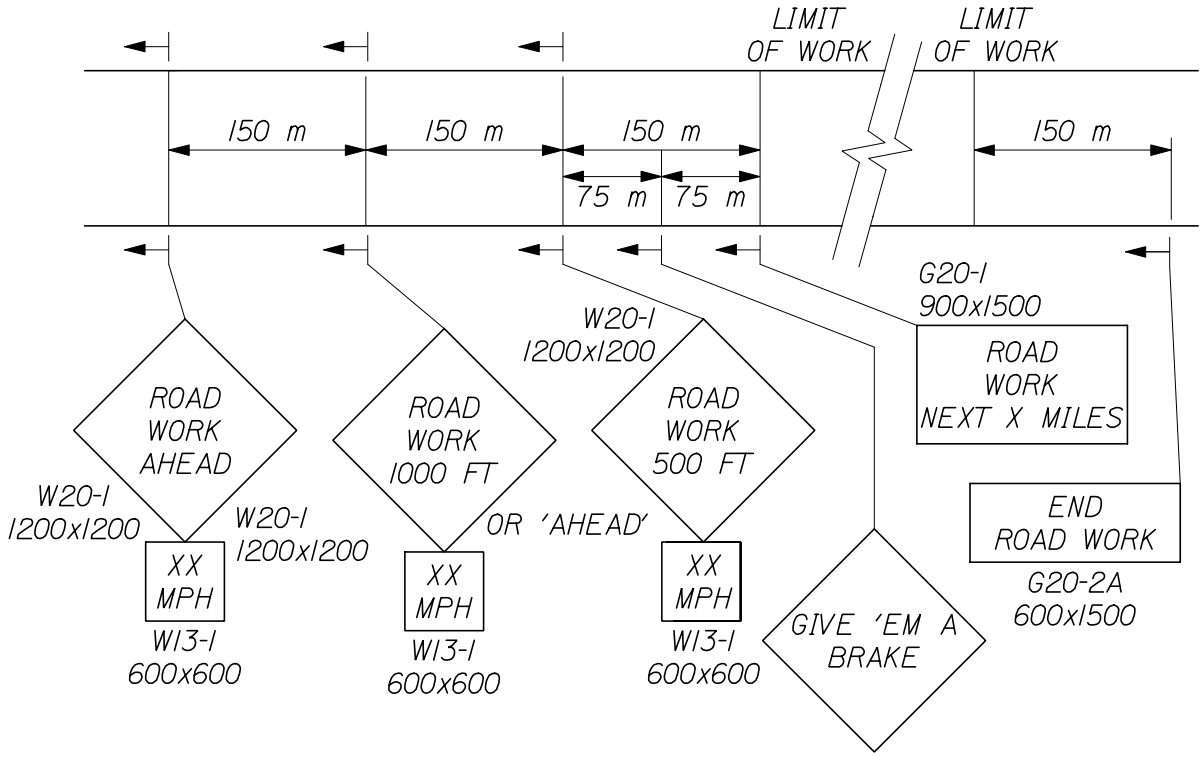
2. Right lane closure is shown. For left lane closure, substitute signing with W20-5L and W4-2L.



TYPICAL APPLICATION: ONE - WAY, TWO LANE ROADWAY, CLOSING ONE LANE, USING TEMPORARY CONCRETE BARRIER (90 KPH OR LESS)



-- ROADSIDE RECOVERY AREA --

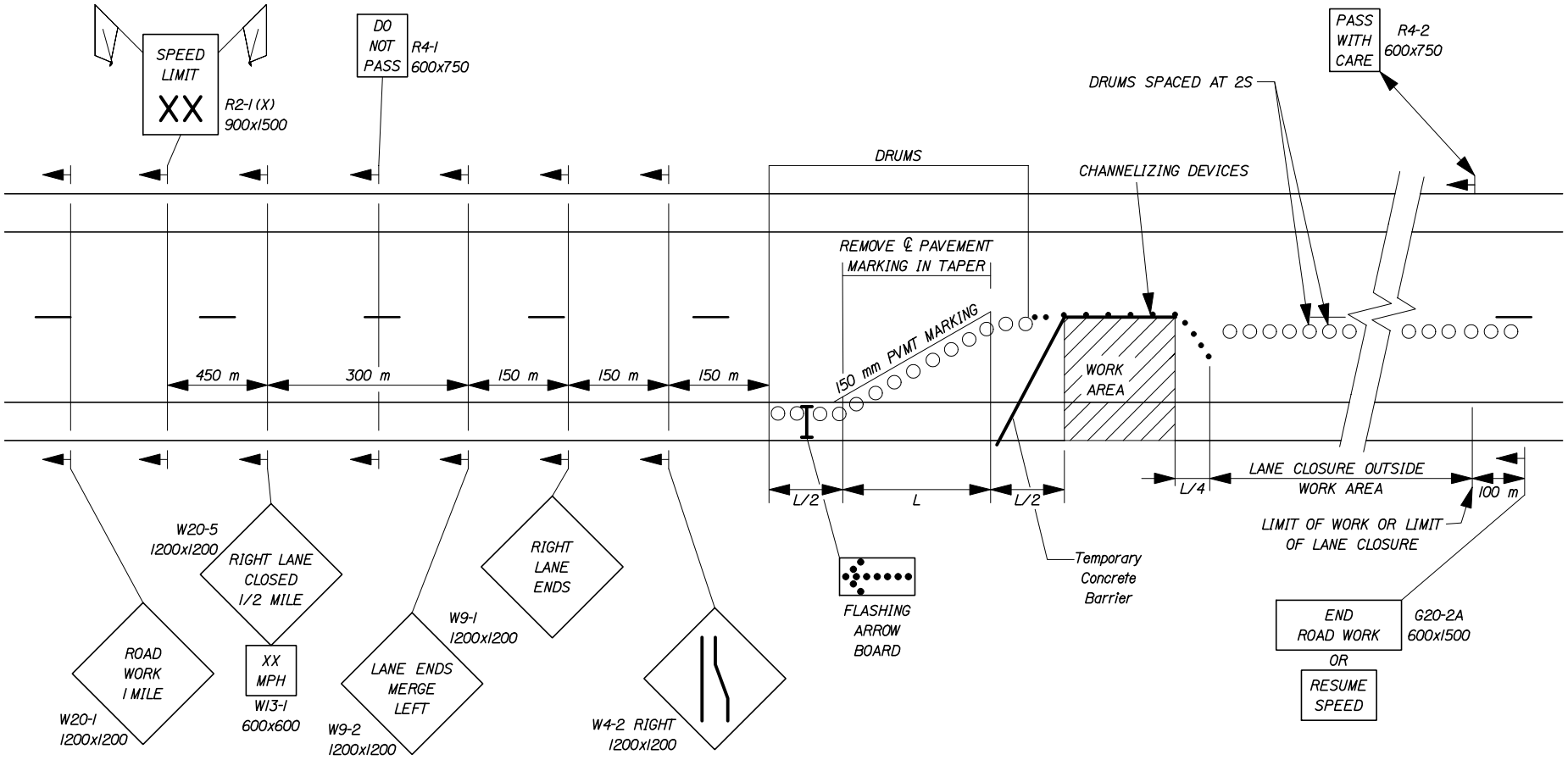


-- PROJECT APPROACH SIGNING --
EXPRESSWAY

# CONSTRUCTION TRAFFIC CONTROL
652(12)

NOTES:

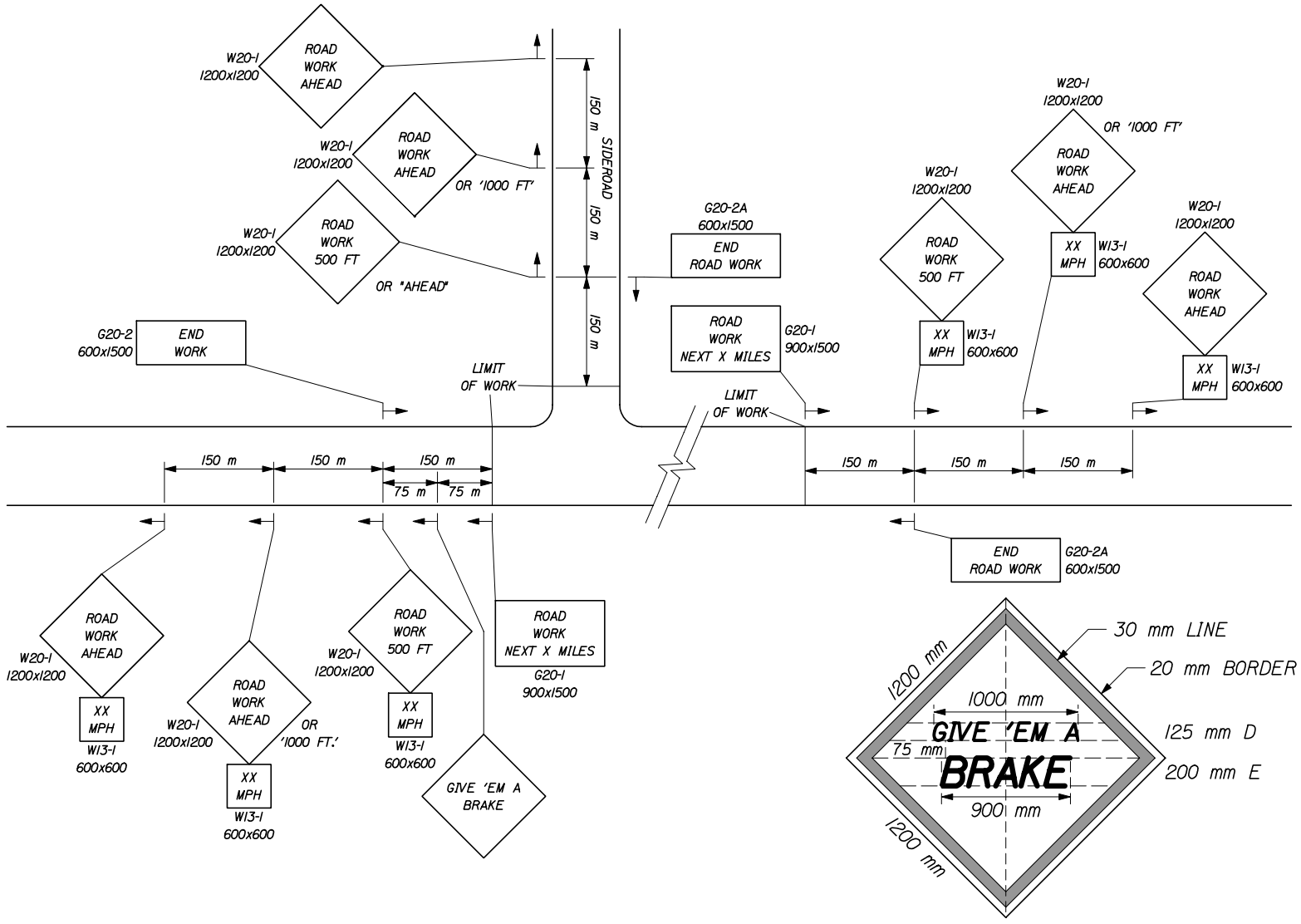
Omit W20-1 if lane closure signing array is within project limits.
Alter pavement markings as required.
Maintain 4.5 m lateral clearance.
Use similar signing for left lane closure.



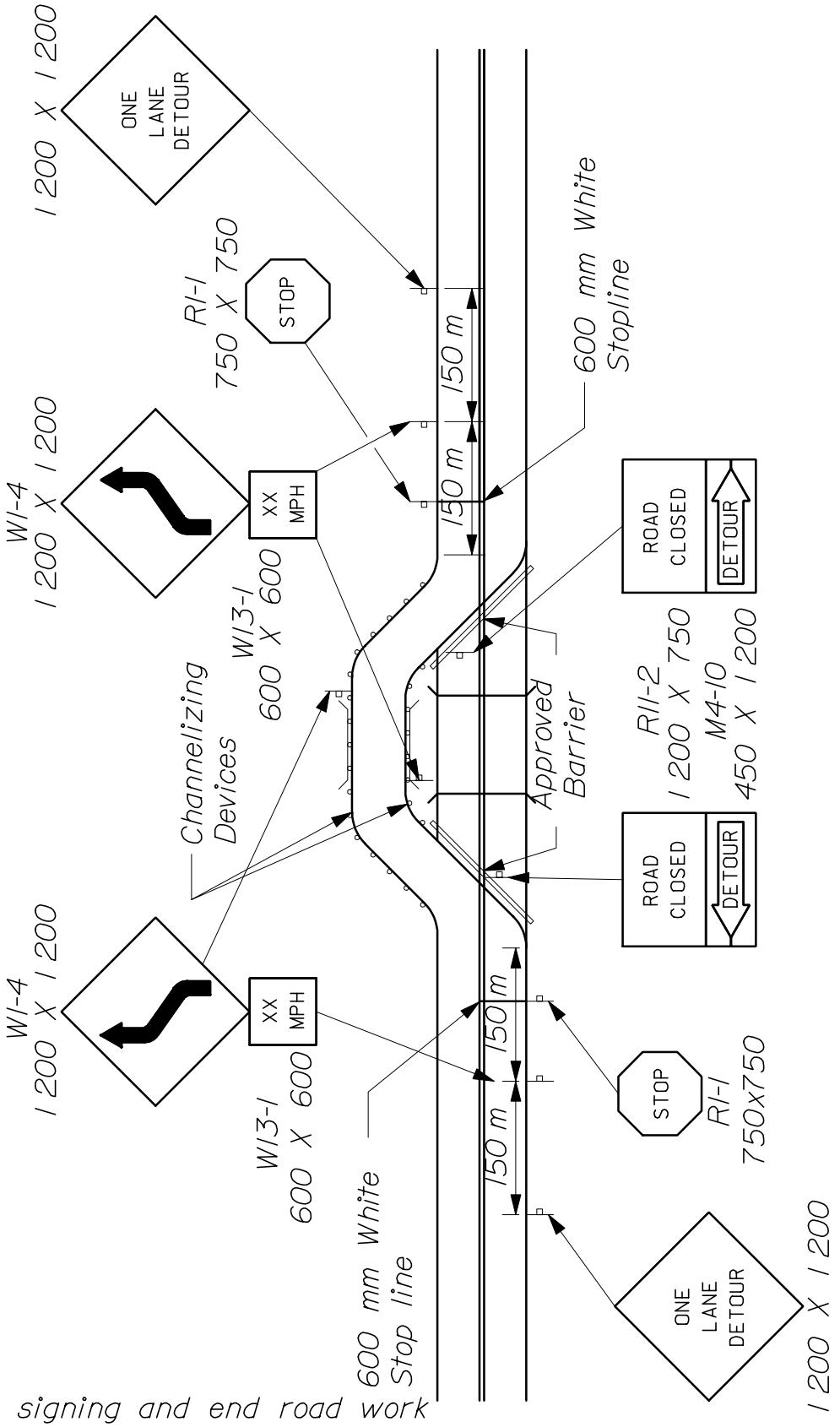
-- EXPRESSWAY LANE CLOSURE --

Note:

Use shaded signs when called for in the Special Provisions



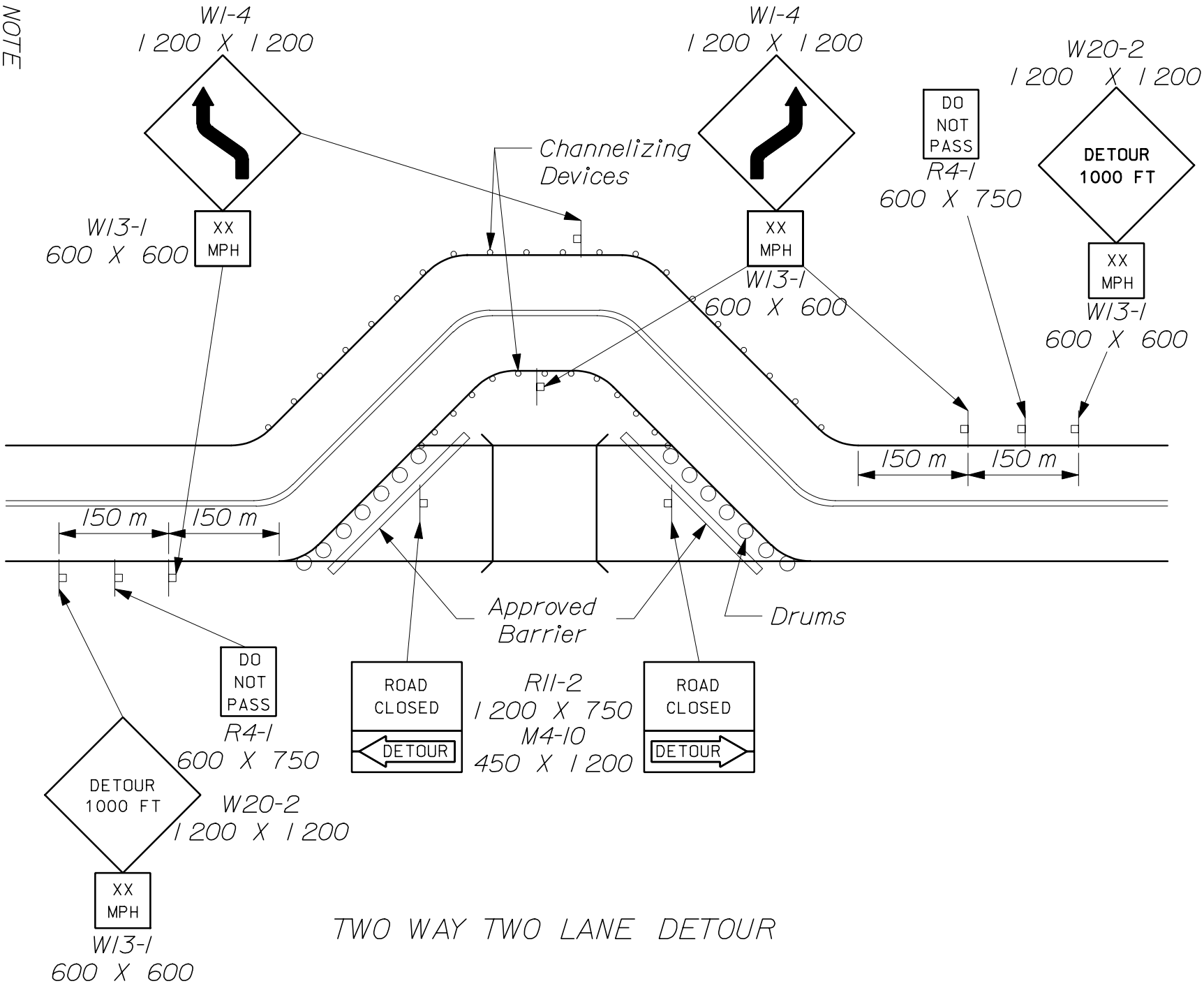
-- PROJECT APPROACH SIGNING --
TWO WAY TRAFFIC



Note:
Approach signing and end road work signs are required if this work is the construction project.

ONE WAY DETOUR
LOW VOLUME ROAD WITH ADEQUATE SIGHT DISTANCE

652(15)



NOTE
APPROACH SIGNING AND END ROAD WORK SIGNS ARE REQUIRED IF THIS WORK IS THE CONSTRUCTION PROJECT.

TWO WAY TWO LANE DETOUR

652(16)

LENGTH AND SPACING TABLE									
Approach Speed		Taper Length (meters)			Buffer Space (meters)	Device Spacing (meters)			Concrete Barrier Flare Rate
Miles Per Hour	Kilometers Per Hour	Lane Width				Taper Area	Buffer Space	Work Space	
		3.0	3.3	3.6					
25	40	35	35	40	20	8	15	15	6.5:1
30	50	50	55	60	25	9	18	18	8:1
35	55	60	70	75	35	10	21	21	9.3:1
40	65	85	95	100	50	12	24	24	10.3:1
45	70	140	155	170	60	14	27	27	12:1
50	80	160	175	190	85	15	30	30	13.5:1
55	90	180	200	210	105	16	30	30	15:1

SIGN SPACING TABLE			
Road Type	Distance Between Signs (meters)		
	A	B	C
Urban (50 km/h and less)	60	60	60
Urban (55 km/h and greater)	105	105	105
Rural	150	150	150
Expressway / Urban Parkway	800	500	300

GENERAL NOTES;

1. Dimensions are in millimeters unless otherwise shown.

2. Final placement of signs and devices may be changed to fit field conditions as approved by the Engineer.