STATE OF NEVADA

STANDARD PLANS

FOR

ROAD AND BRIDGE CONSTRUCTION

METRIC
NDOT

OCTOBER 1997

NEVADA DEPARTMENT OF TRANSPORTATION

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STATE OF NEVADA

STANDARD PLANS

FOR

ROAD AND BRIDGE CONSTRUCTION

DIRECTOR
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DEPARTMENT OF TRANSPORTATION
1263 SOUTH STEWART STREET
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FORWARD TO METRIC STANDARD PLANS

These Standard Plans were revised to be nearly identical to the 1997 English Standard Plans. Included with this edition is a list of drawings that were changed. Simple house cleaning items are not included in this list.

A few game rules have changed. One noticeable change will be the slope ratio. We used to say 4:1, 1 1/2:1, 1:1, 1/2:1 (H:V); now it will be 1:4, 1:1.5, 1:1, 2:1 (V:H). Fractions are not allowed in metrics. Another change is in the rebar. The soft conversion suggested by the Concrete Reinforcing Steel Institute (CRSI) will be used. For example a NO. 4 rebar becomes NO. 13 and a NO. 5 becomes NO. 16.

A lot of manufactured products will just undergo a name change and not a physical change. For example a 24" CMP becomes a 600 mm CMP. Gauges for CMP, wires and plates have been eliminated and replaced with actual thickness to nearest 0.1 mm. Pipe sizes, excluding culvert pipes, will be nominal pipe sizes (NPS). For example, 2" pipe becomes NPS 2 per ASTM A53.

We strongly encourage the use of metric products. However, if a metric product is not economically available then the English equivalent may be substituted.

ASTM, AASHTO, AGC, ARTBA, APWA and other organization's documents are available to provide their metric information. MUTCD had not yet put out their metric version at the time this document was being published.

There are several new sheets in the standard plans, several sheets were eliminated and several sheets split into two sheets for clarity.

A metric conversion manual is available from Richard Oxoby at Operational Analysis Division, 1263 S. Steward Street, Carson City, Nevada 89712.

If you find an error or want to make a comment, make a copy of that sheet with your comments and forward them to Gene Bails, Standards and Manuals, 1263 S. Stewart Street, Carson City, Nevada 89712.

Additional copies of the Standard Plans can be obtained from Administrative Services, 1263 S. Stewart Street, Carson City, Nevada 89712. Their phone number is (702) 888-7070

CHANGES INCLUDED IN 1997 METRIC STANDARD PLANS

Note: Minor changes and spelling changes are not listed below. On some of the drawings the note "Concrete shall be Class A or AA" was added to be consistent with rest of drawings.

Drawing No.	Description of Changes
R-1.1.1 to R-1.1.5	Standardized hatching and adjust spacing of lines to enhanced reproduction.
R-1.1.5	Deleted General Note 9.
R-2.1.3	Deleted extraneous note (600 mm dia. will not support normal highway loads) in 1996 Standard Plans at end of General notes.
R-2.3.1.1	Detail F Elevation View: Section C-C change to Section E-E
R-2.6.1	Added text to headings on first table for CMAP.
R-2.8.2	Added second line to "Two piece integral Flange" under pipe size and "*W or A".
R-3.1.2	Deleted 102 from vertical dimension in section B-B.
R-3.1.3	Deleted 102 from vertical dimension in section A-A.
R-4.3.1	In Section A-A No. 5 bars changed to No. 16 bars.
R-4.6.1.2	Labeled verticle pipe as 600 mm RCP
R-4.7.1	Deleted the Typical Traffic-Strength Manhole Frame & Cover, and the Typical Method of Adjusting Manholes & Valves details. All manhole lid details moved to new drawing R-4.7.3. Added the note (T=thickness) to the general details.
R-4.7.2	Deleted the Typical Traffic-Strength Manhole Frame & Cover. Manhole lid details to new drawing R-4.7.3.
R-4.7.3	New Drawing. Generic version of details from R-4.7.1 and R-4.7.2. New concrete collar detail with extra rebars.
R-5.1.1.1	Labeled Stop Bar. Change Table 1 to Table 1-10 at four locations. General Note 9: Changed Appendix B to Appendix C
R-5.1.1.2	Change Table 1 to Table 1-12 at five locations. Added definitions for Alternates 1, 2 and 3. General Note 9: Changed Appendix B to Appendix C.

R-5.1.1.3	Deleted 1.5 m min. on plan view and replace with "A" and "B" and referred to Table 1-10. Added pay limits for driveway to include wings. Added General Note 6 and 7. General Note 5: Changed Appendix B to Appendix C
R-5.1.1.4	In the Industrial, Commercial, and Multi-Family Driveway Geometrics portion of the drawing R2+6' min changed to R2+1.8 m min.
R-5.1.1.5	In Plan view deleted 1.8 m min. for 1:12 and replace with note to refer to Table 1-12. Added General Note 7 and 8. Deleted Top of Optional Curb and replace with Retaining Curb as needed in section A-A and plan view.
R-5.1.1.6	Section C-C and Plan view: deleted 915 mm and replace with 1.2 m.
R-6.1.2	Deleted barbed on bottom strand of wire on six drawings. Revised General Note 5.
R-6.1.2.1	Deleted barbed on bottom strand of wire on four drawings.
R-7.1.9	Revised General Note No. 1 and revised General Note 5.
R-8.1.4	Title changed from "Typical Installation - Guardrail Flares" to "Typical Guardrail Installation". Delelted "Typical Down Stream MELT Treatment". Replace drawing with two alternate drawings. Ties drawings to AASHTO Roadside Design Guide. Section A-A, added 0.6 m min. distance to back side of post. General Notes completely revised.
R-8.1.5	Change guardrail deflection distance from face of rail to backside of post per 1997 AASHTO Roadside Design Guide. Deleted "Guardrail Post Plate Detail" with elevation view.
R-8.1.5.1	Added Tangent End Treatment for guardrail installations. This is now paid as Guardrail End Treatment (Tangential). The flared end treatments are paid as Guardrail End Treatment (Flared).
R-8.1.6.1	Deleted bid item "W" Beam and combined with Bid item for Guardrail Terminal (Flared) Each. Increase length of 3:1 fill slope behind MELT.
R-8.1.6.4	Deleted incorrect guardrail splice at second post on plan and elevation views. Added play length to include first panel, cable, and concrete anchor.
R-8.1.7	Deleted post in Rail Splice detail. Deleted rectangular blockouts and replaced with modified blockouts with notch in "Steel Post Bolt Hardware and Blockout Detail". The old steel blockout failed the "350" test. Same detail revised 16 mm Hex Head Bolt to 2-16 mm Hex Bolt - one each side diagonal.

R-8.2.2	Deleted post in rail splice detail. Deleted metal post with metal blockout details and replace with steel post with notched wood blockout. Revised "Plan" view.
R-8.2.4	Changed dimensions in the Spacer Block Table to fit the face of the concrete barrier rail. Change plan view to include new deeper blockout without notch. Notched blockouts are used at left limits of this drawing. Detail "B" added 150 mm for beveling face of barrier rail.
R-8.2.4.1	Changed dimensions in the Spacer Block Table to fit the face of the concrete barrier rail. Change plan view to include new deeper blockout without notch. Notched blockouts are used at left limits of this drawing (See R-8.1.7).
R-8.3.1	Deleted Transition Details and End of Barrier Transition drawings. Added 5 mm scored joints at 4.5 m intervals. Revised General notes to include scored joints.
R-8.3.2	New drawing covering 1070 mm F-Shaped Median Concrete Barrier Rail.
R-8.3.3	Added General Note No. 9. Deleted Terminal Panel Details , Section B-B, Section C-C, Section D-D, and revised note 7. Added reflector to section H-H per specifications.
R-9.1.1	Notes on spacing of guide posts were consolidated and clarified under "Guide Post Spacing". Guide post spacing and use remains the same as it was in the 1996 Standard Plans. Thickness of guide post was changed.
R-9.2.1	Deleted Survey Monuments, Reference Monument and Marker Post details. Moved revised information to new drawing R-9.3.
R-9.2.2	Added detail showing acceptable locations for guide post in relation to the guardrail post. Revised "Typical Guardrail-Guide Post Installation" detail.
R-9.3	New drawing. Revised information previously on R-9.2.1. Deleted welded cover detail and steel detail.
R-10.1.1	Added asphalt pavement detail to Pavement End Anchor Detail. In title block, "Plane" wash changed to "Plain".
R-10.1.2	Section C-C changes to Transverse Weaken Plane Joint. Added 325 mm pavement depth to Table.
T-30.1.2	Added note 9 to Trenching Detail.
T-30.1.3	Added (M-2 Mount) to Mast Arm Mount.

T-30.1.4.1	Deleted AVC Detector Loop and moved to new drawing T-30.1.4.2. Added Special Detail for No. 5 Pull Box showing location of 50 mm conduit. Added General Notes 1 and 2. Added Pavement Joint Crossing Details.
T-30.1.4.2	New drawing for AVC Detector Loop. Revised information from T-30.1.4.1.
T-30.1.4.3	New drawing for ATR Detector Loop.
T-30.1.5	Added "See Note 3" to 1.5 m copper wire in R, M, & M1, G Cabinets. Circle 12 note deleted and replace with "not used"
T-30.1.7.1	Section A-A 1.5 m changed to 1.52 m. Section A-A 600 mm changed to 610 mm. Section B-B changed from 1.3 m to 1.27 m. Section B-B 500 changed to 485 mm.
T-30.1.8	In the "Section" drawing, raised fill slope to top of pavement and top of foundation.
T-30.1.10	Safety Bases Note No. 1: T-30.1.8 changed to T-30.1.9. Deleted light lenses Type 7 and 14 Poles.
T-30.1.12	Top of drawing of Detail C: added 13 mm grounding lug and 3 mm min. weld.
T-30.1.13	Deleted light lens from Type 35 and 35-A poles.
T-30.1.18	Added General Note 4. Deleted 32 mm min. From frame base. Added 50 mm drain hole to Special No. 5 Pull Box.
T-31.1.1	General Note 7 was revised. The note under the left sign for the Typical Single Sign Support was revised.
T-31.1.2	General Note 13 was revised and added not 14. All bolts in a sign panel shall be carriage bolts and not hex headed bolts as shown in the 1996 Standard Plans (for all drawings in the T-31 series).
T-31.1.3	Multi-Directional Slip base front detail: Revised bolt, washer and nut note and added NPS 2 base and sign post. Added 16 mm hole to base plate shown as top view.
T-31.1.3.1	Detail B: added NPS 1 pipe data to table.
T-31.1.4	Clarified Details D, E and H in regards to the anchor bolts.

T-31.1.5	In the Minimum Mounting Height Table, deleted and replaced notes in the 4th row. General note 4 is deleted and rest of notes renumbered.. New note 7 revised. Notes under "Sign Island" are revised.
T-31.1.6	Deleted Panel Joint Closure Strip. Refer to drawing T-31.1.3.1 for details. Detail B: deleted top left note going to sign panel nut.
T-31.1.7	Minimum Mounting Height Table was revised. General Notes 4 and 6 were revised. Carriage bolts replace hex headed bolts for those bolts in the sign panel
T-31.1.9	Carriage bolts replace hex headed bolts for those bolts in the sign panel (three locations). On Wood Post Supports detail, See Detail T-31.1.3.1 was added to Panel Joint.
T-35.1.1	The following signs were added to each end of the traffic control layout: NWZ-3, NWZ-1, R2-5A, R2-1, and NWZ-2. General Note 6 added. Revised Legend. Deleted Type B Warning Lights on top of signs
T-35.1.1.1	The following signs were added to each end of the traffic control layout: NWZ-3, NWZ-1, R2-5A, R2-1, and NWZ-2. General Notes 7 and 8 added. Revised Legend. Deleted Type B Warning Lights on top of signs.
T-35.1.2	The following signs were added to each end of the traffic control layout: NWZ-3, NWZ-1, R2-5A, R2-1, and NWZ-2. General Note 4 added. Revised Legend. NPS-1 and W20-7a were reversed. Deleted Type B Warning Lights on top of signs.
T-35.1.2.1	The following signs were added to each end of the traffic control layout: NWZ-3, NWZ-1, R2-5A, R2-1, and NWZ-2. General Note 4 added. Revised Legend. NPS-1 and W20-7a were reversed. Deleted Type B Warning Lights on top of signs. W13-1 added to Multilane detail.
T-35.1.3	Deleted Type B Warning Lights on top of signs.
T-35.1.4	Title was changed. The following signs were added to each end of the traffic control layout: NWZ-3, NWZ-1, R2-5A, R2-1, and NWZ-2. General Notes 7 and 8 added. Revised Legend. TMA traffic control layout deleted and moved to T-35.1.6.2. Deleted Type B Warning Lights on top of signs.
T-35.1.5	Deleted Solid White Edge Line. Added General Notes 1, 2 and 3. Deleted Type B Warning Lights on top of signs.
T-35.1.6	Title changed. Reversed order of NPS-1 and W20-7a. Deleted Type B Warning Lights on top of signs.

T-35.1.6.1 In the Typical Traffic Control for Haul Roads signs NPS-1 and W20-7a were reversed. Deleted Type B Warning Lights on top of signs.

T-35.1.6.2 Deleted Multi-Lane Turn Lanes. Added TMA layout (Multi-lane Closure) from T-35.1.4. Added General Notes 1, 2, 3, 4 and 5. Revised Legend.

T-35.1.1.1 Detail B, Section A-A: Deleted * and moved +/- 2 mm to 38 mm.

T-35.1.8 New drawing. Temporary Impact Attenuators, Sand Filled Modules.

T-35.2. Deleted W10-1 Sign Installation. Moved Special Guardrail Terminal End to T-35.2.1.

T-35.2.1 New Drawing. Revised details from T-35.2. The SPTCO lateral distance to signal base was deleted on the Special Guardrail Terminal End Section. Also, deleted extra guard rail posts and decrease the size of guardrail posts to standard size. Added Note 7 for lateral distance to signal base less than 7 feet. Added notes to refer to MUTCD for details not shown.

T-36.1.11 Plan view - Two Post Hinge: Added 38 mm to match English drawing.

T-36.1.14 Double Beam or Arm Series: Added See T-36.1.15 and 235 mm to match English Drawing.

T-38.1.1 Center Lane and Lane Lines: Added symbol for less than or equal to 3 000 m.

B-20.1.8 Hatching for Roadway Embankment change to match standard hatching for this item.

B-23.1.1 General Note 3 revised

B-25.1.3 Added tolerance of +1.6 mm to-0 mm to 6.3 mm on Railing Details right drawing.

B-25.1.4 Type M (modified): Bottom right note, deleted R-8.3.1 and replace with "of Bridge Plans".

B-25.1.5 Top Post Plate Details: To top rail inserted NPS 1 ½.

B-29.1.1 Section B-B, deleted "Preformed Permeable Liner (See Drainage Details Sht. B-29.2).

TABLE OF CONTENTS

1997 ROADWAY DESIGN INDEX
METRIC VERSION

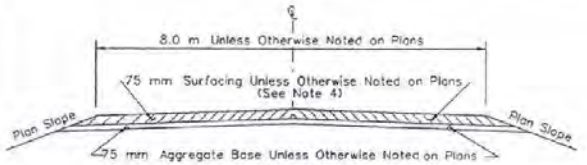
1997 ROADWAY DESIGN INDEX (CONTINUED)
METRIC VERSION

1997 LIGHTING AND SIGNALS INDEX
METRIC VERSION

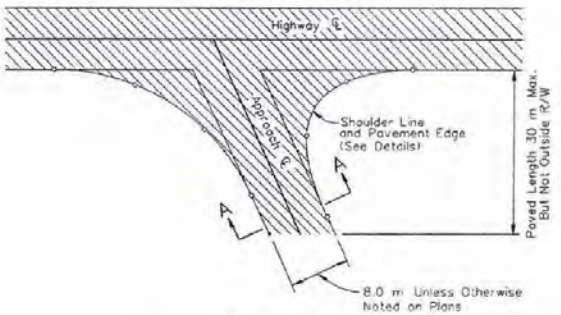
1997 SIGNS, SIGN MOUNTING AND TRAFFIC CONTROL INDEX
METRIC VERSION

1997 SIGNS, SIGN MOUNTING AND TRAFFIC CONTROL INDEX (CONTINUED)
METRIC VERSION

1997 BRIDGE INDEX
METRIC VERSION

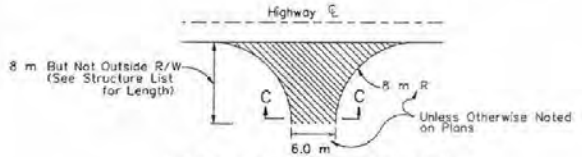


SECTION A-A

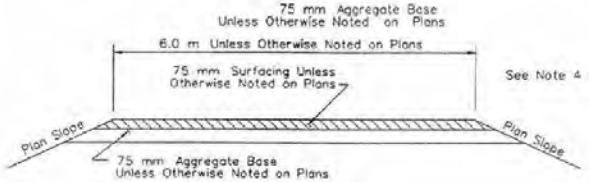


PLAN

TYPE 1 APPROACH (3-CENTERED CURVE)



TYPE 2 & 3 APPROACHES



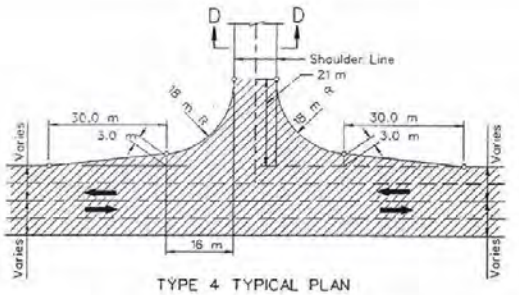
SECTION C-C

APPROACH TYPES

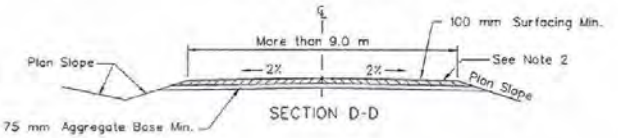
Type 2A - Place Base and Surface as Shown

Type 2B - Place 150 mm Aggregate Base Course Only

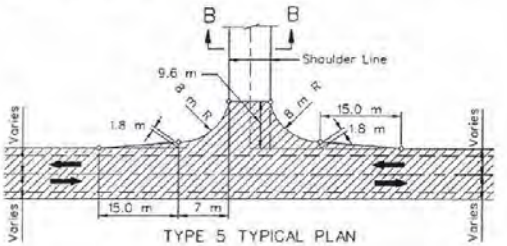
Type 3 - Grade Approach Area Only



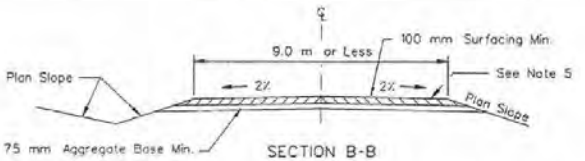
TYPE 4 TYPICAL PLAN



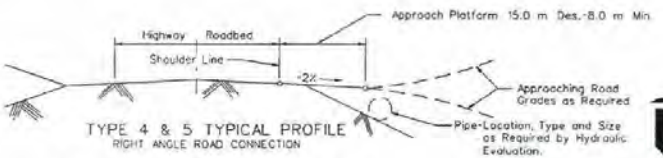
SECTION D-D



TYPE 5 TYPICAL PLAN

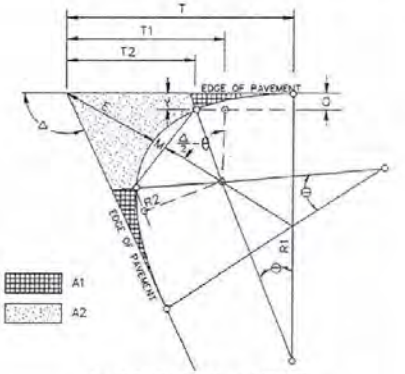


SECTION B-B



TYPE 4 & 5 TYPICAL PROFILE
RIGHT ANGLE ROAD CONNECTION

TYPE 4 AND 5 APPROACHES



3 CENTERED CURVE

Given: Δ, O, R_1 and R_2

To Find: T, T_1, T_2, E, M, θ y and AREA EXTERNAL TO COMP. CURVE

$T_1 = (R_2 + o) \tan \frac{\Delta}{2}$

$T = T_1 + (R_1 - R_2) \sin \theta$

$T_2 = T_1 - R_2 \sin \theta$

$E = \frac{R_2 + O}{\cos \frac{\Delta}{2}} - R_2$

$M = R_2 - [R_2 \cos (\frac{\Delta}{2} - \theta)]$

$\theta = \cos^{-1} \frac{R_1 - R_2 - o}{R_1 - R_2}$

$y = (R_2 + o) - R_2 \cos \theta$

AREA $= A_1 - A_2$

$A_1 = R_1^2 \tan \theta - \frac{\pi R_1^2 \theta}{180}$

$A_2 = (R_2 + o)[t_1 - (R_2 + o) \tan \theta] - \frac{\pi R_1^2 (\frac{\Delta}{2} - \theta)}{180}$

GENERAL NOTES:

1. SEE THE CURRENT EDITION OF THE AASHTO "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS" FOR FURTHER INFORMATION ON AT GRADE INTERSECTIONS AND DESIGN VEHICLES.
2. ALL APPROACHES SHALL BE STAKED AND CONSTRUCTED IN ACCORDANCE WITH THESE APPROACH ROADS AND SHALL BE THE TYPE SPECIFIED ON THE PLANS.
3. DETAILS FOR THE SPECIAL APPROACHES WILL BE SHOWN ON THE PLANS WHEN THEY ARE REQUIRED.
4. PAVED APPROACHES SHALL HAVE A SEAL COAT UNLESS OTHERWISE NOTED.
5. APPROACHES TO BE PAVED TO THE THROAT OR RIGHT-OF-WAY, WHICHEVER OCCURS FIRST, UNLESS OTHERWISE NOTED ON THE PLANS.
6. APPROACHES MAY REQUIRE THE STANDARD STOP SIGNS AND STOP BARS AS DIRECTED BY THE ENGINEER.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 1, 2, 3, 4 AND 5 APPROACH ROADS

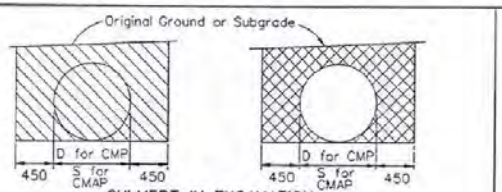
CHIEF ROAD DESIGN ENGR.

R-S2.1 (000)

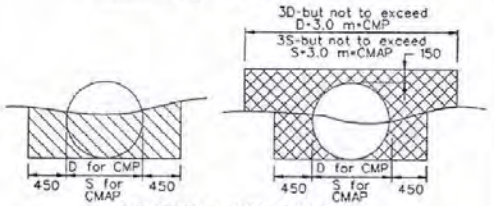
ADOPTED: 7/96

REVISION 8-97

R-1

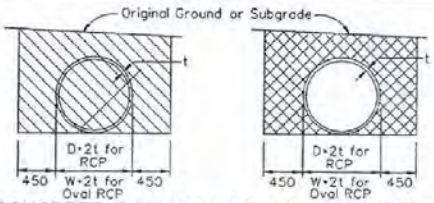


CULVERT IN EXCAVATION
Excavation Depth is Less than 1.2 m

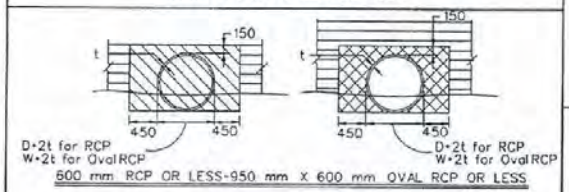


CULVERT IN EMBANKMENT

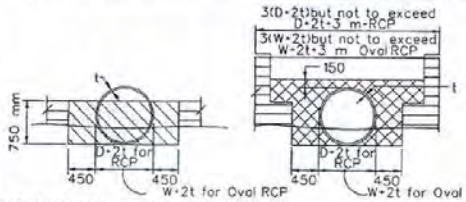
CMP OR CMAP CULVERTS



CONCRETE PIPE CULVERT IN EXCAVATION
All RCP and Oval RCP sizes
Excavation Depth is Less than 1.2m

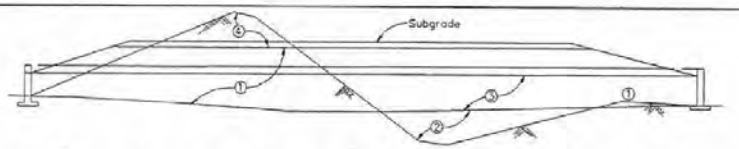


600 mm RCP OR LESS-950 mm X 600 mm OVAL RCP OR LESS



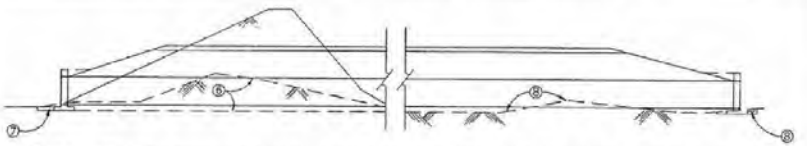
RCP OVER 600 mm-OVAL RCP OVER 950 mm x 600 mm

CONCRETE PIPE CULVERT IN EMBANKMENT
(METHOD A)



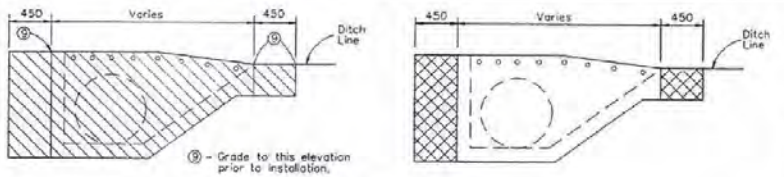
①-Structure Excavation and Backfill in excavation to be paid below subgrade and within designated limits.
②-Embankment to be constructed to flowline prior to installation.
③-Backfill in embankment to be paid from flowline to the designated maximum limits.
④-Roadway Excavation to be paid to subgrade.

CULVERT INSTALLATION IN ROUGH TERRAIN



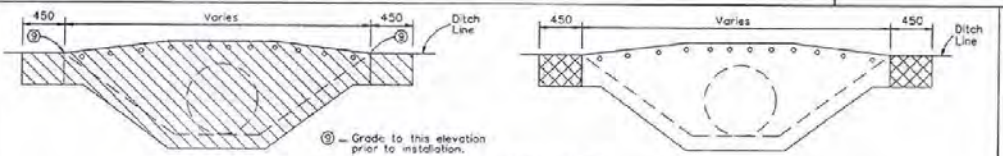
⑥-CMP or RCP - When the pipe is laid in a trench in rock, hard clay, shale or other hard material, the unsuitable material shall be removed to a depth of not less than 150 mm for RCP & 300 mm for CMP below the bottom of the pipe grade and the trench backfilled with a suitable material. In no place shall the pipe be laid directly on unsuitable material.
⑦-No additional excavation is necessary under headwalls when rock or other hard material is encountered.
⑧-When a firm foundation is not encountered, all soft, spongy or other unsuitable material under the culvert shall be removed, and the space filled with Foundation Fill. (Depth of Foundation Fill as indicated on the plans or ordered by the Engineer, but not less than 450 mm).

CULVERT INSTALLATION WITH UNSUITABLE FOUNDATIONS



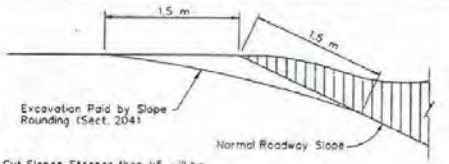
⑨ - Grade to this elevation prior to installation.

TYPE 7 DROP INLET



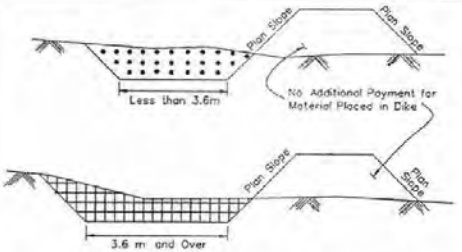
⑨ - Grade to this elevation prior to installation.

TYPE 8 DROP INLET



Cut Slopes Steeper than 1:5 will be Rounded, Except in Rock.

ROUNDED OR TRANSITION SLOPES



FLAT BOTTOM DITCH EXCAVATION

GENERAL NOTES:

1. Excavation for Multiple Pipe Installations Exceeding 3.6 m in Width Will Be Paid as Channel or Roadway Excavation.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

LEGEND

STRUCTURE EXCAVATION
ROADWAY EXCAVATION
DRAINAGE EXCAVATION
GRANULAR BACKFILL
CHANNEL EXCAVATION
ROADWAY EMBANKMENT

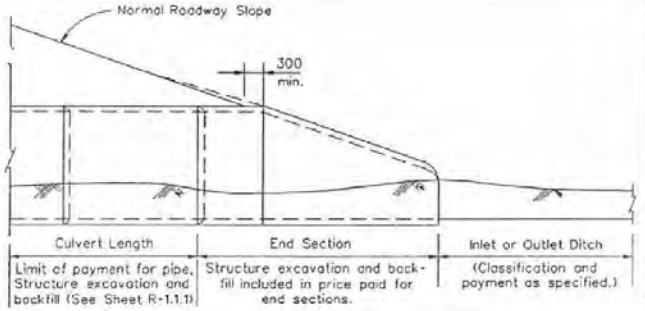
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STRUCTURE EXCAVATION & BACKFILL
(METHOD OF MEASUREMENT)

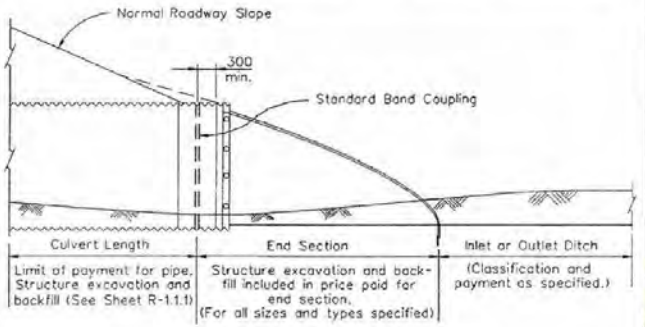
CHIEF ROAD DESIGN ENGR.

R-1.1.1	(206.207)
ADOPTED: 7/96	REVISION 8-97

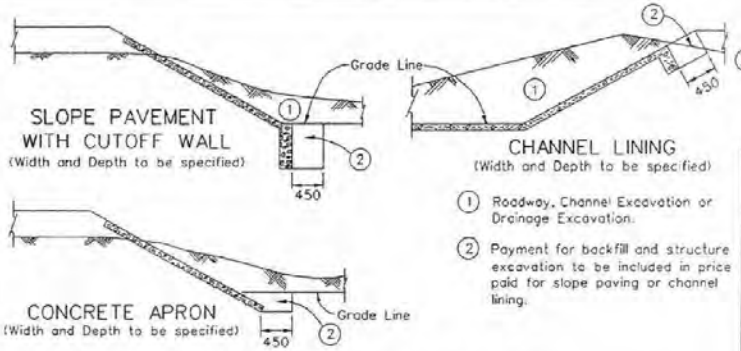
R-2



PRECAST CONCRETE END SECTIONS



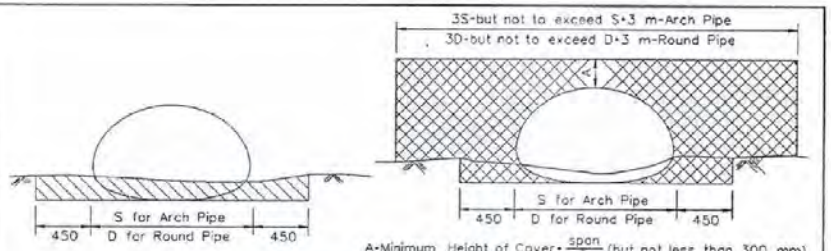
PREFABRICATED METAL END SECTION
(Type 3 Connection)



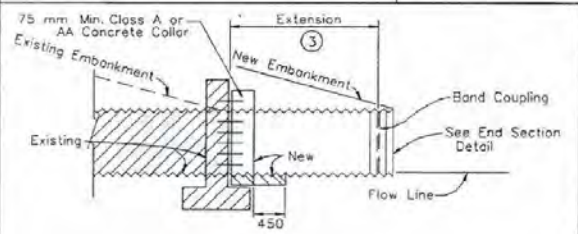
CHANNEL LINING AND SLOPE PAVEMENT

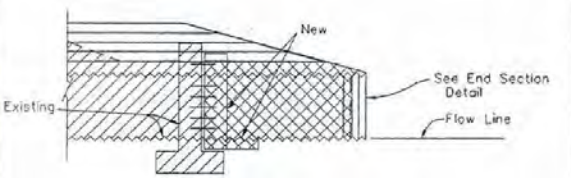
LEGEND

- Granular Backfill
- Structure Excavation
- Limits of Existing
- Roadway Embankment



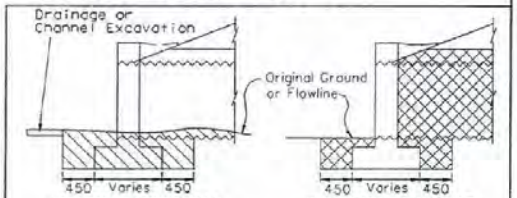
STRUCTURAL PLATE PIPE



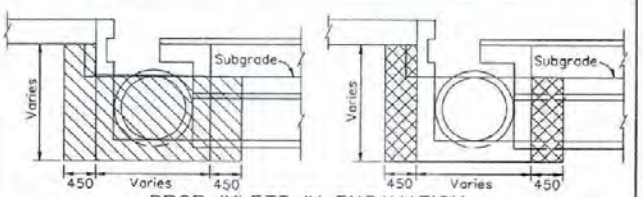


CULVERT EXTENSION WITH
EXISTING HEADWALL
(See Sheet R-2.1.1 For Pipe Culvert Extension)

3 Length of Culvert Shall Be Increased As Follows: Consider Each Side Separately. Measure Pipe From Existing Headwall To The Intersection Of The Top of Pipe And Fillslope. To This Dimension Add 0.3 m When Cover At Shoulder Is 0.3 m to 3 m. Add An Additional 0.2 m For Each Succeeding 1.5 m or Portion Thereof.

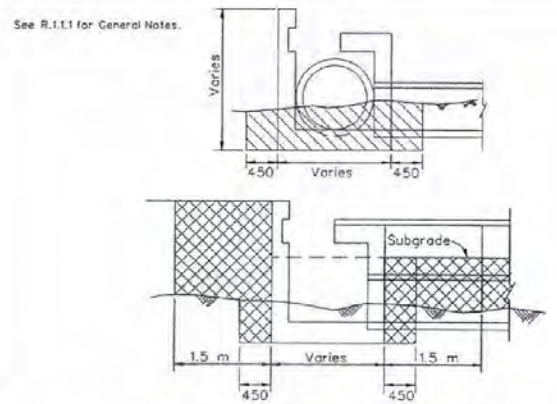


CULVERT HEADWALLS



DROP INLETS IN EXCAVATION
(Type 3 Drop Inlet Illustrated)

See R.1.1.1 for General Notes.



DROP INLETS IN EMBANKMENT
(Type 3 Drop Inlet Illustrated)

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

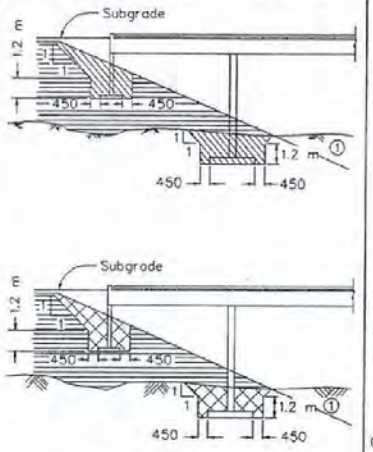
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STRUCTURE EXCAVATION AND BACKFILL
(METHOD OF MEASUREMENT)

CHIEF ROAD DESIGN ENGR

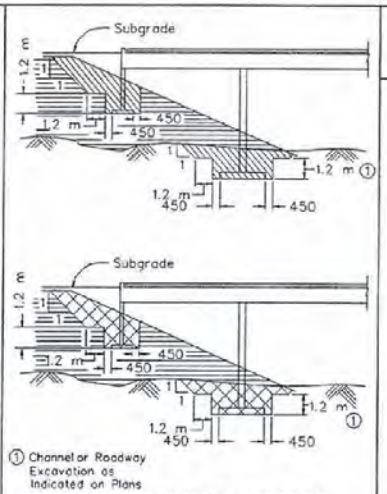
R-1.1.2	(206.207)
ADOPTED: 7/96	REVISION 8/97

R-3



OPEN ABUTMENT BRIDGES
WITH SPREAD FOOTING

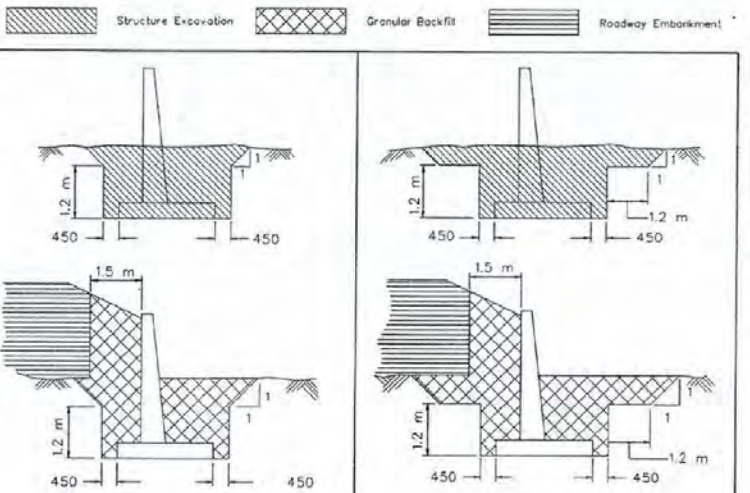
FOOTING WIDTH IS 1.8 m OR LESS



① Channel or Roadway Excavation as Indicated on Plans

OPEN ABUTMENT BRIDGES
WITH SPREAD FOOTING

FOOTING WIDTH IS GREATER THAN 1.8 m

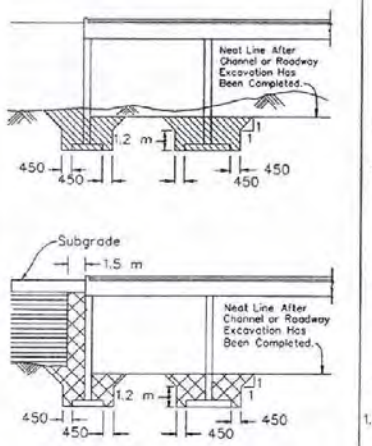


RETAINING WALLS

FOOTING WIDTH IS 1.8 m OR LESS

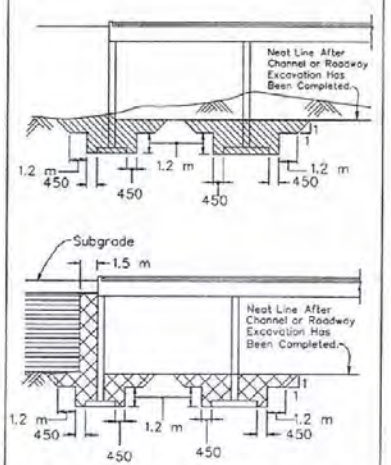
RETAINING WALLS

FOOTING WIDTH IS GREATER THAN 1.8 m



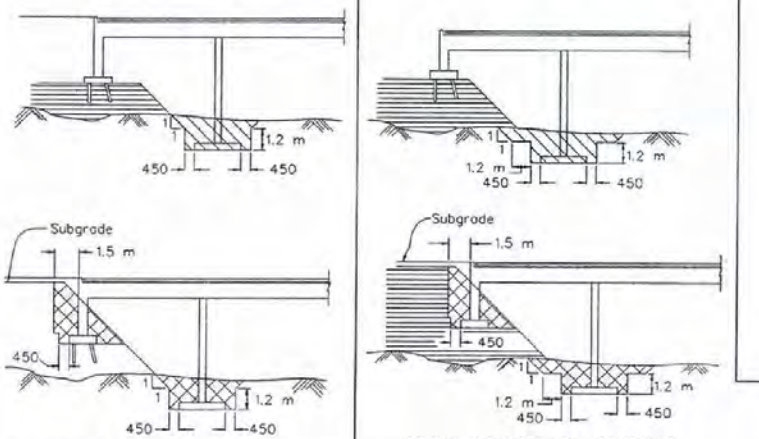
CLOSED ABUTMENT BRIDGES

FOOTING WIDTH IS LESS THAN 1.8 m



CLOSED ABUTMENT BRIDGES

FOOTING WIDTH IS GREATER THAN 1.8 m



OPEN ABUTMENT BRIDGES
ON PILES

FOOTING WIDTH IS LESS THAN 1.8 m

OPEN ABUTMENT BRIDGES
ON PILES

FOOTING WIDTH IS GREATER THAN 1.8 m

GENERAL NOTES:

1. Trenches more than 1.2 m deep shall be shored, laid back to at least the angle of repose for existing field conditions, or some other means of protection shall be provided.
2. If hazardous field conditions indicate ground movement may be expected, trenches less than 1.2 m deep shall also be protected as indicated in note 1.
3. For the purpose of payment, structure excavation and backfill quantities are based on these standard drawings and no additional payment will be made for shoring.
4. If shoring is used, payment will be made for structure excavation and backfill based on these standard drawings and no additional payment will be made for shoring.
5. Trench Excavation Sharing Shall Conform to OSHA Regulations ,Subpart P, Appendix C.
6. The quantity of structure excavation and backfill measured for payment shall be the number of cubic meters calculated minus any duplication of limits which overlap.
7. The limits of structure excavation and backfill shown herein shall be used for the method of measurement and payment only. There shall be no additional compensation for any additional excavation or backfill required for excavations to meet OSHA regulations.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

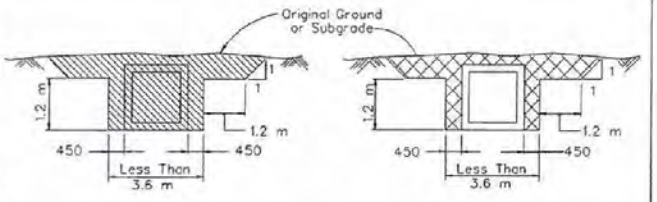
STRUCTURE EXCAVATION AND BACKFILL

(METHOD OF MEASUREMENT)

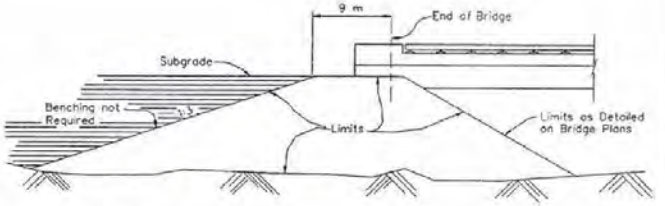
CHIEF ROAD DESIGN ENGR.

R-1.1.3	(206,207)
ADOPTED: 7/96	REVISION: 8/97

R-4



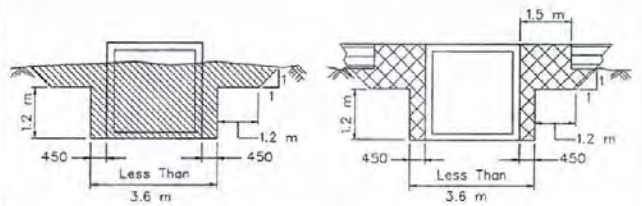
CULVERT IN EXCAVATION



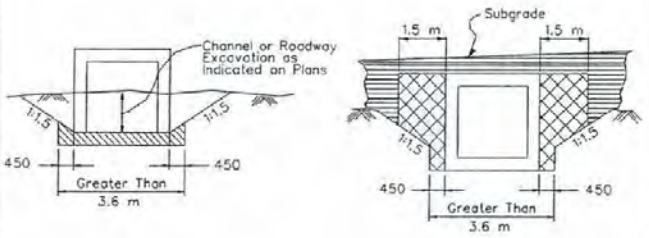
LIMITS OF SELECTED BORROW AT BRIDGE ABUTMENTS

GENERAL NOTES:

1. Trenches more than 1.2 meters deep shall be shored, laid back to at least the angle of repose for existing field conditions, or some other means of protection shall be provided.
2. If hazardous field conditions indicate ground movement may be expected, trenches less than 1.2 meters deep shall also be protected as indicated in note 1.
3. For the purpose of payment, structure excavation and backfill quantities are based on these standard drawings and no additional payment will be made for shoring.
4. If shoring is used, payment will be made for structure excavation and backfill based on these standard drawings and no additional payment will be made for shoring.
5. Trench excavation shoring shall conform to OSHA regulations subpart P, Appendix C
6. The quantity of structure excavation and backfill measured for payment shall be the number of cubic meters calculated minus any duplication of limits which overlap.
7. The limits of structure excavation and backfill shown herein shall be used for the method of measurement and payment only. There shall be no additional compensation for any additional excavation or backfill required for excavations to meet OSHA regulations.
8. See Sheet B-20.1.8 for excavation and backfill for precast concrete box culverts.



CULVERT IN EMBANKMENT



CULVERT IN EXCAVATION OR EMBANKMENT

Structure Excavation

Granular Backfill

Roadway Embankment

ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED

METRIC
NDOT

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STRUCTURE EXCAVATION AND BACKFILL

(METHOD OF MEASUREMENT)

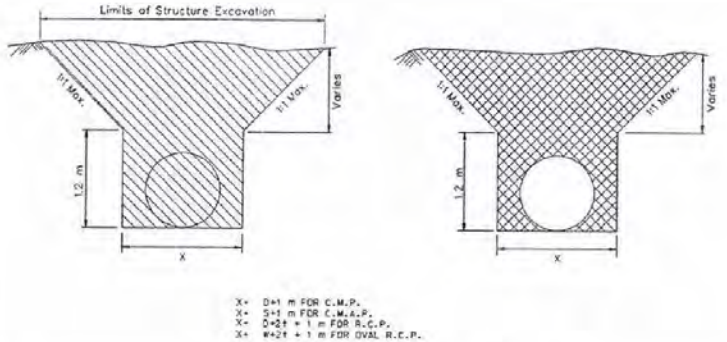
CHIEF ROAD DESIGN ENGR.

R-1.1.4 (206,207)

ADOPTED 7/96

REVISION 8/97

R-5

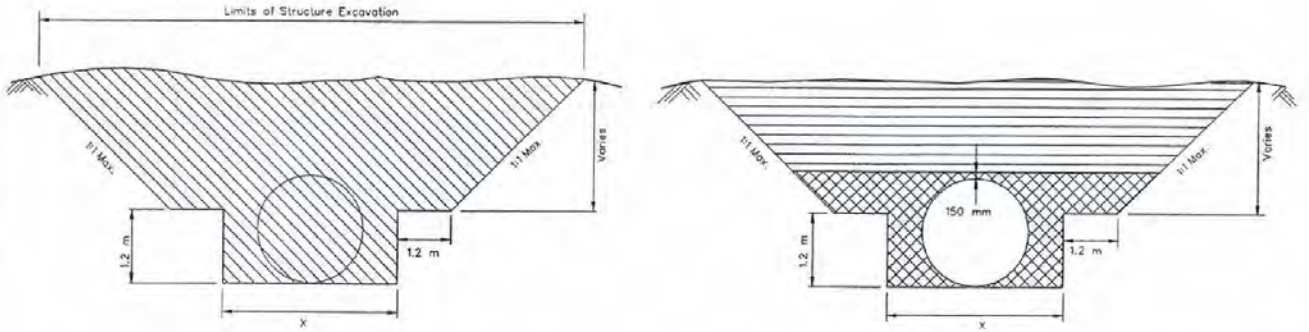


X- D+1 m FOR C.M.P.
X- S+1 m FOR C.M.A.P.
X- D+2t + 1 m FOR R.C.P.
X- W+2t + 1 m FOR OVAL R.C.P.

DIAMETER IS 1800 mm OR LESS

GENERAL NOTES:

1. Trenches more than 1.2 m deep shall be shored, laid back to at least the angle of repose for existing field conditions, or some other means of protection shall be provided.
2. If hazardous field conditions indicate ground movement may be expected, trenches less than 1.2 m deep shall also be protected as indicated in note 1.
3. For the purpose of payment, structure excavation and backfill quantities are based on these standard drawings and no additional payment will be made for shoring.
4. If shoring is used, payment will be made for structure excavation and backfill based on these standard drawings and no additional payment will be made for shoring.
5. Trench excavation shoring shall conform to OSHA regulations, Subpart P, Appendix C.
6. The quantity of structure excavation and backfill measured for payment shall be the number of cubic meters calculated minus any duplication of limits which overlap.
7. Granular backfill to be placed for a depth of 150 mm above the top of the pipe for the width of the trench.
8. The limits of structure excavation and backfill shown herein shall be used for the method of measurement and payment only. There shall be no additional compensation for any additional excavation or backfill required for excavations to meet OSHA regulations.



X- D+1 m FOR C.M.P.
X- S+1 m FOR C.M.A.P.
X- D+2t + 1 m FOR R.C.P.
X- W+2t + 1 m FOR OVAL R.C.P.

DIAMETER IS GREATER THAN 1800 mm

LEGEND

- Structure Excavation
- Granular Backfill
- Roadway Embankment

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

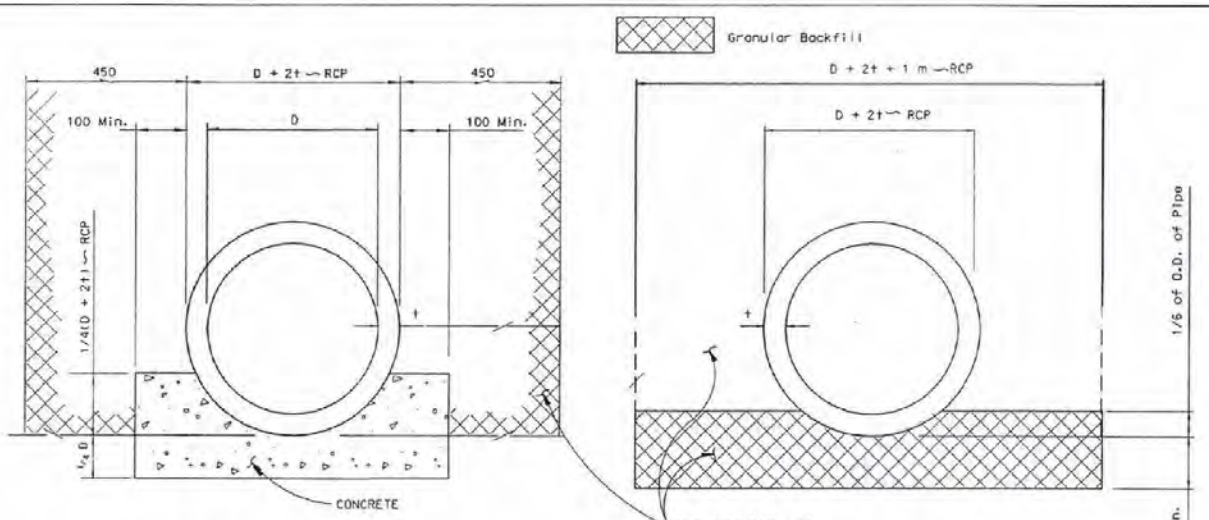
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STRUCTURE EXCAVATION AND BACKFILL
(METHOD OF MEASUREMENT)

CHIEF ROAD DESIGN ENGR.

R-1.1.5	(206,207)
ADOPTED: 7/96	REVISION 8/97

R-6

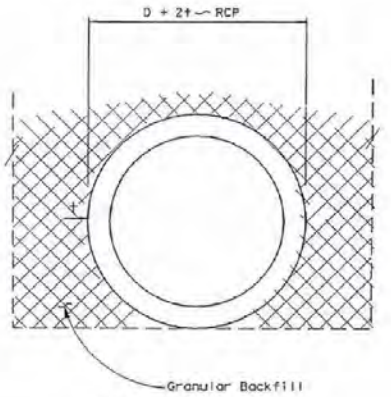


CLASS A BEDDING

PAYMENT FOR EXCAVATED AREA BELOW THE BOTTOM OF THE PIPE GRADE TO BE INCLUDED IN THE UNIT BID PRICE PER CUBIC METER OF CONCRETE.

CLASS B BEDDING

BEDDING SHALL BE CAREFULLY SHAPED TO FIT PIPE PRIOR TO INSTALLATION. NO DIRECT PAYMENT FOR SHAPING THE TRENCH.

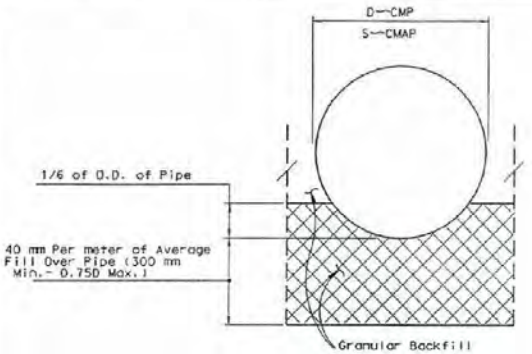


CLASS C BEDDING

GENERAL NOTES:

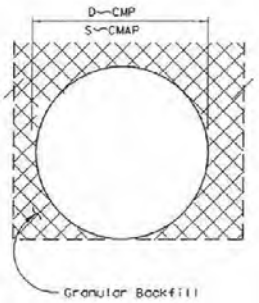
1. MINIMUM DEPTHS AS SPECIFIED IN "CULVERT INSTALLATION WITH UNSUITABLE FOUNDATIONS" ON SHEET R-1.1.1, NOTES NO. 6 AND 8 WILL PREVAIL WHEN THESE CONDITIONS ARE ENCOUNTERED.
2. EXCAVATION FOR MULTIPLE PIPE OR R.C.B. INSTALLATIONS EXCEEDING 4.6 m IN WIDTH SHALL BE PAID FOR AS CHANNEL EXCAVATION OR ROADWAY EXCAVATION.
3. CONCRETE SHALL BE CLASS A OR AA.

BEDDING FOR CONCRETE CULVERT



CLASS B BEDDING

BEDDING SHALL BE CAREFULLY SHAPED TO FIT PIPE PRIOR TO INSTALLATION. NO DIRECT PAYMENT FOR SHAPING THE TRENCH.



CLASS C BEDDING

BEDDING FOR C.M.P. OR C.M.A.P.

ALLOWABLE FILL HEIGHT IN METERS FOR REINFORCED CONCRETE PIPE 600 mm to 2100 mm

Pipe Class	CLASS II			CLASS III			CLASS IV			CLASS V		
Bedding Class	A	B	C	A	B	C	A	B	C	A	B	C
Pipe Size (mm)	(m)			(m)			(m)			(m)		
600	—	—	—	6.6	4.2	3.3	9.0	5.4	4.5	13.8	8.7	6.9
750	—	—	—	6.6	4.2	3.3	9.6	6.0	4.8	14.1	9.0	6.9
900	—	—	—	6.6	4.2	3.3	9.6	6.0	4.8	14.1	9.3	7.2
1050	—	—	—	6.6	4.2	3.3	9.6	6.3	4.8	14.1	9.3	7.2
1200	5.1	3.3	2.7	6.6	4.2	3.3	9.6	6.3	4.8	14.4	9.3	7.2
1350	5.1	3.3	3.0	6.6	4.2	3.6	9.6	6.3	5.1	14.7	9.3	7.2
1500	5.1	3.3	3.0	6.6	4.2	3.6	9.9	6.3	5.1	14.7	9.3	7.5
1650	5.1	3.6	3.3	6.6	4.2	3.9	9.9	6.6	5.1	14.7	9.3	7.5
1800	5.1	3.6	3.3	6.6	4.5	3.9	9.9	6.6	5.1	14.7	9.6	7.5
2100	5.1	3.6	3.3	6.6	4.5	4.2	9.9	6.6	5.1	15.0	9.6	7.5

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT BEDDING & ALLOWABLE FILL HEIGHT FOR R.C.P.

"CHIEF ROAD DESIGN ENGR."

R-1.1.6 (603.604)

ADOPTED: 7/96

REVISION

R-7

68 mm x 13 mm ROUND CORRUGATED ALUMINUM PIPE

PIPE DIAMETER	MINIMUM COVER	PLATE THICKNESS IN mm				
		1.5	1.9	2.7	3.4	4.2
mm	mm	MAX FILL HEIGHTS ABOVE TOP OF PIPE IN METERS				
450	300	9.1	9.1	15.9		
600	300	6.7	6.7	11.9	12.5	
750	300		5.5	9.4	9.8	
900	300		4.6	7.9	8.2	
1050	300			13.7	13.1	
1200	450			12.2	12.5	13.1
1350	450			10.7	11.3	11.6
1500	450				10.1	10.4
1650	600					9.4
1800	600					8.5

75 mm x 25 mm ROUND CORRUGATED ALUMINUM PIPE

PIPE DIAMETER	MINIMUM COVER	PLATE THICKNESS IN mm				
		1.5	1.9	2.7	3.4	4.2
mm	mm	MAX FILL HEIGHTS ABOVE TOP OF PIPE IN METERS				
750	300	10.1	12.5	17.1	21.3	
900	300	8.5	10.4	14.3	17.7	
1050	450	7.3	7.3	12.2	15.9	
1200	450	6.4	8.2	10.7	14.6	15.2
1350	450	5.5	7.0	9.4	14.0	14.3
1500	600	5.2	6.4	8.5	11.9	13.7
1650	600		5.8	7.6	11.6	13.4
1800	600		5.2	7.0	10.7	13.4
1950	600			6.7	9.8	12.8
2100	600			6.1	9.1	11.9
2250	600			5.8	8.5	11.0
2400	600			5.5	7.9	10.4
2550	750				7.6	9.8
2700	750				7.0	9.1
2850	750					8.8
3000	750					8.2

150 mm x 25 mm ROUND CORRUGATED ALUMINUM PIPE

PIPE DIAMETER	MINIMUM COVER	PLATE THICKNESS IN mm				
		1.5	1.9	2.7	3.4	4.2
mm	mm	MAX FILL HEIGHTS ABOVE TOP OF PIPE IN METERS				
1200	450	6.4	8.5	11.3	13.4	15.8
1350	450	5.8	7.6	10.1	11.9	14.0
1500	450		5.8	9.1	10.7	12.8
1650	600		6.1	8.2	9.8	11.6
1800	600			7.6	8.8	10.7
1950	600			7.0	8.2	9.8
2100	600				7.6	9.1
2250	600				7.0	8.5
2400	600					7.9
2550	600					7.3

* CORRUGATED ALUMINUM ALLOY PIPE ARCH
68 mm x 13 mm CORRUGATIONS

PIPE DIMENSIONS SPAN-RISE	** MIN. COVER	CORNER RADIUS	MIN. THICKNESS	MAX. COVER FOR CORNER PRESSURES 192 kPa
mm	mm	mm	mm	Meters
450x275	457	102	1.5	4.6
550x325	457	102	1.5	4.3
625x400	457	102	1.5	3.7
725x450	457	114	1.5	3.0
900x550	457	127	1.5	2.7
1075x675	457	140	1.9	2.7
1250x775	457	152	2.7	2.4
1450x900	457	178	3.4	2.4
1625x1000	457	203	3.4	2.4
1800x1100	457	229	4.2	2.4

* RIVETED OR HELICAL FABRICATION
** TOP OF PIPE TO TOP OF FINISHED GRADE AT SHOULDER LINE FOR 192 kPa

MAXIMUM HEIGHT COVER FOR STRUCTURAL ALUMINUM PLATE PIPE (METERS)
229 mm x 64 mm CORRUGATIONS

DIAM mm	MIN. COVER(m)	MIN. THICKNESS(mm)	METAL THICKNESS IN mm								
			2.5	3.2	3.8	4.4	5.1	5.7	6.4	7.0	7.6
1500	0.3	2.5	7.9	10.7	13.4	16.2	18.3	20.1	21.9	24.1	26.2
1650	0.3	2.5	7.3	9.8	12.2	14.6	16.8	18.3	20.1	21.9	24.1
1800	0.3	2.5	6.7	8.8	11.3	13.4	15.2	16.9	19.5	20.4	21.0
1950	0.3	2.5	6.1	8.2	10.4	12.5	14.0	15.5	16.8	18.6	20.4
2100	0.6	2.5	5.8	7.6	9.8	11.6	13.1	14.3	15.5	17.4	18.0
2250	0.6	2.5	5.5	7.0	9.1	10.7	12.2	13.4	14.6	16.1	17.7
2400	0.6	2.5	5.2	6.7	8.5	10.1	11.6	12.5	13.7	15.2	16.2
2550	0.6	2.5	4.9	6.4	7.9	9.4	10.7	11.9	12.8	14.3	15.5
2700	0.6	2.5	4.6	5.8	7.6	8.8	10.1	11.3	12.2	13.4	14.6
2850	0.6	2.5	4.3	5.5	7.0	8.5	9.8	10.7	11.6	12.8	14.0
3000	0.6	2.5	4.0	5.2	6.7	7.9	9.1	10.1	11.0	12.2	13.1
3150	0.6	2.5	4.0	5.2	6.4	7.6	8.8	9.4	10.4	11.6	12.5
3300	0.6	2.5	3.7	4.9	6.1	7.3	8.2	9.1	10.1	11.0	11.9
3450	0.6	2.5	3.4	4.6	5.8	7.0	7.9	8.8	9.4	10.4	11.6
3600	0.6	3.2		4.3	5.5	6.7	7.6	8.5	9.1	10.1	11.0
3750	0.6	3.2		4.3	5.5	6.4	7.3	7.9	8.8	9.8	10.7
3900	0.6	3.8			5.2	6.1	7.0	7.6	8.5	9.1	10.1
4050	0.6	3.8			4.9	6.1	6.7	7.6	8.2	8.8	9.8
4200	0.6	3.8			4.9	5.8	6.4	7.3	7.9	8.5	9.4
4350	0.6	4.4				5.5	6.4	7.0	7.6	8.2	9.1
4500	0.9	4.4				5.5	6.1	6.7	7.3	7.9	8.8

MAXIMUM HEIGHT OF COVER FOR ALUMINUM STRUCTURAL PLATE PIPE ARCH 808 mm CORNER RADIUS
HEIGHT OF COVER (METERS)

SPAN	MINIMUM COVER	0.5	0.6	0.8	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.4	3.7	4.0	4.3	4.6	4.9	5.2	5.5	5.8	6.1	6.4	6.7	7.0	7.3	7.6	7.9
1.8	0.45	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.2	3.2	3.2	3.8	3.8	3.8	3.8	3.8	4.4	5.1	5.7	6.4	7.0	7.0	7.6
2.1	0.45	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.2	3.2	3.2	3.8	3.8	3.8	4.4	4.4	4.4	5.1	5.7	6.4	7.0	7.6	7.6	
2.4	0.6		3.2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.2	3.2	3.8	3.8	3.8	4.4	4.4	5.1	5.7	6.4	7.0	7.0	7.6	7.6		
2.7	0.6		3.2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.2	3.2	3.2	3.8	3.8	3.8	4.4	5.1	5.7	6.4	7.0						
3.0	0.6		3.2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.2	3.2	3.2	3.8	3.8	3.8	4.4	5.1	5.7	6.4							
3.4	0.6		3.8	3.2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.2	3.2	3.8	3.8	3.8	4.4	5.1	5.7	6.4								
3.7	0.6		4.4	3.8	3.2	2.5	2.5	2.5	2.5	2.5	2.5	3.2	3.2	3.8	4.4	5.1	5.7	6.4										
4.0	0.6		4.4	3.8	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.8	3.8	4.4	5.1	5.7	6.4											
4.2	0.6		4.4	3.8	3.2	3.2	3.2	3.2	3.2	3.2	3.8	4.4	4.4	5.1	5.7	6.4												
4.6	0.6		4.4	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	4.4	5.1	5.7	6.4													
4.9	0.9				4.4	4.4	4.4	4.4	4.4	4.4	4.4	5.1	5.7	6.4														
5.2	0.9				4.4	4.4	4.4	4.4	4.4	4.4	5.1	5.7	6.4															
5.5	0.9				5.1	5.1	5.1	5.1	5.1	5.1	5.7	6.4																
5.8	0.9				6.4	6.4	6.4	6.4	6.4	6.4	6.4	7.0																
6.1	0.9				7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.6																

NOTE: TO DETERMINE PROPER METAL THICKNESS (mm) SELECT THE SPAN IN LEFT HAND COLUMN THAT IS NEXT LARGER TO SIZE STRUCTURE REQUIRED. EXAMPLE--IF YOU NEED A 3251 mm SPAN x 2261 mm RISE STRUCTURE, USE THE LINE FOR SPAN 3.4 m.

NOTE: CONTACT HYDRAULICS ENGINEER FOR MATERIALS OR SIZES NOT LISTED.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ALLOWABLE FILL HEIGHTS FOR ALUMINUM CULVERTS

CHIEF ROAD DESIGN ENGR.

R-1.3.1 (601.605)
ADOPTED: 7/96
REVISION

R-8

* ROUND CORRUGATED STEEL PIPE
68 mm x 12 mm CORRUGATIONS

PIPE DIAMETER	** MIN. COVER	PLATE THICKNESS IN mm									
		1.6		2.0		2.8		3.5		4.3	
		R	E	R	E	R	E	R	E	R	E
mm	mm	MAX. FILL HTS. ABOVE TOP OF PIPE IN METERS									
300	300	19.2		25.3							
375	300	15.2		20.1							
450	300	12.8		16.8		25.6					
600	300	9.8		12.8		18.3		22.9			
750	300	7.6		10.0		14.9		18.3		22.6	
900	300	6.4		8.5		12.5		15.2		18.9	
1050	300	12.5		13.4		14.0	21.9	14.6	23.2	15.2	24.4
1200	300		10.7		11.6	13.7	19.2	14.0	18.9	14.3	21.3
1350	300				10.4	13.1	17.1	13.4	18.0	13.7	19.2
1500	300					12.8	15.2	13.1	16.2	13.4	17.1
1650	300					12.5	14.0	12.8	14.9	13.1	15.5
1800	300							12.5	13.7	12.8	14.3
1950	300								13.1	11.0	13.4
2100	300								12.2	9.4	12.8

R ROUND INSTALLATION
E VERTICAL ELONGATION
(SEE STANDARD SPECIFICATION SEC. 604.03.02) ****

* ROUND CORRUGATED STEEL PIPE
125 mm x 25 mm & 75 mm x 25 mm CORRUGATIONS
FILL HEIGHTS FOR 125 mm x 25 mm CORRUGATION ARE 87% OF THOSE SHOWN.

PIPE DIAMETER	** MIN. COVER	PLATE THICKNESS IN mm									
		1.6		2.0		2.8		3.5		4.3	
		R	E	R	E	R	E	R	E	R	E
mm	mm	MAX. FILL HTS. ABOVE TOP OF PIPE IN METERS									
1350	300	8.2	8.8	11.0	11.6	17.1	18.0	17.4	19.5	19.8	21.6
1500	300	7.6	7.9	9.8	10.4	15.2	16.2	15.5	17.1	17.7	19.5
1650	300	6.7	7.0	8.8	9.4	13.7	14.6	14.0	15.8	16.2	17.7
1800	300	6.4	6.7	8.5	8.8	12.8	13.4	13.1	14.6	14.9	16.2
1950	300	5.8	6.1	7.6	7.9	11.6	12.5	12.8	13.4	13.4	14.9
2100	450			7.0	7.6	11.0	11.6	12.2	12.8	12.8	14.0
2250	450			6.4	7.0	10.0	10.7	11.6	12.2	12.5	13.1
2400	450					9.1	10.0	11.3	11.6	12.2	12.8
2550	600					7.9	8.5	10.4	10.7	11.6	12.5
2700	600					6.7	7.3	9.8	10.4	10.7	11.3
2850	600					6.4	7.0	9.4	9.8	10.4	11.0
3000	600					6.1	6.7	9.1	9.8	9.8	10.0
3150	600							7.9	8.2	9.4	10.0
3300	600							7.6	7.9	9.1	9.4
3450	600							7.0	7.3	8.5	8.8
3600	600									7.6	7.9

* CORRUGATED STEEL PIPE ARCH
68 mm x 12 mm CORRUGATIONS

PIPE DIMENSIONS SPAN-RISE	** MIN. COVER	EQUIV. DIA.	MIN. THICKNESS	MAX. COVER IN METERS FOR CORNER PRESSURE'S IN kPa	
mm	mm	mm	mm	192	*** 287
425 x 325	300	375	1.6	4.0	5.8
525 x 375	300	450	1.6	3.7	5.5
600 x 450	300	525	1.6	3.0	4.9
700 x 500	300	600	1.6	3.0	4.6
875 x 600	300	750	1.6	2.7	4.3
1050 x 725	300	900	1.6	2.7	3.7
1225 x 825	300	1050	2.0	2.4	3.7
1425 x 950	300	1200	2.8	2.4	3.7
1600 x 1075	300	1350	2.8	2.4	3.7
1775 x 1175	300	1500	3.5	2.4	3.7
1925 x 1300	300	1650	4.3	2.4	3.7
2075 x 1425	300	1800	4.3	2.7	4.0

* CORRUGATED STEEL PIPE ARCH
125 mm x 25 mm & 75 mm x 25 mm CORRUGATIONS

PIPE DIMENSIONS SPAN-RISE	** MIN. COVER	EQUIV. DIA.	MIN. THICKNESS	MAX. COVER IN METERS FOR CORNER PRESSURE'S IN kPa	
mm	mm	mm	mm	192 kPa	287 kPa
1500 x 1150	300	1350	1.6	3.7	5.5
1650 x 1275	300	1500	1.6	3.7	5.5
1825 x 1375	300	1650	1.6	3.7	5.5
2025 x 1475	300	1800	1.6	3.7	5.5
2175 x 1575	300	1950	1.6	4.9	6.7
2375 x 1675	450	2100	2.0	4.6	6.4
2575 x 1775	450	2250	2.0	4.3	6.1
2800 x 1875	450	2400	2.8	4.0	5.5
2925 x 1975	600	2550	2.8	3.7	5.2
3200 x 2075	600	2700	2.8	3.4	4.9
3425 x 2175	600	2850	2.8	3.0	4.6
3550 x 2275	600	3000	3.5	2.7	4.3

MAXIMUM HEIGHT OF COVER
FOR STRUCTURAL STEEL PLATE PIPE (5% ELONGATION)
150 mm x 50 mm CORRUGATIONS

DIAMETER IN mm	MIN. COVER mm	ALLOWABLE FILL HEIGHTS IN METERS					
		2.5 mm	3.5 mm	4.5 mm	5.5 mm	6.5 mm	7.0 mm
1500	300	12.8	18.9	24.4			
1650	300	11.9	17.4	22.3			
1800	300	10.7	15.8	20.4	28.7		
1950	300	10.0	14.6	18.9	26.5		
2100	450	9.1	13.7	17.4	24.4	29.0	
2250	450	8.5	12.8	16.5	22.9	26.8	29.3
2400	450	8.2	11.9	15.2	21.3	25.3	27.4
2550	600	7.6	11.3	14.3	20.1	23.8	25.9
2700	600	7.3	10.7	13.7	19.2	22.6	24.4
2850	600	6.7	10.0	12.8	18.0	21.3	23.2
3000	600	6.4	9.4	12.2	17.1	20.1	21.9
3150	600	6.1	9.1	11.6	16.5	19.2	21.0
3300	600	5.8	8.5	11.3	15.5	18.3	20.1
3450	600	5.5	8.2	10.7	14.9	17.7	19.2
3600	600	5.5	7.9	10.4	14.3	16.8	18.3
3750	600	5.2	7.6	9.8	13.7	16.2	17.7
3900	600	4.9	7.3	9.4	13.4	15.5	17.1
4050	600	4.9	7.0	9.1	12.8	14.9	16.5
4200	600	4.6	6.7	8.8	12.2	14.3	15.8
4350	600	4.6	6.7	8.5	11.9	14.0	15.2
4500	900	4.3	6.4	8.2	11.6	13.4	14.6
4650	900	4.3	6.1	7.9	11.0	13.1	14.3
4800	900		6.1	7.6	10.7	12.8	13.7
4950	900		5.8	7.6	10.4	12.2	13.4

NOTE: CONTACT HYDRAULICS ENGINEER FOR MATERIALS OR SIZES NOT LISTED.

* RIVETED OR HELICAL FABRICATION
** TOP OF PIPE TO TOP OF FINISHED GRADE AT SHOULDER LINE FOR 192 kPa
*** SHALL BE USED ONLY AFTER FOUNDATION INVESTIGATION
**** FOR FIELD STRUTTING C.M.P. DETAIL SEE STANDARD SHEET R-2.1.1

MAXIMUM HEIGHT OF COVER
FOR STRUCTURAL STEEL PLATE PIPE ARCH WITH 787 mm CORNER RADII
150 mm x 50 mm CORRUGATIONS

SPAN mm	RISE mm	MIN. COVER mm	ALLOWABLE FILL HEIGHTS IN METERS					
			192KPa BEARING PRESSURE			▲ 287KPa BEARING PRESSURE		
			2.5 mm	3.5 mm	4.5 mm	2.5 mm	3.5 mm	4.5 mm
4039	2845	900	3.4			5.2		
4318	2997	900	3.4			5.2		
4674	3150	900		3.0			4.9	
4953	3302	900		2.7			4.9	
5232	3454	900		2.7			4.6	
5512	3607	900			2.4			4.3
5867	3759	900			2.4			4.0
6071	3912	900			2.1			4.0
6274	4013	900			2.1			

▲ MAY BE USED ONLY WHEN SUPPORTED BY FOUNDATION STUDY

MAXIMUM HEIGHT OF COVER
FOR STRUCTURAL STEEL PLATE PIPE ARCH WITH 457 mm CORNER RADII
150 mm x 50 mm CORRUGATIONS

SPAN mm	RISE mm	MIN. COVER mm	ALLOWABLE FILL HEIGHTS IN METERS					
			192 kPa BEARING PRESSURE			▲ 287 kPa BEARING PRESSURE		
			2.5 mm	3.5 mm	4.5 mm	2.5 mm	3.5 mm	4.5 mm
1854	1397	375						
2134	1549	330						
2413	1702	300				4.9		
2692	1854	250				4.9		
2972	2007	225				4.6		
3327	2159	200				4.0		
3712	2540	200				3.4		
4293	2616	175				3.4		
4674	2819						3.0	
5055	3073						2.4	

▲ MAY BE USED ONLY WHEN SUPPORTED BY FOUNDATION STUDY

HELICAL RIB LOCK SEAM PIPE
ALLOWABLE FILL HEIGHTS (METERS)
19 mm x 25 mm RIBS
OF 292 mm PITCH

PIPE DIAMETER mm	1.6 OR 1.5 mm	2.0 OR 1.9 mm	2.8 OR 2.7 mm
600	14.0	19.5	27.4
750	11.3	15.5	21.9
900	9.4	13.1	18.3
1050	7.9	11.3	15.5
1200	7.0	9.8	13.7
1350	6.4	8.8	12.2
1500	5.8	7.9	11.0
1650		7.0	10.0
1800		6.4	9.1
1950			8.5
2100			7.9
2250			7.3

NOTE: BASED ON MS 18 LOADING. MINIMUM FILL HEIGHTS IS ONE-QUARTER (1/4) OF THE DIAMETER FOR PIPE OVER 1200 mm IN DIAMETER AND 0.3 m FOR ALL OTHER DIAMETERS.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

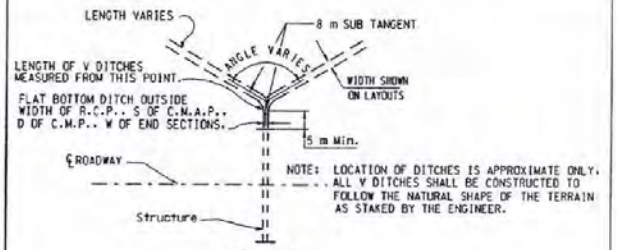
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ALLOWABLE FILL HEIGHTS FOR STEEL CULVERTS

CHIEF ROAD DESIGN ENGR.

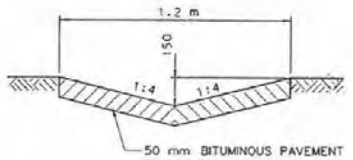
R-1.3.1.2 (600.604.6061)
ADOPTED: 7/96
REVISION 8/97

R-9



PLAN

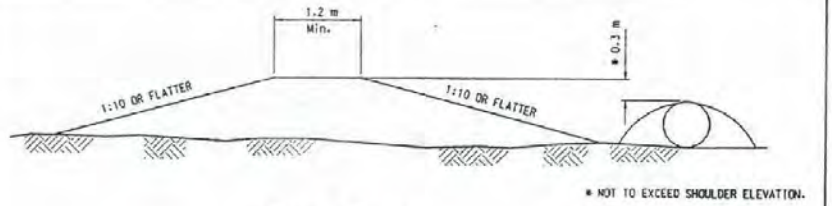
DRAINAGE DITCHES



SECTION

BITUMINOUS TURNOUT DITCH

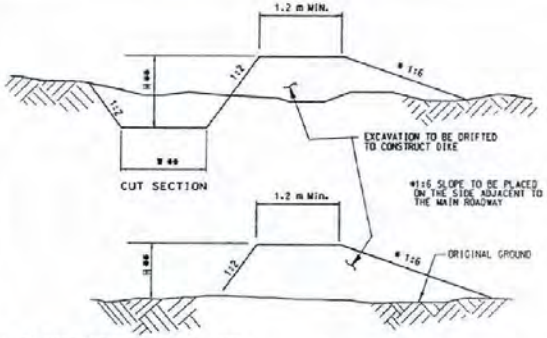
(PLANTMIX OR ROADMIX WITH SEAL COAT)



* NOT TO EXCEED SHOULDER ELEVATION.

DIKE DETAIL

INLET AND OUTLET DIKES WITHIN 9 m OF ROADWAY SHOULDER, AND MEDIAN DIKES. LOCATION AS INDICATED ON THE PLANS.

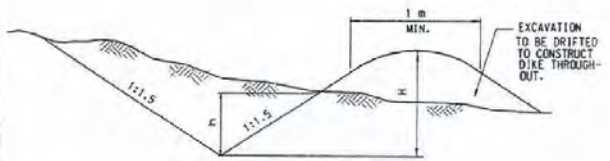


** - SEE HYDRAULIC ENGINEER FOR H, W, & NEED TO RIP RAP FACE OF DIKE.

**H = DEPTH OF DITCH OR HEIGHT OF DIKE AS INDICATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

**W = WIDTH OF DITCH AS INDICATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

FLAT BOTTOM DITCH AND DIKE



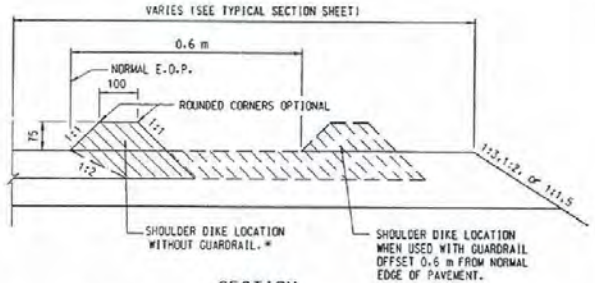
h= DEPTH AS ORDERED BY THE ENGINEER. (450 mm MIN.)

H= HEIGHT AS ORDERED BY THE ENGINEER. (750 mm MIN.)

SECTION

V TYPE DITCH

TO BE USED FOR SURFACE DITCHES AND WHERE ORDERED BY THE ENGINEER.

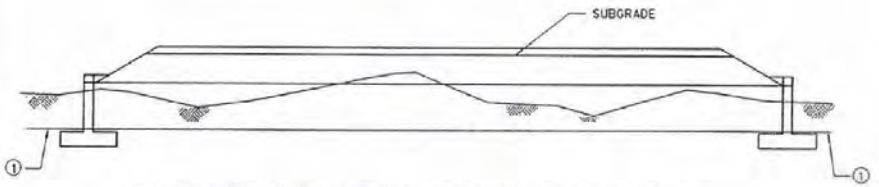


SECTION

BITUMINOUS SHOULDER DIKE

(PLANTMIX OR ROADMIX WITH SEAL COAT)

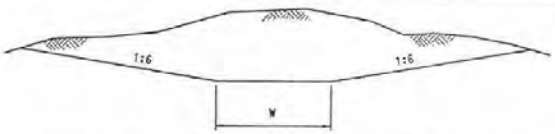
* SHALL NOT BE USED ALONE IN URBAN AREAS FOR DESIGN SPEED GREATER THAN 80 km/h OR RURAL AREAS FOR DESIGN SPEED GREATER THAN 60 km/h



① INLET AND OUTLET DITCHES TO BE ON SAME GRADE AS CULVERT FOR A DISTANCE OF 8 m MINIMUM. (SEE INLET, OUTLET AND MEDIAN DITCH DETAILS FOR DESIGN OF DITCHES.)

CULVERT INSTALLATION

(PREFERRED)



W = WIDTH OF DITCH AS INDICATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

INLET, OUTLET AND MEDIAN DITCH DETAILS

NOTE: DIMENSIONS RELATION TO EXCAVATION (DITCHES) OR EMBANKMENT (DIKES) SHALL BE DESIGNATED AS W (WIDTH).X H (HEIGHT OR DEPTH).X L (LENGTH).

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

DRAINAGE DITCHES AND DIKES

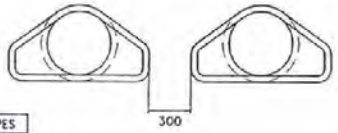
CHIEF ROAD DESIGN ENGR.

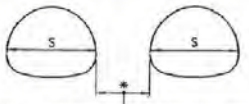
R-1.4.1 (203)

ADOPTED: 7/96 REVISION

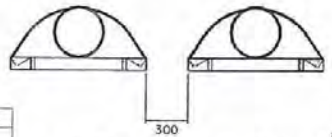
R-10

DIAMETER (mm)	MINIMUM SPACE BETWEEN PIPES
300 to 600	300 mm
750 to 1650	ONE HALF DIAMETER OF PIPE
1800 to 2100	900 mm



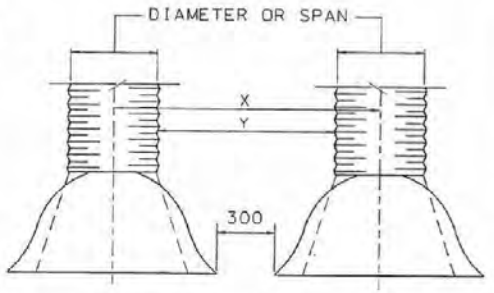


SPAN (mm)	MIN. SPACE BETWEEN PIPE ARCHES
425 to 875	300 mm
1050 to 2075	One Third Span of Pipe Arch



* WHEN HEADWALLS ARE USED OR ANTICIPATED FOR FUTURE USE, SPACE AS PER HEADWALLS STANDARD.

MULTIPLE INSTALLATIONS
WITH END SECTIONS



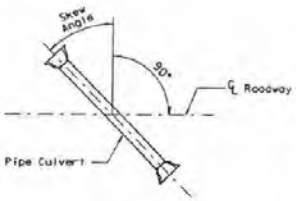
NOTE: WHEN Y DISTANCE EXCEEDS 1.5 m STRUCTURE EXCAVATION AND BACKFILL QUANTITIES SHALL BE CALCULATED FOR EACH CULVERT.

TABLE OF SEPARATION FOR MULTIPLE INSTALLATIONS

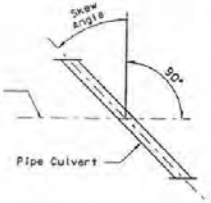
CMP			CMAP			RCP		
DIA. (mm)	X (m)	Y (m)	SPANxRISE (mm)	X (m)	Y (m)	DIA. (mm)	X (m)	Y (m)
			525x375	1.6	1.0	450	1.3	0.8
			600x450	1.8	1.2	600	1.7	0.9
			700x500	2.0	1.3	750	2.0	1.1
600	2.0	1.4	875x600	2.3	1.4	900	2.3	1.2
750	2.4	1.7	1050x725	2.8	1.8	1050	2.5	1.2
900	2.8	1.9	1225x825	3.1	1.9	1200	2.7	1.2
1050	3.2	2.2	1425x950	3.5	2.1	1350	2.6	1.0
1200	3.5	2.3	1600x1075	3.8	2.2			
1350	3.8	2.4	1775x1175	4.1	2.3			
1500	4.1	2.6	1925x1300	4.4	2.5			
1650	4.2	2.6	2075x1425	4.7	2.6			
1800	4.4	2.6						
1950	4.5	2.6						
2100	4.7	2.6						

MULTIPLE INSTALLATIONS
WITHOUT HEADWALLS

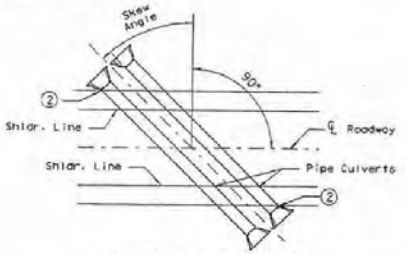
② INTERSECTING POINT OF FILLSLOPE AND TOP OF PIPE CONTROLS THE LENGTH OF PIPE TO BE INSTALLED.



SINGLE CULVERT
WITH END SECTIONS

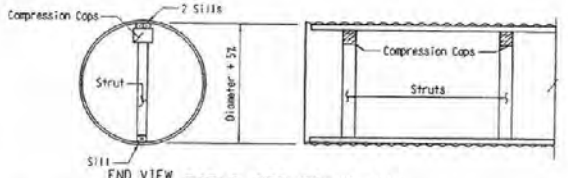


SINGLE CULVERT
WITH HEADWALLS



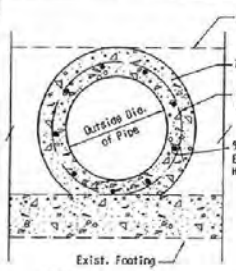
MULTIPLE CULVERT
WITH END SECTIONS

STRUTS SHALL BE LEFT IN PLACE UNTIL FILL HAS BEEN COMPLETED AND COMPACTED, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

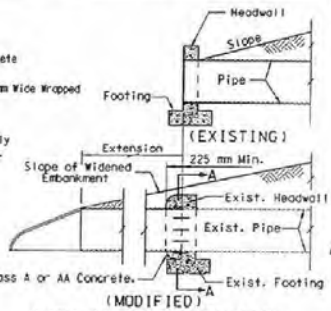


FIELD STRUTTING CMP

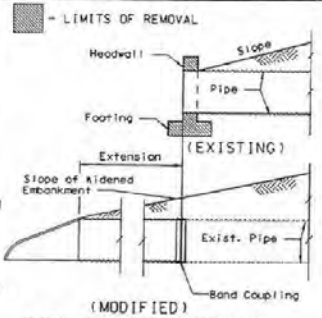
NOTE: FOR STRUT, CAP, SILL SIZE AND SPACING USE MANUFACTURERS RECOMMENDATIONS. STRUTS, CAPS AND SILLS TO BE THE SAME DIMENSION. FOR MAXIMUM FILL HEIGHTS, SEE STANDARD SHEET R-1.3.1.2 UNDER COLUMNS DESIGNATED "E".



SECTION A-A

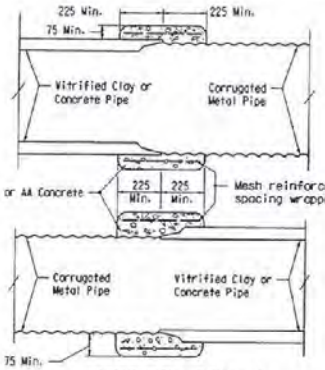


(MODIFIED)
PIPE CULVERT EXTENSION
TYPE 2



(MODIFIED)
PIPE CULVERT EXTENSION
TYPE 1

(FOR ADDITIONAL INFORMATION SEE R-1.1.2)



CONCRETE COLLAR
CMP TO RCP OR VITRIFIED CLAY PIPE EXTENSIONS

METRIC NDOT

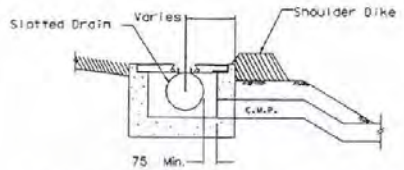
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

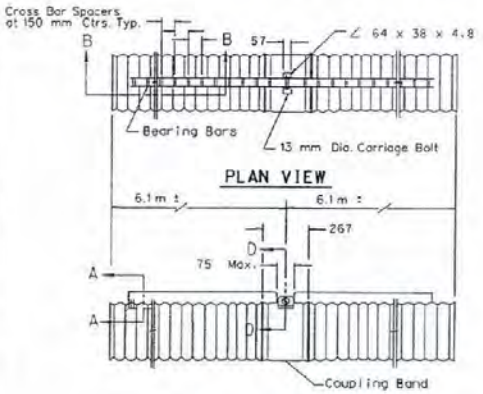
CULVERT INSTALLATION

CHIEF ROAD DESIGN ENGR.

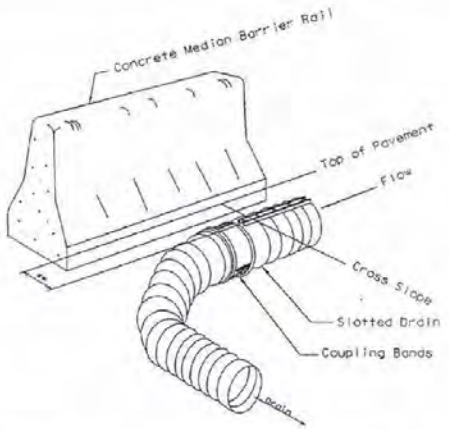
R-2.1.1 (601 THRU 606)
REVISION
ADOPTED: 7/96



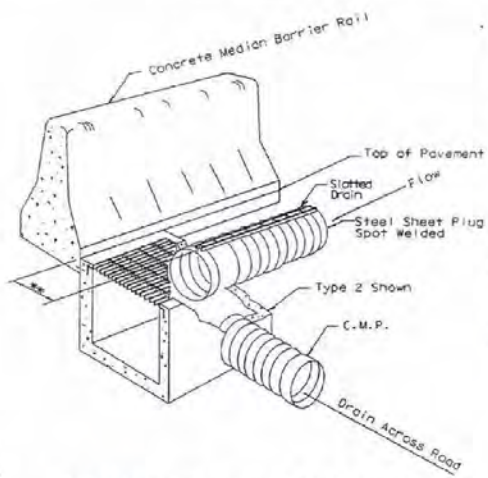
EMBANKMENT PROTECTOR & SLOTTED DRAIN



SLOTTED DRAIN DETAIL



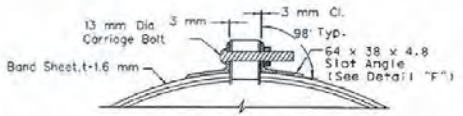
45° ANGLE SLOTTED DRAIN & CONCRETE BARRIER RAIL
(CAN BE USED WITH SHOULDER DIKE)



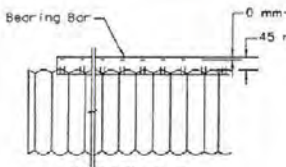
SLOTTED DRAIN, CONCRETE BARRIER RAIL & DROP INLET

GENERAL NOTES:

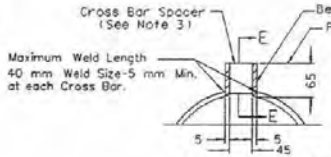
1. DRAIN PIPE SEAMS MAY BE CONTINUOUS HELICAL LOCK SEAM OR HELICAL WELD SEAM.
2. DRAIN SECTIONS SHALL BE ASSEMBLED WITH THE COUPLING BAND SHOWN.
3. THE CROSS BAR SPACER SHALL BE WELDED TO THE BEARING BARS IN SUCH A MANNER AS TO DEVELOP A MINIMUM TENSILE STRENGTH OF 55,000N NORMAL TO THE LONGITUDINAL AXIS OF THE BEARING BARS.
4. THE MAXIMUM VARIANCE FROM A STRAIGHT LINE BETWEEN THE EXTREME TOP CORNERS OF THE BEARING BARS SHALL BE 12 mm in 6.0 m.
5. FOR CONTINUOUS RUNS OF S.C.M.P. IN EXCESS OF 60m. CLEANOUT DI OR STANDARD FLUSHING INLETS SHALL BE INSTALLED AS SHOWN ON THE PLANS.
6. SPOT WELD SHALL DEVELOP MINIMUM REQUIRED STRENGTH OF STRAP.
7. DIMENSIONS SHOWN ARE MINIMUMS.
8. CONTRACTOR TO PROVIDE AN ADEQUATE METHOD OF KEEPING THE A.C. OUT OF PIPE DURING PAVING OPERATIONS.
9. 600 mm DIA. WILL NOT SUPPORT NORMAL HIGHWAY LOADS.
10. CONCRETE SHALL BE CLASS A OR AA.



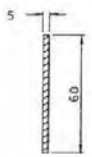
SECTION D-D



SECTION B-B

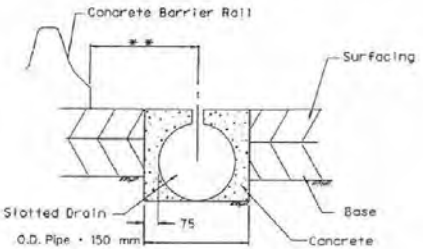


SECTION A-A (Or ALTERNATE)

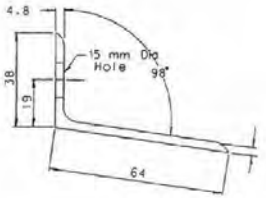


SECTION E-E

** See Plan Structure List

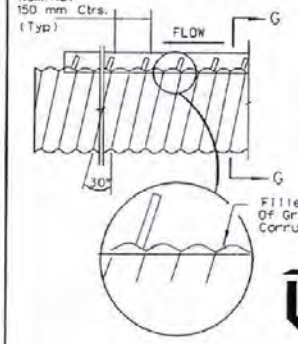


BEDDING DETAIL

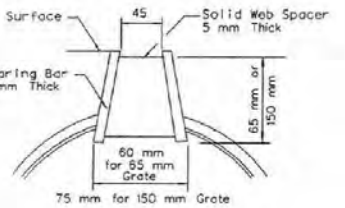


DETAIL "F"

* Attach to Coupling Band with Tack or Fillet Welds or Rivets.



ALTERNATE



SECTION G-G
STANDARD GRATE DETAIL

NOTE: Parallel Side Grate Also Available

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

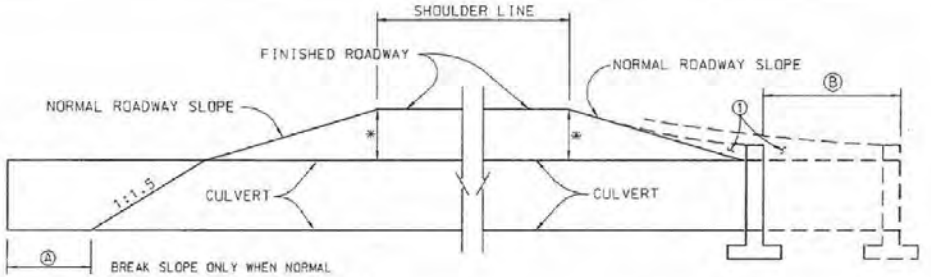
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SLOTTED C.M.P. DRAIN DETAILS

R-2.1.3 (604)

CHIEF ROAD DESIGN ENGR. | ADOPTED: 7/96 | REVISION

R-12

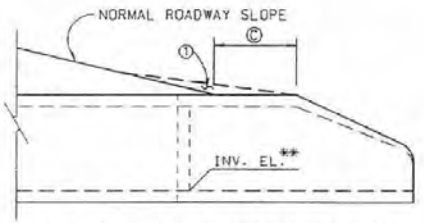


WITHOUT HEADWALL

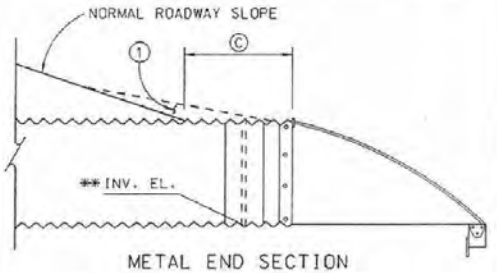
Ⓐ – LENGTH OF CULVERT SHALL BE INCREASED AS FOLLOWS: CONSIDER EACH SIDE SEPARATELY. MEASURE PIPE FROM ROADBED CENTERLINE TO THE INTERSECTION OF PIPE FLOW LINE AND FILLSLOPE. TO THIS DIMENSION ADD 0.6m WHEN COVER AT SHOULDER IS 0.3 m TO 3.0 m ADD AN ADDITIONAL 150 mm FOR EACH SUCCEEDING 1.5 m OF COVER OR PORTION THEREOF.

WITH CONCRETE HEADWALL

Ⓑ – LENGTH OF CULVERTS SHALL BE INCREASED AS FOLLOWS: CONSIDER EACH SIDE SEPARATELY. MEASURE PIPE FROM ROADWAY CENTERLINE TO THE INTERSECTION OF THE TOP OF PIPE AND FILLSLOPE PLUS HEADWALL THICKNESS. TO THIS DIMENSION ADD 0.3 m WHEN COVER AT SHOULDER IS 1.5 m TO 3.0 m ADD AN ADDITIONAL 150 mm FOR EACH SUCCEEDING 1.5 m OF COVER OR PORTION THEREOF.



PRECAST CONCRETE END SECTION



METAL END SECTION

Ⓒ – LENGTH OF CULVERT SHALL BE INCREASED AS FOLLOWS: CONSIDER EACH SIDE SEPARATELY. MEASURE PIPE FROM ROADWAY CENTERLINE TO THE INTERSECTION OF THE TOP OF PIPE AND FILLSLOPE. TO THIS DIMENSION ADD 0.3 m WHEN COVER AT SHOULDER IS 0.3 m TO 3.0 m ADD AN ADDITIONAL 150 mm FOR EACH SUCCEEDING 1.5 m OR PORTION THEREOF.

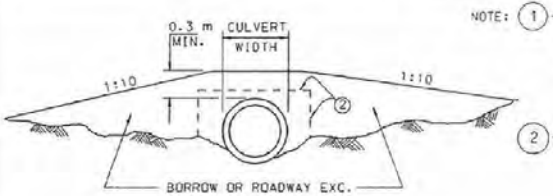
MINIMUM CULVERT INSTALLATION

* RCP: USE 450 mm MIN. WHERE POSSIBLE. IF MINIMUM COVER IS RESTRICTIVE, COMPENSATE BY UTILIZING HIGHER CLASS PIPE OR SELECTIVE BEDDING AS RECOMMENDED BY THE HYDRAULICS SECTION.

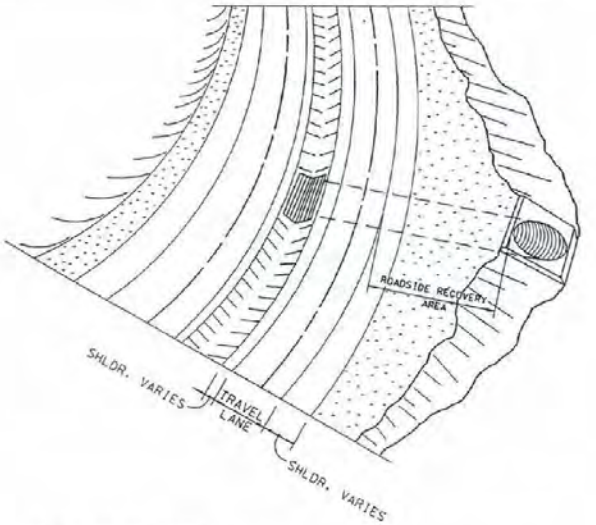
ALUMINUM CULVERTS: SEE STANDARD SHEET R-1.3.1.
STEEL CULVERTS: SEE STANDARD SHEET R-1.3.1.2.

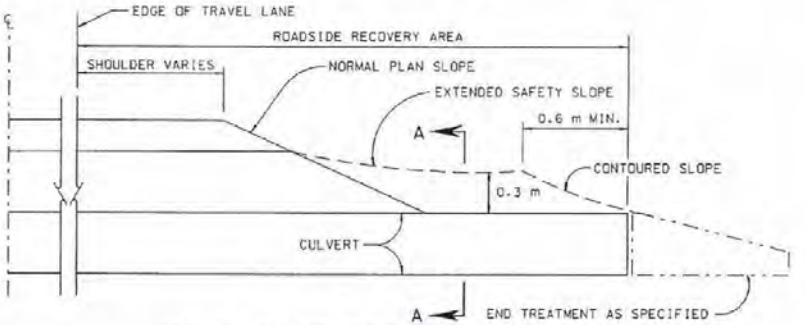
** FOR INFORMATIONAL PURPOSES ONLY

① – CONTOUR THIS AREA TO PROVIDE THE MINIMUM AMOUNT OF OBSTRUCTION EXPOSURE.



SECTION A-A
SAFETY CULVERT INSTALLATION
(TO PROVIDE OBSTRUCTION CLEARANCE)





METHOD OF CONTOURING OVER CULVERTS

NOTE: ① – IF, AFTER EXTENDING THE CULVERT AND/OR WARPING THE FILLSLOPE FOR SAFETY AND/OR AESTHETICS, THE EXTENSION DOES NOT FULFILL THE REQUIREMENTS FOR A CLEAR ROADSIDE RECOVERY AREA, THEN VEHICULAR TRAFFIC MAY BE PROTECTED BY A SAFETY GRATE OR BY SOME OTHER MEANS, SUCH AS GUARDRAIL, BARRIER RAIL OR ANOTHER ACCEPTABLE SAFETY FEATURE.

② – NORMAL STRUCTURE EXCAVATION AND BACKFILL LIMITS.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

METRIC NDOT

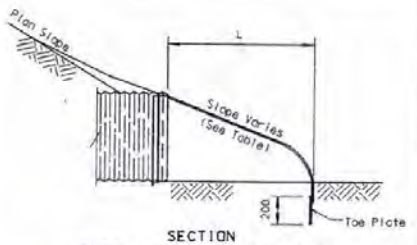
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT INSTALLATION

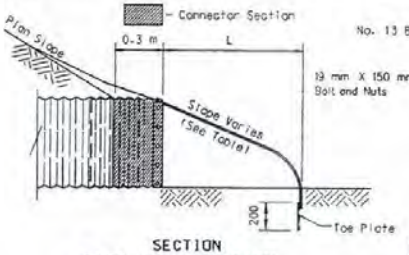
CHIEF ROAD DESIGN ENGR.

R-2.1.4 (601 THRU 606)
ADOPTED: 1/96 | REVISION

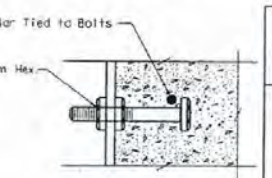
R-13



SECTION
TYPE 1 OR 2 CONNECTION

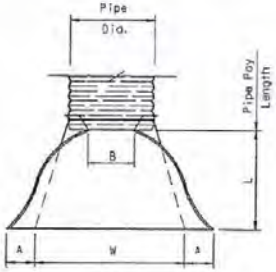


SECTION
TYPE 3 CONNECTION

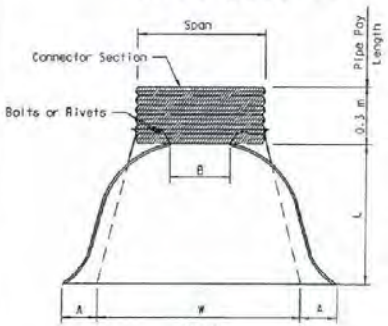


DETAIL B

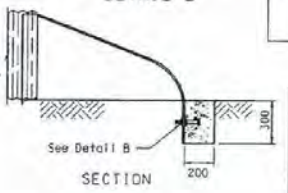
TYPE CONNECTION	PIPE ARCH DIMENSIONS SPAN x RISE	THICK-NESS (mm)	DIMENSIONS A 25 mm +/- *	B MAX	H 25 mm +/- *	L 40 mm +/- *	W 50 mm +/- *	APPROX. SLOPE	CONCRETE (m3**)
TYPE 2 OR 3	425 x 325	1.6	180	225	150	475	750	1 : 2.5	
	525 x 375	1.6	180	250	150	580	910	1 : 2.5	
	600 x 450	1.6	200	300	150	710	1070	1 : 2.5	
	700 x 500	1.6	230	360	150	810	1220	1 : 2.5	
	875 x 600	2.0	250	410	150	990	1520	1 : 2.5	
	1050 x 725	2.0	300	460	200	1170	1910	1 : 2.5	
	1225 x 825	2.8	330	530	230	1350	2160	1 : 2.5	
	1425 x 950	2.8	460	660	300	1600	2290	1 : 2.5	0.20
TYPE 3	1600 x 1075	2.8	460	760	300	1780	2590	1 : 2.25	0.22
	1775 x 1175	2.8	460	840	300	1960	2900	1 : 2.25	0.24
	1925 x 1300	2.8	460	910	300	1960	3200	1 : 2	0.26
	2075 x 1425	2.8	460	990	300	1960	3510	1 : 2	0.28



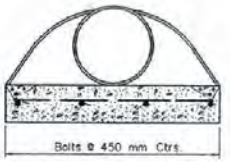
PLAN



PLAN



SECTION

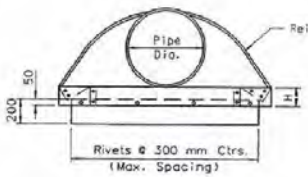


ELEVATION

ANCHOR BLOCK DETAIL
(See Notes 6 thru 9)

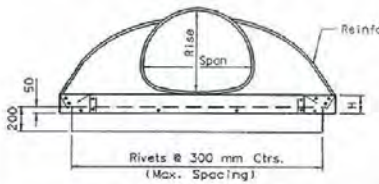
TYPE CONNECTION	DIAMETER (mm)	THICK-NESS (mm)	DIMENSIONS A 25 mm +/- *	B MAX	H 25 mm +/- *	L 40 mm +/- *	W 50 mm +/- *	APPROX. SLOPE	CONCRETE (m3**)
TYPE 1 OR 3	300	1.6	150	150	150	530	610	1 : 2.5	
	375	1.6	180	200	150	660	760	1 : 2.5	
	450	1.6	200	250	150	790	910	1 : 2.5	
	525	1.6	230	300	150	910	1070	1 : 2.5	
	600	1.6	250	330	150	1040	1220	1 : 2.5	
TYPE 2 OR 3	750	2.0	300	410	200	1300	1520	1 : 2.5	
	900	2.0	360	480	230	1520	1830	1 : 2.5	
	1050	2.8	410	560	280	1750	2130	1 : 2.5	
	1200	2.8	460	690	300	1980	2290	1 : 2.25	0.20
	1350	2.8	460	760	300	2130	2590	1 : 2	0.22
	1500	2.8	460	840	300	2210	2900	1 : 1.75	0.24
	1650	2.8	460	910	300	2210	3050	1 : 1.5	0.25
	1800	2.8	460	990	300	2210	3200	1 : 1.33	0.26
	1950	2.8	460	1070	300	2210	3350	1 : 1.25	0.27
	2100	2.8	460	1140	300	2210	3510	1 : 1.16	0.28

* TOLERANCES
** FOR INFORMATION ONLY



ELEVATION

LENGTH OF TOE PLATE TO BE W + 250 mm MIN. FOR 300 mm TO 750 mm DIAMETER PIPE INCLUSIVE AND W + 550 mm MIN. FOR 900 mm DIAMETER PIPES AND LARGER.



ELEVATION

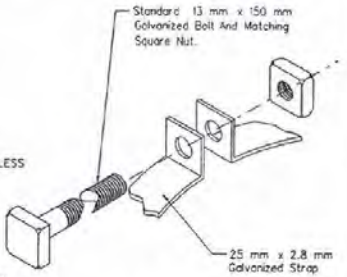
LENGTH OF TOE PLATE TO BE W+ 250 mm MIN. FOR PIPE ARCHES WITH RISE OF 325 mm TO 725 mm INCLUSIVE AND W- 450 mm MIN. FOR PIPE ARCHES WITH RISE OF 825 mm AND LARGER.

METRIC NDOT

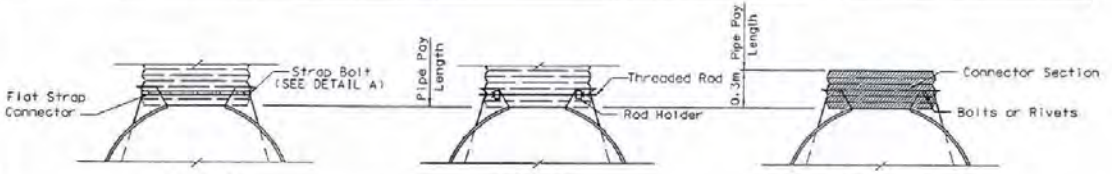
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

GENERAL NOTES:

1. THE CULVERT LENGTHS SHOWN ON THE PLANS AND STRUCTURE LIST SHALL BE THE PAY LENGTH AS INDICATED ON THE STANDARD SHEET INCLUDING CONNECTOR SECTION LENGTHS WHEN USED.
2. PIPE ON SKEW SHALL BE MITERED. SUFFICIENT ADDITIONAL LENGTH OF PIPE SHALL BE ALLOWED TO PROVIDE CLEARANCE FOR END SECTIONS.
3. TOE PLATES REQUIRED ON ROUND PIPE 600 mm AND OVER IN DIAMETER AND ON ARCH PIPE 700 mm x 500 mm AND OVER UNLESS OTHERWISE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS.
4. TOE PLATES SHALL BE PUNCHED WITH 12 mm HOLES TO MATCH HOLES IN LIP OF END SECTION AND BOLTED WITH 10 mm GALVANIZED BOLTS.
5. REINFORCED EDGES TO BE SUPPLEMENTED WITH GALVANIZED STIFFENER ANGLES FOR THE 1500 mm THRU 2100 mm ROUND, 1925 mm x 1300 mm AND 2075 mm x 1425 mm PIPE-ARCH SIZES. THE ANGLES WILL BE 51 mm x 51 mm x 6.4 mm FOR THE 1500 mm THRU 1800 mm ROUND, 1925 mm x 1300 mm AND 2075 mm x 1425 mm PIPE ARCH SIZES AND 64 mm x 64 mm x 6.1 mm FOR 1950 mm THRU 2100 mm ROUND. THE ANGLES TO BE ATTACHED BY 10 mm GALVANIZED NUTS AND BOLTS.
6. ANCHOR BLOCK SHALL BE USED ON INLET END ONLY FOR 1200 mm CMP AND OVER AND FOR 1425 x 950 mm CMAP AND OVER UNLESS OTHERWISE SPECIFIED (SEE ANCHOR BLOCK DETAILS)
7. CONCRETE SHALL BE CLASS A OR AA.
8. TOE PLATE TO BE ELIMINATED WHEN ANCHOR BLOCK IS USED.
9. REINFORCING STEEL BAR TO CLEAR 50 mm ON ENDS OF CONCRETE ANCHOR BLOCK.



DETAIL A



TYPE 1
FOR 300 mm CMP THROUGH 600 mm CMP ONLY

TYPE 2
FOR 750 mm CMP THROUGH 2100 mm CMP, AND FOR 425 mm X 325 mm CMAP THRU 1425 mm X 950 mm CMAP

TYPE 3
FOR 1600 mm X 1075 mm CMAP THROUGH 2075 mm X 1425 mm CMAP OR FOR 300 mm CMP THROUGH 2100 mm CMP (OPTIONAL)

STANDARD CONNECTIONS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

METAL END SECTIONS
300 mm CMP TO 2100 mm CMP
AND 425 mm X 325 mm CMAP
TO 2075 mm X 1425 mm CMAP

CHIEF ROAD DESIGN ENGR.

R-2.2.1 (604)
ADOPTED 7/96 REVISION

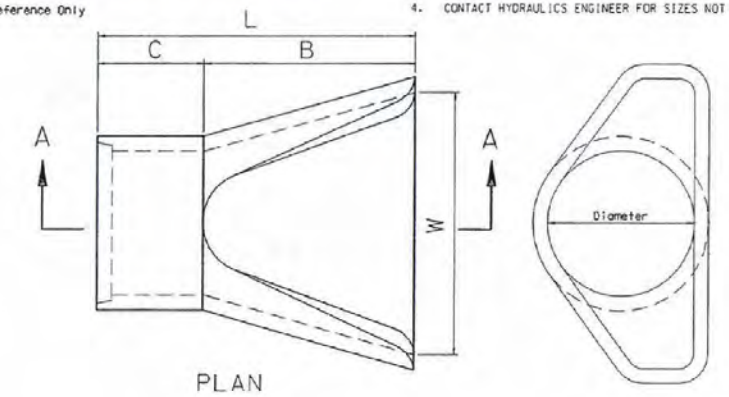
R-14

DIAMETER (mm)	A (mm)	B (mm)	C * (mm)	L (mm)	W (mm)
450	225	625	625	1250	900
600	240	1050	750	1800	1200
750	300	1325	500	1825	1500
900	375	1550	875	2425	1800
1050	525	1575	875	2450	1850
1200	600	1800	650	2450	2100
1350	675	1650	825	2475	2050

* For Reference Only

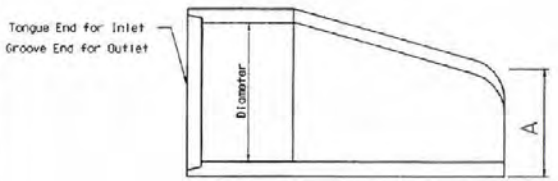
GENERAL NOTES:

1. CLASS AND TYPE OF CONCRETE SHALL BE AS SPECIFIED FOR REINFORCED CONCRETE PIPE.
2. STRUCTURAL DESIGN OF END SECTION SHALL CONFORM TO THAT OF STANDARD REINFORCED CONCRETE CULVERT PIPE.
3. LENGTH OF PIPE SHOWN ON THE DESIGN PLANS DOES NOT INCLUDE CONNECTOR SECTION (LENGTH C).
4. CONTACT HYDRAULICS ENGINEER FOR SIZES NOT LISTED.

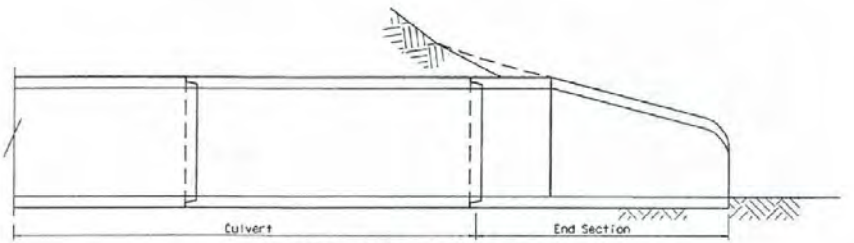


PLAN

END VIEW



SECTION A-A



CROSS SECTION VIEW
450 mm RCP TO 1350 mm RCP

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

METRIC NDOT

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RCP END SECTION
450 mm RCP TO 1350 mm RCP

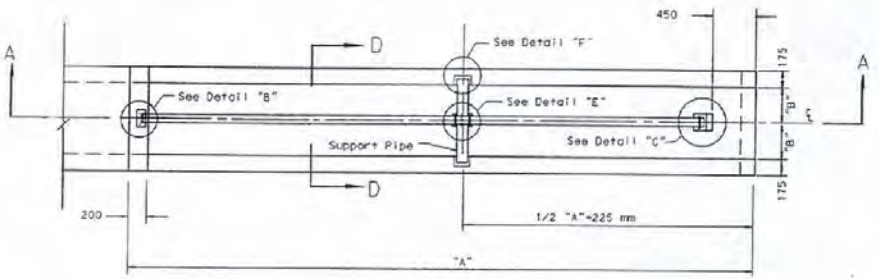
CHIEF ROAD DESIGN ENGR.

R-2.3.1 (603)

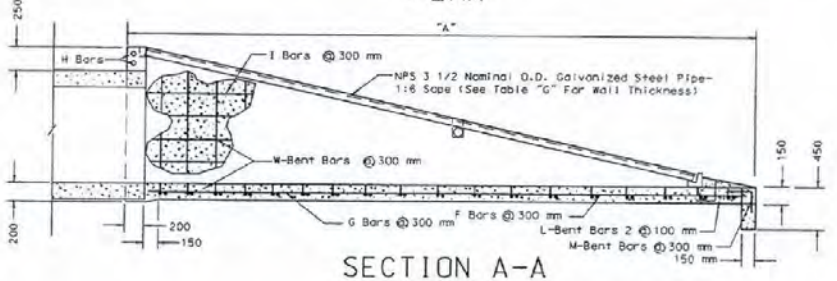
ADOPTED: 7/96

REVISION

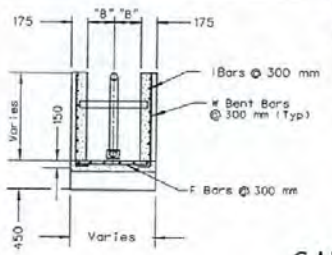
R-15



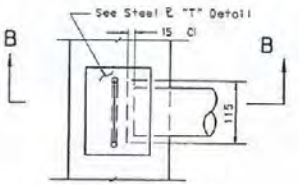
PLAN



SECTION A-A

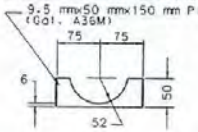


SECTION D-D

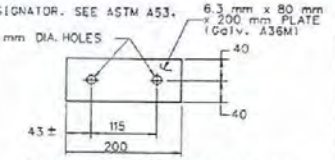


DETAIL "B"
(Plan)

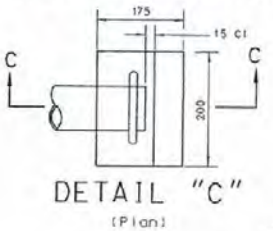
GENERAL NOTES:
1. CONCRETE SHALL BE CLASS A OR CLASS AA.
2. REINFORCING STEEL SHALL BE DEFORMED BARS WITH THE MAXIMUM SPACING OF 300 mm SET 50 mm CLEAR OF SURFACE OF CONCRETE. REINFORCING BARS MAY BE CUT AND BENT IN FIELD.
3. NPS = NOMINAL PIPE SIZE DESIGNATOR. SEE ASTM A53.



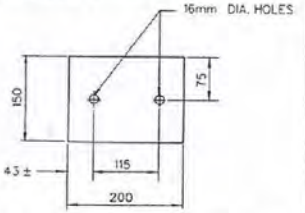
SADDLE PL DETAIL



ANCHOR PL DETAIL



DETAIL "C"
(Plan)



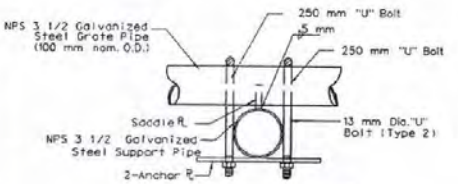
STEEL PL "T" DETAIL

LENGTH OF REINFORCING BARS

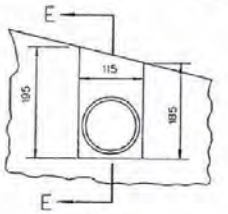
DIA. OF CULVERT	F	G	H	I	M	W
	NO.13 BARS	NO.13 BARS	NO.13 BARS	NO.13 BARS	NO.13 BARS	NO.13 BARS
750 mm	22-550 mm	4-6300 mm	2-975 mm	3-5950 mm TO 750 mm	4-600 mm	19-1450 mm TO 900 mm
825 mm	23-725 mm	4-6600 mm	2-1075 mm	3-6250 mm TO 750 mm	4-600 mm	20-1550 mm TO 600 mm
900 mm	24-800 mm	5-7050 mm	2-1150 mm	3-6700 mm TO 750 mm	5-600 mm	22-1625 mm TO 600 mm
975 mm	26-875 mm	5-7650 mm	2-1225 mm	4-7300 mmTO 750 mm	5-600 mm	24-1725 mm TO 600 mm
1050 mm	28-950 mm	5-8100 mm	2-1300 mm	5-7750 mmTO 750 mm	5-600 mm	25-1800 mm TO 600 mm
1125 mm	29-1025 mm	6-8550 mm	2-1375 mm	5-8200 mmTO 750 mm	6-600 mm	27-1875 mm TO 600 mm
1200 mm	31-1450 mm	6-9000 mm	2-1450 mm	5-8650 mm TO 750 mm	6-600 mm	28-1950 mm TO 600 mm
1275 mm	33-1450 mm	6-9600 mm	2-1525 mm	6-9250 mm TO 750 mm	6-600 mm	30-2050 mm TO 600 mm
1350 mm	34-1600 mm	6-10050 mm	2-1600 mm	6-9700 mm TO 750 mm	6-600 mm	32-2125 mm TO 600 mm
1425 mm	37-1875 mm	7-10500 mm	2-1675 mm	6-10150 mm TO 750 mm	7-600 mm	33-2200 mm TO 600 mm
1500 mm	38-1750 mm	7-11100 mm	2-1750 mm	7-10750 mm TO 750 mm	7-600 mm	35-2300 mm TO 600 mm

TABLE "G"

DIA. OF PIPE	DIM. "A"	DIM. "B"	SCHEDULE NO.
750 mm	6600 mm	375 mm	40
825 mm	6900 mm	415 mm	40
900 mm	7350 mm	450 mm	40
975 mm	7950 mm	490 mm	40
1050 mm	8400 mm	525 mm	40
1125 mm	8850 mm	565 mm	40
1200 mm	9300 mm	600 mm	40
1275 mm	9900 mm	640 mm	80
1350 mm	10350 mm	675 mm	80
1425 mm	10800 mm	715 mm	80
1500 mm	11400 mm	750 mm	80

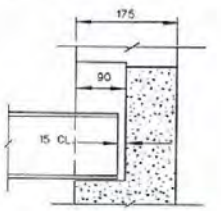


DETAIL "E"

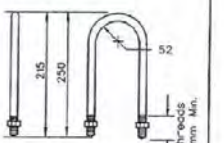


ELEVATION

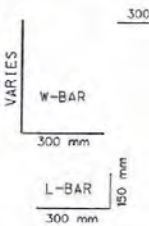
DETAIL "F"

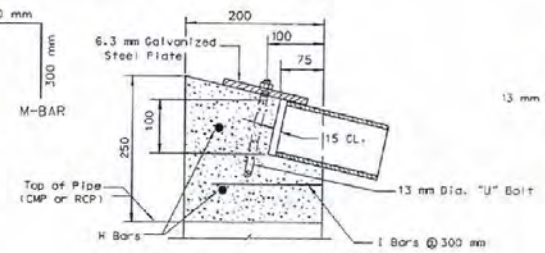


SECTION E-E

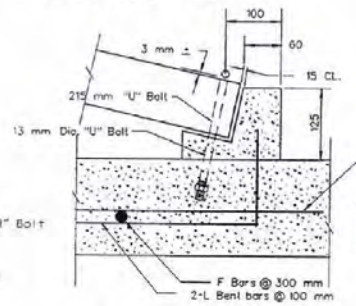


U-BOLT DETAIL





SECTION B-B



SECTION C-C

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

METRIC NDOT

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT END SAFETY GRATE 750 mm - 1500 mm CMP OR RCP

CHIEF ROAD DESIGN ENGR.	ADOPTED: 7/96	REVISION 6/97
	R-2.3.1.1	(601)

R-16

CMP DIA. (mm)	CORR CMAP (mm)	CMP AREA (m^2)	L (mm)	SINGLE CMP * 0° SKEW CONC (m^3)	0° SKEW STEEL (kg)	15° SKEW CONC (m^3)	15° SKEW STEEL (kg)	30° SKEW CONC (m^3)	30° SKEW STEEL (kg)	45° SKEW CONC (m^3)	45° SKEW STEEL (kg)	DOUBLE CMP * 0° SKEW CONC (m^3)	0° SKEW STEEL (kg)	15° SKEW CONC (m^3)	15° SKEW STEEL (kg)	30° SKEW CONC (m^3)	30° SKEW STEEL (kg)	45° SKEW CONC (m^3)	45° SKEW STEEL (kg)
300	---	0.07	1050	0.65	16	0.71	17	0.72	17	0.76	18	0.93	21	0.99	22	1.03	23	1.14	24
375	425x325	0.11	1275	0.83	22	0.91	23	0.93	23	0.97	24	1.15	28	1.24	29	1.28	29	1.41	31
450	525x375	0.16	1500	1.04	25	1.13	27	1.15	27	1.20	28	1.40	32	1.50	33	1.57	34	1.71	36
600	700x500	0.29	1950	1.49	36	1.62	38	1.65	38	1.72	39	1.93	43	2.09	45	2.17	47	2.35	49
750	875x600	0.46	2400	2.00	48	2.18	50	2.22	51	2.30	52	2.59	57	2.79	60	2.90	61	3.14	64
900	1050x725	0.66	2850	2.57	55	2.80	59	2.84	59	2.95	61	3.32	67	3.58	70	3.71	72	4.01	76
1050	1225x825	0.89	3300	3.20	76	3.49	80	3.55	81	3.68	83	4.12	89	4.44	93	4.61	95	4.98	100

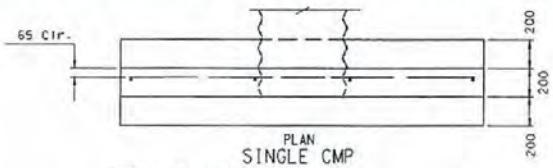
* QUANTITIES SHOWN ABOVE ARE FOR TWO HEADWALLS.

** QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL.

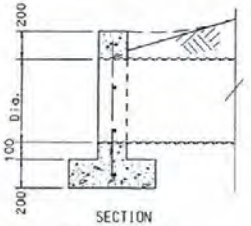
CMP DIA. (mm)	LENGTH OF REINFORCING BARS SINGLE CMP ** 0°-45° NO.13 K @ mm	0° NO.16 N @ mm	15° NO.16 N @ mm	30° NO.16 N @ mm	45° NO.16 N @ mm	SINGLE OR DOUBLE CMP ** 0° NO.13 M @ mm	15° NO.13 M @ mm	30° NO.13 M1@mm	30° NO.13 M @ mm	45° NO.13 M1@mm	45° NO.13 M @ mm	DOUBLE CMP ** 0°-45° NO.13 M1@mm	0° NO.16 K @ mm	15° NO.16 N @ mm	30° NO.16 N @ mm	45° NO.16 N @ mm
300	4@725	2@1275	2@1400	2@1425	2@1500	2@450	1@400	1@600	1@375	1@625	1@300	1@700	5@725	2@1875	2@2025	2@2125	2@2350
375	6@800	2@1575	2@1725	2@1775	2@1850	2@500	1@450	1@650	1@425	1@675	1@350	1@750	7@800	2@2250	2@2425	2@2550	2@2825
450	6@875	2@1875	2@2050	2@2100	2@2200	2@675	1@625	1@875	1@600	1@900	1@525	1@975	7@875	2@2625	2@2825	2@2950	2@3275
600	6@1025	2@2475	2@2700	2@2775	2@2925	4@900	2@850	2@1125	2@825	2@1150	2@750	2@1225	7@1025	2@3375	2@3625	2@3800	2@4200
750	8@1175	2@3075	2@3350	2@3425	2@3625	4@1125	2@1075	2@1400	2@1050	2@1425	2@975	2@1500	9@1175	2@4200	2@4500	2@4725	2@5225
900	8@1325	2@3675	2@4000	2@4100	2@4325	4@1350	2@1300	2@1675	2@1275	2@1700	2@1200	2@1775	9@1325	2@5025	2@5400	2@5650	2@6250
1050	10@1475	2@4275	2@4650	2@4775	2@5050	6@1575	3@1525	3@1950	3@1500	3@1975	3@1425	3@2050	11@1475	2@5850	2@6275	2@6575	2@7275

GENERAL NOTES:

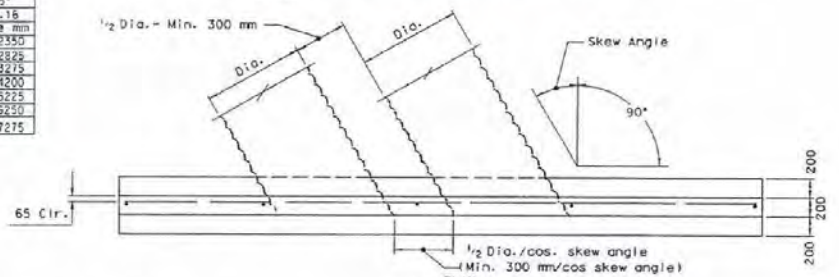
1. CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE DEFORMED BARS WITH MAXIMUM SPACING OF 450 mm SET 65 mm CLEAR OF SURFACE OF CONCRETE EXCEPT AS NOTED. BAR ENDS SHALL BE KEPT 40 mm CLEAR OF SURFACE OF CONCRETE. REINFORCING BARS MAY BE CUT AND BENT IN FIELD.
3. FOOTINGS SHOWN ARE OF MINIMUM DEPTH AND SHALL BE EXTENDED IF SOIL IS UNSUITABLE OR LIABLE TO SCOUR.
4. CULVERT PIPES TO BE SET ON A SKEW SHALL BE MITERED WHEN HEADWALLS ARE CONSTRUCTED. WHEN HEADWALLS ARE NOT CONSTRUCTED THE PIPES SHALL NOT BE MITERED EXCEPT IN OVERFLOW SECTION.
5. FOR ESTIMATING HEADWALL QUANTITIES ON SKEWED CULVERTS:
   0° to 10° - USE QUANTITIES FOR 0° SKEW.
   11° to 25° - USE QUANTITIES FOR 15° SKEW.
   26° to 40° - USE QUANTITIES FOR 30° SKEW.
   41° to 55° - USE QUANTITIES FOR 45° SKEW.
   OVER 55° - CALCULATE QUANTITIES REQUIRED.
   CULVERTS SHOULD BE INSTALLED ON 5° INCREMENTS WHERE IT IS FEASIBLE.



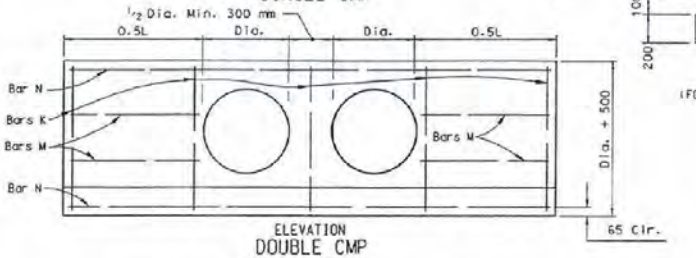
PLAN
SINGLE CMP



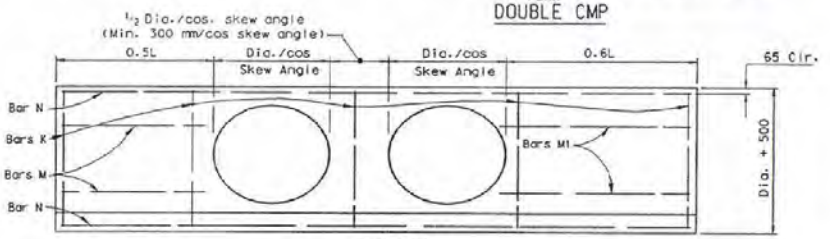
SECTION
(FOR ALL HEADWALLS)



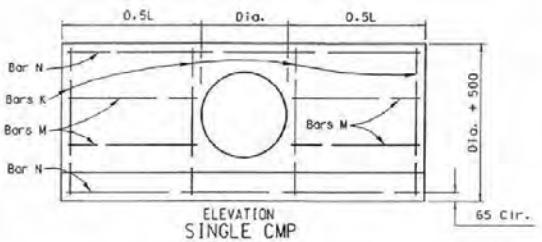
PLAN
DOUBLE CMP



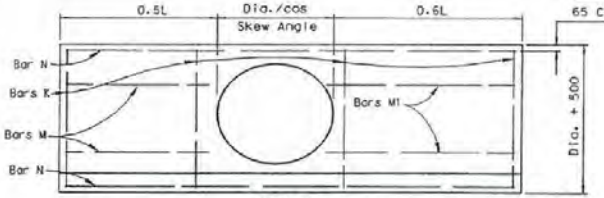
ELEVATION
DOUBLE CMP



ELEVATION
DOUBLE CMP



ELEVATION
SINGLE CMP
0° SKEW



ELEVATION
SINGLE CMP
15° TO 45° SKEW

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS

300 mm CMP TO 1050 mm CMP

CHIEF ROAD DESIGN ENGR

R-2.4.1 (502)
ADOPTED: 7/96
REVISION

R-17

LENGTH OF REINFORCING BARS
SINGLE CMP

CMP DIA. (mm)	0° SKEW NO.16 F (mm)	0° SKEW NO.16 G (mm)	0° SKEW NO.13 M (mm)	0° SKEW NO.13 N (mm)	0° SKEW NO.13 K (mm)	15° SKEW NO.16 F (mm)	15° SKEW NO.16 G (mm)	15° SKEW NO.13 M (mm)	15° SKEW NO.13 M1 (mm)	15° SKEW NO.13 N (mm)	15° SKEW NO.13 K (mm)	30° SKEW NO.16 F (mm)	30° SKEW NO.16 G (mm)	30° SKEW NO.13 M (mm)	30° SKEW NO.13 M1 (mm)	30° SKEW NO.13 N (mm)	30° SKEW NO.13 K (mm)	45° SKEW NO.16 F (mm)	45° SKEW NO.16 G (mm)	45° SKEW NO.13 M (mm)	45° SKEW NO.13 M1 (mm)	45° SKEW NO.13 N (mm)	45° SKEW NO.13 K (mm)
1200	12@825	10@2275	12@1800	9@4875	10@1750	13@825	11@2275	6@1750	6@2175	9@5100	11@1750	13@825	11@2275	6@1700	6@2175	9@5450	11@1750	14@825	12@2275	6@1650	6@2175	9@5750	12@1750
1350	13@825	12@2425	12@2025	9@5475	12@1900	14@825	13@2625	6@1975	6@2425	9@5950	13@1900	15@825	14@2425	6@1925	6@2425	9@6100	14@1900	15@825	14@2425	6@1875	6@2425	9@6450	14@1900
1500	21@1125	18@2625	12@2250	10@6075	12@2050	23@1125	20@2625	6@2200	6@2700	10@6600	13@2050	23@1125	20@2625	6@2150	6@2700	10@6775	14@2050	24@1125	21@2625	6@2100	6@2700	10@7175	14@2050
1800	25@1125	20@2925	16@2700	10@7275	14@2350	27@1125	22@2925	8@2650	8@3250	10@7900	15@2350	28@1125	23@2925	8@2600	8@3250	10@8100	17@2350	29@1125	24@2925	8@2550	8@3250	10@8575	17@2350

DOUBLE CMP

1200	16@825	11@2275	12@1800	9@6675	11@1750	17@825	12@2275	6@1750	6@2175	9@7150	12@1750	18@825	13@2275	6@1700	6@2175	9@7525	13@1750	19@825	14@2275	6@1650	6@2175	9@8300	14@1750
1350	18@825	13@2425	12@2025	9@7500	13@1900	19@825	14@2425	6@1975	6@2425	9@8050	14@1900	20@825	15@2425	6@1925	6@2425	9@8450	15@1900	22@825	17@2425	6@1875	6@2425	9@9325	17@1900
1500	29@1125	21@2625	12@2250	10@8325	14@2050	31@1125	23@2625	6@2200	6@2700	10@8925	15@2050	32@1125	24@2625	6@2150	6@2700	10@9375	16@2050	36@1125	28@2625	6@2100	6@2700	10@10350	18@2050
1800	34@1125	23@2925	16@2700	10@9975	16@2350	36@1125	25@2925	8@2650	8@3250	10@10700	17@2350	38@1125	27@2925	8@2600	8@3250	10@11225	19@2350	42@1125	31@2925	8@2550	8@3250	10@12400	21@2350

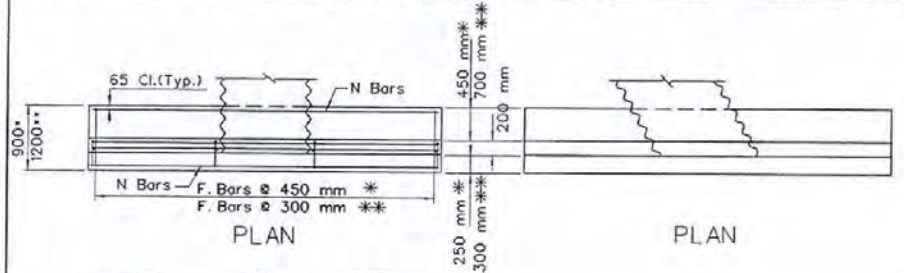
QUANTITIES SHOWN ABOVE ARE FOR ONE HEADWALL.

* - For 1200 mm & 1350 mm Dia.

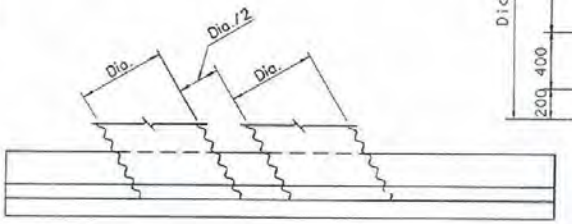
** - For 1500 mm & 1800 mm Dia.

QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS.

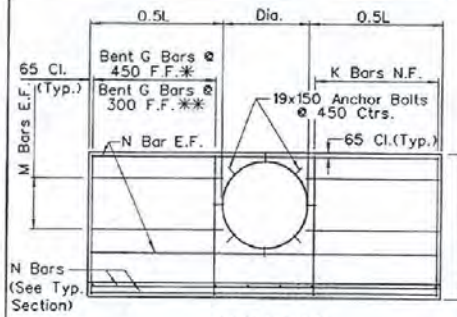
CMP DIA. (mm)	CORR CMAP S x R (mm)	CMP AREA (m^2)	L (mm)	SINGLE CMP 0° SKEW CONC m^3	SINGLE CMP 0° SKEW STEEL kg	SINGLE CMP 15° SKEW CONC m^3	SINGLE CMP 15° SKEW STEEL kg	SINGLE CMP 30° SKEW CONC m^3	SINGLE CMP 30° SKEW STEEL kg	SINGLE CMP 45° SKEW CONC m^3	SINGLE CMP 45° SKEW STEEL kg	DOUBLE CMP 0° SKEW CONC m^3	DOUBLE CMP 0° SKEW STEEL kg	DOUBLE CMP 15° SKEW CONC m^3	DOUBLE CMP 15° SKEW STEEL kg	DOUBLE CMP 30° SKEW CONC m^3	DOUBLE CMP 30° SKEW STEEL kg	DOUBLE CMP 45° SKEW CONC m^3	DOUBLE CMP 45° SKEW STEEL kg
1200	1325x1025	1.17	3750	5.14	271	5.59	295	5.70	298	5.93	316	6.70	324	7.21	350	7.51	370	8.14	396
1350	1500x1150	1.48	4200	6.04	320	6.58	347	6.70	364	6.96	369	7.86	381	8.46	410	8.80	431	9.53	474
1500	1650x1275	1.82	4650	7.76	450	8.46	493	8.62	497	8.98	520	10.15	557	10.93	602	11.37	626	12.33	702
1800	——	2.63	5550	10.04	574	10.93	625	11.13	646	11.56	672	13.05	698	14.05	750	14.61	795	15.83	879



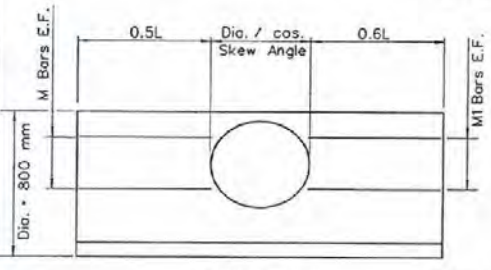
PLAN



PLAN

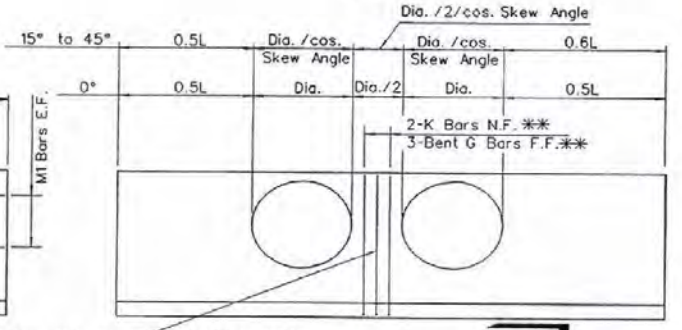


ELEVATION
SINGLE CMP
0° SKEW



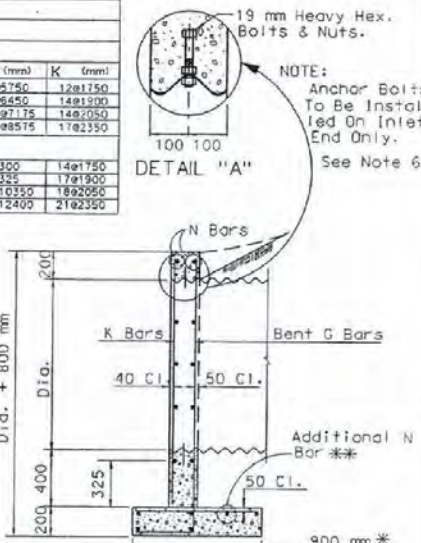
ELEVATION
SINGLE CMP
15° TO 45° SKEW

FOR DIMENSIONS & REINFORCING NOT SHOWN SEE 0° SKEW



ELEVATION
DOUBLE CMP
0° TO 45° SKEW

FOR DIMENSIONS & REINFORCING NOT SHOWN SEE 0° SKEW



TYPICAL SECTION

GENERAL NOTES:

1. CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE DEFORMED BARS WITH MAXIMUM SPACING OF 450 mm SET 65 mm CLEAR OF SURFACE OF CONCRETE EXCEPT AS NOTED. BAR ENDS SHALL BE KEPT 40 mm CLEAR OF SURFACE OF CONCRETE. REINFORCING BARS MAY BE CUT AND BENT IN FIELD.
3. FOOTINGS SHOWN ARE OF MINIMUM DEPTH AND SHALL BE EXTENDED IF SOIL IS UNSUITABLE OR LIABLE TO SCOUR.
4. CULVERT PIPES TO BE SET ON A SKEW SHALL BE MITERED WHEN HEADWALLS ARE CONSTRUCTED. WHEN HEADWALLS ARE NOT CONSTRUCTED THE PIPES SHALL NOT BE MITERED EXCEPT IN OVERFLOW SECTION.
5. FOR ESTIMATING HEADWALL QUANTITIES ON SKEWED CULVERTS:
   0° TO 10° - USE QUANTITIES FOR 0° SKEW.
   11° TO 25° - USE QUANTITIES FOR 15° SKEW.
   26° TO 40° - USE QUANTITIES FOR 30° SKEW.
   41° TO 55° - USE QUANTITIES FOR 45° SKEW.
   OVER 55° - CALCULATE QUANTITIES REQUIRED. CULVERTS SHOULD BE INSTALLED ON 5° INCREMENTS WHERE IT IS FEASIBLE.
6. NO DIRECT PAYMENT FOR ANCHOR BOLTS.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS
1200 mm CMP TO 1800 mm CMP

CHIEF ROAD DESIGN ENGINEER

ADOPTED: 7/96

R-2.4.2 (502)

REVISION

R-18

QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS.

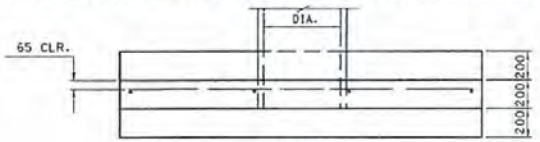
RCP Dia. (mm)	RCP AREA (m^2)	SINGLE RCP 0° SKEW Conc. (m^3)	SINGLE RCP 0° SKEW Steel (kg)	SINGLE RCP 15° SKEW Conc. (m^3)	SINGLE RCP 15° SKEW Steel (kg)	SINGLE RCP 30° SKEW Conc. (m^3)	SINGLE RCP 30° SKEW Steel (kg)	SINGLE RCP 45° SKEW Conc. (m^3)	SINGLE RCP 45° SKEW Steel (kg)	DOUBLE RCP 0° SKEW Conc. (m^3)	DOUBLE RCP 0° SKEW Steel (kg)	DOUBLE RCP 15° SKEW Conc. (m^3)	DOUBLE RCP 15° SKEW Steel (kg)	DOUBLE RCP 30° SKEW Conc. (m^3)	DOUBLE RCP 30° SKEW Steel (kg)	DOUBLE RCP 45° SKEW Conc. (m^3)	DOUBLE RCP 45° SKEW Steel (kg)	X (mm)	Y (mm)	L (mm)	h (mm)
300	0.07	0.76	21	0.83	22	0.84	22	0.87	23	1.08	27	1.16	28	1.21	29	1.32	30	250	350	1200	900
375	0.11	1.01	25	1.11	26	1.12	27	1.16	27	1.38	32	1.48	33	1.54	34	1.67	36	260	360	1500	990
450	0.16	1.24	31	1.35	33	1.38	34	1.41	34	1.64	39	1.77	40	1.83	41	1.99	44	265	365	1725	1015
525	0.22	1.49	35	1.63	37	1.65	38	1.70	39	1.98	43	2.13	46	2.22	47	2.39	49	270	370	1950	1165
600	0.29	1.74	44	1.90	46	1.93	47	1.99	48	2.30	53	2.48	55	2.58	57	2.78	59	275	375	2175	1250
675	0.37	2.00	48	2.19	50	2.22	51	2.29	52	2.66	58	2.87	61	2.97	62	3.21	65	275	375	2400	1325
750	0.46	2.35	53	2.58	56	2.61	56	2.69	58	3.11	64	3.35	67	3.48	69	3.74	72	290	390	2700	1425
825	0.55	2.68	57	2.92	60	2.96	61	3.04	62	3.53	69	3.81	73	3.95	74	4.25	78	295	395	2925	1520
900	0.66	3.00	73	3.28	77	3.32	78	3.42	79	3.97	86	4.27	91	4.43	93	4.77	97	300	400	3150	1600

QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL.

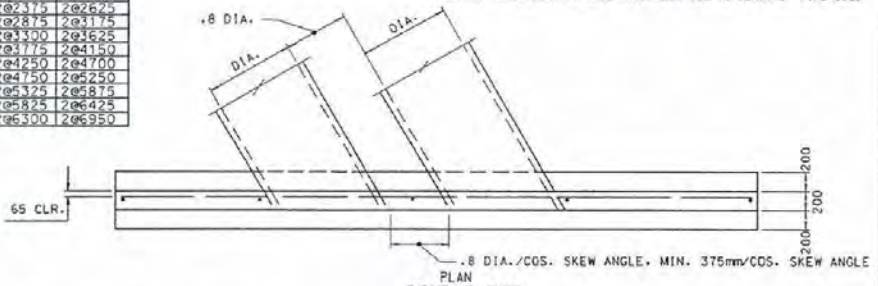
RCP Dia. mm	LENGTH OF REINFORCING BARS SINGLE RCP 0°-45° NO.13 K mm	N mm	0° NO.16 N mm	15° NO.16 N mm	30° NO.16 N mm	45° NO.16 N mm	SINGLE OR DOUBLE RCP 0° NO.13 M mm	15° NO.13 M mm	15° NO.13 M1 mm	30° NO.13 M mm	30° NO.13 M1 mm	45° NO.13 M mm	45° NO.13 M1 mm	DOUBLE RCP 0°-45° NO.13 K mm	N mm	0° NO.16 N mm	15° NO.16 N mm	30° NO.16 N mm	45° NO.16 N mm
300	6@825		2@1425	2@1550	2@1600	2@1675	2@475	1@425	1@625	1@400	1@650	1@325	1@725	7@825		2@2100	2@2250	2@2375	2@2625
375	6@925		2@1800	2@1950	2@2000	2@2100	2@625	1@575	1@800	1@550	1@825	1@475	1@900	7@925		2@2550	2@2750	2@2875	2@3175
450	6@1000		2@2100	2@2300	2@2350	2@2450	4@725	2@675	2@925	2@650	2@950	2@575	2@1025	7@1000		2@2925	2@3150	2@3300	2@3625
525	6@1100		2@2400	2@2625	2@2675	2@2825	4@825	2@775	2@1050	2@750	2@1075	2@675	2@1150	7@1100		2@3350	2@3600	2@3775	2@4150
600	8@1175		2@2700	2@2950	2@3025	2@3175	4@950	2@900	2@1200	2@875	2@1225	2@800	2@1300	9@1175		2@3775	2@4075	2@4250	2@4700
675	8@1250		2@3000	2@3275	2@3350	2@3525	4@1050	2@1000	2@1300	2@975	2@1325	2@900	2@1400	9@1250		2@4225	2@4525	2@4750	2@5250
750	8@1350		2@3375	2@3675	2@3775	2@3950	4@1200	2@1150	2@1500	2@1125	2@1525	2@1050	2@1600	9@1325		2@4725	2@5075	2@5325	2@5875
825	8@1450		2@3675	2@4000	2@4100	2@4300	4@1275	2@1225	2@1575	2@1200	2@1600	2@1125	2@1675	9@1450		2@5175	2@5550	2@5825	2@6425
900	10@1525		2@3975	2@4325	2@4425	2@4675	6@1400	3@1350	3@1725	3@1325	3@1750	3@1250	3@1825	11@1525		2@5600	2@6000	2@6300	2@6950

GENERAL NOTES:

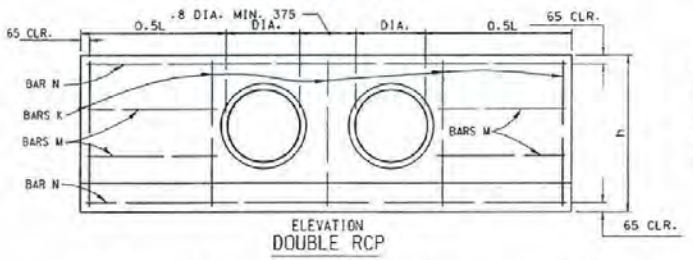
1. CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE DEFORMED BARS WITH MAXIMUM SPACING OF 450 mm SET 65 mm CLEAR OF SURFACE OF CONCRETE EXCEPT AS NOTED. BAR ENDS SHALL BE KEPT 40 mm CLEAR OF SURFACE OF CONCRETE. REINFORCING BARS MAY BE CUT AND BENT IN FIELD.
3. FOOTINGS SHOWN ARE OF MINIMUM DEPTH AND SHALL BE EXTENDED IF SOIL IS UNSUITABLE OR LIABLE TO SCOUR.
4. CULVERT PIPES TO BE SET ON A SKEW SHALL BE MITERED WHEN HEADWALLS ARE CONSTRUCTED. WHEN HEADWALLS ARE NOT CONSTRUCTED THE PIPES SHALL NOT BE MITERED EXCEPT IN OVERFLOW SECTION.
5. FOR ESTIMATING HEADWALL QUANTITIES ON SKEWED CULVERTS:
   0° to 10° – USE QUANTITIES FOR 0° SKEW.
   11° to 25° – USE QUANTITIES FOR 15° SKEW.
   26° to 40° – USE QUANTITIES FOR 30° SKEW.
   41° to 55° – USE QUANTITIES FOR 45° SKEW.
   OVER 55° – CALCULATE QUANTITIES REQUIRED.
   CULVERTS SHOULD BE INSTALLED ON 5° INCREMENTS WHERE IT IS FEASIBLE.
6. DIMENSIONS X, Y, L, AND h TO REMAIN CONSTANT REGARDLESS OF MINOR VARIATIONS IN WALL THICKNESS DUE TO CLASS OF PIPE USED.



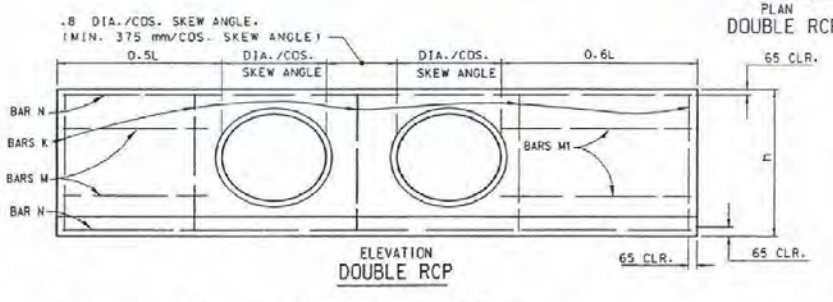
PLAN
SINGLE RCP



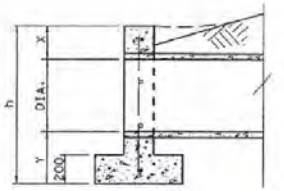
PLAN
DOUBLE RCP



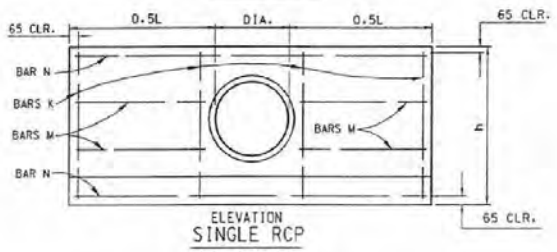
ELEVATION
DOUBLE RCP



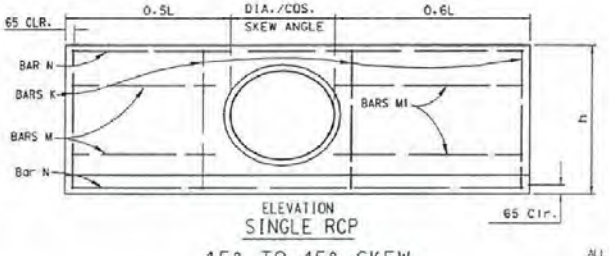
ELEVATION
DOUBLE RCP



SECTION
(FOR ALL HEADWALLS)



ELEVATION
SINGLE RCP
0° SKEW



ELEVATION
SINGLE RCP
15° TO 45° SKEW

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

METRIC NDOT

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS

300 mm RCP TO 900 mm RCP

R-2.5.1 (502)

CHIEF ROAD DESIGN ENGR. ADOPTED: 7/96 REVISION

R-19

QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS.

RCP DIA. (mm)	RCP AREA (m^2)	SINGLE RCP 0° SKEW CONC. (m^3)	0° SKEW STEEL (kg)	15° SKEW CONC. (m^3)	15° SKEW STEEL (kg)	30° SKEW CONC. (m^3)	30° SKEW STEEL (kg)	45° SKEW CONC. (m^3)	45° SKEW STEEL (kg)	DOUBLE RCP 0° SKEW CONC. (m^3)	0° SKEW STEEL (kg)	15° SKEW CONC. (m^3)	15° SKEW STEEL (kg)	30° SKEW CONC. (m^3)	30° SKEW STEEL (kg)	45° SKEW CONC. (m^3)	45° SKEW STEEL (kg)	X (mm)	Y (mm)	L (mm)	h (mm)
1050	0.89	4.66	259	5.09	283	5.17	284	5.34	302	6.25	314	6.73	339	7.00	358	7.58	398	310	610	3600	1965
1200	1.17	5.67	312	6.19	338	6.28	354	6.47	359	7.55	376	8.14	403	8.46	424	9.14	467	325	625	4175	2150
1350	1.48	7.50	449	8.19	495	8.31	497	8.57	520	10.02	561	10.80	608	11.22	633	12.13	709	340	640	4650	2325
1500	1.82	8.63	516	9.42	564	9.56	567	9.85	604	11.53	638	12.42	697	12.91	724	13.95	805	350	650	5100	2500
1800	2.63	11.94	828	13.04	908	13.23	928	13.63	984	15.96	1019	17.19	1118	17.86	1178	19.31	1307	375	675	6075	2850

QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL.

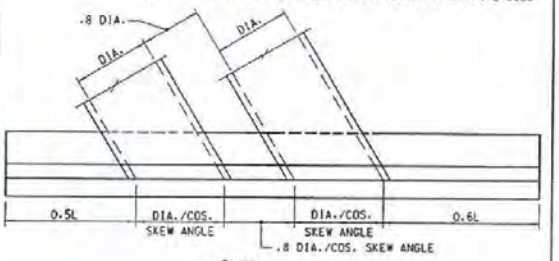
LENGTH OF REINFORCING BARS (mm)

SINGLE RCP

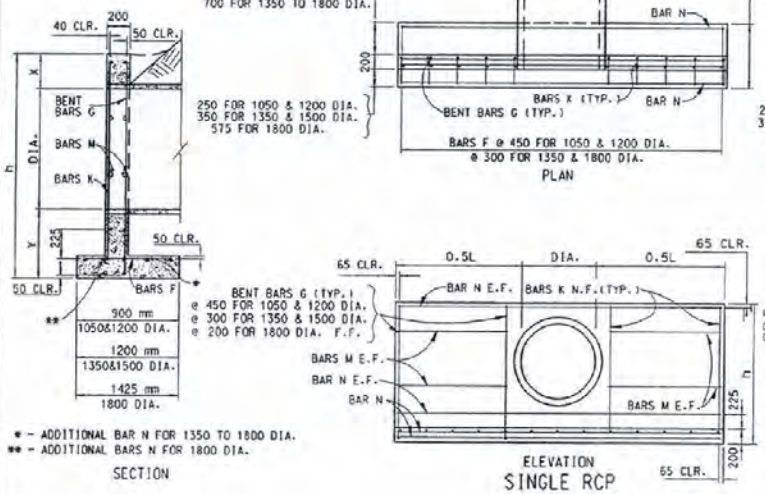
RCP SIZE DIA.	0°SKEW NO.16 F	0°SKEW NO.16 G	0°SKEW NO.13 M	0°SKEW NO.13 N	0°SKEW NO.13 K	15°SKEW NO.16 F	15°SKEW NO.16 G	15°SKEW NO.13 M	15°SKEW NO.13 M1	15°SKEW NO.13 N	15°SKEW NO.13 K	30°SKEW NO.16 F	30°SKEW NO.16 G	30°SKEW NO.13 M	30°SKEW NO.13 M1	30°SKEW NO.13 N	30°SKEW NO.13 K	45°SKEW NO.16 F	45°SKEW NO.16 G	45°SKEW NO.13 M	45°SKEW NO.13 M1	45°SKEW NO.13 N	45°SKEW NO.13 K
1050	12@825	10@2250	12@1625	9@5375	10@1700	13@825	11@2250	6@1575	6@1950	9@5975	11@1700	13@825	11@2250	6@1525	6@1950	9@5100	11@1700	14@825	12@2250	6@1475	6@1950	9@5375	12@1700
1200	13@825	12@2425	12@1875	9@6250	12@1875	14@825	13@2425	6@1825	6@2225	9@6700	13@1875	15@825	14@2425	6@1775	6@2225	9@5850	14@1875	15@825	14@2425	6@1725	6@2225	9@6150	14@1875
1350	21@1125	16@2725	16@2125	10@5925	12@2050	23@1125	18@2725	8@2075	8@2525	10@6450	13@2050	23@1125	18@2725	8@2025	8@2525	10@6600	13@2050	24@1125	19@2725	8@1975	8@2525	10@6950	14@2050
1500	23@1125	18@2900	16@2325	10@6525	14@2225	25@1125	20@2900	8@2275	8@2800	10@7100	15@2225	25@1125	20@2900	8@2225	8@2800	10@7275	15@2225	27@1125	22@2900	8@2175	8@2800	10@7650	16@2225
1800	27@1350	30@3475	20@2800	12@7800	16@2575	29@1350	33@3475	10@2750	10@3375	12@6475	18@2575	30@1350	34@3475	10@2700	10@3375	12@6700	18@2575	32@1350	37@3475	10@2650	10@3375	12@9150	19@2575
1050	16@825	11@2250	12@1625	9@6450	11@1700	17@825	12@2250	6@1575	6@1950	9@6525	12@1700	18@825	13@2250	6@1525	6@1950	9@7275	13@1700	20@825	15@2250	6@1475	6@1950	9@8050	15@1700
1200	18@825	13@2425	12@1875	9@7425	13@1875	19@825	14@2425	6@1825	6@2225	9@7950	14@1875	20@825	15@2425	6@1775	6@2225	9@8350	15@1875	22@825	17@2425	6@1725	6@2225	9@9225	17@1875
1350	29@1125	19@2725	16@2125	10@8350	14@2050	31@1125	21@2725	8@2075	8@2525	10@8950	15@2050	32@1125	22@2725	8@2025	8@2525	10@9400	16@2050	36@1125	26@2725	8@1975	8@2525	10@10400	18@2050
1500	32@1125	21@2900	16@2325	10@9225	14@2225	35@1125	24@2900	8@2275	8@2800	10@9900	16@2225	36@1125	25@2900	8@2225	8@2800	10@10400	17@2225	40@1125	29@2900	8@2175	8@2800	10@11475	19@2225
1800	37@1350	35@3475	20@2800	12@11050	19@2575	40@1350	39@3475	10@2950	10@3375	12@11825	21@2575	42@1350	42@3475	10@2700	10@3375	12@12425	22@2575	46@1350	48@3475	10@2650	10@3375	12@13750	25@2575

GENERAL NOTES:

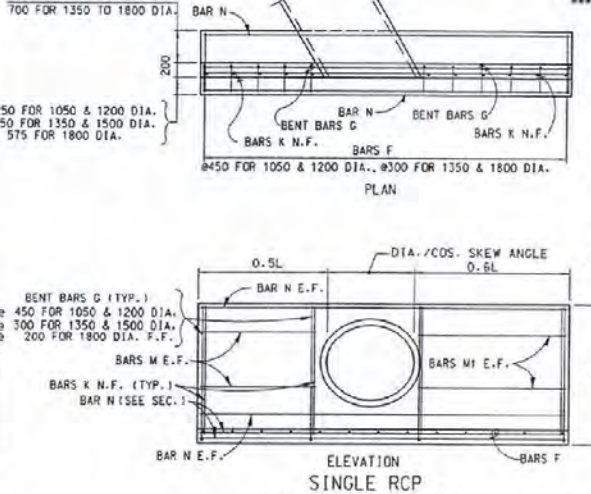
1. CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE DEFORMED BARS WITH MAXIMUM SPACING OF 450 mm SET 65 mm CLEAR OF SURFACE OF CONCRETE EXCEPT AS NOTED. BAR ENDS SHALL BE KEPT 40 mm CLEAR OF SURFACE OF CONCRETE. REINFORCING BARS MAY BE CUT AND BENT IN FIELD.
3. FOOTINGS SHOWN ARE OF MINIMUM DEPTH AND SHALL BE EXTENDED IF SOIL IS UNSUITABLE OR LIABLE TO SCOUR.
4. CULVERT PIPES TO BE SET ON A SKEW SHALL BE MITERED WHEN HEADWALLS ARE CONSTRUCTED. WHEN HEADWALLS ARE NOT CONSTRUCTED THE PIPES SHALL NOT BE MITERED EXCEPT IN OVERFLOW SECTION.
5. FOR ESTIMATING HEADWALL QUANTITIES ON SKEWED CULVERTS:
   0° to 10° – USE QUANTITIES FOR 0° SKEW.
   11° to 25° – USE QUANTITIES FOR 15° SKEW.
   26° to 40° – USE QUANTITIES FOR 30° SKEW.
   41° to 55° – USE QUANTITIES FOR 45° SKEW.
   OVER 55° – CALCULATE QUANTITIES REQUIRED.
   CULVERTS SHOULD BE INSTALLED ON 5° INCREMENTS WHERE IT IS FEASIBLE.
6. DIMENSIONS X, Y, L, AND h TO REMAIN CONSTANT REGARDLESS OF MINOR VARIATIONS IN WALL THICKNESS DUE TO CLASS OF PIPE USED.



PLAN



PLAN



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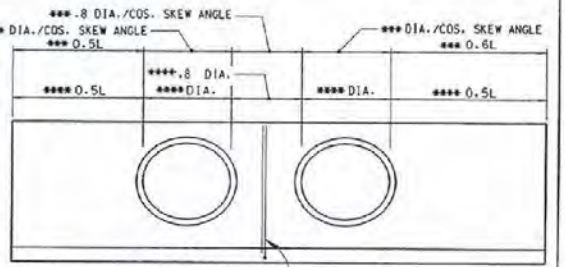

ELEVATION
DOUBLE RCP
0° TO 45° SKEW

* - ADDITIONAL BAR N FOR 1350 TO 1800 DIA.
** - ADDITIONAL BARS N FOR 1800 DIA.
SECTION

ELEVATION
SINGLE RCP
0° SKEW

ELEVATION
SINGLE RCP
15° TO 45° SKEW

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

METRIC NDOT

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS

1050 mm RCP TO 1800 mm RCP

R-2.5.2 (502)

CHIEF ROAD DESIGN ENGR. — ADOPTED: 7/96 — REVISION 8/97

R-20

QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS

CMAP SIZE S X R (mm)	CMP DIA. (mm)	CMAP AREA m^2	L (mm)	SINGLE CMAP 0° SKEW CONC. (m^3)	0° SKEW STEEL (kg)	15° SKEW CONC. (m^3)	15° SKEW STEEL (kg)	30° SKEW CONC. (m^3)	30° SKEW STEEL (kg)	45° SKEW CONC. (m^3)	45° SKEW STEEL (kg)	DOUBLE CMAP 0° SKEW CONC. (m^3)	0° SKEW STEEL (kg)	15° SKEW CONC. (m^3)	15° SKEW STEEL (kg)	30° SKEW CONC. (m^3)	30° SKEW STEEL (kg)	45° SKEW CONC. (m^3)	45° SKEW STEEL (kg)
425x325	375	0.10	975	0.67	16	0.72	17	0.74	17	0.79	18	0.99	22	1.06	23	1.11	24	1.25	26
525x375	450	0.15	1125	0.80	18	0.86	19	0.89	20	0.95	20	1.17	25	1.25	26	1.33	27	1.48	29
600x450	525	0.21	1425	1.11	23	1.17	24	1.21	24	1.28	25	1.52	30	1.63	31	1.71	33	1.89	35
700x500	600	0.27	1500	1.15	27	1.25	29	1.28	29	1.37	30	1.63	35	1.75	37	1.83	38	2.04	41
875x600	750	0.41	1800	1.48	32	1.60	34	1.64	34	1.74	36	2.04	41	2.19	43	2.29	45	2.56	48
1050x725	900	0.60	2175	1.90	46	2.06	49	2.13	49	2.25	51	2.61	57	2.80	60	2.94	62	3.24	66
1225x825	1050	0.80	2475	2.29	52	2.48	54	2.55	55	2.69	58	3.13	65	3.36	68	3.52	70	3.88	75
1425x950	1200	1.06	2850	2.82	59	3.06	62	3.13	64	3.31	66	3.85	74	4.12	78	4.33	80	4.77	86
1600x1075	1350	1.35	3150	3.26	71	3.54	74	3.63	75	3.83	78	4.45	90	4.77	94	5.01	97	5.51	103
1775x1175	1500	1.63	3450	3.75	83	4.07	88	4.17	89	4.39	93	5.09	105	5.46	110	5.73	113	6.30	120
1925x1300	1650	2.00	3750	4.46	97	4.84	102	4.95	103	5.21	107	6.38	119	6.47	125	6.79	129	7.45	137
2075x1425	1800	2.32	4050	5.05	112	5.49	115	5.62	118	5.90	121	7.22	133	7.32	140	7.65	145	8.39	154

QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL

LENGTH OF REINFORCING BARS (mm)

CMP SIZE S X R	SINGLE CMAP 0°-45° NO.13 K	0° NO.16 N	15° NO.16 N	30° NO.16 N	45° NO.16 N	SINGLE OR DOUBLE CMAP 0° NO.13 M	15° NO.13 M	15° M1	30° NO.13 M	30° M1	45° NO.13 M	45° M1	DOUBLE CMAP 0°-45° NO.13 K	0° NO.16 N	15° NO.16 N	30° NO.16 N	45° NO.16 N
425x325	4@700	2@1350	2@1475	2@1525	2@1650	2@400	1@350	1@525	1@525	1@550	1@250	1@625	5@700	2@2100	2@2250	2@2375	2@2700
525x375	4@750	2@1600	2@1725	2@1800	2@1950	2@475	1@425	1@625	1@400	1@650	1@325	1@725	5@750	2@2450	2@2600	2@2775	2@3150
600x450	6@825	2@1950	2@2125	2@2150	2@2325	2@625	1@625	1@775	1@625	1@775	1@625	1@775	5@825	2@2850	2@3025	2@3150	2@3450
700x500	6@875	2@2150	2@2325	2@2400	2@2600	2@675	1@700	1@850	1@675	1@875	1@675	1@950	7@875	2@3175	2@3400	2@3600	2@4050
875x600	6@975	2@2625	2@2850	2@2950	2@3175	2@625	1@775	1@1050	1@750	1@1075	1@750	1@1150	7@975	2@3825	2@4075	2@4325	2@4875
1050x725	8@1100	2@3175	2@3425	2@3550	2@3825	4@1000	2@950	2@1250	2@925	2@1275	2@850	2@1350	7@1100	2@4600	2@4925	2@5200	2@5850
1225x825	8@1200	2@3650	2@3950	2@4100	2@4425	4@1150	2@1100	2@1425	2@1075	2@1450	2@1000	2@1525	9@1200	2@5300	2@5675	2@6025	2@6775
1425x950	8@1325	2@4225	2@4550	2@4725	2@5100	4@1350	2@1300	2@1675	2@1275	2@1700	2@1200	2@1775	9@1325	2@6150	2@6575	2@6975	2@7850
1600x1075	10@1425	2@4700	2@5075	2@5275	2@5700	4@1500	2@1450	2@1850	2@1425	2@1875	2@1350	2@1950	9@1425	2@6850	2@7325	2@7775	2@8750
1775x1175	10@1525	2@5175	2@5575	2@5800	2@6275	6@1650	3@1600	3@2025	3@1575	3@2050	3@1500	3@2125	12@1525	2@7575	2@8075	2@8575	2@9675
1925x1300	10@1725	2@5775	2@6200	2@6450	2@6925	6@1875	3@1875	3@2275	3@1875	3@2275	3@1875	3@2275	12@1725	2@8325	2@8825	2@9400	2@10550
2075x1425	10@1850	2@6200	2@6675	2@6950	2@7475	6@2025	3@2025	3@2450	3@2025	3@2450	3@2025	3@2450	12@1850	2@8975	2@9575	2@10125	2@11400

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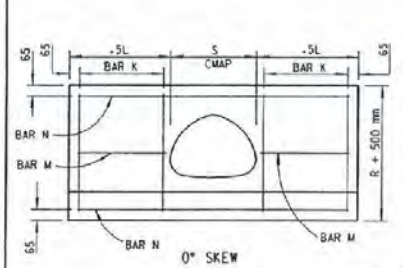
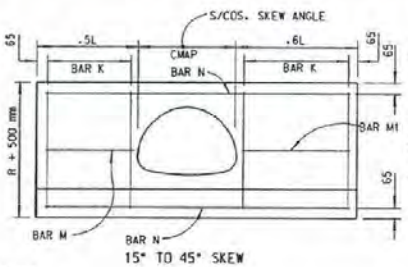
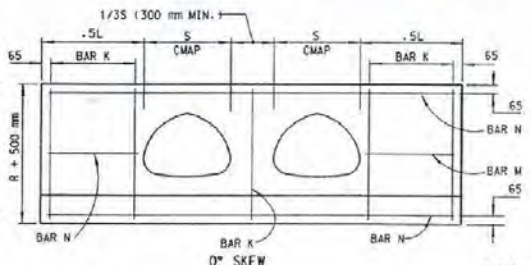
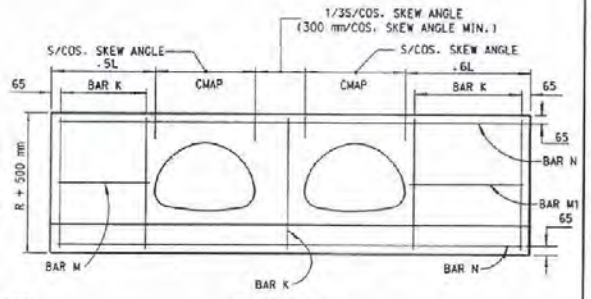
   OVER 55° – CALCULATE QUANTITIES REQUIRED.
   CULVERTS SHOULD BE INSTALLED ON 5° INCREMENTS WHERE IT IS FEASIBLE.



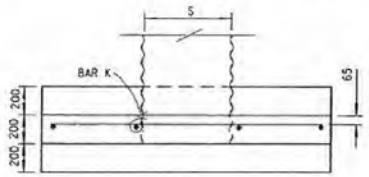


ELEVATIONS

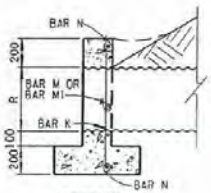




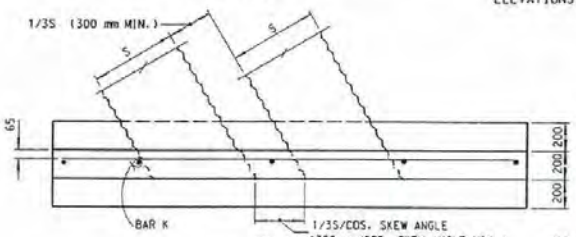
ELEVATIONS



PLAN
SINGLE CMAP



SECTION
FOR ALL HEADWALLS



PLAN
DOUBLE CMAP

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

METRIC NDOT

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS
425 mm X 325 mm CMAP TO
2075 mm X 1425 mm CMAP

CHIEF ROAD DESIGN ENGR.

R-2.6.1 (502)
ADOPTED: 7/96
REVISION

R-21

QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS.

OVAL RCP SIZE W & H (mm)	RCP SIZE (mm)	OVAL RCP AREA (m^2)	SINGLE OVAL RCP								DOUBLE OVAL RCP								X (mm)	Y (mm)	L (mm)	h (mm)
			0° SKEW		15° SKEW		30° SKEW		45° SKEW		0° SKEW		15° SKEW		30° SKEW		45° SKEW					
			CONC. (m^3)	STEEL (kg)	CONC. (m^3)	STEEL (kg)	CONC. (m^3)	STEEL (kg)	CONC. (m^3)	STEEL (kg)	CONC. (m^3)	STEEL (kg)	CONC. (m^3)	STEEL (kg)	CONC. (m^3)	STEEL (kg)	CONC. (m^3)	STEEL (kg)				
575x350	450	0.17	1.05	26	1.14	27	1.16	28	1.22	29	1.48	34	1.59	35	1.67	36	1.84	39	270	370	1425	990
750x475	600	0.30	1.49	36	1.63	37	1.66	38	1.74	39	2.02	44	2.18	47	2.27	48	2.49	51	280	380	1875	1140
850x550	675	0.39	1.76	39	1.91	42	1.95	42	2.03	44	2.38	50	2.55	53	2.67	54	2.91	58	290	390	2100	1225
950x600	750	0.48	1.97	42	2.13	45	2.18	45	2.28	47	2.67	54	2.87	57	3.11	59	3.27	62	295	395	2250	1290
1050x675	825	0.59	2.25	51	2.45	54	2.49	55	2.60	57	3.06	64	3.29	67	3.43	69	3.75	73	295	395	2475	1340
1125x725	900	0.68	2.53	55	2.70	58	2.81	59	2.92	61	3.43	69	3.68	72	3.85	74	4.28	79	315	415	2700	1450
1325x850	1050	0.94	3.10	74	3.38	78	3.44	79	3.58	82	4.19	90	4.51	95	4.69	97	5.12	103	325	425	3075	1600
1500x950	1200	1.19	3.68	83	4.01	87	4.08	88	4.24	90	4.96	100	5.34	105	5.55	108	6.04	114	340	440	3450	1725

QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL.

OVAL RCP SIZE W X H	LENGTH OF REINFORCING BARS (mm)																	
	SINGLE OVAL RCP					SINGLE OR DOUBLE OVAL RCP							DOUBLE OVAL RCP					
	0°-45°	0°	15°	30°	45°	0°	15°		30°		45°		0°-45°	0°	15°	30°	45°	
	No.13	No.16	No.16	No.16	No.16	No.13	No.13		No.13		No.13		No.13	No.16	No.16	No.16	No.16	
	K	N	N	N	N	M	M	M1	M	M1	M	M1	K	N	N	N	N	
575x350	6@925	2@1925	2@2100	2@2150	2@2300	2@575	1@525	1@750	1@500	1@775	1@425	1@850	7@925	2@2875	2@3075	2@3250	2@3650	
750x475	6@1050	2@2550	2@2775	2@2850	2@3050	4@775	2@725	2@975	2@700	2@1000	2@625	2@1075	7@1050	2@3675	2@3925	2@4175	2@4650	
850x550	6@1150	2@2875	2@3100	2@3225	2@3425	4@900	2@850	2@1125	2@825	2@1150	2@750	2@1225	7@1150	2@4175	2@4450	2@4700	2@5250	
950x600	6@1225	2@3125	2@3375	2@3500	2@3750	4@950	2@900	2@1200	2@875	2@1225	2@800	2@1300	7@1225	2@4550	2@4875	2@5150	2@5775	
1050x675	8@1300	2@3450	2@3725	2@3875	2@4125	4@1075	2@1025	2@1350	2@1050	2@1425	2@975	2@1500	9@1300	2@5050	2@5375	2@5700	2@6375	
1125x725	8@1375	2@3750	2@4050	2@4200	2@4475	4@1150	2@1100	2@1425	2@1075	2@1450	2@1000	2@1525	9@1375	2@5450	2@5825	2@6175	2@6900	
1325x850	10@1525	2@4325	2@4675	2@4850	2@5175	6@1350	3@1300	3@1675	3@1275	3@1700	3@1200	3@1775	11@1525	2@6325	2@6750	2@7150	2@8025	
15000x950	10@1650	2@4875	2@5275	2@5450	2@5850	6@1525	3@1475	3@1875	3@1450	3@1900	3@1375	3@1975	11@1650	2@7125	2@7625	2@8050	2@9050	

GENERAL NOTES:

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   41° to 55° – USE QUANTITIES FOR 45° SKEW.
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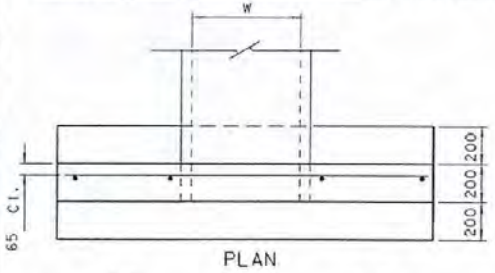
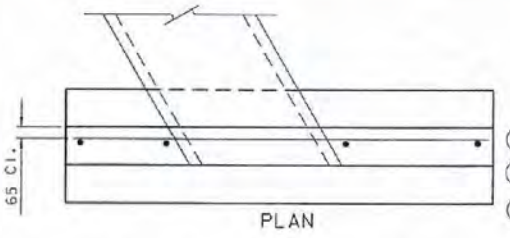
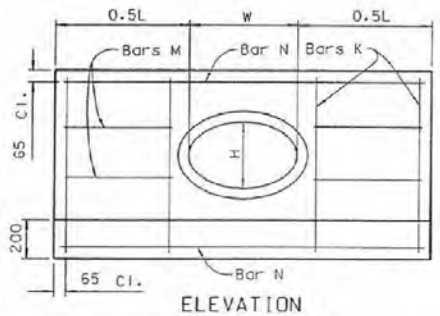


PLAN

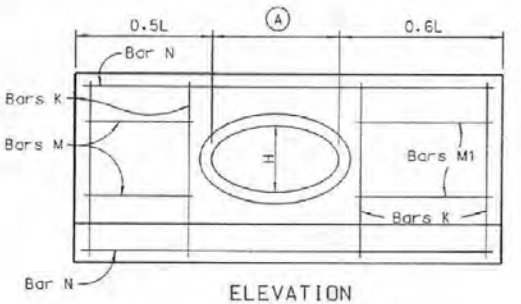


PLAN

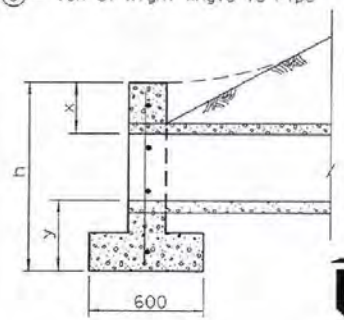
Ⓐ — W/cos Skew Angle
Ⓑ — .8H/cos Skew Angle, Min. 375 mm/cos Skew Angle
Ⓒ — .8H at Right Angle to Pipe



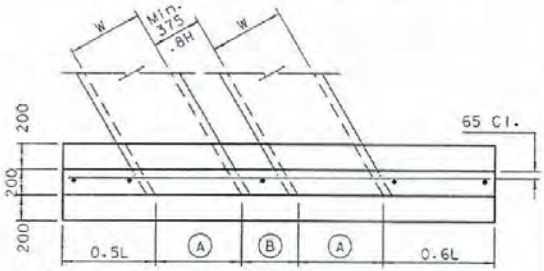
ELEVATION
SINGLE OVAL RCP
0° SKEW



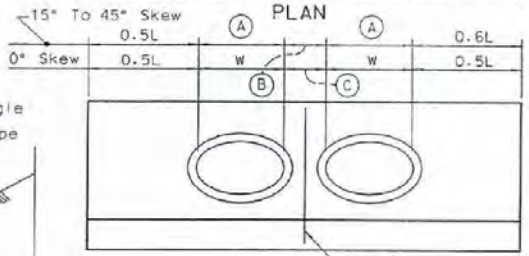
ELEVATION
SINGLE OVAL RCP
15° TO 45° SKEW



SECTION
(FOR ALL HEADWALLS)



PLAN



ELEVATION
DOUBLE OVAL RCP
0° TO 45° SKEW

NOTE: For Reinforcing Not Shown See Single Culvert Headwalls.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS
575 mm x 350 mm OVAL RCP TO 1500 mm x 950 mm OVAL RCP

R-2.7.1 (502)
CHIEF ROAD DESIGN ENGR. ADOPTED: 7/96 REVISION

R-22

QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS.

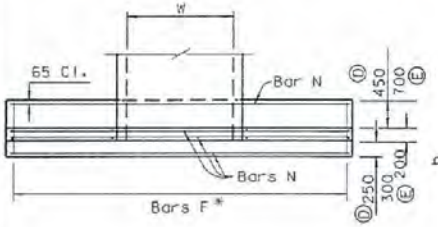
OVAL RCP SIZE (W X H) (mm)	RCP SIZE (mm)	OVAL RCP AREA (m2)	SINGLE OVAL RCP								DOUBLE OVAL RCP								X (mm)	Y (mm)	L (mm)	h (mm)
			0° SKEW		15° SKEW		30° SKEW		45° SKEW		0° SKEW		15° SKEW		30° SKEW		45° SKEW					
			CONC. (m3)	STEEL (kg)	CONC. (m3)	STEEL (kg)	CONC. (m3)	STEEL (kg)	CONC. (m3)	STEEL (kg)	CONC. (m3)	STEEL (kg)	CONC. (m3)	STEEL (kg)	CONC. (m3)	STEEL (kg)	CONC. (m3)	STEEL (kg)				
1700x1075	1350	1.54	5.50	285	5.98	310	6.10	327	6.38	348	7.54	358	8.09	385	8.46	407	9.26	468	365	650	3825	2075
1900x1200	1500	1.91	6.41	338	6.98	365	7.13	369	7.42	403	8.77	418	9.41	447	9.99	488	11.97	547	365	665	4275	2225
2275x1450	1800	2.76	9.26	530	10.08	577	10.27	599	10.72	640	12.68	678	13.62	733	14.23	785	15.56	891	390	690	5100	2525

QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL.

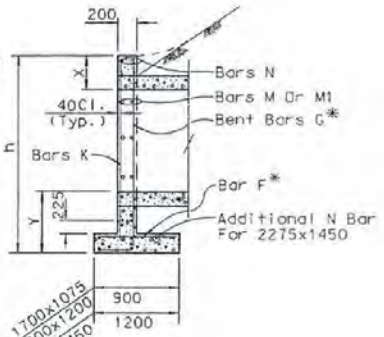
OVAL RCP SIZE W & H (mm)	LENGTH OF REINFORCING BARS																					
	SINGLE OVAL RCP																					
	0° SKEW					15° Skew					30° SKEW						45° SKEW					
	No. 16		No. 13			No. 16		No. 13			No. 16		No. 13				No. 16		No. 13			
	F	G	M	N	K	F	G	M	M1	N	K	F	G	M	M1	N	K	F	G	M	M1	N	K
1700x1075	13@825	10@2350	12@1700	9@5450	10@1800	14@825	12@2350	6@1650	6@2050	9@5900	11@1800	15@825	12@2350	6@1500	6@2050	9@6100	12@1800	16@825	13@2350	6@1550	6@2050	9@6550	13@1800
1900x1200	15@825	12@2500	12@1900	9@6100	12@1950	16@825	13@2500	6@1850	6@2275	9@6500	13@1950	16@825	13@2500	6@1800	6@2275	9@6825	13@1950	17@825	15@2500	6@1750	6@2275	9@7325	15@1950
2275x1450	25@1125	18@2900	16@2275	10@6100	12@2250	27@1125	20@2900	6@2225	8@2725	10@7900	13@2250	28@1125	21@2900	8@2175	8@2725	10@8325	14@2250	30@1125	23@2900	8@2125	8@2725	10@8750	15@2250
DOUBLE OVAL RCP																						
1700x1075	19@825	11@2350	12@1700	9@8000	11@1800	20@825	12@2350	6@1650	6@2050	9@5550	12@1800	21@825	13@2350	6@1600	6@2075	9@9050	13@1800	24@825	16@2350	6@1550	6@2050	9@10150	16@1800
1900x1200	21@825	13@2500	12@1900	9@8950	13@1950	22@825	14@2500	6@1850	6@2275	9@9550	14@1950	24@825	15@2500	6@1800	6@2275	9@10250	13@1950	26@825	19@2500	6@1750	6@2275	9@11350	19@1950
2275x1450	37@1125	21@2900	16@2275	10@10725	14@2250	39@1125	23@2900	8@2225	8@2725	10@11450	16@2250	41@1125	26@2900	8@2175	8@2725	10@12125	17@2250	46@1125	31@2900	8@2125	8@2725	10@13600	20@2250

GENERAL NOTES:

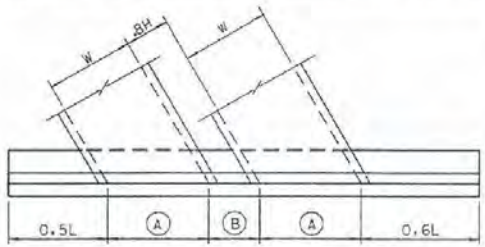
1. CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE DEFORMED BARS WITH MAXIMUM SPACING OF 450 mm SET 65 mm CLEAR OF SURFACE OF CONCRETE EXCEPT AS NOTED. BAR ENDS SHALL BE KEPT 40 mm CLEAR OF SURFACE OF CONCRETE. REINFORCING BARS MAY BE CUT AND BENT IN FIELD.
3. FOOTINGS SHOWN ARE OF MINIMUM DEPTH AND SHALL BE EXTENDED IF SOIL IS UNSUITABLE OR LIABLE TO SCOUR.
4. CULVERT PIPES TO BE SET ON A SKEW SHALL BE MITERED WHEN HEADWALLS ARE CONSTRUCTED. WHEN HEADWALLS ARE NOT CONSTRUCTED THE PIPES SHALL NOT BE MITERED EXCEPT IN OVERFLOW SECTION.
5. DIMENSIONS X-Y-L, AND h TO REMAIN CONSTANT REGARDLESS OF MINOR VARIATIONS IN WALL THICKNESS DUE TO CLASS OF PIPE USED.
6. FOR ESTIMATING HEADWALL QUANTITIES ON SKEWED CULVERTS:
   0° to 10° – USE QUANTITIES FOR 0° SKEW.
   11° to 25° – USE QUANTITIES FOR 15° SKEW.
   26° to 40° – USE QUANTITIES FOR 30° SKEW.
   41° to 55° – USE QUANTITIES FOR 45° SKEW.
   OVER 55° – CALCULATE QUANTITIES REQUIRED.
   CULVERTS SHOULD BE INSTALLED ON 5° INCREMENTS WHERE IT IS FEASIBLE.



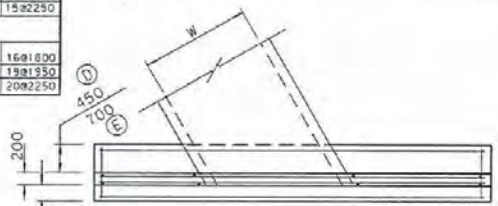
PLAN



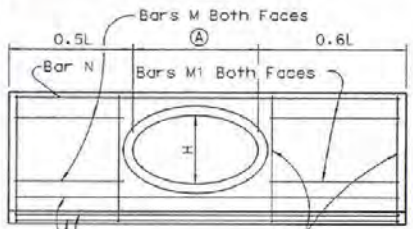
SECTION
(FOR ALL HEADWALLS)



PLAN

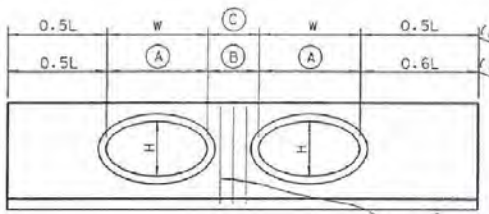


PLAN



ELEVATION
SINGLE OVAL RCP
0° TO 45° SKEW

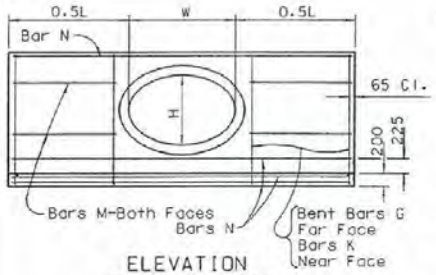
Bent Bars G*
Far Face
Bars K
Near Face



(0° to 14° Skew)
(15° to 45° Skew)

0° TO 45° SKEW
Add 1-G Bar & 1-K Bar for 1700 mm x 1075 mm & 1900 mm x 1200 mm
Add 3-G Bars & 2-K Bars for 2275 x 1450

ELEVATION
DOUBLE OVAL RCP
15° TO 45° SKEW



ELEVATION
SINGLE OVAL RCP
0° SKEW

(A) — W/cos Skew Angle
(B) — .8H/cos Skew Angle
(C) — .8H at Right Angle to Pipe
(D) — For 1700 mm x 1075 mm & 1900 mm x 1200 mm
(E) — For 2275 mm x 1450 mm

NOTE: For Details Of Other Reinforcing Bars. See Single Culvert Headwalls.

*-@450 ctrs. 1700 mm X1075 mm & 1900 mm x 1200 mm @ 300 ctrs. 2275 mm x 1450 mm

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

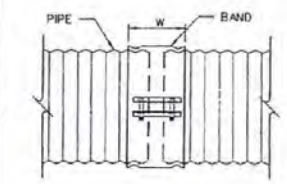
METRIC NDOT

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

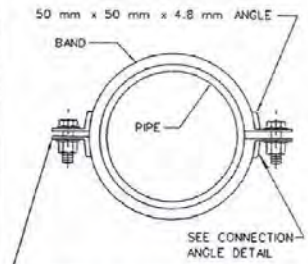
CULVERT HEADWALLS
1700 mm x 1075 mm OVAL RCP TO 2275 mm x 1450 mm OVAL RCP

CHIEF ROAD DESIGN ENGR. | R-2.7.2 | (502) | ADOPTED: 1/96 | REVISION 8/97

R-23

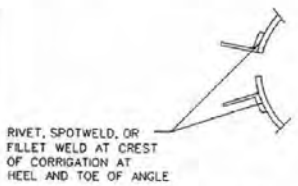


SIDE VIEW



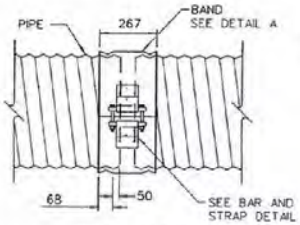
END VIEW

ANNULAR COUPLING BAND

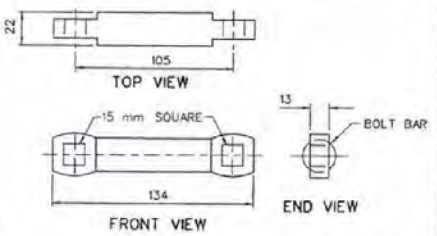


CONNECTION ANGLE DETAIL

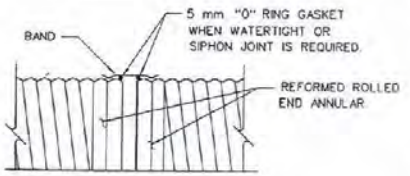
ANNULAR COUPLING BAND			
CORRIGATION	PIPE SIZE	"W" (mm MIN.)	13 mm BOLTS (NO. EACH CONNECTION)
68 x 13	THRU 750	178	2
68 x 13	900 - 1800	305	3
68 x 13	1950 - 2100	610	5
75 x 25	1350 - 1800	355	3
75 x 25	THRU 2400	660	5



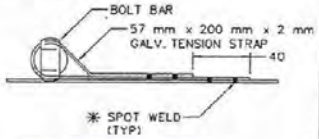
SIDE VIEW



BAR DETAIL

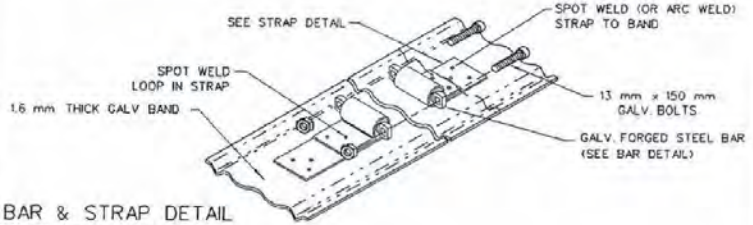


DETAIL A



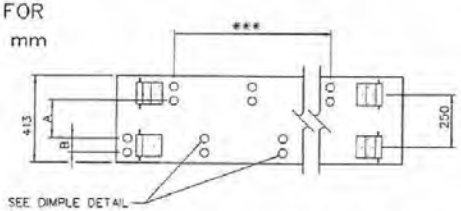
* SPOT WELDS SHALL DEVELOP FULL STRENGTH OF STRAP

STRAP DETAIL



BAR & STRAP DETAIL

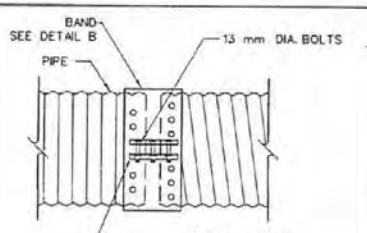
ALTERNATIVE ANNULAR COUPLING BAND FOR HCMP THRU 2100 mm



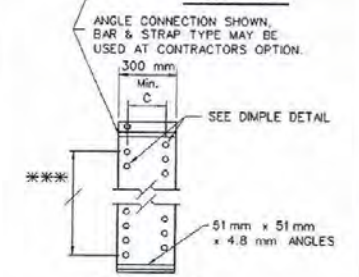
UNIVERSAL COUPLING BAND FOR USE ON 1050 mm THRU 1500 mm CMP INCLUSIVE

DIMENSION A= AS REQUIRED TO FIT HELIX ANGLE, 178 mm MIN.
DIMENSION B= AS REQUIRED TO FIT HELIX ANGLE, 130 mm MIN.
ONE PIECE BAND OPTIONAL ON 1050 mm DIAMETER
TWO PIECE BAND REQUIRED ABOVE 1050 mm DIAMETER.

COUPLING BAND FOR HELICAL WELD SEAM ONLY

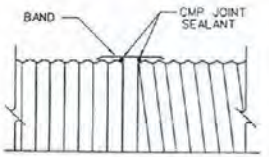


SIDE VIEW



BAND DETAIL

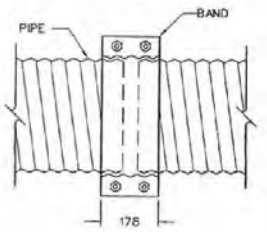
DIMENSION "C": 178 mm MIN. BETWEEN DIMPLES, AS REQUIRED TO FIT THE HELIX ANGLES.



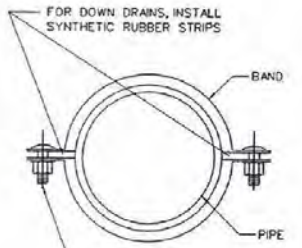
DETAIL B

NOTE: FOR HMCP DOWN DRAINS AND SLOTTED DRAINS

** UNIVERSAL COUPLING BAND FOR USE ON CMP THRU 900 mm INCLUSIVE

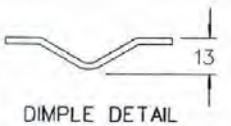


TOP VIEW



END VIEW

** TWO PIECE INTEGRAL FLANGE DIE FORMED FOR USE ON 150 mm, 200 mm, AND 250 mm HCMP



DIMPLE DETAIL

GENERAL NOTES:

1. ALL COUPLING BAND CONNECTING HARDWARE SHALL BE GALVANIZED.
2. FOR PIPE ARCHES USE SAME WIDTH BAND AS FOR ROUND PIPE OF EQUAL PERIPHERY.
3. FOR WATERTIGHT AND SIPHON JOINTS ON ALTERNATIVE ANNULAR COUPLING BAND, PLACE MASTIC SEALANT STRIP 3 mm THK x 40 mm WIDE x 125 mm LONG IN LAP BETWEEN BANDS.
4. FOR ALTERNATIVE ANNULAR COUPLING BAND, 2 BAR AND STRAP ASSEMBLIES ARE REQUIRED FOR PIPE GREATER THAN 1050 mm DIA., OPTIONAL FOR SIZES LESS THAN 1050 mm.

*** 8 SPACES AS REQUIRED TO FIT HELIX ANGLE

** TO BE USED ONLY FOR EXISTING HELICALLY CORRUGATED PIPES.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

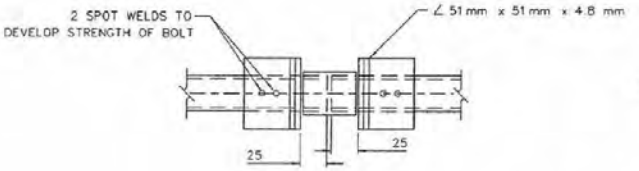
COUPLING BAND DETAILS CMP AND PIPE ARCHES

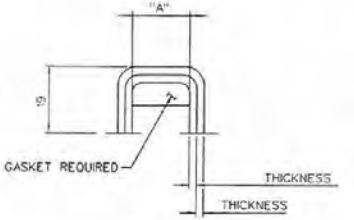
CHIEF ROAD DESIGN ENGR

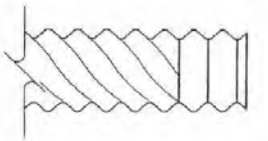
R-2.8.1	(504)
ADOPTED 7/96	REVISION 8/97

* SEE SHEET R-2.8.1. FOR "W" DIMENSION

COUPLING TYPE	CORRUGATION (mm)	PIPE SIZE (mm)	*W OR A (mm)	BAR & STRAP: THICKNESS PIPE WALL (mm)	BAR & STRAP: THICKNESS BAND (mm)	BAR & STRAP: THICKNESS STRAP (mm)	BAR & STRAP: BOLTS (DIA.) (mm)	BAR & STRAP: BAR (DIA.) (mm)	BAR & STRAP: BAR YIELD STRENGTH (M Pa)	ANGLE: DIMENSIONS (mm)	ANGLE: BOLTS (mm)	ANGLE: RIVETS ANGLE TO BAND (mm)	ANGLE: SPOT WELDS ANGLE TO BAND (mm)	WEDGE & STRAP: THICKNESS STRAP (mm)	WEDGE & STRAP: THICKNESS WEDGE (mm)
TWO PIECE INTEGRAL FLANGE	38 x 6.5	150 THRU 250	178	1.6 - 2.0	1.6						2 - 10				
		300 THRU 450	178 OR 305											2.0	3.5
UNIVERSAL	68 x 13	THRU 900	305	1.6 - 3.5	1.6	2.0	13	22	220	51 x 51 x 4.8	3 - 13	3 - 10	5 - 13		
		THRU 900	305	1.6 - 3.5	1.6	DBL 2.0	13	22	220						
		1050 THRU 1500	413	1.6 - 4.3	1.6										
ANNULAR	68 x 13	THRU 900	305	1.6 - 3.5	1.6					51 x 51 x 4.8	3 - 13	3 - 10	5 - 13		
		1050 THRU 1500	305	1.6 - 2.0	1.6					51 x 51 x 4.8	3 - 13	3 - 10	5 - 13		
		1050 THRU 1500	305	1.6 - 4.3	1.6					51 x 51 x 7.9	3 - 13	5 - 10			
		1650 THRU 2100	610	2.8 - 4.3	1.6					51 x 51 x 7.9	5 - 13	7 - 10			
	76 x 25	1200 THRU 1500	356	1.6 - 2.0	1.6					51 x 51 x 4.8	3 - 13	3 - 10	5 - 13		
		1200 THRU 1500	356	2.8	1.6					51 x 51 x 7.9	3 - 13	5 - 10			
		1650 THRU 3000	635	1.6 - 2.0	1.6					51 x 51 x 7.9	5 - 13	9 - 10			
CHANNEL	68 x 13	THRU 600	19	1.6 - 2.0	2.0	2.0	13	22	220	51 x 51 x 7.9	1 - 13	SEE NOTE 8			
		750 THRU 1050	19	1.6 - 2.0	2.0	2.0	13	22	220						
		750 THRU 1050	25	2.8	2.8	2.0	13	22	220						
		1200 THRU 1350	25	1.6 - 2.0	2.8	2.0	13	22	220						





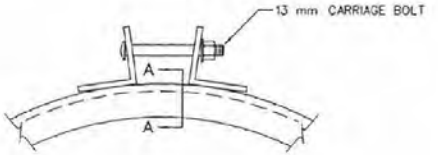


SPIRAL CMP

REFORMED TO ACCEPT UNIVERSAL, ANNULAR, AND CHANNEL COUPLERS

NOMINAL DIMENSIONS		
THICKNESS	"A"	FOR USE WITH CMP
2.0	19	2.0 mm THICK OR LIGHTER
2.8	25	3.5 mm THICK OR HEAVIER

SECTION A-A



CHANNEL COUPLING BAND
FOR USE ON FLANGED END CMP

(CHANNEL COUPLING BAND SHALL BE TWO PIECE)

GENERAL NOTES:

1. ALL COUPLING BAND CONNECTION HARDWARE SHALL BE GALVANIZED OR ELECTROPLATED IN ACCORDANCE WITH STANDARD SPECIFICATIONS.
2. FOR PIPE ARCHES, USE SAME WIDTH BAND AS FOR ROUND PIPE OF EQUAL PERIPHERY.
3. TWO PIECE BAND IS REQUIRED FOR PIPE GREATER THAN 1050 mm DIAMETER.
4. TENSION STRAP MAY BE CONNECTED TO BAND OR SHEET WITH EITHER SPOT WELDS OR FILLET WELDS THAT DEVELOP MINIMUM REQUIRED STRENGTH OF STRAP.
5. USE 32 mm GAGE LINE DIMENSION ON ATTACHED ANGLE LEG FOR RIVETS AND SPOT WELDS.
6. BAND THICKNESS SHALL NOT BE LESS THAN 3 STANDARD THICKNESSES LIGHTER THAN THE THICKNESS OF THE PIPE.
7. DIMENSIONS AND THICKNESS SHOWN ARE MINIMUM.
8. ANGLE 50 mm LONG WITH 1.6 mm x 50 mm STRAP.
9. FILLET WELDS OF EQUIVALENT STRENGTH MAY BE SUBSTITUTED FOR SPOT WELDS OR RIVETS.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

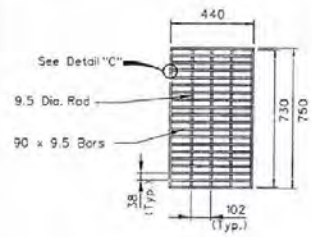
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CMP COUPLING BAND DETAILS

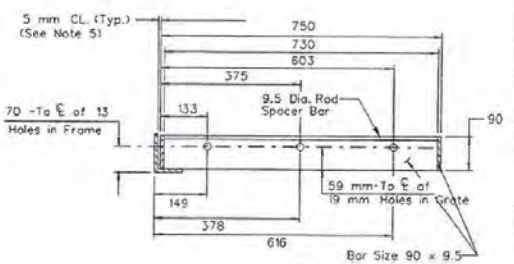
CHIEF ROAD DESIGN ENGINEER

R-2.8.2 (604)

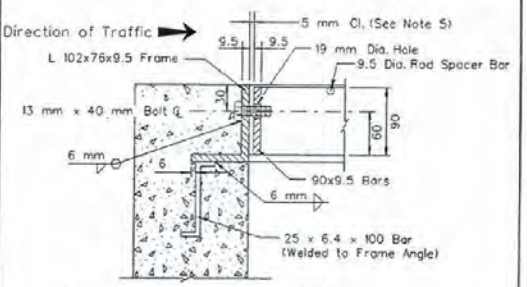
ADOPTED: 7/96 REVISION 8/97



GRATE DETAIL



DETAIL "C"
GRATE HOLE DETAIL
(MAIN BARS NOT SHOWN FOR CLARITY)



DETAIL "D"
GRATE HOLD-DOWN BOLT
(INSTALL ONLY ON APPROACH SIDE OF GRATE & FRAME)

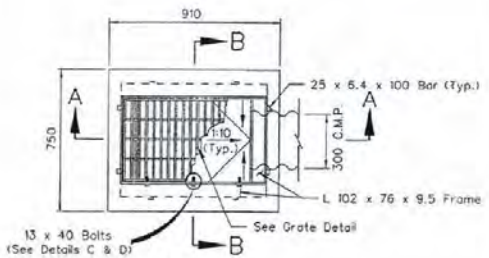
GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING BARS SHALL BE NO. 13 BARS WITH MAXIMUM SPACING AT 450 mm CENTERS. BARS TO BE EMBEDDED A MINIMUM OF 50 mm AND BAR ENDS MUST CLEAR SURFACE BY 40 mm.
3. ALL EXPOSED CONCRETE EDGES SHALL BE CHAMFERED 25 mm.
4. GRATE AND FRAME ANGLE TO BE WELDED AT ALL CONTACT POINTS.
5. 5 mm MAX CL. BETWEEN GRATE & FRAME ON EACH SIDE.
6. CATCH BASIN FLOORS SHALL HAVE A MINIMUM SLOPE OF 1:10 FROM ALL DIRECTIONS TOWARD OUTLET PIPE. IF BASIN IS USED AS A JUNCTION, SHAPE FLOWLINE(S) TO OUTLET PIPE, AND PROVIDE A MINIMUM SLOPE OF 1:10 TO FLOWLINE(S).
7. NPS - NOMINAL PIPE SIZE DESIGNATOR, SEE ASTM A53

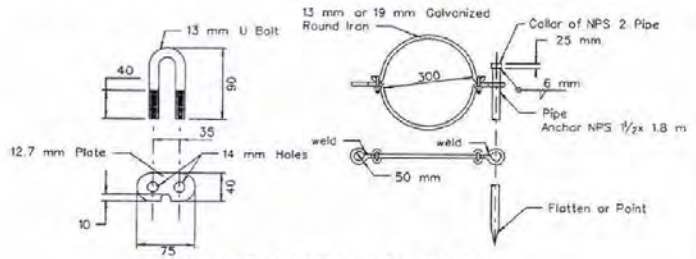
QUANTITIES
FOR INFORMATION ONLY

CONCRETE	REINFORCING STEEL	STRUCTURAL STEEL*
0.31 m3.	11 kg.	104kg.

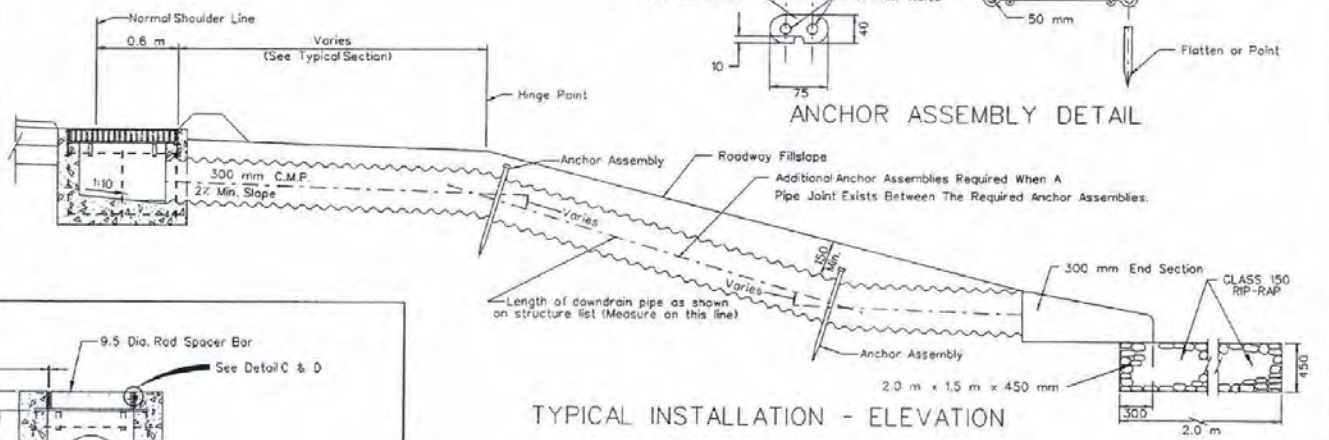
* (Includes Frame, Welded Angle, Grate & Spacer Bars)



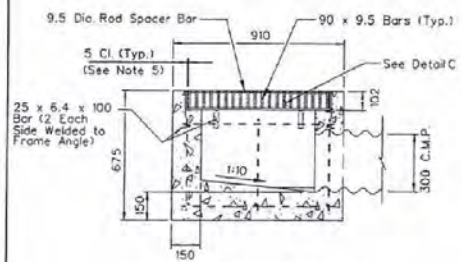
PLAN



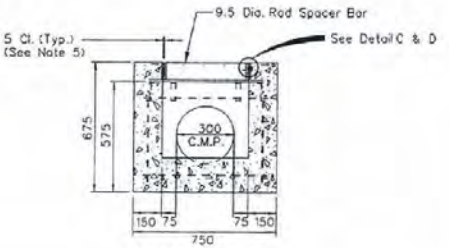
ANCHOR ASSEMBLY DETAIL



TYPICAL INSTALLATION - ELEVATION



SECTION A-A



SECTION B-B

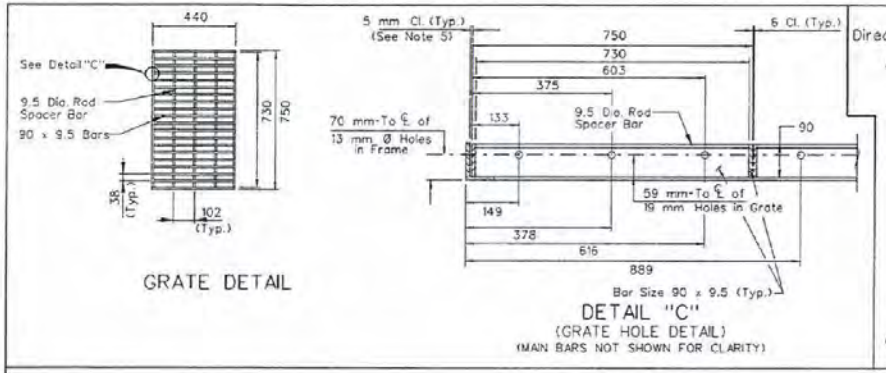
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

EMBANKMENT PROTECTOR TYPE 5

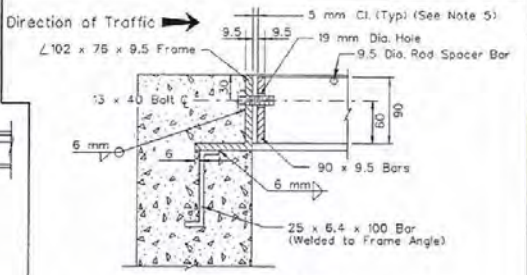
CHIEF ROAD DESIGN ENGR. | R-3.1.2 (608) | ADOPTED: 7/96 | REVISION: 8/97

R-26



GRATE DETAIL

DETAIL "C"
(GRATE HOLE DETAIL)
(MAIN BARS NOT SHOWN FOR CLARITY)



DETAIL "D"
GRATE HOLD-DOWN BOLT
(INSTALL ONLY ON APPROACH SIDE OF GRATE & FRAME)

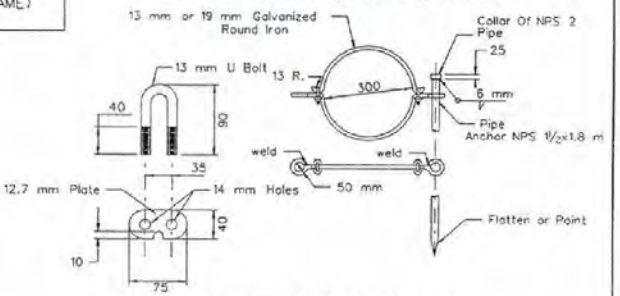
GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING BARS SHALL BE NO. 13 BARS WITH MAXIMUM SPACING AT 450 mm CENTERS. BARS TO BE EMBEDDED A MINIMUM OF 50 mm AND BAR ENDS MUST CLEAR SURFACE BY ONE AND 40 mm.
3. ALL EXPOSED CONCRETE EDGES SHALL BE CHAMFERED 25 mm.
4. GRATE AND FRAME ANGLE TO BE WELDED AT ALL CONTACT POINTS.
5. 5 mm MAX. CL. BETWEEN GRATE AND FRAME ON EACH SIDE.
6. CATCH BASIN FLOORS SHALL HAVE A MINIMUM SLOPE OF 1:10 FROM ALL DIRECTIONS TOWARD OUTLET PIPE. IF BASIN IS USED AS A JUNCTION, SHAPE FLOWLINE(S) TO OUTLET PIPE, AND PROVIDE A MINIMUM SLOPE OF 1:10 TO FLOWLINE(S).
7. NPS - NOMINAL PIPE SIZE DESIGNATOR. SEE ASTM A53.

QUANTITIES
FOR INFORMATION ONLY

CONCRETE	REINFORCING STEEL	STRUCTURAL STEEL*
0.53 m3	18 kg	202 kg

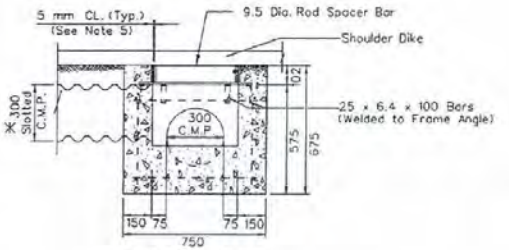
* (Includes Frame, Welded Angle, Grate & Spacer Bars)



ANCHOR ASSEMBLY DETAIL

SECTION A-A

PLAN



SECTION B-B

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

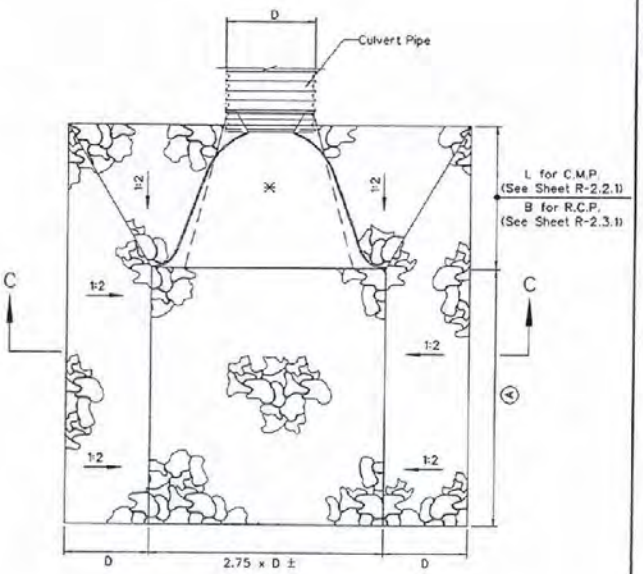
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

EMBANKMENT PROTECTOR (TYPE 5-2G)

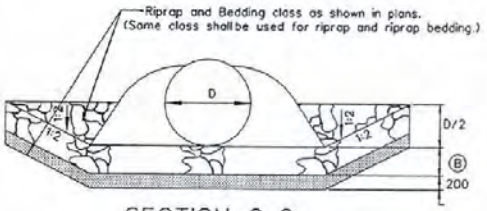
R-3.1.3 (608)

CHIEF ROAD DESIGN ENGR. — ADOPTED: 7/96 REVISION: 8/97

R-27



PLAN



SECTION C-C

CULVERT SIZE	(A)
450 mm to 900 mm	3D
1050 mm to 2100 mm	4D

RIPRAP & BEDDING CLASS	(B) mm
150	300
300	600
400	800
550	1100
700	1400
900	1800

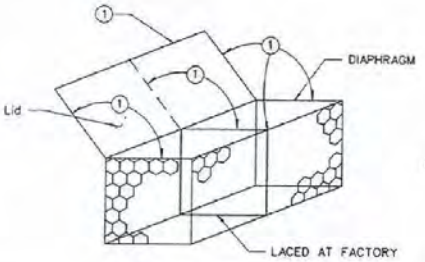
HYDRAULIC SECTION APPROVAL MUST BE OBTAINED PRIOR TO INCORPORATION INTO PLANS

RIPRAP APRON

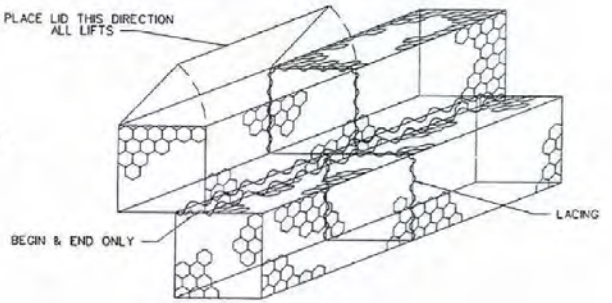
※— When No End Section Is Used, Additional Riprap Shall Be As Required By The Hydraulic Engineer.

NOTE:

① WHEN FULL, LACED TOGETHER

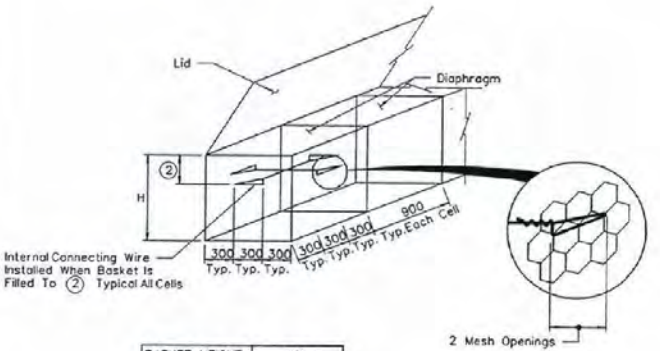


LACING: SINGLE BASKET



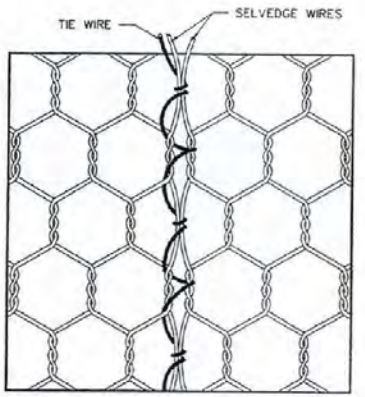
LACING: BASKET TO BASKET

NOTE: OPTIONAL WIRE RING FASTENERS ALLOWED AS PER SPECIAL PROVISIONS.



BASKET HEIGHT H	②
900 mm	1/3H & 2/3H
450 mm	1/2H
300 mm	NONE

INTERNAL CONNECTING WIRE DETAIL
FOR WIRE MESH GABIONS



WIRE MESH LACING DETAIL

GABIONS LACING DETAIL

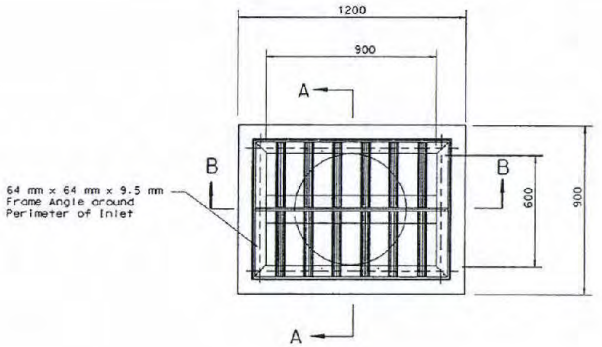
METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED

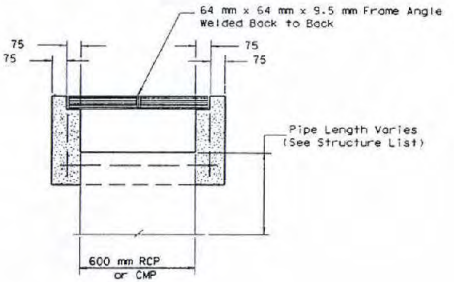
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RIPRAP APRON
GABIONS LACING DETAIL

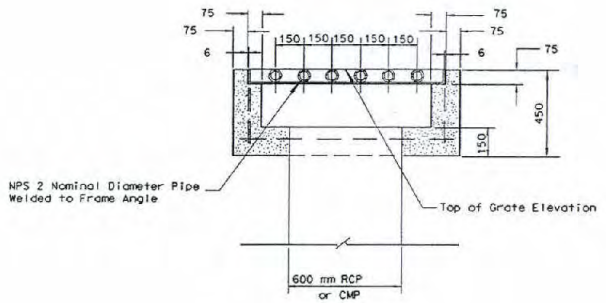
R-2.1.4 (510)
CHIEF ROAD DESIGN ENGR. ADOPTED: 7/96 REVISION:



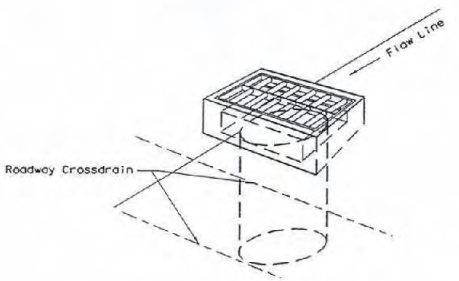
PLAN



SECTION B-B



SECTION A-A



TYPICAL INSTALLATION

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING BARS SHALL BE NO. 13 BARS WITH MAXIMUM SPACING AT 450 mm CENTERS. BARS TO BE EMBEDDED A MINIMUM OF 50 mm AND BAR ENDS MUST CLEAR CONCRETE SURFACES BY 40 mm.
3. ALL EXPOSED CONCRETE EDGES SHALL BE CHAMFERED 25 mm.
4. STRUCTURAL STEEL WEIGHT INCLUDES THE NPS 2 PIPE AND THE 64 mm x 64 mm x 9.5 mm FRAME ANGLES.
5. NPS = NOMINAL PIPE SIZE DESIGNATOR. SEE ASTM A53.

QUANTITIES*		
CONCRETE	REINF. STEEL	STRUCT. STEEL
0.27 m^3	10 kg	77 kg

* FOR INFORMATION ONLY

METRIC NDOT

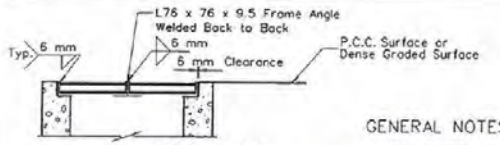
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PIPE RISER INLET (TYPE 3)

R-4.1.2 (609)

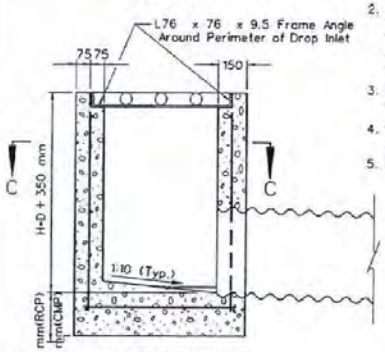
CHIEF ROAD DESIGN ENGR. ADOPTED: 7/96 REVISION



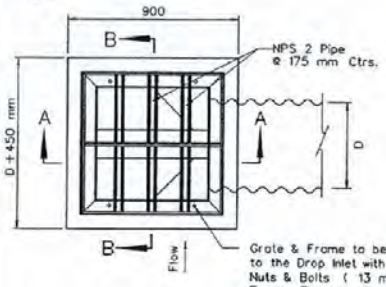
SECTION B-B

GENERAL NOTES:

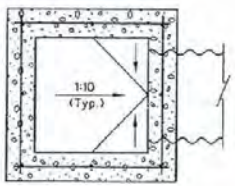
1. ALL CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE NO. 13 BARS WITH MAXIMUM SPACING AT 450 mm CENTERS, WIRED TIGHTLY AT ALL INTERSECTIONS AND EMBEDDED 50 mm CLEAR OF ALL CONCRETE SURFACES.
3. EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 25 mm.
4. STRUCTURAL STEEL WEIGHT INCLUDES THE NPS 2 PIPE AND THE L75 x 76 x 9.5 FRAME ANGLES.
5. NPS = NOMINAL PIPE SIZE DESIGNATOR, SEE ASTM A53



SECTION A-A



PLAN

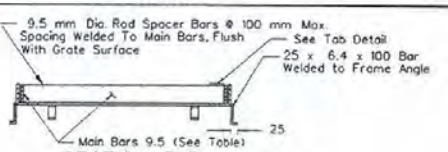


SECTION C-C

C.M.P. SIZE (mm)	CONCRETE (m^3)	REINFORCING (kg)	STRUCTURAL STEEL (kg)
450	0.47	18	54
600	0.59	20	60
750	0.71	27	66
900	0.85	29	72
1050	0.99	31	77

R.C.P. SIZE (mm)	CONCRETE (m^3)	REINFORCING (kg)	STRUCTURAL STEEL (kg)
450	0.52	18	54
600	0.64	20	60
750	0.76	27	66
900	0.89	28	72
1050	1.03	32	77

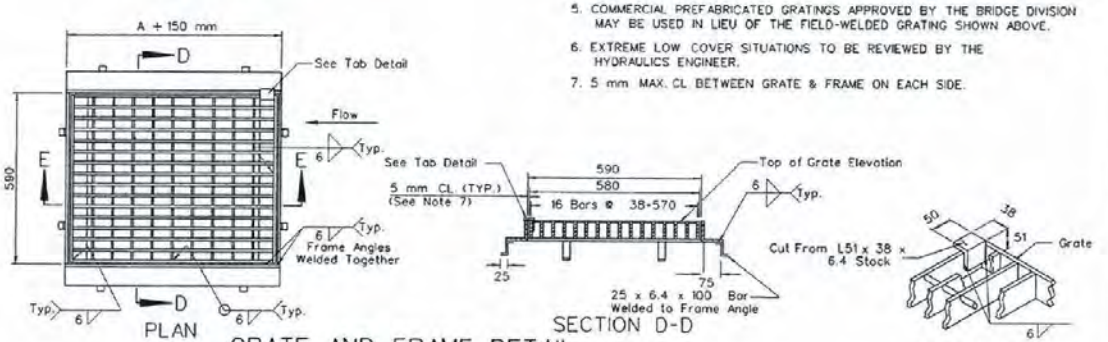
TYPE 2A DROP INLET



SECTION E-E

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE NO. 13 BARS WITH MAXIMUM SPACING AT 450 mm CENTERS, WIRED TIGHTLY AT ALL INTERSECTIONS AND EMBEDDED 50 mm CLEAR OF ALL CONCRETE SURFACES.
3. EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 25 mm.
4. DIMENSIONS MAY BE VARIED TO FIT LOCAL CONDITIONS IF ORDERED BY THE ENGINEER.
5. COMMERCIAL PREFABRICATED GRATINGS APPROVED BY THE BRIDGE DIVISION MAY BE USED IN LIEU OF THE FIELD-WELDED GRATING SHOWN ABOVE.
6. EXTREME LOW COVER SITUATIONS TO BE REVIEWED BY THE HYDRAULICS ENGINEER.
7. 5 mm MAX. CL BETWEEN GRATE & FRAME ON EACH SIDE.

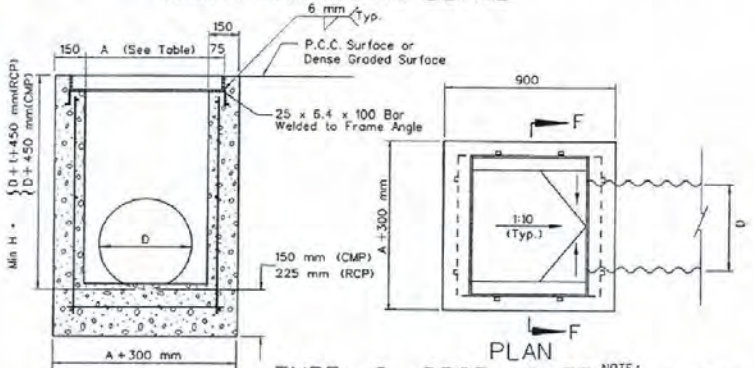


PLAN

SECTION D-D

TAB DETAIL

GRATE AND FRAME DETAIL



SECTION F-F

PLAN

TYPE 2 DROP INLET

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

NOTE:
Catch Basin Floors Shall Have A Minimum Slope of 1:10 From All Directions Toward Outlet Pipe. If Basin is Used As A Junction, Shape Flowline(s) To Outlet Pipe, And Provide A Minimum Slope Of 1:10 To Flowline(s).

BILL OF MATERIALS

X(t=Wall Thickness of RCP)

RCP

PIPE SIZE (mm)	A=D+2+X (mm)	H (m)	CONCRETE (m^3)	REINF. (kg)	MAIN BARS (mm)	FRAME ANGLES (mm)	GRATE (kg)	FRAME (kg)	TOTAL (kg)
375	495	0.90	0.51	19	76x9.5	89x76x9.5	69	30	99
450	585	0.98	0.58	20	76x9.5	89x76x9.5	77	33	110
600	760	1.16	0.73	24	76x9.5	89x76x9.5	93	37	130
750	940	1.31	0.88	27	89x9.5	102x76x9.5	127	44	171
900	1120	1.47	1.04	32	114x9.5	127x76x9.5	191	56	247
1050	1295	1.66	1.22	37	114x9.5	127x76x9.5	217	61	278

CMP

PIPE SIZE (mm)	A (mm)	H (m)	CONCRETE (m^3)	REINF. (kg)	MAIN BARS (mm)	FRAME ANGLES (mm)	GRATE (kg)	FRAME (kg)	TOTAL (kg)
375	610	0.84	0.51	16	76x9.5	89x76x9.5	78	33	111
450	610	0.91	0.50	17	76x9.5	89x76x9.5	78	33	111
600	760	1.07	0.61	23	76x9.5	89x76x9.5	92	37	129
750	915	1.22	0.73	25	89x9.5	102x76x9.5	124	43	167
900	1070	1.37	0.86	27	114x9.5	127x76x9.5	179	54	233
1050	1220	1.52	0.99	35	114x9.5	127x76x9.5	200	59	259

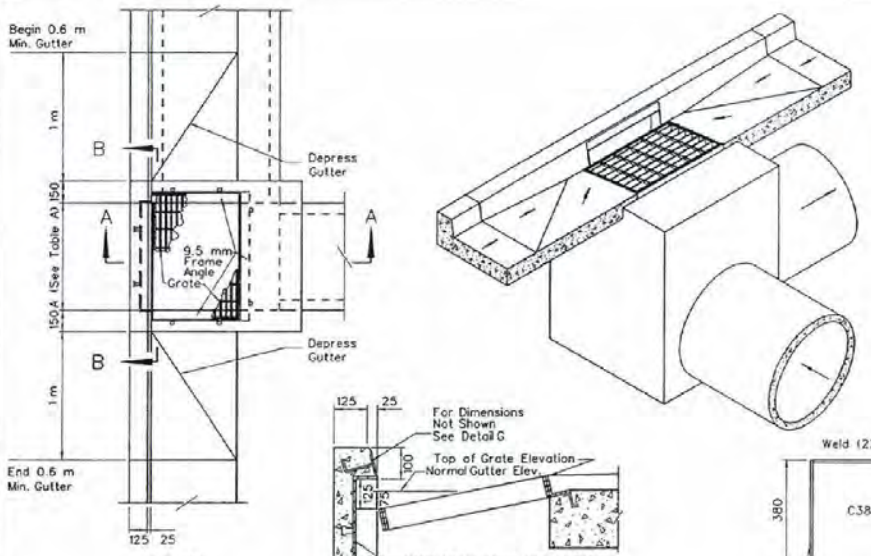
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 2 AND 2A DROP INLET

CHIEF ROAD DESIGN ENGR. — ADOPTED: 7/96

R-4.2.1 (609)
REVISION

R-30

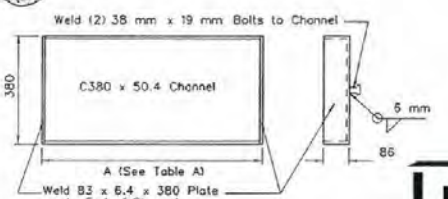


PLAN

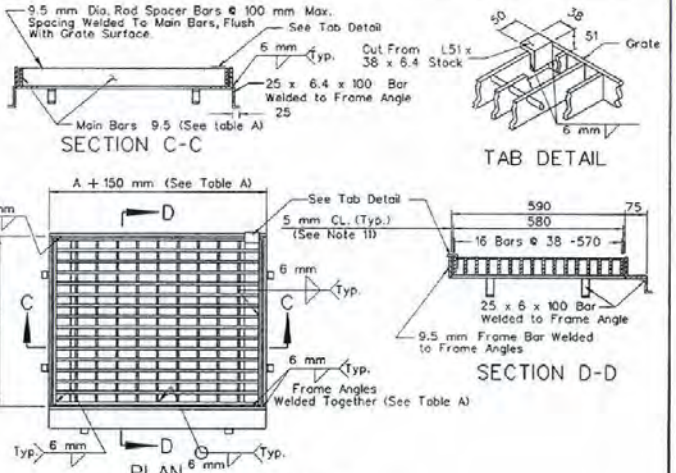
TABLE B

MAXIMUM H		
CMAP (mm)	J OR A (mm)	H (m)
725x450	760	6.3
900x550	915	4.8
1075x675	1070	3.6
---	1220	2.7
---	1370	2.1
---	1525	2.1
---		(with NO.13 bars @ 300 mm centers

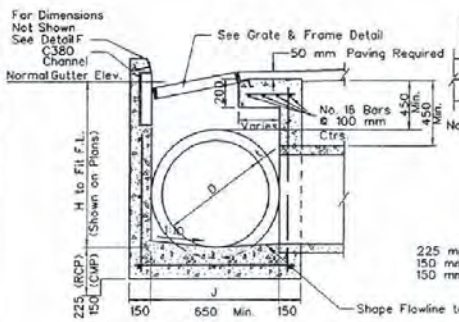
DETAIL F



CHANNEL DETAIL

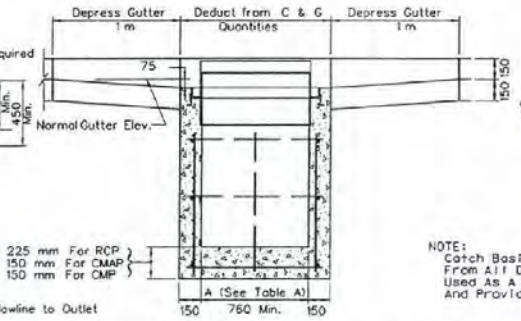


GRATE AND FRAME DETAIL



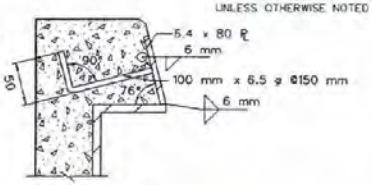
S FOR CMAP
D FOR CMP
D=150 mm FOR RCP 600 mm OR LESS
D=2t FOR RCP 750 mm OR MORE
S=2t FOR LO-HED RCP

SECTION A-A
(FOR CMAP, CMP, RCP & LO-HED RCP)



S FOR CMAP
D FOR CMP
D=150 mm FOR RCP 1050 mm OR LESS
D=2t FOR RCP 1200 mm OR MORE
S=150 mm FOR LO-HED RCP 725 mm x 1125 mm OR LESS
S=2t FOR LO-HED RCP 850 mm x 1325 mm OR MORE

SECTION B-B
(FOR CMAP, CMP, RCP & LO-HED RCP)



DETAIL G

NOTE:
Catch Basin Floors Shall Have A Minimum Slope of 1:10 From All Directions Toward Outlet Pipe. If Basin is Used As A Junction, Shape Flowline(s) To Outlet Pipe, And Provide A Minimum Slope Of 1:10 To Flowline(s).

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS A OR AA.
2. ALL REINFORCING STEEL SHALL BE TIGHTLY WIRED AND EMBEDDED 40 mm CLEAR OF CONCRETE SURFACE. EXCEPT AS NOTED, ALL REINFORCING SHALL BE NO. 13 BARS WITH MAXIMUM SPACING OF 300 mm CENTERS. FOR ALL VALUES OF H TO THE MAXIMUM AS SHOWN IN TABLE B. IF H EXCEEDS THESE MAXIMUMS, DROP INLET WILL REQUIRE SPECIAL DESIGN.
3. EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 25 mm.
4. WHERE PIPE INTERSECTS DROP INLET ON A 12° OR LARGER SKEW INCREASE J TO $\frac{J}{\cos \text{SKEW } \angle}$, REDESIGN FOR SKEWS AT A.
5. WHERE PIPE INTERSECTS DROP INLET ON A 12° OR LARGER SKEW INCREASE S TO $\frac{S}{\cos \text{SKEW } \angle}$ REDESIGN FOR SKEWS AT A.
6. FOR VALUES OF "H" SEE STORM DRAIN SCHEDULE OR STRUCTURE LIST.
7. "H" IS THE DIFFERENCE IN ELEVATION BETWEEN THE OUT FLOW PIPE AND THE NORMAL GUTTER GRADE LINE AT THE CURB FACE.
8. PIPE(S) CAN BE PLACED IN ANY WALL.
9. FOR DROP INLET CONFIGURATIONS WITH 2 PIPES-INFLOW PIPE INVERT ELEVATION SHALL BE ≥ 30 mm ABOVE OUTFLOW PIPE INVERT ELEVATION.
10. EXTREME LOW COVER SITUATIONS TO BE REVIEWED BY THE HYDRAULICS ENGINEER.
11. 5 mm MAX. CL. BETWEEN GRATE & FRAME ON EACH SIDE.

STRUCTURAL STEEL TABLE A

PIPE SIZE				A	MAIN BARS	FRAME ANGLES	FRAME BAR	GRATE	FRAME	CHANNEL & PLATES,	TOTAL
CMAP (mm)	CMP (mm)	RCP (mm)	LO-HED (mm)	(mm)	(mm)	(mm)	(mm)	(kg)	(kg)	(kg)	(kg)
≤725x450	≤750	≤600	≤ 350x575	760	76x9.5	89x76x9.5	89x9.5	92	37	42	171
900x550	900	750	475x750	915	89x9.5	102x76x9.5	102x9.5	124	43	49	216
1075x675	1050	900	550x850	1070	114x9.5	127x76x9.5	127x9.5	179	54	57	290
---	1200	1050	675x850	1220	114x9.5	127x76x9.5	127x9.5	200	59	65	324
---	1350	---	725x1125	1370	114x9.5	127x76x9.5	127x9.5	235	65	73	373

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

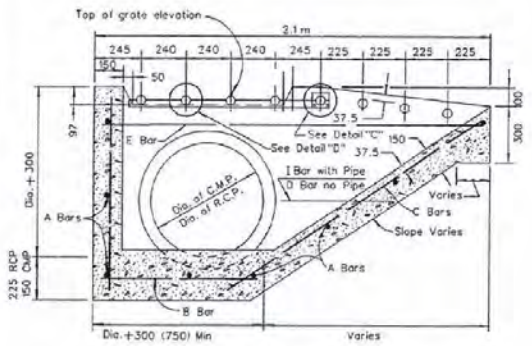
TYPE 3 DROP INLET

R-4.3.1 (609)

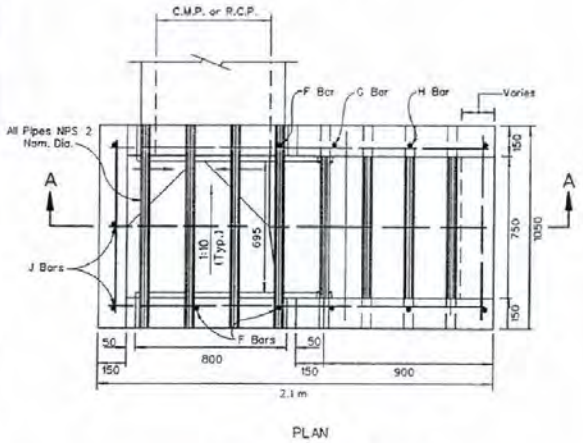
CHIEF ROAD DESIGN ENGR. — ADOPTED: 7/98 REVISION:

R-31

TYPE 7 DROP INLET



SECTION A-A



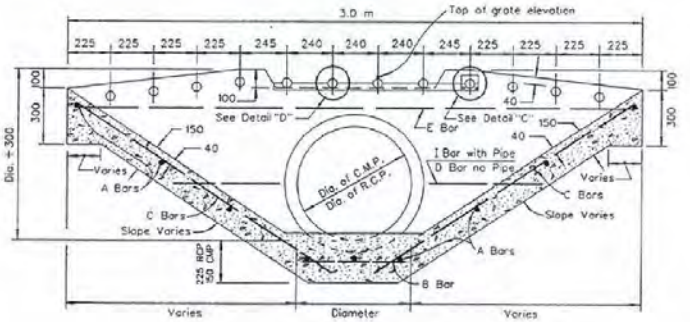
PLAN

TYPE 7 DROP INLET

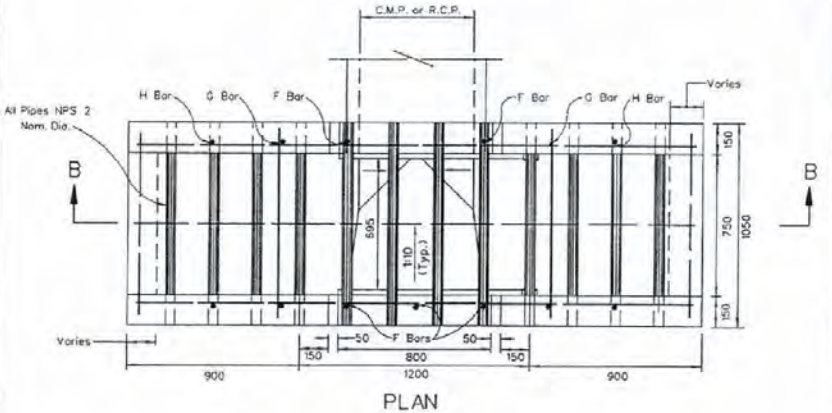
TABLE OF QUANTITIES

PIPE DIA.	A Bars	B Bars	C Bars	D Bars	E Bars	F Bars	G Bars	H Bars	I Bars	J Bars	CONC. (m³)	REINF. STEEL (kg)	STR. STL. GRATE (kg)
CMP													
450	86950	36675	361425	161500	262000	36675	26550	26350	18700	36800	0.85	28	53
600	86950	36825	361425	161500	262000	36825	26600	26400	18675	36950	0.93	29	53
750	86950	361000	361425	161600	262000	36975	26800	26525	18550	361100	1.02	30	53
RCP													
450	86950	36700	361500	161500	262000	36750	26550	26350	18625	36875	0.90	28	53
600	86950	36750	361500	161500	262000	36900	26600	26400	18600	361025	0.97	29	53
750	86950	361000	361500	161600	262000	361050	26800	26525	18500	361175	1.08	31	53

TYPE 8 DROP INLET



SECTION B-B



PLAN

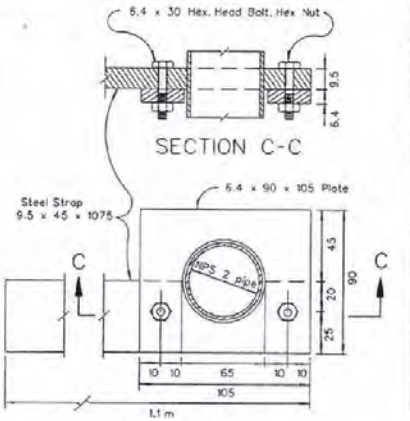
TYPE 8 DROP INLET

TABLE OF QUANTITIES

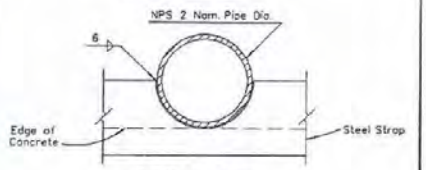
PIPE DIA.	A Bars	B Bars	C Bars	D Bars	E Bars	F Bars	G Bars	H Bars	I Bars	J Bars	CONC. (m³)	REINF. STEEL (kg)	STR. STL. GRATE (kg)
CMP													
450	96950	36600	681425	181950	262900	56875	46550	46350	26700	Not Applicable	1.02	35	76
600	96950	36750	681425	182050	262900	56825	46600	46400	26675		1.11	37	76
750	96950	36900	681425	182100	262900	56975	46800	46525	26550		1.21	39	76
RCP													
450	96950	36600	681500	181950	262900	56750	46550	46350	26625		1.03	36	76
600	96950	36750	681500	182050	262900	56975	46600	46400	26600		1.13	38	76
750	96950	36900	681500	182100	262900	561050	46800	46525	26500		1.25	40	76

METRIC NDOT

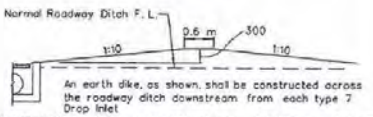
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED



DETAIL "C"



DETAIL "D"



An earth dike, as shown, shall be constructed across the roadway ditch downstream from each type 7 Drop Inlet

SKETCH OF ROADWAY DITCH DIKE

GENERAL NOTES:

1. All concrete shall be Class A or AA.
2. Reinforcing steel shall be No. 13 bars with maximum spacing of 450 mm centers, wired tightly at all intersections and embedded at least 40 mm clear of concrete surface.
3. Dimensions may be varied by the Engineer to fit local conditions.
4. No deductions in concrete shall be made for the 50 mm crossbars.
5. All exposed edges of concrete shall be chamfered one inch.
6. Steel strap and pipe for crossbars are included in the structural steel grate quantities.
7. Catch Basin Floors Shall Have A Minimum Slope of 1:10 From All Directions Toward Outlet Pipe. If Basin is Used As A Junction, Shape Flowline(s) To Outlet Pipe, And Provide A Minimum Slope Of 1:10 To Flowline(s).
8. NPS = Nominal Pipe Size Designator. See ASTM A53.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 7 & 8 DROP INLETS

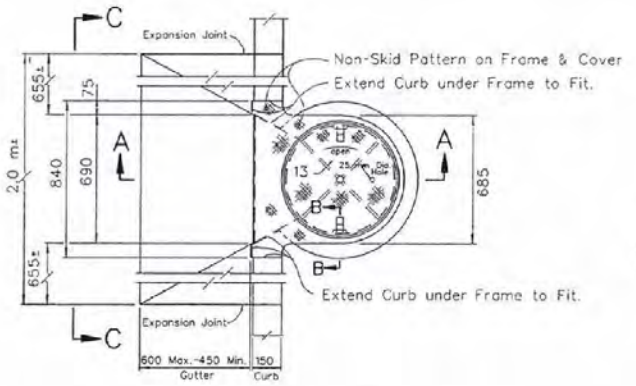
CHIEF ROAD DESIGN ENGR.

R-4.6.1 (609)

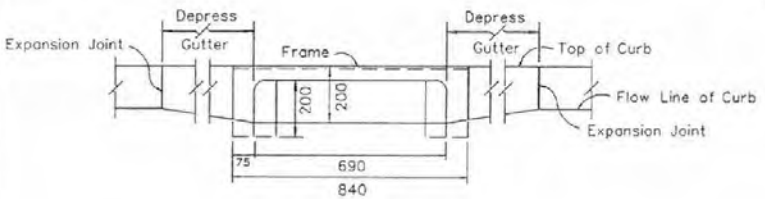
ADOPTED: 7/96

REVISION 8/97

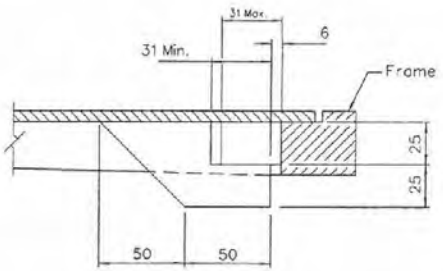
R-32



PLAN VIEW

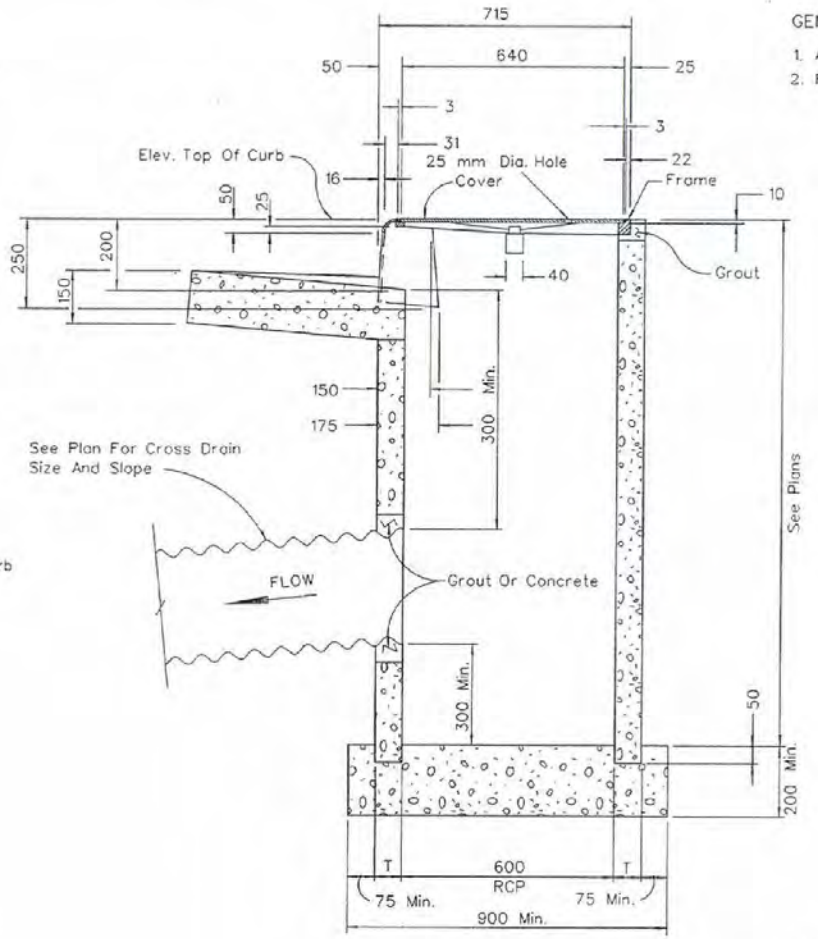


VIEW C-C



SECTION B-B

WEDGE LOCK HOLD DOWN



SECTION A-A

GENERAL NOTES:

1. All concrete shall be class A or AA.
2. Forming of the base will not be required.

CASTINGS *		
	FRAME	COVER
TYPE 10	41 kg	32kg

*For Information Only

T - WALL THICKNESS

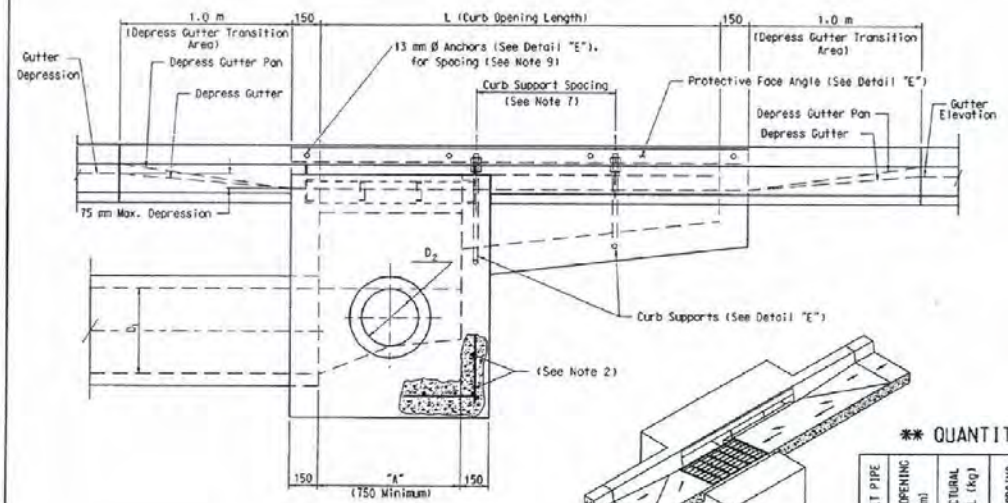
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

METRIC NDOT

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

DROP INLET TYPE 10

CHIEF ROAD DESIGN ENGR. | R-4.6.1.2 (609) | ADOPTED: 7/96 | REVISION

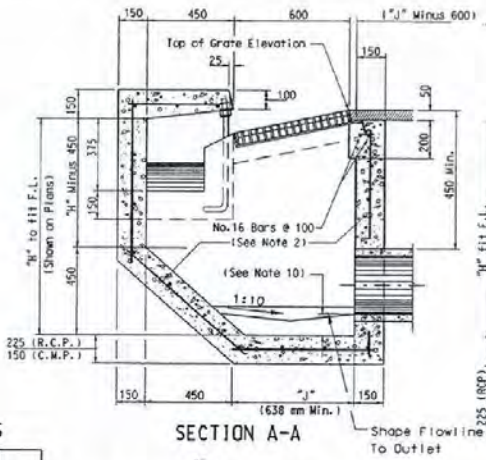


ELEVATION

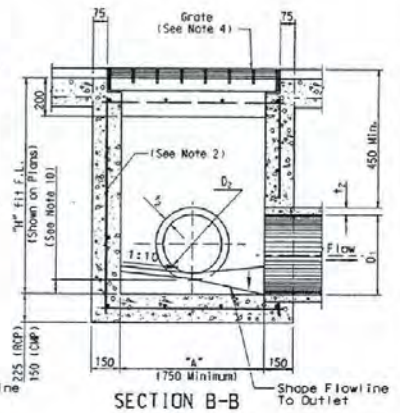
** QUANTITIES

OUTLET PIPE	CURB OPENING (m)	STRUCTURAL STEEL (kg)	REINFORCING STEEL (kg)	CONCRETE (m^3)
450 R.C.P.	2.1	147	57	1.25
	3.0	160	70	1.54
	3.6	166	80	1.73
600 R.C.P.	3.6	166	81	1.79
	4.5	179	95	2.08

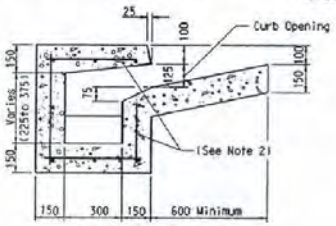
** ASSUMED MINIMUM H 375 mm INLET PIPE



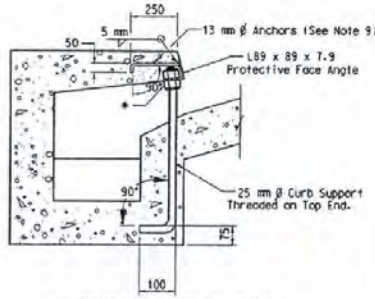
SECTION A-A



SECTION B-B

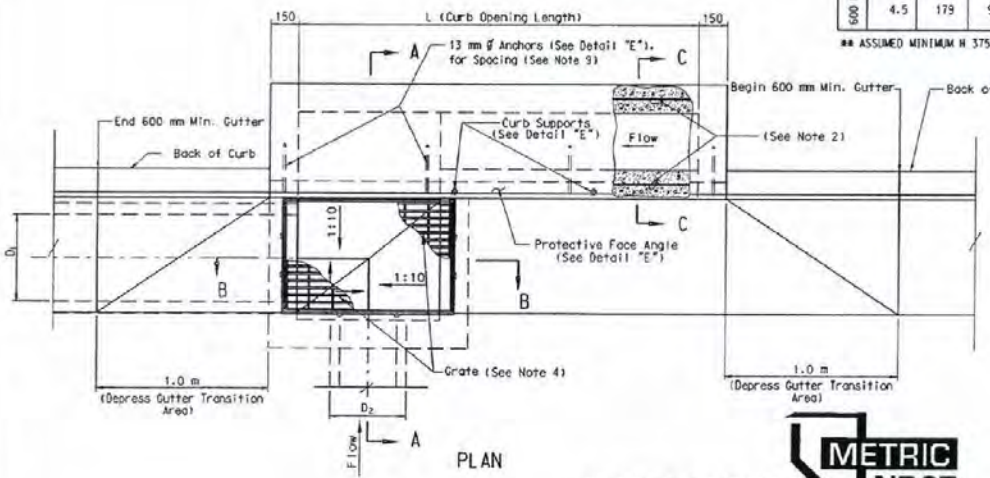


SECTION C-C



* - Bottom Nut Tight On Last Thread.

DETAIL E



PLAN

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

METRIC NDOT

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS AA OR A.
2. REINFORCING STEEL SHALL BE NO. 13 BARS.EXCEPT AS NOTED. WITH MAXIMUM SPACING AT 300 mm CENTERS. WIRED TIGHTLY AT ALL INTERSECTIONS. AND EMBEDDED AT LEAST 40 mm CLEAR OF CONCRETE SURFACE. EXCEPT AS NOTED.
3. EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 25 mm.
4. FOR GRATE AND FRAME DETAIL. SEE STANDARD PLANS SHEET R-4.3.1 (TYPE 3 DROP INLET).
5. FOR VALUES OF "H" AND "L" SEE STORM DRAIN SCHEDULE.
6. "H" IS THE DIFFERENCE IN ELEVATION BETWEEN THE OUT PIPE FLOW LINE AND THE NORMAL GUTTER GRADE LINE AT THE CURB FACE.
7. CURB OPENINGS LONGER THAN 2.1 m SHALL HAVE ONE CURB SUPPORT FOR EACH 2.1 m INCREMENT OR FRACTION THEREOF. EVENLY SPACED.
8. PIPE(S) CAN BE PLACED IN ANY WALL.
9. ANGLE ANCHORS SHALL BE EMBEDDED MIDPOINT IN EACH ENDWALL AND EVENLY SPACED. (MAXIMUM SPACING OF 1.5 m).
10. FOR DROP INLET CONFIGURATIONS WITH 2 PIPES-INFLOW PIPE INVERT ELEVATION SHALL BE ≥ 30 mm ABOVE OUTFLOW PIPE INVERT ELEVATIONS.
11. CATCH BASIN FLOORS SHALL HAVE A MINIMUM SLOPE OF 1:10 FROM ALL DIRECTIONS TOWARD OUTLET PIPE. IF BASIN IS USED AS A JUNCTION. SHAPE FLOWLINE(S) TO OUTLET PIPE. AND PROVIDE A MINIMUM SLOPE OF 1:10 TO FLOWLINE(S).

"A"
D_2 for CMP
D_2 + 150 mm for RCP 1050 mm or Less
$D_2 + 2\ t_2$ for RCP 1200 mm or More

"J"
D_1 for CMP
D_1 + 150 mm for RCP 600 mm or Less
$D_1 + 2\ t_1$ for RCP 750 mm or More

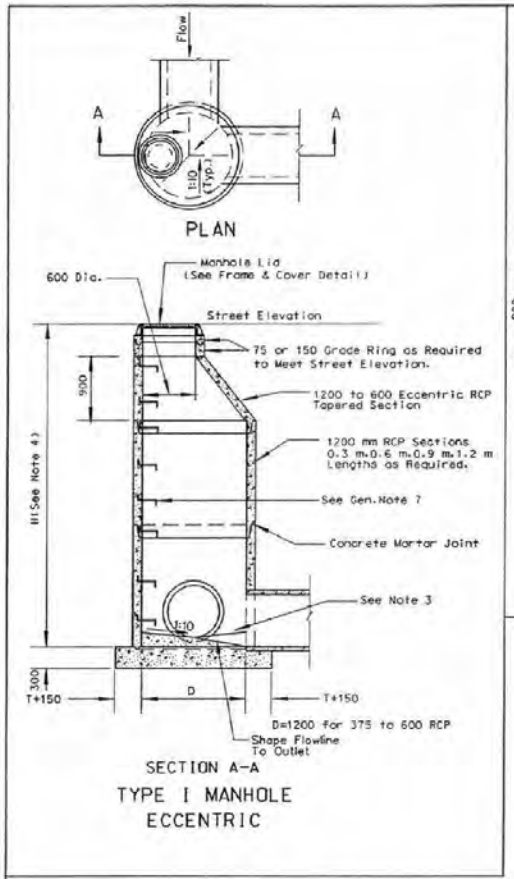
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

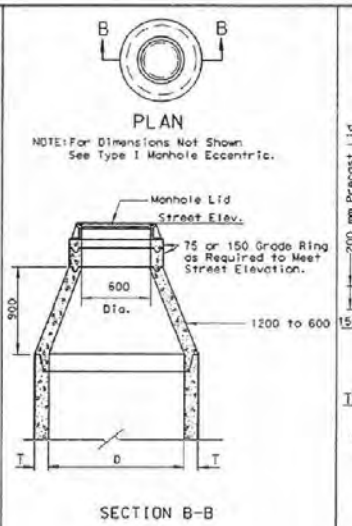
TYPE 11 DROP INLET

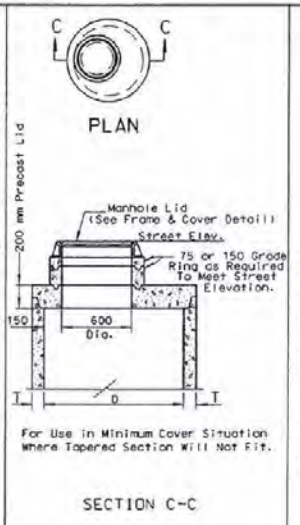
CHIEF ROAD DESIGN ENGR.

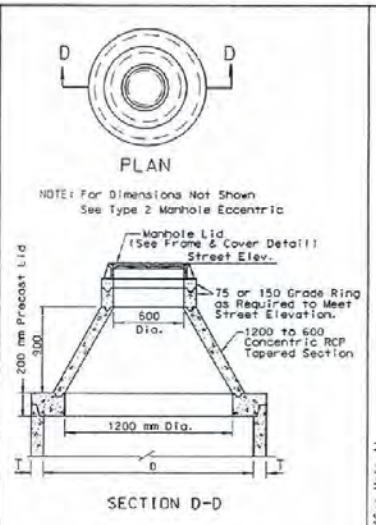
R-4.6.2 (609)
ADOPTED: 7/96 REVISION

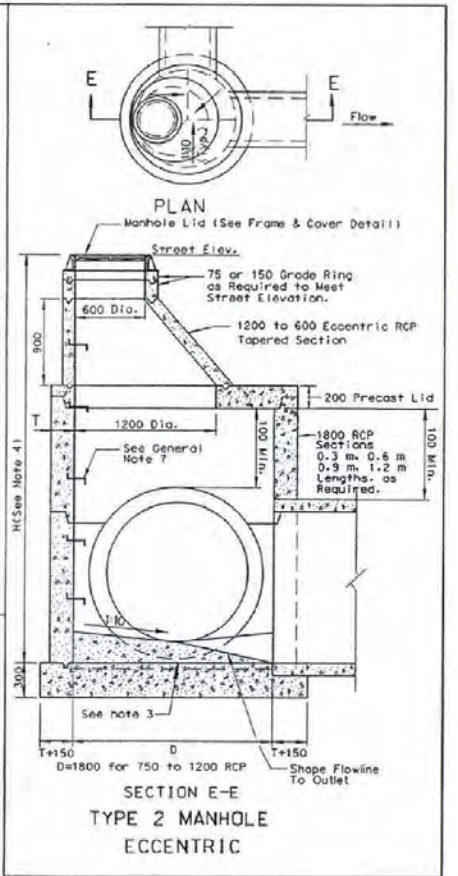
R-34











GENERAL NOTES:

1. FOR CAST IN PLACE CONCRETE BASE ALL REINFORCING STEEL TO BE NO. 13 BARS AT 450 mm CENTERS TIGHTLY WOUND AT ALL INTERSECTIONS AND EMBEDDED IN CONCRETE AT LEAST 50 mm AND BAR ENDS MUST CLEAR CONCRETE SURFACES BY 40 mm.
2. ALL CONCRETE SHALL BE CLASS A OR AA.
3. MANHOLE WITH MORE THAN ONE PIPE-INFLOW PIPE INVERT ELEVATIONS SHALL BE ≥ 30 mm ABOVE OUTFLOW PIPE ELEVATION.
4. FOR VALUES OF "H" SEE STORM DRAIN SCHEDULE OR STRUCTURE LIST. "H" IS THE DIFFERENCE IN ELEVATION BETWEEN THE OUTFLOW PIPE INVERT ELEVATION AND THE TOP OF MANHOLE ELEVATION AT STREET GRADE.
5. DO NOT PLACE PIPES IN TAPERED SECTION.
6. MANHOLE COVER SHALL BEAR ENTITY IDENTIFICATION AND SYSTEM FUNCTION (IF APPLICABLE).
7. MANHOLE STEPS SHALL CONFORM TO ASTM STANDARD SPECIFICTION C-478 WITH MAXIMUM SPACING OF 400 mm AND 100 mm CLEAR DISTANCE FROM THE WALL OF RISER OR CONE SECTION. THE STEP MUST HAVE A 250 mm MINIMUM WIDTH.
8. SHAPE FLOWLINE IN MANHOLE TO OUTLET PIPE. AND PROVIDE A 1:10 MINIMUM SLOPE FROM ALL DIRECTIONS TOWARD FLOWLINE
9. COMMERCIAL PREFABRICATED ADJUSTMENT RINGS FOR MANHOLES MAY BE USED WHEN APPROVED BY THE ENGINEER.

T = THICKNESS PIPE WALL

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

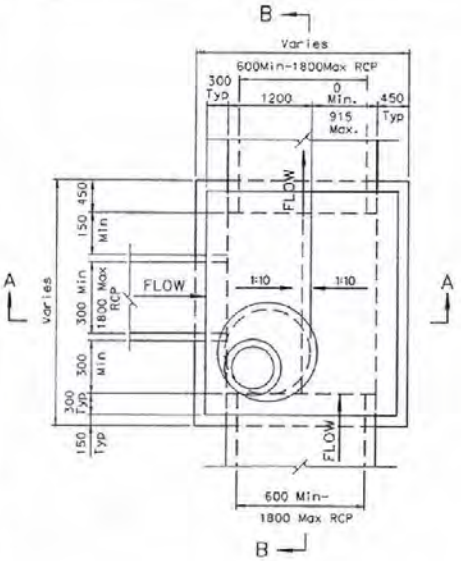
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 1 & 2
and TYPE 1 & 2 MODIFIED
MANHOLES

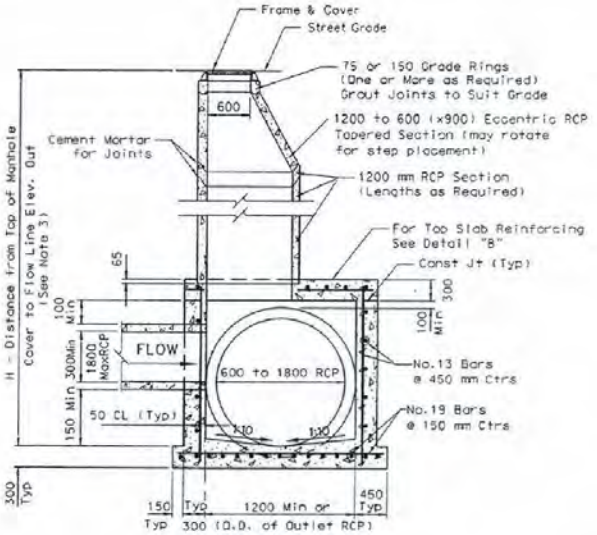
CHIEF ROAD DESIGN ENGR.	ADOPTED: 7/96	REVISION 8/97

(8-4.7.1) (609)

R-35



PLAN

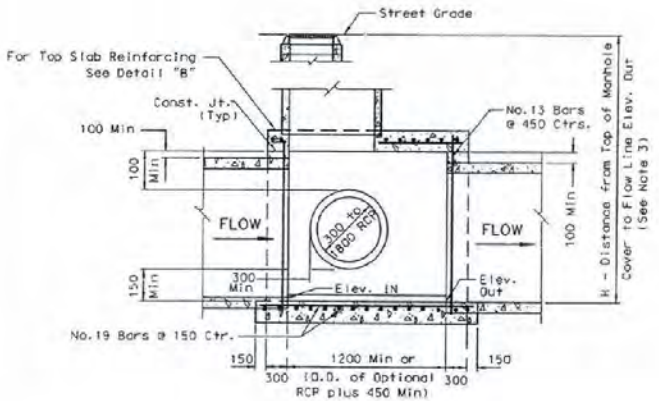


SECTION A-A

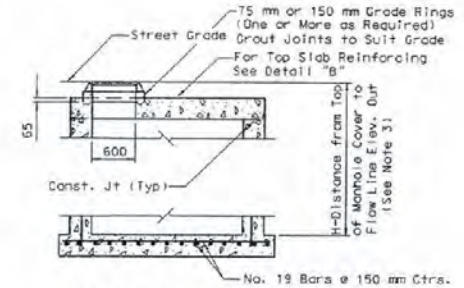
(For Variable Height Situations)

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS A OR CLASS AA.
2. MANHOLES WITH MORE THAN ONE PIPE: THE INFLOW PIPE INVERT ELEVATIONS SHALL BE GREATER THAN OR EQUAL TO 30 mm ABOVE THE OUTFLOW PIPE INVERT ELEVATION.
3. FOR VALUES OF "H", SEE STORM DRAIN SCHEDULE OR STRUCTURE LIST IN CONTRACT PLANS. "H" IS THE DIFFERENCE IN ELEVATION BETWEEN THE OUTFLOW PIPE INVERT ELEVATION AND THE TOP OF MANHOLE ELEVATION AT STREET GRADE.
4. MANHOLE STEPS SHALL CONFORM TO ASTM STANDARD SPECIFICATION C-478 WITH MAXIMUM SPACING OF 400 mm AND 100 mm CLEAR DISTANCE FROM THE MANHOLE WALL. THE STEP MUST BE A 250 mm MINIMUM WIDTH.
5. MANHOLE COVER SHALL BEAR ENTITY IDENTIFICATION AND SYSTEM FUNCTION (IF APPLICABLE).
6. SHAPE FLOWLINE IN MANHOLE TO OUTLET PIPE, AND PROVIDE A 1:10 MINIMUM SLOPE FROM ALL DIRECTIONS TOWARD FLOWLINE.



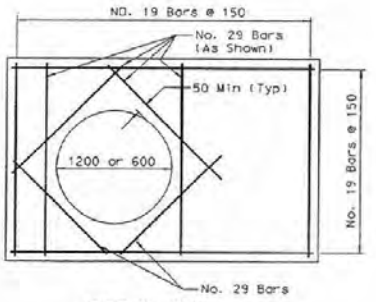
SECTION B-B



SECTION A-A

(For Minimum Height Situation)

Note: Hydraulic Engineer Will Look at Other Options for Extreme Minimum Cover Situations.



DETAIL "B"

(TOP SLAB REINFORCING)

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

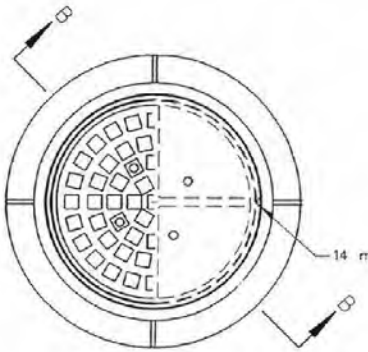
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 4 MANHOLE

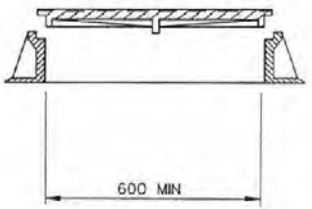
CHIEF ROAD DESIGN ENGR. | R-4.7.2 | (609) | ADOPTED: 7/96 | REVISION 8/97

R-36

4 LINES ON TOP OF CONCRETE COLLAR SCORED 15 mm DEEP. TWO PARALLEL AND TWO PERPENDICULAR TO CENTERLINE OF ROADWAY

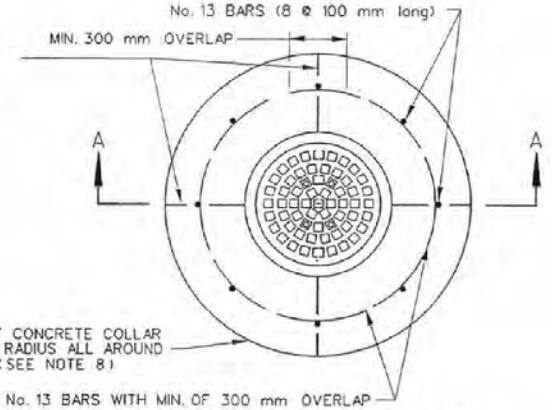


PLAN



SECTION B-B

TRAFFIC-STRENGTH MANHOLE FRAME & COVER

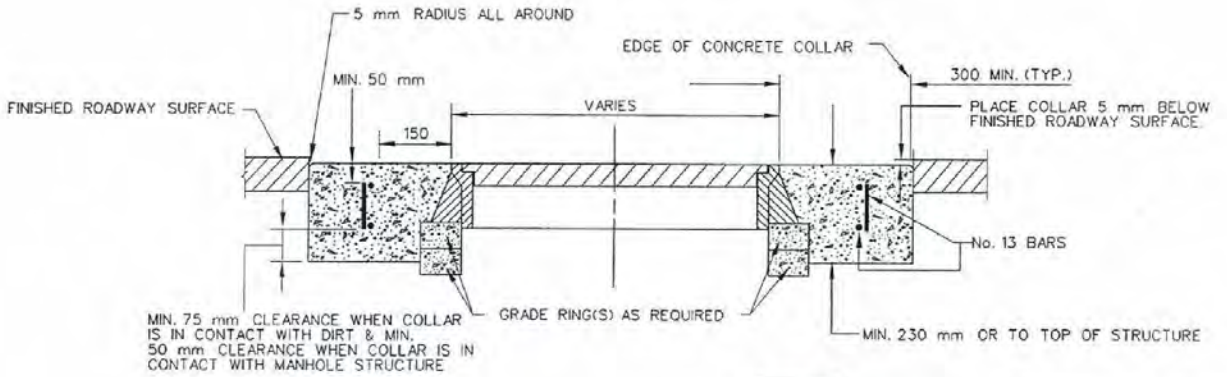


CONCRETE COLLAR PLAN

(SEE NOTE 10)

GENERAL NOTES:

1. THE WEIGHT OF FRAME SHALL BE 65 kg. MINIMUM AND THE WEIGHT OF COVER SHALL BE 56 kg. MINIMUM. TRAFFIC-STRENGTH MANHOLE FRAME & COVER SHALL COMPLY WITH AASHTO M18 WHEEL LOADS. EQUIVALENT MANHOLE FRAMES & COVERS OTHER THAN SHOWN MAY BE USED UPON APPROVAL BY THE ENGINEER.
2. THE FRAME SEAT AND COVER EDGE SHALL BE MACHINED TO A TRUE BEARING SURFACE ALL AROUND. THE FRAME & COVER SHALL BE COMPATIBLE TO THE MANUFACTURERS SPECIFICATIONS.
3. THE SURFACE SHOWN IS FOR ILLUSTRATION ONLY. ANY SURFACE DESIGN. OTHER THAN SMOOTH. MAY BE USED UPON APPROVAL.
4. FRAMES & COVERS SHALL CONFORM TO ASTM A48M. CLASS 275 FOR GRAY IRON CASTINGS.
5. A CAST-IN-PLACE CONCRETE COLLAR SHALL BE PLACED AROUND A MANHOLE FRAME UNLESS OTHERWISE DIRECTED.
6. MANHOLE COVER SHALL BEAR NAME OF ENTITY & SYSTEM FUNCTION (IF APPLICABLE).
7. ALL CONCRETE SHALL BE CLASS A OR AA.
8. CONCRETE COLLARS MAY BE POURED ROUND, OR ANY OTHER APPROPRIATE SHAPE WHEN APPROVED BY THE ENGINEER.
9. COMMERCIAL PREFABRICATED GRADE RINGS FOR MANHOLES MAY BE USED WHEN APPROVED BY THE ENGINEER.
10. MANHOLE COVER & FRAME SHOWN. OTHER SHAPES MAY APPLY TO UTILITY AND VALVE COVERS AND FRAMES



SECTION A-A

(SEE NOTE 10.)

METRIC NDOT

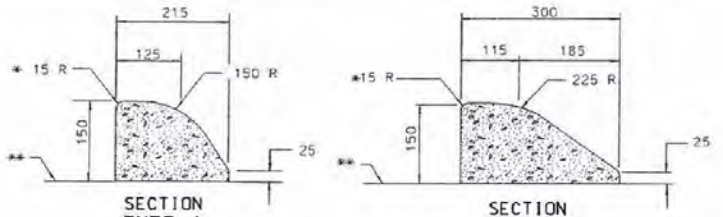
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

MANHOLE COVER, FRAME & CONCRETE COLLAR

R-4.7.3 (609)

CHIEF ROAD DESIGN ENGR. ADOPTED: 7/96 REVISION 8/97

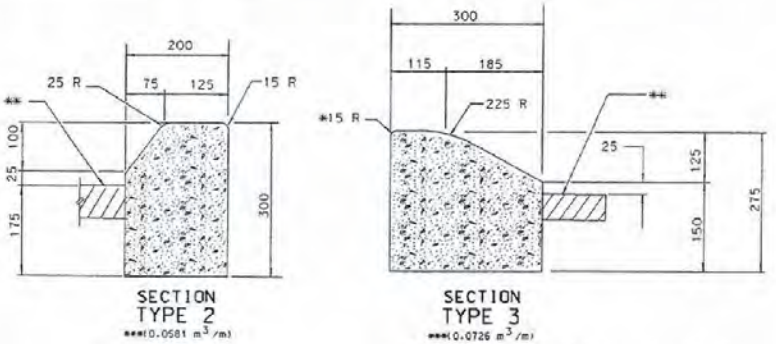


* Omit Rounding When Curbs Are Back To Back (Epoxy Curb to Plant Mix Surface). Note: Epoxy Cement May Be Omitted When Installation Is Temporary.

** P.C.C. or Dense Graded

GLUE DOWN CURBS

*** For Information Only

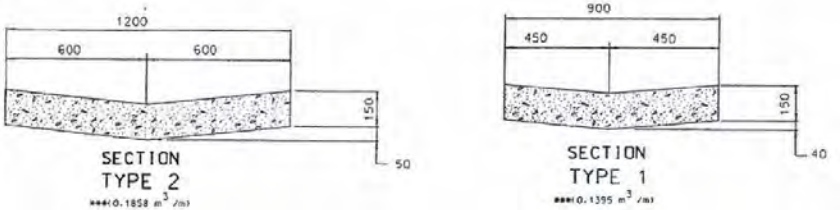


CURB

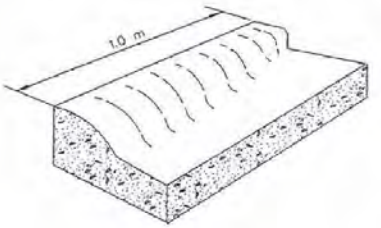
* Omit Rounding When Curbs Are Back To Back.

** P.C.C. or Dense Graded

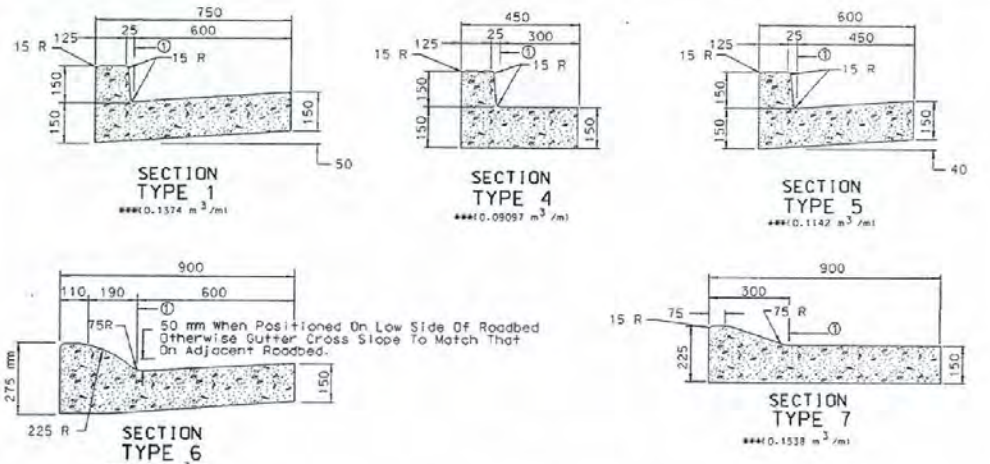
*** For Information Only



VALLEY GUTTER



TYPICAL TRANSITION FROM ROLLED CURB TO VERTICAL FACE



GENERAL NOTES:

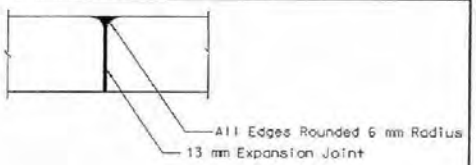
① This Line Should Be Used To Dimension Offsets.

② When Distance Between Back of Curb on Islands Is 1.2 m or Less, Use 100 mm Class A or AA Concrete (Island Paving) And 50 mm of Gravel Base.

③ Concrete Shall Be Class A or AA.

*** For Information Only

CURB AND GUTTER



ELEVATION

TYPICAL EXPANSION JOINT DETAIL

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

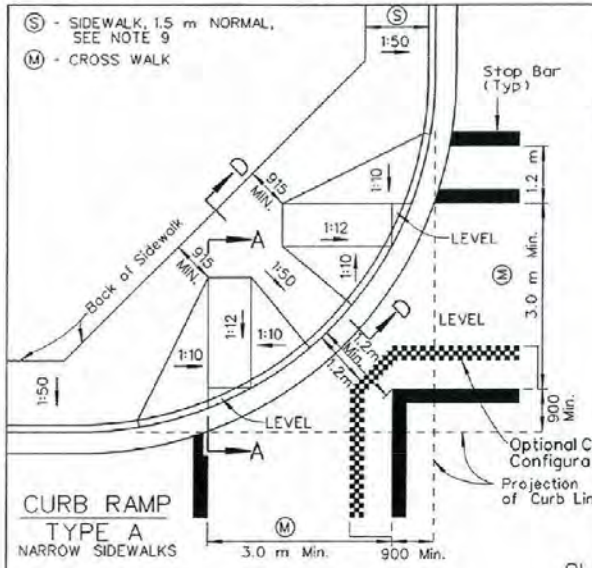
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CURB & GUTTERS

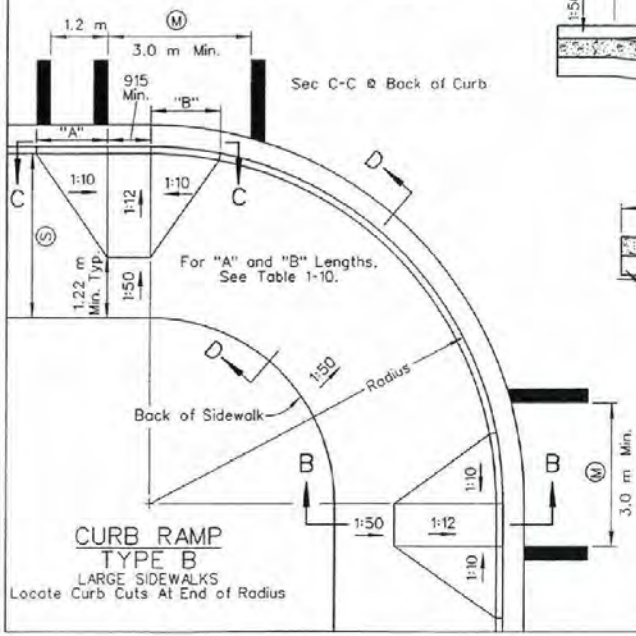
R-5.1.1 (502.613)

CHIEF ROAD DESIGN ENGR. ADOPTED: 7/96 REVISION 8/97

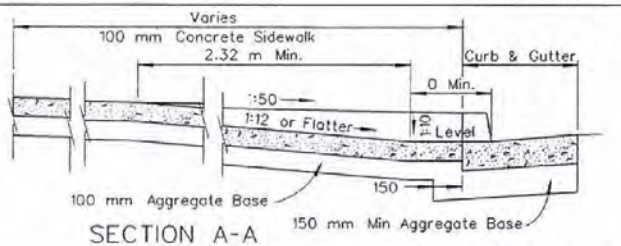
R-38



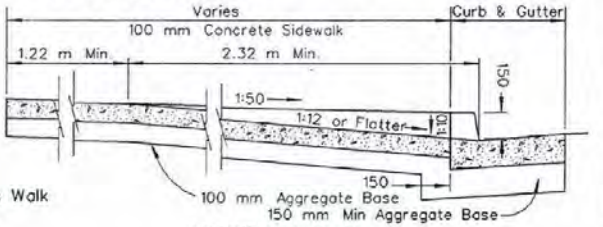
CURB RAMP TYPE A
NARROW SIDEWALKS



CURB RAMP TYPE B
LARGE SIDEWALKS
Locate Curb Cuts At End of Radius



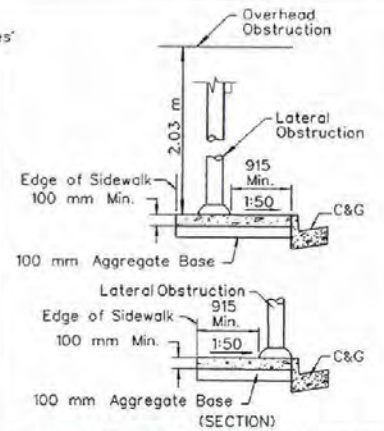
SECTION A-A



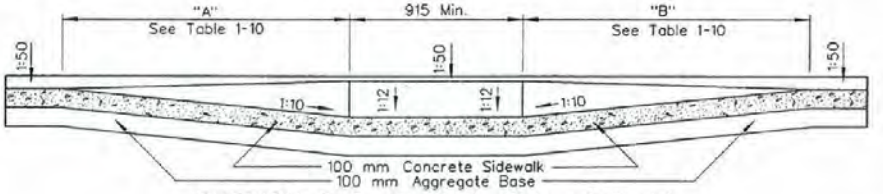
SECTION B-B

TABLE 1-10
Transition Lengths for 1:10 Side Slopes*
(For 1:12 See Sheet R-5.1.1.2)

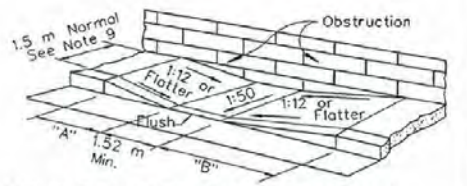
Grade (%) "B" to "A"	"A" (m) Min.	"B" (m) Min.
-6 to -5.01	1.22	3.81
-5 to -4.01	1.22	3.05
-4 to -3.01	1.22	2.59
-3 to -2.01	1.22	2.29
-2 to -1.01	1.37	1.98
-1 to 1	1.68	1.68
1.01 to 2	1.98	1.37
2.01 to 3	2.29	1.22
3.01 to 4	2.59	1.22
4.01 to 5	3.05	1.22
5.01 to 6	3.81	1.22



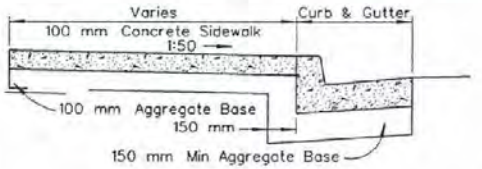
TYPICAL SIDEWALK vs OBSTRUCTION CLEARANCE DETAIL



SECTION C-C (@ Back Side of Curb)



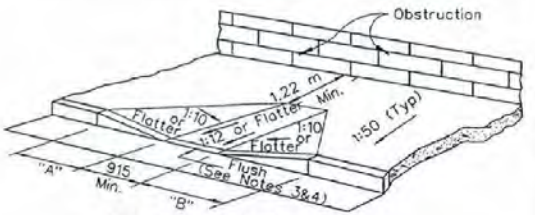
MID BLOCK CURB RAMP ALTERNATE



SECTION D-D

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED



MID BLOCK CURB RAMP

GENERAL NOTES:

1. SEE STRUCTURE LIST AND PLAN SHEETS FOR Ⓜ AND Ⓢ. "A" AND "B".
2. GRATINGS OR SIMILAR ACCESSES SHALL NOT BE LOCATED IN AREA AT THE BASE OF THE CURB RAMP OR LANDING AREA.
3. NO LIP SHALL BE PERMITTED AT THE CURB RAMP SLOPE TO GUTTER PAN.
4. PLANTMIX BITUMINOUS OPEN-GRADED SURFACE SHALL BE FLUSH WITH THE EDGE OF THE GUTTER PAN IN THE AREA OF THE CURB RAMP.
5. ROUGH BROOM TEXTURE ON CURB RAMPS AND WINGS. TEXTURE SHALL PROVIDE A VISUAL CONTRAST TO THE SIDEWALK.
6. CURB RAMP WINGS DO NOT HAVE TO BE WITHIN CROSS-WALK HOWEVER. THE RAMP ITSELF HAS TO BE INSIDE CROSS-WALK.
7. ALL RAMPS SHALL BE 1:12 OR FLATTER.
8. ALL SLOPE RATES ARE RELATIVE TO LEVEL.
9. IF THERE ARE R/W RESTRICTIONS SIDEWALK WIDTHS CAN BE REDUCED TO 1.22 m WITH PRIOR APPROVAL FROM ASSISTANT CHIEF ROAD DESIGN ENGINEER. A 1.52 m x 1.52 m PASSING ZONE IS REQUIRED EVERY 61 m PER ADA APPENDIX C, SECTION 4.3.4 SEE SHEET R-5.1.1.2 FOR 1:12 TRANSITION LENGTHS.
10. CONCRETE SHALL BE CLASS A OR AA.

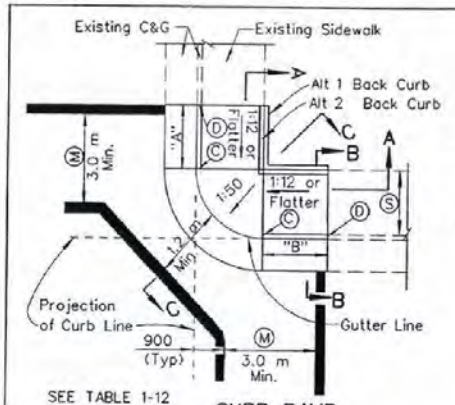
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SIDEWALKS, CURB RAMPS, CROSS WALK MARKINGS (NEW CONSTRUCTION)

CHIEF ROAD DESIGN ENGR.

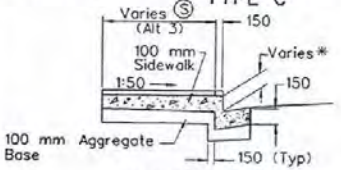
R-5.1.1.1	(613)
ADOPTED: 7/96	REVISION 8/97

R-39

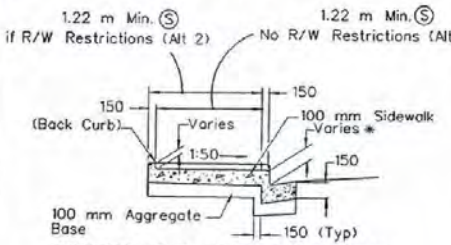


SEE TABLE 1-12 FOR "A and "B" LENGTHS

CURB RAMP TYPE C



SECTION B-B



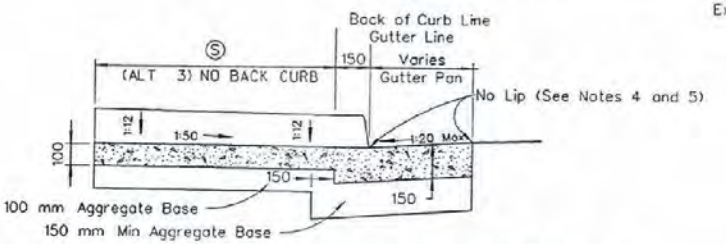
SECTION B-B WITH BACK CURB

Ⓜ - CROSS WALK
Ⓢ - SIDEWALK, 1.5 m NORMAL, SEE NOTE 9
* - FROM 0 AT Ⓒ TO 150 mm AT Ⓓ

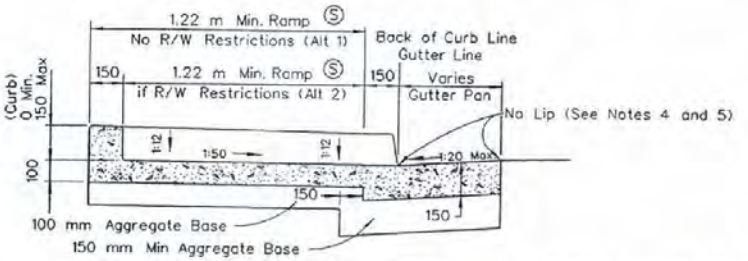
Alt 1: Back Curb Outside Sidewalk - No R/W Restrictions
Alt 2: Back Curb Inside Sidewalk - if R/W Restrictions
Alt 3: No Back Curb

Grade (%) "B" to "A"	"A" (m) Min.	"B" (m) Min.
-6 to -5.01	1.37	6.55
-5 to -4.01	1.37	4.57
-4 to -3.01	1.37	3.66
-3 to -2.01	1.52	2.90
-2 to -1.01	1.68	2.44
-1 to 1	2.13	2.13
1.01 to 2	2.44	1.68
2.01 to 3	2.90	1.52
3.01 to 4	3.66	1.37
4.01 to 5	4.57	1.37
5.01 to 6	6.55	1.37

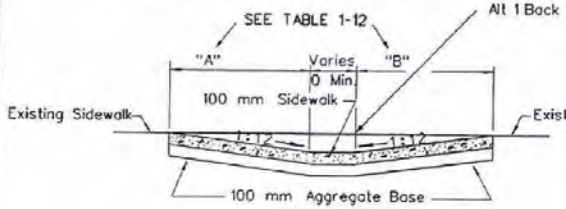
TABLE 1-12
Transition Lengths for 1:12 Side Slopes



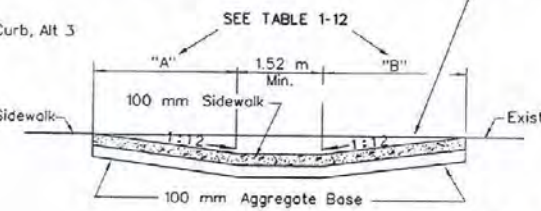
SECTION C-C WITHOUT BACK CURB



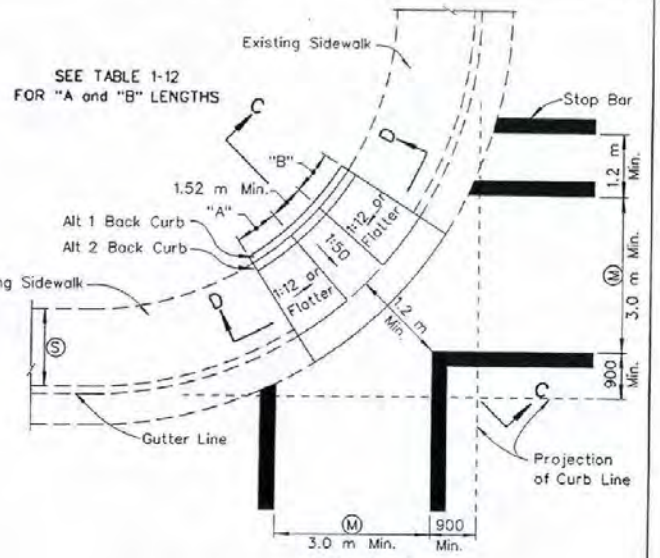
SECTION C-C WITH BACK CURB



SECTION A-A



SECTION D-D



CURB RAMP TYPE D

GENERAL NOTES:

1. IF RIGHT OF WAY IS AVAILABLE, USE TYPE A CURB RAMP.
2. SEE STRUCTURE LIST AND PLAN SHEETS FOR Ⓜ&Ⓢ. "A" AND "B".
3. GRATINGS OR SIMILAR ACCESSES SHALL NOT BE LOCATED IN AREA AT THE BASE OF THE CURB RAMP OR LANDING AREA.
4. NO LIP SHALL BE PERMITTED AT THE CURB RAMP SLOPE TO GUTTER PAN.
5. PLANTMIX BITUMINOUS OPEN-GRADED SURFACE SHALL BE FLUSH WITH THE EDGE OF THE GUTTER PAN IN THE AREA OF THE CURB RAMP.
6. ROUGH BROOM TEXTURE ON CURB RAMPS AND WINGS. TEXTURE SHALL PROVIDE A VISUAL CONTRAST TO THE SIDEWALK.
7. ALL RAMPS SHALL BE 1:12 OR FLATTER.
8. ALL SLOPE RATES ARE RELATIVE TO LEVEL.
9. IF THERE ARE R/W RESTRICTIONS, SIDEWALK WIDTHS CAN BE REDUCED TO 1.22 m WITH PRIOR APPROVAL FROM ASSISTANT CHIEF ROAD DESIGN ENGINEER. A 1.52 m x 1.52 m PASSING ZONE IS REQUIRED EVERY 61 m PER ADA. APPENDIX C. SECTION 4.3.4.
10. CONCRETE SHALL BE CLASS A OR AA.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

METRIC NDOT

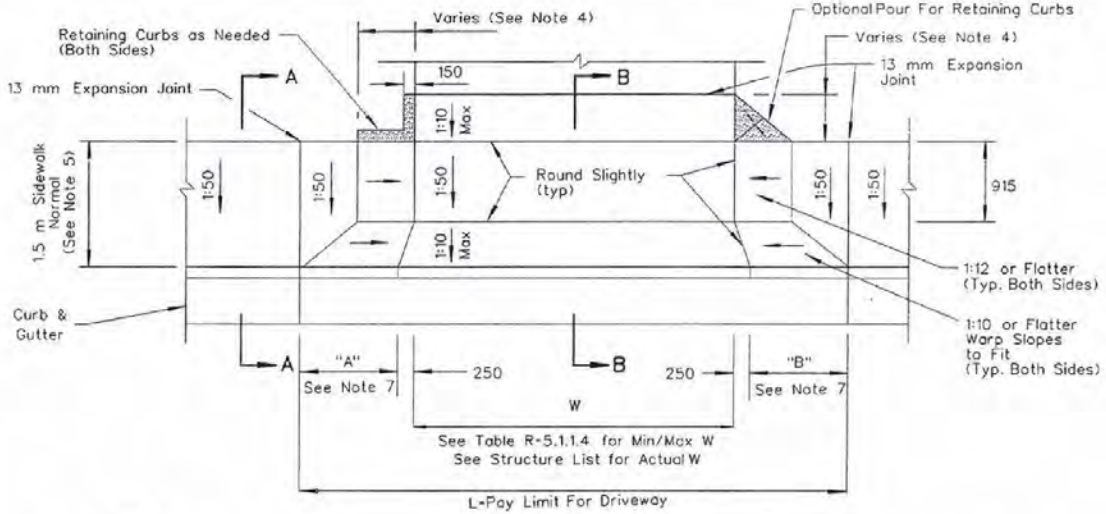
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

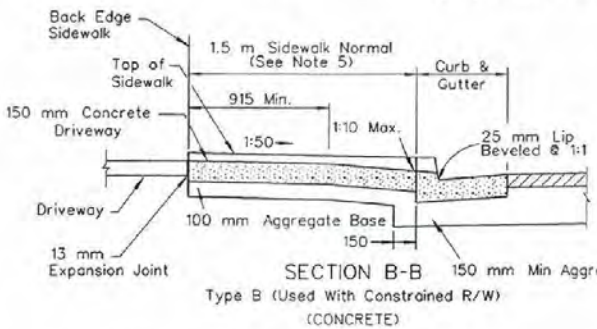
SIDEWALKS, CURB RAMPS, CROSS WALK MARKINGS (EXISTING SIDEWALKS)

R-5.1.1.2 (613)

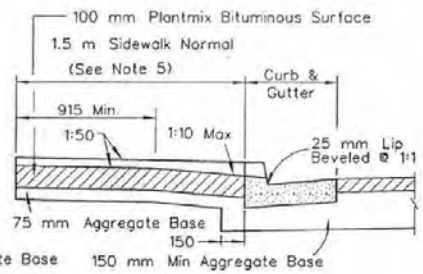
CHIEF ROAD DESIGN ENGR. | ADOPTED: 7/96 | REVISION 10/97

R-40

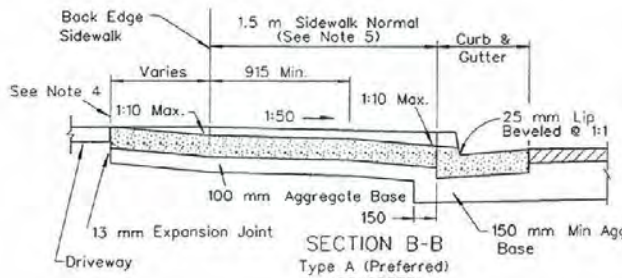




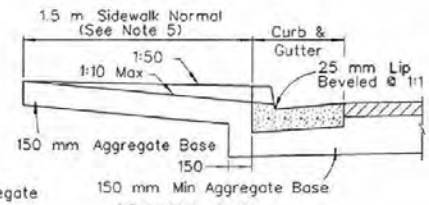
SECTION B-B
Type B (Used With Constrained R/W)
(CONCRETE)



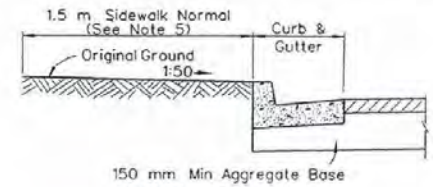
SECTION B-B
(BITUMINOUS SURFACE)



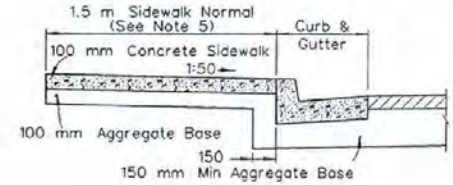
SECTION B-B
Type A (Preferred)
(CONCRETE)



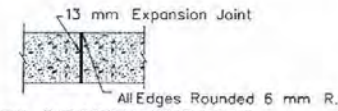
SECTION B-B
(AGGREGATE)



SECTION A-A
(ORIGINAL GROUND)



SECTION A-A
(CONCRETE)



TYPICAL EXPANSION JOINT DETAIL
(ELEVATION)

GENERAL NOTES:

1. ALL RAMPS SHALL BE 1:12 OR FLATTER.
2. CONCRETE DRIVEWAY CAN BE POURED MONOLITHICALLY WITH CURB AND GUTTER.
3. ALL SLOPE RATES ARE RELATIVE TO LEVEL.
4. LENGTH VARIES ACCORDING TO CURB AND GUTTER PROFILE. RETAINING CURBS AND ACQUISTION OF CONSTRUCTION EASEMENTS MAY BE NECESSARY.
5. IF THERE ARE R/W RESTRICTIONS, SIDEWALK WIDTHS CAN BE REDUCED TO 1.22 m WITH PRIOR APPROVAL FROM ASSISTANT CHIEF ROAD DESIGN ENGINEER. A 1.52 m x 1.52 m PASSING ZONE IS REQUIRED EVERY 61 m PER ADA, APPENDIX C, SECTION 4.3.4.
6. CONCRETE SHALL BE CLASS A OR AA.
7. SEE TABLE 1-10, R-5.1.1.1.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

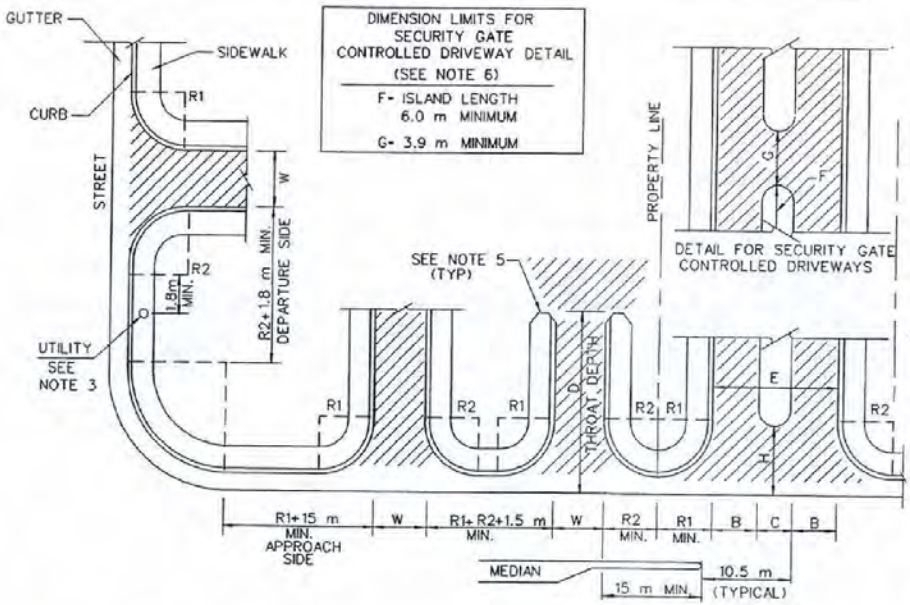
SINGLE FAMILY DRIVEWAYS WITH CURB

CHIEF ROAD DESIGN ENGR.

R-5.1.1.3 (613)
ADOPTED: 7/96
REVISION 8/97

R-41

DIMENSION LIMITS (SEE NOTE 6)	
W= 3.6 m MINIMUM FOR ONE-WAY DRIVEWAYS 7.2 m MINIMUM FOR TWO-WAY DRIVEWAYS 12 m MAXIMUM	D= THROAT DEPTH 7.5 m MINIMUM 10.5 MINIMUM FOR PARKING LOTS OF > 50 CARS/DRIVE 19.5 m MINIMUM FOR PARKING LOTS OF > 150 CARS/DRIVE 30.0 m MINIMUM FOR PARKING LOTS OF > 300 CARS/DRIVE
B= 6.0 m MINIMUM & 7.5 m MAXIMUM	
C= 2.1 m MINIMUM, FACE TO FACE	
E= 15.0 m MINIMUM	
H= 2.4 m MINIMUM & 4.5 m MAXIMUM	
R1= 4.5 m MIN. & 10.5 m MAX.	R2= 7.5 m MIN. & 10.5 m MAX.



DIMENSION LIMITS FOR SECURITY GATE CONTROLLED DRIVEWAY DETAIL (SEE NOTE 6)

F= ISLAND LENGTH 6.0 m MINIMUM

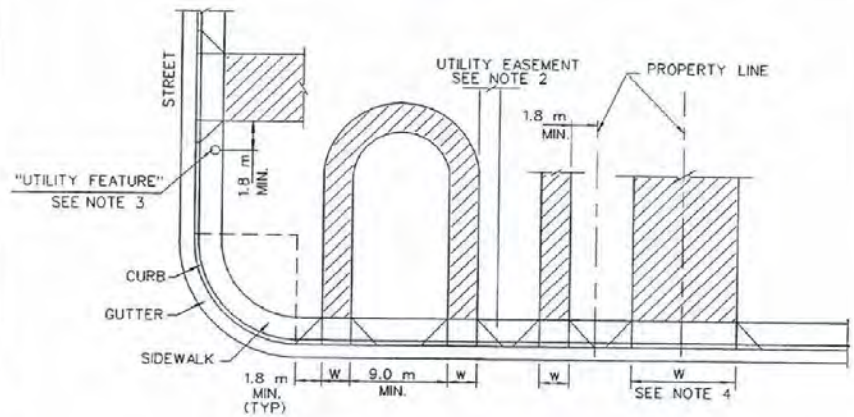
G= 3.9 m MINIMUM

DETAIL FOR SECURITY GATE CONTROLLED DRIVEWAYS

GENERAL NOTES:

1. INDUSTRIAL, AND MULTI-FAMILY DRIVEWAYS SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD DRAWING NUMBERS R-5.1.1.5.
2. THE TOTAL WIDTH "W" OF DRIVEWAY CURB OPENINGS SHALL NOT EXCEED 65% OF FRONT FOOTAGE.
3. NO DRIVEWAY SHALL BE LOCATED WITHIN 1.8 m OF A LIGHT POLE, FIRE HYDRANT, MAIL BOX, ABOVE-GROUND ELECTRICAL TRANSFER BOX, OR BLOCK WALL HIGHER THAN 0.6 m.
4. THE CENTERLINES OF DRIVEWAYS ON OPPOSITE SIDES OF THE STREET AT A MEDIAN OPENING SHOULD BE D ±3 m FROM EACH OTHER. WHEN A PROPERTY LINE FALLS IN A MEDIAN OPENING A JOINT DRIVEWAY AGREEMENT SHALL BE REQUIRED OR NO DRIVEWAY WILL BE ALLOWED.
5. HANDICAPPED ACCESSIBLE SIDEWALKS SHALL BE PROVIDED. SEE STANDARD DRAWINGS R-5.1.1.1 TO R-5.1.1.3
6. FOR ACTUAL DIMENSIONS SEE STRUCTURE LIST.

INDUSTRIAL, COMMERCIAL, AND MULTI-FAMILY DRIVEWAY GEOMETRICS



W = WIDTH OF DRIVEWAY = 3.6 m MIN.
4.8 m MAX. FOR 1 OR 2 CAR GARAGE, OR
8.4 m MAX. FOR 3 GARAGE

GENERAL NOTES:

1. ALL RESIDENTIAL PROPERTIES MAY HAVE ONLY ONE CURB CUT EXCEPT CIRCULAR DRIVEWAYS AS SHOWN.
2. NO DRIVEWAY SHALL BE LOCATED WHOLLY OR PARTIALLY, ON OR OVER A UTILITY EASEMENT WHICH RUNS PERPENDICULAR TO THE CURB LINE.
3. NO DRIVEWAY SHALL BE LOCATED WITHIN 1.8 m OF A LIGHT POLE, FIRE HYDRANT, MAIL BOX, ABOVE-GROUND ELECTRICAL TRANSFER BOX. BLOCK WALL HIGHER THAN 0.6 m, OR THE CURB RETURN AT A STREET INTERSECTION OR ALLEY.
4. COMMON DRIVEWAY CONSTRUCTION MAY BE PERMITTED AT ANY TWO RESIDENTIAL PROPERTIES OF 18 m IN WIDTH OR LESS. THE WIDTH OF THE JOINT DRIVEWAY SHALL BE A MAXIMUM OF 7.2 m. A JOINT DRIVEWAY AGREEMENT SHALL BE REQUIRED.
5. MULTI-FAMILY RESIDENTIAL AND ALL NON-RESIDENTIAL DRIVEWAYS SHALL CONFORM TO THE COMMERCIAL DRIVEWAY STANDARDS.
6. ALL DRIVEWAY LOCATIONS SHALL BE SUBJECT TO REVIEW AND APPROVAL BY THE ENGINEER.
7. FOR CURB RAMPS AND DRIVEWAY APRON DETAIL, SEE STD. DWGS. NO. R-51.1.1 TO R-5.1.1.3.

RESIDENTIAL DRIVEWAY GEOMETRICS

METRIC NDOT

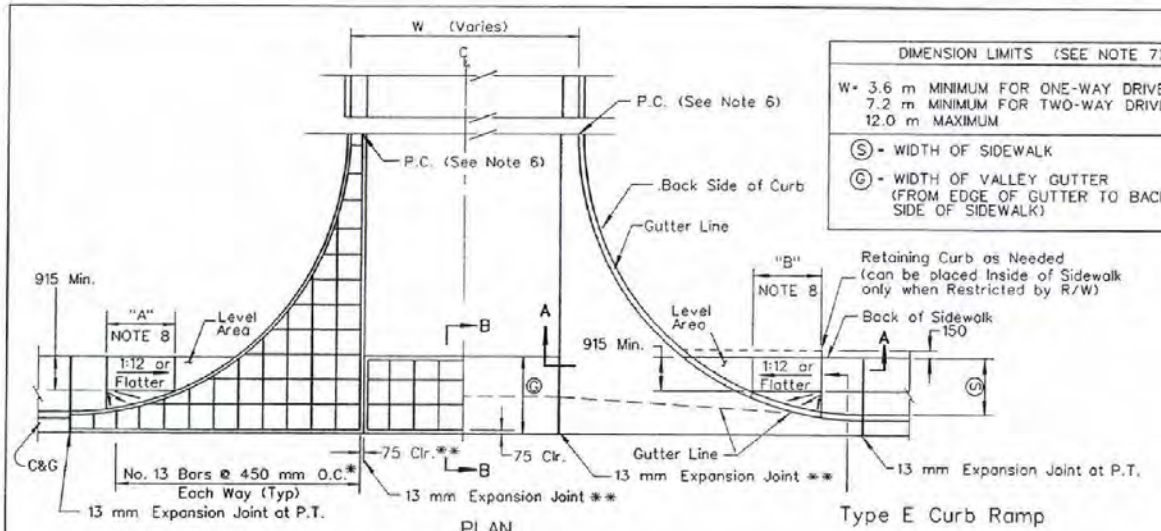
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

DRIVEWAY GEOMETRICS

CHIEF ROAD DESIGN ENGR.

R-5.1.1.4	(613)
ADOPTED: 7/95	REVISION 8/97

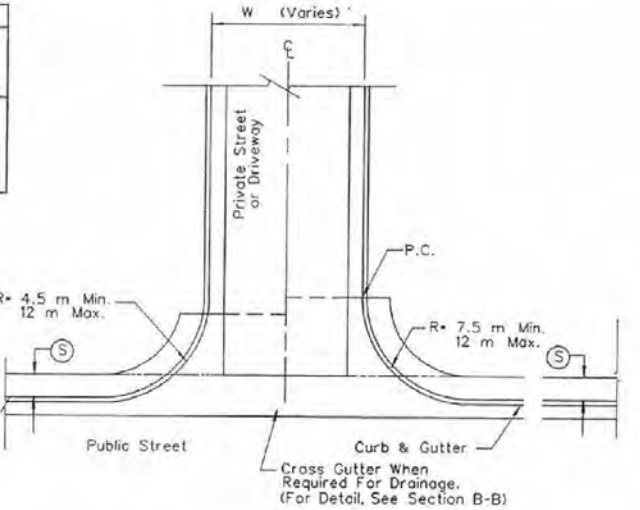


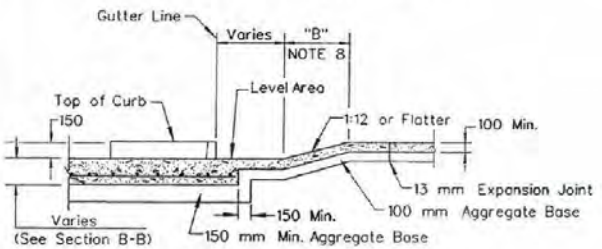
PLAN

* - See Note 1.
** - For Optional Sectional Pour, See Note 2.

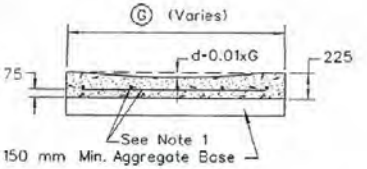
DIMENSION LIMITS (SEE NOTE 7)
W= 3.6 m MINIMUM FOR ONE-WAY DRIVEWAYS 7.2 m MINIMUM FOR TWO-WAY DRIVEWAYS 12.0 m MAXIMUM
Ⓢ - WIDTH OF SIDEWALK
Ⓖ - WIDTH OF VALLEY GUTTER (FROM EDGE OF GUTTER TO BACK OF SIDE OF SIDEWALK)

Type E Curb Ramp

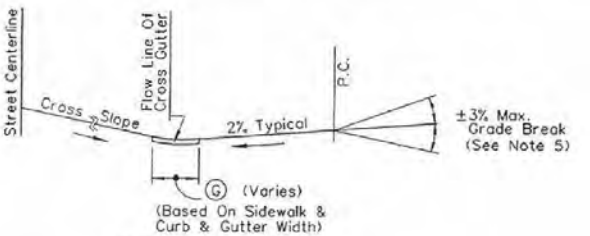




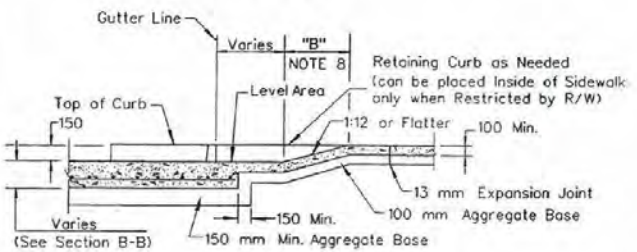
SECTION A-A



SECTION B-B



TYPICAL CROSS SECTION
℄



SECTION A-A WITH RETAINING CURB

GENERAL NOTES:

1. SPACING OF NO. 13 BARS LESS THAN 450 mm TO MEET LOCAL CODES SHALL BE NOTED IN THE STRUCTURE LIST.
2. WHEN CONSTRUCTING DRIVEWAYS WHERE CURB AND GUTTER EXISTS, COMPLETELY REMOVE EXISTING SECTIONS. DRIVEWAY MAY BE POURED MONOLITHIC TO A.C. LINE, IN WHICH CASE THE BARS SHALL BE CONTINUOUS. IF OPTIONAL SECTIONAL POUR IS USED, EXPANSION JOINTS AND REBAR END CLEARANCE SHALL APPLY AS SHOWN.
3. CONCRETE SHALL BE CLASS A OR AA.
4. CURB RAMPS SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD DRAWINGS R-5.1.1.1 TO R-5.1.1.3.
5. FOR GRADE CHANGES GREATER THAN 3%, VERTICAL CURVES OF AT LEAST 3.0 m MUST BE USED.
6. DRIVEWAY GEOMETRICS SHALL GO TO THE P.C.
7. FOR ACTUAL DIMENSIONS SEE STRUCTURE LIST.
8. SEE TABLE I-12, DRAWING R-5.1.1.2, FOR "A" AND "B".

METRIC NDOT

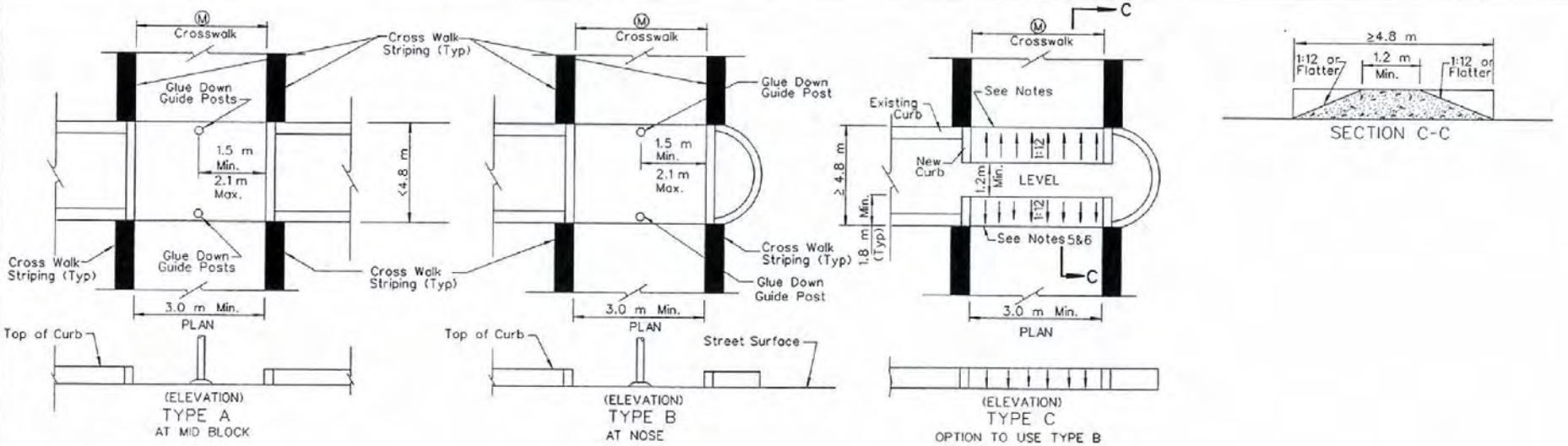
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

MULTI-FAMILY, COMMERCIAL & INDUSTRIAL DRIVEWAY DETAILS

CHIEF ROAD DESIGN ENGR.

R-5.1.1.5	(613)
ADOPTED: 7/96	REVISION 9/97



Ⓜ - CROSS WALK

R-44

GENERAL NOTES:

1. ALL CURB RAMPS SHALL BE 1:12 OR FLATTER.
2. SEE PLAN SHEETS FOR Ⓜ.
3. GRATING OR SIMILAR ACCESSES SHALL NOT BE LOCATED IN AREA AT THE BASE OF THE CURB RAMP OR LANDING AREA.
4. NO LIP SHALL BE PERMITTED AT THE CURB RAMP SLOPE TO GUTTER PAN.
5. PLANTMIX BITUMINOUS OPEN-GRADED SURFACE SHALL BE FLUSH WITH THE EDGE OF THE GUTTER PAN IN THE AREA OF THE CURB RAMP.
7. ROUGH BROOM TEXTURE ON CURB RAMPS AND WINGS. TEXTURE SHALL PROVIDE A VISUAL CONTRAST TO THE MEDIAN ISLAND.
8. CONCRETE SHALL BE CLASS A OR AA.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

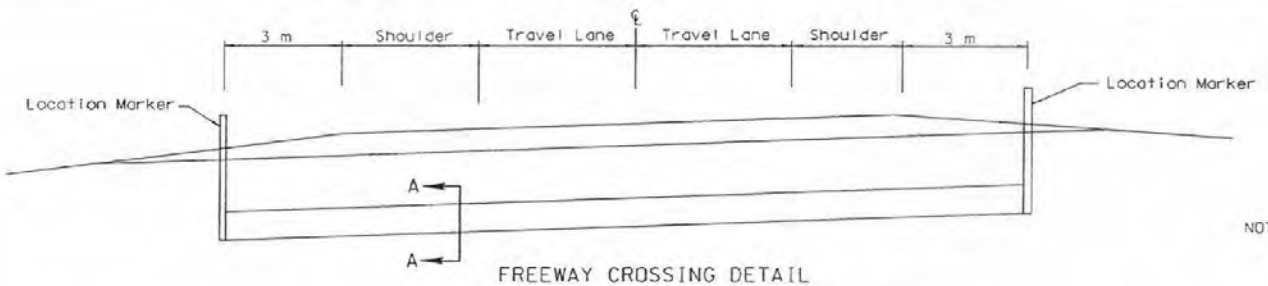
MEDIAN ISLANDS, CURB RAMPS, CROSS WALK MARKINGS

CHIEF ROAD DESIGN ENGR.

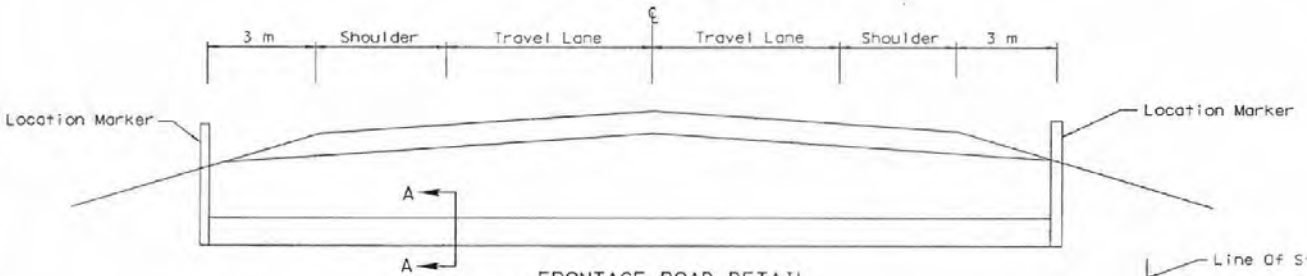
R-5.1.1.6 (613)

ADOPTED: 7/96

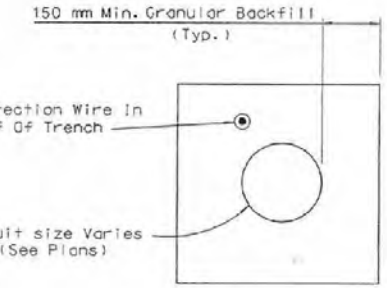
REVISION 8/97



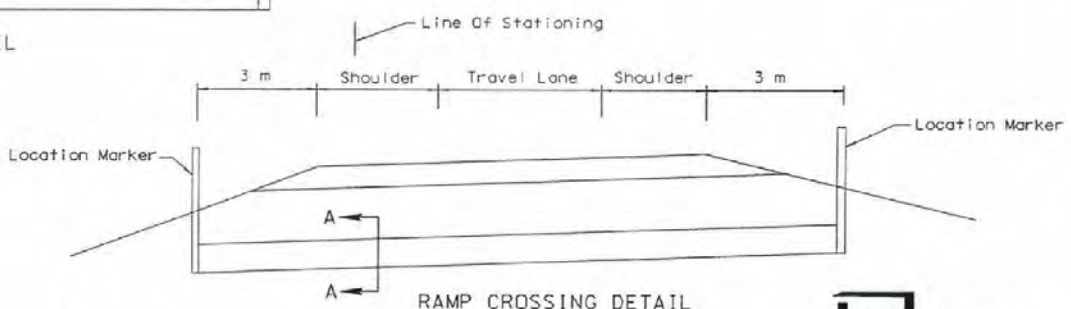
FREEWAY CROSSING DETAIL



FRONTAGE ROAD DETAIL



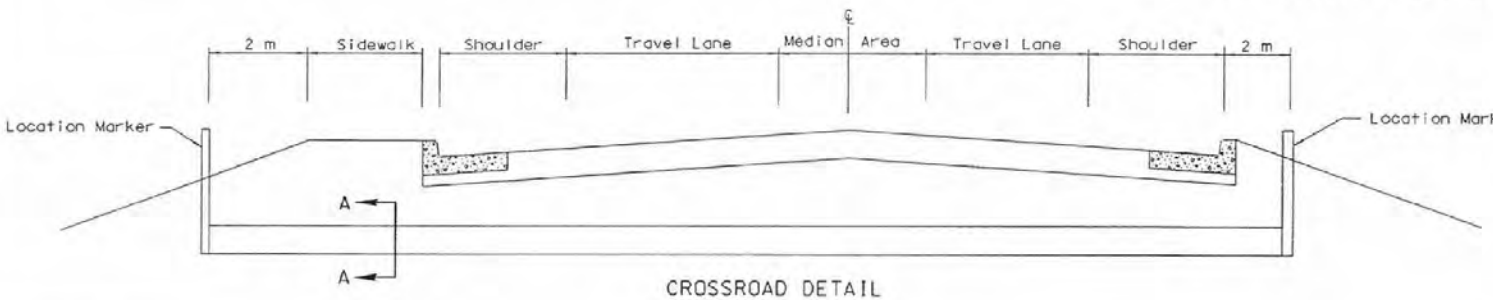
SECTION A-A



RAMP CROSSING DETAIL

GENERAL NOTES:

1. MINIMUM 900 mm COVER OVER TOP OF CONDUIT AT SHOULDER LINE.
2. 2.6 mm BARE COPPER DETECTION WIRE TO LAY IN TRENCH ADJACENT TO CONDUIT AND ATTACH TO LOCATION MARKER AT EACH END.
3. LOCATION MARKER SHALL BE 50 mm P.V.C. OR 1.5 m STEEL FENCE POSTS.



CROSSROAD DETAIL

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

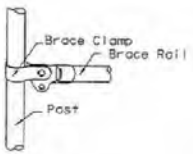
CONDUIT INSTALLATION FOR FUTURE WATER LINES

CHIEF ROAD DESIGN ENGR. | R-5.1.2 | ADOPTED: 7/96 | REVISION

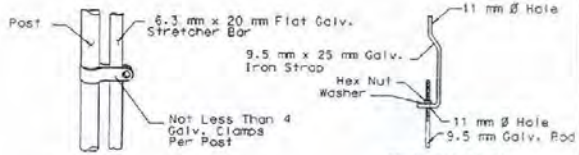
R-45

SIZE OF POSTS–STANDARD FENCING

FENCE HEIGHT	CORNER, END & PULL			LINE		BRACES		
	ROUND PIPE O.D.	MIN. MASS (kg/m) CLASS 1	MIN. MASS (kg/m) CLASS 2	T-SECTION	MIN. MASS (kg/m)	ROUND PIPE O.D.	MIN. MASS (kg/m) CLASS 1	MIN. MASS (kg/m) CLASS 2
0.9 m to 1.8 m	60 mm	5.43	3.93	———	1.93	42 mm	3.38	2.16

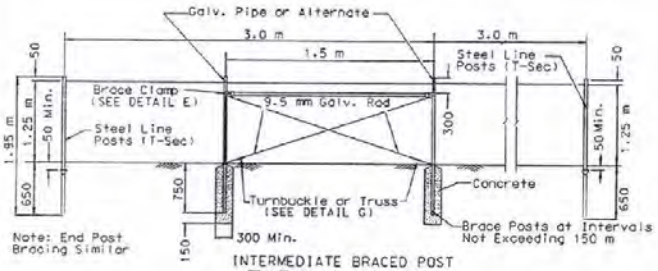


DETAIL E

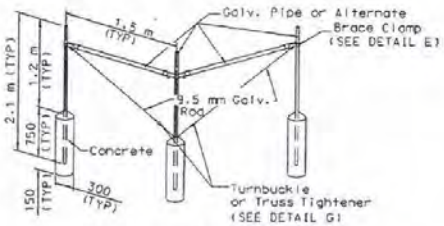


DETAIL F

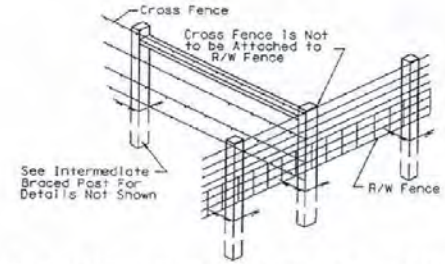
TRUSS TIGHTENER
DETAIL G



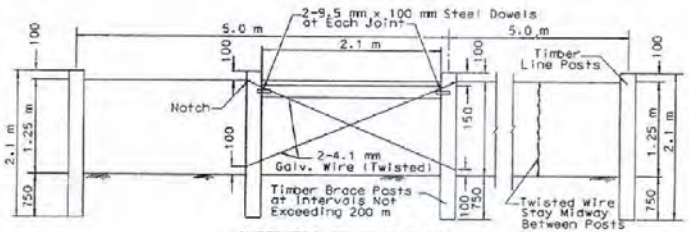
INTERMEDIATE BRACED POST
TYPE A FENCE



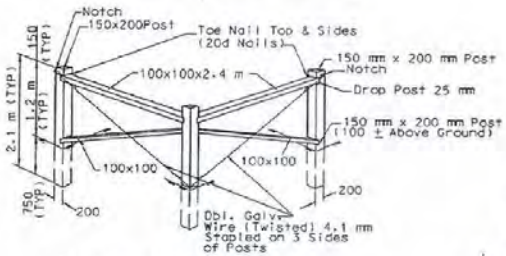
CORNER BRACE FOR
TYPE A FENCE



TYPICAL EXISTING CROSS FENCE TIE



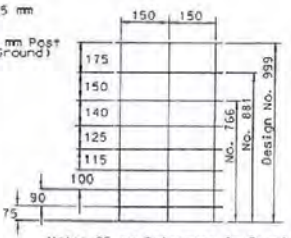
INTERMEDIATE BRACED POST
TYPE B FENCE



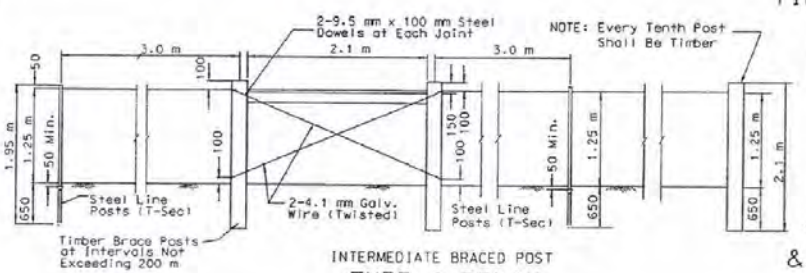
TIMBER CORNER BRACE

GENERAL NOTES:

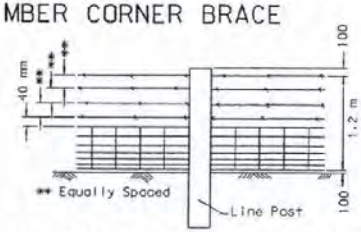
1. FENCE POSTS AND MATERIALS SHALL CONFORM TO THE REQUIREMENTS OF STANDARD SPECIFICATIONS AND SUPPLEMENTS.
2. STANDARD FENCING SHALL CONSIST OF GALVANIZED BARBED WIRE, GALVANIZED WOVEN WIRE (FARM FENCE) OR A COMBINATION OF BOTH ON WOOD OR METAL POSTS OR COMBINATIONS OF POSTS.
3. BARBED WIRE SHALL BE SPACED AS FOLLOWS:
   4 WIRE: BOTTOM WIRE 390 mm ABOVE GROUND. OTHER SPACING 290 mm
   5 WIRE: BOTTOM WIRE 250 mm ABOVE GROUND. OTHER SPACING 250 mm
4. STANDARD FENCING WILL BE DESIGNATED BY TYPE, DESIGN OF FABRIC, AND/OR NUMBER OF BARBED WIRES. THUS:
   TYPE A-881-3B DESIGNATES METAL POSTS, 810 mm WOVEN (FARM) WIRE, AND 3 BARBED WIRES;
   TYPE B-43 DESIGNATES WOOD POSTS, 4 BARBED WIRES;
   TYPE C-766-4B DESIGNATES COMBINATION OF WOOD AND METAL POSTS, 660 mm WOVEN (FARM) WIRE, 4 BARBED WIRES.
5. CONCRETE SHALL BE CLASS A OR AA.



WOVEN WIRE (FARM FENCE)
FABRIC



INTERMEDIATE BRACED POST
TYPE C FENCE



TYPICAL DETAIL OF WOVEN WIRE
& BARBED WIRE FENCE APPLICABLE
TO TYPE A,B & C FENCING

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

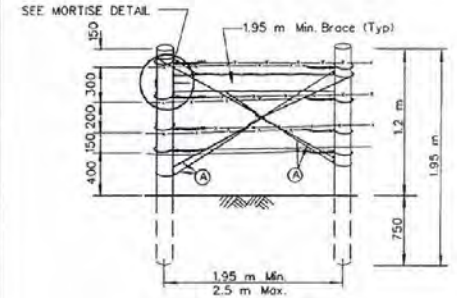
FENCE DETAILS

CHIEF ROAD DESIGN ENGR.

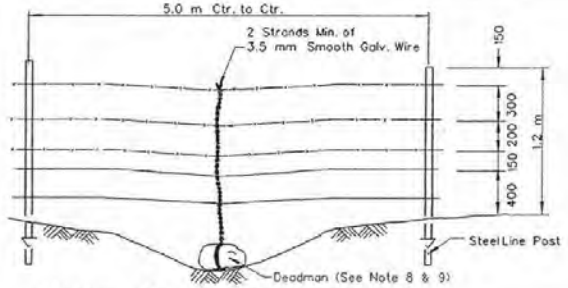
R-6.1.1 (616.724)

ADOPTED: 7/96 | REVISION

R-46



STRESS PANEL

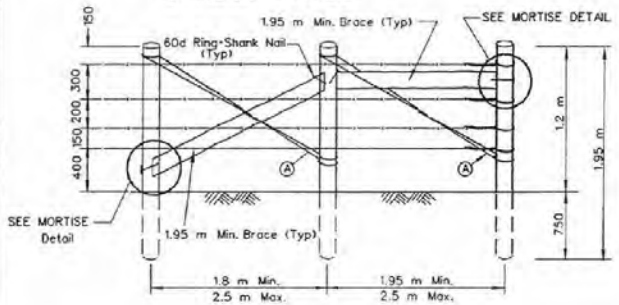


PANEL AT MINOR DEPRESSION

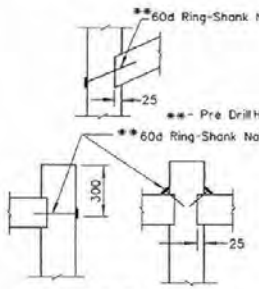
OR INTERMITTANT STREAM

GENERAL NOTES:

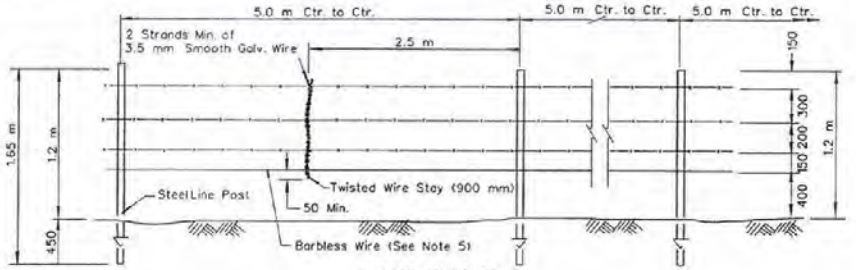
1. STRESS PANELS SHALL BE PLACED EVERY 400 m ON TANGENTS.
2. STRESS PANELS SHALL BE PLACED EVERY 200 m ON CURVES.
3. END PANELS SHALL BE USED WHEREVER A BREAK IN THE FENCE OCCURS. (I.E. GATES, CATTLEGURDS) AND AT THE BEGINNING AND ENDING OF ALL CURVES.
4. SEE TABLE A FOR WOOD POST SPACING ON CURVES.
5. BARBED WIRE SHALL BE USED FOR BOTTOM STRAND WHEN REQUIRED BY NEV. DEPT. OF WILDLIFE OR BUREAU OF LAND MANAGEMENT.
6. WIRES ARE TO BE TIED OFF AT STRETCH POINTS WRAP AND SPLICE TO SELF WITH AT LEAST 4 TURNS AT OPPOSITE END OF PANELS.
7. WOOD POSTS SHALL BE 150 mm NOMINAL DIAMETER.
8. ADD ADDITIONAL STRAND OF BARBED WIRE AND/OR A ROCK DEADMAN (MIN. MASS 25 kg) WHEN SPACE BETWEEN BOTTOM WIRE AND GROUND EXCEEDS 500 mm.
9. STEEL POST DEADMAN DRIVEN APPROXIMATELY 1 m INTO GROUND MAY BE USED IN LIEU OF ROCK DEADMAN.



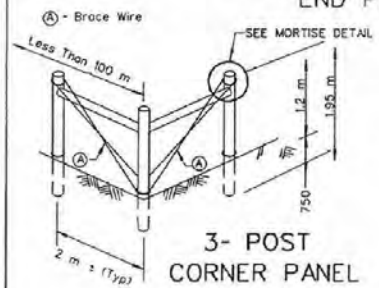
END PANEL



MORTISE DETAIL

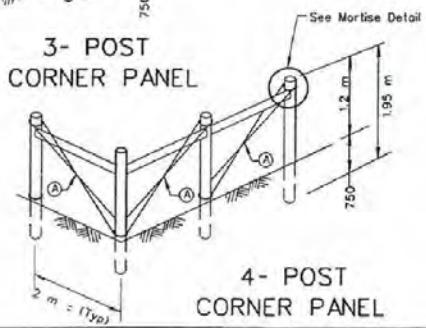


LINE PANELS

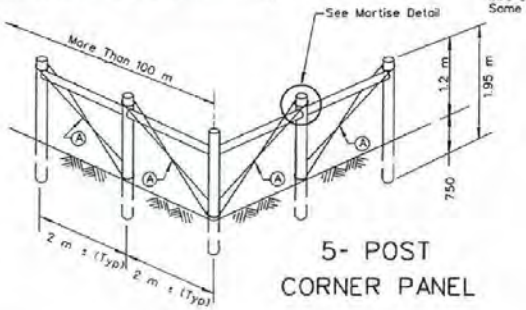


3- POST
CORNER PANEL

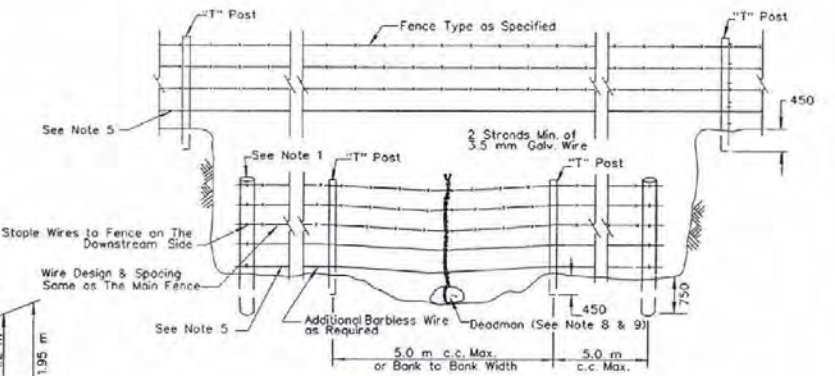
TABLE A: WOOD POST SPACING ON CURVED FENCE LINES	
RADIUS OF CURVE AT FENCE LINE (m)	RATIO (STEEL POST : WOOD POST)
< 300	3:1
300 TO 749.9	4:1
750 TO 1499.9	7:1
1500 TO 3000	NO WOOD POST NEEDED BETWEEN STRESS PANELS AT 200 METERS.
> 3000	TREAT CURVE AS TANGENT



4- POST
CORNER PANEL



5- POST
CORNER PANEL



DRAINAGE CROSSING

METRIC
NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

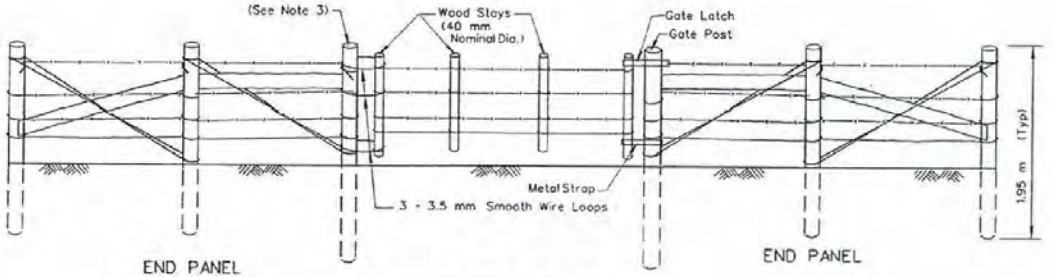
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

NEVADA 4-WIRE FENCE PANEL DETAILS (TYPE C-NV-4B)

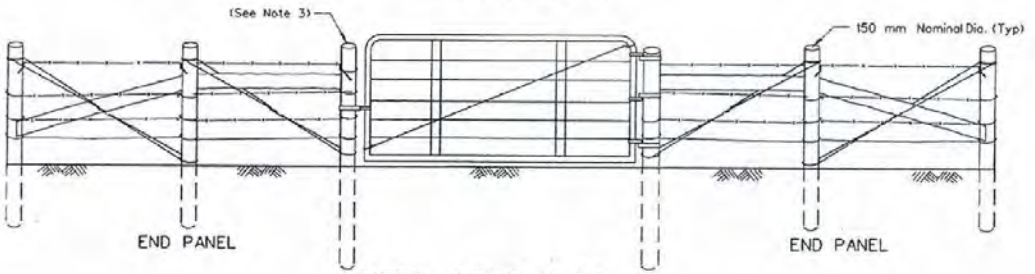
CHIEF ROAD DESIGN ENGR.

R-6.1.2	(616, 724)
ADOPTED: 7/96	REVISION 8/97

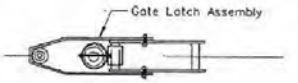
R-47



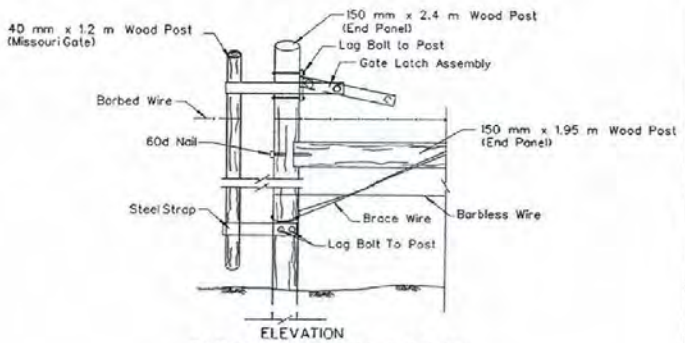
MISSOURI GATE



METAL DRIVE GATE



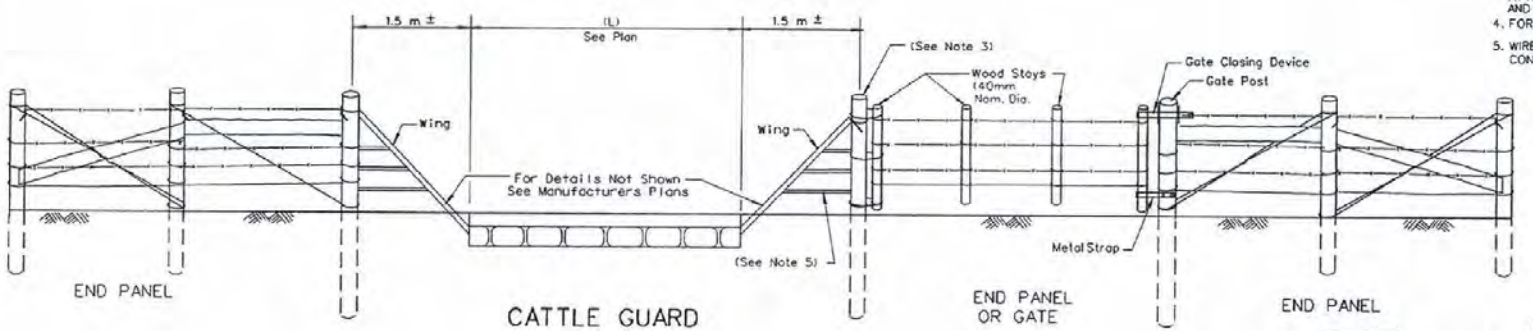
PLAN



TYPICAL GATE LATCH

GENERAL NOTES:

1. SPACING BETWEEN WIRES ON MISSOURI GATE SHALL BE THE SAME AS WIRES ON ADJACENT FENCE.
2. GATE LATCH SHALL BE LAG BOLTED FIRMLY TO THE GATE POST.
3. HINGE POSTS, LATCH POSTS, AND CATTLE GUARD WING ATTACHMENT POSTS SHALL BE 2.4 m IN LENGTH AND SHALL BE BURIED 1 m IN GROUND.
4. FOR END PANEL DETAILS, SEE SHEET R-6.1.2.
5. WIRE MAY BE USED IN LIEU OF METAL STRAP FOR CONNECTION OF CATTLEGUARD WING TO FENCE POST.



CATTLE GUARD

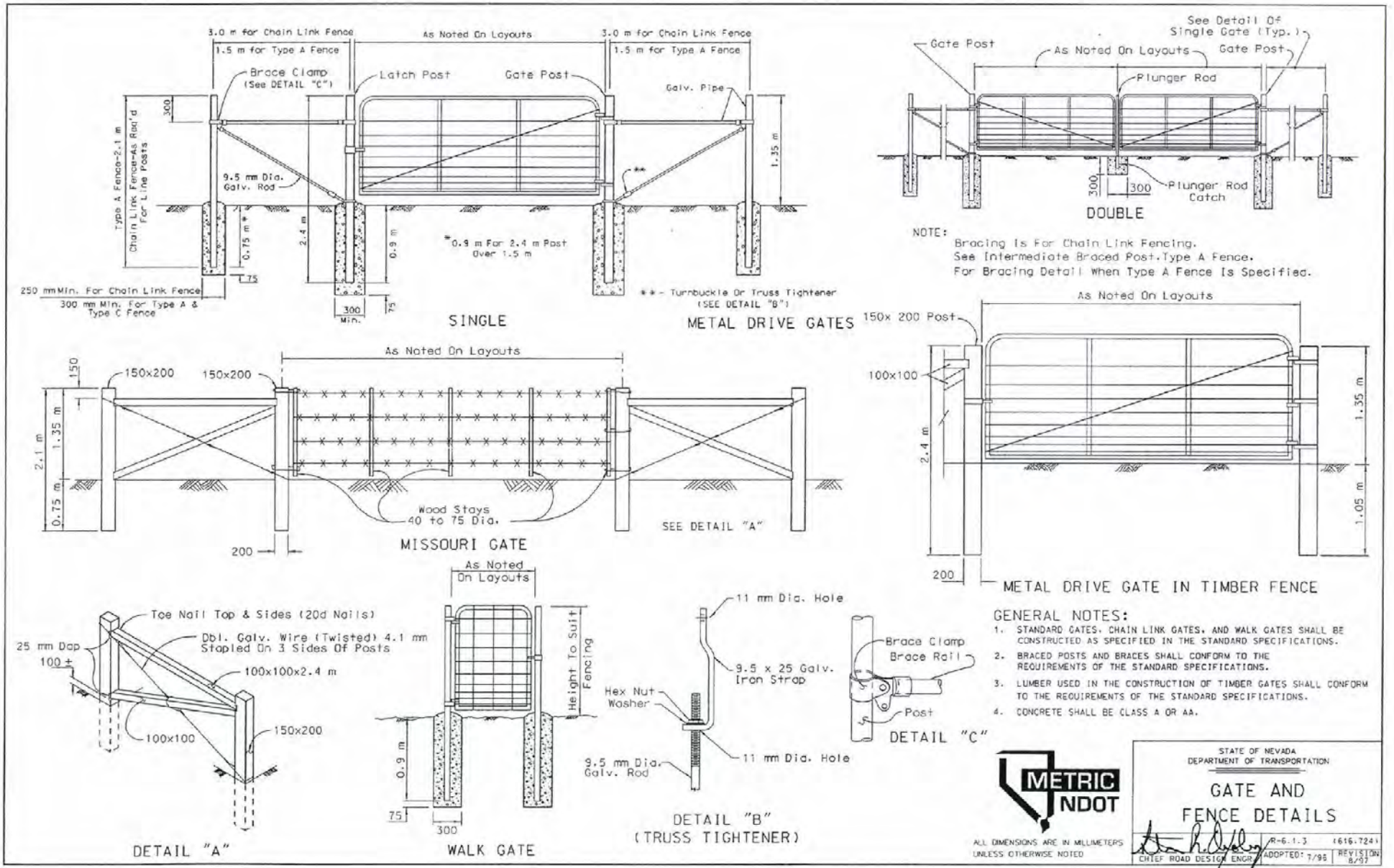
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

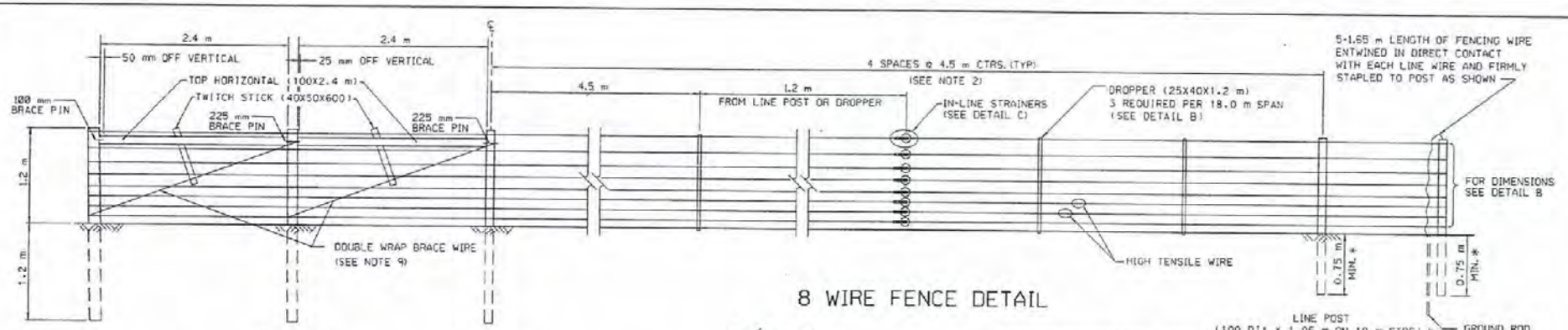
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

NEVADA 4-WIRE FENCE GATE DETAILS (TYPE C-NV-4B)

CHIEF ROAD DESIGN ENGR.

R-6.1.2.1 (616, 724)
ADOPTED: 7/96
REVISION 8/97

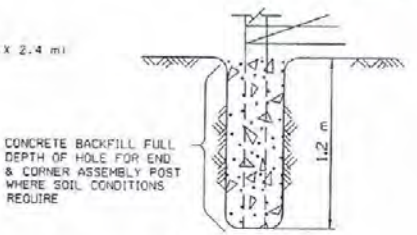

3.0 m for Chain Link Fence
1.5 m for Type A Fence
As Noted On Layouts
3.0 m for Chain Link Fence
1.5 m for Type A Fence
Brace Clamp (See DETAIL "C")
Latch Post
Gate Post
Galv. Pipe
Type A Fence-2.1 m Chain Link Fence-As Req'd For Line Posts
300
9.5 mm Dia. Galv. Rod
0.75 m*
2.4 m
0.9 m
1.35 m
75
250 mm Min. For Chain Link Fence
300 mm Min. For Type A & Type C Fence
300 Min.
75
*0.9 m For 2.4 m Post Over 1.5 m
** - Turnbuckle Or Truss Tightener (SEE DETAIL "B")
SINGLE
Gate Post
As Noted On Layouts
See Detail Of Single Gate (Typ.)
Gate Post
Plunger Rod
300
300
Plunger Rod Catch
DOUBLE
NOTE:
Bracing Is For Chain Link Fencing.
See Intermediate Braced Post.Type A Fence.
For Bracing Detail When Type A Fence Is Specified.
METAL DRIVE GATES
As Noted On Layouts
150
150x200
150x200
2.1 m
1.35 m
0.75 m
Wood Stays 40 to 75 Dia.
SEE DETAIL "A"
200
MISSOURI GATE
150x 200 Post
100x100
2.4 m
1.35 m
1.05 m
200
METAL DRIVE GATE IN TIMBER FENCE
Toe Nail Top & Sides (20d Nails)
25 mm Dap
100 ±
Dbl. Galv. Wire (Twisted) 4.1 mm Stapled On 3 Sides Of Posts
100x100x2.4 m
100x100
150x200
DETAIL "A"
As Noted On Layouts
Height To Suit Fencing
0.9 m
75
300
WALK GATE
11 mm Dia. Hole
9.5 x 25 Galv. Iron Strap
Hex Nut
Washer
9.5 mm Dia. Galv. Rod
11 mm Dia. Hole
DETAIL "B" (TRUSS TIGHTENER)
Brace Clamp
Brace Rail
Post
DETAIL "C"
GENERAL NOTES:
1. STANDARD GATES, CHAIN LINK GATES, AND WALK GATES SHALL BE CONSTRUCTED AS SPECIFIED IN THE STANDARD SPECIFICATIONS.
2. BRACED POSTS AND BRACES SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS.
3. LUMBER USED IN THE CONSTRUCTION OF TIMBER GATES SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS.
4. CONCRETE SHALL BE CLASS A OR AA.
METRIC NDOT
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
GATE AND FENCE DETAILS
R-6.1.3
(616.724)
CHIEF ROAD DESIGN ENGR.
ADOPTED: 7/98
REVISED 8/07



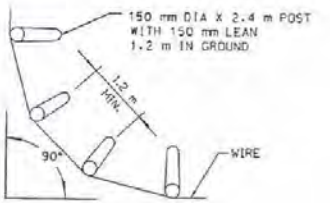
8 WIRE FENCE DETAIL

DOUBLE BRACE END ASSEMBLY

NOTE: FARM GATE 3.6 m OR LESS MAY BE INSTALLED ON POST AFTER FINAL WIRE TENSIONING.

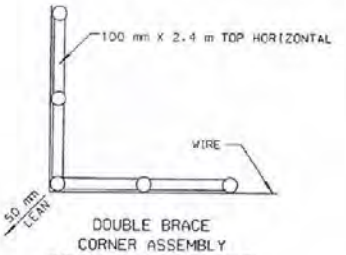


DETAIL A
POST WITH CONCRETE FILL



ALTERNATE FOUR POST CORNER ASSEMBLY

PLAN

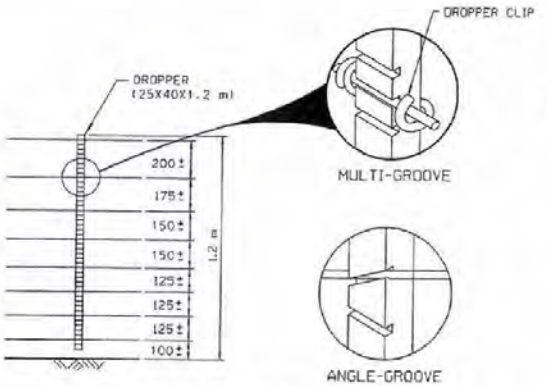


DOUBLE BRACE CORNER ASSEMBLY (FOR DETAILS-SEE ABOVE)

PLAN

CONSTRUCTION NOTES:

1. END POSTS AND LINE POSTS ARE RECOMMENDED TO BE MECHANICALLY DRIVEN INTO THE GROUND WHERE SOIL CONDITIONS PERMIT. TO BE DETERMINED BY THE ENGINEER.
2. MAXIMUM POST SPACING IS 18.0 m ON LEVEL TERRAIN WITH DROPPERS ON 4.5 m CENTERS. POST SPACING MAY BE DECREASED DUE TO TERRAIN CONDITIONS. DROPPER SPACING WILL REMAIN ON 4.5 m MAX. CENTERS. MINIMUM LINE POST SPACING WILL BE ON 4.5 m CENTERS WITHOUT DROPPERS. WITH 100 mm DIAMETER. SMALL END. LINE POST WHEN NEEDED.
3. PLACEMENT OF IN-LINE STRAINERS SHALL BE AS CLOSE TO THE CENTER OF THE FENCE RUN AS POSSIBLE. PLACEMENT OF TENSION INDICATOR SPRING SHALL BE ON THE SECOND WIRE FROM THE TOP. COMPRESSION OF THE INDICATOR SPRING BY 45 mm WILL INDICATE A TENSION OF APPROXIMATELY 115kg ± 5kg).
4. MAXIMUM LENGTH OF WIRE PER IN-LINE STRAINER ON LEVEL TERRAIN: 1500 m: 1-90 DEGREE CORNER; 900 m: 2-90 DEGREE CORNERS; 600 m: 3-90 DEGREE CORNERS; 450 m: 4-90 DEGREE CORNERS; 300 m. FOR UNEVEN TERRAIN REDUCE DISTANCES BY 150 m FOR EACH MAJOR RISE AND DIP. DIP OR RISE POSTS SHALL BE A MINIMUM OF 100 mm DIAMETER SMALL END. 2.4 m LONG. POSITIONED AT HIGH POINTS OF RIDGES AND LOW POINTS OF GULLIES.
5. EXCEPT FOR FASTENING LINE WIRE. WHICH HAS BEEN STRUNG AROUND THE OUTSIDES OF WOOD POSTS IN CORNERS AND CURVES. FENCE STAPLES SHOULD NOT BE DRIVEN VERTICALLY INTO WOOD POSTS. ROTATING STAPLES SLIGHTLY AWAY FROM SLASH CUT POINTS WILL PROVIDE IMPROVEMENT IN RESISTANCE TO PULLOUT.
6. GROUND RODS OF GALVANIZED STEEL (16 mm×2.4 m). SHALL BE PLACED EVERY 45 m IN DRY SOILS. OR EVERY 90 m IN MOIST SOILS. SPECIFIC ROD POSITIONING TO BE DETERMINED BY THE ENGINEER. FENCE UNDER POWER LINES SHALL BE GROUNDED AT 3 POINTS. ONE DIRECTLY UNDER POWER LINE AND ONE EACH SIDE 7.5 m TO 15 m AWAY.
7. IT IS RECOMMENDED FOR TYING OFF WIRES ON END POSTS TO USE TWO (2) NICROPRESS SLEEVES CAT. NO. FW-2-3. MANUFACTURED BY THE NATIONAL TELEPHONE SUPPLY COMPANY OR ACCEPTABLE EQUAL.
8. IT IS RECOMMENDED FOR SPLICING WIRES TO USE THREE (3) NICROPRESS SLEEVES OR 1 RELIABLE WIRELINE. NUMBER 5057V. MANUFACTURED BY RELIABLE ELECTRIC COMPANY OR ACCEPTABLE EQUAL.
9. PROPER TENSION ON THE BRACE WIRE IN THE END ASSEMBLY IS ACCOMPLISHED BY TWISTING THE BRACE WIRE A MINIMUM OF 6 TURNS. TO A MAXIMUM OF 8 TURNS. THE TWITCH STICK SHOULD BE SECURELY FASTENED TO THE TOP HORIZONTAL BRACE POST.
10. LINE WIRES SHOULD BE STAPLED TO THE LINE POST ONLY AFTER TAKING UP PRELIMINARY TENSION (ABOUT 70 kg). ON EACH WIRE. STAPLES SHALL NOT BIND WIRE. AFTER STAPLING IS COMPLETED. TENSION EACH WIRE AN ADDITIONAL 45 kg. FOR A TOTAL OF 115 kg. INSTALL DROPPERS ONLY AFTER FINAL TENSION IS ON EACH WIRE. SEE CONSTRUCTION NOTE "C", ABOUT TENSION INDICATOR SPRING.
11. ADDITIONAL CONSTRUCTION NOTES MAY BE FOUND IN UNITED STATES STEEL CATALOG NO. T111575. "HOW TO BUILD FENCES WITH UNITED STATES STEEL MAX TEN 200 HIGH-TENSILE FENCE WIRE".
12. CONCRETE SHALL BE CLASS A OR AA.



DROPPER DETAIL B

DETAIL C
(IN-LINE WIRE STRAINERS AND TENSION INDICATOR SPRING)

SPECIFICATION NOTES:

A ALL WOOD POSTS AND DROPPERS SHALL BE PRESSURE TREATED IN ACCORDANCE WITH AASHTO DESIGNATION OR EQUIVALENT STATE SPECIFICATION.

B ALL FENCE WIRE, END AND CORNER BRACE ASSEMBLY WIRE SHALL CONSIST OF HIGH TENSILE FENCE WIRE 2.5 mm. WITH A MINIMUM OF 1379 MPa TENSILE STRENGTH AND CONFORMS WITH THE REQUIREMENTS FOR CLASS 3 ZINC COATING OF ASTM SPECIFICATION A116.

C BRACE PINS, DROPPER CLIPS, TENSION INDICATOR SPRINGS, AND IN-LINE STRAINERS SHALL CONFORM WITH THE REQUIREMENTS FOR CLASS 3 ZINC COATING OF ASTM SPECIFICATION A116.

D STAPLES ARE 45 mm. 3.5 mm WITH SLASH CUT POINTS AND SHALL CONFORM WITH THE REQUIREMENTS FOR CLASS 3 ZINC COATING OF ASTM SPECIFICATION A116.

METRIC NDOT

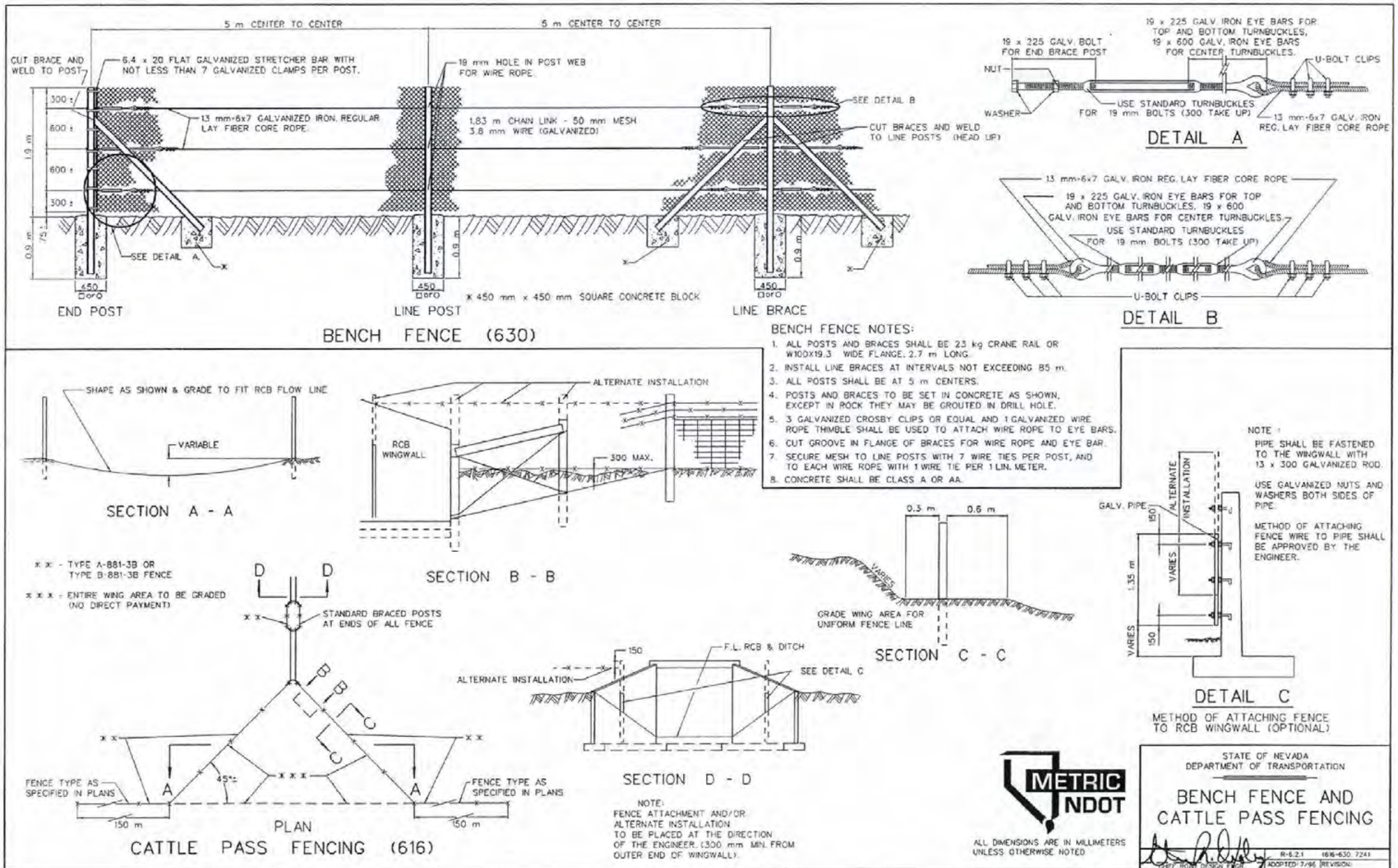
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

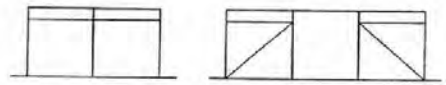
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

HIGH-TENSILE
8-WIRE RANGE FENCE

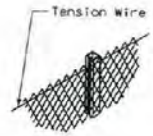
CHIEF ROAD DESIGN ENGR | R-6.1.4 | ADOPTED 7/98 | (616.724) | REVISION

R-50

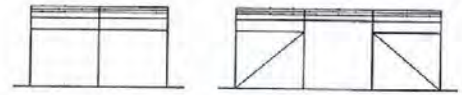

5 m CENTER TO CENTER
5 m CENTER TO CENTER
CUT BRACE AND WELD TO POST
6.4 x 20 FLAT GALVANIZED STRETCHER BAR WITH NOT LESS THAN 7 GALVANIZED CLAMPS PER POST.
19 mm HOLE IN POST WEB FOR WIRE ROPE.
13 mm-6x7 GALVANIZED IRON, REGULAR LAY FIBER CORE ROPE.
1.83 m CHAIN LINK - 50 mm MESH 3.8 mm WIRE (GALVANIZED)
SEE DETAIL B
CUT BRACES AND WELD TO LINE POSTS (HEAD UP)
300 ±
600 ±
600 ±
300 ±
1.9 m
75
0.9 m
SEE DETAIL A
450
□ or ○
✱ 450 mm x 450 mm SQUARE CONCRETE BLOCK
END POST
LINE POST
LINE BRACE
BENCH FENCE (630)
19 x 225 GALV. BOLT FOR END BRACE POST
19 x 225 GALV. IRON EYE BARS FOR TOP AND BOTTOM TURNBUCKLES, 19 x 600 GALV. IRON EYE BARS FOR CENTER TURNBUCKLES.
U-BOLT CLIPS
NUT
WASHER
USE STANDARD TURNBUCKLES FOR 19 mm BOLTS (300 TAKE UP)
13 mm-6x7 GALV. IRON REG. LAY FIBER CORE ROPE
DETAIL A
13 mm-6x7 GALV. IRON REG. LAY FIBER CORE ROPE
19 x 225 GALV. IRON EYE BARS FOR TOP AND BOTTOM TURNBUCKLES, 19 x 600 GALV. IRON EYE BARS FOR CENTER TURNBUCKLES.
USE STANDARD TURNBUCKLES FOR 19 mm BOLTS (300 TAKE UP)
U-BOLT CLIPS
DETAIL B
BENCH FENCE NOTES:
1. ALL POSTS AND BRACES SHALL BE 23 kg CRANE RAIL OR W100X19.3 WIDE FLANGE, 2.7 m LONG.
2. INSTALL LINE BRACES AT INTERVALS NOT EXCEEDING 85 m.
3. ALL POSTS SHALL BE AT 5 m CENTERS.
4. POSTS AND BRACES TO BE SET IN CONCRETE AS SHOWN, EXCEPT IN ROCK THEY MAY BE GROUTED IN DRILL HOLE.
5. 3 GALVANIZED CROSBY CLIPS OR EQUAL AND 1 GALVANIZED WIRE ROPE THIMBLE SHALL BE USED TO ATTACH WIRE ROPE TO EYE BARS.
6. CUT GROOVE IN FLANGE OF BRACES FOR WIRE ROPE AND EYE BAR.
7. SECURE MESH TO LINE POSTS WITH 7 WIRE TIES PER POST, AND TO EACH WIRE ROPE WITH 1 WIRE TIE PER 1 LIN. METER.
8. CONCRETE SHALL BE CLASS A OR AA.
SHAPE AS SHOWN & GRADE TO FIT RCB FLOW LINE
VARIABLE
SECTION A - A
ALTERNATE INSTALLATION
RCB WINGWALL
300 MAX.
SECTION B - B
NOTE:
PIPE SHALL BE FASTENED TO THE WINGWALL WITH 13 x 300 GALVANIZED ROD.
USE GALVANIZED NUTS AND WASHERS BOTH SIDES OF PIPE.
METHOD OF ATTACHING FENCE WIRE TO PIPE SHALL BE APPROVED BY THE ENGINEER.
GALV. PIPE
ALTERNATE INSTALLATION
150
VARIES
1.35 m
VARIES
150
DETAIL C
METHOD OF ATTACHING FENCE TO RCB WINGWALL (OPTIONAL)
0.3 m
0.6 m
VARIES
GRADE WING AREA FOR UNIFORM FENCE LINE
SECTION C - C
✱✱ - TYPE A-881-3B OR TYPE B-881-3B FENCE
✱✱✱ - ENTIRE WING AREA TO BE GRADED (NO DIRECT PAYMENT)
STANDARD BRACED POSTS AT ENDS OF ALL FENCE
FENCE TYPE AS SPECIFIED IN PLANS
FENCE TYPE AS SPECIFIED IN PLANS
45°±
150 m
150 m
PLAN
CATTLE PASS FENCING (616)
150
F.L. RCB & DITCH
SEE DETAIL C
ALTERNATE INSTALLATION
SECTION D - D
NOTE:
FENCE ATTACHMENT AND/OR ALTERNATE INSTALLATION TO BE PLACED AT THE DIRECTION OF THE ENGINEER. (300 mm MIN. FROM OUTER END OF WINGWALL).
METRIC
NDOT
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
BENCH FENCE AND CATTLE PASS FENCING
R-6.2.1
616-630.724
ADOPTED 7/96
REVISION



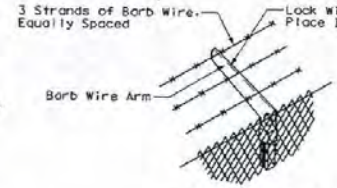
BRACING ARRANGEMENT



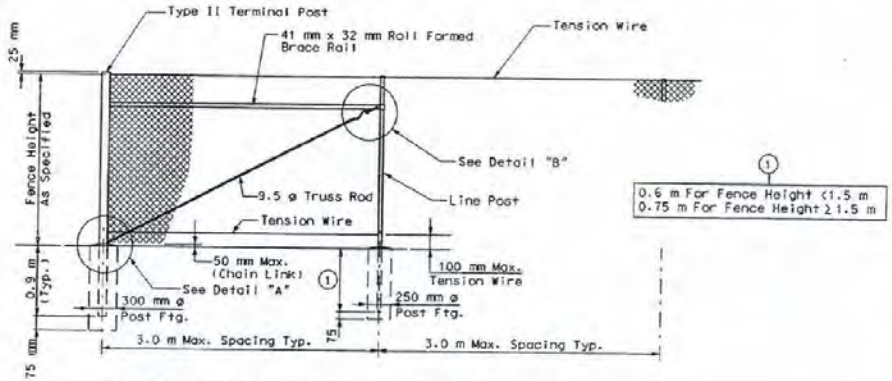
LINE POST TOP



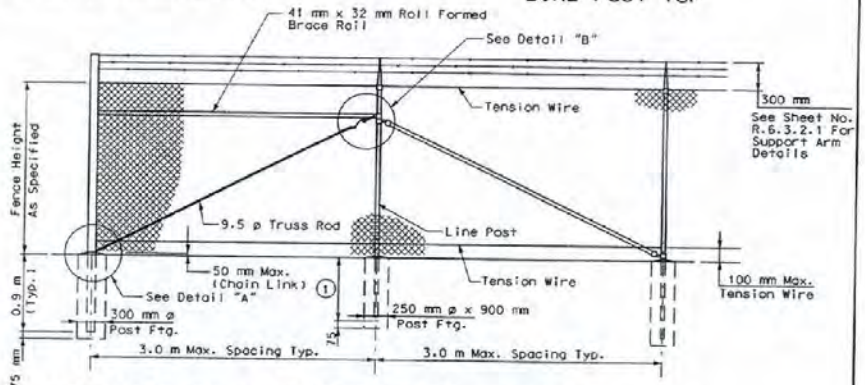
BRACING ARRANGEMENT



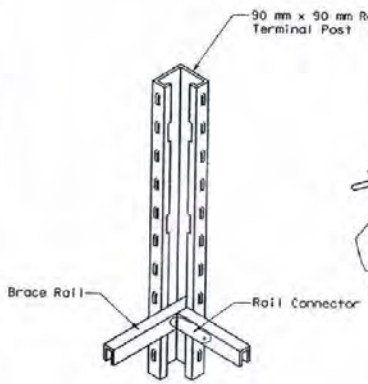
LINE POST TOP



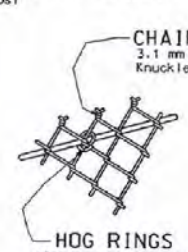
UP TO 1.83 m CHAIN LINK FENCE

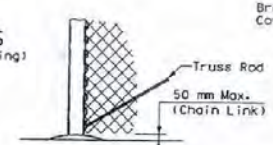


UP TO 1.83 m HEIGHT CHAIN LINK 3B FENCE

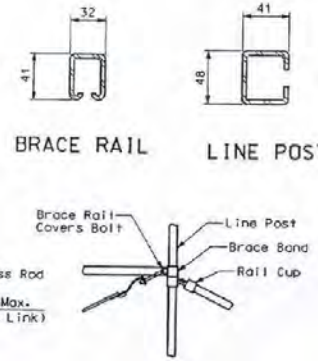


RAIL CONNECTION AT
CORNER POSTS

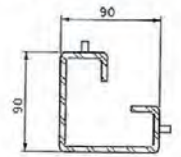




TRUSS ROD HOOKED
INTO LOWER LOOP
(DETAIL "A")



BRACE & TRUSS CONNECTION
AT LINE POST
(DETAIL "B")



FABRIC BAND FOR
LINE POST 3.1 mm

GENERAL NOTES:

1. FENCE POSTS AND MATERIALS SHALL CONFORM TO THE REQUIREMENTS OF STANDARD SPECIFICATIONS AND SUPPLEMENTS.
2. CHAIN LINK FENCING SHALL CONSIST OF GALVANIZED CHAIN LINK FABRIC ON STEEL POSTS (TUBULAR OR C-COLUMN).
3. (A) ALL POSTS SHALL BE SET IN CLASS A OR AA CONCRETE.
   (B) BRACES SHALL BE SPACED APPROXIMATELY 300 mm BELOW TOP OF TERMINAL POSTS AND SHALL EXTEND FROM END, GATE OR CORNER POSTS TO FIRST ADJACENT LINE POST.
   (C) ALL FITTINGS SHALL BE HOT DIPPED GALVANIZED MALLEABLE, CAST IRON, OR PRESSED STEEL.
   (D) FABRIC SHALL BE FASTENED TO LINE POSTS WITH FABRIC BANDS SPACED APPROXIMATELY 350 mm APART, AND TO TOP AND BOTTOM TENSION WIRE WITH HOG RINGS OR TIE WIRES SPACED APPROXIMATELY 600 mm APART.
   (E) FOR TUBULAR POST AND BRACE RAIL DETAILS, SEE SHEET NO. R-6.1.1.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED

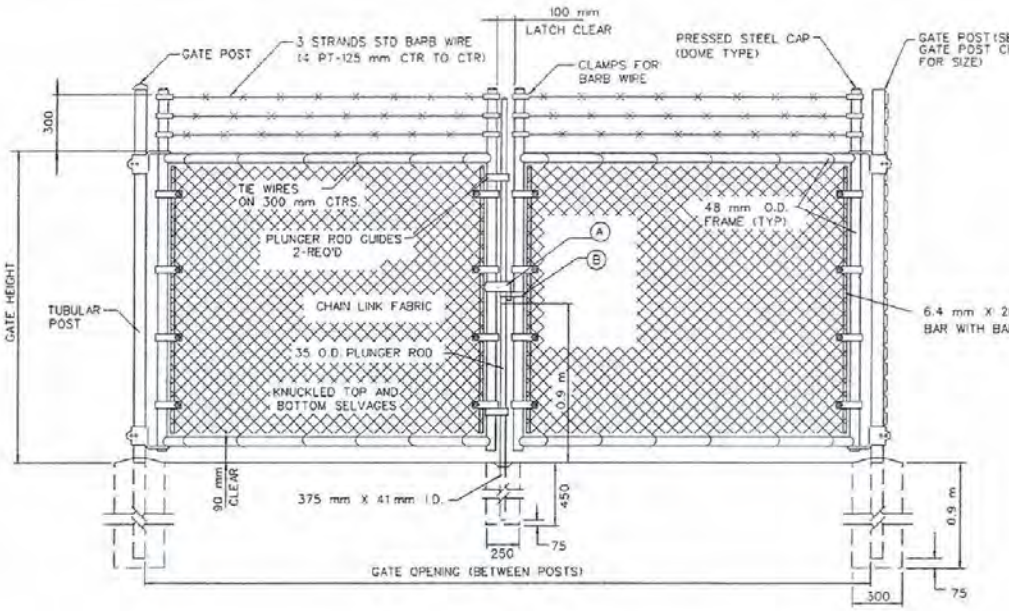
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

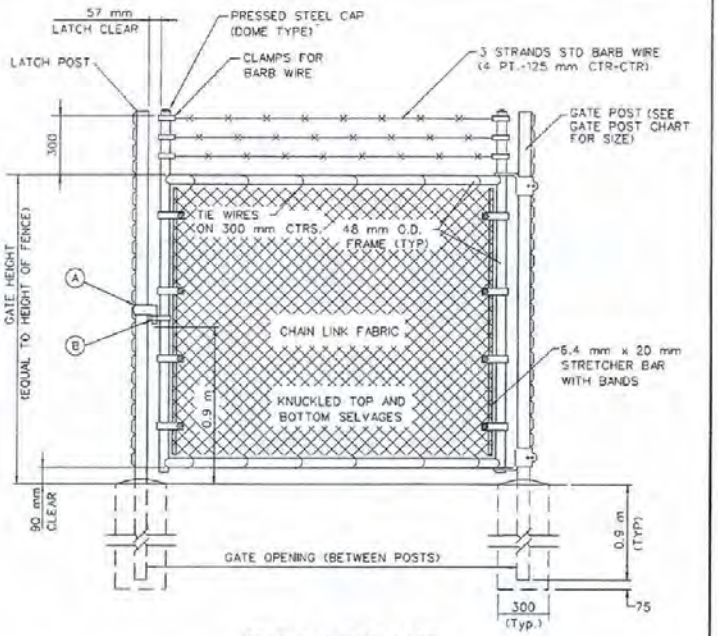
FENCE DETAILS
CHAIN LINK WITH C-TYPE POST

CHIEF ROAD DESIGN ENGR.

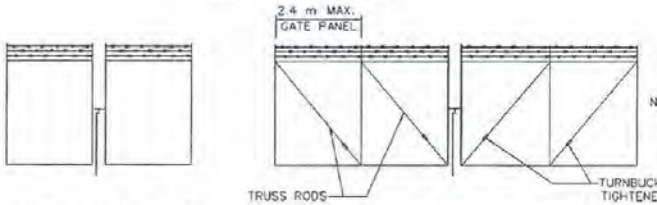
R-6.3.1 (616.724)
ADOPTED: 7/96 REVISION 8/97

R-52





DOUBLE SWING GATE

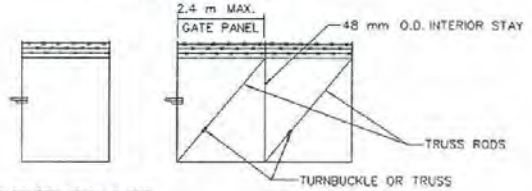


FRAME CONSTRUCTION GATES THRU 3.7 m OPENING

FRAME CONSTRUCTION GATES OVER 3.7 m to 9.7 m OPENING

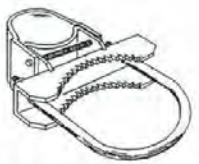
NOTE: 9.5 mm ADJUSTABLE TRUSS RODS SHALL BE INSTALLED ON ALL GATES OVER 1.8 m IN WIDTH. (SEE DETAIL B, SHEET R-6.1.3, FOR TRUSS TIGHTENER DETAIL.)

SINGLE SWING GATE

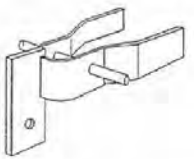


FRAME CONSTRUCTION GATES THRU 1.8 m OPENING

FRAME CONSTRUCTION GATES THRU 1.8 m to 5.5 m OPENING



HINGE FOR TUBULAR POSTS



(A) LOCK KEEPER

(B) LOCK KEEPER GUIDE

GATE POST

GATE OPENING IN METERS		ROUND GATE POSTS O.D. (mm)	MIN. MASS kg/m	
SINGLE GATE	DOUBLE GATE		CLASS 1	CLASS 2
UP TO 1.8	UP TO 3.7	73	8.62	6.91
2.1 THRU 4.0	4.0 THRU 7.9	102	13.56	9.76
4.2 THRU 5.5	8.2 THRU 11.0	168	28.23	—

GENERAL NOTES:

1. DIAMETERS AND MASS LISTED ABOVE ARE MINIMUMS. LARGER SIZES MAY BE USED ON APPROVAL OF ENGINEER.
2. 90 x 90 TYPE II POST (6.91 kg/m) CAN BE USED IN PLACE OF 73 mm O.D. ROUND GATE POST.
3. CONCRETE SHALL BE CLASS A OR AA.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

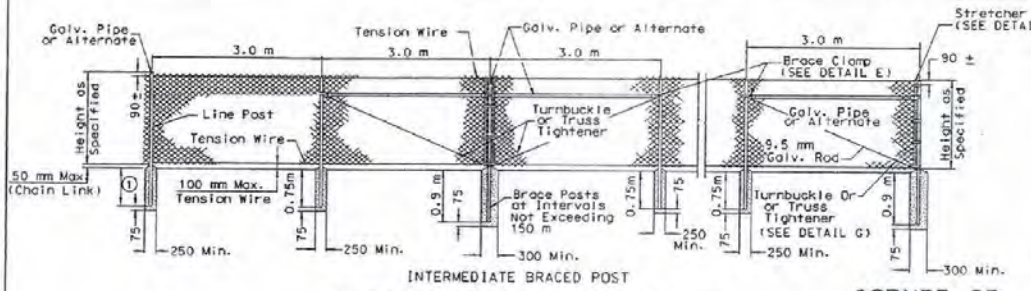
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FENCE DETAILS
SWING GATES FOR UP TO 1.83 m HEIGHT CHAIN LINK 3B FENCE

CHIEF ROAD DESIGN ENGR.

R-6.3.2	(616)
ADOPTED: 7/96	REVISION

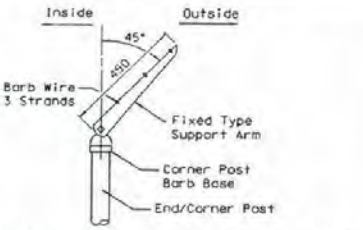
R-53



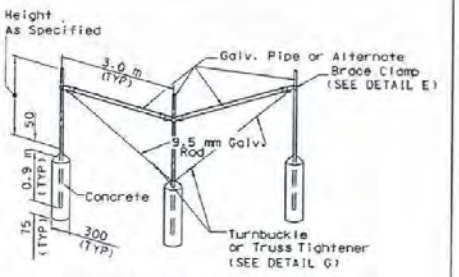
INTERMEDIATE BRACED POST

TYPICAL CHAIN LINK FENCE

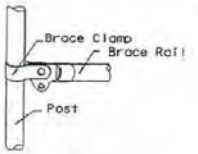
CORNER OR END POST



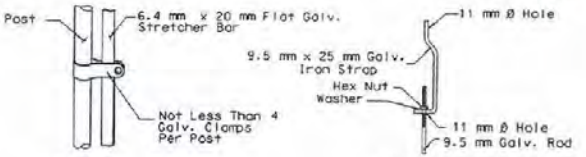
CORNER POST SUPPORT ARM



CORNER BRACE FOR CHAIN LINK FENCE



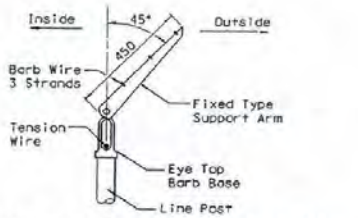
DETAIL E



DETAIL F

TRUSS TIGHTENER

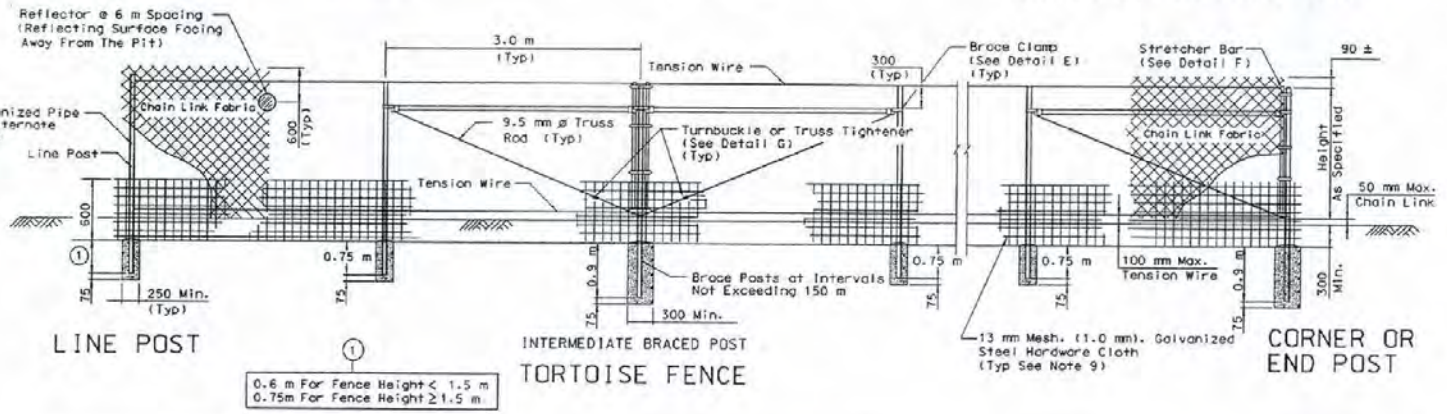
DETAIL G



LINE POST SUPPORT ARM

GENERAL NOTES:

1. CHAIN-LINK FENCING SHALL CONSIST OF GALVANIZED CHAIN-LINK FABRIC ON STEEL POSTS (TUBULAR OR C-SECTION).
2. ALL POSTS SHALL BE SET IN CLASS A OR AA CONCRETE.
3. ALL POSTS TOPS SHALL BE FITTED WITH SUITABLE FINIALS.
4. BRACES SHALL BE SPACED APPROXIMATELY 300 mm BELOW TOP OF TERMINAL POSTS AND SHALL EXTEND FROM END, GATE OR CORNER POSTS TO FIRST ADJACENT LINE POST.
5. ALL FITTINGS SHALL BE HOT-DIPPED GALVANIZED MALLEABLE, CAST IRON, OR PRESSED STEEL.
6. FABRIC SHALL BE FASTENED TO LINE POSTS WITH FABRIC BANDS SPACED APPROXIMATELY 350 mm APART, AND TO TOP TENSION WIRE AND BOTTOM TENSION WIRE WITH HOG RINGS OR TIE WIRES SPACED APPROXIMATELY 600 mm APART.
7. FOR ALTERNATE POST AND BRACERAIL DETAILS SEE SHEETS NO. R-6.3.1 THROUGH R-6.3.3.
8. CLEARANCE BETWEEN BOTTOM OF GATE AND ORIGINAL GROUND SHALL BE 25 mm MAXIMUM ON TORTOISE FENCES ONLY.
9. HARDWARE CLOTH TO BE ATTACHED TO CHAIN LINK FENCE FABRIC WITH HOG RINGS AT 300 mm MAXIMUM SPACING. TO BE INSTALLED OUTSIDE OF PIT. DITCH SHALL BE BACKFILLED WITH EXCAVATED MATERIAL AND COMPACTED AS DIRECTED BY THE ENGINEER.



LINE POST

INTERMEDIATE BRACED POST

TORTOISE FENCE

CORNER OR END POST

① 0.6 m For Fence Height < 1.5 m
0.75m For Fence Height ≥ 1.5 m

SIZE OF POSTS

FENCE HEIGHT (m)	CORNER, END, PULL AND BRACE POSTS					LINE POSTS					BRACE RAIL				
	ROUND PIPE O.D. (mm)	MIN. MASS (kg/m) CLASS 1	MIN. MASS (kg/m) CLASS 2	TYPE II (mm)	MIN. MASS (kg/m)	ROUND PIPE O.D. (mm)	MIN. MASS (kg/m) CLASS 1	MIN. MASS (kg/m) CLASS 2	C-SECTION DIMENSIONS (mm)	MIN. MASS (kg/m)	ROUND PIPE O.D. (mm)	MIN. MASS (kg/m) CLASS 1	MIN. MASS (kg/m) CLASS 2	C-SECTION DIMENSIONS (mm)	MIN. MASS (kg/m)
0.91 to 1.83	60	5.43	3.92	90x90	7.22	48	4.04	2.89	48 x 41	2.38	42	3.38	2.16	41 x 32	2.01

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FENCE DETAILS CHAIN LINK FENCE UP TO 1.83 m HEIGHT

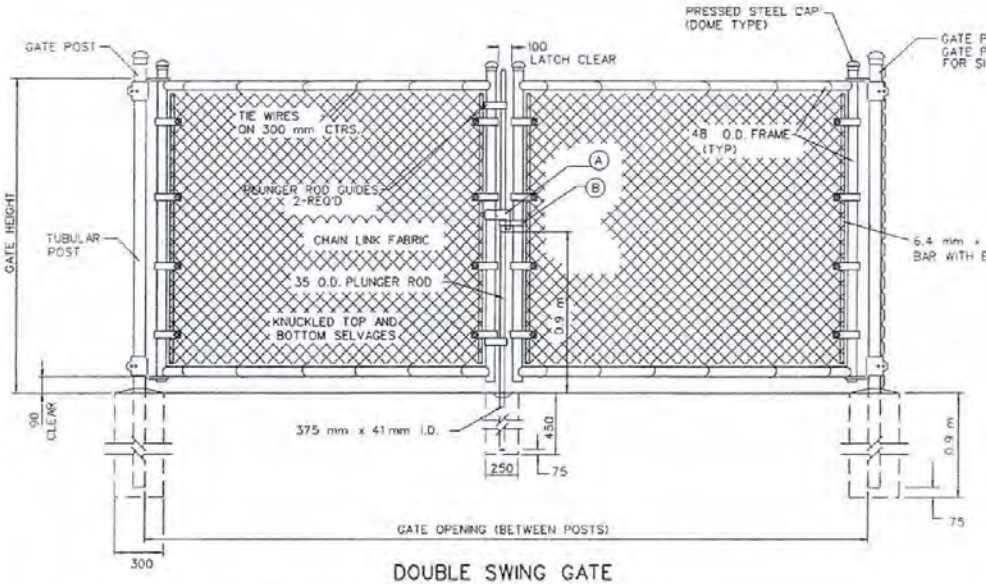
CHIEF ROAD DESIGN ENGR.

R-6.3.2.1 (616)

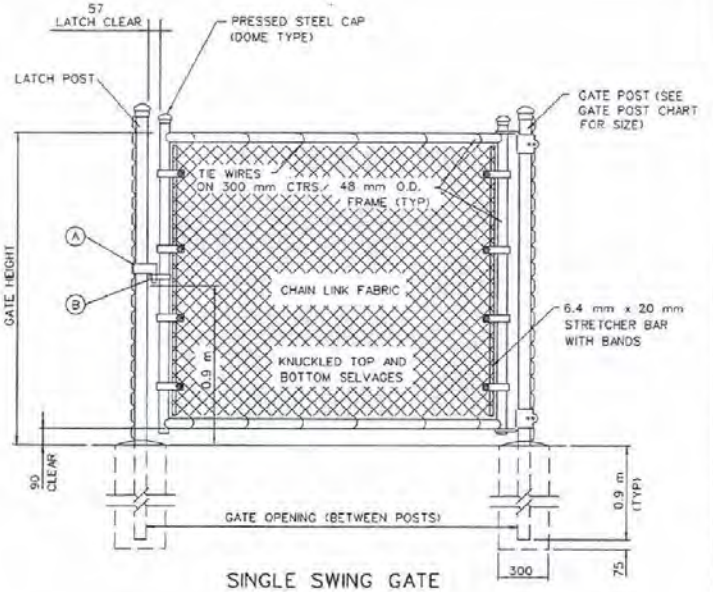
ADOPTED: 7/96

REVISION 8/97

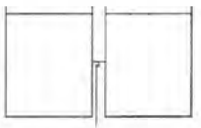
R-54



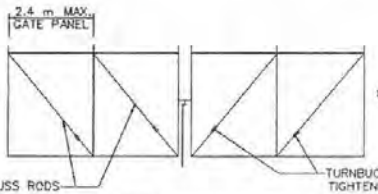
DOUBLE SWING GATE



SINGLE SWING GATE



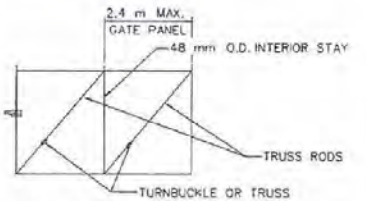
FRAME CONSTRUCTION GATES THRU 3.7 m OPENING



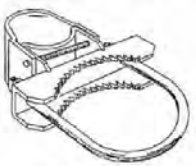
FRAME CONSTRUCTION GATES OVER 3.7 m to 9.7 m OPENING

NOTE: 9.5 mm ADJUSTABLE TRUSS RODS SHALL BE INSTALLED ON ALL GATES OVER 1.8 m IN WIDTH. (SEE DETAIL B, SHEET R-6.1.3, FOR TRUSS TIGHTENER DETAIL.)

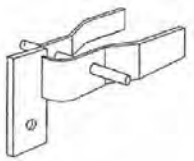
FRAME CONSTRUCTION GATES THRU 1.8 m OPENING



FRAME CONSTRUCTION GATES OVER 1.8 m to 5.5 m OPENING



HINGE FOR TUBULAR POSTS



(A) LOCK KEEPER

(B) LOCK KEEPER GUIDE

GATE POST

GATE OPENING IN METERS		ROUND GATE POSTS O.D. (mm)	MIN. MASS kg/m	
SINGLE GATE	DOUBLE GATE		CLASS 1	CLASS 2
UP TO 1.8	UP TO 3.7	73	8.62	6.91
2.1 THRU 4.0	4.0 THRU 7.9	102	13.56	9.76
4.2 THRU 5.5	8.2 THRU 11.0	168	28.23	—

GENERAL NOTES:

1. DIAMETERS AND MASS LISTED ABOVE ARE MINIMUMS. LARGER SIZES MAY BE USED ON APPROVAL OF ENGINEER.
2. 90 mm x 90 mm TYPE II POST (6.91 kg/m) CAN BE USED IN PLACE OF 73 mm O.D. ROUND GATE POST.
3. CONCRETE SHALL BE CLASS A OR AA.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FENCE DETAILS
SWING GATE FOR UP TO
1.83 m CHAIN LINK FENCE

CHIEF ROAD DESIGN ENGR.

R-6.3.3 (616)

ADOPTED: 07/98 REVISION

BILL OF MATERIALS

TIMBER

ITEM	NO. REQ'D	SIZE (mm)	LENGTH (mm)	m^3
WHEEL GUARDS	2	150x150	2290	.10
WING SLOPE	4	50x150	2440	.08
WING SLOPE	2	50x150	1945	.03
WING BRACES	2	50x150	1015	.02
WING BRACES	4	50x150	1600	.03
WING BRACES	2	50x150	2290	.03
WING BRACES	2	50x150	635	.01
WING BRACES	2	50x150	1220	.02
WING BRACES	2	50x150	1525	.02
WING POST	3	100x150	AS REQ'D	
NAILING STRIP	2	50x50	610	.003

GALVANIZED HARDWARE

ITEM	NO. REQ'D	SIZE (mm)	LENGTH (mm)	MASS (kg)
BOLTS	8	20	305	6.8
WASHERS	8	20		0.5
WASHERS (LOCK)	4	20		0.2
NAILS	50	406		1.4
NAILS	72	204		1.0
BOLTS	4	20	38	0.5
TOTAL				10.4

STRUCTURAL STEEL

3.6 m ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH (mm)	MASS (kg)
I BEAMS	13	S100 x 11.5	3962	550
I BEAMS	6	S200 x 27.4	2240	363
SPACERS	72	63.5 x 7.9	173	49
ANCHOR BOLTS	12	22	305	5.4
END PLATES	2	200 x 6.4	3962	80.3
STEEL STRAPS	3	101.6 x 6.4	2184	33.6
TOTAL				1122

4.2 m ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH (mm)	MASS (kg)
I BEAMS	13	S100 x 11.5	4572	681
I BEAMS	7	S200 x 27.4	2240	424
SPACERS	84	63.5 x 7.9	173	58
ANCHOR BOLTS	14	22	305	8
END PLATES	2	200 x 6.4	4572	93
STEEL STRAPS	4	100 x 6.4	2184	44
TOTAL				1306

4.8 m ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH (mm)	MASS (kg)
I BEAMS	13	S100 x 11.5	5182	772
I BEAMS	8	S200 x 27.4	2210	484
SPACERS	84	63.5 x 7.9	173	58
ANCHOR BOLTS	14	22	305	7
END PLATES	2	200 x 6.4	5182	105
STEEL STRAPS	4	100 x 6.4	2184	44
TOTAL				1470

6.0 m ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH (mm)	MASS (kg)
I BEAMS	13	S100 x 11.5	6400	953
I BEAMS	9	S200 x 27.4	2210	545
SPACERS	108	63.5 x 7.9	173	74
ANCHOR BOLTS	18	22	305	8
END PLATES	2	200 x 6.4	6400	130
STEEL STRAPS	5	100 x 6.4	2184	55
TOTAL				1765

ALL ROADBED WIDTH

ITEM	NO. REQ'D	SIZE	LENGTH (mm)	MASS (kg)
CORR. METAL PIPE	1	300	## X 610	9

REINFORCING

3.6 m ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH (mm)	MASS (kg)
HORIZONTAL BARS	442	NO. 13	3810	45
HORIZONTAL BARS	12	NO. 13	2135	26
HORIZONTAL BARS	18	NO. 13	5105	91
VERTICAL BARS	20	NO. 13	840	17
U-BARS	22	NO. 19	3685	137
HORIZONTAL BARS	4	NO. 13	4015	16
TOTAL				376

4.2 m ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH (mm)	MASS (kg)
HORIZONTAL BARS	442	NO. 13	4420	53
HORIZONTAL BARS	13	NO. 13	2135	28
HORIZONTAL BARS	18	NO. 13	5115	102
VERTICAL BARS	22	NO. 13	840	18
U-BARS	24	NO. 19	3685	198
HORIZONTAL BARS	4	NO. 13	4625	19
TOTAL				418

4.8 m ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH (mm)	MASS (kg)
HORIZONTAL BARS	442	NO. 13	5030	60
HORIZONTAL BARS	15	NO. 13	2135	32
HORIZONTAL BARS	18	NO. 13	6325	113
VERTICAL BARS	26	NO. 13	840	22
U-BARS	29	NO. 19	635	239
HORIZONTAL BARS	4	NO. 13	5230	21
TOTAL				487

6.0 m ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH (mm)	MASS (kg)
HORIZONTAL BARS	442	NO. 13	6250	74
HORIZONTAL BARS	15	NO. 13	3135	36
HORIZONTAL BARS	18	NO. 13	7545	135
VERTICAL BARS	26	NO. 13	840	25
U-BARS	29	NO. 19	635	297
HORIZONTAL BARS	4	NO. 13	6450	26
TOTAL				593

CONCRETE

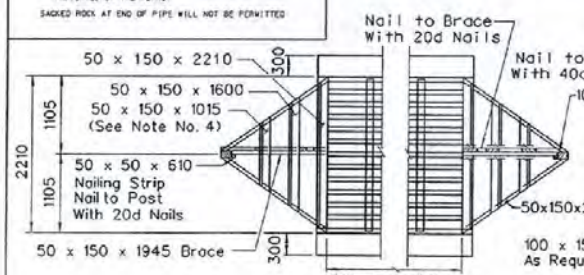
3.6 m ROADBED	4.3 m^3
4.2 m ROADBED	5.4 m^3
4.8 m ROADBED	6.0 m^3
6.0 m ROADBED	7.1 m^3

= NO. 13 BARS WELDED TO S200 I BEAMS

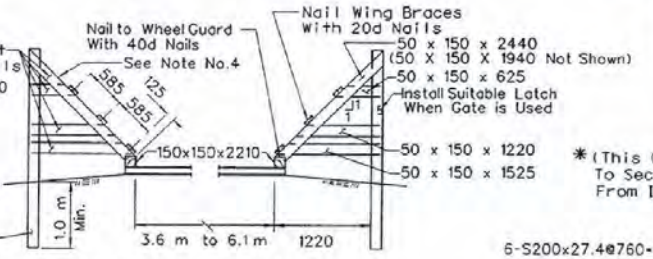
GENERAL NOTES:

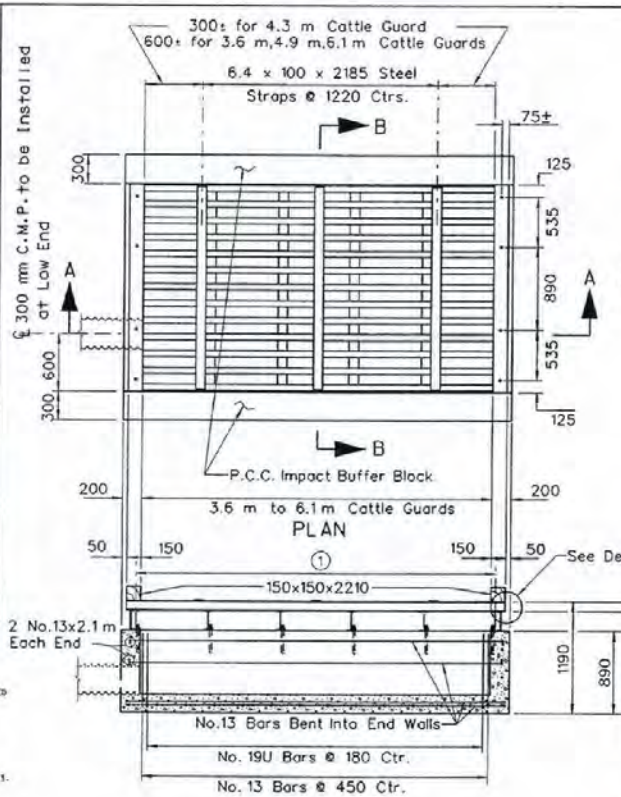
1. ALL CONCRETE TO BE CLASS A OR AA.
2. STANDARD METAL OR TIMBER GATES SHALL BE CONSTRUCTED WHEN SHOWN ON PLANS OR ORDERED BY THE ENGINEER.
3. ALL CONNECTIONS TO BE WELDED.
4. ALL TIMBER SHALL BE PAINTED WHITE PER STANDARD SPECIFICATIONS.
5. METAL WINGS ARE OPTIONAL. SEE DETAIL "A". FOR ADDITIONAL DETAILS AND QUANTITIES SEE SHEET R-7.1.1.
6. ALL WINGS SHALL BE PAINTED WHITE PER STANDARD SPECIFICATIONS.
7. CATTLE GUARD WIDTH SHALL INCLUDE A 0.6 m SHY DISTANCE FROM THE NORMAL E.O.P., EACH SIDE (PER AASHTO).

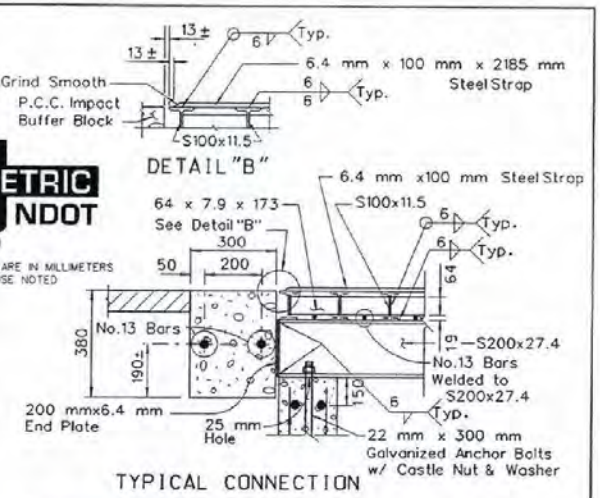
PLAN OF WINGS

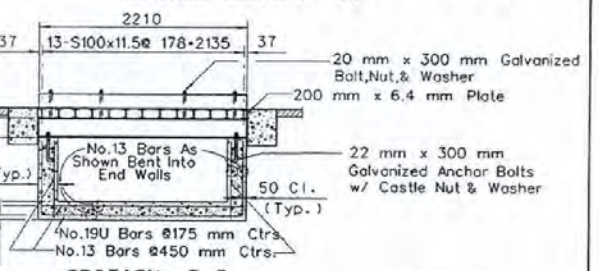


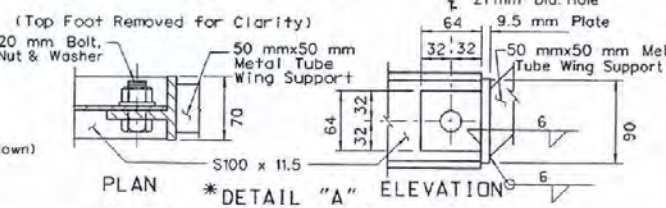
ELEVATION OF WINGS











*(FOR USE WITH OPTIONAL METAL WINGS ONLY)

*(This Connection Shall Be Made To Second S100x11.5 Beam At 210 mm From Impact Buffer Blocks)

① 6-S200x27.4@760-3800 for 3.6 m Cattle Guard
7-S200x27.4@740-4440 for 4.3 m Cattle Guard
8-S200x27.4@720-5040 for 4.9 m Cattle Guard
9-S200x27.4@780-6240 for 6.1 m Cattle Guard

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

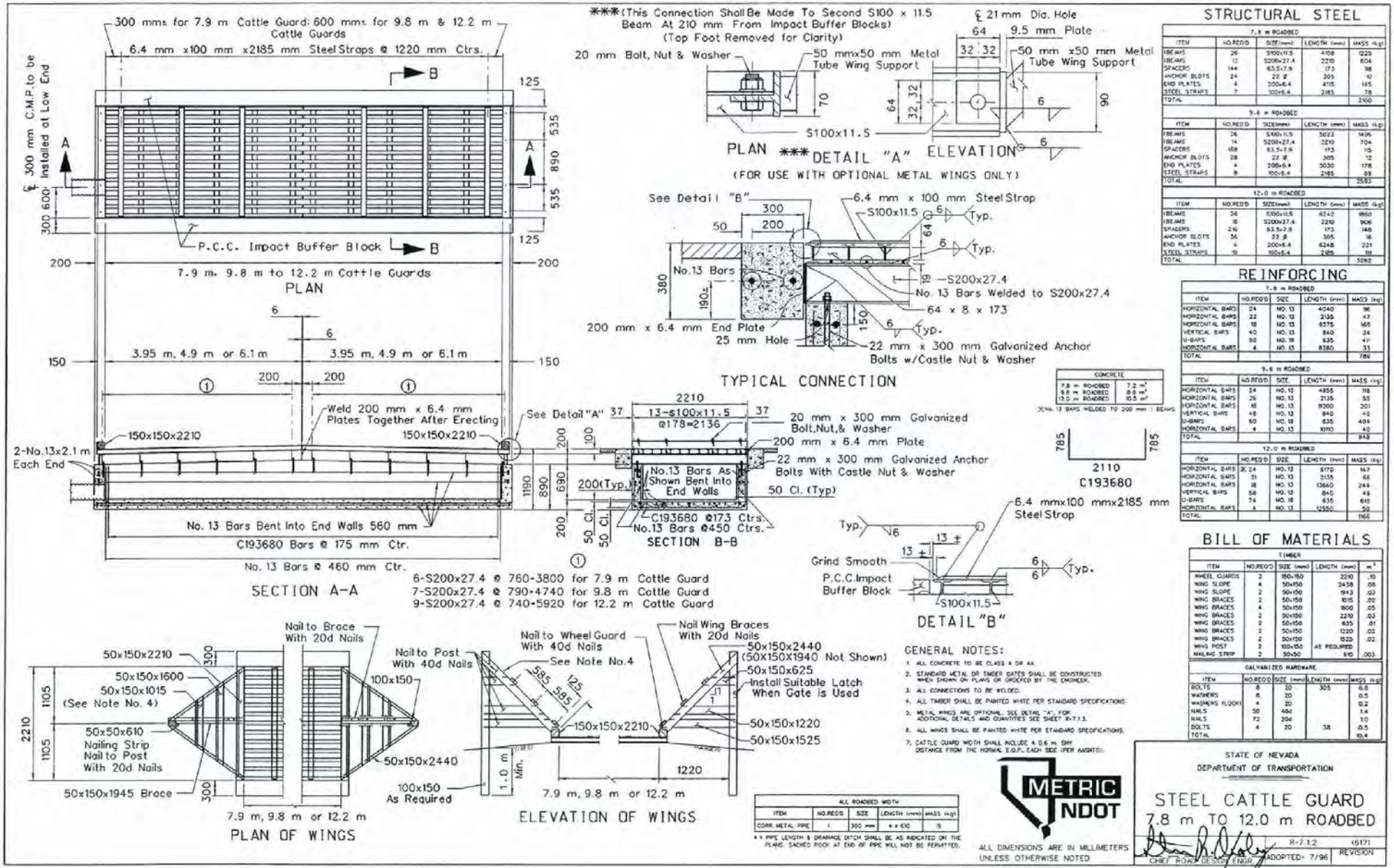
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

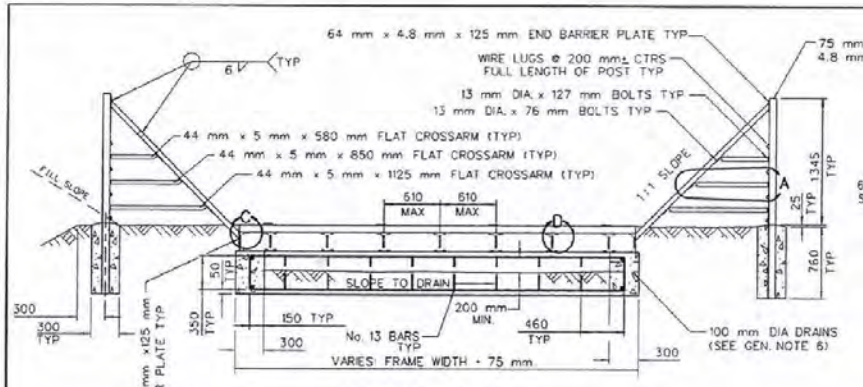
STEEL CATTLE GUARD
3.6m TO 6.0m ROADBED

CHIEF ROAD DESIGN ENGR.

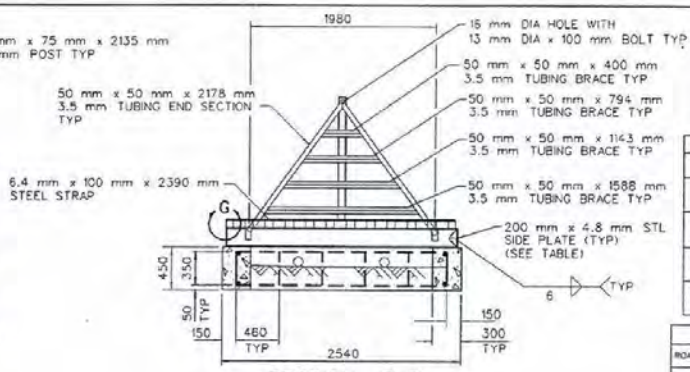
R-7.1.1 (617)
ADOPTED-07/96 REVISION

R-56

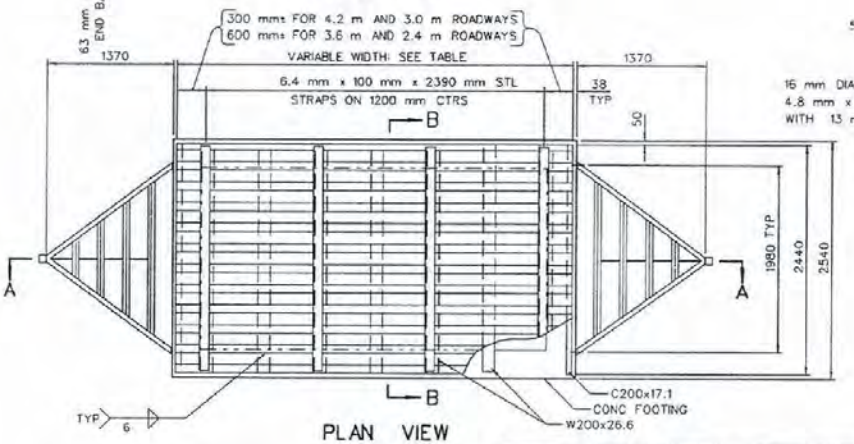

300 mm± for 7.9 m Cattle Guard: 600 mm± for 9.8 m & 12.2 m Cattle Guards
6.4 mm x100 mm x2185 mm Steel Straps @ 1220 mm Ctrs.
℄ 300 mm C.M.P. to be Installed at Low End
P.C.C. Impact Buffer Block
7.9 m, 9.8 m to 12.2 m Cattle Guards
PLAN
3.95 m, 4.9 m or 6.1 m
3.95 m, 4.9 m or 6.1 m
Weld 200 mm x 6.4 mm Plates Together After Erecting
150x150x2210
2-No.13x2.1 m Each End
No. 13 Bars Bent Into End Walls 560 mm
C193680 Bars @ 175 mm Ctr.
No. 13 Bars @ 460 mm Ctr.
SECTION A-A
***(This Connection Shall Be Made To Second S100 x 11.5 Beam At 210 mm From Impact Buffer Blocks) (Top Foot Removed for Clarity)
20 mm Bolt, Nut & Washer
50 mmx50 mm Metal Tube Wing Support
℄ 21 mm Dia. Hole
9.5 mm Plate
50 mm x50 mm Metal Tube Wing Support
S100x11.5
PLAN ***DETAIL "A" ELEVATION
(FOR USE WITH OPTIONAL METAL WINGS ONLY)
See Detail "B"
6.4 mm x 100 mm Steel Strap
S100x11.5
S200x27.4
No. 13 Bars Welded to S200x27.4
64 x 8 x 173
200 mm x 6.4 mm End Plate
25 mm Hole
22 mm x 300 mm Galvanized Anchor Bolts w/Castle Nut & Washer
TYPICAL CONNECTION
See Detail "A"
13-@100x11.5 @178=2136
20 mm x 300 mm Galvanized Bolt,Nut,& Washer
200 mm x 6.4 mm Plate
22 mm x 300 mm Galvanized Anchor Bolts With Castle Nut & Washer
No.13 Bars As Shown Bent Into End Walls
50 Cl. (Typ)
C193680 @173 Ctrs.
No.13 Bars @450 Ctrs.
SECTION B-B
6-S200x27.4 @ 760-3800 for 7.9 m Cattle Guard
7-S200x27.4 @ 790-4740 for 9.8 m Cattle Guard
9-S200x27.4 @ 740-5920 for 12.2 m Cattle Guard
CONCRETE
7.8 m ROADBED 7.2 m³
9.8 m ROADBED 8.6 m³
12.0 m ROADBED 10.5 m³
2-No. 13 BARS WELDED TO 200 mm I BEAMS
2110
C193680
6.4 mmx100 mmx2185 mm Steel Strap
Grind Smooth
P.C.C.Impact Buffer Block
S100x11.5
DETAIL "B"
Nail to Brace With 20d Nails
Nail to Post With 40d Nails
50x150x2210
50x150x1600
50x150x1015 (See Note No. 4)
50x50x610 Nailing Strip Nail to Post With 20d Nails
50x150x1945 Brace
50x150x2440
100x150
100x150 As Required
7.9 m, 9.8 m or 12.2 m
PLAN OF WINGS
Nail to Wheel Guard With 40d Nails
See Note No.4
Nail Wing Braces With 20d Nails
50x150x2440 (50x150x1940 Not Shown)
50x150x625
Install Suitable Latch When Gate is Used
50x150x1220
50x150x1525
150x150x2210
1.0 m Min.
1220
7.9 m, 9.8 m or 12.2 m
ELEVATION OF WINGS
ALL ROADBED WIDTH
ITEM | NO.REQ'D | SIZE | LENGTH (mm) | MASS (kg)
CORR. METAL PIPE | 1 | 300 mm | x x 610 | 9
x x PIPE LENGTH & DRAINAGE DITCH SHALL BE AS INDICATED ON THE PLANS. SACKED ROCK AT END OF PIPE WILL NOT BE PERMITTED.
GENERAL NOTES:
1. ALL CONCRETE TO BE CLASS A OR AA.
2. STANDARD METAL OR TIMBER GATES SHALL BE CONSTRUCTED WHEN SHOWN ON PLANS OR ORDERED BY THE ENGINEER.
3. ALL CONNECTIONS TO BE WELDED.
4. ALL TIMBER SHALL BE PAINTED WHITE PER STANDARD SPECIFICATIONS.
5. METAL WINGS ARE OPTIONAL. SEE DETAIL "A". FOR ADDITIONAL DETAILS AND QUANTITIES SEE SHEET R-7.1.3.
6. ALL WINGS SHALL BE PAINTED WHITE PER STANDARD SPECIFICATIONS.
7. CATTLE GUARD WIDTH SHALL INCLUDE A 0.6 m SHY DISTANCE FROM THE NORMAL E.O.P. EACH SIDE (PER AASHTO).
METRIC NDOT
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED
STRUCTURAL STEEL
7.8 m ROADBED
ITEM | NO.REQ'D | SIZE(mm) | LENGTH (mm) | MASS (kg)
I BEAMS | 26 | S100x11.5 | 4108 | 1229
I BEAMS | 12 | S200x27.4 | 2210 | 804
SPACERS | 144 | 63.5x7.9 | 173 | 98
ANCHOR BLOTS | 24 | 22 Ø | 305 | 10
END PLATES | 4 | 200x6.4 | 4115 | 165
STEEL STRAPS | 7 | 100x6.4 | 2185 | 78
TOTAL | | | | 2100
9.8 m ROADBED
ITEM | NO.REQ'D | SIZE(mm) | LENGTH (mm) | MASS (kg)
I BEAMS | 26 | S100x11.5 | 5023 | 1496
I BEAMS | 14 | S200x27.4 | 2210 | 704
SPACERS | 168 | 63.5x7.9 | 173 | 115
ANCHOR BLOTS | 28 | 22 Ø | 305 | 12
END PLATES | 4 | 200x6.4 | 5030 | 178
STEEL STRAPS | 8 | 100x6.4 | 2185 | 88
TOTAL | | | | 2583
12.0 m ROADBED
ITEM | NO.REQ'D | SIZE(mm) | LENGTH (mm) | MASS (kg)
I BEAMS | 36 | S100x11.5 | 6240 | 1860
I BEAMS | 18 | S200x27.4 | 2210 | 906
SPACERS | 216 | 63.5x7.9 | 173 | 146
ANCHOR BLOTS | 36 | 22 Ø | 305 | 16
END PLATES | 4 | 200x6.4 | 6248 | 221
STEEL STRAPS | 10 | 100x6.4 | 2185 | 111
TOTAL | | | | 3262
REINFORCING
7.8 m ROADBED
ITEM | NO.REQ'D | SIZE | LENGTH (mm) | MASS (kg)
HORIZONTAL BARS | 24 | NO. 13 | 4040 | 98
HORIZONTAL BARS | 22 | NO. 13 | 2135 | 47
HORIZONTAL BARS | 18 | NO. 13 | 8375 | 168
VERTICAL BARS | 40 | NO. 13 | 840 | 34
U-BARS | 50 | NO. 19 | 635 | 49
HORIZONTAL BARS | 4 | NO. 13 | 8380 | 33
TOTAL | | | | 789
9.8 m ROADBED
ITEM | NO.REQ'D | SIZE | LENGTH (mm) | MASS (kg)
HORIZONTAL BARS | 24 | NO. 13 | 4955 | 118
HORIZONTAL BARS | 26 | NO. 13 | 2135 | 55
HORIZONTAL BARS | 18 | NO. 13 | 11200 | 201
VERTICAL BARS | 48 | NO. 13 | 840 | 40
U-BARS | 50 | NO. 19 | 635 | 494
HORIZONTAL BARS | 4 | NO. 13 | 10110 | 40
TOTAL | | | | 948
12.0 m ROADBED
ITEM | NO.REQ'D | SIZE | LENGTH (mm) | MASS (kg)
HORIZONTAL BARS | 24 | NO. 13 | 6170 | 167
HORIZONTAL BARS | 31 | NO. 13 | 2135 | 68
HORIZONTAL BARS | 18 | NO. 13 | 13640 | 244
VERTICAL BARS | 56 | NO. 13 | 840 | 43
U-BARS | 74 | NO. 19 | 635 | 610
HORIZONTAL BARS | 4 | NO. 13 | 12550 | 50
TOTAL | | | | 1166
BILL OF MATERIALS
TIMBER
ITEM | NO.REQ'D | SIZE (mm) | LENGTH (mm) | m³
WHEEL GUARDS | 2 | 150x150 | 2210 | .10
WING SLOPE | 4 | 50x150 | 2438 | .08
WING SLOPE | 2 | 50x150 | 1943 | .03
WING BRACES | 2 | 50x150 | 1015 | .02
WING BRACES | 4 | 50x150 | 1600 | .05
WING BRACES | 2 | 50x150 | 2210 | .03
WING BRACES | 2 | 50x150 | 635 | .01
WING BRACES | 2 | 50x150 | 1220 | .02
WING BRACES | 2 | 50x150 | 1525 | .02
WING POST | 2 | 100x150 | AS REQUIRED |
NAILING STRIP | 2 | 50x50 | 610 | .003
GALVANIZED HARDWARE
ITEM | NO.REQ'D | SIZE (mm) | LENGTH (mm) | MASS (kg)
BOLTS | 8 | 20 | 305 | 6.8
WASHERS | 8 | 20 | | 0.5
WASHERS (LOCK) | 4 | 20 | | 0.2
NAILS | 56 | 40d | | 1.4
NAILS | 72 | 20d | | 1.0
BOLTS | 4 | 20 | 38 | 0.5
TOTAL | | | | 10.4
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
STEEL CATTLE GUARD
7.8 m TO 12.0 m ROADBED
R-7.1.2
(6171)
CHIEF ROAD DESIGN ENGR.
ADOPTED: 7/96
REVISION
R-57



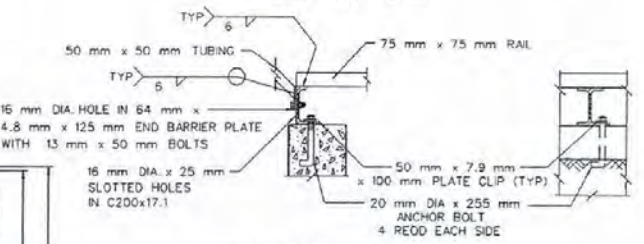
SECTION A-A



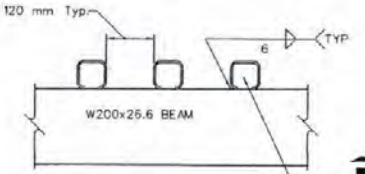
SECTION B-B



PLAN VIEW

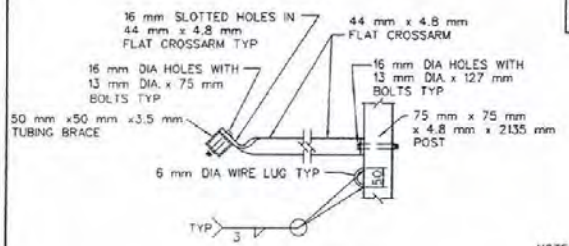


DETAILS "C" & "D"

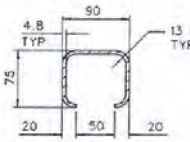


DETAIL "I"

THIS DESIGN IS NOT FOR USE ON MAINLINES, RAMPS, OR CROSSROADS

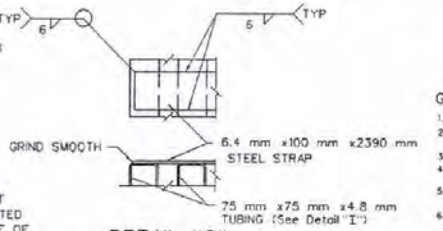


DETAIL "A"



DETAIL "H"

NOTE: A WELDED OR ROLLED UNIT OF EQUIVALENT DESIGN LOADING CAPACITY MAY BE SUBMITTED TO THE ENGINEER FOR APPROVAL IN PLACE OF A 75 mm x 75 mm x 4.8 mm TUBING



DETAIL "G"

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS A OR AA.
2. ALTERNATIVE DESIGN MAY BE SUBSTITUTED BY THE CONTRACTOR FOR APPROVAL BY THE ENGINEER.
3. LIVE LOADING: M-18
4. CATTLE GUARD SLOPE IS TO CONFORM TO THE ROADWAY CROSS SLOPE AND GRADE.
5. "FRAME WIDTH" COMBINATIONS MAY BE VARIED TO OBTAIN THE SPECIFIED WIDTH OF CATTLE GUARDS.
6. EXTEND 100 mm DRAINS TO FACILITATE DRAINAGE OF STRUCTURE.
7. ALL WINGS SHALL BE PAINTED WHITE PER STANDARD SPECIFICATIONS.

BILL OF MATERIALS

FRAME SIZE		LONGITUDINAL STRINGERS			
LENGTH(mm)	WIDTH(mm)	NO. REQ'D	SIZE(mm)	SPACING	MASS (kg)
2438	4267	6	W200x26.6	EQUAL	390
2438	3658	5	W200x26.6	EQUAL	325
2438	3048	4	W200x26.6	EQUAL	260
2438	2438	3	W200x26.6	EQUAL	195

STRUCTURAL STEEL				
ITEM	NO. REQ'D	SIZE (mm)	LENGTH(mm)	MASS (kg)
RAILS	13	75 x 75 x 4.8	4267	567
SIDEPLATE	2	200 x 4.8	4267	65
RAILS	13	75 x 75 x 4.8	3658	485
SIDEPLATE	2	200 x 4.8	3658	55
RAILS	13	75 x 75 x 4.8	3048	405
SIDE RAILS	2	200 x 4.8	3048	46
RAILS	13	75 x 75 x 4.8	2438	323
SIDE RAILS	2	200 x 4.8	2438	37

STRUCTURAL STEEL				
ROAD WIDTH	ITEM	NO. REQ'D	SIZE (mm)	MASS (kg)
4.2 m	STEEL STRAP	4	6.4 x 100 x 2390	48
3.6 m	STEEL STRAP	3	6.4 x 100 x 2390	36
3.0 m	STEEL STRAP	3	6.4 x 100 x 2390	36
2.4 m	STEEL STRAP	2	6.4 x 100 x 2390	24

MATERIAL LIST FOR WINGS				
ITEM	NO. REQ'D	SIZE (mm)	LENGTH (mm)	MASS (kg)
FLAT CROSSARMS	2	44 x 4.8	578	2
FLAT CROSSARMS	2	44 x 4.8	851	3
FLAT CROSSARMS	2	44 x 4.8	1124	4
BRACES	2	50 x 50 x 3.5	400	5
BRACES	2	50 x 50 x 3.5	794	10
BRACES	2	50 x 50 x 3.5	1194	17
BRACES	2	50 x 50 x 3.5	1588	20
END BARRIER	4	50 x 50 x 3.5	2178	56
END BARRIER PLATE	6	64 x 4.8	127	2
UPRIGHT POST	2	75 x 75 x 4.8	2134	44

MATERIAL LIST FOR ALL SIZES				
ITEM	NO. REQ'D	SIZE	LENGTH(mm)	MASS(kg)
CHANNELS	2	C200x17.1	2438	83
PLATE CLIP	12	50x7.9	114	4
ANCHOR BOLT CLIP	14	50x7.9	100	5

CONCRETE		REINFORCING STEEL
LENGTH(mm)	m^3	MASS (kg)
4267	1.75	37
3658	1.6	33
3048	1.4	30
2438	1.2	27

GALVANIZED HARDWARE			
ITEM	NO. REQ'D	SIZE(mm)	LENGTH(mm)
BOLT	6	13	75
BOLT	38	13	50
BOLT	6	13	127
WASHER	56	13	-
WASHER	14	24	-
NUT	28	13	-
NUT	14	20	-
ANCHOR BOLT	14	20	-

NOTE: MATERIAL LISTS ARE FOR INFORMATION ONLY.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STEEL CATTLE GUARD
(TYPE B)

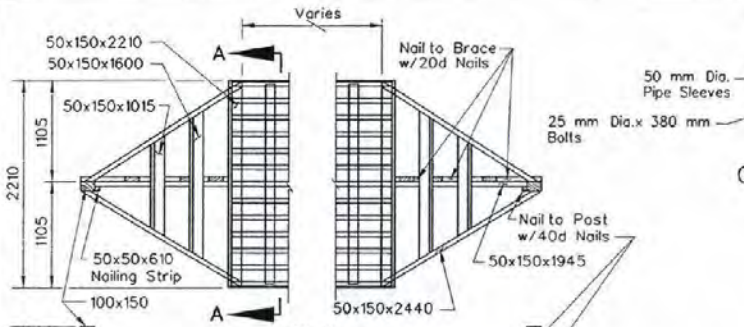
CHIEF ROAD DESIGN ENGR.

R-7.1.3 (517)

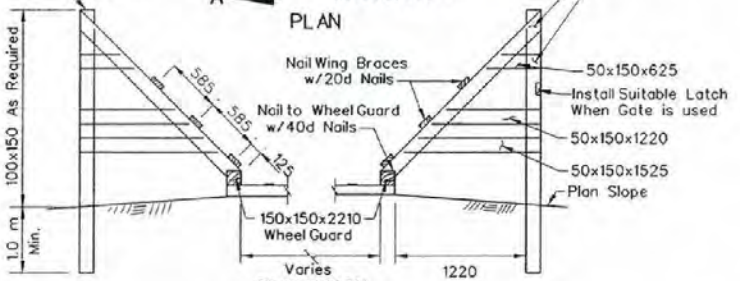
ADOPTED: 07/96

REVISION

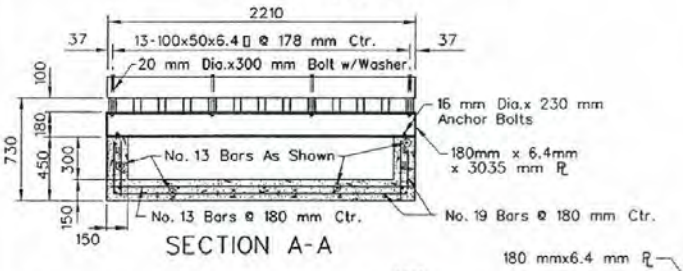
R-58



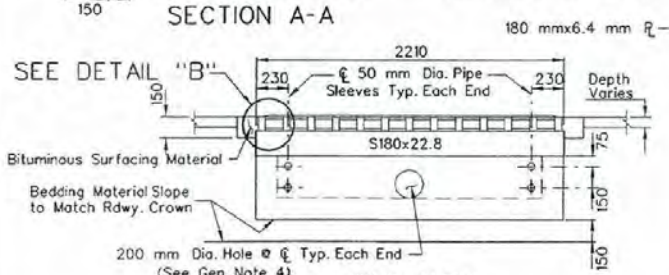
PLAN



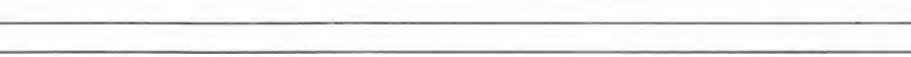
ELEVATION
TIMBER WINGS



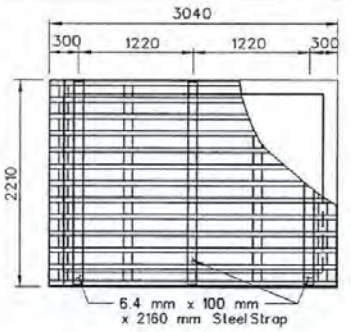
SECTION A-A



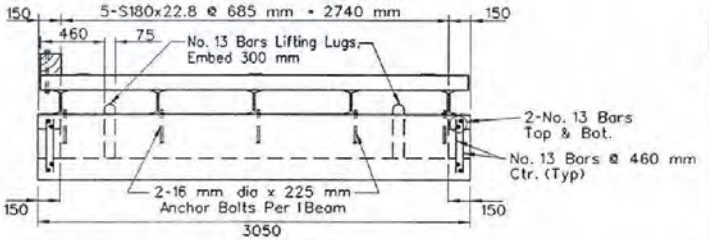
END VIEW



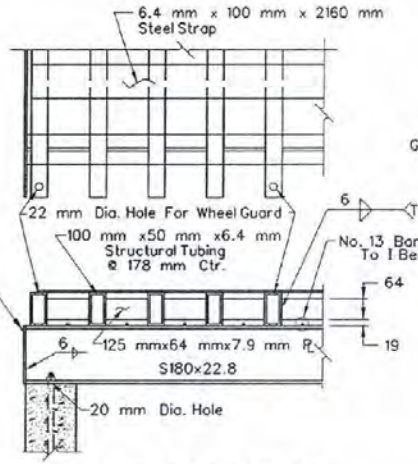
CONNECTION DETAIL



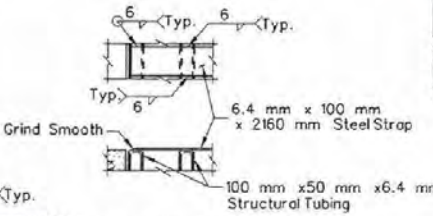
PLAN



ELEVATION



TYPICAL CONNECTION



DETAIL "B"

STRUCTURAL STEEL (1-3050 mm COMPONENT)				
ITEM	NO. REQ'D	SIZE (mm)	LENGTH(mm)	MASS(kg)
BEAMS	5	S180x22.8	2210	252
STRUCTURAL TUBING	13	100x50x6.4	3035	317
SPACER PLATES	60	64X7.9	135	30
ANCHOR BOLTS	10	16	230	4
STEEL STRAPS	3	100X6.4	2160	33
END PLATES	2	180X6.4	3035	54
PIPE SLEEVES	8	50	150	7
CONNECTION PLATES	AS REQ'D	230X100X6.4	-	-
CONNECTION BOLTS	AS REQ'D	25	380	-

REINFORCING STEEL (1-3050 mm COMPONENT)				
ITEM	NO. REQ'D	SIZE	LENGTH(mm)	MASS(kg)
✳HORIZONTAL BARS	12	NO. 13	2895	35
HORIZONTAL BARS	18	NO. 13	2970	53
HORIZONTAL BARS	18	NO. 13	2135	38
VERTICAL BARS	44	NO. 13	380	17
LIFTING LUGS	4	NO. 13	840	3
U BARS	18	NO. 19	2895	118
			TOTAL	263

TIMBER				
ITEM	NO. REQ'D	SIZE(mm)	LENGTH(mm)	m^3
WHEEL GUARDS	2	150X150	2210	.10
WING SLOPE	4	50X150	2440	.08
WING SLOPE	2	50X150	1945	.03
WING BRACES	2	50X150	1015	.03
WING BRACES	4	50X150	1600	.05
WING BRACES	2	50X150	2210	.03
WING BRACES	2	50X150	635	.01
WING BRACES	2	50X150	1220	.02
WING BRACES	2	50X150	1525	.02
WING POST	2	100X150	AS REQ'D	AS REQ'D
NAILING STRIP	2	50X50	610	.003

GALVANIZED HARDWARE				
ITEM	NO. REQ'D	SIZE	LENGTH(mm)	MASS(kg)
BOLTS	8	20 DIA	305	6.8
WASHERS	8	20 DIA	-	0.5
NAILS	50	40d	-	0.2
NAILS	72	40d	-	1.4
			TOTAL	8.9

CONCRETE	
1-3050 mm COMPONENT	1.5 m^3

✳ - No. 13 BARS WELDED TO I BEAMS.

GENERAL NOTES:

1. ALL CONCRETE TO BE CLASS BA.
2. ALL CONNECTIONS TO BE WELDED.
3. WHEN GATE IS NOT SPECIFIED: INSTALL THE REQUIRED TYPE OF INTERMEDIATE BRACED POST ADJACENT TO THE WING POST. FENCE WIRES TO BE TIED TO BRACED POST ONLY.
4. EXTEND DRAIN PIPES TO FACILITATE DRAINAGE OF STRUCTURE.
5. WINGS SHALL BE PAINTED WHITE PER STANDARD SPECIFICATIONS.

THIS DESIGN IS NOT FOR USE ON MAINLINES, RAMPS, OR CROSSROADS

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

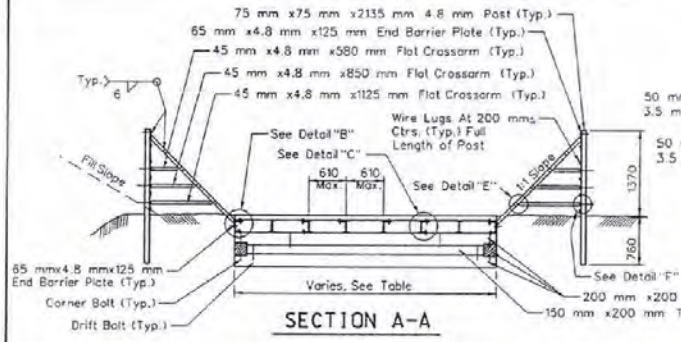
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STEEL CATTLE GUARD (TYPE C)

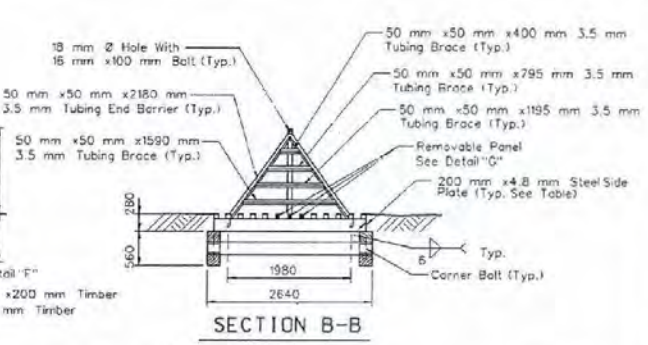
R-7.1.4 (617)

CHIEF ROAD DESIGN ENGR. ADOPTED: 07/96 REVISION

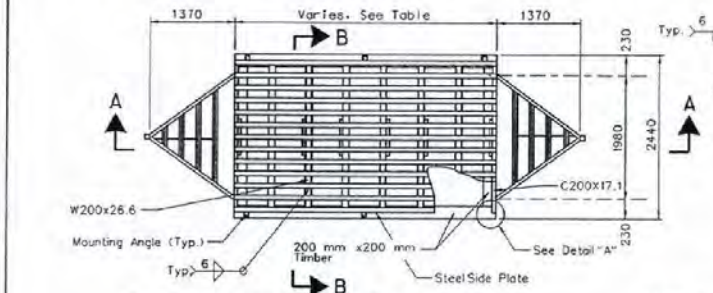
R-59



SECTION A-A



SECTION B-B



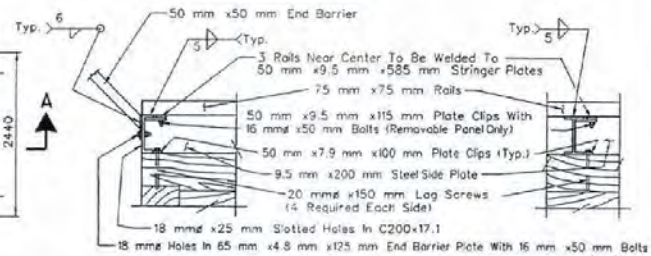
PLAN

NOTE: MATERIAL LIST IS FOR INFORMATION ONLY.

MATERIAL LIST FOR WINGS				
ITEM	REQD.	SIZE(mm)	LENGTH(mm)	MASS (Kg)
FLAT CROSSARMS	2	45 x 4.8	580	2
FLAT CROSSARMS	2	45 x 4.8	850	3
FLAT CROSSARMS	2	45 x 4.8	995	4
BRACES	2	50 x 50 x 3.5	400	5
BRACES	2	50 x 50 x 3.5	795	10
BRACES	2	50 x 50 x 3.5	1195	17
BRACES	2	50 x 50 x 3.5	1590	20
END BARRIER	4	50 x 50 x 3.5	2180	56
END BARRIER PLATES	6	65 x 4.8	125	2
UPRIGHT POST	2	75 x 75 x 4.8	2135	44

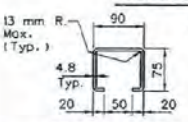
THIS DESIGN IS NOT FOR USE ON MAINLINES, RAMPS, OR CROSSROADS

GALVANIZED HARDWARE			
ITEM	NO. REQD.	SIZE(mm)	LENGTH(mm)
BOLTS	6	16	75
BOLTS	6	16	125
BOLTS	16	16	50
WASHERS	56	17	
WASHERS	14	21	
NUTS	28	16	
NUTS	14	20	
LAG SCREWS	14	20	150



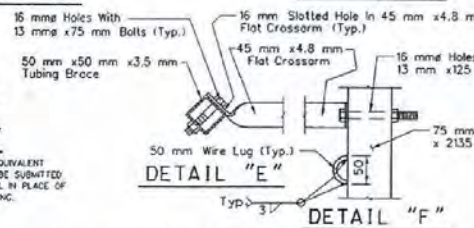
DETAIL "B"

DETAIL "C"



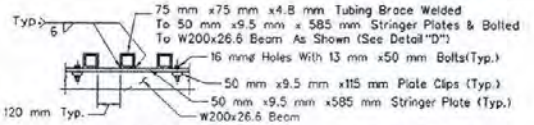
DETAIL "D"

NOTE: A WELDED OR ROLLED UNIT OF EQUIVALENT DESIGN LOADING CAPACITY, MAY BE SUBMITTED TO THE ENGINEER FOR APPROVAL IN PLACE OF 75 mm x75 mm x4.8 mm TUBING.



DETAIL "E"

DETAIL "F"



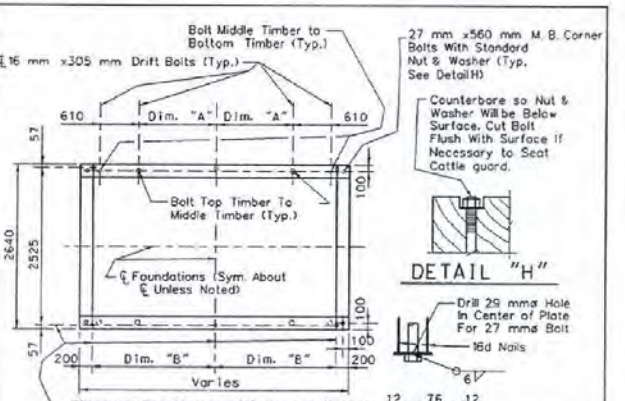
DETAIL "G"

MATERIAL LIST FOR ALL SIZES				
ITEM	NO.REQ'D	SIZE(mm)	LENGTH(mm)	MASS(kg)
CHANNELS	2	C200x17.1	2440	84
STRINGER PLATES	6	50 x 9.5	585	14
PLATE CLIPS	12	50 x 9.5	115	4
ANCHOR BOLT CLIPS	14	50 x 7.9	100	5

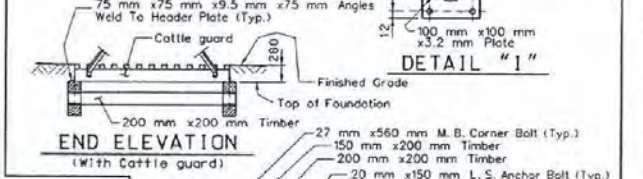
BILL OF MATERIALS										
FRAME SIZE		LONGITUDINAL STRINGERS				STRUCTURAL STEEL				
LENGTH	WIDTH	NO. REQD.	SIZE	SPACING	MASS (Kg)	ITEM	NO. REQD	SIZE(mm)	LENGTH(mm)	MASS(kg)
2440	4265	6	W200x26.6	EQUAL	390	RAILS	13	75x75x4.8	4265	568
						SIDE PLATES	2	200x4.8	4265	65
2440	3660	5	W200x26.6	EQUAL	325	RAILS	13	75x75x4.8	3660	486
						SIDE PLATES	2	200x4.8	3660	55
2440	3050	4	W200x26.6	EQUAL	260	RAILS	13	75x75x4.8	3050	405
						SIDE PLATES	2	200x4.8	3050	46
2440	2440	3	W200x26.6	EQUAL	195	RAILS	13	75x75x4.8	2440	324
						SIDE PLATES	2	200x4.8	2440	37

GENERAL NOTES:

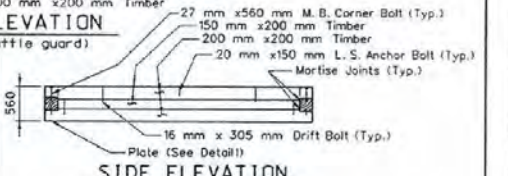
1. ALTERNATE DESIGN MAY BE SUBSTITUTED BY THE CONTRACTOR FOR APPROVAL BY THE ENGINEER.
2. LIVE LOADING: M-18
3. CATTLE GUARD IS TO BE PLACED ON LEVEL GRADE ACROSS ROADWAY – ROADWAY CROSS SLOPE IS TO TRANSITION FROM NORMAL SECTION TO LEVEL SECTION 7.6 m BACK ON LINE AND 7.6 m AHEAD ON LINE FROM EDGE OF CATTLE GUARD.
4. "FRAME WIDTH" COMBINATIONS MAY BE VARIED TO OBTAIN THE SPECIFIED WIDTH OF CATTLE GUARDS.
5. USE SELF-LOCKING NUTS ON REMOVABLE PANEL.
6. ALL WINGS SHALL BE PAINTED WHITE PER STANDARD SPECIFICATIONS.



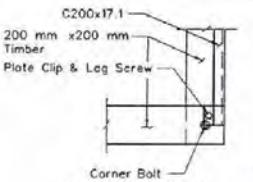
PLAN



END ELEVATION
(With Cattle guard)



SIDE ELEVATION
(Without Cattleguard)



DETAIL "A"

FRAME SIZE		DIM.	DIM.
LENGTH(mm)	WIDTH(mm)	"A"	"B"
2640	4265	1220	1930
2640	3660	915	1625
2640	3050	610	1320
2640	2440	305	1015

GENERAL NOTES:

1. USE SINGLE LAYER FOUNDATION UNIT FOR EACH CATTLE GUARD FRAME.
2. TIMBERS USED IN FOUNDATIONS SHALL BE TREATED.

TIMBER FOUNDATION DETAILS

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STEEL CATTLE GUARD TIMBER FOUNDATION

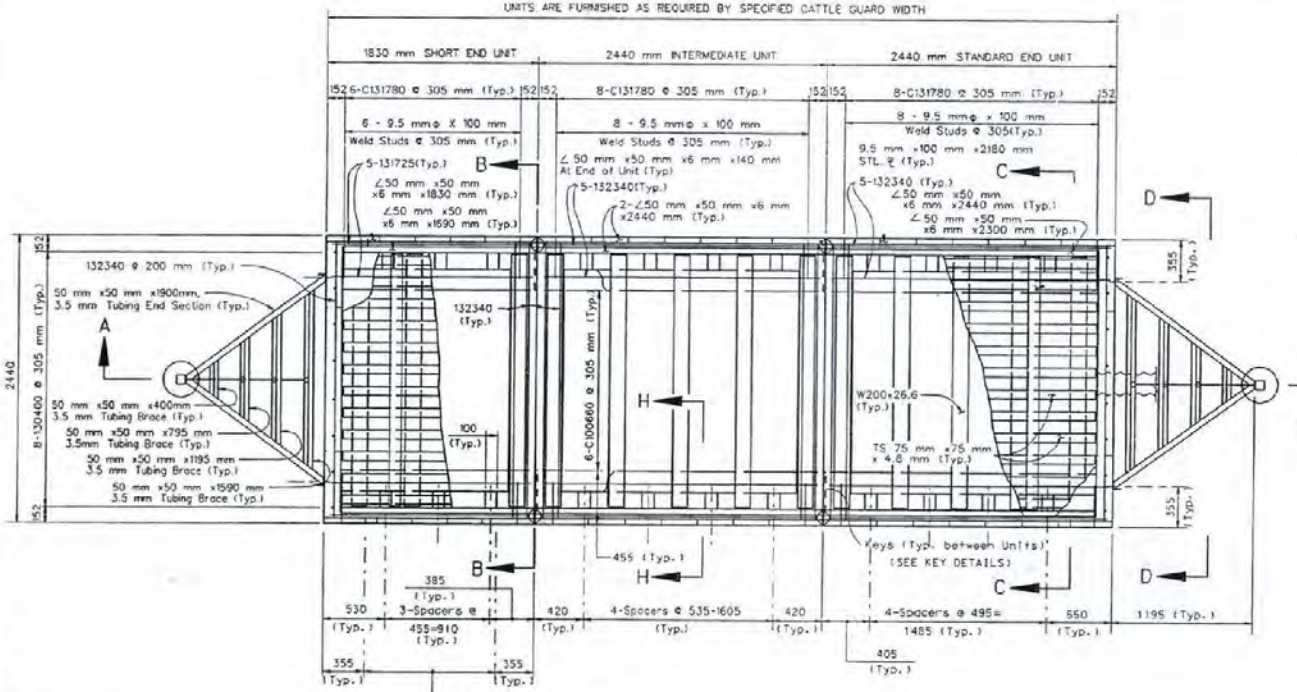
CHIEF ROAD DESIGN ENGINEER

R-7.1.5 (617)

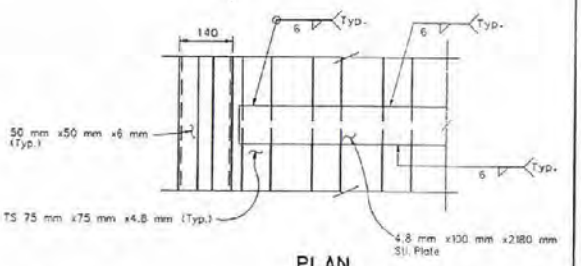
ADOPTED: 07/96

REVISION

R-60

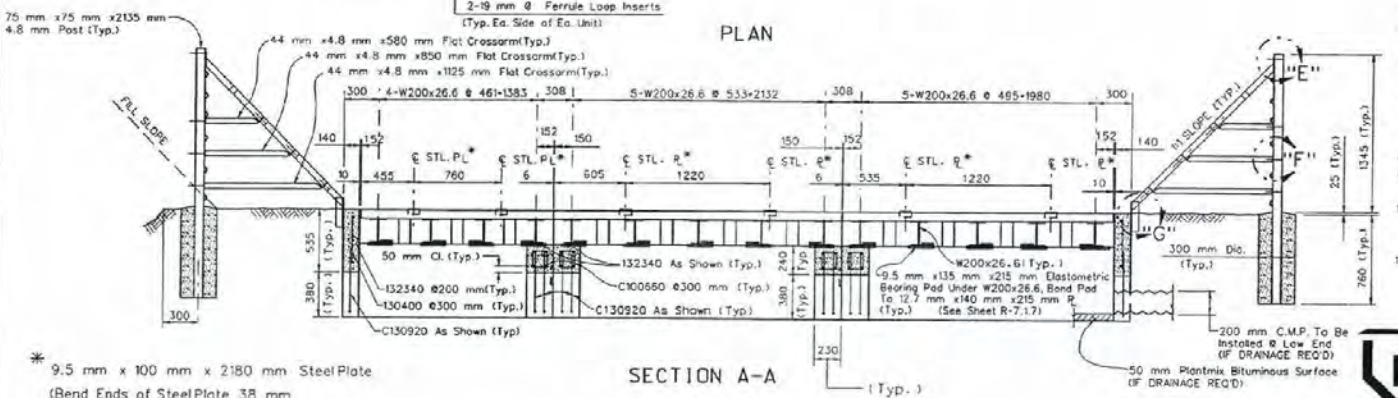


PLAN



PLAN

ELEVATION
SECTION H-H



SECTION A-A

* 9.5 mm x 100 mm x 2180 mm Steel Plate (Bend Ends of Steel Plate 38 mm Down Vertical Face of Outside TS Members (See Sec. H-H)

NOTE: For Details B-B, C-C, D-D, E, F, G, Not Shown See Standard Sheet R-7.1.7

GENERAL NOTES:

1. PRECAST CONCRETE SHALL REACH Fc' = 30 MPa AT 28 DAYS. ALL OTHER CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE GRADE 40 (Fs =300 MPa.)
3. DESIGN LIVE LOAD M-18.
4. MINIMUM SOIL BEARING PRESSURE OF 200 kPa SHALL BE OBTAINED BY PLACING A FINE AGGREGATE (SECTION 706.03.03) BED 75 mm THICK OVER SOIL COMPACTED TO NOT LESS THAN 95% DENSITY AND HAND LEVELED.
5. STRUCTURAL STEEL SHALL CONFORM TO ASTM A36M.
6. FASTENERS SHALL BE GALVANIZED.
7. BEARING PADS SHALL BE 50 DUROMETER HARDNESS.
8. CATTLE GUARD SHALL BE SLOPED TO CONFORM TO THE ROADWAY CROSS SECTION.
9. WHEN CATTLE GUARD IS TO BE INSTALLED IN IMPERVIOUS MATERIAL, ADEQUATE DRAINAGE SHALL BE PROVIDED TO INSURE AGAINST POSSIBLE SUBGRADE DAMAGE. DRAINAGE DETAILS SHALL BE AS SHOWN ON THE PLANS.
10. APPROVED ALTERNATE DESIGNS MAY BE USED.
11. METAL WINGS SHALL BE PAINTED WHITE PER STANDARD SPECIFICATIONS.
12. SHOP DRAWINGS SHOWING THE DETAILS OF FABRICATION AND THE PROPOSED LAYOUT OF UNITS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
13. CATTLE GUARD WIDTH SHALL INCLUDE A 0.6 m SHY DISTANCE FROM THE NORMAL E.O.P., EACH SIDE (PER AASHTO).

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PRECAST CATTLE GUARD

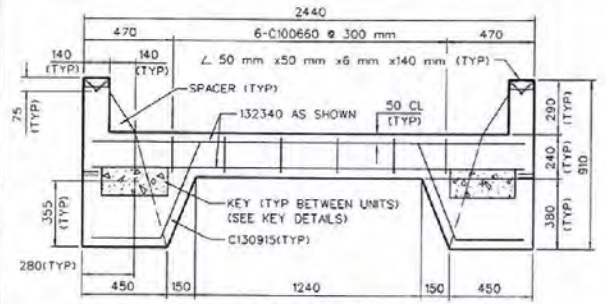
CHIEF ROAD DESIGN ENGR.

R-7.1.6 (617)

ADOPTED 7/96

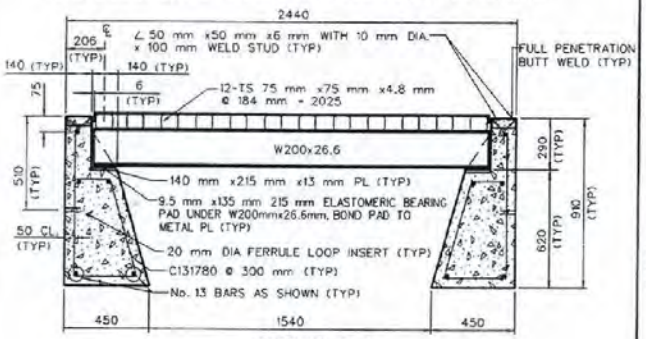
REVISION 9/97

R-61



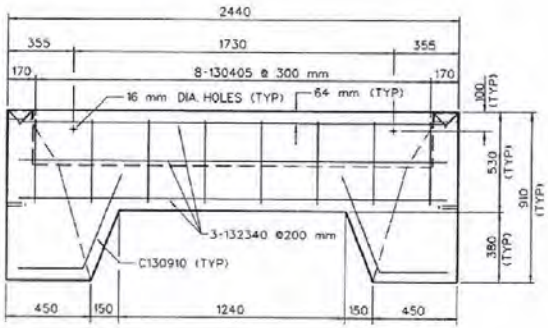
SECTION B-B

(ALL DIMENSIONS, KEYS, REINFORCING & STRUCTURAL STEEL TYPICAL ALL UNITS)



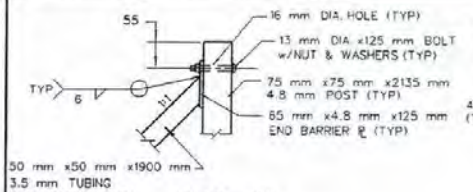
SECTION C-C

(ALL DIMENSIONS, KEYS, REINFORCING & STRUCTURAL STEEL TYPICAL ALL UNITS)

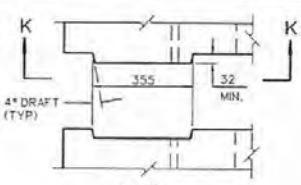


VIEW D-D

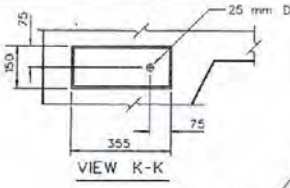
(ALL DIMENSIONS, KEYS, REINFORCING & STRUCTURAL STEEL TYPICAL ALL UNITS)



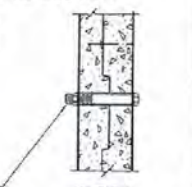
DETAIL "E"



PLAN

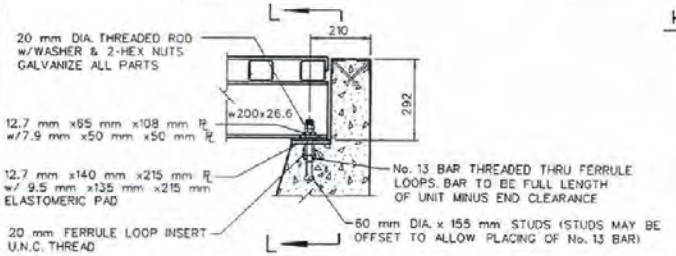


VIEW K-K



TYPICAL KEY CONNECTION

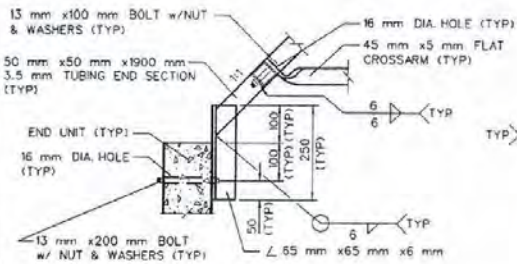
KEY DETAILS



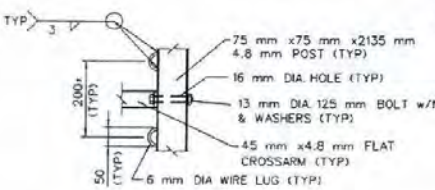
W200x26.6 ANCHOR ASSY.

GENERAL NOTES:

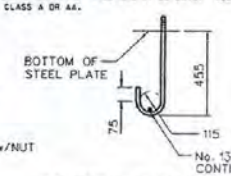
1. 12.7 mm x 140 mm x 215 mm PLATE WITH FERRULE AND STUDS ATTACHED IS TO BE CAST IN THE CONCRETE FRAME. AFTER THE CONCRETE FRAME HAS BEEN MANUFACTURED: THE 20 mm DIA. A307 THREADED ROD ① IS TO BE TIGHTENED INTO THE FERRULE. THE ROD IS THEN TO BE WELDED ② TO THE PLATE. THE ELASTOMERIC PAD IS THEN BONDED TO THE PLATE. THE STEEL GRATE IS THEN PLACED AND ADJUSTED TO ITS SPECIFIC POSITION. THE METAL CLAMPS ARE PLACED AND THE NUTS TIGHTENED. THE FIRST NUT IS JUST TO BE SNUG TIGHT. THE SECOND NUT IS TO BE TIGHT AGAINST THE FIRST NUT TO LOCK IT IN PLACE. AFTER A FINAL CHECK THAT THE STEEL GRATE IS STILL IN ITS SPECIFIED POSITION, THE METAL CLAMPING PLATE IS THEN WELDED ③ TO THE FRAME OF THE STEEL GRATE. ALL WELDING SHALL BE DONE AT THE PLACE OF THE FABRICATION. IF STEEL GRATE AND CONCRETE FRAME ARE SHIPPED SEPARATELY, THEY SHALL BE MATCH MARKED.
2. ALTERNATE: USE OF "J" BOLT. 12.7 mm x 140 mm x 215 mm PLATE WITH 20 mm DIA A307 "J" BOLT ① AND STUDS ATTACHED IS TO BE CAST IN THE CONCRETE FRAME. THE "J" BOLT IS TO BE WELDED TO BOTH FACES OF THE PLATE ②. THE ELASTOMERIC PAD IS BONDED TO THE PLATE. THE STEEL GRATE IS PLACED AND ADJUSTED TO ITS SPECIFIED POSITION. THE METAL CLAMPS ARE PLACED AND THE NUTS TIGHTENED. THE FIRST NUT IS JUST TO BE SNUG TIGHT. THE SECOND NUT IS TO BE TIGHT AGAINST THE FIRST NUT TO LOCK IT IN PLACE. AFTER A FINAL CHECK THAT THE STEEL GRATE IS IN ITS SPECIFIED POSITION, THE METAL CLAMPING PLATE IS WELDED ③ TO THE FRAME OF THE STEEL GRATE. ALL WELDING SHALL BE DONE AT THE PLACE OF FABRICATION. IF STEEL GRATE AND CONCRETE FRAME ARE SHIPPED SEPARATELY, THEY SHALL BE MATCH MARKED.
3. PRECAST CONCRETE SHALL REACH Fc' = 30 MPa AT 28 DAYS. ALL OTHER CONCRETE SHALL BE CLASS A OR AA.



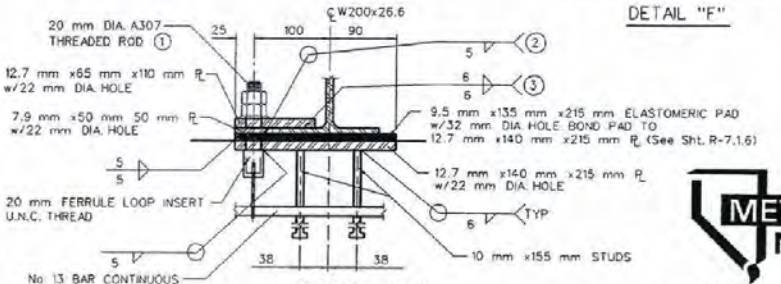
DETAIL "G"



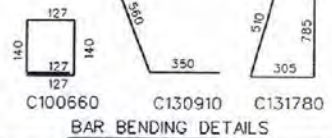
DETAIL "F"



"J" BOLT ALTERNATIVE



SECTION "L-L"



BAR BENDING DETAILS

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

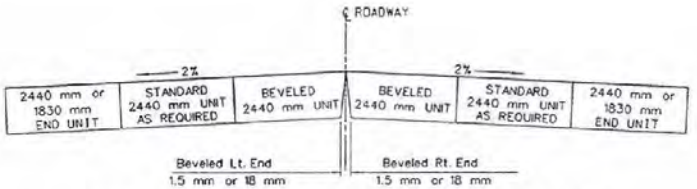
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PRECAST CATTLE GUARD SECTIONS AND DETAILS

R-7.1.7 (6 | 7)

CHIEF ROAD DESIGN ENGR. ADOPTED: 07/96 REVISION 9/97

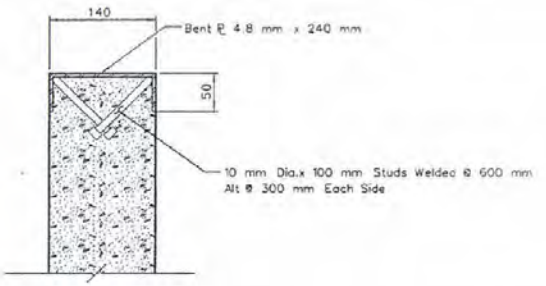
R-62



TYPICAL CATTLE GUARD INSTALLATION ON CROWNED ROADWAYS

NOTE: ALL CATTLE GUARD INSTALLATIONS, ON CROWNED ROADWAYS, SHALL BE INSTALLED USING AN EVEN NUMBER OF UNITS AS SHOWN ABOVE, AND AS INDICATED IN THE TABLE BELOW.

UNITS FOR ROADWAY CROWNED AT					
WIDTH OF ROADWAY (m)	LENGTH OF END UNITS (mm)	2440 mm UNITS BEVELED	2440 mm UNITS STANDARD	LENGTH SUPPLIED (mm)	LENGTH BEYOND SHLDR. (mm)
7.2	2 @ 1830	2		8540	610
7.8	2 @ 1830	2		8540	305
8.4	2 @ 1830	2		8540	0
9.0	2 @ 2440	2		9760	305
9.6	2 @ 2440	2		9760	0
10.2	2 @ 1830	2	2	13420	1525
10.8	2 @ 1830	2	2	13420	1220
11.4	2 @ 1830	2	2	13420	915
12.0	2 @ 1830	2	2	13420	610
12.6	2 @ 1830	2	2	13420	305
13.2	2 @ 1830	2	2	13420	0
13.8	2 @ 2440	2	2	14640	305
14.4	2 @ 2440	2	2	14640	0
15.0	2 @ 1830	2	2	18300	1525
15.6	2 @ 1830	2	2	18300	1220
16.2	2 @ 1830	2	2	18300	915
16.8	2 @ 1830	2	2	18300	610
17.4	2 @ 1830	2	2	18300	305
18.0	2 @ 1830	2	2	18300	0



ALTERNATE ARMOR DETAIL

NOTE: The Above Alternate Armor Detail May be Substituted for The 50 mm x 50 mm x 6 mm Armor Angles at The Contractors Option.

GENERAL NOTES:

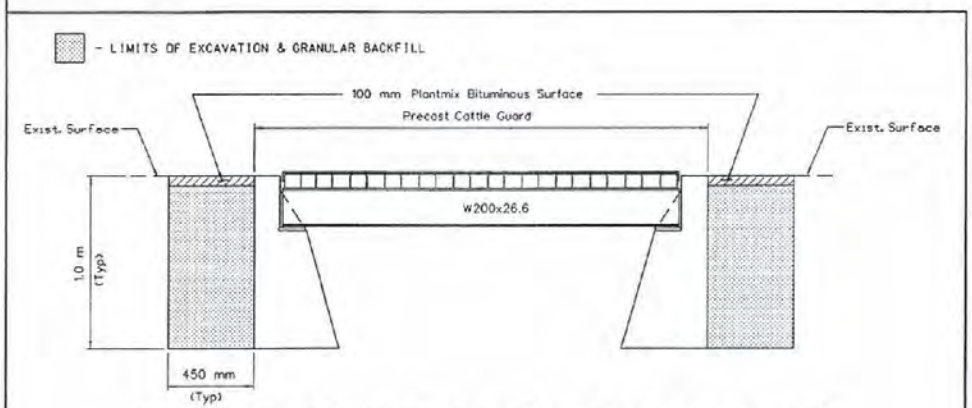
1. PRECAST CONCRETE SHALL REACH Fc' = 30 MPa AT 28 DAYS. ALL OTHER CONCRETE SHALL BE CLASS A OR AA.
2. MATERIAL LIST IS FOR INFORMATION ONLY.

STRUCTURAL STEEL				
UNIT	ITEM (mm)	REQ'D	LENGTH (mm)	MASS (kg)
SHORT END	TS 75x75x4.8	12	1680	308
	W200x26.6	4	2135	229
	∠ 50x50x6	2	140	1
	∠ 50x50x6	2	1830	17
	∠ 50x50x6	2	1690	16
	10 mm DIA. STUD	12	100	1
	ANCHOR ASSY.	8	- — —	41
	9.5 mm x100 mm. Plate	2	2180	33
				646
INTERMEDIATE	TS 75x75x4.8	12	2430	447
	W200x26.6	5	2135	286
	∠ 50x50x6	4	140	2
	∠ 50x50x6	4	2440	46
	10 mm DIA. STUD	14	100	1
	ANCHOR ASSY.	10	- — —	51
	9.5 mm x100 mm. Plate	2	2180	33
				867
STANDARD END	TS 75x75x4.8	12	2285	420
	W200x26.6	5	2135	286
	∠ 50x50x6	2	140	1
	∠ 50x50x6	2	2440	25
	∠ 50x50x6	2	2300	22
	10 mm DIA. STUD	14	100	1
	ANCHOR ASSY.	10	- — —	51
	9.5 mm x100 mm. Plate	2	2180	33
				837

REINFORCING STEEL AND CONCRETE				
UNIT	NO. REQ'D	BAR MARK	MASS (kg)	CONCRETE (m^3)
SHORT END	7	132340	16	1.29
	10	131725	17	
	6	130405	3	
	6	C100660	2	
	12	C131780	21	
	6	C130915	5	
			64	
INTERMEDIATE	18	132340	42	1.35
	12	C100660	5	
	16	C131780	28	
	8	C130915	7	
			82	
STANDARD END	17	132340	40	1.62
	8	130405	3	
	6	C100660	2	
	16	C131780	28	
	6	C130915	5	
			78	

HARDWARE				
LOCATION	ITEM	NO. REQ'D	SIZE(mm)	LENGTH(mm)
WINGS	BOLTS	4	13	200
	BOLTS	6	13	100
PER UNIT CONNECTION	BOLTS	8	13	125
	WASHERS	36	14	-
	NUTS	18	13	-
	BOLTS	2	20	510
	WASHERS	4	21	-
	NUTS	2	20	-

MATERIAL LIST FOR WINGS				
ITEM	REQ'D	SIZE(mm)	LENGTH(mm)	MASS(kg)
FLAT CROSSARMS	2	44X4.8	580	2
FLAT CROSSARMS	2	44X4.8	850	3
FLAT CROSSARMS	2	44X4.8	1125	4
BRACES	2	50X50X3.5	400	5
BRACES	2	50X50X3.5	795	10
BRACES	2	50X50X3.5	1195	17
BRACES	2	50X50X3.5	1590	20
END BARRIER	4	50X50X3.5	1900	49
BARRIER PLATES	2	64X64X6	125	0.5
BARRIER ANGLES	4	64X64X6	255	6
UPRIGHT POSTS	2	75X75X4.8	2135	44



METHOD OF PATCHING AT PRECAST CATTLE GUARDS

METRIC NDOT

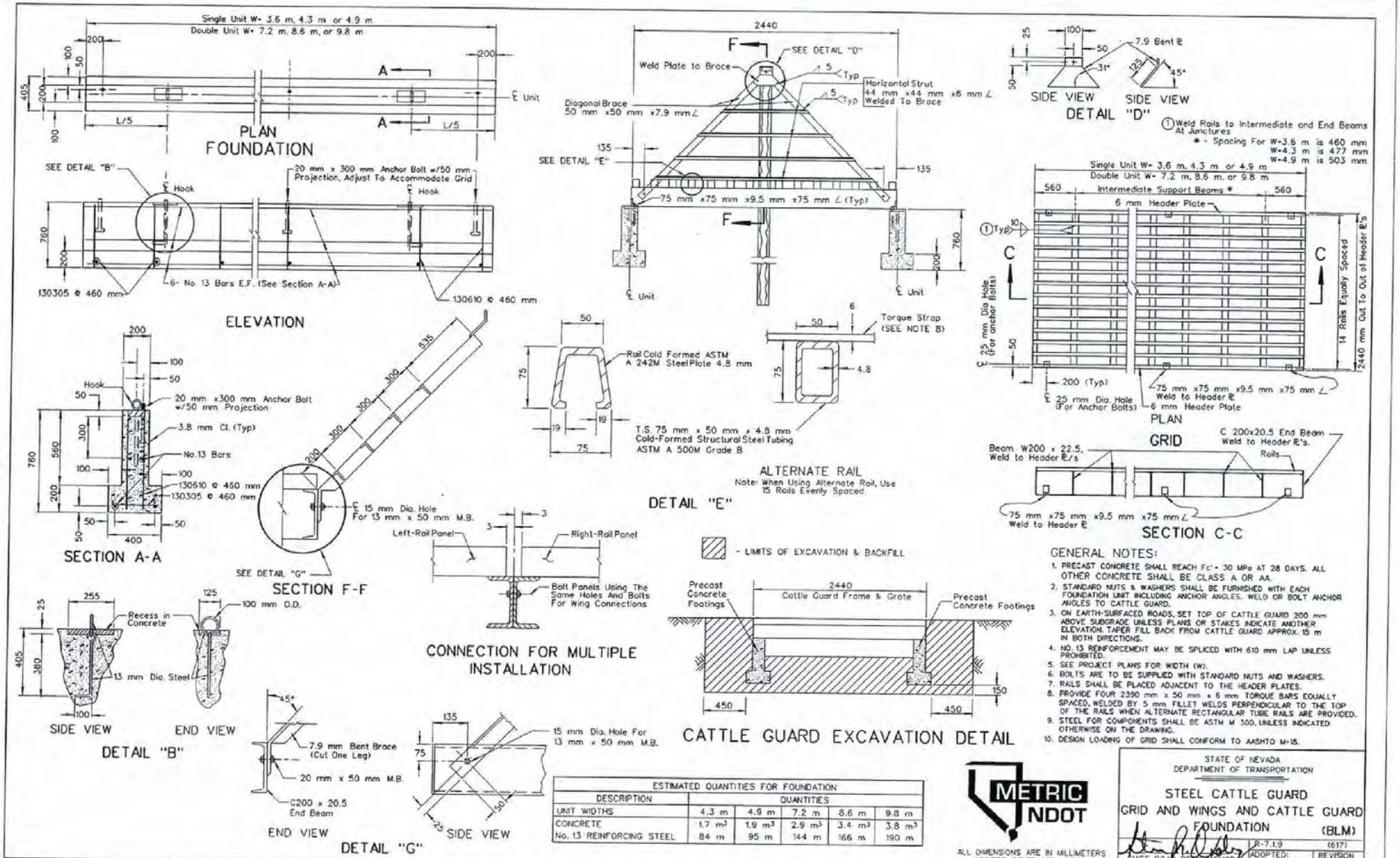
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PRECAST CATTLE GUARD SECTIONS AND DETAILS

CHIEF ROAD DESIGN ENGR. | R-7.1.8 | (6|7) | ADOPTED: 07/96 | REVISION 9/97

R-63



GENERAL NOTES:

1. PRECAST CONCRETE SHALL REACH Fc' = 30 MPa AT 28 DAYS. ALL OTHER CONCRETE SHALL BE CLASS A OR AA.
2. STANDARD NUTS & WASHERS SHALL BE FURNISHED WITH EACH FOUNDATION UNIT INCLUDING ANCHOR ANGLES. WELD OR BOLT ANCHOR ANGLES TO CATTLE GUARD.
3. ON EARTH-SURFACED ROADS, SET TOP OF CATTLE GUARD 200 mm ABOVE SUBGRADE UNLESS PLANS OR STAKES INDICATE ANOTHER ELEVATION. TAPER FILL BACK FROM CATTLE GUARD APPROX. 15 m IN BOTH DIRECTIONS.
4. NO. 13 REINFORCEMENT MAY BE SPLICED WITH 610 mm LAP UNLESS PROHIBITED.
5. SEE PROJECT PLANS FOR WIDTH (W).
6. BOLTS ARE TO BE SUPPLIED WITH STANDARD NUTS AND WASHERS.
7. RAILS SHALL BE PLACED ADJACENT TO THE HEADER PLATES.
8. PROVIDE FOUR 2390 mm x 50 mm x 6 mm TORQUE BARS EQUALLY SPACED, WELDED BY 5 mm FILLET WELDS PERPENDICULAR TO THE TOP OF THE RAILS WHEN ALTERNATE RECTANGULAR TUBE RAILS ARE PROVIDED.
9. STEEL FOR COMPONENTS SHALL BE ASTM M 300, UNLESS INDICATED OTHERWISE ON THE DRAWING.
10. DESIGN LOADING OF GRID SHALL CONFORM TO AASHTO M-18.

ESTIMATED QUANTITIES FOR FOUNDATION

DESCRIPTION	QUANTITIES				
UNIT WIDTHS	4.3 m	4.9 m	7.2 m	8.6 m	9.8 m
CONCRETE	1.7 m³	1.9 m³	2.9 m³	3.4 m³	3.8 m³
No. 13 REINFORCING STEEL	84 m	95 m	144 m	166 m	190 m

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STEEL CATTLE GUARD GRID AND WINGS AND CATTLE GUARD FOUNDATION (BLM)

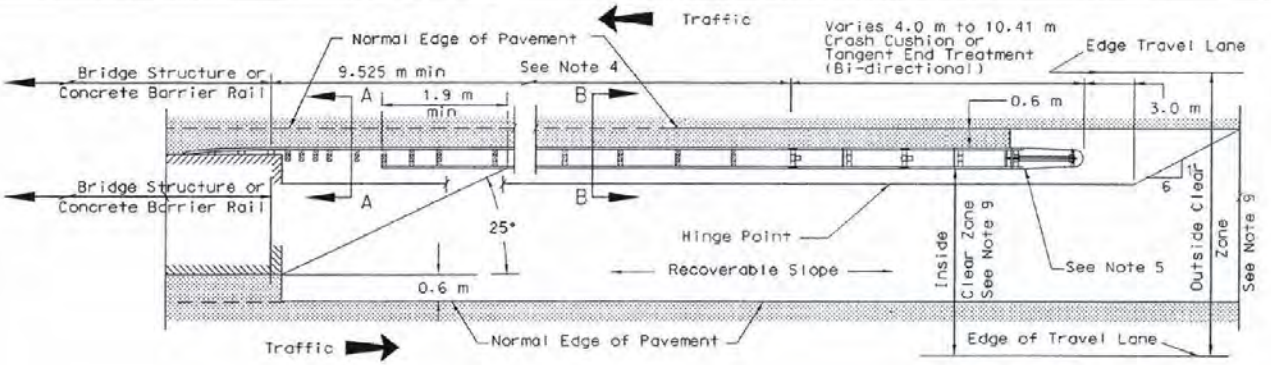
CHIEF ROAD DESIGN ENGR.

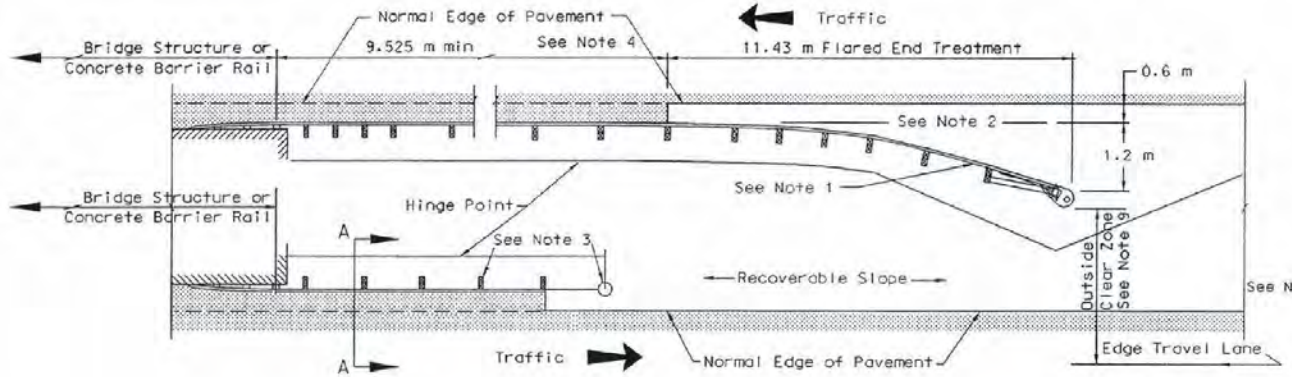
R-7.1.9 (617)

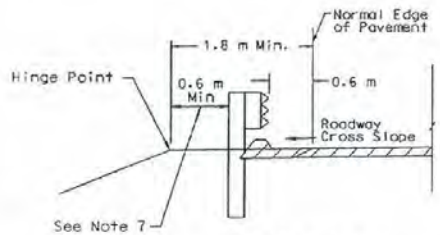
ADOPTED: 07/96

REVISION 9/97

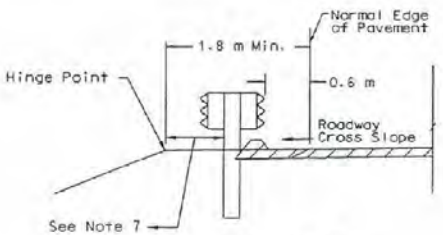
R-64







SECTION A-A



SECTION B-B

Design Speed (km/h)	Flare Rate
120	1:16
110	1:15
100	1:14
90	1:12
80	1:11
70	1:10
60	1:8
50	1:7

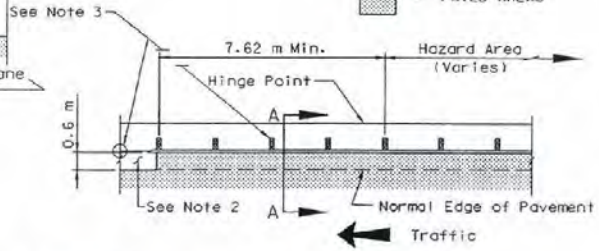
GUARDRAIL
FLARE RATES

GENERAL NOTES

1. MELT: SEE STANDARD DRAWINGS R-8.1.6.1 THRU 8.1.6.3 FOR OTHER END TREATMENTS NOT SHOWN. REFER TO MANUFACTURER'S DRAWINGS
2. THESE AREAS MAY REQUIRE PAVING IF SHOULDER DIKES AND/OR DOWN DRAINS ARE USED
3. TRAILING END ANCHOR: SEE STANDARD DRAWING R-8.1.6.4.
4. GALVANIZED GUARDRAIL (TRIPLE CORRUGATIONS): SEE STANDARD DRAWINGS R-8.1.7.
5. CRASH CUSHION OR TANGENT END TREATMENT (BI-DIRECTIONAL) CAN BE FLARED AT 1:50 TAPER.
6. RECOVERABLE SLOPES REQUIRED BEHIND GATING PORTION OF END TREATMENT OR CRASH CUSHION
7. ON RETROFIT INSTALLATIONS WHEN DISTANCE BETWEEN BACK OF POST AND HINGE POINT IS LESS THAN 0.6 m, THE POST SHALL BE LENGTHENED 0.3 m MIN.
8. GUARDRAIL HEIGHTS ON STAGE CONSTRUCTION PROJECTS SHALL BE GOVERNED BY FINAL SURFACING HEIGHT.
9. REFERENCE: AASHTO ROADSIDE DESIGN GUIDE, 1996 EDITION.
10. CLEAR ZONE SHOULD BE BASED ON 20 YEAR TRAFFIC DESIGN.
11. RECOVERABLE SLOPES ARE 1:4 OR FLATTER.

LEGEND

- PAVED AREAS



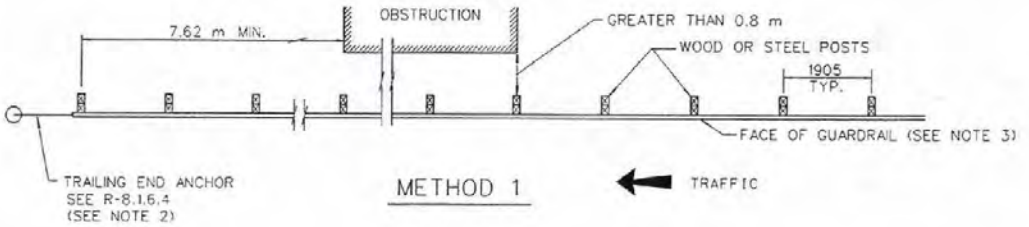
METRIC NDOT

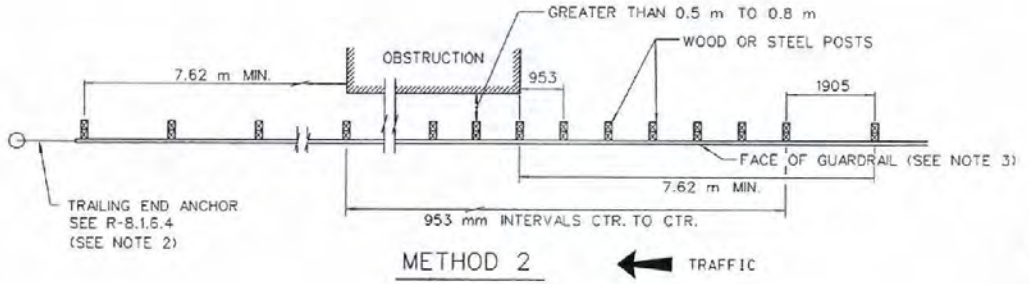
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

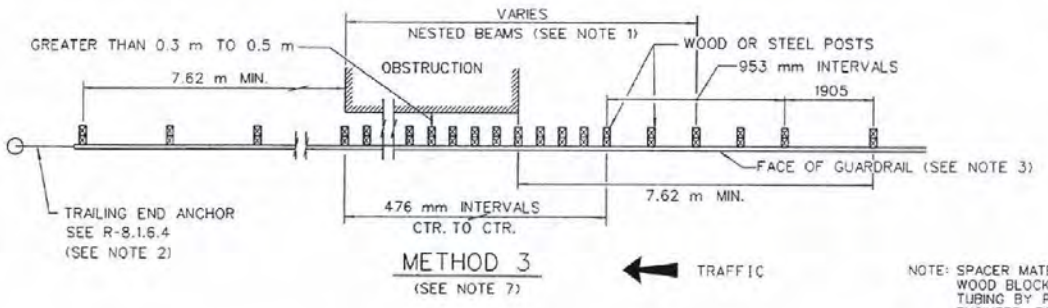
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

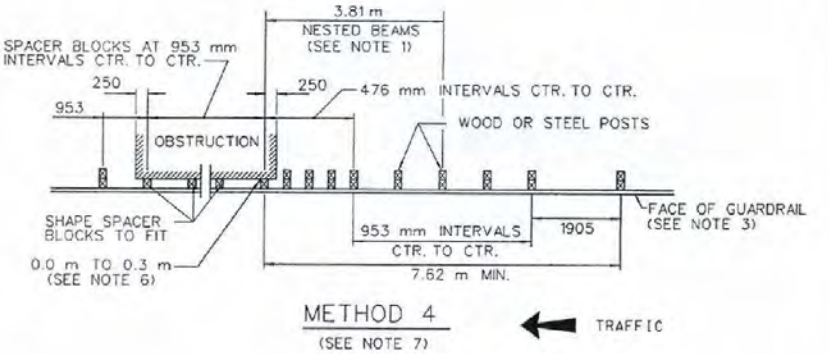
TYPICAL GUARDRAIL INSTALLATION

CHIEF ROAD DESIGN ENGR. | R-8.1.4 (618) | ADOPTED: 07/96 | REVISION 9/97









GENERAL NOTES:

1. USE NESTED THRIE BEAM. SEE DETAIL "N" STANDARD PLAN SHEET R-8.1.5.1
2. A GUARDRAIL ENERGY ABSORBING TERMINAL SHOULD BE USED IF THE ONE WAY FACILITY IS TO BE USED AS A TWO WAY DETOUR. THE TERMINAL SHOULD BE LEFT IN PLACE ONCE THE DETOUR IS REMOVED.
3. FOR DETAILS NOT SHOWN SEE STANDARD DRAWING R-8.1.7
4. REFER TO AASHTO ROADSIDE DESIGN GUIDE, 1996 EDITION, SECTION 5.6.1 FOR DESIGN INFORMATION NOT SHOWN.
5. SEE STANDARD DRAWING R-8.1.5.2 FOR OPTIONAL GUARDRAIL INSTALLATION.
6. INCREASE 0.6 m SHY DISTANCE TO PLACE SPACER BLOCKS ON OBSTRUCTION.
7. IF GUARDRAIL SYSTEM IS NOT SATISFACTORY, USE CONCRETE BARRIER RAIL.

NOTE: SPACER MATERIAL MAY BE "I" BEAM, WOOD BLOCK OR FORMED STRUCTURAL TUBING BY PRIOR APPROVAL OF THE ENGINEER. FOR DETAILS SEE STANDARD SHEET R-8.1.7

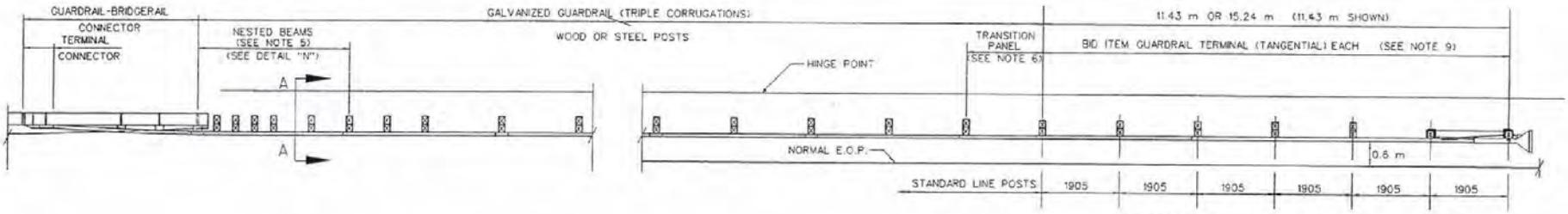
METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

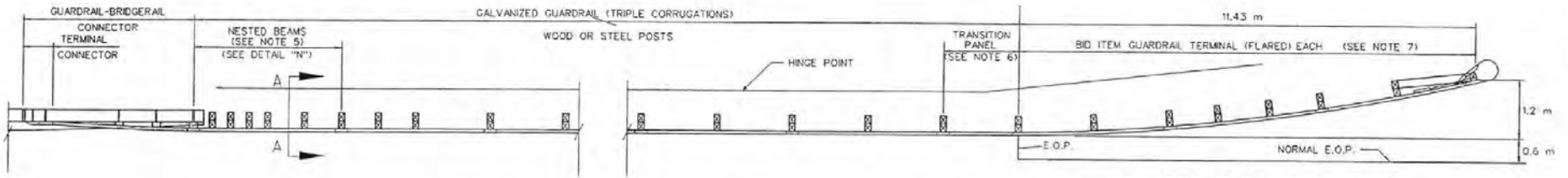
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL GUARDRAIL-TRANSITION INSTALLATIONS

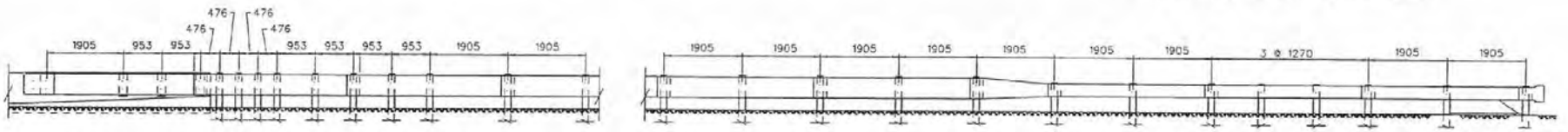
CHIEF ROAD DESIGN ENGR. | R-8.1.5 | 1(1B) | ADOPTED 07/96 | REVISION: 9/97



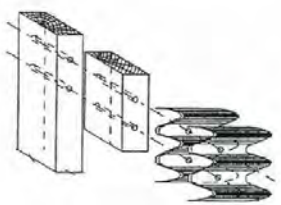
TANGENT END TREATMENT



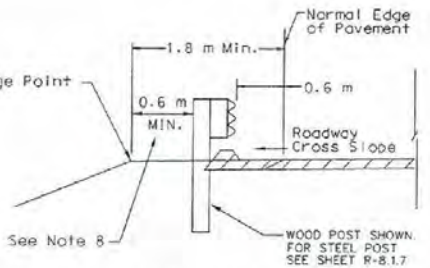
FLARED END TREATMENT



TYPICAL GUARDRAIL INSTALLATION



NESTED BEAMS
DETAIL "N"



SECTION A-A

GENERAL NOTES:

1. FOR DETAILS AND DIMENSIONS NOT SHOWN SEE SHEETS R-8.1.4. THRU R-8.2.4.1.
2. SEE SHEET T-35.2.1 FOR SPECIAL GUARDRAIL TERMINAL END FOR RAILROAD CROSSING.
3. SEE SHEET R-8.1.6.4 FOR TRAILING END ANCHOR FOR ONE-WAY ROADS.
4. MINIMUM INSTALLATION:

GUARDRAIL-BRIDGERAIL CONNECTOR	--	3.81 m
NESTED BEAM SECTION	--	3.81 m
THRIE BEAM SECTION	--	3.81 m
TRANSITION PANEL	--	1.905 m
MELT OR OTHER "350" TERMINAL	--	11.43 m OR 15.24 m
		24.765 m OR 28.575 m

ANY OTHER VARIATION THAT REDUCES THE MINIMUM LENGTH SHALL REQUIRE APPROVAL OF THE CHIEF ROAD DESIGN ENGINEER.

5. NO DIRECT PAYMENT FOR THE ADDITIONAL GUARDRAIL PANEL.
6. THE LENGTH OF THE TRANSITION PANEL (1905 mm) SHALL BE ADDED TO THE ESTIMATED LENGTH OF THE THRIE BEAM GUARDRAIL. SEE SHEET R-8.1.7
7. FOR MODIFIED ECCENTRIC LOADER TERMINAL SEE R-8.1.6.1 THRU R-8.1.6.3. FOR OTHER GUARDRAIL ENERGY ABSORBING TERMINALS NOT SHOWN, REFER TO MANUFACTURERS' DRAWINGS.
8. ON RETROFIT INSTALLATIONS IF MINIMUM CANNOT BE MET AND THE DISTANCE BETWEEN BACK OF POST AND HINGE POINT IS LESS THAN 0.6 m, THE POST SHALL BE LENGTHENED 0.3 m MIN.
9. WHEN GUARDRAIL IS PLACED AT NORMAL EDGE OF PAVEMENT, THE TANGENT END TREATMENT SHALL BE FLARED @ 1:50 TAPER TO GET HEAD PIECE CLEAR OF EDGE OF PAVEMENT.

METRIC NDOT

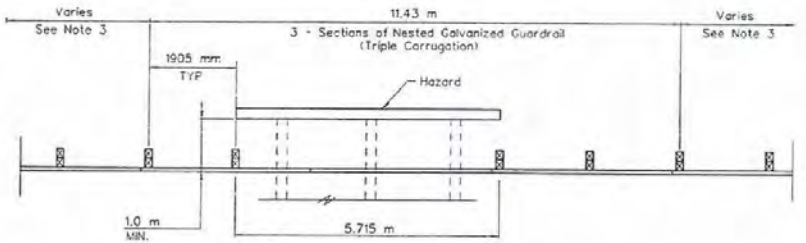
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

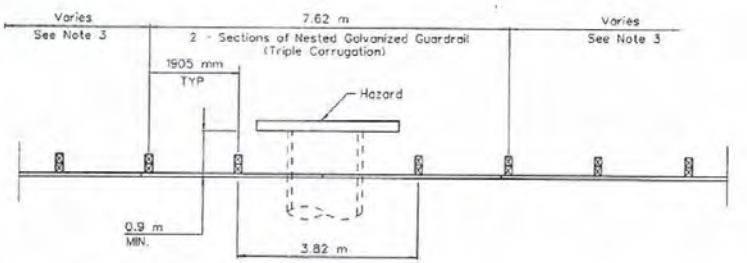
TYPICAL GUARDRAIL INSTALLATION

CHIEF ROAD DESIGN ENGR. | R-8.1.5.1 | (6181) | ADOPTED: 7/96 | REVISION: 9/97

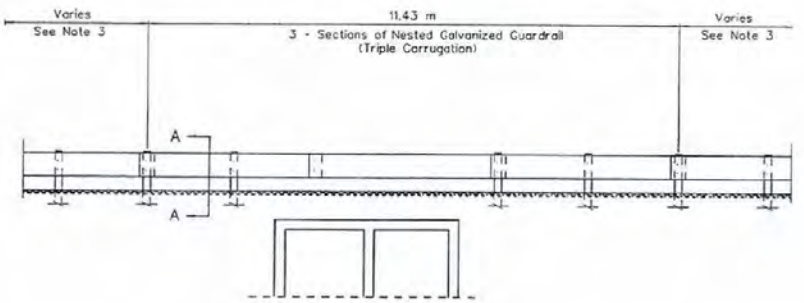
R-67



PLAN

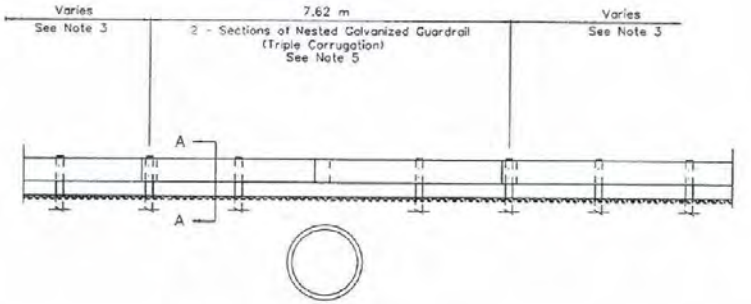


PLAN



ELEVATION

TYPE 2
(2 Posts Missing)



ELEVATION

TYPE 1
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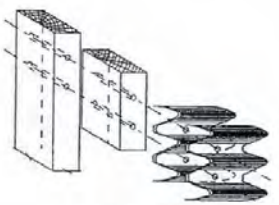


NESTED BEAMS

SECTION "A-A"

GENERAL NOTES:

1. THESE DETAILS ARE TO BE USED ONLY WHEN GUARDRAIL POST CANNOT BE INSTALLED TO AVOID UNDERGROUND OBSTRUCTIONS WITH GUARDRAIL POSTS.
2. SEE SHEET R-8.1.7 FOR DETAILS ON GALVANIZED GUARDRAIL (TRIPLE CORRUGATIONS) NOT SHOWN.
3. GUARDRAIL LENGTHS OF NEED SHALL BE BASED ON DESIGN YEAR TRAFFIC VOLUMES. SEE AASHTO ROADSIDE DESIGN GUIDE FOR DETAILS.
4. CHECK FEASIBILITY OF REMOVING HAZARD OR EXTENDING CULVERT OUTSIDE CLEAR ZONE VERSUS COST OF GUARDRAIL.
5. IF THE GUARDRAIL SPLICE OCCURS ON THE POSTS WHICH ARE ADJACENT TO THE MISSING POST THEN THREE CONTIGUOUS SECTIONS (11.43 m) OF NESTED GUARDRAIL ARE REQUIRED, WITH THE MIDDLE SECTION BEING CENTERED AT THE LOCATION OF THE MISSING POST.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

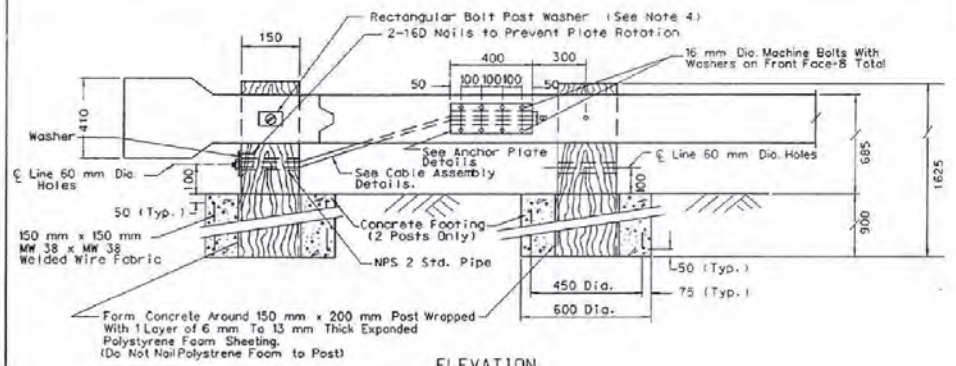
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GUARDRAIL INSTALLATION MISSING POST

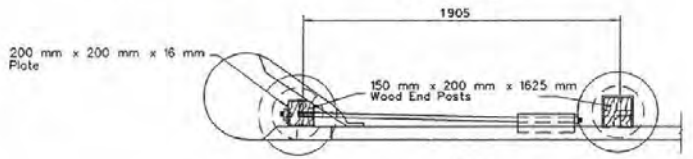
R-8.1.5.2 (618)

CHIEF ROAD DESIGN ENGR. ADOPTED: 7-96 REVISION:

R-68

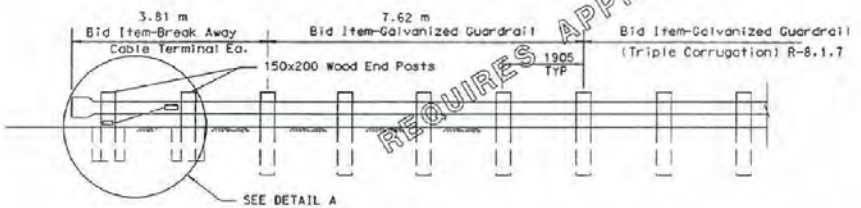


ELEVATION

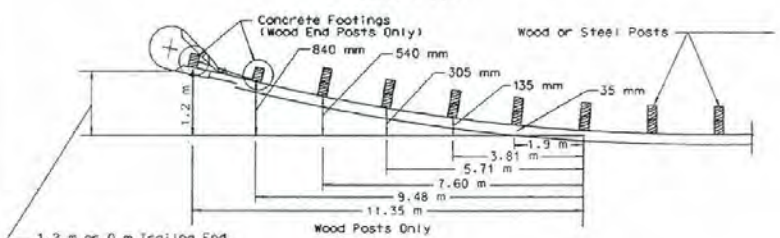


PLAN

DETAIL A

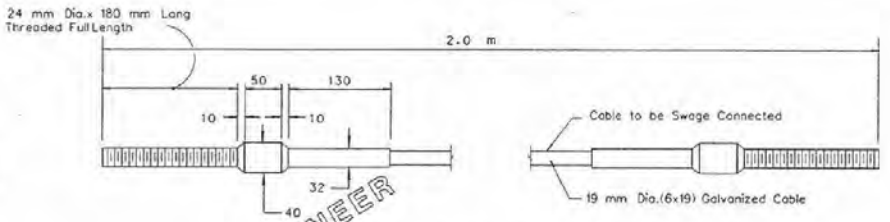


ELEVATION

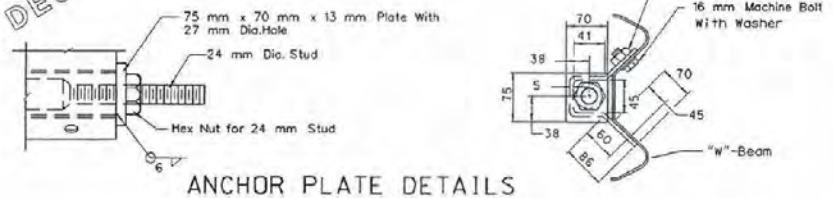


PLAN

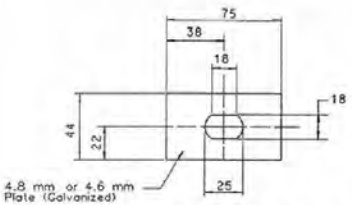
11.43 m Parabolic Offsets



CABLE ASSEMBLY DETAILS

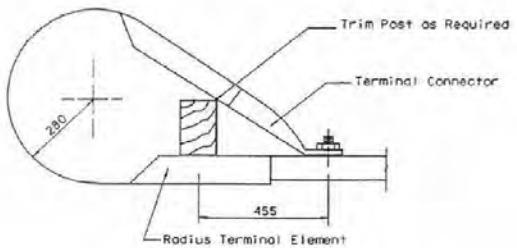


ANCHOR PLATE DETAILS



RECTANGULAR POST BOLT WASHER

(See Note 4)



END SECTION

REQUIRES APPROVAL OF CHIEF ROAD DESIGN ENGINEER DEC. 23, 1994

GENERAL NOTES:

1. Post Spacing Shall be 1905 mm Except as Otherwise Noted.
2. For Details Not Shown Refer to Standard Guardrail Sheet R-8.2.2.
3. Cable Assembly Should be Taut with No Obvious Slack in Cable.
4. Rectangular Post Bolt Washer Shall be Installed on First Post Only.
5. Steel Posts Shall Not be Substituted for Wood Posts and/or Blocks Where Required.
6. Concrete Shall be Class A or AA.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

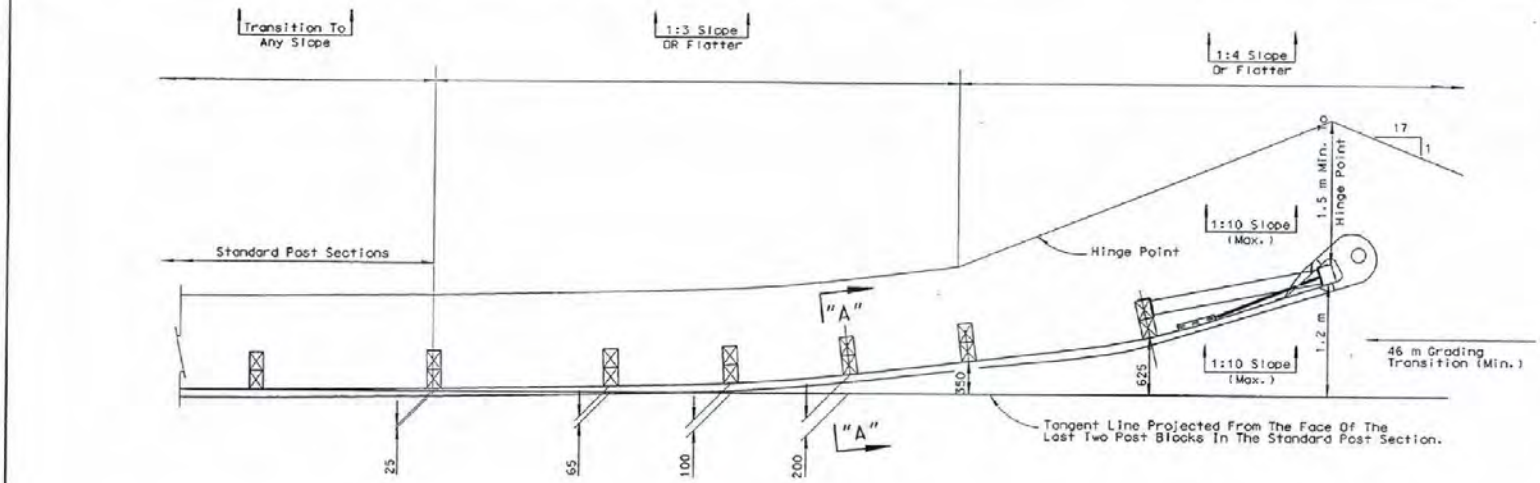
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

BREAKAWAY CABLE TERMINAL

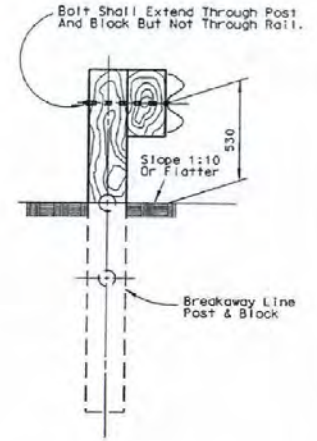
CHIEF ROAD DESIGN ENGR.

R-8.1.6	(618)
ADOPTED: 7/96	REVISION 9/97

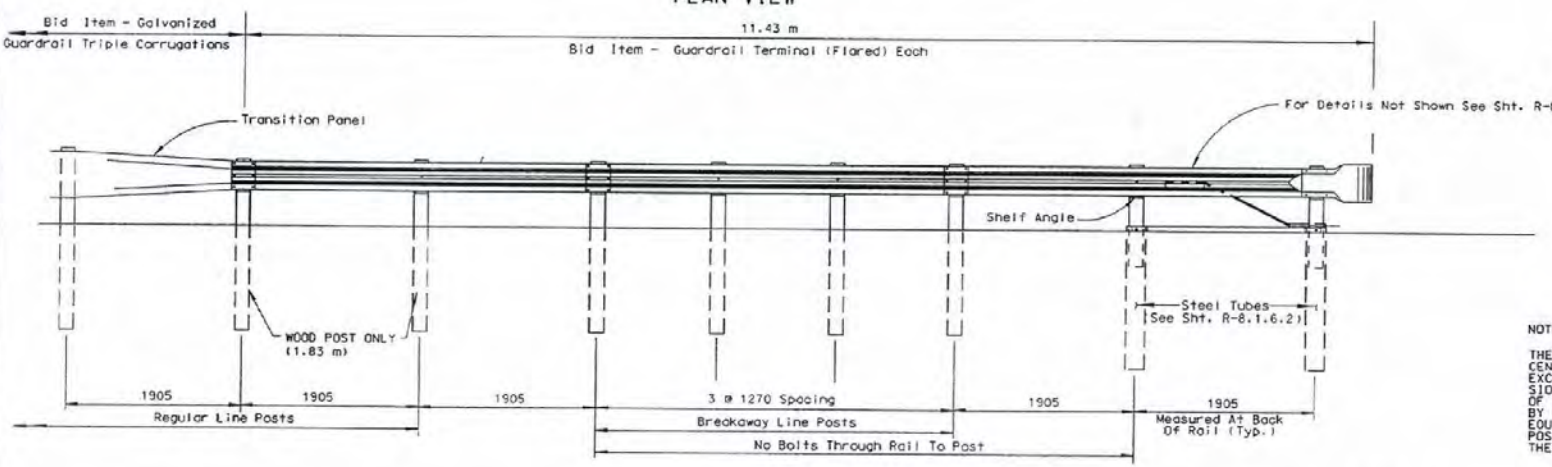
R-69



PLAN VIEW



SECTION "A"-"A"



ELEVATION

NOTE:

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 SPACINGS SHOWN. POSTS ARE TO BE SET APPROXIMATELY RADIAL TO THE RAILING AT EACH POST LOCATION.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

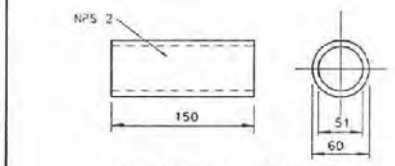
MODIFIED ECCENTRIC LOADER TERMINAL (MELT)

Post Layout

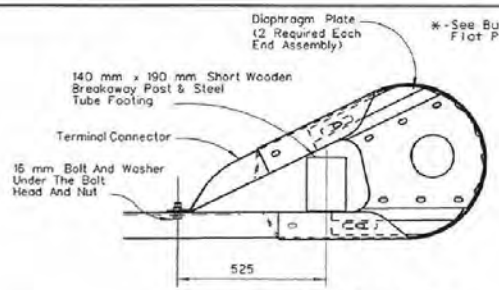
CHIEF ROAD DESIGN ENGR.

R-8.1.6.1	(618)
ADOPTED: 07/96	REVISION 9/97

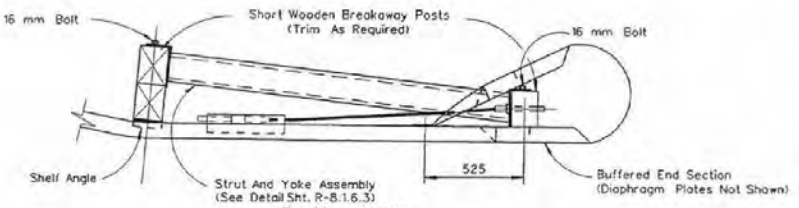
R-70



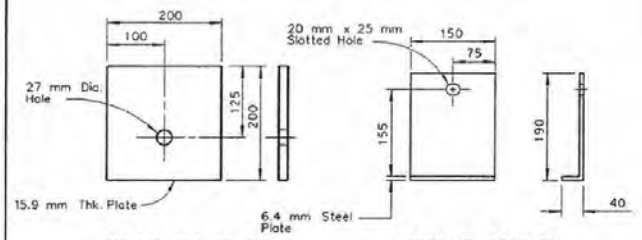
BREAKAWAY TERMINAL POST SLEEVE



BUFFERED END ASSEMBLY

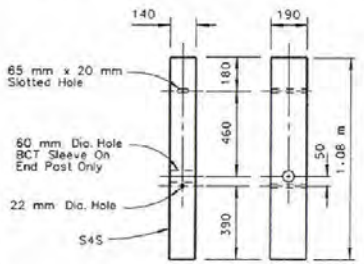


PLAN VIEW

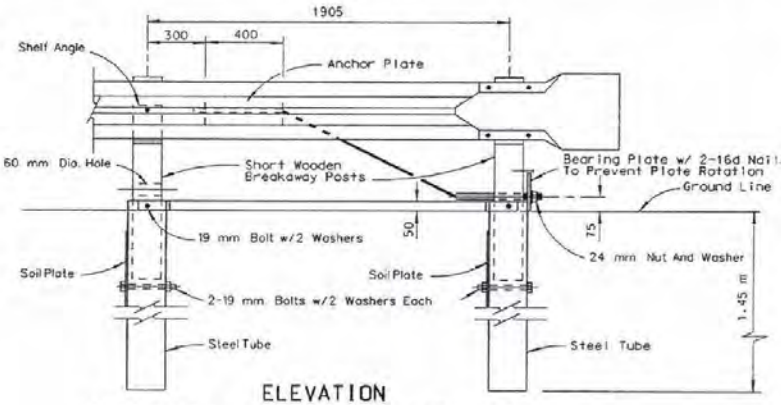


BEARING PLATE

SHELF ANGLE

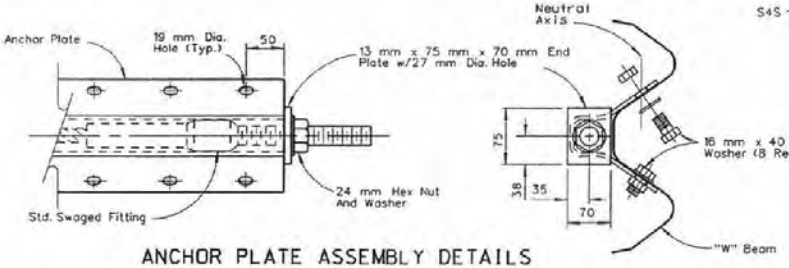


SHORT WOODEN BREAKAWAY POST

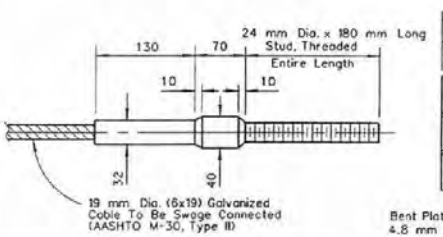


ELEVATION

BUFFERED END AND ANCHORAGE ASSEMBLY

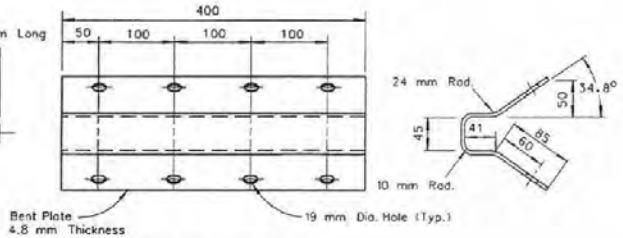


ANCHOR PLATE ASSEMBLY DETAILS

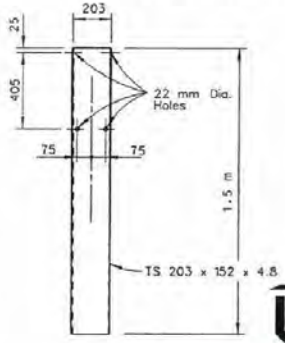


CABLE ASSEMBLY

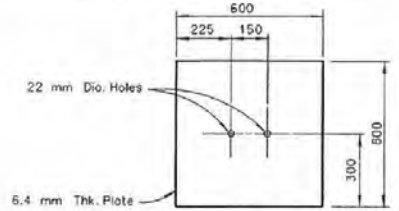
STANDARD SWAGED FITTING AND STUD



ANCHOR PLATE



STEEL TUBE



SOIL PLATE

METRIC NDOT

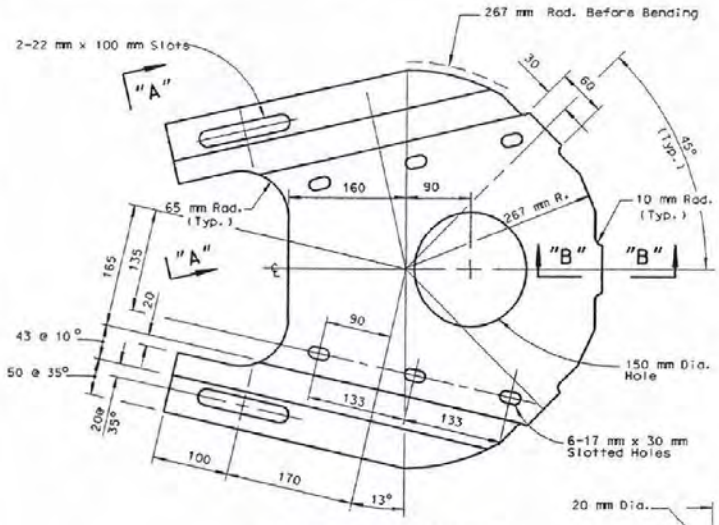
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

MODIFIED ECCENTRIC LOADER TERMINAL (MELT) ASSEMBLY AND STEEL TUBE FOOTING DETAIL

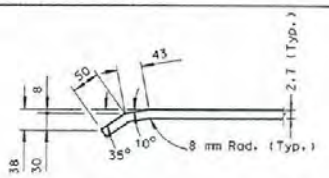
CHIEF ROAD DESIGN ENGR.	R-8.1.6.2	(618)
	ADOPTED: 07/96	REVISION 9/97

R-71

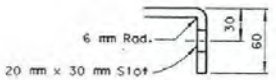


(2 Required Each Terminal)

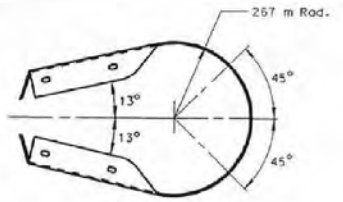
DIAPHRAGM PLATE DETAIL



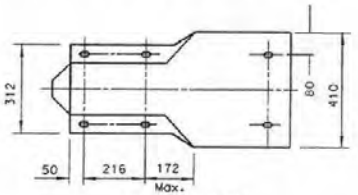
VIEW "A"-"A"



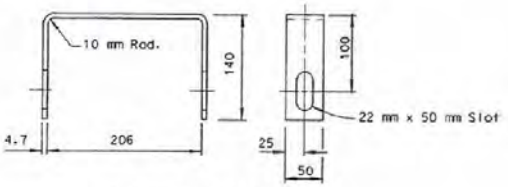
SECTION "B" "B"



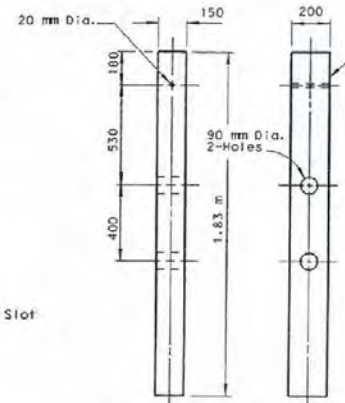
PLAN
BUFFERED END SECTION



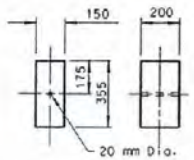
ELEVATION
BUFFERED END SECTION



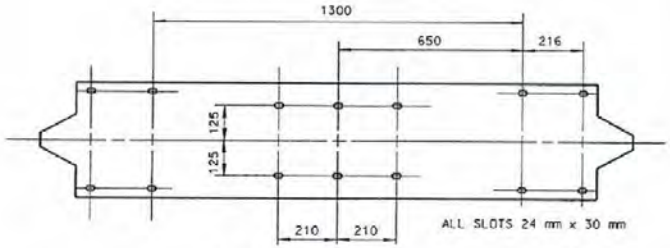
YOKE DETAIL



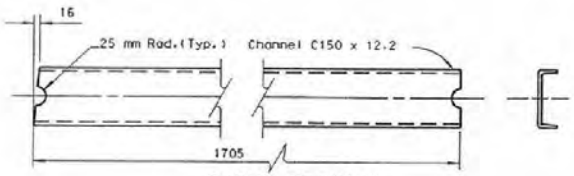
BREAKAWAY LINE POST



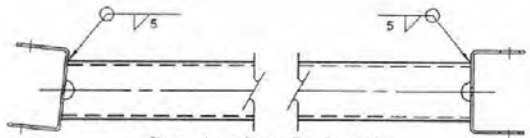
WOOD BLOCK



FLAT PLATE LAYOUT
BUFFERED END SECTION



STRUT DETAILS



STRUT AND YOKE ASSEMBLY

METRIC NDOT

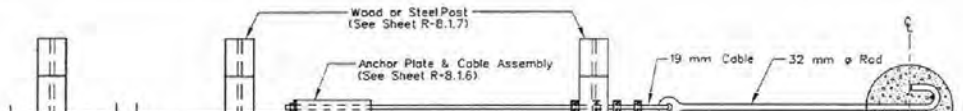
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

MODIFIED ECCENTRIC LOADER TERMINAL (MELT) STRUT, BREAKAWAY LINE POST AND BUFFERED END SECTION DETAILS

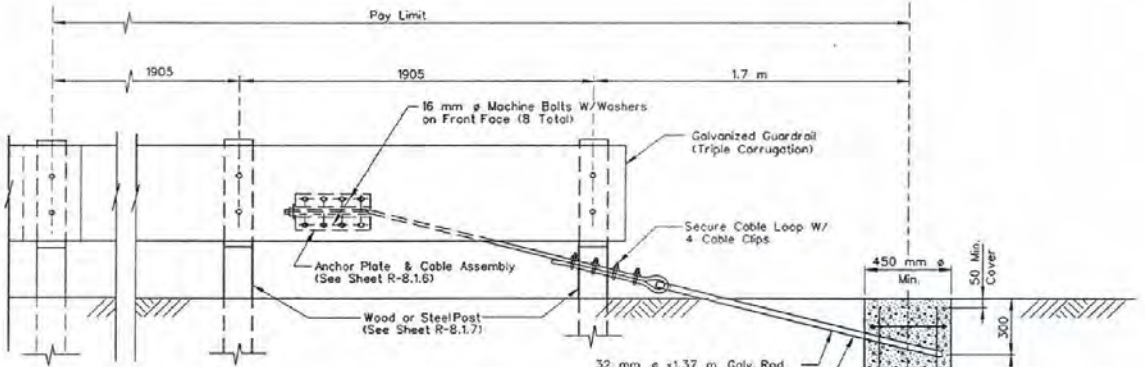
CHIEF ROAD DESIGN ENGR.	P-S.1.6.3	(618)
	ADOPTED 07/96	REVISION

R-72

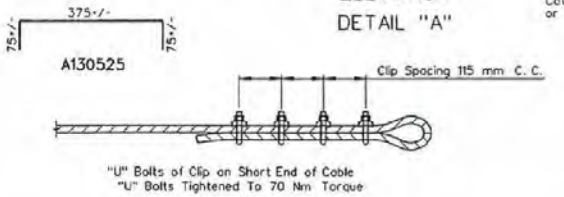


PLAN

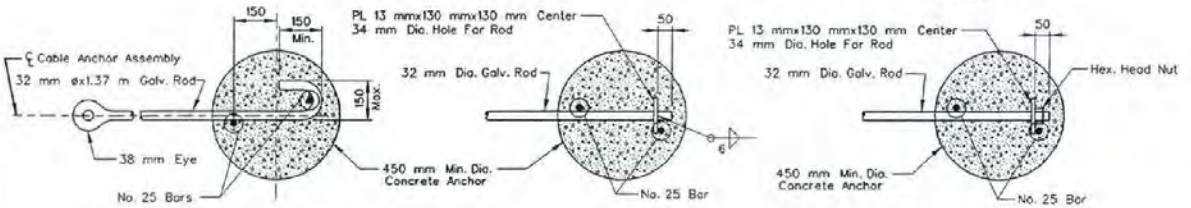
Direction of Traffic



ELEVATION
DETAIL "A"

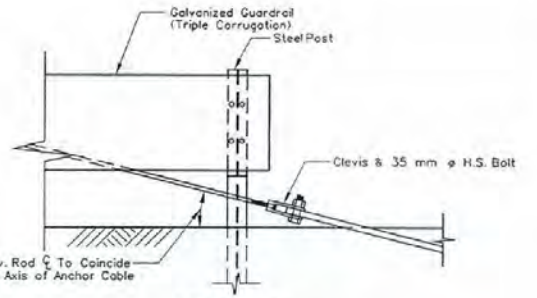


CABLE CLIP INSTALLATION



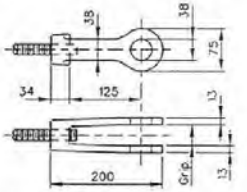
SINGLE ANCHOR

OPTIONAL ANCHOR ROD END DETAILS
(Single Anchors Only)



DETAIL "B"
CABLE ANCHOR ASSEMBLY
STEEL POST GUARD RAIL

NOTE: Other Alternative For Attaching Cable To Anchor Rod Must Be Approved By The Engineer



Grip = Thickness Of Eye On Anchor Rods + 6 mm

CLEVIS

GENERAL NOTES:

1. ANCHOR CABLE TO BE PARALLEL TO GUARD RAIL FOR STRAIGHT RUNS OF RAIL. ANCHOR CABLE MAY HAVE ANGLE POINT AT ANCHOR PLATE IF GUARD RAIL IS CURVED.
2. ANCHOR ROD HOOKS TO BE IN CONTACT WITH ANCHOR REINFORCEMENT WHEN CONCRETE IS PLACED. WIRE TIES MAY BE USED TO POSITION ANCHOR RODS.
3. CABLE CLIP CONNECTION (DETAIL A) OR CLEVIS AND BOLT CONNECTION (DETAIL B) TO BE USED WITH WOOD POST GUARD RAILING INSTALLATION. FOR STEEL POST GUARD RAILING INSTALLATIONS, CLEVIS AND BOLT CONNECTION (DETAIL B) IS TO BE USED. OTHER ALTERNATIVE FOR ATTACHING CABLE TO ANCHOR ROD MUST BE APPROVED BY THE ENGINEER.
4. TRAILING END ANCHOR IS TO BE USED ONLY ON ONEWAY ROADWAYS AS SHOWN IN STANDARD DRAWING R-8.1.4 AND R-8.1.5
5. CONCRETE SHALL BE CLASS A OR AA.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

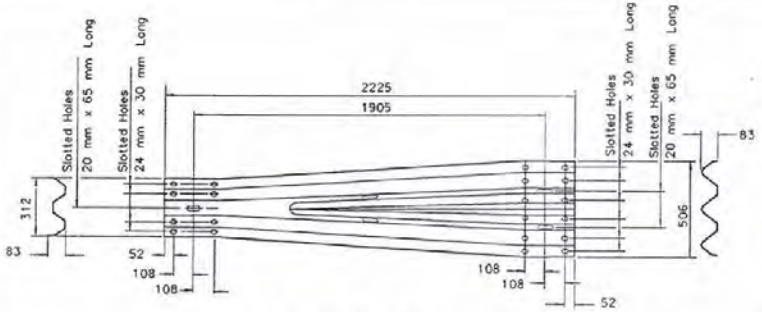
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TRAILING END ANCHOR
(FOR ONEWAY
ROADWAYS ONLY)

CHIEF ROAD DESIGN ENGR.

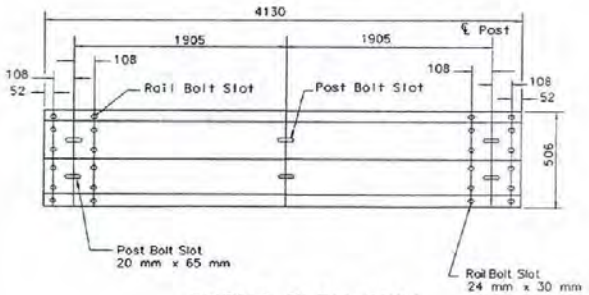
R-8.1.6.4	(6/8)
ADOPTED: 07/96	REVISION: 9/97

R-73

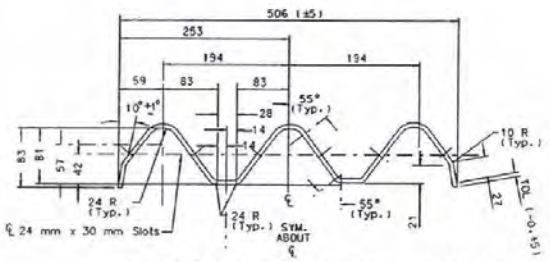


TRANSITION SECTION

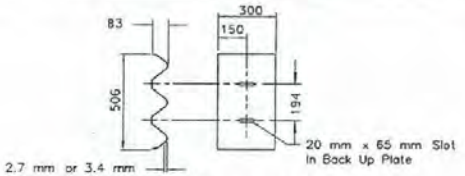
PLAN VIEW



FRONT ELEVATION

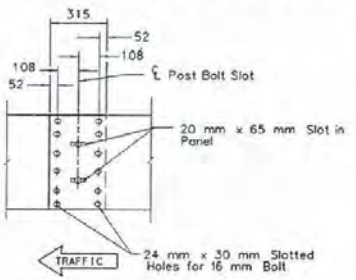


SECTION THROUGH RAIL ELEMENT

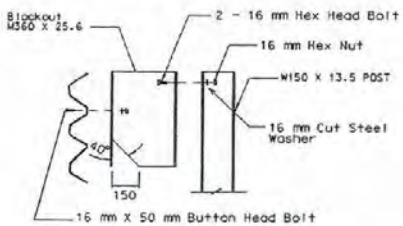


BACK-UP PLATE

(FOR USE BETWEEN GUARDRAIL AND STEEL BLOCK AT POSTS BETWEEN RAIL SPLICES)

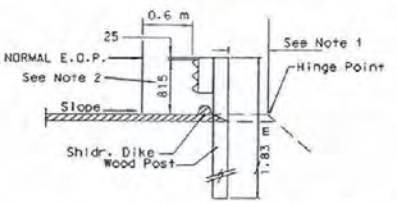


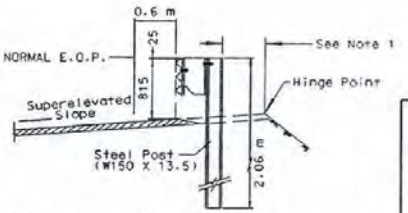
RAIL SPLICE



STEEL POST BOLT HARDWARE AND BLOCKOUT DETAIL

(ALL HARDWARE TO BE GALVANIZED)



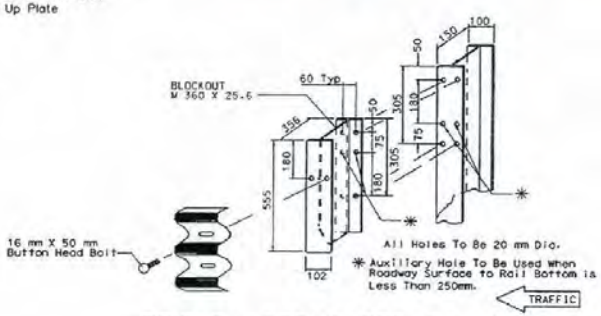


TYPICAL GUARDRAIL INSTALLATIONS

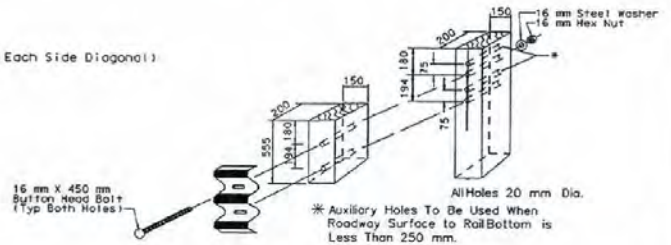
(STEEL POST OR WOOD POST)

GENERAL NOTES:

1. WHEN DISTANCE BETWEEN BACK OF GUARDRAIL POST AND HINGE POINT IS LESS THAN 0.6 m THE POST SHALL BE LENGTHENED 0.3 m MIN.
2. GUARDRAIL HEIGHTS ON STAGE CONSTRUCTION PROJECTS SHALL BE GOVERNED BY FINAL SURFACING ELEVATIONS.



TRIPLE CORRUGATED RAIL-STEEL POST



TRIPLE CORRUGATED RAIL-WOOD POST

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

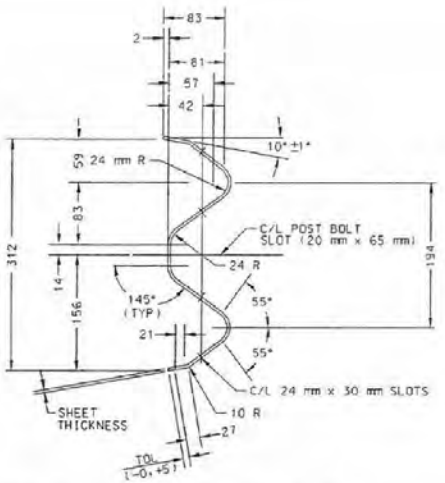
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GALVANIZED GUARDRAIL (TRIPLE CORRUGATION)

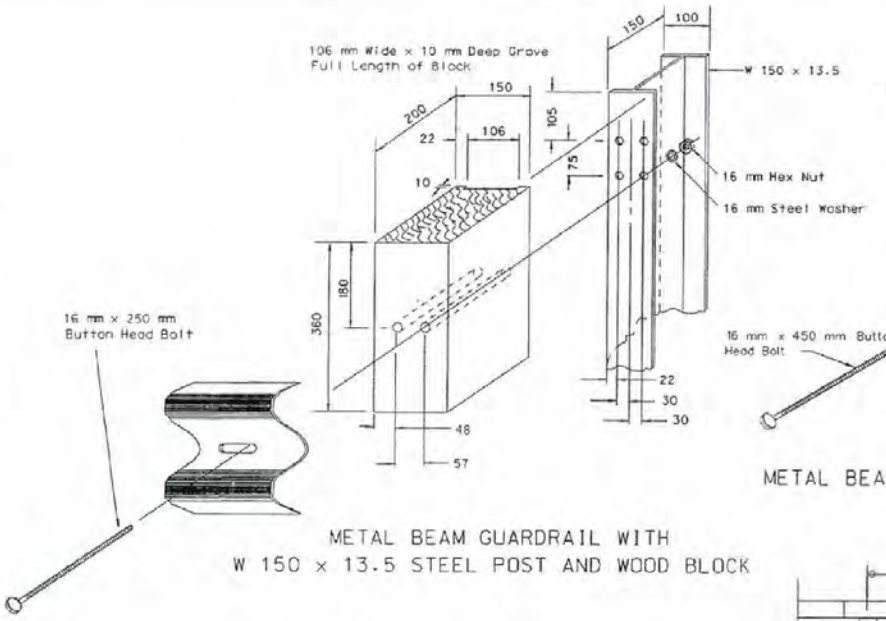
R-8.1.7 (6 of 8)

CHIEF ROADWAY DESIGN ENGR. ADOPTED: 07/96 REVISION: 9/97

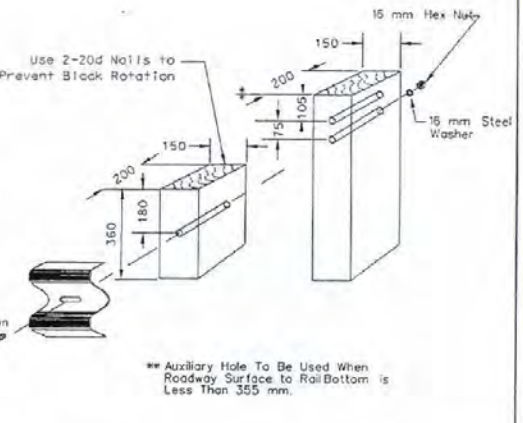
R-7.4



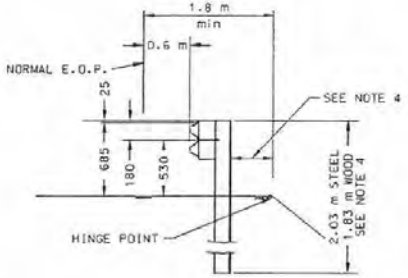
SECTION THRU RAIL ELEMENT



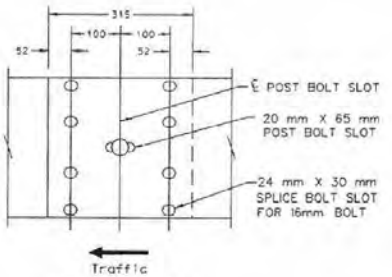
METAL BEAM GUARDRAIL WITH W 150 x 13.5 STEEL POST AND WOOD BLOCK



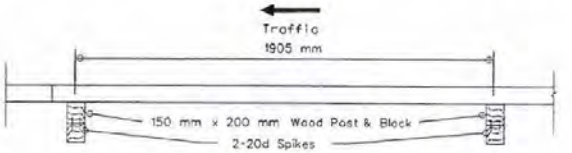
METAL BEAM GUARDRAIL WITH WOOD POSTS & BLOCKS.



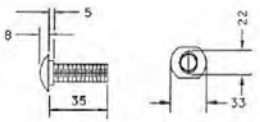
TYPICAL GUARD RAIL INSTALLATION



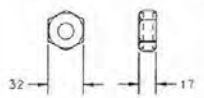
RAIL SPLICE



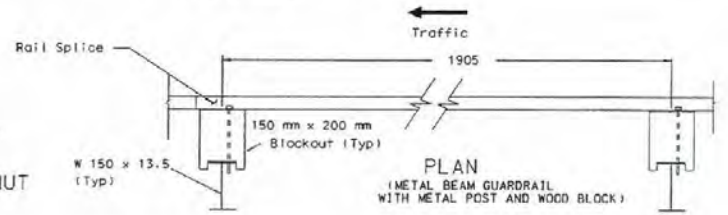
PLAN
(METAL BEAM GUARDRAIL WITH WOOD POST AND BLOCK.)



16 mm SPLICE BOLT



16 mm RECESSED NUT



PLAN
(METAL BEAM GUARDRAIL WITH METAL POST AND WOOD BLOCK)

GENERAL NOTES:

1. ALL HOLES 20 mm DIA.
2. RAIL MOUNTS TO BLOCK WITH BOLT ON APPROACHING TRAFFIC SIDE OF BLOCK AND POST WEB.
3. BLOCK MOUNTS TO POST WITH 2 BOLTS STAGGERED. LOWER BOLT ON APPROACHING TRAFFIC SIDE OF BLOCK AND POST WEB. (FOR METAL BLOCKS ONLY).
4. ON RETROFIT INSTALLATIONS WHEN DISTANCE BETWEEN BACK OF GUARDRAIL POST AND HINGE POINT IS LESS THAN 600 mm. THE POST SHALL BE LENGTHENED 300 mm MIN.
5. GUARDRAIL HEIGHTS ON STAGE CONSTRUCTIONS PROJECTS SHALL BE GOVERNED BY FINAL SURFACING ELEVATIONS.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

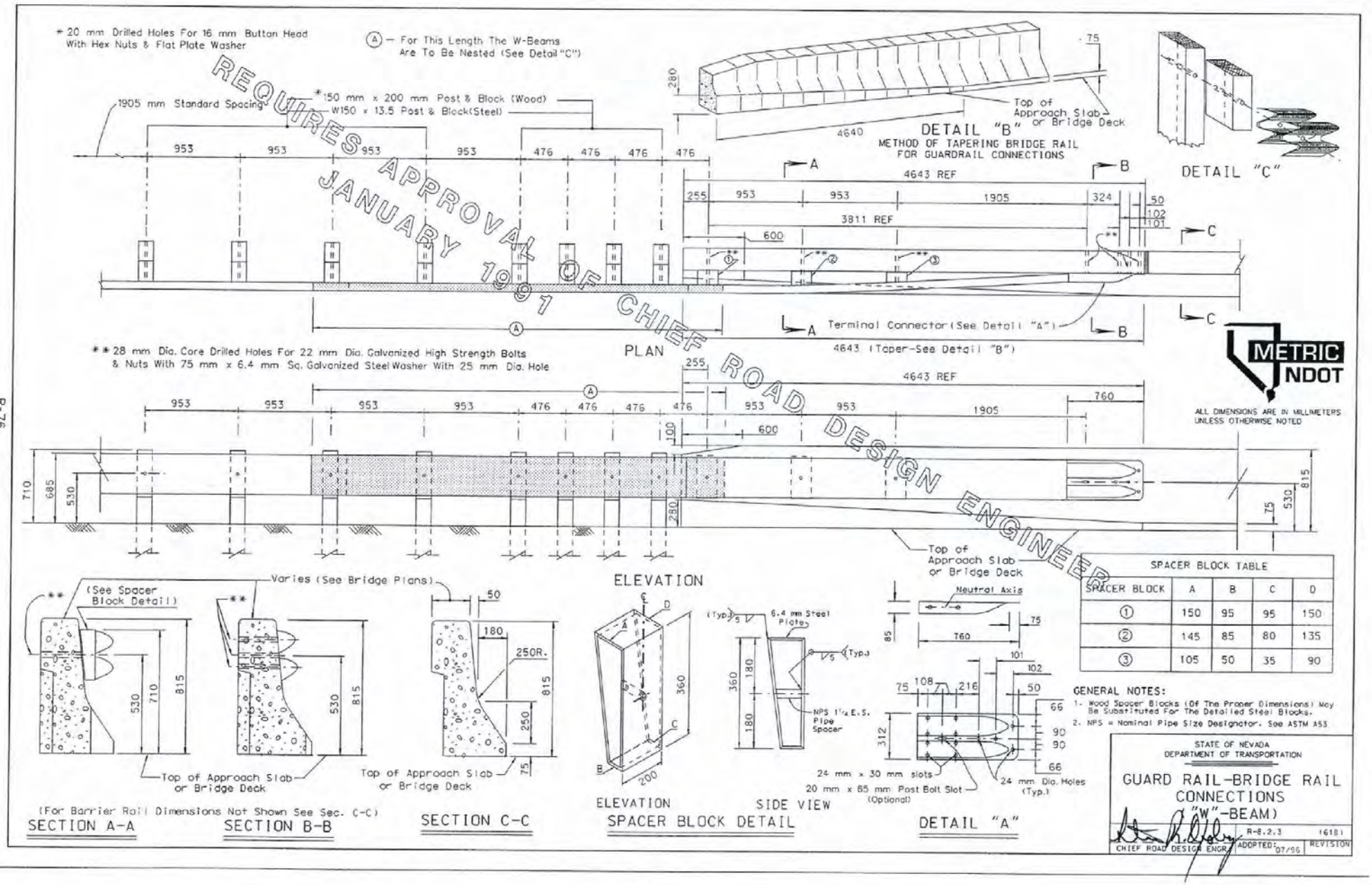
GALVANIZED GUARDRAIL

("W" BEAM)

CHIEF ROAD DESIGN ENGR.

R-8.2.2	(618)
ADOPTED: 7/96	REVISION 9/97

R-75



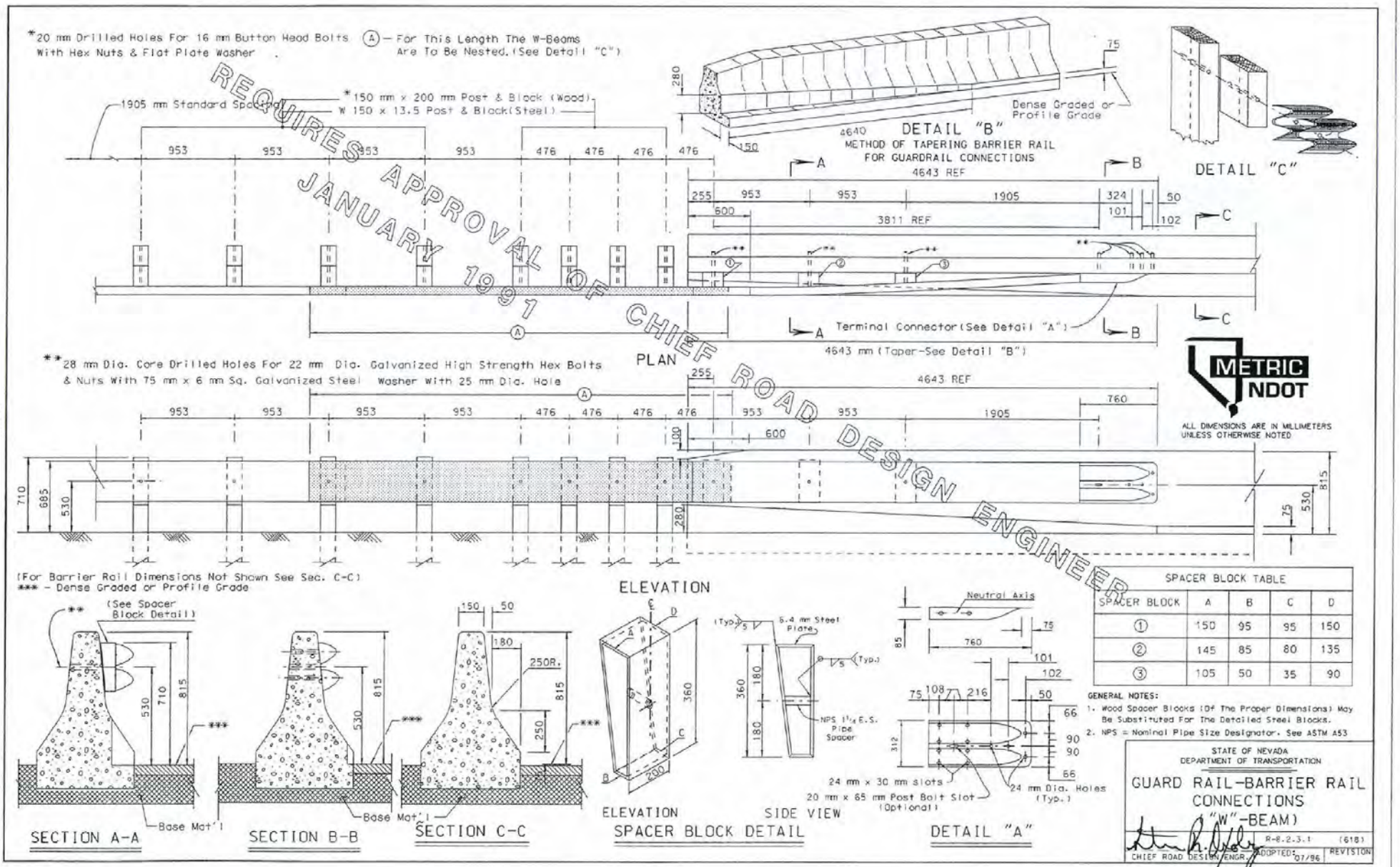
SPACER BLOCK TABLE				
SPACER BLOCK	A	B	C	D
①	150	95	95	150
②	145	85	80	135
③	105	50	35	90

GENERAL NOTES:
1. Wood Spacer Blocks (Of The Proper Dimensions) May Be Substituted For The Detailed Steel Blocks.
2. NPS = Nominal Pipe Size Designator. See ASTM A53

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GUARD RAIL-BRIDGE RAIL CONNECTIONS ("W"-BEAM)

CHIEF ROAD DESIGN ENGR. | R-8.2.3 | ADOPTED: 07/96 | (618) REVISION



SPACER BLOCK TABLE				
SPACER BLOCK	A	B	C	D
①	150	95	95	150
②	145	85	80	135
③	105	50	35	90

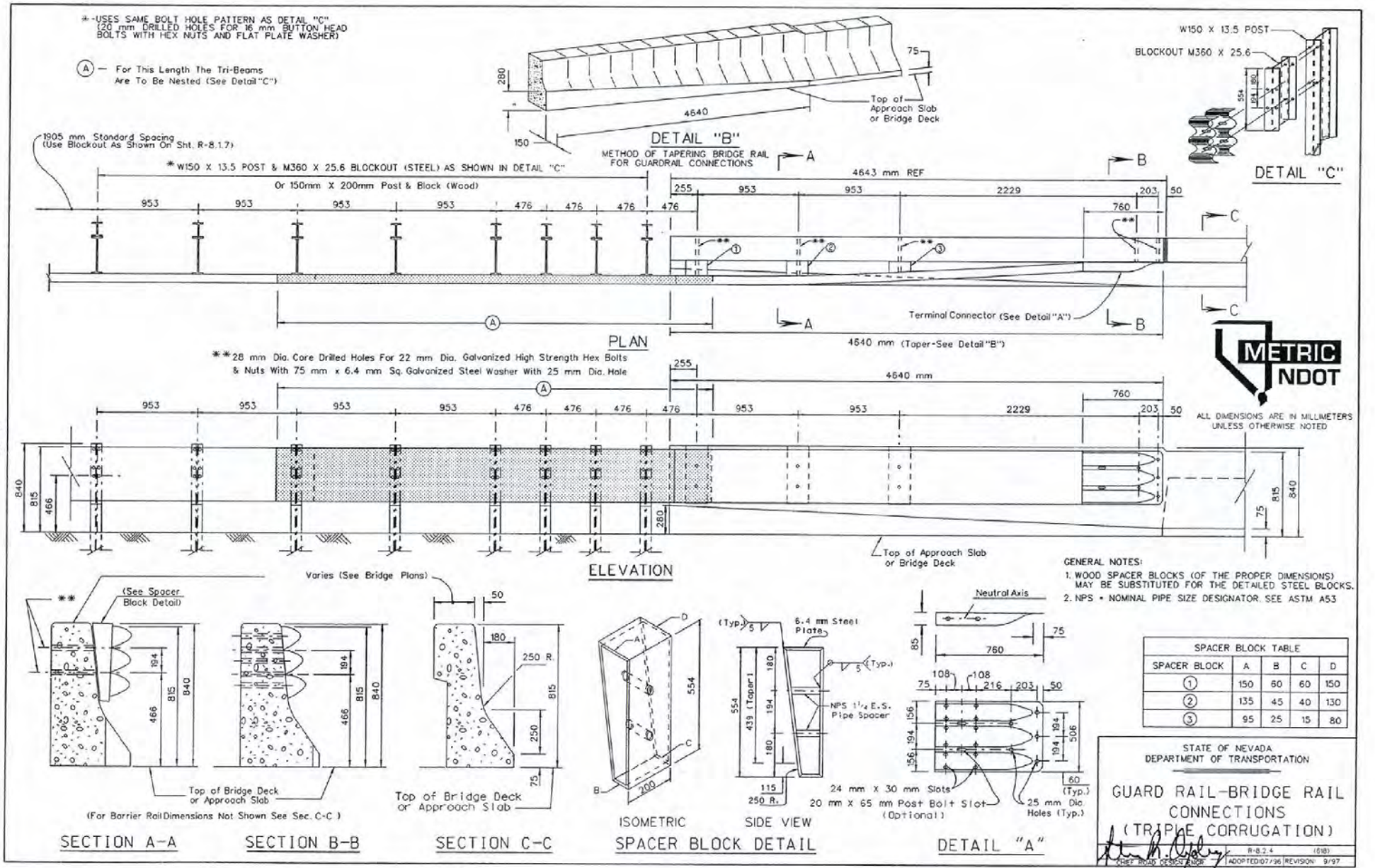
GENERAL NOTES:
1. Wood Spacer Blocks (Of The Proper Dimensions) May Be Substituted For The Detailed Steel Blocks.
2. NPS = Nominal Pipe Size Designator. See ASTM A53

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GUARD RAIL-BARRIER RAIL CONNECTIONS ("W"-BEAM)

CHIEF ROAD DESIGN ENGR. | ADOPTED: 07/96 | R-8.2.3.1 (618) REVISION

R-77



SPACER BLOCK TABLE				
SPACER BLOCK	A	B	C	D
①	150	60	60	150
②	135	45	40	130
③	95	25	15	80

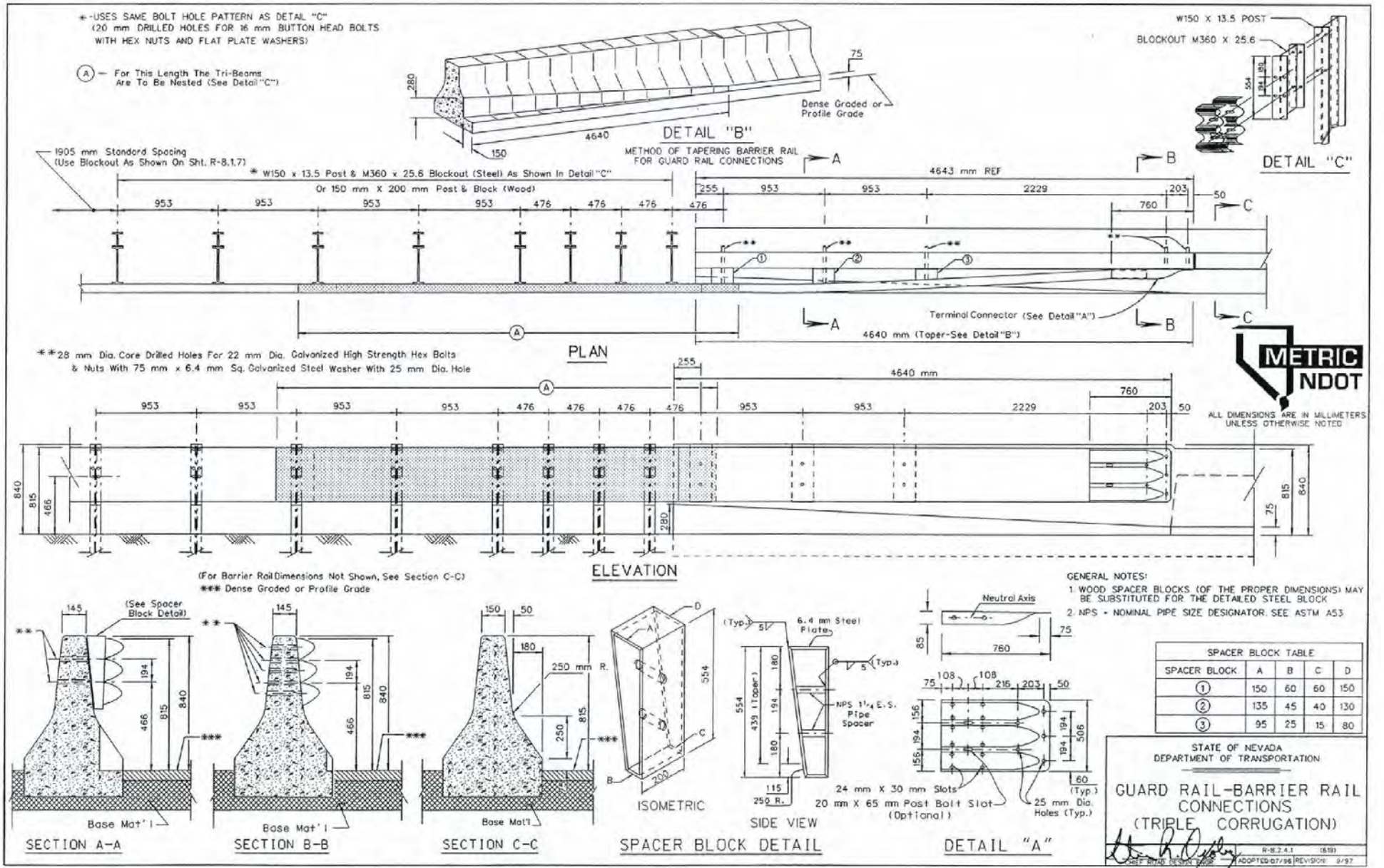
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GUARD RAIL-BRIDGE RAIL CONNECTIONS (TRIPLE CORRUGATION)

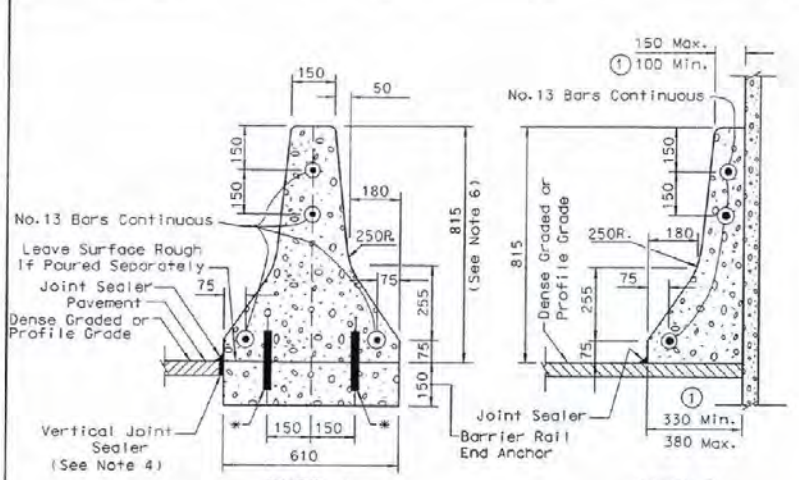
R-8.2.4 (6B)

CHIEF ROAD DESIGN ENGINEER | ADOPTED 07/96 | REVISION: 9/97

R-78


*-USES SAME BOLT HOLE PATTERN AS DETAIL "C"
(20 mm DRILLED HOLES FOR 16 mm BUTTON HEAD BOLTS
WITH HEX NUTS AND FLAT PLATE WASHERS)
(A) — For This Length The Tri-Beams Are To Be Nested (See Detail "C")
DETAIL "B"
METHOD OF TAPERING BARRIER RAIL FOR GUARD RAIL CONNECTIONS
Dense Graded or Profile Grade
W150 X 13.5 POST
BLOCKOUT M360 X 25.6
DETAIL "C"
1905 mm Standard Spacing
(Use Blockout As Shown On Sht. R-8.1.7)
* W150 x 13.5 Post & M360 x 25.6 Blockout (Steel) As Shown In Detail "C"
Or 150 mm X 200 mm Post & Block (Wood)
4643 mm REF
Terminal Connector (See Detail "A")
4640 mm (Taper-See Detail "B")
PLAN
**28 mm Dia. Core Drilled Holes For 22 mm Dia. Galvanized High Strength Hex Bolts & Nuts With 75 mm x 6.4 mm Sq. Galvanized Steel Washer With 25 mm Dia. Hole
4640 mm
ELEVATION
(For Barrier Rail Dimensions Not Shown, See Section C-C)
*** Dense Graded or Profile Grade
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED
SECTION A-A
SECTION B-B
SECTION C-C
Base Mat'l
ISOMETRIC
SPACER BLOCK DETAIL
SIDE VIEW
6.4 mm Steel Plate
NPS 1 1/4 E.S. Pipe Spacer
24 mm X 30 mm Slots
20 mm X 65 mm Post Bolt Slot (Optional)
25 mm Dia. Holes (Typ.)
DETAIL "A"
Neutral Axis
GENERAL NOTES:
1. WOOD SPACER BLOCKS (OF THE PROPER DIMENSIONS) MAY BE SUBSTITUTED FOR THE DETAILED STEEL BLOCK
2. NPS = NOMINAL PIPE SIZE DESIGNATOR. SEE ASTM A53
SPACER BLOCK TABLE
SPACER BLOCK | A | B | C | D
1 | 150 | 60 | 60 | 150
2 | 135 | 45 | 40 | 130
3 | 95 | 25 | 15 | 80
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
GUARD RAIL-BARRIER RAIL CONNECTIONS
(TRIPLE CORRUGATION)
R-8.2.4.1 (5/19)
ADOPTED 07/96 REVISION 9/97

R-79



TYPE A

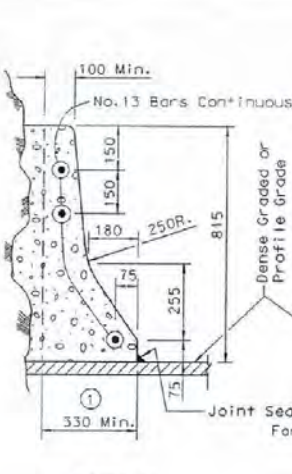
CONCRETE (INFORMATION ONLY)

0.2589 m^3 PER m WITHOUT BASE SLAB
0.3517 m^3 PER m WITH BASE SLAB

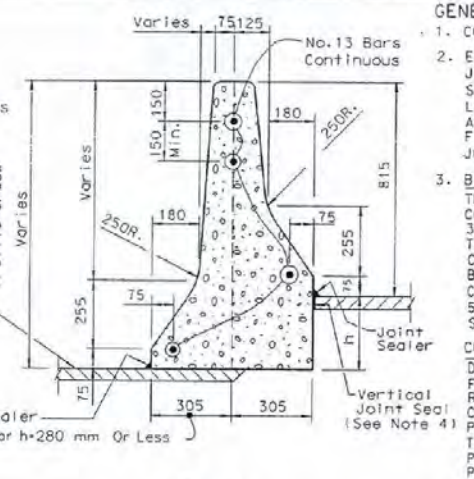
TYPE B

CONCRETE (INFORMATION ONLY)

100 mm MIN. 0.1500 m^3 PER m
150 mm MIN. 0.1919 m^3 PER m

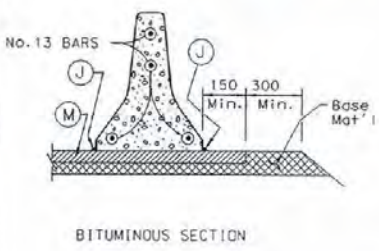


TYPE C

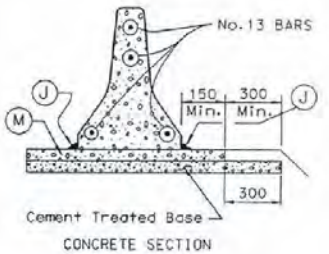


TYPE D

With Each 150 mm Increase In "h" Elevation, The Base Width Will Increase 50 mm Over The Normal 305 mm Dim.

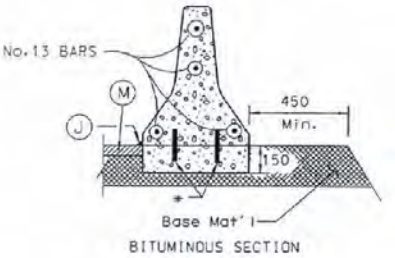


BITUMINOUS SECTION

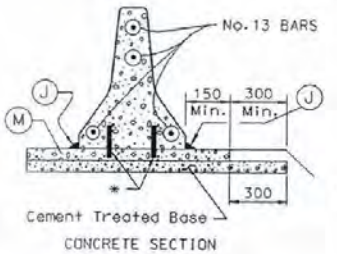


CONCRETE SECTION

NORMAL ROADWAY DETAIL
(5 mm SCORED JOINTS @ 4.5 m)



BITUMINOUS SECTION



CONCRETE SECTION

BARRIER RAIL END ANCHOR DETAIL
(FIRST & LAST 3.0 m)

(1) - Dimension Used When Barrier Is Placed Against Rock Or Solid Object Such As A Retaining Wall.

(M) — Pavement (See Note 3)

(J) — Joint Sealer (See Note 5)

* 25 mm x 200 mm STEEL DOWEL @ 0.6 m CTR'S (IF NEEDED SEE NOTE 3)

DESIGN SPEED	FLARE RATE
120 km/h	1:22
110 km/h	1:20
100 km/h	1:18
90 km/h	1:16
80 km/h	1:14
70 km/h	1:12
60 km/h	1:10
50 km/h	1:8

CONCRETE BARRIER RAIL FLARE RATES

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

GENERAL NOTES:

1. CONCRETE SHALL BE CLASS A OR AA.
2. EXPANSION JOINTS AT ALL STRUCTURES. JOINTS IN BARRIER RAIL OVER A STRUCTURE SHALL BE AT THE SAME LOCATION AND OF THE SAME DIMENSIONS AS THOSE IN THE STRUCTURE. JOINT FILLER NOT REQUIRED IN EXPANSION JOINT IN BARRIER RAIL.
3. BITUMINOUS PAVING REQUIREMENTS:
   THE BARRIER END ANCHORS SHALL BE CONSTRUCTED IN THE FIRST AND LAST 3.0 m OF THE BARRIER RAIL RUN. AT THE CONTRACTORS OPTION, 150 mm CONCRETE BASE AND BARRIER RAIL MAY BE PLACED MONOLITHICALLY. IN WHICH CASE DOWELS MAY BE ELIMINATED. 5 mm SCORED JOINTS EVERY 4.5 m. SEE BARRIER RAIL END ANCHOR DETAILS.
   CONCRETE PAVING REQUIREMENTS:
   DOWELS SHALL BE REQUIRED IN THE FIRST AND LAST 3.0 m OF THE BARRIER RAIL RUN. THE SURFACE OF THE CONCRETE SHALL BE CLEAN PRIOR TO PLACEMENT OF THE BARRIER RAIL. AT THE CONTRACTORS OPTION, CONCRETE PAVEMENT AND BARRIER RAIL MAY BE PLACED MONOLITHICALLY. IN WHICH CASE DOWELS MAY BE ELIMINATED. SEE CONCRETE SECTION FOR DOWELS IN BARRIER RAIL END ANCHOR. 5 mm SCORED JOINTS EVERY 4.5 m TO MATCH EXISTING TRANSVERSE JOINTS IN THE CONCRETE PAVEMENT.
4. VERTICAL JOINTS SHALL HAVE HOT RUBBERIZED ASPHALT SEALS FULL DEPTH OF JOINT.
5. JOINT SEALER SHALL BE HOT RUBBERIZED ASPHALT 25 mm THICK.
6. THE HEIGHT OF THE BARRIER RAIL SHALL BE MEASURED FROM THE TOP OF THE PLANTMIX BITUMINOUS SURFACE, OR THE TOP OF THE CONCRETE PAVEMENT.
7. FOR IMPACT ATTENUATOR ATTACHMENT DETAILS, SEE MANUFACTURERS DRAWINGS. FOR GUARDRAIL ENERGY ABSORBING TERMINAL ATTACHMENT, SEE STANDARD PLAN SHEET R-8.1.5.1
8. ALL CONTACT JOINTS SHALL BE AT PLANNED SCORED JOINT LOCATION.

METRIC NDOT

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

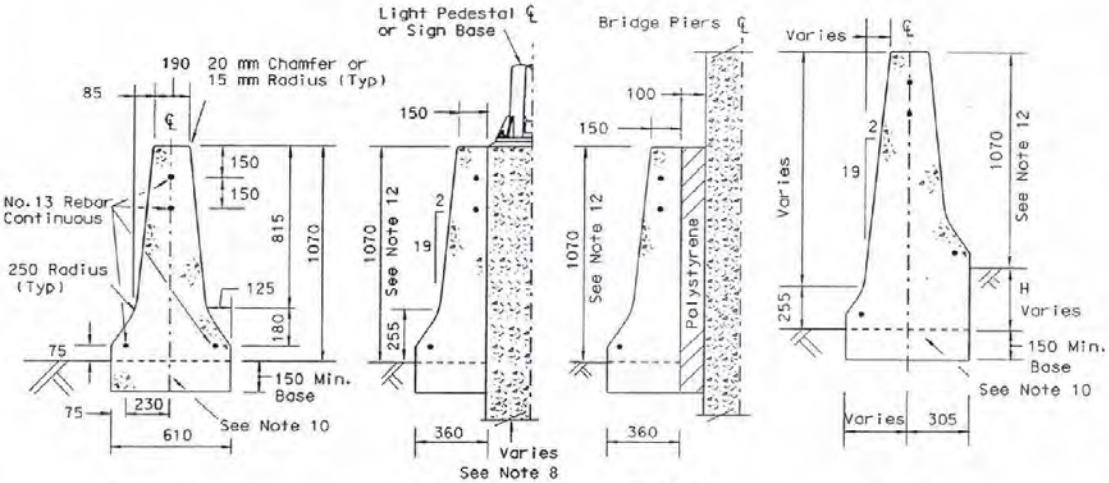
CONCRETE BARRIER RAIL

CHIEF ROAD DESIGN ENGR.

R-8.3.1 (502)

ADOPTED: 7/96 REVISION 9/97

R-80



TYPE FA

TYPE FB

TYPE FB

TYPE FD

CONCRETE (FOR INFORMATION ONLY)

0.3846 m^3 PER LIN. m WITH BASE

0.2930 m^3 PER LIN. m WITHOUT BASE

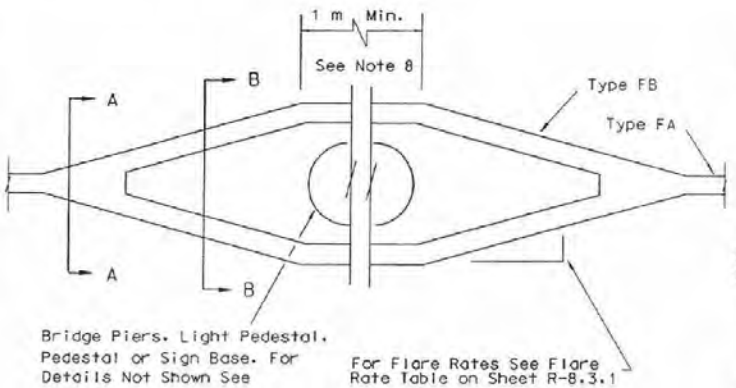
CONCRETE (FOR INFORMATION ONLY)

0.2918 m^3 PER LIN. m WITH BASE

0.2378 m^3 PER LIN. m WITHOUT BASE

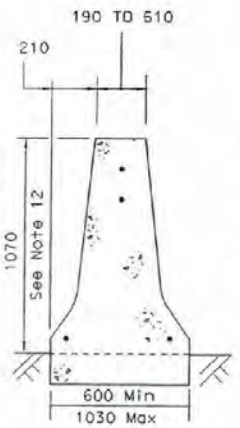
GENERAL NOTES:

1. CONCRETE SHALL BE CLASS A OR AA.
2. MEDIAN BARRIER RAIL SHALL BE SCORED 5mm DEEP EVERY 4.5 m.
3. ALL CONTACT JOINTS SHALL BE AT PLANNED SCORED JOINT LOCATIONS.
4. ALL JOINTS AND OTHER LOCATIONS NEEDING SEALING SHALL FOLLOW REQUIREMENT SET IN DRAWING R-8.3.1.
5. FOR IMPACT ATTENUATOR ATTACHMENT DETAILS. SEE MANUFACTURES DRAWINGS. MEDIAN END TREATMENTS SHALL BE BI-DIRECTIONAL.
6. REFER TO THE 1996 ROADSIDE DESIGN GUIDE FOR FURTHER DESIGN INFORMATION NOT SHOWN HERE.
7. EXPANSION JOINTS AT ALL STRUCTURES. JOINTS IN BARRIER RAIL OVER A STRUCTURE SHALL BE AT THE SAME LOCATION AND OF THE SAME DIMENSIONS AS THOSE IN THE STRUCTURE. JOINT FILLER NOT REQUIRED IN EXPANSION JOINT IN BARRIER RAIL.
8. SEE CONTRACT PLANS FOR EXACT DIMENSIONS.
9. THESE 1070 mm BARRIER RAILS ARE CONSIDERED INNOVATIVE.
10. DEPTH OF 150 mm BASE SHALL BE CHECKED AND INCREASED AS NEEDED FOR FOUNDATION STABILITY. WHEN BARRIER RAIL SITS ON CONCRETE PAVEMENT. THE BASE CAN BE ELIMINATED. BARRIER RAIL END ANCHORS MAY BE REQUIRED. SEE DRAWING R-8.3.1.
11. THE 1070 mm TYPE FA BARRIER RAIL MAY ALSO BE CONSIDERED ON THE OUTSIDE CURVES NEXT TO SENSITIVE AREAS SUCH AS SCHOOLS. HOUSING DEVELOPMENTS. AND PROBLEM AREAS THAT NEED EXTRA PROTECTION.
12. FOR DETAILS NOT SHOWN SEE TYPE FA.
13. NTS = NOT TO SCALE.

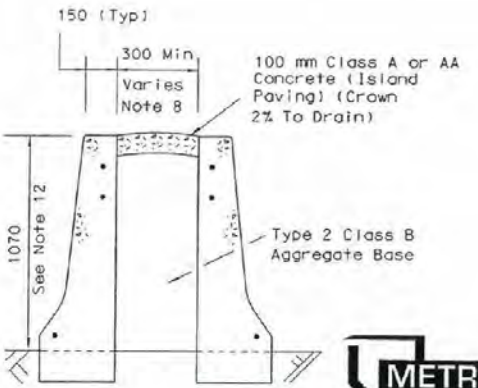


PLAN

NTS



SECTION A-A



SECTION B-B

METRIC NDOT

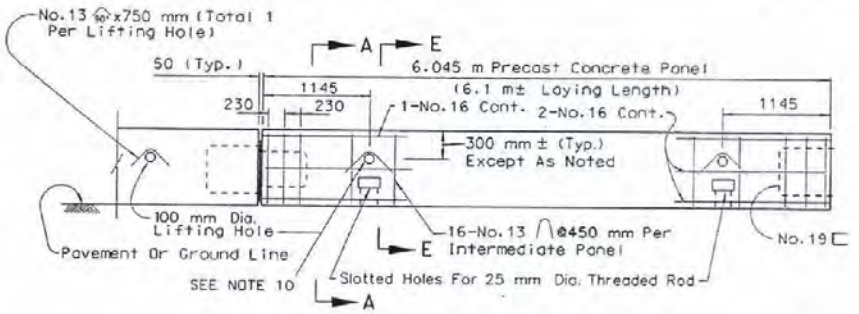
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CONCRETE BARRIER RAIL
MEDIAN F-SHAPES

CHIEF ROAD DESIGN ENGR	R-8.3.2	(502)
	ADOPTED: 9/97	REVISION

R-81



ELEVATION

TYPICAL INTERMEDIATE PANEL
Concrete: 1.48 m³ Per Panel
Reinforcing: 77 kg Per Panel
Mass: 3538 kg Per Panel

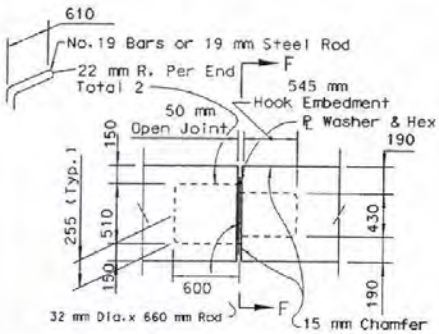
NOTE: No.13 ⌒@ 450 May Be Replaced By Welded Wire Fabric Of Equivalent Cross-Sectional Area.

GENERAL NOTES:

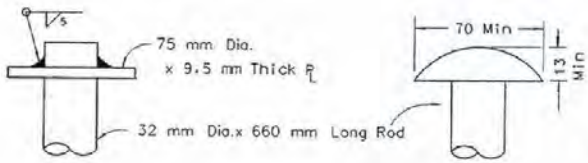
1. SEE PROJECT PLANS OR SPECIAL PROVISIONS FOR LAYOUT OF TEMPORARY RAILINGS.
2. OFFSET FOR TERMINAL SECTIONS AT APPROACH ENDS SHALL BE 1.8 m MIN. FROM EDGE OF ROADWAY, OR AS DIRECTED BY THE ENGINEER.
3. WHERE BARRIERS ARE PLACED ON CURVES AND RADII THAT ARE TOO SEVERE TO PIN THE JOINTS, BARRIERS ARE TO BE BACKED CONTINUOUSLY WITH EARTH FILL. SEE SECTION H-H
4. BOLT UNITS TO DECK SLABS WHEN REQUIRED BY BRIDGE PLANS.
5. ATTACH UNITS TO PAVEMENT WHEN REQUIRED IN THE PLANS.
6. THE TWO No.16 BARS SHALL BE EQUALLY SPACED FROM THE VERTEX OF THE STIRRUP BARS. ONE No.16 BAR SHALL BE TIGHTLY WIRED TO THE STIRRUP BARS AND THE SECOND No.16 BAR SHALL BE TACK WELDED TO THE STIRRUP BARS. EACH PROCESS SHALL BE CONTINUOUS FOR EACH No.16 BAR.
7. NPS - NOMINAL PIPE SIZE DESIGNATOR, SEE ASTM A53
8. CONCRETE SHALL BE CLASS A OR AA.
9. TWO-WAY REFLECTOR IN CENTER OF EACH BARRIER RAIL SECTION. SEE SHEET R-9.2.2
10. LIFTING HOLES NOT REQUIRED.

CONCRETE BARRIER RAIL FLARE RATES

DESIGN SPEED	FLARE RATE
120 km/h	1:22
110 km/h	1:20
100 km/h	1:18
90 km/h	1:16
80 km/h	1:14
70 km/h	1:12
60 km/h	1:10
50 km/h	1:8

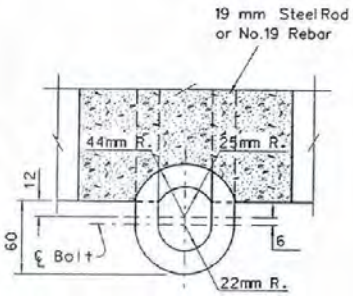


CONNECTION DETAIL

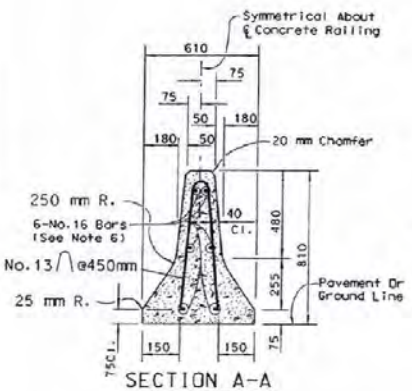


WELDED FORGED

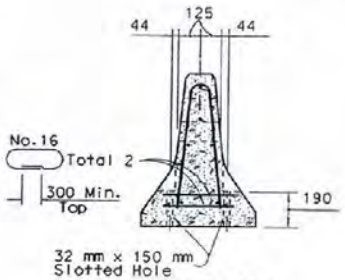
ALTERNATIVE HEAD DETAIL



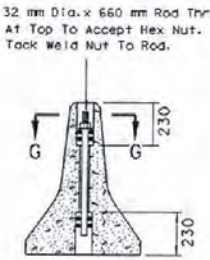
SECTION G-G



SECTION A-A



SECTION E-E



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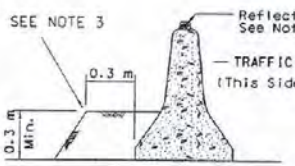
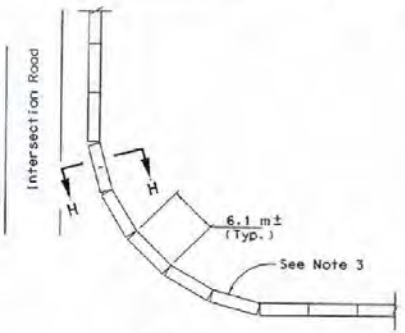


SECTION H-H



CURVED LAYOUT

METRIC NDOT

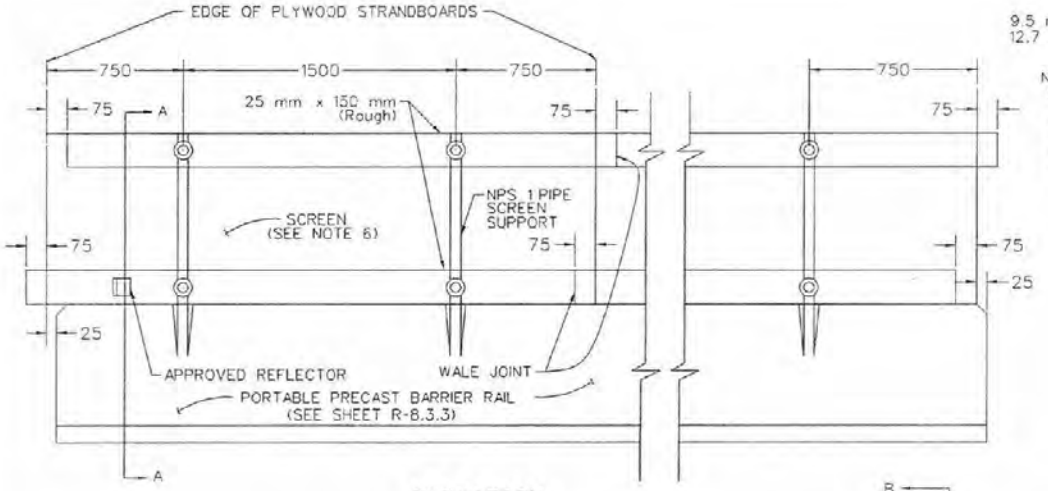
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

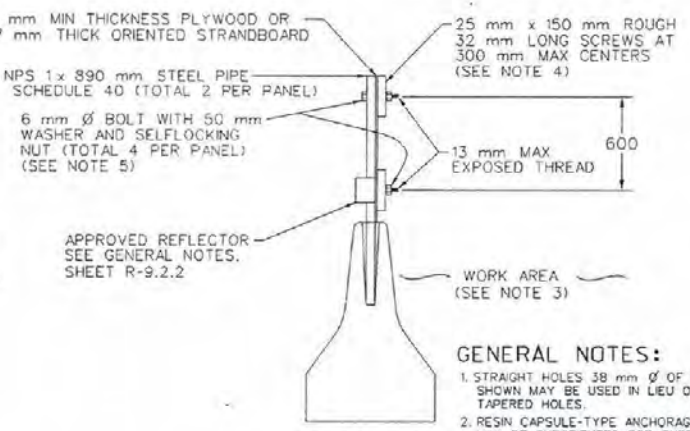
PORTABLE PRECAST CONCRETE BARRIER RAIL

CHIEF ROAD DESIGN ENGR. | R-8.3.3 (502 625) | ADOPTED: 7/96 | REVISION 9/97

R-82



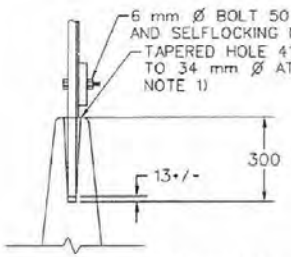
ELEVATION



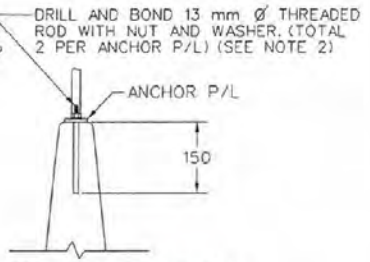
SECTION A-A

GENERAL NOTES:

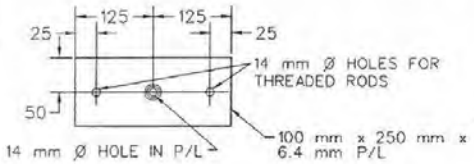
1. STRAIGHT HOLES 38 mm Ø OF THE DEPTH SHOWN MAY BE USED IN LIEU OF THE TAPERED HOLES.
2. RESIN CAPSULE-TYPE ANCHORAGE DEVICES MAY BE SUBSTITUTED FOR THREADED RODS.
3. PLACE SCREEN ON WORK AREA SIDE OF TEMPORARY RAILING WHERE TRAFFIC WILL ONLY BE ON ONE SIDE OF THE TEMPORARY RAILING. WHERE TRAFFIC WILL BE ON BOTH SIDES OF THE TEMPORARY RAILING THE SCREEN MAY BE PLACED ON EITHER SIDE OF THE PIPE SUPPORT.
4. CLINCHED 8d BOX NAILS MAY BE SUBSTITUTED FOR SCREWS. THE NAILS SHALL BE CLINCHED ON THE WORK AREA SIDE OF THE SCREEN WHERE TRAFFIC WHERE TRAFFIC WILL ONLY BE ON ONE SIDE OF THE TEMPORARY RAILING.
5. 6 mm U-BOLTS MAY BE SUBSTITUTED FOR 6 mm Ø BOLTS.
6. OPENINGS IN THE SCREEN AREA OF 1 m +/- SHALL BE PROVIDED AT 61 m +/- INTERVALS.
7. NPS = NOMINAL PIPE SIZE DESIGNATOR, SEE ASTM A53



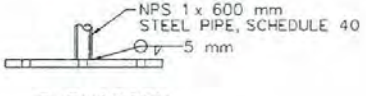
SCREEN ANCHORAGE DETAIL



SCREEN ANCHORAGE DETAIL ALTERNATIVE 'A'

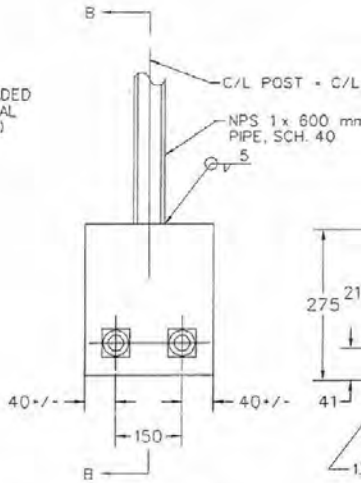


PLAN

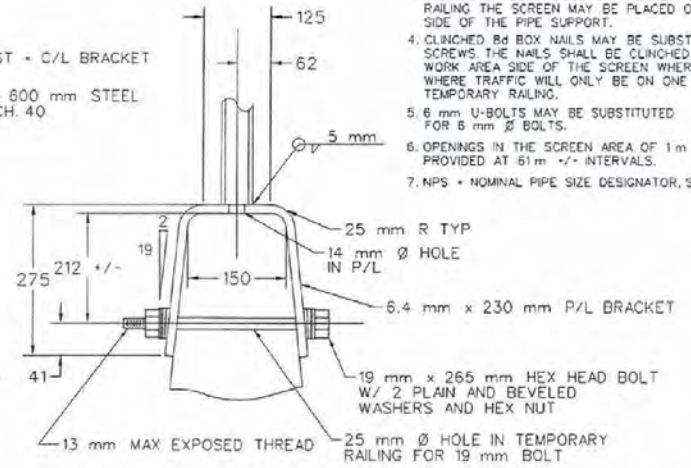


ELEVATION

ANCHOR PLATE DETAIL ALTERNATIVE 'A'



ELEVATION



SECTION B-B

SCREEN ANCHORAGE DETAIL ALTERNATIVE 'B'

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

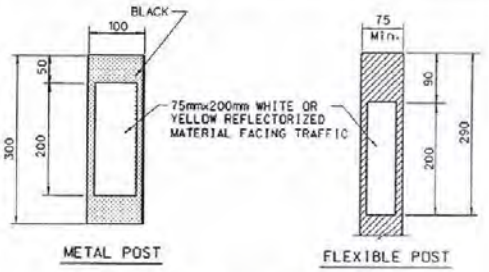
TEMPORARY TRAFFIC SCREEN

CHIEF ROAD DESIGN ENGR. — ADOPTED: 7/99

R-8.3.4 (502)

REVISION

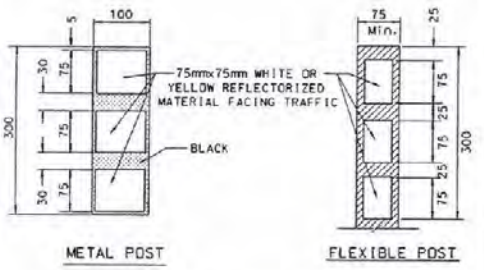
R-83



TYPE 1 REFLECTORS

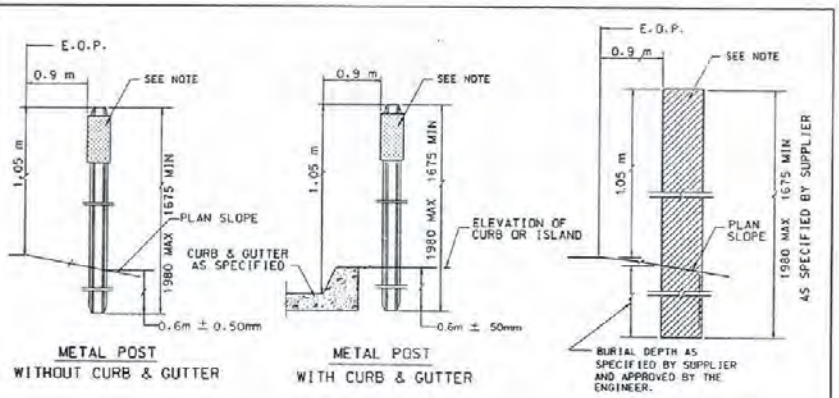
(ROADWAY - RAMPS)

NOTE:
IN URBAN OR SUBURBAN AREAS WHERE A RAISED AND CURBED MEDIAN IS PROVIDED, EACH PROJECT SHOULD BE INVESTIGATED TO DETERMINE WHETHER OR NOT GUIDE POSTS WILL BE NEEDED IN THE MEDIAN.



TYPE 3 REFLECTORS

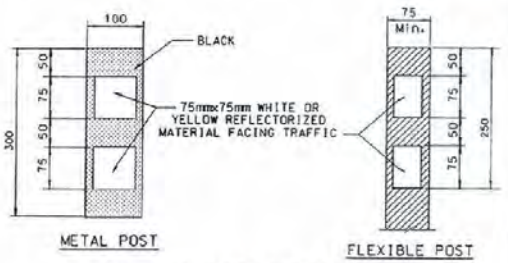
(ISLANDS, CURBS, SHOULDER DIKES)



TYPICAL INSTALLATION

NOTE:
TYPE OF REFLECTORS ACCORDING TO LOCATION. COLOR TO MATCH ADJACENT EDGE LINE.

FLEXIBLE POST
FOR TUBULAR POST, WRAPAROUND REFLECTORS ARE ACCEPTABLE.
(SEE TYPES FOR VERTICAL DIMENSIONS)



TYPE 2 REFLECTORS

(MEDIAN CROSSOVERS, APPROACHES)

MULTI-LANED DIVIDED HIGHWAYS:
(FREEWAY STANDARDS)

IN AREAS WHERE MEDIAN CROSSOVERS ARE PROVIDED A SINGLE GUIDE POST WITH AMBER REFLECTORS SHALL BE PLACED ON THE LEFT SIDE OF THE THROUGH ROADWAY ON THE FAR SIDE OF THE CROSSOVER FOR EACH ROADWAY.

ALL APPROACHES:

ALL APPROACHES SHALL BE DELINEATED WITH WHITE TYPE 2 GUIDE POSTS AT THE BEGINNING AND ENDING LIMITS OF THE APPROACHES. TYPE 4 AND 5 APPROACHES WILL HAVE AN ADDITIONAL GUIDE POST AT EACH TAPER SETBACK.

TABLE 1

MAXIMUM SPACING FOR HIGHWAY DELINEATORS
ON HORIZONTAL CURVES LESS THAN OR EQUAL TO 3000 m.

(DISTANCE IN METERS ROUNDED TO THE NEAREST 1.5 METERS)

RADIUS OF CURVE (R) (m)	SPACING ON CURVE (S) (m)	SPACING IN ADVANCE OF & BEYOND CURVE (m)		
		1ST	2ND	3RD
15	6	12	18	36
45	9	18	27	54
60	10.5	21	31.5	63
75	12	24	36	72
90	15	30	45	90
120	16.5	33	49.5	90
150	19.5	39	58.5	90
180	21	42	63	90
210	22.5	45	67.5	90
240	24	48	72	90
270	25.5	51	76.5	90
300	27	54	81	90
360	30	60	90	90
420	33	66	90	90
480	36	72	90	90
540	37.5	75	90	90
600	39	78	90	90
750	43	90	90	90
900	49.5	90	90	90
1500	63	90	90	90
3000	90	90	90	90

SPACING FOR SPECIFIC RADII NOT SHOWN MAY BE INTERPOLATED FROM TABLE 1 OR COMPUTED FROM THE FORMULA $S=1.65\sqrt{R-15}$. S REFERS TO THE DELINEATOR SPACING AND R REFERS TO THE RADIUS OF THE CURVE. THE MINIMUM SPACING SHOULD BE 6 m. THE MAXIMUM SPACING ON CURVES SHOULD NOT EXCEED 90 m. IN ADVANCE OF & BEYOND A CURVE, AND MEASURED PROCEEDING AWAY FROM THE END POINT OF THE CURVE. THE SPACING OF THE FIRST DELINEATOR IS 25. THE SECOND IS 35. AND THE THIRD IS (BUT IN NO CASE TO EXCEED 90 m.

THE COLOR OF DELINEATORS SHALL BE WHITE ON THE RIGHT SHOULDER INSTALLATIONS AND YELLOW ON THE LEFT EDGE OF DIVIDED OR ONE-WAY ROADWAYS. THE COLORS SHALL BE DENOTED BY A LETTER CODE (EG: TYPE I-Y FOR SINGLE DELINEATOR, YELLOW) IN THE SUMMARY OF GUIDE POST ONLY.

FOR PLACEMENT OF GUIDE POSTS ALONG GUARDRAIL SEE SHEET R-9.2.2

GENERAL NOTES:

1. GUIDE POSTS SHALL BE INSTALLED AT THE BEGINNING AND END OF EACH CURVE AND THE THE SPACING ADJUSTED, THROUGH THE LENGTH OF THE CURVE, INTO EQUAL SPACING NEAREST TO THAT SPECIFIED IN TABLE 1.
2. WHERE NORMAL UNIFORM SPACING IS INTERRUPTED BY DRIVEWAYS, INTERSECTIONS, ETC., GUIDE POSTS MAY BE MOVED A DISTANCE NOT EXCEEDING ¼ OF THE NORMAL SPACING. IF THEY STILL FALL WITHIN SUCH AREAS, THE GUIDE POSTS SHOULD BE ELIMINATED.
3. TYPE OF REFLECTORS ACCORDING TO LOCATION. COLOR TO MATCH ADJACENT EDGE LINE.
4. FOR DETAILS NOT SHOWN, REFER TO M.U.T.C.D., 1988 EDITION.

GUIDE POST SPACING NOTES

TYPE OF ROADWAY:

1. MULTI-LANE DIVIDED, ONE-WAY RAMPS. (POSTS SHALL BE INSTALLED ON BOTH SIDES OF THE ROADWAY WITH THE APPROPRIATE COLORED REFLECTORS.

   A. CURVES (RADIUS LESS THAN OR EQUAL TO 3000 m): SPACING SHALL BE AS SHOWN IN TABLE 1. THE POSTS ON THE MEDIAN SIDE SHALL HAVE YELLOW REFLECTORS AND BE PLACED DIRECTLY OPPOSITE THOSE ON THE OUTER SIDE. THE POSTS ON THE OUTER SIDE SHALL HAVE WHITE REFLECTORS. THE SPACING ON THE MEDIAN SIDE SHALL BE ADJUSTED WHERE APPROACHING OR LEAVING A CURVE TO MATCH THE SPACING USED ON TANGENTS.

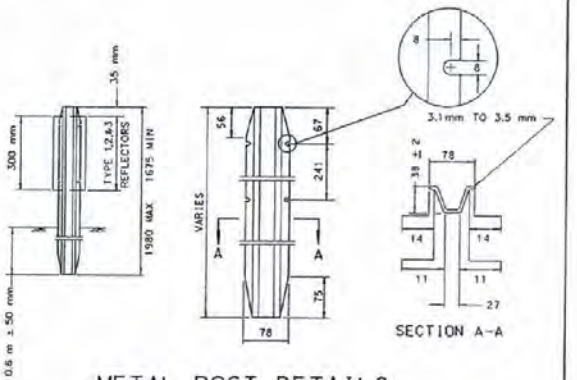
   B. TANGENTS AND CURVES WITH RADIUS GREATER THAN 3000 m: SPACING SHALL BE 240 m FOR POSTS ON THE MEDIAN SIDE, AND THE MEDIAN GUIDE POSTS SHALL HAVE YELLOW REFLECTORS. SPACING SHALL BE 120 m FOR POSTS ON THE OUTER SIDE, AND THESE POSTS SHALL HAVE WHITE REFLECTORS.

   C. ACCELERATION AND DECELERATION LANES, AND RAMPS: SPACING SHALL BE 20 m MAXIMUM AND IN ACCORDANCE WITH TABLE 1 FOR TURNING RAMPS. MEDIAN GUIDE POSTS SHALL HAVE YELLOW REFLECTORS AND THE GUIDE POSTS ON THE OUTER SIDE SHALL HAVE WHITE REFLECTORS.

2. TWO LANE AND MULTI-LANE UNDIVIDED. (POSTS SHALL BE INSTALLED ON THE RIGHT SIDE OF THE SHOULDER WITH THE APPROPRIATE COLORED REFLECTORS).

   A. ON CURVES HAVING A RADIUS OF 3000 m OR LESS GUIDE POSTS SHALL HAVE WHITE REFLECTORS AND BE INSTALLED ON THE RIGHT SIDE ON THE OUTSIDE OF THE CURVE AT THE SPACING SHOWN IN TABLE 1 AND ON THE INSIDE OF THE CURVE AT DOUBLE THE SPACING SHOWN IN THE TABLE AND SHALL NOT EXCEED 90 m.

   B. TANGENTS AND CURVES WITH RADIUS GREATER THAN 3000 m: SPACING SHALL BE 180 m. GUIDE POSTS SHALL HAVE WHITE REFLECTORS.



METAL POST DETAILS

METRIC NDOT

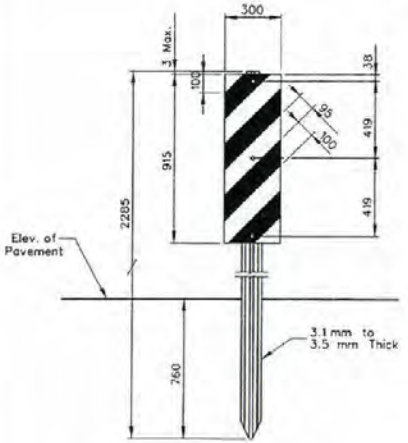
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GUIDE POSTS

CHIEF ROAD DESIGN ENGR	R-9.1.1 ADOPTED: 07/98	(6191) REVISION 9/97

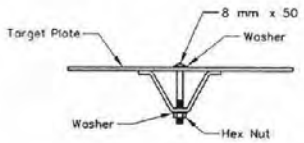
R-84



TYPE 3
BRIDGES, PIERS, ABUTMENTS

Front: Facing Traffic, Alternating Black With Reflectorized Yellow Stripes Sloping Down at A 45° Angle Toward Edge of Obstruction on Which Traffic Will Pass.

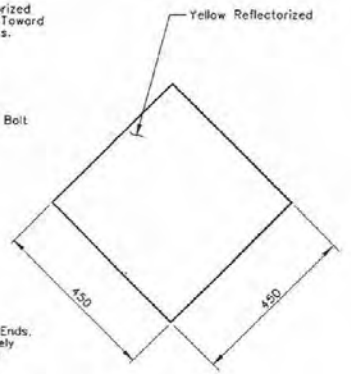
Back: Solid White



(Electroplated Bolts & Nuts & Protective Flat Non-Metalic Washers.)

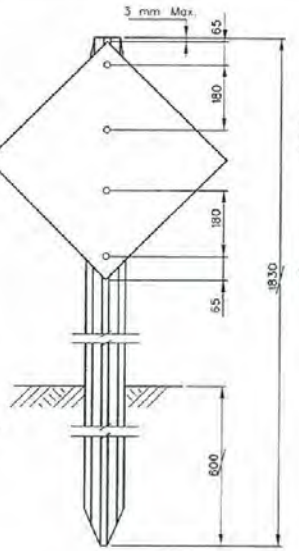
Object Markers Shall be Installed to Delineate Bridge Ends, Underpass Abutments and All Other Obstructions Closely Adjacent to the Edges of the Roadway. They May be Omitted When Guardrail or Barrier Rail Protects the Obstruction.

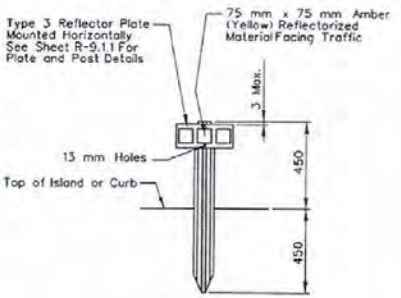
For Post Details See Sheet R-9.1.1



When Used as "End Of Roadway" Marker, Red Reflectors On a Red Background or Type III Reflectorized Sheeting Shall be Used.

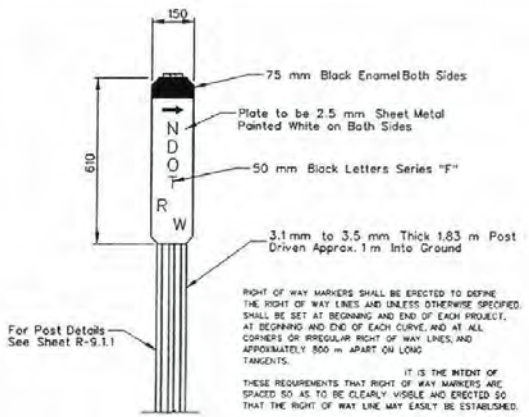
TYPE 1
MEDIAN OBSTRUCTIONS





TYPE 2
(USE ON APPROACH END OF MEDIAN ISLANDS ONLY)

OBJECT MARKERS

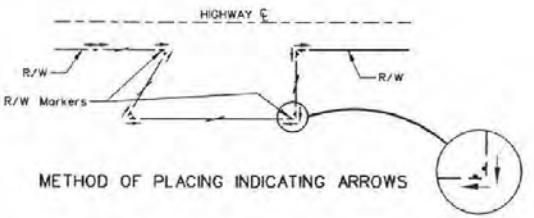


RIGHT OF WAY MARKERS SHALL BE ERECTED TO DEFINE THE RIGHT OF WAY LINES AND UNLESS OTHERWISE SPECIFIED, SHALL BE SET AT BEGINNING AND END OF EACH PROJECT, AT BEGINNING AND END OF EACH CURVE, AND AT ALL CORNERS OR IRREGULAR RIGHT OF WAY LINES, AND APPROXIMATELY 800 m APART ON LONG TANGENTS.

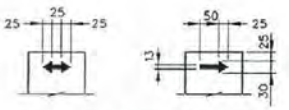
IT IS THE INTENT OF THESE REQUIREMENTS THAT RIGHT OF WAY MARKERS ARE SPACED SO AS TO BE CLEARLY VISIBLE AND ERECTED SO THAT THE RIGHT OF WAY LINE MAY EASILY BE ESTABLISHED.

RIGHT OF WAY MARKERS SHALL BE OMITTED WHERE RIGHT OF WAY LINE IS FENCED.

RIGHT OF WAY MARKERS



METHOD OF PLACING INDICATING ARROWS



R/W INDICATING ARROWS

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

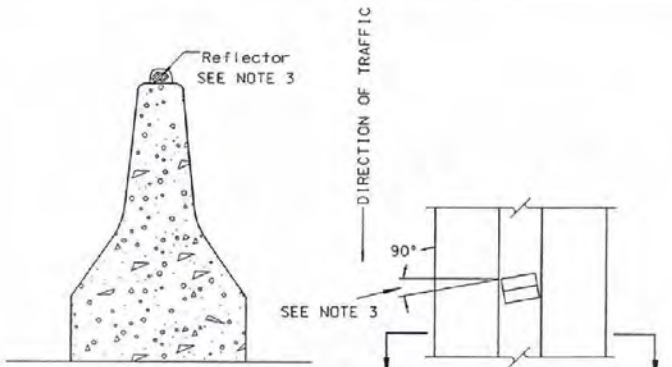
OBJECT MARKERS,
RIGHT OF WAY MARKERS

CHIEF ROAD DESIGN ENGR

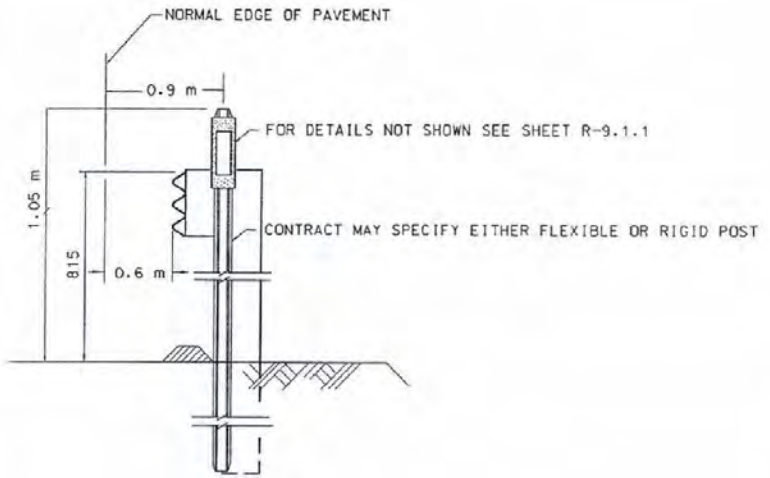
R-9.2.1 (619-6201)

ADOPTED: 7/96 REVISION 9/97

R-85



BARRIER RAIL REFLECTOR INSTALLATION



TYPICAL GUARDRAIL-GUIDE POST INSTALLATION

GENERAL NOTES:

1. ALL REFLECTORS SHALL BE SELECTED & INSTALLED PURSUANT TO THE PROJECT PLANS & SPECIFICATIONS OR AT THE DIRECTION OF THE ENGINEER. THE DEPICTED REFLECTORS ARE FOR MOUNTING LOCATION INFORMATION ONLY.
2. SPACING: SEE "REFLECTOR PLACEMENT ON GUARDRAIL" NOTES AND TABLE "A", OF THIS SHEET.
3. REFLECTORS SHALL BE MOUNTED AS SPECIFIED BY THE MANUFACTURER OR AS DIRECTED BY THE ENGINEER.
4. COLOR: SHALL COMPLY WITH THE GUIDELINES ESTABLISHED BY THE M.U.T.C.D., 1988 EDITION AND REVISIONS THERETO.

REFLECTOR PLACEMENT SPACING ON GUARDRAIL/BARRIER RAIL

SPACING SHALL BE:

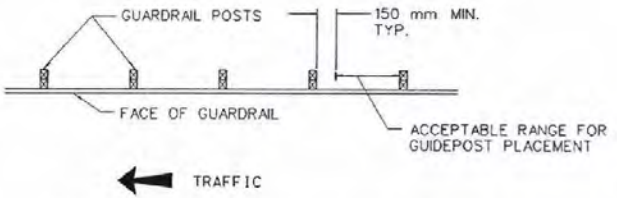
(a) 15 METER ON TANGENTS AND ON CURVES OF 90 METER RADIUS OR GREATER. IF LESS THAN 90 METER RADIUS SEE TABLE "A".

(b) REFLECTORS SHALL BE OMITTED ON THE FLARED SECTIONS OF GUARDRAIL.

(c) NO DIRECT PAYMENT FOR REFLECTORS REGARDLESS OF TYPE OF INSTALLATION.

TABLE "A"

Radius of Curve (In METERS)	Reflector Spacing
≤ 15	6 m
45	9 m
60	11 m
75	12 m
≥ 90	15 m



GUARDRAIL-GUIDE POST LOCATION

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

REFLECTORS
GUARDRAIL-GUIDE POST

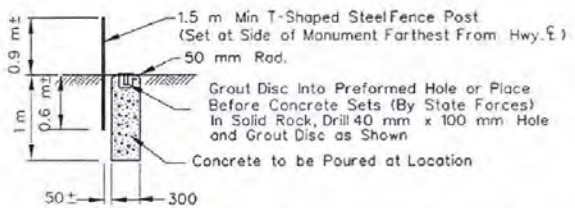
CHIEF ROAD DESIGN ENGR.

8-9.2.2 (618-619)

ADOPTED: 07/96

REVISION 9/97

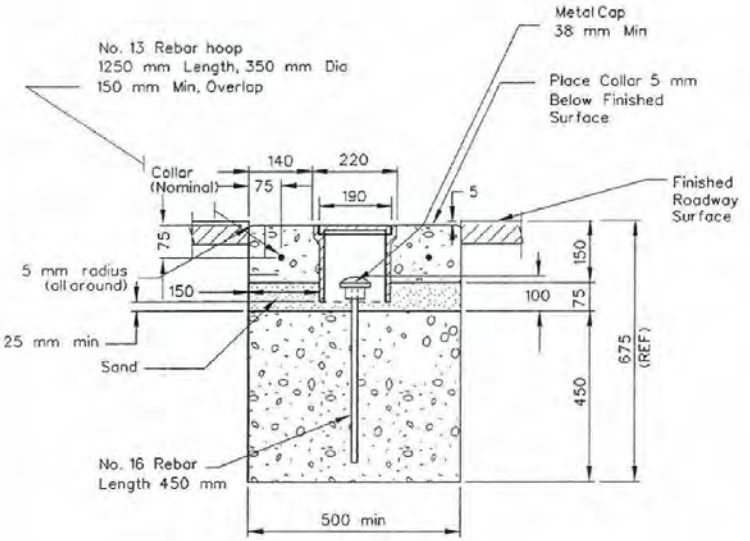
R-86



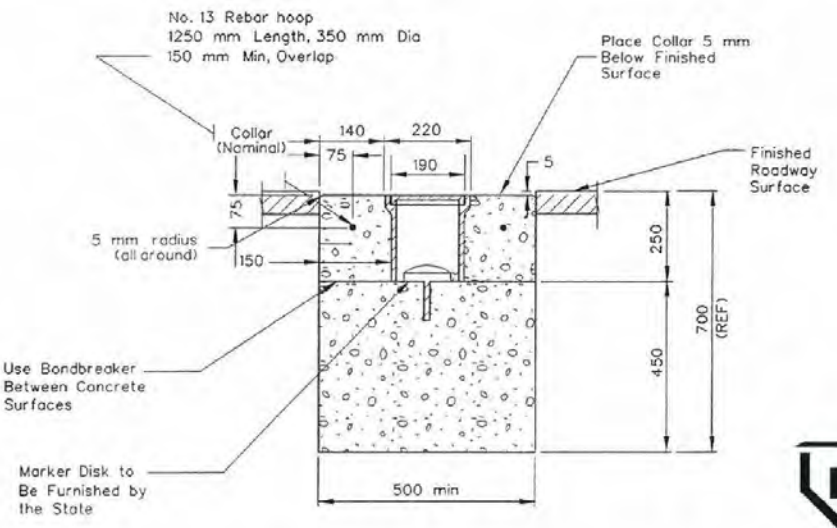
REFERENCE MONUMENT AND MARKER POST

GENERAL NOTES:

1. CONCRETE SHALL BE CLASS A OR AA.
2. MONUMENTS SHALL BE SET TO ASSIST IN REESTABLISHMENT OF THE CENTERLINE FOR FUTURE USE AND SHALL BE SET AT THE BEGINNING AND END OF EACH PROJECT, AT BEGINNING AND END OF EACH CURVE, AT ALL ANGLE POINTS, AND APPROXIMATELY 800 METERS APART ON LONG TANGENTS.
3. MONUMENTS MAY BE POURED SQUARE OR ROUND
4. MONUMENT STAMPING SHALL INCLUDE DESCRIPTION, ANGLE AND OFFSET.



SURVEY COVER & RING
(CAST IRON)



ALTERNATE PLACEMENT
(CAST IRON)

ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SURVEY MONUMENTS AND
REFERENCE MONUMENTS

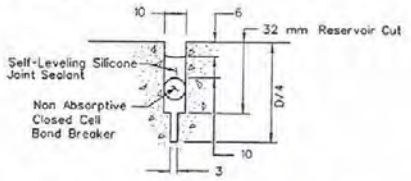
CHIEF ROAD DESIGN ENGR

R-9.3 (621)
ADOPTED: 7/96 REVISION 9/97

SURVEY MONUMENTS

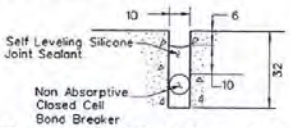
R-87

ALL MEASUREMENT ±2 mm TOLERANCE



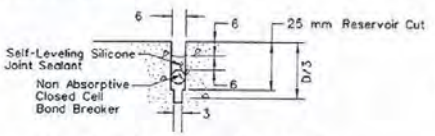
TRANSVERSE WEAKENED PLANE JOINT
DOUBLE SAW CUT

ALL MEASUREMENT ±2 mm TOLERANCE



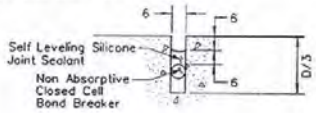
TRANSVERSE CONTACT JOINT
SINGLE SAW CUT

ALL MEASUREMENT ±2 mm TOLERANCE

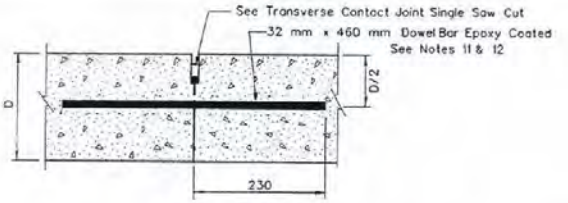


LONGITUDINAL WEAKENED PLANE JOINT
DOUBLE SAW CUT

ALL MEASUREMENT ±2 mm TOLERANCE

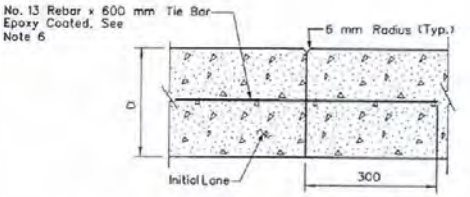


LONGITUDINAL WEAKENED PLANE JOINT
SINGLE SAW CUT

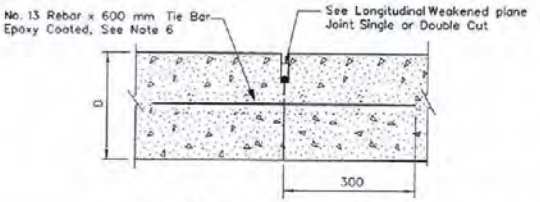


SECTION A-A

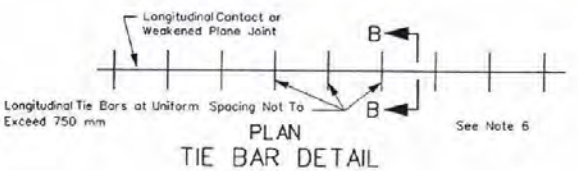
TRANSVERSE CONTACT JOINT WITH DOWEL BARS
See Note 5



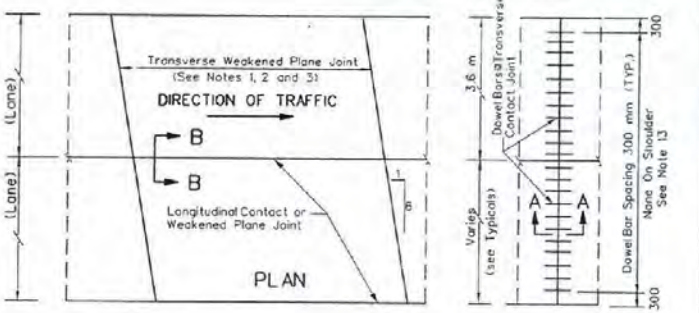
SECTION B-B
LONGITUDINAL CONTACT JOINT

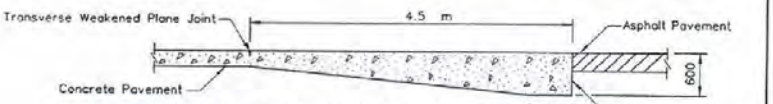


SECTION B-B
LONGITUDINAL WEAKENED PLANE JOINT



PLAN
TIE BAR DETAIL





PAVEMENT END ANCHOR DETAIL
See Note 8

GENERAL NOTES:

1. ALL WEAKENED PLANE JOINTS SHALL BE SAWED DIAGONALLY AS SHOWN, EXCEPT AS INDICATED IN THE END ANCHOR AND STRUCTURE APPROACH DETAILS. WHEN ONLY ONE LANE IS BEING CONSTRUCTED ALONGSIDE EXISTING LANES, JOINTS SHALL BE SAWED EITHER DIAGONALLY OR AS DIRECTED BY THE ENGINEER. OFFSET IS 1 IN 6 AND SKEWED COUNTERCLOCKWISE.
2. SPACING OF WEAKENED PLANE JOINTS SHALL BE SUCCESSIVELY 4.5 m, 3.9 m, 4.2 m, 3.6 m AND REPEAT, EXCEPT FOR THE FIRST JOINT AT PAVEMENT END ANCHORS AND AT REINFORCED STRUCTURE APPROACHES.
3. TRANSVERSE CONTACT JOINTS SHALL BE CONSTRUCTED AT LEAST 1.8 m FROM ANY TRANSVERSE WEAKENED PLANE JOINT.
4. LONGITUDINAL WEAKENED PLANE JOINTS SHALL BE CUT AT ALL LANE AND SHOULDER LINES EXCEPT WHERE LANE PLUS ADJACENT SHOULDER WIDTH IS LESS THAN OR EQUAL TO 4.8 m.
5. ALL TRANSVERSE CONTACT JOINTS SHALL BE SAWED AND JOINT SEALER USED PER RESPECTIVE TRANSVERSE CONTACT JOINT DETAIL THIS SHEET.
6. ALL TIE BARS TO BE EPOXY COATED EXCEPT IN CLARK CO.. TIE BARS TO BE PLACED IN MIDDLE 1/3 OF SLAB THICKNESS.
7. TRANSVERSE CONTACT JOINTS WITH DOWEL BARS SHALL BE USED AT ALL CONSTRUCTION JOINTS AND ELSEWHERE IF ORDERED BY THE ENGINEER.
8. PAVEMENT END ANCHORS SHALL BE CONSTRUCTED AS THE TERMINAL PANELS OF ALL PAVEMENT NOT ABUTTING EXISTING CONCRETE PAVEMENTS OR STRUCTURES, AND ELSEWHERE IF ORDERED BY THE ENGINEER.
9. INITIAL 3 mm WEAKENED PLANE JOINT SAW CUT TO BE DONE WITHIN SPECIFIED TIME LIMIT. RESERVOIR CUT SHALL BE DONE AT A LATER TIME.
10. RATIO OF DEPTH TO WIDTH OF JOINT SEALANT SHALL BE 1:1
11. DOWEL BARS SHALL BE LOCATED WITHIN 25 mm OF THE PLANNED TRANSVERSE AND DEPTH LOCATION AND WITHIN 50 mm OF THE PLANNED LONGITUDINAL LOCATION.
12. THE DOWEL BARS SHALL BE PARALLEL TO THE PAVEMENT SURFACE AND CENTERLINE WITHIN A TOLERANCE OF 13 mm IN 460 mm.
13. DOWEL BARS SHALL NOT BE PLACED WITHIN 300 mm OF LONGITUDINAL JOINTS.
14. D = SLAB THICKNESS.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

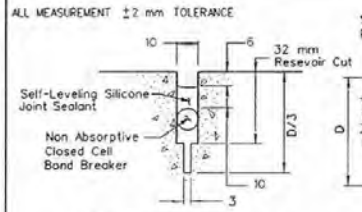
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PLAIN JOINTED CONCRETE PAVEMENT DETAILS

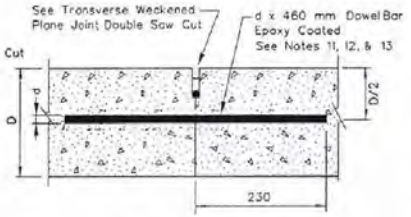
R-10.1.1 (402)

CHIEF ROAD DESIGN ENGR. ADOPTED 07/98 REVISION 9/97

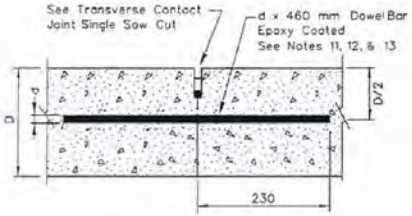
R-88



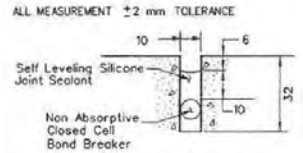
TRANSVERSE WEAKENED
PLANE JOINT
DOUBLE SAW CUT



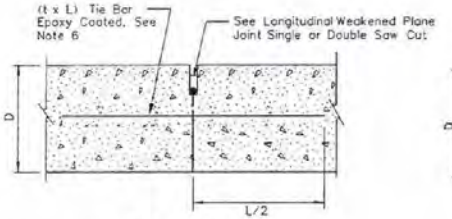
SECTION C-C
TRANSVERSE WEAKENED PLANE JOINT



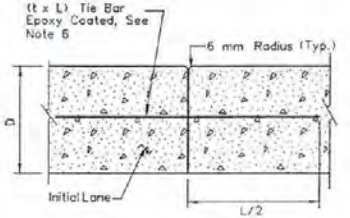
SECTION A-A
TRANSVERSE CONTACT JOINT
See Note 5



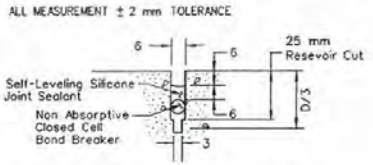
TRANSVERSE CONTACT JOINT
SINGLE SAW CUT



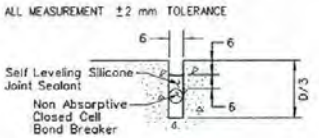
SECTION B-B
LONGITUDINAL WEAKENED PLANE JOINT



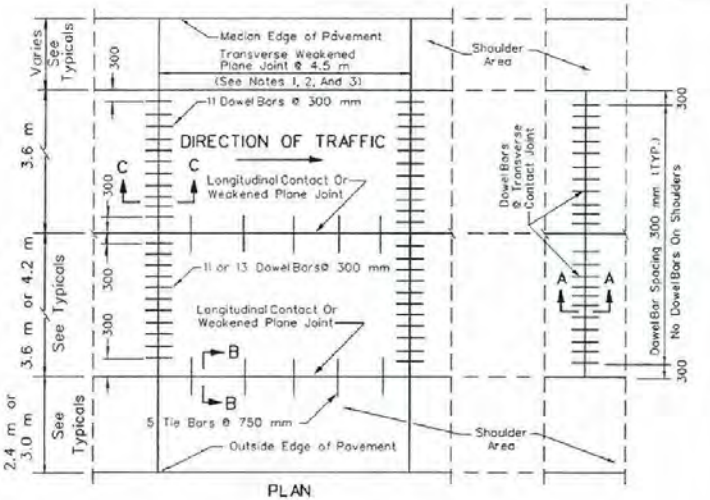
SECTION B-B
LONGITUDINAL CONTACT JOINT



LONGITUDINAL WEAKENED
PLANE JOINT
DOUBLE SAW CUT



LONGITUDINAL WEAKENED
PLANE JOINT
SINGLE SAW CUT



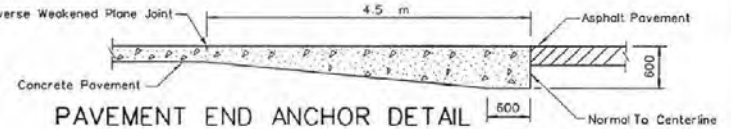
PLAN

TIE BAR AND DOWEL BAR APPLICATIONS
(TWO LANES SHOWN, TYP. FOR ADDITIONAL LANES)

PAVEMENT THICKNESS D mm	DOWEL BAR DIA. d mm MIN.	TIE BAR SIZE REBAR t	LENGTH OF TIE BAR L mm
250	32	No. 13	600
275	35	No. 16	750
300 & 325	38	No. 16	750

GENERAL NOTES:

1. ALL WEAKENED PLANE JOINTS SHALL BE SAWED PERPENDICULAR AS SHOWN, EXCEPT AS INDICATED IN THE STRUCTURE APPROACH DETAILS. WHEN ONLY ONE LANE IS BEING CONSTRUCTED ALONGSIDE EXISTING LANES, JOINTS SHALL BE SAWED AS DIRECTED BY THE ENGINEER.
2. SPACING OF WEAKENED PLANE JOINTS SHALL BE 4.5 m EXCEPT AT REINFORCED STRUCTURE APPROACHES.
3. TRANSVERSE WEAKENED PLANE JOINTS SHALL BE AT LEAST 1.8 m FROM ANY CONTACT JOINT.
4. LONGITUDINAL WEAKENED PLANE JOINTS SHALL BE CUT AT ALL LANE AND SHOULDER LINES EXCEPT WHERE LANE PLUS ADJACENT SHOULDER WIDTH IS LESS THAN OR EQUAL TO 4.8 m.
5. ALL TRANSVERSE CONTACT JOINTS SHALL BE SAWED AND JOINT SEALER USED PER RESPECTIVE TRANSVERSE CONTACT JOINT DETAIL THIS SHEET.
6. ALL TIE BARS TO BE EPOXY COATED EXCEPT IN CLARK CO.. TIE BARS TO BE PLACED IN MIDDLE 1/3 OF SLAB THICKNESS. TIE BARS SHALL NOT BE PLACED WITHIN 300 mm OF DOWEL BARS.
7. TRANSVERSE CONTACT JOINTS WITH DOWEL BARS SHALL BE USED AT ALL CONSTRUCTION JOINTS AND ELSEWHERE IF ORDERED BY THE ENGINEER.
8. PAVEMENT END ANCHORS SHALL BE CONSTRUCTED AS THE TERMINAL PANELS OF ALL PAVEMENT NOT ABUTTING EXISTING CONCRETE PAVEMENTS OR STRUCTURES, AND ELSEWHERE IF ORDERED BY THE ENGINEER.
9. INITIAL 3 mm WEAKENED PLANE JOINT SAW CUT TO BE DONE WITHIN SPECIFIED TIME LIMIT. RESERVOIR CUT SHALL BE DONE AT A LATER TIME.
10. RATIO OF DEPTH TO WIDTH OF JOINT SEALANT SHALL BE 1:1
11. DOWEL BARS SHALL BE LOCATED WITHIN 25 mm OF THE PLANNED TRANSVERSE AND DEPTH LOCATION AND WITHIN 50 mm OF THE PLANNED LONGITUDINAL LOCATION.
12. DOWEL BARS SHALL BE PARALLEL TO THE PAVEMENT SURFACE AND CENTERLINE WITHIN A TOLERANCE OF 13 mm IN 460 mm.
13. DOWEL BARS SHALL NOT BE PLACED WITHIN 300 mm OF LONGITUDINAL JOINTS.
14. D = SLAB THICKNESS



PAVEMENT END ANCHOR DETAIL
See Note 8

METRIC
NDOT

ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED

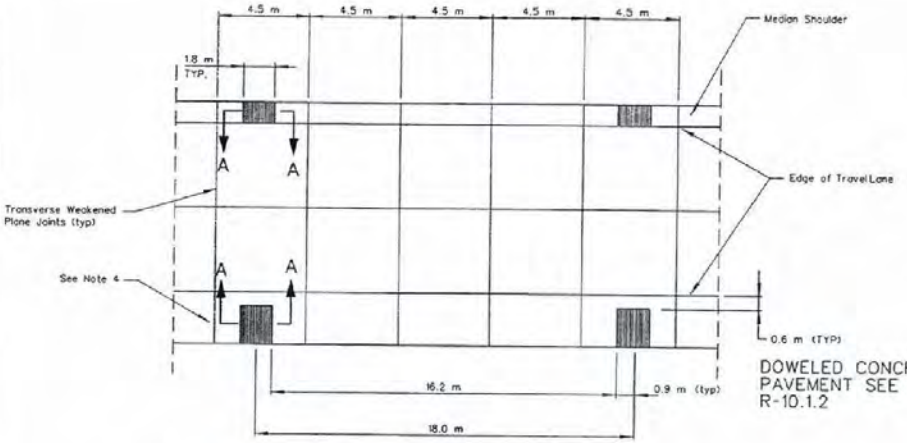
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

DOWELED CONCRETE PAVEMENT DETAILS

CHIEF ROAD DESIGN ENGR.

R-10.1.2	(409)
ADOPTED 07/96	REVISION 9/97

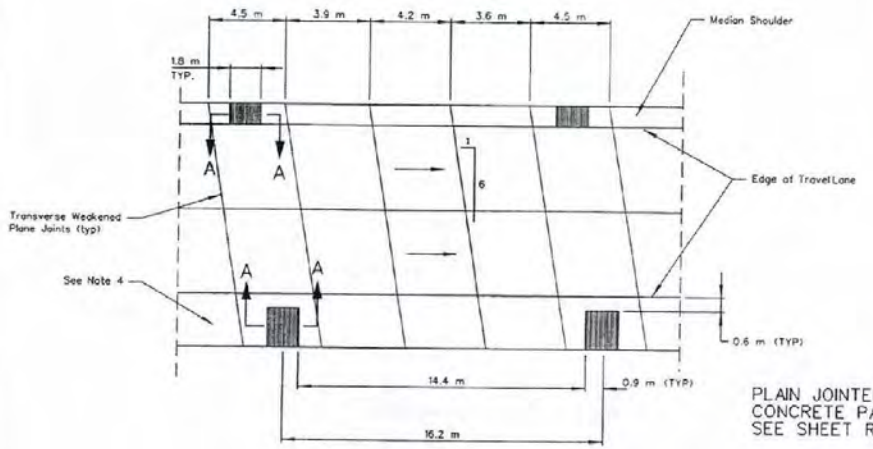
R-89



DOWELED CONCRETE PAVEMENT SEE SHEET R-10.1.2

RUMBLE STRIPS ON CONCRETE SHOULDERS

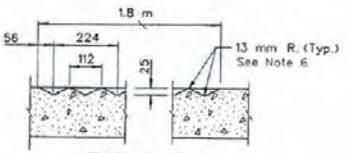
(RUMBLE STRIPS SHALL NOT BE USED IN URBAN AREAS)



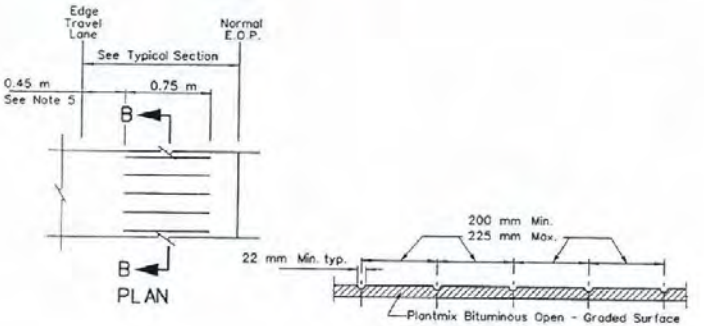
PLAIN JOINTED CONCRETE PAVEMENT SEE SHEET R-10.1.1

RUMBLE STRIPS ON CONCRETE SHOULDERS

(RUMBLE STRIPS SHALL NOT BE USED IN URBAN AREAS)



SECTION A-A



SECTION B-B

RUMBLE STRIP SHALL BE CONTINUOUS AS DESCRIBED ON PLANS TO BE USED ON ROADS WITH SHOULDERS 1.2 m WIDE AND OVER.

RUMBLE STRIPS ON ASPHALT SHOULDERS

(RUMBLE STRIPS SHALL NOT BE USED IN URBAN AREAS)

GENERAL NOTES:

1. DO NOT SCORE THRU DECELERATION AND ACCELERATION AREAS OF RAMPS AND TAPERED APPROACHES. DO NOT SCORE ACROSS MINOR APPROACHES.
2. SHOULDER TRANSVERSE JOINTS SHALL BE THE SAME PATTERN AS MAIN ROADWAY.
3. 1.8 m RUMBLE STRIPS SHALL BE SCORED BETWEEN THE 4.5 m DIAGONALLY SAWED TRANSVERSE JOINTS.
4. SEE TYPICAL SECTION FOR WIDTH OF SHOULDER AND LONGITUDINAL WEAKENED PLANE JOINT LOCATION.
5. WHEN SHOULDER WIDTH IS 1.8 m OR WIDER INCREASE 0.45 m TO 0.6 m.
6. THE HIGHEST PORTION OF THE RUMBLE STRIP SHALL NOT BE ABOVE THE ROADWAY SURFACE.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

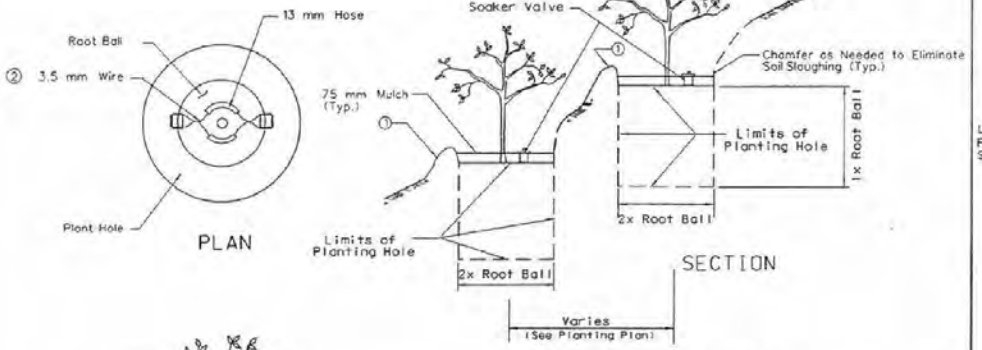
RUMBLE STRIPS CONCRETE AND ASPHALT

CHIEF ROAD DESIGN ENGR.

R-10.1.3 (403) (409)

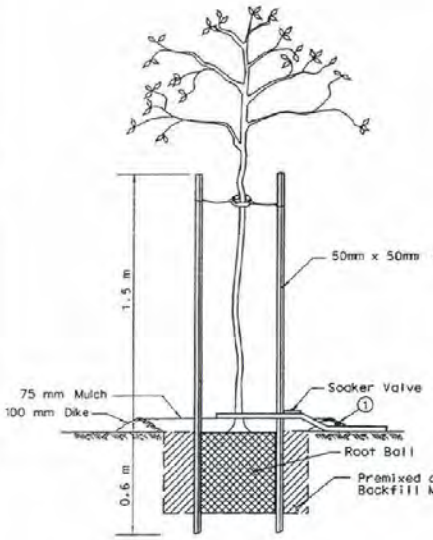
ADOPTED 07/96 | REVISION 9/97

R-90



SLOPING AREAS

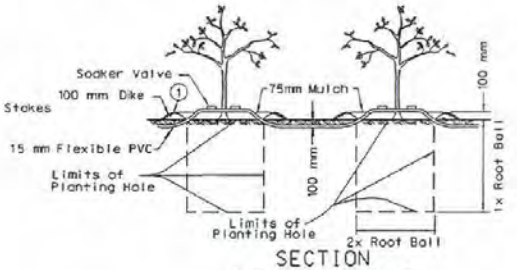
PLANTHOLE & SOAKER IRRIGATION DETAILS



SECTION

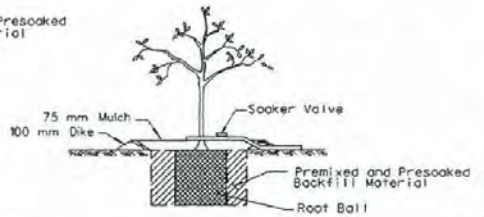
STAKING DETAILS

NOTE:
TOP OF ROOT BALL TO BE 25 mm ABOVE GRADE.



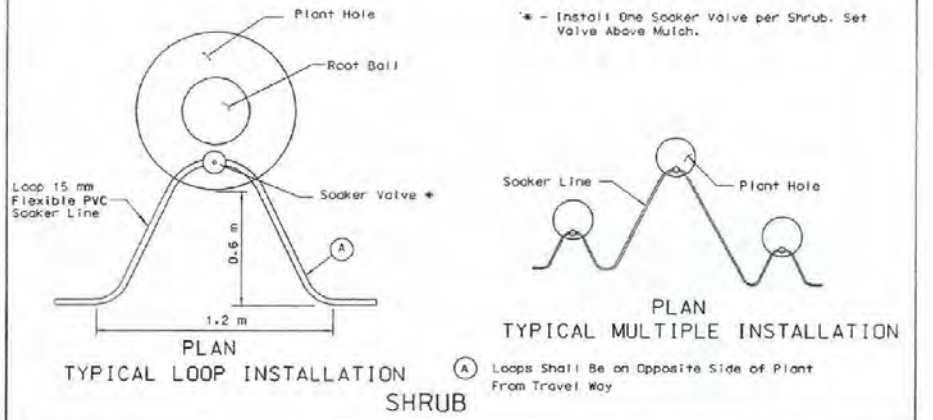
SECTION

LEVEL AREAS

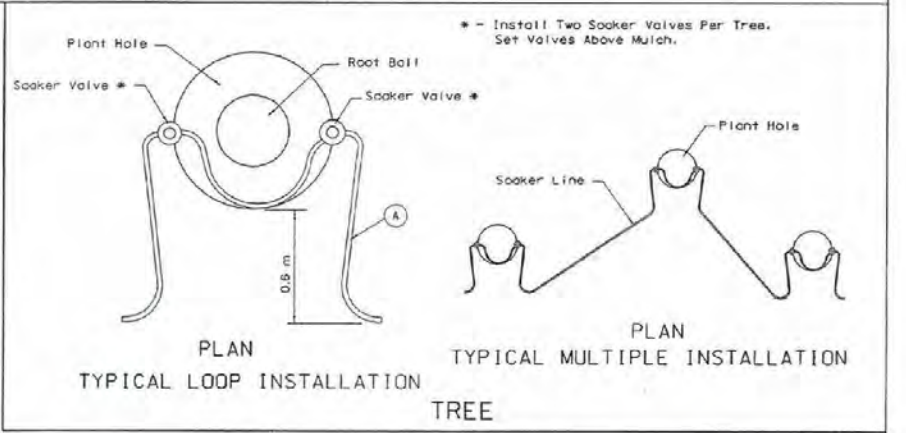


SECTION

PLANTING TECHNIQUES



SHRUB



TREE

① Basin To be Constructed of Soil From Plant Hole and Shall be 1 m Inside Diameter.

② See Section 726.03.09 of Specifications for Additional Approved Tree Ties.

SOIL SCHEDULE

BACKFILL MATERIAL SHALL CONSIST OF TWO PARTS NATIVE SOIL AND ONE PART HUMUS.

PLANT TABLET SCHEDULE

FOR TREES, SHRUBS AND GROUNDCOVERS

NO.1	1 TABLET
NO.5	2 TABLETS
NO.15	3 TABLETS
600 mm BOX	5 TABLETS

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

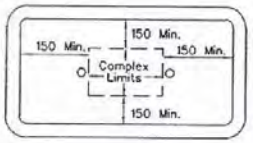
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PLANTING DETAILS

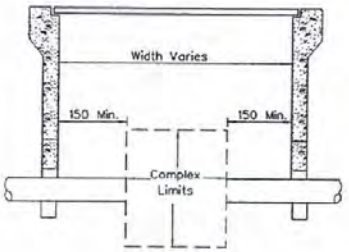
CHIEF ROAD DESIGN ENGR.

R-11.1.1	(212)
ADOPTED: 7/96	REVISION 9/97

R-91

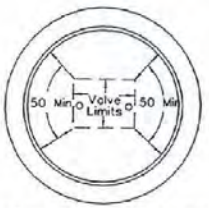


TOP VIEW VALVE BOX

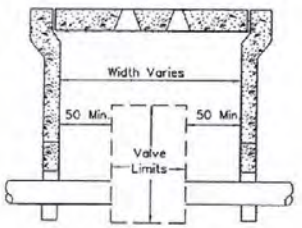


SECTION
VALVE BOX

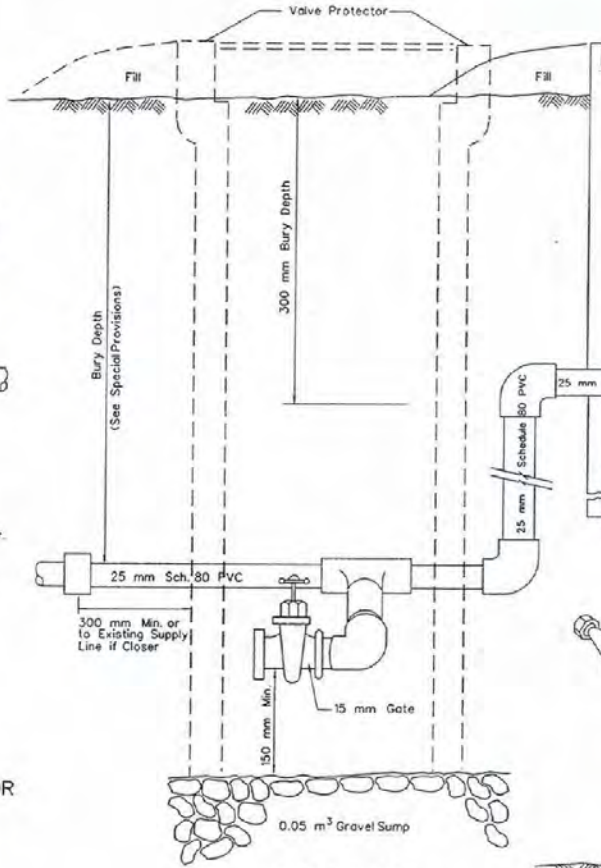
One for Each: Soaker Irrigation Control Unit.
Electric Control Valve.
Gate Valves 25 mm and Larger.
Filtration Unit.



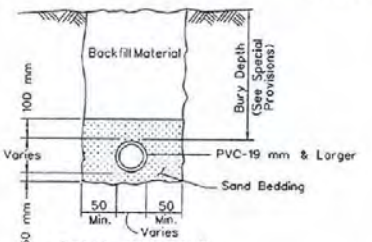
TOP VIEW VALVE PROTECTOR



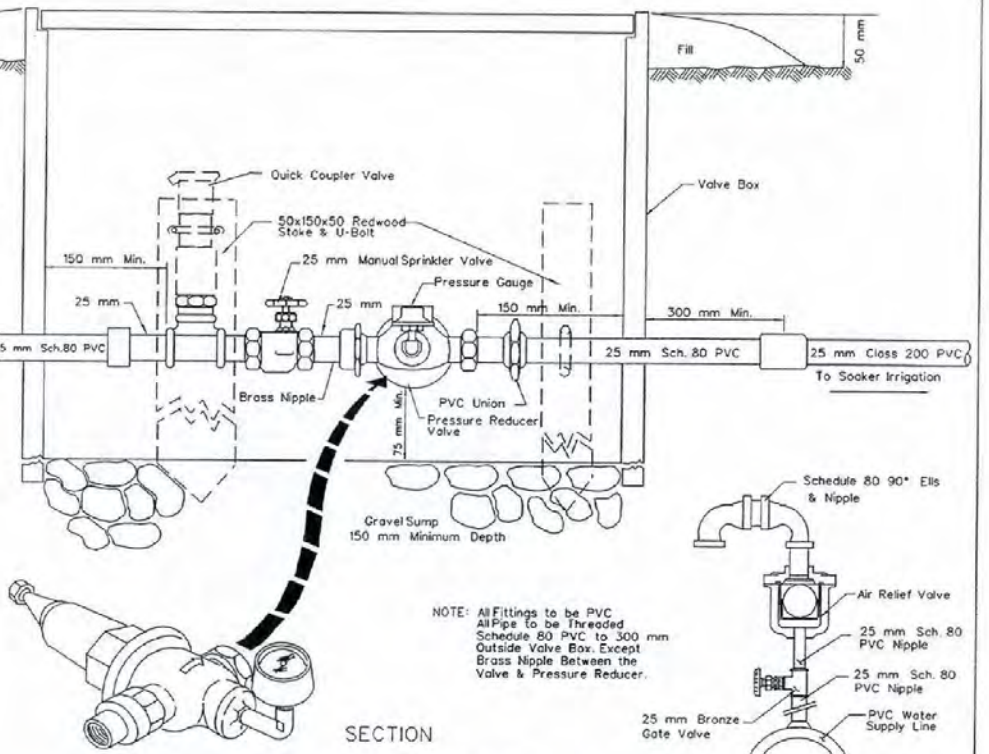
SECTION
VALVE PROTECTOR
(One For Each 15 mm Gate Valve)



DRAIN DETAIL
(Delete in Las Vegas Area)



SAND BEDDING



NOTE: All Fittings to be PVC
All Pipe to be Threaded
Schedule 80 PVC to 300 mm
Outside Valve Box. Except
Brass Nipple Between the
Valve & Pressure Reducer.

SECTION

SOAKER IRRIGATION CONTROL UNIT
WITH QUICK COUPLER VALVE

ELEVATION
AIR RELIEF VALVE UNIT

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

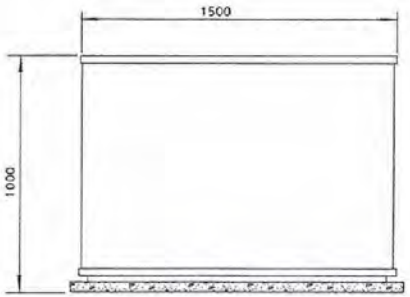
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SOAKER CONTROL AND VALVE BOX DETAILS

R-11.1.2 (213)

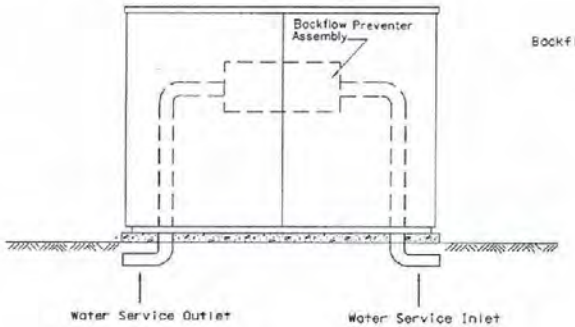
CHIEF ROAD DESIGN ENGR. | ADOPTED: 07/98 | REVISION

R-92

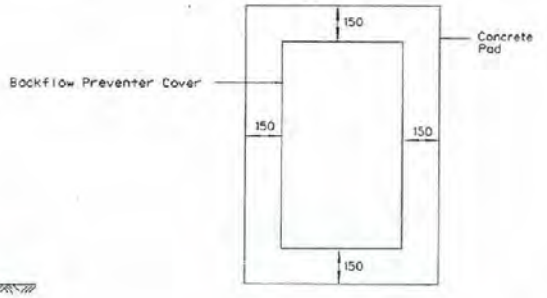


SIDE VIEW

FRONT VIEW



BACKFLOW PREVENTER COVER

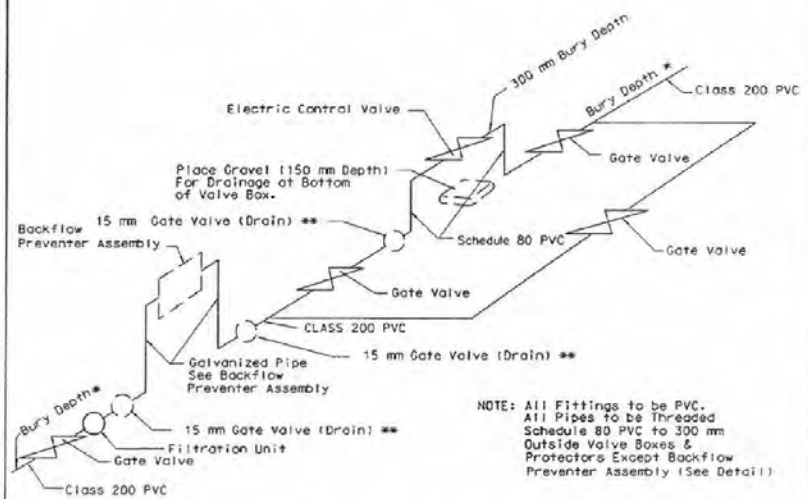


Concrete Shall Be Class A or AA

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

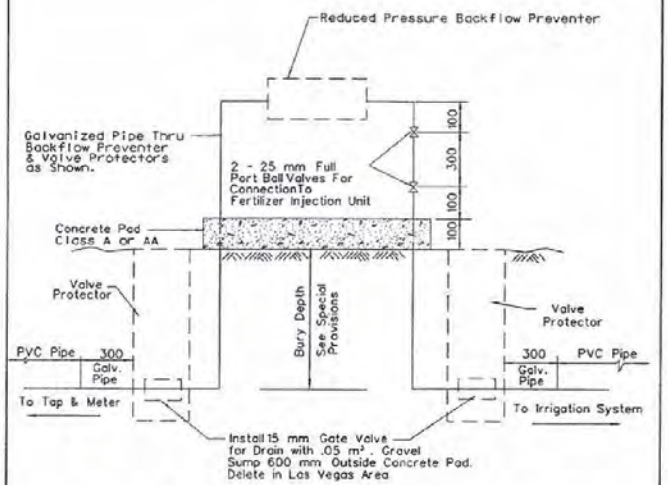
R-93

* Bury Depth. See Special Provisions
** Delete in Las Vegas Area

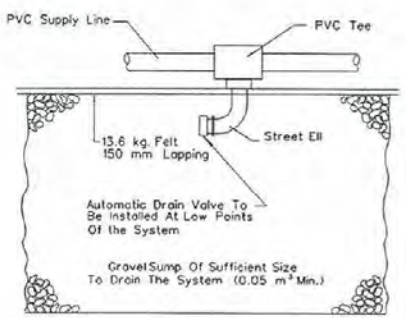


NOTE: All Fittings to be PVC. All Pipes to be Threaded Schedule 80 PVC to 300 mm Outside Valve Boxes & Protectors Except Backflow Preventer Assembly (See Detail)

TYPICAL VALVE COMPLEX



BACKFLOW PREVENTER ASSEMBLY



SECTION

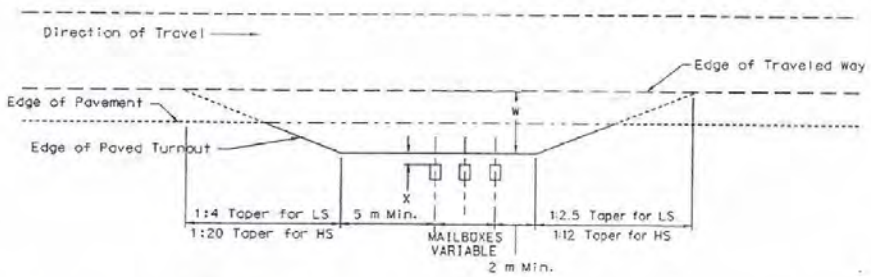
AUTOMATIC DRAIN VALVE & SUMP

(Delete in Las Vegas Area)

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

BACKFLOW PREVENTER AND VALVE COMPLEX DETAILS

CHIEF ROAD DESIGN ENGR.	R-11.1.3 (213)	
	ADOPTED: 07/96	REVISION



LS = A Minimum Design for Roads Carrying LOW speed Traffic and for Local and Collector Roads.
HS = For Roads Carrying HIGH Speed Traffic.
W = For Suggested Widths See TABLE 1.
MAILBOXES = For Mailbox Spacing and Variable Length See Sheets R-12.1.2 and R-12.1.3
X = For Mailbox Face Offset See TABLE 1 (0 to 300 mm).

MAILBOX TURNOUT

SUGGESTED GUIDELINES FOR LATERAL PLACEMENT OF MAILBOXES

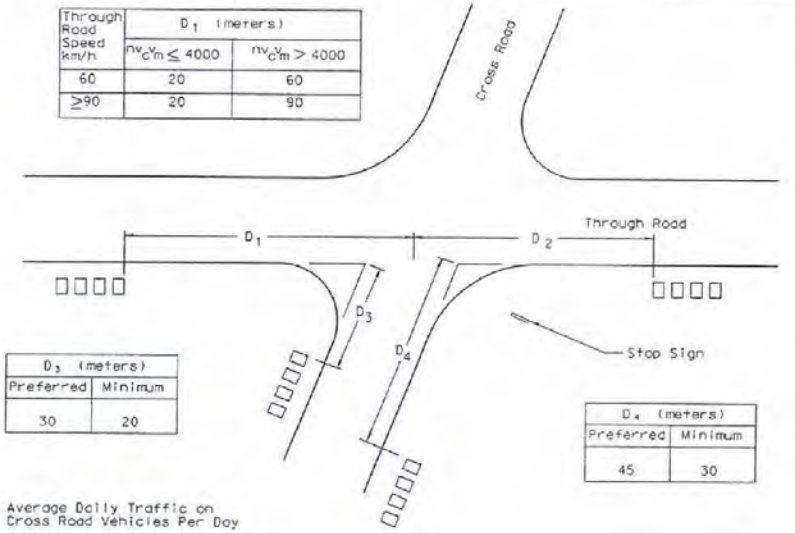
TABLE 1

HIGHWAY TYPE AND TRAFFIC CONDITIONS	WIDTH (W) OF ALL-WEATHER SURFACE OF TURNOUT OR AVAILABLE SHOULDER AT MAILBOX		DISTANCE (X) ROADSIDE FACE OF MAILBOX IS TO BE OFFSET BEHIND EDGE OF TURN OUT OR USABLE SHOULDER	
	PREFERRED (m)	MINIMUM (m)	PREFERRED (mm)	MINIMUM (mm)
RURAL HIGHWAY ADT= OVER 10000 vpd	>3.6	3.0	200 TO 300	0
RURAL HIGHWAY ADT= 1,500 TO 10,000 vpd	3.6	2.4	200 TO 300	0
RURAL HIGHWAY ADT= 100 TO 1500 vpd	3.0	2.4	200 TO 300	0
RURAL ROAD ADT= UNDER 100 vpd	2.4	1.8	200 TO 300	200*
RESIDENT STREET WITHOUT CURB OR ALL WEATHER SHOULDER	1.8	0	200 TO 300	200*
CURBED RESIDENTIAL STREET	N/A	N/A	200 TO 300 BEHIND TRAFFIC FACE OF CURB	150 BEHIND TRAFFIC FACE OF CURB

ADT = AVERAGE DAILY TRAFFIC vpd = VEHICLES PER DAY
* IF TURNOUT IS PROVIDED, THIS MAY BE REDUCED TO ZERO.

Through Road Speed km/h	D_2 (meters)		
	$\frac{V_c}{1.5n-.5} \leq 50$	$50 < \frac{V_c}{1.5n-.5} \leq 400$	$\frac{V_c}{1.5n-.5} > 400$
60	20	30	30
≥ 90	45	45	60

Through Road Speed km/h	D_1 (meters)	
	$nv_{cm} \leq 4000$	$nv_{cm} > 4000$
60	20	60
≥90	20	90



D_3 (meters)	
Preferred	Minimum
30	20

D_4 (meters)	
Preferred	Minimum
45	30

V_c Average Daily Traffic on Cross Road Vehicles Per Day

V_m Average Daily Traffic on Through Road Vehicles Per Day

n Number of Mailboxes at Mail Stop

MINIMUM CLEARANCE DISTANCES TO NEAREST MAILBOX IN MAIL STOPS AT INTERSECTIONS

GENERAL NOTES:

1. For Further Information On Mailboxes See ASHTO "a Guide For Erecting Mailboxes On Highways, 1994 Edition.
2. Mailboxes Within The Clear Zone Shall Be The Types Shown In Sheets R-12.1.2 And R-12.1.3 Or An Approved Equal.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

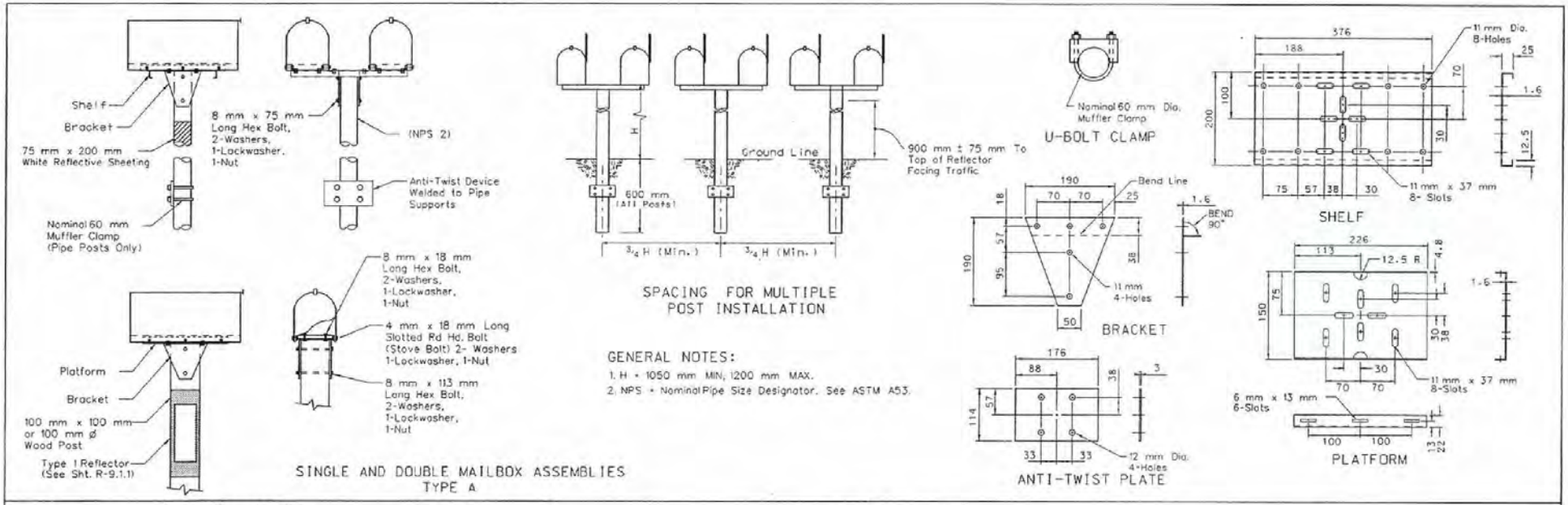
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

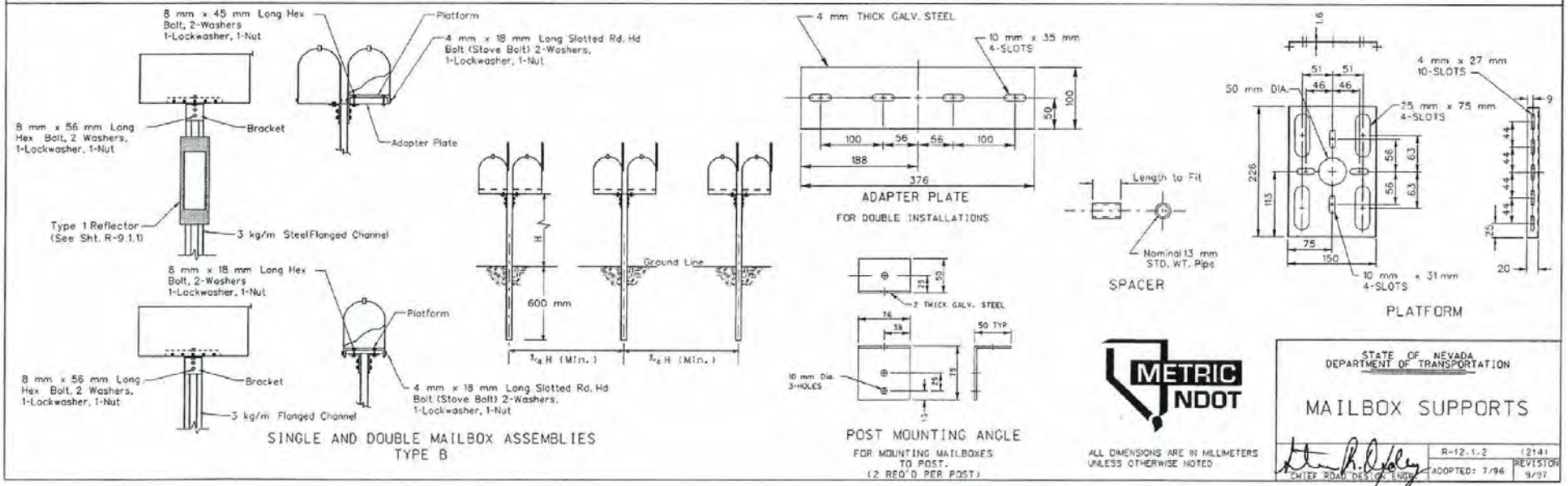
MAILBOX TURNOUTS

R-12.1.1 (214)

CHIEF ROAD DESIGN ENGR. ADOPTED: 7/96 REVISION

R-94





METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

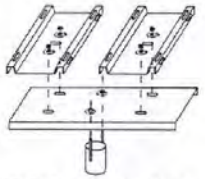
MAILBOX SUPPORTS

CHIEF ROAD DESIGN ENGR.

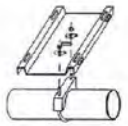
R-12.1.2	(214)
ADOPTED: 7/96	REVISION 9/97

R-95

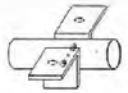
SINGLE MAILBOX MOUNT



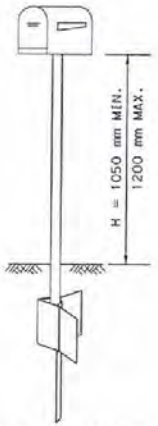
DOUBLE MAILBOX MOUNT



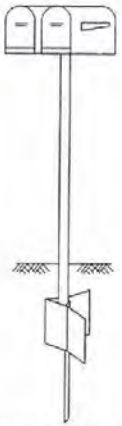
MULTIPLE MAILBOX MOUNT



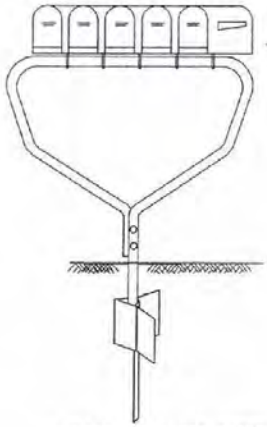
BRACKET MOUNT ALTERNATIVE



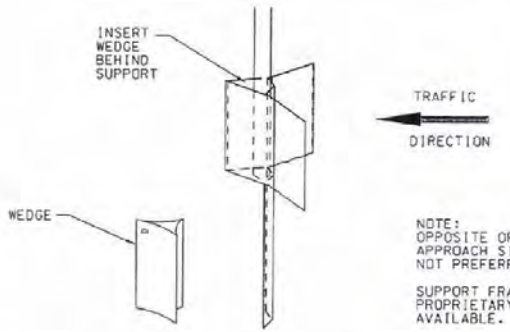
SINGLE SUPPORT SYSTEM



DOUBLE SUPPORT SYSTEM



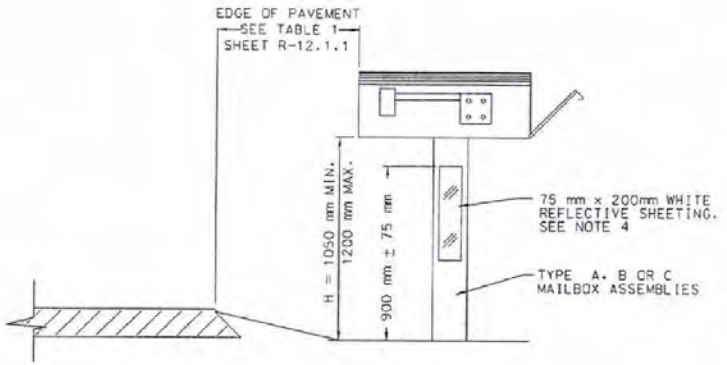
MULTIPLE SUPPORT SYSTEM



NOTE:
OPPOSITE ORIENTATION WITH WEDGE ON TRAFFIC APPROACH SIDE OF POST IS ALLOWABLE BUT NOT PREFERRED

SUPPORT FRAME AND FOUNDATION ARE PROPRIETARY PRODUCTS COMMERCIALLY AVAILABLE.

SINGLE AND MULTIPLE MAILBOX ASSEMBLIES
TYPE C



ALTERNATE PLACEMENT
(SEE NOTE 3)

GENERAL NOTES:

1. FOR FURTHER INFORMATION ON MAILBOXES SEE AASHTO "A GUIDE FOR ERECTING MAIL BOXES ON HIGHWAYS", 1994 EDITION.
2. INSTALLATION OF TYPE C MAILBOX ASSEMBLIES SHALL BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
3. THE DIRECTION OF THE MAILBOX OPENING IN RELATION TO THE TRAVEL LANES SHALL BE SET BY THE UNITED STATES POSTAL SERVICE.
4. 75 mm x 200 mm WHITE REFLECTORIZED SHEETING SHALL BE PLACED FACING TRAFFIC 900 mm +/- 75 mm FROM GROUND ON ALL MAILBOX SUPPORT STRUCTURES.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

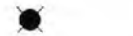
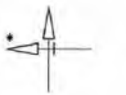
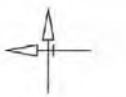
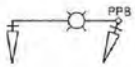
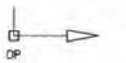
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

MAILBOX SUPPORTS

CHIEF ROAD DESIGN ENGR.

R-12.1.3 (214)
ADOPTED: 7/96
REVISION 9/97

R-96

NEW	EXISTING	DESCRIPTION
		Luminaire
		Electrolier
		Underpass Luminaire
		Traffic Signal Head, 3 Section, 300 mm Red, Yellow and Green Sections (unless Indicated Otherwise)
		Traffic Signal Head With Back Plate
		Traffic Signal Head, Programmed Visability, 300 mm Green Arrow, 300 mm Solid Yellow and Red Sections, With Back Plate
		Traffic Signal Head With 300 mm Green, Yellow and Red Arrow Sections, With Back Plate
		Mast Arm Signal With Back Plate
		Combination Traffic Signal standard With Luminaire and Signal Mast Arms and Attached Signal Heads, With Back Plate PPB=Pedestrian Push Button and Sign
		Traffic Signal Head With Optical Detector Unit
		M-5 (Cluster Type Head) 300 mm Green , Yellow And Red Balls With 300 mm Green And Yellow Arrows.
		Pedestrian Signal

NEW	EXISTING	DESCRIPTION
		Pull Box
		Controller Cabinet
		Electrical Cabinet
		Service (120-240 V.A.C. Unless Otherwise Specified)
		Transformer Pad
		Power Source
		Conduit
		Conduit (Jacked)
		Pole Designation
		Conduit Run
		Junction Box
		Wood Power Pole
		Flashing Beacons "R" Indicates Red Lens, "Y" Indicates Yellow Lens
		Special Junction Cabinet (For Interconnect Cable)

NEW	EXISTING	DESCRIPTION
		Vehicle Detector-Inductive Loop Unless Otherwise Indicated
		Quadrapole Detector Loop

METRIC NDOT

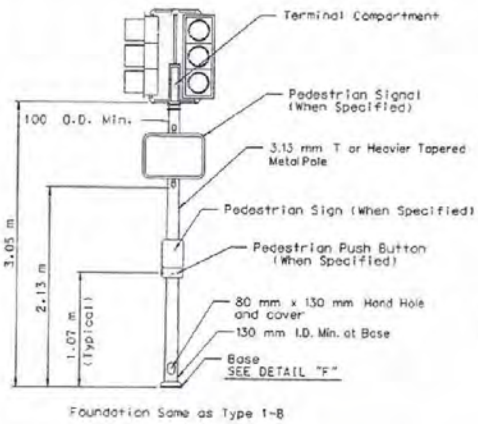
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

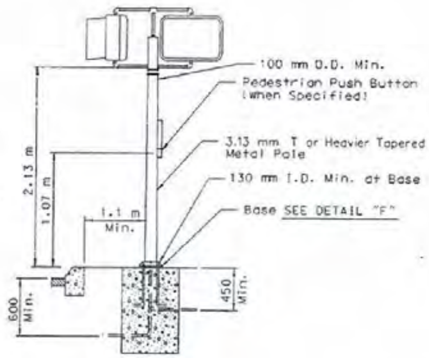
SIGNAL AND LIGHTING SYMBOLS

CHIEF TRAFFIC ENGINEER

T-30.1.1	(623)
ADOPTED 7/96	REV.



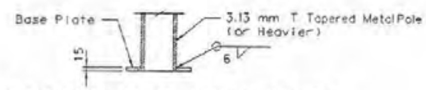
TYPE 1-A



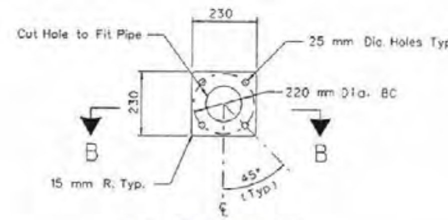
TYPE 1B

SIGNAL STANDARDS

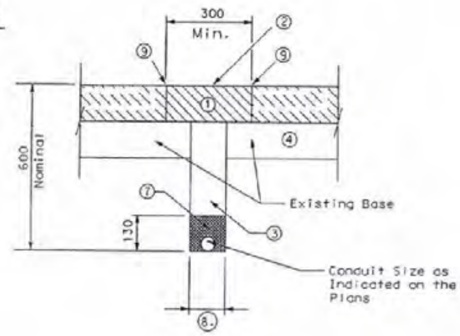
1. For Pedestrian Push Button And Sign See Sheet T-30.1.3
2. For Foundation Details See Sheet T-30.1.13
3. Mounting Heights of Signal And Pedestrian Heads And Pedestrian Push Buttons Shall Be Applicable To Installations on Pole Types 28, 30 & 35.



SECTION B-B WITH PIPE

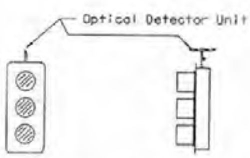


DETAIL "F"



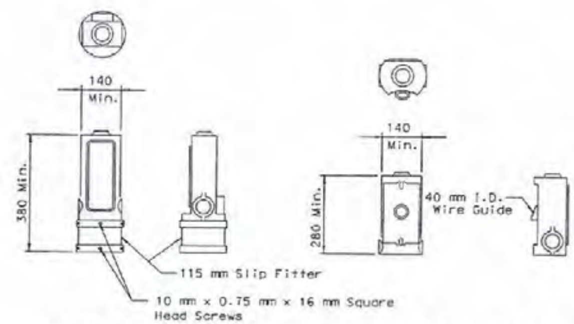
TRENCHING DETAIL

1. Remove And Replace Existing Surface. New Surface Material Shall Be From An Approved Commercial Source.
2. Seal And Sand New Surface. (As Directed By The Engineer)
3. Two Sack Slurry Mix Cement.
4. Recompact Existing Base.
5. All New Surface And Concrete Material Shall Be Approved By Engineer.
6. New Material And Trenching Shall Not Be Paid For Directly But Included In The Price For The Conduit.
7. Sand Bedding.
8. 2 Conduit Diameters Min.
9. Saw Cut As Directed By Engineer.



FRONT VIEW SIDE VIEW

MOUNTING DETAIL
OPTICAL DETECTOR



POST TOP MOUNTED SIDE BRACKET MOUNTED

TERMINAL COMPARTMENTS

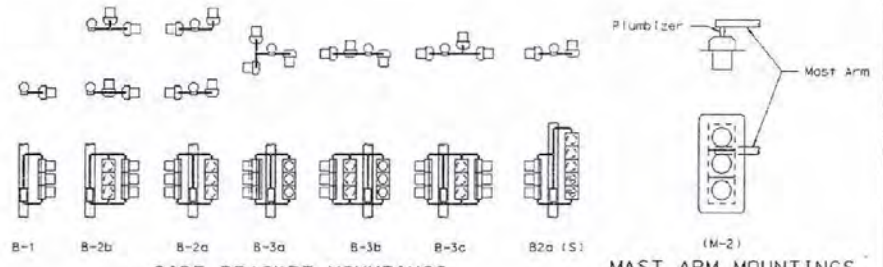
METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED
T = THICKNESS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

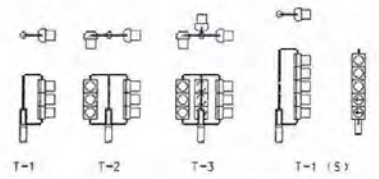
TYPE 1A AND 1B POLES, OPTICAL MOUNT AND TERMINAL COMPARTMENTS

CHIEF TRAFFIC ENGINEER | T-30.1.2 | (623) | ADOPTED 7/96 | REVISION 9/97

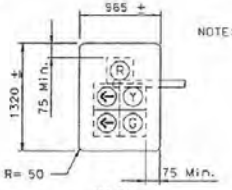


SIDE BRACKET MOUNTINGS

MAST ARM MOUNTINGS



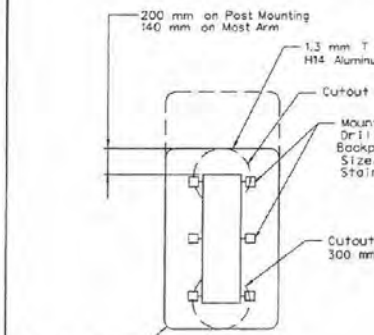
TOP MOUNTINGS



NOTE: All Signal Heads Shall Have Backplates

MAST ARM MOUNT
(M-2 Mount)

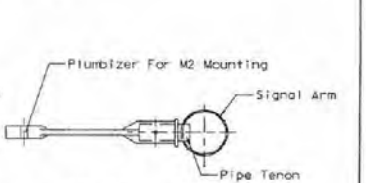
VEHICULAR SIGNALS AND MOUNTINGS



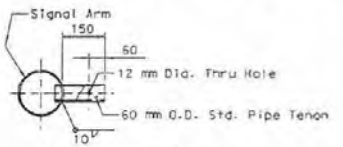
REAR VIEW

NOTE: No Background Light to Show Between Plate and Head. All Mast Arm Backplates Shall Be Louvered.

BACKPLATE



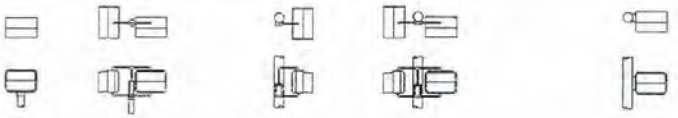
SPECIAL DETAIL
FOR MOUNTING SIGNAL HEAD



M-2 SIDE MOUNT

SEE DETAIL FOR MOUNTING SIGNAL HEAD
ON SHEET T-30.1.15

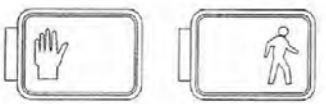
SIGNAL MOUNTING



TOP MOUNTINGS

SIDE MOUNTINGS

CLAMSHELL MOUNT



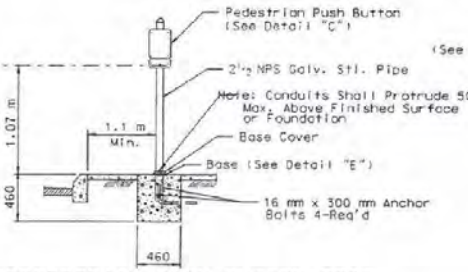
PEDESTRIAN SIGNAL-INTERNATIONAL SYMBOL
(To Be Used Unless Otherwise Specified)

POLE PLATE

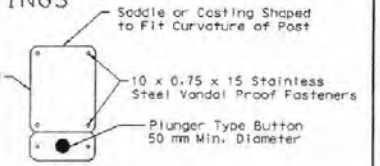
TERMINAL COMPARTMENT

CLAMSHELL MOUNTING HARDWARE (CS)
(To Be Used Only When Specified)

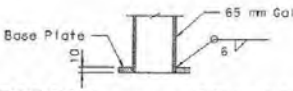
PEDESTRIAN SIGNALS AND MOUNTINGS



PEDESTRIAN PUSH BUTTON POST



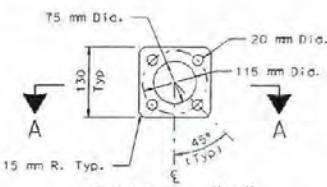
DETAIL "C"



SECTION A-A WITH PIPE

Note:
1. Arrow To Be Left Or Right or Both as Required.
2. Porcelain Enameled, 230 mm x 300 mm Sign. Black Symbols on White Background.
3. NPS = Nominal Pipe Size Designator. See ASTM A53

DETAIL "B"



DETAIL-"E"

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED
T = THICKNESS

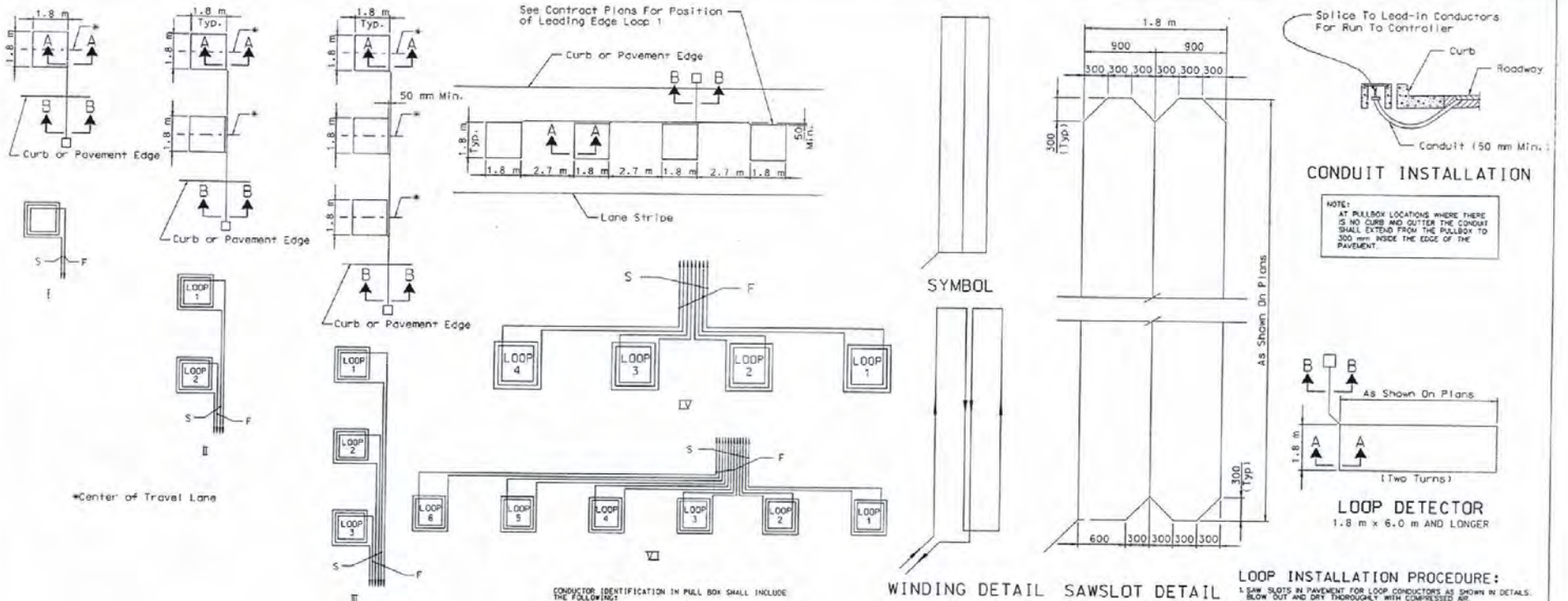
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SIGNAL MOUNTING
PEDESTRIAN SIGNALS

CHIEF TRAFFIC ENGINEER

T-30.1.3	(623)
ADOPTED 7/96	REVISION 5/97

T-3



CONDUCTOR IDENTIFICATION IN PULL BOX SHALL INCLUDE THE FOLLOWING:

1. SENSOR NUMBER AND PHASE
2. LOOP NUMBER
3. START (S) AND FINISH (F)

CABLE IDENTIFICATION IN CONTROLLER CABINET SHALL INCLUDE THE FOLLOWING

1. LOWER CASE LETTER AS SHOWN ON PLANS FOR DETECTOR AMPLIFIER ASSIGNMENT
2. PHASE DESIGNATION

WINDING DETAIL (TWO TURNS)

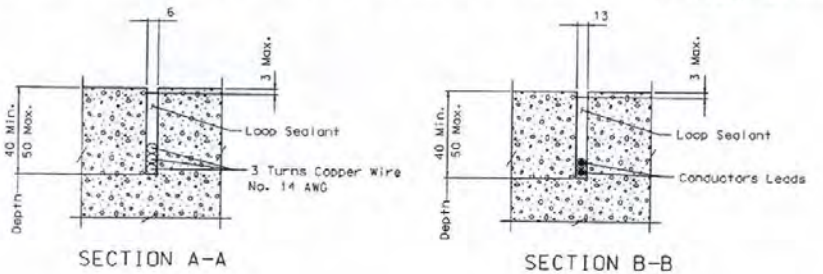
SAWSLOT DETAIL

QUADRAPOLE LOOP DETECTOR

LOOP INSTALLATION PROCEDURE:

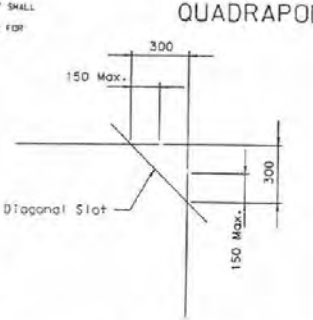
1. SAW SLOTS IN PAVEMENT FOR LOOP CONDUCTORS AS SHOWN IN DETAILS. BLOW OUT AND DRY THOROUGHLY WITH COMPRESSED AIR.
2. INSTALL TERMINATION PULL BOX.
3. INSTALL #14 AWG LOOP CONDUCTOR IN SLOTS USING A 5 mm TO 6 mm THICK WOOD PADDLE (SEE "LOOP WINDING PATTERNS"). ALLOW ADDITIONAL LENGTH FOR THE RUN TO TERMINATION PULL BOX PLUS 1.5 m OF SLACK IN PULL BOX. THIS ADDITIONAL LENGTH OF CONDUCTOR FOR EACH LOOP CIRCUIT SHALL BE TWISTED TOGETHER INTO A PAIR (AT LEAST 15 TURNS PER METER) BEFORE BEING RUN TO PULL BOX.
4. IDENTIFY LOOP CIRCUIT PAIRS. IDENTIFY START AND FINISH OF CONDUCTOR.
5. SPLICE LOOP CONDUCTORS TO LEAD-IN CABLE. ALL SPLICES SHALL BE SOLDERED USING 60/40 RESIN CORE SOLDER.
6. ALL SPLICES AND TAPINGS SHALL BE PROVIDED A SOUND ENVIRONMENTAL SEAL.
7. WHERE LOOP CONDUCTORS ARE NOT TO BE SPLICED TO A LEAD-IN CABLE, ENDS OF CONDUCTORS SHALL SHALL BE TAPED.
8. FILL SLOTS AS SHOWN IN DETAILS.
9. NO MORE THAN FOUR LOOP DETECTOR CONDUCTORS SHALL BE INSTALLED IN ONE SAWED SLOT. ALL LOOP CONDUCTORS IN SAME SLOT SHALL BE FOR SAME SIGNAL PHASE.
10. LEAD-IN CABLE SHALL NOT BE SPLICED BETWEEN THE TERMINATION PULL BOX AND THE CONTROLLER CABINET.
11. DISTANCE BETWEEN SIDE OF LOOP AND LEAD-IN SAW CUT SHALL BE 600 mm MINIMUM. DISTANCE BETWEEN LEAD-IN SAW CUTS SHALL BE 150 mm MINIMUM.
12. WHEN LEAD-IN SAW CUTS ARE FOR SAMPLING DETECTORS OR FOR LEFT TURN LANE DETECTORS WHERE SAW CUTS CROSS OTHER TRAFFIC LANES, CONDUCTORS SHALL BE PAIRED FOR EACH LOOP CIRCUIT AND TWISTED 15 TURNS PER METER BETWEEN LOOP AND PULL BOX.

DETECTOR LAYOUTS, DIMENSIONS & WIRING PATTERNS



SECTION A-A

SECTION B-B



PLAN VIEW OF DIAGONAL SLOT AT CORNERS

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

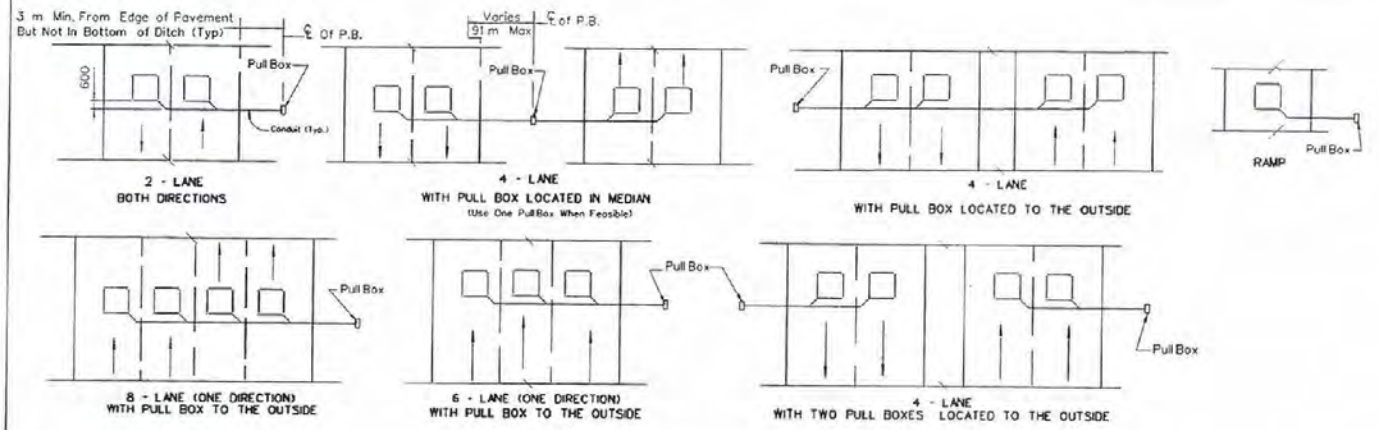
LOOP DETECTORS

CHIEF TRAFFIC ENGINEER

T-30.1.4 (623)

ADOPTED 7/96 REVISION

T-4



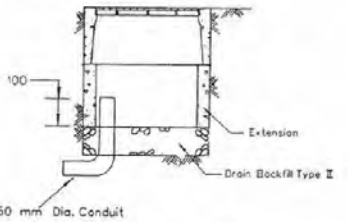
TRAFFIC DETECTOR LOOP

INSTALLATION NOTES

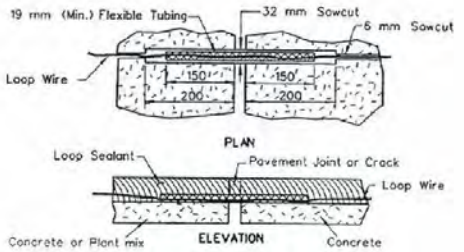
1. EACH LOOP SHALL BE 1.8 m X 1.8 m WITH 4 TURNS.
2. DEPTH OF SAW CUT SHALL BE 62 mm MIN. TO 75 mm MAX.
3. LOOPS SHALL BE CENTERED IN ALL TRAVEL AND TURN LANES.
4. LOOP WIRE SHALL BE STRANDED #14 AWG.
5. EACH INDIVIDUAL CONDUCTOR SHALL BE A CONTINUOUS RUN WITH NO SPLICES AND SHALL BE LABELED AT EACH END WITH THE LANE ASSIGNMENT.
6. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO ASCERTAIN THAT THE LOOP PLACEMENT IS NOT IN CONFLICT WITH OTHER ITEMS OF WORK.
7. PRIOR TO PLACEMENT OF LOOP DETECTORS THE RESIDENT ENGINEER SHALL NOTIFY THE TRAFFIC SECTION OF THE PLANNING DIVISION (888-7445) FOR ASSISTANCE IN ESTABLISHING THE EXACT LOCATION.
8. DETECTORS SHALL BE INSTALLED AFTER DENSE GRADED PAVING OR PROFILE GRADE IS ESTABLISHED
9. LOOP LOCATION SHALL BE MARKED ON THE EDGE OF THE PAVEMENT BY PAINTING THE WORD "LOOP" IN WHITE.
10. FOR DIAGONAL SLOT AT CORNERS DETAIL SEE STANDARD SHT. T-30.1.4.

GENERAL NOTES:

1. ALL PULL BOXES SHALL BE NO. 5
   SEE SHEET T-30.1.18 FOR DETAILS NOT SHOWN
2. PAYMENT SHALL BE MADE UNDER THE FOLLOWING ITEMS:
   50 mm DIAMETER CONDUIT
   NO. 5 PULL BOX
   1.8m x 1.8 m DETECTOR LOOPS

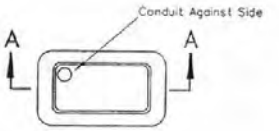


SECTION A-A



PAVEMENT JOINT CROSSING DETAILS

(NO DIRECT PAYMENT)



NO.5 PULL BOX

CONDUIT LOCATION (SEE GENERAL NOTES 1 AND 2)

METRIC NDOT

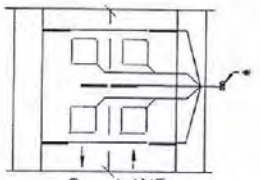
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

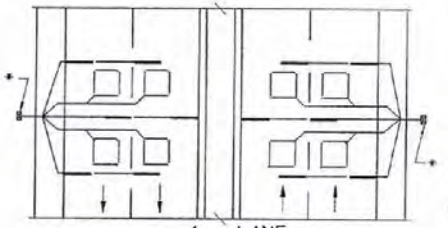
TRAFFIC DETECTOR LOOP

CHIEF TRAFFIC ENGR.	T-30.1.4.1	(623)
	ADOPTED: 9/97	REVISION

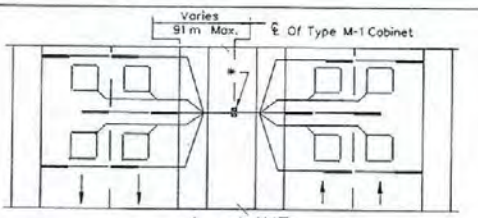
T-5



2 - LANE
BOTH DIRECTIONS

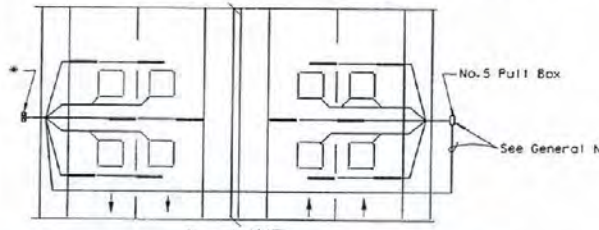


4 - LANE
WITH TWO SPECIAL M-1 CABINETS
LOCATED TO THE OUTSIDE

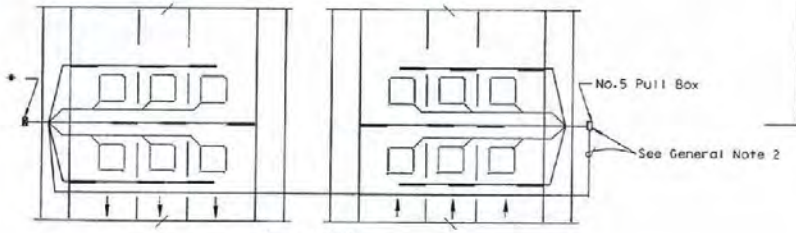


4 - LANE
WITH ONE SPECIAL M-1 CABINET LOCATED IN MEDIAN

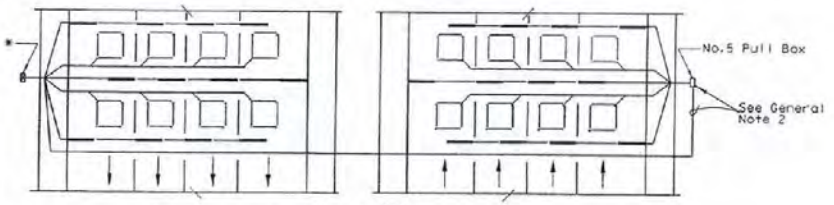
*-Special M-1 Cabinet



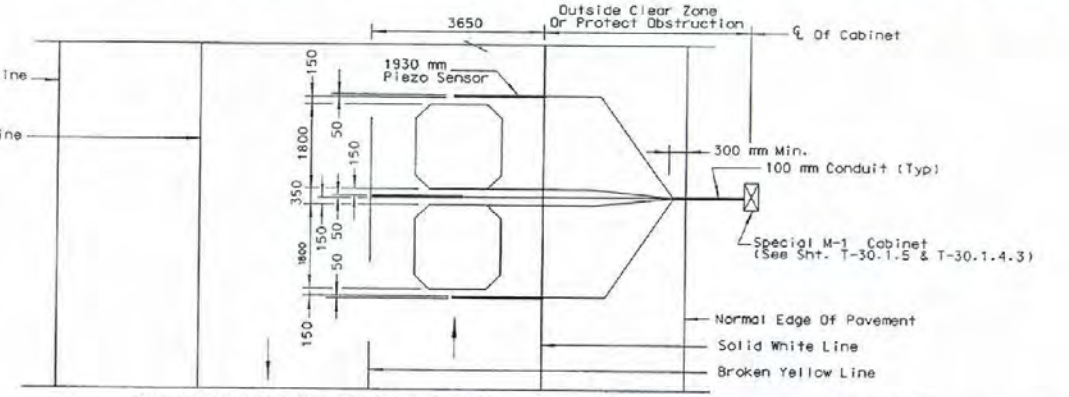
4 - LANE
WITH ONE SPECIAL M-1 CABINET TO THE OUTSIDE



6 - LANE
WITH ONE SPECIAL M-1 CABINET TO THE OUTSIDE



8 - LANE
WITH ONE SPECIAL M-1 CABINET TO THE OUTSIDE



AVC DETECTOR LOOP PLACEMENT DETAIL
(OPPOSITE LANE LOOPS NOT SHOWN FOR CLARITY)

INSTALLATION NOTES

1. EACH LOOP SHALL BE 1.8 m X 1.8 m WITH 4 TURNS.
2. DEPTH OF LOOP SAW CUT SHALL BE 62 mm MIN. TO 75 mm MAX.
3. LOOPS SHALL BE CENTERED IN ALL TRAVEL AND TURN LANES.
4. LOOP WIRE SHALL BE STRANDED #14 AWG.
5. EACH INDIVIDUAL CONDUCTOR SHALL BE A CONTINUOUS RUN WITH NO SPLICES AND SHALL BE LABELED AT EACH END WITH THE LANE ASSIGNMENT.
6. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO ASCERTAIN THAT THE LOOP PLACEMENT IS NOT IN CONFLICT WITH OTHER ITEMS OF WORK.
7. PRIOR TO PLACEMENT OF LOOP DETECTORS THE RESIDENT ENGINEER SHALL NOTIFY THE TRAFFIC SECTION OF THE PLANNING DIVISION (888-7445) FOR ASSISTANCE IN ESTABLISHING THE EXACT LOCATION.
8. DETECTORS SHALL BE INSTALLED BEFORE OPEN GRADED PAVING OR FINAL GRADE IS ESTABLISHED
9. LOOP LOCATION SHALL BE MARKED ON THE EDGE OF THE PAVEMENT BY PAINTING THE WORD "LOOP" IN WHITE.
10. FOR DIAGONAL SLOT AT CORNERS DETAIL SEE STANDARD SHT. T-30.1.4.

GENERAL NOTES:

1. PAYMENT SHALL BE MADE UNDER THE FOLLOWING ITEMS:
   AVC DETECTOR SYSTEM (EACH)
   TO INCLUDE THREE PIEZOELECTRIC DETECTORS AND TWO 1.8 m X 1.8 m LOOPS.

   SPECIAL CABINET (EACH)
   TO INCLUDE CONDUIT.
2. PAYMENT SHALL BE MADE UNDER THE FOLLOWING ITEMS:
   100 mm DIAMETER CONDUIT
   NO. 5 PULL BOX
3. PIEZOELECTRIC DETECTOR SHALL INCLUDE ALL CONDUCTORS AND SAW CUTTING NECESSARY FOR INSTALLATION.
4. IF GUARDRAIL/BARRIER RAIL IS PROVIDED, THE CABINET SHALL BE PLACED A MINIMUM OF 600 mm BEHIND RAIL.
5. 91 m MAX. FOR PIEZO SENSOR LEADS.
6. SEE SHEET T-30.1.4.1 FOR PAVEMENT JOINT DETAILS.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

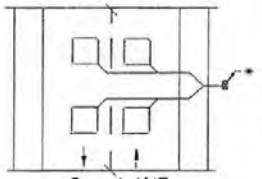
AVC DETECTOR LOOP
CONFIGURATIONS AND NOTES

Jack L. Wilson — CHIEF TRAFFIC ENGR.

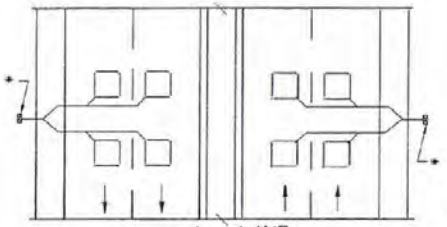
T-30.1.4.2 (623)

ADOPTED: 9/97 REVISION

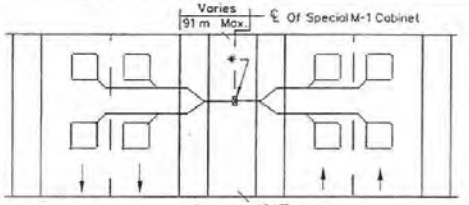
T-6



2 - LANE
BOTH DIRECTIONS



4 - LANE
WITH TWO SPECIAL M-1 CABINETS
LOCATED TO THE OUTSIDE

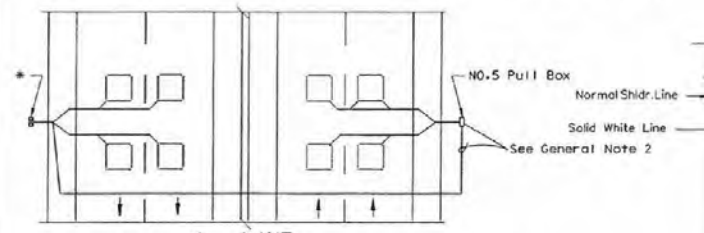


4 - LANE
WITH ONE SPECIAL M-1 CABINET LOCATED IN MEDIAN

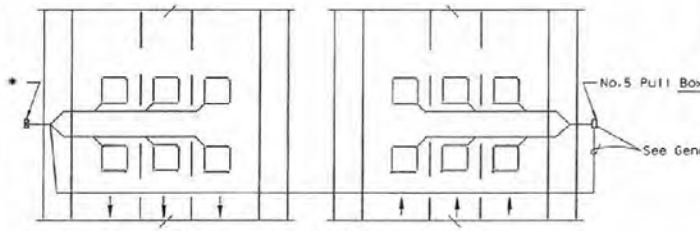
* - Special M-1 Cabinet

INSTALLATION NOTES

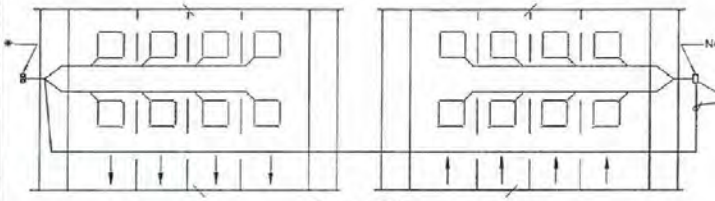
1. EACH LOOP SHALL BE 1.8 m X 1.8 m WITH 4 TURNS.
2. DEPTH OF LOOP SAW CUT SHALL BE 62 mm MIN. TO 75 mm MAX.
3. LOOPS SHALL BE CENTERED IN ALL TRAVEL AND TURN LANES.
4. LOOP WIRE SHALL BE STRANDED #14 AWG.
5. EACH INDIVIDUAL CONDUCTOR SHALL BE A CONTINUOUS RUN WITH NO SPLICES AND SHALL BE LABELED AT EACH END WITH THE LANE ASSIGNMENT.
6. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO ASCERTAIN THAT THE LOOP PLACEMENT IS NOT IN CONFLICT WITH OTHER ITEMS OF WORK.
7. PRIOR TO PLACEMENT OF LOOP DETECTORS THE RESIDENT ENGINEER SHALL NOTIFY THE TRAFFIC SECTION OF THE PLANNING DIVISION (888-7445) FOR ASSISTANCE IN ESTABLISHING THE EXACT LOCATION.
8. DETECTORS SHALL BE INSTALLED AFTER DENSE GRADE PAVING OR PROFILE GRADE IS ESTABLISHED
9. LOOP LOCATION SHALL BE MARKED ON THE EDGE OF THE PAVEMENT BY PAINTING THE WORD "LOOP" IN WHITE.
10. FOR DIAGONAL SLOT AT CORNERS DETAIL SEE STANDARD SHT. T-30.1.4.



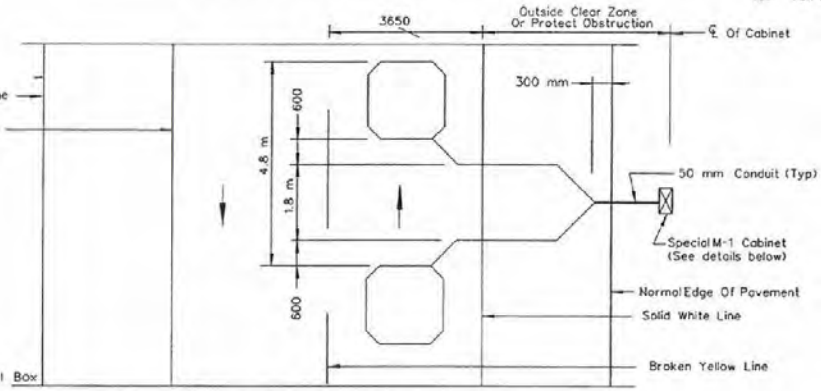
4 - LANE
WITH ONE SPECIAL M-1 CABINET TO THE OUTSIDE



6 - LANE
WITH ONE SPECIAL M-1 CABINET TO THE OUTSIDE



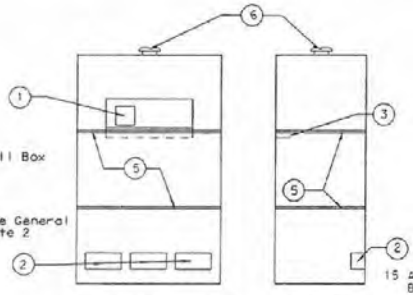
8 - LANE
WITH ONE SPECIAL M-1 CABINET TO THE OUTSIDE



ATR/SPEED DETECTOR LOOP PLACEMENT DETAIL
(OPPOSITE LANE LOOPS NOT SHOWN FOR CLARITY)

GENERAL NOTES:

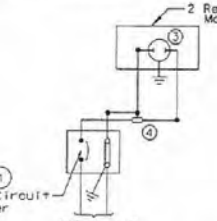
1. PAYMENT SHALL BE MADE UNDER THE FOLLOWING ITEMS:
   SPECIAL CABINET (INCLUDES 100 mm CONDUIT)
   1.8 m X 1.8 m DETECTOR LOOPS.
2. PAYMENT SHALL BE MADE UNDER THE FOLLOWING ITEMS:
   50 mm DIAMETER CONDUIT
   NO. 5 PULL BOX
3. IF GUARDRAIL/BARRIER RAIL IS PROVIDED, THE CABINET SHALL BE PLACED A MINIMUM OF 600 mm BEHIND RAIL.
4. SEE SHEET T-30.1.4.1 FOR PAVEMENT JOINT DETAILS.



SPECIAL M-1 CABINET

SEE SHEET T-30.1.5 FOR ADDITIONAL DETAILS

① MAIN SWITCH.
② FIELD WIRE TERMINAL BLOCKS.
③ N.E.M.A. STANDARD PLUG RECEPTACLE WITH GROUNDING CONTACT.
④ RADIO INTERFERENCE SUPPRESSOR.
⑤ SHELF.
⑥ THERMOSTAT-CONTROLLED FAN WITH T VENT.



CABINET WIRING

METRIC NDOT

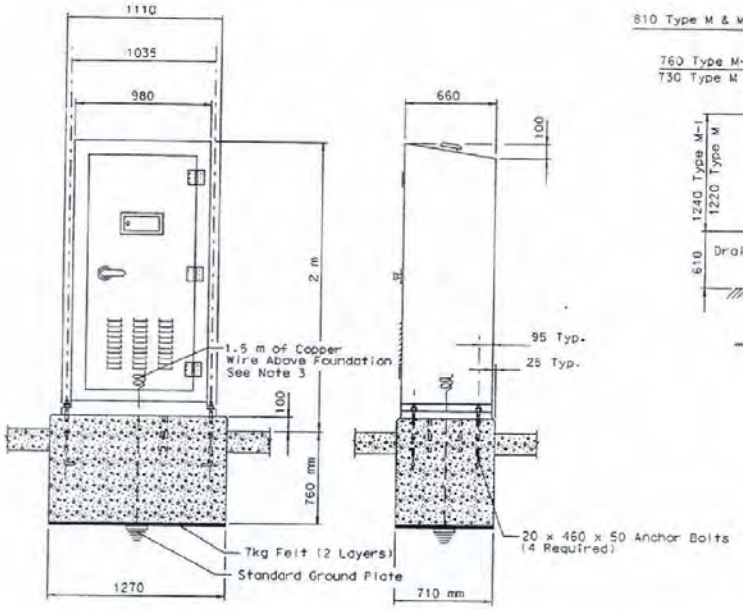
ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

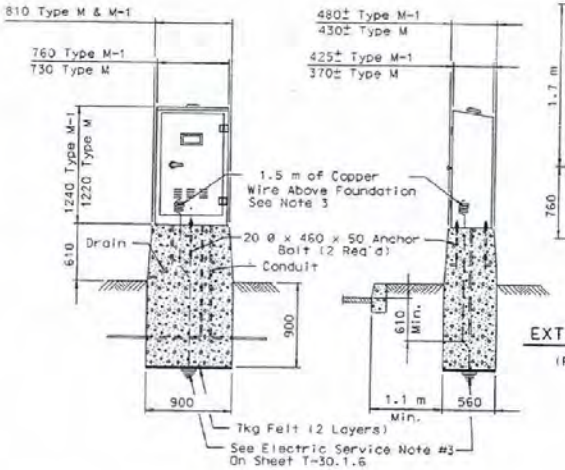
ATR/SPEED DETECTOR LOOP
CONFIGURATION AND NOTES

CHIEF TRAFFIC ENGR. | T-30.1.4.3 (623) | ADOPTED: 9/97 | REVISION

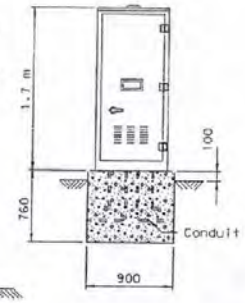
T-7



TYPE "R" CABINET

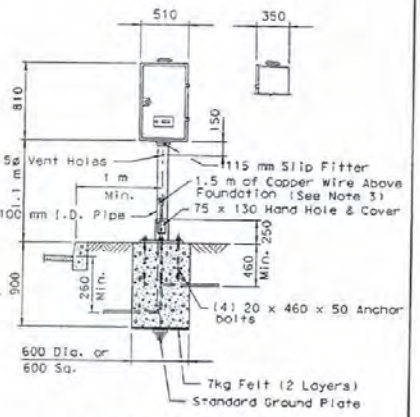


TYPE M & M-1 CABINET



EXTENDED TYPE M CABINET

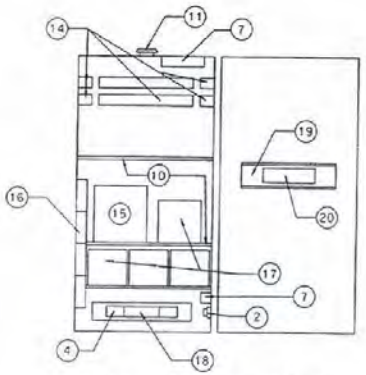
(For Details Not Shown See Type M Cabinet)



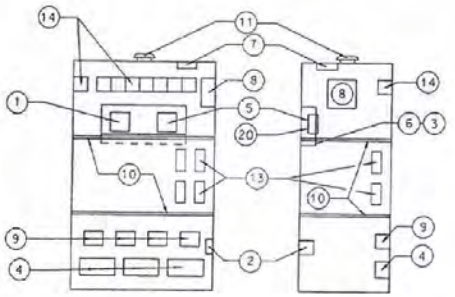
TYPE "G" CABINET

GENERAL NOTES:

1. ALL CONDUITS SHALL EXTEND ABOVE FOUNDATIONS A MINIMUM OF 50 mm.
2. ALL CABINETS SHALL BE PAINTED WHITE ON THE INSIDE AND OUTSIDE UNLESS SPECIFIED IN THE SPECIAL PROVISIONS.
3. 13 mm x 2.5 m GROUND ROD MAY BE SUBSTITUTED IN LIEU OF COPPER WIRE.
4. CONCRETE SHALL BE CLASS A OR AA.

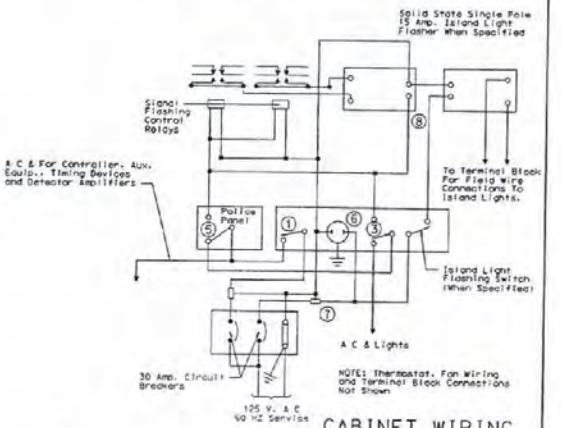


TYPE "R" CABINET



TYPE M & M-1 CABINET

1. MAIN SWITCH.
2. PLUG FUSE.
3. SIGNAL FLASH SWITCH INSIDE CABINET.
4. FIELD WIRE TERMINAL BLOCKS.
5. AUXILIARY DOOR FLASH SWITCH.
6. N.E.M.A. STANDARD PLUG RECEPTACLE WITH GROUNDING CONTACT.
7. RADIO INTERFERENCE SUPPRESSOR.
8. SOLID STATE SIGNAL FLASHER (CABINET MFR. TO DETERMINE POLES & CAPACITY, UNLESS OTHERWISE SPECIFIED).
9. EXTERNAL LIGHT RELAYS.
10. SHELF.
11. THERMOSTAT-CONTROLLED FAN WITH T VENT.
12. NOT USED
13. INSTRUMENT TERMINAL STRIP.
14. CONTROL RELAYS.
15. DISPATCHER UNIT.
16. INTERNAL INTERCONNECT TERMINAL STRIPS.
17. MINOR MOVEMENT UNITS.
18. SLANT PANEL.
19. POLICE PANEL.
20. INTERNAL POWER PANEL AND RECALL SWITCHES FOR ALL DETECTED PHASES.



CABINET WIRING

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

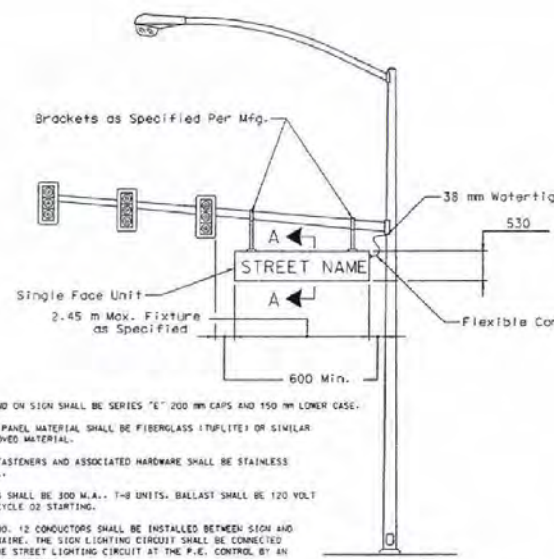
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CONTROLLER CABINETS

Dan L. Thorem
CHIEF TRAFFIC ENGINEER

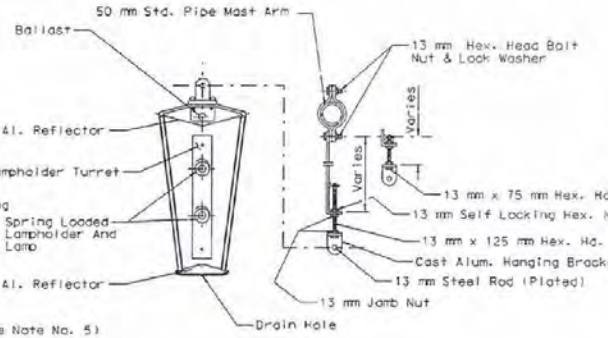
T-30.1.5 (623)
ADOPTED 7/98
REVISION 9/97

T-8

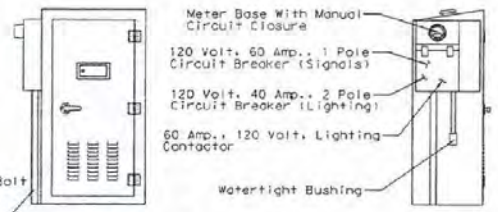


NOTES:

1. LEGEND ON SIGN SHALL BE SERIES "E" 200 mm CAPS AND 150 mm LOWER CASE.
2. SIGN PANEL MATERIAL SHALL BE FIBERGLASS (TUFLITE) OR SIMILAR APPROVED MATERIAL.
3. ALL FASTENERS AND ASSOCIATED HARDWARE SHALL BE STAINLESS STEEL.
4. LAMPS SHALL BE 300 W.A., T-8 UNITS. BALLAST SHALL BE 120 VOLT ,60 CYCLE 02 STARTING.
5. TWO NO. 12 CONDUCTORS SHALL BE INSTALLED BETWEEN SIGN AND LUMINAIRE. THE SIGN LIGHTING CIRCUIT SHALL BE CONNECTED TO THE STREET LIGHTING CIRCUIT AT THE P.E. CONTROL BY AN APPROVED METHOD.
6. SIGN CLAMPS SHALL BE SIZED TO FIT RESPECTIVE SIGNAL ARMS.



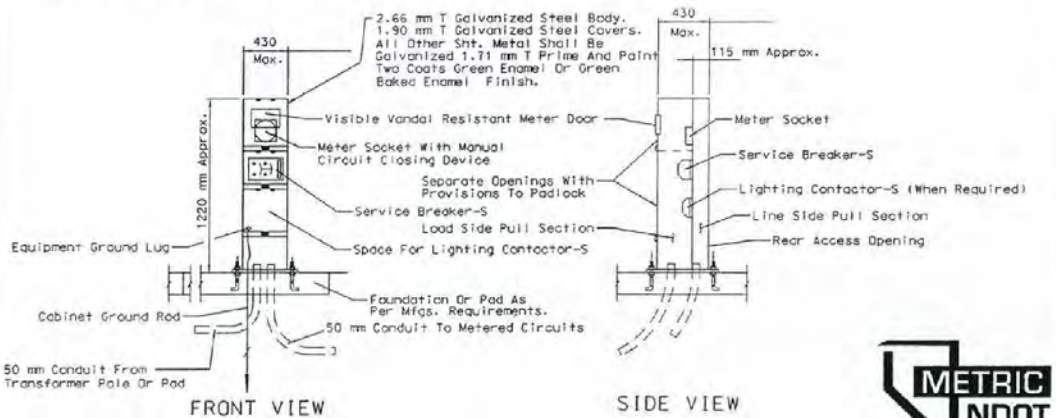
SECTION A-A



CONTROLLER CABINET SERVICE INSTALLATION

ELECTRIC SERVICE NOTES

1. MAIN BREAKER SHALL BE 100 AMP. MINIMUM (120/240 V.A.C. 60 HZ. SINGLE PHASE, 3 WIRE). CIRCUIT BREAKERS SHALL BE AS SHOWN ABOVE UNLESS INDICATED OTHERWISE ON PLANS.
2. PANEL OPENINGS FOR BREAKERS OR SEPARATE ENCLOSURES SHALL HAVE HASPS AND LOCKS AS REQUIRED BY THE UTILITY COMPANY.
3. GROUNDING FOR SERVICE EQUIPMENT AND ALL CONTROLLER CABINETS SHALL BE AS FOLLOWS:
   a. GROUND WIRE MUST BE A MINIMUM SIZED NO. 8 FOR 100 AMP. AND NO. 6 FOR 200 AMP AND BE CONTINUOUS TO THE SERVICE EQUIPMENT.
   b. MINIMUM GROUND PLATE DIMENSION:
      AREA = 0.2 m^2
      THICKNESS = 0.6 mm STEEL, 0.2 mm COPPER.
   c. GROUND ROD OF GALVANIZED STEEL OR PIPE OF AT LEAST 20 mm DIAMETER OR 0.15 mm DIAMETER COPPER IS ACCEPTABLE IN LIEU OF GROUND PLATE AS SHOWN.



UNDERGROUND SERVICE PEDESTAL

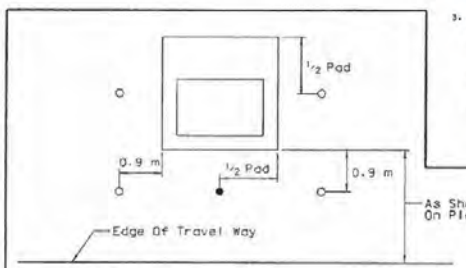
NOTES:

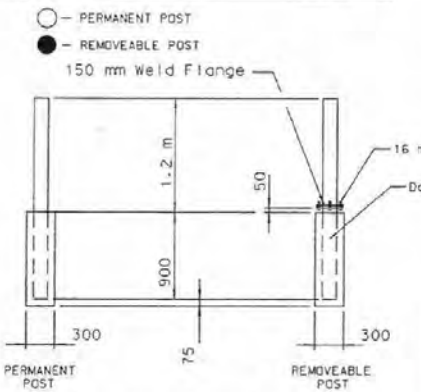
1. CONDUIT SHALL EXTEND UP INTO CABINET A MINIMUM OF 50 mm ABOVE CONCRETE PAD.
2. SEE PLANS FOR LOAD RATING, PANEL DISTRIBUTION AND CIRCUIT BREAKERS REQUIRED.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

T= THICKNESS





TRANSFORMER PAD BARRIER POST

NOTES

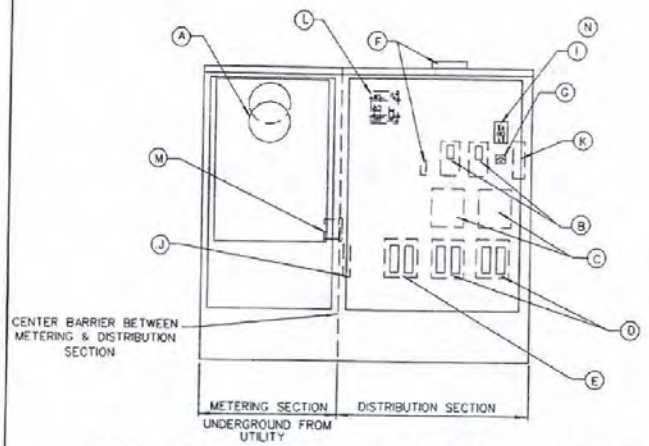
1. BARRIER POSTS ARE TO BE USED ONLY WHERE PAD MOUNTED TRANSFORMERS ARE INSTALLED IN AREAS SUBJECT TO DAMAGE BY VEHICULAR TRAFFIC. THE CONTRACTOR SHALL COORDINATE INSTALLATION WITH THE SERVING UTILITY COMPANY TO DETERMINE THE EXACT NUMBER OF POSTS REQUIRED.
2. FOOTINGS TO BE DRILLED HOLES, AS SHOWN, AND FILLED WITH CLASS "A" OR CLASS "AA" CONCRETE.
3. POST CONSTRUCTED OF 150 mm STANDARD PIPE (WELL CASING) PRIMED AND PAINTED YELLOW, AND CONCRETE FILLED.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ELECTRICAL SERVICES INTERNALLY ILLUMINATED SIGN

CHIEF TRAFFIC ENGINEER

ADOPTED	T-30.1.6	(623)
7/96		REVISION

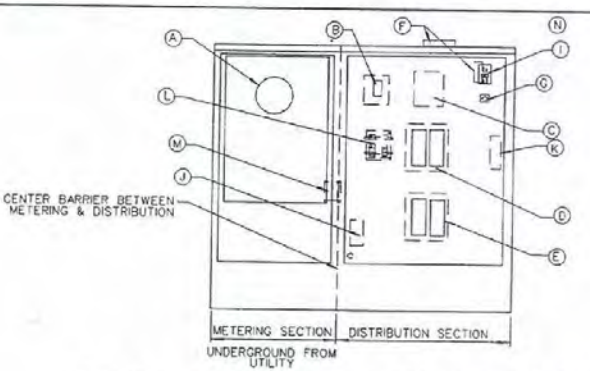


BACK ELEVATION (1.5 METER CABINET)

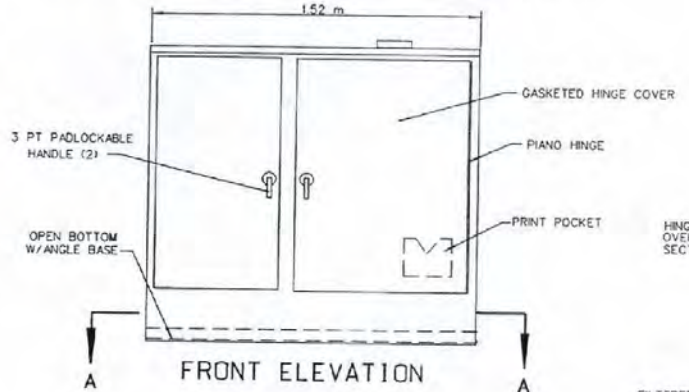
TYPE 3R LIGHTING CABINET NOTES:

LEGEND

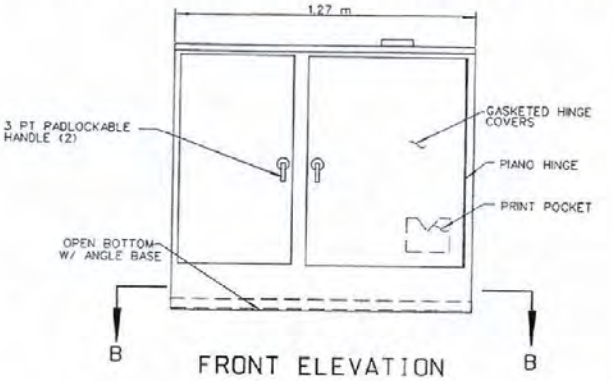
- (A) 400 AMP 10 3W 120/240 VOLT METER SOCKET SELF OPERATED. 200 AMP 10 3W 120/240 VOLT METER SOCKET W/TEST BYPASS FACILITIES
- (B) 200 AMP 2 POLE CIRCUIT BREAKER.
- (C) 200 AMP 2 POLE CONTACTOR 120 VOLTCOIL ELECTRICALLY HELD.
- (D) 200 AMP 3W MAIN LUG LOAD CENTER WITH 2 POLE CIRCUIT BREAKERS PER REQUIREMENTS.
- (E) 100 AMP 10 3W MAIN LUG LOAD CENTER WITH 1-15 AMP 1 POLE AND 3-20 AM 1 POLE CIRCUIT BREAKERS.
- (F) CABINET FAN WITH T-STAT.
- (G) DPDT TOGGLE SWITCH WITH NAMEPLATE.
- (H) NOT USED.
- (I) 15 AMP GFCI DUPLEX RECEPTACLE.
- (J) 5 (200) OR 12 (400) POSITION GROUND BAR.
- (K) 12 POSITION WIRING TERMINAL BLOCK.
- (L) 2 POLE (200) OR 3 POLE (400) DISTRIBUTION BLOCK.
- (M) 50 mm (200) OR 75 mm (400) CLOSE NIPPLE WITH LOCKNUT, PLASTIC BUSHING AND BOND BUSHING.
- (N) P.E. SHALL BE INTERNALLY MOUNTED BEHIND A GLASS WINDOW ON THE NORTH FACING WALL.
- (O) FOUNDATION OR PAD PER MFG's. RECOMMENDATION.



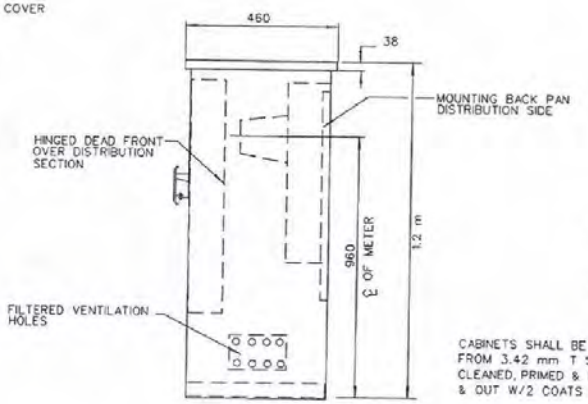
BACK ELEVATION (1.3 METER CABINET)



FRONT ELEVATION

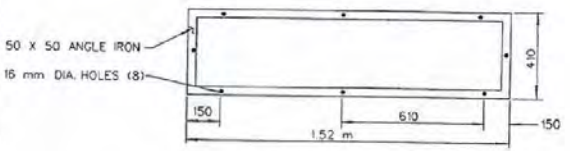


FRONT ELEVATION

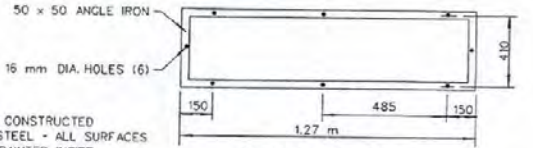


SIDE ELEVATION

(1.3 m & 1.5 m CABINET)



SECTION A-A



SECTION B-B

CABINETS SHALL BE CONSTRUCTED FROM 3.42 mm T STEEL - ALL SURFACES CLEANED, PRIMED & PAINTED INSIDE & OUT W/2 COATS WHITE ENAMEL.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED
T = THICKNESS

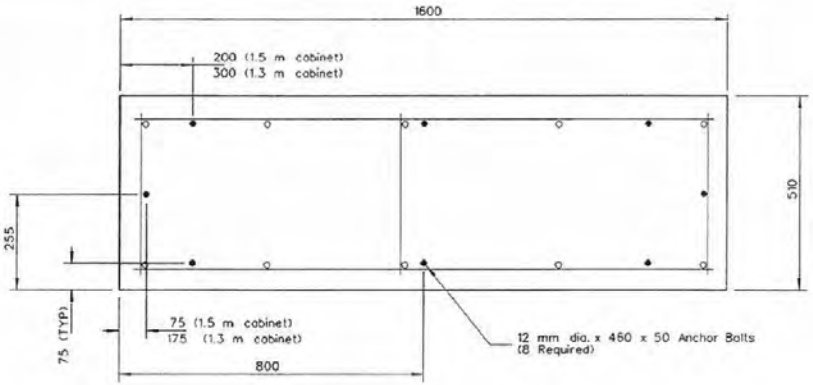
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 3R LIGHTING CABINET

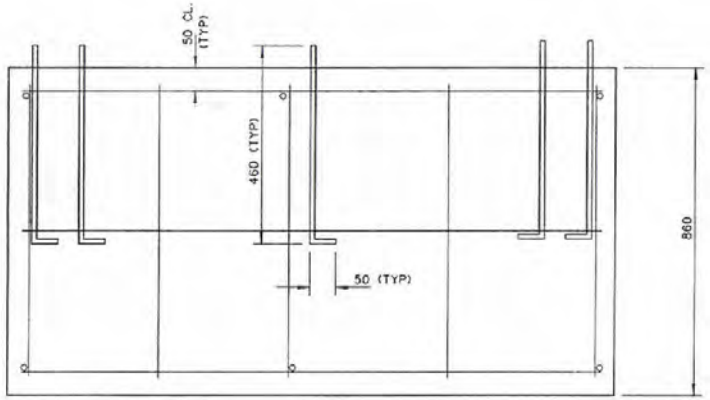
Scott L. Wasson — T-30.1.7.1 (623)

CHIEF TRAFFIC ENGINEER — ADOPTED: 7/96 — REVISION 9/97

T-10



PLAN VIEW



FRONT VIEW

SIDE VIEW

GENERAL NOTES:

1. The Ultimate Concrete Compressive Strength Shall Be f'c - 28 MPa.
2. All Reinforcing Steel Shall Be AASHTO M31M Grade 400. All Reinforcing Steel Shall Be No. 13 Metric Bars At Equal Spacing.
3. Anchor Bolts Shall Be ASTM A307 Grade C. Adjust The Reinforcing Steel If There Is A Conflict Between The Anchor Bolts And The Reinforcing Steel.

LIGHTING CABINET FOUNDATION PLAN

METRIC NDOT

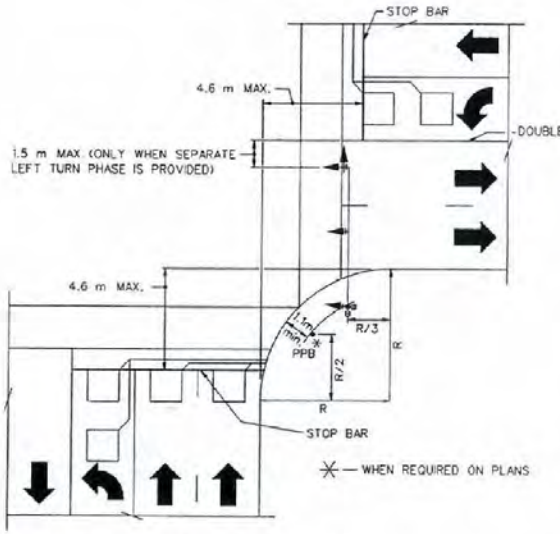
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

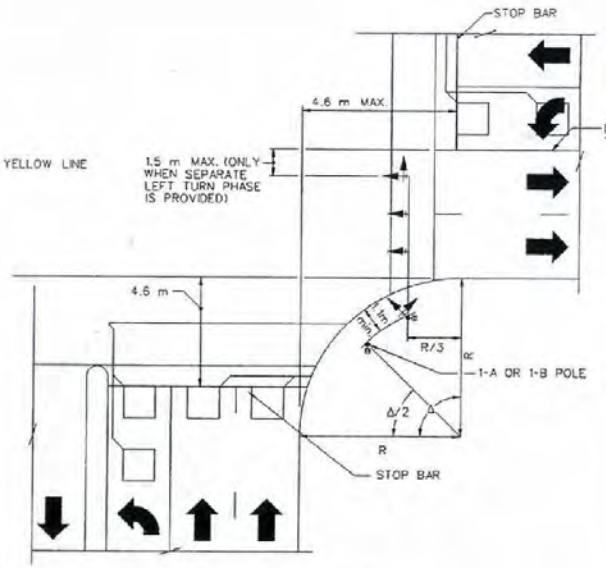
TYPE 3R
LIGHTING CABINET
FOUNDATION PLAN

CHIEF TRAFFIC ENGINEER | ADOPTED: 7/95 | T-30.1.7.2 | (623) | REVISION

T-11



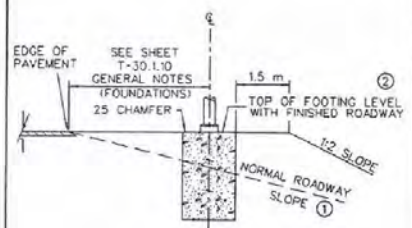
7.5 m AND SMALLER RADII CURB RETURN AND MEDIAN LOCATION



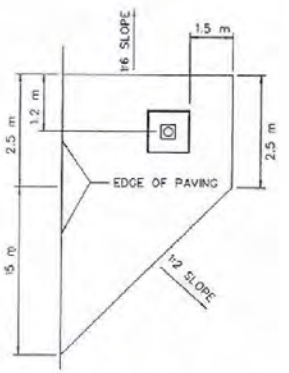
>7.5 m AND LARGER RADII CURB RETURN AND MEDIAN LOCATION

GENERAL NOTES:

1. ISLANDS SHALL BE PLACED ONLY ON SLOPES GREATER THAN 1:10.
2. WHEN USING SAFETY BASES THE TOP OF THE FOUNDATION SHALL BE PLACED FLUSH WITH THE TOP OF THE FOUNDATION ISLAND.
3. CONCRETE SHALL BE CLASS A OR AA.



SECTION



FOUNDATION ISLAND PLAN

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

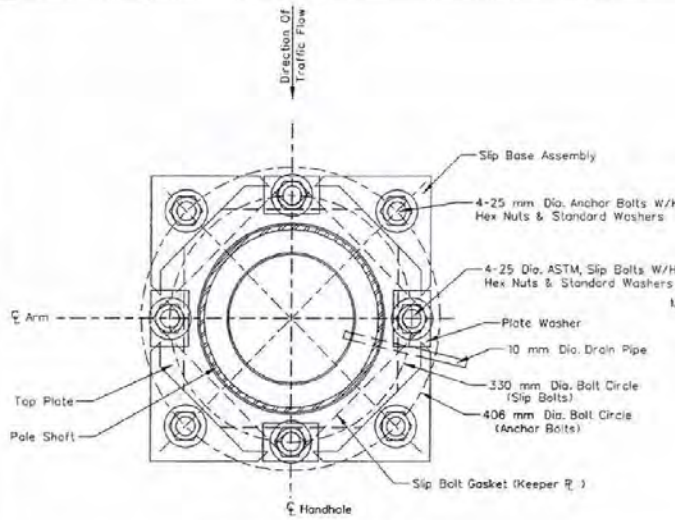
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SIGNAL POLE AND LOOP DETECTOR LOCATIONS FOUNDATION ISLAND

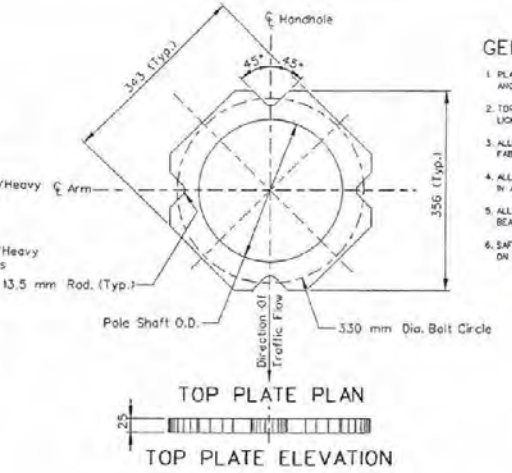
CHIEF TRAFFIC ENGINEER

T-30.1.8 (623)

ADOPTED: 7/96 REVISION: 9/97



SAFETY BASE PLAN



TOP PLATE PLAN

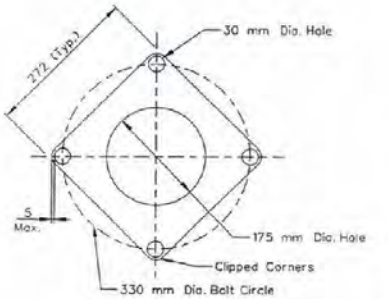
TOP PLATE ELEVATION

GENERAL NOTES:

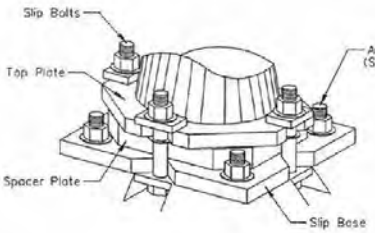
1. PLACE BOTTOM PLATE WITH SPACER PLATE ON LEVELING NUTS ON ANCHOR BOLTS AND FASTEN IN PLACE.
2. TOP PLATE SHALL BE FURNISHED BY LIGHT POLE FABRICATOR AS LIGHT POLE BASE PLATE WITH DIMENSIONS AS SHOWN IN PLAN VIEW.
3. ALL STEEL PLATE ASSEMBLIES SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION.
4. ALL NUTS, BOLTS AND WASHERS SHALL BE ELECTRO-PLATED CADMIUM IN ACCORDANCE WITH ASTM B-766 TYPE NS.
5. ALL CONTACT AREAS OF PLATES SHALL BE FREE OF GALVANIZING BEADS OR RUNS.
6. SAFETY BASES SHALL BE UTILIZED ON ALL STEEL LIGHT POLES EXCEPT ON STRUCTURES OR IF PLACED BEHIND BARRIER RAIL OR GUARDRAIL.
7. GROUTING SHALL BE DONE AFTER LIGHT POLE HAS BEEN LOCATED IN FINAL POSITION.
8. ANCHOR BOLT SHALL NOT EXTEND ABOVE SLIP BASE GASKET.
9. SLIP BOLT TORQUING REQUIREMENTS:
   - A. TORQUE ALL BOLTS TO 108 N-M
   - B. LOOSEN BOLTS
   - C. RETIGHTEN TO FINAL TORQUE USING THE FOLLOWING SEQUENCES:

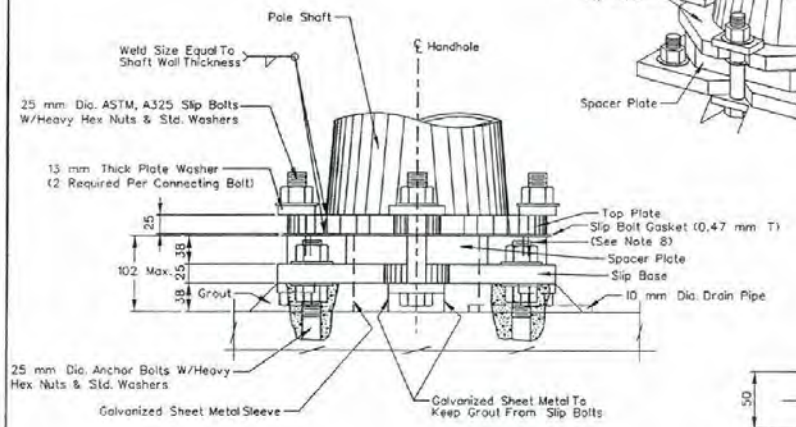
     1, 3, 2, 4

     81 N-M, 88 N-M THEN 95 N-M, RECHECK EACH BOLT FOR 95 N-M
   - D. CAULK AREAS AROUND SLIP BASE GASKET. MATERIAL SHALL CONFORM TO FED SPEC. NO. TT-S-230, TYPE II OR EQUAL.
   - E. SPRAY CADMIUM BOLTS WITH GALVUTE COLD GALVANIZING COMPOUND OR EQUIVALENT.

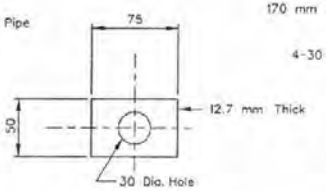


SLIP BOLT GASKET (0.47 mm T)

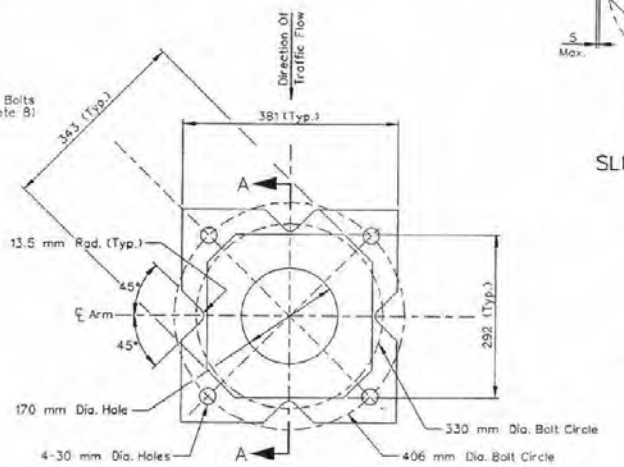




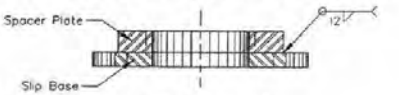
SAFETY BASE ELEVATION



PLAN
PLATE WASHER



SLIP BASE & SPACER PLATE PLAN



SECTION A-A

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

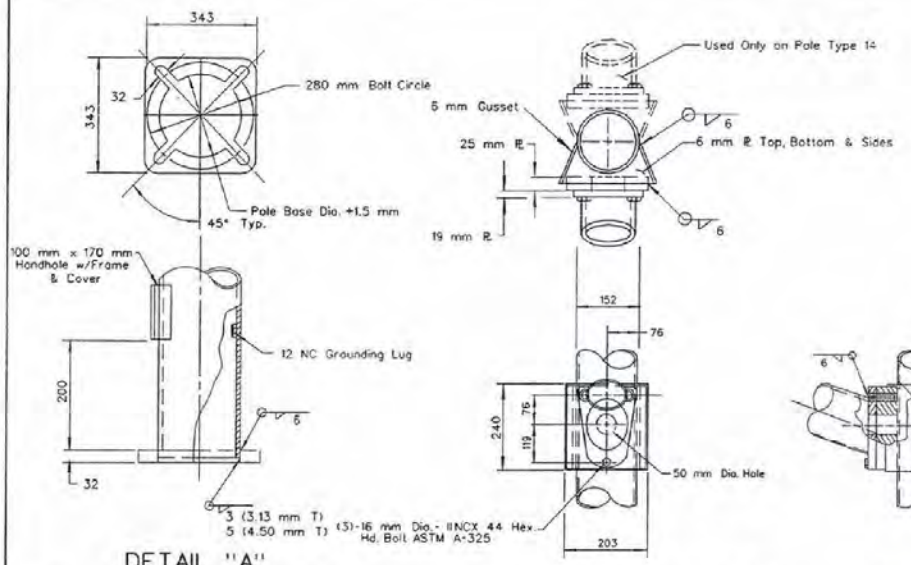
T = THICKNESS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SAFETY BASE

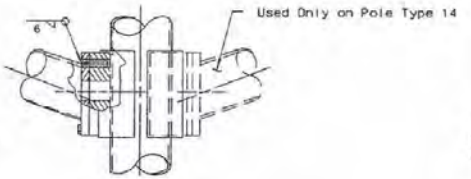
CHIEF TRAFFIC ENGINEER	T-30.1.9 (623)	
	ADOPTED 7/96	REVISION 9/97

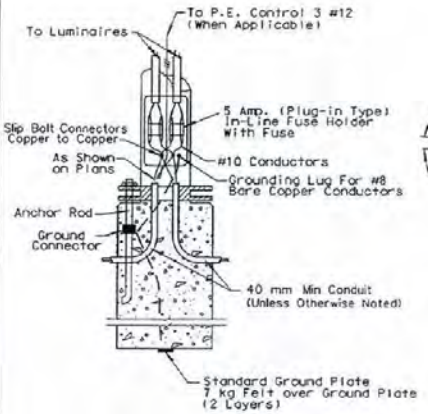
T-13



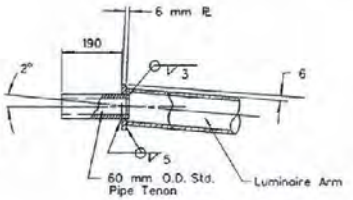
DETAIL "A"
BASE PLATE
(NOT APPLICABLE WHEN SAFETY BASES ARE REQ'D.)

DETAIL "C"
LUMINAIRE ARM CONNECTION

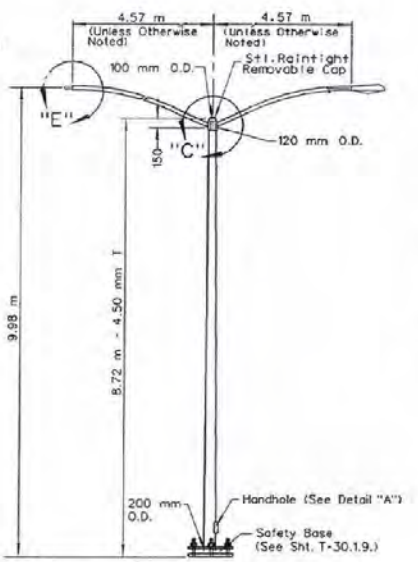




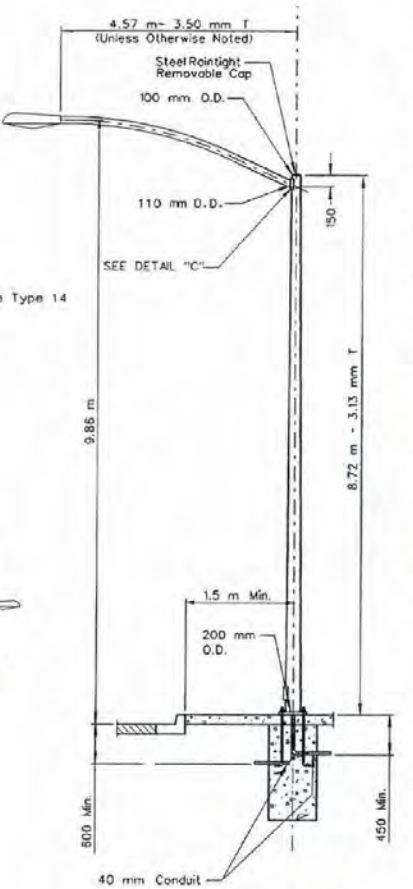
WIRING DIAGRAM FOR
POLE TYPE 7 AND TYPE 14



DETAIL "E"
LUMINAIRE TENON DETAIL



POLE TYPE 14



POLE TYPE 7

GENERAL NOTES:
FOR ALL POLE TYPES

GALVANIZING

1. POLES SHALL BE GALVANIZED AS PER ASTM A-123. HARDWARE SHALL BE GALVANIZED AS PER ASTM A-153.

STEEL SIGNAL AND LUMINAIRE ARMS

1. THE LAST 75 mm OF THE LUMINAIRE ARM SHALL BE STRAIGHT AND HORIZONTAL WITH LUMINAIRE ATTACHED.
2. CONNECTION BETWEEN ARMS AND POLES SHALL BE MADE BY MEANS OF A RAIN TIGHT SOCKET OR A DESIGN PERMITTING SIMPLE REMOVAL OF THE ARMS.

ANCHOR BOLTS

1. 4-ASTM A-325 ANCHOR BOLTS ARE REQUIRED FOR EACH POLE, WITH A HEAVY HEX NUT, LEVELING NUT AND 2 F436 WASHERS FOR EACH BOLT.
2. THREADS MAY BE CUT OR ROLLED. BOLTS SHALL BE GALVANIZED OR PLATED AFTER THREADS ARE FORMED. EACH BOLT SHALL BE PROVIDED WITH 150 mm OF THREADS.
3. WHEN USING A SAFETY BASE, ANCHOR BOLTS SHALL NOT EXTEND ABOVE THE SLIP BOLT GASKET.

STEEL POLES

1. BASE COVERS ARE REQUIRED ON ALL POLES EXCEPT WHERE SAFETY BASE IS SPECIFIED.
2. A REDUCED POLE SHAFT THICKNESS WILL BE ACCEPTABLE ABOVE SIGNAL ARM ATTACHMENT BUT SHALL NOT BE LESS THAN 3.13 mm T.

WELDS

1. LONGITUDINAL WELDS BY SUBMERGED ARC OR ERW CIRCUMFERENTIAL BUTT WELDS SHALL HAVE PERMANENT BACK-UP RINGS. ALL EXPOSED BUTT WELDS SHALL BE GROUND FLUSH.
2. FOR WELD SIZES NOT SHOWN, USE MINIMUM SIZE WELD AS SPECIFIED BY THE LATEST WELDING CODE.
3. BREAK ALL SHARP EDGES FOR WIRE PROTECTION.

FOUNDATIONS

1. AT LOCATIONS BEHIND CURB, ALL SIGNAL AND LIGHTING POLES SHALL BE LOCATED AT THE BACK EDGE OF SIDEWALK OR AT THE R/W LINE. TO OBTAIN A MINIMUM SETBACK DISTANCE OF 1.5 m BEHIND THE BACK EDGE OF CURB TO CENTER OF POLE. (SEE SHEET T-30.1.8 FOR TYPICAL LOCATIONS.)
2. AT LOCATIONS WITHOUT CURB, POLES SHALL BE PLACED A MINIMUM DISTANCE OF 2.4 m FROM SHOULDER OR A MINIMUM OF 3 m FROM TRAVEL WAY, WHICH EVER IS GREATER.
3. FOR FOUNDATION DETAILS SEE SHEET T30.1.13.
4. FOR FOUNDATION ISLAND SEE SHEET T-30.1.8.
5. CONCRETE SHALL BE CLASS A OR AA.

SAFETY BASES

1. TYPE 7 AND TYPE 14 POLES SHALL REQUIRE SAFETY BASE ASSEMBLIES UNLESS MOUNTED ON STRUCTURE BEHIND BARRIER RAIL OR NOTED OTHERWISE ON THE PLANS. (SEE SHEET T-30.1.9 FOR DETAILS)

METRIC
NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

T = THICKNESS

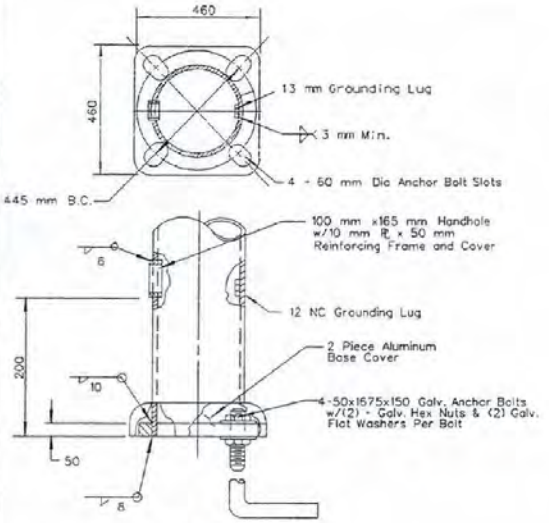
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 7 & 14 POLE LIGHTING & SIGNAL LIGHT POLES

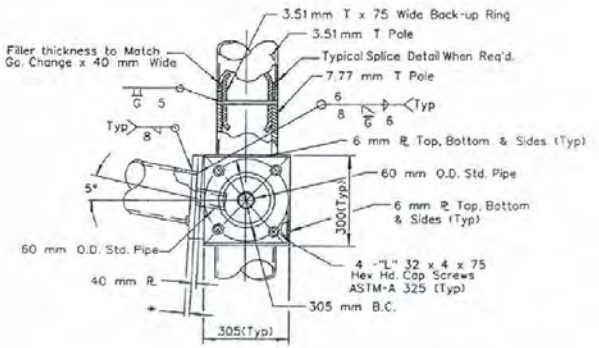
Jon L. Nelson — CHIEF TRAFFIC ENGINEER

T-30.1.10 (623)

ADOPTED: 7/96 | REVISION 9/97

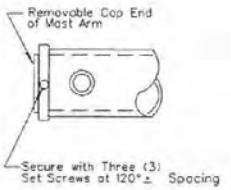


DETAIL "B"
POLE BASE

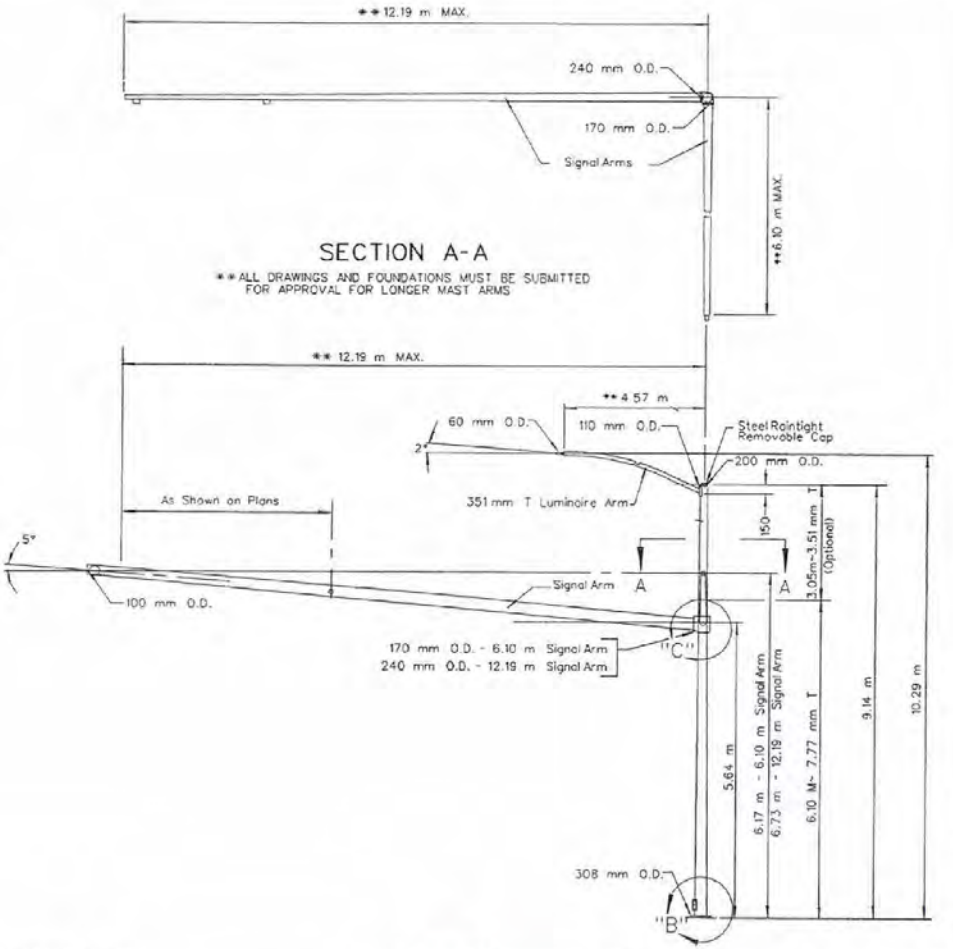


DETAIL "C"
SIGNAL ARM CONNECTION

* 25 mm R FOR 6.1 m SIGNAL ARM
32 mm R FOR 12.2 m SIGNAL ARM



MAST ARM END CAP



SECTION A-A

** ALL DRAWINGS AND FOUNDATIONS MUST BE SUBMITTED FOR APPROVAL FOR LONGER MAST ARMS

GENERAL NOTES:

1. FOR POLE FOUNDATION SEE SHEET T-30.1.13
   FOR M-2 SIDEMOUNT DETAIL SEE SHEET T-30.1.3
2. FOR LUMINAIRE ARM CONNECTION & LUMINAIRE TENON DETAIL SEE SHEET T-30.1.10
3. THE DISTANCE FROM THE ROADWAY SURFACE TO THE BOTTOM OF THE MAST ARM SIGNAL HEADS SHALL BE 5.1 m.

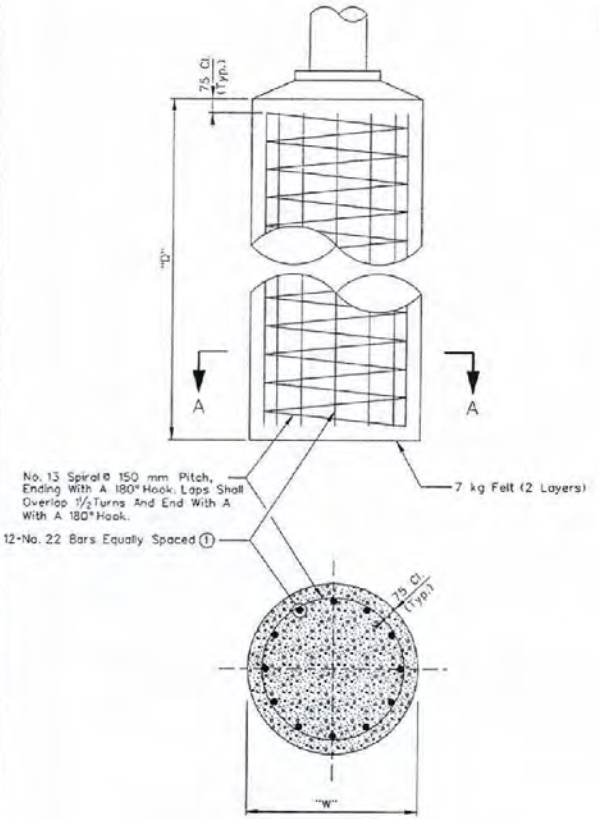
METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED
T - THICKNESS

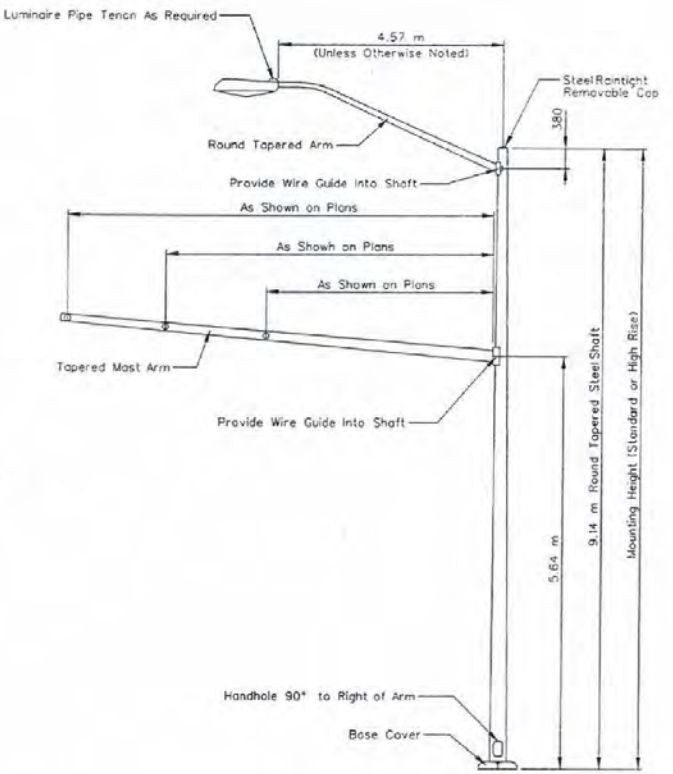
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 28 POLE

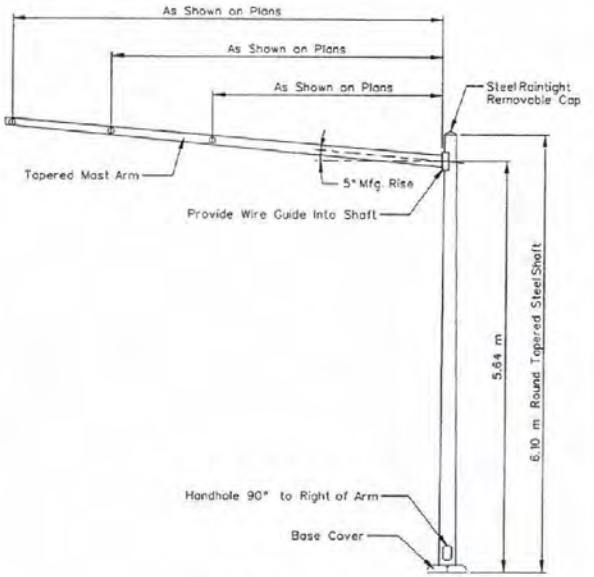
CHIEF TRAFFIC ENGINEER | T-30.1.12 (623) | ADOPTED: 7/96 | REVISION: 9/97



SECTION A-A
PILE FOUNDATION



POLE TYPE 35 (MAST ARMS ≤ 13.72 m)
POLE TYPE 35-A (MAST ARMS > 13.72 m)



POLE TYPE 30 (MAST ARMS ≤ 13.72 m)
POLE TYPE 30-A (MAST ARMS > 13.72 m)

PILE FOUNDATION TABLE

POLE TYPE	MAST ARM LENGTH	**"D"	**"W" (1)	ANCHOR BOLTS (4 EACH)
1A & 1B	N/A	915mm	610mm	20x460x100
7 AND 14	ALL	1.5 m	760mm	*25X915X100
28	ALL	3.6 m	915mm	50X1675X150
30 AND 35	≤13.7 m	3.6 m	915mm	45X1525X150
30A AND 35A	>13.7 m	3.6 m	915mm	50X1675X150

** UNLESS OTHERWISE SHOWN ON PLANS.
* NOT APPLICABLE WHEN MOUNTED ON STRUCTURES.
(1) - WHEN "W" = 610 mm USE 4-No.16 BARS EQUALLY SPACED.
WHEN "W" = 760 mm USE 8-No.16 BARS EQUALLY SPACED.

GENERAL NOTES:

1. SHOP DRAWINGS AND STRUCTURAL CALCULATIONS SHALL BE SUBMITTED AND APPROVED BEFORE POLES MAY BE UTILIZED ON PROJECT.
2. IF INDICATED IN THE PLANS, ALL POLES SHALL BE PRIME PAINTED BY MANUFACTURER AND FINISH PAINTED BY CONTRACTOR. SEE STANDARD SPECIFICATION SEC. 714.03.01.
3. THE DISTANCE FROM THE ROADWAY SURFACE TO THE BOTTOM OF THE MAST ARM SIGNAL HEADS SHALL BE 5.1 m.
4. CONCRETE SHALL BE CLASS A OR AA.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

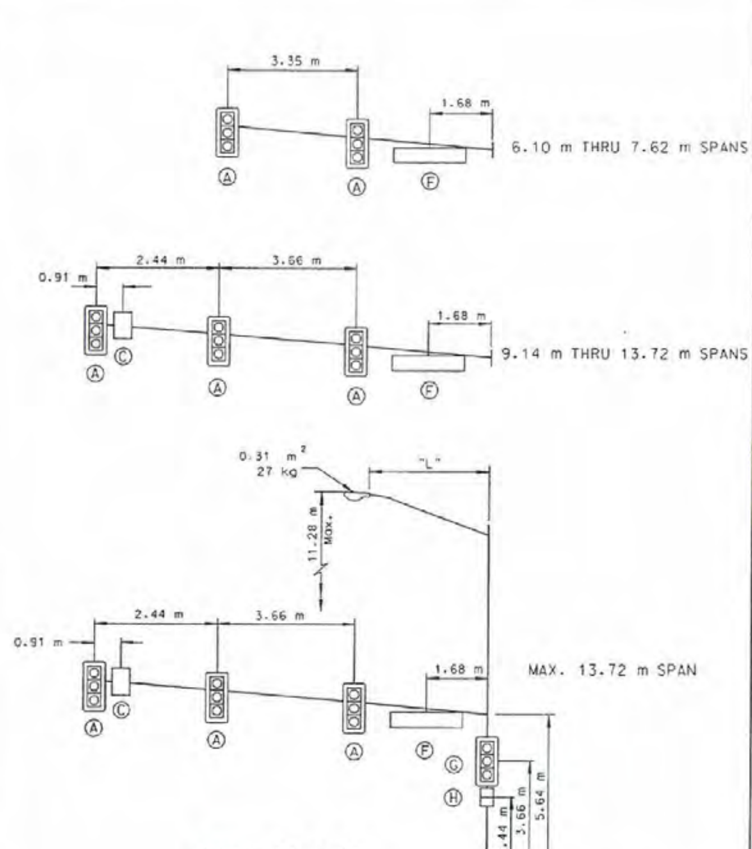
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 30 AND 35 POLES PILE FOUNDATION

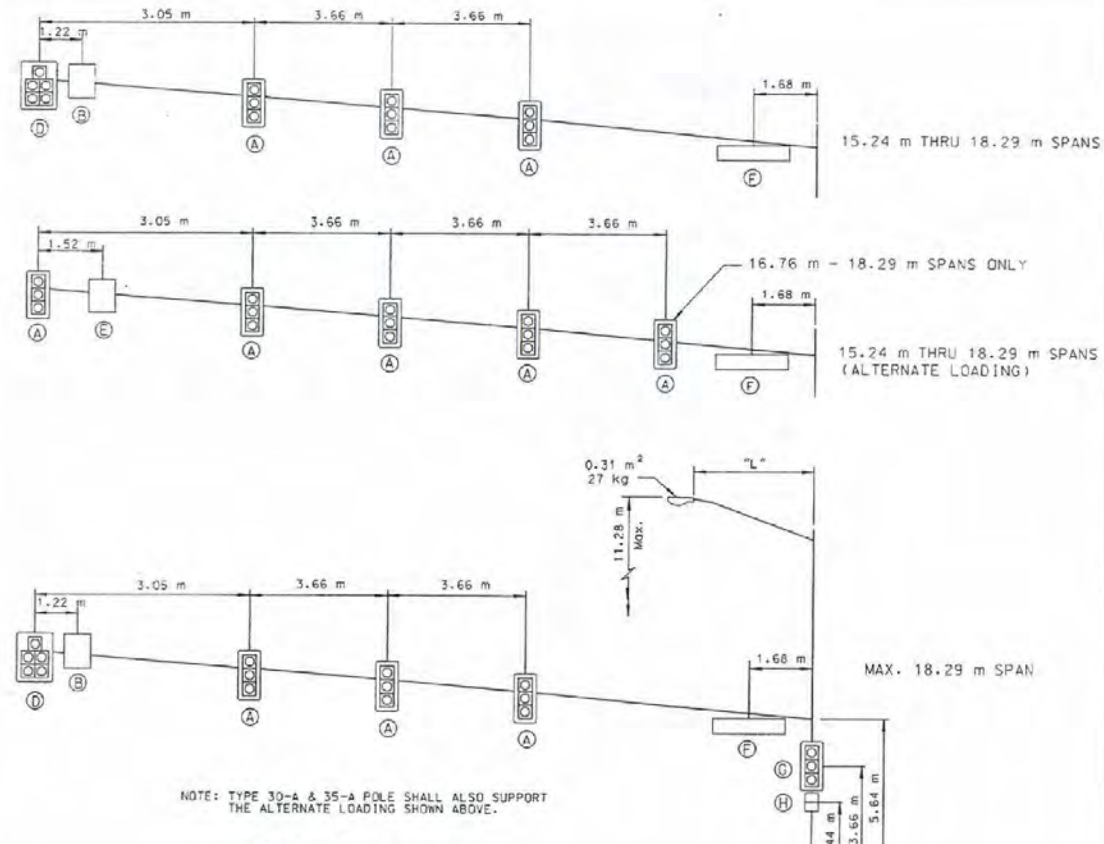
CHIEF TRAFFIC ENGINEER

T-30.1.13 (623)
ADOPTED: 7/96 REVISION: 9/97

T-16



TYPE 30 & 35



NOTE: TYPE 30-A & 35-A POLE SHALL ALSO SUPPORT THE ALTERNATE LOADING SHOWN ABOVE.

TYPE 30-A & 35-A

DEVICE	DESCRIPTION	PROJECT AREA (m^2)	Mass (kg)
Ⓐ SIGNAL	300-3 Sec. w/Backplates (2M)	0.91	18
Ⓑ SIGN	R10-12 600x750	0.45	7
Ⓒ SIGN	R3-4 600x600	0.36	4.5
Ⓓ SIGNAL	300-5 Sec. w/Backplates	1.27	36
Ⓔ SIGN	R10-5(d) S 900x1125	1.01	14
Ⓕ SIGN	Street Name-Free Swinging 500x2.44 m	1.25	45
Ⓖ SIGNAL	Dual-300-3 Sec. w/Backplates	1.61	36
Ⓗ SIGNAL	Dual-Pedestrian	0.74	27

LUMINAIRE ARM DATA

ARM SPAN "L" (m)	FIXED END DIA. (mm)	FREE END DIA. (mm)	THICK-NESS (mm)	LUMINAIRE MOUNTING HEIGHT (m)	
				Low Rise	High Rise
1.83	87	60	3.13	9.45	9.75
2.44	95	60	3.13	9.60	10.13
3.05	106	60	3.13	9.68	10.67
3.66	115	60	3.13	10.06	11.13
4.57	126	60	3.13	10.21	11.28

DESIGN CRITERIA:

1985 AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS,LUMINAIRES AND TRAFFIC SIGNALS.

MAXIMUM DESIGN MINIMUM YIELD STRENGTH FOR TUBULAR MEMBERS SHALL BE LIMITED TO 331 MPa FOR COLD WORKED MATERIALS AND 345 MPa FOR NON-COLD WORKED MATERIALS.

WIND VELOCITY:

130 km/h. ISOTACH

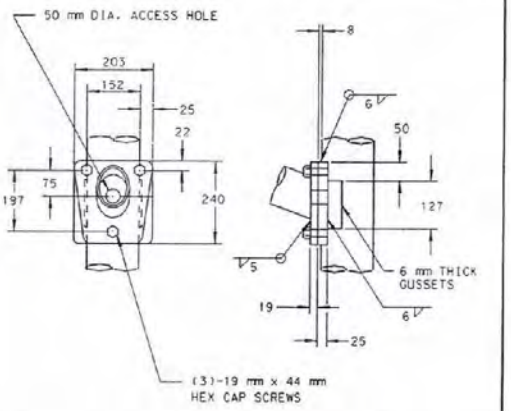
METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

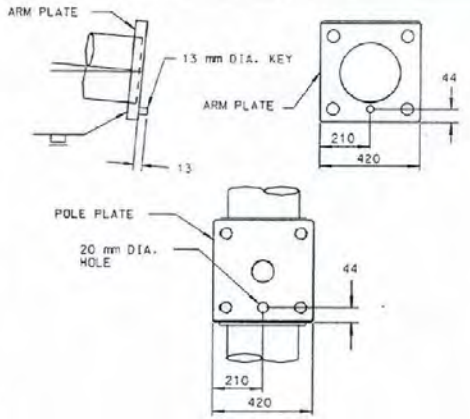
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 30 & 30A
35 & 35A
LOADING INFORMATION

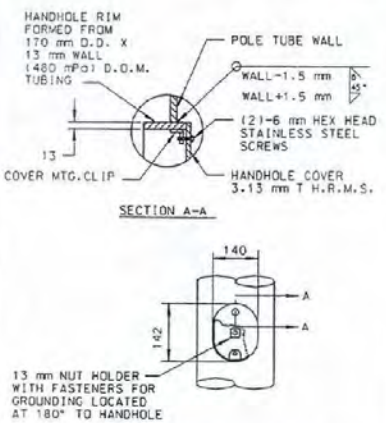
CHIEF TRAFFIC ENGR. | T-30.1.14 | ADOPTED 7/95 | REVISION:



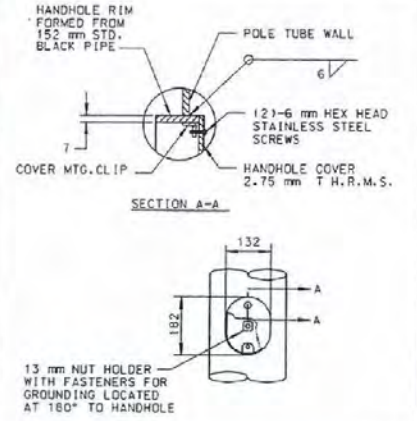
LUMINAIRE ARM ATTACHMENT



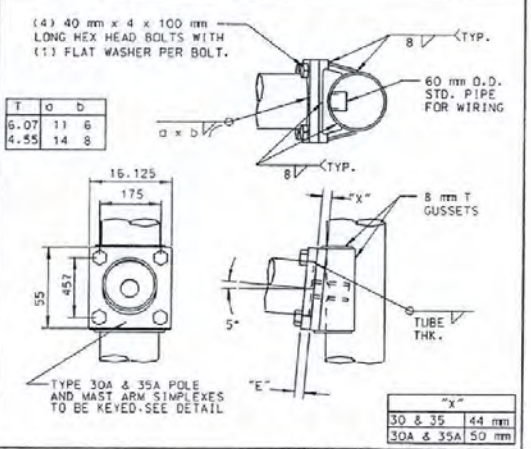
SIGNAL ARM SIMPLEX KEY



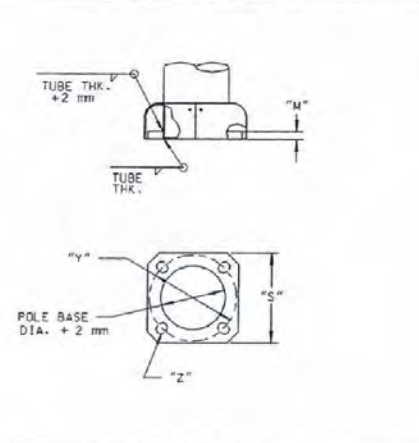
TYPE 30-A & 35-A HANDHOLE



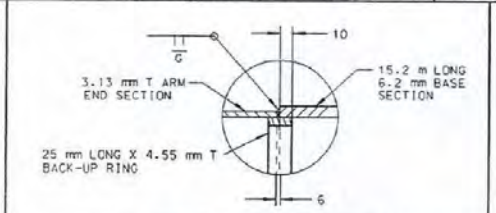
TYPE 30 & 35 HANDHOLE



SIGNAL ARM ATTACHMENT



POLE BASE PLATE



16.7 m & 18.3 m SIGNAL ARM SPLICE

POLE BASE PLATE				
TYPE	SQUARE "S" (mm)	BOLT CIRCLE "Y" (mm)	THK. "M" (mm)	HOLE "Z" (mm)
30 & 35	432	420	38	50
30A & 35A	483	483	45	57

METRIC NDOT

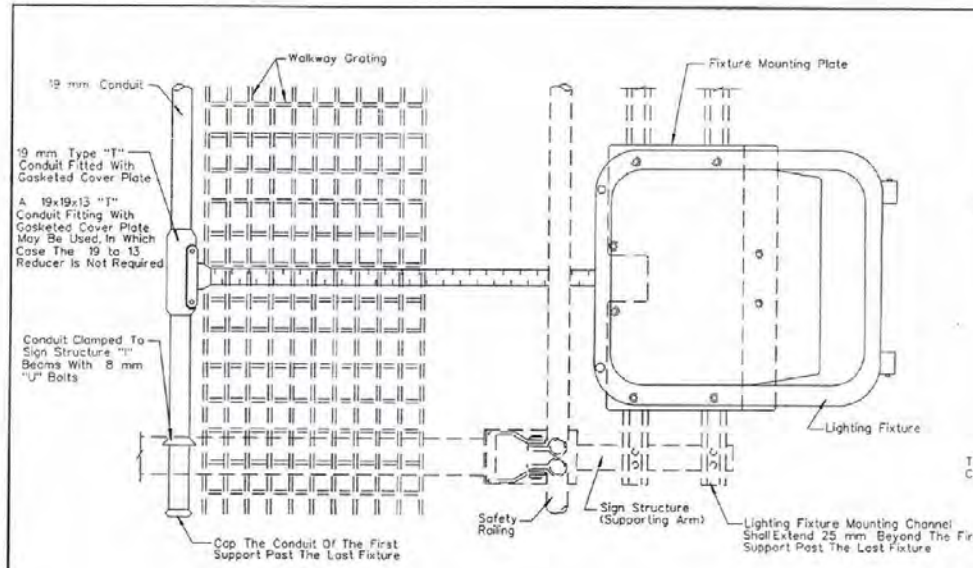
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

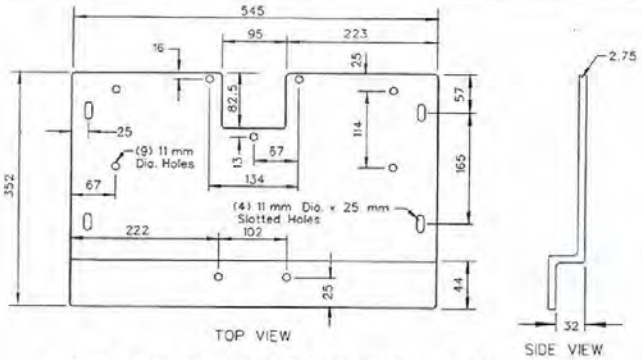
T - THICKNESS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 30 & 30A 35 & 35A DETAILS

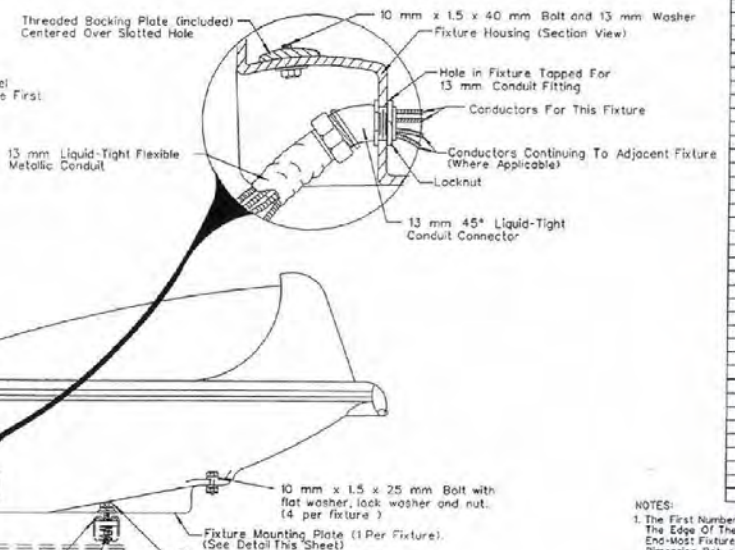
CHIEF TRAFFIC ENGR. — T-30.1.15 — ADOPTED: 7/96 REVISION:

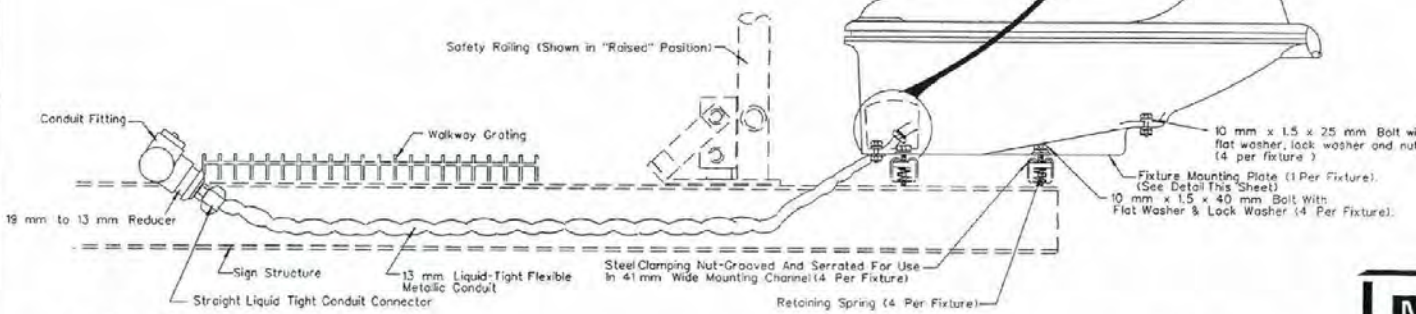




SIGN LIGHTING FIXTURE MOUNTING PLATE

Material Hot-Dip Galvanized Sheet Steel After Fabrication
All Dimensions Typical





All Bolts, Nuts, Washers and Other Hardware Shall Be SAE Grade 5 and Cadmium-Plated.

LIGHTING FIXTURE MOUNTING DETAIL (TYPICAL)

FIXTURE SPACING TABLE

LENGTH OF PANEL (METERS)	NUMBER OF FIXTURES (EACH)	FIXTURE SPACING (mm) SEE NOTES 1 & 2
1.5	1	750
1.8		900
2.1		1050
2.4		1200
2.7		1350
3		1500
3.4		1700
3.7		1850
4		2000
4.3		2150
4.6		2300
4.9		2450
5.2	2	1300,2600
5.5		1360,2780
5.8		1440,2920
6.1		1520,3060
6.4		1600,3200
6.7		1670,3360
7		1750,3500
7.3		1820,3660
7.6		1900,3800
8		2000,4000
8.2		2050,4100
8.5		2120,4260
8.8		2200,4400
9.2		2300,4600
9.5		2370,4750
9.8		2450,4900
10.1	3	1680,3370
10.4		1730,3470
10.7		1780,3570
11		1830,3670
11.3		1880,3770
11.6		1930,3870
11.9		1980,3970
12.2		2030,4070
12.5		2080,4170
12.8		2130,4270
13.1		2180,4320
13.4		2230,4470
13.7		2280,4570
14		2330,4670
14.3		2380,4770
14.6		2430,4870
15	4	1980,3740
15.3		1920,3820
15.6		1950,3900
15.9		1980,3980
16.2		2010,4060
16.5		2070,4120
16.8		2100,4200
17.1		2160,4260
17.4		2190,4340
17.7		2210,4420
18		2250,4500
18.3		2290,4570
18.6		2320,4650
18.9		2360,4720
19.2		2400,4800
19.5		2440,4880

NOTES:
1. The First Number Listed Is The Dimension From The Edge Of The Sign Panel To The Center Of The End-Most Fixture. The Second Number Listed Is The Dimension Between Centers Of Successive Fixtures.
2. Where Adjacent Sign Panels Are Spaced 305 mm Or Less The Combination Of These Panels (And Spaces) Shall Be Considered A Single Panel.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

T= THICKNESS

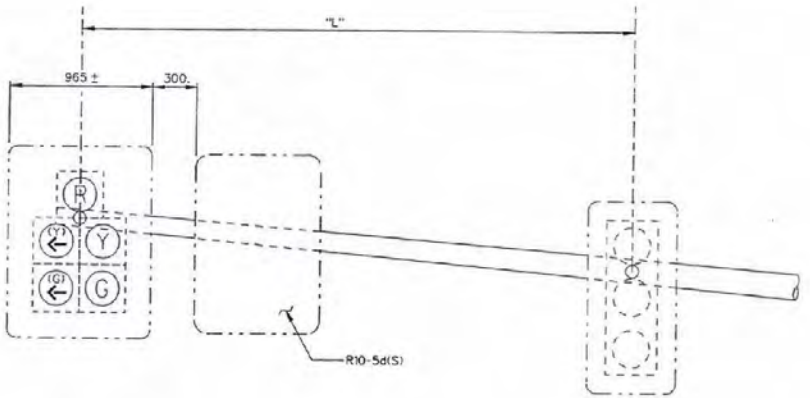
METRIC NDOT

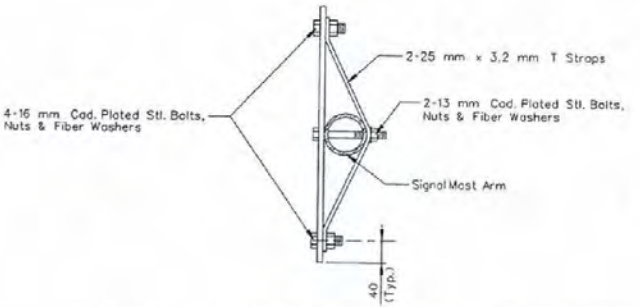
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SIGN LIGHTING FIXTURES

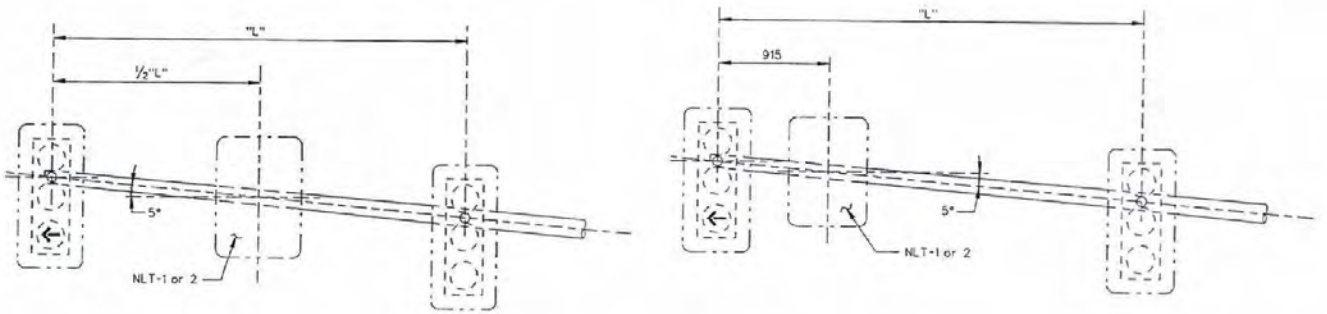
CHIEF TRAFFIC ENGINEER | T-30.1.16.1 (623) | ADOPTED: 7/96 | REVISION

T-19





TYPICAL METHOD OF SIGN ATTACHMENT



MAST ARM SIGNAL AND SIGN PLACEMENT

"L" - AS SHOWN ON PLANS

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED
T - THICKNESS

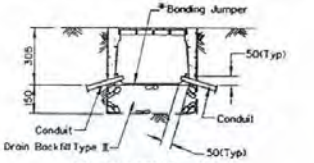
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL
SIGN PLACEMENT

CHIEF TRAFFIC ENGINEER

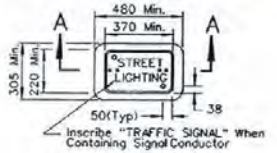
T-30.1.17 (623)

ADOPTED: 7/96 REVISION:

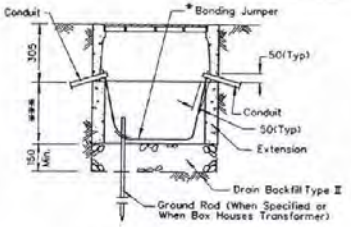


SECTION A-A

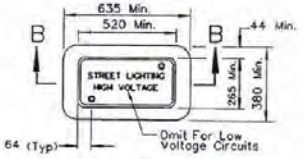
*** NOTE: WHEN CONCRETE PULL BOX IS FURNISHED, EXTENSIONS SHALL BE 250 mm MIN. WHEN PLASTIC PULL BOXES ARE FURNISHED, EXTENSION SHALL BE 200 mm MIN.



NO. 3½ PULL BOX

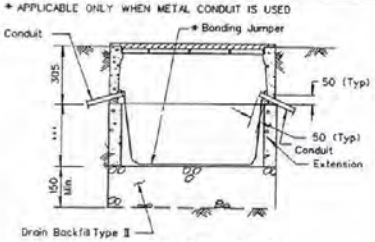


SECTION B-B

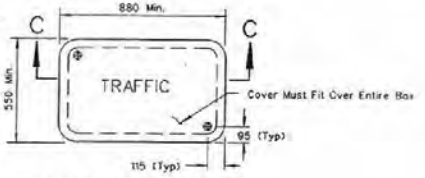


NO.5 PULL BOX

* APPLICABLE ONLY WHEN METAL CONDUIT IS USED



SECTION C-C

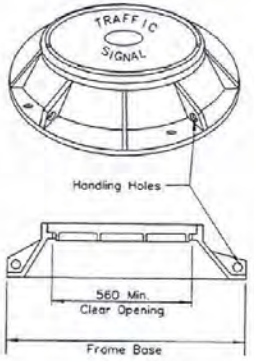


NO.7 PULL BOX

NOTE: BOXES SHALL BE SEALED WITH MORTAR AROUND CONDUIT OPENINGS.

NOTES FOR PULL BOXES

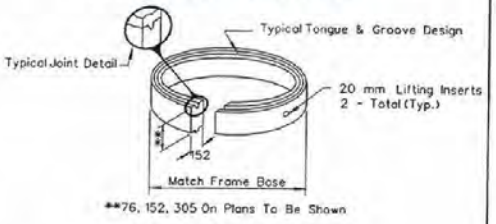
1. USE STEEL COVER WHEN PULL BOX IS SUBJECT TO VEHICULAR TRAFFIC LOADS. HOWEVER, WHEN PULL BOX IS LOCATED IN THE TRAVEL WAY, AN ELECTRICAL MANHOLE FRAME AND COVER SHALL BE INSTALLED.
2. WHEN THE PULL BOX IS INSTALLED IN A SIDEWALK AREA OR IN A STRUCTURE, THE DEPTH OF THE TOP OF THE PULL BOX SHALL BE ADJUSTED SO THAT THE TOP IS FLUSH WITH THE TOP OF THE SIDEWALK.
3. IN AREAS WHERE THE POSSIBILITY OF MATERIAL ERODING FROM AROUND THE PULL BOX EXISTS, THE PULL BOX SHALL BE PLACED IN TYPE 1C DRAIN BACKFILL MATERIAL (610 DEPTH ON EACH SIDE & 305 DEPTH) AS DIRECTED BY THE ENGINEER.
4. REFER TO R-4.7.3 FOR CONCRETE COLLAR DETAILS.



ELECTRICAL MANHOLE FRAME & COVER

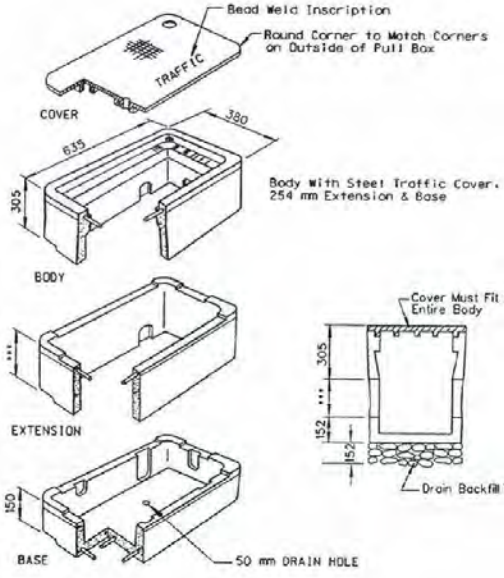
NOTES: 1. A COMPACTED BASE AND A CONCRETE FOOTING SUPPORT SHALL BE CONSTRUCTED PRIOR TO PLACEMENT OF THE CAST IRON FRAME AS DIRECTED BY THE ENGINEER.

2. ADJUSTMENTS TO ELEVATIONS SHALL BE MADE WITH COLLAR/RISERS AS REQUIRED. (MIN. DEPTH 450 mm)

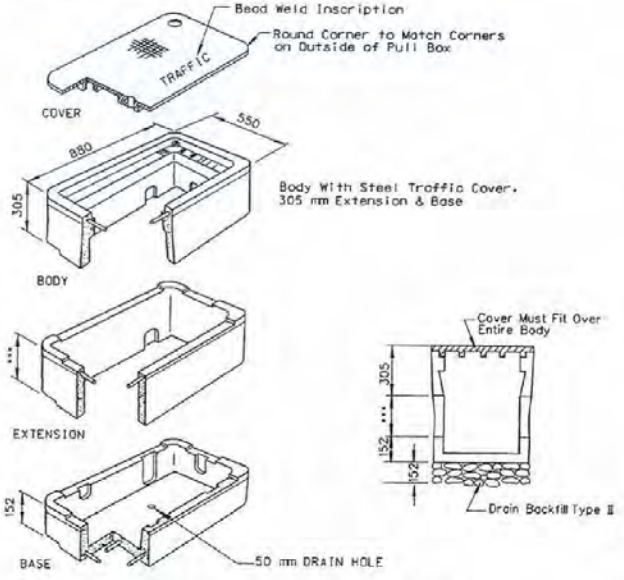


**76, 152, 305 On Plans To Be Shown

COLLAR RISER



SPECIAL NO.5 PULL BOX



SPECIAL NO.7 PULL BOX

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

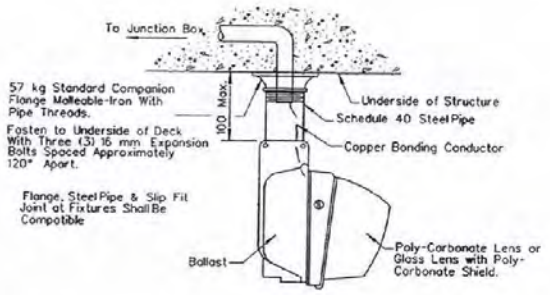
PULL BOXES & ELECTRICAL MANHOLE FRAME & COVER

CHIEF TRAFFIC ENGINEER

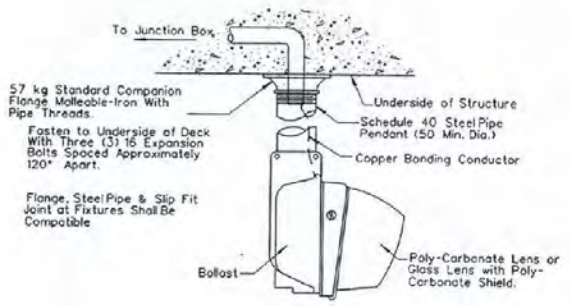
T-30.1.18 (623)

ADOPTED: 7/96 REVISION 5/97

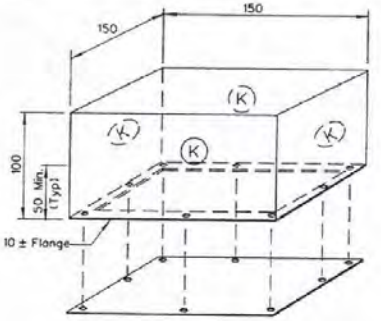
T-21



TYPE "A" UNDERPASS LUMINAIRE

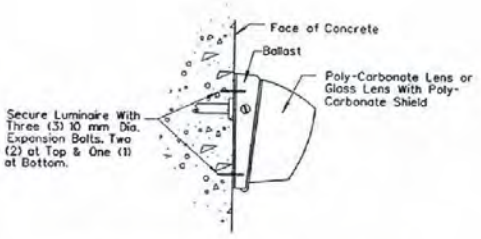


TYPE "C" UNDERPASS LUMINAIRE

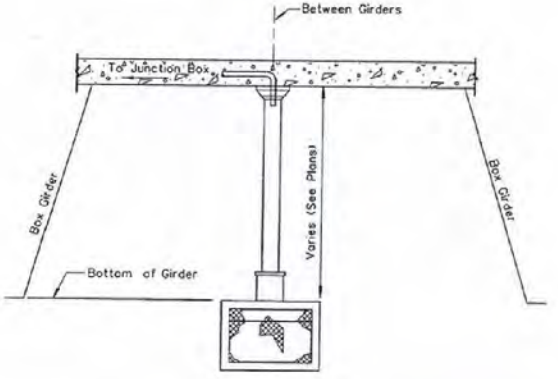


JUNCTION BOX DETAIL (J)

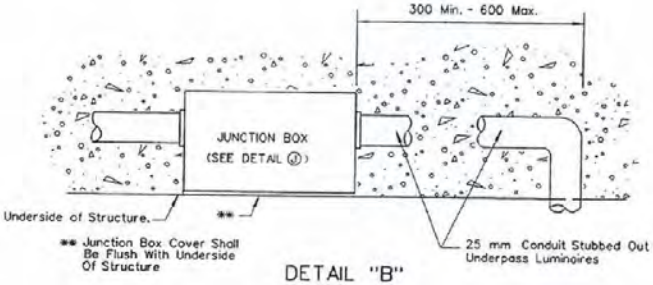
1. JUNCTION BOX AND COVER SHALL BE 1.61 mm T STEEL.
2. GALVANIZE ASSEMBLY AFTER FABRICATION
3. BOX SHALL BE FLUSH WITH BOTTOM OF STRUCTURE.
4. FASTEN COVER BY DRILL AND TAP WITH EIGHT #10-24 UNC BRASS SCREWS.
5. COVER SHALL BE ON BOX DURING POURING.
6. AN EQUIVALENT APPROVED MFG. BOX MAY BE USED IN LIEU OF DETAIL (J) JUNCTION BOX.
7. (K) KNOCK OUT FOR 25 mm CONDUIT. BOTTOM SHALL BE MIN. OF 90 mm ABOVE COVER TO CLEAR STRUCTURAL STEEL.



TYPE "B" UNDERPASS LUMINAIRE



PENDANT INSTALLATION
(TYPE "C" UNDERPASS LUMINAIRE)



DETAIL "B"

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED
T= THICKNESS

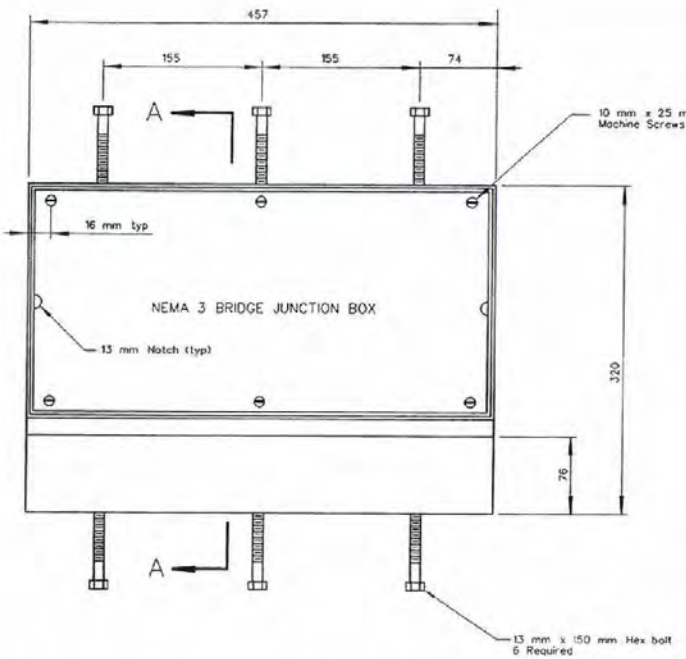
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

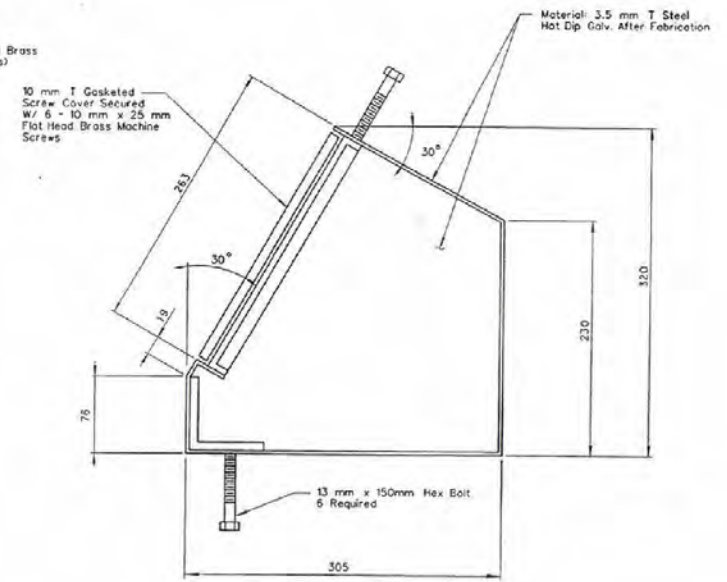
UNDERPASS LUMINAIRES & JUNCTION BOX

CHIEF TRAFFIC ENGINEER	ADOPTED: 7/96	REVISION

T-30.1.19 (623)

T-22





VIEW A-A

GENERAL NOTES:

1. SEAM WELD CONSTRUCTION W/ 5 DIA FILLET WELD OUTSIDE EDGES.
   TACK WELD CONSTRUCTION FOR INNER FRAME AND ANGLE 6 mm x 18 mm x 127 mm CENTERS.
2. GASKET MATERIAL 3 mm x 50 mm NEOPRENE EPDM AND SBR SPONGE WITH PSA.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

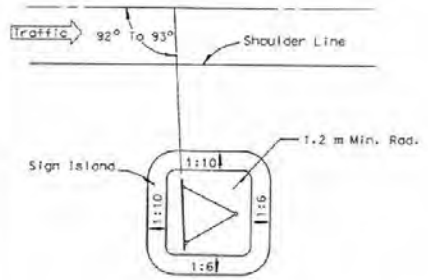
T - THICKNESS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

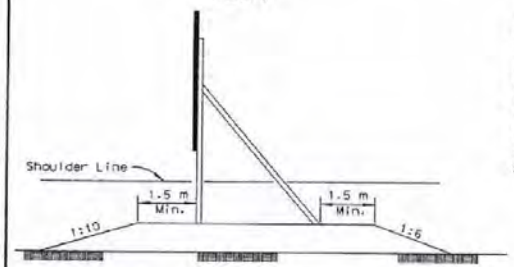
BRIDGE / BARRIER RAIL JUNCTION BOX

CHIEF TRAFFIC ENGINEER	ADOPTED: 7/96	REVISION

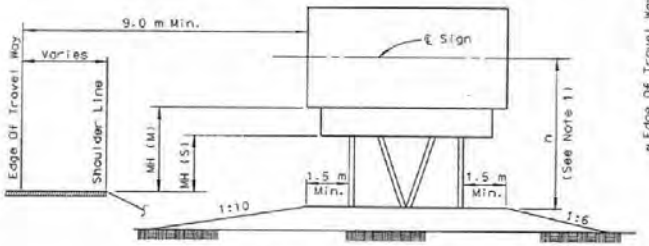
T-30.1.20



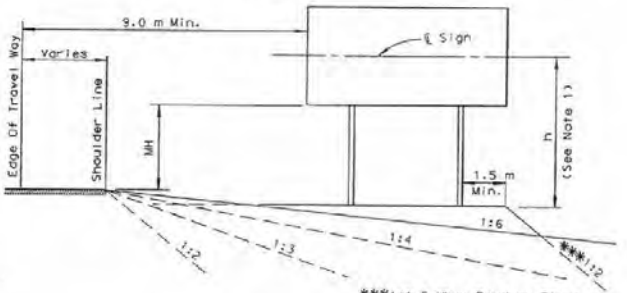
PLAN



ELEVATION

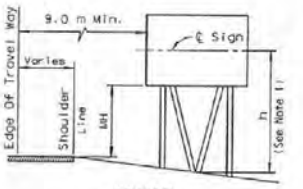


LEVEL

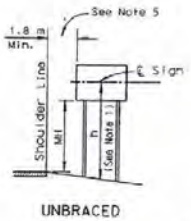


***1:1.5 When Roadway Slope Is 1:2 Or Greater.

EMBANKMENT

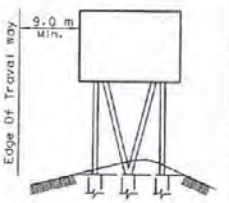


BRACED

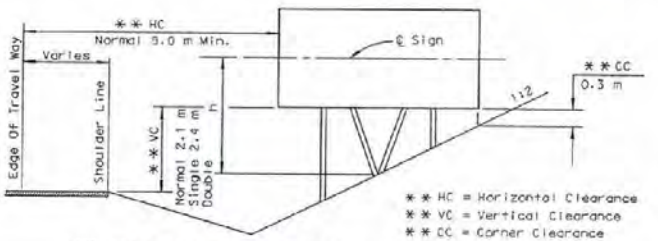


UNBRACED

EMBANKMENT
(WITHOUT SIGN ISLAND)



When The Sign Location Is In Original Ground, The Area Between The Supports And The Braces Shall Be Leveled To Maintain Identical Post Lengths. (No Direct Payment For The Leveling)



** HC = Horizontal Clearance
** VC = Vertical Clearance
** CC = Corner Clearance

NOTE: If CC Is Less Than 0.3 m Minimum.

(1) Raise Sign Until CC=0.3 m OR VC=3.0 m Max. For Single Sign VC=3.3 m Max For Double Sign. Or h=4.5 m Max.

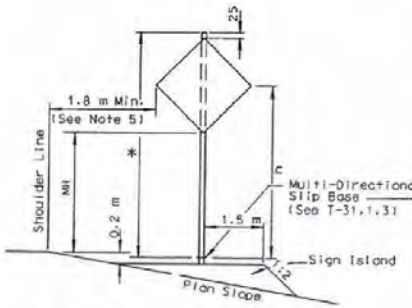
(2) Maintain VC=3.0 m Or 3.3 m And Move Sign Toward Shoulder Until CC=0.3 m .HC=4.8 m Min. Or h=4.5 m Max.

(3) Special Consideration Is Necessary If Given Limits Are Exceeded

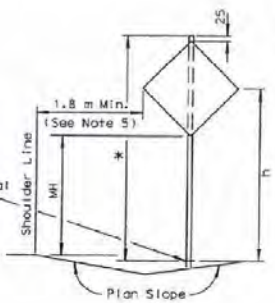
EXCAVATION

GENERAL NOTES:

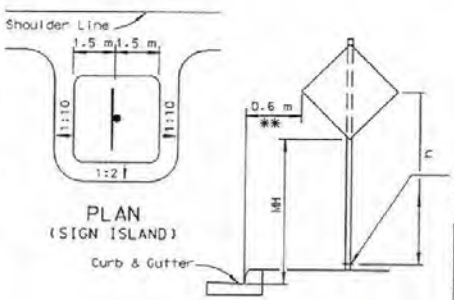
1. SIGN ISLAND FOR TWO POST SIGNS REQUIRED ONLY WHEN h EXCEEDS 4.5 m OR FILL SLOPE IS GREATER THAN 16. ISLAND TO BE COMPACTED TO 95%.
2. FOOTING AND SIGN DETAILS SHOWN ON SHEETS T-31.1.2, T-31.1.3 & T-31.1.4.
3. 30.0' MIN. DISTANCE FROM EDGE OF TRAVEL WAY TO EDGE OF SIGN PANEL EXCEPT WHERE PROTECTED BY GUARDRAIL OR BARRIER RAIL.
4. ALL SIGN SUPPORTS SHALL BE OF BREAK-AWAY DESIGN.
5. SIGNS SHOULD NOT BE CLOSER THAN 1.8 m FROM THE EDGE OF THE SHOULDER. OR IF NO SHOULDER, 3.6 m FROM THE EDGE OF THE TRAVELED WAY. IN URBAN AREAS A LESSER CLEARANCE MAY BE USED WHERE NECESSARY.
6. FOR BRACING DETAILS SEE SHEET T-31.1.2.
7. PAYMENT FOR SIGN ISLANDS WILL BE IN ACCORDANCE WITH WITH THE CONTRACT PLANS OR THE SPECIAL PROVISIONS.



*-Post Length As Shown On Sign Summary Sheet Are Estimates Only.



TYPICAL SINGLE SIGN SUPPORT



**Lateral Clearance For All Gore Signs Shall Be 0.6 m Either From Curb Face Or Normal Shoulder Line.

MINIMUM MOUNTING HEIGHTS (MH) FOR SIGNS

	Single Guide Signs	Double Guide Signs	Route Markers, Regulatory And Warning Signs
Freeways And Expressways	2.1 m	2.4 m (M) 1.5 m (S)	2.1 m
Commercial, Residential, Curb & Gutter	2.1 m	2.1 m (M) 1.8 m (S)	2.1 m
Rural Roads And Interchange Ramps	2.1 m	2.1 m (M) 1.8 m (S)	2.1 m
Freeway Entrance And Do Not Enter-Wrong Way Assemblies			0.6 m

(M) Major Sign (S) Secondary Sign

NOTE: For Mounting Heights (MH) For Construction Signs And Temporary Signs, (See Sheet T-31.1.5)

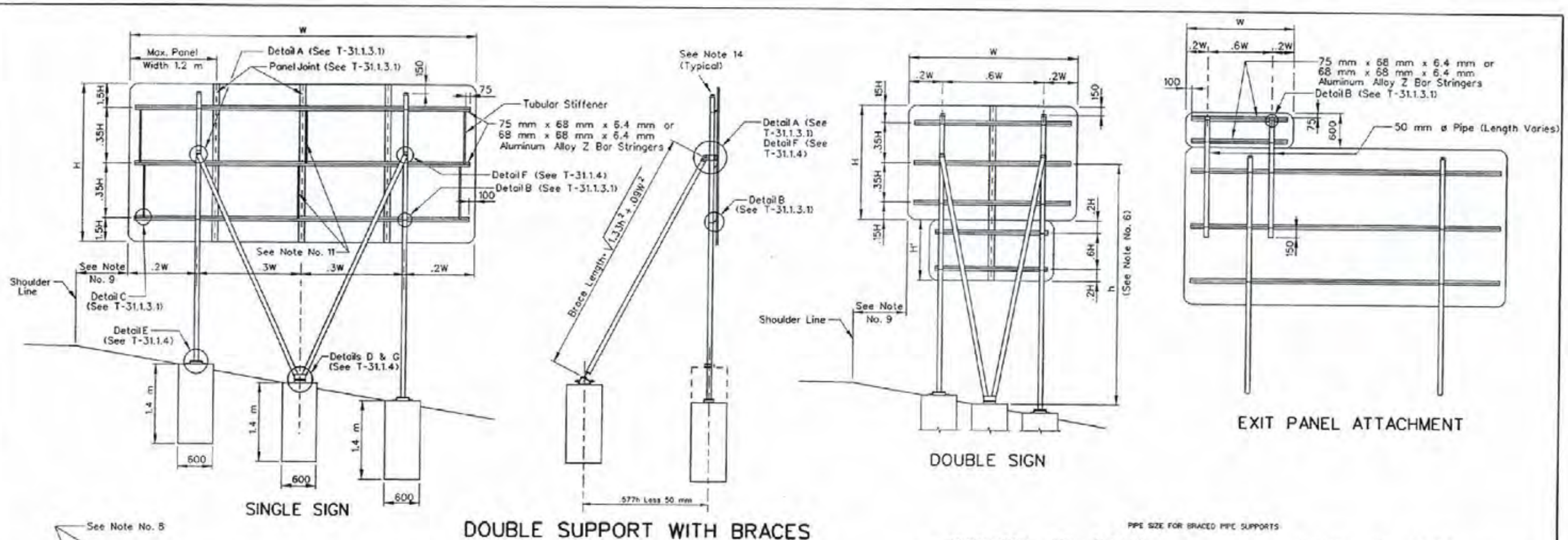
METRIC NDOT

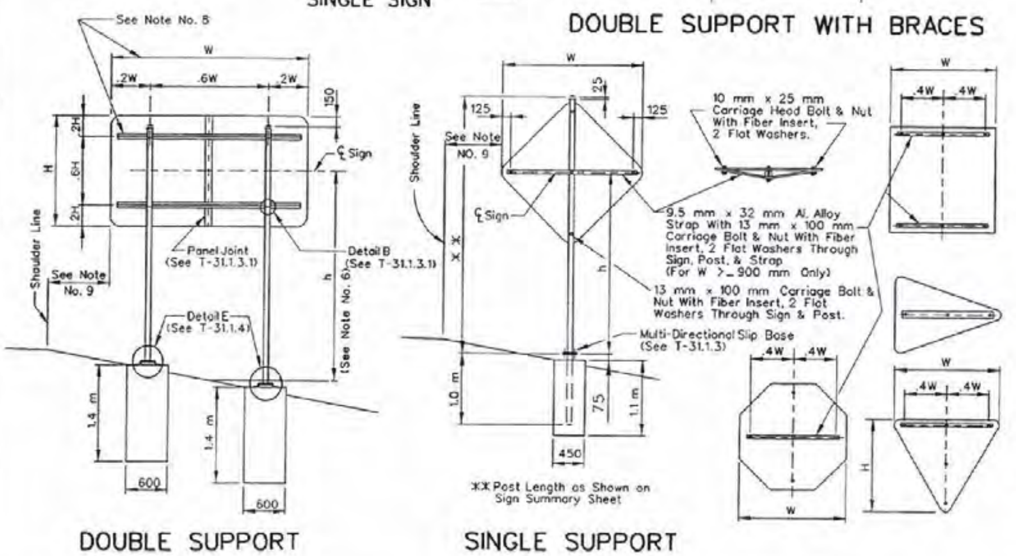
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GROUND MOUNTED SIGN SUPPORTS (ROUND METAL POSTS)

CHIEF TRAFFIC ENGR. | T-31.1.1 (627) | ADOPTED: | REVISION: 9/97





PIPE SIZE FOR BRACED PIPE SUPPORTS

VERTICAL POST SIZE (NPS) See Note 15

SIGN AREA m^2	h (m)			
	0 - 1.5	1.5 - 1.8	1.8 - 3.0	3.0 - 3.6
0 - 6.5	2	2	2	2
6.5 - 13.0	2	2	3	3
13.0 - 18.5	3	3	3	-

BRACE SIZE (NPS) See Note 15

SIGN AREA m^2	h (m)				
	0 - 2.4	2.4 - 2.7	2.7 - 3.3	3.3 - 3.6	3.6 - 4.5
0 - 6.5	2	2	2	3	3
6.5 - 13.0	2	2	2	3	3
13.0 - 18.5	2	2	3	3	3

NOTE: WHEN PIPE SIZE FROM TABLES FOR VERTICAL POSTS AND BRACES DIFFER, USE LARGER DIAMETER INDICATED FOR BOTH SUPPORTS.

PIPE SIZE (NPS) DETERMINATION FOR SINGLE POST AND DOUBLE POST WITHOUT BRACE (See Note 15)

SIGN AREA m^2	h (m)					
	0 - 2.4	2.4 - 3.0	3.0 - 3.6	3.6 - 4.2	4.2 - 4.5	4.5 - 5.0
0 - .05	S 2	S 2	S 2	S 2	S 2	S 2
0.5 - 0.7	S 2	S 2	S 2	S 2	S 3	S 3
0.7 - 0.9	S 2	S 2	S 3	S 3	S 3	S 3
0.9 - 1.2	S 2	S 3	S 3	S 3	S 3	D 3
1.2 - 1.4	S 3	S 3	S 3	D 3	D 3	D 3
1.4 - 1.6	S 3	S 3	S 3	D 3	D 3	-
1.6 - 1.8	S 3	S 3	D 3	D 3	D 3	-
1.8 - 2.3	S 3	S 3	D 3	-	-	-
2.3 - 4.0	S 3	S 3	-	-	-	-

S = Single Post
D = Double Post

GENERAL NOTES:

1. SIZES AND TYPES OF SIGNS, POSTS AND BRACES ARE AS SHOWN ON SIGN SUMMARY SHEET.
2. FOR MATERIALS NOT DIRECTLY SPECIFIED SEE SPECIAL PROVISIONS.
3. FOOTINGS TO BE DRILLED HOLES, AS SHOWN, AND FILLED WITH CLASS A OR CLASS AA CONCRETE.
4. SIGN PANELS TO BE ALUMINUM SHEET CONSTRUCTION.
5. TUBULAR STIFFENERS REQUIRED ONLY WHEN .2W EXCEEDS 600 mm ALUMINUM SHEET CONSTRUCTION.
6. SIGN ISLAND REQUIRED ONLY WHEN h EXCEEDS 4.5 m ISLAND TO BE COMPACTED TO 95% (SEE T-31.1.1).
7. FOR DOUBLE SIGN, DOUBLE SUPPORT WITH BRACES, AREA FOR TABLES IS TOTAL AREA OF TWO SIGNS. H' IS NOT CONSIDERED PART OF H.
8. "Z" BAR WILL BE USED ON ALL SIGNS REQUIRING TWO POSTS.
9. SEE T-31.1.1 FOR SIGN PLACEMENT.
10. SEE T-31.1.4 FOR ANCHOR BOLT DETAILS.
11. TUBULAR STIFFENERS TO BE ADDED WHEN "W" EXCEEDS 3.0 m.
12. REFER TO THE STANDARD HIGHWAY SIGN MANUAL FOR DRILL HOLE PLACEMENT.
13. PAYMENT FOR SIGN ISLANDS WILL BE IN ACCORDANCE WITH THE CONTRACT PLANS OR SPECIAL PROVISIONS.
14. METAL POST CAP REQUIRED FOR ALL ROUND METAL POSTS.
15. NPS = NOMINAL PIPE SIZE. SEE ASTM A 53.

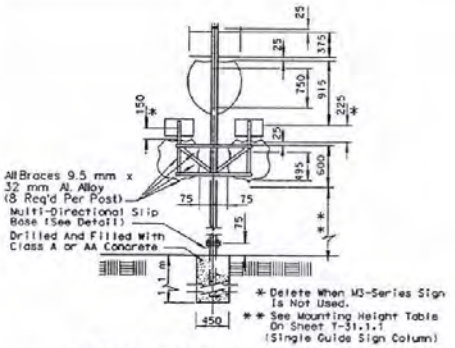
METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

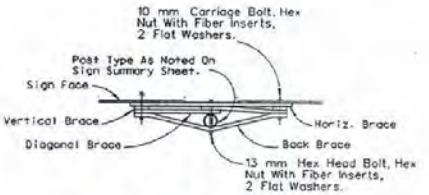
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GROUND MOUNTED SIGN SUPPORTS (ROUND METAL POSTS)

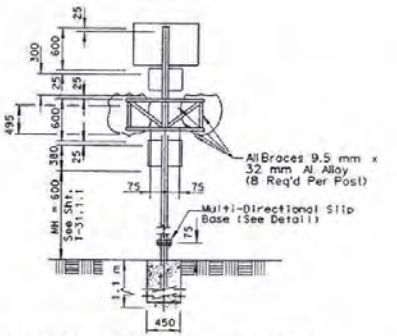
CHIEF TRAFFIC ENGINEER | T-31.1.2 | (627) | ADOPTED: 7/96 | REVISION: 9/97



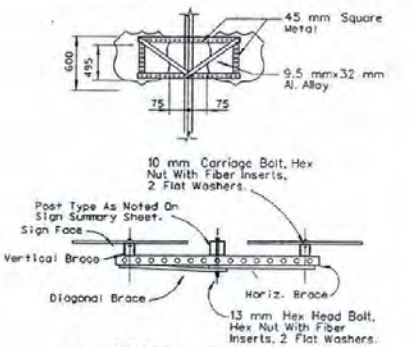
ROUTE MARKER ASSEMBLY



SIDE BY SIDE MOUNTING DETAIL

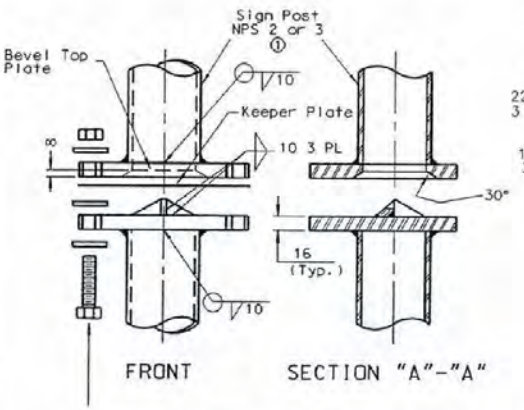


TYPICAL FREEWAY ENTRANCE

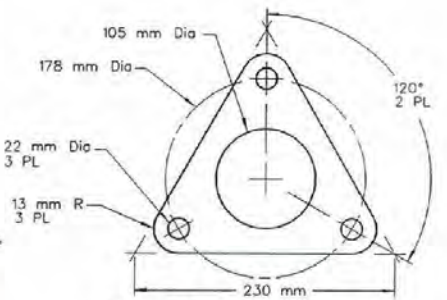


ALTERNATE SIDE BY SIDE SIGN MOUNTING DETAIL

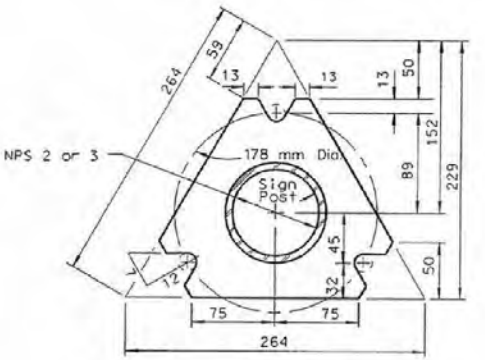
① NPS = Nominal Pipe Size See ASTM A 53.



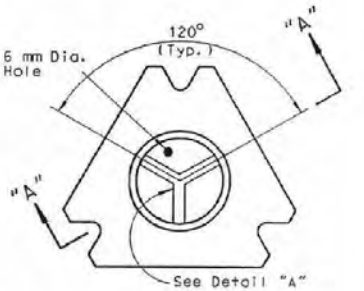
16 mm x 80 mm Heavy Hex Structural Bolt, Type 1 ASTM A325M or Type 1 ASTM A449M; Each With Three Hardened Washers ASTM F436M Type 1; And One Heavy Hex Prevailing Torque Type Nut With Top Insert, Class 10 ANSI B18.16.1M. Torque to 50 N-m.



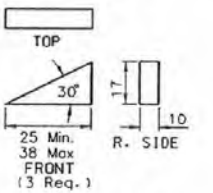
DETAILS OF KEEPER PLATE
0.5 to 1 mm Thickness
Galvanize After Fabrication



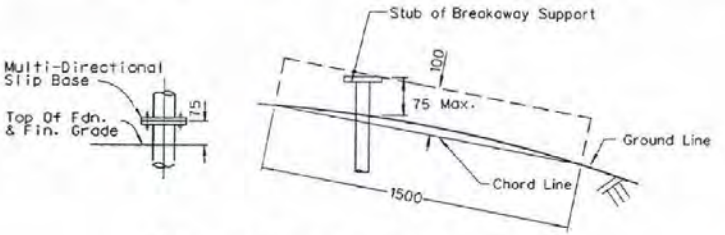
DETAILS OF MULTI-DIRECTIONAL SLIP BASE



TOP VIEW



DETAIL "A"



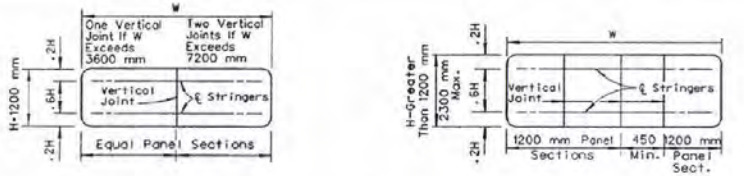
BREAKAWAY SUPPORT STUB HEIGHT MEASUREMENT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GROUND MOUNTED SIGN SUPPORTS (ROUND METAL POSTS)

CHIEF TRAFFIC ENGR. | T-31.1.3 (627) | ADOPTED: 7/96 REVISION: 9/97



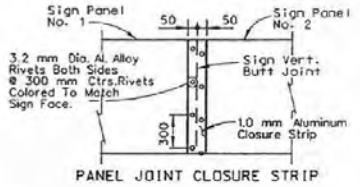
2 STRINGER MOUNTING

3 STRINGER MOUNTING

4 STRINGER MOUNTING

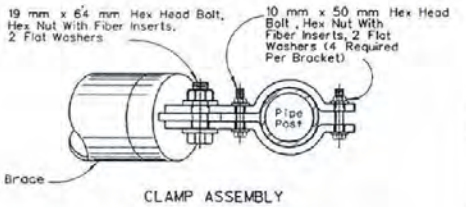
NOTE: To Obtain Desired Panel Width, Max. Of 2 Panels May Be Cut Less Than 1200 mm, (450 mm Min. Each)

STRINGER AND PANEL ARRANGEMENT



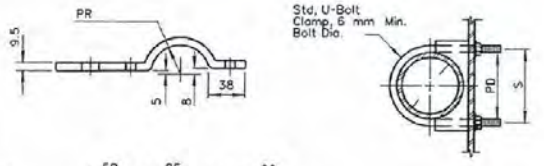
PANEL JOINT CLOSURE STRIP

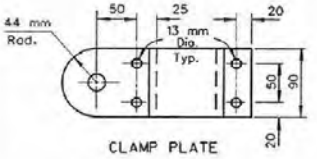
ALUMINUM SHEET CONSTRUCTION



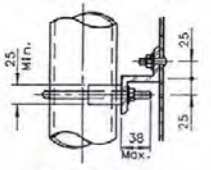
CLAMP ASSEMBLY

DETAIL A



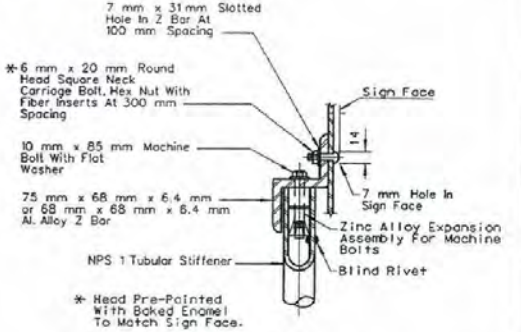


CLAMP PLATE



DETAIL B

POST Nom. Dia.	PR (mm)	PD (mm)	S (mm)
NPS 1	16	33	40
NPS 2	30	60	65
NPS 3	45	90	95



DETAIL C

GENERAL NOTES:

1. See Standard Sheets T-31.1.1 Through T-31.1.4 For Details Not Shown.
2. NPS = Nominal Pipe Size. See ASTM A 53.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

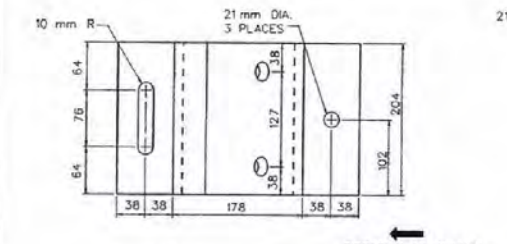
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GROUND MOUNTED SIGN SUPPORTS (ROUND METAL POSTS)

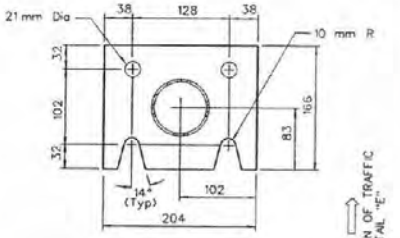
CHIEF TRAFFIC ENGR

T-31.1.3.1 (627)

ADOPTED: 7/96 REVISION: 9/97

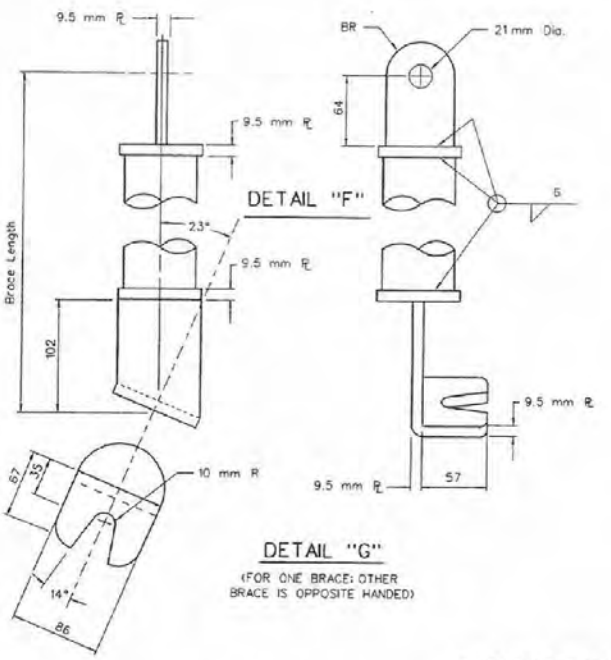


TOP PLATE



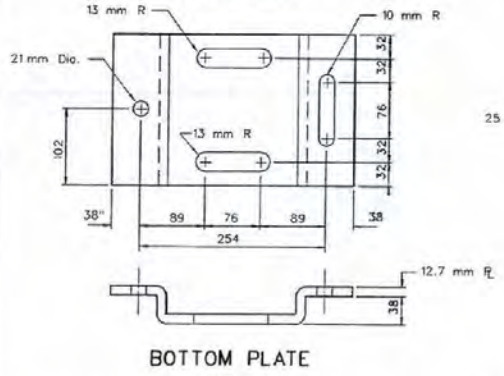
TOP PLATE

BRACE NOM. DIA.	BR RADIUS
NPS 2	30 mm
NPS 3	45 mm

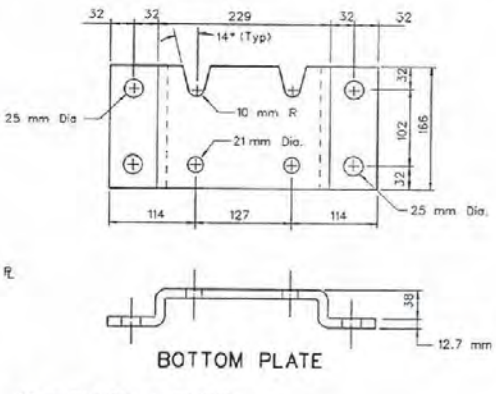


DETAIL "G"

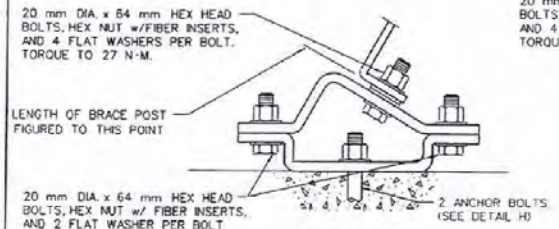
(FOR ONE BRACE; OTHER BRACE IS OPPOSITE HANDED)



BOTTOM PLATE

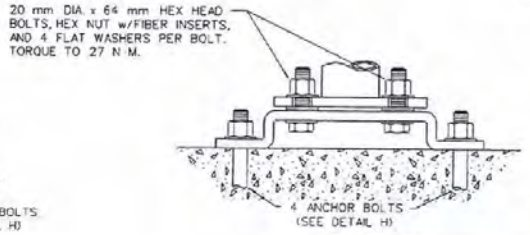


BOTTOM PLATE



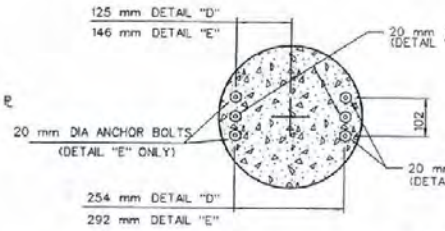
ASSEMBLY

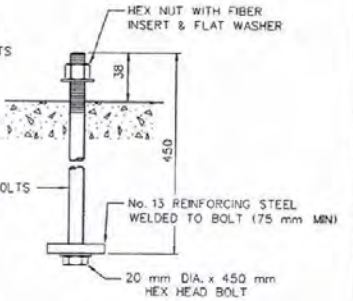
DETAIL "D"



ASSEMBLY

DETAIL "E"





PLACEMENT

DETAIL "H"

GENERAL NOTES:

1. FLAT WASHERS REQUIRED AS SHOWN.
2. NPS = NOMINAL PIPE SIZE. SEE ASTM A 53.
3. CONCRETE SHALL BE CLASS A OR AA.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

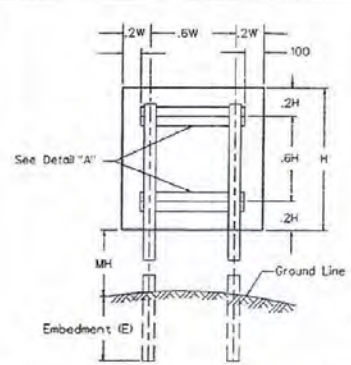
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GROUND MOUNTED SIGN SUPPORTS (ROUND METAL POSTS)

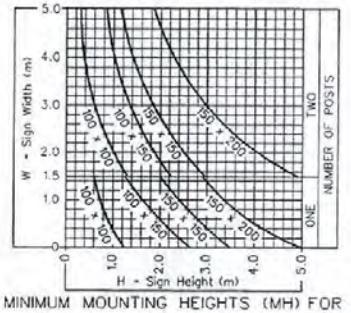
CHIEF TRAFFIC ENGR.

T-31.1.4 (627)

ADOPTED: 7/98 REVISION: 9/97



RECTANGULAR TIMBER POST SELECTION

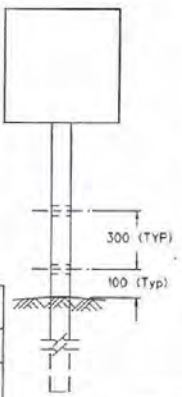


Sign Post Embedments	
100 x 100 - 0.9 m 150 x 150 - 1.5 m	100 x 150 - 1.2 m 150 x 200 - 1.8 m

MINIMUM MOUNTING HEIGHTS (MH) FOR SIGNS

	SINGLE GUIDE SIGNS	DOUBLE GUIDE SIGNS	ROUTE MARKERS, REGULATORY and WARNING SIGNS
FREEWAYS and EXPRESSWAYS	2.1 m	2.4 m (M) 1.5 m (S)	2.1 m
COMMERCIAL, RESIDENTAL CURB and GUTTER	2.1 m	2.1 m (M) 1.8 m (S)	2.1 m
RURAL ROADS and INTERCHANGE RAMPS	2.1 m	2.1 m (M) 1.8 m (S)	2.1 m
FREEWAY ENTRANCE and Do Not ENTER WRONG WAY ASSEMBLIES			0.6 m

(M) MAJOR SIGN (S) SECONDARY SIGN



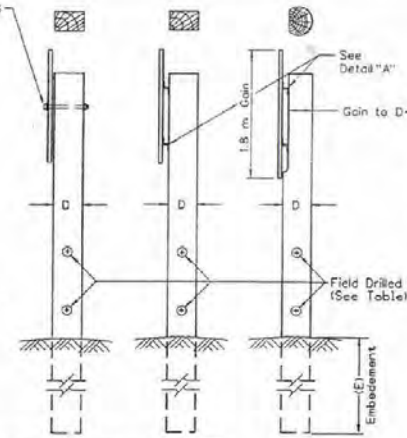
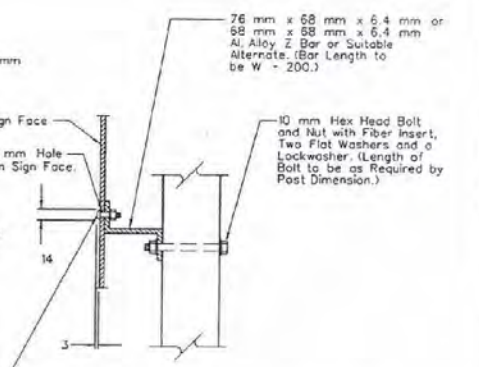
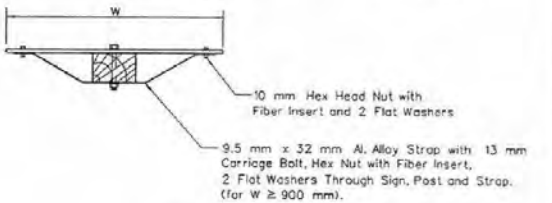
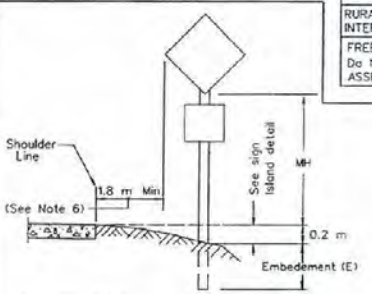


TABLE of HOLE DIAMETERS (mm)		
Post Size (D)	< 100 x 100 or 100 mm Dia.	> 100 x 100 or 100 mm Dia.
Hole Dia.	No Hole	50

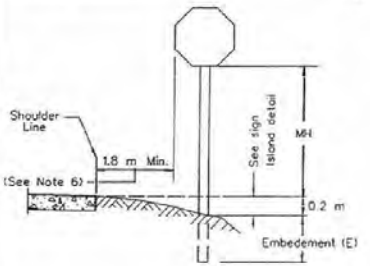


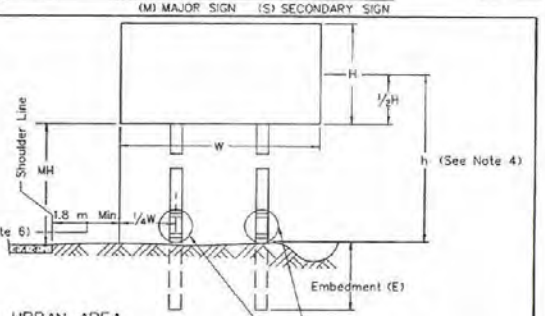
DETAIL "A"



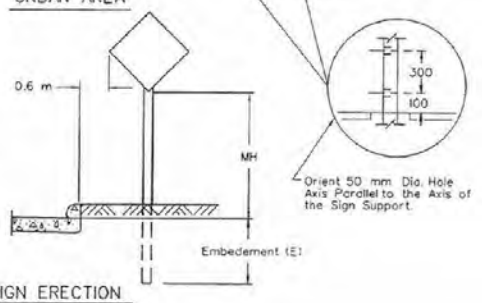


RURAL AREA

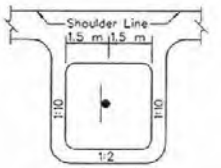




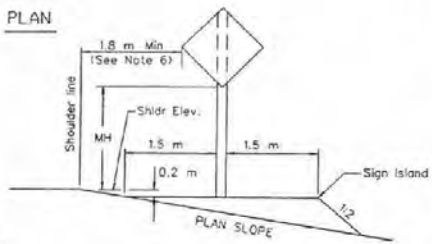
URBAN AREA



TYPICAL SIGN ERECTION



PLAN



SIGN ISLAND

Post Length as Shown on Sign Summary Sheet or Estimates Only.

GENERAL NOTES:

1. All Bolts, Nuts, and Washers are to be Galvanized.
2. All Posts with Cross Sectional Area Larger than 100 mm x 100 mm are to be Drilled as Shown.
3. "Z" Bars Will be used on all Signs Requiring Two Posts.
4. Sign Island for Signs Shall Be Constructed When "h" exceeds 4.5 m or Fill Slope is Greater Than 1:6. Island to be Compacted to 95%.
5. For Bracing Details, See Sheet T-31.1.2.
6. Signs Should not be Closer Than 1.8 m From the Edge of the Shoulder, or if None, 3.6 m from the Edge of the Traveled Way. In Urban Areas, a Lesser Clearance May be used Where Necessary.
7. Payment for Sign Islands will be in accordance with the Contract Plans or Special Provisions.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

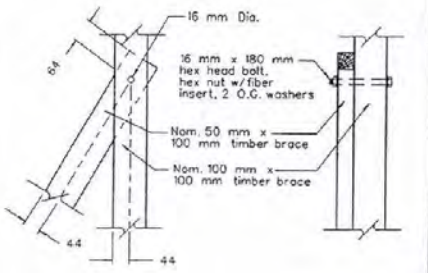
GROUND MOUNTED SIGN SUPPORTS (TIMBER POSTS)

T-31.1.5 (627)

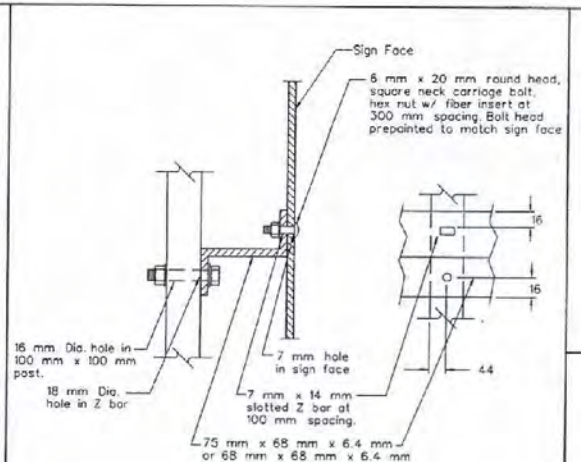
CHIEF TRAFFIC ENGR.

ADOPTED: 7/96 REVISION: 8/97

T-29



DETAIL "A"



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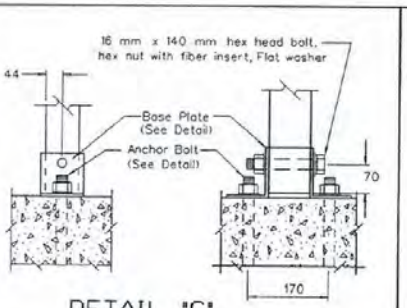
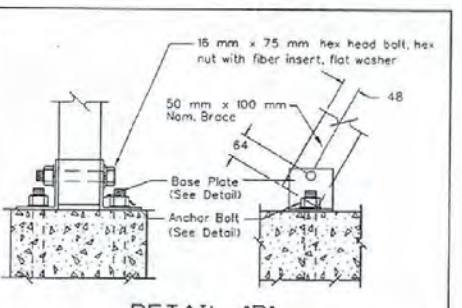
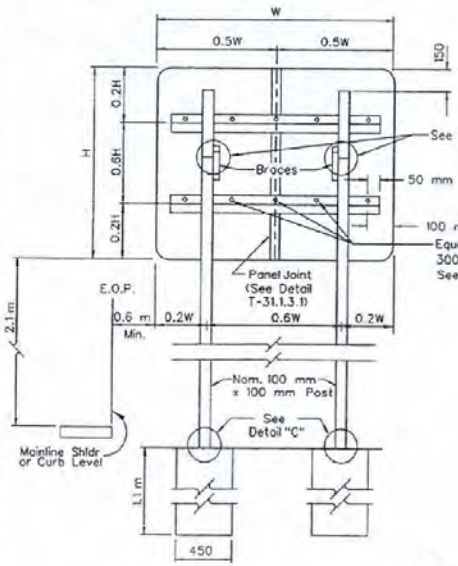


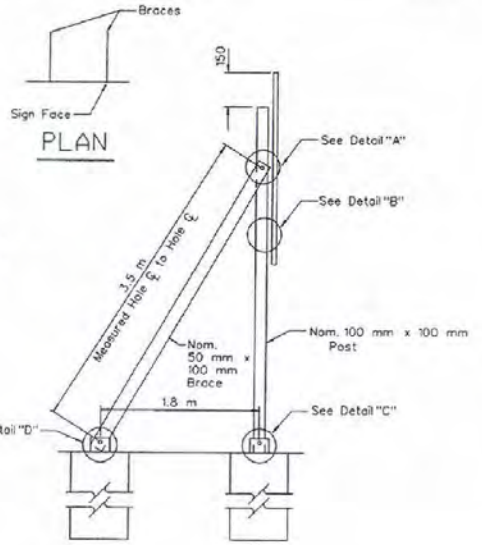
DETAIL "C"



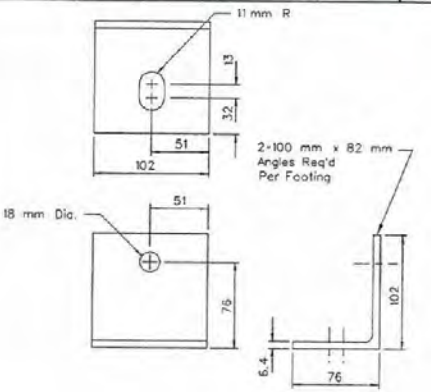
DETAIL "D"



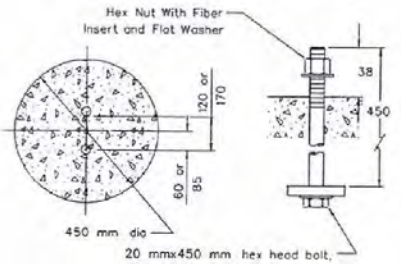
ELEVATION



PLAN



BASE PLATE DETAIL



ANCHOR BOLTS DETAIL

GENERAL NOTES:

1. All drilled holes in timber to be 16 mm Dia. unless otherwise noted.
2. Back brace hole in 100 mm x 100 mm post to be drilled and filled in field. All other holes may be shop drilled in standard position.
3. Footings to be drilled - 450 mm diameter, 1.1 m deep, filled with class A, or class AA concrete.
4. For Bracing Details, See Sheet T31.1.2.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

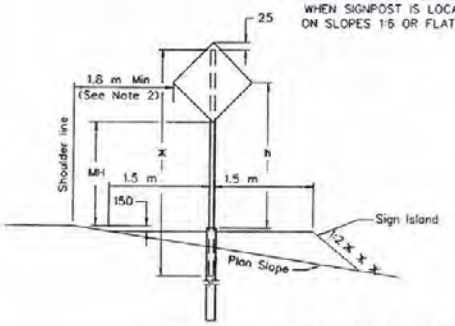
GROUND MOUNTED GORE SIGN (TIMBER SUPPORTS)

T-31.1.6 (627)

CHIEF TRAFFIC ENGR

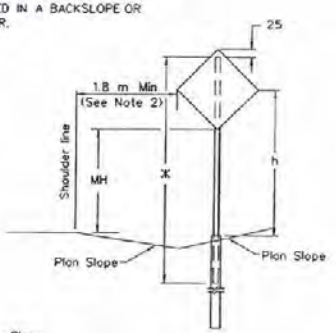
ADOPTED: 7/96 REVISION: 9/97

X POST LENGTH AS SHOWN ON SIGN SUMMARY SHEET. POST LENGTH CALCULATIONS ARE BASED ON USE OF SIGN ISLAND. SIGN ISLAND SHALL BE USED EXCEPT WHEN SIGNPOST IS LOCATED IN A BACKSLOPE OR ON SLOPES 1:6 OR FLATTER.

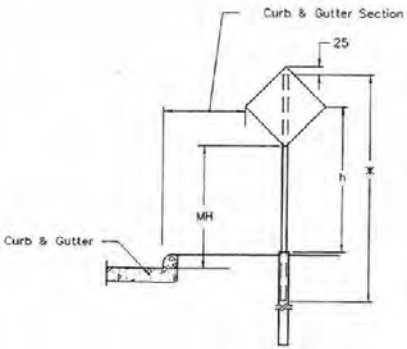


ELEVATION

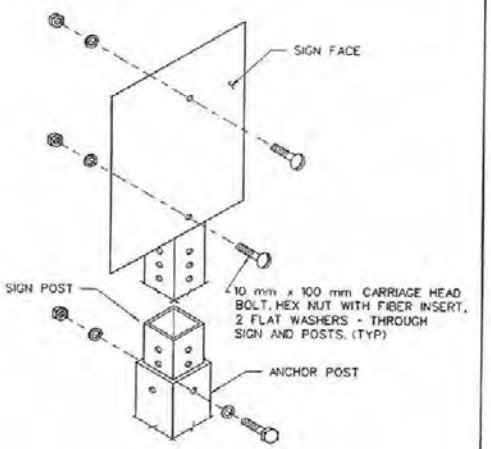
X X X = 1:1.5 When Roadway Slope is 1:2 or Greater



SIGN ON BACKSLOPE



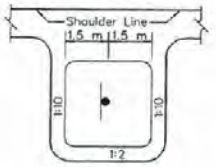
SIGN ON GORE



MINIMUM MOUNTING HEIGHTS (MH) FOR SIGNS

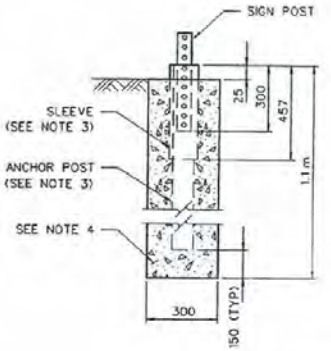
	SINGLE GUIDE SIGNS	DOUBLE GUIDE SIGNS	ROUTE MARKERS, REGULATORY and WARNING SIGNS
FREEWAYS and EXPRESSWAYS	2.1 m	2.4 m (M) 1.5 m (S)	2.1 m
COMMERCIAL, RESIDENTAL CURB and GUTTER	2.1 m	2.1 m (M) 1.8 m (S)	2.1 m
RURAL ROADS and INTERCHANGE RAMPS	2.1 m	2.1 m (M) 1.8 m (S)	2.1 m
FREEWAY ENTRANCE and Do Not ENTER WRONG WAY ASSEMBLIES			0.6 m

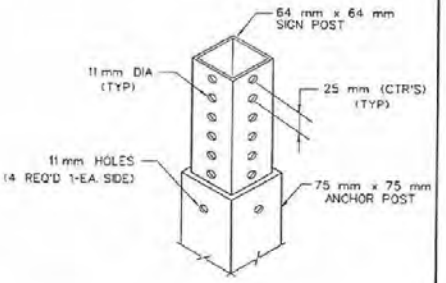
(M) MAJOR SIGN (S) SECONDARY SIGN

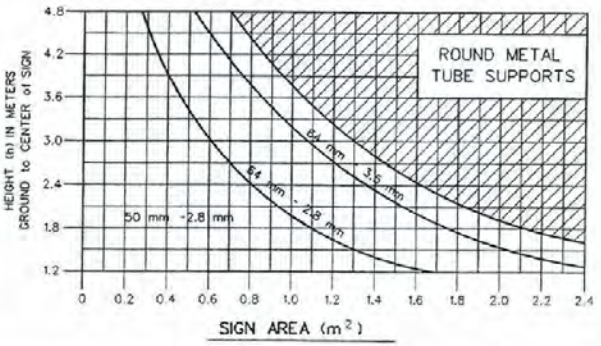


PLAN

SIGN ON SIGN ISLAND







SIGN AREA (m^2)

GENERAL NOTES:

1. SIGN ISLAND TO BE COMPACTED TO 95%.
2. SIGN SHOULD NOT BE CLOSER THAN 1.8 m FROM THE EDGE OF THE SHOULDER, OR IF NONE, 3.6 m FROM THE EDGE OF THE TRAVELWAY. IN AN URBAN AREA, A LESSER CLEARANCE MAY BE USED WHERE NECESSARY.
3. ANCHOR POST AND SLEEVE ARE TO BE INCLUDED IN THE COST OF POST LENGTH AS SHOWN ON THE SIGN SUMMARY SHEET.
4. FOOTINGS TO BE DRILLED HOLES AS SHOWN AND FILLED WITH CLASS A OR CLASS AA CONCRETE.
5. FOR BRACING DETAILS, SEE SHEET T31.1.2.
6. PAYMENT FOR SIGN ISLANDS WILL BE IN ACCORDANCE WITH THE CONTRACT PLANS OR SPECIAL PROVISIONS.

POST SIZE	ANCHOR POST SIZE	SLEEVE SIZE
50 mm	57 mm	64 mm
64 mm	75 mm	NOT REQ'D

METRIC NDOT

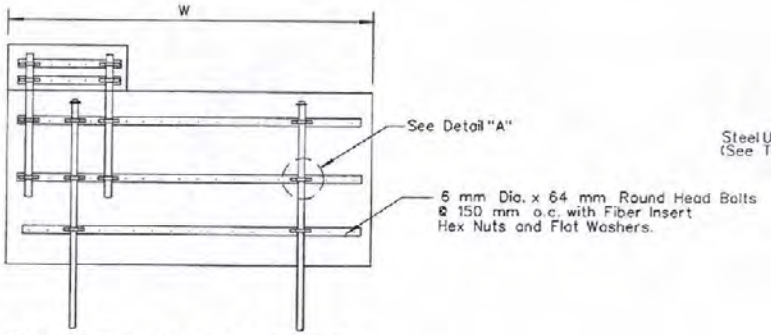
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

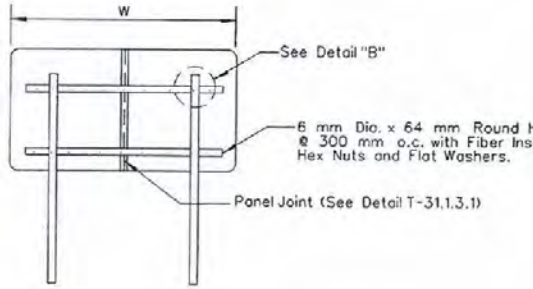
GROUND MOUNTED SIGN SUPPORTS (SQUARE METAL POSTS)

CHIEF TRAFFIC ENGR	ADOPTED: 7/96	REVISION 9/97

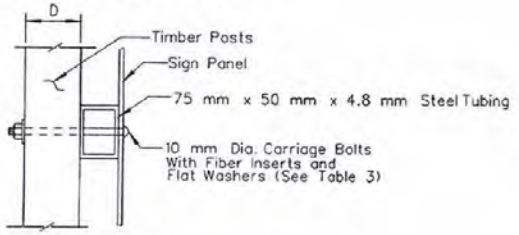
T-31.1.7 (627)



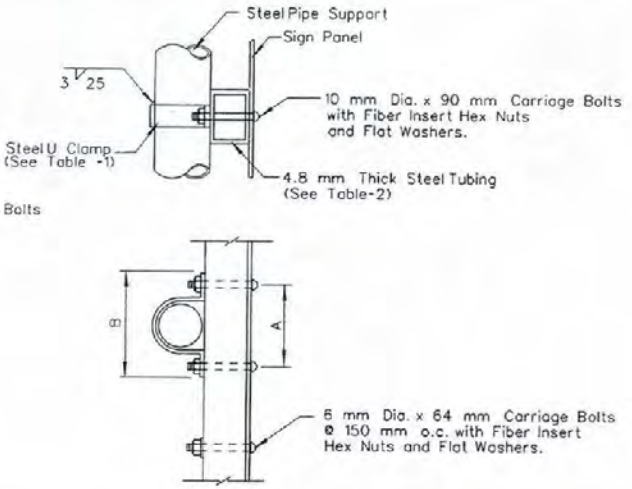
STEEL PIPE POST SUPPORTS



WOOD POST SUPPORTS



DETAIL "B"
WOOD POST MOUNTING



DETAIL "A"
ALTERNATE MOUNTING (STEEL POSTS)

TABLE - 1
(Clamp Sizes)
(mm)

PIPE DIA.	O.D.	A	B	CLAMPSTOCK
NPS 2	60	103	144	6 X 38
NPS 3	89	132	173	6 x 38

TABLE - 2
(Tubing Size)

SIGN WIDTH	TUBING SIZE (mm)
7.2 m or Less	75 x 50 x 4.8
7.2 m to 8.4 m	100 x 50 x 4.8

TABLE - 3

POST SIZE	"D"	BOLT SIZE
100 x 100	90	10 Dia. x 160
100 x 150	140	10 Dia. x 160
150 x 150	140	10 Dia. x 210
150 x 200	190	10 Dia. x 260

GENERAL NOTES:

1. FOR MOUNTING DETAILS NOT SHOWN, SEE SHEETS T-31.1.1 THROUGH T-31.1.4 FOR ROUND METAL SUPPORTS AND SHEETS T-31.1.5 AND T-31.1.6 FOR TIMBER SUPPORTS.
2. NPS = NOMINAL PIPE SIZE DESIGNATOR. SEE ASTM A 53.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

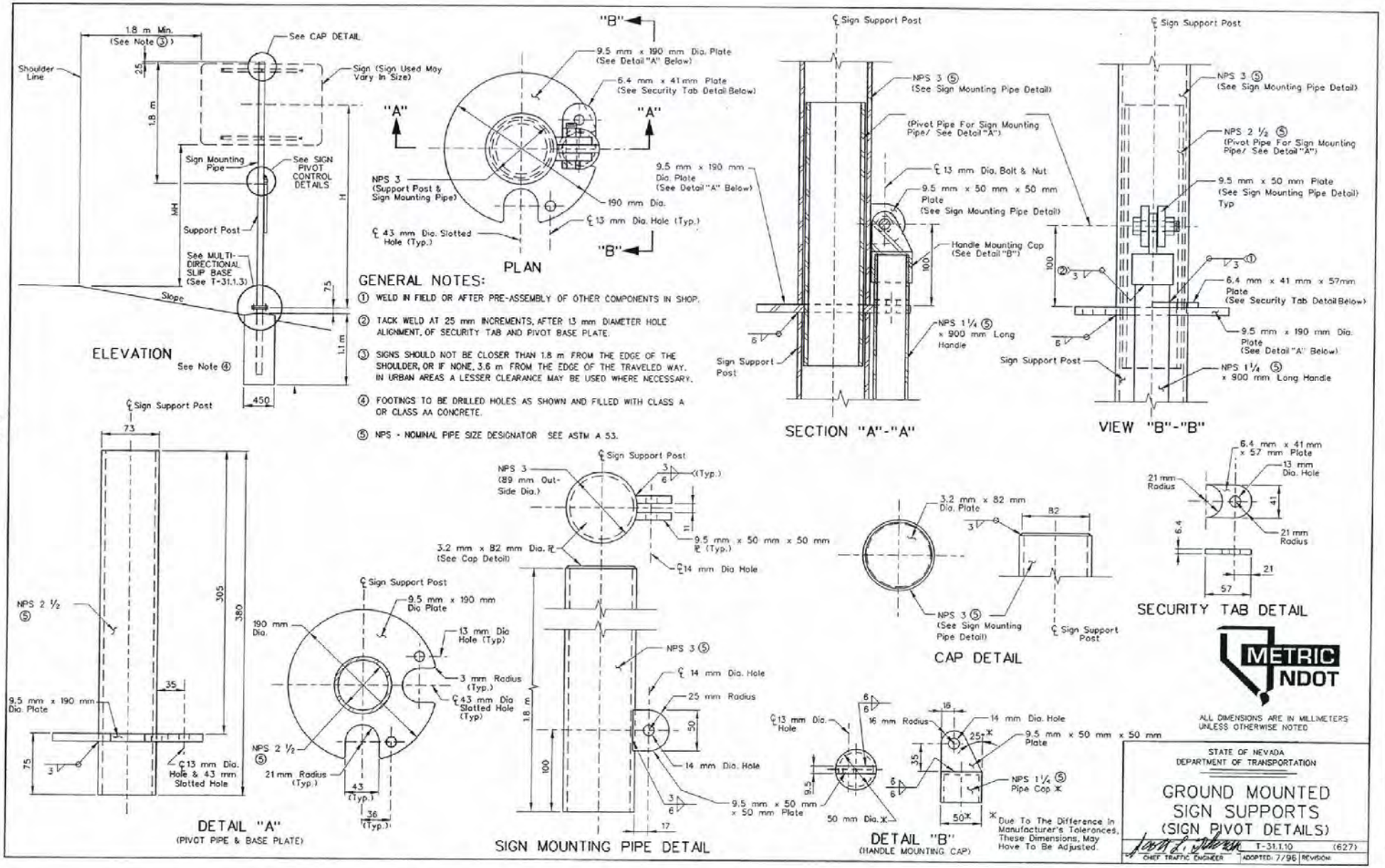
ALTERNATE MOUNTING DETAIL

CHIEF TRAFFIC ENGINEER

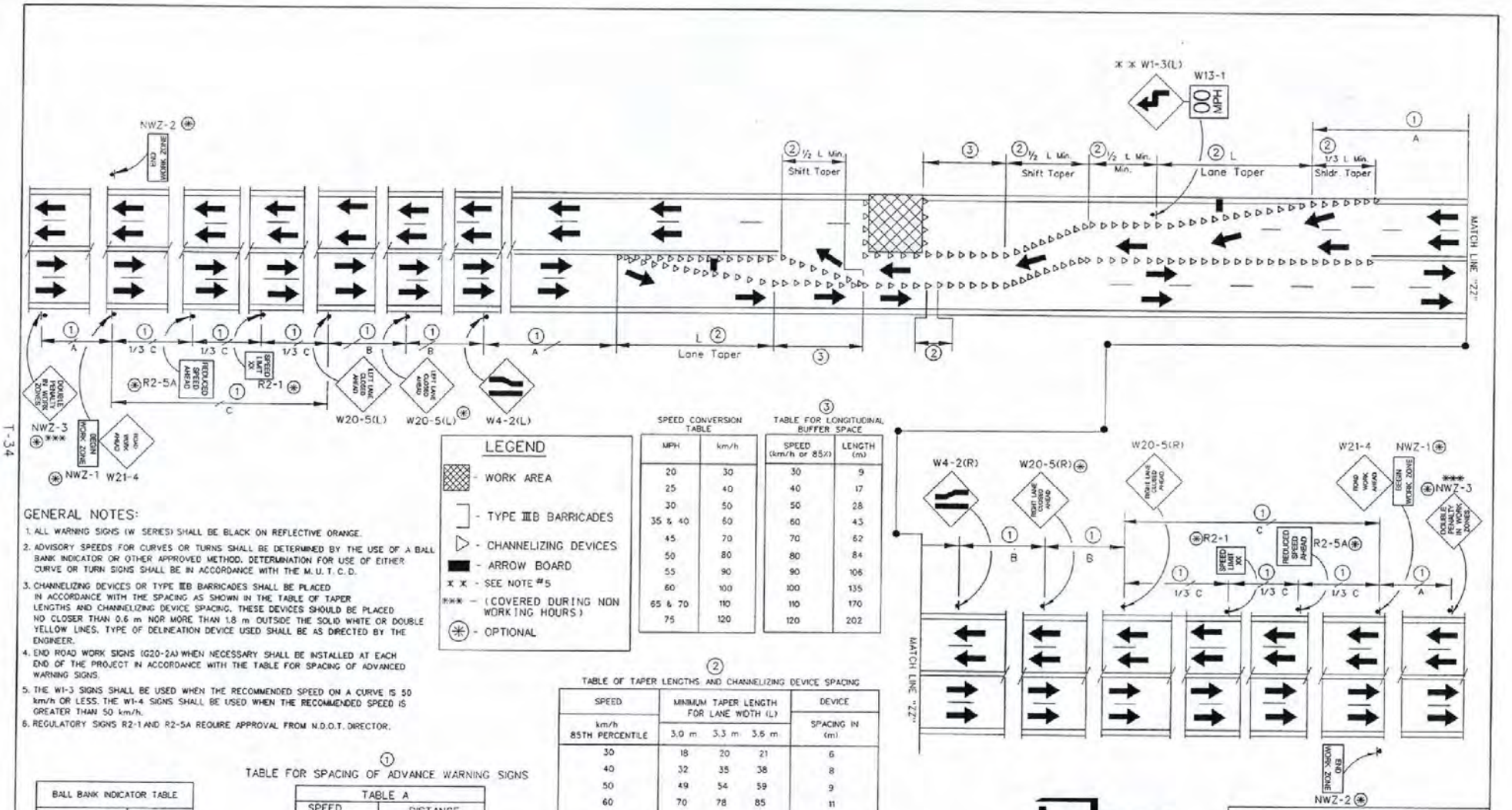
T-31.1.9 (627)

ADOPTED: 7/96

REVISION 9/97


1.8 m Min. (See Note ③)
See CAP DETAIL
Shoulder Line
Sign (Sign Used May Vary In Size)
Sign Mounting Pipe
See SIGN PIVOT CONTROL DETAILS
Support Post
See MULTI-DIRECTIONAL SLIP BASE (See T-31.1.3)
Slope
See Note ④
ELEVATION
"A"
"B"
9.5 mm x 190 mm Dia. Plate (See Detail "A" Below)
6.4 mm x 41 mm Plate (See Security Tab Detail Below)
NPS 3 (Support Post & Sign Mounting Pipe)
190 mm Dia.
℄ 43 mm Dia. Slotted Hole (Typ.)
℄ 13 mm Dia. Hole (Typ.)
PLAN
GENERAL NOTES:
① WELD IN FIELD OR AFTER PRE-ASSEMBLY OF OTHER COMPONENTS IN SHOP.
② TACK WELD AT 25 mm INCREMENTS, AFTER 13 mm DIAMETER HOLE ALIGNMENT, OF SECURITY TAB AND PIVOT BASE PLATE.
③ SIGNS SHOULD NOT BE CLOSER THAN 1.8 m FROM THE EDGE OF THE SHOULDER, OR IF NONE, 3.6 m FROM THE EDGE OF THE TRAVELED WAY. IN URBAN AREAS A LESSER CLEARANCE MAY BE USED WHERE NECESSARY.
④ FOOTINGS TO BE DRILLED HOLES AS SHOWN AND FILLED WITH CLASS A OR CLASS AA CONCRETE.
⑤ NPS - NOMINAL PIPE SIZE DESIGNATOR SEE ASTM A 53.
℄ Sign Support Post
NPS 3 ⑤ (See Sign Mounting Pipe Detail)
(Pivot Pipe For Sign Mounting Pipe/ See Detail "A")
℄ 13 mm Dia. Bolt & Nut
9.5 mm x 50 mm x 50 mm Plate (See Sign Mounting Pipe Detail)
Handle Mounting Cap (See Detail "B")
NPS 1¼ ⑤ x 900 mm Long Handle
Sign Support Post
SECTION "A"-"A"
NPS 2 ½ ⑤ (Pivot Pipe For Sign Mounting Pipe/ See Detail "A")
9.5 mm x 50 mm Plate (See Sign Mounting Pipe Detail) Typ
6.4 mm x 41 mm x 57mm Plate (See Security Tab Detail Below)
9.5 mm x 190 mm Dia. Plate (See Detail "A" Below)
VIEW "B"-"B"
NPS 2 ½ ⑤
9.5 mm x 190 mm Dia. Plate
13 mm Dia. Hole & 43 mm Slotted Hole
DETAIL "A" (PIVOT PIPE & BASE PLATE)
NPS 3 (89 mm Out-Side Dia.)
3.2 mm x 82 mm Dia. Plate (See Cap Detail)
9.5 mm x 50 mm x 50 mm PL (Typ.)
℄14 mm Dia Hole
NPS 3 ⑤
℄ 14 mm Dia. Hole
25 mm Radius
9.5 mm x 50 mm x 50 mm Plate
SIGN MOUNTING PIPE DETAIL
3.2 mm x 82 mm Dia. Plate
NPS 3 ⑤ (See Sign Mounting Pipe Detail)
CAP DETAIL
6.4 mm x 41 mm x 57 mm Plate
13 mm Dia. Hole
21 mm Radius
SECURITY TAB DETAIL
℄13 mm Dia. Hole
16 mm Radius
14 mm Dia. Hole
9.5 mm x 50 mm x 50 mm Plate
NPS 1¼ ⑤ Pipe Cap *
50 mm Dia. *
DETAIL "B" (HANDLE MOUNTING CAP)
* Due To The Difference In Manufacturer's Tolerances, These Dimensions, May Have To Be Adjusted.
METRIC NDOT
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
GROUND MOUNTED SIGN SUPPORTS (SIGN PIVOT DETAILS)
CHIEF TRAFFIC ENGINEER
T-31.1.10 (627)
ADOPTED: 7/96
REVISION:

T-33



T-34

GENERAL NOTES:

1. ALL WARNING SIGNS (W SERIES) SHALL BE BLACK ON REFLECTIVE ORANGE.
2. ADVISORY SPEEDS FOR CURVES OR TURNS SHALL BE DETERMINED BY THE USE OF A BALL BANK INDICATOR OR OTHER APPROVED METHOD. DETERMINATION FOR USE OF EITHER CURVE OR TURN SIGNS SHALL BE IN ACCORDANCE WITH THE M.U.T.C.D.
3. CHANNELIZING DEVICES OR TYPE IIIB BARRICADES SHALL BE PLACED IN ACCORDANCE WITH THE SPACING AS SHOWN IN THE TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING. THESE DEVICES SHOULD BE PLACED NO CLOSER THAN 0.6 m NOR MORE THAN 1.8 m OUTSIDE THE SOLID WHITE OR DOUBLE YELLOW LINES. TYPE OF DELINEATION DEVICE USED SHALL BE AS DIRECTED BY THE ENGINEER.
4. END ROAD WORK SIGNS (G20-2A) WHEN NECESSARY SHALL BE INSTALLED AT EACH END OF THE PROJECT IN ACCORDANCE WITH THE TABLE FOR SPACING OF ADVANCED WARNING SIGNS.
5. THE W1-3 SIGNS SHALL BE USED WHEN THE RECOMMENDED SPEED ON A CURVE IS 50 km/h OR LESS. THE W1-4 SIGNS SHALL BE USED WHEN THE RECOMMENDED SPEED IS GREATER THAN 50 km/h.
6. REGULATORY SIGNS R2-1 AND R2-5A REQUIRE APPROVAL FROM N.D.O.T. DIRECTOR.

LEGEND

- WORK AREA
- TYPE IIIB BARRICADES
- CHANNELIZING DEVICES
- ARROW BOARD
- x x - SEE NOTE #5
- *** - (COVERED DURING NON WORKING HOURS)
- (*) - OPTIONAL

SPEED CONVERSION TABLE

MPH	km/h
20	30
25	40
30	50
35 & 40	60
45	70
50	80
55	90
60	100
65 & 70	110
75	120

③ TABLE FOR LONGITUDINAL BUFFER SPACE

SPEED (km/h or 85%)	LENGTH (m)
30	9
40	17
50	28
60	43
70	62
80	84
90	106
100	135
110	170
120	202

② TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED km/h 85TH PERCENTILE	MINIMUM TAPER LENGTH FOR LANE WIDTH (L) 3.0 m	3.3 m	3.6 m	DEVICE SPACING IN (m)
30	18	20	21	6
40	32	35	38	8
50	49	54	59	9
60	70	78	85	11
70	133	148	162	13
80	152	168	182	15
90	170	187	198	17
100	180	208	227	19
110	210	230	250	21
120	228	250	273	23

BALL BANK INDICATOR TABLE

BELOW 30 km/h	14 DEGREES
40 TO 50 km/h	12 DEGREES
60 TO 120 km/h	10 DEGREES

ADVISORY SPEED PLATES SHALL NOT BE POSTED FOR CURVES OVER 80 km/h

① TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A SPEED 85TH. PERCENTILE km/h	DISTANCE BETWEEN SIGNS (m) A	B	C
0-30	60	60	60
> 30-50	90	90	90
> 50-65	120	120	120
> 65-80	180	180	180
> 80	300	480	780

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

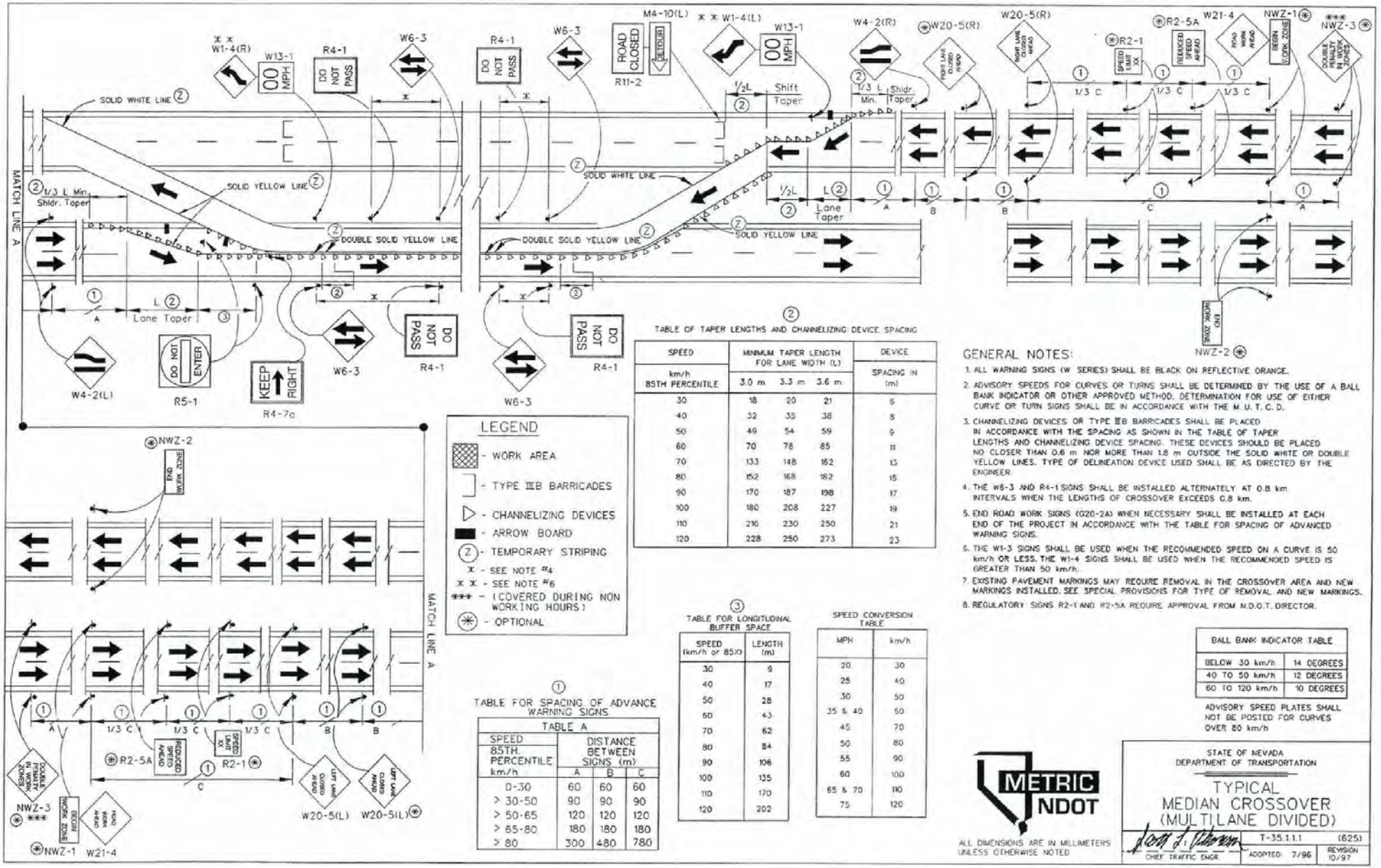
TYPICAL HALF ROAD CLOSURE (MULTILANE UNDIVIDED)

CHIEF TRAFFIC ENGR.

T-35.1.1 (525)

ADOPTED: 5/79

REVISION 10/97



LEGEND

- WORK AREA
- TYPE IIIB BARRICADES
- CHANNELIZING DEVICES
- ARROW BOARD
- (Z) - TEMPORARY STRIPING
- x - SEE NOTE #4
- x x - SEE NOTE #6
- *** - (COVERED DURING NON WORKING HOURS)
- (*) - OPTIONAL

(2) TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED km/h 85TH PERCENTILE	MINIMUM TAPER LENGTH FOR LANE WIDTH (L) 3.0 m	3.3 m	3.6 m	DEVICE SPACING IN (m)
30	18	20	21	5
40	32	35	38	8
50	49	54	59	9
60	70	78	85	11
70	133	148	162	13
80	152	168	182	15
90	170	187	198	17
100	180	208	227	19
110	210	230	250	21
120	228	250	273	23

GENERAL NOTES:

1. ALL WARNING SIGNS (W SERIES) SHALL BE BLACK ON REFLECTIVE ORANGE.
2. ADVISORY SPEEDS FOR CURVES OR TURNS SHALL BE DETERMINED BY THE USE OF A BALL BANK INDICATOR OR OTHER APPROVED METHOD. DETERMINATION FOR USE OF EITHER CURVE OR TURN SIGNS SHALL BE IN ACCORDANCE WITH THE M.U.T.C.D.
3. CHANNELIZING DEVICES OR TYPE IIIB BARRICADES SHALL BE PLACED IN ACCORDANCE WITH THE SPACING AS SHOWN IN THE TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING. THESE DEVICES SHOULD BE PLACED NO CLOSER THAN 0.6 m NOR MORE THAN 1.8 m OUTSIDE THE SOLID WHITE OR DOUBLE YELLOW LINES. TYPE OF DELINEATION DEVICE USED SHALL BE AS DIRECTED BY THE ENGINEER.
4. THE W6-3 AND R4-1 SIGNS SHALL BE INSTALLED ALTERNATELY AT 0.8 km INTERVALS WHEN THE LENGTHS OF CROSSOVER EXCEEDS 0.8 km.
5. END ROAD WORK SIGNS (G20-2A) WHEN NECESSARY SHALL BE INSTALLED AT EACH END OF THE PROJECT IN ACCORDANCE WITH THE TABLE FOR SPACING OF ADVANCED WARNING SIGNS.
6. THE W1-3 SIGNS SHALL BE USED WHEN THE RECOMMENDED SPEED ON A CURVE IS 50 km/h OR LESS. THE W1-4 SIGNS SHALL BE USED WHEN THE RECOMMENDED SPEED IS GREATER THAN 50 km/h.
7. EXISTING PAVEMENT MARKINGS MAY REQUIRE REMOVAL IN THE CROSSOVER AREA AND NEW MARKINGS INSTALLED. SEE SPECIAL PROVISIONS FOR TYPE OF REMOVAL AND NEW MARKINGS.
8. REGULATORY SIGNS R2-1 AND R2-5A REQUIRE APPROVAL FROM N.D.O.T. DIRECTOR.

(1) TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A SPEED 85TH. PERCENTILE km/h	DISTANCE BETWEEN SIGNS (m) A	B	C
0-30	60	60	60
> 30-50	90	90	90
> 50-65	120	120	120
> 65-80	180	180	180
> 80	300	480	780

(3) TABLE FOR LONGITUDINAL BUFFER SPACE

SPEED (km/h or 85%)	LENGTH (m)
30	9
40	17
50	28
60	43
70	62
80	84
90	106
100	135
110	170
120	202

SPEED CONVERSION TABLE

MPH	km/h
20	30
25	40
30	50
35 & 40	60
45	70
50	80
55	90
60	100
65 & 70	110
75	120

BALL BANK INDICATOR TABLE	
BELOW 30 km/h	14 DEGREES
40 TO 50 km/h	12 DEGREES
60 TO 120 km/h	10 DEGREES

ADVISORY SPEED PLATES SHALL NOT BE POSTED FOR CURVES OVER 80 km/h

METRIC NDOT

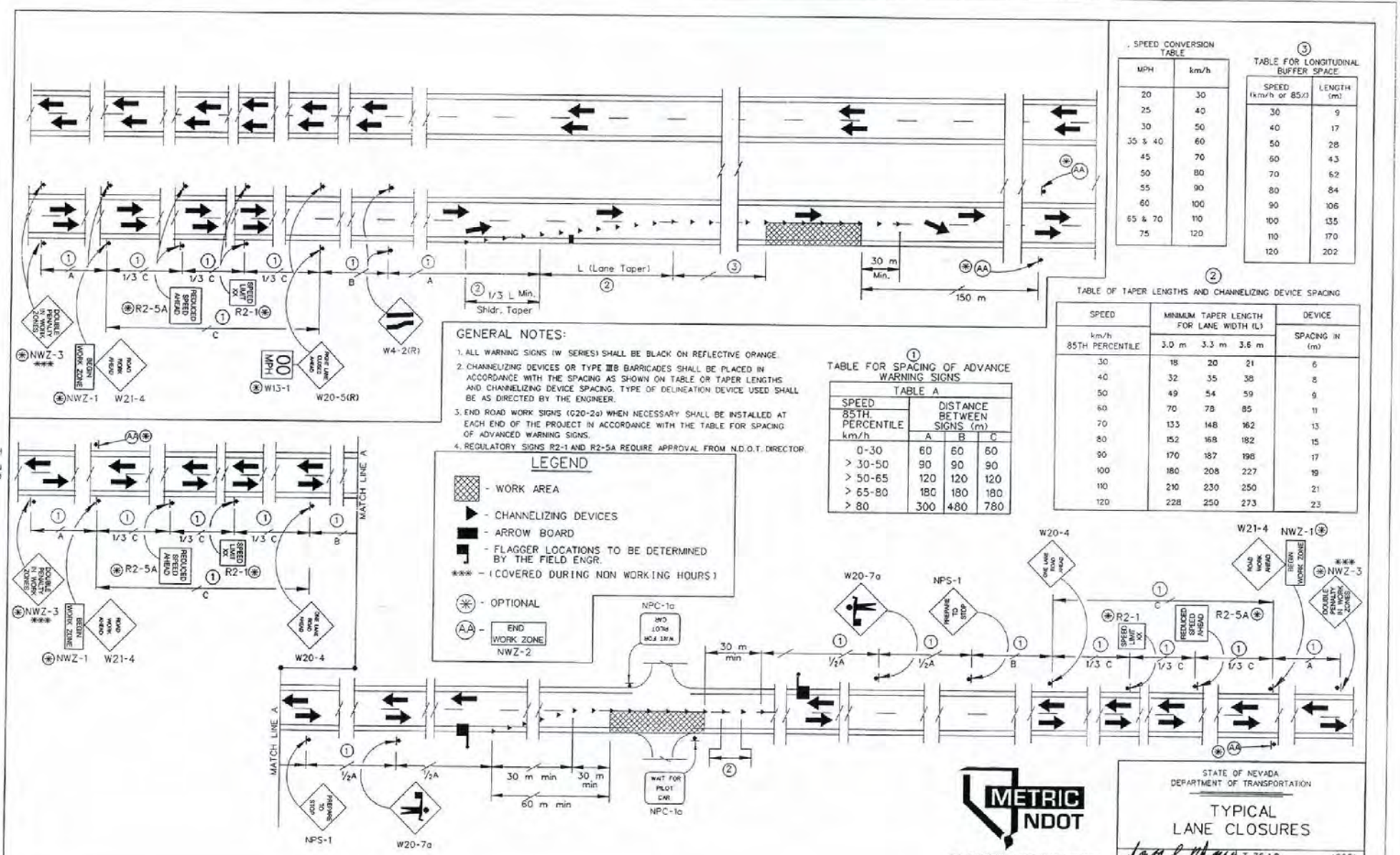
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL MEDIAN CROSSOVER (MULTILANE DIVIDED)

T-35.1.1.1 (625)

CHIEF TRAFFIC ENGR. — ADOPTED: 7/96 — REVISION 10/97



. SPEED CONVERSION TABLE

MPH	km/h
20	30
25	40
30	50
35 & 40	60
45	70
50	80
55	90
60	100
65 & 70	110
75	120

③ TABLE FOR LONGITUDINAL BUFFER SPACE

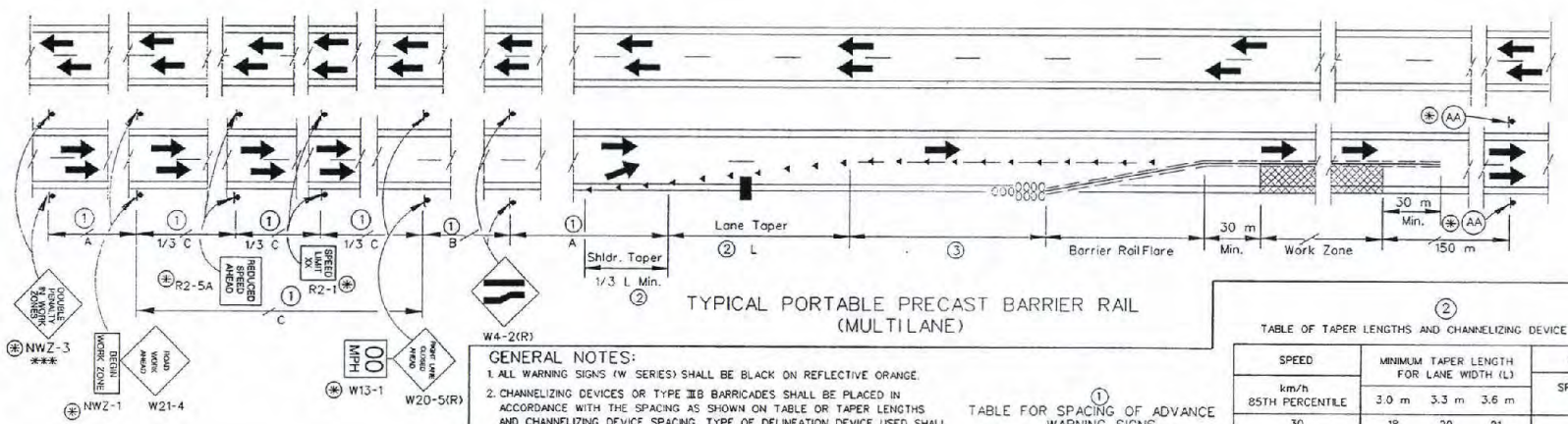
SPEED (km/h or 85%)	LENGTH (m)
30	9
40	17
50	28
60	43
70	62
80	84
90	106
100	135
110	170
120	202

① TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A			
SPEED 85TH PERCENTILE km/h	DISTANCE BETWEEN SIGNS (m) A	B	C
0-30	60	60	60
> 30-50	90	90	90
> 50-65	120	120	120
> 65-80	180	180	180
> 80	300	480	780

② TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED km/h 85TH PERCENTILE	MINIMUM TAPER LENGTH FOR LANE WIDTH (L) 3.0 m	3.3 m	3.6 m	DEVICE SPACING IN (m)
30	18	20	21	6
40	32	35	38	8
50	49	54	59	9
60	70	78	85	11
70	133	148	162	13
80	152	168	182	15
90	170	187	198	17
100	180	208	227	19
110	210	230	250	21
120	228	250	273	23



TYPICAL PORTABLE PRECAST BARRIER RAIL
(MULTI LANE)

SPEED CONVERSION TABLE

MPH	km/h
20	30
25	40
30	50
35 & 40	60
45	70
50	80
55	90
60	100
65 & 70	110
75	120

GENERAL NOTES:

1. ALL WARNING SIGNS (W SERIES) SHALL BE BLACK ON REFLECTIVE ORANGE.
2. CHANNELIZING DEVICES OR TYPE III BARRICADES SHALL BE PLACED IN ACCORDANCE WITH THE SPACING AS SHOWN ON TABLE OR TAPER LENGTHS AND CHANNELIZING DEVICE SPACING. TYPE OF DELINEATION DEVICE USED SHALL BE AS DIRECTED BY THE ENGINEER.
3. END ROAD WORK SIGNS (G20-2a) WHEN NECESSARY SHALL BE INSTALLED AT EACH END OF THE PROJECT IN ACCORDANCE WITH THE TABLE FOR SPACING OF ADVANCED WARNING SIGNS.
4. REGULATORY SIGNS R2-1 AND R2-5A REQUIRE APPROVAL FROM N.D.O.T. DIRECTOR.

(1) TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A

SPEED 85TH. PERCENTILE km/h	DISTANCE BETWEEN SIGNS (m) A	B	C
0-30	60	60	60
> 30-50	90	90	90
> 50-65	120	120	120
> 65-80	180	180	180
> 80	300	480	780

(2) TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

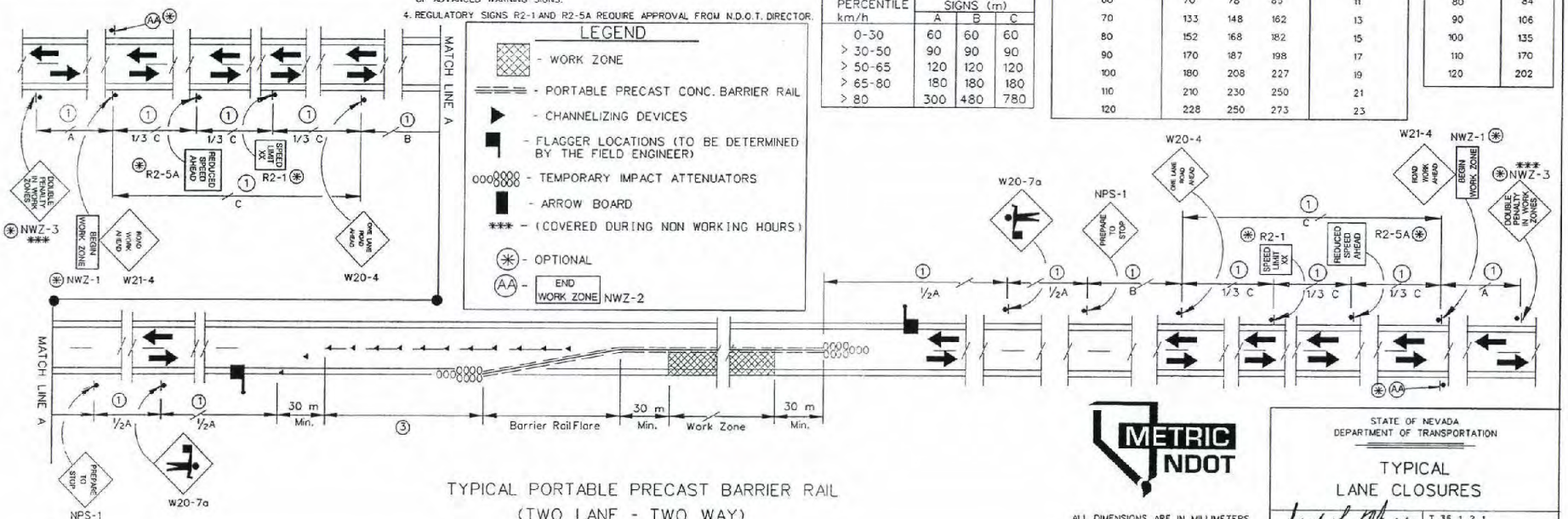
SPEED km/h 85TH PERCENTILE	MINIMUM TAPER LENGTH FOR LANE WIDTH (L) 3.0 m	3.3 m	3.6 m	DEVICE SPACING IN (m)
30	18	20	21	6
40	32	35	38	8
50	49	54	59	9
60	70	78	85	11
70	133	148	162	13
80	152	168	182	15
90	170	187	198	17
100	180	208	227	19
110	210	230	250	21
120	228	250	273	23

(3) TABLE FOR LONGITUDINAL BUFFER SPACE

SPEED (km/h or 85%)	LENGTH (m)
30	9
40	17
50	28
60	43
70	62
80	84
90	106
100	135
110	170
120	202

LEGEND

- WORK ZONE
- PORTABLE PRECAST CONC. BARRIER RAIL
- CHANNELIZING DEVICES
- FLAGGER LOCATIONS (TO BE DETERMINED BY THE FIELD ENGINEER)
- TEMPORARY IMPACT ATTENUATORS
- ARROW BOARD
- *** (COVERED DURING NON WORKING HOURS)
- (*) OPTIONAL
- (AA) END WORK ZONE NWZ-2



TYPICAL PORTABLE PRECAST BARRIER RAIL
(TWO LANE - TWO WAY)

METRIC NDOT

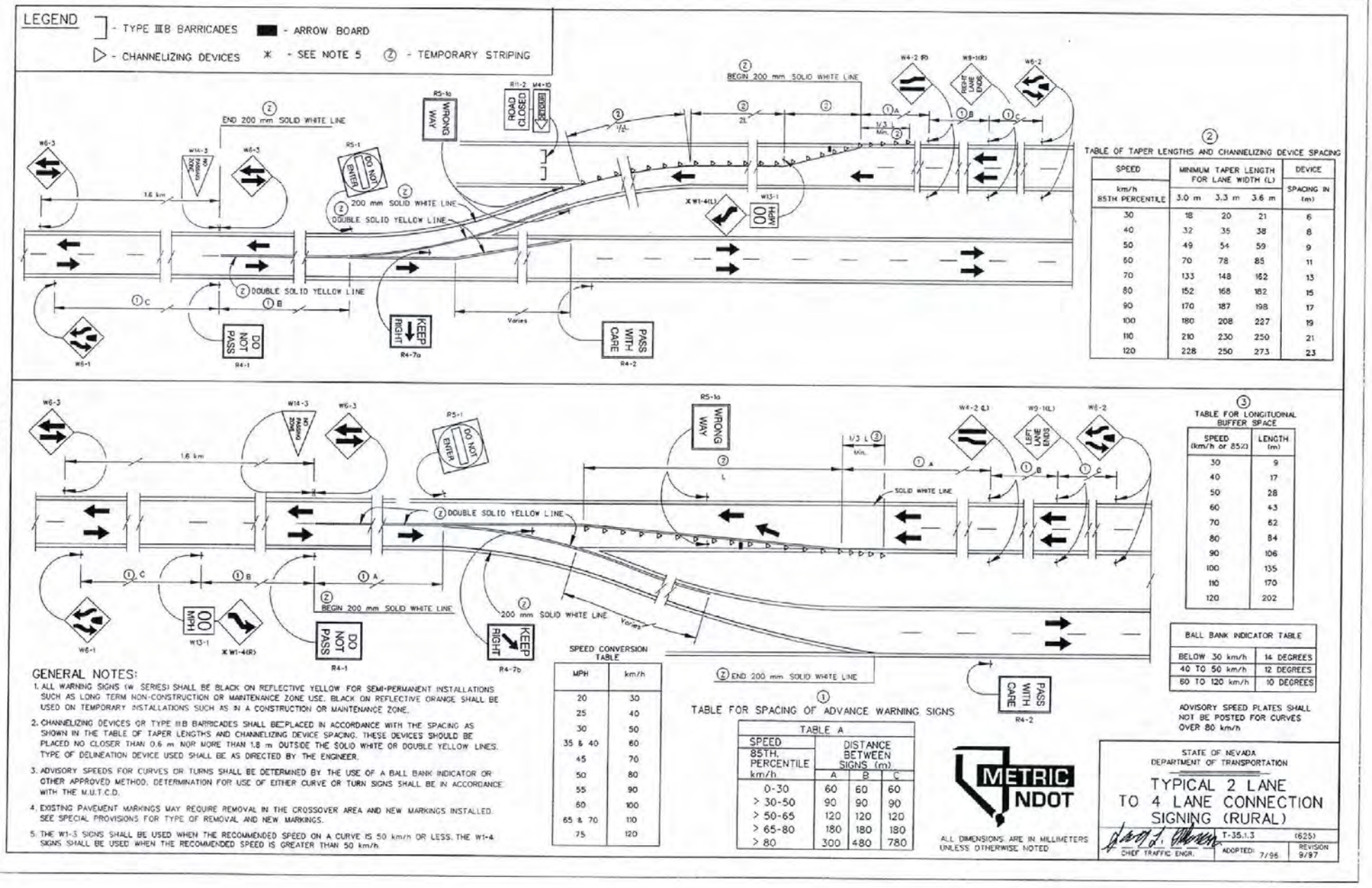
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL
LANE CLOSURES

Scott L. Thomas
CHIEF TRAFFIC ENGR.

T.35.1.2.1
ADOPTED: 7/98
REVISION 10/97



(2) TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED km/h 85TH PERCENTILE	MINIMUM TAPER LENGTH FOR LANE WIDTH (L) 3.0 m	3.3 m	3.6 m	DEVICE SPACING IN (m)
30	18	20	21	6
40	32	35	38	8
50	49	54	59	9
60	70	78	85	11
70	133	148	162	13
80	152	168	182	15
90	170	187	198	17
100	180	208	227	19
110	210	230	250	21
120	228	250	273	23

(3) TABLE FOR LONGITUDINAL BUFFER SPACE

SPEED (km/h or 85%)	LENGTH (m)
30	9
40	17
50	28
60	43
70	62
80	84
90	106
100	135
110	170
120	202

BALL BANK INDICATOR TABLE	
BELOW 30 km/h	14 DEGREES
40 TO 50 km/h	12 DEGREES
60 TO 120 km/h	10 DEGREES

ADVISORY SPEED PLATES SHALL NOT BE POSTED FOR CURVES OVER 80 km/h

SPEED CONVERSION TABLE

MPH	km/h
20	30
25	40
30	50
35 & 40	60
45	70
50	80
55	90
60	100
65 & 70	110
75	120

(1) TABLE FOR SPACING OF ADVANCE WARNING SIGNS

SPEED 85TH. PERCENTILE km/h	DISTANCE BETWEEN SIGNS (m) A	B	C
0-30	60	60	60
> 30-50	90	90	90
> 50-65	120	120	120
> 65-80	180	180	180
> 80	300	480	780

GENERAL NOTES:

1. ALL WARNING SIGNS (W SERIES) SHALL BE BLACK ON REFLECTIVE YELLOW FOR SEMI-PERMANENT INSTALLATIONS SUCH AS LONG TERM NON-CONSTRUCTION OR MAINTENANCE ZONE USE. BLACK ON REFLECTIVE ORANGE SHALL BE USED ON TEMPORARY INSTALLATIONS SUCH AS IN A CONSTRUCTION OR MAINTENANCE ZONE.
2. CHANNELIZING DEVICES OR TYPE IIIB BARRICADES SHALL BE PLACED IN ACCORDANCE WITH THE SPACING AS SHOWN IN THE TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING. THESE DEVICES SHOULD BE PLACED NO CLOSER THAN 0.6 m NOR MORE THAN 1.8 m OUTSIDE THE SOLID WHITE OR DOUBLE YELLOW LINES. TYPE OF DELINEATION DEVICE USED SHALL BE AS DIRECTED BY THE ENGINEER.
3. ADVISORY SPEEDS FOR CURVES OR TURNS SHALL BE DETERMINED BY THE USE OF A BALL BANK INDICATOR OR OTHER APPROVED METHOD. DETERMINATION FOR USE OF EITHER CURVE OR TURN SIGNS SHALL BE IN ACCORDANCE WITH THE M.U.T.C.D.
4. EXISTING PAVEMENT MARKINGS MAY REQUIRE REMOVAL IN THE CROSSOVER AREA AND NEW MARKINGS INSTALLED. SEE SPECIAL PROVISIONS FOR TYPE OF REMOVAL AND NEW MARKINGS.
5. THE W1-3 SIGNS SHALL BE USED WHEN THE RECOMMENDED SPEED ON A CURVE IS 50 km/h OR LESS. THE W1-4 SIGNS SHALL BE USED WHEN THE RECOMMENDED SPEED IS GREATER THAN 50 km/h

METRIC NDOT

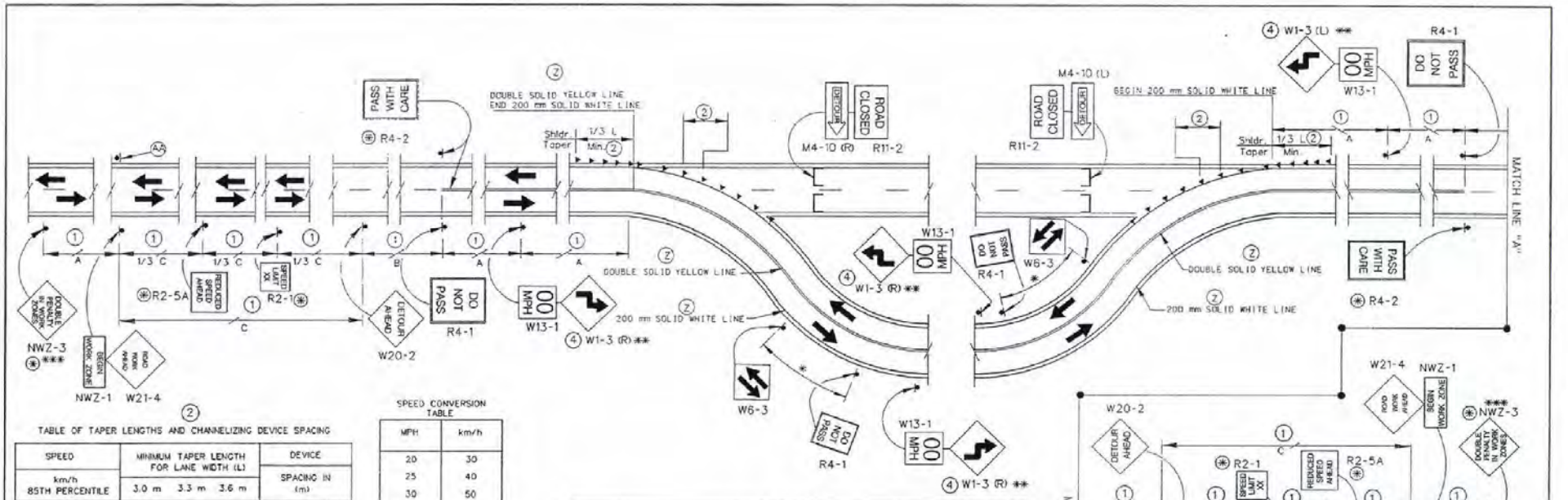
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL 2 LANE TO 4 LANE CONNECTION SIGNING (RURAL)

T-35.1.3 (625)

CHIEF TRAFFIC ENGR. | ADOPTED: 7/96 | REVISION 9/97



LEGEND

- WORK AREA
- TYPE IIIB BARRICADES
- CHANNELIZING DEVICES
- ARROW BOARD
- (AA) - END WORK ZONE NWZ-2
- (Z) - TEMPORARY STRIPING
- * - SEE GENERAL NOTE 4
- ** - SEE GENERAL NOTE 6
- (4) - SEE GENERAL NOTE 2
- *** - (COVERED DURING NON WORKING HOURS)
- (*) - OPTIONAL

(2) TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED km/h 85TH PERCENTILE	MINIMUM TAPER LENGTH FOR LANE WIDTH (L) 3.0 m	3.3 m	3.6 m	DEVICE SPACING IN (m)
30	18	20	21	6
40	32	35	38	8
50	49	54	59	9
60	70	78	85	11
70	133	148	162	13
80	152	168	182	15
90	170	187	198	17
100	180	208	227	19
110	210	230	250	21
120	228	250	273	23

SPEED CONVERSION TABLE

MPH	km/h
20	30
25	40
30	50
35 & 40	60
45	70
50	80
55	90
60	100
65 & 70	110
75	120

BALL BANK INDICATOR TABLE

BELOW 30 km/h	14 DEGREES
40 TO 50 km/h	12 DEGREES
60 TO 120 km/h	10 DEGREES

ADVISORY SPEED PLATES SHALL NOT BE POSTED FOR CURVES OVER 80 km/h

(1) TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A

SPEED 85TH PERCENTILE km/h	DISTANCE BETWEEN SIGNS (m) A	B	C
0-30	60	60	60
> 30-50	90	90	90
> 50-65	120	120	120
> 65-80	180	180	180
> 80	300	480	780

GENERAL NOTES:

1. ALL WARNING SIGNS (W SERIES) SHALL BE BLACK ON REFLECTIVE ORANGE.
2. ADVISORY SPEEDS FOR CURVES OR TURNS SHALL BE DETERMINED BY THE USE OF A BALL BANK INDICATOR OR OTHER APPROVED METHOD. DETERMINATION FOR USE OF EITHER CURVE OR TURN SIGNS SHALL BE IN ACCORDANCE WITH THE M.U.T.C.D.
3. CHANNELIZING DEVICES OR TYPE IIIB BARRICADES SHALL BE PLACED IN ACCORDANCE WITH THE SPACING AS SHOWN IN THE TABLE OR TAPER LENGTHS AND CHANNELIZING DEVICE SPACING. THESE DEVICES SHOULD BE PLACED NO CLOSER THAN 0.6 m NOR MORE THAN 1.8 m OUTSIDE THE SOLID WHITE OR DOUBLE YELLOW LINES. TYPE OF DELINEATION DEVICE USED SHALL BE AS DIRECTED BY THE ENGINEER.
4. THE W6-3 AND R4-1 SIGNS SHALL BE INSTALLED ALTERNATELY AT 0.8 km INTERVALS WHEN THE LENGTH OF CROSSOVER EXCEEDS 0.8 km.
5. END ROAD WORK SIGNS (G20-2a) WHEN NECESSARY SHALL BE INSTALLED AT EACH END OF THE PROJECT IN ACCORDANCE WITH THE TABLE FOR SPACING OF ADVANCED WARNING SIGNS.
6. THE W1-3 SIGNS SHALL BE USED WHEN THE RECOMMENDED SPEED ON A CURVE IS 50 km/h OR LESS. THE W1-4 SIGNS SHALL BE USED WHEN THE RECOMMENDED SPEED IS GREATER THAN 50 km/h.
7. EXISTING PAVEMENT MARKINGS MAY REQUIRE REMOVAL IN THE CROSSOVER AREA AND NEW MARKINGS INSTALLED. SEE SPECIAL PROVISIONS FOR TYPE OF REMOVAL AND NEW MARKINGS.
8. REGULATORY SIGNS R2-1 AND R2-5A REQUIRE APPROVAL FROM N.D.O.T. DIRECTOR.

METRIC NDOT

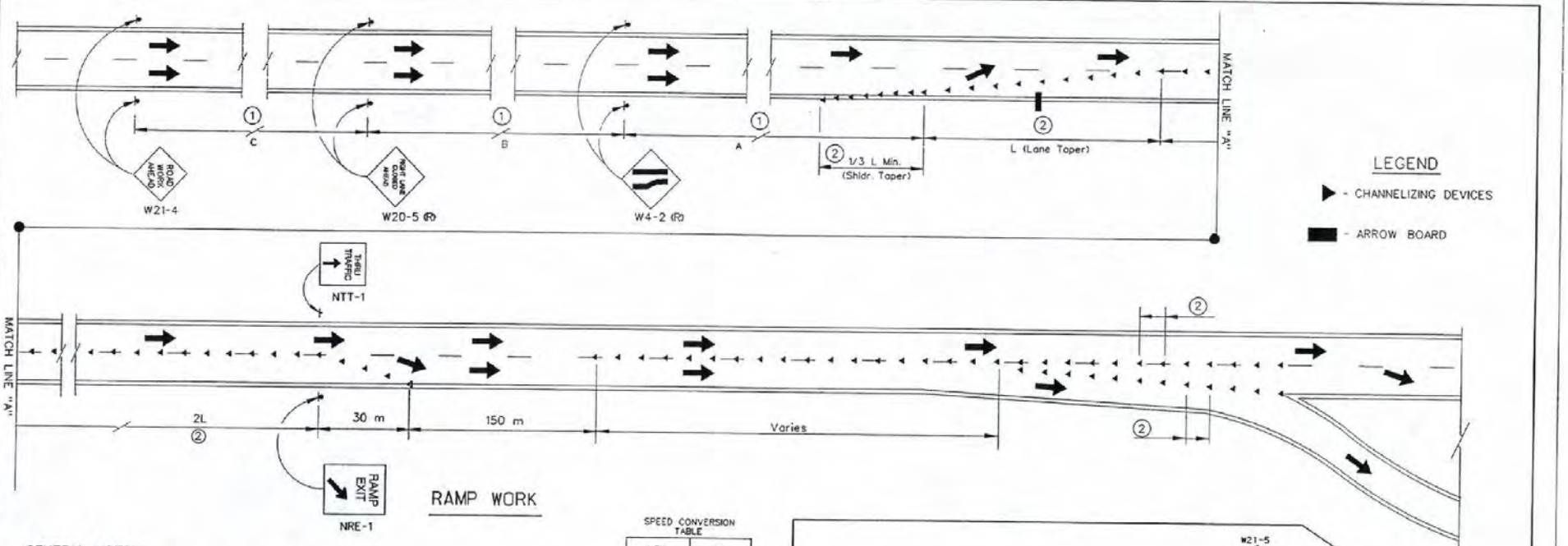
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL ROAD CLOSURE DETOUR

Janet L. Brown
CHIEF TRAFFIC ENGR.

T-35.1.4 (625)
ADOPTED: 7/96
REVISION 10/97



RAMP WORK

GENERAL NOTES:

1. ALL WARNING SIGNS (W SERIES) SHALL BE BLACK ON REFLECTIVE ORANGE.
2. TRAFFIC CONES, GUIDE POSTS, VERTICAL PANELS OR TYPE IIIB BARRICADES SHALL BE PLACED IN ACCORDANCE WITH THE SPACING AS SHOWN ON TABLE OR TAPER LENGTHS AND CHANNELIZING DEVICE SPACING, TYPE OF DELINEATION DEVICE USED SHALL BE AS DIRECTED BY THE ENGINEER.
3. END ROAD WORK SIGNS (G20-2a) WHEN NECESSARY SHALL BE INSTALLED AT EACH END OF THE PROJECT IN ACCORDANCE WITH THE TABLE FOR SPACING OF ADVANCED WARNING SIGNS.

(2)

TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED	MINIMUM TAPER LENGTH FOR LANE WIDTH (L)			DEVICE
km/h 85TH PERCENTILE	3.0 m	3.3 m	3.6 m	SPACING IN (m)
30	18	20	21	6
40	32	35	38	8
50	49	54	59	9
60	70	78	85	11
70	133	148	162	13
80	152	168	182	15
90	170	187	198	17
100	180	208	227	19
110	210	230	250	21
120	228	250	273	23

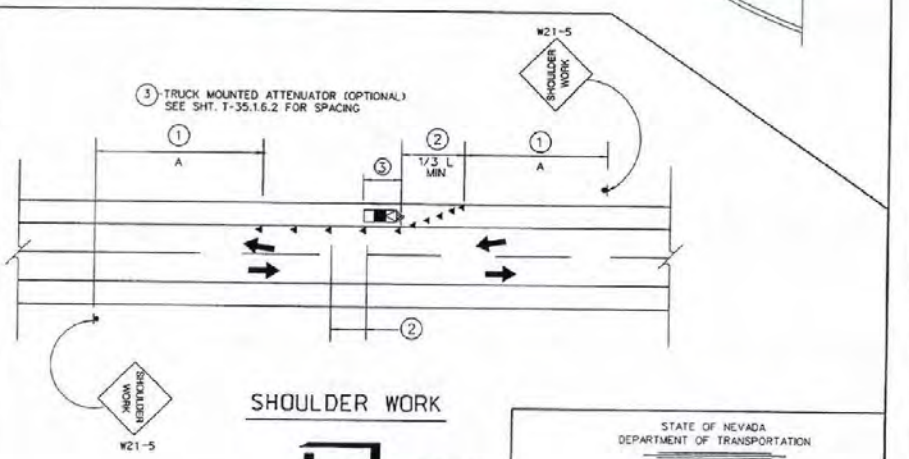
SPEED CONVERSION TABLE

MPH	km/h
20	30
25	40
30	50
35 & 40	60
45	70
50	80
55	90
60	100
65 & 70	110
75	120

(1)

TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A			
SPEED 85TH. PERCENTILE km/h	DISTANCE BETWEEN SIGNS (m)		
	A	B	C
0-30	60	60	60
> 30-50	90	90	90
> 50-65	120	120	120
> 65-80	180	180	180
> 80	300	480	780



SHOULDER WORK

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

METRIC NDOT

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

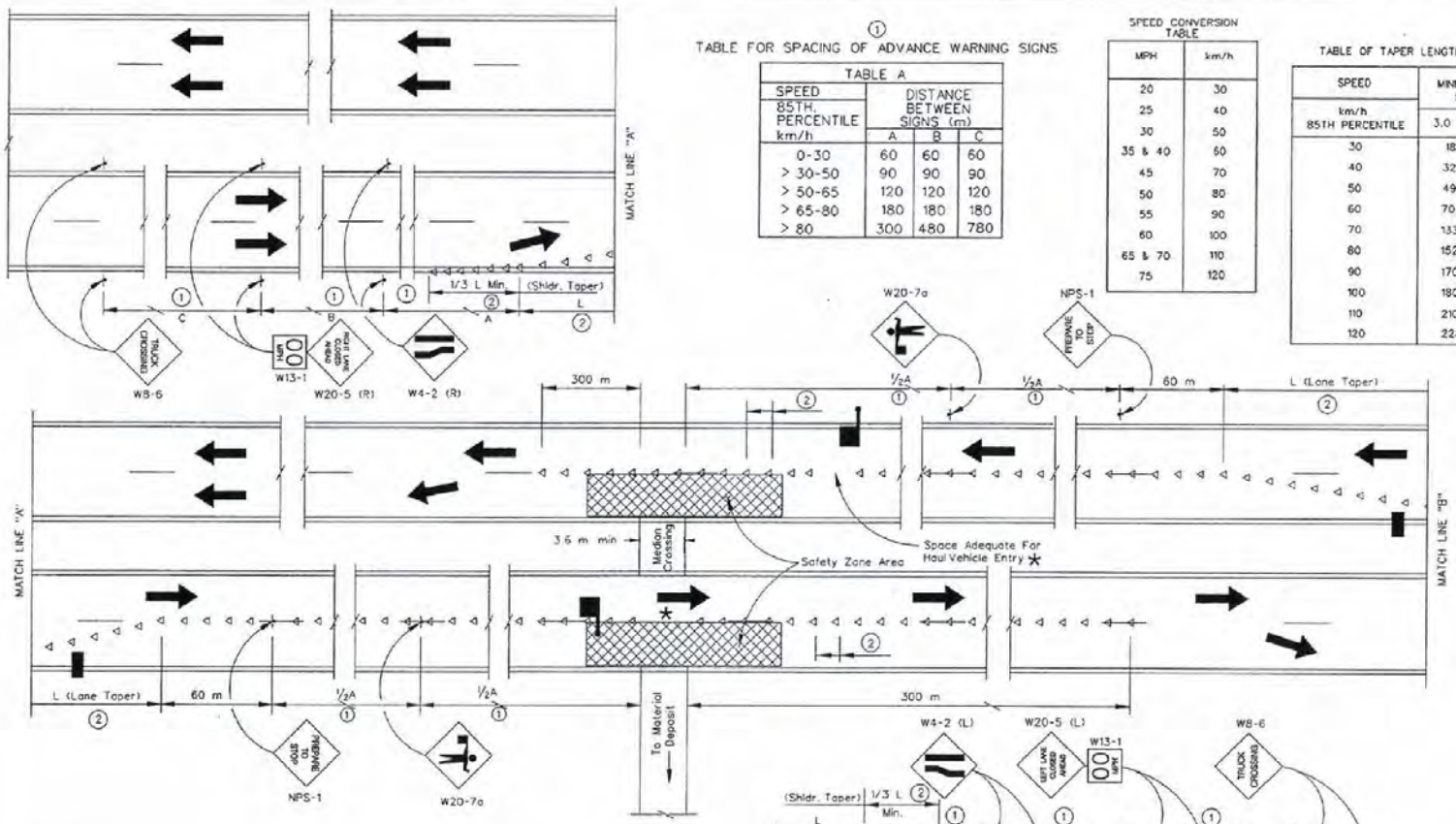
TYPICAL EXIT RAMP & SHOULDER WORK

CHIEF TRAFFIC ENGR.

T-35.1.5 (625)

ADOPTED: 7/96

REVISION 9/97



① TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A			
SPEED 85TH. PERCENTILE km/h	DISTANCE BETWEEN SIGNS (m) A	B	C
0-30	60	60	60
> 30-50	90	90	90
> 50-65	120	120	120
> 65-80	180	180	180
> 80	300	480	780

SPEED CONVERSION TABLE

MPH	km/h
20	30
25	40
30	50
35 & 40	60
45	70
50	80
55	90
60	100
65 & 70	110
75	120

② TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED km/h 85TH PERCENTILE	MINIMUM TAPER LENGTH FOR LANE WIDTH (L) 3.0 m	3.3 m	3.6 m	DEVICE SPACING IN (m)
30	18	20	21	6
40	32	35	38	8
50	49	54	59	9
60	70	78	85	11
70	133	148	162	13
80	152	168	182	15
90	170	187	198	17
100	180	208	227	19
110	210	230	250	21
120	228	250	273	23

LEGEND

- SAFETY ZONE AREA
- CHANNELIZING DEVICES
- FLAGGER (LOCATIONS TO BE DETERMINED BY THE FIELD ENGR.)
- ARROW BOARD

GENERAL NOTES:

1. ALL WARNING SIGNS (W SERIES) SHALL BE BLACK ON REFLECTIVE ORANGE.
2. CHANNELIZING DEVICES OR TYPE III BARRICADES SHALL BE PLACED IN ACCORDANCE WITH THE SPACING AS SHOWN ON TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING. TYPE OF DELINEATION DEVICE USED SHALL BE AS DIRECTED BY THE ENGINEER.
3. END ROAD WORK SIGN (G20-2a) WHEN NECESSARY SHALL BE INSTALLED AT EACH END OF THE PROJECT IN ACCORDANCE WITH THE TABLE FOR SPACING OF ADVANCE WARNING SIGNS.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

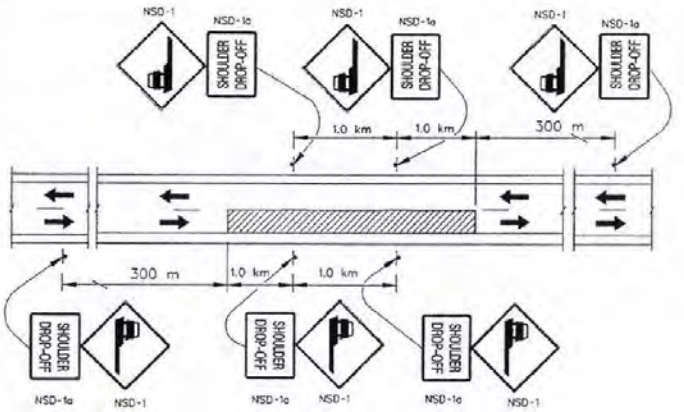
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL TRAFFIC CONTROL FOR HAUL ROAD (MULTILANE)

CHIEF TRAFFIC ENGR.

T-35.1.6 (625)

ADOPTED: 7/96 REVISION 9/97



TYPICAL PLACEMENT OF SHOULDER DROP OFF SIGNS
(PLACED WHEN SHOULDER DROP-OFF EXIST DURING NON-WORKING HOURS)

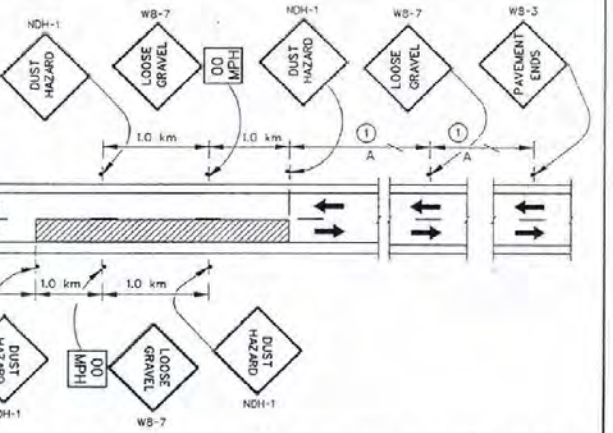
NOTE: THE "SHOULDER DROP-OFF" SYMBOL SIGN AND PLAQUE ARE TO BE USED IN ALL CASES WHERE THERE IS A VERTICAL DIFFERENCE OF 50 mm OR GREATER AT THE SHOULDER.
THE "SHOULDER DROP-OFF" PLAQUE SHALL ONLY BE USED WITH THE "SHOULDER DROP-OFF" SYMBOL SIGN.

SPEED CONVERSION TABLE

MPH	km/h
20	30
25	40
30	50
35 & 40	60
45	70
50	80
55	90
60	100
65 & 70	110
75	120

LEGEND

- LIMITS OF PAVING OPERATION OR MILLING OPERATION (DAILY RUN)

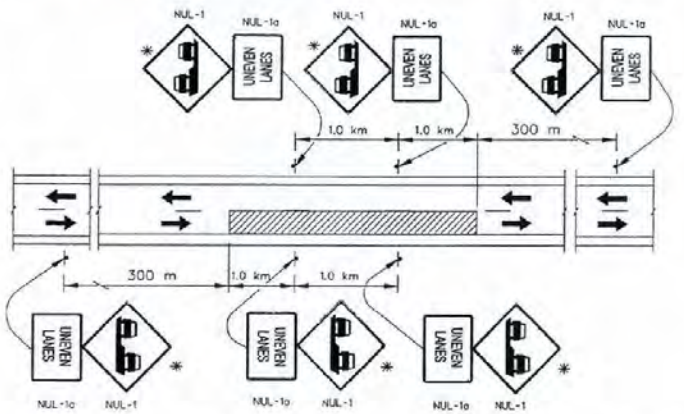


TYPICAL PLACEMENT OF LOOSE GRAVEL/DUST HAZARD (ALTERNATING) SIGNS

LEGEND

- LIMITS OF PAVING OPERATION OR MILLING OPERATION (DAILY RUN)
* - MIRROR SIGNS WHEN APPLICABLE

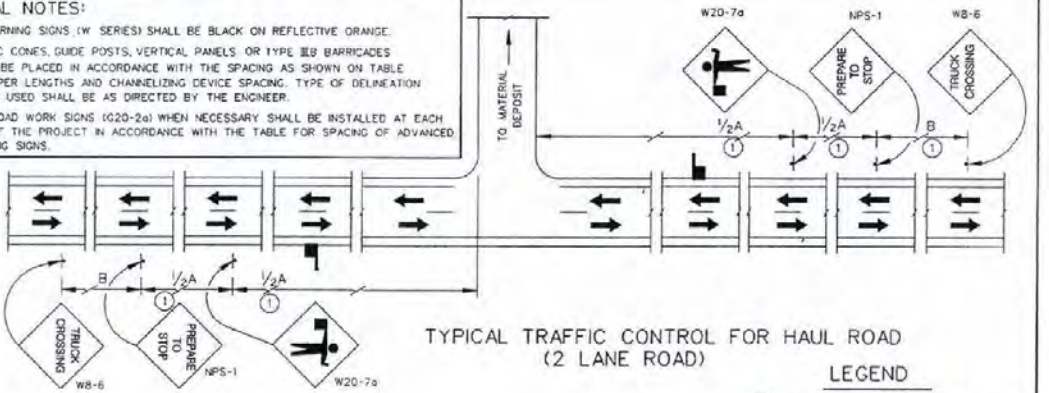
NOTE: THE "UNEVEN LANES" SYMBOL SIGN AND PLAQUE ARE TO BE USED IN ALL CASES WHERE THERE IS A VERTICAL DIFFERENCE OF 25 mm TO 75 mm BETWEEN THE TRAVEL LANES.
THE "UNEVEN LANES" PLAQUE SHALL ONLY BE USED WITH THE "UNEVEN LANES" SYMBOL SIGN.



TYPICAL PLACEMENT OF UNEVEN LANES SIGNS
(PLACED WHEN UNEVEN LANES EXIST DURING NON-WORKING HOURS)

GENERAL NOTES:

1. ALL WARNING SIGNS (W SERIES) SHALL BE BLACK ON REFLECTIVE ORANGE.
2. TRAFFIC CONES, GUIDE POSTS, VERTICAL PANELS OR TYPE III B BARRICADES SHALL BE PLACED IN ACCORDANCE WITH THE SPACING AS SHOWN ON TABLE OR TAPER LENGTHS AND CHANNELIZING DEVICE SPACING. TYPE OF DELINEATION DEVICE USED SHALL BE AS DIRECTED BY THE ENGINEER.
3. END ROAD WORK SIGNS (G20-2a) WHEN NECESSARY SHALL BE INSTALLED AT EACH END OF THE PROJECT IN ACCORDANCE WITH THE TABLE FOR SPACING OF ADVANCED WARNING SIGNS.



TYPICAL TRAFFIC CONTROL FOR HAUL ROAD
(2 LANE ROAD)

LEGEND

- FLAGGER (LOCATIONS TO BE DETERMINED BY THE FIELD ENGR.)

TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A

SPEED 85TH. PERCENTILE km/h	DISTANCE BETWEEN SIGNS (m) A	B	C
0-30	60	60	60
> 30-50	90	90	90
> 50-65	120	120	120
> 65-80	180	180	180
> 80	300	480	780

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

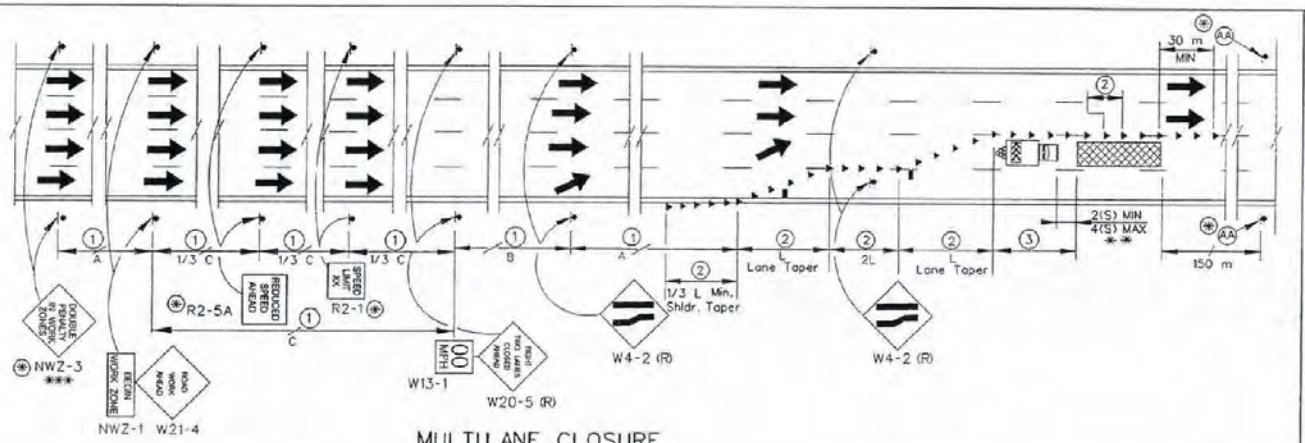
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL TRAFFIC CONTROL SIGNING

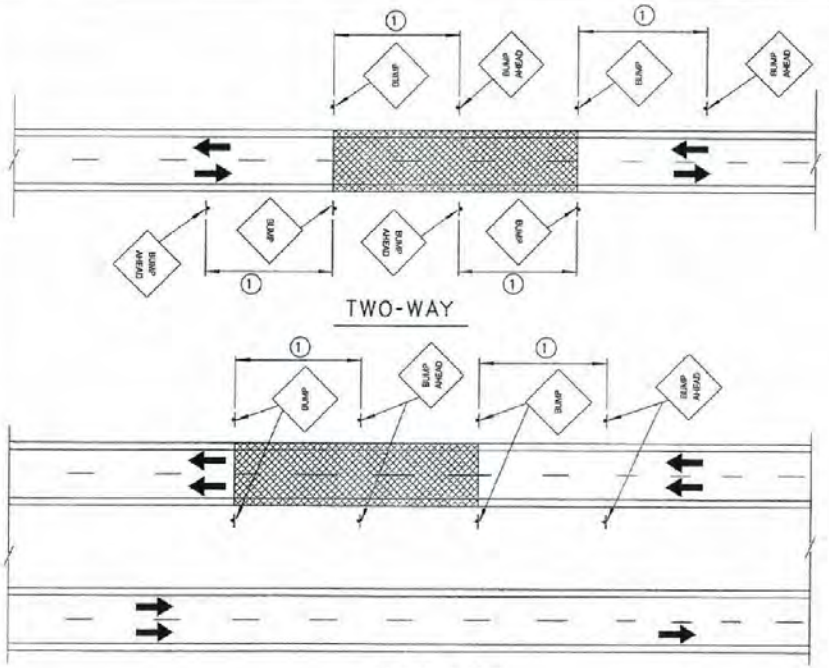
Scott L. Osborn
CHIEF TRAFFIC ENGR.

T-35.1.6.1 (1251)
ADOPTED: 7-96
REVISION 9/97

T-42



MULTILANE CLOSURE



TWO-WAY

MULTI-LANE

GENERAL NOTES:

1. ALL WARNING SIGNS (W SERIES) SHALL BE BLACK ON REFLECTIVE ORANGE.
2. TRAFFIC CONES, GUIDE POSTS, VERTICAL PANELS OR TYPE IIIB BARRICADES SHALL BE PLACED IN ACCORDANCE WITH THE SPACING AS SHOWN ON TABLE OR TAPER LENGTHS AND CHANNELIZING DEVICE SPACING. TYPE OF DELINEATION DEVICE USED SHALL BE AS DIRECTED BY THE ENGINEER.
3. END ROAD WORK SIGNS (G20-2a) WHEN NECESSARY SHALL BE INSTALLED AT EACH END OF THE PROJECT IN ACCORDANCE WITH THE TABLE FOR SPACING OF ADVANCED WARNING SIGNS.
4. REGULATORY SIGNS R2-1 AND R2-5A REQUIRE APPROVAL FROM N.D.O.T. DIRECTOR.
5. CONVERT MIN.-MAX. OFFSET X MPH TO METRIC EQUIVALENT (METERS)

(2)
TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED	MINIMUM TAPER LENGTH FOR LANE WIDTH (L)			DEVICE
km/h 85TH PERCENTILE	3.0 m	3.3 m	3.6 m	SPACING IN (m)
30	18	20	21	6
40	32	35	38	8
50	49	54	59	9
60	70	78	85	11
70	133	148	162	13
80	152	168	182	15
90	170	187	198	17
100	180	208	227	19
110	210	230	250	21
120	228	250	273	23

(1)
TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A			
SPEED 85TH. PERCENTILE km/h	DISTANCE BETWEEN SIGNS (m) A	B	C
0-30	60	60	60
> 30-50	90	90	90
> 50-65	120	120	120
> 65-80	180	180	180
> 80	300	480	780

(3)
TABLE FOR LONGITUDINAL BUFFER SPACE

SPEED (km/h or 85%)	LENGTH (m)
30	9
40	17
50	28
60	43
70	62
80	84
90	106
100	135
110	170
120	202

SPEED CONVERSION TABLE

MPH	km/h
20	30
25	40
30	50
35 & 40	60
45	70
50	80
55	90
60	100
65 & 70	110
75	120

LEGEND

- WORK AREA
- TYPE IIIB BARRICADES
- CHANNELIZING DEVICES
- ARROW BOARD
- (S) - POSTED SPEED (MPH)
- TRUCK MOUNTED IMPACT ATTENUATOR (OPTIONAL)
- ** - SEE NOTE 5
- *** - (COVERED DURING NON WORKING HOURS)
- (AA) - END WORK ZONE NWZ-2
- (*) - OPTIONAL

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

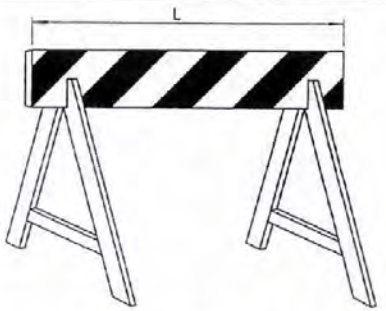
TYPICAL TRAFFIC CONTROL SIGNING

CHIEF TRAFFIC ENGR.

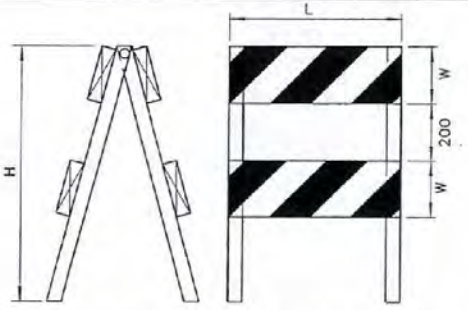
T-35.1.6.2

ADOPTED: 7/96

REVISION 10/97



TYPE I BARRICADE



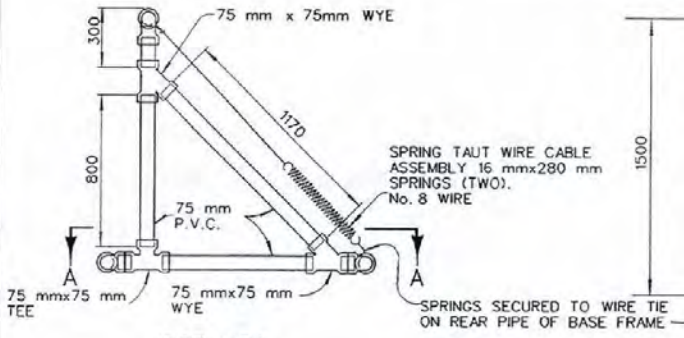
TYPE II BARRICADE
(FRAMEWORK TO BE WHITE)

NOTE: TYPE IIIB BARRICADES USED FOR TEMPORARY SIGN SUPPORTS, SIGNS SHALL BE MOUNTED 300 mm MIN. FROM GROUND.

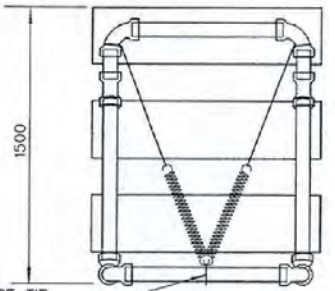
BARRICADE CHARACTERISTICS

	TYPE I BARRICADE	TYPE II BARRICADE
W= Width of Rail	200 mm Min. - 275 mm Max.	200 mm Min. -300 mm Max.
L= Length of Rail	0.6 m Min.	0.6 m Min.
Width of Stripes	Rail Length <0.9 m = 100 mm Rail Length ≥0.9 m = 150 mm	Rail Length <0.9 m = 100 mm Rail Length ≤0.9 m = 150 mm
H= Height	0.9 m Min.	0.9 m Min.
Number of Reflectorized Rail faces	2 (One each Direction)	4 (Two each Direction)

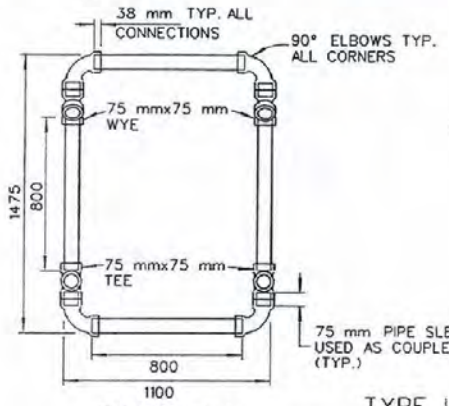
MARKINGS FOR BARRIER RAILS AND VERTICAL PANELS SHALL BE ALTERNATE REFLECTORIZED ORANGE AND REFLECTORIZED WHITE STRIPES SLOPING DOWNWARD AT AN ANGLE OF 45 DEGREES IN THE DIRECTION OF TRAFFIC.



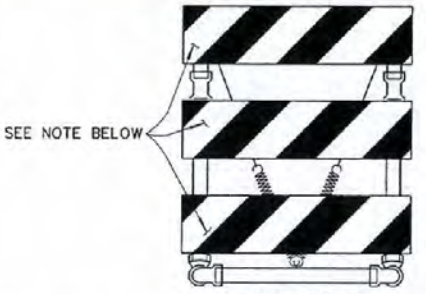
SIDE VIEW



BACK VIEW



SECTION A-A



FRONT VIEW

NOTE: 225 mm x 1200 mm BARRICADE HAZARD PANELS ORANGE AND WHITE RIGHT OR LEFT, (0.6 mm ANODIZED ALUMINUM) PANELS ATTACHED WITH 25 mm No. 14 PAN HEAD METAL SCREW OR 3.2 mm POLYETHYLENE WITH PLASTIC RIVETS

TYPE III B BARRICADE
(BARRICADE TO BE WEIGHTED DOWN WITH SANDBAGS.)

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

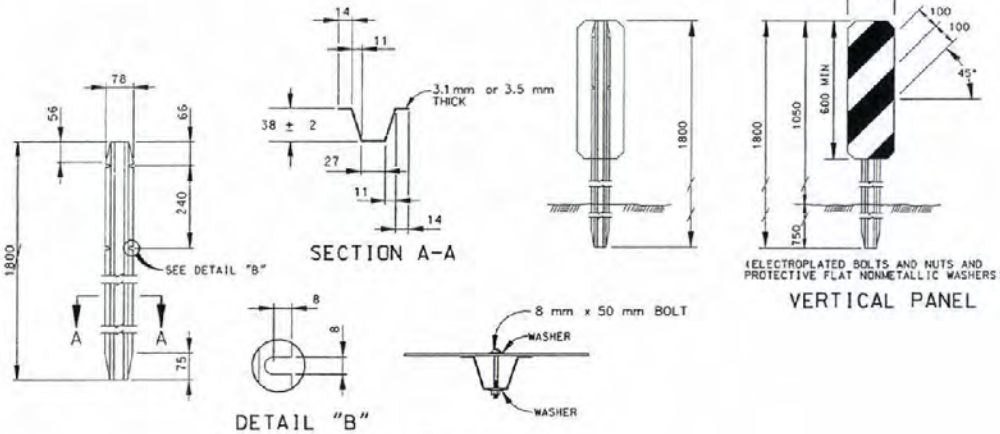
BARRICADES

CHIEF TRAFFIC ENGR.

T-35.1.7 (625)

ADOPTED: 7/96 REVISION 11/97

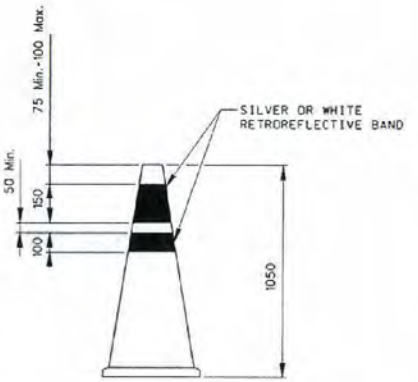
T-44



DETAIL "B"

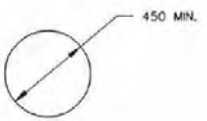
POST DETAILS

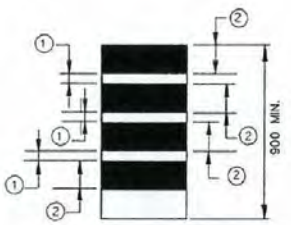
VERTICAL PANEL



1. CONES TO BE PREDOMINATELY ORANGE.
2. CONES TO BE USED DURING HOURS OF DARKNESS SHALL BE RETROREFLECTIVE AS SHOWN ABOVE.
3. CONES SHALL HAVE WEIGHTED BASES.

TRAFFIC CONES





TRAFFIC DRUMS

① - 50 mm MAX. NON RETROREFLECTIVE MATERIAL
② - 100 mm MIN. - 150 mm MAX. RETROREFLECTIVE MATERIAL

NOTE: DRUMS/BARRELS SHALL HAVE A MIN. OF 2 WHITE AND 2 ORANGE RETROREFLECTIVE BANDS AND 450 mm WIDTH REGARDLESS OF ORIENTATION

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

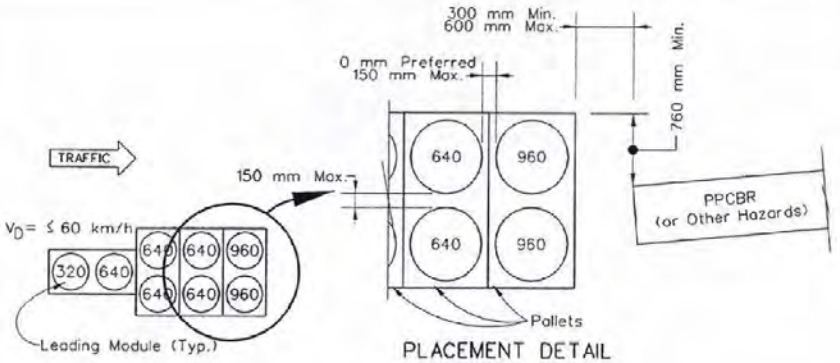
TRAFFIC CONES, DRUMS, BARRELS AND VERTICAL PANELS

CHIEF TRAFFIC ENGR.

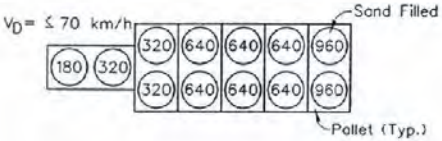
T-35.1.7.1 (625)

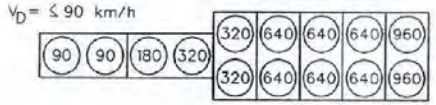
ADOPTED: 7/96

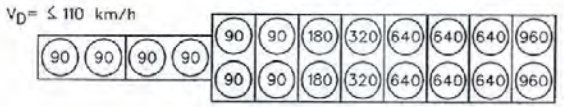
REVISION 9/97

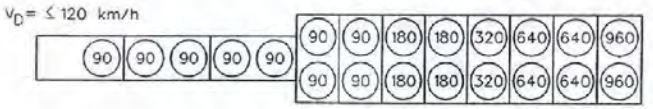


PLACEMENT DETAIL

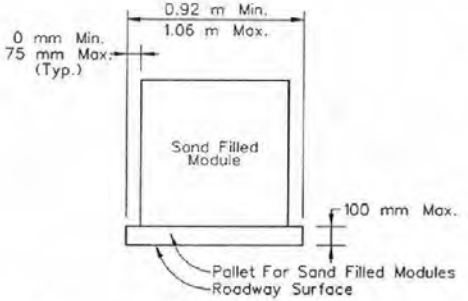


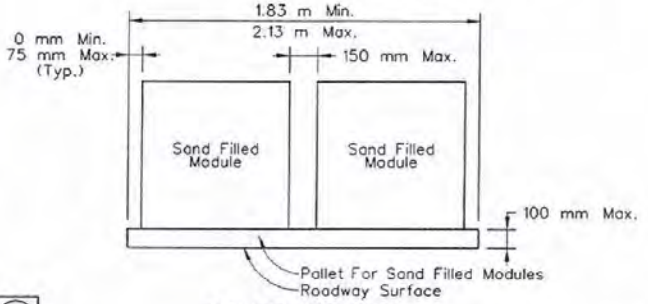






TYPICAL LAYOUTS





PALLET DETAILS

GENERAL NOTES:

1. (XX) INDICATES THE MASS IN KILOGRAMS OF THAT SAND FILLED MODULE. MASSES ARE NOMINAL.
2. SHAPES OF THE SAND FILLED MODULES ARE USED FOR ILLUSTRATION PURPOSES ONLY.
3. AT LOCATIONS WHERE VIBRATIONS AND/OR SURFACE SLOPES MAY CAUSE MODULES TO SHIFT, MODULES SHALL BE ANCHORED TO PREVENT MOVEMENT ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS AND AS APPROVED BY THE ENGINEER.
4. IN COLD CLIMATES, SAND HAVING A MOISTURE CONTENT OF 3% OR MORE SHALL BE MIXED WITH 5% ROCK SALT.
5. PPCBR = PORTABLE PRECAST CONCRETE BARRIER RAIL. V_D = DESIGN VELOCITY.
6. FOR OTHER SAND MODULE LAYOUTS NOT SHOWN, SEE STANDARD AND MANUALS ENGINEER.
7. THE LEADING MODULE OF EACH ATTENUATOR SHALL BE DELINEATED AS SHOWN. THE OBJECT MARKER PANEL SHALL BE 1 mm THICK ALUMINUM SHEETING APPROXIMATELY 750 mm SQUARE. THE PANEL IS COVERED WITH YELLOW REFLECTIVE SHEETING WITH BLACK STRIPES 125 mm WIDE. BLACK STRIPES SHALL BE AT 45 DEGREES WITH 100 mm SPACE BETWEEN STRIPES.
8. THE MAXIMUM LATERAL AND LONGITUDINAL SLOPE THAT SAND MODULES MAY BE INSTALLED ON SHALL NOT EXCEED 5%
9. IF SPACE PERMITS ANGLE CENTERLINE OF SAND BARREL ARRAY TOWARDS ON-COMING TRAFFIC 0 TO 5 DEGREES TO SUIT MOST PROBABLE VEHICLE DEPARTURE BASED ON CONDITIONS AT EACH LOCATION.
10. THE ALTERNATING BLACK AND REFLECTORIZED YELLOW STRIPE SHALL BE SLOPED DOWN TOWARD THE SIDE WHICH TRAFFIC WILL PASS.

DELINEATION FOR LEADING MODULE
(USE CORRECT PANEL)
(See Note 10)

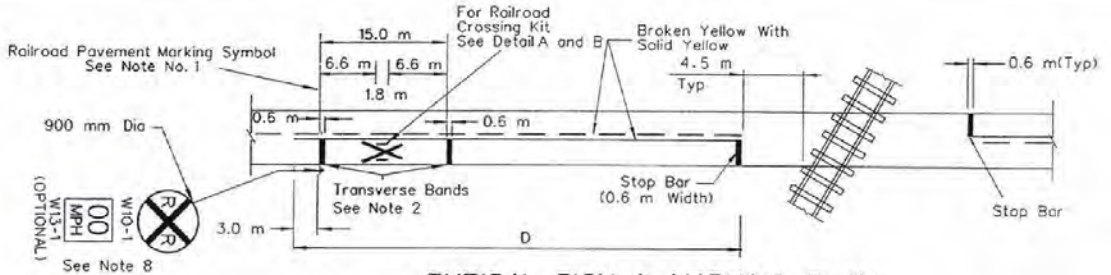
METRIC
NDOT

ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED

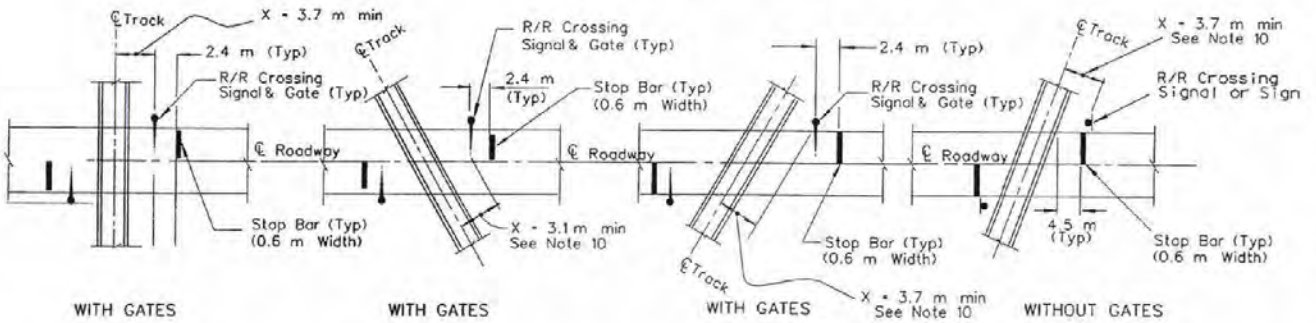
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL TRAFFIC CONTROL
TEMPORARY IMPACT
ATTENUATORS
SAND FILLED MODULES

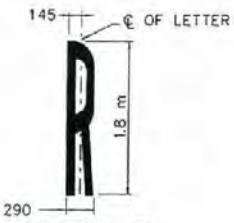
CHIEF TRAFFIC ENGINEER | ADOPTED: 3/97 | T-35.1.8 (625) | REV: 9/97



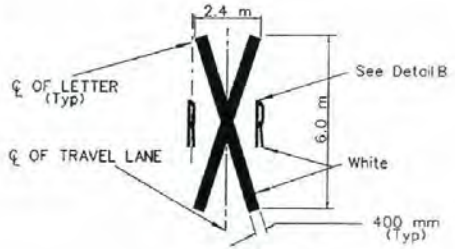
TYPICAL SIGN & MARKING PLAN



R/R STOP BAR, SIGNAL & GATE PLACEMENT



DETAIL B



DETAIL A

RAILROAD CROSSING KIT

One Set of Markers Per TravelLane (6.5 m^2)
See Note 5

D

Table For Minimum Spacing of Advance Warning Sign

SPEED km/h	SPACING (m)
30	30
40	30
50	35
60	60
70	85
80	115
90	145
100	180
110	220
120	265

SPEED CONVERSION TABLE

MPH	km/h
20	30
25	40
30	50
35 & 40	60
45	70
50	80
55	90
60	100
65 & 70	110
75	120

GENERAL NOTES

1. RAILROAD PAVEMENT MARKING SYMBOL INCLUDES THE TWO TRANSVERSE BANDS PLUS THE RAILROAD CROSSING KIT.
2. THE FIRST TRANSVERSE BAND OF THE RAILROAD PAVEMENT SYMBOL SHOULD BE DIRECTLY OPPOSITE THE ADVANCE WARNING SIGN (W10-1). IF NEEDED, SUPPLEMENTAL RAILROAD PAVEMENT MARKING SYMBOL(S) MAY BE PLACED BETWEEN THE FIRST RAILROAD PAVEMENT MARKING SYMBOL AND THE RAILROAD CROSSING, BUT SHOULD BE AT LEAST 15 m FROM THE STOP BAR.
3. A THREE-LANE ROADWAY SHOULD BE MARKED WITH A CENTERLINE FOR TWO-LANE APPROACH OPERATION ON THE APPORACH TO A RAILROAD CROSSING.
4. ON MULTI-LANE ROADS, THE TRANSVERSE BANDS SHOULD EXTEND ACROSS ALL APPROACH TRAVEL LANES, AND INDIVIDUAL RXR SYMBOLS SHOULD BE USED IN EACH APPROACH TRAVEL LANE.
5. PAVEMENT MARKINGS FOR STOP BARS, TRANSVERSE BANDS AND CENTER LINES ARE REQUIRED IN ADDITION TO PAVEMENT MARKINGS AS SHOWN IN DETAIL A.
6. ADDITIONAL INFORMATION ON RAILROAD GRADE CROSSINGS CAN BE FOUND IN MUTCD, PART VIII.
7. STOP BARS SHALL BE PERPENDICULAR TO ROADWAY AND SHALL BE WHITE.
8. FOR SIGN MOUNTING DETAILS, SEE STANDARD PLANS DRAWINGS T-31.1.1 THRU T-31.1.7.
9. REFER TO METRIC ALPHABET FOR HIGHWAY SIGNS AND MARKINGS FOR RXR SYMBOL DETAILS.
10. THE DISTANCE X SHALL BE NOTED IN THE PLANS AND/OR STRUCTURE LIST.

METRIC NDOT

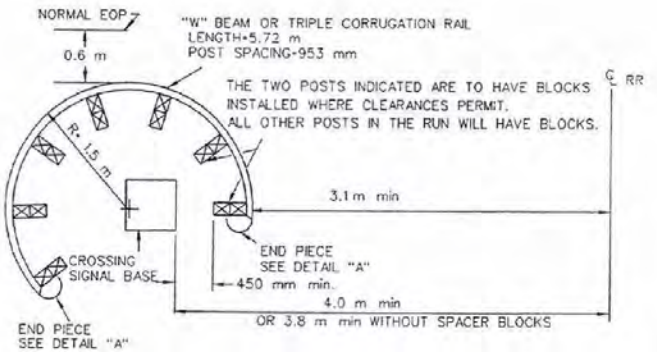
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

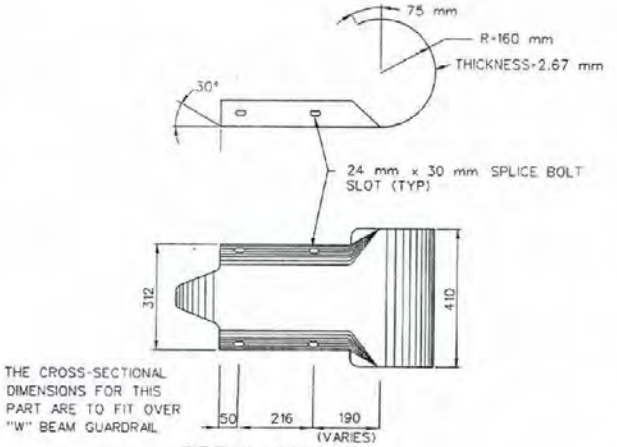
RAILROAD CROSSING MARKING DETAILS

Scott L. Thomsen
CHIEF TRAFFIC ENGINEER

T-35.2 (627, 634)
ADOPTED: 7/96
REVISION 5/97



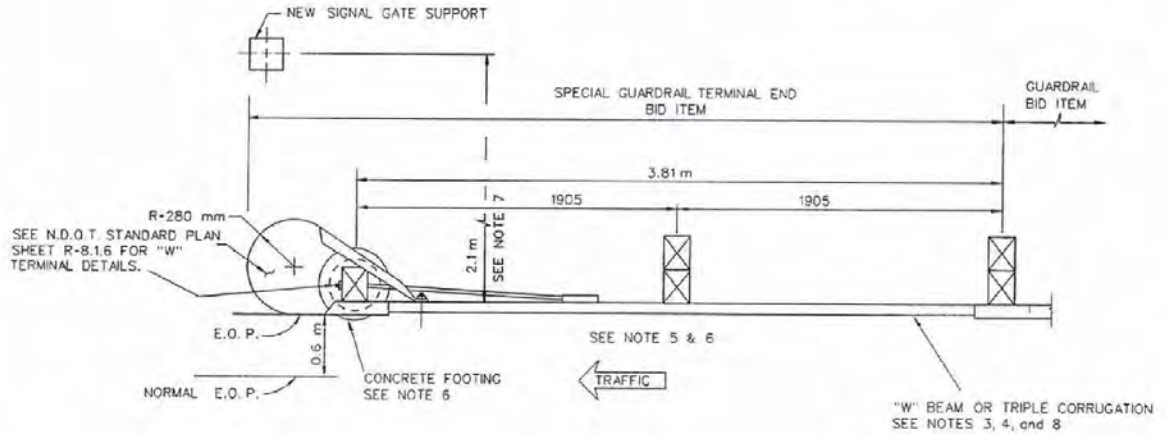
URBAN INSTALLATION
SEE NOTE 1



DETAIL "A"

GENERAL NOTES:

1. RING TYPE GUARDRAIL MAY BE INSTALLED TO PROVIDE PROTECTION FOR THE SIGNAL ASSEMBLY IN INDUSTRIAL OR OTHER AREAS INVOLVING ONLY LOW-SPEED HIGHWAY TRAFFIC AND WHERE SIGNALS ARE VULNERABLE TO DAMAGE BY TURNING TRUCK TRAFFIC. USE OF RING TYPE GUARDRAIL REQUIRES APPROVAL BY THE CHIEF SAFETY ENGINEER OR THE CHIEF ROADWAY DESIGN ENGINEER.
2. FOR ADDITIONAL INFORMATION REGARDING TRAFFIC CONTROL SYSTEMS FOR RAILROAD-HIGHWAY GRADE CROSSINGS REFER TO STANDARD PLAN DRAWING T-35.2 AND THE MUTCD, PART VIII.
3. FOR "W" BEAM GUARDRAIL DETAILS SEE STANDARD PLAN DRAWING R-8.2.2.
4. FOR TRIPLE CORRUGATION GUARDRAIL DETAILS SEE STANDARD PLAN DRAWING R-8.1.7.
5. SPECIAL GUARDRAIL TERMINAL END TO BE INSTALLED ON GUARDRAIL END NEAREST TO RAILROAD.
6. NO POST HOLES SHALL BE DRILLED NEXT TO THE SIGNAL APPARATUS WITHOUT FIRST NOTIFYING THE RAILROAD INSPECTOR.
7. FOR SIGNALS WITH LESS THAN 2.1 METERS REFER TO DRAWING R-8.1.5 AND 1996 AASHTO ROADSIDE DESIGN GUIDE TABLE 5.3 FOR ALTERNATE POST SPACING.
8. FOR TRIPLE CORRUGATION DETAILS NOT SHOWN REFER TO STANDARDIZED HIGHWAY BARRIER HARDWARE BY AASHTO-AGC-ARTEA REPORT MAY 1995.



SPECIAL GUARDRAIL TERMINAL END

METRIC NDOT

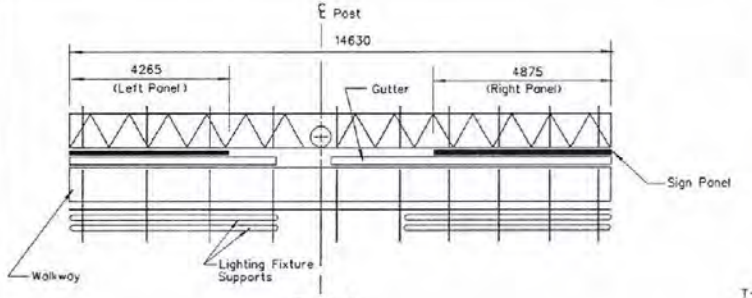
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

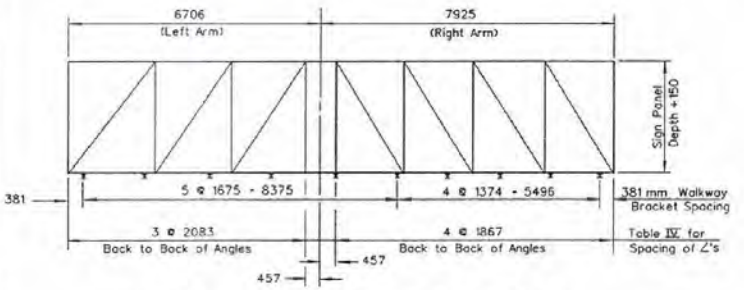
RAILROAD CROSSING GUARDRAIL DETAILS

CHIEF TRAFFIC ENGINEER	T-35.2.1 ADOPTED:	(618) REVISION

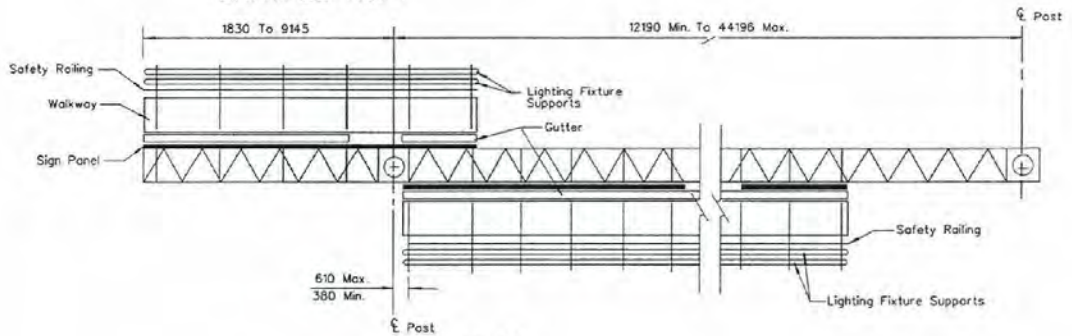
T-48



PLAN



UNBALANCED SINGLE POST TYPE
EXAMPLE NO. 1



PLAN
TWO POST TYPE WITH CANTILEVER
(PART DOUBLE-FACED)
EXAMPLE NO. 3

INSTRUCTIONS TO FABRICATOR

FORMAT SHEET SHOWS:

1. Sign Structure Location.
2. Length of Structure Frame.
3. Panel Size and Locations on Structure.
4. Post Type and Height to Bottom of Frame.
5. Base Plate Elevation.
6. Footing Elevation or Location of Alternate Pile Foundation.
7. Photo Electric Cell Location if Required.

REFER TO THE FOLLOWING SHEETS FOR DETAILS NOT SHOWN ON FORMAT SHEET:

T-36.1.1 - Instructions & Examples
T-36.1.2- Post Type II Thru VII
T-36.1.3 - Post Type I-S Thru VII-S.
T-36.1.4 - Structural Frame Members (Single Post Type).
T-36.1.5 - Structural Frame Members (Two Post Type).
T-36.1.6 - Structural Frame Details.
T-36.1.7 - Frame Juncture Details.
T-36.1.8 - Removable Sign Panel Frames.
T-36.1.9 & T-36.1.10 - Walkway Details No. 1 & No. 2.
T-36.1.11 - Walkway Safety Railing Details.
T-36.1.12 - Alternate Pile Foundations.

WALKWAY BRACKETS: Maintain Uniform Spacing Where Possible. Maximum Spacing Shall Not Exceed 1675 mm.

LIGHTING FIXTURE SUPPORTS: Where Distance From Walkway Bracket To End of Sign Panel Exceeds 406 mm, Extend Lighting Fixture Supports to Next Walkway Bracket. See Example No. 2.

WALKWAY AND SAFETY RAILING: Walkway to be Continuous For Entire Length of Frame For Single Post Signs and For 2 Post Signs From the Nearest Post Continuous Across All the Sign Panels. Safety Railing to Protect Entire Walkway, But Continuous For No More Than 3350 mm in One Unit.

NOTE: Signs Are Shown and Dimensioned Looking in The Direction of Traffic. Double Faced Signs Are Shown and Dimensioned Looking Ahead Along Stationing.

GENERAL NOTES:

SPECIFICATIONS:

DESIGN: A.A.S.H.T.O. Specifications For Structural Supports for Highway Signs, Luminaires and Traffic Signals, Dated 1994.

CONSTRUCTION: Standard Specifications for Road and Bridge Construction and the Special Provisions There To.

LOADING:

WIND LOADING: Normal to Face of Sign: 1490 Pa
Transverse to Face of Sign: 0.2 of Normal Force.

WALKWAY LOADING: Dead Load + 2.22 KN Concentrated Live Load.

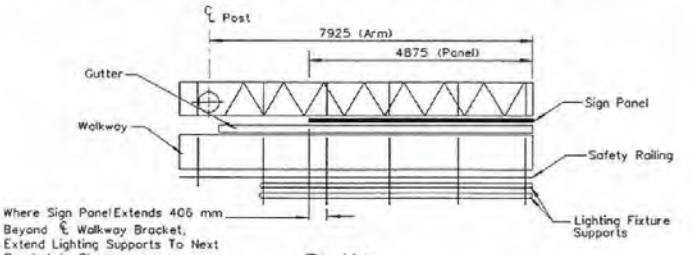
UNIT STRESSES:

STRUCTURAL STEEL: Fs = 138 MPa
REINFORCED CONCRETE: Fs = 138 MPa
Fc = 8.3 MPa
FOOTING SOIL PRESSURE: 120 KPa

MINIMUM CLEARANCE: Vertical Roadway Clearance 5500 mm

WELDING: All Welding Continuous Unless Otherwise Noted on the Plans. All Welding to be Done in Accordance With the Standard Specifications For Road and Bridge Construction.

FINISH: All Steel Parts to be Hot-Dipped Galvanized After Fabrication, Except As Shown on Plans Or As Called For In Special Provisions.



PLAN
CANTILEVER SINGLE
POST TYPE
EXAMPLE NO. 2

METRIC NDOT

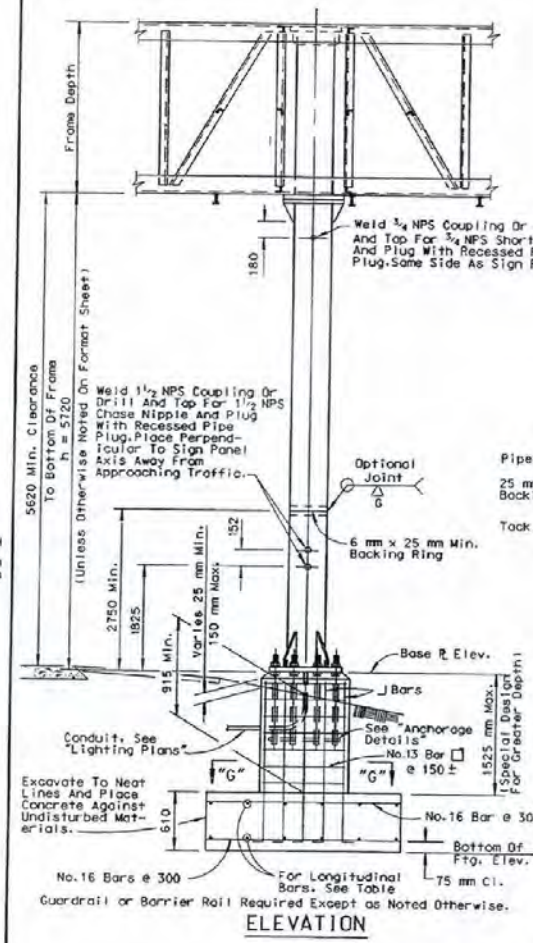
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

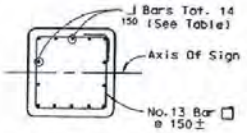
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
INSTRUCTIONS & EXAMPLES

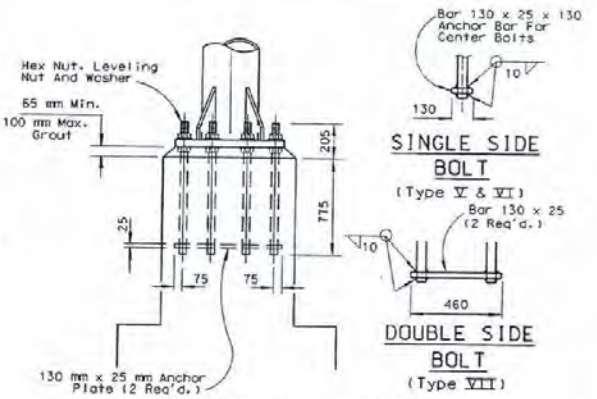
CHIEF TRAFFIC ENGINEER	ADOPTED: 7/96	T-36.1.1	(627) REVISION

T-49

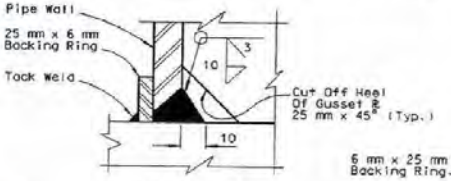




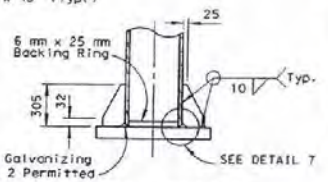
SECTION "G"-"G"



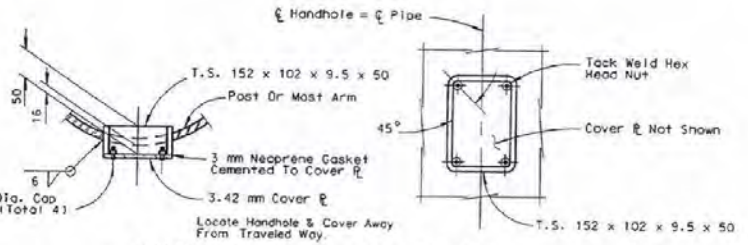
ANCHORAGE DETAILS



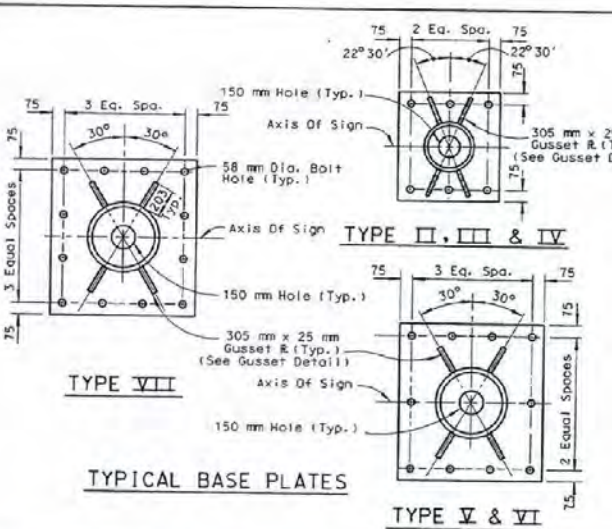
DETAIL 7
THRU POST @ BASE ℄



GUSSET DETAIL



HANDHOLE AND COVER DETAILS



TYPICAL BASE PLATES

Post Type	Pipe Size NPS	Pipe Size (mm)	Cap Plate Size (mm)	Base Plate Size (Note 2) (mm)	51mm Dia. Anchor Bolts	Pedestal Size (Note 2) (mm)	Footing Size (Note 2) (m)	Longitudinal Footing Reinforcement Top	Longitudinal Footing Reinforcement Bottom	J Bars
II	12	9.53	483 x 483 x 22	715 x 635 x 51	6	890 x 815	2.4 x 3.1	6-No.13 Bars	9-No.16 Bars	No.16
III	14	12.7	508 x 508 x 22	790 x 690 x 51	6	965 x 865	2.4 x 3.7	8-No.16 Bars	8-No.22 Bars	No.19
IV	16	12.7	560 x 560 x 22	940 x 840 x 51	6	1120 x 1020	2.4 x 4.3	9-No.16 Bars	9-No.25 Bars	No.19
V	18	12.7	610 x 610 x 22	990 x 915 x 51	10	1170 x 1095	2.8 x 4.6	9-No.16 Bars	9-No.29 Bars	No.22
VI	20	12.7	660 x 660 x 25	990 x 915 x 51	10	1170 x 1095	2.8 x 4.9	8-No.19 Bars	8-No.32 Bars	No.25
VII	24	12.7	762 x 762 x 25	1095 x 990 x 51	12	1295 x 1195	3.1 x 5.2	10-No.19 Bars	10-No.32 Bars	No.32

NOTES:

1. For General Notes See "Instructions And Examples" Sheet T-36.1.1
2. Base Plates, Pedestals And Footings Longer Sides Shall Be Normal To Axis Of Sign.
3. Backfill Shall Be In Place Prior To Erection Of Post.
4. Thread Upper 200 mm Of Anchor Bolts And Galvanize Upper 300 mm.
5. Spread Footing Shown. Alternate Pile Foundation Is Optional.
6. For Reinforcement, Embedment Is Clear To Outside Of Bar And Is 50 mm To Main Reinforcement, Except As Noted.
7. Anchor Plates May Be Retained With Hex Nut Or Formed Head.
8. On Single Post Sign Structures, The Post Shall Be Raked Out Of Plumb With The Use Of The Leveling Nuts To Make The Bottom Of The Sign Frame Level.
9. At Final Position Of Post All Top And Bottom Nuts Shall Be Tighten Against Base Plate.
10. When Foundation Is Located On A Steep Slope With Exposed Face Of Concrete Adjacent To Traffic, See Detail On "Pile Foundation" Sheet.
11. Use Post Footing Connection On Top Of Footing Where Required To Attach Guardrail Posts.
12. NPS = Nominal Pipe Size Designator. See ASTM A53.

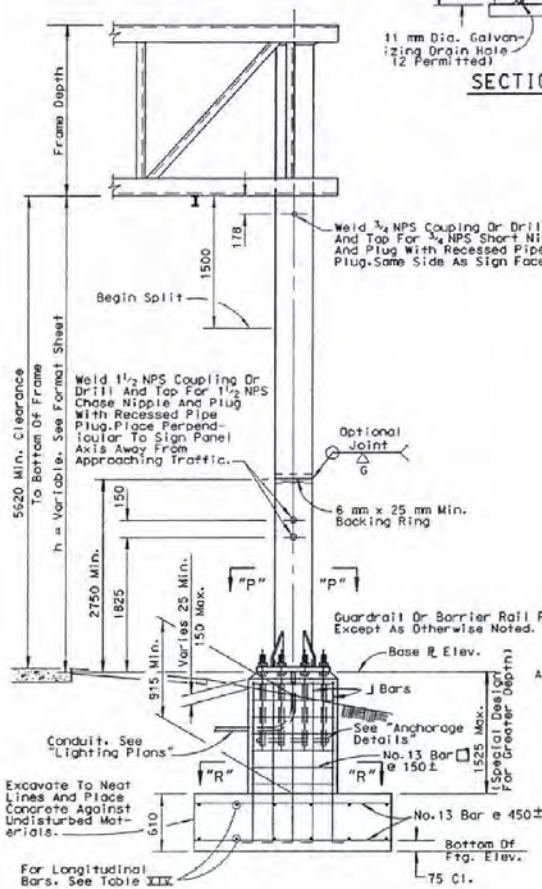
METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

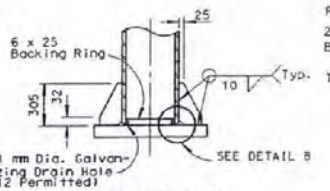
OVERHEAD SIGNS SINGLE POST TYPES II THRU VII

CHIEF TRAFFIC ENGR. | T-36.1.2 (627) | ADOPTED: 7/96 | REVISION:

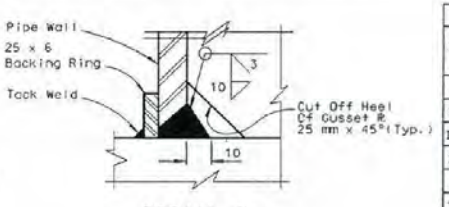


ELEVATION

NOTE: Post Without Cantilever Is Shown.



SECTION S-S

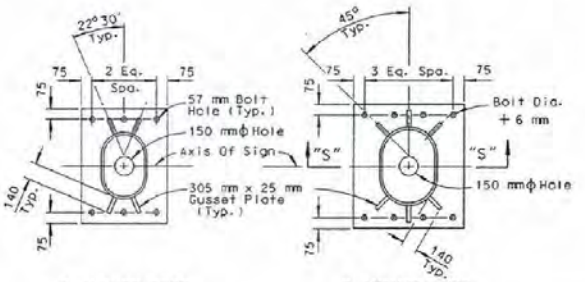


DETAIL 8

TABLE XIV										
Post Type	Pipe Size NPS	Pipe Size "t" (mm)	Split (mm)	Base Plate Size (Note 2) (mm)	Anchor Bolts (mm)	Pedestal Size (Note 2) (mm)	Footing Size (Note 2) (m)	Longitudinal Footing Reinforcement Top	Longitudinal Footing Reinforcement Bottom	J Bars
I-S	10	9.27	100	685 x 535 x 51	6-51 Φ	840 x 690	1.5 x 3.0	5-No.13 Bars	5-No.19 Bars	No.19
II-S	12	9.53	130	760 x 585 x 51	6-51 Φ	915 x 765	1.8 x 3.4	6-No.13 Bars	6-No.22 Bars	No.19
III-S	14	12.7	130	840 x 610 x 51	6-51 Φ	1015 x 790	2.1 x 4.0	7-No.13 Bars	7-No.25 Bars	No.25
IV-S	16	12.7	150	890 x 790 x 51	8-51 Φ	1070 x 965	2.4 x 4.3	8-No.16 Bars	8-No.29 Bars	No.25
V-S	18	12.7	180	940 x 840 x 51	8-51 Φ	1120 x 1015	2.4 x 4.9	8-No.16 Bars	8-No.29 Bars	No.29
VI-S	20	12.7	200	1040 x 840 x 51	8-51 Φ	1220 x 1015	2.7 x 5.2	9-No.16 Bars	9-No.32 Bars	No.32
VII-S	24	12.7	200	1145 x 990 x 51	8-57 Φ	1350 x 1195	3.0 x 5.9	10-No.19 Bars	10-No.36 Bars	No.36

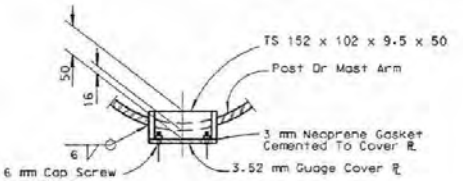
NOTES:

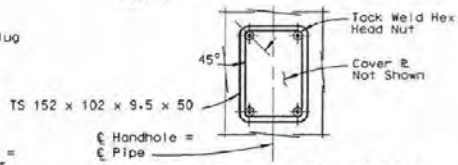
1. For General Notes See "Instructions And Examples" Sheet T-36.1.1
2. Base Plates, Pedestals And Footings Longer Sides Shall Be Normal To Axis Of Sign.
3. Backfill Shall Be In Place Prior To Erection Of Post.
4. Thread Upper 203 mm Of Anchor Bolts And Galvanize Upper 305 mm.
5. Spread Footing Shown. Alternate Pile Foundation Is Optional.
6. For Reinforcement, Embedment Is Clear To Outside Of Bar And Is 50 mm To Main Reinforcement, Except As Noted.
7. Anchor Plates May Be Retained With Hex Nut Or Formed Head.
8. Use Post Footing Connection On Top Of Footing Where Required To Attach Guardrail Posts.
9. NPS = Nominal Pipe Size Designator. See ASTM A53



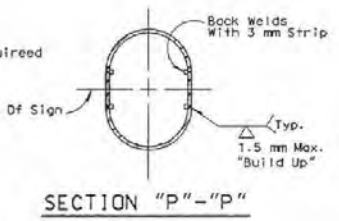
6 ANCHOR TYPE 8 ANCHOR TYPE

TYPICAL BASE PLATES

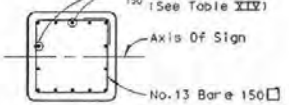




HANDHOLE & COVER DETAIL



SECTION "P"-"P"



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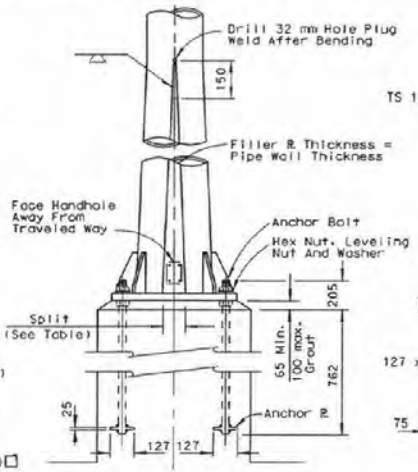
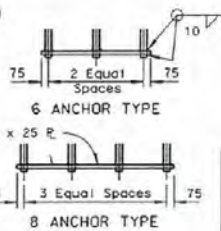




ANCHORAGE DETAILS

METRIC NDOT

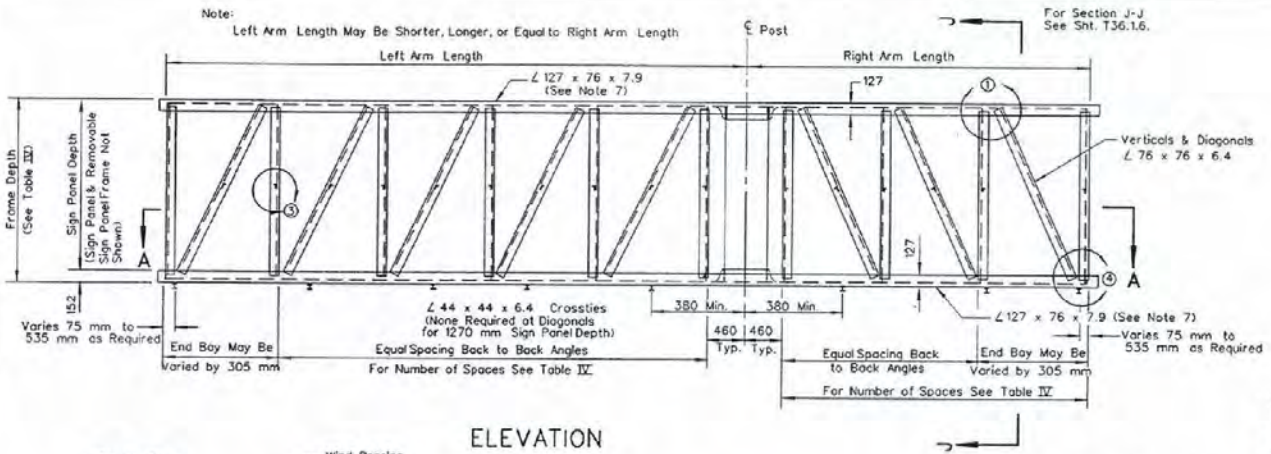
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

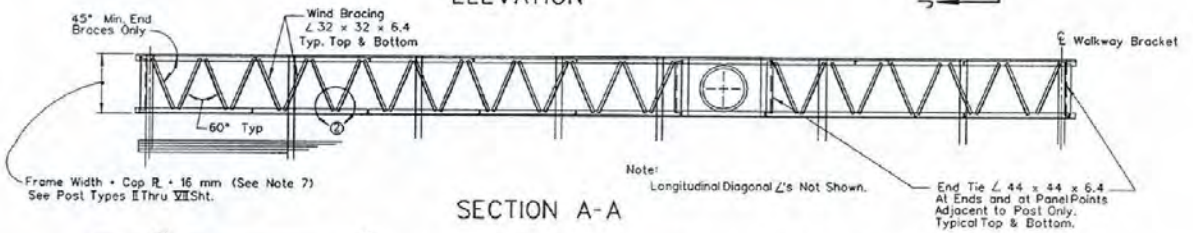
OVERHEAD SIGNS TWO POST TYPES I-S THRU VII-S

CHIEF TRAFFIC ENGR.

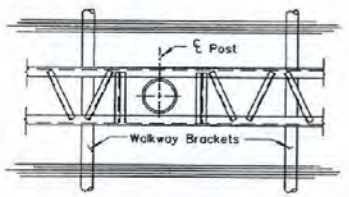
T-36.1.3 (6/27)
ADOPTED: 7/96 REVISION:



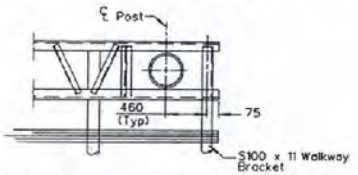
ELEVATION



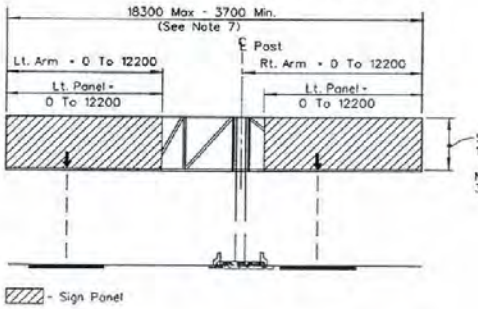
SECTION A-A



PART PLAN OF DOUBLE FACED TYPE AT POST



PART PLAN OF CANTILEVER TYPE AT POST



LIMITING DIMENSIONS OF FRAME & SIGN PANEL

TABLE IV

Sign Panel Depth	Frame Depth	Maximum Vertical ∠ Spacing	Arm Length See Note No. 10
(mm)	(mm)	(mm)	(mm)
1270	1425	1375	1220
1525	1675	1525	1220
1780	1930	1675	1220
2035	2185	1830	1525
2290	2440	2135	1525
2540	2700	2135	1830
2795	2700	2135	1830
3050	2700	2135	1830

NOTES:

1. FOR DETAILS ① THRU ④ SEE "STRUCTURAL FRAME DETAILS" SHT. T36.1.6.
2. FOR SIGN PANEL FRAMES SEE "REMOVABLE SIGN PANEL FRAMES " SHT. T36.1.8.
3. FOR CONNECTION OF FRAME TO POST SEE "FRAME JUNCTURE DETAILS" SHT. T36.1.7.
4. FOR WALKWAY SEE "STANDARD WALKWAY DETAILS NO. 1 & NO. 2, SHTS. T-36.1.9 & T-36.1.10
5. FOR TYPICAL WALKWAY ARRANGEMENT, SPECIAL INSTRUCTIONS AND EXAMPLES, SEE "INSTRUCTIONS AND EXAMPLES" SHT. T36.1.1.
6. MINIMUM LENGTH OF FRAME = 3660 mm. MAXIMUM LENGTH OF FRAME = 18290 mm
7. FOR ARM LENGTHS 10670 mm TO 12190 mm AND SIGN DEPTHS 2035 mm THRU 3050 mm:
   A. USE 127 x 76 x 11.1 CHORD ∠'S.
   B. FRAME WIDTH = CAP R. + 22 mm.
8. ON SINGLE POST SIGN STRUCTURES, THE POST SHALL BE RAKED OUT OF PLUMB, WITH THE USE OF THE LEVELING NUTS TO MAKE THE BOTTOM OF THE SIGN FRAME LEVEL.
9. AT FINAL POSITION OF POST ALL TOP AND BOTTOM NUTS SHALL BE TIGHTENED AGAINST BASE PLATE.
10. DIAGONAL NOT REQUIRED IF ARM LENGTH IS EQUAL TO OR LESS THAN SHOWN IN THIS COLUMN OF TABLE IV.

METRIC NDOT

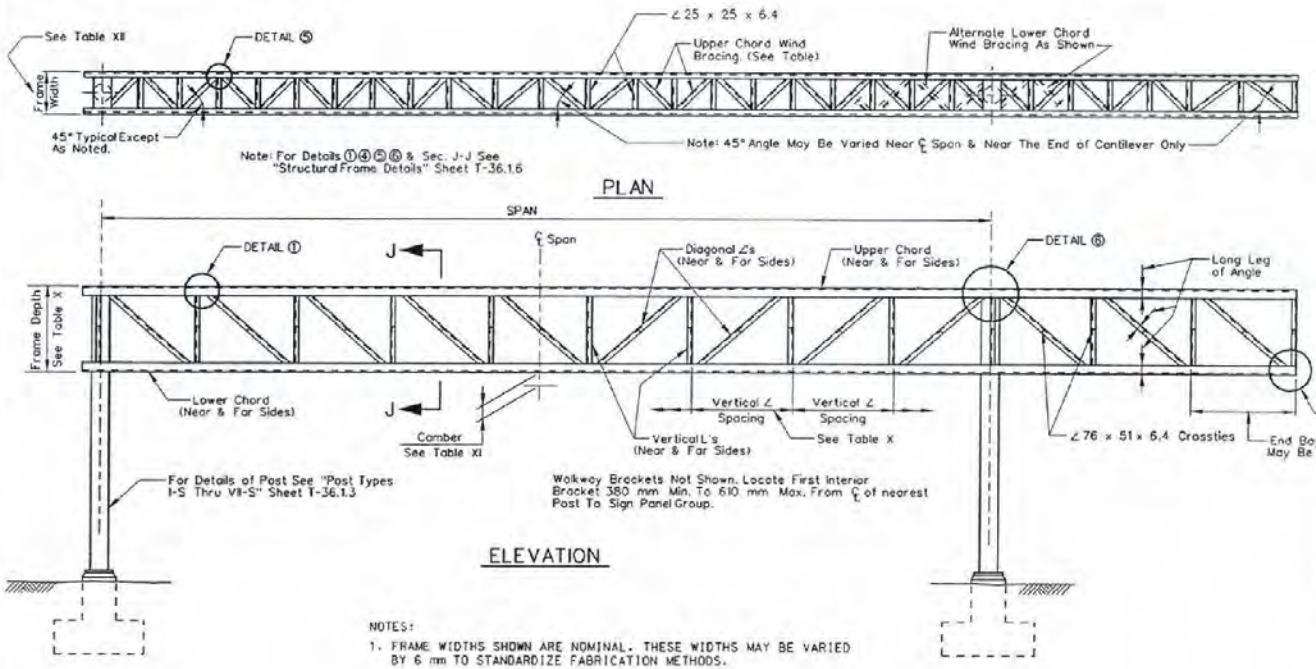
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS-SINGLE POST STRUCTURAL FRAME MEMBERS

T-36.1.4 (627)

CHIEF TRAFFIC ENGINEER | ADOPTED: 7/96 | REVISION



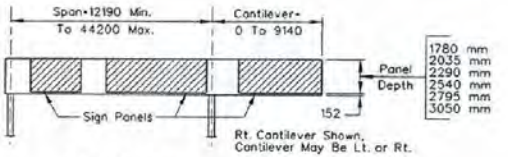
PANEL DEPTH (mm)	FRAME DEPTH (mm)	MAX VERTICAL ∠ SPACING (mm)
1780	1930	1830
2035	2185	1830
2290	2440	2290
2540	2695	2290
2795	2695	2290
3050	2695	2290

TABLE X

CAMBER FOR FABRICATION AT ℄ SPAN	
SPAN (m)	CAMBER (mm)
2.19-15.24	13
15.25-30.48	26
30.49-44.20	38

FABRICATE CAMBER TO APPROXIMATE PARABOLA. CAMBER OF CANTILEVER ARM = 413 mm FOR ARMS GREATER THAN 3000.

TABLE XI



RANGE OF STRUCTURE SIZES

NOTE: Sign Panel Depths 2795 mm And 3050 mm Will Project Above Top Of Frame.

NOTES:

1. FRAME WIDTHS SHOWN ARE NOMINAL. THESE WIDTHS MAY BE VARIED BY 6 mm TO STANDARDIZE FABRICATION METHODS.

* ADD 152 mm TO FRAME WIDTH FOR POST TYPE V-S & VI-S ; ADD 305 mm FOR POST TYPE VII-S.

** ADD 152 mm TO FRAME WIDTH FOR POST TYPE VII-S.

Span (m)	1780 mm Panel Depth (mm)					2035 mm PANEL DEPTH (mm)					2290 mm PANEL DEPTH (mm)				
	Frame Width	Chord ∠'s	Vertical ∠'s	Diagonal ∠'s	Wind Bracing	FRAME WIDTH	CHORD ∠'S	VERTICAL ∠'S	DIAGONAL ∠'S	WIND BRACING	FRAME WIDTH	CHORD ∠'S	VERTICAL ∠'S	DIAGONAL ∠'S	WIND BRACING
12.19-15.24	610 *	127x89x7.9	76 x 76 x 6.4	76 x 76 x 6.4	32 x 32 x 6.4	610 *	127x89x7.9	76 x 76 x 6.4	76 x 76 x 6.4	32 x 32 x 6.4	610 *	127x89x7.9	76 x 76 x 7.9	76 x 76 x 7.9	32 x 32 x 6.4
15.55-18.29	610 *	127x89x7.9			32 x 32 x 6.4	610 *	127x89x7.9			32 x 32 x 6.4	610 *	127x89x7.9			32 x 32 x 6.4
18.59-21.43	762 **	127x89x7.9			32 x 32 x 6.4	762 **	127x89x7.9			32 x 32 x 6.4	762 **	127x89x7.9			32 x 32 x 6.4
21.43-24.38	762 **	152x102x9.5			32 x 32 x 6.4	762 **	152x102x9.5			32 x 32 x 6.4	610	152x102x9.5			38 x 38 x 6.4
24.69-27.43	915	152x102x9.5			38 x 38 x 6.4	915	152x102x9.5			38 x 38 x 6.4	915	152x102x9.5			44 x 44 x 6.4
27.44-30.48	915	152x102x9.5			38 x 38 x 6.4	915	152x102x9.5			38 x 38 x 6.4	915	152x102x9.5			44 x 44 x 6.4
30.49-33.53	915	178x102x12.7			44 x 44 x 6.4	915	178x102x12.7			44 x 44 x 6.4	915	178x102x12.7			44 x 44 x 6.4
33.54-36.58	915	178x102x12.7			44 x 44 x 6.4	915	178x102x12.7			44 x 44 x 6.4	915	203x102x12.7			44 x 44 x 6.4
36.59-40.23	915	203x102x12.7			44 x 44 x 6.4	915	203x102x12.7			44 x 44 x 6.4	1067	203x102x12.7			51 x 51 x 6.4
40.24-44.20	915	203x102x12.7			44 x 44 x 6.4	915	203x102x12.7			44 x 44 x 6.4	1067	203x102x19.0			51 x 51 x 6.4

Span (m)	2540 mm Panel Depth (mm)					2795 mm AND 3050 mm PANEL DEPTH (mm)				
	Frame Width	Chord ∠'s	Vertical ∠'s	Diagonal ∠'s	Wind Bracing	FRAME WIDTH	CHORD ∠'S	VERTICAL ∠'S	DIAGONAL ∠'S	WIND BRACING
12.19-15.24	610 *	127x89x7.9	76 x 76 x 7.9	76 x 76 x 7.9	32 x 32 x 6.4	610 *	127x89x7.9	76 x 76 x 7.9	76 x 76 x 7.9	44 x 44 x 6.4
15.55-18.29	610 *	127x89x7.9			32 x 32 x 6.4	610 *	127x89x7.9			44 x 44 x 6.4
18.59-21.14	762 **	127x89x7.9			38 x 38 x 6.4	762 **	127x89x7.9			51 x 51 x 6.4
21.64-24.38	915	152x102x9.5			44 x 44 x 6.4	915	152x102x9.5			51 x 51 x 6.4
24.69-27.43	915	152x102x9.5			44 x 44 x 6.4	915	152x102x9.5			64 x 64 x 6.4
27.74-30.48	915	152x102x9.5			44 x 44 x 6.4	1067	152x102x9.5			64 x 64 x 6.4
30.79-33.53	1067	178x102x12.7			51 x 51 x 6.4	1067	178x102x12.7			64 x 64 x 6.4
33.83-36.58	1067	178x102x12.7			51 x 51 x 6.4	1067	203x102x12.7			76 x 76 x 12.7
36.88-40.23	1067	203x102x12.7			51 x 51 x 6.4	1067	203x102x15.0			76 x 76 x 12.7
40.54-44.20	1067	203x102x19.0			51 x 51 x 6.4	1067	229x102x15.9			76 x 76 x 12.7

TABLE XII

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

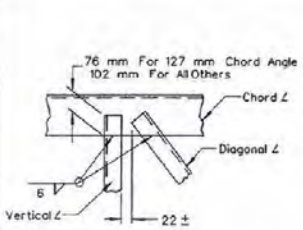
OVERHEAD SIGNS-TWO POST STRUCTURAL FRAME MEMBERS

CHIEF TRAFFIC ENGINEER

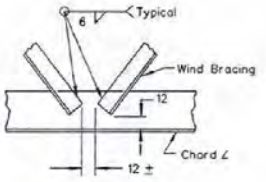
T-36.1.5 (627)

ADOPTED: 7/96 REVISION:

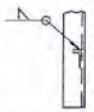
T-53



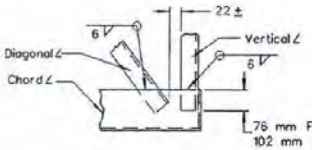
DETAIL ①



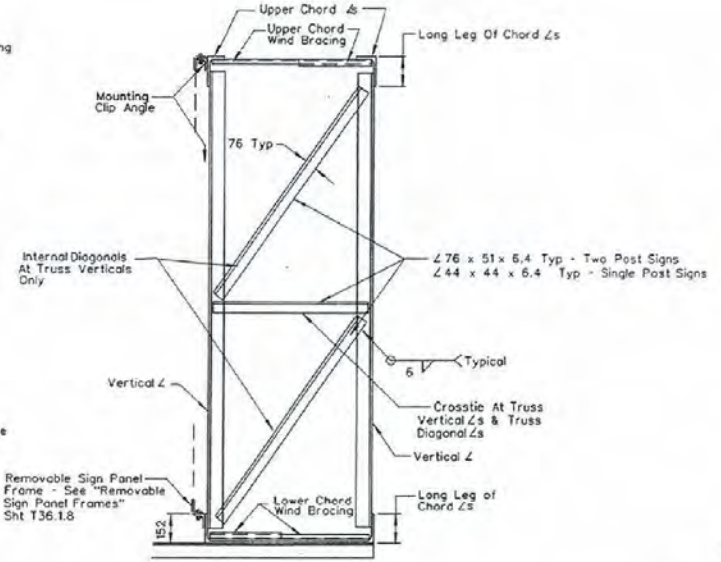
DETAIL ②



DETAIL ③



DETAIL ④



TYPICAL SECTION J-J

Note:
Diagonal ∠s in Plane of Truss, Not Shown. Bracing Shown Is At All Vertical ∠s Of Truss.

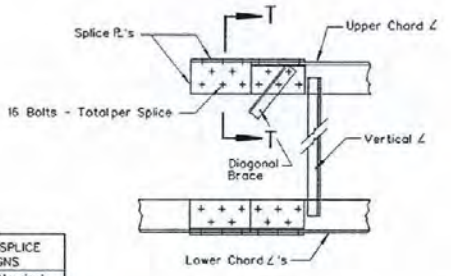
SPLICE NOTES:

Specifications:
The Bolted Splice Shall Conform To Current "Specifications For Structural Joints Using ASTM A325 Bolts".

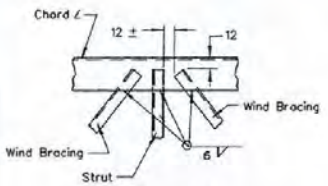
Location of Splices:
The Splice Shall Be Located So As Not To Interfere With Mounting The Walkway Brackets Or The Clip Angles For The Removable Sign Panel Frame. The Wind Bracing In The Area Of The Bolted Chord Splice Shall Be Bolted To The Chord Angles With a 10 mm Unfinished Bolt, With Hex Head and Nut, 2 Cut Washers And Lock Washer.

Bolts:
The Bolts Shall Be High Strength With An Interference Type Body And Torqued To The Required Amount As Stated In The Above Specifications.

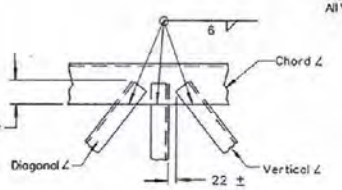
Filler PL:
The Plates Welded To The Angle Legs On The Inside Shall Be Welded Before Punching The Bolt Holes. They Shall Be The Same Length As The Cover Plates. The Plates Are Not Necessary On The Single Post Signs If The Splice Is Located Over 1/3 Of The Cantilever Length From The Post Alternative Splice Details May Be Used If Approved By The Engineer.



OPTIONAL
BOLTED CHORD SPLICE

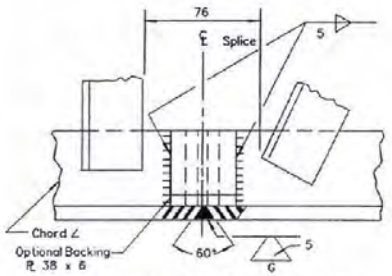


DETAIL ⑤



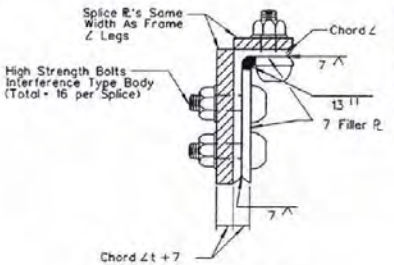
DETAIL ⑥

BOLTED CHORD SPLICE TWO POST SIGNS	
Chord ∠	Nominal Bolt Diam.
127x89x7.9	M20
152x102x9.5	M22
178x102x12.7	M27
203x102x12.7	M27
203x102x19.0	M30
229x102x15.9	M30
SINGLE POST SIGNS	
Chord ∠	Nominal Bolt Diam.
127x76x7.9	M20
127x76x11.1	M20



WELDED CHORD SPLICE

Note:
1. Prepare Edges By Beveling to Angle Shown.
2. Weld to 100% Full Penetration.
3. Grind Flush With Base Metal.



SECTION T-T

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

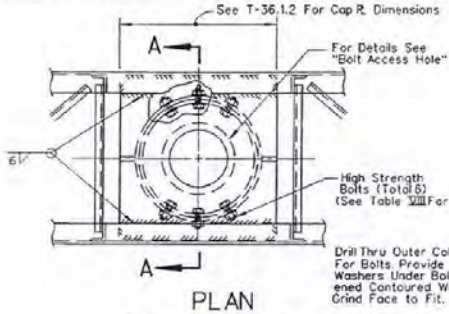
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
STRUCTURAL FRAME DETAILS

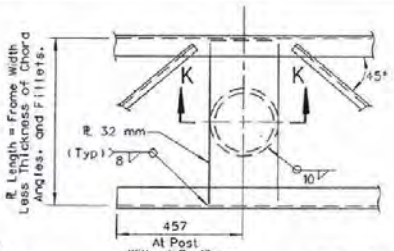
CHIEF TRAFFIC ENGINEER

T-36.1.6 (627)
ADOPTED: 7/96 REVISION

T-54

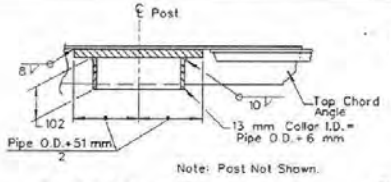


PLAN



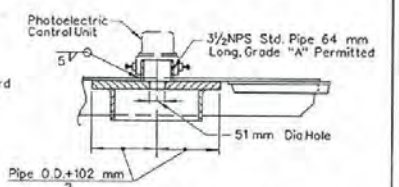
UPPER CHORD CONNECTION TO POST

TWO POST TYPE



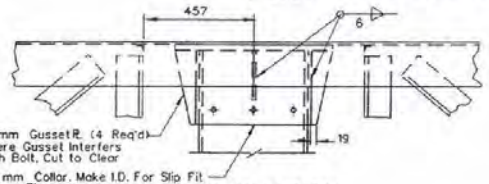
SECTION K-K

WITHOUT PHOTOELECTRIC CONTROL UNIT

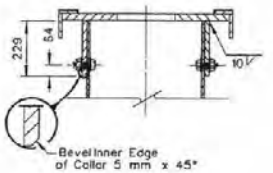


SECTION K-K

WITH PHOTOELECTRIC CONTROL UNIT



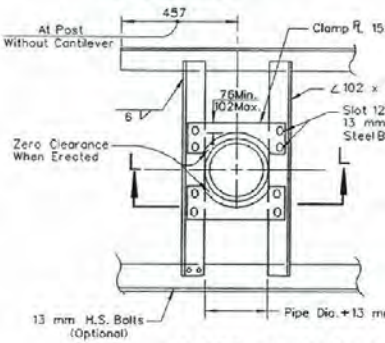
ELEVATION

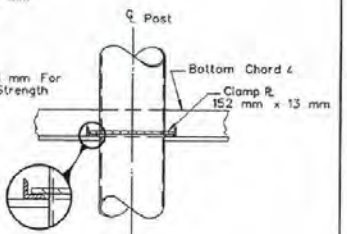


SECTION A-A

UPPER JUNCTURE CONNECTION

SINGLE POST TYPE

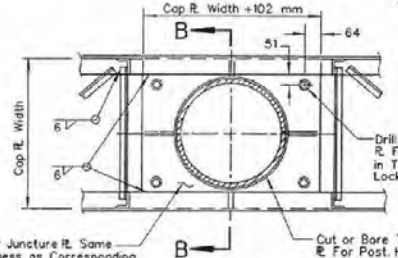




SECTION L-L

LOWER CHORD CONNECTION TO POST

TWO POST TYPE

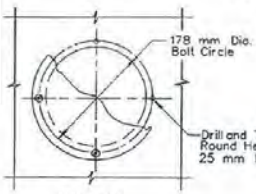


PLAN

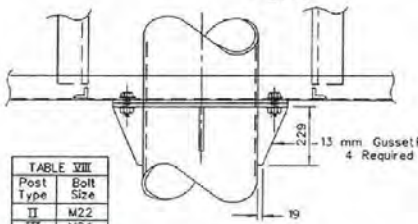
NOTES: (SINGLE POST TYPE)

1. Drilled Holes for Unfinished Bolts Shall Not Exceed Nominal Bolt Diameter by More Than 2 mm.
2. All Bolts, Nuts and Washers Shall Be Galvanized.
3. In All Cases, Sign Frame Shall Be Supported At Top of Post. Bearing Surface at Top of Post Shall Be Finished True.
4. At Lower Juncture Connection, Shims Shall Be Used Where Any Clearance Exists Between Bottom of Frame and Post PL Prior to Tightening of Bolts in Lower Connection. Shims May be Galvanized Steel Cut Washers.

NPS • Nominal Pipe Size Designator, See ASTM A53.



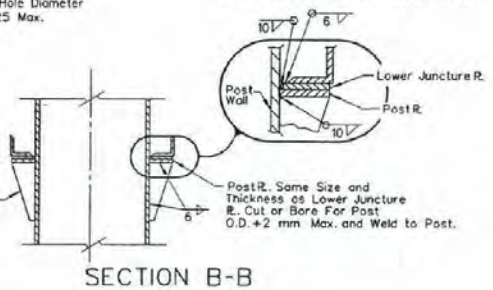
PLAN



ELEVATION

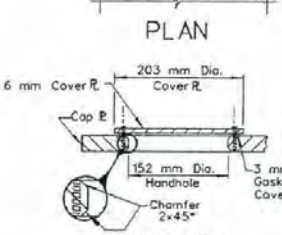
LOWER JUNCTURE CONNECTION

SINGLE POST TYPE



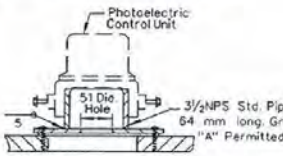
SECTION B-B

TABLE VIII	
Post Type	Bolt Size
II	M22
III	M24
IV	M30
V	M30
VI	M30
VII	M30



SECTION

WITHOUT PHOTOELECTRIC CONTROL UNIT



SECTION

WITH PHOTOELECTRIC CONTROL UNIT

BOLT ACCESS HOLE

SINGLE POST TYPE

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
FRAME JUNCTURE DETAILS

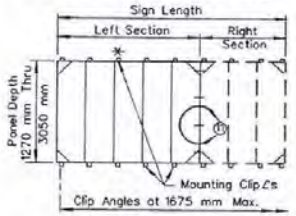
CHIEF TRAFFIC ENGINEER	T-36.1.7 (627)
	ADOPTED: 7/96 REVISION

T-55

NOTES:
Frames for Signs Greater than 6100 mm in Length Shall be Fabricated in Two Sections With Left Section A Multiple of 1220 mm in Length. See Table A.
Sections Shall be Hoisted Into Place Individually and Bolted Together As Per Detail (11) Prior to Tightening of Mounting Clip Bolts.
Bolting Two Sections Together and Hoisting Simultaneously Will Not be Permitted.

Table A

Sign Length (mm)	Left Section (mm)	Right Section (mm)
6710	3660	3050
7320	3660	3660
7920	3660	4270
8530	4880	3660
9140	4880	4270
9750	4880	4880
10360	4880	5490
10970	6100	4880
11580	6100	5490
12200	6100	6100



* - 2795 mm And 3050 mm Sign Panel Frames Will Project Above The Top Chord Of The Truss. In These Cases, The Top Clips Shall Be Bolted To Vertical Frame Members.
SEE SHEET T-36.1.8.1

REMOVABLE FRAME
GREATER THAN 6100 mm

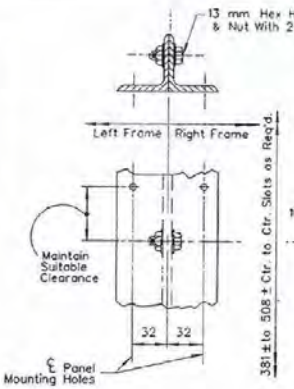
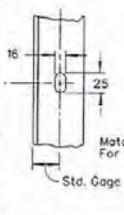


Table B

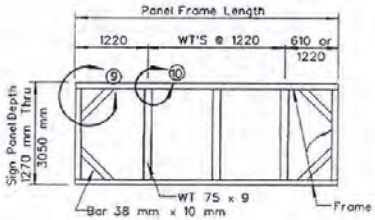
Panel Depth (mm)	No. of Slots
1270	2
1780	3
2030 & 2290	4
2540 & 2790	5
3050	6



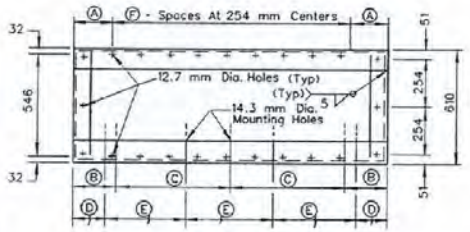
Matched Slots In End ∠'s For Number Req'd. See Table B.

DETAIL (11)

Note: Panel Mounting Holes Not Shown. Panel Lengths Available in 610 mm Increments.



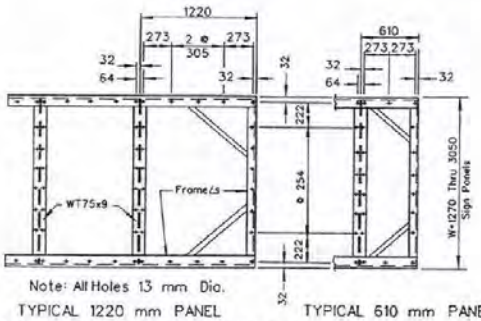
TYPICAL REMOVABLE FRAME
(1220 mm THRU 6100 mm)



TYPICAL EXIT PANEL FRAMES

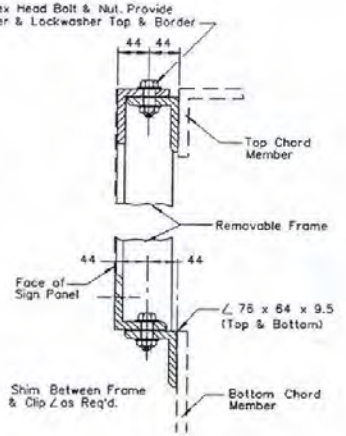
Frame Width (mm)	Ⓐ (mm)	Ⓑ (mm)	Ⓒ (mm)	Ⓓ (mm)	Ⓔ (mm)	Ⓕ
1676	203	229	610	—	—	5
2134	178	457	610	—	—	7
2591	152	—	—	381	610	9

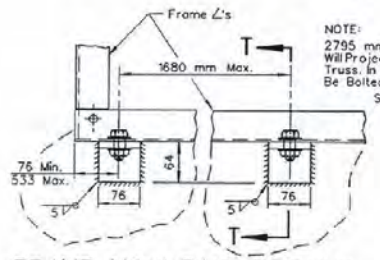
NOTES:
1. Frame ∠'s Shall Be 76 x 76 x 4.8 ASTM-A36
2. 13 mm Panel Mounting Holes Shall Be Drilled With Templates.
3. Holes For Mounting Sign May Be Slotted 25 mm.
4. Mount Exit Frame At Right Edge of Removable Frame So Front Faces Are Flush.



Note: All Holes 13 mm Dia.
TYPICAL 1220 mm PANEL
TYPICAL 610 mm PANEL

MOUNTING HOLE SPACING FOR SIGN PANEL & FRAME

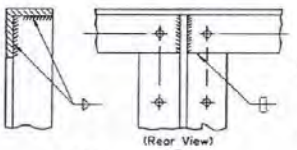




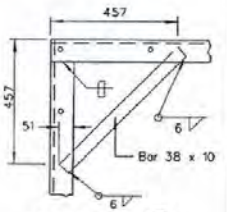
NOTE:
2795 mm And 3050 mm Sign Panel Frames Will Project Above The Top Chord Of The Truss. In These Cases, The Top Clips Shall Be Bolted To Vertical Frame Members.
SEE SHEET T-36.1.8.1

FRAME MOUNTING DETAILS

NOTES:
1. Frames Shall Be All-Welded Construction.
2. 13 mm Panel Mounting Holes Shall Be Drilled By Template. Sign Panel May Be Considered a Template.
3. Drilled and Tapped Holes (6.3 mm-20 N.C.) May Be Used Where Interference Due To Welds or Structural Members Is Encountered.
4. WT 75 x 9 Faces Shall Be Flush With Faces of Frame Angles.
5. Mounting Clip Angles Shall Be Located Such as to Allow The The Top and Bottom Frame Angles of the Removable Sign Panel Frame to Lie On a Straight Horizontal Line.
6. Holes for Mounting Removable Sign Panel Frame May be Slotted 25 mm Maximum Parallel to the Axis of The Sign.
7. WT 75 x 9 May Be Crimped at Ends to Join Frame Angles. Fillet Weld All Around.
8. Panels Shall Be 610 mm Minimum and 1220 mm Maximum.



DETAIL (10)



DETAIL (9)

TYPICAL JOINT DETAILS

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
REMOVABLE SIGN PANEL FRAMES

T-36.1.8 (627)

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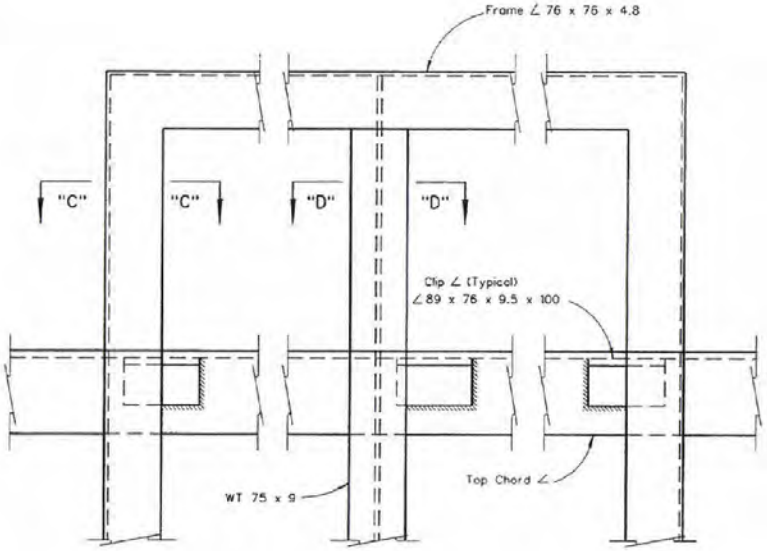
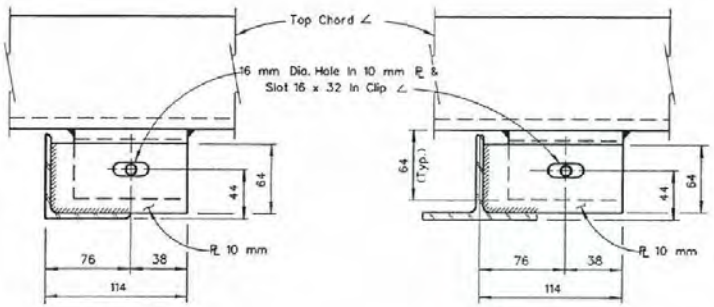
T-56

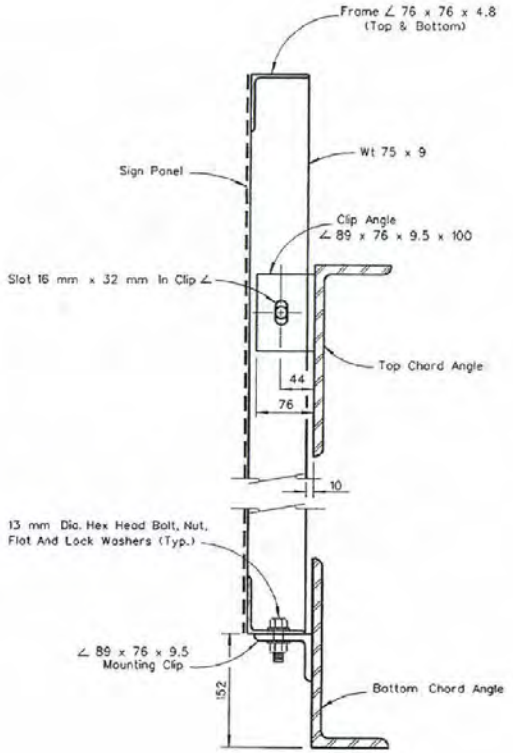




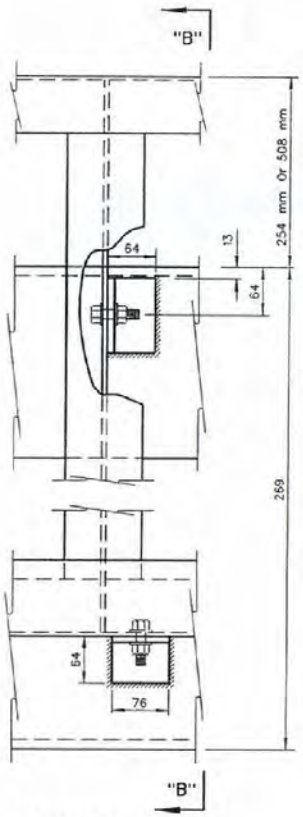
SECTION "C"-"C"

SECTION "D"-"D"

ALTERNATIVE CONNECTIONS AT TOP CHORD



SECTION "B"-"B"



ELEVATION VIEW

STEEL REMOVABLE SIGN PANEL FRAMES

NOTES:

1. For Steel Removable Sign Panel Frame Details, See Standard Plan T-36.1.8.
2. Minimum Fillet Weld Is 7 mm For Clip Angles Welded To Chord Member Of Truss.
3. Maximum Spacing Of Bottom Clip Angle Is 1675 mm.
4. Top Clip Required For Each Vertical Member Or Removable Sign Panel Frame.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

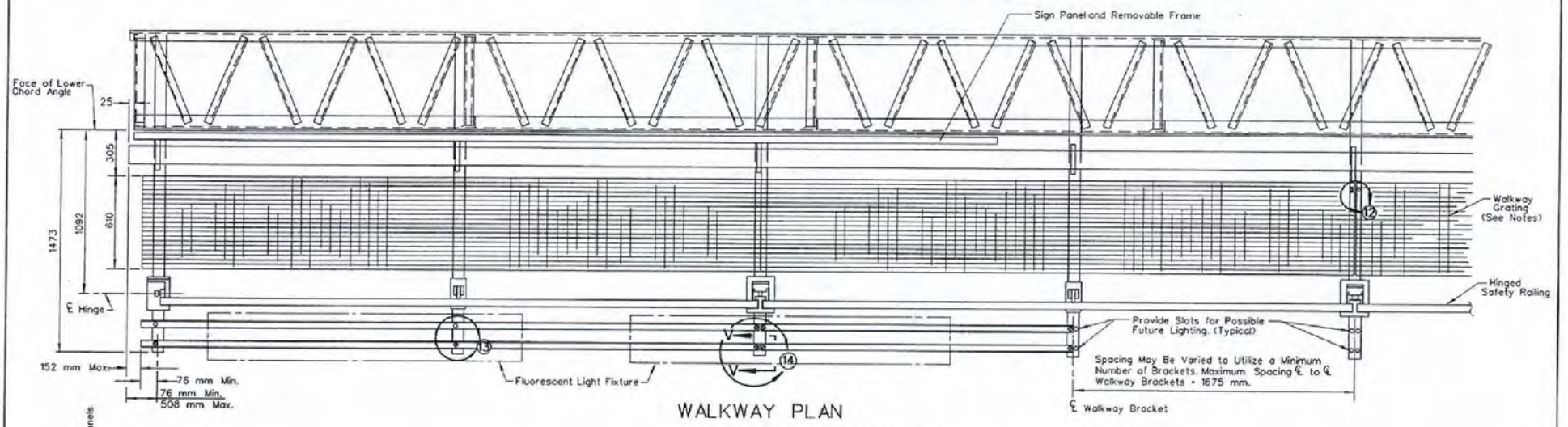
OVERHEAD SIGNS
REMOVABLE SIGN PANEL FRAMES
2795 mm AND 3050 mm SIGN PANELS

CHIEF TRAFFIC ENGINEER

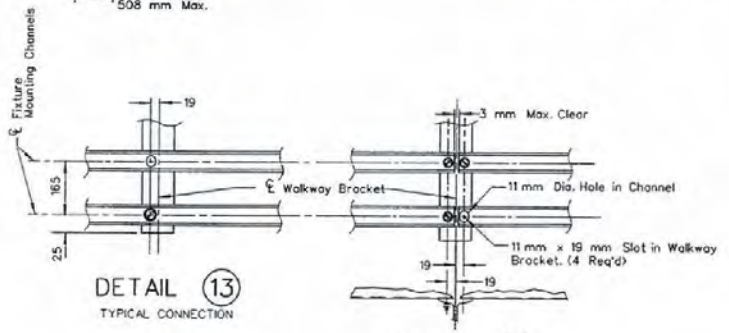
T-36.1.8.1 (627)

ADOPTED: 7/96 REVISION

T-57

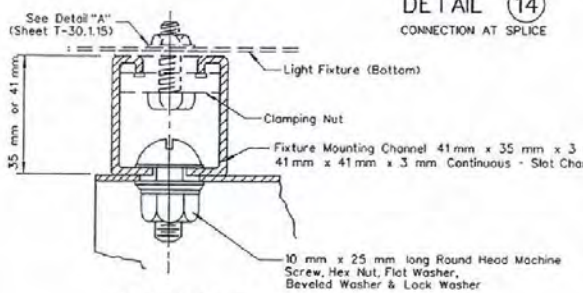


WALKWAY PLAN

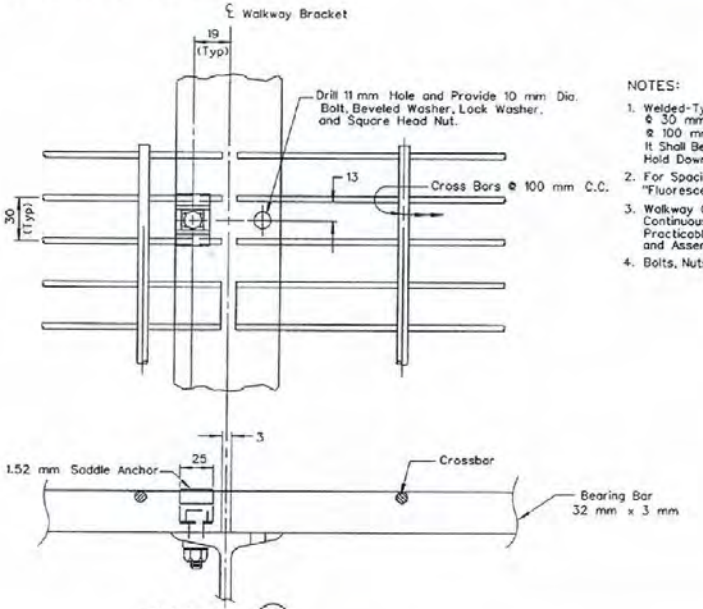


DETAIL (13)
TYPICAL CONNECTION

DETAIL (14)
CONNECTION AT SPLICE



SECTION V-V



DETAIL (12)

NOTES:

1. Welded-Type Grating Shall Have 32 mm x 3 mm Bearing Bars @ 30 mm Centers with 6mm Diameter (or Equal) Cross Bars @ 100 mm Centers. See Detail 12 . If Mechanical Lock Grating is Used It Shall Be Equal in Strength To The Welded-Type. Alternate Hold Down Clips May Be Submitted for Approval.
2. For Spacing of Lighting Fixtures See Table of Spacings on "Fluorescent Sign Lighting Equipment" Sheet.
3. Walkway Grating and Light Fixture Mounting Channels to Be Continuous (No Splices) Over As Many Walkway Brackets As Practicable Consistent With Fabrication, Ease of Handling and Assembling.
4. Bolts, Nuts, Washers, Etc. To Be Galvanized.

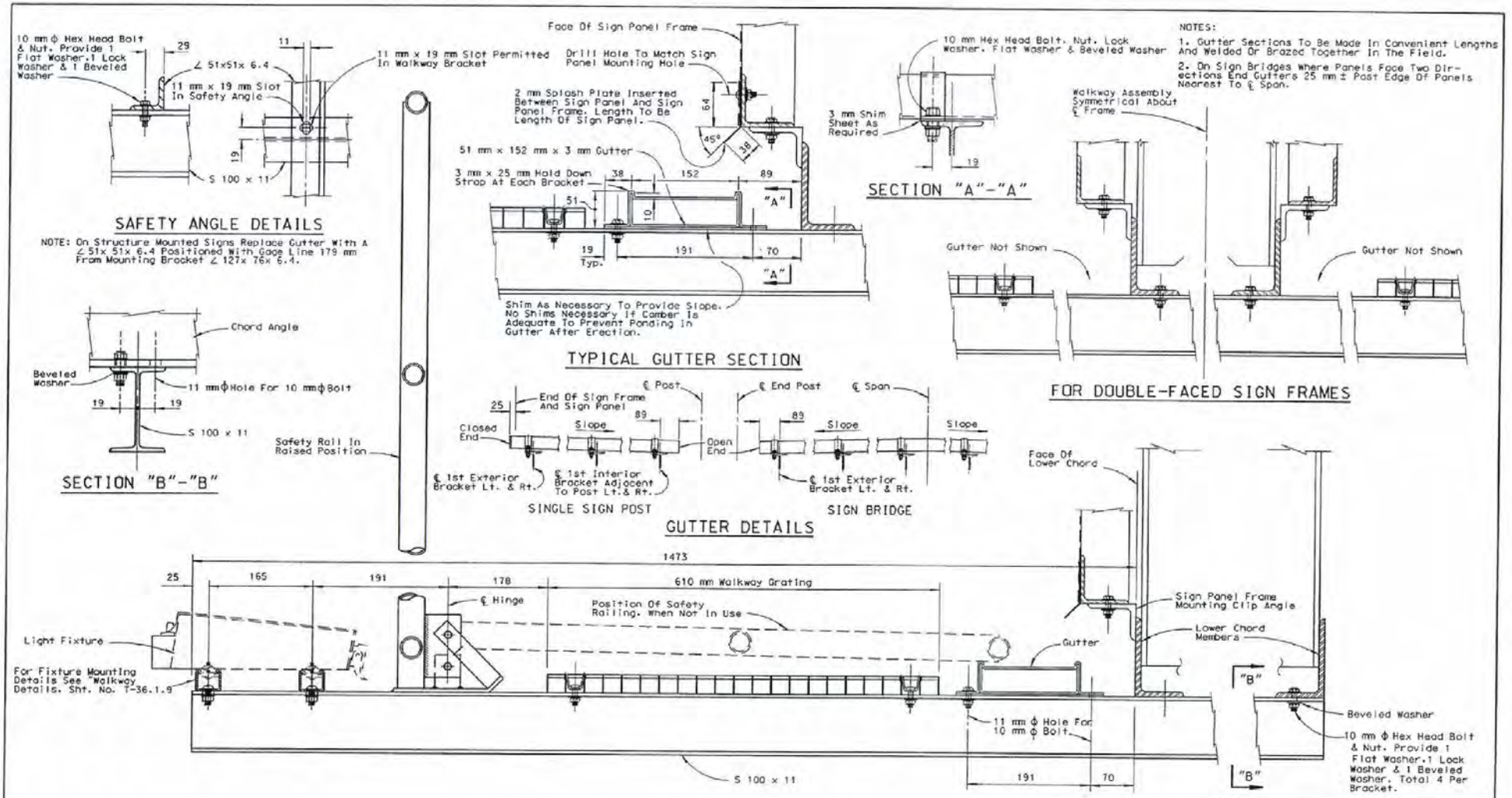
METRIC NDOT

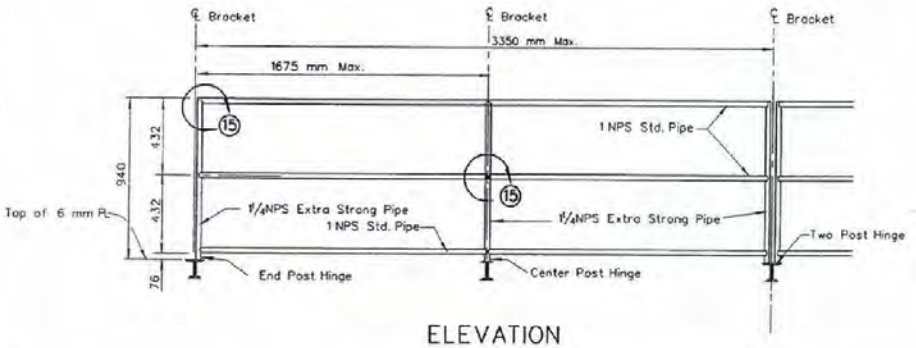
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

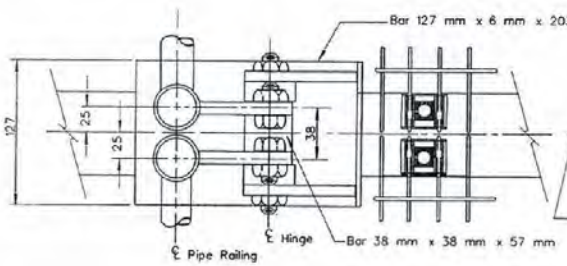
OVERHEAD SIGNS
WALKWAY DETAILS NO. 1

CHIEF TRAFFIC ENGINEER	ADOPTED: 11/95	T-36.1.9	(627) REVISION

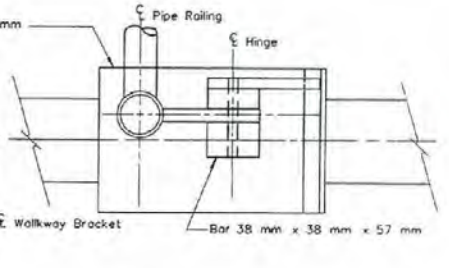

10 mm ϕ Hex Head Bolt & Nut. Provide 1 Flat Washer.1 Lock Washer & 1 Beveled Washer
29
11
∠ 51x51x 6.4
11 mm x 19 mm Slot In Walkway Bracket
11 mm x 19 mm Slot In Safety Angle
19
S 100 x 11
SAFETY ANGLE DETAILS
NOTE: On Structure Mounted Signs Replace Gutter With A ∠ 51x 51x 6.4 Positioned With Gage Line 178 mm From Mounting Bracket ∠ 127x 76x 6.4.
Face Of Sign Panel Frame
Drill Hole To Match Sign Panel Mounting Hole
2 mm Splash Plate Inserted Between Sign Panel And Sign Panel Frame. Length To Be Length Of Sign Panel.
64
45°
38
51 mm x 152 mm x 3 mm Gutter
3 mm x 25 mm Hold Down Strap At Each Bracket
38
152
89
51
10
"A"
19 Typ.
191
70
Shim As Necessary To Provide Slope. No Shims Necessary If Camber Is Adequate To Prevent Ponding In Gutter After Erection.
TYPICAL GUTTER SECTION
10 mm Hex Head Bolt, Nut, Lock Washer, Flat Washer & Beveled Washer
3 mm Shim Sheet As Required
19
SECTION "A"-"A"
NOTES:
1. Gutter Sections To Be Made In Convenient Lengths And Welded Or Brazed Together In The Field.
2. On Sign Bridges Where Panels Face Two Directions End Gutters 25 mm ± Past Edge Of Panels Nearest To ℄ Span.
Walkway Assembly Symmetrical About ℄ Frame
Gutter Not Shown
Gutter Not Shown
FOR DOUBLE-FACED SIGN FRAMES
Chord Angle
Beveled Washer
11 mmϕHole For 10 mmϕBolt
19
19
S 100 x 11
Safety Rail In Raised Position
SECTION "B"-"B"
℄ Post
℄ End Post
℄ Span
End Of Sign Frame And Sign Panel
25
Closed End
Slope
89
Open End
89
Slope
Slope
℄ 1st Exterior Bracket Lt. & Rt.
℄ 1st Interior Bracket Adjacent To Post Lt.& Rt.
℄ 1st Exterior Bracket Lt. & Rt.
SINGLE SIGN POST
SIGN BRIDGE
GUTTER DETAILS
1473
25
165
191
178
610 mm Walkway Grating
℄ Hinge
Position Of Safety Railing. When Not In Use
Light Fixture
For Fixture Mounting Details See "Walkway Details. Sht. No. T-36.1.9
S 100 x 11
Face Of Lower Chord
Sign Panel Frame Mounting Clip Angle
Lower Chord Members
Gutter
"B"
11 mm ϕ Hole For 10 mm ϕ Bolt
Beveled Washer
10 mm ϕ Hex Head Bolt & Nut. Provide 1 Flat Washer.1 Lock Washer & 1 Beveled Washer. Total 4 Per Bracket.
191
70
WALKWAY ASSEMBLY
NOTE: For Spacing Of Lighting Fixtures. See Table Of Spacing On "Sign Lighting Fixtures" Sheet T-30.1.16.1
METRIC
NDOT
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
OVERHEAD SIGNS
WALKWAY DETAILS NO. 2
CHIEF TRAFFIC ENGR
T-36.1.10
(627)
ADOPTED: 7/96 REVISION



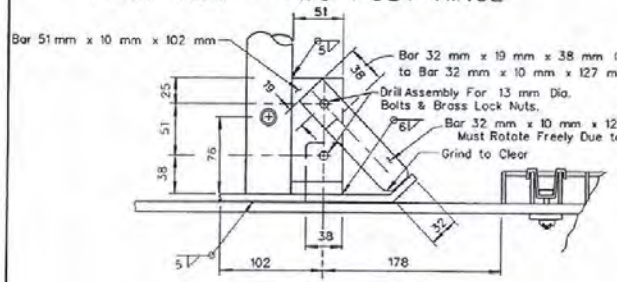
ELEVATION



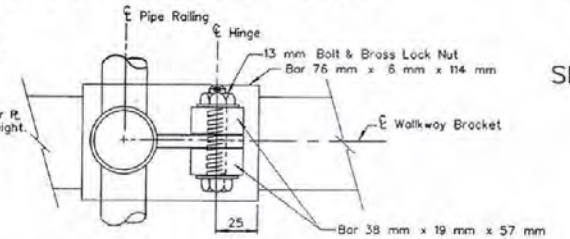
PLAN VIEW - TWO POST HINGE



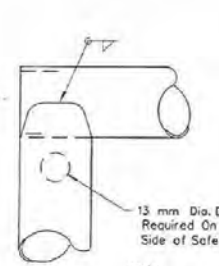
PLAN VIEW - END POST HINGE



ELEVATION

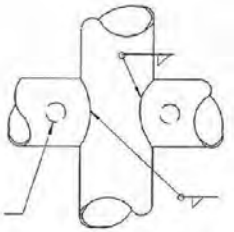


PLAN VIEW - CENTER POST HINGE



Note:
Alternative Venting Methods May Be Used If Approved by The Engineer.

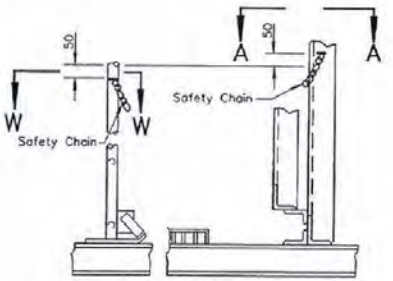
DETAIL (15)

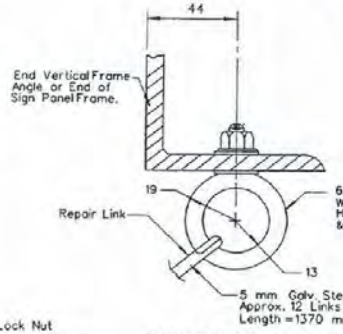


DETAIL (16)

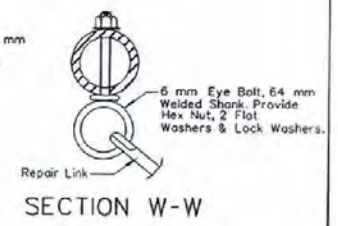
NOTES:

1. Special Care Shall Be Taken to Insure That The Completed Hinge and Latch Assembly Will Hold The Safety Railing In A Steady Manner, Free of Wobble While in the Raised Position. Maximum Allowable Displacement From Vertical at Top of Railing When Latched Shall Be 25 mm.
2. Details For Bolting Hinge Base Pl. to Walkway Bracket May Be Submitted for Approval.
3. Alternative Details Approved By The Engineer May Be Substituted For The Safety Chain Connections Shown.
4. NPS • Nominal Pipe Size Designator, See M A53.





SECTION A-A



SECTION W-W

CHAIN ASSEMBLY

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

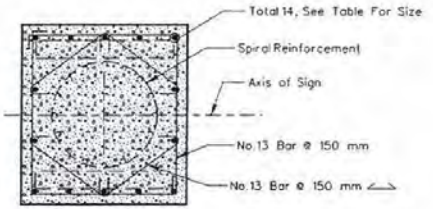
OVERHEAD SIGNS
WALKWAY SAFETY RAILING DETAILS

CHIEF TRAFFIC ENGINEER

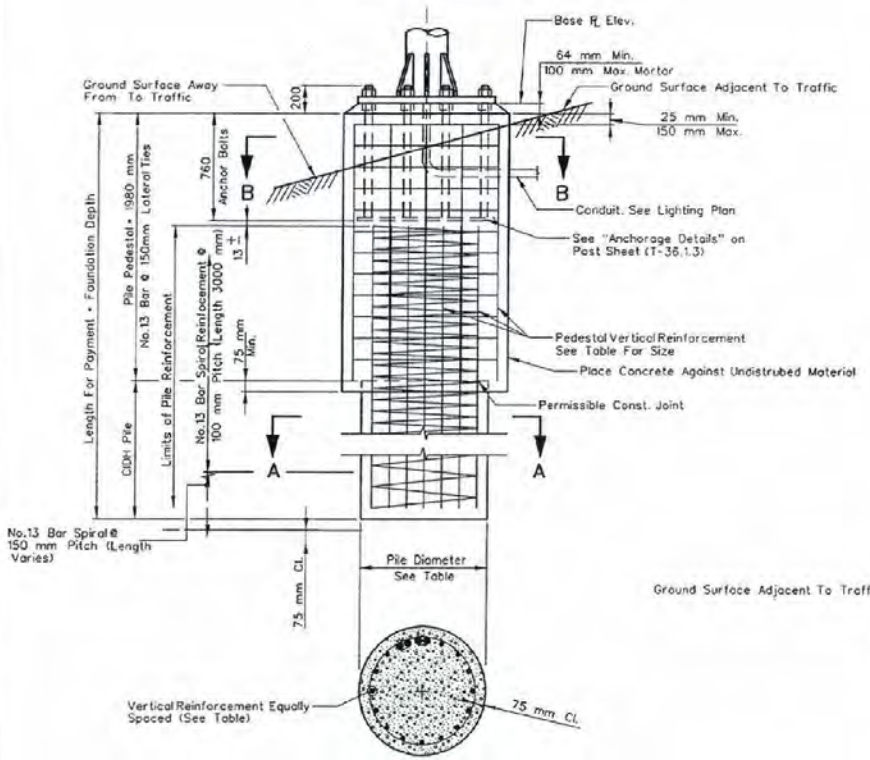
T-36.1.11 (627)

ADOPTED: 7/96 REVISION 9/97

T-60



SECTION B-B



SECTION A-A

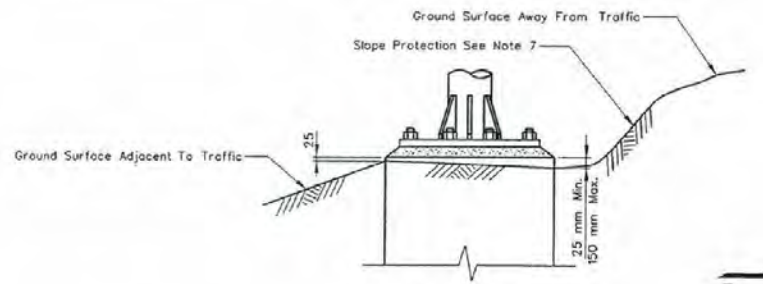
POST TYPE	ANCHOR BOLTS	PEDESTAL SIZE (mm)	REINFORCING STEEL VERTICAL	PILE DIAMETER (mm)	FOUNDATION DEPTH ** (m)
II	6-51 mm	890 X 865	14 - No. 22 Bar	760	4.0
III	6-51 mm	965 X 865	14 - No. 25 Bar	760	4.0
IV	6-51 mm	1120 X 1020	16 - No. 25 Bar	915	4.0
V	10-51 mm	1170 X 1095	16 - No. 29 Bar	915	5.0
VI	10-51 mm	1170 X 1095	16 - No. 32 Bar	915	5.5
VII	12-51 mm	1295 X 1195	16 - No. 36 Bar	915	6.5
I-S	6-51 mm	865 X 865	14 - No. 22 Bar	760	4.0
II-S	6-51 mm	940 X 865	14 - No. 25 Bar	760	5.0
III-S	6-51 mm	1020 X 865	14 - No. 32 Bar	760	5.5
IV-S	8-51 mm	1070 X 1020	16 - No. 32 Bar	915	6.0
V-S	8-51 mm	1145 X 1020	16 - No. 36 Bar	915	7.0
VI-S	8-51 mm	1245 X 1020	16 - No. 36 Bar	915	7.0
VII-S	8-57 mm	1350 X 1195	* 24 - No. 36 Bar	915	8.0

** USE FOUNDATION DEPTH SHOWN IN TABLE UNLESS OTHERWISE SHOWN ON THE "FORMAT" SHEET.

* BUNDLED BARS

NOTES:

1. FOR ANCHOR BOLT LAYOUT SEE POST SHEET(T-36.1.3).
2. FOR "BASE R ELEV." SEE "FORMAT" SHEET.
3. PEDESTRAL AND PILE SHALL BE CLASS "A" OR CLASS "AA" PCC
4. PEDESTALS & BASE PLATES. LONGER SIDES SHALL BE NORMAL TO AXIS OF SIGN.
5. PRIOR TO ERECTION OF THE POST, BACKFILL WHICH IS EQUIVALENT TO THE SURROUNDING MATERIAL SHALL BE IN PLACE.
6. PEDESTAL SHALL BE FORMED 150 mm MIN. BELOW GROUND SURFACE. REMAINDER TO BE PLACED AGAINST UNDISTURBED MATERIAL.
7. SLOPE PROTECTION REQUIRED WHEN INDICATED ON THE ROAD PLANS.



DETAIL C

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

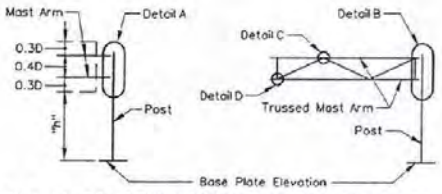
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
ALTERNATE PILE FOUNDATION

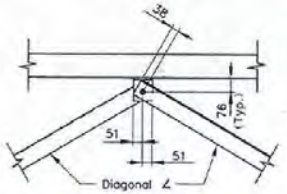
CHIEF TRAFFIC ENGINEER

T-36.1.12 (627)

ADOPTED: 7/96 REVISION:

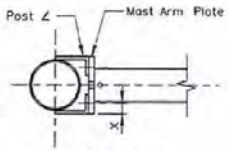


DOUBLE MAST ARM SERIES TRUSSED MAST ARM SERIES



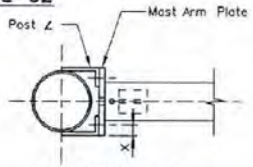
DETAIL C

TYPE C1

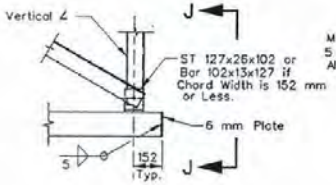


SECTION F-F

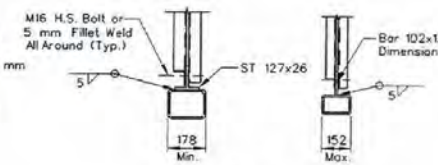
TYPE C2



SECTION G-G

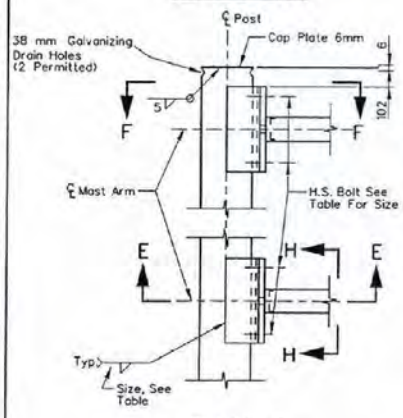


DETAIL D

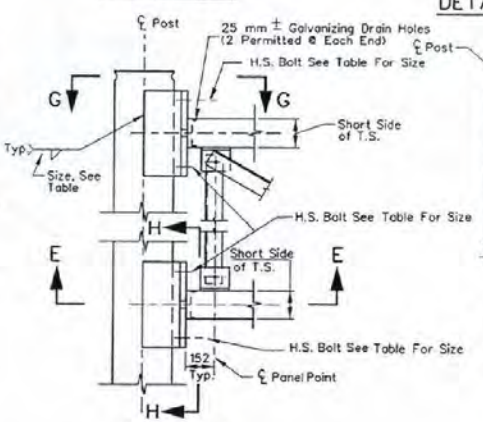


VIEW J-J

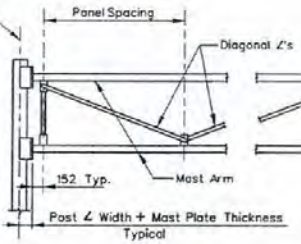
POST ANGLES			
POST SIZE	ANGLE	X (mm)	WELD (mm)
6	∠127X76X12.7	44	6
8	∠152X120X15.9	57	6
10	∠178X102X15.9	57	6
12	∠203X152X19.0	57	8
14	∠203X152X19.0	57	8



DETAIL A



DETAIL B



MAST ARM PLATE			
TWO ARMS	TRUSSED ARMS	PLATE (mm)	H.S. BOLT
TS 76X76X6.4		19	M16
TS 102X102X6.4		25	M16
TS 127X127X6.4		25	M20
TS 152X152X6.4		25	M20
TS 178X178X6.4	TS 127X76X9.5	32	M20
	TS 152X102X9.5	32	M22
	TS 178X127X9.5	32	M22
	TS 203X152X9.5	32	M22
	TS 254X152X9.5	32	M27

POST TO ARM FRAMING DATA

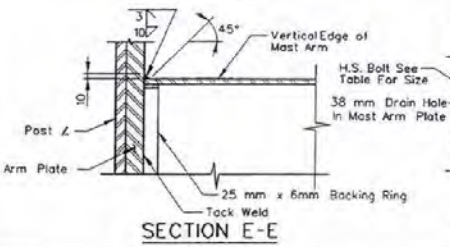
SIGN DEPTH (mm)	ARM CLEARANCE (mm)	MAX. PANEL SPACING (mm)	VERTICAL ANGLE	DIAGONAL ANGLE
D=1016-1778	610	1321	∠51X51X6.4	∠51X51X6.4
D=2032-2540	914	1981	∠89X64X6.4 *	∠89X64X6.4 *

* Short Leg Outstanding

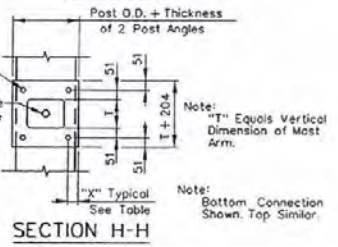
TRUSS FRAMING DATA

NOTES:
1. For Post Connection To Base Plate See T-36.1.16
2. For Mast Arm Length And Mast Arm To Sign Panel Connections See T-36.1.14
3. NPS = Nominal Pipe Size Designator. See ASTM A53.

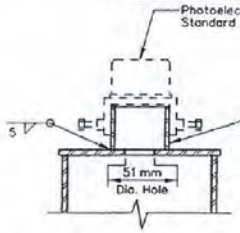
FOR GENERAL NOTES SEE T-36.1.16



SECTION E-E



SECTION H-H



PHOTOELECTRIC CONTROL UNIT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

METRIC NDOT

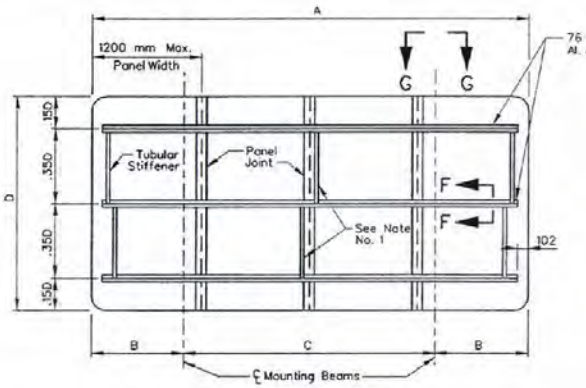
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

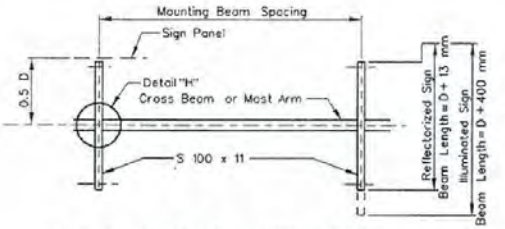
OVERHEAD SIGNS
LIGHTWEIGHT
TYPE C
CONNECTION DETAILS

T-36.1.13 (627)

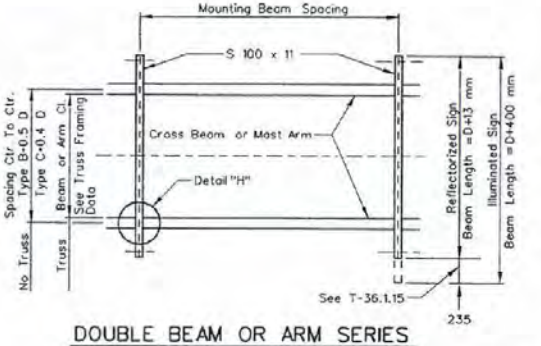
CHIEF TRAFFIC ENGINEER | ADOPTED: 7/96 | REVISION:

T-62

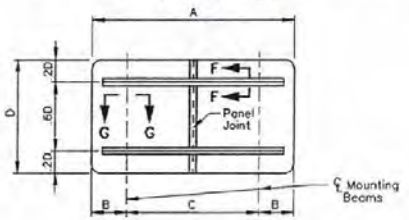


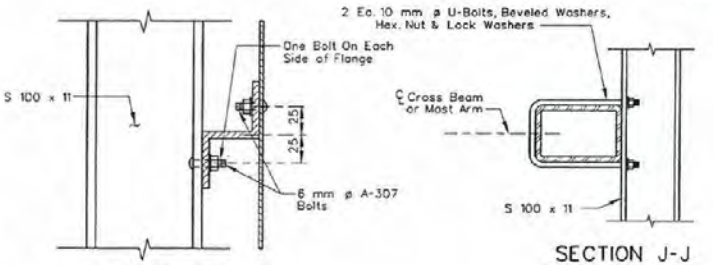


SINGLE BEAM OR ARM SERIES



DOUBLE BEAM OR ARM SERIES





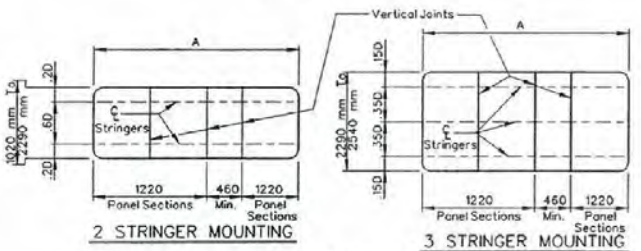
SECTION F-F

SECTION J-J

SIGN PANEL LENGTH A (mm)	NUMBER MOUNTING BEAMS	SIGN PANEL OVERHANG B (mm)	MOUNTING BEAM SPACING C (mm)
1525	2	230	1065
1830	2	305	1220
2135	2	380	1370
2440	2	460	1525
2745	2	535	1675
3050	2	610	1830
3355	2	685	1980
3660	2	765	2135
3965	2	765	2440
4270	2	765	2745
4575	2	915	2745
4880	2	915	3050 *
5185	2	990	3200 *
5490	2	1065	3355 *

* - CENTER MOUNT REQUIRED. DIVIDE "C" SPACING BY 2.

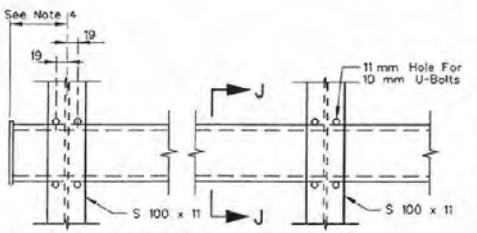
MOUNTING BEAM SPACING



2 STRINGER MOUNTING

3 STRINGER MOUNTING

STRINGER AND PANEL ARRANGEMENT

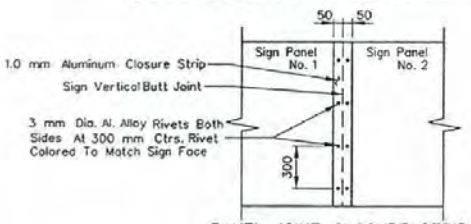


END ARM DETAIL SINGLE POST SIGNS

DETAIL H

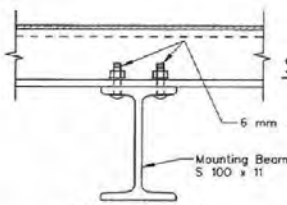
NOTES:

1. TUBULAR STIFFENERS TO BE ADDED WHEN "A" EXCEEDS 3000 mm.
2. POSITION SIGN PANEL SO THAT MOUNTING BEAMS WILL CLEAR TRUSS CONNECTIONS AND ARM TO POST JOINTS. WHERE INTERFERENCE CANNOT BE AVOIDED, 13 mm ø HOLES TO PASS THE 10 mm ø U-BOLTS MAY BE DRILLED THROUGH MAST ARM ANGLES OR TRUSS CONNECTION MEMBERS AS NECESSARY.
3. TORQUE ALUMINUM SIGN PANEL MOUNTING BOLT TO 11.3 N-m.
4. 280 mm FOR TYPE C-1 AND C-2. OTHERS 100 mm.
5. FLAT WASHERS REQUIRED ON ALL BOLTS. 1 OR 2 AS NECESSARY.
6. ALL NUTS TO HAVE FIBER INSERTS.
7. TO OBTAIN DESIRED PANEL WIDTH. MAX. OF 2 PANELS MAY BE CUT LESS THAN 1220 mm (460 mm MIN. EACH).
8. TUBULAR STIFFENERS REQUIRED ONLY WHEN PANEL OVERHANG EXCEEDS 600 mm.



PANEL JOINT CLOSURE STRIP

ALUMINUM SHEET CONSTRUCTION



SECTION G-G

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

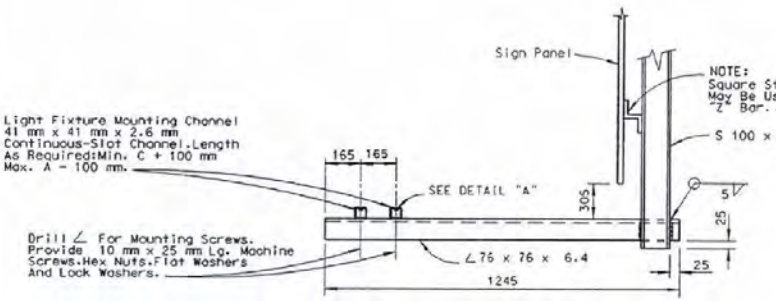
OVERHEAD SIGNS LIGHTWEIGHT SIGN PANEL MOUNTING DETAILS

CHIEF TRAFFIC ENGINEER

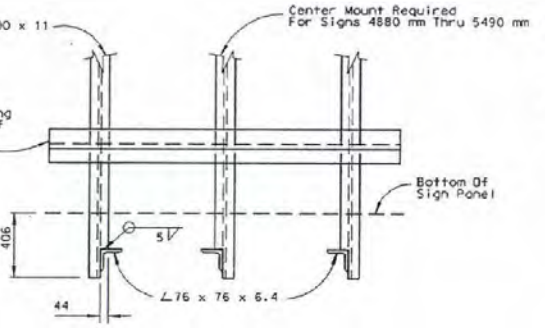
T-36.1.14 (627)

ADOPTED: 7/96 REVISION: 9/97

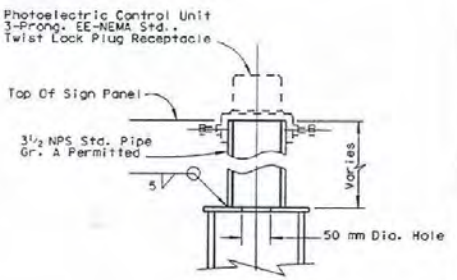
T-63



SIDE VIEW - SINGLE FACED SIGN TYPES C



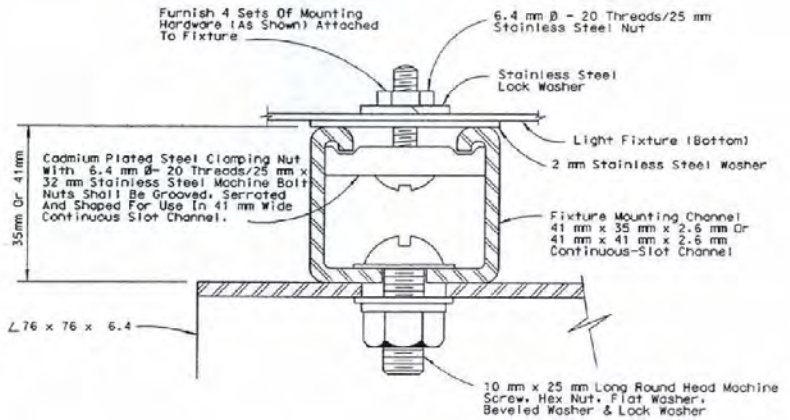
FRONT VIEW



PHOTOELECTRIC
CONTROL UNIT

LIGHT FIXTURE MOUNTING DETAIL

Note: NPS = Nominal Pipe Size Designator. See ASTM A53.



DETAIL "A"

METRIC NDOT

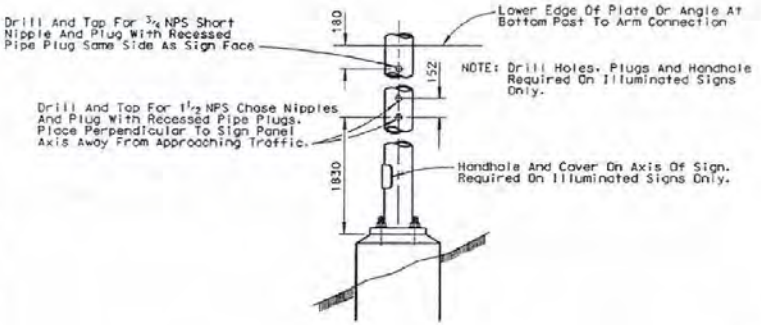
ALL DIMENSIONS ARE IN MILLIMETERS
UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

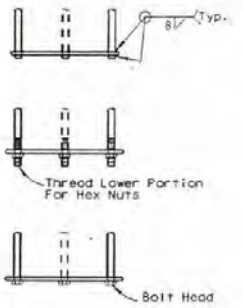
OVERHEAD SIGNS
LIGHTWEIGHT

(LIGHT FIXTURE MOUNTING DETAILS)

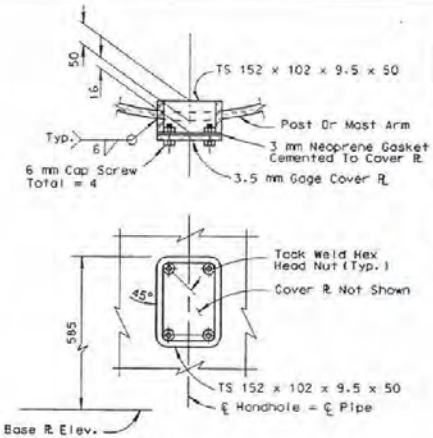
CHIEF TRAFFIC ENGR. | T-36.1.15 (627) | ACCEPTED: 7/96 | REVISION:



ELEVATION

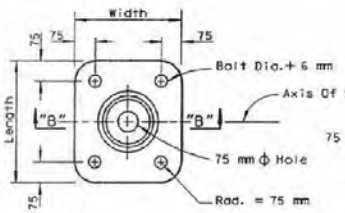


ALTERNATIVE BAR CONNECTIONS

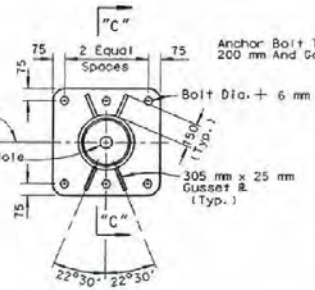


HANDHOLE AND COVER DETAILS

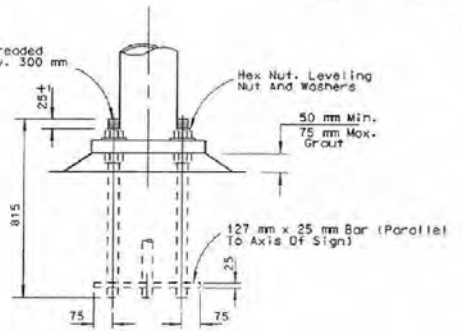
POST SIZE		BASE PLATE (mm)	ANCHOR BOLTS	
NPS	T (mm)		No.	BOLTS Ø (mm)
6	7.11	355 x 355 x 40	4	32
6	10.97	355 x 355 x 40	4	38
8	8.18	460 x 460 x 40	4	44
8	12.7	460 x 460 x 50	4	51
10	12.7	510 x 510 x 50	4	57
12	12.7	510 x 510 x 50	4	64
14	12.7	715 x 715 x 50	6	51
14	19.05	715 x 715 x 50	6	57



PLAN



PLAN



ANCHOR BOLT

NOTES:

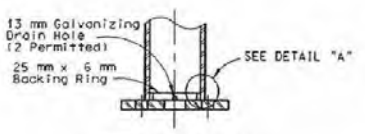
1. Footings Shall Be Placed With Long Dimensions Normal To Axis Of Sign.
2. On Single Post Signs The Post Shall Be Raked Out Of Plumb With The Use Of The Leveling Nuts To Make The Bottom Of The Sign Frame Level.
3. 51 mm ϕ Anchor Bolts May Be Substituted For 44 mm ϕ Bolts. 64 mm ϕ Anchor Bolts May Be Substituted For 57 mm ϕ Bolts.
4. NPS = Nominal Pipe Size Designator. See ASTM A53.

GENERAL NOTES:

DESIGN: A.A.S.H.O. Specifications For The Design And Construction Of Structural Supports For Highway Signs, Luminaires And Traffic Signals, Dated 1994.

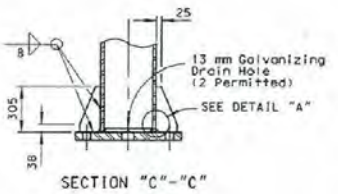
CONSTRUCTION: Standard Specifications For Road And Bridge Construction, Current Edition And Supplements There To.

WELDING: All Welding Continuous Unless Otherwise Noted On The Plans. All Welding To Be Done In Accordance With The Standard Specifications.



SECTION "B"-"B"

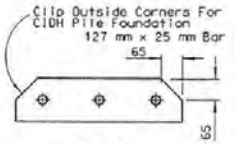
6 NPS THRU 12 NPS POST



SECTION "C"-"C"

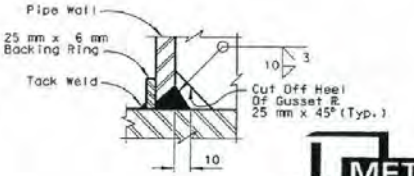
14 NPS POST

BASE PLATE DETAILS



BAR PLAN

ANCHORAGE DETAILS



DETAIL "A"

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS LIGHTWEIGHT POST DETAILS

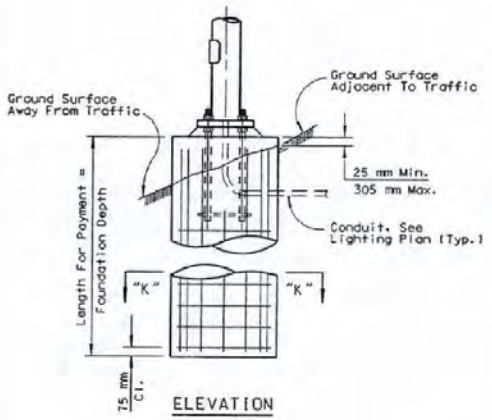
CHIEF TRAFFIC ENGR. — T-36.1.16 (627) — ADOPTED: 7/96 | REVISION:

T-65

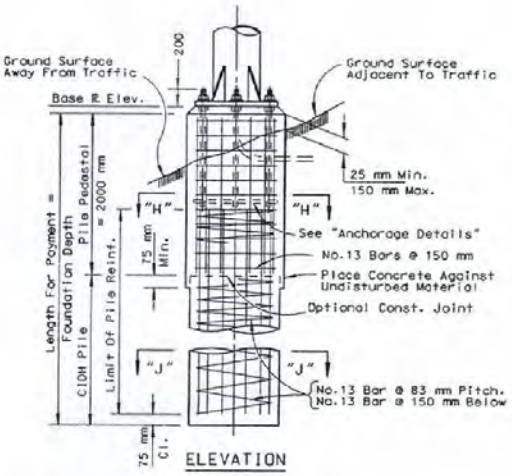
POST SIZE		PILE FOUNDATION				SPREAD FOOTING				
NPS	† (mm)	Pedestal (mm)	Pile Dia. (mm)	Ftng. Depth (m)	Reinf. Size	Pedestal (mm)	Footing (mm)	Reinf. Top	Bot.	J Bar
6	7.11		610	2.4	No.16 Bar	560 x 560	1220 x 1830	No.13 Bar	No.13 Bar	No.16 Bar
6	10.97		610	2.7	No.16 Bar	560 x 560	1220 x 2135	No.13 Bar	No.13 Bar	No.16 Bar
8	8.18		760	2.7	No.19 Bar	660 x 660	1525 x 2440	No.13 Bar	No.13 Bar	No.16 Bar
8	12.7		760	3.4	No.22 Bar	660 x 660	1830 x 2745	No.13 Bar	No.16 Bar	No.16 Bar
10	12.7	865 x 865	760	4.0	No.25 Bar	710 x 710	2135 x 3050	No.16 Bar	No.22 Bar	No.22 Bar
12	12.7	865 x 865	760	4.6	No.32 Bar	710 x 710	2135 x 3660	No.19 Bar	No.25 Bar	No.25 Bar
14	12.7	1015 x 1015	920	4.6	No.32 Bar	890 x 890	2135 x 3965	No.22 Bar	No.29 Bar	No.25 Bar
14	19.05	1015 x 1015	920	4.9	No.32 Bar	890 x 890	2440 x 4270	No.22 Bar	No.29 Bar	No.25 Bar

NOTES:

1. Backfill Shall Be In Place Prior To Erection Of Post.
2. Slope Protection Required When Indicated On The Plans.
3. Pile Pedestal Shall Be Formed 150 mm Min. Below Ground Surface. Remainder Shall Be Placed Against Undisturbed Material.
4. NPS = Nominal Pipe Size Designator. See ASTM A53.



ELEVATION



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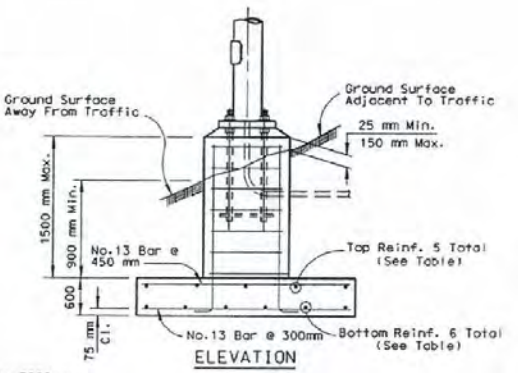
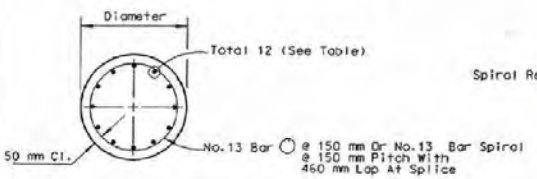
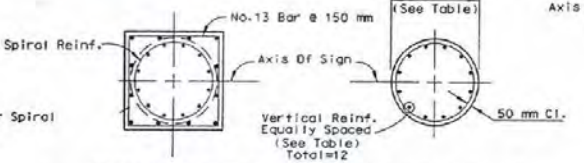


ELEVATION



SECTION "K"-"K"

6 NPS AND 8 NPS POSTS

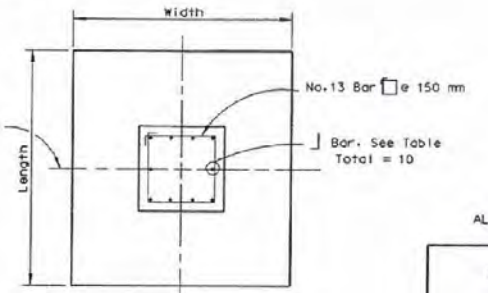


SECTION "H"-"H"

SECTION "J"-"J"

10 NPS THRU 14 NPS POSTS

PILE FOUNDATION



PLAN

SPREAD FOOTING

METRIC NDOT

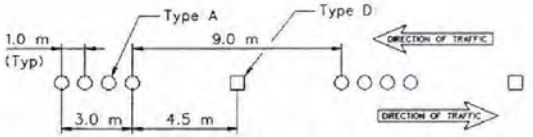
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

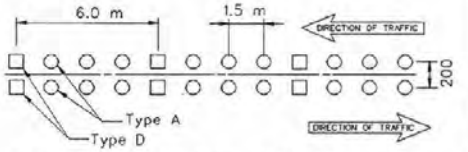
OVERHEAD SIGNS LIGHTWEIGHT FOUNDATION

CHIEF TRAFFIC ENGR. — T-36.1.17 (627)
ADOPTED: 7/96 REVISION: 9/97

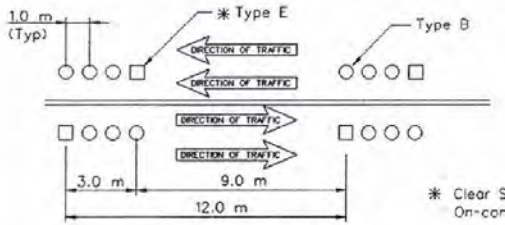
99-1



CENTER LANE TWO WAY TRAFFIC

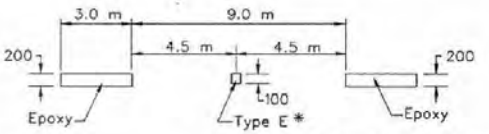


DOUBLE YELLOW CENTER LINE



* Clear Side Shall Face On-coming Traffic.

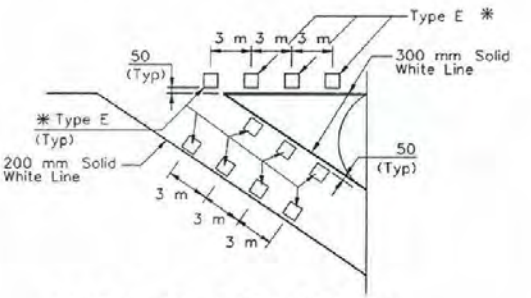
LANE LINE



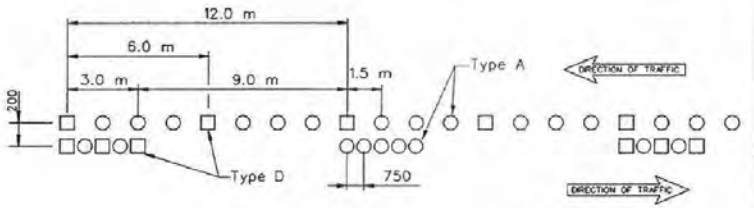
* Clear Side Shall Face On-coming Traffic.

LANE LINE (FREEWAY)

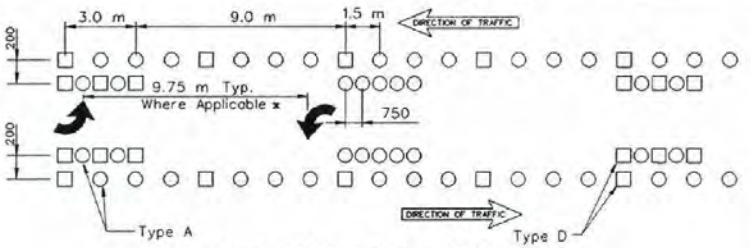
* Clear Side Shall Face On-coming Traffic.



EXIT RAMP GORE STRIPING

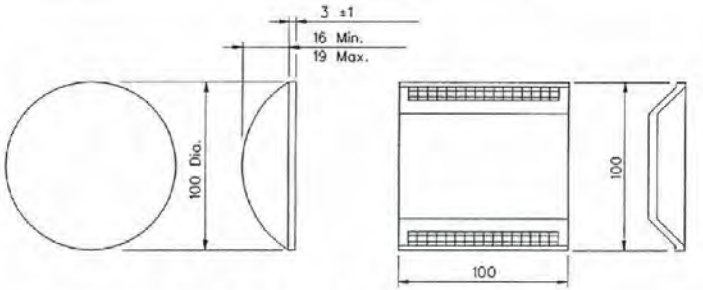


ONE WAY PASSING ZONE



TWO WAY LEFT TURN LANE

* See Plan Sheets for Location



REFLECTOR

NON-REFLECTIVE & REFLECTIVE MARKERS

Type A - Non-Reflective Yellow Marker
Type B - Non-Reflective White Marker
Type C - One Way Clear Reflective Marker
Type D - Two Way Yellow Reflective Marker
Type E - Red/Clear Reflective Marker

METRIC NDOT

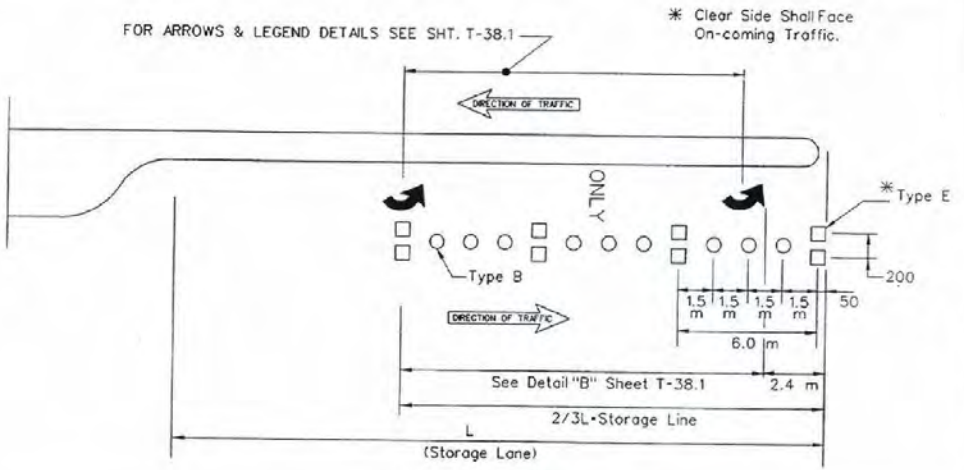
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

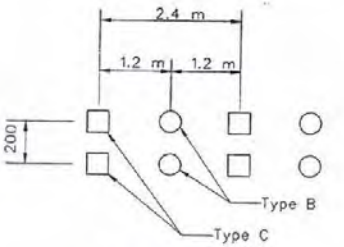
RAISED PAVEMENT MARKERS

CHIEF TRAFFIC ENGR	T-37.1.1	(633)
	ADOPTED 7/98	REVISION

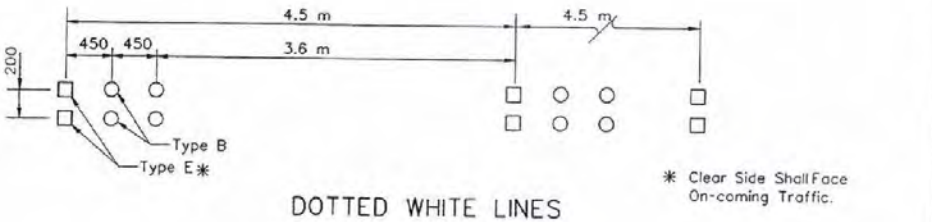
T-67



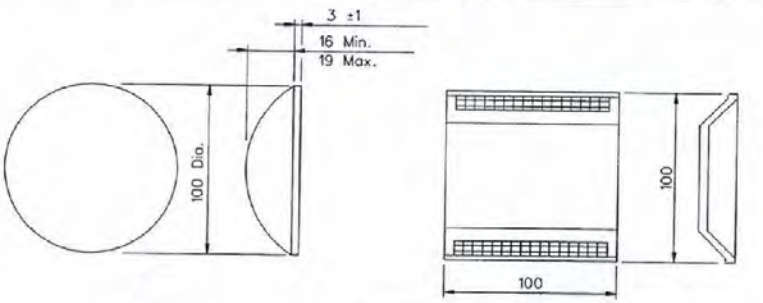
STORAGE LINE



INTERSECTIONS
DUAL TURN LANES (CAT TRACKS)



DOTTED WHITE LINES



NON-REFLECTIVE & REFLECTIVE MARKERS

Type A - Non-Reflective Yellow Marker
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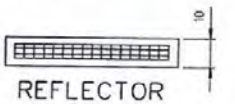
Type C - One Way Clear Reflective Marker
Type D - Two Way Yellow Reflective Marker
Type E - Red/Clear Reflective Marker



REFLECTOR

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RAISED PAVEMENT MARKERS

CHIEF TRAFFIC ENGR

T-37.1.2	(633)
ADOPTED 7/96	REVISION

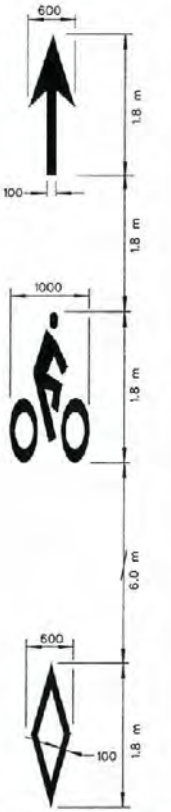
T-68

T-69

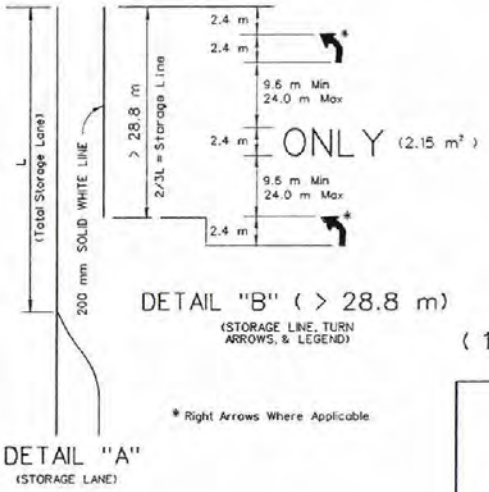
LEGENDS

XING 1200
ONLY 1200

NOTE: THESE LEGENDS AS SHOWN ARE FOR BIKE LANE USE.



BICYCLE PAVEMENT MARKINGS

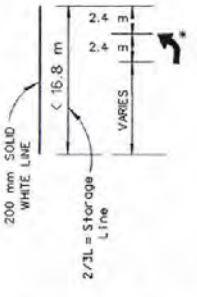


DETAIL "A" (STORAGE LANE)

DETAIL "B" (> 28.8 m) (STORAGE LINE, TURN ARROWS, & LEGEND)

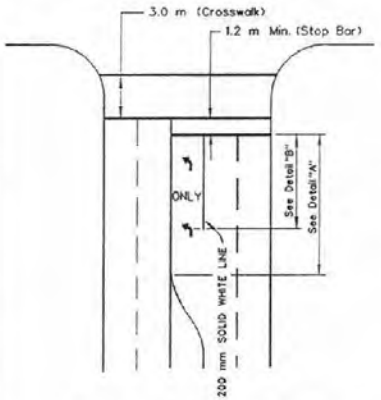
* Right Arrows Where Applicable

DETAIL "B" (16.8 m to 28.8 m)



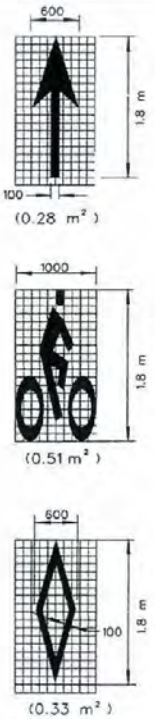
DETAIL "B" (< 16.8 m)

NOTE: All Stop Bars and Crosswalk Lines Shall Be 300 mm Wide Unless Otherwise Noted.

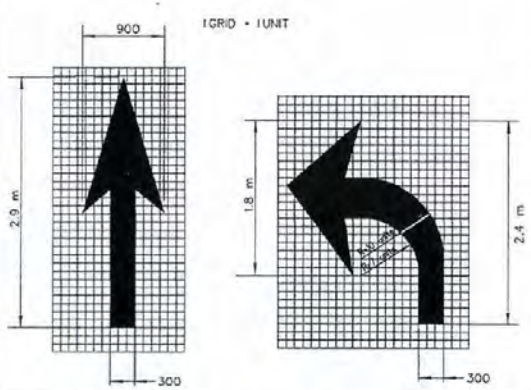


TYPICAL INTERSECTION CROSSWALKS & STOP BARS

NOTE: INSTALLATION OF MARKING FILM SHALL BE PERFORMED BY THE CONTRACTOR UNLESS OTHERWISE NOTED. FOR FINAL LOCATIONS, SEE STRIPING DETAILS.

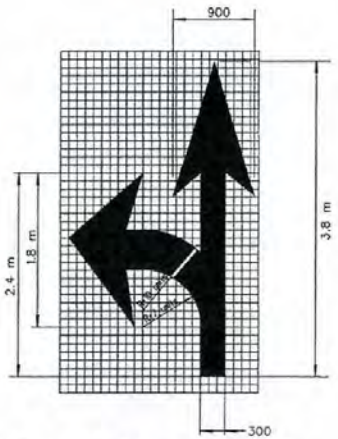


BIKE LANE

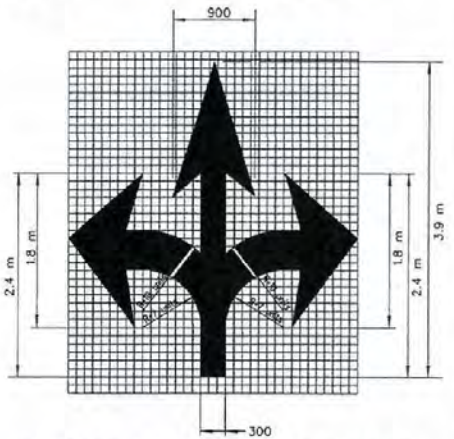


STRAIGHT ARROW (1.11 m²)

TURN ARROW (1.44 m²)



LEFT/STRAIGHT ARROW (2.51 m²)



LEFT/STRAIGHT/RIGHT ARROW (3.35 m²)

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

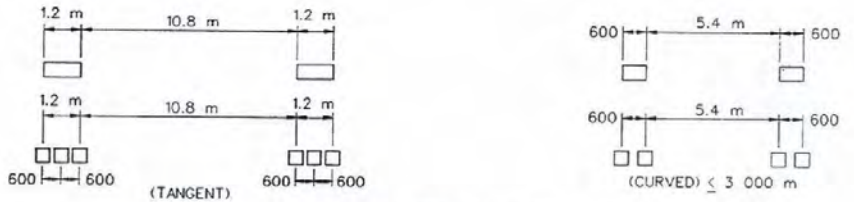
PERMANENT PAVEMENT MARKING FILM

Scott L. Wasserman — CHIEF TRAFFIC ENGINEER

T-38.1 (634)
ADOPTED: 7/96 REVISION

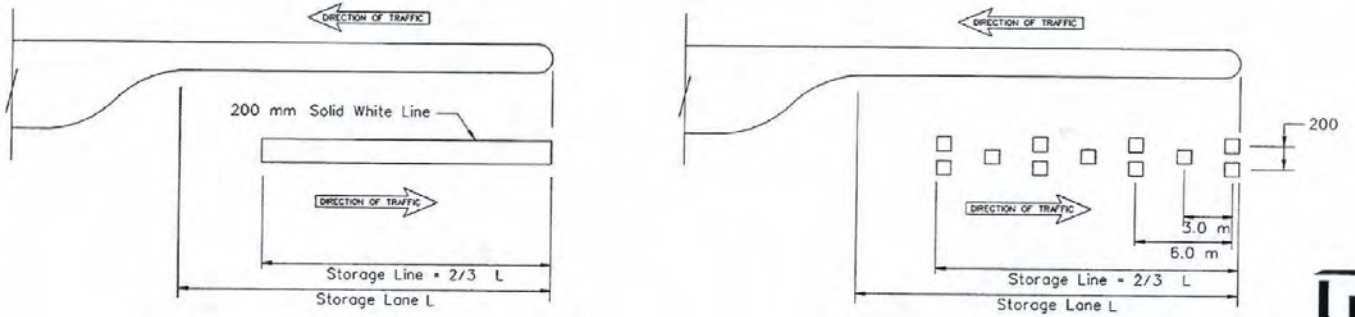
▭ - TEMPORARY TAPE OR PAINT (100 mm UNLESS OTHERWISE NOTED)

□ - TEMPORARY RAISED MARKERS (100 mm)



CENTER LANE & LANE LINES

DOUBLE YELLOW CENTER LINE



STORAGE LINE

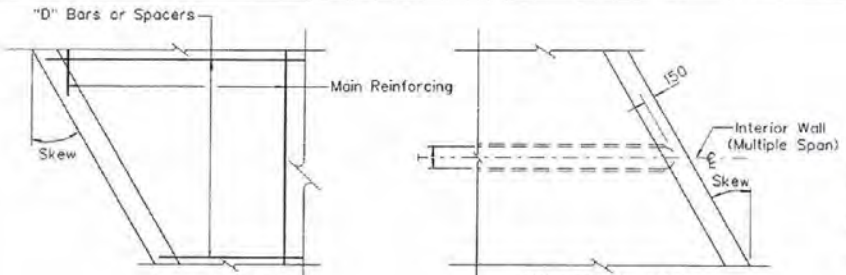
METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

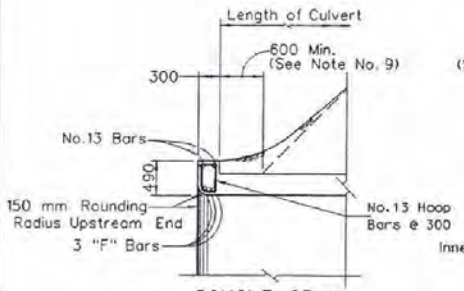
TEMPORARY PAVEMENT MARKINGS

CHIEF TRAFFIC ENGINEER | T-38.1.1 (634) | ADOPTED: 7/96 | REVISION 9/97

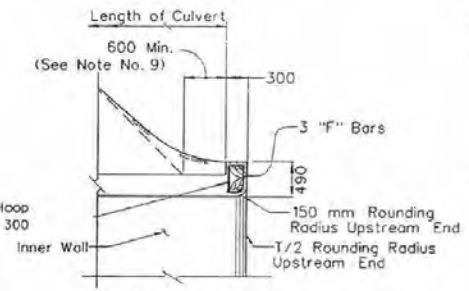


SINGLE SPAN PLAN

MULTIPLE SPAN PLAN

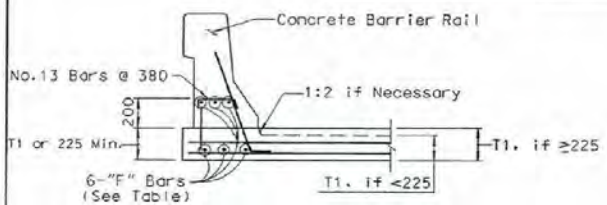


SINGLE SPAN ELEVATION



MULTIPLE SPAN ELEVATION

SKEWED PARAPETS									
SKEW ANGLE	SPAN		1.5 m	1.8 m	2.1 m	2.4 m	3.0 m	3.7 m	4.3 m
0°-15°	"F" BARS	BAR NO.	13	16	16	19	22	25	25
16°-30°	"F" BARS	BAR NO.	16	19	19	22	25	25	25
31°-45°	"F" BARS	BAR NO.	19	19	19	22	25	25	25
0°-45°	No.13 HOOP Bars		300 CTRS.						



PARAPET DETAILS

COPING REINFORCING INCLUDED IN THE HEADWALL QUANTITIES

GENERAL NOTES :

1) DESIGN SPECIFICATIONS : AASHTO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES. 1983, EXCEPT AS NOTED BELOW.

2) CONSTRUCTION SPECIFICATIONS: STATE OF NEVADA DEPARTMENT OF HIGHWAYS "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION," CURRENT EDITION, AND SPECIAL PROVISIONS THERE TO.

3) LOADING: LIVE LOAD: STANDARD HS20-44 OR ALTERNATE FHWA MILITARY LOADING. IMPACT FOR TOP SLAB IS 30% UP TO 300 mm COVER, 20% UP TO 600 mm COVER, AND 10% UP TO 900 mm COVER. NO IMPACT ABOVE 900 mm COVER. NO IMPACT FOR INVERT. NO SURCHARGE FOR WALLS.
EARTH LOAD: EQUIVALENT FLUID PRESSURE FOR TWO CONDITIONS.
1) 2240 kg/m^3 VERTICAL, 670 kg/m^3 HORIZONTAL.
2) 2240 kg/m^3 VERTICAL, 2240 kg/m^3 HORIZONTAL.
LOAD FACTORS: 1.5D + 1.5E + 2.5 (L+I).

4) CONCRETE: THE CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 23MPa MAXIMUM ALLOWABLE SHEAR, Vc = $\sqrt{0.291}$ f'c MPa TAKEN AT A DISTANCE "d" FROM THE SUPPORTING MEMBER.

5) REINFORCING STEEL: ALL REINFORCING STEEL TO BE AASHTO M31M GRADE 400. MAIN REINFORCEMENT IS TO BE PLACED IN THE TRANSVERSE DIRECTION. STAGGER ALL LAP SPLICES NOT SHOWN. HOOKS MAY BE ROTATED OR TILTED, AS NECESSARY, FOR CLEARANCE. REINFORCEMENT SHALL HAVE A 65 mm CLEARANCE ON BOTTOM OF BOTTOM SLAB AND 50 mm CLEARANCE ON REMAINDER OF STRUCTURE AND ITS APPURTENANCES UNLESS OTHERWISE NOTED ON THE PLANS. REINFORCING STEEL IN THE TOP SLAB SHALL HAVE AN EPOXY COATING WHEN THERE IS 150 mm OR LESS OF COVER ON THE RCB (CLARK COUNTY EXCLUDED).

6) FOUNDATION PRESSURE: THE RCB CULVERTS ARE DESIGNED TO THE FOLLOWING SOIL BEARING PRESSURES:

COVER HEIGHTS	3000 mm	6000 mm
RCB HEIGHT	KPa	
1800 mm	95	150
2400 mm	105	150
3000 mm	115	170
3700 mm	125	180
4300 mm	135	190

7) SPECIAL DESIGN: CULVERTS WITH CONDITIONS, LOADING, OR SIZES DISSIMILAR TO THOSE GIVEN ON THESE RCB CULVERT SHEETS MAY REQUIRE A SPECIAL DESIGN.

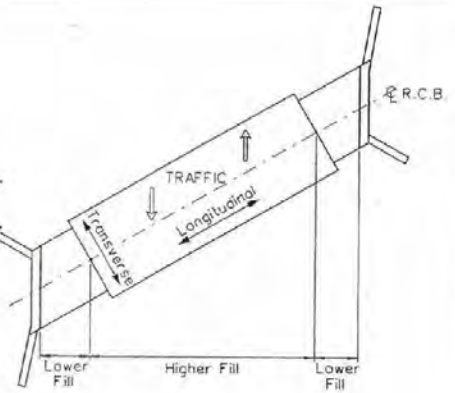
8) DESIGNATION: BOX CULVERTS ARE SHOWN ON PLANS AS SPAN TIMES HEIGHT TIMES LENGTH (3000 mm x 2400 mm x 59700 mm RCB).

9) ADDITIONAL LENGTH: LENGTH OF CULVERT SHALL BE INCREASED AS FOLLOWS: ADD 600 mm TO EACH END WHEN COVER AT SHOULDER IS 0.0 TO 1500 mm. ADD AN ADDITIONAL 300 mm TO EACH END FOR EACH SUCCEEDING 1500 mm OF COVER OR PORTION THEREOF.

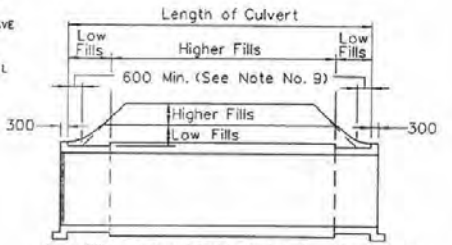
10) HEADWALLS: ALL RCB CULVERTS SHALL HAVE TYPE I HEADWALLS UNLESS OTHERWISE NOTED ON THE PLANS.

11) QUANTITIES: QUANTITIES DO NOT INCLUDE "d" BARS , NOR SPLICES IN BARS ,NOR TEMPERATURE BARS FOR EXPOSED TOP SLAB, NOR CONCRETE OR REINFORCEMENT FOR PARAPETS OR PAVING LEDGES.

12) THREE OR MORE CELLS: FOR CULVERTS WITH MORE THAN TWO CELLS, USE DIMENSIONS AND REINFORCEMENT FOR THE "DOUBLE BOX CULVERT" AND ADJUST THE QUANTITIES ACCORDINGLY.



PLAN - SKEWED



Low Fills - Lowest Table Value for, Given Span
Higher Fills - Slab Increase as Shown in Table

ELEVATION

FILL HEIGHT TRANSITIONS

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

R.C.B., CULVERTS, GENERAL NOTES

E. J. Marucci
CHIEF BRIDGE DESIGN ENGR.

B-20.1.1	(502)
ADOPTED: 7/96	REVISION

B-1

Span 1.2 m

Item	Unit	H 0.6 / Cover 3.0	H 0.6 / Cover 6.0	H 0.9 / Cover 3.0	H 0.9 / Cover 6.0	H 1.2 / Cover 3.0	H 1.2 / Cover 6.0
CONC. ROOF T1	mm	180	180	180	180	180	180
CONC. WALLS T2	mm	150	150	150	150	150	165
CONC. INVERT T3	mm	150	150	150	150	150	165
REINF. SPACING	mm	125	125	125	180	180	180
REINF. "a" BAR NO.		16	16	16	19	19	19
REINF. "e" BAR NO.		13	13	13	16	16	19
QUAN. CONCRETE	m^3/m	0.69	0.69	0.78	0.78	0.87	0.94
QUAN. REINFORCEMENT	kg/m	74	74	77	86	86	100

Span 1.5 m

Item	Unit	H 0.6 / 3.0	H 0.6 / 6.0	H 0.9 / 3.0	H 0.9 / 6.0	H 1.2 / 3.0	H 1.2 / 6.0	H 1.5 / 3.0	H 1.5 / 6.0
CONC. ROOF T1	mm	190	190	190	190	190	190	190	190
CONC. WALLS T2	mm	150	150	150	150	150	180	165	190
CONC. INVERT T3	mm	165	180	165	180	165	180	165	180
REINF. SPACING	mm	150	100	215	140	215	140	215	140
REINF. "a" BAR NO.		19	16	22	19	22	19	22	19
REINF. "e" BAR NO.		13	13	13	13	16	16	19	19
QUAN. CONCRETE	m^3/m	0.83	0.85	0.93	0.95	1.02	1.11	1.16	1.27
QUAN. REINFORCEMENT	kg/m	95	92	86	101	100	120	122	156

Span 1.8 m

Item	Unit	H 0.9 / 3.0	H 0.9 / 6.0	H 1.2 / 3.0	H 1.2 / 6.0	H 1.5 / 3.0	H 1.5 / 6.0	H 1.8 / 3.0	H 1.8 / 6.0
CONC. ROOF T1	mm	205	205	205	205	205	205	205	205
CONC. WALLS T2	mm	150	150	150	180	165	190	180	215
CONC. INVERT T3	mm	180	205	180	205	180	205	180	205
REINF. SPACING	mm	190	125	190	125	190	125	190	115
REINF. "a" BAR NO.		22	19	22	19	22	19	22	19
REINF. "e" BAR NO.		13	13	16	16	19	19	22	19
QUAN. CONCRETE	m^3/m	1.09	1.14	1.18	1.32	1.32	1.48	1.48	1.70
QUAN. REINFORCEMENT	kg/m	104	120	122	143	144	179	184	220

Span 2.1 m

Item	Unit	H 0.9 / 3.0	H 0.9 / 6.0	H 1.2 / 3.0	H 1.2 / 6.0	H 1.5 / 3.0	H 1.5 / 6.0	H 1.8 / 3.0	H 1.8 / 6.0	H 2.1 / 3.0	H 2.1 / 6.0
CONC. ROOF T1	mm	205	230	205	230	205	230	215	230	215	230
CONC. WALLS T2	mm	150	150	150	180	165	190	180	215	205	240
CONC. INVERT T3	mm	205	230	205	230	205	230	205	230	205	230
REINF. SPACING	mm	165	125	165	115	165	140	165	140	165	140
REINF. "a" BAR NO.		22	19	22	19	22	22	22	22	22	22
REINF. "e" BAR NO.		13	13	16	16	19	19	19	22	22	22
QUAN. CONCRETE	m^3/m	1.27	1.38	1.36	1.56	1.50	1.72	1.88	1.95	1.92	2.21
QUAN. REINFORCEMENT	kg/m	140	140	156	176	180	219	193	263	238	286

Span 2.4 m

Item	Unit	H 0.9 / 3.0	H 0.9 / 6.0	H 1.2 / 3.0	H 1.2 / 6.0	H 1.5 / 3.0	H 1.5 / 6.0	H 1.8 / 3.0	H 1.8 / 6.0	H 2.1 / 3.0	H 2.1 / 6.0	H 2.4 / 3.0	H 2.4 / 6.0
CONC. ROOF T1	mm	215	240	215	240	215	240	215	255	215	255	215	255
CONC. WALLS T2	mm	150	180	150	180	165	190	180	215	205	240	215	270
CONC. INVERT T3	mm	205	240	205	240	205	255	205	255	205	255	205	255
REINF. SPACING	mm	150	125	150	125	150	125	150	115	150	125	150	115
REINF. "a" BAR NO.		22	22	22	22	22	22	22	22	22	22	22	22
REINF. "e" BAR NO.		16	16	16	16	16	19	19	19	19	22	22	22
QUAN. CONCRETE	m^3/m	1.43	1.67	1.52	1.77	1.66	1.96	1.81	2.24	2.05	2.50	2.24	2.80
QUAN. REINFORCEMENT	kg/m	171	207	183	225	195	254	204	295	238	320	286	375

"c" BARS, FOR EARTH COVERS UP TO AND INCLUDING 1.0 m TO BE PLACED IN TOP SLAB ONLY								
SPAN (m)	1.2	1.5	1.8	2.1	2.4	3.0	3.7	4.3
NUMBER of BARS	7	8	9	10	11	12	15	20

Span 3.0 m

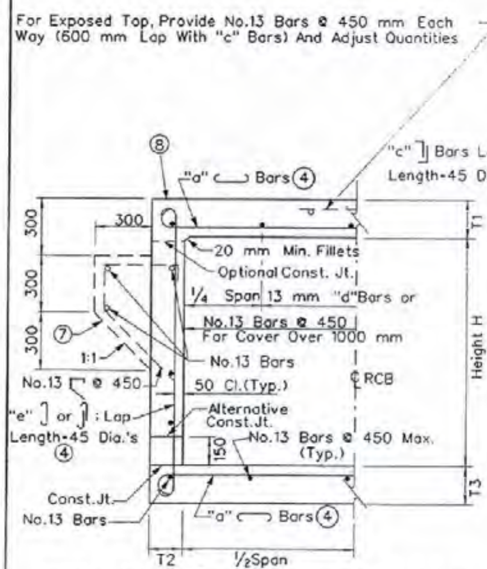
Item	Unit	H 0.9 / 3.0	H 0.9 / 6.0	H 1.2 / 3.0	H 1.2 / 6.0	H 1.5 / 3.0	H 1.5 / 6.0	H 1.8 / 3.0	H 1.8 / 6.0	H 2.1 / 3.0	H 2.1 / 6.0	H 2.4 / 3.0	H 2.4 / 6.0	H 2.7 / 3.0	H 2.7 / 6.0	H 3.0 / 3.0	H 3.0 / 6.0
CONC. ROOF T1	mm	205	270	205	270	205	270	205	270	205	270	205	270	205	270	215	280
CONC. WALLS T2	mm	205	205	205	205	205	205	205	230	205	230	205	255	215	290	240	320
CONC. INVERT T3	mm	205	280	205	280	205	280	205	280	205	280	205	280	205	280	215	280
REINFORCEMENT SPACING	mm	330	305	330	305	330	305	305	305	280	280	255	280	280	255	280	255
"a" ⑥ BAR NO.		19	22	19	22	19	22	19	22	19	22	19	22	19	19	19	19
"b" BAR NO.		19	22	19	22	19	22	19	22	19	22	19	22	19	19	22	22
"b" DIMENSION "B"	mm	900	900	900	900	900	900	900	925	900	1150	900	1150	900	1150	900	1150
"b" DIMENSION "BW"	mm	900	900	900	900	1475	1525	1475	1525	1475	1525	1475	1525	1475	1525	1400	1400
"c" BAR NO.		19	22	19	22	19	22	19	22	19	22	19	22	22	22	22	22
"c" DIMENSION "C"	mm	1025	1025	1025	1025	1025	1025	2250	1425	2325	1425	2500	1425	2325	1425	2325	1425
"e" ⑤ BAR NO.		13	13	13	13	13	13	13	13	13	13	13	13	13	13	16	16
QUAN. CONCRETE	m3/m	1.77	2.26	1.89	2.38	2.01	2.50	2.14	2.74	2.26	2.88	2.38	3.17	2.58	3.50	2.98	3.93
QUAN. REINFORCEMENT	kg/m	240	342	251	353	284	397	347	424	387	484	446	504	467	487	536	555

Span 3.7 m

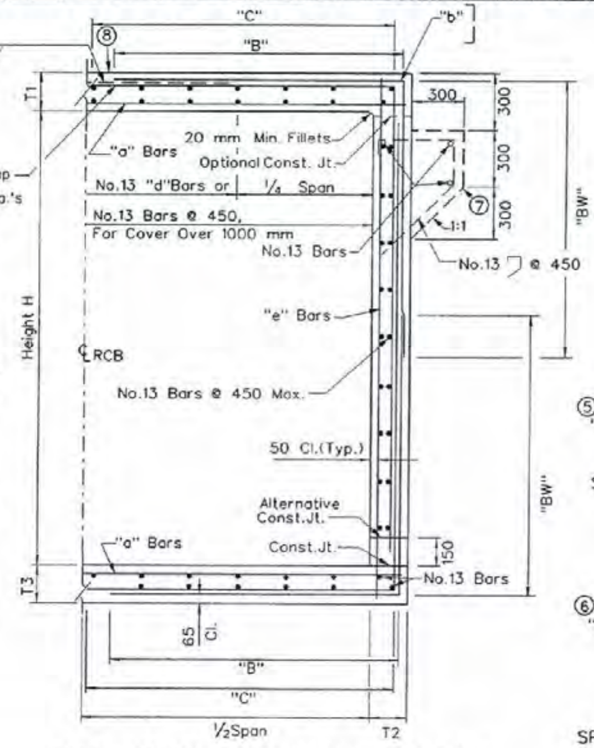
Item	Unit	H 1.2 / 3.0	H 1.2 / 6.0	H 1.5 / 3.0	H 1.5 / 6.0	H 1.8 / 3.0	H 1.8 / 6.0	H 2.1 / 3.0	H 2.1 / 6.0	H 2.4 / 3.0	H 2.4 / 6.0	H 2.7 / 3.0	H 2.7 / 6.0	H 3.0 / 3.0	H 3.0 / 6.0	H 3.4 / 3.0	H 3.4 / 6.0	H 3.7 / 3.0	H 3.7 / 6.0
CONC. ROOF T1	mm	215	305	215	305	215	305	215	305	215	305	215	305	215	305	240	305	240	305
CONC. WALLS T2	mm	205	255	205	255	205	255	215	270	215	270	215	290	230	320	270	345	290	380
CONC. INVERT T3	mm	215	320	215	320	215	320	230	320	230	320	230	320	230	320	240	330	255	330
REINFORCEMENT SPACING	mm	230	255	230	255	230	255	230	255	230	255	205	255	205	255	255	230	230	205
"a" ⑥ BAR NO.		19	22	19	22	19	22	19	22	19	22	19	22	19	22	19	19	19	19
"b" BAR NO.		19	22	19	22	19	22	19	22	19	22	19	22	19	22	22	22	19	22
"b" DIMENSION "B"	mm	950	975	950	975	950	975	1150	1150	1150	1150	1100	1150	1100	1325	1100	1325	1325	1325
"b" DIMENSION "BW"	mm	1220	1220	1220	1220	1850	1800	1900	2025	1900	2025	1500	1500	1500	1500	1500	1500	1325	1325
"c" BAR NO.		19	22	19	22	19	22	19	22	19	22	19	22	19	22	22	22	22	22
"c" DIMENSION "C"	mm	1325	1325	1325	1325	1325	1100	2475	1700	2475	1700	2475	1700	2475	1700	2475	1700	2475	1700
"e" ⑤ BAR NO.		13	13	13	13	13	13	13	13	13	13	13	13	13	13	16	16	16	16
QUAN. CONCRETE	m3/m	2.25	3.21	2.37	3.36	2.49	3.50	2.72	3.73	2.81	3.89	3.00	4.22	3.21	4.63	3.78	5.04	4.22	5.56
QUAN. REINFORCEMENT	kg/m	403	493	414	504	439	539	525	609	543	625	598	615	618	631	655	701	696	795

Span 4.3 m

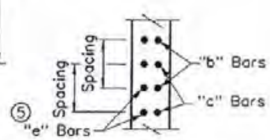
Item	Unit	H 2.1 / 3.0	H 2.1 / 6.0	H 2.4 / 3.0	H 2.4 / 6.0	H 2.7 / 3.0	H 2.7 / 6.0	H 3.0 / 3.0	H 3.0 / 6.0	H 3.4 / 3.0	H 3.4 / 6.0	H 3.7 / 3.0	H 3.7 / 6.0	H 4.0 / 3.0	H 4.0 / 6.0	H 4.3 / 3.0	H 4.3 / 6.0
CONC. ROOF T1	mm	240	355	240	355	240	355	240	355	255	355	255	355	270	355	280	355
CONC. WALLS T2	mm	240	280	240	290	240	290	255	320	270	355	290	380	320	420	345	445
CONC. INVERT T3	mm	255	370	255	370	255	370	255	370	270	370	270	380	280	380	290	380
REINFORCEMENT SPACING	mm	255	230	255	230	255	205	255	205	255	205	205	255	255	255	255	230
"a" ⑥ BAR NO.		22	22	22	22	22	22	22	22	22	22	19	22	19	22	19	22
"b" BAR NO.		19	22	22	22	22	22	22	22	22	22	19	25	22	25	22	25
"b" DIMENSION "B"	mm	850	1275	1025	1325	1025	1375	1025	1375	1075	1375	1075	1375	1075	1375	1450	1850
"b" DIMENSION "BW"	mm	1975	2150	2150	2550	2150	2550	1850	1850	1850	1850	1850	1850	1525	1850	1375	1850
"c" BAR NO.		22	22	22	22	22	22	22	22	22	22	22	25	25	25	25	25
"c" DIMENSION "C"	mm	1225	1275	2075	2075	1800	1800	1850	1950	2725	1950	2725	1950	2725	1950	2725	1950
"e" ⑤ BAR NO.		13	13	13	13	13	13	13	13	13	13	13	16	19	19	19	19
QUAN. CONCRETE	m3/m	3.36	4.73	3.51	4.93	3.67	5.10	3.89	5.45	4.26	5.95	4.64	6.46	5.17	7.04	5.72	7.55
QUAN. REINFORCEMENT	kg/m	557	701	668	777	664	874	668	863	732	887	799	900	839	943	899	1130



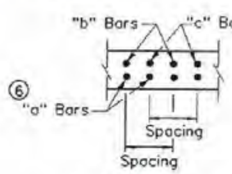
TYPICAL SECTION - SPANS 1.2 m THRU 2.4 m



TYPICAL SECTION - SPANS 3.0 m THRU 4.3 m



WALL SECTION
SPANS 3.0 m THRU 4.3 m



ROOF SECTION
SPANS 3.0 m THRU 4.3 m
Invert Similar

NOTES:

① FOR BOXES WITH SPAN OR HEIGHT LESS THAN ANY OF THOSE SHOWN IN TABLE, USE NEXT GREATER SIZE BOX CONCRETE DIMENSIONS AND REINFORCEMENT. MAKE NECESSARY CHANGES IN BAR LENGTHS AND QUANTITIES.

② FOR BOXES WITH SPAN OR HEIGHT OR COVER GREATER THAN THOSE SHOWN IN TABLES, A SPECIAL DESIGN IS REQUIRED.

③ QUANTITIES ARE APPROXIMATE AND FOR DESIGN PURPOSES ONLY.

④ IT IS PERMISSIBLE TO ELIMINATE THE 180° HOOKS ON EVERY OTHER BAR.

⑤ "e" BARS ARE AT HALF SPACING.(SPANS 3.0 m, 3.7 m, 4.3 m ONLY)

⑥ "a" BARS ARE AT HALF SPACING.(SPANS 3.0 m, 3.7 m, 4.3 m ONLY)

⑦ PROVIDE PAVING NOTCH WHEN TOP IS EXPOSED AND WHERE P.C.C. PAVEMENT OR APPROACH SLAB IS USED. ADJUST THE QUANTITIES.

⑧ WHEN TOP IS EXPOSED, THE TOP SLAB CONCRETE SHALL BE "EA", f'c=31 MPa, OR "A", f'c=28MPa, AS DETERMINED BY THE ENGINEER. IF "EA" CONCRETE IS TO BE USED, ALL REINFORCING STEEL WITHIN THE TOP SLAB SHALL HAVE AN EPOXY COATING.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SINGLE
RCB CULVERTS

E. T. Marnell [signature]
CHIEF BRIDGE DESIGN ENGR.

B-20.1.2 (502)
ADOPTED: 7/96 | REVISION

SPAN (m)	1.2						1.5							
HEIGHT (m)	0.6		0.9		1.2		0.6		0.9		1.2		1.5	
MAXIMUM EARTH COVER (m)	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0
CONC. ROOF T1 (mm)	180	180	180	180	180	180	180	190	180	190	180	190	180	190
CONC. WALLS T2 (mm)	150	150	150	150	150	180	150	150	150	150	150	180	165	190
CONC. INVERT T3 (mm)	180	180	180	180	180	180	180	205	180	205	180	205	180	205
REINF. SPACING (mm)	380	305	380	305	380	305	290	355	290	355	290	355	290	380
REINF. "g" BAR NO.	16	19	16	19	16	19	13	22	13	22	13	22	13	22
REINF. "f" BAR NO.	16	16	16	16	16	16	16	16	16	16	16	16	16	16
REINF. "a" BAR NO.	19	13	19	13	19	13	19	13	19	13	19	13	19	13
REINF. "e" (5) BAR NO.	16	13	16	16	16	19	13	13	13	16	16	19	16	22
QUAN. CONCRETE (m^3/m)	1.30	1.30	1.44	1.44	1.58	1.65	1.51	1.65	1.65	1.79	1.79	2.00	1.98	2.21
QUAN. REINFORCEMENT (kg/m)	119	135	128	144	141	170	180	170	182	180	199	204	216	241

SPAN (m)	1.8								2.1									
HEIGHT (m)	0.9		1.2		1.5		1.8		0.9		1.2		1.5		1.8		2.1	
MAXIMUM EARTH COVER (m)	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0
CONC. ROOF T1 (mm)	180	230	180	230	180	230	180	230	190	255	190	255	190	255	190	255	205	255
CONC. WALLS T2 (mm)	150	150	150	180	165	205	180	215	150	150	150	180	165	190	180	230	205	240
CONC. INVERT T3 (mm)	180	230	180	230	180	230	180	230	190	270	190	270	190	270	190	270	190	270
REINF. SPACING (mm)	290	305	290	305	290	305	290	305	280	265	280	265	280	265	280	265	280	265
REINF. "g" BAR NO.	19	22	19	22	19	22	19	22	19	22	19	22	19	22	19	22	19	22
REINF. "f" BAR NO.	16	16	16	16	16	16	16	16	19	16	19	16	19	16	19	16	19	16
REINF. "a" BAR NO.	22	13	22	13	22	13	22	13	19	13	19	13	19	13	19	13	19	13
REINF. "e" (5) BAR NO.	13	16	13	19	16	19	19	22	13	16	16	16	16	19	19	22	19	22
QUAN. CONCRETE (m^3/m)	1.87	2.29	2.00	2.51	2.19	2.76	2.40	3.00	2.20	2.86	2.34	3.10	2.53	3.30	2.73	3.63	3.00	3.88
QUAN. REINFORCEMENT (kg/m)	277	241	286	266	307	283	338	315	308	293	327	310	338	339	375	390	387	411

SPAN (m)	2.4											
HEIGHT (m)	0.9		1.2		1.5		1.8		2.1		2.4	
MAXIMUM EARTH COVER (m)	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0
CONC. ROOF T1 (mm)	205	280	205	280	205	280	205	280	205	280	205	280
CONC. WALLS T2 (mm)	150	190	150	190	165	205	180	230	205	255	215	280
CONC. INVERT T3 (mm)	205	290	205	290	205	290	205	290	205	290	205	290
REINF. SPACING (mm)	230	255	230	255	230	255	230	255	230	255	230	255
REINF. "g" BAR NO.	22	22	22	22	22	22	22	22	22	22	22	22
REINF. "f" BAR NO.	16	16	16	16	16	16	16	16	16	16	16	16
REINF. "a" BAR NO.	19	13	19	13	19	13	19	13	19	13	19	13
REINF. "e" (5) BAR NO.	13	16	13	16	16	19	19	19	19	22	19	22
QUAN. CONCRETE (m^3/m)	2.58	3.58	2.71	3.73	2.90	3.94	3.10	4.23	3.38	4.54	3.62	4.89
QUAN. REINFORCEMENT (kg/m)	402	333	421	353	449	396	506	415	521	464	536	485

"e" BARS, FOR EARTH COVERS UP TO AND INCLUDING 1.0m TO BE PLACED IN TOP SLAB ONLY								
SPAN (m)	1.2	1.5	1.8	2.1	2.4	3.0	3.7	4.3
NUMBER of BARS	5	6	8	10	13	14	16	19

SPAN (m)	3.0															
HEIGHT (m)	0.9		1.2		1.5		1.8		2.1		2.4		2.7		3.0	
MAXIMUM EARTH COVER (m)	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0
CONC. ROOF T1 (mm)	230	320	230	320	230	320	230	320	230	320	230	320	240	320	240	320
CONC. WALLS T2 (mm)	205	205	205	205	205	205	205	215	205	240	205	270	215	290	240	320
CONC. INVERT T3 (mm)	230	320	230	320	230	320	230	320	230	320	230	320	230	320	230	320
REINFORCEMENT SPACING (mm)	280	190	280	190	280	190	265	190	255	205	255	205	265	205	265	215
"g" BAR NO.	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
"f" BAR NO.	22	16	22	16	22	16	19	16	19	16	19	16	19	16	19	16
"a" BAR NO.	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
"b" BAR NO.	16	16	16	16	16	16	13	16	16	16	19	16	19	19	19	19
"b" DIMENSION "B" (mm)	1550	800	1550	800	1550	800	625	850	700	850	800	950	800	950	800	950
"b" DIMENSION "BW" (mm)	1070	1170	1070	1170	1225	1500	1225	1500	1225	1500	1225	1500	1225	1500	1225	1500
"c" BAR NO.	16	16	16	16	16	16	19	19	19	19	19	19	22	19	22	19
"c" DIMENSION "C" (mm)	920	850	920	850	950	850	1150	1000	1375	1300	1675	1375	1850	1450	1850	1450
"e" (5) BAR NO.	13	13	13	13	13	13	13	13	13	13	13	13	13	13	16	16
QUAN. CONCRETE (m^3/m)	3.62	4.81	3.81	5.00	3.97	5.17	4.15	5.41	4.34	5.74	4.52	6.09	4.88	6.50	5.23	6.92
QUAN. REINFORCEMENT (kg/m)	504	618	519	637	551	676	567	735	622	735	684	759	723	818	771	845

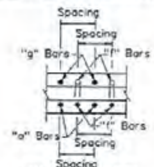
SPAN (m)	3.7																	
HEIGHT (m)	1.2		1.5		1.8		2.1		2.4		2.7		3.0		3.4		3.7	
MAXIMUM EARTH COVER (m)	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0
CONC. ROOF T1 (mm)	255	370	255	370	255	370	255	370	255	370	255	370	255	370	255	370	255	370
CONC. WALLS T2 (mm)	205	215	205	215	205	215	205	230	215	270	230	290	240	320	255	355	280	380
CONC. INVERT T3 (mm)	255	380	255	380	255	380	255	380	255	380	255	380	255	380	255	380	255	380
REINFORCEMENT SPACING (mm)	230	205	230	205	230	205	230	205	205	190	205	190	215	190	215	205	215	205
"g" BAR NO.	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
"f" BAR NO.	22	22	22	22	22	22	22	22	19	19	19	19	19	19	19	19	19	19
"a" BAR NO.	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
"b" BAR NO.	16	16	16	16	16	16	16	19	16	19	16	19	19	19	16	19	19	19
"b" DIMENSION "B" (mm)	800	950	800	950	800	950	925	975	1075	975	1075	1025	1150	1025	1150	1025	1150	1025
"b" DIMENSION "BW" (mm)	1250	975	1250	975	1250	975	1250	1025	1250	1025	1250	1100	1150	1100	1150	1100	1100	1100
"c" BAR NO.	19	19	19	19	19	19	19	19	19	19	19	19	19	19	22	22	22	22
"c" DIMENSION "C" (mm)	1175	1100	1175	1100	1175	1100	1375	1325	1700	1525	2000	1575	2200	1625	2275	1700	2275	1700
"e" (5) BAR NO.	13	13	13	13	13	13	13	13	13	13	13	13	13	13	16	16	16	16
QUAN. CONCRETE (m^3/m)	4.77	6.73	4.95	6.82	5.11	7.09	5.30	7.35	5.56	7.79	5.82	8.18	6.12	8.61	6.42	9.18	6.85	9.66
QUAN. REINFORCEMENT (kg/m)	753	845	765	859	808	899	838	961	893	987	914	1024	933	1028	1043	1115	1091	1137

SPAN (m)	4.3															
HEIGHT (m)	2.1		2.4		2.7		3.0		3.4		3.7		4.0		4.3	
MAXIMUM EARTH COVER (m)	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0
CONC. ROOF T1 (mm)	290	420	290	420	290	420	290	420	290	420	290	420	290	420	290	420
CONC. WALLS T2 (mm)	215	240	215	270	230	290	240	320	270	355	290	380	320	420	330	445
CONC. INVERT T3 (mm)	290	430	290	430	290	430	290	430	290	430	290	430	290	430	290	430
REINFORCEMENT SPACING (mm)	215	205	215	205	215	205	215	205	215	205	215	205	230	205	230	205
"g" BAR NO.	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
"f" BAR NO.	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
"a" BAR NO.	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
"b" BAR NO.	16	19	19	19	16	19	19	19	19	19	19	22	22	22	22	22
"b" DIMENSION "B" (mm)	800	800	1000	1000	1225	1225	1225	1225	1400	1325	1400	1500	1600	1500	1600	1500
"b" DIMENSION "BW" (mm)	1525	1150	1525	1375	1525	1525	1525	1525	1450	1675	1450	1875	1575	1875	1575	1875
"c" BAR NO.	19	19	19	22	22	22	22	22	22	22	22	22	22	22	25	25
"c" DIMENSION "C" (mm)	1300	1200	1675	1575	2350	1725	2575	1950	2700	2000	2750	2075	2825	2075	2825	2075
"e" (5) BAR NO.	13	13	13	13	13	13	13	13	13	13	16	16	16	16	19	19
QUAN. CONCRETE (m^3/m)	6.67	9.26	6.87	9.66	7.14	10.0	7.43	10.50	7.82	11.10	8.25	11.50	8.74	12.20	9.11	12.70
QUAN. REINFORCEMENT (kg/m)	985	1057	1064	1165	1125	1220	1201	1259	1240	1299	1311	1426	1316	1455	1491	1652

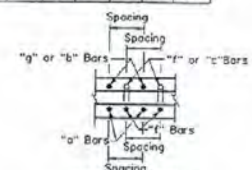
EXTERIOR WALL SECTION
SPANS 1.2 m THRU 2.4 m

EXTERIOR WALL SECTION
SPANS 3.0 m THRU 4.3 m

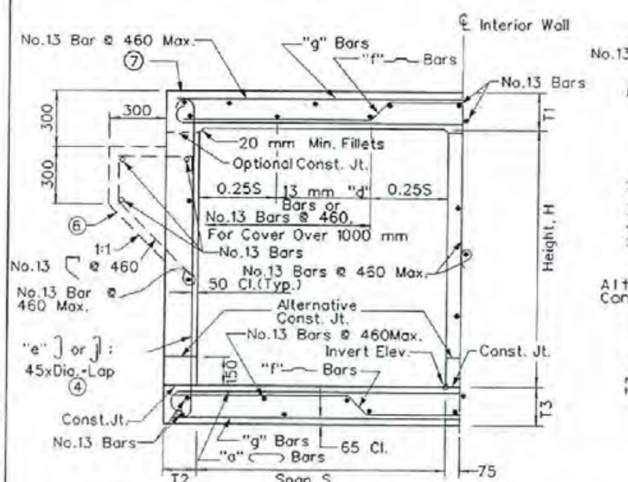
NOTE: THIS PLAN SHEET MAY BE USED FOR MULTIPLE CELL CULVERTS BY MAKING NECESSARY ADJUSTMENTS.



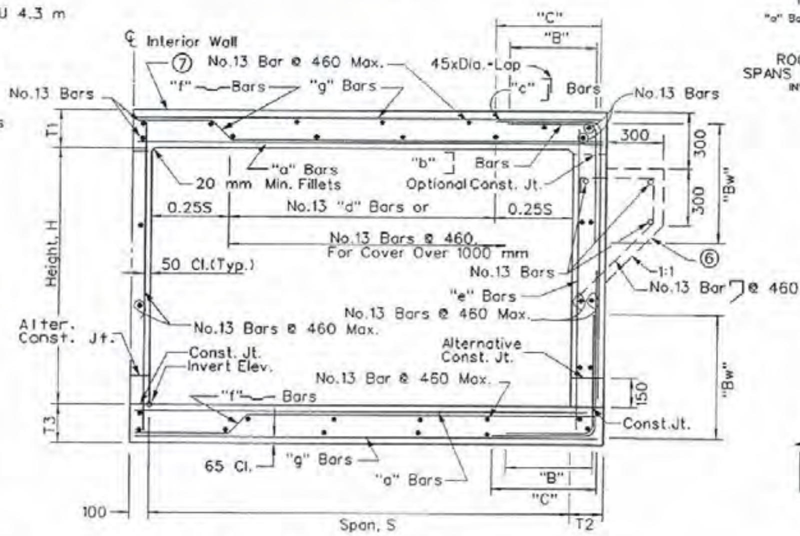
ROOF SECTION
SPANS 1.2 m THRU 2.4 m
INVERT SIMILAR



ROOF SECTION
SPANS 3.0 m THRU 4.3 m
INVERT SIMILAR



TYPICAL SECTION - SPANS 1.2 m THRU 2.4 m



TYPICAL SECTION - SPANS 3.0 m THRU 4.3 m

NOTES:

(1) FOR BOXES WITH SPAN OR HEIGHT LESS THAN ANY OF THOSE SHOWN IN TABLE, USE NEXT GREATER SIZE BOX CONCRETE DIMENSIONS AND REINFORCEMENT. MAKE NECESSARY CHANGES IN BAR LENGTHS AND QUANTITIES.

(2) FOR BOXES WITH SPAN OR HEIGHT OR COVER GREATER THAN THOSE SHOWN IN TABLES, A SPECIAL DESIGN IS REQUIRED.

(3) QUANTITIES ARE APPROXIMATE AND FOR DESIGN PURPOSES ONLY.

(4) IT IS PERMISSIBLE TO ELIMINATE THE 180° HOOKS ON EVERY OTHER "e" BAR.

(5) "e" BARS ARE AT HALF SPACING.

(6) PROVIDE PAVING NOTCH WHEN TOP IS EXPOSED AND WHERE P.C.C. PAVEMENT OR APPROACH SLAB IS USED. ADJUST THE QUANTITIES.

(7) WHEN TOP IS EXPOSED, THE TOP SLAB CONCRETE SHALL BE "EA", f'c=31 MPa, OR "A", f'c=28 MPa, AS DETERMINED BY THE ENGINEER. IF "EA" CONCRETE IS TO BE USED, ALL REINFORCING STEEL WITHIN THE TOP SLAB SHALL HAVE AN EPOXY COATING.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

E. J. Marcuson
CHIEF BRIDGE DESIGN ENGR.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

DOUBLE RCB CULVERTS

B-20.1.3 (502)
ADOPTED: 7/96 REVISION

SPAN	m	1.2						1.5								1.8										2.1										2.4									
HEIGHT	m	0.6		0.9		1.2		0.6		0.9		1.2		1.5		0.9		1.2		1.5		1.8		0.9		1.2		1.5		1.8		2.1		0.9		1.2		1.5		1.8		2.1		2.4	
MAXIMUM EARTH COVER	m	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0
QUAN. CONCRETE	m3/m	0.65	0.65	0.72	0.72	0.79	0.82	0.75	0.82	0.82	0.89	0.89	1.00	0.99	1.10	0.98	1.14	1.00	1.45	1.09	1.38	1.20	1.50	1.10	1.43	1.17	1.55	1.26	1.65	1.36	1.81	1.50	1.94	1.29	1.79	1.35	1.86	1.45	1.97	1.55	2.11	1.69	2.27	1.81	2.44
QUAN. REINFORCEMENT	kg/m	44	52	49	56	55	69	74	69	83	80	86	85	89	83	120	101	124	104	128	109	131	112	152	140	155	143	159	146	162	149	164	150	198	158	201	161	204	165	207	168	208	170	211	173

SPAN	m	3.0														3.7														4.3															
HEIGHT	m	0.9		1.2		1.5		1.8		2.1		2.4		2.7		3.0		1.2		1.5		1.8		2.1		2.4		2.7		3.0		3.4		3.7		2.1		2.4		2.7		3.0		3.4	
MAXIMUM EARTH COVER	m	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0
QUAN. CONCRETE	m3/m	1.81	2.40	1.90	2.50	1.98	2.58	2.07	2.70	2.17	2.87	2.26	3.04	2.44	3.25	2.61	3.46	2.38	3.36	2.47	3.41	2.55	3.54	2.65	3.67	2.78	3.89	2.91	4.09	3.06	4.30	3.21	4.59	3.42	4.83	3.33	4.63	3.43	4.83	3.57	5.00	3.71	5.25	3.91	5.55
QUAN. REINFORCEMENT	kg/m	210	238	211	240	214	243	207	246	216	235	219	238	214	241	216	232	292	326	295	329	299	332	299	333	302	321	305	324	292	326	296	313	299	315	366	388	371	293	374	396	375	397	378	400

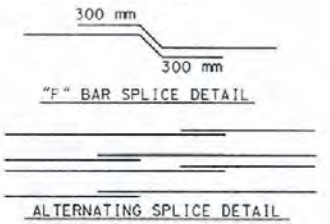
SPAN	m	4.3															
HEIGHT	m	3.7		4.0		4.3		3.7		4.0		4.3		3.7		4.0	
MAXIMUM EARTH COVER	m	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0
QUAN. CONCRETE	m3/m	3.81	5.25	4.37	6.10	4.55	6.35	4.12	5.25	4.37	6.10	4.55	6.35	4.12	5.25	4.37	6.10
QUAN. REINFORCEMENT	kg/m	378	400	381	403	366	405	369	408	378	400	381	403	366	405	369	408

NOTES:

① NOTES ON ①, ②, ③ & ⑦ OF SHEET B-20.1.3 SHALL APPLY.

② WHEN THE ADDITION OF CELLS CAUSES THE LENGTHS OF THE "a", "f" AND "g" BARS TO EXCEED 18000 mm. THE BARS WILL REQUIRE SPLICING. SPLICES FOR THE "a" BARS SHALL BE CENTERED ABOUT THE CENTER LINE OF THE INTERIOR WALLS. SPLICES FOR THE "g" BARS SHALL BE CENTERED ABOUT THE CENTER OF THE CELLS. SPLICES FOR THE "f" BARS SHALL BE DONE AT THE 45 DEGREE LEG AND CONFORM TO THE SPLICE DETAIL SHOWN. SPLICE LOCATIONS SHALL BE ALTERNATED FROM BAR TO BAR. SEE DETAIL SHOWN. SPLICE LENGTHS FOR THE "a" AND "g" BARS SHALL BE AS FOLLOWS:

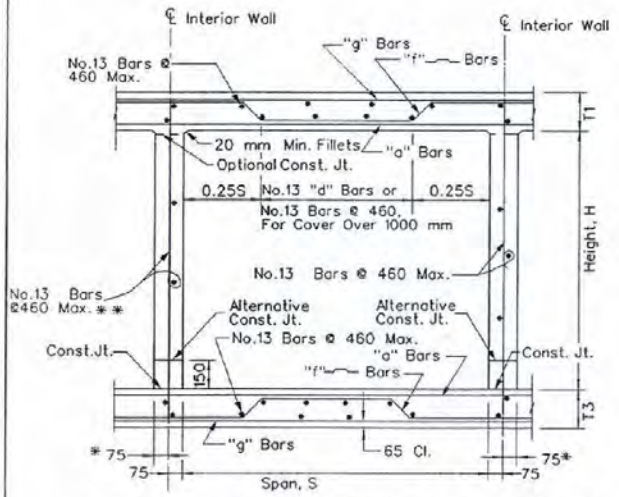
No.13 BARS - 400 mm
No.19 BARS - 600 mm
No.22 BARS - 800 mm
No.25 BARS - 1000 mm



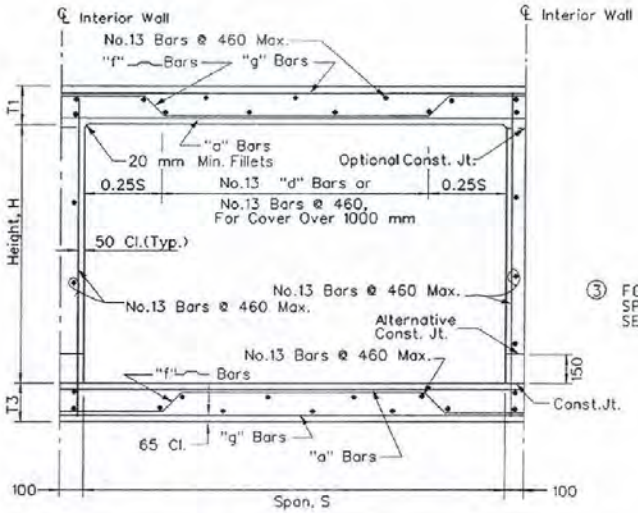
"F" BAR SPLICE DETAIL

ALTERNATING SPLICE DETAIL

③ FOR DIMENSIONS, BAR SIZES, BAR SPACING, AND ROOF SECTION SPACING DETAIL. SEE SHEET B-20.1.3. FOR GENERAL NOTES. SEE SHEET B-20.1.1.



TYPICAL SECTION - SPANS 1.2 m THRU 2.4 m



TYPICAL SECTION - SPANS 3.0 m THRU 4.3 m

* - CONCRETE FOR THIS PORTION IS INCLUDED IN QUANTITIES OF ADJOINING CELLS.
** - REINFORCING STEEL INCLUDED IN PREVIOUS CELLS QUANTITIES.

METRIC NDOT

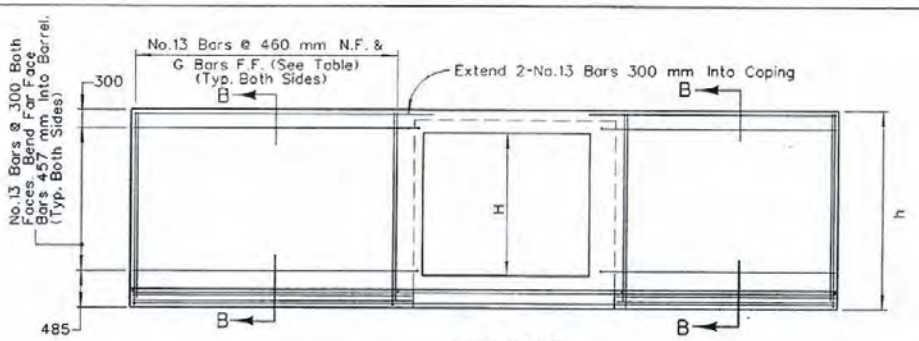
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

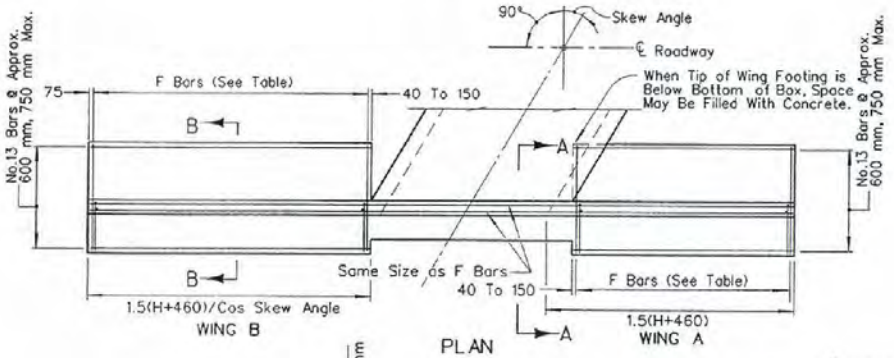
ADDITIONAL CELLS TO BE USED WITH DOUBLE RCB CULVERTS TO PROVIDE FOR MULTIPLE CELL CULVERTS

E. L. Wanucci
CHIEF BRIDGE DESIGN ENGR.

B-20.1.3.1 (502)
ADOPTED: 7/98 | REVISION



ELEVATION

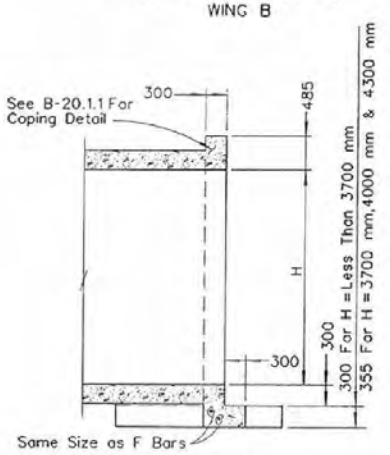


PLAN

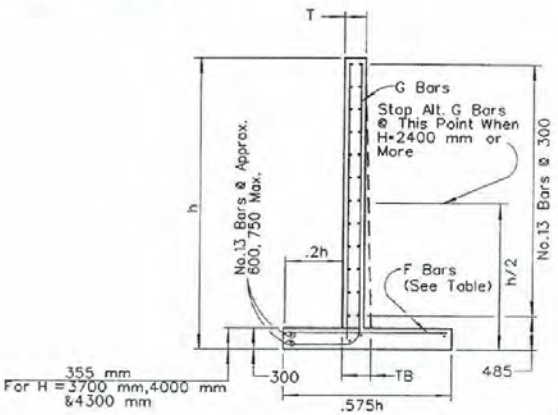
NOTES:

1. FOR GENERAL NOTES SEE SHEET B-20.1.1
2. FOR QUANTITIES SEE SHEET B-20.1.4.1

TABLE						
			G BARS		F BARS	
H = HEIGHT (mm)	T = (mm)	TB = (mm)	SIZE NO.	SPACE (mm)	SIZE NO.	SPACE (mm)
600	205	205	16	240	13	300
900	205	205	16	240	13	300
1200	205	205	16	240	13	300
1500	230	230	19	240	13	280
1800	255	255	22	255	13	165
2100	300	300	22	255	16	190
2400	300	330	22	165	19	205
2700	300	355	22	180	19	190
3000	300	405	25	165	25	255
3400	300	460	29	165	25	230
3700	300	510	29	180	25	215
4000	300	560	29	150	25	150
4300	300	600	29	150	25	150



SECTION A-A



SECTION B-B

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

SHEET 1 OF 2

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RCB CULVERTS TYPE II HEADWALLS

B. J. Marconi
CHIEF BRIDGE DESIGN ENGR.

B-20.1.4 (502)
ADOPTED: 7-98 REVISION

B-5

① - QUANTITIES SHOWN ARE FOR HEADWALLS AT THE INLET AND OUTLET

CUBIC METERS OF CONCRETE AND KILOGRAMS OF REINFORCING FOR TWO TYPE II HEADWALLS ①

SPAN (m)	HEIGHT (m)	SINGLE BOX								DOUBLE BOX								TRIPLE BOX								HEIGHT (m)	SPAN (m)
		0° SKEW		15° SKEW		30° SKEW		45° SKEW		0° SKEW		15° SKEW		30° SKEW		45° SKEW		0° SKEW		15° SKEW		30° SKEW		45° SKEW			
		CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.		
1.2	0.6																									0.6	
	0.9																									0.9	1.2
	1.2																									1.2	
1.5	0.6																									0.6	
	0.9	7.2	395	7.2	403	7.8	430	8.8	487	8.7	450	8.9	459	9.6	492	10.9	564									0.9	
	1.2	9.8	518	9.8	528	10.3	561	11.9	635	11.3	572	11.5	588	12.2	624	14.2	711	12.8	620	13.0	634	14.1	679	16.4	779	1.2	1.5
	1.5	12.5	760	12.7	774	13.4	822	15.1	927	14.2	814	14.2	831	15.2	885	17.4	1004	15.7	862	15.9	880	17.0	941	19.6	1072	1.5	
1.8	0.9	7.5	402	7.5	410	8.1	437	9.3	496	9.3	496	9.3	508	10.1	546	11.7	630									0.9	
	1.2	10.1	524	10.1	534	10.8	569	12.4	644	11.8	619	11.9	632	12.8	678	14.8	777	13.6	697	13.8	713	14.9	768	17.4	888	1.2	
	1.5	12.8	767	13.6	781	14.5	830	15.7	936	15.3	861	15.6	879	16.6	939	19.0	1070	17.1	939	17.4	960	18.7	1029	21.6	1181	1.5	1.8
	1.8	19.7	1178	20.0	1200	21.1	1274	23.8	1433	21.3	1273	21.8	1298	25.1	1383	26.4	1568	23.2	1351	23.8	1379	25.2	1473	29.3	1678	1.8	
2.1	0.9	7.8	408	7.8	416	8.4	445	9.6	505																	0.9	
	1.2	10.4	531	10.4	541	11.1	576	12.7	653																	1.2	
	1.5	13.2	773	13.2	787	14.8	837	16.0	946																	1.5	2.1
	1.8	20.0	1185	20.1	1207	21.4	1281	24.2	1443																	1.8	
	2.1	24.6	1670	25.0	1701	26.5	1804	29.8	2032																	2.1	
2.4	0.9	8.1	415	8.1	423	8.7	452	10.0	514	10.6	588	10.7	602	11.6	651	13.1	750									0.9	
	1.2	10.7	537	10.7	547	11.4	583	13.0	662	13.0	710	13.2	727	14.1	783	16.5	907	15.4	830	15.6	851	18.4	922	19.9	1076	1.2	
	1.5	13.4	779	13.5	794	14.4	845	16.3	955	15.9	953	16.0	973	17.3	1045	19.8	1200	19.0	1072	19.2	1098	20.6	1183	24.1	1369	1.5	
	1.8	20.2	1191	20.4	1213	21.7	1289	24.5	1452	22.3	1362	22.9	1393	24.3	1489	27.8	1697	24.8	1484	25.3	1517	27.1	1627	31.3	1867	1.8	2.4
	2.1	25.1	1677	25.2	1708	26.7	1812	30.0	2039	27.4	1844	27.1	1881	29.4	2006	33.4	2277	29.8	1965	30.3	2005	32.3	2144	36.3	2446	2.1	
	2.4	30.9	2258	31.2	2300	33.1	2439	37.3	2742	33.5	2419	33.8	2465	36.0	2624	40.8	2969	35.9	2538	36.4	2589	38.9	2809	44.3	3138	2.4	
3.0	0.9	8.7	428	8.7	436	9.6	467	10.9	533	11.3	728	11.3	748	12.6	813	14.5	957									0.9	
	1.2	11.2	550	11.2	561	12.1	599	13.8	680	13.9	850	14.0	872	15.1	945	18.4	1105									1.2	
	1.5	14.1	792	14.1	808	15.1	860	17.2	973	15.6	1092	15.8	1119	18.3	1207	20.5	1398	19.6	1286	19.8	1320	21.6	1431	25.2	1672	1.5	
	1.8	20.6	1204	20.8	1227	22.1	1304	25.1	1470	23.2	1504	23.9	1538	25.3	1650	29.1	1867	26.1	1698	26.8	1739	28.7	1874	33.2	2169	1.8	3.0
	2.1	25.5	1691	25.8	1723	27.6	1829	31.3	2060	28.4	1984	28.7	2026	30.7	2167	34.9	2474	31.3	2179	31.8	2227	34.0	2391	39.1	2748	2.1	
	2.4	31.5	2277	31.7	2316	33.6	2458	37.2	2766	33.9	2558	34.2	2596	36.5	2786	41.4	3166	37.0	2752	37.4	2811	39.9	3010	45.7	3441	2.4	
	2.7	38.1	2580	38.4	2627	40.6	2787	45.6	3134																	2.7	
	3.0	46.6	1871	46.9	3942	49.8	4180	56.0	4698	49.8	4132	50.3	4212	53.7	4481	60.6	5066	53.2	4326	53.8	4413	57.8	4705	65.3	5341	3.0	
3.7	1.2	11.8	565	11.9	574	12.7	615	14.6	699	15.0	1035	15.2	1067	16.4	1163	19.0	1371									1.2	
	1.5	14.4	805	14.5	821	15.4	875	17.5	991	17.6	1281	17.7	1314	19.1	1424	22.1	1664									1.5	
	1.8	21.4	1217	21.6	1240	22.9	1319	25.9	1488	24.6	1693	25.7	1733	26.8	1868	30.7	2162	28.1	1987	28.6	2038	30.8	2208	35.7	2678	1.8	
	2.1	26.1	1706	25.8	1738	27.9	1846	31.6	2080	29.4	2173	29.8	2221	31.8	2385	36.3	2741	32.9	2468	33.5	2526	35.9	2725	41.4	3157	2.1	
	2.4	32.1	2291	32.2	2333	34.3	2476	38.7	2788	35.6	2747	35.9	2785	38.4	3003	42.8	3433	39.1	3041	39.5	3110	42.5	3343	48.6	3850	2.4	3.7
	2.7	38.5	2595	38.8	2644	41.1	2806	46.3	3157	42.2	3052	42.7	3116	45.4	3332	51.5	3802	45.9	3346	46.5	3421	49.7	3672	56.7	4218	2.7	
	3.0	47.2	3892	47.6	3963	50.4	4204	56.8	4727	50.9	4321	51.3	4406	54.8	4698	63.0	5333	54.6	4615	55.3	4712	59.3	5038	67.4	5749	3.0	
	3.4																									3.4	
	3.7	67.3	5869	67.9	5975	71.9	6334	80.8	7113	71.3	6298	72.0	6418	76.3	6828	86.5	7719	74.9	6592	75.8	6723	80.7	7168	91.3	8136	3.7	
4.3	2.1																									2.1	
	2.4																									2.4	
	2.7																									2.7	
	3.0																									3.0	
	3.4																									3.4	4.3
	3.7																									3.7	
	4.0																									4.0	
	4.3																									4.3	

QUANTITIES FOR ADDITIONAL CELLS

CONCRETE FOR TWO TYPE II HEADWALLS FOR EACH ADDITIONAL CELL (CU. METER) (ADD THIS QUANTITY TO THE QUANTITY FOR A DOUBLE BOX)

FOR HEIGHT (H) LESS THAN 3.7 METERS
0.85 (SPAN (m) + 0.2)/COS SKEW ANGLE

FOR HEIGHT (H) EQUAL TO OR GREATER THAN 3.7 METERS
0.91 (SPAN(m) + 0.2)/COS SKEW ANGLE

REINFORCING FOR TWO TYPE II HEADWALLS FOR EACH ADDITIONAL CELL (KILOGRAMS) (ADD THIS QUANTITY TO THE QUANTITY FOR A DOUBLE BOX)

FOR HEIGHT (H) LESS THAN OR EQUAL TO 2.1 METERS
26.11 (SPAN (m) + 0.2)/COS SKEW ANGLE

FOR HEIGHT (H) EQUAL TO 2.4 OR 2.7 METERS
38.67 (SPAN (m) +0.2)/COS SKEW ANGLE

FOR HEIGHT (H) EQUAL TO OR GREATER THAN 3.0 METERS
63.79 (SPAN (m) +0.2)/COS SKEW ANGLE

ANGLE	COSINE
0°	1.0000
15°	0.9659
30°	0.8660
45°	0.7071

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

SHEET 2 OF 2

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RCB CULVERTS
TYPE II HEADWALLS

R. J. Marucci
CHIEF BRIDGE DESIGN ENGR.

B-20.1.4.1 (502)
ADOPTED: 7/96
REVISION

B-8

TYPE I HEADWALL DIMENSIONS AND REINFORCING STEEL

0° SKEW

H-Height In Meters	h- All Wings Except B For 45° Skew	AA & BB	CC & DD	C & D	E & K	F & L	G & M	J & N	Wings A&B G Bars Size	Wings A&B G Bars Spacing	Wings A&B F Bars Size	Wings A&B F Bars Spacing
0.9	2005	1220	1270	205	405	255	635	1015	13	305	13	305
1.2	2310	1525	1730	205	460	355	865	1170	13	305	13	305
1.5	2615	1880	1880	205	535	380	940	1320	13	305	13	305
1.8	2920	2185	2030	205	585	405	1015	1475	13	265	13	305
2.1	3225	2540	2210	205	660	460	1120	1625	13	180	13	305
2.4	3530	2845	2360	205	710	485	1195	1780	19	265	13	280
2.7	3835	3175	2515	230	760	510	1270	1930	19	230	13	230
3.0	4140	3505	2690	255	840	535	1345	2085	19	190	13	165
3.7	4750	4140	3025	305	965	610	1525	2390	22	180	16	165
4.3												

15° SKEW

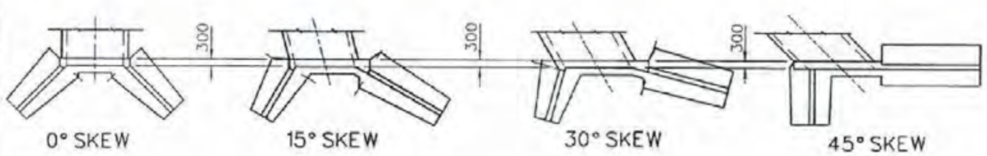
H-Height In Meters	AA	BB	CC	DD	C	D	E & K	F	G	J & N	L	M	Wings A G Bars Size	Wings A G Bars Spacing	Wings A F Bars Size	Wings A F Bars Spacing	Wings B G Bars Size	Wings B G Bars Spacing	Wings B F Bars Size	Wings B F Bars Spacing
0.9	1090	1420	1500	1700	205	205	405	305	760	1015	355	865	13	305	13	305	13	305	13	305
1.2	1370	1805	1625	1880	205	205	460	330	815	1170	380	940	13	305	13	305	13	305	13	305
1.5	1675	2185	1755	2060	205	205	535	355	890	1320	405	1040	13	305	13	305	13	255	13	305
1.8	1955	2565	1905	2235	205	205	585	380	965	1475	460	1120	13	305	13	305	13	165	13	305
2.1	2285	2970	2060	2440	205	205	660	405	1040	1625	485	1220	13	215	13	305	19	255	13	305
2.4	2565	3355	2185	2615	230	230	710	430	1090	1780	510	1320	19	300	13	305	19	205	13	240
2.7	2845	3735	2310	2795	230	255	760	460	1170	1930	560	1395	19	255	13	255	22	230	13	205
3.0	3150	4115	2465	3020	230	305	840	485	1245	2085	610	1525	19	205	13	215	22	190	13	150
3.7	3735	4850	2770	3455	280	380	965	560	1395	2390	685	1725	22	190	16	165	22	150	16	150
4.3																				

30° SKEW

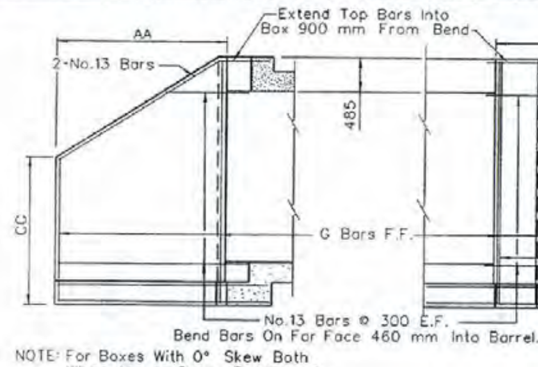
H-Height In Meters	AA	BB	CC	DD	C	D	E & K	F	G	J & N	L	M	Wings A G Bars Size	Wings A G Bars Spacing	Wings A F Bars Size	Wings A F Bars Spacing	Wings B G Bars Size	Wings B G Bars Spacing	Wings B F Bars Size	Wings B F Bars Spacing
0.9	1015	1780	1420	1880	205	205	405	280	710	1015	380	1015	13	305	13	305	13	305	13	305
1.2	1295	2285	1575	2110	205	205	460	305	790	1170	460	1170	13	305	13	305	13	215	13	305
1.5	1575	2720	1675	2335	205	205	535	330	840	1320	535	1320	13	305	13	305	13	165	13	305
1.8	1855	3200	1805	2540	205	205	585	355	915	1475	510	1475	13	305	13	305	19	305	13	305
2.1	2135	3710	1955	2820	230	230	660	405	990	1625	560	1625	13	265	13	305	19	215	13	265
2.4	2415	4190	2085	3050	230	230	710	430	1040	1780	710	1780	13	150	13	305	19	180	13	190
2.7	2690	4650	2210	3275	230	305	760	460	1115	1930	760	1930	16	190	13	230	22	205	16	180
3.0	2970	5130	2335	3530	230	330	840	480	1170	2085	840	2080	19	230	13	190	22	165	19	190
3.7	3505	6070	2615	4040	280	405	965	535	1320	2390	965	2390	22	230	16	190	25	165	19	190
4.3																				

45° SKEW

H-Height In Meters	AA	BB	CC	DD	C	D	E & K & L	F	G	J & M & N	h	DD	Wings A G Bars Size	Wings A G Bars Spacing	Wings A F Bars Size	Wings A F Bars Spacing	Wings B G Bars Size	Wings B G Bars Spacing	Wings B F Bars Size	Wings B F Bars Spacing
0.9	1015	2540	1395	2005	205	205	405	280	710	1015	2005	2005	13	305	13	305	13	305	13	305
1.2	1270	3175	1525	2310	205	205	460	305	760	1170	2310	2310	13	305	13	305	16	240	13	305
1.5	1550	3835	1650	2615	230	230	535	330	840	1320	2615	2615	13	305	13	305	19	240	13	280
1.8	1805	4470	1780	2920	255	255	585	355	890	1475	2920	2920	13	305	13	305	22	255	13	165
2.1	2110	5180	1905	3225	305	305	660	380	965	1625	3225	3225	13	265	13	305	22	215	16	190
2.4	2360	5815	2032	3530	305	305	710	405	1015	1780	3530	3530	13	180	13	305	22	165	19	205
2.7	2615	6450	2160	3835	230	355	760	430	1090	1930	3835	3835	16	205	13	255	22	150	19	190
3.0	2895	7110	2285	4140	230	405	840	460	1145	2085	4140	4140	19	240	13	190	25	165	25	255
3.7	3430	8405	2590	4800	280	508	965	510	1270	2390	4800	4800	22	230	16	180	22	205	25	215
4.3																				

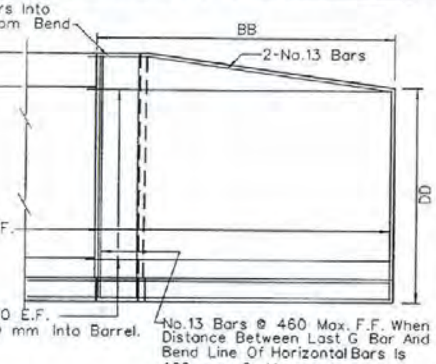


0° SKEW   15° SKEW   30° SKEW   45° SKEW

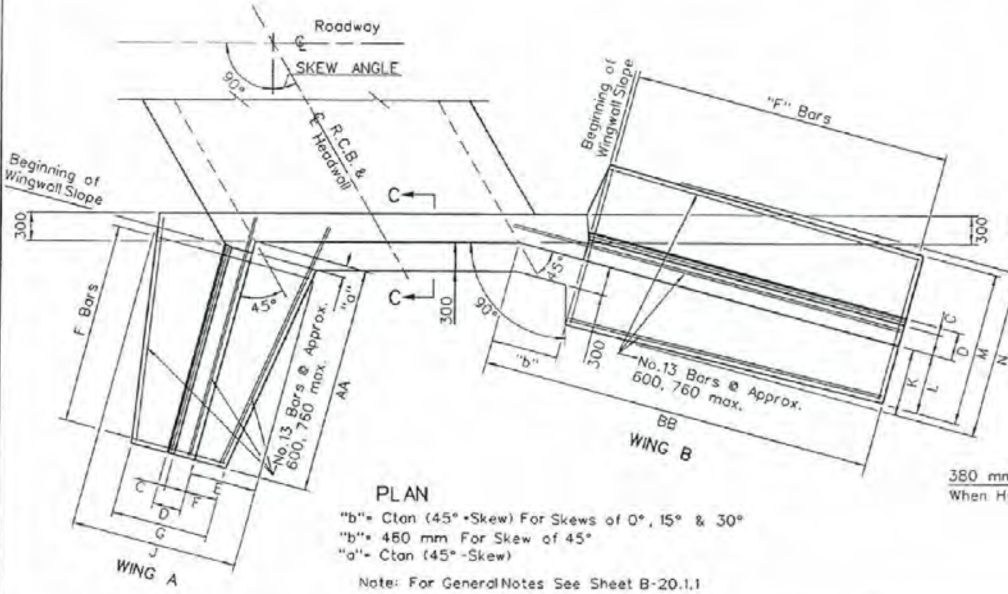


NOTE: For Boxes With 0° Skew Both Wings Are As Shown For Wing A.

SECTION WING A



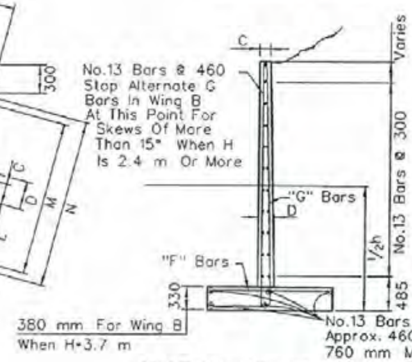
SECTION WING B



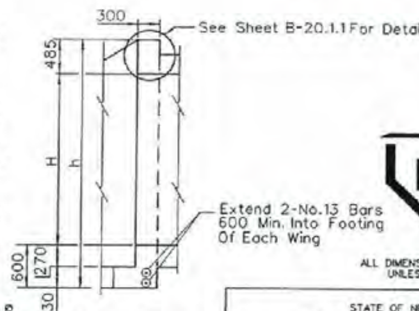
PLAN

"b"= Ctan (45° +Skew) For Skews of 0°, 15° & 30°
"b"= 460 mm For Skew of 45°
"a"= Ctan (45° -Skew)

Note: For General Notes See Sheet B-20.1.1



SECTION OF WINGS A AND B



SECTION C-C

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RCB CULVERTS TYPE I HEADWALLS

B.J. Marcucci
CHIEF BRIDGE DESIGN ENGR.

B-20.1.5	(502)
ADOPTED: 7/96	REVISION

CUBIC METERS OF CONCRETE AND KILOGRAMS OF REINFORCING FOR TWO TYPE 1 HEADWALLS ①

SPAN (M)	HEIGHT (M)	SINGLE BOX						DOUBLE BOX								TRIPLE BOX							
		0°SKEW		15°SKEW		30°SKEW		45°SKEW		0°SKEW		15°SKEW		30°SKEW		45°SKEW		0°SKEW		15°SKEW		30°SKEW		45°SKEW	
		CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.
1.2	0.6																								
	0.9																								
	0.9																								
1.5	0.6																								
	0.9	4.3	178	4.9	216	5.5	255	6.8	335	5.9	230	6.5	271	7.3	318	9.2	413								
	1.2	5.8	276	6.1	292	7.3	351	8.9	429	7.4	329	7.7	348	9.2	414	11.2	508	9.0	382	9.4	402	11.0	474	13.4	581
	1.5	7.3	320	7.8	355	9.0	427	11.5	562	8.9	374	9.5	412	10.9	492	13.8	641	10.6	428	11.2	467	12.8	553	16.1	716
1.8	0.9	4.6	190	5.2	229	5.8	270	7.2	353	6.3	272	7.0	317	7.9	371	9.7	482								
	1.2	6.0	289	6.3	305	7.6	366	9.2	447	7.9	372	8.3	394	9.7	468	11.8	576	9.6	455	10.1	480	11.8	564	14.4	692
	1.5	7.6	331	8.1	367	9.3	442	11.8	580	9.4	416	9.9	458	11.5	546	14.4	710	11.2	500	11.8	544	13.5	641	16.9	827
	1.8	9.5	446	9.6	502	11.8	683	15.6	979	11.3	532	11.5	594	14.0	789	18.1	1111	13.2	617	13.4	681	16.1	885	20.7	1228
2.1	0.9	4.8	200	5.4	241	6.1	284	7.6	372																
	1.2	6.3	302	6.6	318	8.0	380	9.6	465																
	1.5	7.9	343	8.3	380	9.6	456	12.2	598																
	1.8	9.8	459	9.9	516	12.1	700	15.9	1002																
	2.1	11.9	650	12.5	743	15.4	997	20.6	1434																
2.4	0.9	5.1	212	5.7	254	6.4	298	7.9	391	6.0	371	8.2	483	9.0	503	11.1	575								
	1.2	6.6	314	7.0	332	8.3	396	10.0	483	9.0	474	9.4	489	10.9	562	13.2	669	11.4	599	11.8	619	13.6	707	16.4	843
	1.5	8.1	355	8.6	392	9.9	471	12.5	617	10.6	516	11.1	552	12.7	637	15.7	804	13.0	641	13.6	681	15.4	780	19.1	979
	1.8	10.0	471	10.2	530	12.5	718	16.3	1026	12.5	635	12.7	692	15.2	888	19.6	1214	15.0	761	15.2	823	18.0	1032	22.9	1390
	2.1	12.2	664	12.8	759	15.7	1017	21.0	1460	14.7	827	16.1	968	18.6	1188	24.3	1650	17.2	956	18.6	1107	21.4	1336	27.6	1828
	2.4	13.7	864	15.4	1013	18.5	1260	25.3	1786	16.2	1028	18.0	1158	21.3	1384	30.2	1977	18.7	1158	20.6	1293	24.2	1534	33.6	2156
3.0	0.9	5.6	234	6.3	278	7.0	327	8.7	427	8.6	504	9.3	557	10.4	627	12.8	787								
	1.2	7.1	340	7.5	358	8.9	425	10.8	519	10.1	611	10.6	633	12.3	729	15.0	880								
	1.5	8.6	378	9.2	417	10.6	499	13.3	654	11.6	650	12.3	694	14.1	803	17.6	1016	14.7	851	15.4	900	17.5	1031	21.8	1296
	1.8	10.6	496	10.7	559	13.1	753	17.0	1073	13.6	770	13.8	805	16.6	992	21.4	1436	16.7	971	17.0	1006	20.1	1209	25.7	1717
	2.1	12.7	693	13.3	792	16.4	1056	21.7	1512	15.8	968	16.5	1070	20.0	1363	26.1	1877	18.9	1171	19.7	1280	23.5	1596	30.4	2160
	2.4	14.2	897	16.0	1050	19.1	1302	26.1	1839	17.4	1173	19.3	1331	22.7	1608	30.5	2204	20.5	1378	22.5	1542	26.3	1840	34.7	2488
	2.7	17.7	960	19.4	1126	23.8	1471	31.7	2085																
	3.0	22.6	1520	24.2	1632	29.5	1994	39.5	2673	25.8	1799	27.5	1913	33.3	2303	44.0	3040	28.9	2006	30.8	2126	36.9	2539	48.5	3327
3.7	1.2	7.6	365	8.0	385	9.5	454	11.5	555	11.2	785	11.6	819	13.5	948	16.4	1111								
	1.5	9.2	401	9.7	442	11.2	528	14.1	690	12.7	823	13.4	880	15.3	1019	19.0	1292								
	1.8	11.1	521	11.2	588	13.7	788	17.8	1120	14.7	946	15.0	1018	17.8	1278	22.9	1723	18.3	1245	18.7	1325	21.9	1622	27.9	2147
	2.1	13.2	722	13.8	824	17.0	1096	22.5	1564	16.9	1148	17.6	1259	21.2	1586	27.6	2169	20.5	1450	21.3	1570	25.3	1933	32.7	2594
	2.4	14.0	882	16.7	1090	19.7	1343	26.8	1892	17.7	1308	20.4	1540	23.9	1836	32.0	2498	21.3	1612	24.2	1857	28.1	2191	37.2	2924
	2.7	18.3	989	20.0	1158	24.4	1509	32.4	2134	21.9	1417	23.8	1598	28.7	2002	37.6	2741	25.6	1722	27.6	1913	32.9	2355	42.9	3168
	3.0	23.1	1555	24.7	1669	30.1	2036	40.3	2723	26.8	1984	28.6	2107	34.5	2531	45.6	3331	30.5	2290	32.4	2423	38.8	2882	50.8	3760
	3.7	32.7	2330	36.1	2437	43.1	2756	61.2	3685	36.5	2761	40.0	2876	47.6	3239	66.7	4296	40.3	3070	44.0	3196	51.9	3597	72.0	4726
4.3	2.1																								
	2.4																								
	2.7																								
	3.0																								
	3.4																								
	3.7																								
	4.0																								
	4.3																								

① -QUANTITIES SHOWN ARE FOR TWO HEADWALLS. ONE AT THE INLET AND ONE AT THE OUTLET

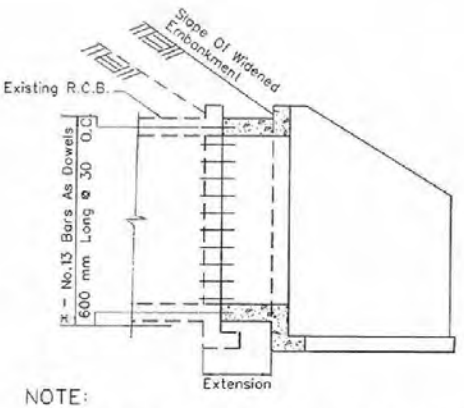
METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ESTIMATE OF QUANTITIES TYPE 1 HEADWALLS

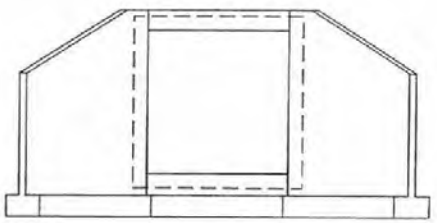
E. J. Marcus — CHIEF BRIDGE DESIGN ENGR. | 8-20.1.6 (502) | ADOPTED: 7/96 | REVISION:



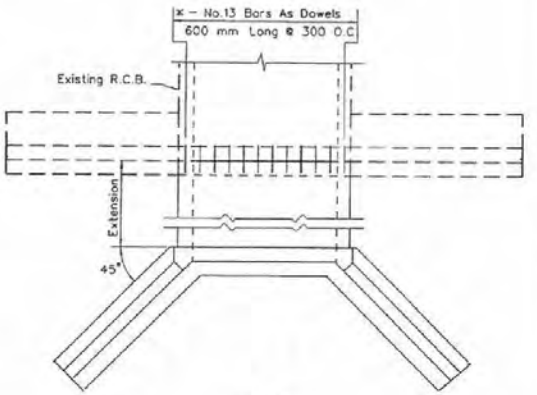
* - Place Bars In Center Of Walls And Slabs

NOTE:
Old Headwalls To Remain In Place, Unless Otherwise Noted.

PART LONGITUDINAL SECTION



ELEVATION

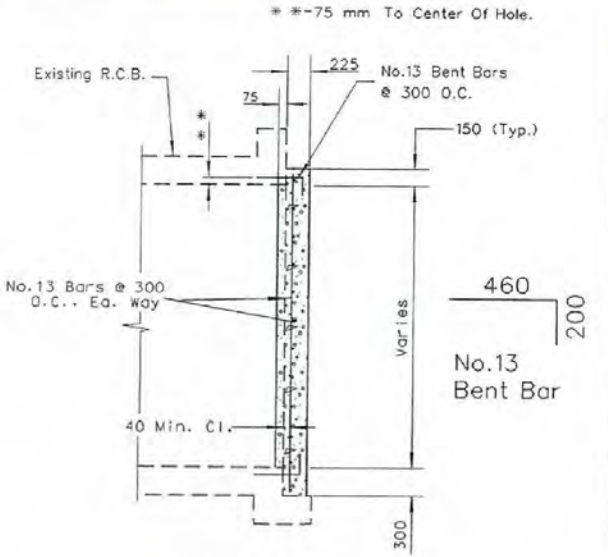


PLAN

* - Place Bars In Center Of Walls And Slabs

R.C.B. CULVERT EXTENSION

NOTES:
1. FOR GENERAL NOTES SEE SHEET B-20.1.1.
2. DOWELLING: DOWEL HOLES SHALL BE DRILLED 300 mm INTO EXISTING CONCRETE. DIAMETER OF HOLE SHALL BE 6 mm LARGER THAN DIAMETER OF BAR. HOLE MAY BE INCLINED NO MORE THAN 5 ° OFF THE HORIZONTAL. DOWELS SHALL BE EPOXIED INTO CLEAN HOLES. EPOXY SHALL CONFORM TO THE REQUIREMENT OF SECTION 728 OF THE STANDARD SPECIFICATIONS.



SECTION

METHOD OF PLUGGING R.C.B.
NOTE: Width And Height Varies.

METRIC NDOT

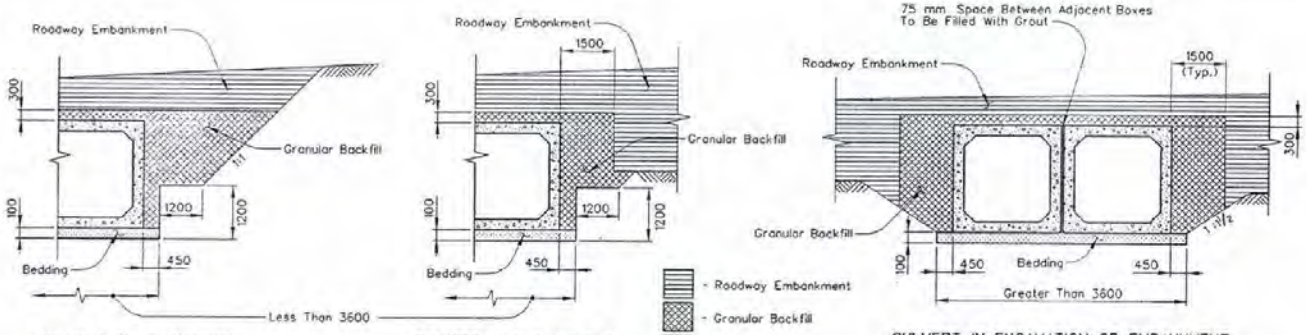
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

METHOD OF EXTENDING R.C.B. CULVERTS

R. J. Marconi
CHIEF BRIDGE ENGR.

B-20.1.7 (502)
ADOPTED- 7/96 REVISION



EXCAVATION AND BACKFILL

(Backfill Shown, Excavation As Shown On Sheet R-1.1.4 With The Addition Of The Area For Bedding.)

1) Design Specifications: AASHTO "Standard Specifications for Highway Bridges", and AASHTO M259M or M273M (ASTM C789M or C850M) as indicated by the following:

Condition	Min. Cover*	AASHTO	Equiv. ASTM
600 mm or more cover	600 mm	M259M, Table 2	C789M, Table 2
Less than 600 mm cover	0 mm	M273M Table 2	C850M, Table 2

The Specifications noted above show concrete dimensions, reinforcing placement, earth cover, and other details needed to manufacture the box culverts.

2) Construction Specifications: Current edition of the State of Nevada Department of Transportation "Standard Specifications for Road and Bridge Construction", subsection 502.03.24, and Special Provisions thereto.

3) Live Loads: Interstate loading conditions (Table 2), (Standard HS20-44 and FHWA alternate military loading.)

4) Concrete: Concrete shall be as specified in AASHTO M259M or M273M (ASTM C789M or C850M), as modified in subsection 502.03.24 of the Standard Specifications and the Special Provisions.

5) Reinforcing Steel: Reinforcing steel shall be AASHTO M31M (ASTM A615M) Grade 400. Welded wire fabric shall be AASHTO M55 (ASTM A185) (smooth wire), or AASHTO M221 (ASTM A497) (deformed wire). Reinforcing steel in the top slab shall have an epoxy coating conforming to AASHTO M284M (ASTM D3963M), when there is 150 mm or less of cover on the RCB (Clark County excluded).

6) Bedding: Bedding material shall be either 100 mm of granular backfill or 100 mm of type 2 class B aggregate. Choice of bedding will be at the Contractors option. Excavation for bedding shall be paid for as 100 mm of structure excavation, and bedding material shall be paid for as 100 mm of granular backfill regardless of which option the Contractor uses.

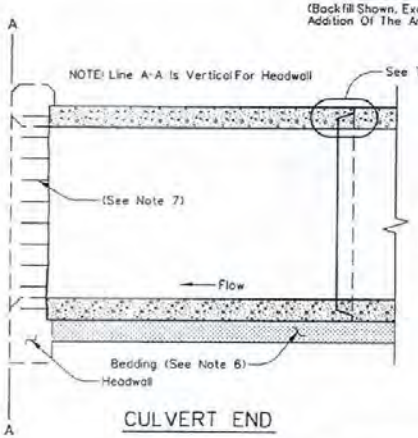
7) Headwalls: Headwall details shall be as shown in the Standard Plans. Exposed reinforcements to tie cast-in-place headwall to precast box shall consist of either 13 mm bars at 300 mm spacings or exposure of the double cage of welded wire fabric. The 13 mm bars shall be cast a min. of 460 mm into the precast box segment. Both the 13 mm bar or welded wire fabric shall extend a min. of 300 mm into the cast in place headwall.

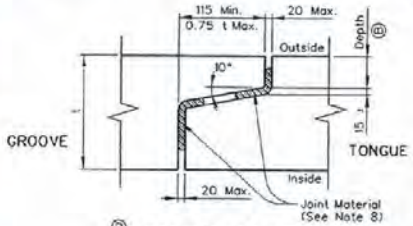
8) Joint Materials: Joint material shall be a preformed joint material meeting AASHTO M198 type B. The material shall be installed in accordance with the manufacturers recommendations. A double application of joint material shall be used. One application shall be applied to the tongue and the other to the groove. The minimum size of joint material shall be 30 mm. Any joint material extruding from the interior of the joint shall be removed flush with the box wall.

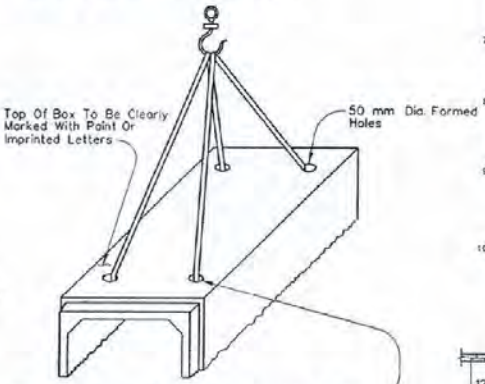
9) Special Designs: A special design of the precast box shall be required for the following conditions:

a. RCBs requiring the use of approach slabs.
b. RCBs requiring the use of bridge rail.
c. RCBs requiring the use of guardrail where the height of cover is less than the embedment length of the guardrail post.

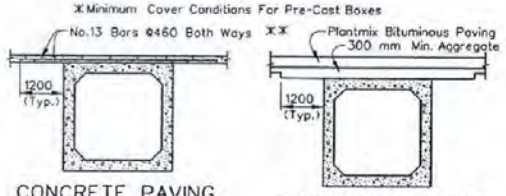
10) Markings: In addition to the markings required by the AASHTO and ASTM specifications, each box section shall be marked with appropriate NDOT Contract Number.

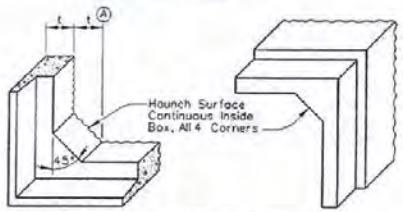


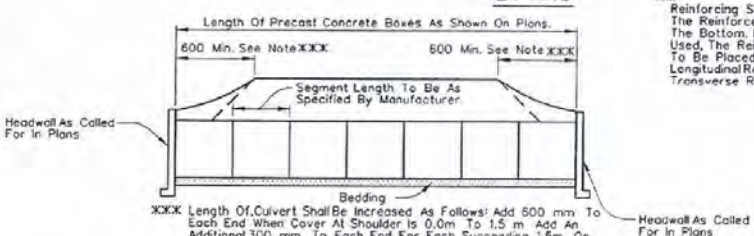




* Minimum Cover Conditions For Pre-Cast Boxes







** Reinforcing Steel Shall Extend Full Width Of Concrete Pavement. The Reinforcement Shall Have A Minimum Clearance Of 75 mm On The Bottom. In Areas Of The State Where Road Salts Are Used, The Reinforcing Shall Be Epoxy Coated. Reinforcing Is To Be Placed Parallel To The Centerline Of Road For Longitudinal Reinforcement And Parallel To The Precast Box For Transverse Reinforcement.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

Designer To Investigate The Availability Of The Required Box Size.

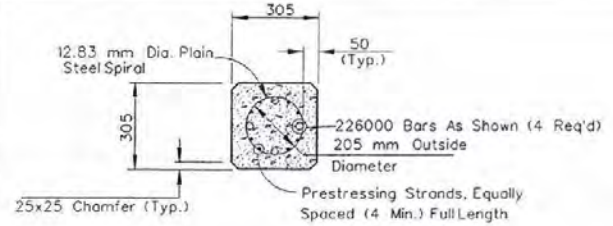
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

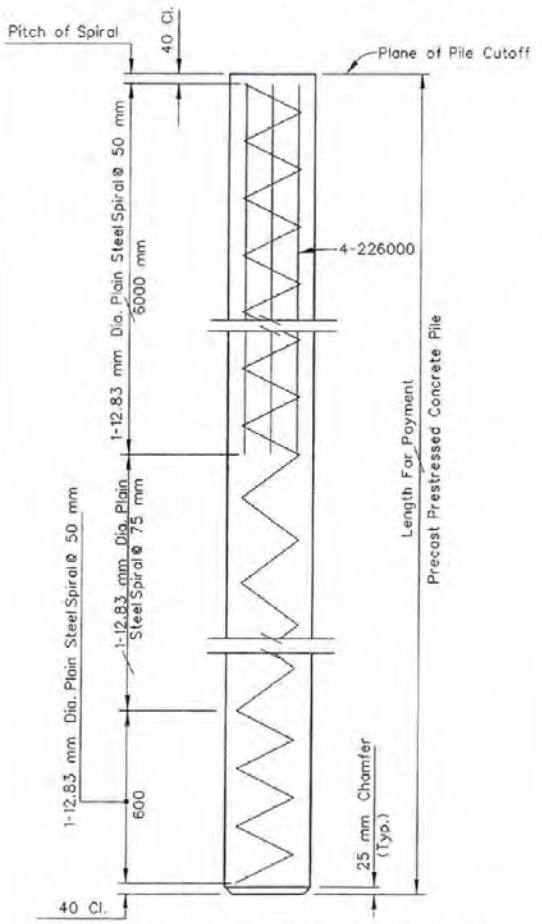
PRECAST CONCRETE BOX CULVERT

E. J. Maraver
CHIEF BRIDGE ENGINEER

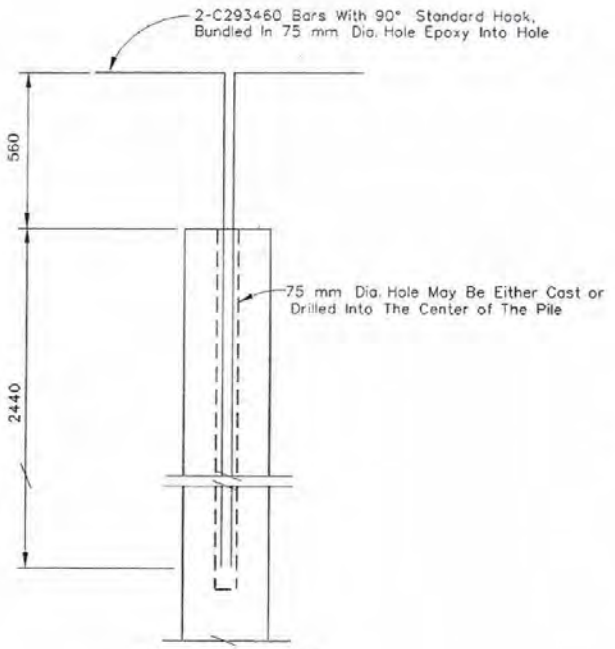
B-20.1.8 (502)
ADOPTED: 7/96 REVISION: 8/97

B-10

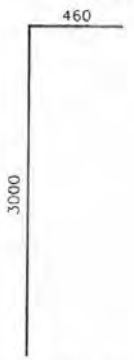




TYPICAL PRECAST PRESTRESSED PILE



PILE ANCHORAGE



C293460

GENERAL NOTES:

1. CONCRETE: ALL CONCRETE IN PRECAST PRESTRESSED PILES SHALL BE CLASS PAA CONCRETE, EXCEPT THE MIX SHALL CONTAIN NOT LESS THAN 10.5 SACKS OF CEMENT PER CUBIC METER. AIR ENTRAINMENT SHALL BE 0% TO 4%. MINIMUM ULTIMATE COMPRESSIVE STRENGTH SHALL BE:
   F'ci AT TRANSFER - 28 MPa
   F'c AT 28 DAYS - 41 MPa
2. FINAL FORCE: THE FORCE REMAINING IN THE PILES AFTER ALL LOSSES IN THE PRESTRESSING STEEL SHALL BE 445 kN. (5 MPa CONCRETE STRESS). TOTAL LOSSES IN PRESTRESSING STEEL SHALL BE TAKEN AS 276 MPa.
3. PRESTRESSING STEEL: PRESTRESSING STEEL SHALL BE HIGH-TENSILE STRENGTH SEVEN WIRE STRAND CONFORMING TO THE REQUIREMENTS OF ASTM A416M.
4. REINFORCEMENT: ALL REINFORCING STEEL SHALL BE AASHTO M31M GRADE 400. COLD-DRAWN STEEL WIRE FOR SPIRAL REINFORCEMENT SHALL CONFORM TO AASHTO M32.

CONSTRUCTION NOTES:

1. LAPPED SPLICES IN SPIRAL REINFORCEMENT SHALL BE 60 DIAMETERS MINIMUM. ALL SPIRAL REINFORCEMENT AT SPLICES AND AT ENDS OF THE PILE SHALL BE TERMINATED BY A 135 °HOOK WITH 150 mm TAIL HOOKED AROUND A LONGITUDINAL BAR OR STRAND.
2. LOCATION AND TYPE OF LIFTING DEVICES SHALL BE APPROVED BY THE ENGINEER.
3. MAXIMUM CUT-OFF LENGTH AT THE TOP OF PILE IS 3000 mm.
4. PRECAST PRESTRESSED CONCRETE PILES SHALL BE SUPPLIED FULL LENGTH. SPLICES SHALL NOT BE ALLOWED.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

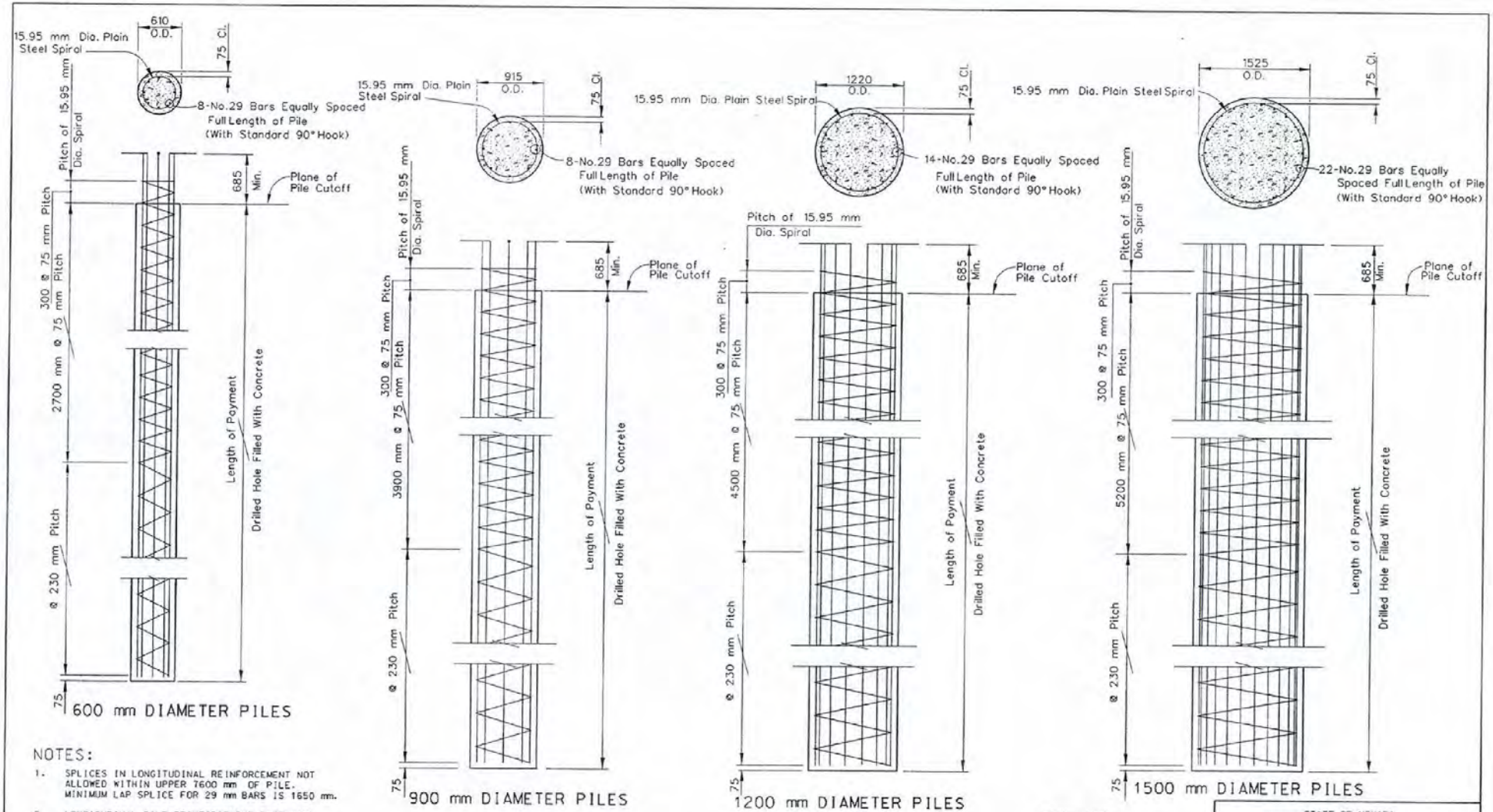
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PRECAST PRESTRESSED CONCRETE PILE DETAILS

B. J. Mauney
CHIEF BRIDGE ENGR.

B-23.1.1 (508)
ADOPTED: 7/98 REVISION 8/97

B-11



NOTES:

1. SPLICES IN LONGITUDINAL REINFORCEMENT NOT ALLOWED WITHIN UPPER 7600 mm OF PILE. MINIMUM LAP SPLICE FOR 29 mm BARS IS 1650 mm.
2. LONGITUDINAL PILE REINFORCEMENT EXTENDING INTO THE FOOTING SHALL PROVIDE 75 MILIMETERS OF CLEARANCE TO TOP OF FOOTING. A STANDARD 180° HOOK MAY BE USED IN LIEU OF THE 90° HOOK.
3. LAPPED SPLICES IN SPIRAL REINFORCEMENT SHALL BE LAPPED 60 BAR DIAMETERS MINIMUM. ALL SPIRAL REINFORCEMENT AT SPLICES AND AT THEIR ENDS SHALL BE TERMINATED BY A 135° HOOK WITH 200 MILIMETERS TAIL HOOKED AROUND A LONGITUDINAL BAR.

METRIC NDOT

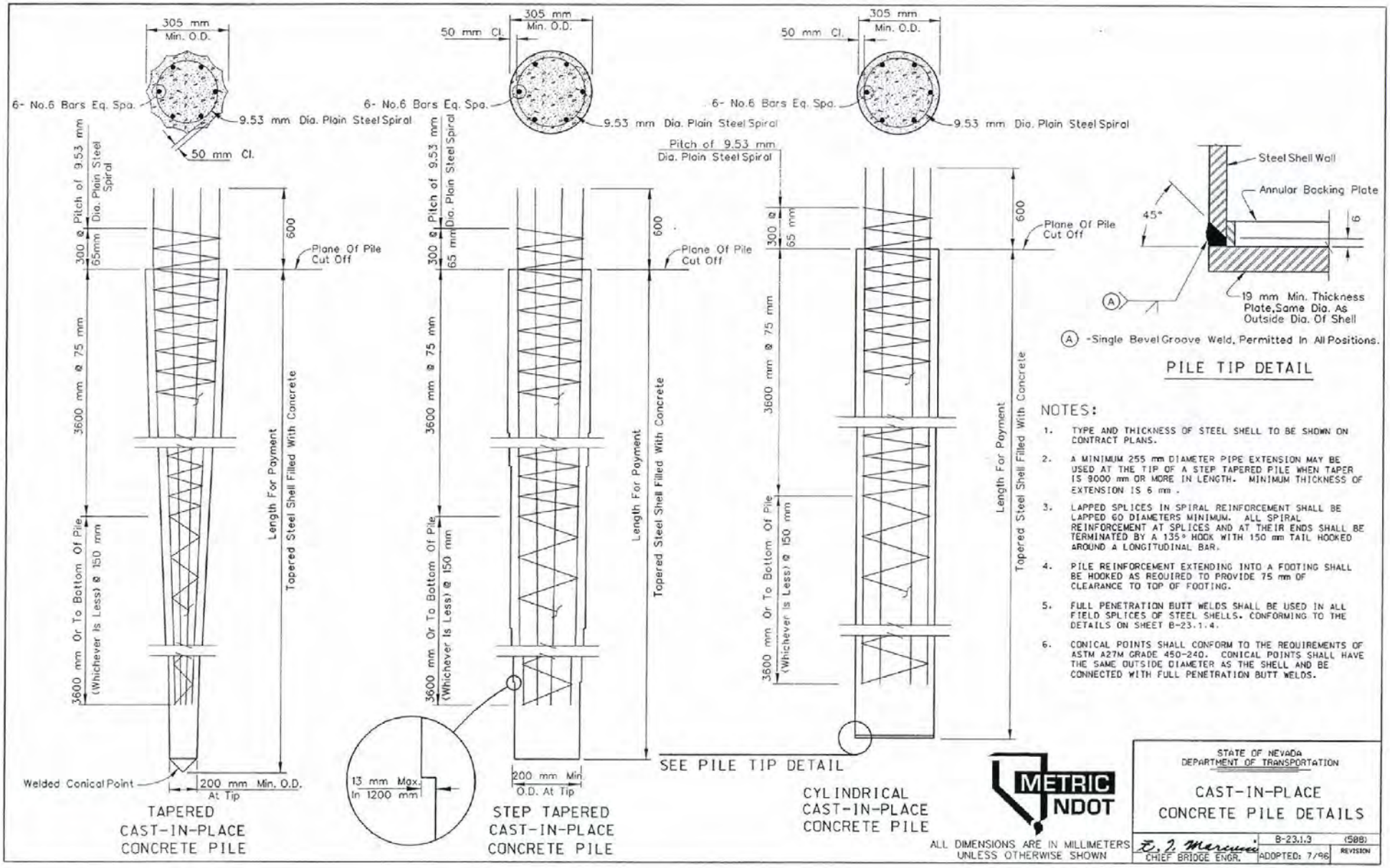
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CAST IN DRILLED HOLE CONCRETE PILE DETAILS

R. T. Maruani
CHIEF BRIDGE ENGR.

B-23.1.2	(508)
ADOPTED: 7/96	REVISION



NOTES:

1. TYPE AND THICKNESS OF STEEL SHELL TO BE SHOWN ON CONTRACT PLANS.
2. A MINIMUM 255 mm DIAMETER PIPE EXTENSION MAY BE USED AT THE TIP OF A STEP TAPERED PILE WHEN TAPER IS 9000 mm OR MORE IN LENGTH. MINIMUM THICKNESS OF EXTENSION IS 6 mm .
3. LAPPED SPLICES IN SPIRAL REINFORCEMENT SHALL BE LAPPED 60 DIAMETERS MINIMUM. ALL SPIRAL REINFORCEMENT AT SPLICES AND AT THEIR ENDS SHALL BE TERMINATED BY A 135° HOOK WITH 150 mm TAIL HOOKED AROUND A LONGITUDINAL BAR.
4. PILE REINFORCEMENT EXTENDING INTO A FOOTING SHALL BE HOOKED AS REQUIRED TO PROVIDE 75 mm OF CLEARANCE TO TOP OF FOOTING.
5. FULL PENETRATION BUTT WELDS SHALL BE USED IN ALL FIELD SPLICES OF STEEL SHELLS. CONFORMING TO THE DETAILS ON SHEET B-23.1.4.
6. CONICAL POINTS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A27M GRADE 450-240. CONICAL POINTS SHALL HAVE THE SAME OUTSIDE DIAMETER AS THE SHELL AND BE CONNECTED WITH FULL PENETRATION BUTT WELDS.

METRIC NDOT

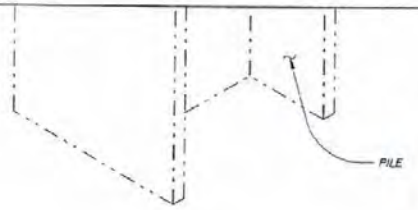
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

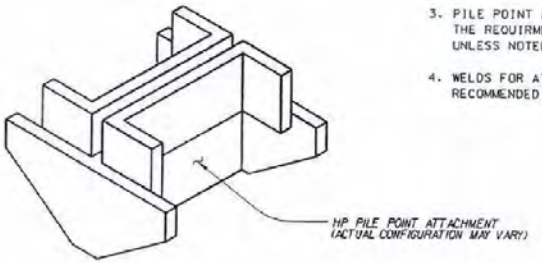
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CAST-IN-PLACE CONCRETE PILE DETAILS

R. J. Marcucci
CHIEF BRIDGE ENGR.

B-23.1.3 (SDB)
ADOPTED: 7/96 REVISION

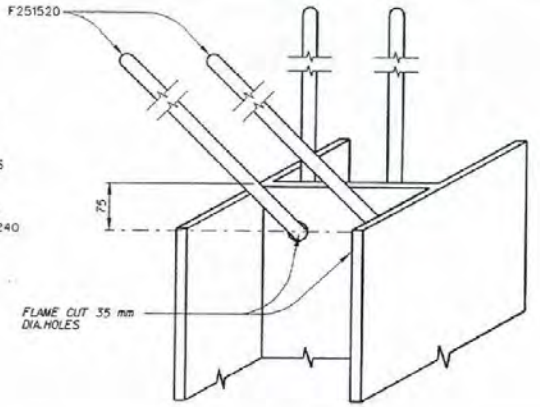




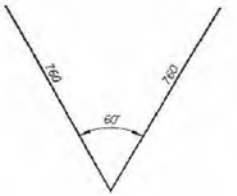
TYPICAL HP PILE POINT DETAIL

HP PILE POINT ATTACHMENT NOTES:

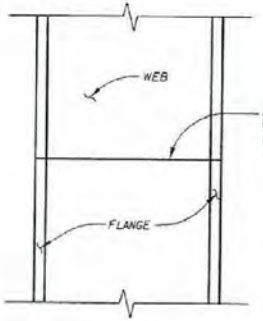
1. HP PILE POINT ATTACHMENTS ARE REQUIRED ONLY WHEN SHOWN ON THE PLANS OR IN THE SPECIAL PROVISIONS.
2. THE PILE POINT CONFIGURATION SHALL BE AS SHOWN ON PLANS.
3. PILE POINT ATTACHMENTS SHALL CONFORM TO THE REQUIRMENTS OF ASTM A27M GRADE 450-240 UNLESS NOTED OTHERWISE.
4. WELDS FOR ATTACHMENTS SHALL BE AS RECOMMENDED BY THE MANUFACTURER.



HP PILE ANCHORAGE DETAIL



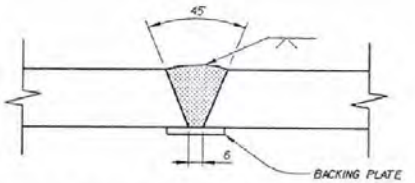
2-F251520



HP PILE SPLICE DETAIL

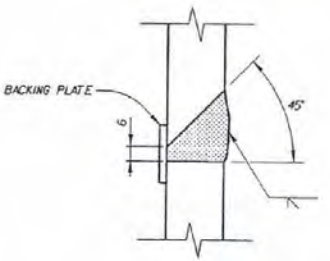
PILE SPLICE NOTES:

1. PILE SPLICE WELDS SHALL CONFORM TO AWS D1.1.
2. PILE MUST BE STOPPED AT LEAST 1000 mm ABOVE GROUND PRIOR TO SPLICING.



SINGLE VEE-GROOVE BUTT WELD

PERMITTED FOR ALL POSITIONS



SINGLE BEVEL-GROOVE BUTT WELD

PERMITTED IN HORIZONTAL POSITION ONLY

PILE SPLICE WELDING DETAILS

METRIC NDOT

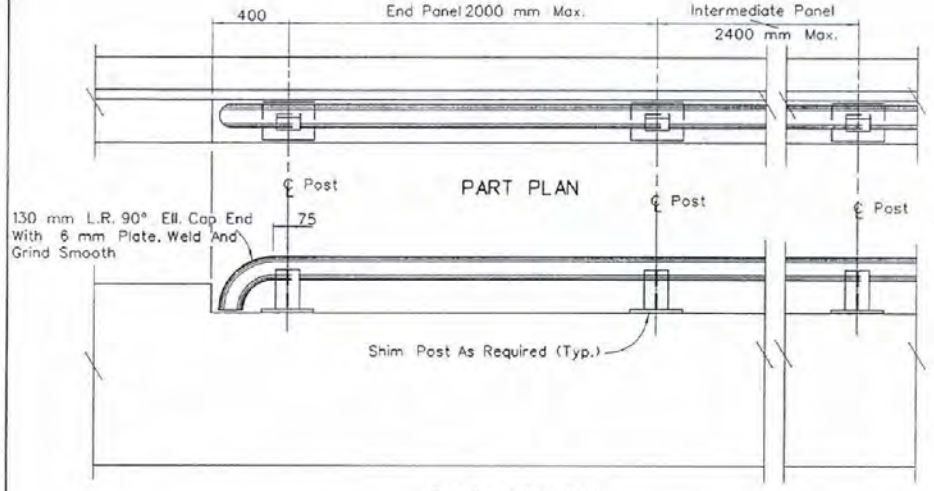
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

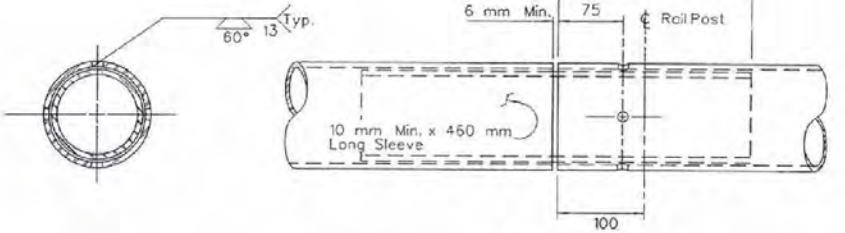
"HP" PILE DETAILS

E.J. Marconi
CHIEF BRIDGE ENGINEER

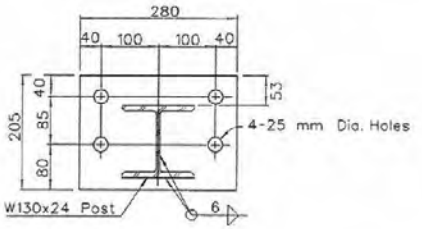
B-23.1.4 (508)
ADOPTED 7/96 REVISION



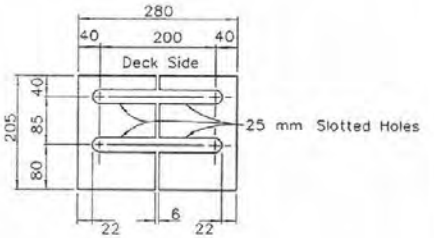
PART ELEVATION



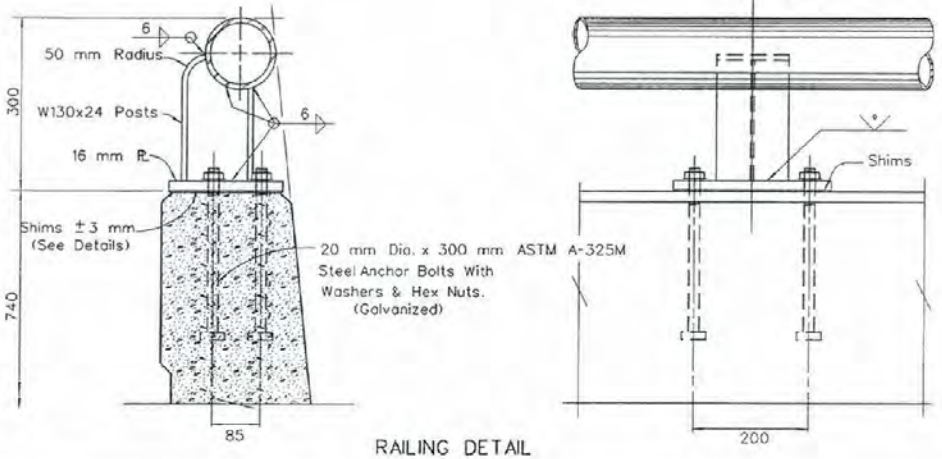
SLIP JOINT DETAIL



ANCHOR PLATE DETAIL



SHIM DETAIL



RAILING DETAIL

GENERAL NOTES:

1. RAILING TO CONFORM TO VERTICAL AND HORIZONTAL ALIGNMENT.
2. JOINTS TO BE SPACED 12000 mm CENTER TO CENTER. MAXIMUM.
3. SLIP JOINTS TO BE PLACED IN PANELS TO MATCH EXPANSION JOINTS IN DECK. THE 6 mm FOR MOVEMENT WILL BE CHANGED TO MATCH ALLOWANCE FOR MOVEMENT IN THE DECK AND CURB.
4. DESIGN WEIGHT: 25.3 kg. PER METER.
5. RAILING ASSEMBLY SHALL BE GALVANIZED AFTER FABRICATION.
6. ALL EXPOSED SURFACES OF RAILING ASSEMBLY SHALL BE PAINTED WHITE.

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

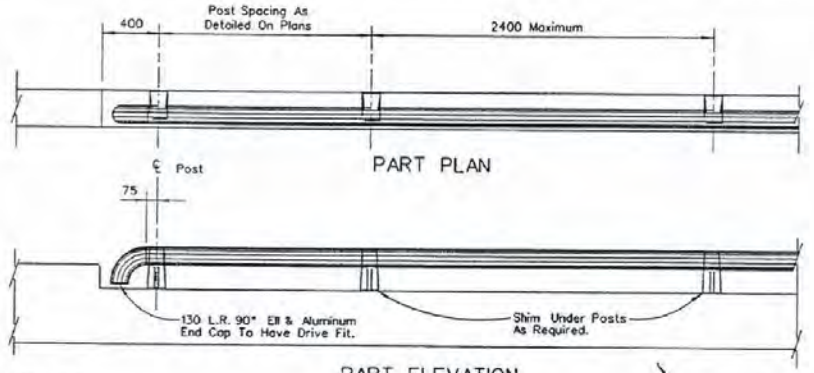
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

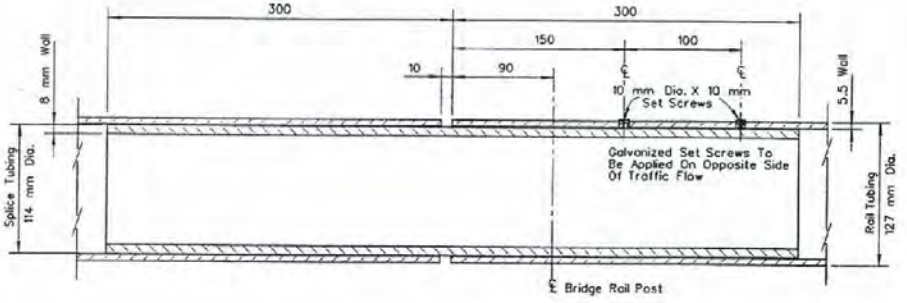
STEEL BRIDGE RAIL TYPE "H"

R. J. Marucci
CHIEF BRIDGE ENGR.

B-25.1.2	(506)
ADOPTED: 7/96	REVISION

B-15



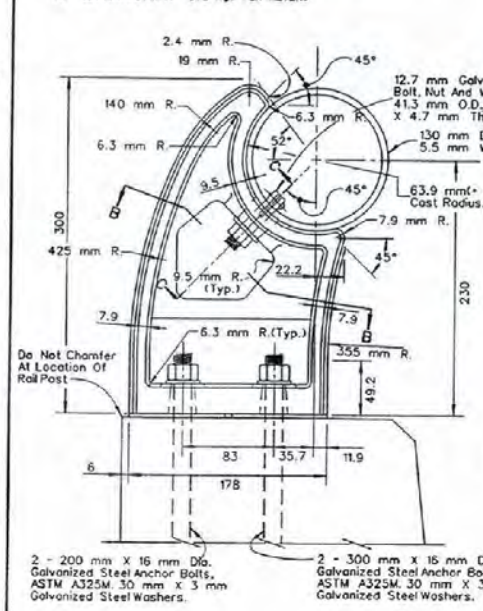


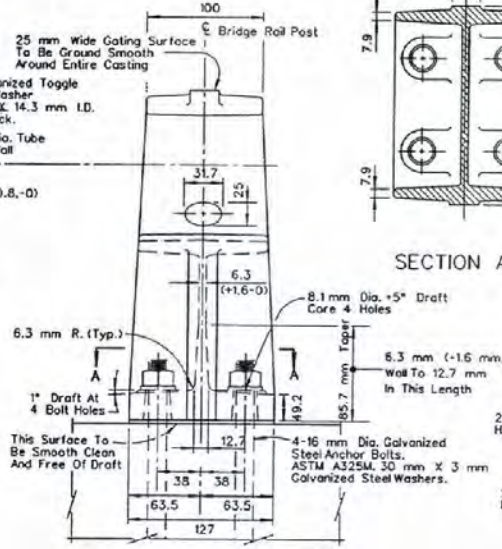
GENERAL NOTES:

1. RAILING TO CONFORM TO VERTICAL AND HORIZONTAL ALIGNMENT.
2. JOINT TO BE PLACED 7500 mm CENTER TO CENTER, MAX.
3. SLIP JOINT TO BE PLACED IN PANELS TO MATCH EXPANSION JOINTS IN DECK. THE 10 mm FOR MOVEMENT WILL BE CHANGED TO MATCH ALLOWANCES FOR MOVEMENT IN THE DECK AND CURB.
4. DESIGN WEIGHT: 9.3 kg. PER METER.

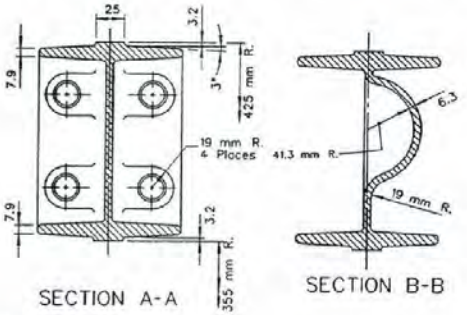
NOTE:

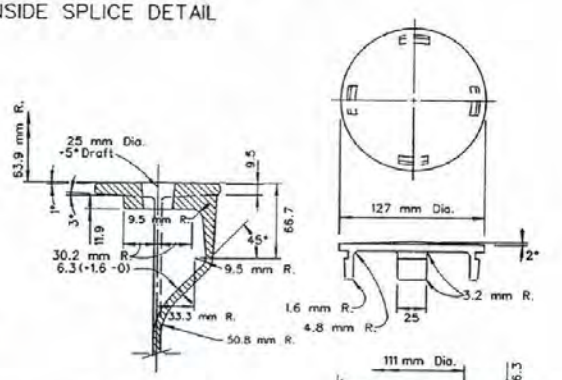
UNLESS OTHERWISE SPECIFIED ALL DRAFT TO BE 3°.
ALL UNMARKED RADII TO BE 3 mm R.

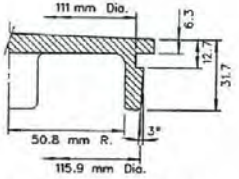


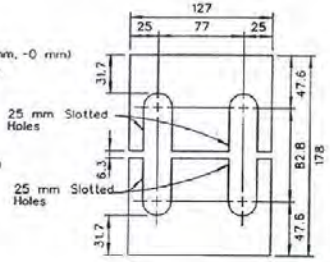


RAILING DETAILS









METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

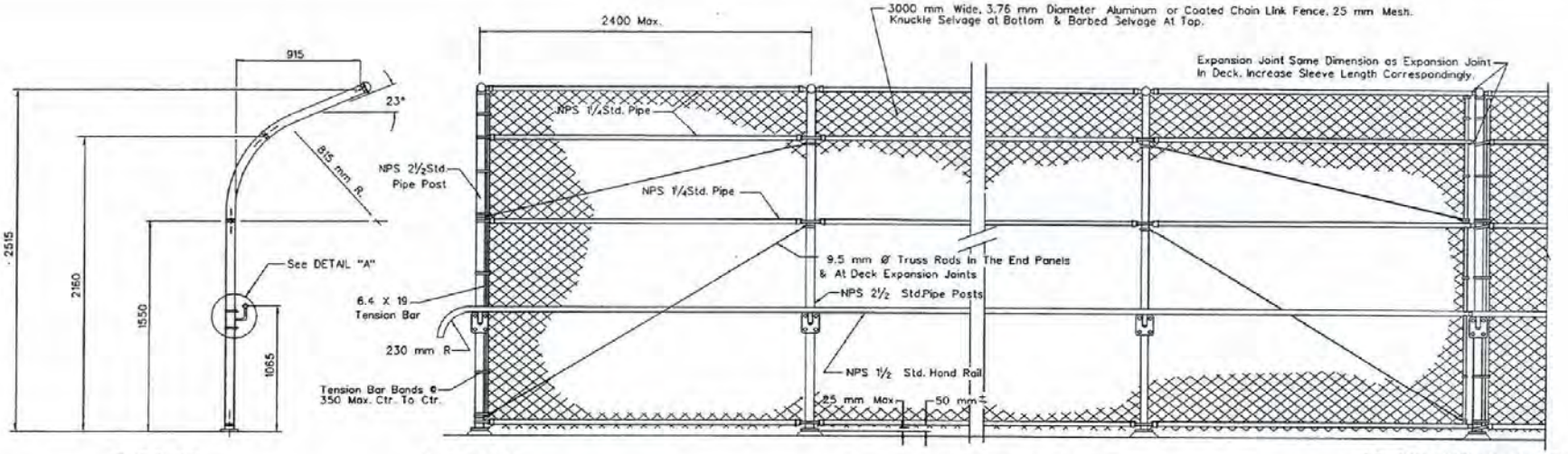
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

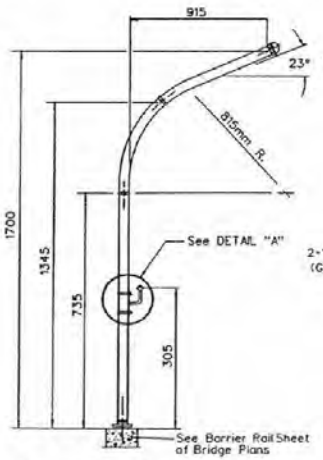
ALUMINUM BRIDGE RAIL TYPE "H"

B-25.1.3 (506)

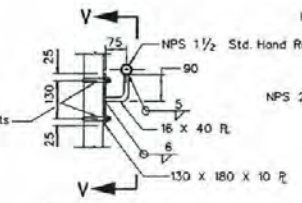
CHIEF ENGINEER — ADOPTED: 7/96 REVISION: 8/97

B-16

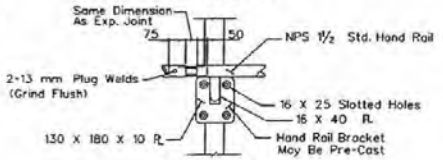




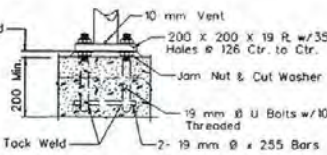
TYPE "M" (MODIFIED)



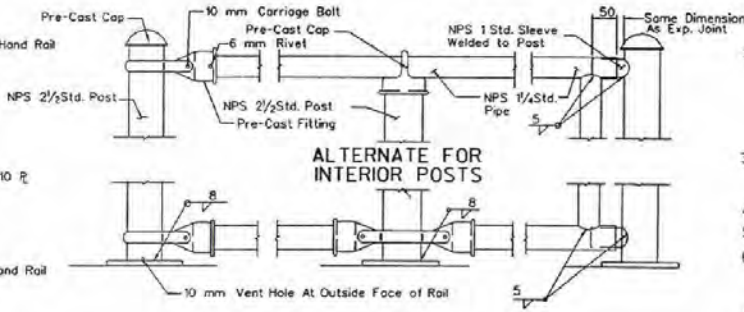
DETAIL "A"



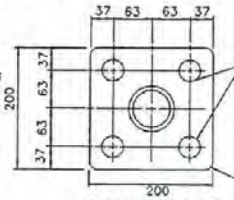
VIEW V-V



ANCHORAGE DETAILS



TYPICAL CONNECTION DETAILS



BASE PLATE

GENERAL NOTES:

1. RAILING ASSEMBLY EXCEPT CHAIN LINK FABRIC. TO BE GALVANIZED AFTER FABRICATION.
2. RAILING SHALL CONFORM TO HORIZONTAL AND VERTICAL ALIGNMENTS. POSTS SHALL BE VERTICAL. TOP, INTERMEDIATE AND BOTTOM PIPES SHALL BE BENT IF THE RADIUS IS 45000 mm OR LESS: MAY BE ON 2400 mm CHORDS IF RADIUS IS OVER 45000 mm.
3. SPACE POSTS TO CLEAR EXPANSION JOINTS JOINTS BY 150 mm MIN. TO CENTERLINE POSTS.
4. ALL EXPOSED CORNERS TO BE SMOOTH.
5. PEEN ALL 10 mm BOLTS.
6. WHEN FENCE IS ON SLOPE THE 3000 mm FABRIC SHALL BE PLACED PARALLEL TO THE SLOPE.
7. ALTERNATIVE DETAILS MAY BE SUBMITTED BY THE CONTRACTOR FOR THE ENGINEERS APPROVAL.
8. NPS = NOMINAL PIPE SIZE DESIGNATION

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

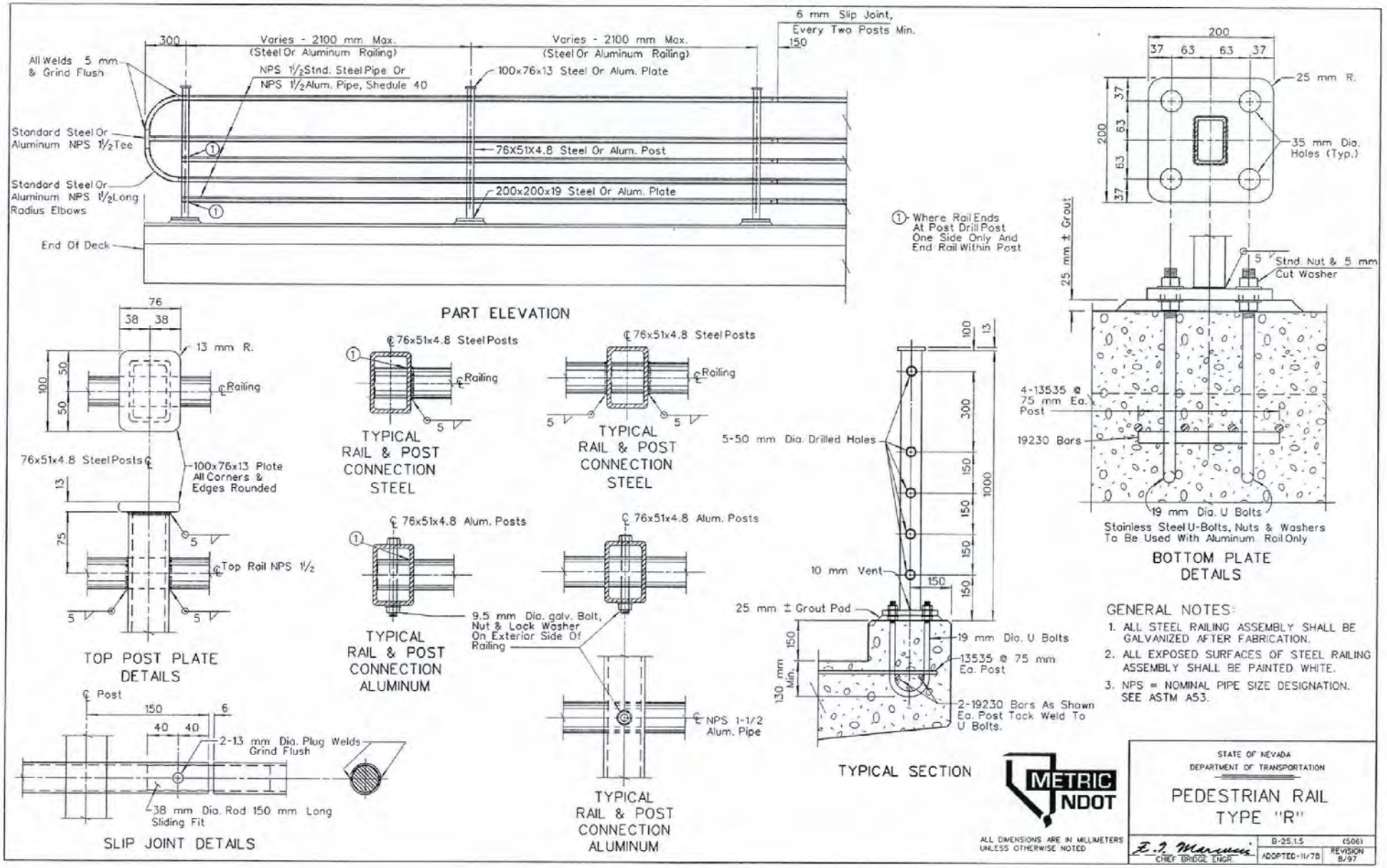
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

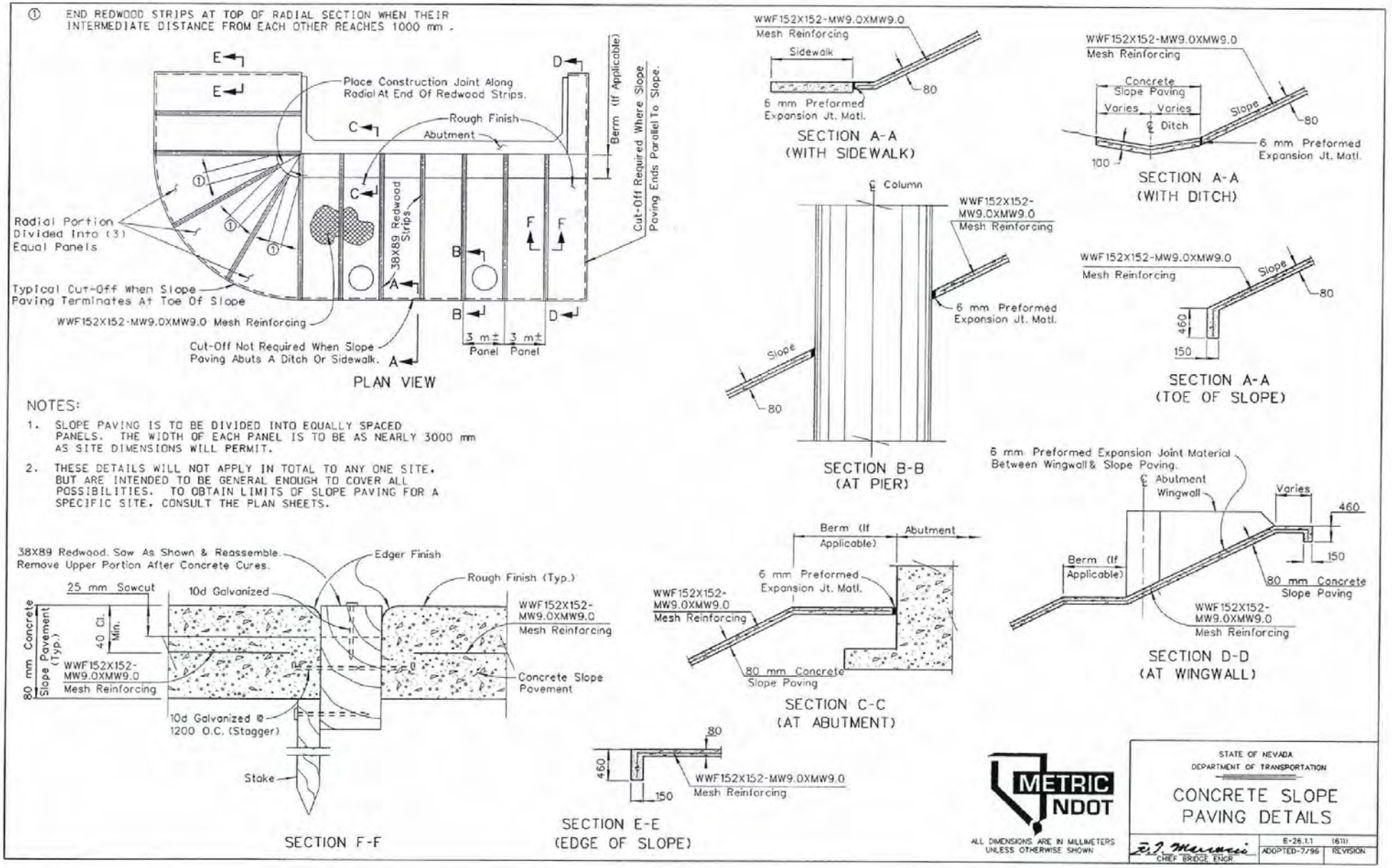
PEDESTRIAN RAIL
TYPE "M"

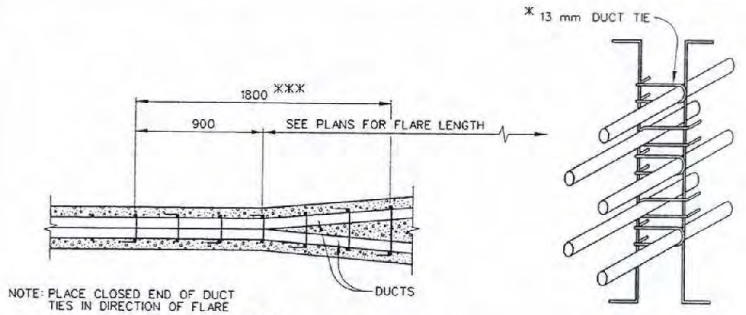
E. J. Marcuse
CHIEF BRIDGE ENGR.

B-25.1.4 (506)
ADOPTED: 7/98 REVISION 8/02

B-17


6 mm Slip Joint, Every Two Posts Min.
300
Varies - 2100 mm Max. (Steel Or Aluminum Railing)
Varies - 2100 mm Max. (Steel Or Aluminum Railing)
150
All Welds 5 mm & Grind Flush
NPS 1½ Stnd. Steel Pipe Or NPS 1½ Alum. Pipe, Shedule 40
100x76x13 Steel Or Alum. Plate
Standard Steel Or Aluminum NPS 1½ Tee
76X51X4.8 Steel Or Alum. Post
Standard Steel Or Aluminum NPS 1½ Long Radius Elbows
200x200x19 Steel Or Alum. Plate
End Of Deck
PART ELEVATION
① Where Rail Ends At Post Drill Post One Side Only And End Rail Within Post
200
37 63 63 37
25 mm R.
35 mm Dia. Holes (Typ.)
25 mm ± Grout
5
Stnd. Nut & 5 mm Cut Washer
4-13535 @ 75 mm Ea. Post
19230 Bars
19 mm Dia. U Bolts
Stainless Steel U-Bolts, Nuts & Washers To Be Used With Aluminum Rail Only
BOTTOM PLATE DETAILS
76
38 38
13 mm R.
℄ Railing
76x51x4.8 Steel Posts ℄
100x76x13 Plate All Corners & Edges Rounded
Top Rail NPS 1½
TOP POST PLATE DETAILS
℄ 76x51x4.8 Steel Posts
TYPICAL RAIL & POST CONNECTION STEEL
℄ 76x51x4.8 Steel Posts
TYPICAL RAIL & POST CONNECTION STEEL
℄ 76x51x4.8 Alum. Posts
9.5 mm Dia. galv. Bolt, Nut & Lock Washer On Exterior Side Of Railing
TYPICAL RAIL & POST CONNECTION ALUMINUM
℄ 76x51x4.8 Alum. Posts
NPS 1-1/2 Alum. Pipe
TYPICAL RAIL & POST CONNECTION ALUMINUM
℄ Post
150
40 40
6
2-13 mm Dia. Plug Welds Grind Flush
38 mm Dia. Rod 150 mm Long Sliding Fit
SLIP JOINT DETAILS
100
13
300
150
1000
5-50 mm Dia. Drilled Holes
10 mm Vent
25 mm ± Grout Pad
130 mm Min.
19 mm Dia. U Bolts
13535 @ 75 mm Ea. Post
2-19230 Bars As Shown Ea. Post Tack Weld To U Bolts.
TYPICAL SECTION
GENERAL NOTES:
1. ALL STEEL RAILING ASSEMBLY SHALL BE GALVANIZED AFTER FABRICATION.
2. ALL EXPOSED SURFACES OF STEEL RAILING ASSEMBLY SHALL BE PAINTED WHITE.
3. NPS = NOMINAL PIPE SIZE DESIGNATION. SEE ASTM A53.
METRIC NDOT
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
PEDESTRIAN RAIL TYPE "R"
R.F. Maruna
CHIEF BRIDGE ENGR.
B-25.1.5
(506)
ADOPTED-11/78
REVISION 8/97


① END REDWOOD STRIPS AT TOP OF RADIAL SECTION WHEN THEIR INTERMEDIATE DISTANCE FROM EACH OTHER REACHES 1000 mm .
Place Construction Joint Along Radial At End Of Redwood Strips.
Rough Finish
Abutment
Berm (If Applicable)
Cut-Off Required Where Slope Paving Ends Parallel To Slope.
38X89 Redwood Strips
Radial Portion Divided Into (3) Equal Panels
Typical Cut-Off When Slope Paving Terminates At Toe Of Slope
WWF152X152-MW9.0XMW9.0 Mesh Reinforcing
Cut-Off Not Required When Slope Paving Abuts A Ditch Or Sidewalk.
3 m± Panel
3 m± Panel
PLAN VIEW
WWF152X152-MW9.0XMW9.0
Mesh Reinforcing
Sidewalk
80
6 mm Preformed Expansion Jt. Matl.
SECTION A-A (WITH SIDEWALK)
WWF152X152-MW9.0XMW9.0
Mesh Reinforcing
Concrete Slope Paving
Varies
Varies
℄ Ditch
Slope
80
100
6 mm Preformed Expansion Jt. Matl.
SECTION A-A (WITH DITCH)
℄ Column
WWF152X152-MW9.0XMW9.0
Mesh Reinforcing
6 mm Preformed Expansion Jt. Matl.
Slope
80
SECTION B-B (AT PIER)
WWF152X152-MW9.0XMW9.0
Mesh Reinforcing
Slope
80
460
150
SECTION A-A (TOE OF SLOPE)
NOTES:
1. SLOPE PAVING IS TO BE DIVIDED INTO EQUALLY SPACED PANELS. THE WIDTH OF EACH PANEL IS TO BE AS NEARLY 3000 mm AS SITE DIMENSIONS WILL PERMIT.
2. THESE DETAILS WILL NOT APPLY IN TOTAL TO ANY ONE SITE. BUT ARE INTENDED TO BE GENERAL ENOUGH TO COVER ALL POSSIBILITIES. TO OBTAIN LIMITS OF SLOPE PAVING FOR A SPECIFIC SITE. CONSULT THE PLAN SHEETS.
6 mm Preformed Expansion Joint Material Between Wingwall & Slope Paving.
℄ Abutment Wingwall
Varies
460
150
Berm (If Applicable)
80 mm Concrete Slope Paving
WWF152X152-MW9.0XMW9.0
Mesh Reinforcing
SECTION D-D (AT WINGWALL)
38X89 Redwood. Saw As Shown & Reassemble. Remove Upper Portion After Concrete Cures.
Edger Finish
Rough Finish (Typ.)
25 mm Sawcut
10d Galvanized
80 mm Concrete Slope Pavement (Typ.)
40 Cl. Min.
WWF152X152-MW9.0XMW9.0
Mesh Reinforcing
Concrete Slope Pavement
10d Galvanized @ 1200 O.C. (Stagger)
Stake
SECTION F-F
Berm (If Applicable)
Abutment
6 mm Preformed Expansion Jt. Matl.
WWF152X152-MW9.0XMW9.0
Mesh Reinforcing
80 mm Concrete Slope Paving
SECTION C-C (AT ABUTMENT)
80
460
150
WWF152X152-MW9.0XMW9.0
Mesh Reinforcing
SECTION E-E (EDGE OF SLOPE)
METRIC NDOT
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
CONCRETE SLOPE PAVING DETAILS
E.J. Marasi
CHIEF BRIDGE ENGR
E-26.1.1
ADOPTED-7/96
(611)
REVISION



STIRRUP REINFORCEMENT AT FLARE OF GIRDER STEM

DISTRIBUTION OF PRESTRESSING FORCE:

UNLESS OTHERWISE NOTED THE PRESTRESSING FORCE. P JACK OR PF. SHALL BE DISTRIBUTED WITH AN APPROXIMATELY EQUAL AMOUNT IN EACH GIRDER AND SHALL BE PLACED SYMMETRICALLY ABOUT THE CENTERLINE OF THE STRUCTURE. IN SLABS. THE PRESTRESSING FORCE SHALL BE UNIFORMLY DISTRIBUTED ACROSS THE SLAB.

STRESSING SEQUENCE:

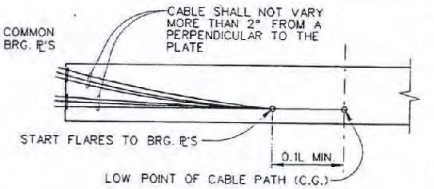
NO MORE THAN 1/2 OF THE PRESTRESSING FORCE IN ANY GIRDER MAY BE STRESSED BEFORE AN EQUAL FORCE IS STRESSED IN THE ADJACENT GIRDERS. AT NO TIME DURING THE STRESSING OPERATIONS WILL MORE THAN 1/6 OF THE TOTAL PRESTRESSING FORCE BE APPLIED ECCENTRICALLY ABOUT THE CENTERLINE OF THE STRUCTURE.

GIRDER STEM SHALL BE FLARED NEAR ANCHORAGE TO PROVIDE A MINIMUM OF 40 mm CONCRETE COVERING THE REBAR. FLARE MAY BE ON ONE SIDE OF THE GIRDER ONLY. BAR REINFORCEMENT INTERFERING WITH THE PRESTRESSING TENDON ALIGNMENT SHALL BE ADJUSTED AS APPROVED BY THE ENGINEER.

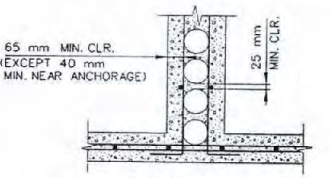
* BARS MARKED THUSLY ARE TO BE INCLUDED IN THE COST OF PRESTRESSING CAST-IN-PLACE CONCRETE.

** CONCRETE USED IN THE BEARING SEATS IS TO BE INCLUDED IN THE COST OF PRESTRESSING CAST-IN-PLACE CONCRETE.

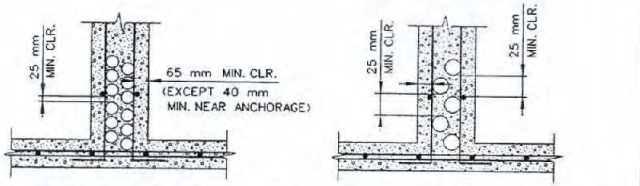
*** ADD ADDITIONAL No.13 STIRRUP BARS. IN PAIRS. AS NECESSARY TO MAINTAIN A 300 mm STIRRUP SPACING. SEE PLANS FOR STIRRUP BENDING DIMENSIONS AND EPOXY COATING REQUIREMENTS. ADDITIONAL No.13 STIRRUP BARS TO BE INCLUDED IN COST OF PRESTRESSING.



COMMON BEARING PLATE PRESTRESSING PATH



DUCTS OVER 114 mm O.D.

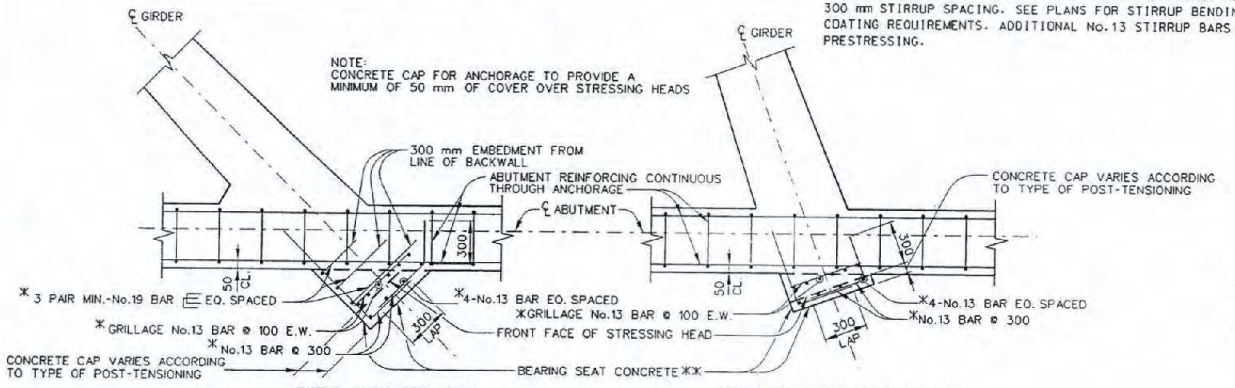


DUCTS 76 mm O.D. & LESS

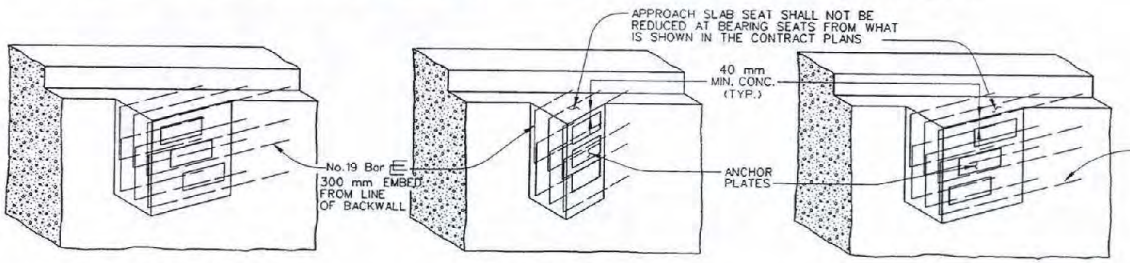
DUCTS OVER 76 mm O.D. TO 114 mm O.D.

CLEARANCE REQUIREMENTS FOR DUCTS

1. DUCT PATTERNS SHOWN ARE FOR 300 mm WIDE GIRDER STEM: FOR OTHER WIDTHS THE MINIMUM CLEARANCES MUST BE MAINTAINED.
2. VERTICAL DIMENSIONS AT TENTH POINTS TO BE SHOWN IN ORDER TO FACILITATE THE PLACING OF THE DUCTS ACCURATELY.
3. APPROVAL OF THE ENGINEER IS REQUIRED FOR DEVIATIONS.



BEARING SEAT FOR PRESTRESSED ANCHORAGE AT DIAPHRAGM TYPE ABUTMENTS



NOTE: DETAILS MAY BE MODIFIED TO SUIT SPECIFIC ANCHORAGE

TYPICAL BEARING SEAT ILLUSTRATIONS

METRIC NDOT

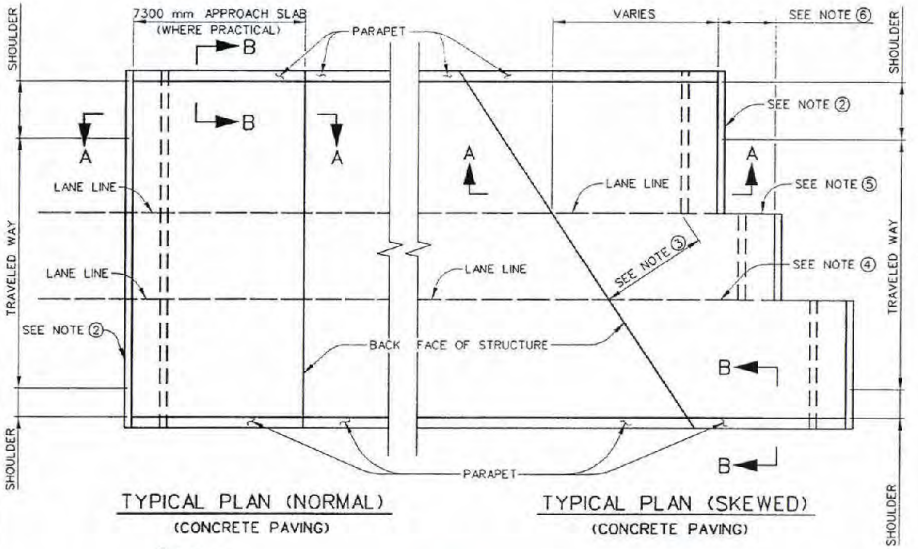
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CAST-IN-PLACE PRESTRESSED GIRDER DETAILS

E. L. Marucci
CHIEF BRIDGE ENGINEER

B-28.1.1 (503)
ADOPTED: 7/96 REVISION:

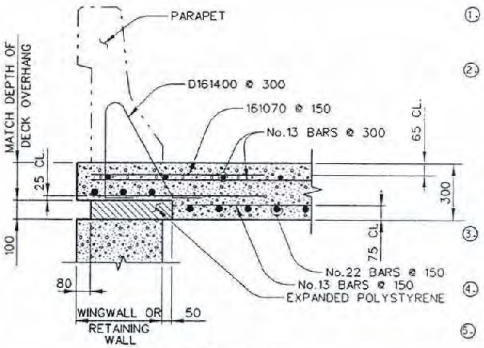


TYPICAL PLAN (NORMAL)

(CONCRETE PAVING)

TYPICAL PLAN (SKEWED)

(CONCRETE PAVING)



SECTION B-B

A) WHEN THE APPROACH SLAB EXTENDS BEYOND THE WINGWALLS, EXTEND THE EXPANDED POLYSTYRENE 50 mm BEYOND THE WINGWALL ENDS. ADJUST THE APPROACH SLAB TO ITS FULL DEPTH, AND ELIMINATE THE 161070 BARS.

GENERAL NOTES:

① THE CONCRETE SHALL BE "EA", F'c=31MPa, OR "A" F'c=28MPa, AS DETERMINED BY THE ENGINEER. WHEN "EA" CONCRETE IS REQUIRED, THE REINFORCING STEEL SHALL HAVE AN EPOXY COATING.

② A. THE CONTACT JOINT BETWEEN THE CONCRETE PAVEMENT AND THE APPROACH SLAB SHALL PARALLEL THE BACK FACE OF THE STRUCTURE FOR SKEWS OF 20 DEGREES OR LESS; FOR SKEWS GREATER THAN 20 DEGREES THE CONTACT JOINT SHALL BE NORMAL TO THE ROADWAY ALIGNMENT CONTROL LINE. JOINTS SHALL BE STAGGERED ON LANE LINES FOR SKEWED STRUCTURES. STAGGER LINES SHALL BE AT EACH LANE LINE FOR SKEWS OF 45 DEGREES OR MORE.

B. THE CONTACT JOINT BETWEEN ASPHALT PAVEMENT AND APPROACH SLAB SHALL PARALLEL THE BACK FACE OF THE STRUCTURE.

③ FOR SKEWS GREATER THAN 20 DEGREES THE DISTANCE MEASURED NORMAL TO AND FROM THE BACK FACE OF THE STRUCTURE TO THE END OF THE APPROACH SLAB SHALL BE A MINIMUM OF 4500 mm.

④ LONGITUDINAL CONSTRUCTION JOINTS IN THE APPROACH SLAB MAY BE LOCATED ON LANE LINES WHEN PERMITTED BY THE ENGINEER.

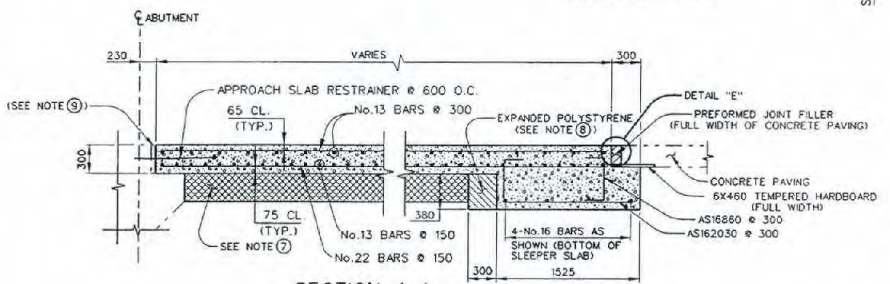
⑤ PLACE 6 mm EXPANSION JOINT MATERIAL BETWEEN THE CONCRETE PAVEMENT AND THE LONGITUDINAL FACE OF THE APPROACH SLAB. THE EXPANSION JOINT MATERIAL IS TO BE RECESSED 12 mm FROM THE SURFACE AND THE JOINT SEALED IDENTICALLY TO THE "LONGITUDINAL WEAKENED PLANE JOINT" ON SHEET R-76 OF THE STANDARD PLANS.

⑥ THE LENGTH OF THE STEPS MUST BE 3600 mm MINIMUM TO 4500 mm MAXIMUM OR INCREMENTAL INTERVALS (7300 mm MIN. TO 9100 mm MAX...) TO MAINTAIN A 3600 mm MINIMUM TO 4500 mm MAXIMUM SPACING OF THE TRANSVERSE WEAKENED PLANE JOINTS IN THE CONCRETE PAVEMENT. SEE SECTION 409.03.09 OF THE SPECIAL PROVISIONS AND SHEET R-76 OF THE STANDARD PLANS FOR SAW-CUTTING DETAILS.

⑦ WHEN CALLED FOR ON THE PLANS, FILL MATERIAL UNDER APPROACH SLABS SHALL BE COMPACTED TO NOT LESS THAN NINETY-FIVE (95) PERCENT OF THE MAXIMUM DENSITY. SEE SECTION 203.03.17 OF THE STANDARD SPECIFICATIONS AND/OR SPECIAL PROVISIONS FOR SPECIFIC TEST METHODS.

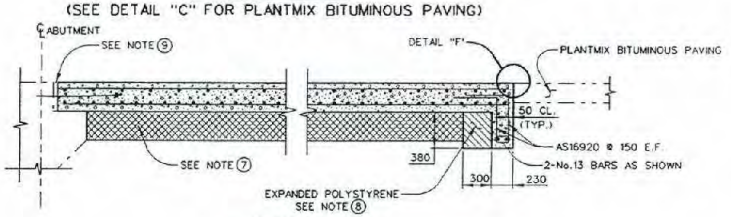
⑧ EXPANDED POLYSTYRENE TO BE USED WHEN NOTED ON THE PLANS.

⑨ SEE PLANS FOR EXPANSION JOINT DETAILS.



SECTION A-A

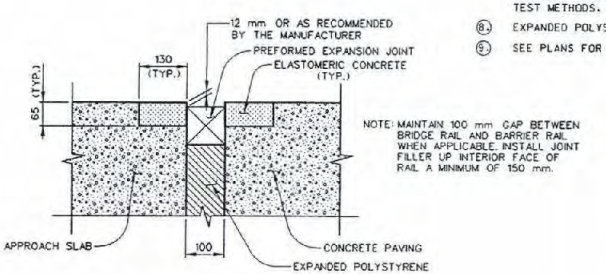
(SEE DETAIL "C" FOR PLANTMIX BITUMINOUS PAVING)



DETAIL "C"

(PLANTMIX BITUMINOUS PAVING)

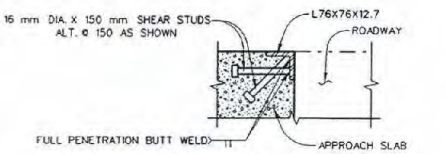
NOTE: FOR INFORMATION & DIMENSIONS NOT SHOWN SEE SECTION A-A



NOTE: MAINTAIN 100 mm GAP BETWEEN BRIDGE RAIL AND BARRIER RAIL WHEN APPLICABLE. INSTALL JOINT FILLER UP INTERIOR FACE OF RAIL A MINIMUM OF 150 mm.

DETAIL "E"

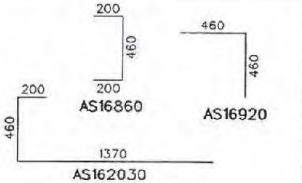
(CONCRETE PAVING OPTION)



DETAIL "F"

(APPROACH SLAB JOINT PROTECTION-PLANTMIX BITUMINOUS PAVING)

THIS SHEET IS FOR GENERAL INFORMATION FOR ACTUAL DIMENSIONS AND REINFORCING STEEL LAYOUTS, SEE CONTRACT PLANS.



BENT BARS

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

APPROACH SLAB

CHIEF BRIDGE ENGINEER

B-29.1.1 (502)

ADOPTED: 7/96 REVISION: