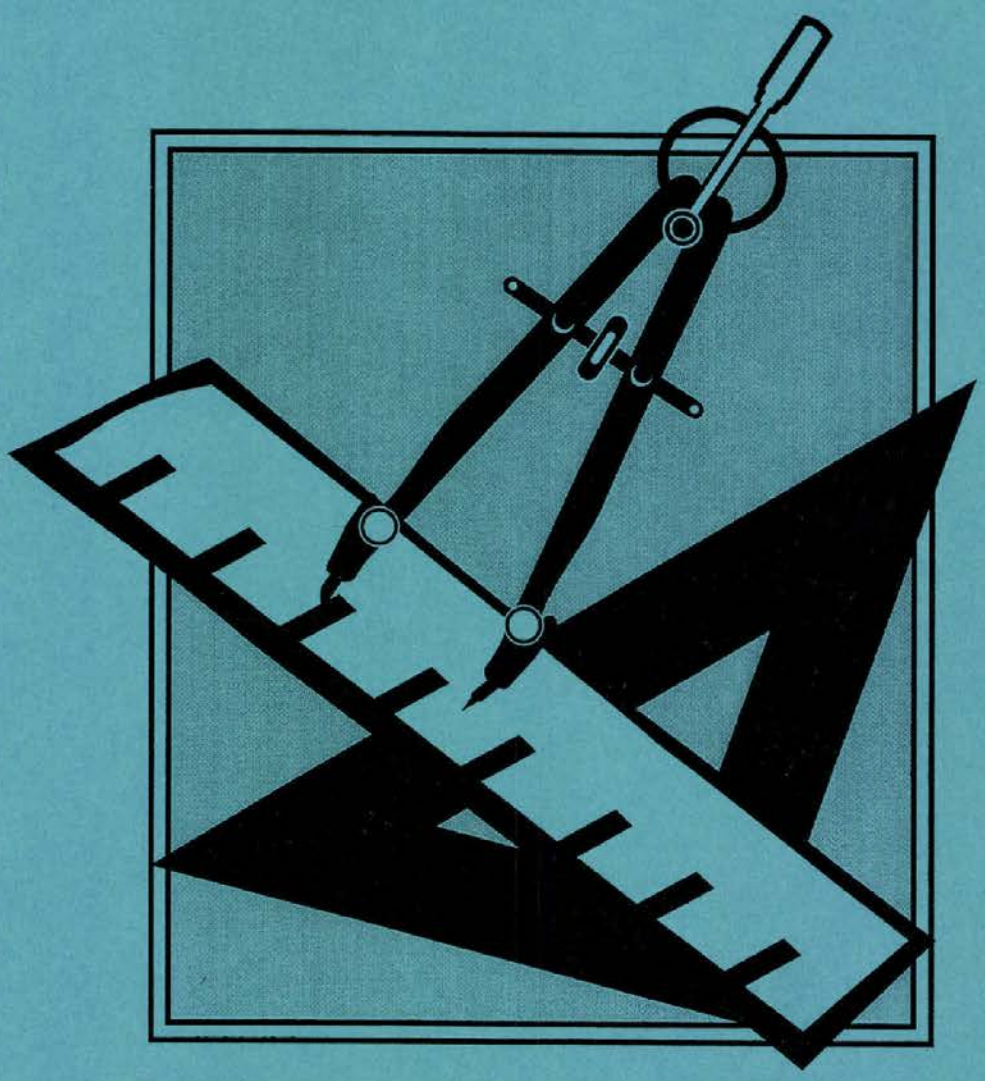
STATE OF NEVADA

STANDARD PLANS

FOR

ROAD AND BRIDGE

CONSTRUCTION



JANUARY 1999

NEVADA DEPARTMENT OF TRANSPORTATION

DEPARTMENT OF TRANSPORTATION

STATE OF NEVADA

STANDARD PLANS

FOR

ROAD AND BRIDGE

CONSTRUCTION

NEVADA

DEPARTMENT OF TRANSPORTATION

DIRECTOR
TOM STEPHENS, P.E.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
1263 SOUTH STEWART STREET
CARSON CITY, NEVADA 89712

FOREWORD TO 1999 ENGLISH STANDARD PLANS

These Standard Plans were revised to be nearly identical to the Metric Standard Plans. All significant changes are shown in red. Revisions to this edition will be noted and posted in a accessible location until the next edition of the Standard Plans are available. Standard Plans will be revised every other year.

There are several new sheets/drawings in this Standard Plans, several sheets were eliminated and several sheets split into two sheets for clarity. In Section R-5.*.* (Sidewalks, Driveways, Curb Ramps), R-8.*.* (Guardrails and Barrier Rails, T-30.*.* (Lighting and Signals), and T-31.*.* (Roadside Signs), the drawing numbers were changed or rearranged to allow for increased clarity and new products. This is part of an on going process to update the Standard Plans. We have updated the Standard Plans to meet NCHRP 350 products approved by NDOT.

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

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

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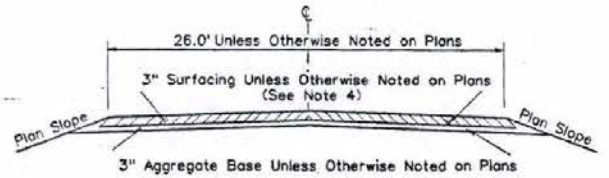
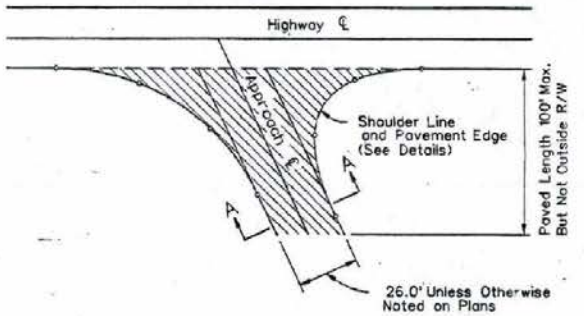
ENGLISH VERSION

1999 BRIDGE INDEX
ENGLISH VERSION

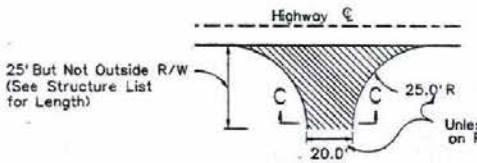


SECTION A-A

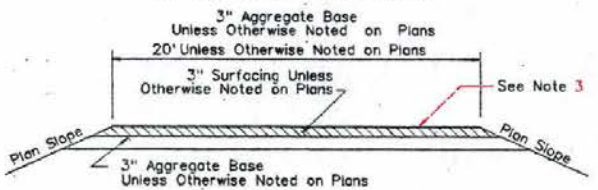


PLAN

TYPE 1 APPROACH (3-CENTERED CURVE)



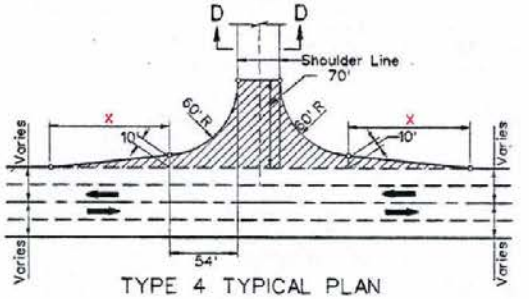
TYPE 2 & 3 APPROACHES



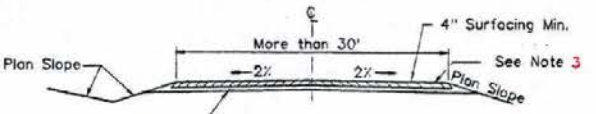
SECTION C-C

APPROACH TYPES

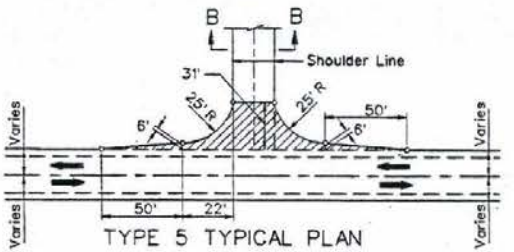
Type 2A - Place Base and Surface as Shown
Type 2B - Place 6" Aggregate Base Course Only
Type 3 - Grade Approach Area Only



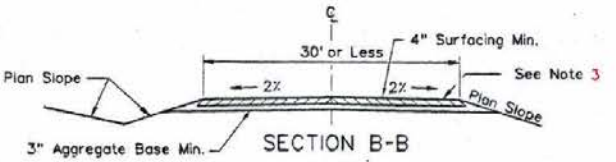
TYPE 4 TYPICAL PLAN



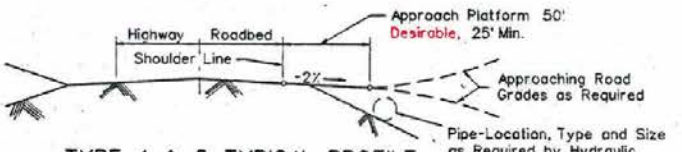
SECTION D-D



TYPE 5 TYPICAL PLAN



SECTION B-B

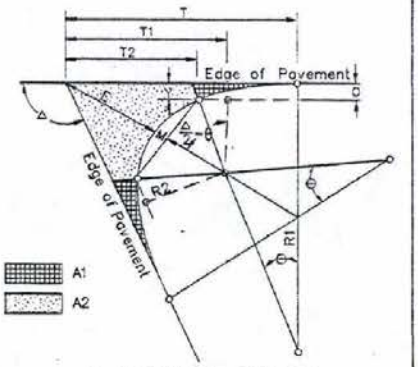


TYPE 4 & 5 TYPICAL PROFILE

Right Angle Road Connection

TYPE 4 AND 5 APPROACHES

X	Design Speed V_D
100'	< 45 mph
150'	≥ 45 mph



3 CENTERED CURVE

Given: Δ, R_1 and R_2
To Find: T, T_1, T_2, E, M, θ, y
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 = $A_1 - A_2$
and
$A_1 = R_1^2 \tan\theta \frac{\pi R_1^2 \theta}{180}$

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

GENERAL NOTES:

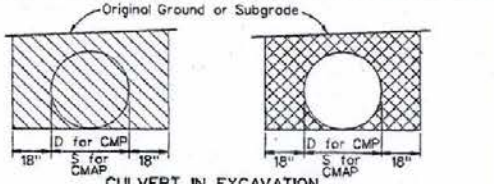
1. See the current edition of the AASHTO "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS" for further information on at-grade intersections and design vehicles.
2. Details for the special approaches will be shown on the plans when they are required.
3. Paved approaches shall have a seal coat unless otherwise noted.
4. Approaches to be paved to the throat or right-of-way, whichever occurs first, unless otherwise noted on the plans.
5. Approaches may require the standard stop signs and stop bars as directed by the engineer.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

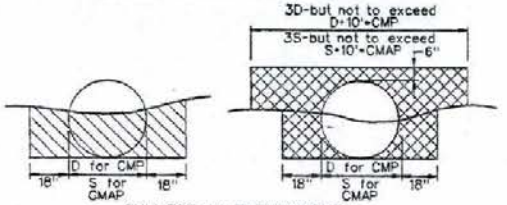
TYPE 1, 2, 3, 4 AND 5
APPROACH ROADS

CHIEF ROAD DESIGN ENGR. | R-02.1 | (000) | ADOPTED: 7/96 | REVISION 10/98

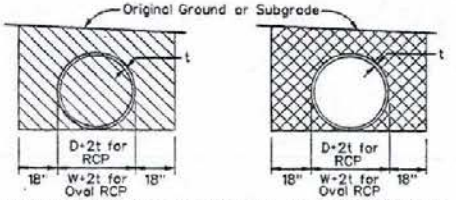
R-1



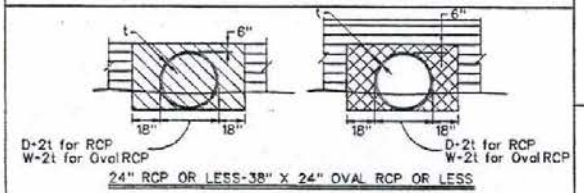
CULVERT IN EXCAVATION
Excavation Depth is Less than 4 Feet



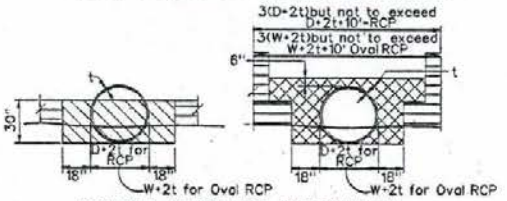
CULVERT. IN EMBANKMENT
CMP OR CMAP CULVERTS



CONCRETE PIPE CULVERT IN EXCAVATION
All RCP and Oval RCP sizes
Excavation Depth is Less than 4 feet

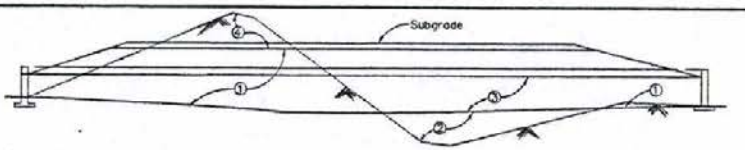


24" RCP OR LESS-38" X 24" OVAL RCP OR LESS



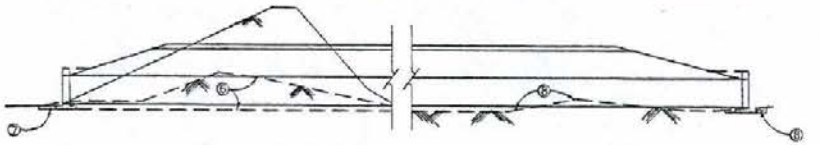
RCP OVER 24"-OVAL RCP OVER 38" X 24"

CONCRETE PIPE CULVERT IN EMBANKMENT
(METHOD A)



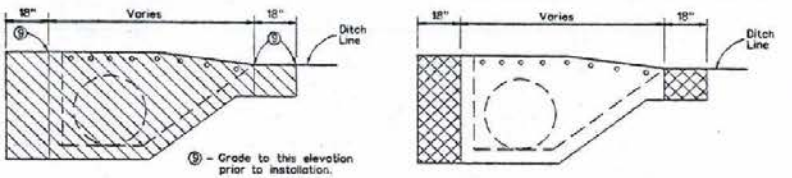
①-Structure Excavation and Backfill in excavation to be paid below subgrade and within designated limits.
②-Embankment to be constructed to flowline prior to installation.
③-Backfill in embankment to be paid from flowline to the designated maximum limits.
④-Roadway Excavation to be paid to subgrade.

CULVERT INSTALLATION IN ROUGH TERRAIN



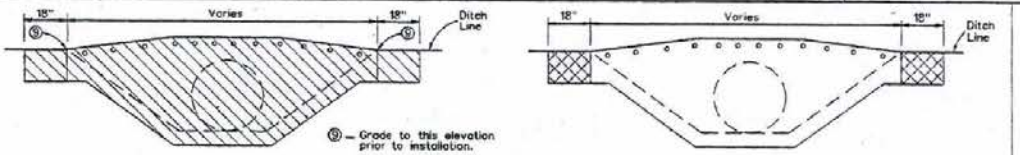
⑥-CMP or RCP - When the pipe is laid in a trench in rock, hard clay, shale or other hard material, the unsuitable material shall be removed to a depth of not less than 6" for RCP & 12" for CMP below the bottom of the pipe grade and the trench backfilled with a suitable material. In no place shall the 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 1'-6").

CULVERT INSTALLATION WITH UNSUITABLE FOUNDATIONS



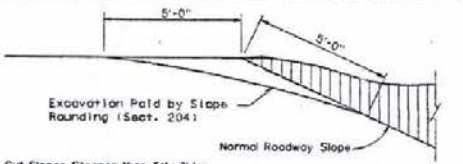
⑨ - Grade to this elevation prior to installation.

TYPE 7 DROP INLET



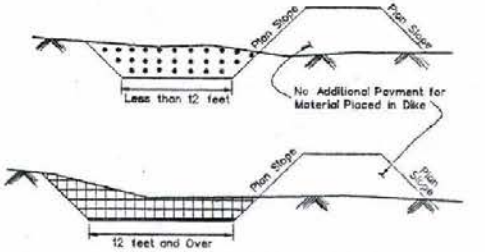
⑨ - Grade to this elevation prior to installation.

TYPE 8 DROP INLET



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

ROUNDED OR TRANSITION SLOPES



FLAT BOTTOM DITCH EXCAVATION

GENERAL NOTES:

1. Excavation for Multiple Pipe installations 12' and over in Width Will Be Paid as Channel or Roadway Excavation.

LEGEND

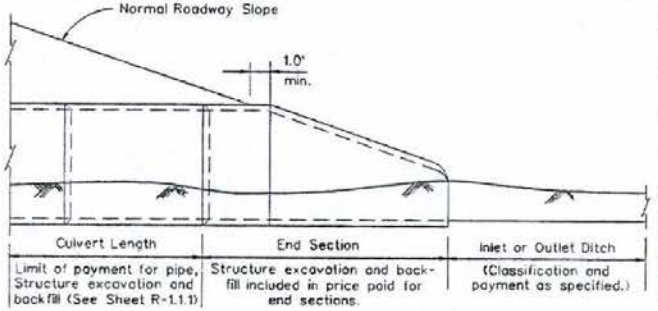
STRUCTURE EXCAVATION
ROADWAY EXCAVATION
DRAINAGE EXCAVATION
GRANULAR BACKFILL
CHANNEL EXCAVATION
ROADWAY EMBANKMENT

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

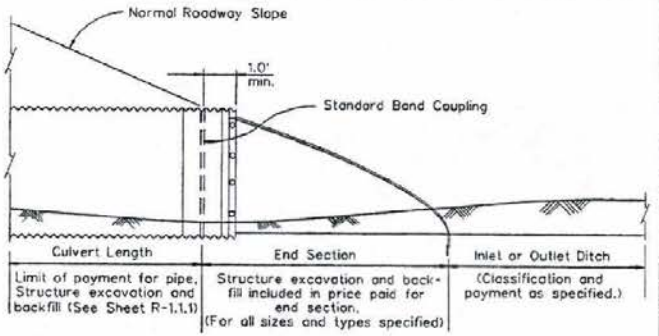
STRUCTURE EXCAVATION & BACKFILL
(METHOD OF MEASUREMENT)

CHIEF ROAD DESIGN ENGR. | R-1.1. | (206,207) | ADOPTED: 8/69 | REVISION 10-98

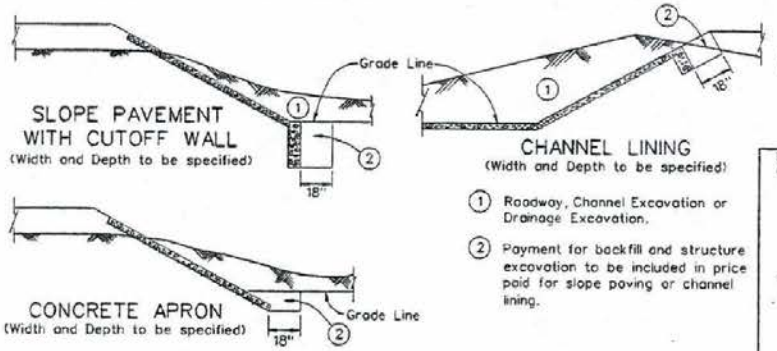
R-2



PRECAST CONCRETE END SECTIONS



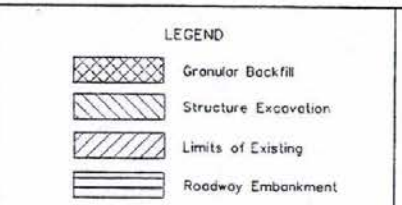
PREFABRICATED METAL END SECTION
(Type 3 Connection)

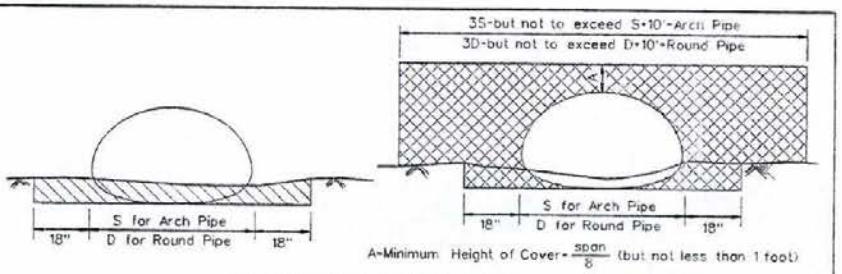


① Roadway, Channel Excavation or Drainage Excavation.

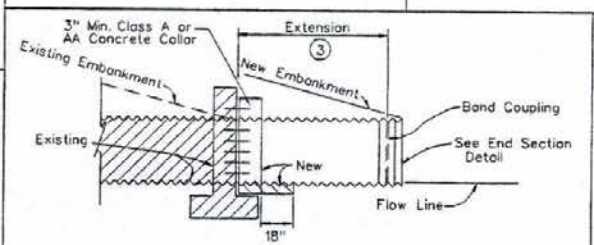
② Payment for backfill and structure excavation to be included in price paid for slope paving or channel lining.

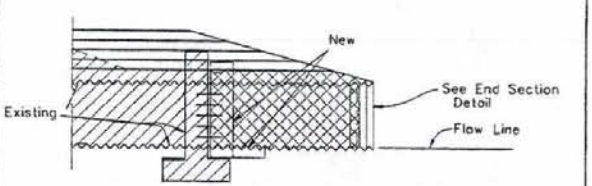
CHANNEL LINING AND SLOPE PAVEMENT





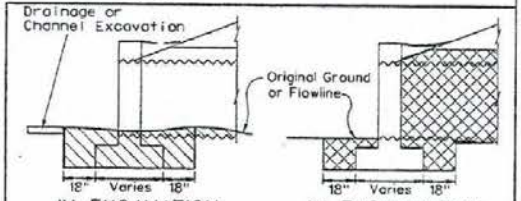
STRUCTURAL PLATE PIPE



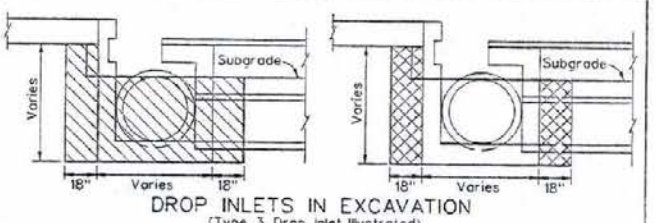


CULVERT EXTENSION OF EXISTING HEADWALL
(See Sheet R-2.1.1 For Pipe Culvert Extension)

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 1.0' When Cover At Shoulder Is 1.0' to 10.0'. Add An Additional 0.5' For Each Succeeding 5.0' Or Portion Thereof.

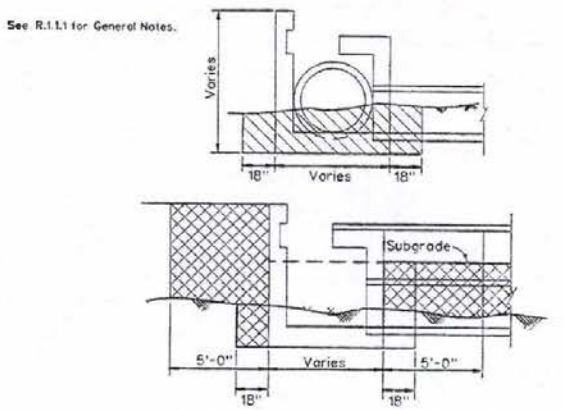


CULVERT HEADWALLS



DROP INLETS IN EXCAVATION
(Type 3 Drop Inlet Illustrated)

See R.1.1.1 for General Notes.



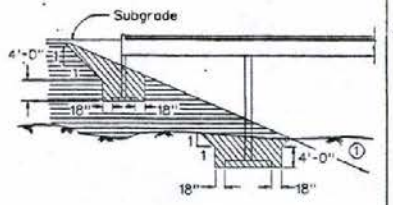
DROP INLETS IN EMBANKMENT
(Type 3 Drop Inlet Illustrated)

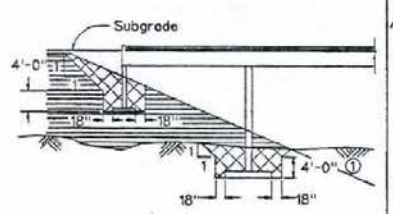
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STRUCTURE EXCAVATION AND BACKFILL
(METHOD OF MEASUREMENT)

CHIEF ROAD DESIGN ENGR.

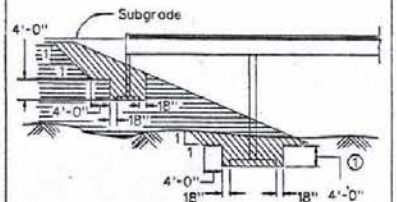
R-1.1.2	(206.207)
ADOPTED: 8/69	REVISION 8/97

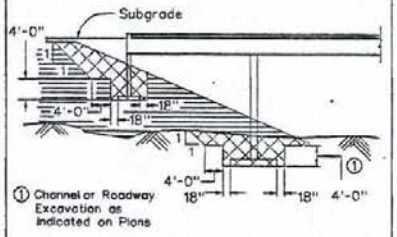




OPEN ABUTMENT BRIDGES
WITH SPREAD FOOTING

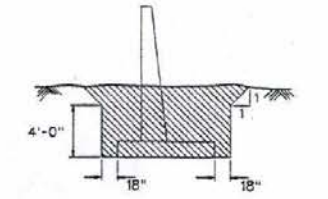
FOOTING WIDTH IS 6 FEET OR LESS

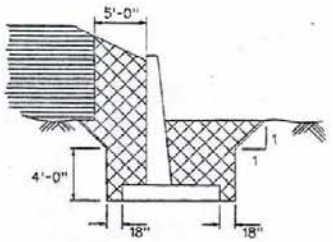




OPEN ABUTMENT BRIDGES
WITH SPREAD FOOTING

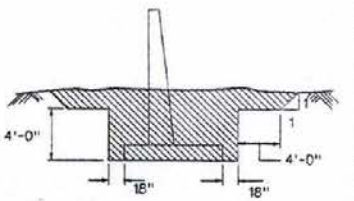
FOOTING WIDTH IS GREATER THAN 6 FEET

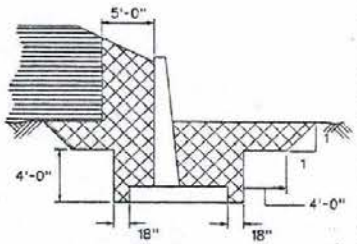




RETAINING WALLS

FOOTING WIDTH IS 6 FEET OR LESS



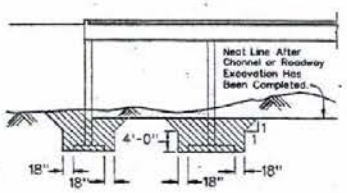


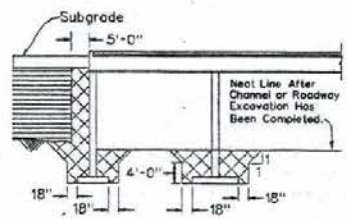
RETAINING WALLS

FOOTING WIDTH IS GREATER THAN 6 FEET

GENERAL NOTES:

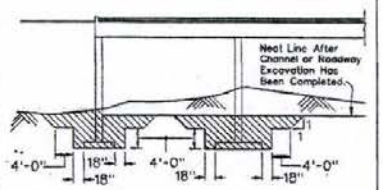
1. Trenches more than 4 feet deep shall be shored, laid back to at least the angle of repose for existing field conditions, or some other means of protection shall be provided.
2. If hazardous field conditions indicate ground movement may be expected, trenches less than 4 feet deep shall also be protected 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 29 CFR Part 1926, Subpart P, Appendix C.
6. The quantity of structure excavation and backfill measured for payment shall be the number of cubic yards 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.

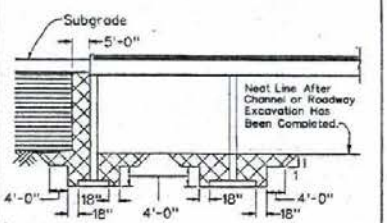




CLOSED ABUTMENT BRIDGES

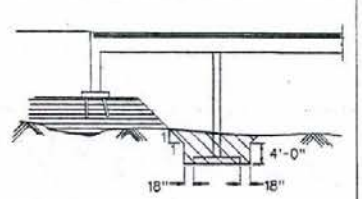
FOOTING WIDTH IS 6 FEET OR LESS

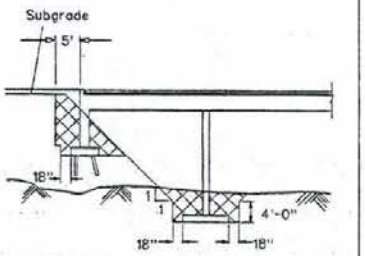




CLOSED ABUTMENT BRIDGES

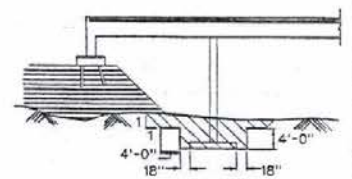
FOOTING WIDTH IS GREATER THAN 6 FEET

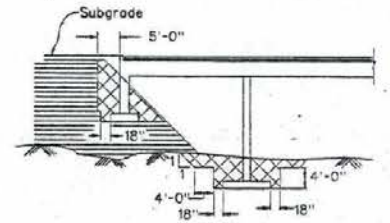




OPEN ABUTMENT BRIDGES
ON PILES

FOOTING WIDTH IS 6 FEET OR LESS





OPEN ABUTMENT BRIDGES
ON PILES

FOOTING WIDTH IS GREATER THAN 6 FEET

Structure Excavation

Granular Backfill

Roadway Embankment

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STRUCTURE EXCAVATION AND BACKFILL
(METHOD OF MEASUREMENT)

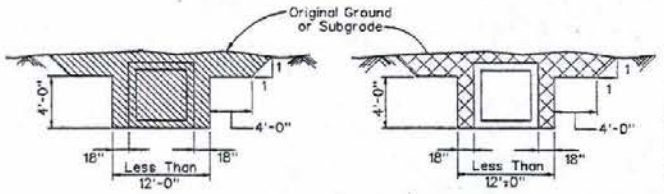
CHIEF ROAD DESIGN ENGR.

R-1.1.1 (206,207)

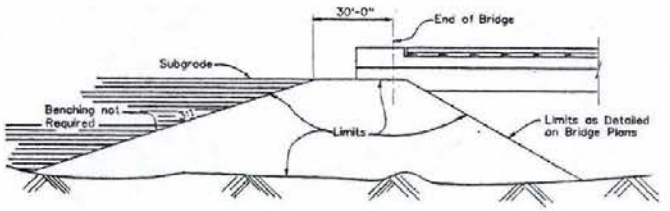
ADOPTED: 11/73

REVISION 10/98

R-4



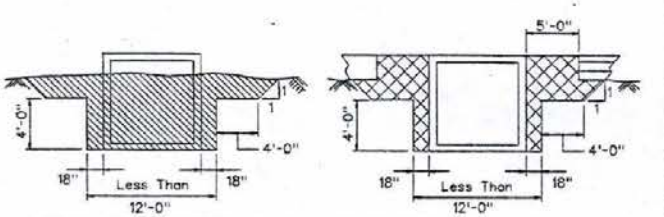
CULVERT IN EXCAVATION



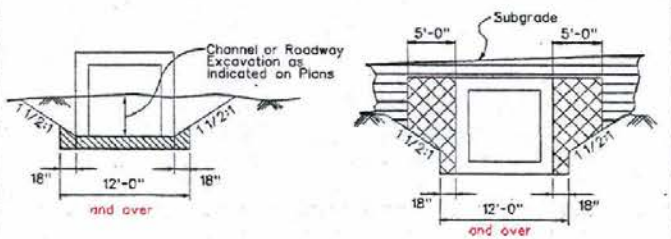
LIMITS OF SELECTED BORROW AT BRIDGE ABUTMENTS

GENERAL NOTES:

1. Trenches more than 4 feet 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 4 feet 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 29 CFR Part 1926, Subpart P, Appendix C.
6. The quantity of structure excavation and backfill measured for payment shall be the number of cubic yards 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

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STRUCTURE EXCAVATION AND BACKFILL

(METHOD OF MEASUREMENT)

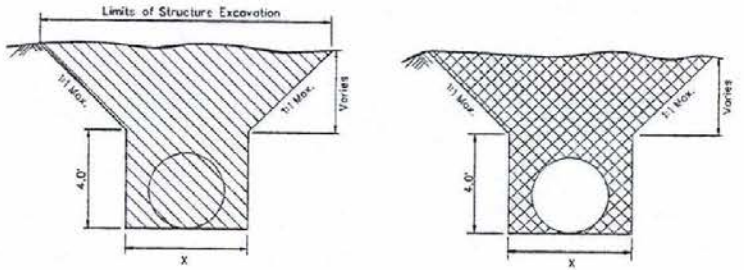
CHIEF ROAD DESIGN ENGR.

R-1.1.4 (206.207)

ADOPTED: 11/73

REVISION: 8/97

R-5

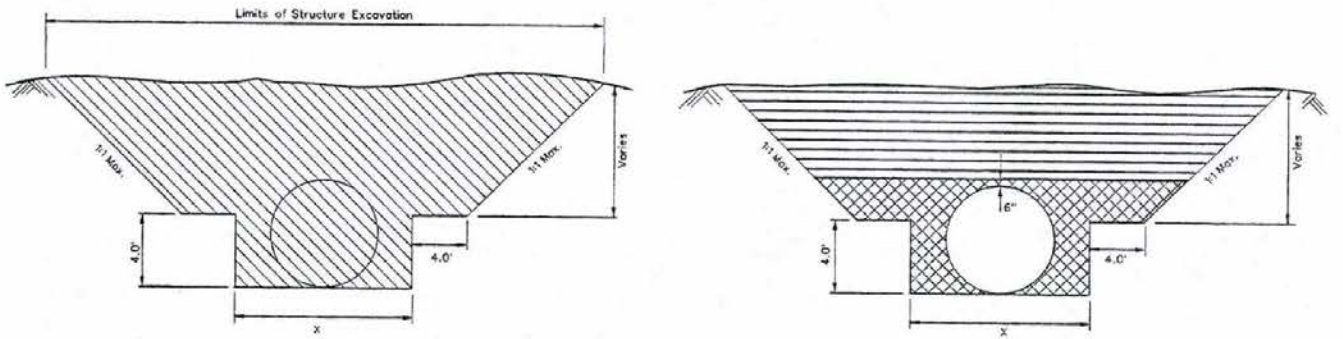


X= D+3.0' FOR C.M.P.
X= S+3.0' FOR C.M.A.P.
X= D+2t +3.0' FOR R.C.P.
X= W+2t +3.0' FOR OVAL R.C.P.

DIAMETER IS 6 FEET OR LESS

GENERAL NOTES:

1. Trenches more than 4 feet 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 4 feet 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 29 CFR Part 1926, Subpart P, Appendix C.
6. The quantity of structure excavation and backfill measured for payment shall be the number of cubic yards calculated minus any duplication of limits which overlap.
7. Granular backfill to be placed for a depth of 6" 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+3.0' FOR C.M.P.
X= S+3.0' FOR C.M.A.P.
X= D+2t +3.0' FOR R.C.P.
X= W+2t +3.0' FOR OVAL R.C.P.

DIAMETER IS GREATER THAN 6 FEET

LEGEND

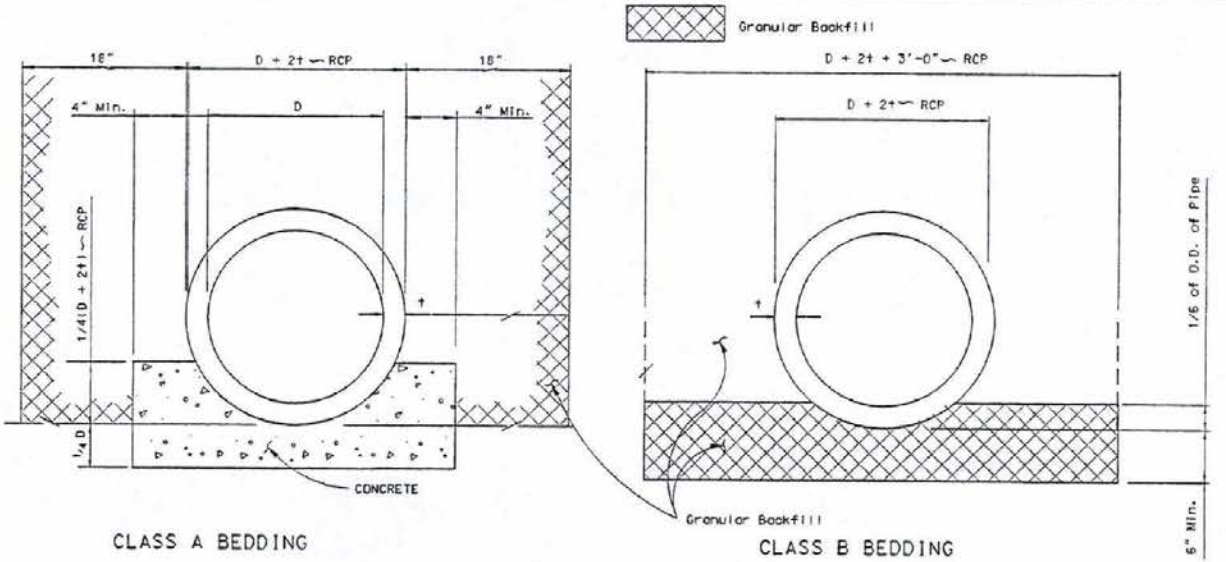
- Structure Excavation
- Granular Backfill
- Roadway Embankment

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STRUCTURE EXCAVATION AND BACKFILL
(METHOD OF MEASUREMENT)

CHIEF ROAD DESIGN ENGR.	R-1.1.5	(206,207)
	ADOPTED: 10/72	REVISION 10/98

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 YARD OF CONCRETE.

CLASS B BEDDING

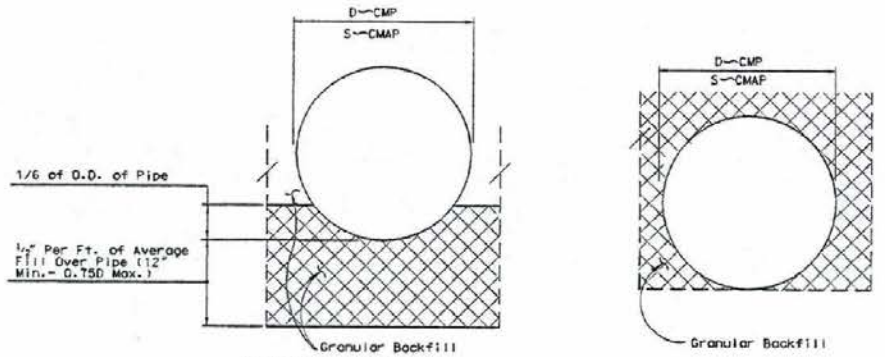
BEDDING SHALL BE CAREFULLY SHAPED TO FIT PIPE PRIOR TO INSTALLATION. NO DIRECT PAYMENT FOR SHAPING THE TRENCH.

CLASS C BEDDING

BEDDING FOR CONCRETE CULVERT

GENERAL NOTES:

1. MINIMUM DEPTHS AS SPECIFIED IN "CULVERT INSTALLATION WITH UNSUITABLE FOUNDATIONS" ON SHEET R-1.1.1. NOTES NO. 6 & 8 WILL PREVAIL WHEN THESE CONDITIONS ARE ENCOUNTERED.
2. CONCRETE SHALL BE CLASS A OR AA.



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 FOR REINFORCED CONCRETE PIPE 24" TO 84"

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												
24"	--	--	--	22	14	11	30	18	15	46	29	23
30"	--	--	--	22	14	11	32	20	16	47	30	23
36"	--	--	--	22	14	11	32	20	16	47	31	24
42"	--	--	--	22	14	11	32	21	16	47	31	24
48"	17	11	09	22	14	11	32	21	16	48	31	24
54"	17	11	10	22	14	12	32	21	17	49	31	24
60"	17	11	10	22	14	12	33	21	17	49	31	25
66"	17	12	11	22	14	13	33	22	17	49	31	25
72"	17	12	11	22	15	13	33	22	17	49	32	25
84"	17	12	11	22	15	14	33	22	17	50	32	25

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: 8/69 | REVISION 10/98

2 2/3"x1/2" ROUND CORRUGATED ALUMINUM PIPE

PIPE DIAMETER	MINIMUM COVER	PLATE THICKNESS				
		IN	.060	.075	.105	.135	.164
		GA	16	14	12	10	8
INCHES	INCHES	MAX FILL HEIGHTS ABOVE TOP OF PIPE IN FEET					
18	12		30	30	52		
24	12		22	22	39	41	
30	12			18	31	32	
36	12			15	26	27	
42	12				45	43	
48	18				40	41	43
54	18				35	37	38
60	18					33	34
66	24						31
72	24						28

* CORRUGATED ALUMINUM ALLOY PIPE ARCH
2 2/3" x 1/2" CORRUGATIONS

PIPE DIMENSIONS SPAN-RISE	** MIN. COVER	CORNER RADIUS	MIN. THICKNESS	MAX. COVER FOR CORNER PRESSURES 2 TONS PER SQ. FT.
INCHES	INCHES	INCHES	INCHES	FEET
18x11	18	4	0.060	15
22x13	18	4	0.060	14
25x16	18	4	0.060	12
29x18	18	4 1/2	0.060	10
36x22	18	5	0.060	9
43x27	18	5 1/2	0.075	9
50x31	18	6	0.105	8
58x36	18	7	0.135	8
65x40	18	8	0.135	8
72x44	18	9	0.164	8

* RIVETED OR HELICAL FABRICATION
** TOP OF PIPE TO TOP OF FINISHED GRADE AT SHOULDER LINE FOR 2 TONS PER SQ. FT.

EQUIVALENT GAGE NUMBERS			
GAGE NUMBER	THICKNESS IN INCHES		
	STEEL		
	ZN. COAT	UNCOATED	AL.
16	0.064	0.0598	0.060
14	0.079	0.0747	0.075
12	0.109	0.1046	0.105
10	0.138	0.1345	0.135
8	0.168	0.1644	0.164
7	0.188	0.1838	
5	0.218	0.2145	
3	0.249	0.2451	
1	0.280	0.2758	

3"x 1" ROUND CORRUGATED ALUMINUM PIPE

PIPE DIAMETER	MINIMUM COVER	PLATE THICKNESS				
		IN	.060	.075	.105	.135	.164
		GA	16	14	12	10	8
INCHES	INCHES	MAX FILL HEIGHTS ABOVE TOP OF PIPE IN FEET					
30	12		33	41	56	70	
36	12		28	34	47	58	
42	18		24	24	40	52	
48	18		21	27	35	48	50
54	18		18	23	31	46	47
60	24		17	21	28	39	45
66	24			19	25	38	44
72	24			17	23	35	44
78	24				22	32	42
84	24				20	30	39
90	24				19	28	36
96	24				18	26	34
102	30					25	32
108	30					23	30
114	30						28
120	30						27

MAXIMUM HEIGHT COVER FOR STRUCTURAL ALUMINUM PLATE PIPE (FEET)
9" x 2 1/2"Corrugation

Diam. Inches	Min. Cover	Min. Ga.	Metal Thickness ---(Inches)								
			.100	.125	.150	.175	.200	.225	.250	.275	.300
60	1.0'	.100	26	35	44	53	60	66	72	79	86
66	1.0'	.100	24	32	40	48	55	60	66	72	79
72	1.0'	.100	22	29	37	44	50	63	64	67	69
78	1.0'	.100	20	27	34	41	46	51	55	61	67
84	1.5'	.100	19	25	32	38	43	47	51	57	59
90	1.5'	.100	18	23	30	35	40	44	48	53	58
96	1.5'	.100	17	22	28	33	38	41	45	50	53
102	2.0'	.100	16	21	26	31	35	39	42	47	51
108	2.0'	.100	15	19	25	29	33	37	40	44	48
114	2.0'	.100	14	18	23	28	32	35	38	42	46
120	2.0'	.100	13	17	22	26	30	33	36	40	43
126	2.0'	.100	13	17	21	25	29	31	34	38	41
132	2.0'	.100	12	16	20	24	27	30	33	36	39
138	2.0'	.100	11	15	19	23	26	29	31	34	38
144	2.0'	.125		14	18	22	25	28	30	33	36
150	2.0'	.125		14	18	21	24	26	29	32	35
156	2.0'	.150			17	20	23	25	28	30	33
162	2.0'	.150			16	20	22	25	27	29	32
168	2.0'	.150			16	19	21	24	26	28	31
174	2.0'	.175				18	21	23	25	27	30
180	3.0'	.175				18	20	22	24	26	29

6"x 1" ROUND CORRUGATED ALUMINUM PIPE

PIPE DIAMETER	MINIMUM COVER	PLATE THICKNESS				
		IN.	.060	.075	.105	.135	.164
		GA.	16	14	12	10	8
INCHES	INCHES	MAX. FILL HEIGHTS ABOVE TOP OF PIPE IN FEET					
48	18		21	28	37	44	52
54	18		19	25	33	39	46
60	18			19	30	35	42
66	24			20	27	32	38
72	24				25	29	35
78	24				23	27	32
84	24					25	30
90	24					23	28
96	24						26
102	24						24

MAXIMUM HEIGHT OF COVER FOR ALUMINUM STRUCTURAL PLATE PIPE ARCH 31.8" CORNER RADIUS
Height Of Cover (Feet)

Span Ft.	Min. Cover	1.5	2.0	2.5	3.0	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
6-0	1.5'	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.125	.125	.125	.150	.150	.150	.150	.150	.175	.200	.225	.250	.275	.275	.300
7-0	1.5'	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.125	.125	.125	.150	.150	.150	.175	.175	.200	.225	.250	.250	.300	.300	.300
8-0	2.0'		.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.125	.125	.125	.150	.150	.150	.175	.175	.200	.225	.250	.275	.275			
9-0	2.0'		.125	.100	.100	.100	.100	.100	.100	.100	.100	.100	.125	.125	.150	.150	.150	.175	.175	.200	.225	.250						
10-0	2.0'		.125	.100	.100	.100	.100	.100	.100	.100	.100	.125	.125	.125	.150	.150	.150	.175	.175	.200	.225	.250						
11-0	2.0'		.150	.125	.100	.100	.100	.100	.100	.100	.100	.125	.125	.150	.150	.150	.175	.175	.200	.225	.250	.275						
12-0	2.0'		.175	.150	.125	.100	.100	.100	.100	.100	.100	.125	.125	.150	.150	.175	.175	.200	.225	.250								
13-0	2.0'		.175	.150	.125	.125	.125	.125	.125	.125	.125	.150	.150	.175	.200	.200	.225	.250										
14-0	2.0'		.175	.150	.125	.125	.125	.125	.125	.125	.150	.175	.175	.200	.225	.225	.250											
15-0	2.0'		.175	.150	.150	.150	.150	.150	.150	.150	.150	.175	.200	.225	.250	.250												
16-0	3.0'				.175	.175	.175	.175	.175	.175	.175	.200	.225	.250														
17-0	3.0'				.175	.175	.175	.175	.175	.175	.200	.225	.250															
18-0	3.0'				.200	.200	.200	.200	.200	.200	.225	.250																
19-0	3.0'				.250	.250	.250	.250	.250	.250	.250	.275																
20-0	3.0'				.275	.275	.275	.275	.275	.275	.275	.300																

NOTE: TO DETERMINE PROPER METAL THICKNESS SELECT THE SPAN IN LEFT HAND COLUMN THAT IS NEXT LARGER TO SIZE STRUCTURE REQUIRED. EXAMPLE--IF YOU NEED A 10'-8" SPAN x 7'-5" RISE STRUCTURE, USE THE LINE FOR SPAN 11'-0".

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

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ALLOWABLE FILL HEIGHTS FOR ALUMINUM CULVERTS

CHIEF ROAD DESIGN ENGR.

R-1.3.1 (601.605)
ADOPTED:12/19/78 REVISION 1/98

* ROUND CORRUGATED STEEL PIPE
2 2/3"x1/2" CORRUGATIONS

PIPE DIAMETER	** MIN. COVER	PLATE THICKNESS IN INCHES									
		0.064		0.079		0.109		0.138		0.168	
		R	E	R	E	R	E	R	E	R	E
INCHES	INCHES	MAX. FILL HTS. ABOVE TOP OF PIPE IN FEET									
12	12	63		83							
15	12	50		66							
18	12	42		55		84					
24	12	32		42		61		75			
30	12	25		33		49		60		74	
36	12	21		28		41		50		62	
42	12	41		44		46	72	48	76	50	80
48	12		35		38	45	63	46	67	47	70
54	12				34	43	56	44	59	45	63
60	12					42	50	43	53	44	56
66	12					41	46	42	49	43	51
72	12							41	45	42	47
78	12								43	36	44
84	12								40	31	42

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

* ROUND CORRUGATED STEEL PIPE
5" x 1" & 3" x 1" CORRUGATIONS
FILL HEIGHTS FOR 5"x1" CORRUGATION ARE 87% OF THOSE SHOWN.

PIPE DIAMETER	** MIN. COVER	PLATE THICKNESS IN INCHES									
		0.064		0.079		0.109		0.138		0.168	
		R	E	R	E	R	E	R	E	R	E
INCHES	INCHES	MAX. FILL HTS. ABOVE TOP OF PIPE IN FEET									
54	12	27	29	36	38	56	59	57	64	65	71
60	12	25	26	32	34	50	53	51	56	58	64
66	12	22	23	29	31	45	48	46	52	53	58
72	12	21	22	28	29	42	44	43	48	49	53
78	12	19	20	25	26	38	41	42	44	44	49
84	18			23	25	36	38	40	42	42	46
90	18			21	23	33	35	38	40	41	43
96	18					30	33	37	38	40	42
102	24					26	28	34	35	38	41
108	24					22	24	32	34	35	37
114	24					21	23	31	32	34	36
120	24					20	22	30	32	32	33
126	24							26	27	31	33
132	24							25	26	30	31
138	24							23	24	28	29
144	24									25	26

* CORRUGATED STEEL PIPE ARCH
2 2/3"x1/2" CORRUGATIONS

PIPE DIMENSIONS SPAN-RISE	** MIN. COVER	EQUIV. DIA.	MIN. THICKNESS	MAX. COVER IN FEET CORNER PRESSURE'S FOR IN TONS PER SQ.FT.	
INCHES	INCHES	INCHES	INCHES	2 TONS	*** 3 TONS
17 x 13	12	15	0.064	13	19
21 x 15	12	18	0.064	12	18
24 x 18	12	21	0.064	10	16
28 x 20	12	24	0.064	10	15
35 x 24	12	30	0.064	9	14
42 x 29	12	36	0.064	9	12
49 x 33	12	42	0.079	8	12
57 x 38	12	48	0.109	8	12
64 x 43	12	54	0.109	8	12
71 x 47	12	60	0.138	8	12
77 x 52	12	66	0.168	8	12
83 x 57	12	72	0.168	9	13

* CORRUGATED STEEL PIPE ARCH
5" x 1" & 3" x 1" CORRUGATIONS

PIPE DIMENSIONS SPAN-RISE	** MIN. COVER	EQUIV. DIA.	MIN. THICKNESS	MAX. COVER IN FEET CORNER PRESSURE'S FOR IN TONS PER SQ.FT.	
INCHES	INCHES	INCHES	INCHES	2 TONS	*** 3 TONS
60 x 46	12	54	0.064	12	18
66 x 51	12	60	0.064	12	18
73 x 55	12	66	0.064	12	18
81 x 59	12	72	0.064	12	18
87 x 63	12	78	0.064	16	22
95 x 67	18	84	0.079	15	21
103 x 71	18	90	0.079	14	20
112 x 75	18	96	0.109	13	18
117 x 79	24	102	0.109	12	17
128 x 83	24	108	0.109	11	16
137 x 87	24	114	0.109	10	15
142 x 91	24	120	0.138	9	14

MAXIMUM HEIGHT OF COVER
FOR STRUCTURAL STEEL PLATE PIPE (5% ELONGATION)
6" x 2" CORRUGATIONS

DIAMETER IN INCHES	MIN. COVER INCHES	ALLOWABLE FILL HEIGHTS IN FEET						
		12 GAGE 0.109	10 GAGE 0.138	8 GAGE 0.168	7 GAGE 0.188	5 GAGE 0.218	3 GAGE 0.249	1 GAGE 0.280
60	12	42	62	80	93			
66	12	39	57	73	85			
72	12	35	52	67	78	94		
78	12	33	48	62	72	87		
84	18	30	45	57	67	80	95	
90	18	28	42	54	62	75	88	96
96	18	27	39	50	58	70	83	90
102	24	25	37	47	55	66	78	85
108	24	24	35	45	51	63	74	80
114	24	22	33	42	49	59	70	76
120	24	21	31	40	47	56	66	72
126	24	20	30	38	45	54	63	69
132	24	19	28	37	43	51	60	66
138	24	18	27	35	41	49	58	63
144	24	18	26	34	39	47	55	60
150	24	17	25	32	38	45	53	58
156	24	16	24	31	36	44	51	56
162	24	16	23	30	35	42	49	54
168	24	15	22	29	34	40	47	52
174	24	15	22	28	32	39	46	50
180	36	14	21	27	31	38	44	48
186	36	14	20	26	30	36	43	47
192	36		20	25	29	35	42	45
198	36		19	25	29	34	40	44

MAXIMUM HEIGHT OF COVER
FOR STRUCTURAL STEEL PLATE PIPE ARCH WITH 31" CORNER RADIIS
6" x 2" CORRUGATIONS

SPAN	RISE	MIN. COVER INCHES	ALLOWABLE FILL HEIGHTS IN FEET							
			2 TONS/SQ.FT. BEARING PRESSURE				▲3 TONS/SQ. FT. BEARING PRESSURE			
			12 GAGE 0.109	10 GAGE 0.138	8 GAGE 0.168	7 GAGE 0.188	12 GAGE 0.109	10 GAGE 0.138	8 GAGE 0.168	7 GAGE 0.188
13'-3"	9'-4"	36	11				17			
14'-2"	9'-10"	36	11				17			
15'-4"	10'-4"	36		10				16		
16'-3"	10'-10"	36		9				16		
17'-2"	11'-4"	36		9				15		
18'-1"	11'-10"	36			8				14	
19'-3"	12'-4"	36			8				13	
19'-11"	12'-10"	36			7				13	
20'-7"	13'-2"	36			7					12

▲ MAY BE USED ONLY WHEN SUPPORTED BY FOUNDATION STUDY

MAXIMUM HEIGHT OF COVER
FOR STRUCTURAL STEEL PLATE PIPE ARCH WITH 18" CORNER RADII
6" x 2" CORRUGATIONS

SPAN	RISE	MIN. COVER INCHES	ALLOWABLE FILL HEIGHTS IN FEET							
			2 TONS/SQ.FT. BEARING PRESSURE				▲3 TONS/SQ. FT. BEARING PRESSURE			
			12 GAGE 0.109	10 GAGE 0.138	8 GAGE 0.168	7 GAGE 0.188	12 GAGE 0.109	10 GAGE 0.138	8 GAGE 0.168	7 GAGE 0.188
6'-1"	4'-7"	15								
7'-0"	5'-1"	13								
7'-11"	5'-7"	12								
8'-10"	6'-1"	10					16			
9'-9"	6'-7"	9					16			
10'-11"	7'-1"	8					15			
12'-10"	8'-4"	8					13			
14'-1"	8'-9"	7					11			
15'-4"	9'-3"						11			
16'-7"	10'-1"							10		
								8		

▲ MAY BE USED ONLY WHEN SUPPORTED BY FOUNDATION STUDY

GAGE NUMBER	EQUIVALENT GAGE NUMBERS THICKNESS IN INCHES STEEL		AL.
	ZN. COAT	UNCOATED	
16	0.064	0.0598	0.060
14	0.079	0.0747	0.075
12	0.109	0.1046	0.105
10	0.138	0.1345	0.135
8	0.168	0.1644	0.164
7	0.188	0.1838	
5	0.218	0.2145	
3	0.249	0.2451	
1	0.280	0.2756	

HELICAL RIB LOCK SEAM PIPE
ALLOWABLE FILL HEIGHTS (FEET) 3/4"x1" RIBS OF 11 1/2" PITCH

PIPE DIAMETER INCHES	16 GAGE	14 GAGE	12 GAGE
24	46	64	90
30	37	51	72
36	31	43	60
42	26	37	51
48	23	32	45
54	21	29	40
60	19	26	36
66		23	33
72		21	30
78			28
84			26
90			24

NOTE: BASED ON H-20 LOADING. MINIMUM FILL HEIGHTS IS ONE-QUARTER (1/4) OF THE DIAMETER FOR PIPE OVER FORTY-EIGHT (48) INCHES IN DIAMETER AND ONE (1) FOOT FOR ALL OTHER DIAMETERS.

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 2 TONS PER SQ. FT.
*** SHALL BE USED ONLY AFTER FOUNDATION INVESTIGATION
**** FOR FIELD STRUTTING C.M.P. DETAIL SEE STANDARD SHEET R-2.1.1

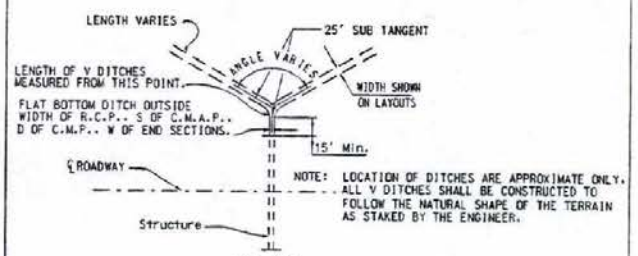
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ALLOWABLE FILL HEIGHTS FOR STEEL CULVERTS

CHIEF ROAD DESIGN ENGR.

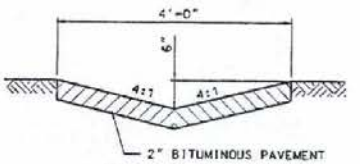
R-1.3.1.2 (600.604.6061)
ADOPTED: 7/73
REVISION 8/97

R-9



PLAN

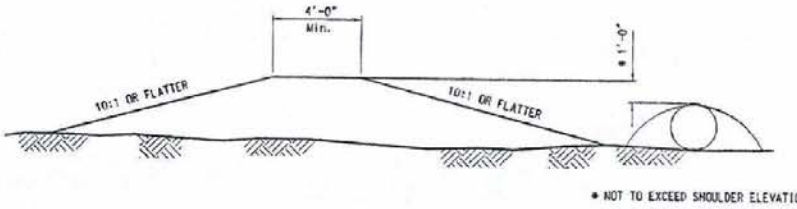
DRAINAGE DITCHES



SECTION

BITUMINOUS TURNOUT DITCH

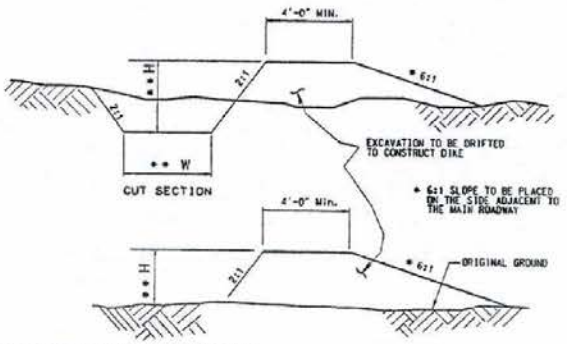
(PLANTMIX OR ROADMIX WITH SEAL COAT)



* NOT TO EXCEED SHOULDER ELEVATION.

DIKE DETAIL

INLET AND OUTLET DIKES WITHIN 30' OF ROADWAY SHOULDER, AND MEDIAN DIKES. LOCATION AS INDICATED ON THE PLANS.

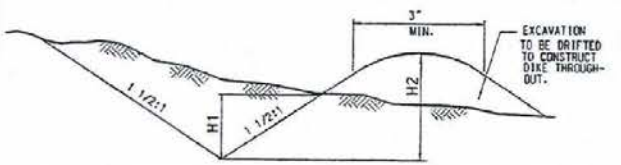


** - SEE HYDRAULIC ENGINEER FOR H. W. & NEED TO RIP RAP FACE OF DIKE.

** 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



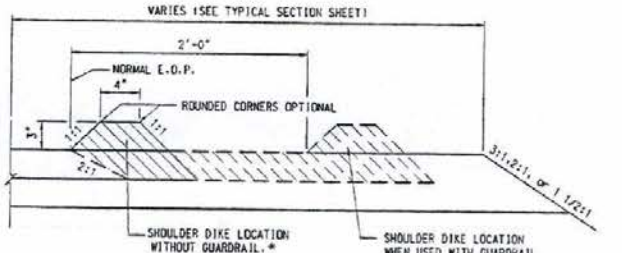
H1 = DEPTH AS ORDERED BY THE ENGINEER. (1'-6" MIN.)

H2 = HEIGHT AS ORDERED BY THE ENGINEER. (2'-6" MIN.)

SECTION

V TYPE DITCH

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

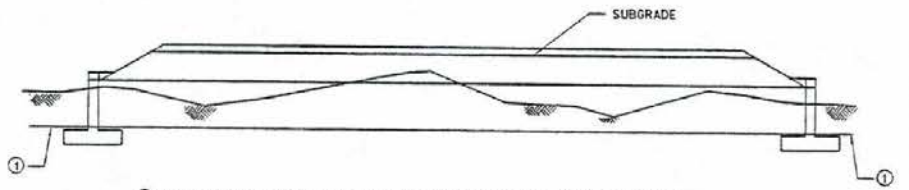


SECTION

BITUMINOUS SHOULDER DIKE

(PLANTMIX OR ROADMIX WITH SEAL COAT)

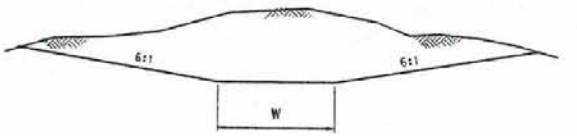
* SHALL NOT BE USED ALONE IN URBAN AREAS FOR DESIGN SPEED GREATER THAN 50 M.P.H. OR RURAL AREAS FOR DESIGN SPEED GREATER THAN 40 M.P.H.



① INLET AND OUTLET DITCHES TO BE ON SAME GRADE AS CULVERT FOR A DISTANCE OF 25' 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 RELATED TO EXCAVATION (DITCHES) OR EMBANKMENT (DIKES) SHALL BE DESIGNATED AS W (WIDTH) x H (HEIGHT OR DEPTH) x L (LENGTH).

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

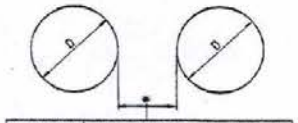
DRAINAGE DITCHES AND DIKES

CHIEF ROAD DESIGN ENGR.

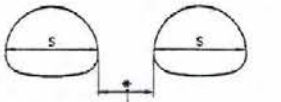
R-1.4.1 (203)

ADOPTED: 8/69 REVISION 1/98

R-10



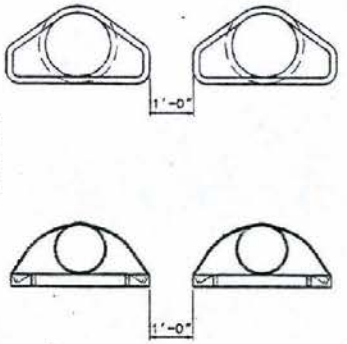
DIAMETER	MINIMUM SPACE BETWEEN PIPES
12" to 24"	1'-0"
30" to 66"	ONE HALF DIAMETER OF PIPE
72" to 84"	3'-0"



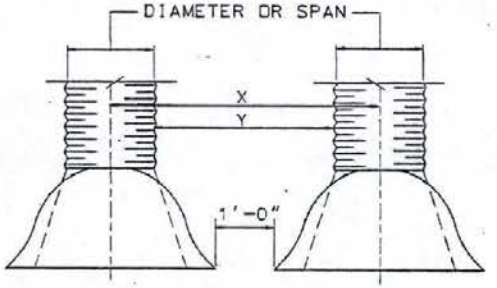
SPAN	MIN. SPACE BETWEEN PIPE ARCHES
17" to 35"	1'-0"
42" to 83"	One Third Span of Pipe Arch

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

MULTIPLE INSTALLATIONS
WITHOUT HEADWALLS



MULTIPLE INSTALLATIONS
WITH END SECTIONS

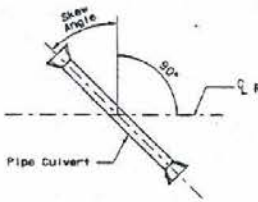


NOTE: WHEN Y DISTANCE EXCEEDS 5'-0", STRUCTURE EXCAVATION AND BACKFILL QUANTITIES SHALL BE CALCULATED FOR EACH CULVERT.

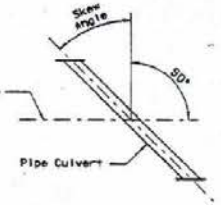
TABLE OF SEPARATION FOR MULTIPLE INSTALLATIONS

CMP			CMAP			RCP		
DIA.	X	Y	SPAN	X	Y	DIA.	X	Y
			21"x15"	5'-2"	3'-5"	18"	4'-4"	2'-6"
			24"x18"	5'-10"	3'-10"	24"	5'-5"	3'-0"
			28"x20"	6'-6"	4'-2"	30"	6'-6"	3'-6"
24"	6'-8"	4'-8"	35"x24"	7'-8"	4'-9"	36"	7'-7"	4'-0"
30"	8'-0"	5'-6"	42"x29"	9'-3"	5'-9"	42"	8'-2"	4'-0"
36"	9'-4"	6'-4"	49"x33"	10'-3"	6'-2"	48"	8'-9"	4'-0"
42"	10'-8"	7'-2"	57"x38"	11'-6"	6'-9"	54"	8'-7"	3'-4"
48"	11'-6"	7'-6"	64"x43"	12'-6"	7'-2"			
54"	12'-6"	8'-0"	71"x47"	13'-6"	7'-7"			
60"	13'-6"	8'-6"	77"x52"	14'-6"	8'-1"			
66"	14'-0"	8'-6"	83'x57"	15'-6"	8'-7"			
72"	14'-6"	8'-6"						
78"	15'-0"	8'-6"						
84'	15'-6"	8'-6"						

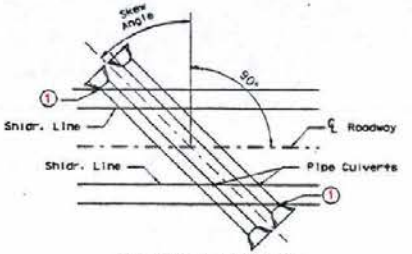
① INTERSECTING POINT OF FILLSLOPE AND TOP OF PIPE CONTROLS THE LENGTH OF PIPE TO BE INSTALLED.



SINGLE CULVERT
WITH END SECTIONS

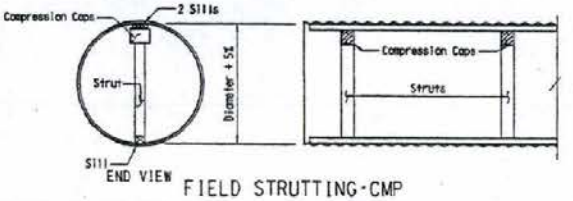


SINGLE CULVERT
WITH HEADWALLS



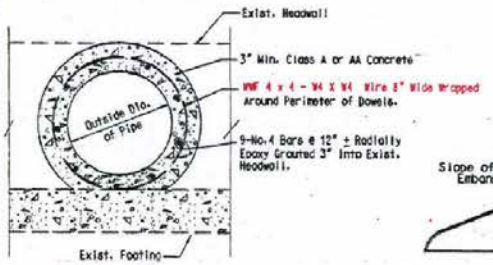
MULTIPLE CULVERT
WITH END SECTIONS

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

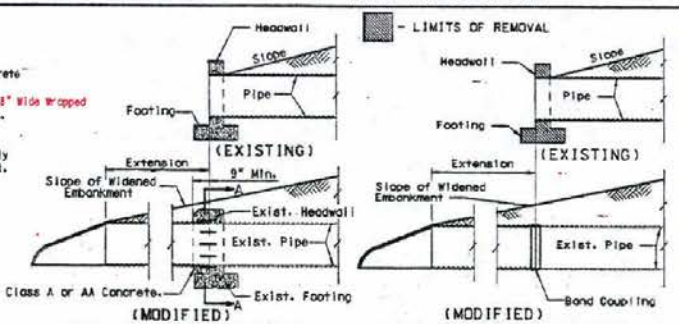


FIELD STRUTTING-CMP

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".

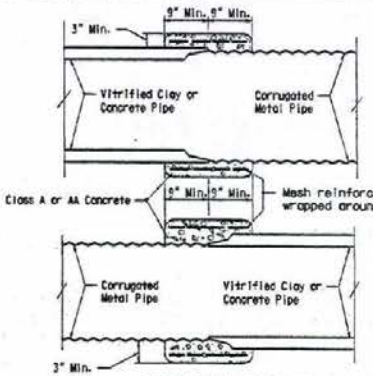


SECTION A-A



(MODIFIED)
PIPE CULVERT EXTENSION
TYPE 2
(FOR ADDITIONAL INFORMATION SEE R-1.1.2)

(MODIFIED)
PIPE CULVERT EXTENSION
TYPE 1



CONCRETE COLLAR
CMP TO RCP OR VITRIFIED CLAY PIPE EXTENSIONS

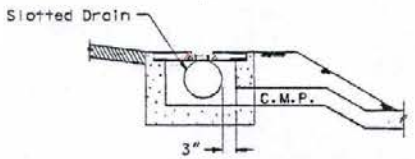
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT INSTALLATION

CHIEF ROAD DESIGN ENGR.

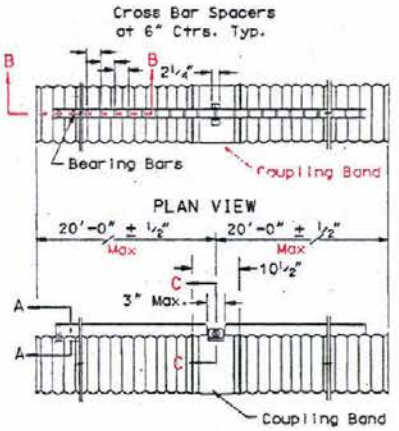
R-2.1.1 (601 THRU 606)
ADOPTED: 8/69
REVISION 1/98

R-11

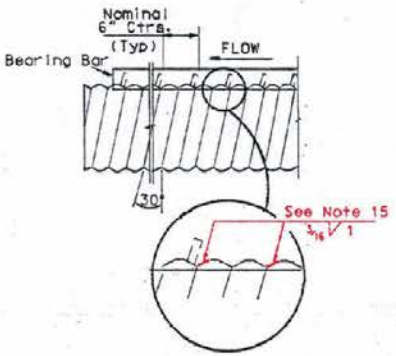


EMBANKMENT PROTECTOR & SLOTTED DRAIN

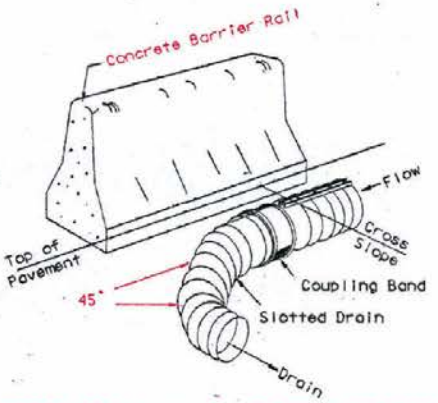
For Details Not Shown See R-3.1.2 and R-3.1.3.



ELEVATION VIEW

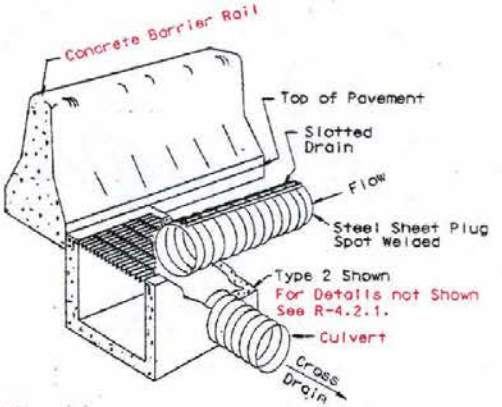


SECTION B-B

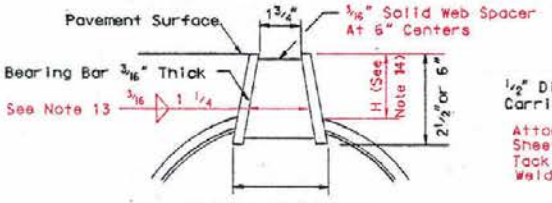


SLOTTED DRAIN & CONCRETE BARRIER RAIL

(CAN BE USED WITH SHOULDER DIKE)

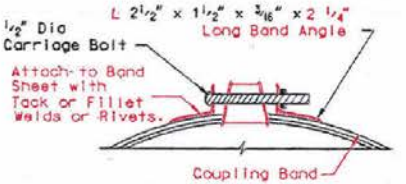


SLOTTED DRAIN, CONCRETE BARRIER RAIL & DROP INLET

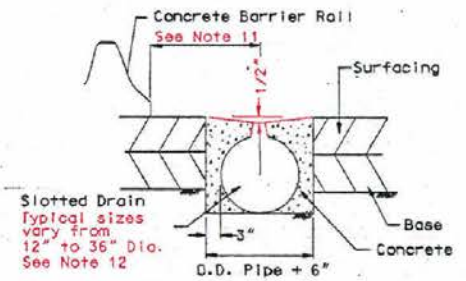


STANDARD GRATE DETAIL

SECTION A-A



SECTION C-C



BEDDING DETAIL

GENERAL NOTES:

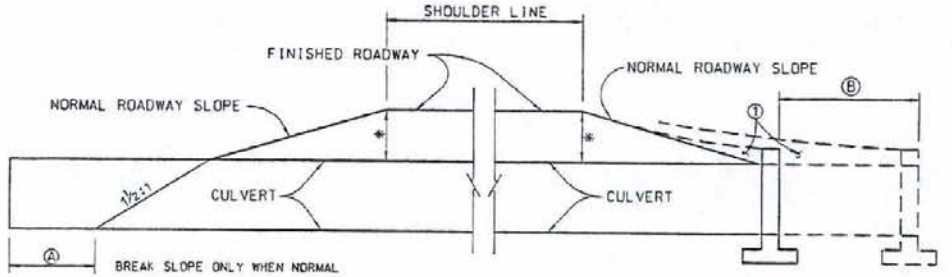
1. Drain pipe seams may be continuous helical lock seam or helical weld seam.
2. Drain sections shall be assembled with the coupling band shown.
3. The cross bar spacer shall be welded to the bearing bars in such a manner as to develop a minimum tensile strength of 12,000 lbs. normal to the longitudinal axis of the bearing bars.
4. The maximum variance from a straight line between the extreme top corners of the bearing bars shall be ½" in 20'.
5. For continuous runs of S.C.M.P. in excess of 200', 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. Design shall be in accordance with the latest edition of the AASHTO Standard Specification for Highway Bridges, Section 12. Minimum live load to be H20.
10. Concrete shall be Class A or AA.
11. Hydraulics engineer will state pipe size.
12. The spacer plates shall be welded on both sides to each bearing bar with four 1¼" long 3/16" fillet welds.
13. H = height of bearing bar (2½" or 6") - ½" corrugation - gage of pipe in inches.
14. The grate shall be welded with a 3/16" fillet weld minimum 1" long to the corrugated steel pipe on each side of the grate at every other corrugation.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SLOTTED C.M.P. DRAIN DETAILS

R-2.1.3 (604)

CHIEF ROAD DESIGN ENGR. | ADOPTED: 6/72 | REVISION 10/96



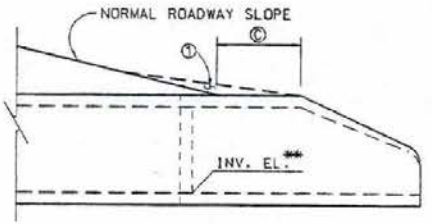
BREAK SLOPE ONLY WHEN NORMAL ROADWAY SLOPE IS FLATTER THAN 2:1

WITHOUT HEADWALL

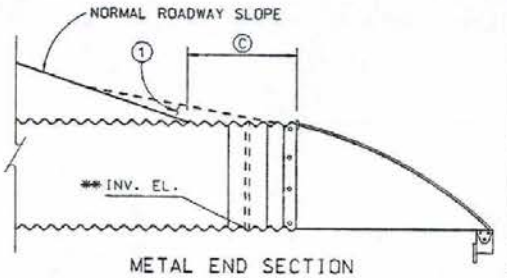
Ⓐ— LENGTH OF CULVERT SHALL BE INCREASED AS FOLLOWS: CONSIDER EACH SIDE SEPARATELY. MEASURE PIPE FROM ROADBED CENTERLINE TO THE INTERSECTION OF PIPE FLOW LINE AND FILLSLOPE. TO THIS DIMENSION ADD 2.0' WHEN COVER AT SHOULDER IS 1.0' TO 10.0' ADD AN ADDITIONAL 0.5' FOR EACH SUCCEEDING 5.0' OF COVER OR PORTION 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 1.0' WHEN COVER AT SHOULDER IS 5.0' TO 10.0', ADD AN ADDITIONAL 0.5' FOR EACH SUCCEEDING 5.0' 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 1.0' WHEN COVER AT SHOULDER IS 1.0' TO 10.0' ADD AN ADDITIONAL 0.5' FOR EACH SUCCEEDING 5.0' OR PORTION THEREOF.

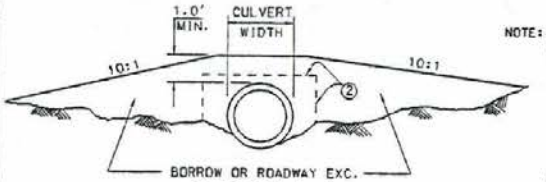
MINIMUM CULVERT INSTALLATION

* RCP: USE 1'6" MIN. WHERE POSSIBLE. IF MINIMUM COVER IS RESTRICTIVE, COMPENSATE BY UTILIZING HIGHER CLASS PIPE OR SELECTIVE BEDDING AS RECOMMENDED BY THE HYDRAULICS SECTION.

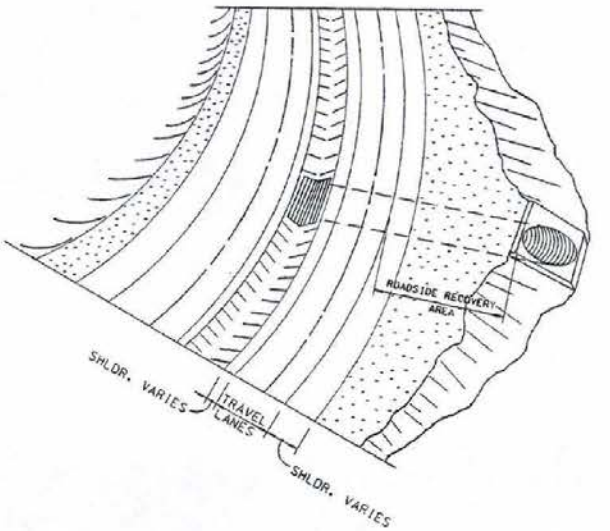
ALUMINUM CULVERTS: SEE STANDARD SHEET R-1.3.1.
STEEL CULVERTS: SEE STANDARD SHEET R-1.3.1.2.

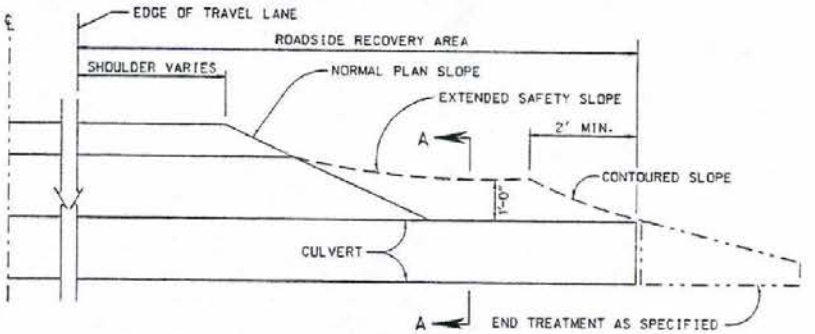
** FOR INFORMATIONAL PURPOSES ONLY

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 SOME OTHER MEANS, SUCH AS GUARDRAIL, BARRIER RAIL OR ANOTHER ACCEPTABLE SAFETY FEATURE.

2—NORMAL STRUCTURE EXCAVATION AND BACKFILL LIMITS.

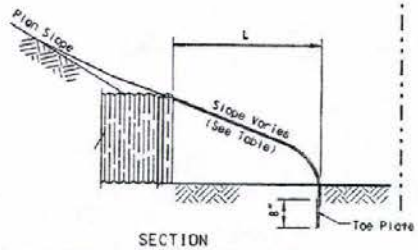
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT INSTALLATION

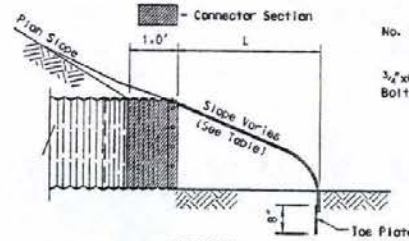
CHIEF ROAD DESIGN ENGR.

R-2.1.4 (601 THRU 606)
ADOPTED: 6/72 | REVISION 1/98

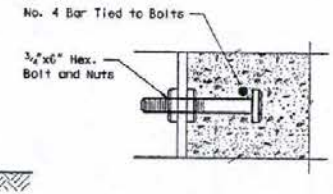
R-13



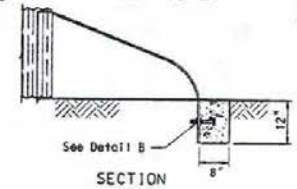
SECTION
TYPE 1 OR 2 CONNECTION



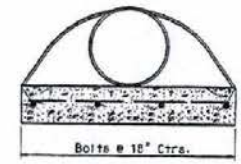
SECTION
TYPE 3 CONNECTION



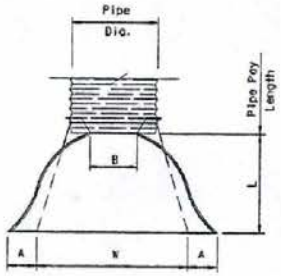
DETAIL B



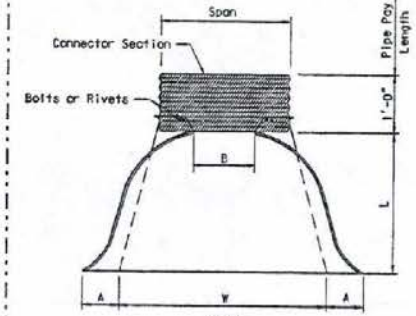
SECTION



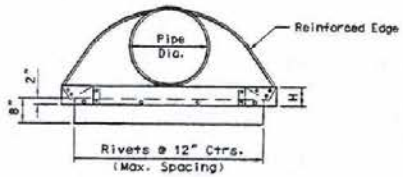
ELEVATION
ANCHOR BLOCK DETAIL
(See Notes 6 thru 9)



PLAN

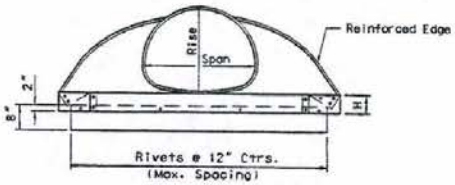


PLAN



ELEVATION

LENGTH OF TOE PLATE TO BE W + 10" MIN. FOR 12" TO 30" DIAMETER PIPE INCLUSIVE AND W + 22" MIN. FOR 36" DIAMETER PIPES AND LARGER.



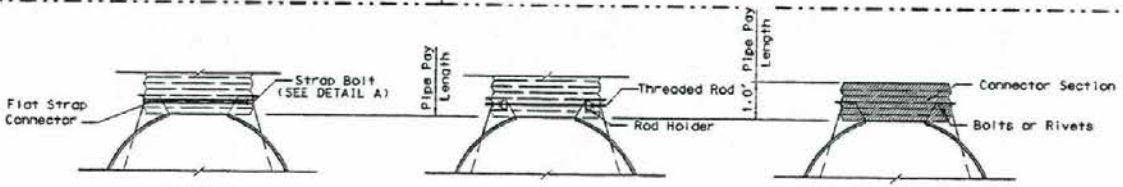
ELEVATION

LENGTH OF TOE PLATE TO BE W + 10" MIN. FOR PIPE ARCHES WITH RISE OF 13" TO 29" INCLUSIVE AND W+ 18" MIN. FOR PIPE ARCHES WITH RISE OF 33" AND LARGER.

TYPE CONNECTION	PIPE ARCH DIMENSIONS SPAN	RISE	GAGE	DIMENSIONS A 1" TOL.	B MAX.	H 1" TOL.	L 1 1/2" TOL.	W 2" TOL.	APPROX. SLOPE	*CONCRETE CU. YD.
TYPE 2	17"	13"	16	7"	9"	6"	19"	30"	2 1/2:1	
	21"	15"	16	7"	10"	6"	23"	36"	2 1/2:1	
	24"	18"	16	8"	12"	6"	28"	42"	2 1/2:1	
	28"	20"	16	9"	14"	6"	32"	48"	2 1/2:1	
	35"	24"	14	10"	16"	6"	39"	60"	2 1/2:1	
	42"	29"	14	12"	18"	8"	46"	75"	2 1/2:1	
	49"	33"	12	13"	21"	9"	53"	85"	2 1/2:1	
	57"	38"	12	18"	26"	12"	63"	90"	2 1/2:1	0.26
TYPE 3	64"	43"	12	18"	30"	12"	70"	102"	2 1/4:1	0.29
	71"	47"	12	18"	33"	12"	77"	114"	2 1/4:1	0.31
	77"	52"	12	18"	36"	12"	77"	126"	2:1	0.34
	83"	57"	12	18"	39"	12"	77"	138"	2:1	0.36

TYPE CONNECTION	PIPE DIAM.	GAGE	DIMENSIONS A 1" TOL.	B MAX.	H 1" TOL.	L 1 1/2" TOL.	W 2" TOL.	APPROX. SLOPE	*CONCRETE CU. YD.
TYPE 1	12"	16	6"	6"	6"	21"	24"	2 1/2:1	
	15"	16	7"	8"	6"	26"	30"	2 1/2:1	
	18"	16	8"	10"	6"	31"	36"	2 1/2:1	
	21"	16	9"	12"	6"	36"	42"	2 1/2:1	
	24"	16	10"	13"	6"	41"	48"	2 1/2:1	
TYPE 2	30"	14	12"	16"	8"	51"	60"	2 1/2:1	
	36"	14	14"	19"	9"	60"	72"	2 1/2:1	
TYPE 2 OR TYPE 3	42"	12	16"	22"	11"	69"	84"	2 1/2:1	
	48"	12	18"	27"	12"	78"	90"	2 1/4:1	0.26
	54"	12	18"	30"	12"	84"	102"	2 :1	0.29
	60"	12	18"	33"	12"	87"	114"	1 3/4:1	0.31
	66"	12	18"	36"	12"	87"	120"	1 1/2:1	0.32
	72"	12	18"	39"	12"	87"	126"	1 1/3:1	0.34
	78"	12	18"	42"	12"	87"	132"	1 1/4:1	0.35
	84"	12	18"	45"	12"	87"	138"	1 1/6:1	0.36

* FOR INFORMATION ONLY



TYPE 1
FOR 12" CMP THROUGH 24" CMP ONLY

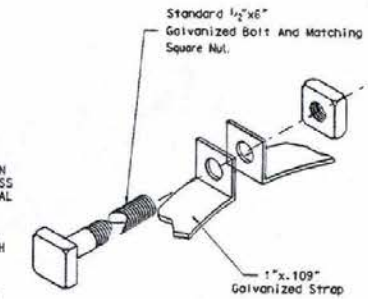
TYPE 2
FOR 30" CMP THROUGH 84" CMP, AND FOR 17" X 13" CMAP THRU 57" X 38" CMAP

TYPE 3
FOR 64" X 43" CMAP THROUGH 83" X 57" CMAP OR FOR 42" CMP THROUGH 84" CMP (OPTIONAL)

STANDARD CONNECTIONS

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 24" AND OVER IN DIAMETER AND ON ARCH PIPE 28"x 20" AND OVER UNLESS OTHERWISE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS.
4. TOE PLATES SHALL BE PUNCHED WITH 7/16" HOLES TO MATCH HOLES IN LIP OF END SECTION AND BOLTED WITH 3/8" GALVANIZED BOLTS.
5. REINFORCED EDGES TO BE SUPPLEMENTED WITH GALVANIZED STIFFENER ANGLES FOR THE 60" THRU 84" ROUND, 77"x 52" AND 83"x 57" PIPE-ARCH SIZES. THE ANGLES WILL BE 2"x 2"x 1/4" FOR THE 60" THRU 72" ROUND, 77"x 52" AND 83"x 57" PIPE ARCH SIZES AND 2½"x 2½"x¼"FOR 78" THRU 84"ROUND. THE ANGLES TO BE ATTACHED BY 3/8" GALVANIZED NUTS AND BOLTS.
6. ANCHOR BLOCK SHALL BE USED ON INLET END ONLY FOR 48" CMP AND OVER AND FOR 57"x 38" 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 2" ON ENDS OF CONCRETE ANCHOR BLOCK.



DETAIL A

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

METAL END SECTIONS
12" CMP TO 84" CMP AND
17"X13" CMAP TO 83"X57" CMAP

CHIEF ROAD DESIGN ENGR.

R-2.2.1 (604)
ADOPTED: 8/75 REVISION 1/98

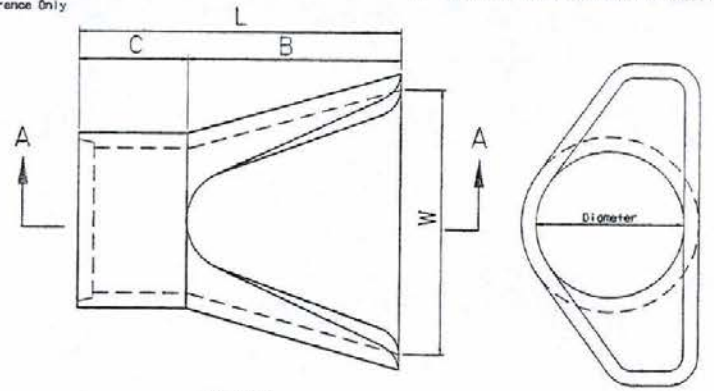
R-14

DIAMETER	WEIGHT	A	B	C *	L	W
18"	670	9"	2'-1"	2'-1"	4'-2"	3'-0"
24"	1300	9 1/2"	3'-6"	2'-6"	6'-0"	4'-0"
30"	1850	1'-0"	4'-5"	1'-8"	6'-1"	5'-0"
36"	3500	1'-3"	5'-2"	2'-11"	8'-1"	6'-0"
42"	4930	1'-9"	5'-3"	2'-11"	8'-2"	6'-2"
48"	6700	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"
54"	7150	2'-3"	5'-6"	2'-9"	8'-3"	6'-10"

* For Reference Only

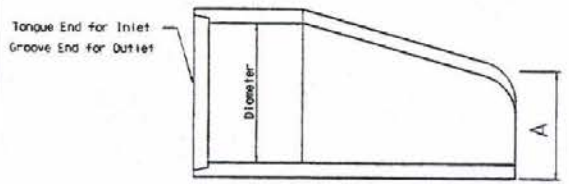
GENERAL NOTES:

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.

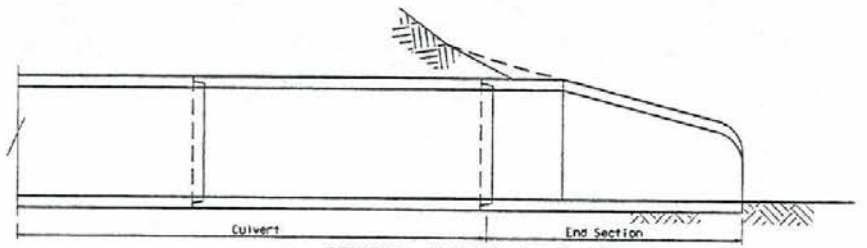


PLAN

END VIEW



SECTION A-A



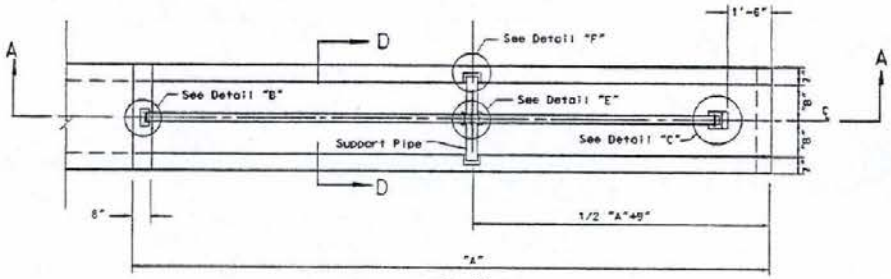
CROSS SECTION VIEW
18" RCP TO 54" RCP

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

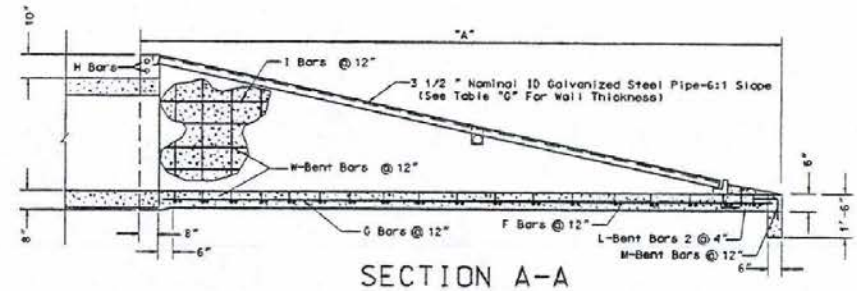
RCP END SECTION
12" RCP TO 54" RCP

R-3.3.1 (603)

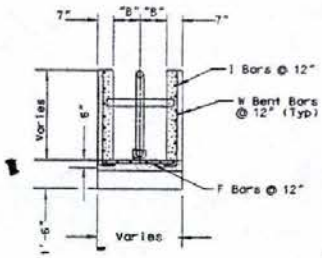
CHIEF ROAD DESIGN ENGR. ADOPTED: 1/75 REVISION 1- 12/82



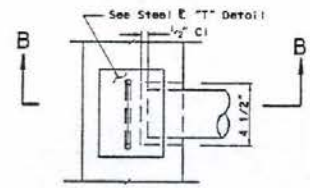
PLAN



SECTION A-A



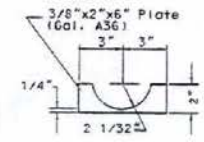
SECTION D-D



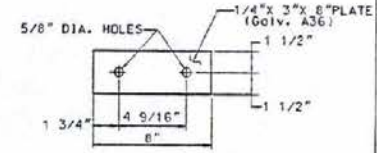
DETAIL "B"
(Plan)

GENERAL NOTES:

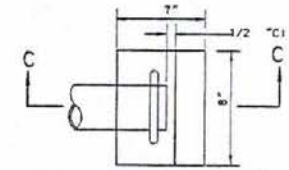
1. CONCRETE SHALL BE CLASS A OR CLASS AA.
2. REINFORCING STEEL SHALL BE DEFORMED BARS WITH THE MAXIMUM SPACING OF 12" SET 2" CLEAR OF SURFACE OF CONCRETE. REINFORCING BARS MAY BE CUT AND BENT IN FIELD.



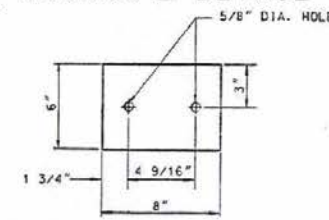
SADDLE PL DETAIL



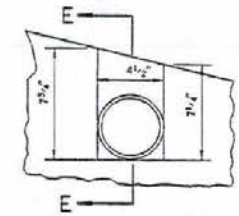
ANCHOR PL DETAIL



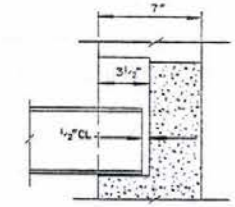
DETAIL "C"
(Plan)



STEEL PL "T" DETAIL

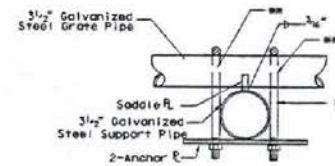


ELEVATION

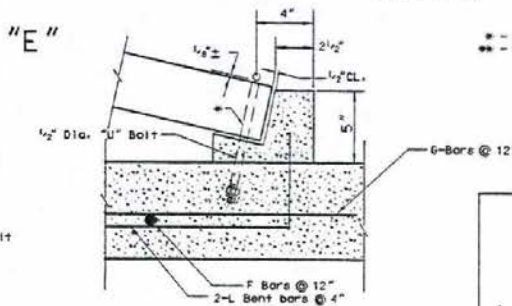


SECTION E-E

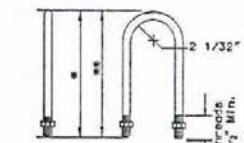
DETAIL "F"



DETAIL "E"



SECTION C-C



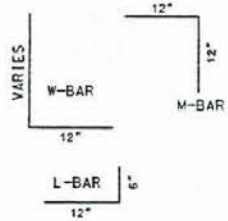
U-BOLT DETAIL

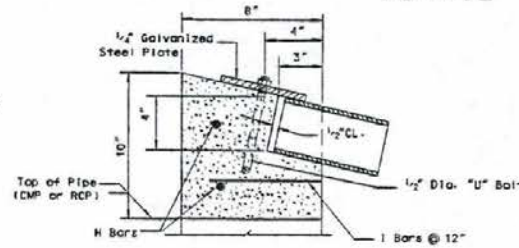
LENGTH OF REINFORCING BARS

DIA. OF PIPE	F NO.4 BARS	G NO.4 BARS	H NO.4 BARS	I NO.4 BARS	M NO.4 BARS	W NO.4 BARS
30"	22'-0"+3"	4-21"-0"	2-3"-3"	5-19"-10" TO 2'-6"	6-2"-0"	19-6"-10" TO 2'-0"
33"	23'-0"+8"	4-22"-0"	2-3"-7"	5-20"-10" TO 2'-6"	6-2"-0"	20-6"-0" TO 2'-0"
36"	24'-0"+8"	5-23"-6"	2-4"-10"	5-22"-6" TO 2'-6"	6-2"-0"	22-6"-0" TO 2'-0"
39"	26'-0"+11"	5-25"-6"	2-4"-11"	6-24"-4" TO 2'-6"	6-2"-0"	24-6"-0" TO 2'-0"
42"	28'-1"+2"	5-27"-0"	2-4"-4"	6-25"-10" TO 2'-6"	6-2"-0"	26-6"-0" TO 2'-0"
45"	29'-3"5"	6-28"-6"	2-4"-7"	6-27"-4" TO 2'-6"	6-2"-0"	27-6"-3" TO 2'-0"
48"	31'-6"+10"	6-30"-0"	2-4"-10"	6-28"-10" TO 2'-6"	6-2"-0"	28-6"-6" TO 2'-0"
51"	33'-6"+10"	6-32"-0"	2-5"-1"	6-30"-10" TO 2'-6"	8-2"-0"	30-6"-10" TO 2'-0"
54"	34'-5"+6"	6-33"-6"	2-5"-4"	6-32"-4" TO 2'-6"	8-2"-0"	32-7"+1" TO 2'-0"
57"	37'-6"+7"	7-35"-0"	2-5"-7"	6-33"-10" TO 2'-6"	7-2"-0"	33-7"-4" TO 2'-0"
60"	38'-5"10"	7-37"-6"	2-5"-10"	7-35"-10" TO 2'-6"	7-2"-0"	35-7"-8" TO 2'-0"

TABLE "G"

DIA. OF PIPE	DIM. "A"	DIM. "B"	PIPE CLASS
30"	22'-0"	1'-3"	40
33"	23'-0"	1'-4½"	40
36"	24'-6"	1'-6"	40
39"	26'-6"	1'-7½"	40
42"	28'-0"	1'-9"	40
45"	29'-6"	1'-10½"	40
48"	31'-0"	2'-0"	40
51"	33'-0"	2'-1½"	80
54"	34'-6"	2'-3"	80
57"	36'-0"	2'-4½"	80
60"	38'-0"	2'-6"	80





SECTION B-B

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT END SAFETY GRATE
30"-60" CMP OR RCP

R-2.3.1.1 (601)

CHIEF ROAD DESIGN ENGR. ADOPTED: 1/1 REVISION 8/97

R-16

CMP SIZE Dia.	CORR CMAP SXR	CMP AREA SQ. FT.	L	SINGLE CMP								DOUBLE CMP							
				0°SKEW		15°SKEW		30°SKEW		45°SKEW		0°SKEW		15°SKEW		30°SKEW		45°SKEW	
				CONC CU.YD.	STEEL LB.	CONC CU.YD.	STEEL LB.	CONC CU.YD.	STEEL LB.	CONC CU.YD.	STEEL LB.	CONC CU.YD.	STEEL LB.	CONC CU.YD.	STEEL LB.	CONC CU.YD.	STEEL LB.	CONC CU.YD.	STEEL LB.
12"		0.79	3'-6"	0.85	35	0.92	37	0.94	37	0.99	39	1.21	46	1.30	49	1.35	50	1.49	53
15"	18"X11"	1.23	4'-3"	1.09	48	1.19	50	1.21	51	1.27	52	1.51	61	1.62	64	1.68	65	1.85	69
18"	22"X13"	1.77	5'-0"	1.36	55	1.48	59	1.51	59	1.57	61	1.83	70	1.96	73	2.05	75	2.24	80
24"	29"X18"	3.14	6'-6"	1.95	78	2.12	83	2.16	84	2.25	86	2.53	95	2.73	100	2.84	103	3.08	108
30"	36"X22"	4.91	8'-0"	2.61	105	2.85	111	2.90	112	3.01	115	3.39	126	3.65	132	3.79	135	4.11	142
36"	43"X27"	7.07	9'-6"	3.36	122	3.66	129	3.72	131	3.86	134	4.34	147	4.68	155	4.85	158	5.25	167
42"	50"X31"	9.62	11'-0"	4.18	167	4.56	177	4.64	179	4.81	182	5.39	196	5.81	206	6.03	210	6.52	220

QUANTITIES SHOWN ABOVE ARE FOR TWO HEADWALLS.

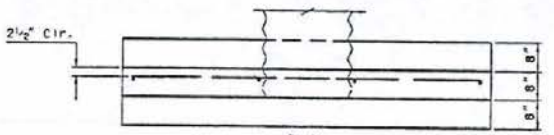
QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL.

LENGTH OF REINFORCING BARS

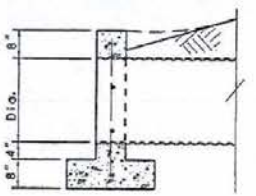
CMP SIZE	SINGLE CMP					SINGLE OR DOUBLE CMP						DOUBLE CMP				
	0°-45°	0°	15°	30°	45°	0°		15°		30°		45°	0°-45°	0°	15°	30°	45°
	NO.4	NO.5	NO.5	NO.5	NO.5	NO.4	NO.4	NO.4	NO.4	NO.4	NO.4	NO.4	NO.4	NO.5	NO.5	NO.5	NO.5
	J	N	N	N	N	M	M	M1	M	M1	M	M1	K	N	N	N	N
12"	4@2'-5"	2@4'-3"	2@4'-8"	2@4'-9"	2@5'-0"	2@1'-6"	3@1'-4"	1@2'-0"	3@1'-3"	1@2'-1"	3@1'-0"	1@2'-4"	5@2'-5"	2@6'-3"	2@6'-6"	2@7'-1"	2@7'-10"
15"	6@2'-8"	2@5'-3"	2@5'-9"	2@6'-11"	2@6'-2"	2@1'-8"	3@1'-6"	1@2'-2"	3@1'-5"	1@2'-3"	3@1'-2"	1@2'-6"	7@2'-6"	2@7'-6"	2@8'-1"	2@8'-6"	2@9'-6"
18"	6@2'-11"	2@6'-3"	2@6'-10"	2@7'-0"	2@7'-4"	2@2'-3"	3@2'-1"	1@2'-4"	3@2'-0"	1@2'-5"	3@1'-8"	1@2'-8"	7@2'-11"	2@8'-9"	2@9'-5"	2@9'-10"	2@10'-11"
24"	6@3'-6"	2@8'-3"	2@9'-0"	2@9'-3"	2@9'-9"	4@3'-0"	2@2'-10"	2@3'-2"	2@2'-9"	2@3'-3"	2@2'-8"	2@3'-10"	9@3'-1"	2@10'-3"	2@11'-3"	2@12'-1"	2@12'-8"	2@14'-0"
30"	8@3'-11"	2@10'-3"	2@11'-2"	2@11'-5"	2@12'-1"	4@3'-9"	2@3'-7"	2@4'-6"	2@3'-6"	2@4'-0"	2@3'-3"	2@5'-0"	9@3'-11"	2@14'-0"	2@15'-0"	2@15'-9"	2@17'-5"
36"	8@4'-5"	2@12'-3"	2@13'-4"	2@13'-8"	2@14'-2"	4@4'-6"	2@4'-4"	2@5'-7"	2@4'-3"	2@5'-2"	2@4'-0"	2@6'-0"	9@4'-5"	2@16'-9"	2@18'-0"	2@18'-10"	2@20'-10"
42"	10@4'-11"	2@14'-3"	2@15'-6"	2@15'-11"	2@16'-10"	6@5'-3"	2@5'-1"	3@6'-6"	2@5'-0"	3@6'-7"	2@4'-9"	3@6'-10"	11@4'-11"	2@19'-6"	2@20'-11"	2@21'-11"	2@24'-3"

GENERAL NOTES:

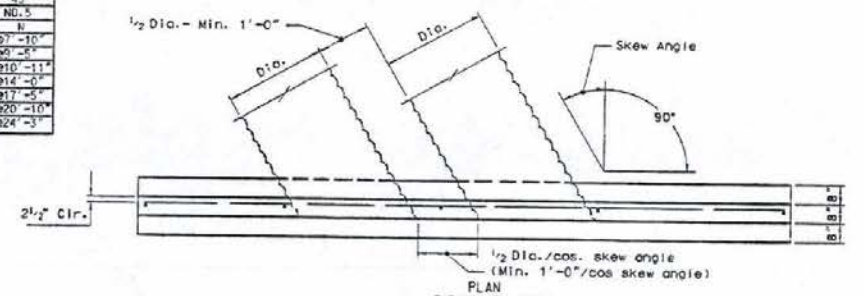
1. CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE DEFORMED BARS WITH MAXIMUM SPACING OF 18" SET 2 1/2" CLEAR OF SURFACE OF CONCRETE EXCEPT AS NOTED. BAR ENDS SHALL BE KEPT 1 1/2" CLEAR OF SURFACE OF CONCRETE. REINFORCING BARS MAY BE CUT AND BENT IN FIELD.
3. FOOTINGS SHOWN ARE OF MINIMUM 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 SHEWED 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.



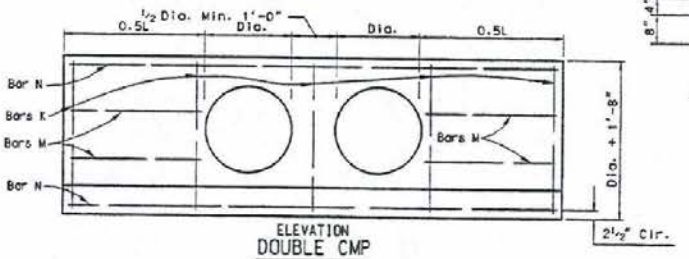
PLAN
SINGLE CMP



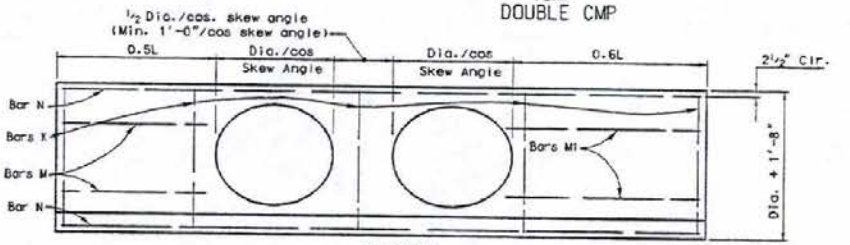
SECTION
(FOR ALL HEADWALLS)



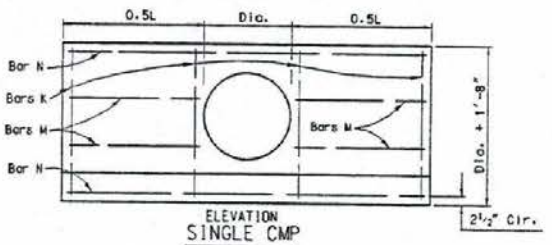
PLAN
DOUBLE CMP



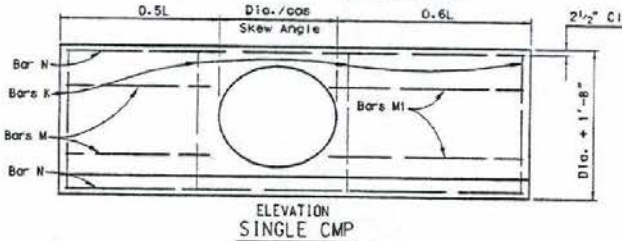
ELEVATION
DOUBLE CMP



ELEVATION
DOUBLE CMP



ELEVATION
SINGLE CMP
0° SKEW



ELEVATION
SINGLE CMP
15° TO 45° SKEW

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS

12" CMP TO 42"CMP

CHIEF ROAD DESIGN ENGR.

R-2.4.1 (502)

ADOPTED: 8/69 REVISION 8/97

R-17

LENGTH OF REINFORCING BARS

SINGLE CMP

CMP SIZE DIA.	0° SKEW					15° SKEW						30° SKEW						45° SKEW					
	NO.5		NO.4			NO.5		NO.4				NO.5		NO.4				NO.5		NO.4			
	F	G	M	N	K	F	G	M	M1	N	K	F	G	M	M1	N	K	F	G	M	M1	N	K
48"	12@2'-9"	10@7'-7"	12@6'-0"	9@16'-3"	10@5'-10"	13@2'-9"	11@7'-7"	6@5'-10"	6@ 7'- 3"	9@17'- 8"	11@5'-10"	13@2'-9"	11@7'-7"	6@5'-8"	6@ 7'- 3"	9@18'-2"	11@5'-10"	14@2'-9"	12@7'-7"	6@5'-6"	6@ 7'- 3"	9@19'- 2"	12@5'-10"
54"	13@2'-9"	12@8'-1"	12@6'-9"	9@18'-3"	12@6'- 4"	14@2'-9"	13@8'-1"	6@6'- 7"	6@ 8'- 1"	9@19'-10"	13@6'- 4"	15@2'-9"	14@8'-1"	6@6'-5"	6@ 8'- 1"	9@20'-4"	14@6'- 4"	15@2'-9"	14@8'-1"	6@6'-3"	6@ 8'- 1"	9@21'- 6"	14@6'- 4"
60"	21@3'-9"	18@8'-9"	12@7'-6"	10@20'-3"	12@6'-10"	23@3'-9"	20@8'-9"	6@7'- 4"	6@ 9'- 0"	10@22'- 0"	13@6'-10"	23@3'-9"	20@8'-9"	6@7'-2"	6@ 9'- 0"	10@22'-7"	13@6'-10"	24@3'-8"	21@8'-9"	6@7'-0"	6@ 9'- 0"	10@23'-11"	14@6'-10"
72"	25@3'-9"	20@9'-9"	16@9'-0"	10@24'-3"	14@7'-10"	27@3'-9"	22@9'-9"	8@6'-10"	8@10'-10"	10@26'- 4"	15@7'-10"	28@3'-9"	23@9'-9"	8@6'-8"	8@10'-10"	10@27'-0"	16@7'-10"	29@3'-9"	24@9'-9"	8@6'-6"	8@10'-10"	10@28'- 7"	17@7'-10"

DOUBLE CMP

48"	16@2'-9"	11@7'-7"	12@6'-0"	9@22'-3"	11@5'-10"	17@2'-9"	12@7'-7"	6@5'-10"	6@ 7'- 3"	9@23'-10"	12@5'-10"	18@2'-9"	13@7'-7"	6@5'-8"	6@ 7'- 3"	9@25'-1"	13@5'-10"	19@2'-9"	14@7'-7"	6@5'-6"	6@ 7'- 3"	9@27'- 8"	14@5'-10"
54"	18@2'-9"	13@8'-1"	12@6'-9"	9@25'-0"	13@6'- 4"	19@2'-9"	14@8'-1"	6@6'- 7"	6@ 8'- 1"	9@26'-10"	14@6'- 4"	20@2'-9"	15@8'-1"	6@6'-5"	6@ 8'- 1"	9@28'-2"	15@6'- 4"	22@2'-9"	17@8'-1"	6@6'-3"	6@ 8'- 1"	9@31'- 1"	17@6'- 4"
60"	29@3'-9"	21@8'-9"	12@7'-6"	10@27'-9"	14@6'-10"	31@3'-9"	23@8'-9"	6@7'- 4"	6@ 9'- 0"	10@29'- 9"	15@6'-10"	32@3'-9"	24@8'-9"	6@7'-2"	6@ 9'- 0"	10@31'-3"	16@6'-10"	36@3'-9"	28@8'-9"	6@7'-0"	6@ 9'- 0"	10@34'- 6"	18@6'-10"
72"	34@3'-9"	23@9'-9"	16@9'-0"	10@33'-3"	16@7'-10"	36@3'-9"	25@9'-9"	8@6'-10"	8@10'-10"	10@35'- 8"	17@7'-10"	38@3'-9"	27@9'-9"	8@6'-8"	8@10'-10"	10@37'-5"	19@7'-10"	42@3'-9"	31@9'-9"	8@6'-6"	8@10'-10"	10@41'- 4"	21@7'-10"

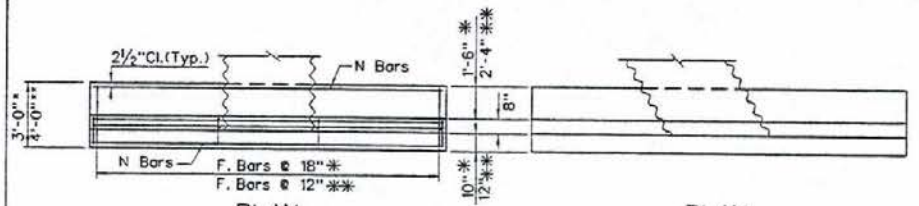
QUANTITIES SHOWN ABOVE ARE FOR ONE HEADWALL.

QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS.

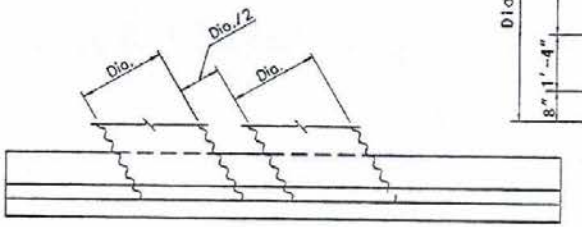
CMP SIZE DIA.	CMP AREA SQ FT	L	SINGLE CMP 0° SKEW CONC	SINGLE CMP 0° SKEW STEEL	SINGLE CMP 15° SKEW CONC	SINGLE CMP 15° SKEW STEEL	SINGLE CMP 30° SKEW CONC	SINGLE CMP 30° SKEW STEEL	SINGLE CMP 45° SKEW CONC	SINGLE CMP 45° SKEW STEEL	DOUBLE CMP 0° SKEW CONC	DOUBLE CMP 0° SKEW STEEL	DOUBLE CMP 15° SKEW CONC	DOUBLE CMP 15° SKEW STEEL	DOUBLE CMP 30° SKEW CONC	DOUBLE CMP 30° SKEW STEEL	DOUBLE CMP 45° SKEW CONC	DOUBLE CMP 45° SKEW STEEL
48"	12.57	12'-6"	6.72	597	7.31	651	7.45	656	7.75	696	8.76	715	9.43	772	9.82	815	10.65	874
54"	15.90	14'-0"	7.90	706	8.60	766	8.76	802	9.10	814	10.28	841	11.07	904	11.51	950	12.47	1045
60"	19.64	15'-6"	10.17	993	11.07	1089	11.28	1095	11.74	1147	13.28	1229	14.30	1328	14.87	1381	16.13	1547
72"	28.27	18'-6"	13.13	1265	14.30	1377	14.56	1424	15.12	1481	17.07	1538	18.38	1654	19.11	1753	20.70	1937

* - For 48"&54" Dia.

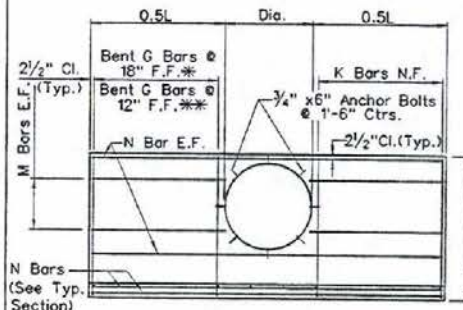
** - For 60"&72" Dia.



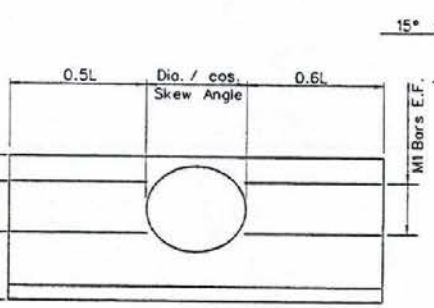
PLAN



PLAN

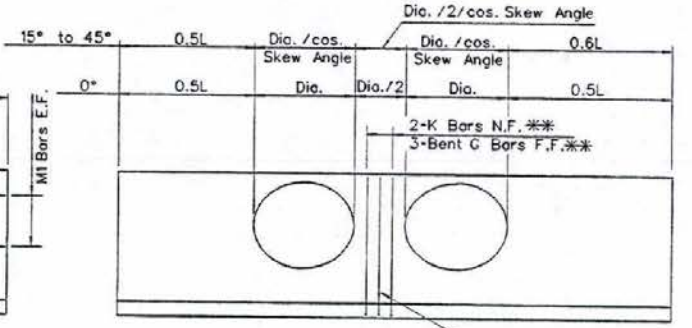


ELEVATION
SINGLE CMP
0° SKEW



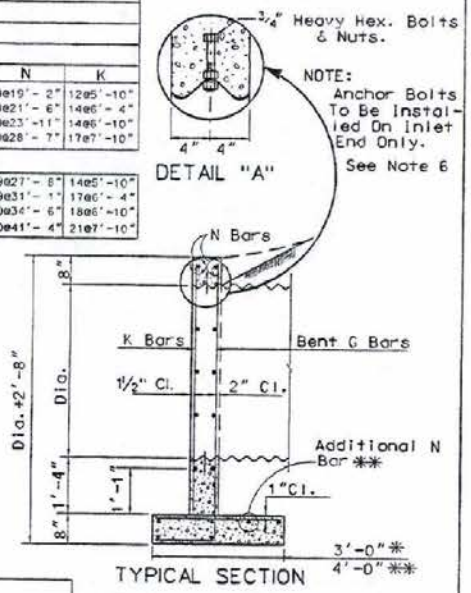
ELEVATION
SINGLE CMP
15° TO 45° SKEW

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 18" SET 2 1/2" CLEAR OF SURFACE OF CONCRETE EXCEPT AS NOTED. BAR ENDS SHALL BE KEPT 1 1/2" 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 IN 5° INCREMENTS WHERE IT IS FEASIBLE.
6. NO DIRECT PAYMENT FOR ANCHOR BOLTS.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS
48" CMP TO 72" CMP

CHIEF ROAD DESIGN ENGINEER

P-2.4.2	(502)
ADOPTED: 8/69	REVISION 10/98

R-18

QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS.

RCP SIZE DIA.	RCP AREA SQ.FT.	SINGLE RCP 0° SKEW CONC. CU. YD.	0° SKEW STEEL LB.	15° SKEW CONC. CU. YD.	15° SKEW STEEL LB.	30° SKEW CONC. CU. YD.	30° SKEW STEEL LB.	45° SKEW CONC. CU. YD.	45° SKEW STEEL LB.	DOUBLE RCP 0° SKEW CONC. CU. YD.	0° SKEW STEEL LB.	15° SKEW CONC. CU. YD.	15° SKEW STEEL LB.	30° SKEW CONC. CU. YD.	30° SKEW STEEL LB.	45° SKEW CONC. CU. YD.	45° SKEW STEEL LB.	X	Y	L	h
12"	0.79	1.00	46	1.09	49	1.10	49	1.14	50	1.41	59	1.52	62	1.58	64	1.73	67	0'-10"	1'-2"	4'-0"	3'-0"
15"	1.23	1.32	55	1.45	58	1.47	59	1.52	60	1.80	70	1.93	73	2.01	75	2.18	79	0'-10 1/4"	1'-2 1/4"	5'-0"	3'-3 1/2"
18"	1.77	1.62	69	1.77	73	1.80	74	1.85	75	2.15	85	2.31	89	2.40	91	2.60	96	0'-10 1/2"	1'-2 1/2"	5'-9"	3'-7"
21"	2.41	1.95	77	2.13	82	2.16	83	2.23	85	2.59	95	2.79	101	2.90	103	3.13	108	0'-10 3/4"	1'-2 3/4"	6'-6"	3'-10 1/2"
24"	3.14	2.27	96	2.48	102	2.52	103	2.60	105	3.01	116	3.24	122	3.37	125	3.64	131	0'-11"	1'-3"	7'-3"	4'-2"
27"	3.98	2.62	105	2.86	111	2.90	112	2.99	114	3.48	128	3.75	134	3.85	137	4.21	144	0'-11"	1'-3"	8'-0"	4'-5"
30"	4.91	3.06	117	3.37	123	3.41	124	3.44	127	4.07	141	4.38	148	4.55	152	4.90	156	0'-11 1/2"	1'-3 1/2"	9'-0"	4'-9"
33"	5.94	3.50	125	3.82	132	3.87	134	3.98	137	4.62	153	4.98	160	5.17	164	5.56	172	0'-11 3/4"	1'-3 3/4"	9'-9"	5'-1/2"
36"	7.07	3.93	161	4.29	169	4.34	171	4.47	174	5.19	190	5.59	200	5.80	204	6.24	213	1'-0"	1'-4"	10'-6"	5'-4"

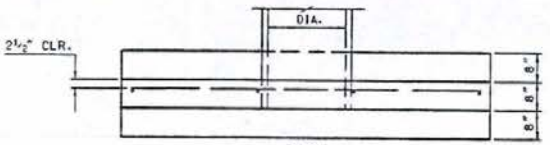
QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL.

LENGTH OF REINFORCING BARS

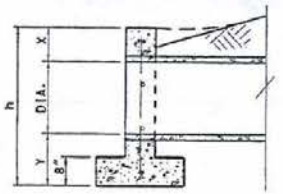
RCP SIZE Dia.	SINGLE RCP 0°-45° NO.4 K	0° NO.5 N	15° NO.5 N	30° NO.5 N	45° NO.5 N	SINGLE OR DOUBLE RCP 0° NO.4 M	15° NO.4 M	15° NO.4 M1	30° NO.4 M	30° NO.4 M1	45° NO.4 M	45° NO.4 M1	DOUBLE RCP 0°-45° NO.4 Y	0° NO.5 N	15° NO.5 N	30° NO.5 N	45° NO.5 N
12"	6'2"-9"	2'4"-8"	2'6"-2"	2'6"-4"	2'6"-7"	2'1"-7"	2'1"-5"	1'8"-1"	1'1"-4"	1'0"-2"	1'0"-1"	1'0"-6"	7'2"-9"	2'7"-0"	2'7"-6"	2'7"-11"	2'8"-6"
15"	6'2"-1"	2'6"-0"	2'6"-6"	2'6"-8"	2'7"-0"	2'2"-1"	2'1"-11"	1'8"-8"	1'1"-10"	1'0"-9"	1'1"-7"	1'0"-0"	7'3"-1"	2'8"-6"	2'8"-2"	2'9"-7"	2'10"-7"
18"	6'3"-4"	2'7"-0"	2'7"-8"	2'7"-10"	2'8"-2"	4'2"-6"	2'2"-3"	2'3"-1"	2'2"-2"	2'3"-2"	2'1"-11"	2'3"-6"	7'3"-4"	2'9"-6"	2'10"-6"	2'11"-0"	2'12"-1"
21"	6'3"-8"	2'8"-0"	2'8"-9"	2'8"-11"	2'9"-5"	4'2"-8"	2'2"-7"	2'3"-6"	2'2"-6"	2'3"-7"	2'2"-3"	2'3"-10"	7'3"-8"	2'11"-2"	2'12"-0"	2'12"-7"	2'13"-10"
24"	8'3"-11"	2'9"-0"	2'9"-10"	2'10"-1"	2'10"-7"	4'3"-2"	2'3"-0"	2'4"-0"	2'2"-11"	2'4"-1"	2'2"-8"	2'4"-4"	9'3"-11"	2'12"-7"	2'13"-7"	2'14"-2"	2'15"-8"
27"	8'4"-2"	2'10"-0"	2'10"-11"	2'11"-2"	2'11"-8"	4'3"-6"	2'3"-4"	2'4"-4"	2'3"-1"	2'4"-5"	2'3"-0"	2'4"-8"	9'4"-2"	2'14"-1"	2'15"-1"	2'15"-10"	2'17"-6"
30"	8'4"-6"	2'11"-3"	2'12"-3"	2'12"-7"	2'13"-2"	4'4"-0"	2'3"-10"	2'5"-0"	2'3"-6"	2'5"-1"	2'3"-6"	2'5"-4"	9'4"-6"	2'15"-9"	2'16"-11"	2'17"-8"	2'19"-7"
33"	8'4"-10"	2'12"-3"	2'13"-4"	2'13"-8"	2'14"-4"	4'4"-3"	2'4"-1"	2'5"-3"	2'4"-0"	2'5"-4"	2'3"-9"	2'5"-7"	9'4"-10"	2'17"-3"	2'18"-6"	2'19"-5"	2'21"-5"
36"	10'5"-1"	2'13"-3"	2'14"-5"	2'14"-9"	2'15"-7"	6'4"-8"	2'4"-6"	2'5"-9"	2'4"-5"	2'5"-10"	2'4"-2"	2'6"-1"	11'5"-1"	2'18"-8"	2'20"-0"	2'21"-0"	2'23"-2"

GENERAL NOTES:

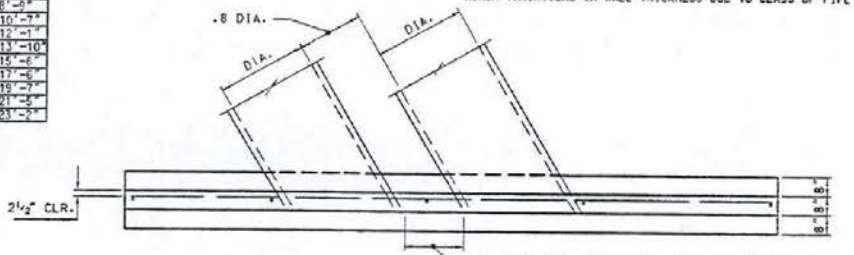
1. CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE DEFORMED BARS WITH MAXIMUM SPACING OF 18" SET 2 1/2" CLEAR OF SURFACE OF CONCRETE EXCEPT AS NOTED. BAR ENDS SHALL BE KEPT 1 1/2" CLEAR OF SURFACE OF CONCRETE. REINFORCING BARS MAY BE CUT AND BENT IN FIELD.
3. FOOTINGS SHOWN ARE OF MINIMUM 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.



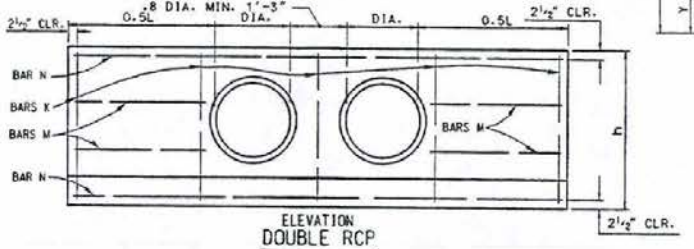
PLAN
SINGLE RCP



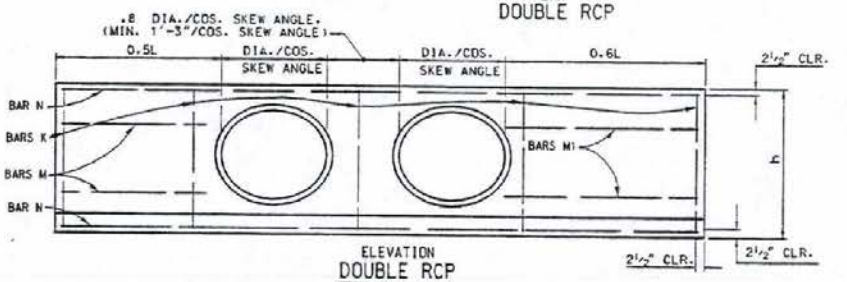
SECTION
(FOR ALL HEADWALLS)



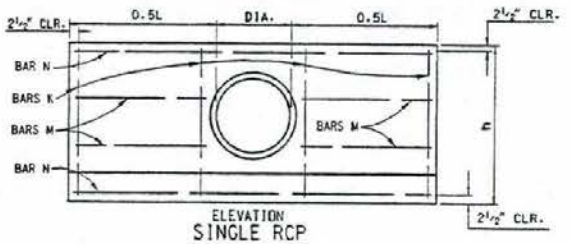
PLAN
DOUBLE RCP



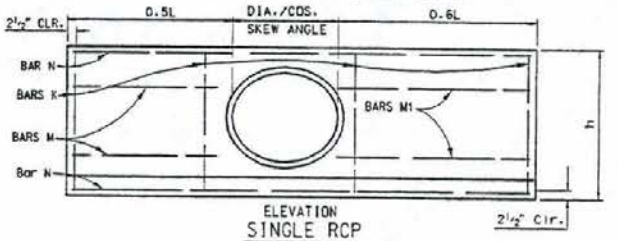
ELEVATION
DOUBLE RCP



ELEVATION
DOUBLE RCP



ELEVATION
SINGLE RCP
0° SKEW



ELEVATION
SINGLE RCP
15° TO 45° SKEW

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS

12" RCP TO 36"RCP

R-2.5.1 (502)

ADOPTED: 8/69 REVISION 10/94

R-19

QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS.

RCP SIZE DIA.	RCP AREA SQ.FT.	SINGLE RCP 0° SKEW CONC. CU. YD.	0° SKEW STEEL LB.	15° SKEW CONC. CU. YD.	15° SKEW STEEL LB.	30° SKEW CONC. CU. YD.	30° SKEW STEEL LB.	45° SKEW CONC. CU. YD.	45° SKEW STEEL LB.	DOUBLE RCP 0° SKEW CONC. CU. YD.	0° SKEW STEEL LB.	15° SKEW CONC. CU. YD.	15° SKEW STEEL LB.	30° SKEW CONC. CU. YD.	30° SKEW STEEL LB.	45° SKEW CONC. CU. YD.	45° SKEW STEEL LB.	X	Y	L	h
42"	9.62	6.10	571	6.66	624	6.76	627	6.98	666	8.18	692	8.80	748	9.15	790	9.91	877	1'-0¼"	2'-0¼"	12'-0"	6'-6½"
48"	12.57	7.41	688	8.10	745	8.21	781	8.46	792	9.88	829	10.65	889	11.07	935	11.96	1030	1'-1"	2'-1"	13'-9"	7'-2"
54"	15.90	9.81	990	10.71	1091	10.87	1096	11.21	1146	13.11	1236	14.12	1340	14.68	1395	15.86	1562	1'-1½"	2'-1½"	15'-6"	7'-9"
60"	19.64	11.29	1137	12.32	1244	12.50	1250	12.88	1332	15.08	1407	16.25	1537	16.88	1596	18.25	1774	1'-2"	2'-2"	17'-0"	8'-4"
72"	28.27	15.62	1825	17.05	2002	17.30	2045	17.83	2170	20.87	2247	22.48	2464	23.36	2596	25.26	2881	1'-3"	2'-3"	20'-3"	9'-6"

QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL.

LENGTH OF REINFORCING BARS

SINGLE RCP

RCP SIZE DIA.	0°SKEW NO.5 F	NO.5 G	NO.4 M	NO.4 N	NO.4 K	15°SKEW NO.5 F	NO.5 G	NO.4 M	NO.4 M1	NO.4 N	NO.4 K
42"	12e3'-9"	10e7'-6"	12e5'-5"	9e15'-3"	10e5'-8"	13e3'-9"	11e7'-6"	6e6'-3"	6e6'-6"	9e16'-7"	11e5'-8"
48"	13e2'-9"	12e0'-1"	12e6'-1"	9e17'-6"	12e6'-3"	14e2'-9"	13e6'-1"	6e6'-1"	6e7'-5"	9e15'-0"	13e6'-3"
54"	21e3'-9"	16e9'-1"	16e7'-1"	10e19'-9"	12e6'-10"	23e3'-9"	18e9'-1"	8e6'-11"	8e8'-5"	10e21'-6"	13e6'-10"
60"	23e3'-9"	18e9'-8"	16e7'-9"	10e21'-9"	14e7'-5"	25e3'-9"	20e9'-8"	8e7'-7"	8e9'-4"	10e23'-8"	15e7'-5"
72"	27e4'-6"	30e11'-7"	20e9'-11"	12e26'-0"	16e8'-7"	29e4'-6"	33e11'-7"	10e5'-2"	10e11'-3"	12e28'-3"	18e8'-7"

RCP SIZE DIA.	30°SKEW NO.5 F	NO.5 G	NO.4 M	NO.4 M1	NO.4 N	NO.4 K	45°SKEW NO.5 F	NO.5 G	NO.4 M	NO.4 M1	NO.4 N	NO.4 K
42"	13e2'-6"	11e7'-6"	6e5'-1"	6e6'-6"	9e17'-0"	11e5'-8"	14e2'-9"	12e7'-6"	6e4'-11"	6e6'-6"	9e7'-11"	12e5'-8"
48"	14e2'-6"	13e6'-1"	6e5'-11"	6e7'-5"	9e19'-6"	13e6'-3"	15e2'-9"	14e6'-1"	6e5'-9"	6e7'-5"	9e20'-6"	14e6'-3"
54"	23e3'-0"	18e9'-1"	8e6'-9"	8e8'-5"	10e22'-0"	13e6'-10"	24e3'-9"	19e9'-1"	8e6'-7"	8e8'-5"	10e23'-2"	14e6'-10"
60"	25e3'-0"	20e9'-8"	8e7'-5"	8e9'-4"	10e24'-3"	15e7'-5"	27e3'-9"	22e9'-8"	8e7'-3"	8e9'-4"	10e25'-4"	16e7'-5"
72"	30e4'-6"	34e11'-7"	10e9'-0"	10e11'-3"	12e29'-0"	18e8'-7"	32e4'-6"	37e11'-7"	10e8'-10"	10e11'-3"	12e30'-6"	19e8'-7"

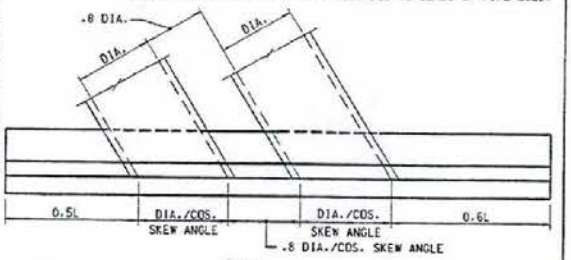
DOUBLE RCP

RCP SIZE DIA.	0°SKEW NO.5 F	NO.5 G	NO.4 M	NO.4 M1	NO.4 N	NO.4 K	15°SKEW NO.5 F	NO.5 G	NO.4 M	NO.4 M1	NO.4 N	NO.4 K
42"	16e2'-9"	11e7'-6"	12e5'-5"	9e21'-6"	11e5'-8"	17e2'-9"	12e7'-6"	6e6'-3"	6e6'-6"	9e23'-1"	12e5'-8"	18e2'-9"
48"	18e2'-9"	13e6'-1"	12e6'-3"	9e24'-9"	13e6'-3"	19e2'-9"	14e6'-1"	6e6'-1"	6e7'-5"	9e26'-6"	14e6'-3"	20e2'-9"
54"	29e3'-9"	19e9'-1"	16e7'-0"	10e27'-10"	14e6'-10"	31e3'-9"	21e9'-1"	8e6'-11"	8e8'-5"	10e29'-10"	15e6'-10"	32e3'-9"
60"	32e3'-9"	21e9'-8"	16e7'-9"	10e30'-9"	14e7'-5"	35e3'-9"	24e9'-8"	8e7'-7"	8e9'-4"	10e33'-0"	16e7'-5"	36e3'-9"
72"	37e4'-6"	35e11'-7"	20e9'-11"	12e36'-10"	19e8'-7"	40e4'-6"	39e11'-7"	10e9'-2"	10e11'-3"	12e39'-6"	21e8'-7"	42e4'-6"

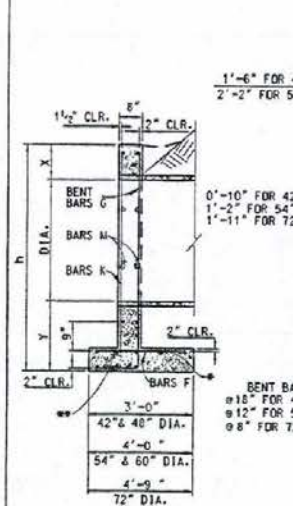
RCP SIZE DIA.	30°SKEW NO.5 F	NO.5 G	NO.4 M	NO.4 M1	NO.4 N	NO.4 K	45°SKEW NO.5 F	NO.5 G	NO.4 M	NO.4 M1	NO.4 N	NO.4 K
42"	13e7'-6"	6e5'-1"	6e6'-6"	9e24'-3"	13e5'-8"	20e2'-9"	15e7'-6"	6e4'-11"	6e6'-6"	9e26'-10"	15e5'-8"	20e2'-9"
48"	15e8'-6"	6e5'-11"	6e7'-5"	9e27'-10"	15e6'-3"	22e2'-9"	17e8'-1"	6e5'-9"	6e7'-5"	9e30'-9"	17e6'-3"	22e2'-9"
54"	22e9'-1"	8e6'-9"	8e8'-5"	10e31'-6"	16e6'-10"	36e3'-9"	26e9'-1"	8e6'-7"	8e8'-5"	10e34'-6"	18e6'-10"	40e3'-9"
60"	25e9'-8"	8e7'-5"	8e9'-4"	10e34'-8"	17e7'-5"	40e3'-9"	29e9'-8"	8e7'-3"	8e9'-4"	10e38'-3"	19e7'-5"	44e3'-9"
72"	39e11'-7"	10e9'-0"	10e11'-3"	12e41'-5"	22e8'-7"	46e4'-6"	48e11'-7"	10e8'-10"	10e11'-3"	12e45'-10"	25e8'-7"	52e4'-6"

GENERAL NOTES:

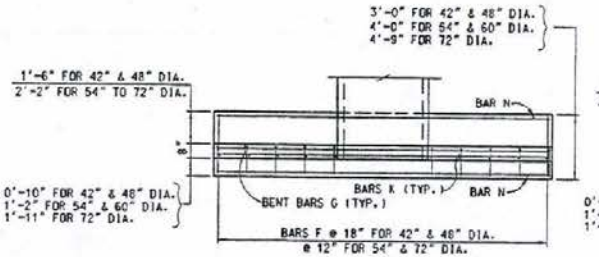
1. CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE DEFORMED BARS WITH MAXIMUM SPACING OF 18" SET 2 1/2" CLEAR OF SURFACE OF CONCRETE EXCEPT AS NOTED. BAR ENDS SHALL BE KEPT 1 1/2" CLEAR OF SURFACE OF CONCRETE. REINFORCING BARS MAY BE CUT AND BENT IN FIELD.
3. FOOTINGS SHOWN ARE OF MINIMUM 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.



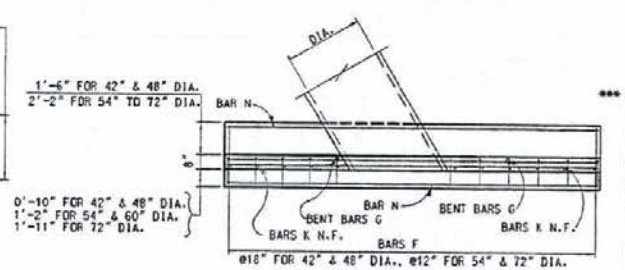
PLAN



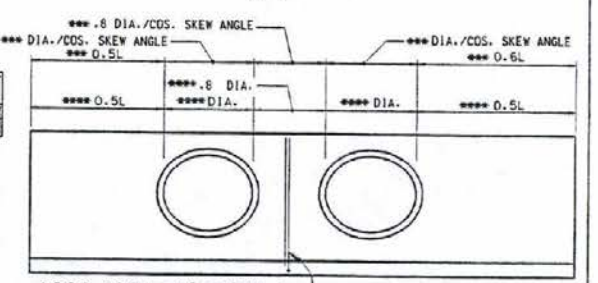
* - ADDITIONAL BAR N FOR 54" TO 72"DIA.
** - ADDITIONAL BARS N FOR 72"DIA.
SECTION



PLAN



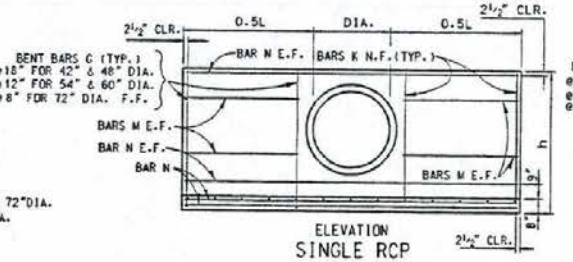
PLAN



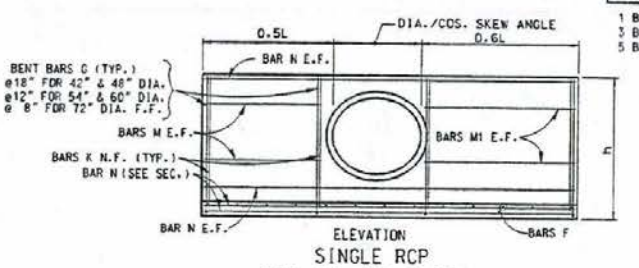
1 BAR G, 1 BAR K - 42" & 48" DIA.
3 BARS G, 2 BARS K - 54" & 60" DIA.
5 BARS G, 3 BARS K - 72" DIA.

*** - 15° TO 45° SKEW
**** - 0° TO 14° SKEW

ELEVATION
DOUBLE RCP
0° TO 45° SKEW



ELEVATION
SINGLE RCP
0° SKEW



ELEVATION
SINGLE RCP
15° TO 45° SKEW

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS

42" RCP TO 72"RCP

CHIEF ROAD DESIGN ENGR.

R-2.5.2 (502)
ADOPTED: 8/69 REVISION 8/97

QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS

CMAP SIZE S X R	CMP DIA.	CMAP AREA SQ. FT.	L	SINGLE CMAP 0° SKEW CONC. CU. YD.	0° SKEW STEEL LB.	15° SKEW CONC. CU. YD.	15° SKEW STEEL LB.	30° SKEW CONC. CU. YD.	30° SKEW STEEL LB.	45° SKEW CONC. CU. YD.	45° SKEW STEEL LB.	DOUBLE CMAP 0° SKEW CONC. CU. YD.	0° SKEW STEEL LB.	15° SKEW CONC. CU. YD.	15° SKEW STEEL LB.	30° SKEW CONC. CU. YD.	30° SKEW STEEL LB.	45° SKEW CONC. CU. YD.	45° SKEW STEEL LB.
17" X 13"	15"	1.1	3'-3"	0.87	35	0.94	37	0.97	38	1.03	39	1.30	48	1.38	51	1.46	53	1.64	57
21" X 15"	18"	1.6	3'-9"	1.05	40	1.13	42	1.17	43	1.24	45	1.54	55	1.64	58	1.74	60	1.94	65
24" X 18"	21"	2.3	4'-9"	1.45	50	1.53	54	1.58	54	1.67	55	1.99	66	2.13	69	2.24	72	2.47	78
28" X 20"	24"	2.9	5'-0"	1.51	59	1.64	63	1.68	64	1.79	66	2.13	77	2.29	81	2.40	84	2.67	90
35" X 24"	30"	4.4	6'-0"	1.93	70	2.09	74	2.15	75	2.28	79	2.67	91	2.86	95	3.00	99	3.32	106
42" X 29"	36"	6.4	7'-3"	2.49	101	2.70	107	2.78	109	2.94	112	3.41	126	3.66	132	3.84	136	4.24	145
49" X 33"	42"	8.5	8'-3"	2.99	114	3.25	120	3.34	122	3.52	127	4.10	143	4.39	150	4.61	155	5.08	165
57" X 38"	48"	11.4	9'-6"	3.69	130	4.00	137	4.10	140	4.33	145	5.03	163	5.39	171	5.66	177	6.24	189
64" X 43"	54"	14.5	10'-6"	4.27	156	4.63	164	4.75	166	5.01	172	5.82	199	6.24	208	6.55	214	7.21	228
71" X 47"	60"	17.5	11'-6"	4.90	184	5.32	194	5.45	197	5.74	204	6.66	231	7.14	242	7.49	249	8.24	265
77" X 52"	66"	21.2	12'-6"	5.83	214	6.33	225	6.48	228	6.82	235	8.35	263	8.46	275	8.88	284	9.74	302
83" X 57"	72"	25.0	13'-6"	6.61	246	7.18	254	7.35	260	7.72	267	9.44	294	9.57	308	10.00	319	10.98	339

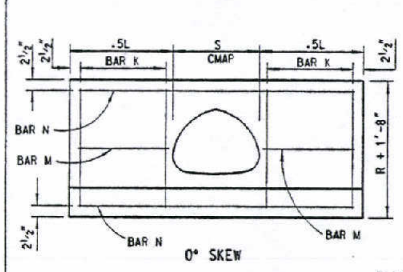
QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL

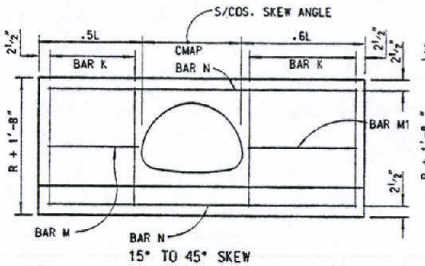
LENGTH OF REINFORCING BARS

CMP SIZE S X R	SINGLE CMAP 0°-45° NO. 4 K	SINGLE CMAP 0° NO. 5 N	SINGLE CMAP 15° NO. 5 N	SINGLE CMAP 30° NO. 5 N	SINGLE CMAP 45° NO. 5 N	SINGLE OR DOUBLE CMAP 0° NO. 4 M	SINGLE OR DOUBLE CMAP 15° NO. 4 M	SINGLE OR DOUBLE CMAP 15° NO. 4 M1	SINGLE OR DOUBLE CMAP 30° NO. 4 M	SINGLE OR DOUBLE CMAP 30° NO. 4 M1	SINGLE OR DOUBLE CMAP 45° NO. 4 M	SINGLE OR DOUBLE CMAP 45° NO. 4 M1	DOUBLE CMAP 0°-45° NO. 4 K	DOUBLE CMAP 0° NO. 5 N	DOUBLE CMAP 15° NO. 5 N	DOUBLE CMAP 30° NO. 5 N	DOUBLE CMAP 45° NO. 5 N
17" X 13"	4@ 2'-4"	2@ 4'-6"	2@ 4'-11"	2@ 5'-1"	2@ 5'-6"	2@ 1'-4"	1@ 1'-2"	1@ 1'-9"	1@ 1'-9"	1@ 1'-10"	1@ 0'-10"	1@ 2'-1"	5@ 2'-4"	2@ 7'-0"	2@ 7'-6"	2@ 7'-11"	2@ 9'-0"
21" X 15"	4@ 2'-6"	2@ 5'-4"	2@ 5'-9"	2@ 6'-0"	2@ 6'-6"	2@ 1'-7"	1@ 1'-5"	1@ 2'-1"	1@ 1'-4"	1@ 2'-2"	1@ 1'-1"	1@ 2'-5"	5@ 2'-6"	2@ 8'-2"	2@ 8'-8"	2@ 9'-3"	2@ 10'-6"
24" X 18"	6@ 2'-9"	2@ 6'-6"	2@ 7'-1"	2@ 7'-2"	2@ 7'-9"	2@ 2'-1"	1@ 2'-1"	1@ 2'-7"	1@ 2'-1"	1@ 2'-7"	1@ 2'-1"	1@ 2'-7"	7@ 2'-9"	2@ 9'-6"	2@ 10'-1"	2@ 10'-6"	2@ 11'-6"
28" X 20"	6@ 2'-11"	2@ 7'-2"	2@ 7'-8"	2@ 8'-0"	2@ 8'-8"	2@ 2'-3"	1@ 2'-4"	1@ 2'-10"	1@ 2'-3"	1@ 2'-11"	1@ 2'-3"	1@ 3'-2"	7@ 2'-11"	2@ 10'-7"	2@ 11'-4"	2@ 12'-0"	2@ 13'-6"
35" X 24"	6@ 3'-3"	2@ 8'-0"	2@ 9'-6"	2@ 9'-10"	2@ 10'-7"	2@ 2'-6"	1@ 2'-7"	1@ 3'-6"	1@ 2'-6"	1@ 3'-7"	1@ 2'-6"	1@ 3'-10"	7@ 3'-3"	2@ 12'-9"	2@ 13'-7"	2@ 14'-5"	2@ 16'-3"
42" X 29"	8@ 3'-8"	2@ 10'-7"	2@ 11'-5"	2@ 11'-10"	2@ 12'-8"	4@ 3'-4"	2@ 3'-2"	2@ 4'-2"	2@ 3'-1"	2@ 4'-3"	2@ 2'-10"	2@ 4'-6"	9@ 3'-8"	2@ 15'-4"	2@ 16'-5"	2@ 17'-4"	2@ 19'-6"
49" X 33"	8@ 4'-0"	2@ 12'-2"	2@ 13'-2"	2@ 13'-8"	2@ 14'-8"	4@ 3'-10"	2@ 3'-8"	2@ 4'-8"	2@ 3'-7"	2@ 4'-10"	2@ 3'-4"	2@ 5'-1"	9@ 4'-0"	2@ 17'-8"	2@ 18'-11"	2@ 20'-1"	2@ 22'-7"
57" X 38"	8@ 4'-5"	2@ 14'-1"	2@ 15'-2"	2@ 15'-9"	2@ 17'-0"	4@ 4'-6"	2@ 4'-4"	2@ 5'-7"	2@ 4'-3"	2@ 5'-8"	2@ 4'-0"	2@ 5'-11"	9@ 4'-5"	2@ 20'-6"	2@ 21'-11"	2@ 23'-3"	2@ 26'-2"
64" X 43"	10@ 4'-9"	2@ 15'-8"	2@ 16'-11"	2@ 17'-7"	2@ 19'-0"	4@ 5'-0"	2@ 4'-10"	2@ 6'-2"	2@ 4'-9"	2@ 6'-3"	2@ 4'-6"	2@ 6'-6"	12@ 4'-9"	2@ 22'-10"	2@ 24'-5"	2@ 25'-11"	2@ 29'-2"
71" X 47"	10@ 5'-1"	2@ 17'-3"	2@ 18'-7"	2@ 19'-4"	2@ 20'-11"	6@ 3'-6"	3@ 3'-4"	3@ 4'-8"	3@ 3'-3"	3@ 4'-10"	3@ 3'-0"	3@ 4'-11"	12@ 5'-1"	2@ 25'-3"	2@ 26'-11"	2@ 28'-7"	2@ 32'-3"
77" X 52"	10@ 5'-9"	2@ 19'-3"	2@ 20'-8"	2@ 21'-6"	2@ 23'-1"	6@ 3'-7"	3@ 3'-7"	3@ 4'-7"	3@ 3'-7"	3@ 4'-10"	3@ 3'-3"	3@ 5'-1"	12@ 5'-8"	2@ 27'-6"	2@ 28'-11"	2@ 31'-4"	2@ 35'-2"
83" X 57"	10@ 6'-2"	2@ 20'-8"	2@ 22'-3"	2@ 23'-2"	2@ 24'-11"	6@ 3'-9"	3@ 3'-9"	3@ 4'-2"	3@ 3'-9"	3@ 4'-2"	3@ 3'-6"	3@ 4'-2"	12@ 6'-2"	2@ 29'-11"	2@ 31'-11"	2@ 33'-9"	2@ 38'-0"

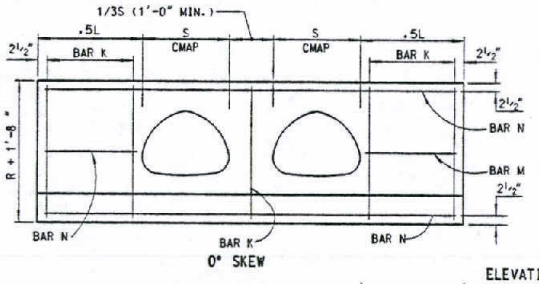
GENERAL NOTES:

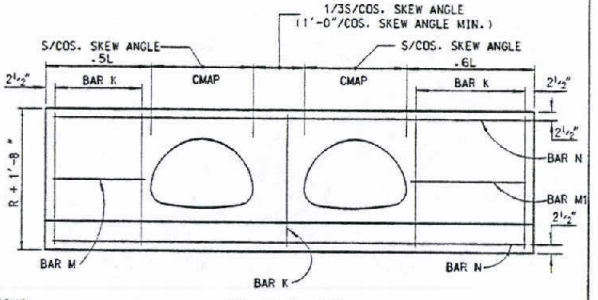
1. CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE DEFORMED BARS WITH MAXIMUM SPACING OF 18" SET 2 1/2" CLEAR OF SURFACE OF CONCRETE EXCEPT AS NOTED. BAR ENDS SHALL BE KEPT 1 1/2" CLEAR OF SURFACE OF CONCRETE. REINFORCING BARS MAY BE CUT AND BENT IN FIELD.
3. FOOTINGS SHOWN ARE OF MINIMUM 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.



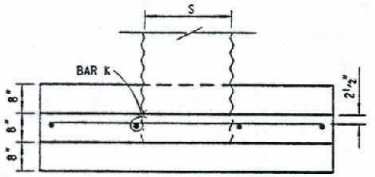


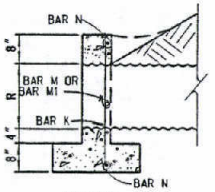
ELEVATIONS

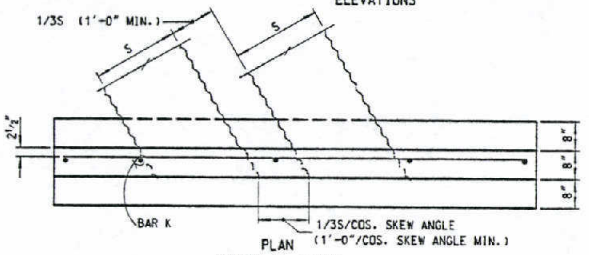




ELEVATIONS







STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS

17" X 13" CMAP TO 83" X 57"CMAP

CHIEF ROAD DESIGN ENGR.

R-2.6.1 (502)
ADOPTED: 8/69 REVISION 8/97

R-21

QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS.

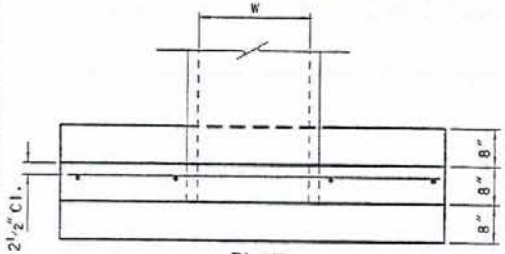
OVAL RCP SIZE W X H	RCP SIZE	OVAL RCP AREA SQ.FT	SINGLE OVAL RCP 0° SKEW CONC. CU. YD.	0° SKEW STEEL LB.	15° SKEW CONC. CU. YD.	15° SKEW STEEL LB.	30° SKEW CONC. CU. YD.	30° SKEW STEEL LB.	45° SKEW CONC. CU. YD.	45° SKEW STEEL LB.	DOUBLE OVAL RCP 0° SKEW CONC. CU. YD.	0° SKEW STEEL LB.	15° SKEW CONC. CU. YD.	15° SKEW STEEL LB.	30° SKEW CONC. CU. YD.	30° SKEW STEEL LB.	45° SKEW CONC. CU. YD.	45° SKEW STEEL LB.	X	Y	L	h
23"x14"	18"	1.82	1.37	57	1.49	60	1.52	61	1.60	63	1.94	74	2.08	77	2.18	80	2.40	86	10 3/4"	1'-0 3/4"	4'-9"	3'-3 1/2"
30"x19"	24"	3.21	1.95	79	2.13	82	2.17	83	2.27	86	2.64	98	2.85	103	2.97	106	3.25	113	11 1/4"	1'-3 1/4"	6'-3"	3'-9 1/2"
34"x22"	27"	4.20	2.30	87	2.50	92	2.55	93	2.66	96	3.11	110	3.34	116	3.49	119	3.81	127	11 1/2"	1'-3 1/2"	7'-0"	4'-1"
38"x24"	30"	5.15	2.57	93	2.79	99	2.85	100	2.98	104	3.49	119	3.75	125	4.07	129	4.26	137	11 3/4"	1'-3 3/4"	7'-6"	4'-3 1/2"
42"x27"	33"	6.39	2.94	113	3.20	120	3.26	121	3.40	125	4.00	141	4.30	148	4.49	153	4.91	162	11 3/4"	1'-3 3/4"	8'-3"	4'-6 1/2"
45"x29"	36"	7.37	3.31	122	3.53	128	3.68	130	3.82	134	4.48	152	4.81	159	5.04	164	5.47	174	1'-0 1/2"	1'-4 1/2"	9'-0"	4'-10"
53"x34"	42"	10.15	4.06	164	4.42	173	4.50	175	4.68	180	5.48	199	5.90	209	6.14	214	6.69	226	1'-1"	1'-0"	10'-3"	5'-4"
60"x38"	48"	12.86	4.81	182	5.24	192	5.33	194	5.54	199	6.49	221	6.98	231	7.26	238	7.90	251	1'-1 1/2"	1'-5 1/2"	11'-6"	5'-9"

QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL.

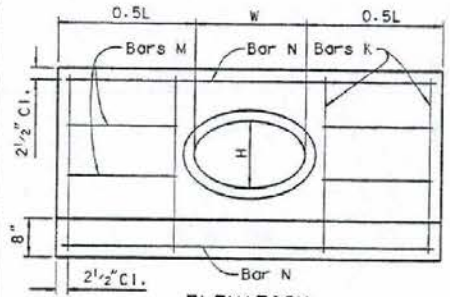
OVAL RCP SIZE W & H	LENGTH OF REINFORCING BARS SINGLE OVAL RCP 0°-45° No.4 K	0° No.5 N	15° No.5 N	30° No.5 N	45° No.5 N	SINGLE OR DOUBLE OVAL RCP 0° No.4 M	15° No.4 M	15° M1	30° No.4 M	30° M1	45° No.4 M	45° M1	DOUBLE OVAL RCP 0°-45° No.4 K	0° No.5 N	15° No.5 N	30° No.5 N	45° No.5 N
23"x14"	6@3'-1"	2@6'-5"	2@7'-0"	2@7'-2"	2@7'-8"	2@1'-11"	1@1'-8"	1@2'-6"	1@1'-8"	1@2'-7"	1@1'-5"	1@2'-10"	7@3'-1"	2@9'-7"	2@10'-3"	2@10'-10"	2@12'-2"
30"x19"	6@3'-6"	2@8'-6"	2@9'-3"	2@9'-6"	2@10'-2"	4@2'-7"	2@2'-5"	2@3'-3"	2@2'-4"	2@3'-4"	2@2'-1"	2@3'-7"	7@3'-6"	2@12'-3"	2@13'-1"	2@13'-11"	2@15'-6"
34"x22"	6@3'-10"	2@9'-7"	2@10'-4"	2@10'-9"	2@11'-5"	4@3'-0"	2@2'-10"	2@3'-9"	2@2'-8"	2@3'-10"	2@2'-6"	2@4'-1"	7@3'-10"	2@13'-11"	2@14'-10"	2@15'-8"	2@17'-6"
38"x24"	6@4'-1"	2@10'-5"	2@11'-3"	2@11'-8"	2@12'-6"	4@3'-2"	2@3'-0"	2@4'-0"	2@2'-11"	2@4'-1"	2@2'-8"	2@4'-4"	7@4'-1"	2@15'-2"	2@16'-3"	2@17'-2"	2@19'-3"
42"x27"	8@4'-4"	2@11'-6"	2@12'-5"	2@12'-11"	2@13'-9"	4@3'-7"	2@3'-5"	2@4'-6"	2@3'-6"	2@4'-9"	2@3'-3"	2@5'-0"	9@4'-4"	2@16'-10"	2@17'-11"	2@19'-0"	2@21'-3"
45"x29"	8@4'-7"	2@12'-6"	2@13'-6"	2@14'-0"	2@14'-11"	4@3'-10"	2@3'-8"	2@4'-9"	2@3'-7"	2@4'-10"	2@3'-4"	2@5'-1"	9@4'-7"	2@18'-2"	2@19'-5"	2@20'-7"	2@23'-0"
53"x34"	10@5'-1"	2@14'-5"	2@15'-7"	2@16'-2"	2@17'-3"	6@4'-6"	3@4'-4"	3@5'-7"	3@4'-3"	3@5'-8"	3@4'-0"	3@5'-11"	11@5'-1"	2@21'-1"	2@22'-6"	2@23'-10"	2@26'-9"
60"x38"	10@5'-6"	2@16'-3"	2@17'-7"	2@18'-2"	2@19'-6"	6@5'-1"	3@4'-11"	3@6'-3"	3@4'-10"	3@6'-4"	3@4'-7"	3@6'-7"	11@5'-6"	2@23'-9"	2@25'-5"	2@26'-10"	2@30'-2"

GENERAL NOTES:

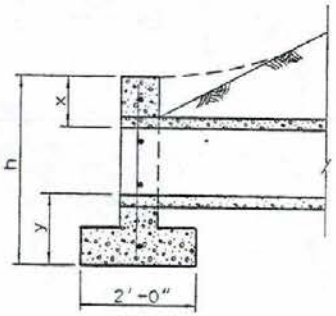
1. CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE DEFORMED BARS WITH MAXIMUM SPACING OF 18" SET 2 1/2" CLEAR OF SURFACE OF CONCRETE EXCEPT AS NOTED. BAR ENDS SHALL BE KEPT 1 1/2" CLEAR OF SURFACE OF CONCRETE. REINFORCING BARS MAY BE CUT AND BENT IN FIELD.
3. FOOTINGS SHOWN ARE OF MINIMUM 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.



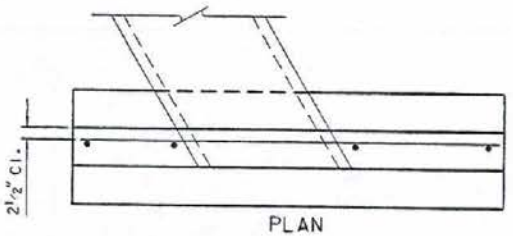
PLAN



ELEVATION
SINGLE OVAL RCP
0° SKEW



SECTION
(FOR ALL HEADWALLS)



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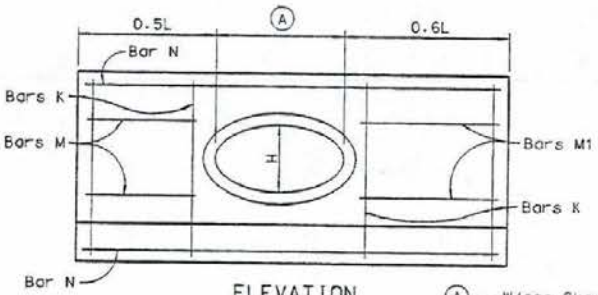
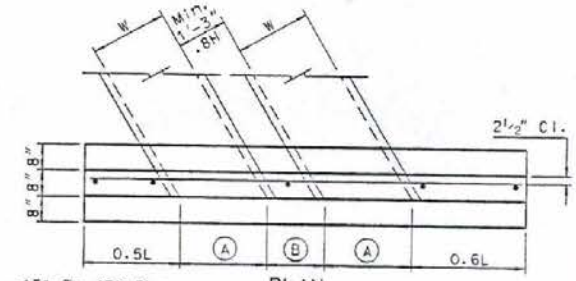
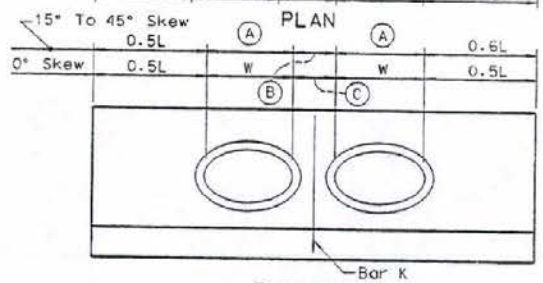


ELEVATION
SINGLE OVAL RCP
15° TO 45° SKEW



PLAN



ELEVATION
DOUBLE OVAL RCP
0° TO 45° SKEW

NOTE: For Reinforcing Not Shown See Single Culvert Headwalls.

(A) — W/cos Skew Angle
(B) — .8H/cos Skew Angle, Min. 1'-3"/cos Skew Angle
(C) — .8H at Right Angle to Pipe

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS 23"x14" OVAL RCP TO 60"x38" OVAL RCP

CHIEF ROAD DESIGN ENGR. | R-2.7.1 (502) | ADOPTED: 8/69 | REVISION 12-94

R-22

QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS.

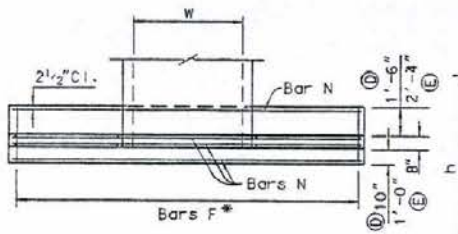
OVAL RCP SIZE W X H	RCP SIZE	OVAL RCP AREA SQ.FT	SINGLE OVAL RCP 0° SKEW CONC. CU. YD.	0° SKEW STEEL LB.	15° SKEW CONC. CU. YD.	15° SKEW STEEL LB.	30° SKEW CONC. CU. YD.	30° SKEW STEEL LB.	45° SKEW CONC. CU. YD.	45° SKEW STEEL LB.	DOUBLE OVAL RCP 0° SKEW CONC. CU. YD.	0° SKEW STEEL LB.	15° SKEW CONC. CU. YD.	15° SKEW STEEL LB.	30° SKEW CONC. CU. YD.	30° SKEW STEEL LB.	45° SKEW CONC. CU. YD.	45° SKEW STEEL LB.	X	Y	L	h
68"x43"	54"	16.62	7.19	628	7.82	683	7.98	720	8.34	767	9.86	789	10.56	848	11.07	897	12.11	1031	1'-2½"	2'-2 "	12'-9"	6'-11"
76"x48"	60"	20.55	8.39	746	9.13	805	9.32	813	9.71	889	11.47	921	12.31	985	13.06	1075	15.66	1207	1'-2½"	2'-2½"	14'-3"	7'-5"
91"x58"	72"	29.71	12.11	1168	13.18	1273	13.43	1321	14.02	1412	16.59	1495	17.82	1616	16.61	1730	20.36	1965	1'-3½"	2'-3½"	17'-0"	8'-5"

QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL.

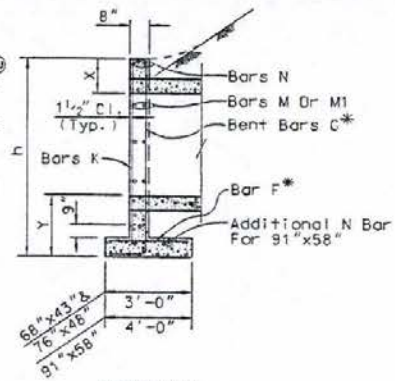
OVAL RCP SIZE W & H	LENGTH OF REINFORCING BARS SINGLE OVAL RCP 0° SKEW No. 5 F	No. 5 G	No. 4 M	No. 4 N	No. 4 K	15° Skew No. 5 F	No. 5 G	No. 4 M	No. 4 M1	No. 4 N	No. 4 K	30° SKEW No. 5 F	No. 5 G	No. 4 M	No. 4 M1	No. 4 N	No. 4 K	45° SKEW No. 5 F	No. 5 G	No. 4 M	No. 4 M1	No. 4 N	No. 4 K
68"x43"	13@2'-9"	10@7'-10"	12@5'-8"	9@18'-2"	10@6'-0"	14@2'-9"	12@7'-10"	6@5'-6"	6@6'-10"	9@19'-8"	11@6'-0"	15@2'-9"	12@7'-10"	6@5'-4"	6@5'-10"	9@20'-4"	12@6'-0"	16@2'-5"	13@7'-10"	6@5'-2"	6@6'-10"	9@21'-10"	13@6'-0"
76"x48"	15@2'-5"	12@8'-4"	12@6'-4"	9@20'-4"	12@6'-6"	16@2'-5"	13@8'-4"	6@6'-2"	6@7'-7"	9@22'-0"	13@6'-6"	16@2'-9"	13@8'-4"	6@6'-0"	6@7'-7"	9@22'-5"	13@6'-6"	17@2'-5"	15@8'-4"	6@5'-10"	6@7'-7"	9@24'-5"	15@6'-6"
91"x58"	25@3'-9"	18@9'-8"	16@7'-7"	10@20'-4"	12@7'-6"	27@3'-9"	20@9'-8"	8@7'-5"	8@9'-1"	10@26'-4"	13@7'-6"	28@3'-9"	21@9'-8"	8@7'-3"	8@9'-1"	10@27'-9"	14@7'-6"	30@3'-5"	23@9'-8"	8@7'-1"	8@9'-1"	10@29'-2"	15@7'-6"
DOUBLE OVAL RCP																							
68"x43"	19@2'-9"	11@7'-10"	12@6'-8"	9@26'-8"	11@6'-0"	20@2'-9"	12@7'-10"	6@5'-6"	6@6'-10"	9@28'-6"	12@6'-0"	21@2'-5"	13@7'-10"	6@5'-4"	6@6'-11"	9@30'-2"	13@6'-0"	24@2'-9"	16@7'-10"	6@5'-2"	6@6'-10"	9@33'-10"	16@6'-0"
76"x48"	21@2'-9"	13@8'-4"	12@6'-4"	9@29'-10"	13@6'-6"	22@2'-9"	14@8'-4"	6@6'-2"	6@7'-7"	9@31'-10"	14@6'-6"	24@2'-9"	16@8'-4"	6@6'-0"	6@7'-7"	9@34'-2"	13@6'-6"	26@2'-9"	19@8'-4"	6@5'-10"	6@7'-7"	9@37'-10"	19@6'-6"
91"x58"	37@3'-9"	21@9'-8"	16@7'-7"	10@35'-8"	14@7'-6"	39@3'-9"	23@9'-8"	8@7'-5"	8@9'-1"	10@38'-2"	16@7'-6"	41@3'-5"	26@9'-8"	8@7'-3"	8@9'-1"	10@40'-5"	17@7'-6"	46@3'-9"	31@9'-8"	8@7'-1"	8@9'-1"	10@45'-4"	20@7'-6"

GENERAL NOTES:

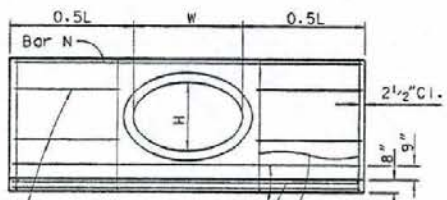
1. CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE DEFORMED BARS WITH MAXIMUM SPACING OF 18" SET 2 1/2" CLEAR OF SURFACE OF CONCRETE EXCEPT AS NOTED. BAR ENDS SHALL BE KEPT 1 1/2" CLEAR OF SURFACE OF CONCRETE. REINFORCING BARS MAY BE CUT AND BENT IN FIELD.
3. FOOTINGS SHOWN ARE OF MINIMUM 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.



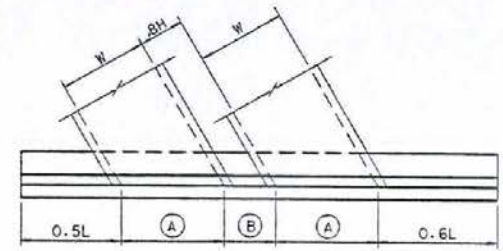
PLAN



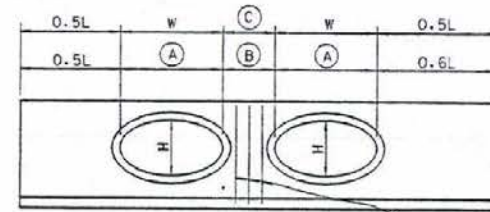
SECTION
(FOR ALL HEADWALLS)



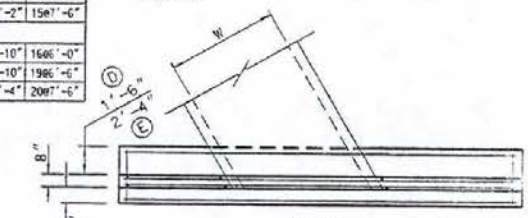
ELEVATION
SINGLE OVAL RCP
0° SKEW



PLAN



ELEVATION
DOUBLE OVAL RCP
15° TO 45° SKEW



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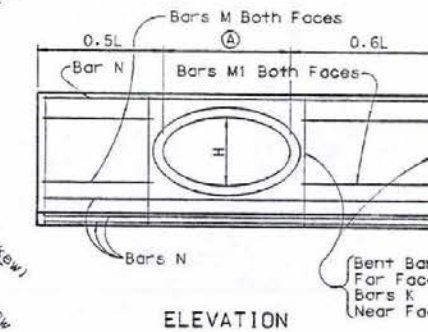


ELEVATION
SINGLE OVAL RCP
0° TO 45° SKEW

Ⓐ — W/cos Skew Angle

Ⓑ — .8H/cos Skew Angle

Ⓒ — .8H at Right Angle to Pipe

Ⓓ — For 68"x43" & 76"x48"

Ⓔ — For 91"x58"

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

0° TO 45° SKEW
Add 1-G Bar & 1-K Bar for 68"x43" & 76"x48"
Add 3-G Bars & 2-K Bars for 91"x58"

*-@18" ctrs. 68"x43" & 76"x48" @ 12" ctrs. 91"x58"

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

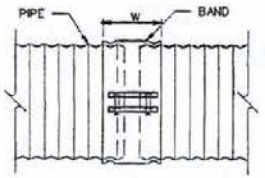
CULVERT HEADWALLS 68"x43" OVAL RCP TO 91"x58" OVAL RCP

CHIEF ROAD DESIGN ENGR.

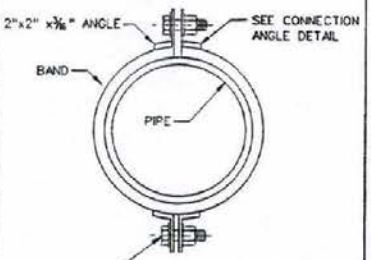
R-2.7.2 (502)

ADOPTED: 8/69 REVISION 8/97

R-23

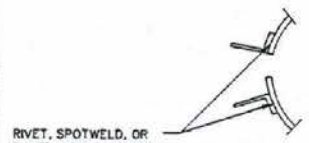


SIDE VIEW



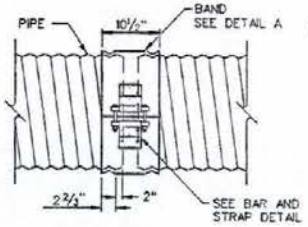
END VIEW

ANNULAR COUPLING BAND

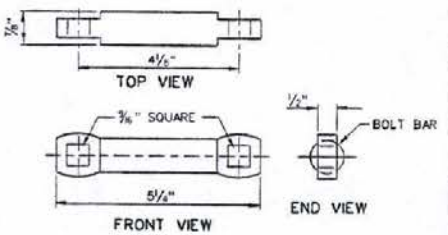


CONNECTION ANGLE DETAIL

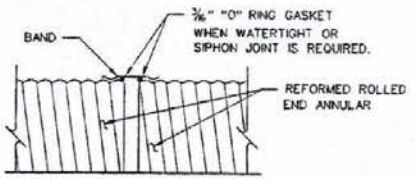
ANNULAR COUPLING BAND			
CORRIGATION	PIPE SIZE	"W" (IN MIN.)	½" BOLTS (NO. EACH CONNECTION)
2 2/3" x½"	THRU 30"	7	2
2 2/3" x½"	THRU 60"	12	3
2 2/3" x½"	THRU 84"	24	5
3"x1"	54" THRU 60"	14	3
3"x1"	THRU 96"	26	5



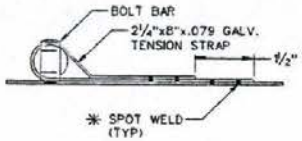
SIDE VIEW



BAR DETAIL

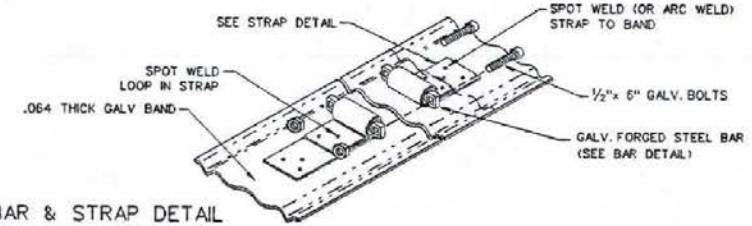


DETAIL A



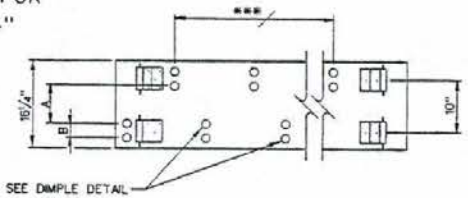
* SPOT WELDS SHALL DEVELOP FULL STRENGTH OF STRAP

STRAP DETAIL



BAR & STRAP DETAIL

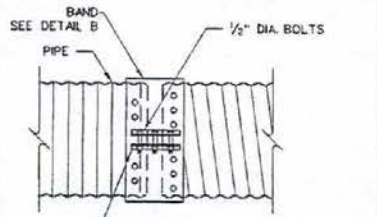
ALTERNATIVE ANNULAR COUPLING BAND FOR HCMP THRU 84"



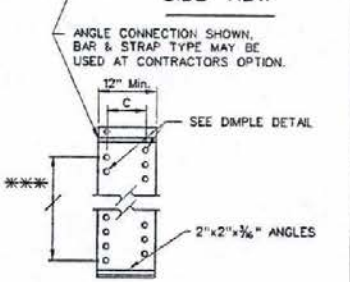
UNIVERSAL COUPLING BAND FOR USE ON 42" THRU 60" CMP INCLUSIVE

DIMENSION A: AS REQUIRED TO FIT HELIX ANGLE, 7" MIN.
DIMENSION B: AS REQUIRED TO FIT HELIX ANGLE, 2 2/3" MIN.
ONE PIECE BAND OPTIONAL ON 42" DIAMETER.
TWO PIECE BAND REQUIRED ABOVE 42" DIAMETER.

COUPLING BAND FOR HELICAL WELD SEAM ONLY

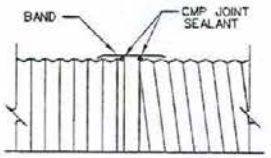


SIDE VIEW



BAND DETAIL

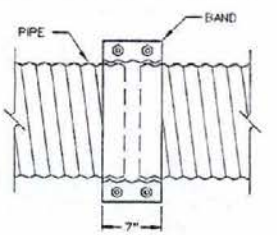
DIMENSION "C": 7" MIN. BETWEEN DIMPLES, AS REQUIRED TO FIT THE HELIX ANGLES.



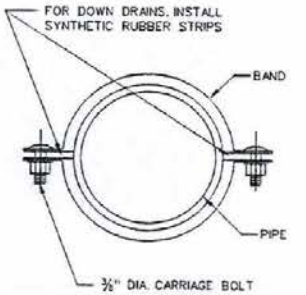
DETAIL B

NOTE: FOR HMCP DOWN DRAINS AND SLOTTED DRAINS

** UNIVERSAL COUPLING BAND FOR USE ON CMP THRU 36" INCLUSIVE

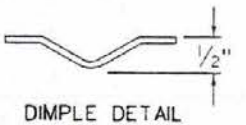


TOP VIEW



END VIEW

** TWO PIECE INTEGRAL FLANGE DIE FORMED FOR USE ON 6", 8", AND 10" HCMP



DIMPLE DETAIL

*** 8 SPACES AS REQUIRED TO FIT HELIX ANGLE.

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

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 ⅛" THK x 1½" WIDE x 5" LONG IN LAP BETWEEN BANDS.
4. FOR ALTERNATIVE ANNULAR COUPLING BAND, 2 BAR AND STRAP ASSEMBLIES ARE REQUIRED FOR PIPE GREATER THAN 42" DIA., OPTIONAL FOR SIZES LESS THAN 42".

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

COUPLING BAND DETAILS CMP AND PIPE ARCHES

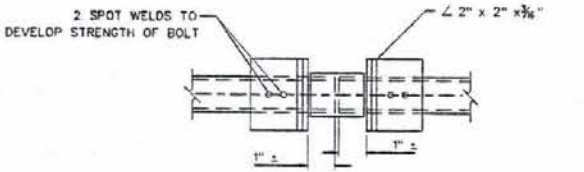
CHIEF ROAD DESIGN ENGR. ADOPTED: 6/71

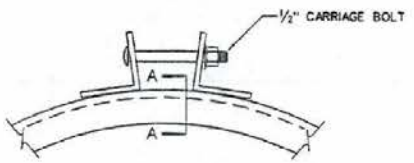
R-2.8.1 (604)

REVISION 8/97

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

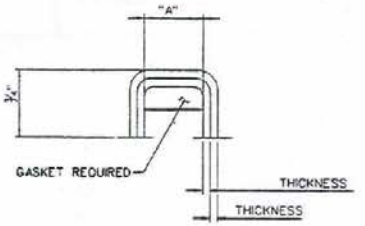
COUPLING TYPE	CORRUGATION	PIPE SIZE	*W OR A	BAR & STRAP: THICKNESS PIPE WALL	BAR & STRAP: THICKNESS BAND	BAR & STRAP: THICKNESS STRAP	BAR & STRAP: BOLTS (DIA.)	BAR & STRAP: BAR (DIA.)	BAR & STRAP: BAR YIELD STRENGTH (P.S.I.)	ANGLE: DIMENSIONS	ANGLE: BOLTS	ANGLE: RIVETS ANGLE TO BAND	ANGLE: SPOT WELDS ANGLE TO BAND	WEDGE & STRAP: THICKNESS STRAP	WEDGE & STRAP: THICKNESS WEDGE
TWO PIECE INTEGRAL FLANGE	½" x ¼"	6" THRU 10"	7"	0.064 - 0.079	0.064						2 - ⅜"				
		12" THRU 18"	7" OR 12"												
UNIVERSAL	2⅔" x ½"	THRU 36"	12"	0.064 - 0.138	0.064									0.079	0.138
		THRU 36"	12"	0.064 - 0.138	0.064	0.079	½"	⅞"	32,000	2" x 2" x 3/16"	3 - ½"	3 - ⅜"	5 - ½"		
		42" THRU 60"	16¼"	0.064 - 0.168	0.064	DBL 0.079	½"	⅞"	32,000						
ANNULAR	2⅔" x ½"	THRU 36"	12"	0.064 - 0.138	0.064					2" x 2" x 3/16"	3 - ½"	3 - ⅜"	5 - ½"		
		42" THRU 60"	12"	0.064 - 0.079	0.064					2" x 2" x 5/16"	3 - ½"	3 - ⅜"	5 - ½"		
		42" THRU 60"	12"	0.064 - 0.168	0.064					2" x 2" x 3/16"	3 - ½"	5 - ⅜"			
		66" THRU 84"	24"	0.109 - 0.168	0.064					2" x 2" x 5/16"	5 - ½"	7 - ⅜"			
	3" x 1"	48" THRU 60"	14"	0.064 - 0.079	0.064					2" x 2" x 3/16"	3 - ½"	3 - ⅜"	5 - ½"		
		48" THRU 60"	14"	0.109	0.064					2" x 2" x 5/16"	3 - ½"	5 - ⅜"			
		66" THRU 120"	25"	0.064 - 0.079	0.064					2" x 2" x 5/16"	5 - ½"	9 - ⅜"			
CHANNEL	2⅔" x ½"	THRU 24"	¾"	0.064 - 0.079	0.079	0.079	½"	⅞"	32,000	2" x 2" x 5/16"	1 - ½"	SEE NOTE 8			
		30" THRU 42"	¾"	0.064 - 0.079	0.079	0.079	½"	⅞"	32,000						
		30" THRU 42"	1"	0.109	0.109	0.079	½"	⅞"	32,000						
		48" THRU 54"	1"	0.064 - 0.079	0.109	0.079	½"	⅞"	32,000						





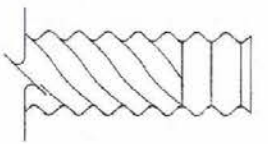
CHANNEL COUPLING BAND
FOR USE ON FLANGED END CMP

(CHANNEL COUPLING BAND SHALL BE TWO PIECE)



NOMINAL DIMENSIONS		
THICKNESS	"A"	FOR USE WITH CMP
0.079"	¾"	0.079" THICK OR LIGHTER
0.109"	1"	0.138" THICK OR HEAVIER

SECTION A-A



SPIRAL CMP

REFORMED TO ACCEPT UNIVERSAL, ANNULAR, AND CHANNEL COUPLERS

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 42" 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 1-1/4" 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 2" LONG WITH 0.064" X 2" STRAP.
9. FILLET WELDS OF EQUIVALENT STRENGTH MAY BE SUBSTITUTED FOR SPOT WELDS OR RIVETS.

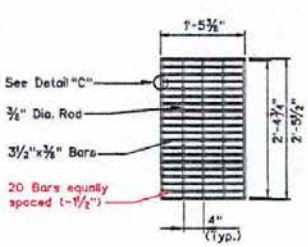
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CMP COUPLING BAND DETAILS

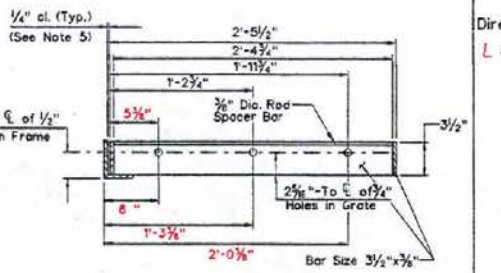
CHIEF ROAD DESIGN ENGINEER

R-2.8.2 (604)
ADOPTED: 1/78 REVISION 8/97

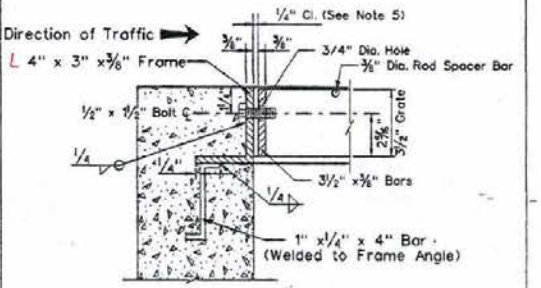
R-25



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)

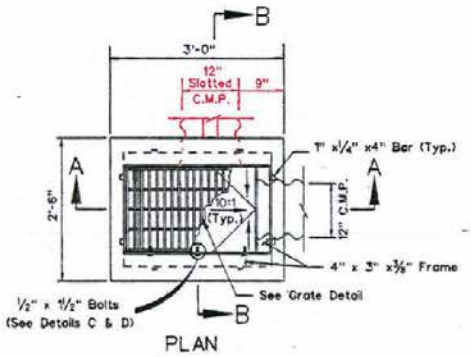
GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING BARS SHALL BE NO. 4 BARS WITH MAXIMUM SPACING AT 18" CENTERS. BARS TO BE EMBEDDED A MINIMUM OF TWO INCHES AND BAR ENDS MUST CLEAR SURFACE BY ONE AND ONE-HALF INCHES.
3. ALL EXPOSED CONCRETE EDGES SHALL BE CHAMFERED ONE INCH.
4. GRATE AND FRAME ANGLE TO BE WELDED AT ALL CONTACT POINTS.
5. ¼" MAX. CL. BETWEEN GRATE & FRAME ON EACH SIDE.
6. CATCH BASIN FLOORS SHALL HAVE A MINIMUM SLOPE OF 10:1 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 10:1 TO FLOWLINE(S).

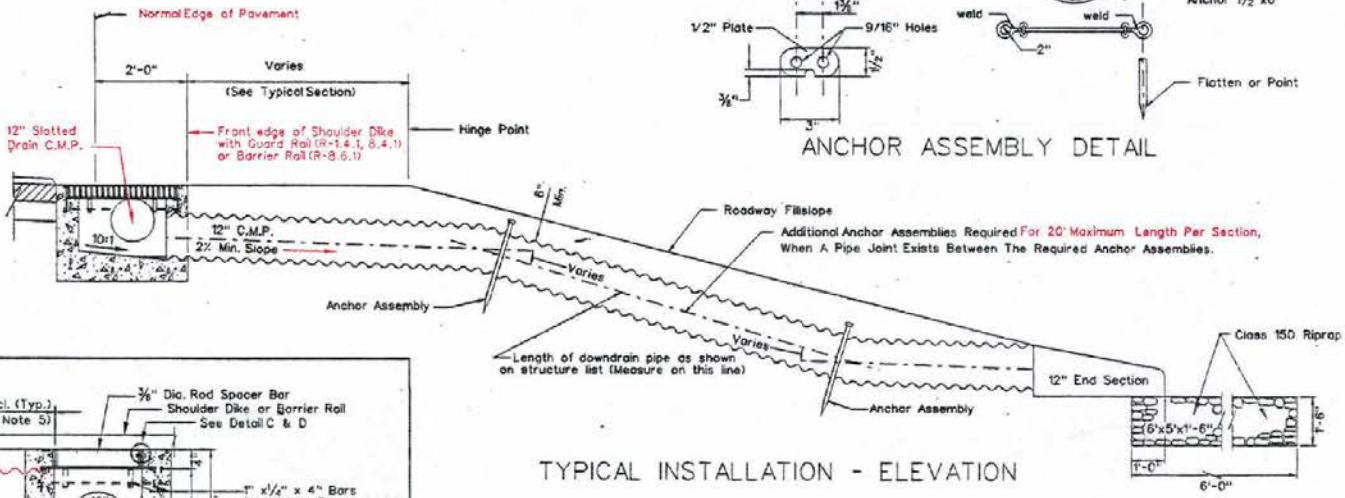
QUANTITIES
FOR INFORMATION ONLY

CONCRETE	REINFORCING STEEL	STRUCTURAL STEEL
0.4 CU. YD.	25 LBS.	230 LBS.*

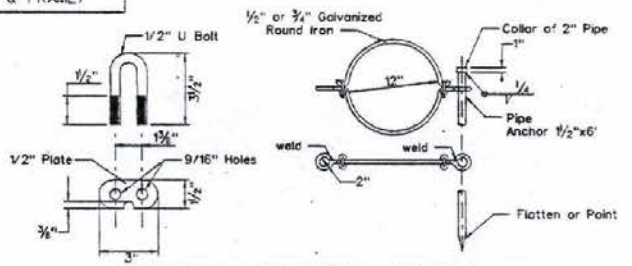
*(Includes Frame, Welded Angle, Grate & Spacer Bars)



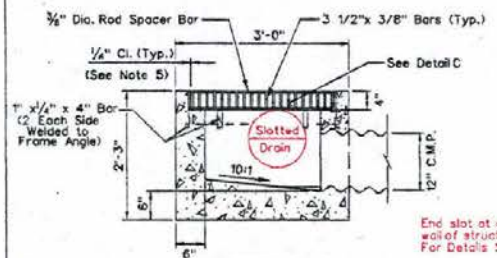
PLAN



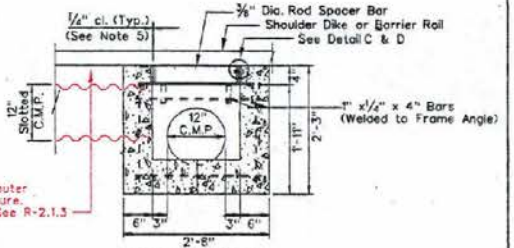
TYPICAL INSTALLATION - ELEVATION



ANCHOR ASSEMBLY DETAIL



SECTION A-A



SECTION B-B

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

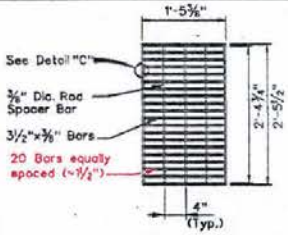
EMBANKMENT PROTECTOR TYPE 5

CHIEF ROAD DESIGN ENGR.

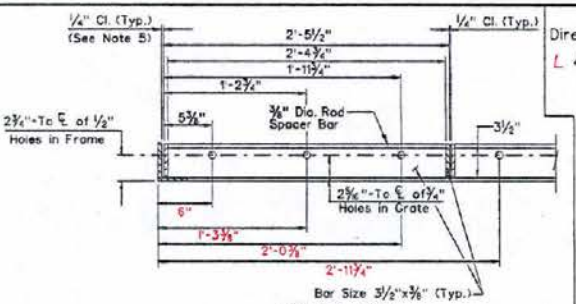
R-3.1.2 (608)

ADOPTED: 5/79 REVISION: 10/98

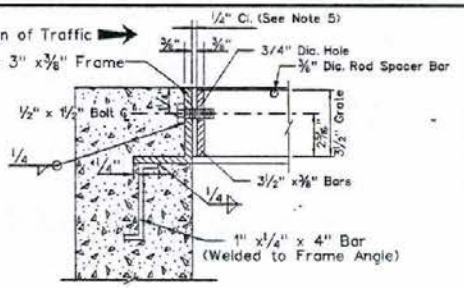
R-26



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)

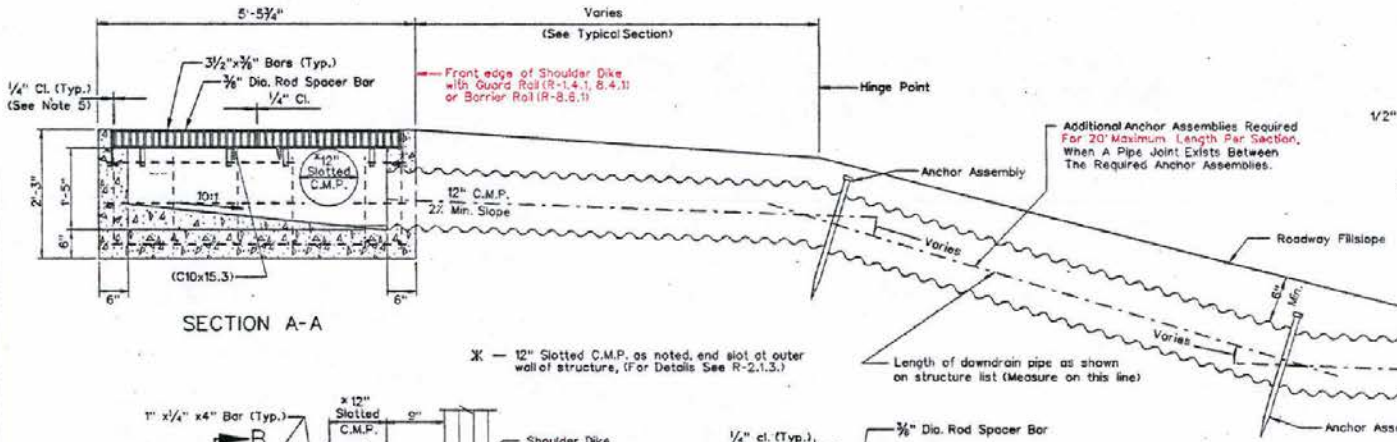
GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING BARS SHALL BE NO. 4 BARS WITH MAXIMUM SPACING AT 18" CENTERS. BARS TO BE EMBEDDED A MINIMUM OF TWO INCHES AND BAR ENDS MUST CLEAR SURFACE BY ONE AND ONE-HALF INCHES.
3. ALL EXPOSED CONCRETE EDGES SHALL BE CHAMFERED ONE INCH.
4. GRATE AND FRAME ANGLE TO BE WELDED AT ALL CONTACT POINTS.
5. ¼" MAX. CL. BETWEEN GRATE & FRAME ON EACH SIDE.
6. CATCH BASIN FLOORS SHALL HAVE A MINIMUM SLOPE OF 10:1 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 10:1 TO FLOWLINE(S).

QUANTITIES
FOR INFORMATION ONLY

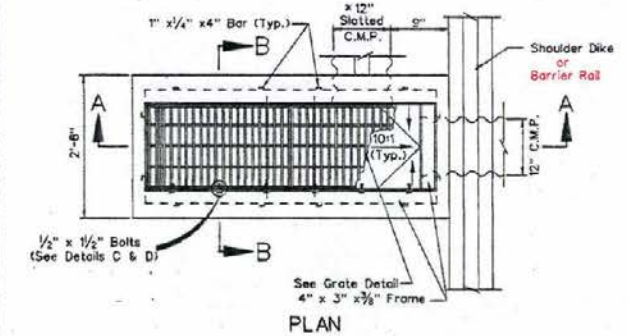
CONCRETE	REINFORCING STEEL	STRUCTURAL STEEL
0.69 CU. YD.	40 LBS.	445 LBS.*

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

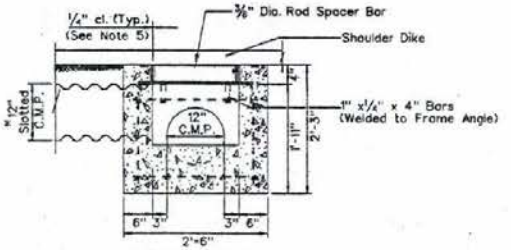


SECTION A-A

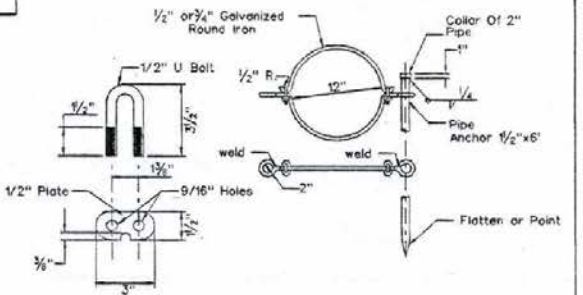
* — 12" Slotted C.M.P. as noted, end slot at outer wall of structure, (For Details See R-2.1.3.)



PLAN



SECTION B-B



ANCHOR ASSEMBLY DETAIL

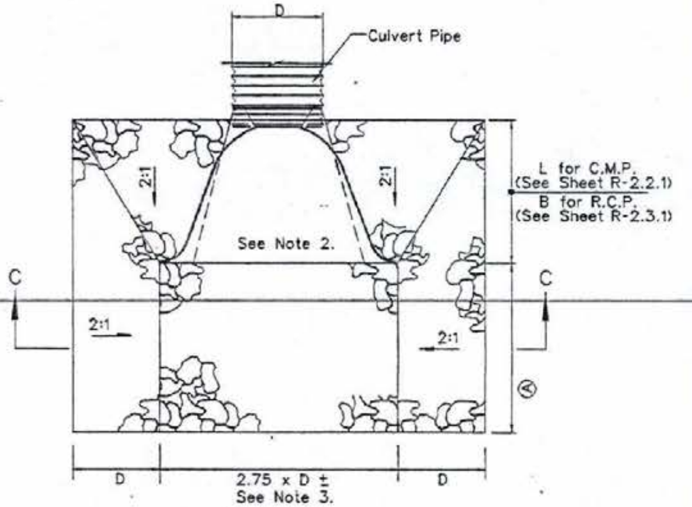
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

EMBANKMENT PROTECTOR (TYPE 5-2G)

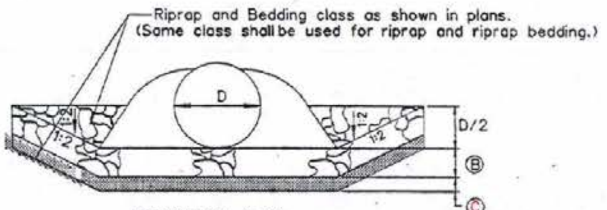
CHIEF ROAD DESIGN ENGR.

R-3.1.3	(608)
ADOPTED: 5/79	REVISION: 10/98

R-27



PLAN



SECTION C-C

CULVERT SIZE	Ⓐ
18" to 36"	3D
42" to 84"	4D

RIPRAP AND BEDDING CLASS	Ⓑ in.	Ⓒ in.
150	12	8
300	24	8
400	32	10
550	44	10
700	56	12
900	72	12

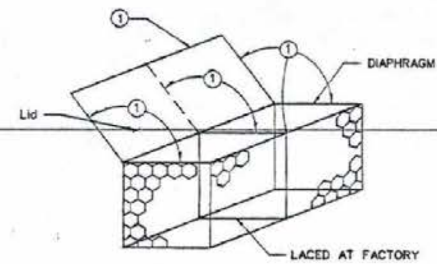
RIPRAP APRON

NOTES:

1. Hydraulic Section's approval must be obtained prior to incorpation into plans.
2. When no End Section is used, additional Riprap shall be as required by the Hydraulic Engineer.
3. For muultiple pipe installations, this dimension shall be adjusted according to pipe separation. Information is on drawing R-2.1.1.

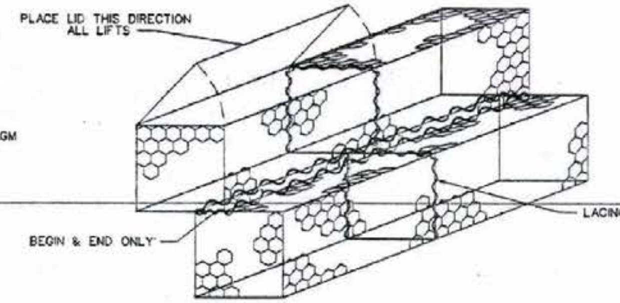
NOTE:

① WHEN FULL, LACED TOGETHER

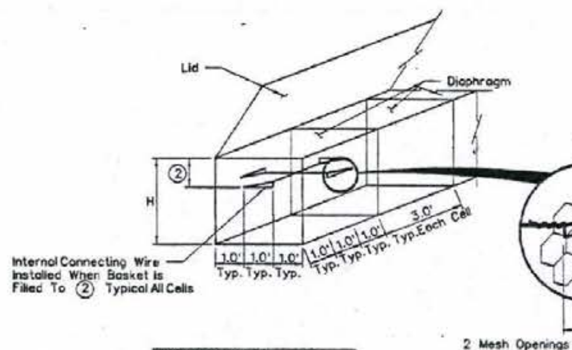


LACING: SINGLE BASKET

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



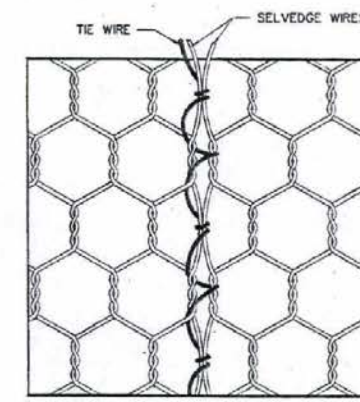
LACING: BASKET TO BASKET



BASKET HEIGHT H	②
3'-0"	1/3H & 2/3H
1'-6"	1/2H
1'-0"	NONE

INTERNAL CONNECTING WIRE DETAIL
FOR WIRE MESH GABIONS

GABIONS LACING DETAIL

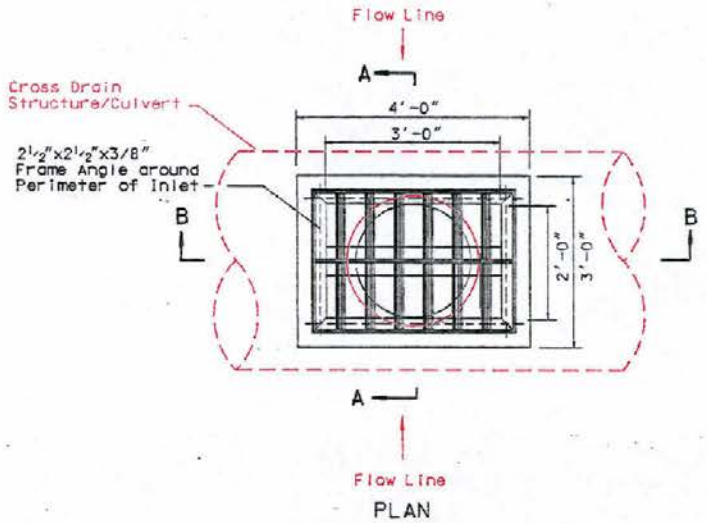


WIRE MESH LACING DETAIL

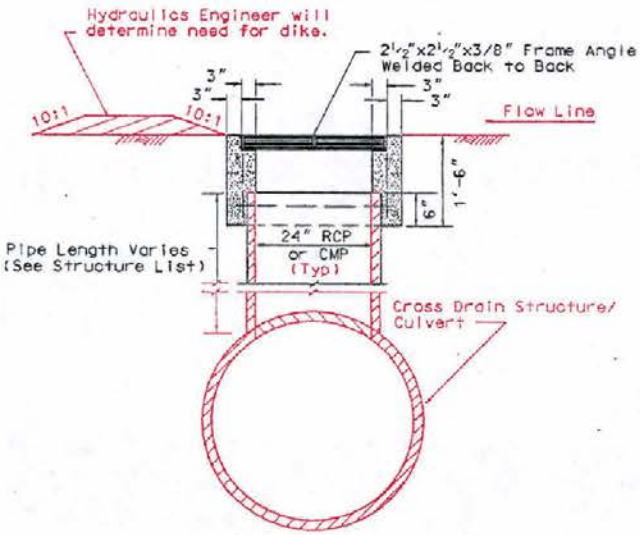
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RIPRAP APRON
GABIONS, LACING DETAIL

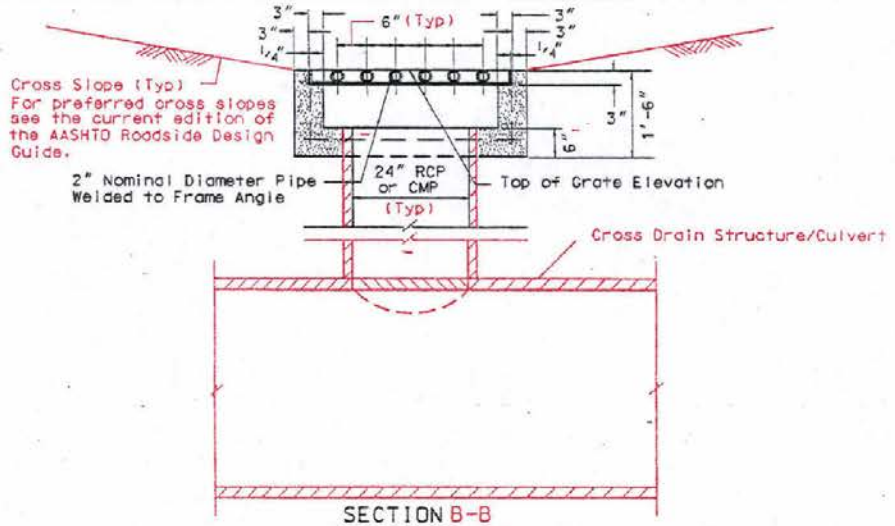
CHIEF ROAD DESIGN ENGR. | R-3.1.4 | 1010 | ADOPTED 6/1/85 | REVISION 8/97



PLAN



SECTION A-A



SECTION B-B

GENERAL NOTES:

1. All concrete shall be Class A or AA.
2. Reinforcing bars shall be No. 4 bars with maximum spacing at 18" centers.
   Bars to be embedded a minimum of 2" and bar ends must clear concrete surfaces by 1 ½".
3. All exposed concrete edges shall be chamfered 1".
4. Structural steel weight includes 2" pipe and the 2½"X2½"X3/8" frame angles.

QUANTITIES*		
CONCRETE	REINF. STEEL	STRUCT. STEEL
0.36 Cu. Yd.	23 lbs.	170 lbs.

* For Information Only

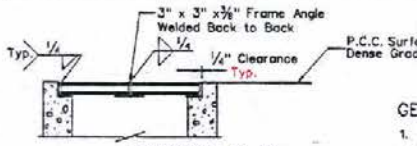
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PIPE RISER INLET (TYPE 3)

CHIEF ROAD DESIGN ENGR.

R-4.1.2 (609)

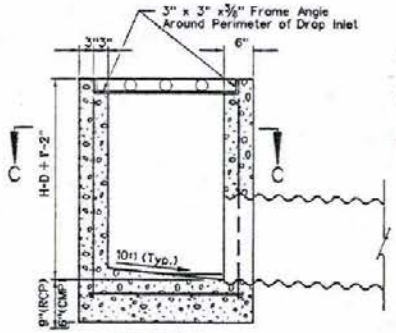
ADOPTED: 8/69 | REVISION 2/98



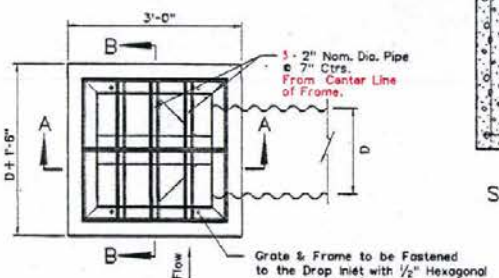
SECTION B-B

GENERAL NOTES:

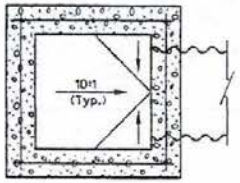
1. ALL CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE NO.4 BARS WITH MAXIMUM SPACING AT 18" CENTERS, WIRED TIGHTLY AT ALL INTERSECTIONS AND EMBEDDED 2" CLEAR OF ALL CONCRETE SURFACES.
3. EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 1".
4. STRUCTURAL STEEL WEIGHT INCLUDES THE 2" PIPE, STANDARD WEIGHT, AND THE 3"x3"x3/16" FRAME ANGLES.
5. FOR 2" PIPE SEE ASTM A53.



SECTION A-A



PLAN

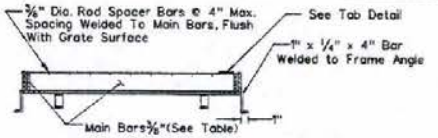


SECTION C-C

C.M.P. SIZE	CONCRETE CU. YD.	REINFORCING LB.	STRUCTURAL STEEL LB.
18"	0.62	39	120
24"	0.77	44	132
30"	0.93	59	145
36"	1.11	64	158
42"	1.29	89	170

R.C.P. SIZE	CONCRETE CU. YD.	REINFORCING LB.	STRUCTURAL STEEL LB.
18"	0.68	40	120
24"	0.84	45	132
30"	0.99	60	145
36"	1.17	65	158
42"	1.35	70	170

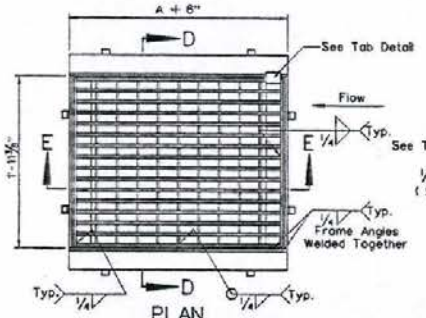
TYPE 2A DROP INLET



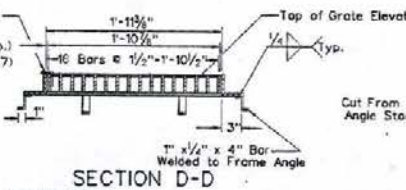
SECTION E-E

GENERAL NOTES:

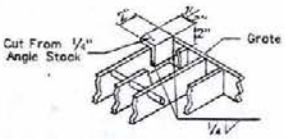
1. ALL CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE NO.4 BARS WITH MAXIMUM SPACING AT 18" CENTERS, WIRED TIGHTLY AT ALL INTERSECTIONS AND EMBEDDED 2" CLEAR OF ALL CONCRETE SURFACES.
3. EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 1".
4. DIMENSIONS MAY BE VARIED TO FIT LOCAL CONDITIONS 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 ENGR.
7. 1/4" MAX.CL. BETWEEN GRATE & FRAME ON EACH SIDE.



PLAN

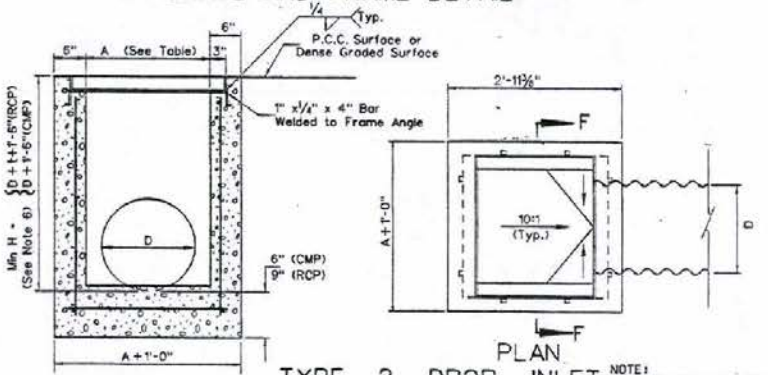


SECTION D-D



TAB DETAIL

GRATE AND FRAME DETAIL



SECTION F-F

PLAN

TYPE 2 DROP INLET

NOTE:
Catch Basin Floors Shall Have A Minimum Slope of 10:1 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 10:1 To Flowline(s).

BILL OF MATERIALS

X (t=Wall Thickness of RCP)

RCP

PIPE SIZE (INCH)	A=D+2+X	H (FT.)	CONCRETE CU. YD.	REINF. LB.	MAIN BARS (INCH)	FRAME ANGLES (INCH)	GRATE LB.	FRAME LB.	TOTAL LB.
15	1'-7 1/2"+X	2.94	0.67	41	3X3/8	3 1/2X3X3/8	152	67	219
18	1'-11"+X	3.21	0.78	44	3X3/8	3 1/2X3X3/8	170	72	242
24	2'-6"+X	3.75	0.95	53	3X3/8	3 1/2X3X3/8	204	81	285
30	3'-1"+X	4.29	1.15	56	3 1/2X3/8	4X3X3/8	279	97	376
36	3'-8"+X	4.83	1.36	71	4 1/2X3/8	5X3X3/8	422	123	545
42	4'-3"+X	5.38	1.58	82	4 1/2X3/8	5X3X3/8	478	134	612

CMP

PIPE SIZE (INCH)	A	H (FT.)	CONCRETE CU. YD.	REINF. LB.	MAIN BARS (INCH)	FRAME ANGLES (INCH)	GRATE LB.	FRAME LB.	TOTAL LB.
15	2'-0"	2.76	0.67	36	3X3/8	3 1/2X3X3/8	171	73	244
18	2'-6"	3.00	0.65	37	3X3/8	3 1/2X3X3/8	171	73	244
24	3'-0"	3.50	0.80	51	3X3/8	3 1/2X3X3/8	203	81	284
30	3'-6"	4.00	0.96	56	3 1/2X3/8	4X3X3/8	273	95	368
36	4'-0"	4.50	1.12	60	4 1/2X3/8	5X3X3/8	395	119	514
42	4'-6"	5.00	1.30	77	4 1/2X3/8	5X3X3/8	442	129	571

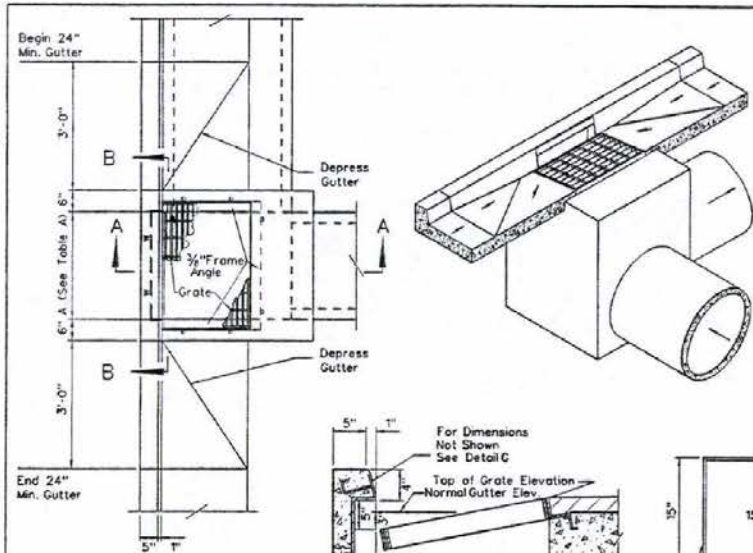
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 2 AND 2A DROP INLET

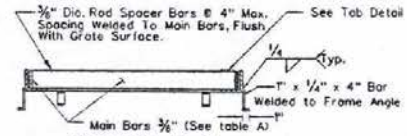
R-4.2.1 (609)

CHIEF ROAD DESIGN ENGR. ADOPTED: 11/70 REVISION: 2/98

R-30



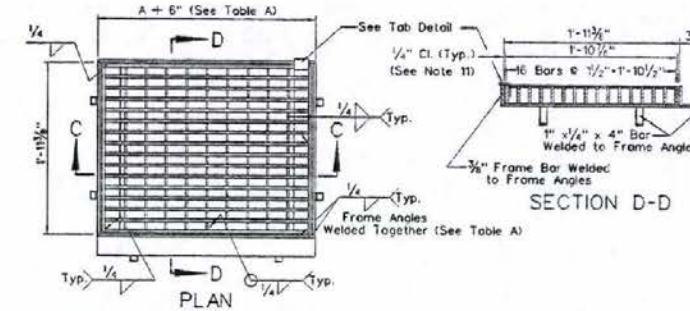
PLAN



SECTION C-C

TABLE B

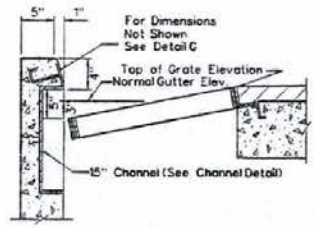
MAXIMUM H		
CMAP	J OR A	H
29" x 18" OR LESS	30" OR LESS	21'-0"
36" x 22"	36"	16'-0"
43" x 27"	42"	12'-0"
	48"	9'-0"
	54"	7'-0"
	60"	7'-0" (WITH #4 BARS @ 12" CENTERS)



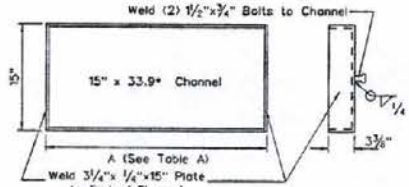
PLAN

SECTION D-D

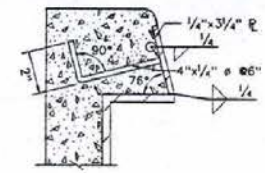
GRATE AND FRAME DETAIL



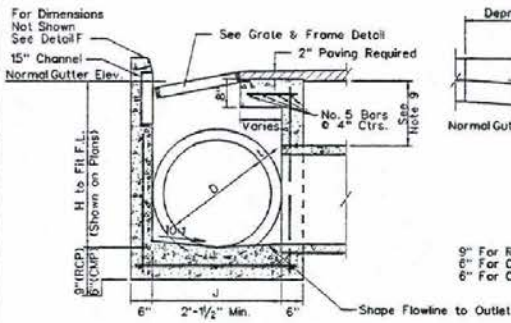
DETAIL F



CHANNEL DETAIL

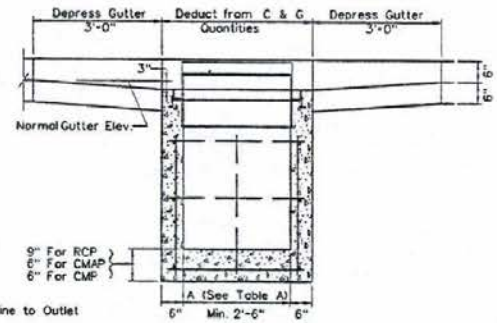


DETAIL G



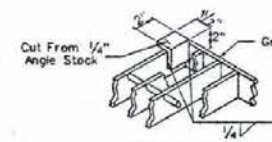
S FOR CMAP
D FOR CMP
D+6" FOR RCP 24" OR LESS
D+2† FOR RCP 30" OR MORE
S+2† FOR LO-HED RCP

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



S FOR CMAP
D FOR CMP
D+6" FOR RCP 42" OR LESS
D+2† FOR RCP 48" OR MORE
S+6" FOR LO-HED RCP 29"x45" OR LESS
S+2† FOR LO-HED RCP 34"x53" OR MORE

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



TAB DETAIL

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS A OR AA.
2. ALL REINFORCING STEEL SHALL BE TIGHTLY WIRED AND EMBEDDED 1 1/2" CLEAR OF CONCRETE SURFACE. EXCEPT AS NOTED, ALL REINFORCING SHALL BE NO. 4 BARS WITH MAXIMUM SPACING OF 12" 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 ONE INCH.
4. WHERE PIPE INTERSECTS DROP INLET ON A 12° OR LARGER SKEW INCREASE J TO $\frac{J}{\text{COS SKEW } \angle}$, REDESIGN FOR SKEWS AT A.
5. WHERE PIPE INTERSECTS DROP INLET ON A 12° OR LARGER SKEW INCREASE S TO $\frac{S}{\text{COS SKEW } \angle}$, 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 ≥ 0.1' ABOVE OUTFLOW PIPE INVERT ELEVATION.
10. EXTREME LOW COVER SITUATIONS TO BE REVIEWED BY THE HYDRAULICS ENGR.
11. 1/4" MAX. CL. BETWEEN GRATE & FRAME ON EACH SIDE.
12. CATCH BASIN FLOORS SHALL HAVE A MINIMUM SLOPE OF 10:1 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 10:1 TO FLOWLINE(S).

STRUCTURAL STEEL TABLE A

PIPE SIZE				A	MAIN BARS	FRAME ANGLES	FRAME BAR	GRATE LBS.	FRAME LBS.	CHANNEL & PLATES, LBS.	TOTAL LBS.
CMAP	CMP	RCP	LO-HED								
29" x 18"	30"	24"	14" x 23"	2'-6"	3" x 3/8"	3 1/2" x 3" x 3/8"	3 1/2" x 3/8"	203	81	93	377
OR LESS	OR LESS	OR LESS	OR LESS	3'-0"	3 1/2" x 3/8"	4" x 3" x 3/8"	4" x 3/8"	273	95	107	475
36" x 22"	36"	30"	19" x 30"	3'-6"	4 1/2" x 3/8"	5" x 3" x 3/8"	5" x 3/8"	395	119	126	640
43" x 27"	42"	36"	22" x 34"	4'-0"	4 1/2" x 1/2"	5" x 3" x 1/2"	5" x 1/2"	442	129	143	714
	48"	42"	27" x 34"	4'-6"	4 1/2" x 1/2"	5" x 3" x 1/2"	5" x 1/2"	517	144	160	821
	54"		29" x 45"								

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

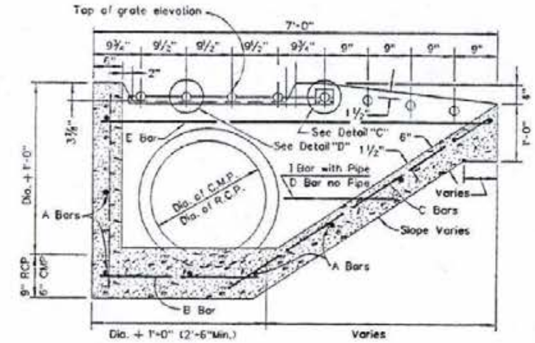
TYPE 3 DROP INLET

R-4.3.1 | 16091

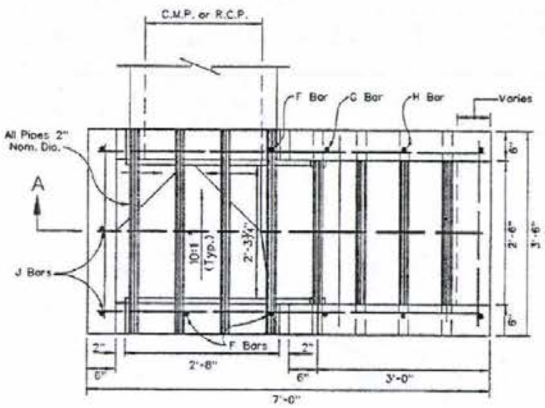
CHIEF ROAD DESIGN ENGR. | ADOPTED: 10/85 | REVISION: 1/98

R-31

TYPE 7 DROP INLET



SECTION A-A



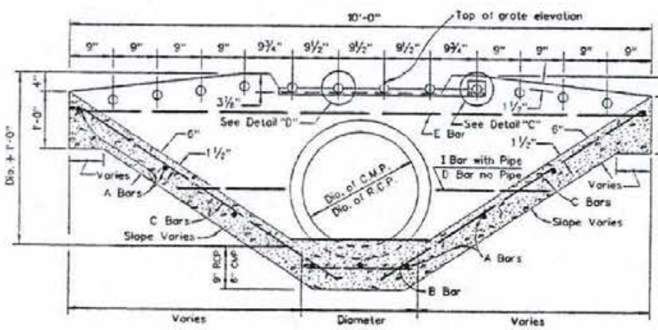
PLAN

TYPE 7 DROP INLET

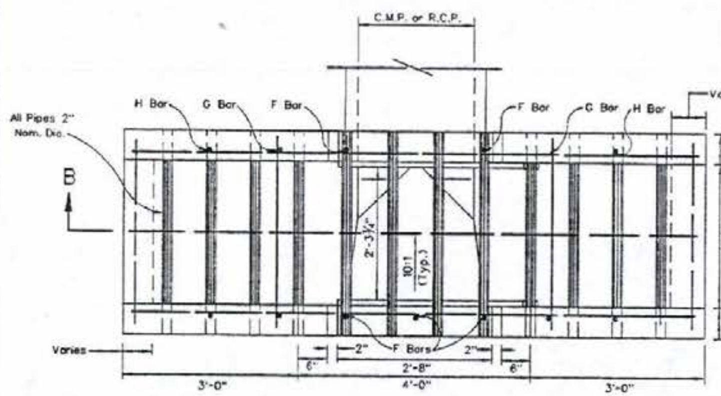
TABLE OF QUANTITIES

Size in.	A Bars	B Bars	C Bars	D Bars	E Bars	F Bars	G Bars	H Bars	I Bars	J Bars	Conc. Cu. Yd.	Reinf. Steel Lb.	Str. St. Grate Lb.
							CMP						
18"	8@3'-2"	3@2'-3"	3@4'-9"	1@5'-0"	2@6'-8"	3@2'-3"	2@1'-10"	2@1'-2"	1@2'-4"	3@2'-8"	1.11	61	117
24"	8@3'-2"	3@2'-9"	3@4'-9"	1@5'-0"	2@6'-8"	3@2'-9"	2@2'-0"	2@1'-4"	1@2'-3"	3@3'-2"	1.21	63	117
30"	8@3'-2"	3@3'-4"	3@4'-9"	1@5'-4"	2@6'-8"	3@3'-3"	2@2'-8"	2@1'-9"	1@1'-10"	3@3'-8"	1.34	67	117
							RCP						
18"	8@3'-2"	3@2'-4"	3@5'-0"	1@5'-0"	2@6'-8"	3@2'-6"	2@1'-10"	2@1'-2"	1@2'-1"	3@2'-11"	1.18	62	117
24"	8@3'-2"	3@2'-4"	3@5'-0"	1@5'-0"	2@6'-8"	3@3'-0"	2@2'-0"	2@1'-4"	1@2'-0"	3@3'-5"	1.27	65	117
30"	8@3'-2"	3@3'-4"	3@5'-0"	1@5'-4"	2@6'-8"	3@3'-6"	2@2'-8"	2@1'-9"	1@1'-8"	3@3'-11"	1.41	68	117

TYPE 8 DROP INLET



SECTION B-B

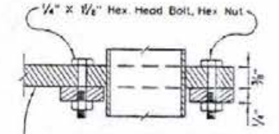


PLAN

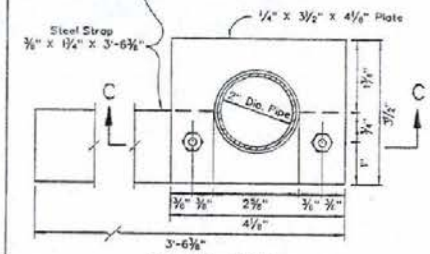
TYPE 8 DROP INLET

TABLE OF QUANTITIES

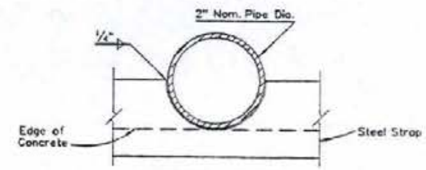
Size in.	A Bars	B Bars	C Bars	D Bars	E Bars	F Bars	G Bars	H Bars	I Bars	J Bars	Conc. Cu. Yd.	Reinf. Steel Lb.	Str. St. Grate Lb.
							CMP						
18"	9@3'-2"	3@2'-0"	6@4'-9"	1@6'-6"	2@9'-8"	5@2'-3"	4@1'-10"	4@1'-2"	2@2'-4"	Not Applicable	1.33	78	168
24"	9@3'-2"	3@2'-6"	6@4'-9"	1@6'-10"	2@9'-8"	5@2'-9"	4@2'-0"	4@1'-4"	2@2'-3"		1.45	82	168
30"	9@3'-2"	3@3'-0"	6@4'-9"	1@7'-0"	2@9'-8"	5@3'-3"	4@2'-8"	4@1'-9"	2@1'10"		1.59	87	168
							RCP						
18"	9@3'-2"	3@2'-0"	6@5'-0"	1@6'-6"	2@9'-8"	5@2'-6"	4@1'-10"	4@1'-2"	2@2'-1"		1.35	80	168
24"	9@3'-2"	3@2'-6"	6@5'-0"	1@6'-10"	2@9'-8"	5@3'-3"	4@2'-0"	4@1'-4"	2@2'-0"		1.48	84	168
30"	9@3'-2"	3@3'-0"	6@5'-0"	1@7'-0"	2@9'-8"	5@3'-6"	4@2'-8"	4@1'-9"	2@1'-8"		1.63	89	168



SECTION C-C



DETAIL "C"



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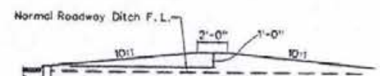


An earth dike, as shown, shall be constructed across the roadway ditch downstream from each type 7 Drop Inlet

SKETCH OF ROADWAY DITCH DIKE

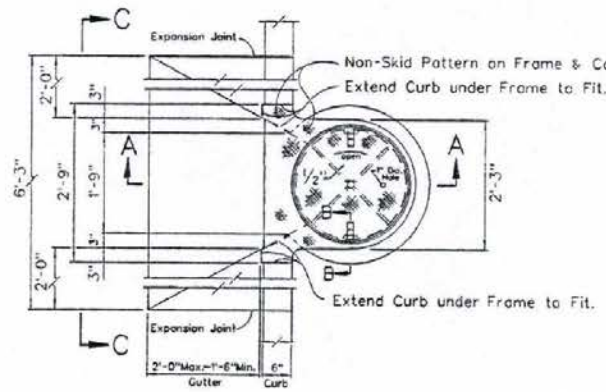
GENERAL NOTES:

1. All concrete shall be Class A or AA.
2. Reinforcing steel shall be No. 4 bars with maximum spacing of 18" centers, wired tightly at all intersections and embedded at least one and one half inch 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 2" 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 10:1 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 10:1 To Flowline(s).

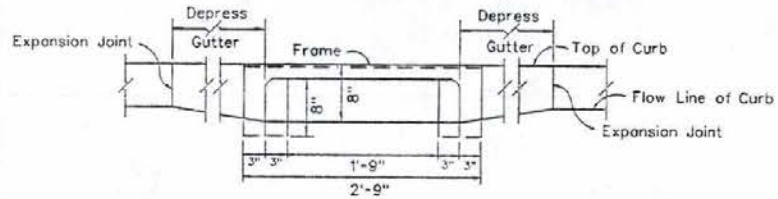
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 7 & 8
DROP INLETS

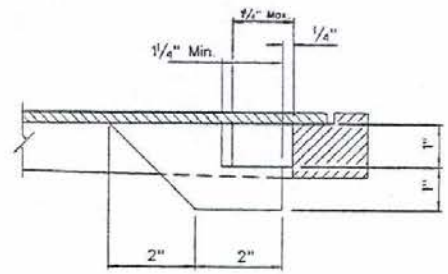
CHIEF ROAD DESIGN ENGR. | R-4.6.1 (609) | ADOPTED 8/69 | REVISION 10/94



PLAN VIEW

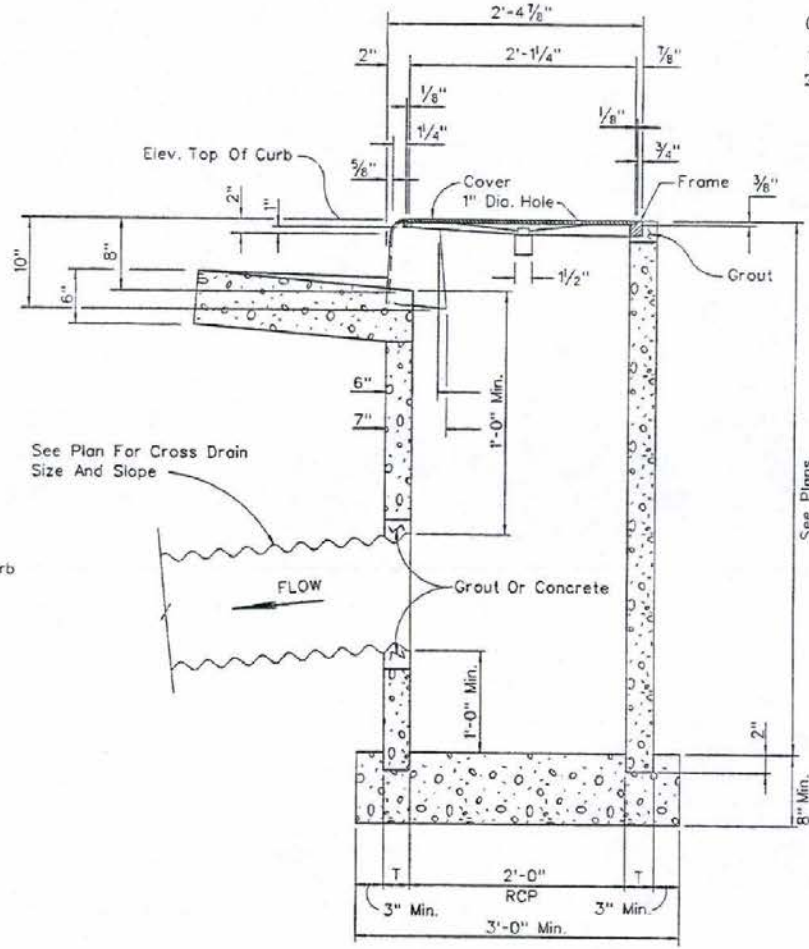


VIEW C-C



SECTION B-B

WEDGE LOCK HOLD DOWN



SECTION A-A

GENERAL NOTES:

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

CASTINGS *		
	FRAME	COVER
TYPE 10	90 Lbs.	70 Lbs.

*For Information Only

T - WALL THICKNESS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

DROP INLET TYPE 10

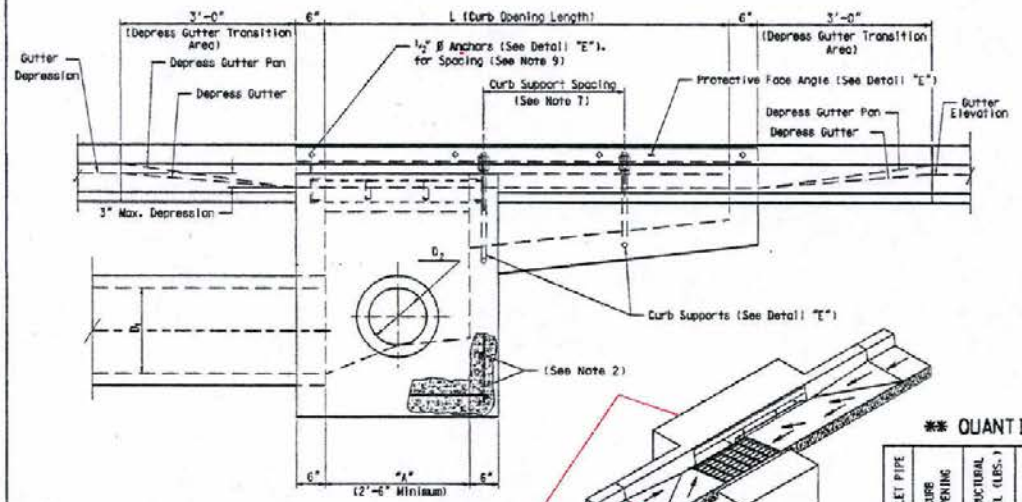
CHIEF ROAD DESIGN ENGR.

R-4.6.1.2 (609)

ADOPTED: 11/71

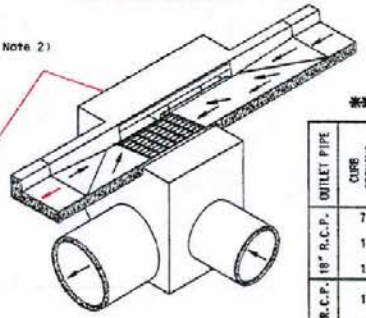
REVISION 3/97

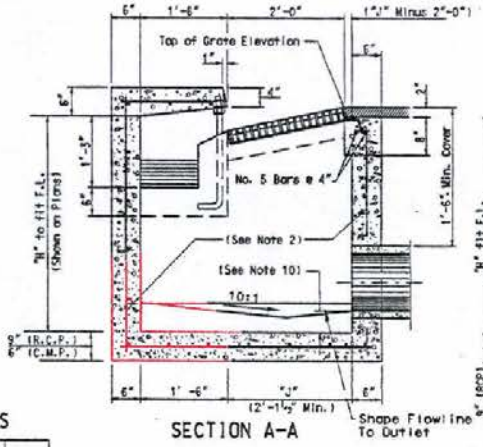
R-33



ELEVATION

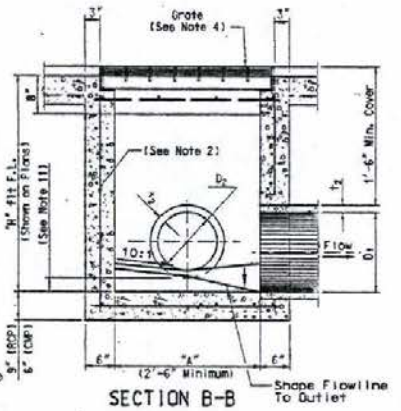
Side curb opening to be upstream of grate





SECTION A-A

Shape Flowline To Outlet



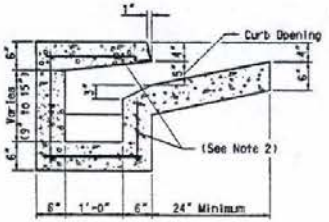
SECTION B-B

Shape Flowline To Outlet

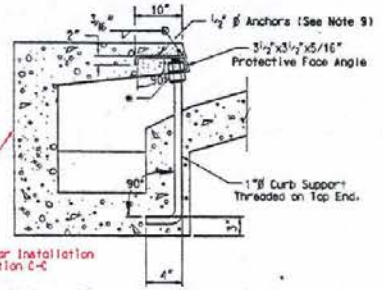
** QUANTITIES

OUTLET PIPE	CURB OPENING	STRUCTURAL STEEL (LBS.)	REINFORCING STEEL (LBS.)	CONCRETE (CU. YDS.)
18" R.C.P.	7'	325	126	1.64
	10'	352	155	2.01
	12'	367	176	2.26
24" R.C.P.	12'	367	179	2.34
	15'	394	209	2.72

** ASSUMED MINIMUM H 15" INLET PIPE



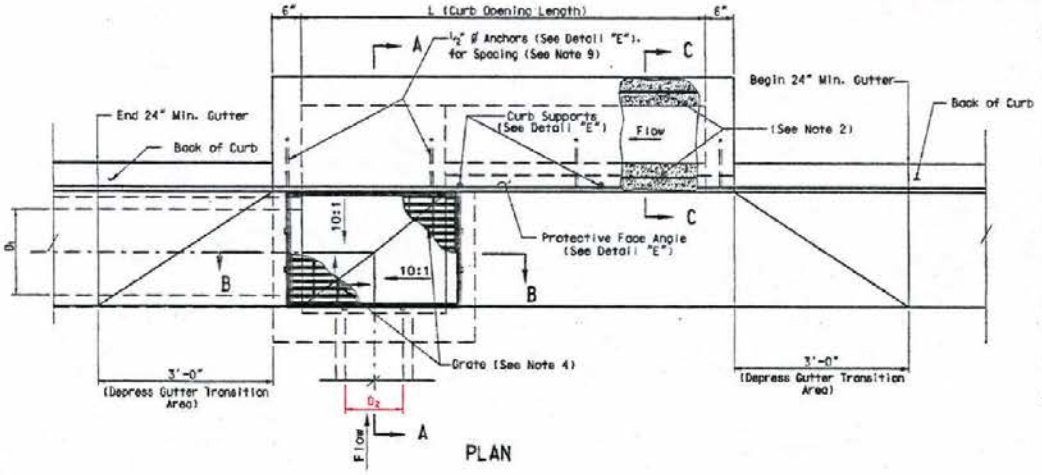
SECTION C-C



For Rebar Installation See Section C-C

* = Bottom Nut Tight On Last Thread.

DETAIL E



PLAN

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS AA OR A.
2. REINFORCING STEEL SHALL BE NO. 4 BARS, EXCEPT AS NOTED, WITH MAXIMUM SPACE AT 12" CENTERS, WIRED TIGHTLY AT ALL INTERSECTIONS, AND EMBEDDED AT LEAST 1½" CLEAR OF CONCRETE SURFACE, EXCEPT AS NOTED.
3. EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED ONE INCH.
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 7' SHALL HAVE ONE CURB SUPPORT FOR EACH 7' 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 5').
10. FOR DROP INLET CONFIGURATIONS WITH 2 PIPES-INFLOW PIPE INVERT ELEVATION SHALL BE ≥ 0.1' ABOVE OUTFLOW PIPE INVERT ELEVATIONS.
11. CATCH BASIN FLOORS SHALL HAVE A MINIMUM SLOPE OF 10:1 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 10:1 TO FLOWLINE(S).

"A"
D_2 for CMP
D_2 + 6" for RCP 42" or Less
D_2 + 2 t_2 for RCP 48" or More

"L"
D_1 for CMP
D_1 + 6" for RCP 24" or Less
D_1 + 2 t_1 for RCP 30" or More

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 11 DROP INLET

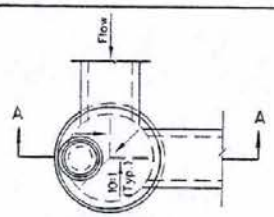
CHIEF ROAD DESIGN ENGR.

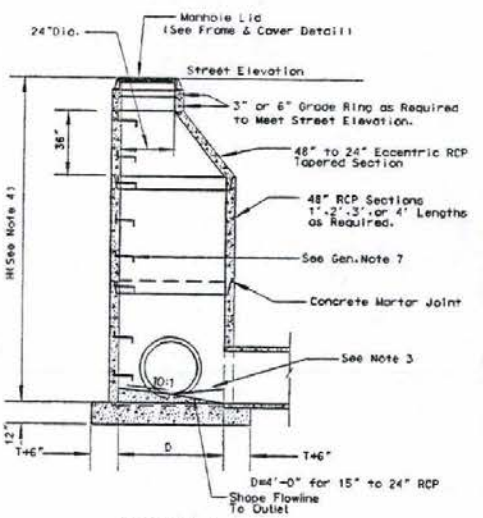
R-4.6.2 (609)

ADOPTED: 5/85

REVISION 10/98

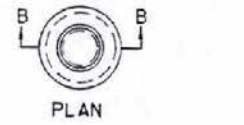
R-34



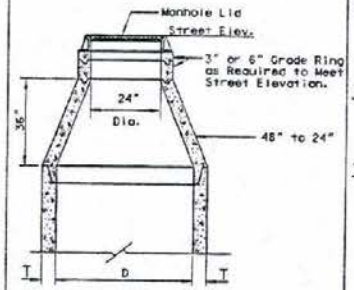


SECTION A-A

TYPE 1 MANHOLE
ECCENTRIC

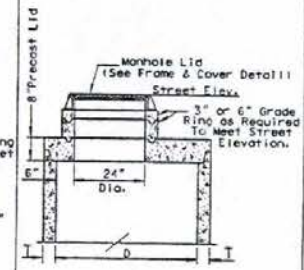


NOTE: For Dimensions Not Shown
See Type 1 Manhole Eccentric.



SECTION B-B

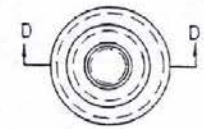
TYPE 1 MANHOLE
CONCENTRIC



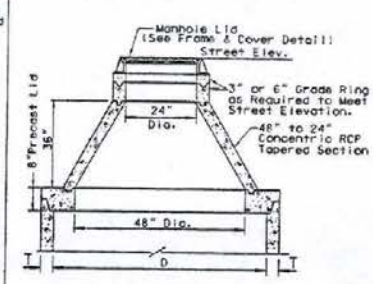
For Use In Minimum Cover Situation
Where Tapered Section Will Not Fit.

SECTION C-C

TYPE 1 & 2 MANHOLE
MODIFIED

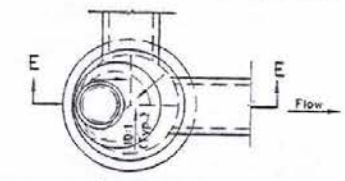


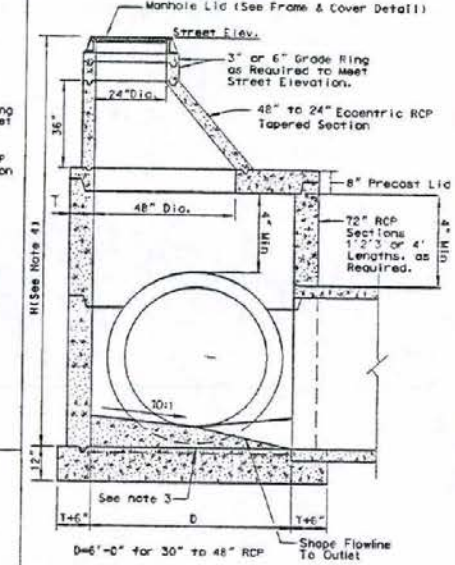
NOTE: For Dimensions Not Shown
See Type 2 Manhole Eccentric



SECTION D-D

TYPE 2 MANHOLE
CONCENTRIC





SECTION E-E

TYPE 2 MANHOLE
ECCENTRIC

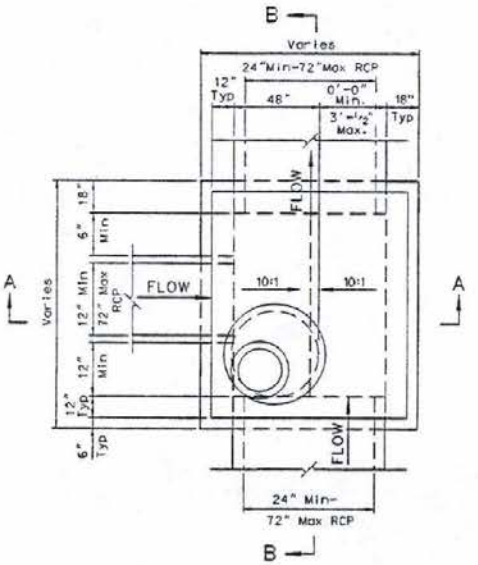
GENERAL NOTES:

1. FOR CAST IN PLACE CONCRETE BASE ALL REINFORCING STEEL TO BE NO. 4 BARS AT 18" CENTERS TIGHTLY WOUND AT ALL INTERSECTIONS AND EMBEDDED IN CONCRETE AT LEAST 2" AND BAR ENDS MUST CLEAR CONCRETE SURFACES BY $1\frac{1}{2}$".
2. ALL CONCRETE SHALL BE CLASS A OR AA.
3. MANHOLE WITH MORE THAN ONE PIPE-INFLOW PIPE INVERT ELEVATIONS SHALL BE ≥ 0.1' 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 16" AND 4" CLEAR DISTANCE FROM THE WALL OF RISER OR CONE SECTION. THE STEP MUST HAVE A 10" MINIMUM WIDTH.
8. SHAPE FLOWLINE IN MANHOLE TO OUTLET PIPE, AND PROVIDE A 10:1 MINIMUM SLOPE FROM ALL DIRECTIONS TOWARD FLOWLINE
9. COMMERCIAL PREFABRICATED ADJUSTMENT RINGS FOR MANHOLES MAY BE USED WHEN APPROVED BY THE ENGINEER.
10. T = THICKNESS PIPE WALL

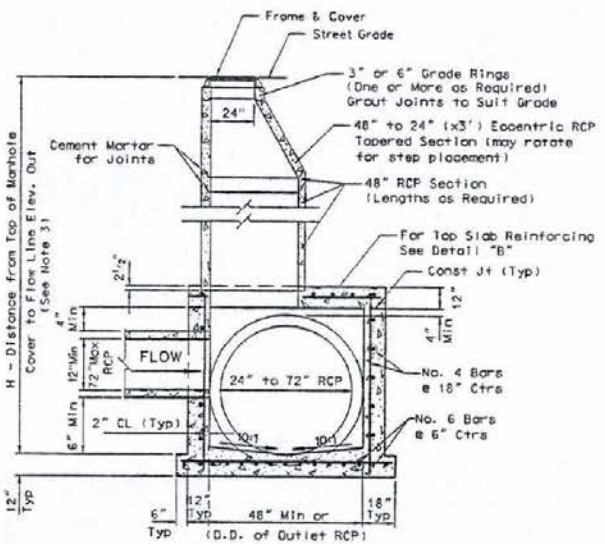
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 1 & 2
AND TYPE 1 & 2 MODIFIED
MANHOLES

CHIEF ROAD DESIGN ENGR.	R-4.7.1	(609)
	ADOPTED: 10/85	REVISION 2/96



PLAN

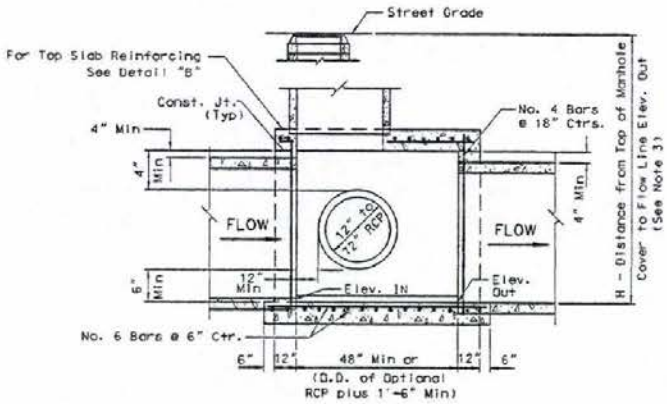


SECTION A-A

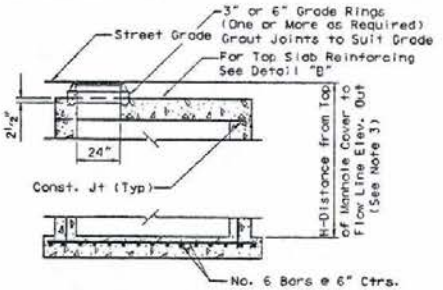
(For Variable Height Situations)

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 0.1' 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 16" AND 4" CLEAR DISTANCE FROM THE MANHOLE WALL. THE STEP MUST BE A 10" 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 10:1 MINIMUM SLOPE FROM ALL DIRECTIONS TOWARD FLOW LINE.

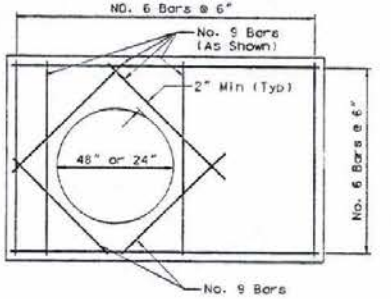


SECTION B-B



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)

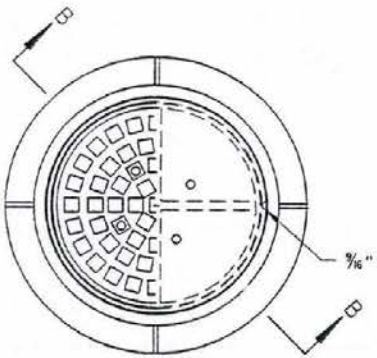
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 4 MANHOLE

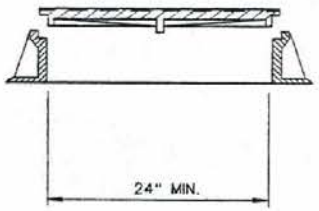
CHIEF ROAD DESIGN ENGR

R-4.7.2	(609)
ADOPTED: 10/85	REVISION 8/97

R-36



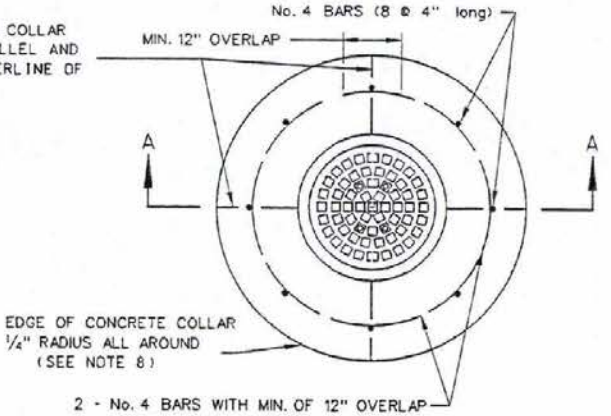
PLAN



SECTION B-B

TRAFFIC-STRENGTH
MANHOLE FRAME & COVER

4 LINES ON TOP OF CONCRETE COLLAR SCORED 1/2" DEEP. TWO PARALLEL AND TWO PERPENDICULAR TO CENTERLINE OF ROADWAY

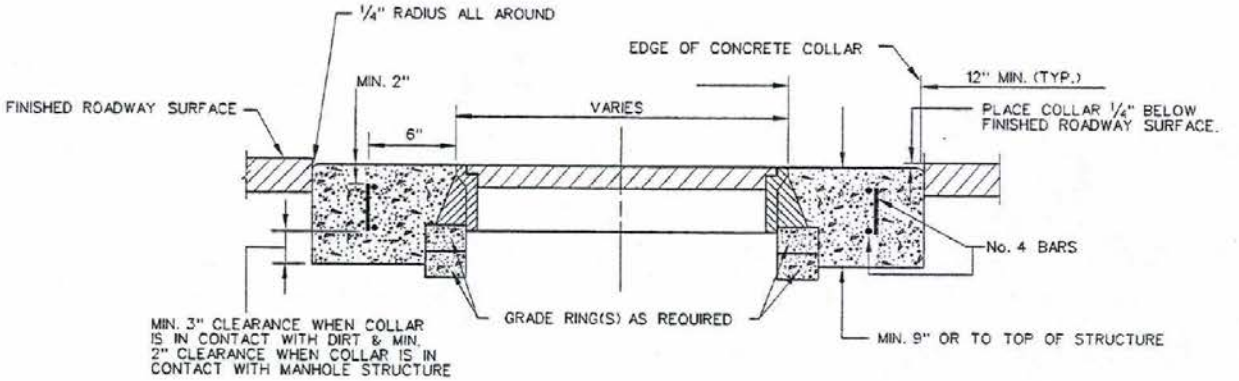


CONCRETE COLLAR PLAN

(SEE NOTE 10)

GENERAL NOTES:

1. THE WEIGHT OF FRAME SHALL BE 145 lbs. MINIMUM AND THE WEIGHT OF COVER SHALL BE 125 lbs. 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 A48, CLASS 40 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.)

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

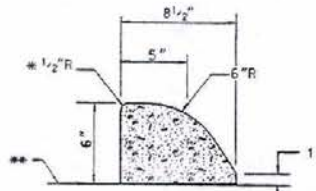
MANHOLE COVER, FRAME & CONCRETE COLLAR

CHIEF ROAD DESIGN ENGR.

R-4.7.3 (609)

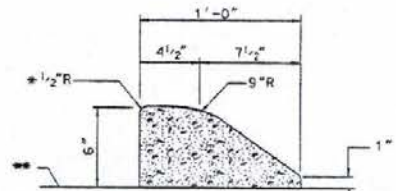
ADOPTED: 8/69 REVISION 10/96

R-37



SECTION
TYPE A

(0.0108 Cu. Yds. Per Lin. Ft.)



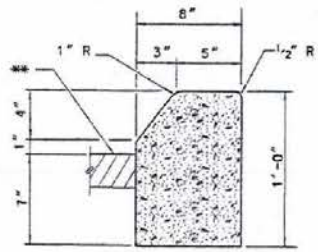
SECTION
TYPE B

(0.0185 Cu. Yds. Per Lin. Ft.)

← Omit Rounding When Curbs Are Back To Back (Epoxy Curb To Plantmix Surface)
Note: Epoxy Cement May Be Omitted When Installation Is Temporary.

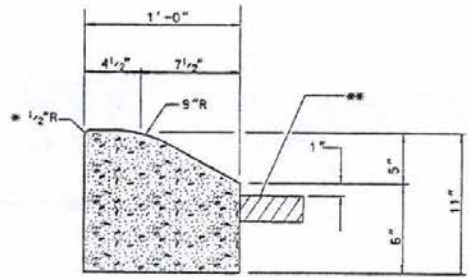
** P.C.C. or Dense Graded

GLUE DOWN CURBS



SECTION
TYPE 2

(0.02315 Cu. yd. per ft.)



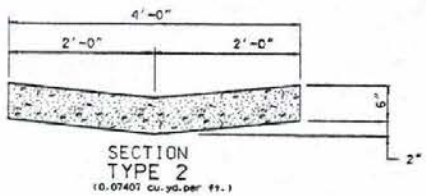
SECTION
TYPE 3

(0.02894 cu. yd. per ft.)

CURB

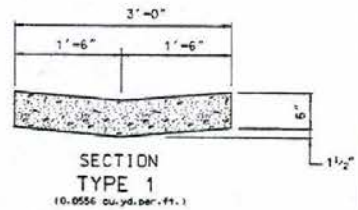
** P.C.C. or Dense Graded

← Omit Rounding When Curbs Are Back To Back.



SECTION
TYPE 2

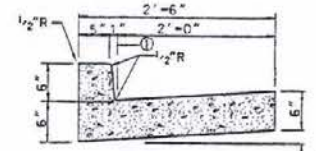
(0.07407 cu.yd.per ft.)



SECTION
TYPE 1

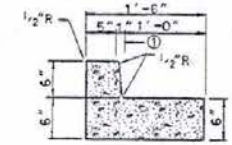
(0.0556 cu.yd.per.ft.)

VALLEY GUTTER



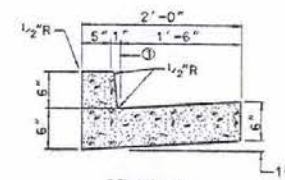
SECTION
TYPE 1

(0.05478 cu.yd.per ft.)



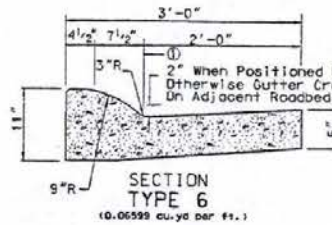
SECTION
TYPE 4

(0.03627 cu.yd. per ft.)



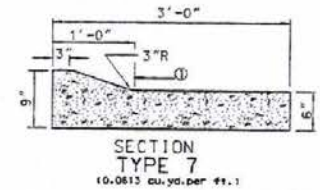
SECTION
TYPE 5

(0.04552 cu.yd. per ft.)



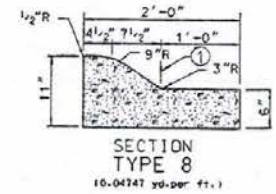
SECTION
TYPE 6

(0.06599 cu.yd per ft.)



SECTION
TYPE 7

(0.0613 cu.yd.per ft.)



SECTION
TYPE 8

(0.04747 yd.per ft.)

GENERAL NOTES:

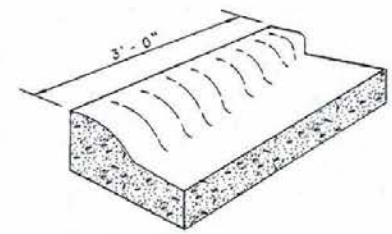
① This Line Should Be Used To Dimension Offsets.

② When Distance Between Back of Curb on Islands Is 4 Feet or Less, Use 4" Class A or AA Concrete (Island Paving) And 2" Of Gravel Base.

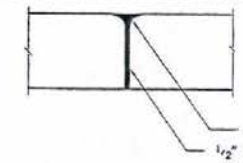
③ Concrete Shall Be Class A or AA.

④ All Concrete Unit Volume For Information Only.

CURB AND GUTTER



TYPICAL TRANSITION FROM
ROLLED CURB TO VERTICAL FACE



ELEVATION
TYPICAL EXPANSION JOINT DETAIL

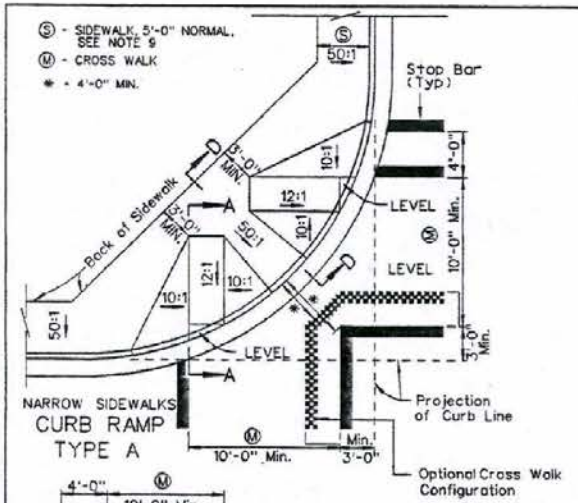
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

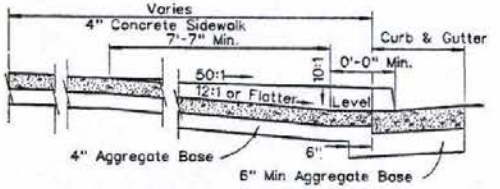
CURB & GUTTERS

R-5.1.1 (502-613)

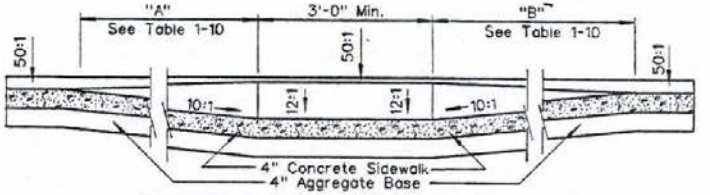
CHIEF ROAD DESIGN ENGR. | ADOPTED: 8/69 | REVISION 8/97

R-38

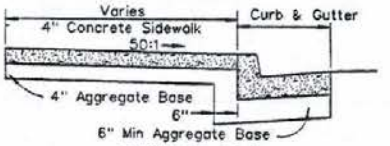




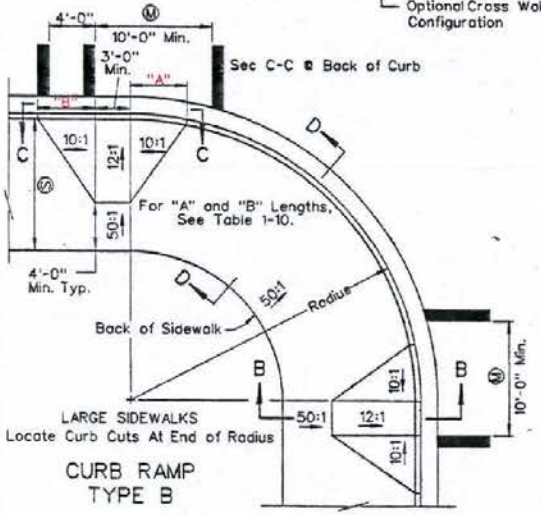
SECTION A-A

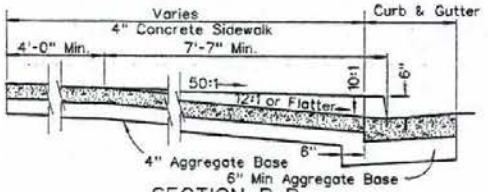


SECTION C-C (℄ Back Side of Curb)

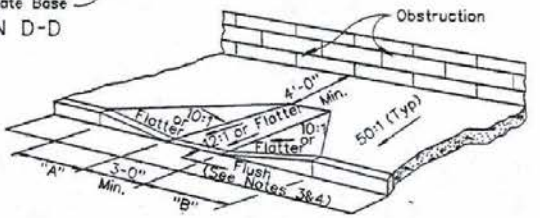


SECTION D-D

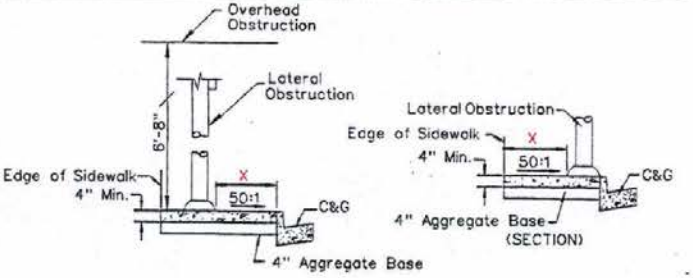




SECTION B-B



MID BLOCK CURB RAMP



X = 2'-8" Min. and 3'-0" Desirable

TYPICAL SIDEWALK vs OBSTRUCTION CLEARANCE DETAIL

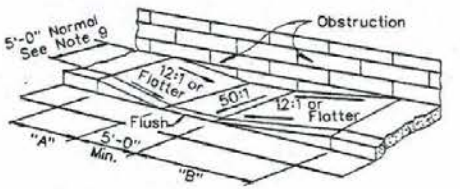
GENERAL NOTES:

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 12:1 OR FLATTER.
8. ALL SLOPE RATES ARE RELATIVE TO LEVEL.
9. IF THERE ARE R/W RESTRICTIONS, SIDEWALK WIDTHS CAN BE REDUCED TO 4'-0" WITH PRIOR APPROVAL FROM ASSISTANT CHIEF ROAD DESIGN ENGINEER. A 5'-0" x 5'-0" PASSING ZONE IS REQUIRED EVERY 200'-0" PER ADA APPENDIX C, SECTION 4.3.4.
10. CONCRETE SHALL BE CLASS A OR AA.
11. RAISE GUTTER AND/OR REDUCE THE HEIGHT OF THE CURB 4" MINIMUM, SO THAT NO DRAINAGE POCKETS WILL EXIST IN THE MIDDLE OF THE RAMPS.

TABLE 1-10

TRANSITION LENGTHS FOR 10:1 SIDE SLOPES
(For 12:1 See Table 1-12, Sheet R-5.2.2)

GRADE % "B" TO "A"	"A" MIN.	"B" MIN.
-6 TO -5.01	4' - 0"	12' - 6"
-5 TO -4.01	4' - 0"	10' - 0"
-4 TO -3.01	4' - 0"	8' - 0"
-3 TO -2.01	4' - 0"	6' - 0"
-2 TO -1.01	4' - 0"	5' - 0"
-1 TO 1	5' - 0"	4' - 0"
1.01 TO 2	6' - 0"	4' - 0"
2.01 TO 3	7' - 0"	4' - 0"
3.01 TO 4	8' - 0"	4' - 0"
4.01 TO 5	10' - 0"	4' - 0"
5.01 TO 6	12' - 6"	4' - 0"



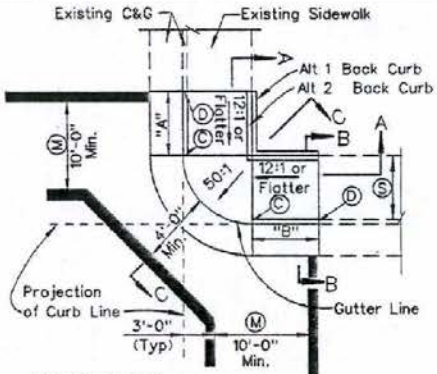
MID BLOCK CURB RAMP ALTERNATE

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

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

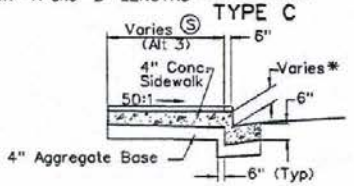
CHIEF ROAD DESIGN ENGR. | R-5.2.1 | (613) | ADOPTED: 7/96 | REVISION 8/98

R-39



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

CURB RAMP TYPE C



SECTION B-B

Ⓜ- CROSS WALK
Ⓢ- SIDEWALK, 5'-0" NORMAL, SEE NOTE 9
✱ - FROM 0" AT Ⓒ TO 6" AT Ⓓ

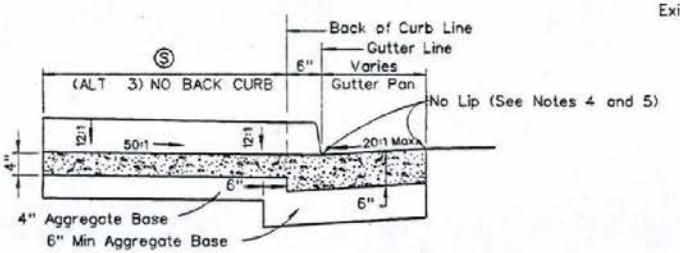
Alt 1: Back Curb Outside Sidewalk - No R/W Restrictions

Alt 2: Back Curb Inside Sidewalk - If R/W Restrictions

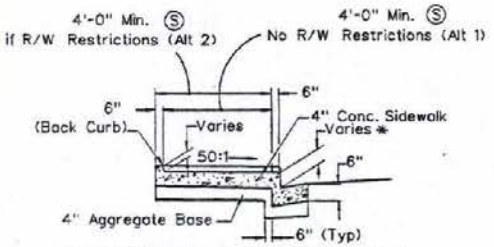
Alt 3: No Back Curb

GRADE % "B" TO "A"	"A" MIN.	"B" MIN.
-6 TO -5.01	4' - 6"	21' - 6"
-5 TO -4.01	4' - 6"	15' - 0"
-4 TO -3.01	4' - 6"	12' - 0"
-3 TO -2.01	5' - 0"	9' - 6"
-2 TO -1.01	5' - 6"	8' - 0"
-1 TO 1	7' - 0"	7' - 0"
1.01 TO 2	8' - 0"	5' - 6"
2.01 TO 3	9' - 6"	5' - 0"
3.01 TO 4	12' - 0"	4' - 6"
4.01 TO 5	15' - 0"	4' - 6"
5.01 TO 6	21' - 6"	4' - 6"

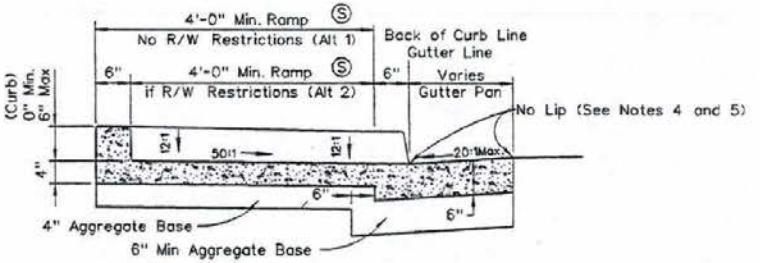
TABLE 1-12
Transition Lengths for 12:1 Side Slopes



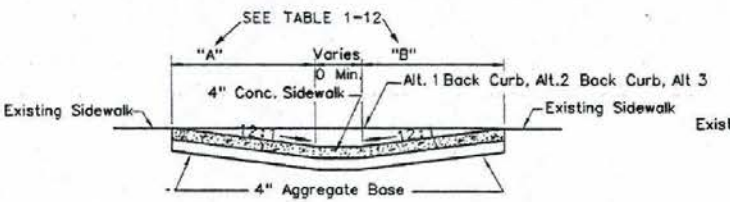
SECTION C-C WITHOUT BACK CURB



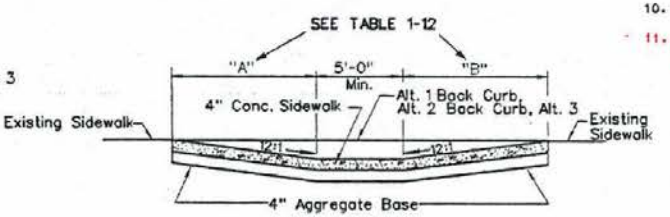
SECTION B-B WITH BACK CURB



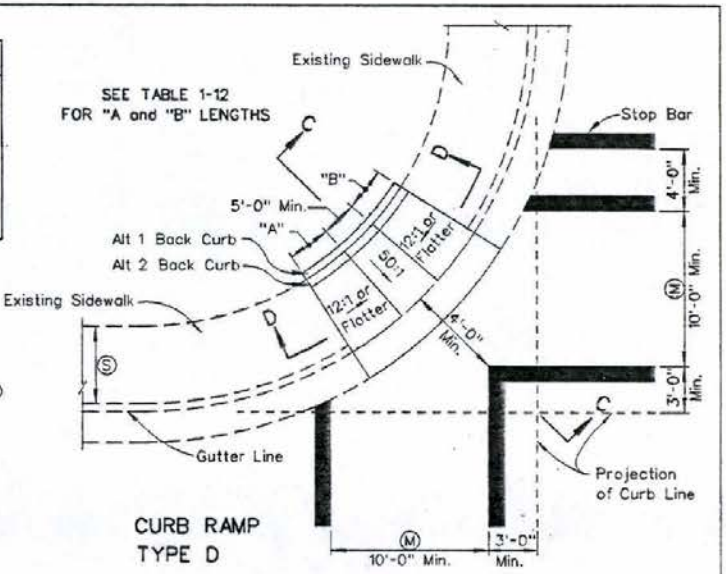
SECTION C-C WITH BACK CURB



SECTION A-A



SECTION D-D



CURB RAMP TYPE D

GENERAL NOTES:

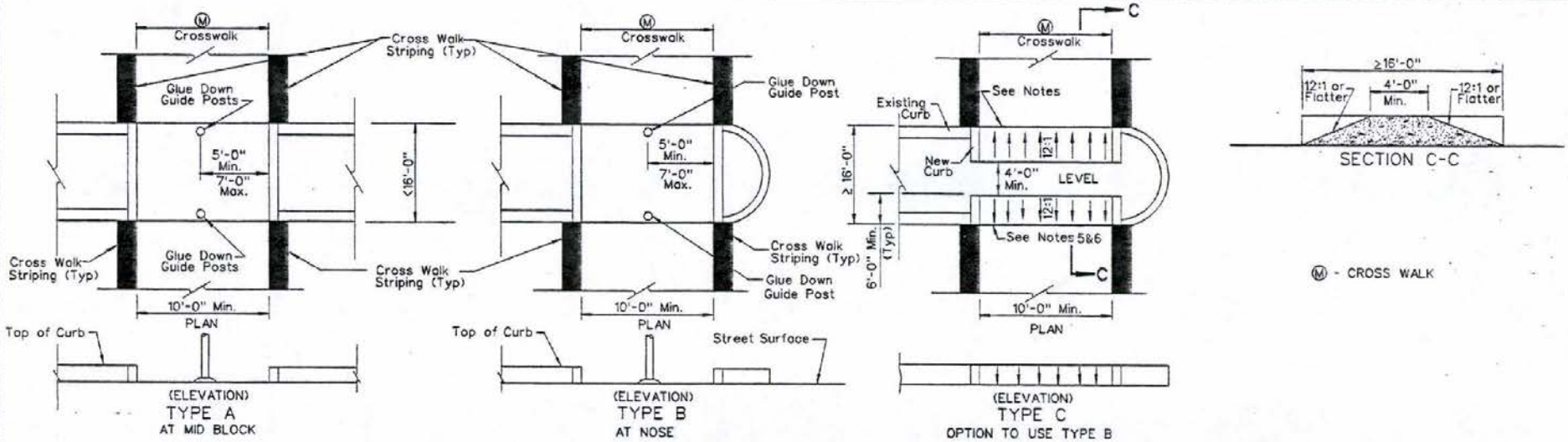
1. IF RIGHT OF WAY IS AVAILABLE, USE TYPE A CURB RAMP.
2. SEE STRUCTURE LIST AND PLAN SHEETS FOR Ⓜ & Ⓢ. "A" AND "B".
3. GRATINGS OR SIMILAR ACCESSES SHALL NOT BE LOCATED IN AREA AT THE BASE OF THE CURB RAMP OR LANDING AREA.
4. NO LIP SHALL BE PERMITTED AT THE CURB RAMP SLOPE TO GUTTER PAN.
5. PLANTMIX 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 12:1 OR FLATTER.
8. ALL SLOPE RATES ARE RELATIVE TO LEVEL.
9. IF THERE ARE R/W RESTRICTIONS, SIDEWALK WIDTHS CAN BE REDUCED TO 4'-0" WITH PRIOR APPROVAL FROM ASSISTANT CHIEF ROAD DESIGN ENGINEER. A 5'-0" x 5'-0" PASSING ZONE IS REQUIRED EVERY 200'-0" PER ADA. APPENDIX C, SECTION 4.3.4.
10. CONCRETE SHALL BE CLASS A OR AA.
11. RAISE GUTTER AND/OR REDUCE THE HEIGHT OF THE CURB 4" MINIMUM, SO THAT NO DRAINAGE POCKETS WILL EXIST IN THE MIDDLE OF THE RAMPS.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

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

R-5.2.2 (613)

CHIEF ROAD DESIGN ENGR. ADOPTED: 7/96 REVISION 2/98



GENERAL NOTES:

1. ALL CURB RAMPS SHALL BE 12:1 OR FLATTER.
2. SEE PLAN SHEETS FOR Ⓜ. M = CROSS WALK. MINIMUM WIDTH 10' - 0".
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.
9. RAISE GUTTER AND/OR REDUCE THE HEIGHT OF THE CURB 4" MINIMUM. SO THAT NO DRAINAGE POCKETS WILL EXIST IN THE MIDDLE OF THE RAMPS.

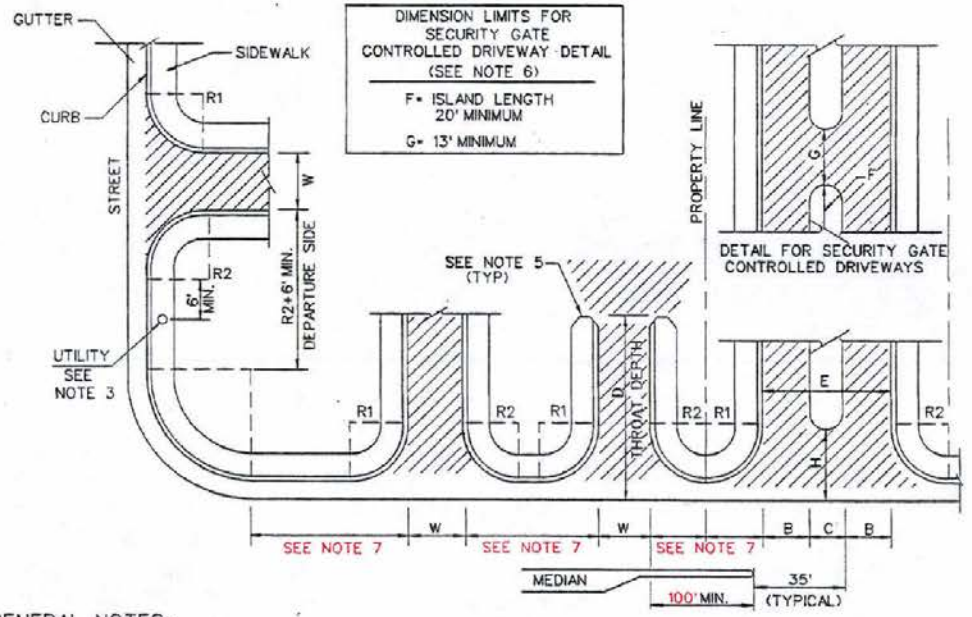
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

MEDIAN ISLANDS, CURB RAMPS, CROSS WALK MARKINGS

CHIEF ROAD DESIGN ENGR. ADOPTED: 7/96 REVISION 2/98

R-5.2.3 (613)

DIMENSION LIMITS (SEE NOTE 6)	
W= 12' MINIMUM FOR ONE-WAY DRIVEWAYS 24' MINIMUM FOR TWO-WAY DRIVEWAYS 40' MAXIMUM	D = THROAT DEPTH 25' MINIMUM 35' MINIMUM FOR > 50 CARS/DAY 65' MINIMUM FOR > 150 CARS/DAY 100' MINIMUM FOR > 300 CARS/DAY
B= 20' MINIMUM & 25' MAXIMUM	R2 = 25' MIN.
C= 7' MINIMUM, FACE TO FACE	
E= 50' MINIMUM	
H= 8' MINIMUM & 15' MAXIMUM	
R1 = 25' MIN.	



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

F= ISLAND LENGTH 20' MINIMUM

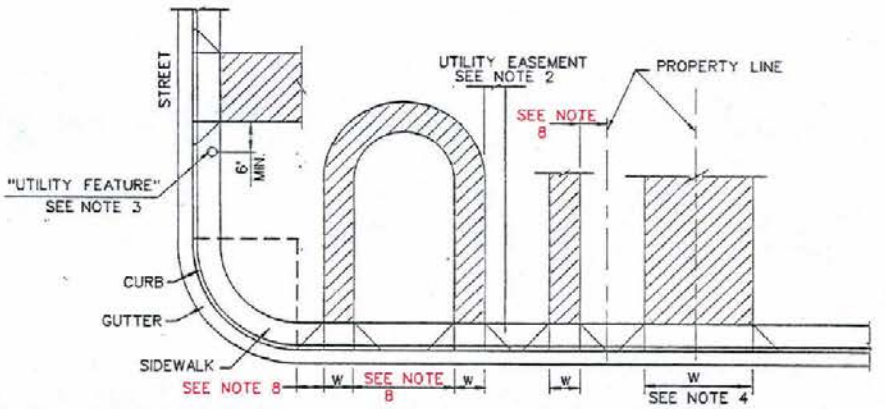
G= 13' MINIMUM

DETAIL FOR SECURITY GATE CONTROLLED DRIVEWAYS

GENERAL NOTES:

1. INDUSTRIAL, AND MULTI-FAMILY DRIVEWAYS SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD DRAWING NUMBERS R-5.3.3.
2. THE TOTAL WIDTH "W" OF DRIVEWAY CURB OPENINGS SHALL NOT EXCEED 65% OF FRONT FOOTAGE.
3. NO DRIVEWAY SHALL BE LOCATED WITHIN 6 FEET OF A LIGHT POLE, FIRE HYDRANT, MAIL BOX, ABOVE-GROUND ELECTRICAL TRANSFER BOX, OR BLOCK WALL HIGHER THAN 2 FEET.
4. THE CENTERLINES OF DRIVEWAYS ON OPPOSITE SIDES OF THE STREET AT A MEDIAN OPENING SHOULD BE D ±10 FEET 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-5.2.1 TO R-5.2.2 and R-5.3.3.
6. FOR ACTUAL DIMENSIONS SEE STRUCTURE LIST.
7. DRIVEWAY SPACING, CLEARANCES, AND RETURN RADII SHALL BE IN ACCORDANCE WITH THE DEPARTMENT'S ACCESS MANAGEMENT STANDARDS.

INDUSTRIAL, COMMERCIAL, AND MULTI-FAMILY DRIVEWAY GEOMETRICS



W = WIDTH OF DRIVEWAY = 12' MIN.
16' MAX. FOR 1 OR 2 CAR GARAGE, OR
28' 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 6 FEET OF A LIGHT POLE, FIRE HYDRANT, MAIL BOX, ABOVE-GROUND ELECTRICAL TRANSFER BOX, BLOCK WALL HIGHER THAN 2 FEET, OR THE CURB RETURN AT A STREET INTERSECTION OR ALLEY.
4. COMMON DRIVEWAY CONSTRUCTION MAY BE PERMITTED AT ANY TWO RESIDENTIAL PROPERTIES OF 60 FEET IN WIDTH OR LESS. THE WIDTH OF THE JOINT DRIVEWAY SHALL BE A MAXIMUM OF 24 FEET. 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-5.2.1 TO R-5.2.2 and R-5.3.2.
8. DRIVEWAY SPACING, CLEARANCES, AND RETURN RADII SHALL BE IN ACCORDANCE WITH THE DEPARTMENT'S ACCESS MANAGEMENT STANDARDS.

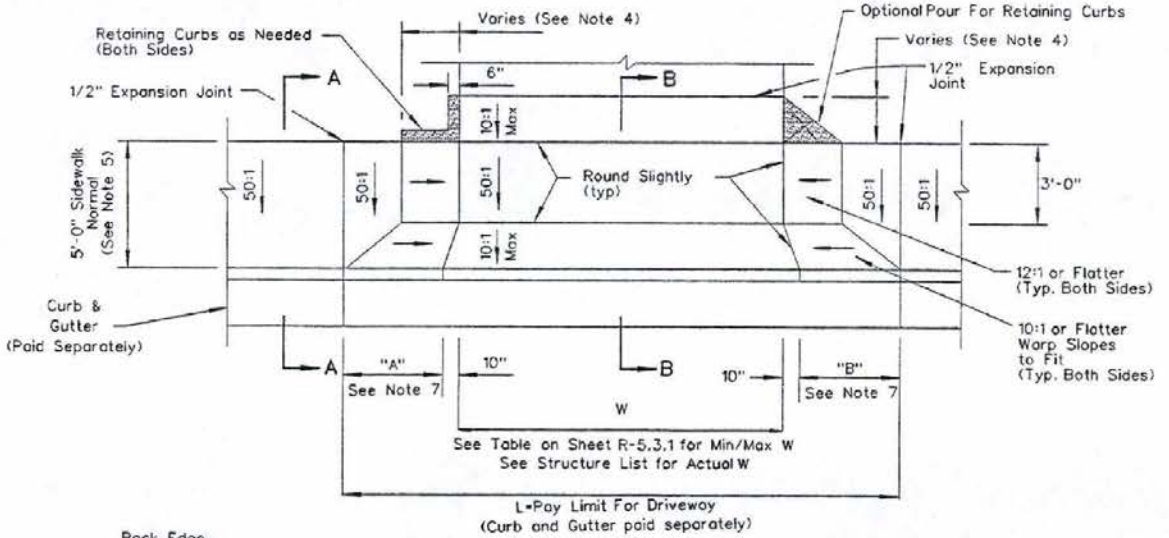
RESIDENTIAL DRIVEWAY GEOMETRICS

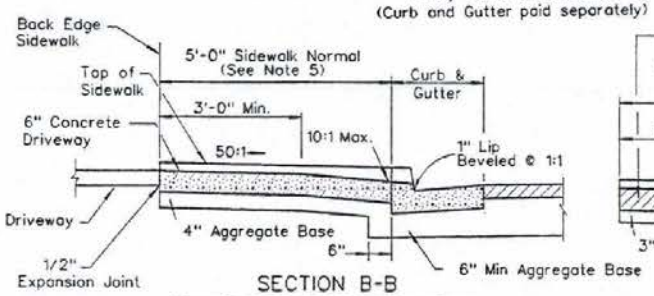
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

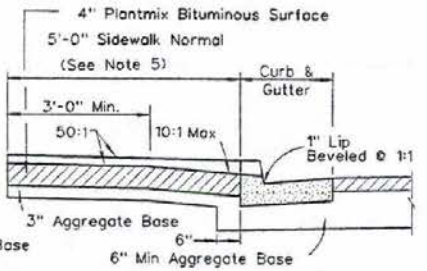
DRIVEWAY GEOMETRICS

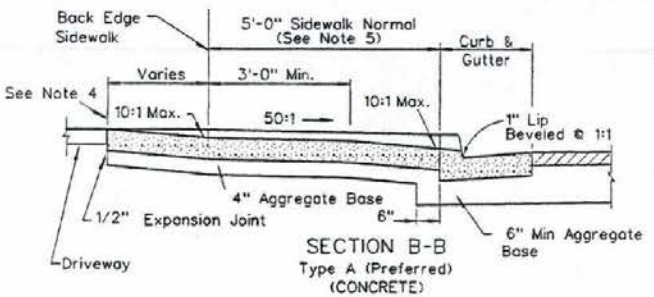
CHIEF ROAD DESIGN ENGR.

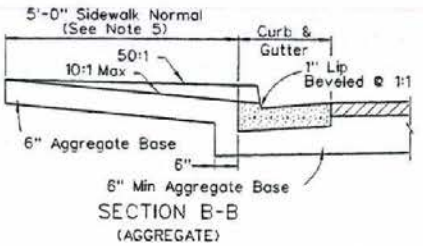
R-5.3.1	(613)
ADOPTED: 1/95	REVISION 10/98

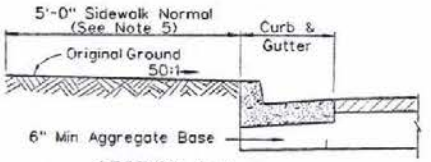


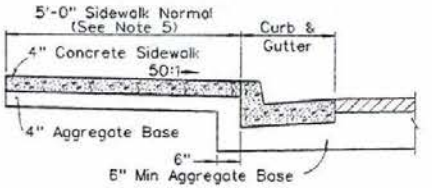


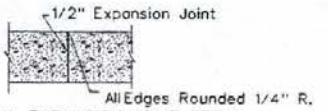












GENERAL NOTES:

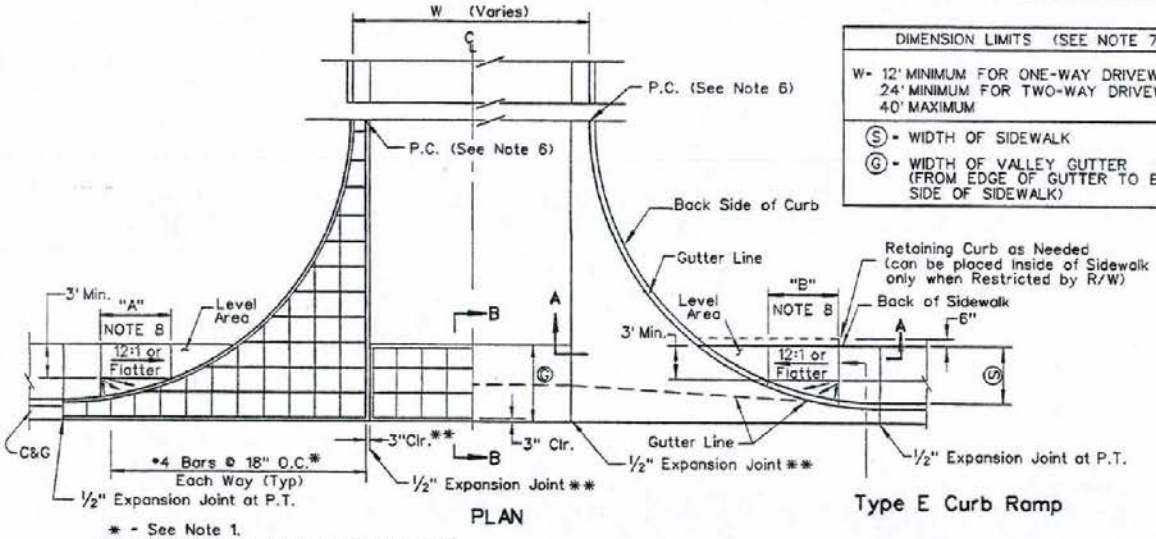
1. ALL RAMPS SHALL BE 12:1 OR FLATTER.
2. CONCRETE DRIVEWAY CAN BE POURED MONOLITHICALLY WITH CURB AND GUTTER.
3. ALL SLOPE RATES ARE RELATIVE TO LEVEL.
4. LENGTH VARIES ACCORDING TO CURB AND GUTTER PROFILE. RETAINING CURBS AND ACQUISTION OF CONSTRUCTION EASEMENTS MAY BE NECESSARY.
5. IF THERE ARE R/W RESTRICTIONS, SIDEWALK WIDTHS CAN BE REDUCED TO 4'-0" WITH PRIOR APPROVAL FROM ASSISTANT CHIEF ROAD DESIGN ENGINEER. A 5'-0" x 5'-0" PASSING ZONE IS REQUIRED EVERY 200' PER ADA. APPENDIX C, SECTION 4.3.4.
6. CONCRETE SHALL BE CLASS A OR AA.
7. SEE TABLE 1-10, ON STANDARD DRAWING R-5.2.1.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SINGLE FAMILY DRIVEWAYS WITH CURB

R-5.3.2 (613)

ASSISTANT CHIEF ROAD DESIGN ENGR. ADOPTED: 7/96 REVISION 2/98

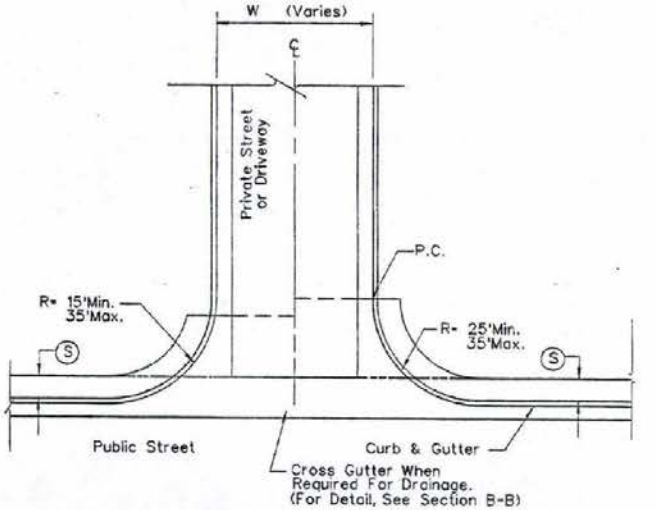


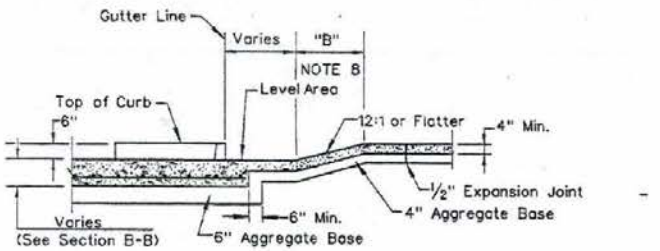
PLAN

DIMENSION LIMITS (SEE NOTE 7)
W= 12' MINIMUM FOR ONE-WAY DRIVEWAYS 24' MINIMUM FOR TWO-WAY DRIVEWAYS 40' MAXIMUM
Ⓢ = WIDTH OF SIDEWALK
Ⓖ = WIDTH OF VALLEY GUTTER (FROM EDGE OF GUTTER TO BACK OF SIDE OF SIDEWALK)

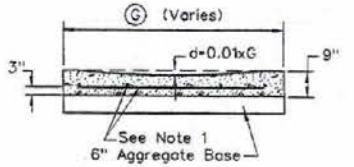
Type E Curb Ramp

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

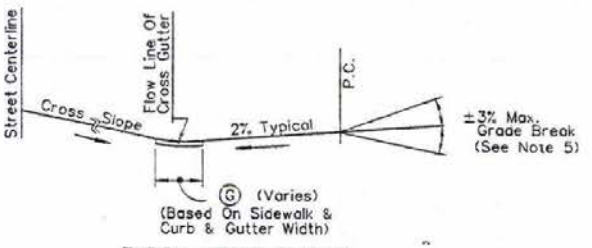




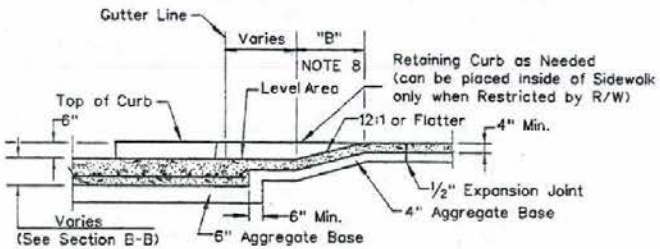
SECTION A-A



SECTION B-B



TYPICAL CROSS SECTION
℄



SECTION A-A WITH RETAINING CURB

GENERAL NOTES:

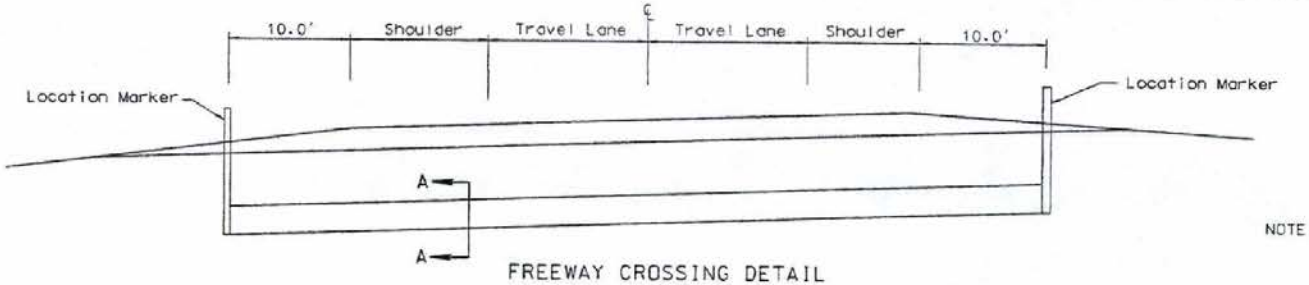
1. SPACING OF NO. 4 BARS LESS THAN 18" TO MEET LOCAL CODES SHALL BE NOTED IN THE STRUCTURE LIST.
2. WHEN CONSTRUCTING DRIVEWAYS WHERE CURB AND GUTTER EXISTS, COMPLETELY REMOVE EXISTING SECTIONS. DRIVEWAY MAY BE POURED MONOLITHIC TO A.C. LINE, IN WHICH CASE THE BARS SHALL BE CONTINUOUS. IF OPTIONAL SECTIONAL 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-5.2.1 TO R-5.2.2 AND R-5.3.1.
5. FOR GRADE CHANGES GREATER THAN 3%, VERTICAL CURVES OF AT LEAST 10 FEET MUST BE USED.
6. DRIVEWAY GEOMETRICS SHALL GO TO THE P.C.
7. FOR ACTUAL DIMENSIONS SEE STRUCTURE LIST.
8. SEE TABLE 1-12, ON DRAWING R-5.2.2 , FOR "A" AND "B".
9. RAISE GUTTER AND/OR REDUCE THE HEIGHT OF THE CURB 4" MINIMUM, SO THAT NO DRAINAGE POCKETS WILL EXIST IN THE MIDDLE OF THE RAMPS.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

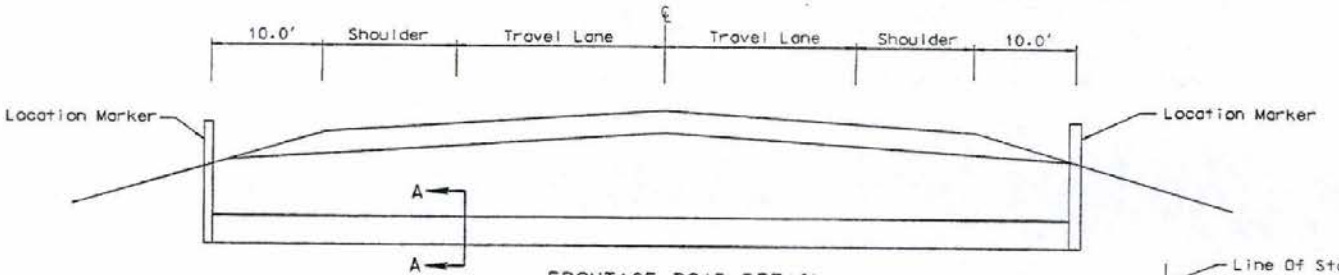
MULTI-FAMILY, COMMERCIAL & INDUSTRIAL DRIVEWAY DETAILS

CHIEF ROAD DESIGN ENGR

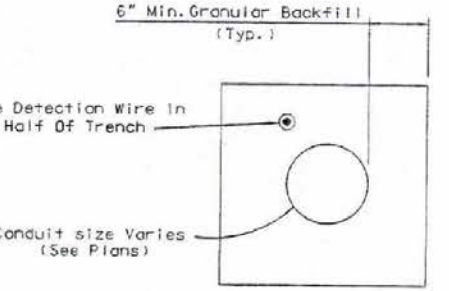
R-5.3.3	(613)
ADOPTED: 1/95	REVISION 2/98



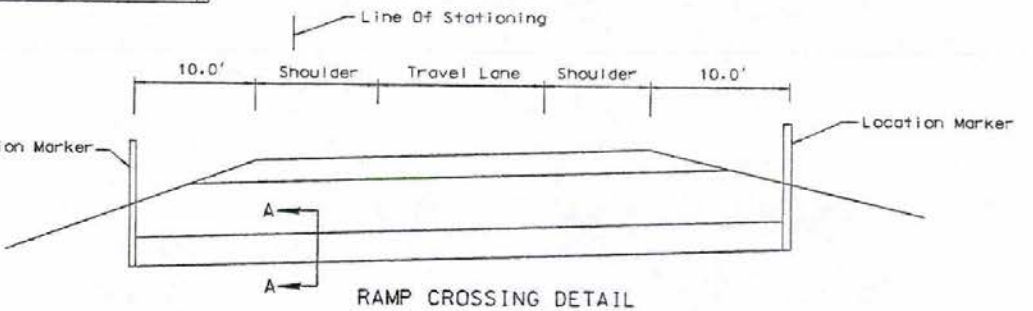
FREEWAY CROSSING DETAIL



FRONTAGE ROAD DETAIL



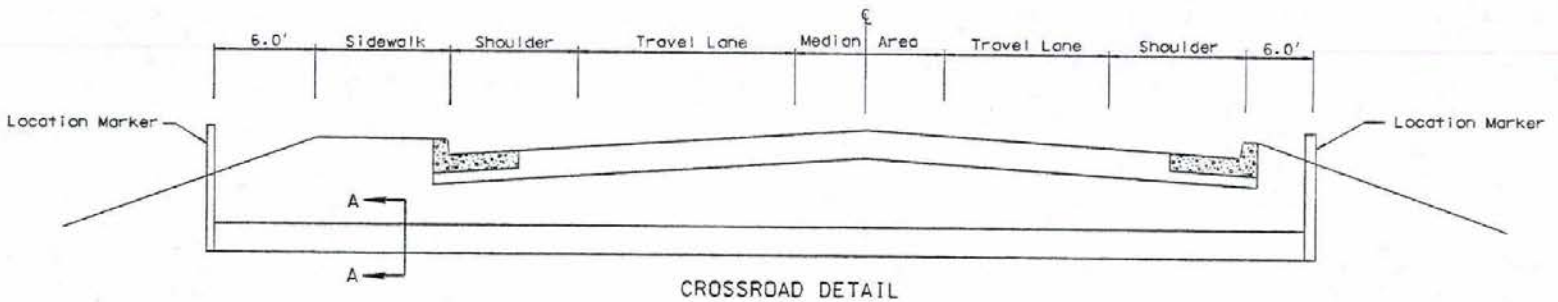
SECTION A-A



RAMP CROSSING DETAIL

GENERAL NOTES:

1. MINIMUM 3.0' COVER OVER TOP OF CONDUIT AT SHOULDER LINE.
2. 12 GAGE BARE COPPER DETECTION WIRE TO LAY IN TRENCH ADJACENT TO CONDUIT AND ATTACH TO LOCATION MARKER AT EACH END.
3. LOCATION MARKER SHALL BE 2" P.V.C. OR 5.0' STEEL FENCE POSTS.



CROSSROAD DETAIL

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

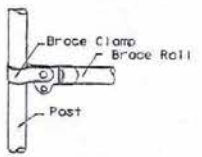
CONDUIT INSTALLATION FOR FUTURE WATER LINES

CHIEF ROAD DESIGN ENGR.

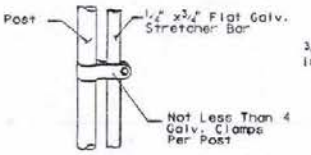
R-5.4.1 (213)
ADOPTED: 5/73 REVISION 2/98

SIZE OF POSTS-STANDARD FENCING

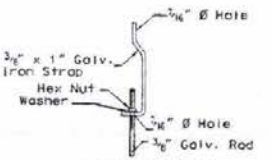
FENCE HEIGHT	CORNER, END & PULL			LINE		BRACES		
	ROUND PIPE O.D.	MIN. WT. (LBS/L.F.) CLASS 1	MIN. WT. (LBS/L.F.) CLASS 2	T-SECTION	MIN. WT. (LBS/L.F.)	ROUND PIPE O.D.	MIN. WT. (LBS/L.F.) CLASS 1	MIN. WT. (LBS/L.F.) CLASS 2
3' to 6'	2.375"	3.65	2.64	——	1.30	1.660"	2.27	1.45



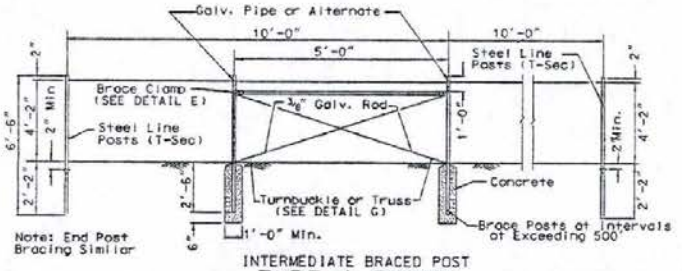
DETAIL E



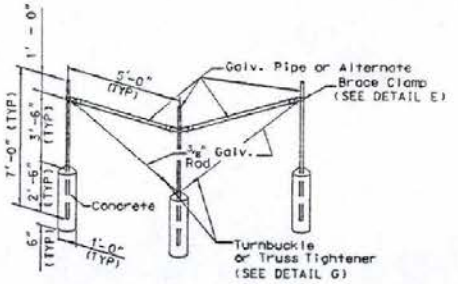
DETAIL F



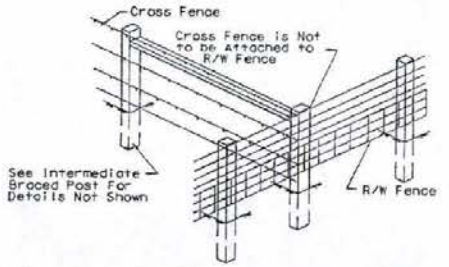
TRUSS TIGHTENER
DETAIL G



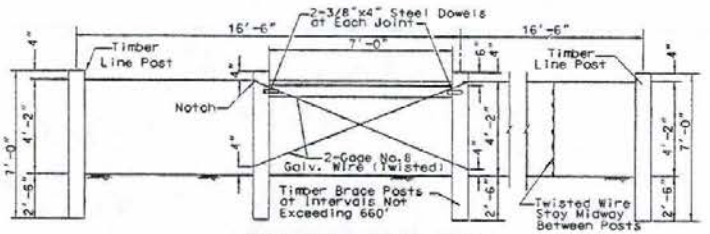
INTERMEDIATE BRACED POST
TYPE A FENCE



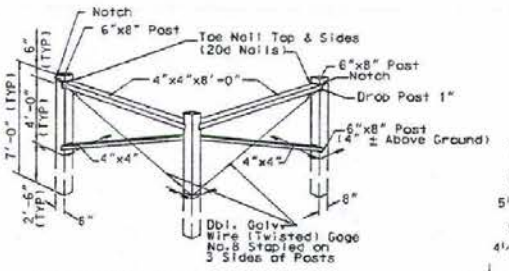
CORNER BRACE FOR
TYPE A FENCE



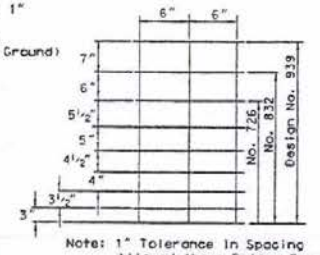
TYPICAL EXISTING CROSS FENCE TIE



INTERMEDIATE BRACED POST
TYPE B FENCE



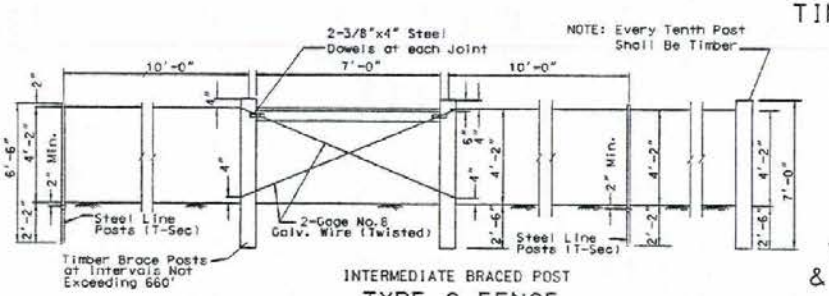
TIMBER CORNER BRACE



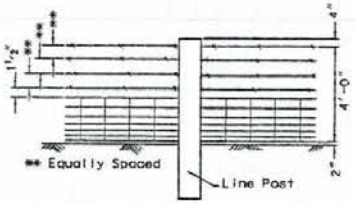
WOVEN WIRE (FARM FENCE)
FABRIC

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 15 1/2" ABOVE GROUND, OTHER SPACING 11 1/2
   5 WIRE: BOTTOM WIRE 10" ABOVE GROUND, OTHER SPACING 10"
4. STANDARD FENCING WILL BE DESIGNATED BY TYPE, DESIGN OF FABRIC, AND/OR NUMBER OF BARBED WIRES. THUS:
   TYPE A-832-3B DESIGNATES METAL POSTS, 32" WOVEN (FARM) WIRE, AND 3 BARBED WIRES;
   TYPE B-4B DESIGNATES WOOD POSTS, 4 BARBED WIRES;
   TYPE C-726-4B DESIGNATES COMBINATION OF WOOD AND METAL POSTS, 26" WOVEN (FARM) WIRE, 4 BARBED WIRES.
5. CONCRETE SHALL BE CLASS A OR AA.



INTERMEDIATE BRACED POST
TYPE C FENCE



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

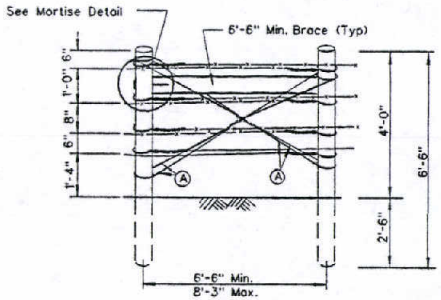
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FENCE DETAILS

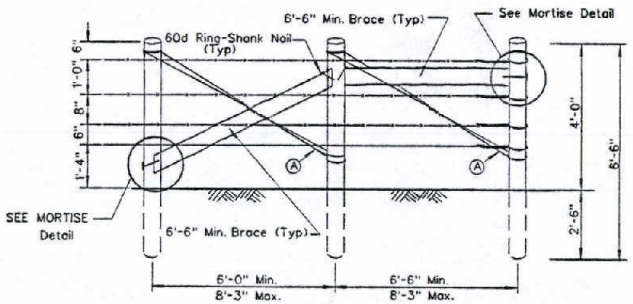
CHIEF ROAD DESIGN ENGR.

R-6.1.1	(616.724)
ADOPTED: 8/69	REVISION 8/97

R-46



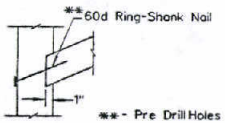
STRESS PANEL

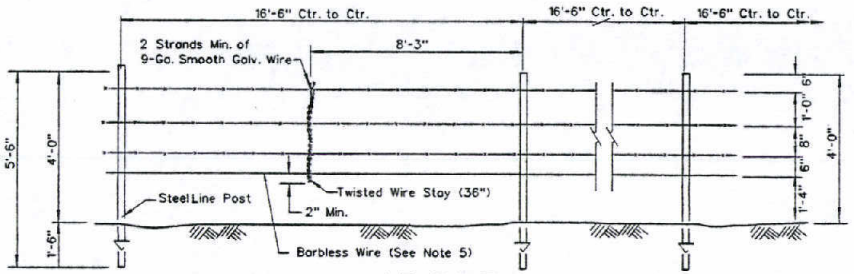


END PANEL

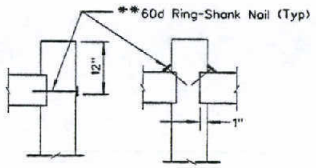
GENERAL NOTES:

1. STRESS PANELS SHALL BE PLACED EVERY 1320' ON TANGENTS.
2. STRESS PANELS SHALL BE PLACED EVERY 660' ON CURVES.
3. END PANELS SHALL BE USED WHEREVER A BREAK IN THE FENCE OCCURS. (I.E. GATES, CATTLEGUARDS) 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 6" NOMINAL DIAMETER.
8. ADD ADDITIONAL STRAND OF BARBED WIRE AND/OR ROCK DEADMAN (MIN. WEIGHT 50 LBS.) WHEN SPACE BETWEEN BOTTOM WIRE AND GROUND EXCEEDS 20".
9. STEEL POST DEADMAN DRIVEN APPROXIMATELY 3'-0" INTO GROUND MAY BE USED IN LIEU OF ROCK DEADMAN.



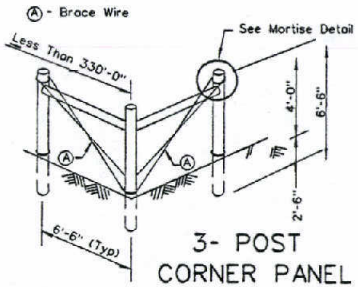


LINE PANELS

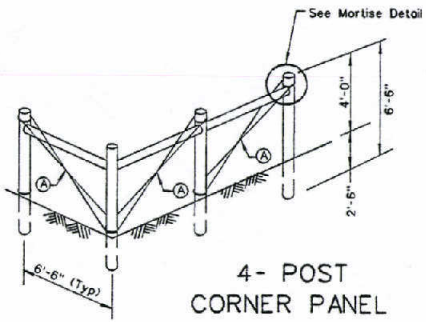


MORTISE DETAIL

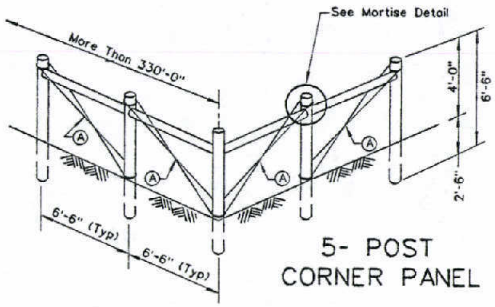
TABLE A: WOOD POST SPACING ON CURVED FENCE LINES	
RADIUS OF CURVE AT FENCE LINE (FT.)	RATIO (STEEL POST : WOOD POST)
< 1,000	3:1
1,000 TO 2,500	4:1
2,500TO 5,000	7:1
5,000 TO 10,000	NO WOOD POST NEEDED BETWEEN STRESS PANELS AT 660'-0"
> 10,000	TREAT CURVE AS TANGENT



3- POST CORNER PANEL



4- POST CORNER PANEL



5- POST CORNER PANEL

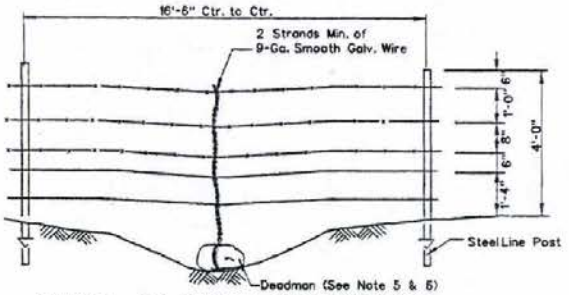
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

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

R-6.1.2 (616.724)

CHIEF ROAD DESIGN ENGR. | ADOPTED: 7/96 | REVISION 10/98

R-47

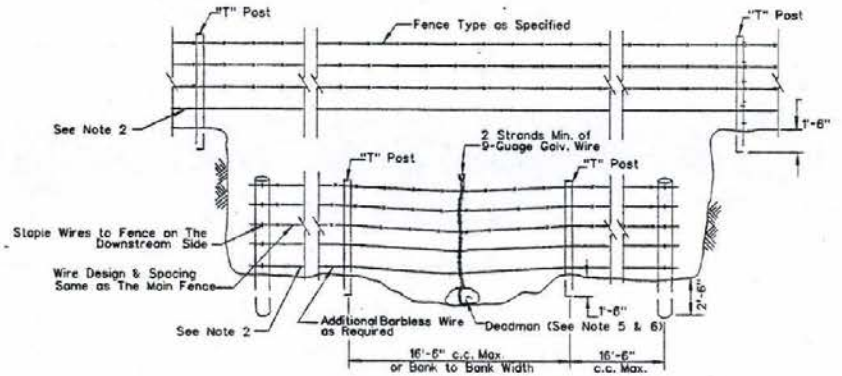


PANEL AT MINOR DEPRESSION

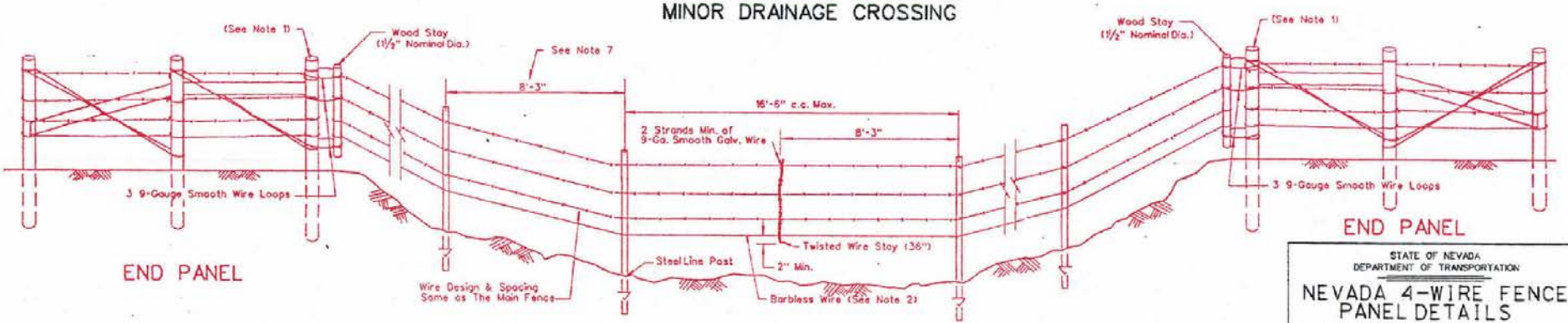
OR INTERMITTENT STREAM

GENERAL NOTES:

1. HINGE POST SHALL BE 8' IN LENGTH AND SHALL BE BURIED 3' IN GROUND.
2. BARBED WIRE SHALL BE USED FOR BOTTOM STRAND WHEN REQUIRED BY NEV. DEPT. OF WILDLIFE OR BUREAU OF LAND MANAGEMENT.
3. WIRES ARE TO BE TIED OFF AT STRETCH POINTS. WRAP AND SPLICE TO SELF WITH AT LEAST 4 TURNS AT OPPOSITE END OF PANELS.
4. WOOD POSTS SHALL BE 6" NOMINAL DIAMETER.
5. ADD ADDITIONAL STRAND OF BARBED WIRE AND/OR A ROCK DEADMAN (MIN. WEIGHT 50 LBS.) WHEN SPACE BETWEEN BOTTOM WIRE AND GROUND EXCEEDS 20".
6. STEEL POST DEADMAN DRIVEN APPROXIMATELY 1m INTO GROUND MAY BE USED IN LIEU OF ROCK DEADMAN.
7. STEEL LINE POSTS AT 8'-3" SPACING TO MAINTAIN BOTTOM WIRE CLEARANCE.



MINOR DRAINAGE CROSSING



END PANEL

END PANEL

MAJOR DRAINAGE CROSSING

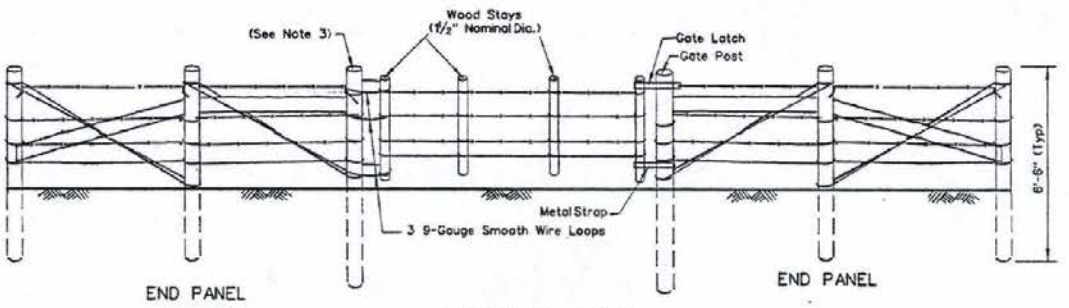
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

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

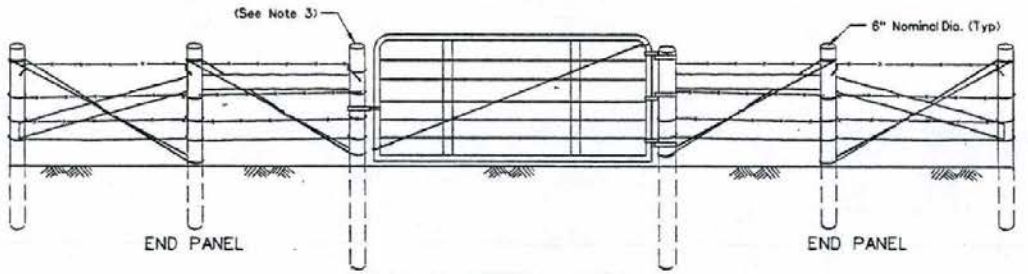
CHIEF ROAD DESIGN ENGR.

R-6.1.2.1 (616.724)
ADOPTED: 7/98
REVISION 10/98

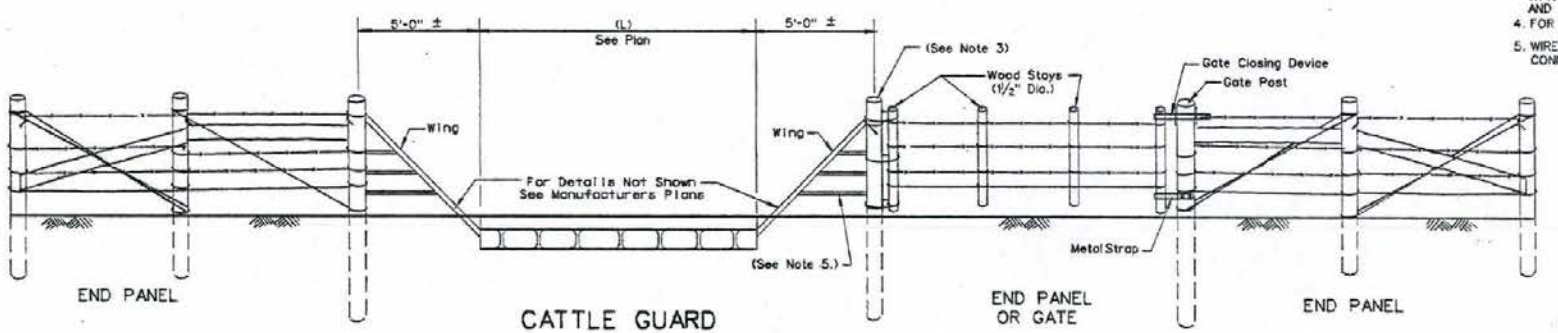
R-48



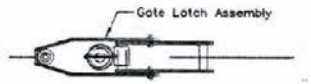
MISSOURI GATE



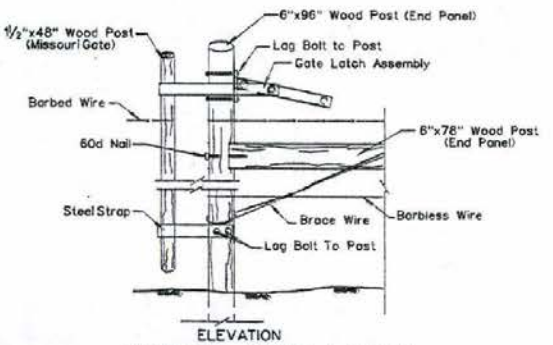
METAL DRIVE GATE



CATTLE GUARD



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 8 FT. IN LENGTH AND SHALL BE BURIED 3 FT. 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.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

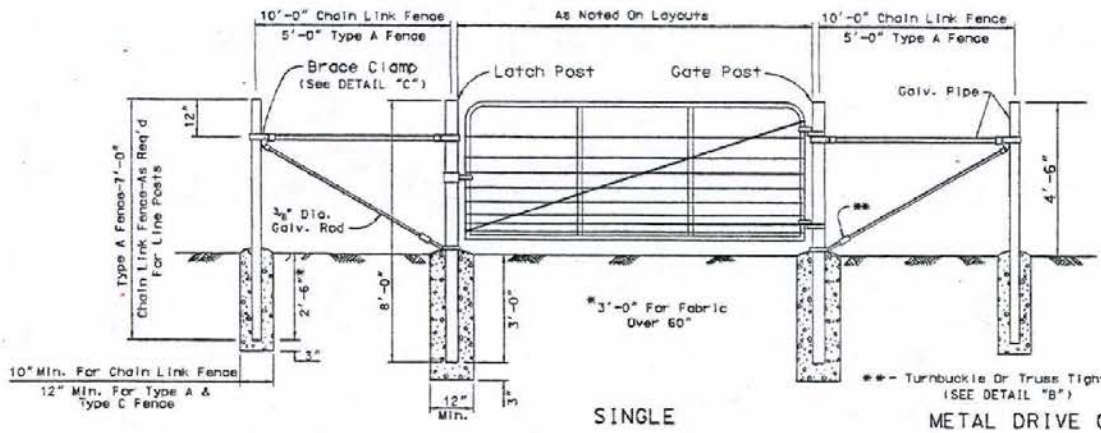
NEVADA 4-WIRE FENCE GATE DETAILS (TYPE G-NV-4B)

CHIEF ROAD DESIGN ENGR.

R-6.1.2.2 (616, 724)

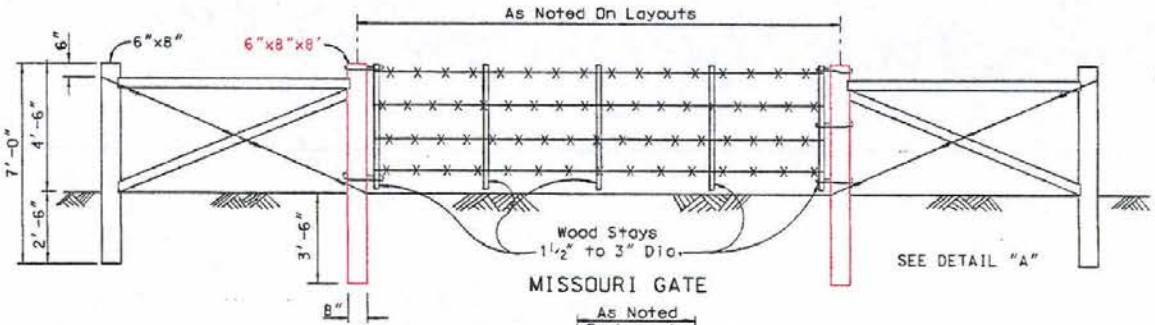
ADOPTED: 10/98 | REVISION

R-49

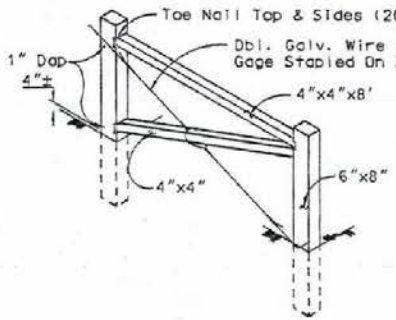


SINGLE

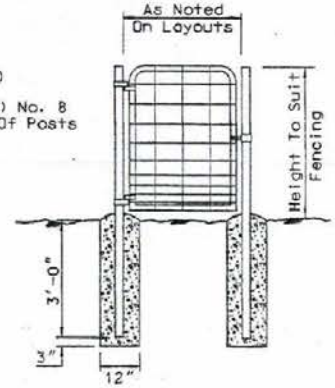
METAL DRIVE GATES



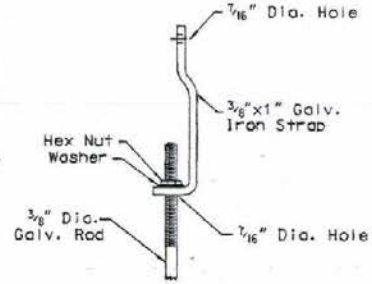
MISSOURI GATE



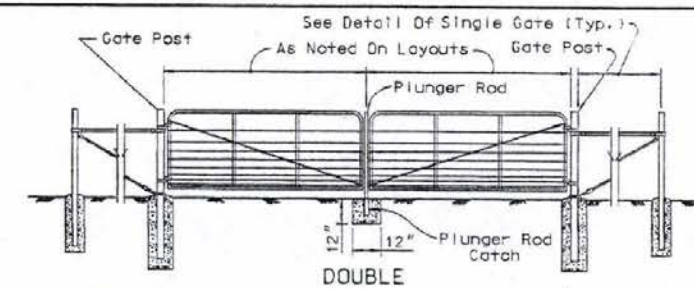
DETAIL "A"



WALK GATE

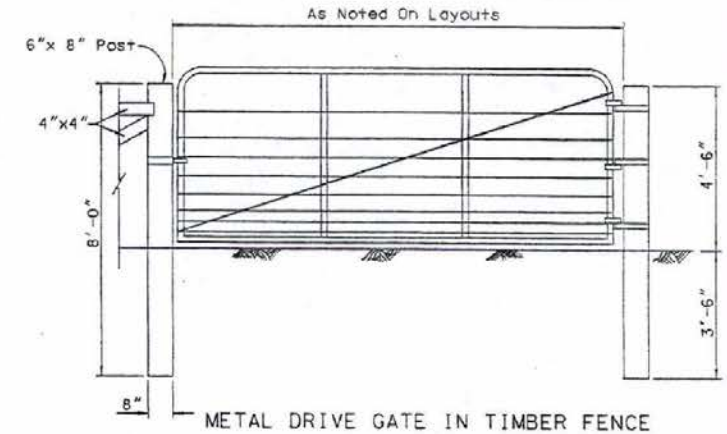


DETAIL "B"
(TRUSS TIGHTENER)



DOUBLE

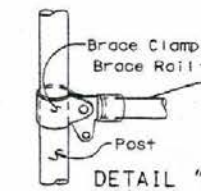
NOTE:
Bracing Is For Chain Link Fencing.
See Intermediate Braced Post,Type A Fence,
For Bracing Detail When Type A Fence Is Specified.



METAL DRIVE GATE IN TIMBER FENCE

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.



DETAIL "C"

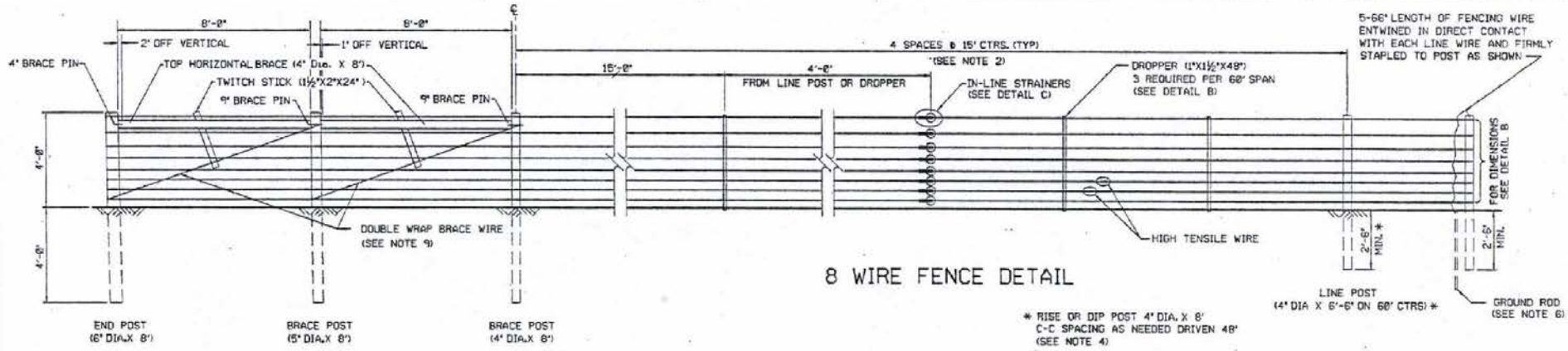
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GATE AND FENCE DETAILS

R-6.1.3 · (616.724)

CHIEF ROAD DESIGN ENGR. | ADOPTED: 8/69 | REVISION 10/96

R-50



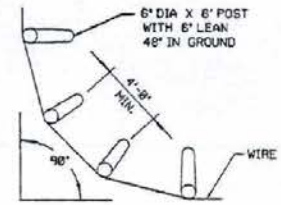
8 WIRE FENCE DETAIL

* RISE OR DIP POST 4" DIA. X 8'
C-C SPACING AS NEEDED DRIVEN 48"
(SEE NOTE 4)

DOUBLE BRACE END ASSEMBLY

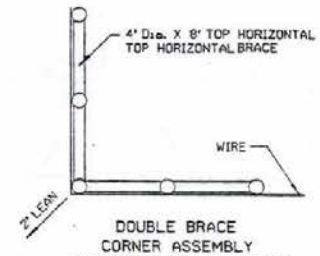
NOTE: FARM GATE 12' OR LESS MAY BE INSTALLED ON POST AFTER FINAL WIRE TENSIONING.

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



ALTERNATE FOUR POST
CORNER ASSEMBLY

PLAN

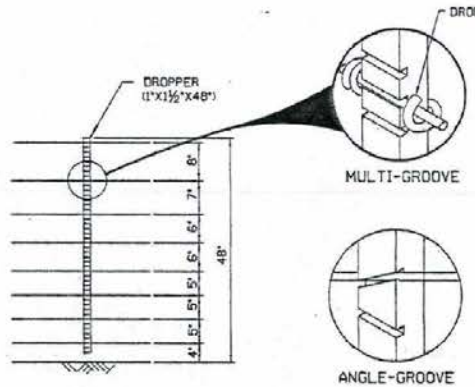


DOUBLE BRACE
CORNER ASSEMBLY
(FOR DETAILS-SEE ABOVE)

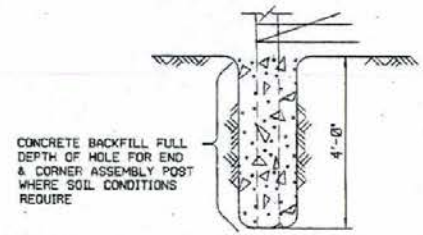
PLAN

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 60' ON LEVEL TERRAIN WITH DROPPERS ON 15' CENTERS. POST SPACING MAY BE DECREASED DUE TO TERRAIN CONDITIONS. DROPPER SPACING WILL REMAIN ON 15' MAX. CENTERS. MINIMUM LINE POST SPACING WILL BE ON 15' CENTERS WITHOUT DROPPERS. WITH 4" 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 1 3/4" WILL INDICATE A TENSION OF APPROXIMATELY 250 LBS. (± 10 LBS).
4. MAXIMUM LENGTH OF WIRE PER IN-LINE STRAINER ON LEVEL TERRAIN: STRAIGHT=5000'; 1-90 DEGREE CORNER: 3000'; 2-90 DEGREE CORNERS: 2000'; 3-90 DEGREE CORNERS: 1500'; 4-90 DEGREE CORNERS: 1000'. FOR UNEVEN TERRAIN REDUCE DISTANCES BY 500' FOR EACH MAJOR RISE AND DIP. DIP OR RISE POSTS SHALL BE A MINIMUM OF 4" DIAMETER SMALL END, 8' 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 (5/8"x8'), SHALL BE PLACED EVERY 1/2 MI IN DRY SOILS, OR EVERY 300' 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 25' TO 50' AWAY.
7. IT IS RECOMMENDED FOR TYING OFF WIRES ON END POSTS TO USE TWO (2) NICROPRESS SLEEVES CAT. NO. P-W-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 WIRELINK, 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 5 TURNS, TO A MAXIMUM OF 6 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 150 LBS.) ON EACH WIRE. STAPLES SHALL NOT BIND WIRE. AFTER STAPLING IS COMPLETED, TENSION EACH WIRE AN ADDITIONAL 100 LBS. FOR A TOTAL OF 250 LBS. 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 A
POST WITH CONCRETE FILL

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 12 1/2 GAL. WITH A MINIMUM OF 200,000 LB/IN 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 1¾", 9 GAUGE WITH SLASH CUT POINTS AND SHALL CONFORM WITH THE REQUIREMENTS FOR CLASS 3 ZINC COATING OF ASTM SPECIFICATION A116.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

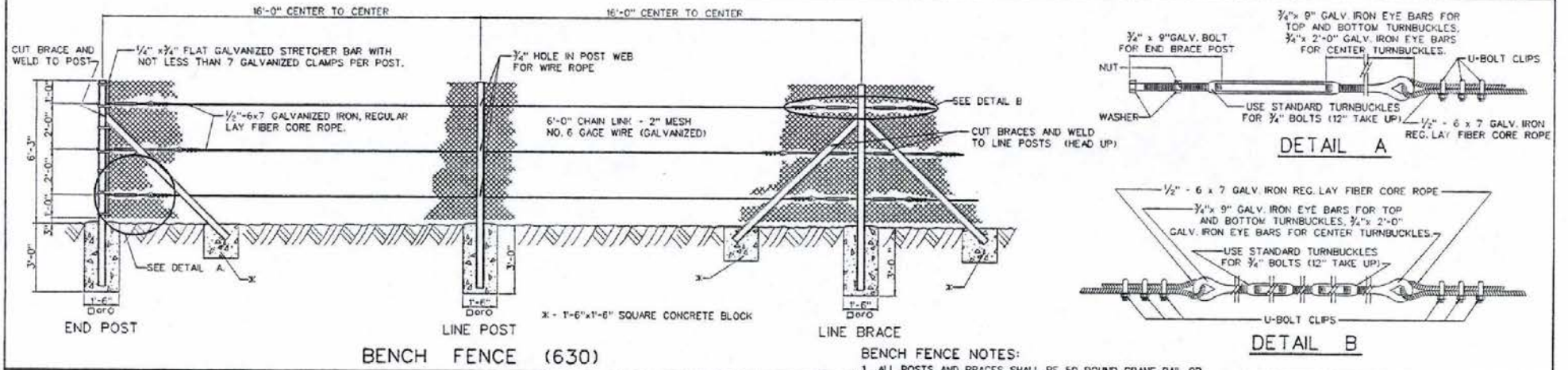
HIGH-TENSILE 8-WIRE RANGE FENCE

CHIEF ROAD DESIGN ENGR.

R-6.1.4 (616, 724)

ADOPTED 11/82 REVISION 2/98

R-51



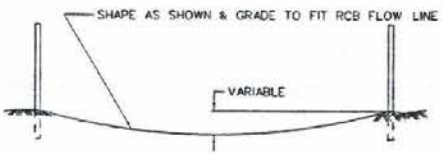
BENCH FENCE (630)

DETAIL A

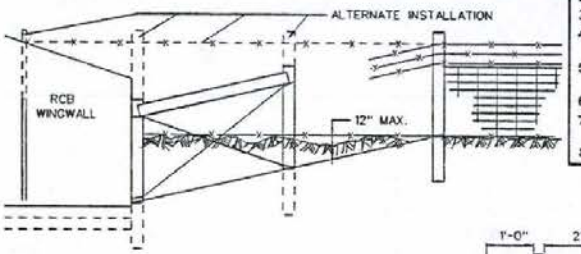
DETAIL B

BENCH FENCE NOTES:

1. ALL POSTS AND BRACES SHALL BE 50 POUND CRANE RAIL OR 4"X4"X13 POUND WIDE FLANGE, 9' LONG.
2. INSTALL LINE BRACES AT INTERVALS NOT EXCEEDING 275'.
3. ALL POSTS SHALL BE AT 16' 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 3 LIN. FEET.
8. CONCRETE SHALL BE CLASS A OR AA.



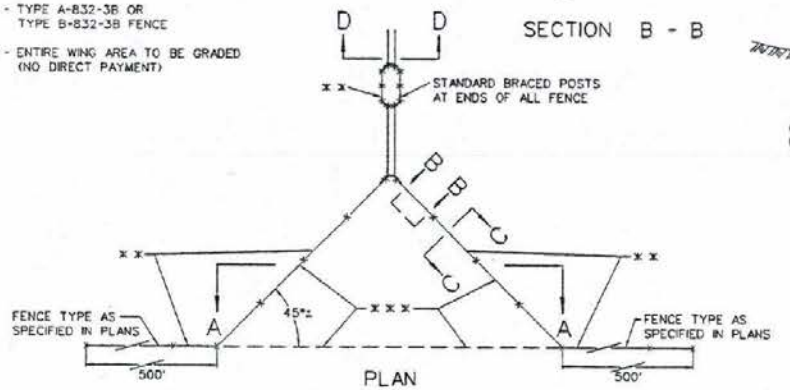
SECTION A - A



SECTION B - B

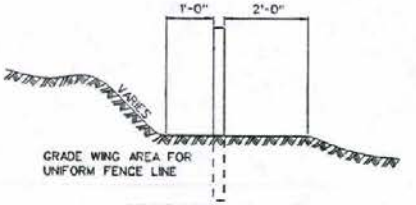
x x - TYPE A-832-3B OR TYPE B-832-3B FENCE

x x x - ENTIRE WING AREA TO BE GRADED (NO DIRECT PAYMENT)

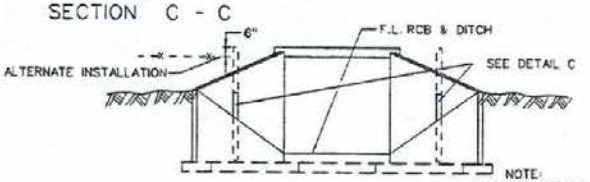


PLAN

CATTLE PASS FENCING (616)

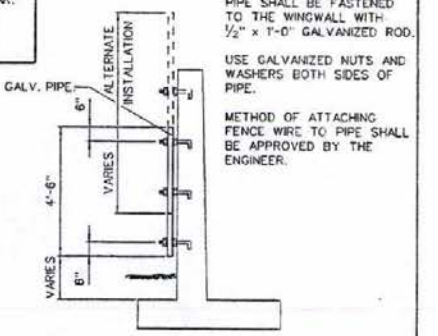


SECTION C - C



SECTION D - D

NOTE:
FENCE ATTACHMENT AND/OR ALTERNATE INSTALLATION TO BE PLACED AT THE DIRECTION OF THE ENGINEER. (1'-0" MIN. FROM OUTER END OF WINGWALL).



DETAIL C

METHOD OF ATTACHING FENCE TO RCB WINGWALL (OPTIONAL)

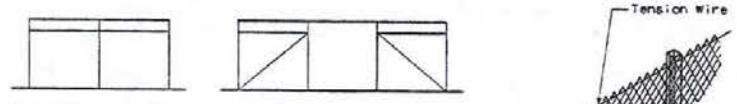
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

BENCH FENCE AND CATTLE PASS FENCING

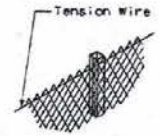
CHIEF ROAD DESIGN ENGR.

R-6.2.1 (616-630, 724)
ADOPTED 8/69 REVISION: 2-11/82

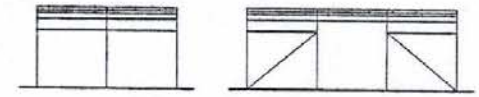
R-52



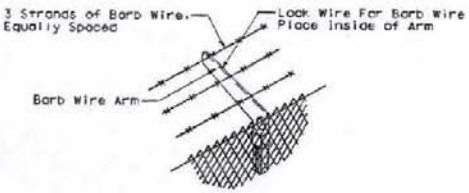
BRACING ARRANGEMENT



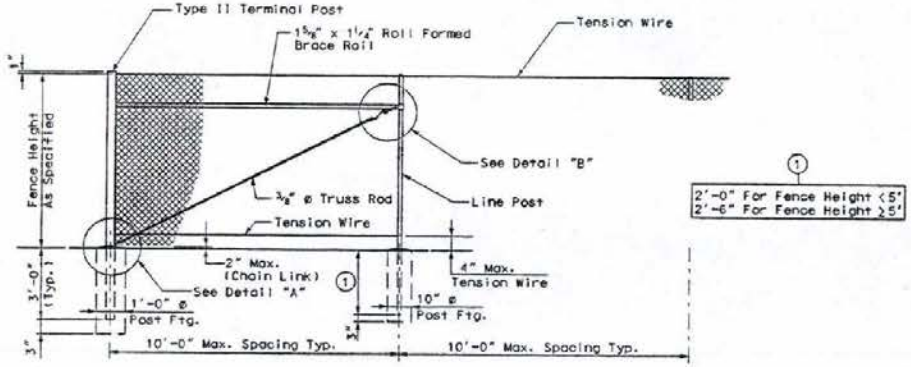
LINE POST TOP



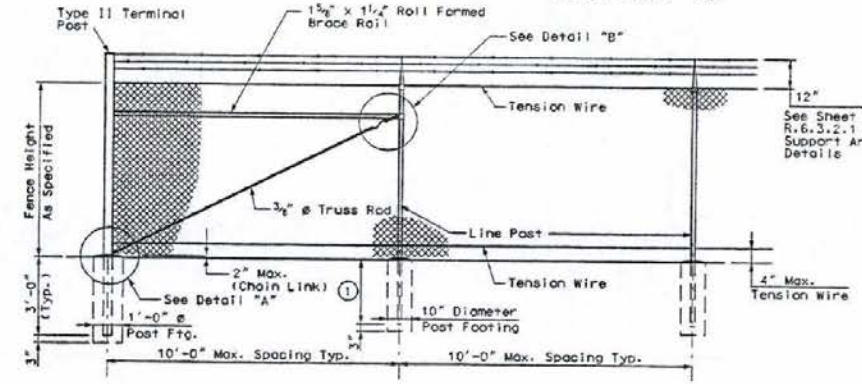
BRACING ARRANGEMENT



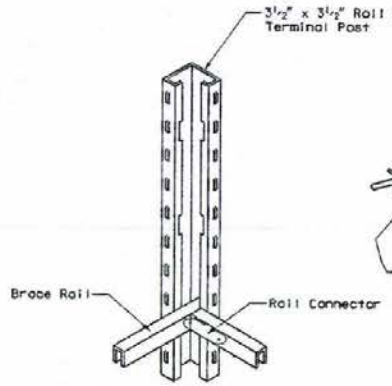
LINE POST TOP



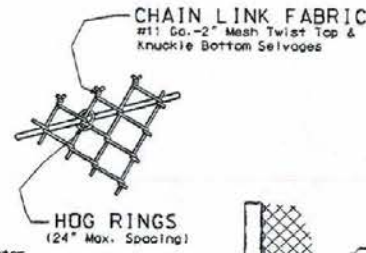
UP TO 72-INCH CHAIN LINK FENCE

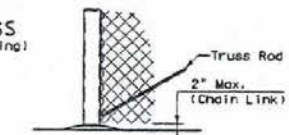


UP TO 72-INCH HEIGHT CHAIN LINK 3B FENCE

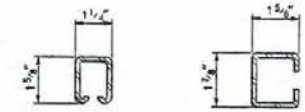


RAIL CONNECTION AT CORNER POSTS



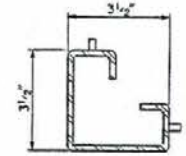


TRUSS ROD HOOKED INTO LOWER LOOP (DETAIL "A")

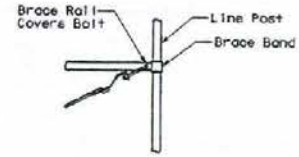


BRACE RAIL

LINE POST



TYPE II TERMINAL POST



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

FABRIC BAND FOR LINE POST #11 GA.

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 12" 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 14" APART, AND TO TOP AND BOTTOM TENSION WIRE WITH HOG RINGS OR TIE WIRES SPACED APPROXIMATELY 24" APART.
   (E) FOR TUBULAR POST AND BRACE RAIL DETAILS, SEE SHEET NO. R-6.1.1.

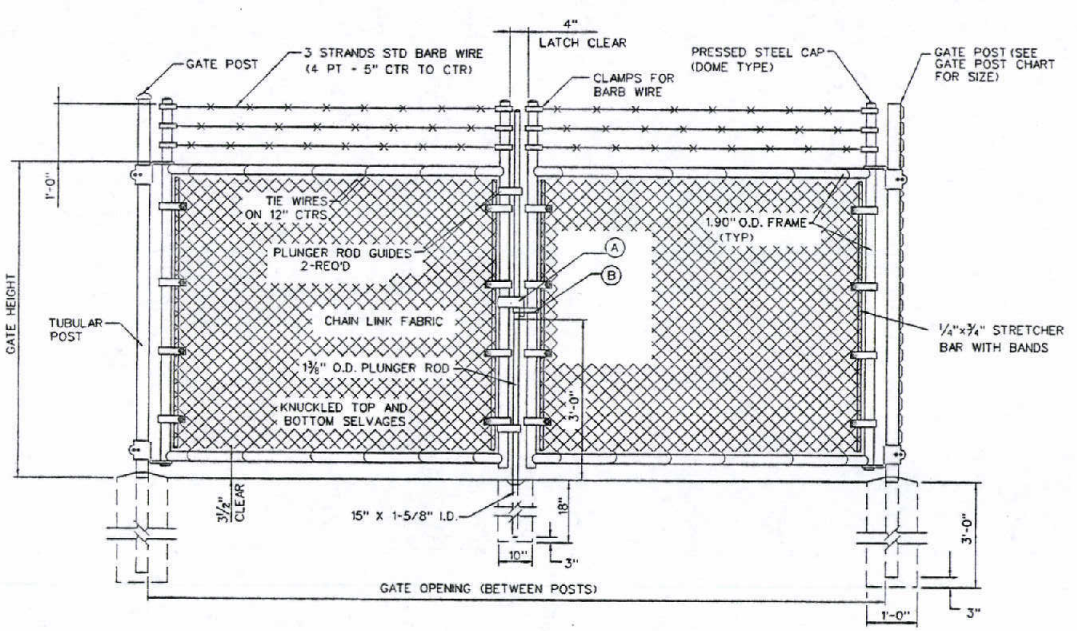
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FENCE DETAILS
CHAIN LINK WITH C-TYPE POST

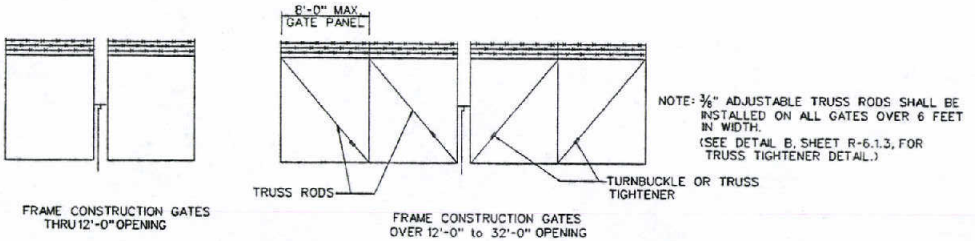
R-6.3.1 (616.724)

CHIEF ROAD DESIGN ENGR. ADOPTED:3/79 REVISION 8/97

R-53

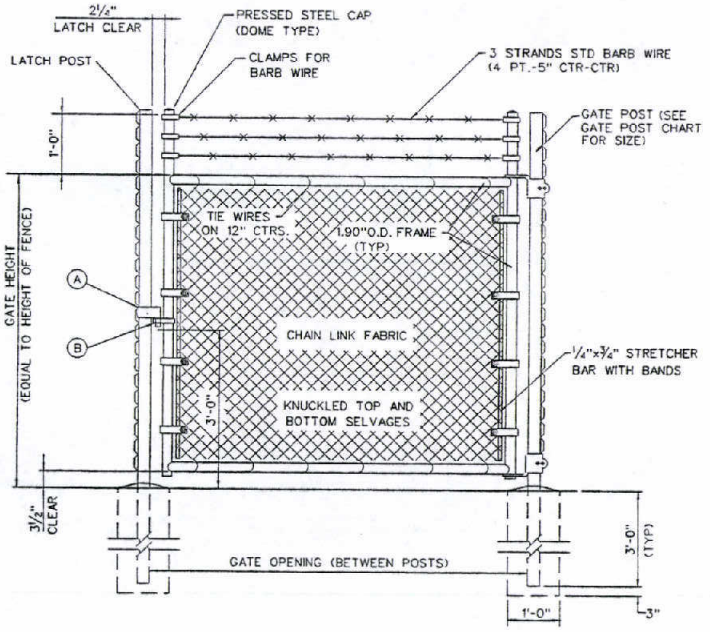


DOUBLE SWING GATE

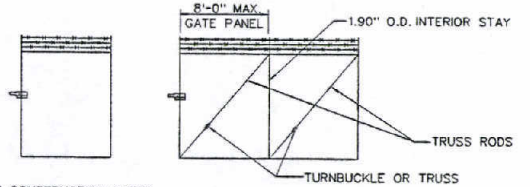


FRAME CONSTRUCTION GATES
THRU 12'-0" OPENING

FRAME CONSTRUCTION GATES
OVER 12'-0" to 32'-0" OPENING

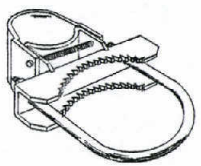


SINGLE SWING GATE

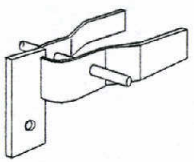


FRAME CONSTRUCTION GATES
THRU 6'-0" OPENING

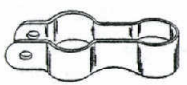
FRAME CONSTRUCTION GATES
THRU 6'-0" to 18'-0" OPENING



HINGE FOR TUBULAR POSTS



(A) LOCK KEEPER



(B) LOCK KEEPER GUIDE

GATE POST

GATE OPENING IN FEET		ROUND GATE POSTS O.D. DIA. (INCHES)	MIN. WEIGHT POUNDS/LIN. FT.	
SINGLE GATE	DOUBLE GATE		CLASS 1	CLASS 2
UP TO 6	UP TO 12	2.875	5.79	4.64
7 THRU 13	13 THRU 26	4.000	9.11	6.56
14 THRU 18	27 THRU 36	6.625	18.97	—

GENERAL NOTES:

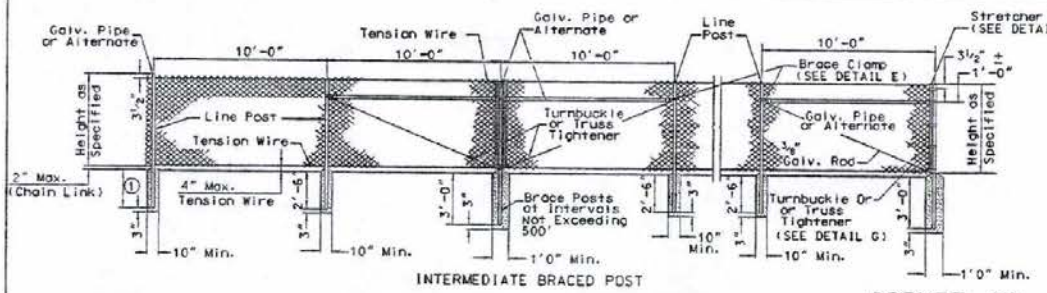
1. DIAMETERS AND WEIGHTS LISTED ABOVE ARE MINIMUMS. LARGER SIZES MAY BE USED ON APPROVAL OF ENGINEER.
2. 3½" X 3½" TYPE II POST (4.65 LBS/FT) CAN BE USED IN PLACE OF 2.875" O.D. ROUND GATE POST.
3. CONCRETE SHALL BE CLASS A OR AA.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

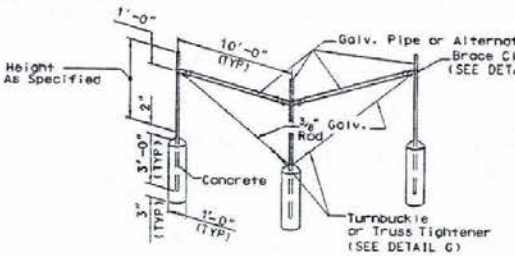
FENCE DETAILS
SWING GATES FOR UP TO 72 INCH HEIGHT CHAIN LINK 3B FENCE

CHIEF ROAD DESIGN ENGR.

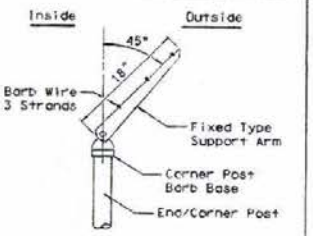
R-6.3.2	(616)
ADOPTED: 3/79	REVISION 10/97



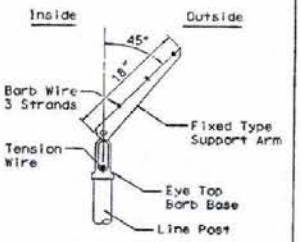
TYPICAL CHAIN LINK FENCE



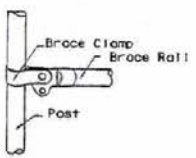
CORNER BRACE FOR CHAIN LINK FENCE



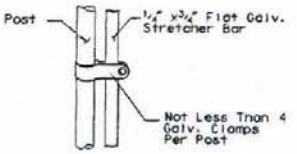
CORNER POST SUPPORT ARM



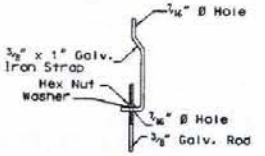
LINE POST SUPPORT ARM



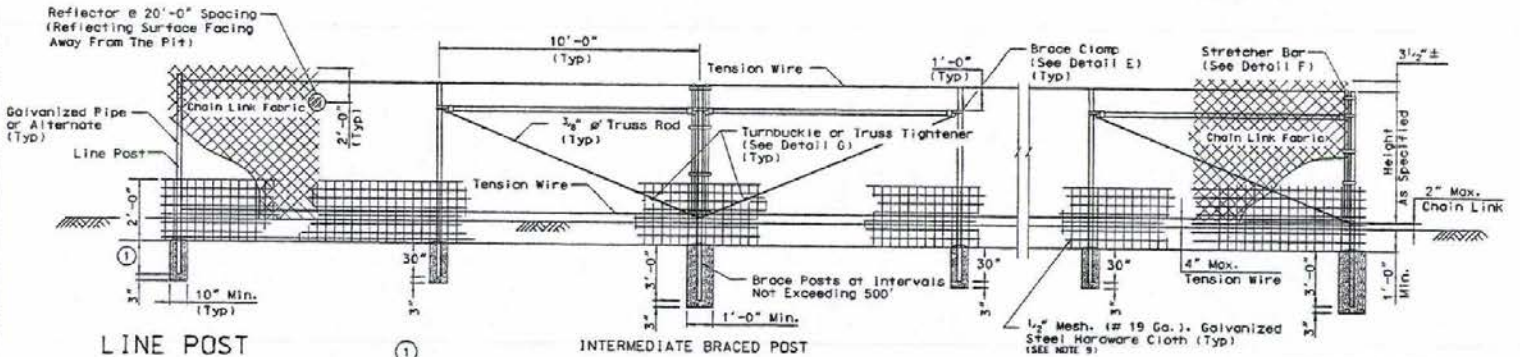
DETAIL E



DETAIL F



TRUSS TIGHTENER
DETAIL G



LINE POST

INTERMEDIATE BRACED POST

CORNER OR END POST

① 2'-0" For Fence Height ≤ 5'
2'-6" For Fence Height ≥ 5'

TORTOISE FENCE

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 12" 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 14" APART, AND TO TOP TENSION WIRE AND BOTTOM TENSION WIRE WITH HOG RINGS OR TIE WIRES SPACED APPROXIMATELY 24" 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 1" MAXIMUM ON TORTOISE FENCES ONLY.
9. HARDWARE CLOTH TO BE ATTACHED TO CHAIN LINK FENCE FABRIC WITH HOG RINGS AT 12" MAXIMUM SPACING TO BE INSTALLED OUTSIDE OF PIT. DITCH SHALL BE BACKFILLED WITH EXCAVATED MATERIAL AND COMPACTED AS DIRECTED BY THE ENGINEER.

SIZE OF POSTS

FENCE HEIGHT	CORNER, END, PULL AND BRACE POSTS					LINE POSTS					BRACE RAIL				
	ROUND PIPE O.D.	MIN. WT. (LBS/L.F.) CLASS 1	MIN. WT. (LBS/L.F.) CLASS 2	TYPE II	MIN. WT. (LBS/L.F.)	ROUND PIPE O.D.	MIN. WT. (LBS/L.F.) CLASS 1	MIN. WT. (LBS/L.F.) CLASS 2	C-SECTION DIMENSIONS	MIN. WT. (LBS/L.F.)	ROUND PIPE O.D.	MIN. WT. (LBS/L.F.) CLASS 1	MIN. WT. (LBS/L.F.) CLASS 2	C-SECTION DIMENSIONS	MIN. WT. (LBS/L.F.)
3' to 6'	2.375"	3.65	2.64	3.5"x3.5"	4.85	1.900"	2.72	1.94	1.875"x1.625"	1.60	1.660"	2.27	1.45	1.625"x1.250"	1.35

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

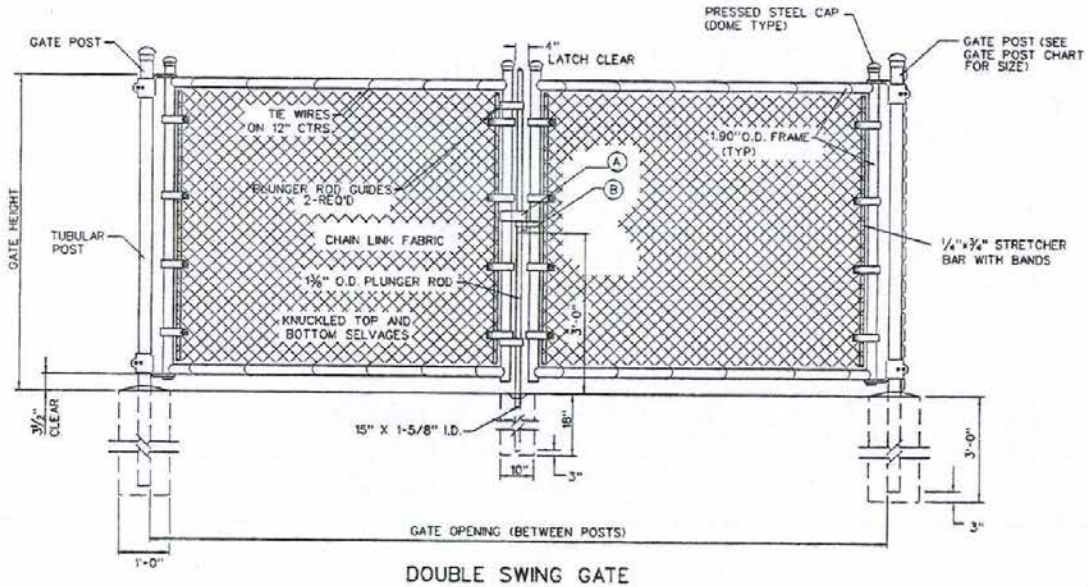
FENCE DETAILS
CHAIN LINK FENCE
UP TO 72" HEIGHT

CHIEF ROAD DESIGN ENGR.

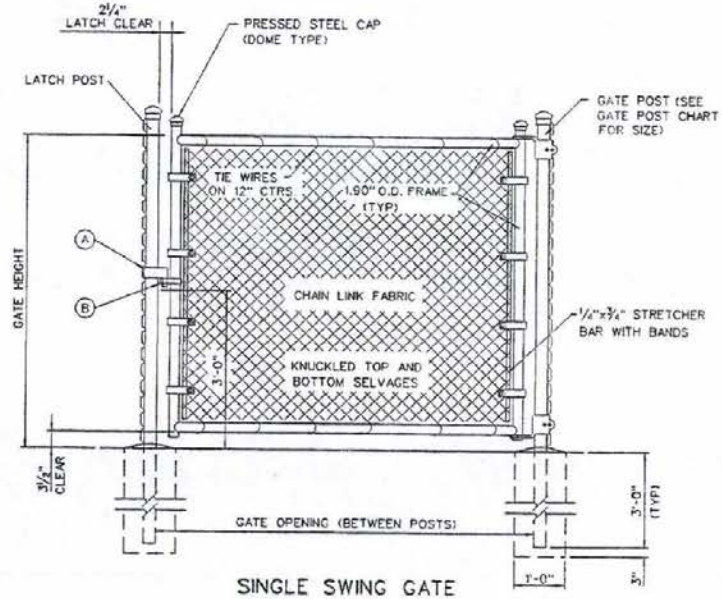
R-6.3.2.1 (616)

ADOPTED: 10/94 | REVISION 2/98

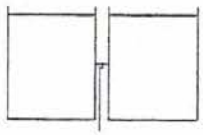
R-55



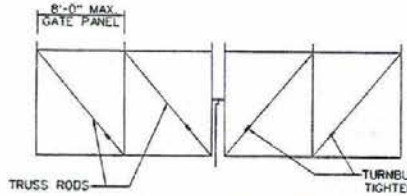
DOUBLE SWING GATE



SINGLE SWING GATE



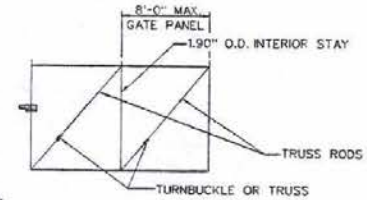
FRAME CONSTRUCTION GATES THRU 12'-0" OPENING



FRAME CONSTRUCTION GATES OVER 12'-0" to 32'-0" OPENING

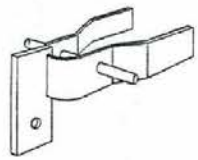
NOTE: ⅜" ADJUSTABLE TRUSS RODS SHALL BE INSTALLED ON ALL GATES OVER 6 FEET IN WIDTH.
(SEE DETAIL B, SHEET R-6.1.3, FOR TRUSS TIGHTENER DETAIL.)

FRAME CONSTRUCTION GATES THRU 6'-0" OPENING



FRAME CONSTRUCTION GATES OVER 6'-0" to 18'-0" OPENING

HINGE FOR TUBULAR POSTS



(A) LOCK KEEPER

(B) LOCK KEEPER GUIDE

GATE POST

GATE OPENING IN FEET		ROUND GATE POSTS O.D. DIA. (INCHES)	MIN. WEIGHT POUNDS/LIN. FT.	
SINGLE GATE	DOUBLE GATE		CLASS 1	CLASS 2
UP TO 6	UP TO 12	2.875	5.79	4.64
7 THRU 13	13 THRU 26	4.000	9.11	6.56
14 THRU 18	27 THRU 36	6.625	18.97	—

GENERAL NOTES:

1. DIAMETERS AND WEIGHTS LISTED ABOVE ARE MINIMUMS. LARGER SIZES MAY BE USED ON APPROVAL OF ENGINEER.
2. 3½" X 3½" TYPE II POST (4.85 LBS/FT) CAN BE USED IN PLACE OF 2.875" O.D. ROUND GATE POST.
3. CONCRETE SHALL BE CLASS A OR AA.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FENCE DETAILS
SWING GATE FOR UP TO
72-INCH CHAIN LINK FENCE

CHIEF ROAD DESIGN ENGR.

R-6.3.3	(616)
ADOPTED: 3/79	REVISION 1-11-82

R-56

BILL OF MATERIALS

TIMBER

ITEM	NO. REQ'D	SIZE	LENGTH	FT.BM
WHEEL GUARDS	2	6"x6"	7'-3"	43.5
WING SLOPE	4	2"x6"	8'-0"	32.0
WING SLOPE	2	2"x6"	8'-4½"	12.8
WING BRACES	2	2"x6"	3'-4"	6.7
WING BRACES	4	2"x6"	8'-3"	21.0
WING BRACES	2	2"x6"	7'-3"	14.5
WING BRACES	2	2"x6"	2'-4"	4.2
WING BRACES	2	2"x6"	4'-0"	8.0
WING BRACES	2	2"x6"	5'-0"	10.0
WING POST	2	4"x6"	AS REQUIRED	
MAILING STRIP	2	2"x2"	2'-0"	1.3

GALVANIZED HARDWARE

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
BOLTS	8	¾"	12"	15
WASHERS	8	¾"		1
WASHERS (LOCK)	4	¾"		½
NAILS	50	40d		3
NAILS	72	20d		2-¼
BOLTS	4	¾"	1 ½"	1
TOTAL				22-¾

STRUCTURAL STEEL

12' ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
I BEAMS	13	S4x7.7	12'-0"	1,301
I BEAMS	6	S8x18.4	7'-3"	800
SPACERS	72	2½"x5/16"	0'-6⅝"	108
ANCHOR BOLTS	12	⅞"	1'-0"	12
END PLATES	2	8"x1/2"	13'-0"	177
STEEL STRAPS	3	4"x1/4"	7'-2"	74
TOTAL				2,473

14' ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
I BEAMS	13	S4x7.7	15'-0"	1,502
I BEAMS	7	S8x18.4	7'-3"	934
SPACERS	84	2½"x5/16"	0'-6⅝"	127
ANCHOR BOLTS	14	⅞"	1'-0"	14
END PLATES	2	8"x1/4"	15'-0"	204
STEEL STRAPS	4	4"x1/4"	7'-2"	99
TOTAL				2,879

16' ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
I BEAMS	13	S4x7.7	17'-0"	1,702
I BEAMS	8	S8x18.4	7'-3"	1,067
SPACERS	84	2½"x5/16"	0'-6⅝"	127
ANCHOR BOLTS	14	⅞"	1'-0"	14
END PLATES	2	8"x1/4"	17'-0"	231
STEEL STRAPS	4	4"x1/4"	7'-2"	99
TOTAL				3,259

20' ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
I BEAMS	13	S4x7.7	21'-0"	2,102
I BEAMS	9	S8x18.4	7'-3"	1,201
SPACERS	108	2½"x5/16"	0'-6⅝"	163
ANCHOR BOLTS	18	⅞"	1'-0"	18
END PLATES	2	8"x1/4"	21'-0"	286
STEEL STRAPS	5	4"x1/4"	7'-2"	122
TOTAL				3,892

ALL ROADBED WIDTH

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
CORR. METAL PIPE	1	12"	##2'-0"	20

##PIPE LENGTH & DRAINAGE DITCH SHALL BE AS INDICATED ON THE PLANS.

SACKED ROCK AT END OF PIPE WILL NOT BE PERMITTED

REINFORCING

12' ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
HORIZONTAL BARS	*12	NO. 4	12'-6"	100
HORIZONTAL BARS	12	NO. 4	7'-0"	56
HORIZONTAL BARS	18	NO. 4	16'-9"	201
VERTICAL BARS	20	NO. 4	2'-9"	37
U-BARS	32	NO. 6	12'-1"	400
HORIZONTAL BARS	4	NO. 4	12'-2"	35
TOTAL				900

14' ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
HORIZONTAL BARS	*12	NO. 4	14'-6"	116
HORIZONTAL BARS	13	NO. 4	7'-6"	61
HORIZONTAL BARS	18	NO. 4	16'-9"	225
VERTICAL BARS	22	NO. 4	2'-9"	40
U-BARS	24	NO. 6	12'-1"	436
HORIZONTAL BARS	4	NO. 4	16'-2"	41
TOTAL				1,009

16' ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
HORIZONTAL BARS	*12	NO. 4	16'-6"	132
HORIZONTAL BARS	15	NO. 4	7'-6"	70
HORIZONTAL BARS	18	NO. 4	20'-9"	249
VERTICAL BARS	26	NO. 4	2'-9"	48
U-BARS	29	NO. 6	12'-1"	521
HORIZONTAL BARS	4	NO. 4	17'-2"	48
TOTAL				1,135

20' ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
HORIZONTAL BARS	*12	NO. 4	20'-6"	164
HORIZONTAL BARS	11	NO. 4	7'-0"	79
HORIZONTAL BARS	18	NO. 4	24'-9"	297
VERTICAL BARS	30	NO. 4	2'-9"	55
U-BARS	36	NO. 6	12'-1"	654
HORIZONTAL BARS	4	NO. 4	21'-2"	57
TOTAL				1,355

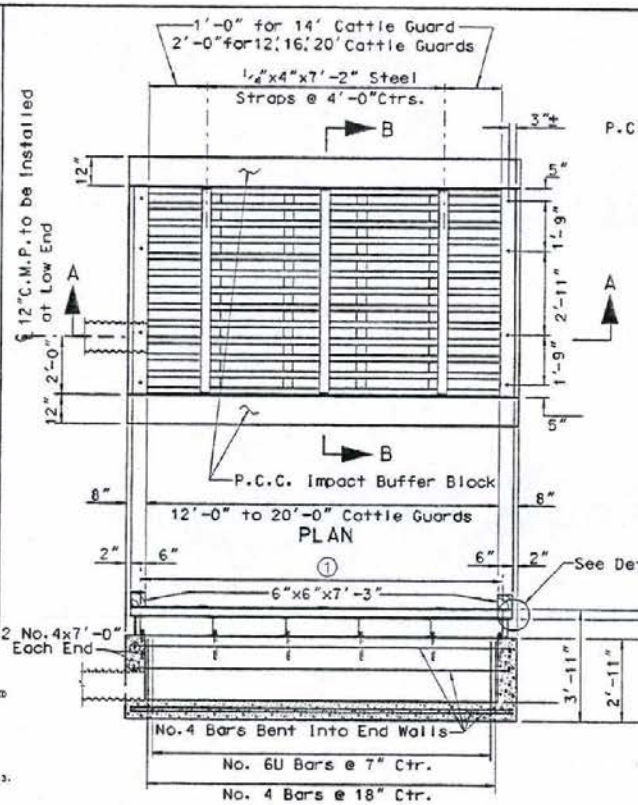
CONCRETE

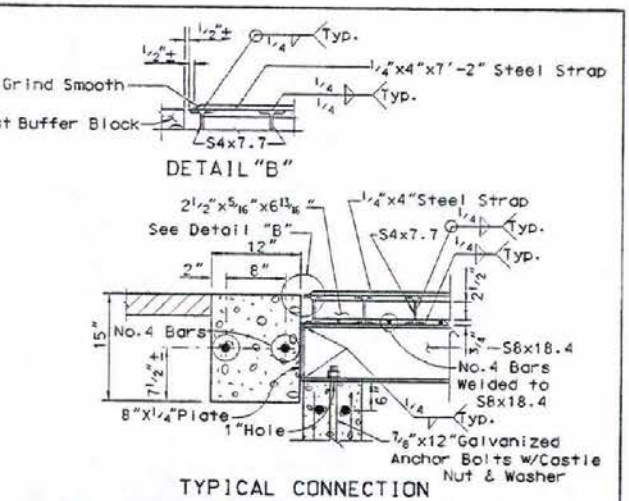
12' ROADBED	6.25 CU. YD.
14' ROADBED	7.05 CU. YD.
16' ROADBED	7.79 CU. YD.
20' ROADBED	9.34 CU. YD.

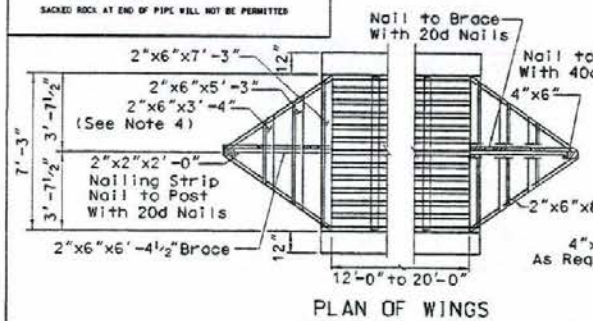
* NO. 4 BARS WELDED TO 8" I BEAMS

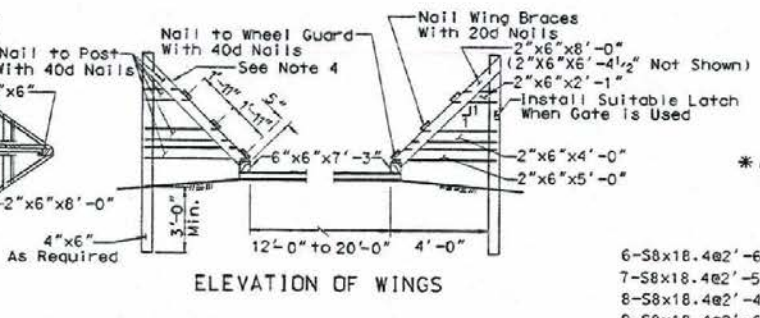
GENERAL NOTES:

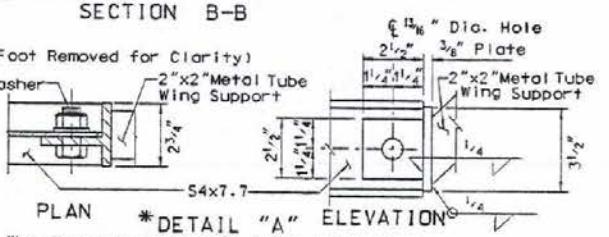
1. ALL CONCRETE TO BE CLASS A OR AA.
2. STANDARD METAL OR TIMBER GATES SHALL BE CONSTRUCTED WHEN SHOWN ON PLANS OR ORDERED BY THE ENGINEER.
3. ALL CONNECTIONS TO BE WELDED.
4. ALL TIMBER SHALL BE PAINTED WHITE PER STANDARD SPECIFICATIONS.
5. METAL WINGS ARE OPTIONAL. SEE DETAIL "A". FOR ADDITIONAL DETAILS AND QUANTITIES SEE SHEET M-7.1.3.
6. ALL WINGS SHALL BE PAINTED WHITE PER STANDARD SPECIFICATIONS.
7. CATTLE GUARD WIDTH SHALL INCLUDE A 2' SHY DISTANCE FROM THE NORMAL EDGE OF PAVEMENT. EACH SIDE (PER AASHTO).











*(This Connection Shall Be Made To Second S4x7.7 Beam At 8.33" From Impact Buffer Blocks)

① 6-S8x18.4@2'-6"=12'-6" for 12'Cattle Guard
7-S8x18.4@2'-5"=14'-6" for 14'Cattle Guard
8-S8x18.4@2'-4¼"=16'-6" for 16'Cattle Guard
9-S8x18.4@2'-6¾"=20'-6" for 20'Cattle Guard

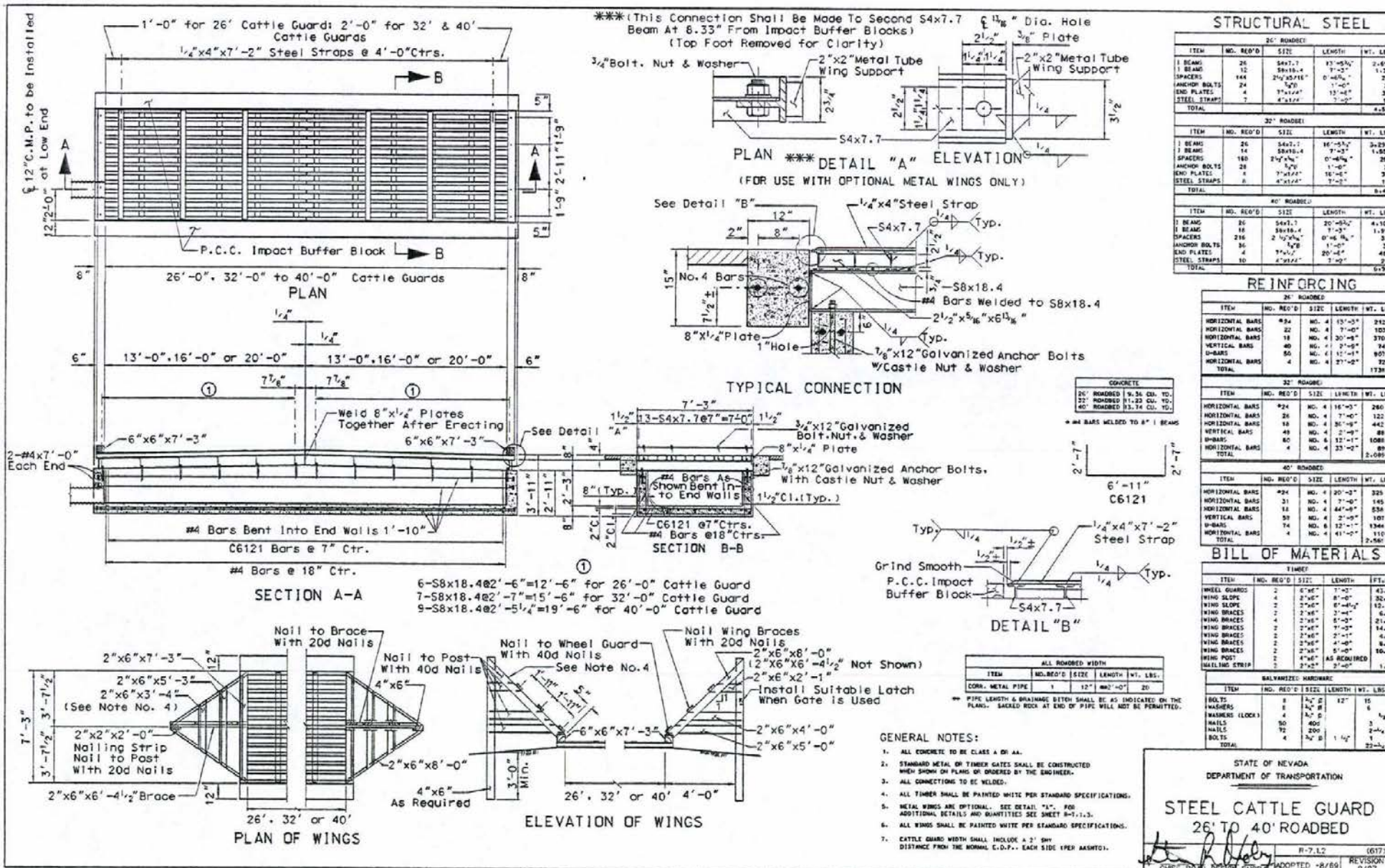
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STEEL CATTLE GUARD
12' TO 20' ROADBED

CHIEF ROAD DESIGN ENGR.

R-7.1.1 (617)
ADOPTED 8-69 REVISION 2-98

R-57



STRUCTURAL STEEL

26' ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
I BEAMS	26	S4x7.7	13'-5 3/4"	2,699
I BEAMS	12	S8x18.4	7'-3"	1,331
SPACERS	144	2"x3"x15/16"	0'-4 15/16"	212
ANCHOR BOLTS	24	7/8"Ø	1'-0"	23
END PLATES	4	7"x1/4"	13'-6"	320
STEEL STRAPS	7	4"x1/4"	7'-0"	171
TOTAL				4,567

32' ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
I BEAMS	26	S4x7.7	16'-5 3/4"	3,299
I BEAMS	14	S8x18.4	7'-3"	1,553
SPACERS	168	2"x3"x15/16"	0'-4 15/16"	294
ANCHOR BOLTS	28	7/8"Ø	1'-0"	27
END PLATES	4	7"x1/4"	16'-6"	392
STEEL STRAPS	8	4"x1/4"	7'-0"	195
TOTAL				5,460

40' ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
I BEAMS	26	S4x7.7	20'-5 3/4"	4,100
I BEAMS	18	S8x18.4	7'-3"	1,997
SPACERS	216	2 1/2"x3"x15/16"	0'-4 15/16"	326
ANCHOR BOLTS	36	7/8"Ø	1'-0"	35
END PLATES	4	7"x1/2"	20'-6"	487
STEEL STRAPS	10	4"x1/4"	7'-0"	244
TOTAL				6,950

REINFORCING

26' ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
HORIZONTAL BARS	#24	NO. 4	13'-5"	212
HORIZONTAL BARS	22	NO. 4	7'-0"	103
HORIZONTAL BARS	18	NO. 4	30'-8"	370
VERTICAL BARS	40	NO. 4	2'-9"	74
U-BARS	56	NO. 4	12'-1"	907
HORIZONTAL BARS	4	NO. 4	2'-2"	32
TOTAL				1738

32' ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
HORIZONTAL BARS	#24	NO. 4	16'-3"	260
HORIZONTAL BARS	26	NO. 4	7'-0"	122
HORIZONTAL BARS	18	NO. 4	30'-8"	442
VERTICAL BARS	48	NO. 4	2'-9"	88
U-BARS	80	NO. 4	12'-1"	1088
HORIZONTAL BARS	4	NO. 4	33'-2"	89
TOTAL				2,089

40' ROADBED

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
HORIZONTAL BARS	#24	NO. 4	20'-2"	325
HORIZONTAL BARS	31	NO. 4	7'-0"	145
HORIZONTAL BARS	18	NO. 4	44'-8"	536
VERTICAL BARS	59	NO. 4	2'-9"	107
U-BARS	74	NO. 4	12'-1"	1344
HORIZONTAL BARS	4	NO. 4	41'-0"	110
TOTAL				2,566

CONCRETE	
26' ROADBED	9.36 CU. YD.
32' ROADBED	11.23 CU. YD.
40' ROADBED	13.74 CU. YD.

* #4 BARS WELDED TO 8" I BEAMS

BILL OF MATERIALS

TIMBER

ITEM	NO. REQ'D	SIZE	LENGTH	FT.BM
WHEEL GUARDS	2	6"x6"	7'-2"	43.0
WING SLOPE	4	2"x6"	8'-0"	32.0
WING SLOPE	2	2"x6"	8'-4 1/2"	12.6
WING BRACES	2	2"x6"	3'-4"	6.7
WING BRACES	4	2"x6"	8'-3"	21.0
WING BRACES	2	2"x6"	7'-3"	14.5
WING BRACES	2	2"x6"	2'-1"	4.2
WING BRACES	2	2"x6"	4'-0"	8.0
WING BRACES	2	2"x6"	5'-0"	10.0
WING POST	2	4"x6"	AS REQUIRED	
NAILING STRIP	2	2"x2"	2'-0"	1.3

GALVANIZED HARDWARE

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
BOLTS	8	3/4" Ø	12"	15
WASHERS	8	3/4" Ø		6
WASHERS (LOCK)	4	3/4" Ø		1/2
NAILS	50	40d		3
NAILS	72	20d		2-1/4
BOLTS	4	3/4" Ø	1 1/2"	1
TOTAL				22-1/2

ALL ROADBED WIDTH				
ITEM	NO.REQ'D	SIZE	LENGTH	WT. LBS.
CORR. METAL PIPE	1	12"	66'-0"	20

** 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 2' SHY DISTANCE FROM THE NORMAL E.O.P., EACH SIDE (PER AASHTO).

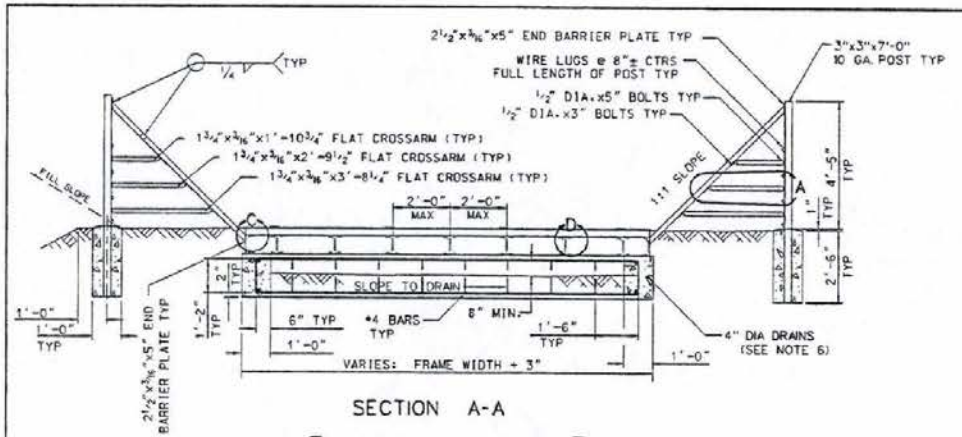
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STEEL CATTLE GUARD 26' TO 40' ROADBED

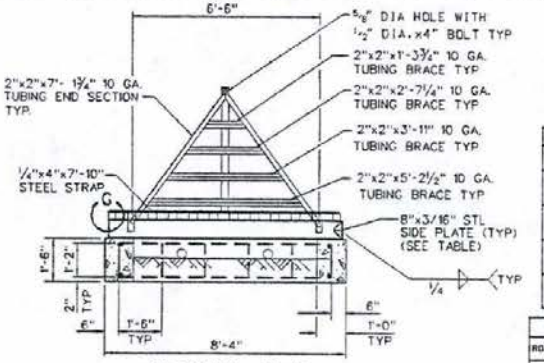
R-7.1.2 (617)

CHIEF ROAD DESIGN ENGR. ADOPTED -8/69 REVISION 9/97

R-58



SECTION A-A



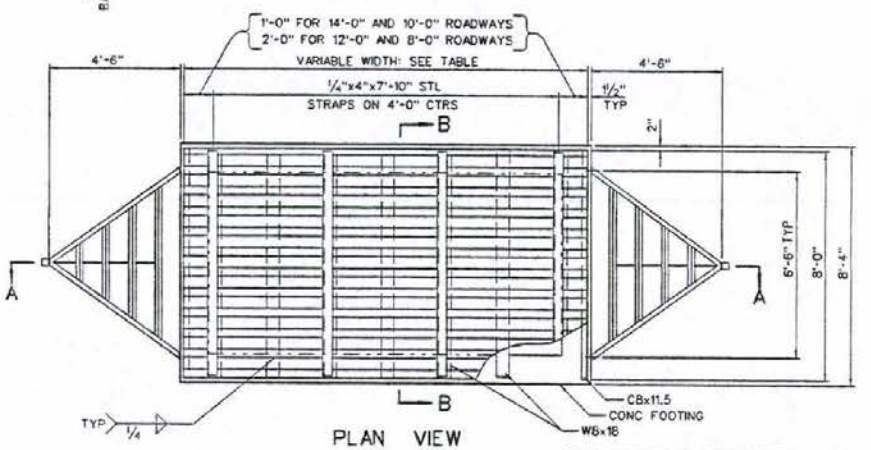
SECTION B-B

BILL OF MATERIALS

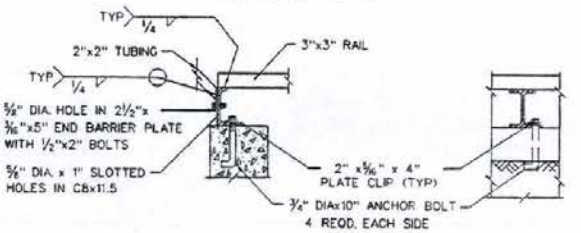
FRAME SIZE		LONGITUDINAL STRINGERS			
LENGTH	WIDTH	NO. REQD	SIZE	SPACING	WT. LBS
6'-0"	14'-0"	6	W8x18	EQUAL	859
8'-0"	12'-0"	5	W8x18	EQUAL	716
8'-0"	10'-0"	4	W8x18	EQUAL	573
8'-0"	8'-0"	3	W8x18	EQUAL	430

STRUCTURAL STEEL				
ITEM	NO. REQD	SIZE	LENGTH	WT. LBS
RAILS	13	3"x3"x3/16"	14'-0"	1249
SIDE PLATE	2	8"x3/16"	14'-0"	143
RAILS	13	3"x3"x3/16"	12'-0"	1070
SIDE PLATE	2	8"x3/16"	12'-0"	122
RAILS	13	3"x3"x3/16"	10'-0"	892
SIDE RAILS	2	8"x3/16"	10'-0"	102
RAILS	13	3"x3"x3/16"	8'-0"	713
SIDE RAILS	2	8"x3/16"	8'-0"	82

STRUCTURAL STEEL				
ROAD WIDTH	ITEM	NO. REQD	SIZE	WT. LBS
14'	STEEL STRAP	4	1/4"x4"x7'-10"	101
12'	STEEL STRAP	3	1/4"x4"x7'-10"	80
10'	STEEL STRAP	3	1/4"x4"x7'-10"	80
8'	STEEL STRAP	2	1/4"x4"x7'-10"	53



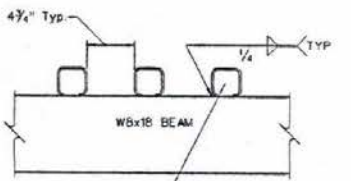
PLAN VIEW



DETAILS "C" & "D"

MATERIAL LIST FOR WINGS				
ITEM	NO. REQD	SIZE	LENGTH	WT. LBS
FLAT CROSSARMS	2	1-3/4"x3/16"	1'-10 3/4"	4
FLAT CROSSARMS	2	1-3/4"x3/16"	2'-9 1/2"	6
FLAT CROSSARMS	2	1-3/4"x3/16"	3'-8 1/4"	8
BRACES	2	2"x2"x10 GA	1'-3 3/4"	11
BRACES	2	2"x2"x10 GA	2'-7 1/4"	23
BRACES	2	2"x2"x10 GA	3'-11"	38
BRACES	2	2"x2"x10 GA	5'-2 1/2"	45
END BARRIER	4	2"x2"x10 GA	7'-1 3/4"	123
END BARRIER PLATE	6	2 1/2"x3/16"	5"	4
UPRIGHT POST	2	3"x3"x 3/16"	7'-0"	96

MATERIAL LIST FOR ALL SIZES				
ITEM	NO. REQD	SIZE	LENGTH	WT. LBS
CHANNELS	2	CBx11.5	8'-0"	184
PLATE CLIP	12	2"x3/16"	4 1/2"	9
ANCHOR BOLT CLIP	14	2"x5/16"	4"	10

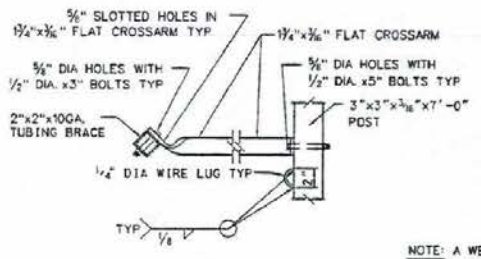


DETAIL "I"

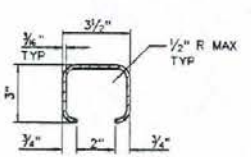
CONCRETE		REINFORCING STEEL
LENGTH	CUBIC YDS.	WT. LBS
14'-0"	2.29	82
12'-0"	2.06	74
10'-0"	1.84	67
8'-0"	1.62	60

GALVANIZED HARDWARE			
ITEM	NO. REQD	SIZE	LENGTH
BOLT	6	1/2"	3"
BOLT	16	1/2"	2"
BOLT	6	1/2"	5"
WASHER	56	9 1/16"	-
WASHER	14	13/16"	-
NUT	28	1/2"	-
NUT	14	3/4"	-
ANCHOR BOLT	14	3/4"	-

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

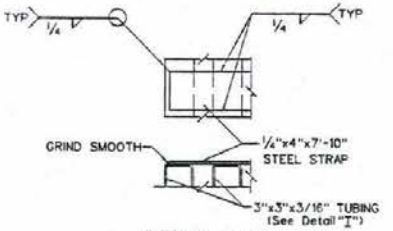


DETAIL "A"



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 3"x3"x3/16" TUBING



DETAIL "G"

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-20
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 4" DRAINS TO FACILITATE DRAINAGE OF STRUCTURE.
7. ALL WINGS SHALL BE PAINTED WHITE PER STANDARD SPECIFICATION.

NOTE: MATERIAL LISTS ARE FOR INFORMATION ONLY.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

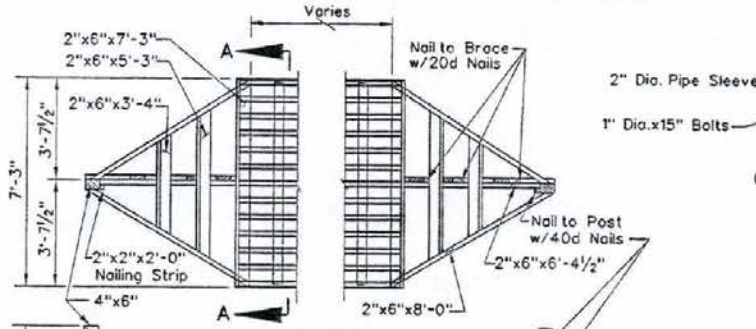
STEEL CATTLE GUARD
(TYPE B)

CHIEF ROAD DESIGN ENGR

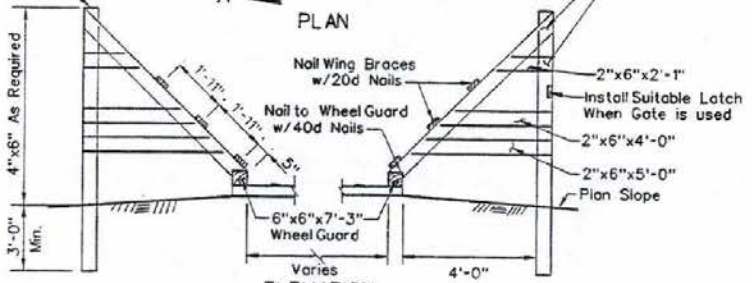
R-7.1.3 (617)

ADOPTED 3-71 REVISION 9/97

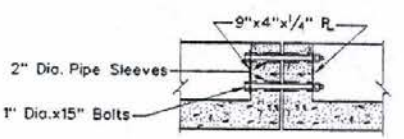
R-59



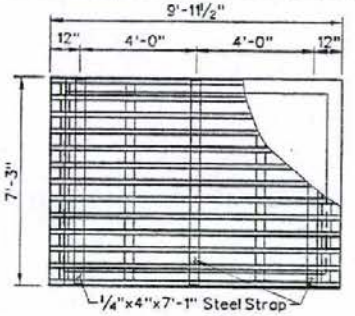
PLAN



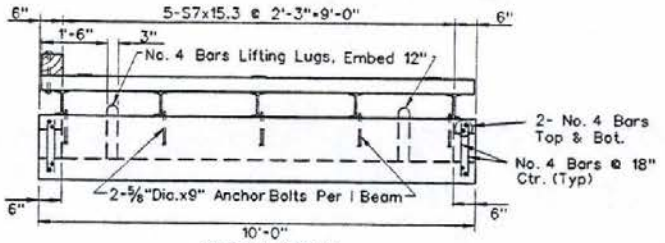
ELEVATION
TIMBER WINGS



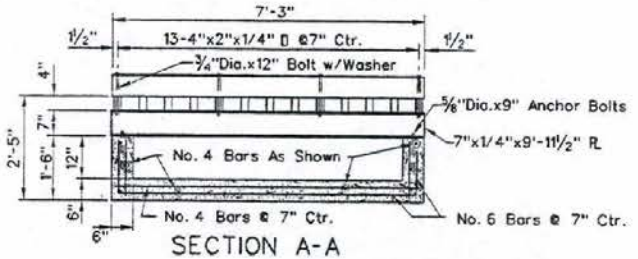
CONNECTION DETAIL



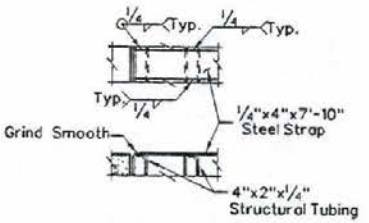
PLAN



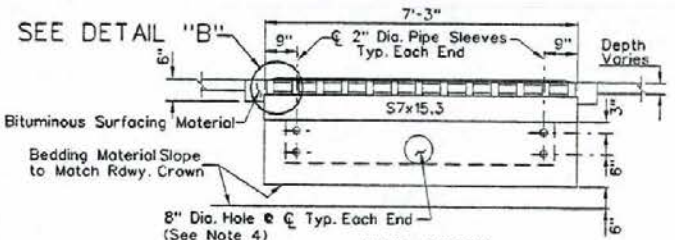
ELEVATION



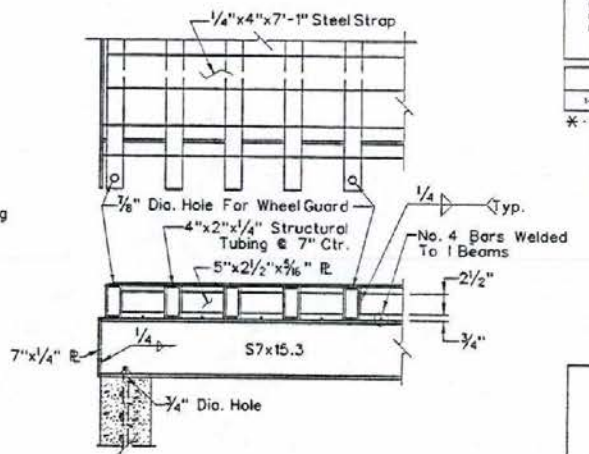
SECTION A-A



DETAIL "B"



END VIEW



TYPICAL CONNECTION

STRUCTURAL STEEL (1-10'-0" COMPONENT)				
ITEM	NO. REQUIRED	SIZE	LENGTH	WT. LBS
BEAMS	5	S7x15.3	7'-3"	554.6
STRUCTURAL TUBING	13	4"x2"x 1/4"	5'-11 1/2"	1139.3
SPACER PLATES	60	2½"x⅝"	0'-5"	67.0
ANCHOR BOLTS	10	⅝"	0'-9"	9.0
STEEL STRAPS	3	4"x 1/4"	7'-1"	72.3
END PLATES	2	7"x 1/4"	5'-11 1/2"	118.5
PIPE SLEEVES	8	2"	0'-6"	14.6
CONNECTION PLATES	AS REQ'D	9"x4"x 1/4"	-	-
CONNECTION BOLTS	AS REQ'D	1"	1'5"	-

REINFORCING STEEL (1-10'-0" COMPONENT)				
ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS
* HORIZONTAL BARS	12	NO. 4	9'-6"	76
HORIZONTAL BARS	16	NO. 4	9'-9"	117
HORIZONTAL BARS	16	NO. 4	7'-0"	84
VERTICAL BARS	44	NO. 4	1'-3"	37
LIFTING LUGS	4	NO. 4	2'-9"	7
U BARS	18	NO. 6	9'-6"	258
		TOTAL		580

TIMBER				
ITEM	NO. REQUIRED	SIZE	LENGTH	BD. FT.
WHEEL GUARDS	2	6"x6"	7'-3"	43.5
WING SLOPE	4	2"x6"	8'-0"	32.0
WING SLOPE	2	2"x6"	6'-4 1/2"	12.8
WING BRACES	2	2"x6"	3'-4"	6.7
WING BRACES	4	2"x6"	5'-0"	20.0
WING BRACES	2	2"x6"	7'-3"	14.5
WING BRACES	2	2"x6"	2'-1"	4.2
WING BRACES	2	2"x6"	4'-0"	8.0
WING BRACES	2	2"x6"	5'-0"	10.0
WING POST	2	4"x6"	AS REQUIRED	
NAILING STRIP	2	2"x2"	2'-0"	1.3

GALVANIZED HARDWARE				
ITEM	NO. REQUIRED	SIZE	LENGTH	WT. LBS
BOLTS	8	3/4" DIA.	17"	15
WASHERS	8	3/4"	-	6
NAILS	80	40d	-	3
NAILS	72	40d	-	2 1/4
			TOTAL	26 1/4

CONCRETE	
1-10'-0" COMPONENT	1.94 CU. YDS.

* - NO. 4 BARS WELDED TO I BEAMS.

GENERAL NOTES:

1. ALL CONCRETE TO BE CLASS DA.
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

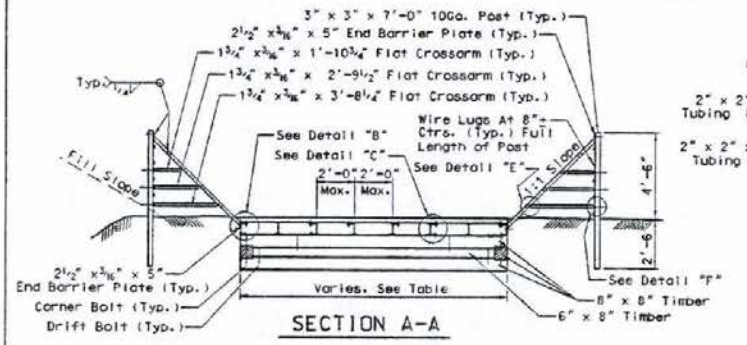
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STEEL CATTLE GUARD
(TYPE C)

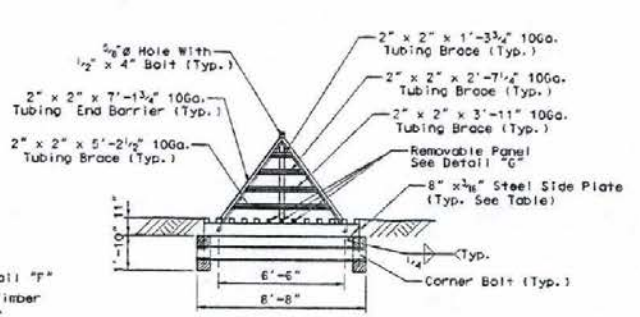
R-7.1.4 (617)

CHIEF ROAD DESIGN ENGR. ADOPTED: 10/70 REVISION 7/98

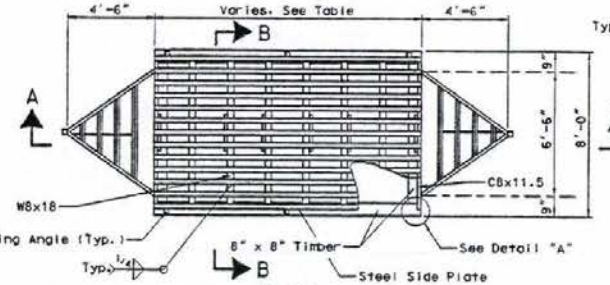
R-60



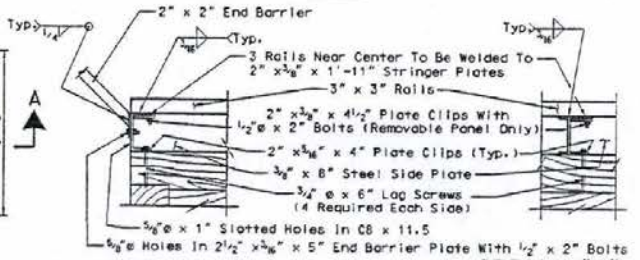
SECTION A-A



SECTION B-B



PLAN



DETAIL "B"

DETAIL "C"

NOTE: MATERIAL LIST IS FOR INFORMATION ONLY.

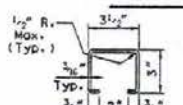
MATERIAL LIST FOR WINGS

ITEM	REQD.	SIZE	LENGTH	WT. LBS.
FLAT CROSSARMS	2	1 3/4" X 3/16"	1'-10 3/4"	4
FLAT CROSSARMS	2	1 3/4" X 3/16"	2'-9 1/2"	6
FLAT CROSSARMS	2	1 3/4" X 3/16"	3'-8 1/4"	8
BRACES	2	2" X 2" X 10GA.	1'-3 3/4"	11
BRACES	2	2" X 2" X 10GA.	2'-7 1/4"	23
BRACES	2	2" X 2" X 10GA.	3'-11"	38
BRACES	2	2" X 2" X 10GA.	5'-2 1/2"	45
END BARRIER	4	2" X 2" X 10GA.	7'-1 3/4"	123
END BARRIER PLATES	6	2 1/2" X 3/16"	5"	4
UPRIGHT POST	2	3" X 3" X 3/16"	7'-0"	96

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

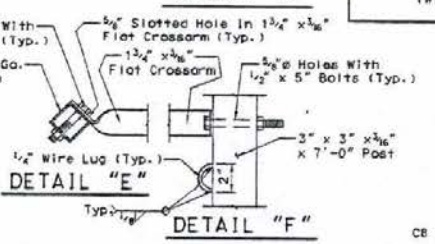
GALVANIZED HARDWARE

ITEM	NO. REQD.	SIZE	LENGTH
BOLTS	6	1/2"	3"
BOLTS	6	1/2"	5"
BOLTS	16	1/2"	2"
WASHERS	56	9/16"	
WASHERS	14	13/16"	
NUTS	28	1/2"	
NUTS	14	3/4"	
LAG SCREWS	14	3/4"	6"



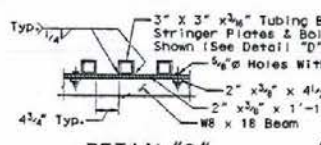
DETAIL "D"

NOTE: A WELDED OR ROLLED UNIT OF EQUIVALENT DESIGN LOADING CAPACITY, MAY BE SUBMITTED TO THE ENGINEER FOR APPROVAL IN PLACE OF 3" X 3" X 3/16" TUBING.



DETAIL "E"

DETAIL "F"



DETAIL "G"

BILL OF MATERIALS

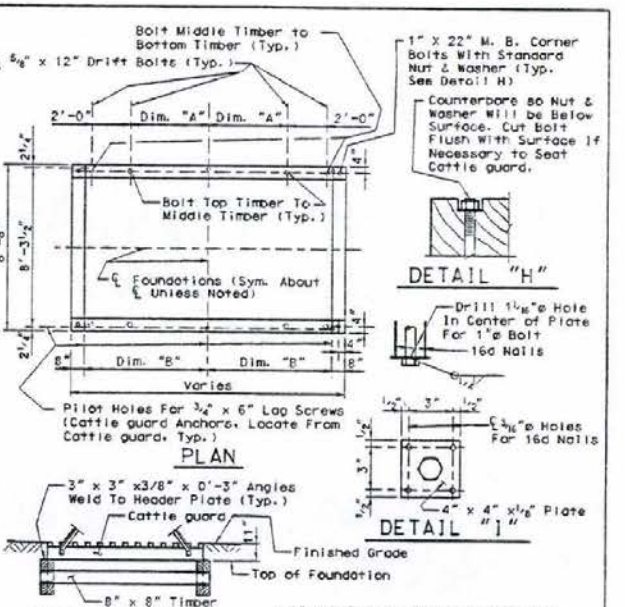
FRAME SIZE		LONGITUDINAL STRINGERS				STRUCTURAL STEEL				
LENGTH	WIDTH	NO. REQD.	SIZE	SPACING	WT. LBS.	ITEM	NO. REQD.	SIZE	LENGTH	WT. LBS.
8'-0"	14'-0"	6	W8X18	EQUAL	859	RAILS	13	3" X 3" X 3/16"	14'-0"	1249
						SIDE PLATES	2	8" X 3/16"	14'-0"	143
8'-0"	12'-0"	5	W8X18	EQUAL	716	RAILS	13	3" X 3" X 3/16"	12'-0"	1070
						SIDE PLATES	2	8" X 3/16"	12'-0"	122
8'-0"	10'-0"	4	W8X18	EQUAL	573	RAILS	13	3" X 3" X 3/16"	10'-0"	892
						SIDE PLATES	2	8" X 3/16"	10'-0"	102
8'-0"	8'-0"	3	W8X18	EQUAL	430	RAILS	13	3" X 3" X 3/16"	8'-0"	713
						SIDE PLATES	2	8" X 3/16"	8'-0"	82

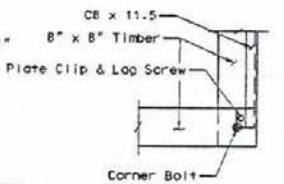
MATERIAL LIST FOR ALL SIZES

ITEM	NO. REQD.	SIZE	LENGTH	WT. LBS.
CHANNELS	2	C8 X 11.5	8'-0"	184
STRINGER PLATES	6	2" X 3/8"	1'-11"	30
PLATE CLIPS	12	2" X 3/8"	4 1/2"	9
ANCHOR BOLT CLIPS	14	2" X 5/16"	4"	10

GENERAL NOTES:

1. ALTERNATE DESIGN MAY BE SUBSTITUTED BY THE CONTRACTOR FOR APPROVAL BY THE ENGINEER.
2. LIVE LOADING: H20
3. CATTLE GUARD IS TO BE PLACED ON LEVEL GRADE ACROSS ROADWAY - ROADWAY CROSS SLOPE IS TO TRANSITION FROM NORMAL SECTION TO LEVEL SECTION 25' BACK ON LINE AND 25' 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.





DETAIL "A"

FRAME SIZE		DIM.	DIM.
LENGTH	WIDTH	"A"	"B"
8'-8"	14'-0"	4'-0"	6'-4"
8'-8"	12'-0"	3'-0"	5'-4"
8'-8"	10'-0"	2'-0"	4'-4"
8'-8"	8'-0"	1'-0"	3'-4"

GENERAL NOTES:

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

TIMBER FOUNDATION DETAILS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

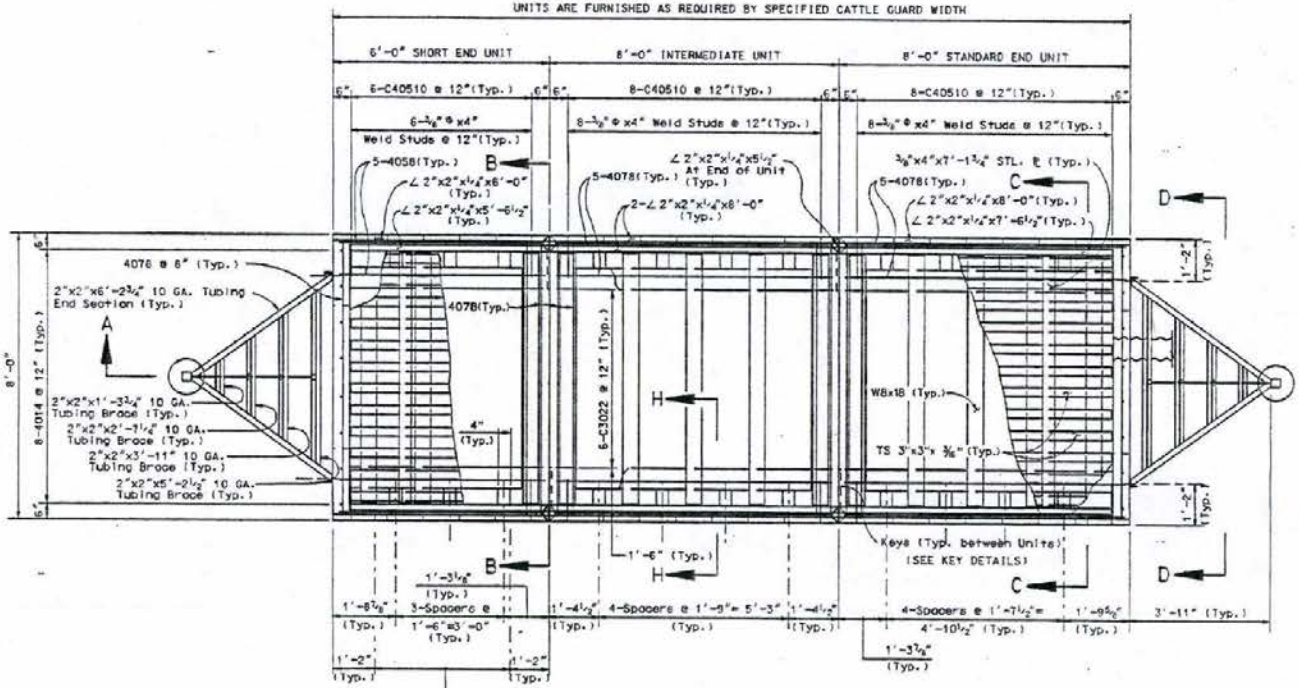
STEEL CATTLE GUARD
TIMBER FOUNDATION

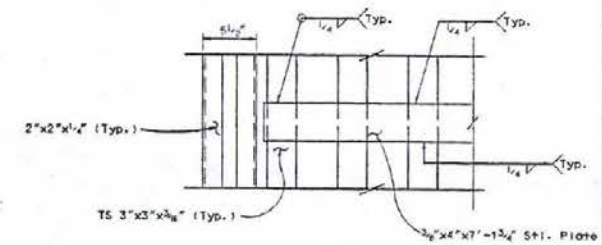
R-1.1.5 (617)

CHIEF ROAD DESIGN ENGINEER

ADOPTED: 7/77 REVISION 1-6/80

R-61





GENERAL NOTES:

1. PRECAST CONCRETE SHALL REACH Fc' = 4500 PSI AT 28 DAYS. ALL OTHER CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE GRADE 40 (Fs =20,000 PSI)
3. DESIGN LIVE LOAD H-20.
4. MINIMUM SOIL BEARING PRESSURE OF 4000 LBS/FT^2 SHALL BE OBTAINED BY PLACING A FINE AGGREGATE (SECTION 706.03.03) BED 3 INCHES THICK OVER SOIL COMPACTED TO NOT LESS THAN 95% DENSITY AND HAND LEVELED.
5. STRUCTURAL STEEL SHALL CONFORM TO ASTM A36.
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 2' SHY DISTANCE FROM THE NORMAL E.O.P., EACH SIDE (PER AASHTO).

* ⅜"x4"x7'-1¾" Steel Plate (Bend Ends of Steel Plate 1½" 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

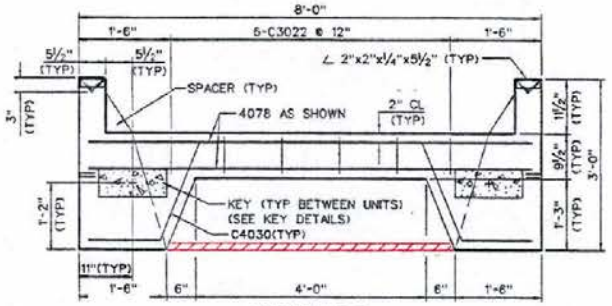
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PRECAST CATTLE GUARD

CHIEF ROAD DESIGN ENGR.

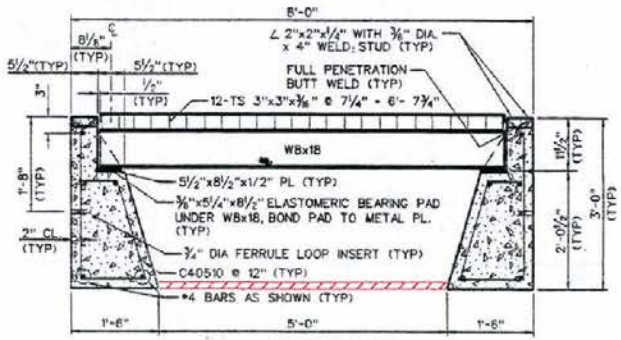
R-7.1.6	(017)
ADOPTED: 11/88	REVISION 8/98

R-62



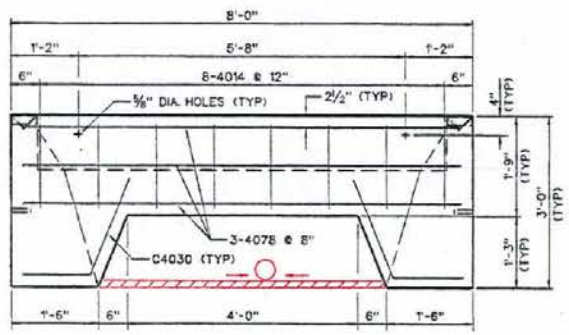
SECTION B-B

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



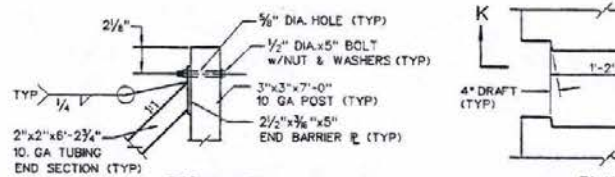
SECTION C-C

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

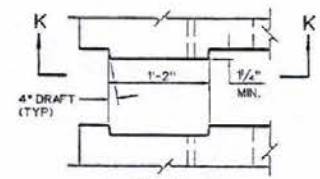


VIEW D-D

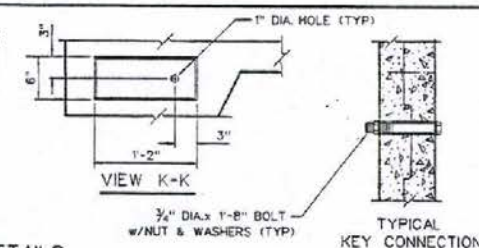
(ALL DIMENSIONS, KEYS, REINFORCING & STRUCTURAL STEEL TYPICAL ALL UNITS)



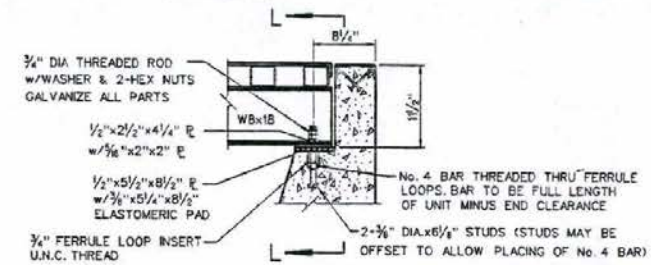
DETAIL "E"



PLAN



KEY DETAILS



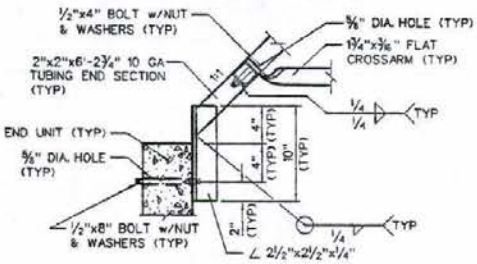
W8x18 ANCHOR ASSY.

GENERAL NOTES:

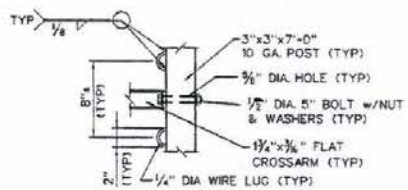
1. ½"x8-1/2"x8-1/2" PLATE WITH FERRULE AND STUDS ATTACHED IS TO BE CAST IN THE CONCRETE FRAME. AFTER THE CONCRETE FRAME HAS BEEN MANUFACTURED: THE 3/4" DIA. A307 THREADED ROD ① IS TO BE TIGHTENED INTO THE FERRULE. THE ROD IS THEN TO BE WELDED ② TO THE PLATE. THE ELASTOMERIC PAD IS THEN BONDED TO THE 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.
1/2"x5-1/2"x8-1/2" PLATE WITH 3/4" 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.

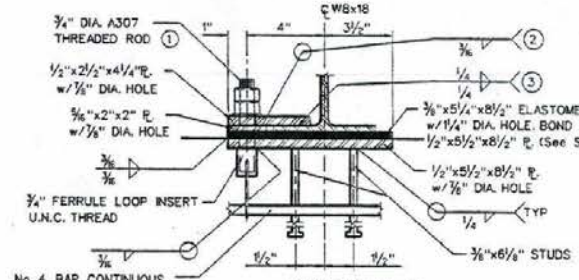
3. PRECAST CONCRETE SHALL REACH Fc' = 4500 PSI AT 28 DAYS. ALL OTHER CONCRETE SHALL BE CLASS A OR AA.



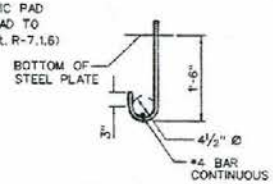
DETAIL "G"



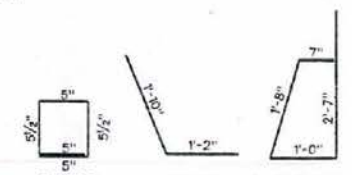
DETAIL "F"



SECTION "L-L"



"J" BOLT ALTERNATIVE



BAR BENDING DETAILS

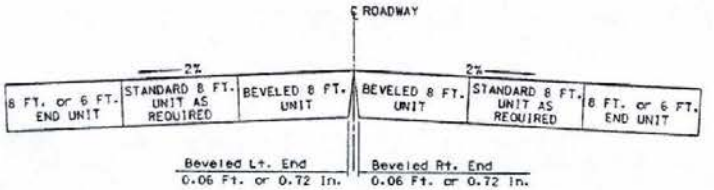
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PRECAST CATTLE GUARD SECTIONS & DETAILS

R-7.1.7 (617)

CHIEF ROAD DESIGN ENGR. ADOPTED: 11/80 REVISION 8/90

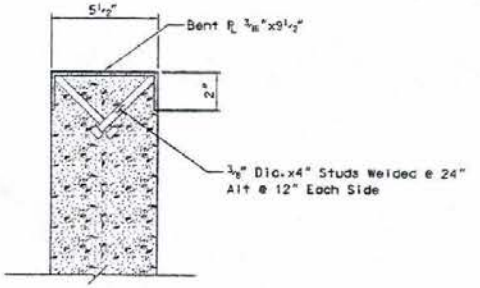
R-63



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	LENGTH OF END UNITS	8 FT. UNITS BEVELED	8 FT. UNITS STANDARD	LENGTH SUPPLIED	LENGTH BEYOND SHLDR.
24.0'	2 @ 6.0'	2		28.0'	2.0'
26.0'	2 @ 6.0'	2		28.0'	1.0'
28.0'	2 @ 6.0'	2		28.0'	0.0'
30.0'	2 @ 8.0'	2		32.0'	1.0'
32.0'	2 @ 8.0'	2		32.0'	0.0'
34.0'	2 @ 6.0'	2	2	44.0'	5.0'
36.0'	2 @ 6.0'	2	2	44.0'	4.0'
38.0'	2 @ 6.0'	2	2	44.0'	3.0'
40.0'	2 @ 6.0'	2	2	44.0'	2.0'
42.0'	2 @ 6.0'	2	2	44.0'	1.0'
44.0'	2 @ 6.0'	2	2	44.0'	0.0'
46.0'	2 @ 8.0'	2	2	48.0'	1.0'
48.0'	2 @ 8.0'	2	2	48.0'	0.0'
50.0'	2 @ 6.0'	2	4	60.0'	5.0'
52.0'	2 @ 6.0'	2	4	60.0'	4.0'
54.0'	2 @ 6.0'	2	4	60.0'	3.0'
56.0'	2 @ 6.0'	2	4	60.0'	2.0'
58.0'	2 @ 6.0'	2	4	60.0'	1.0'
60.0'	2 @ 6.0'	2	4	60.0'	0.0'



ALTERNATE ARMOR DETAIL

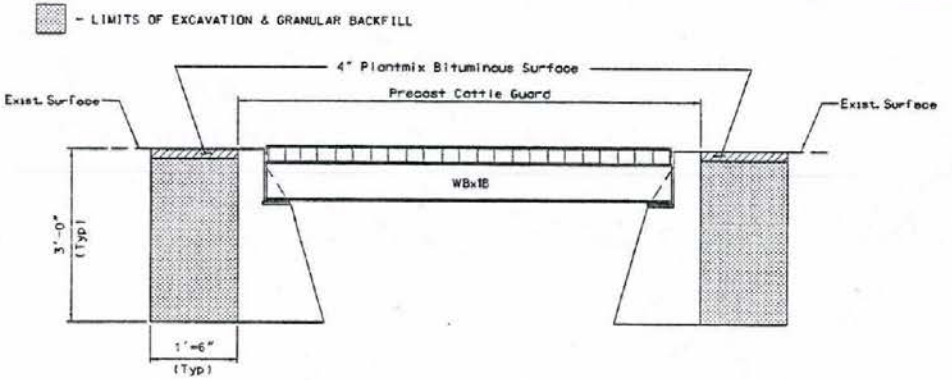
NOTE: The Above Alternate Armor Detail May be Substituted for The 2"x2"x¼" Armor Angles at The Contractors Option.

GENERAL NOTES:

1. PRECAST CONCRETE SHALL REACH Fc' = 4500 PSI AT 28 DAYS. ALL OTHER CONCRETE SHALL BE CLASS A OR AA.
2. MATERIAL LIST IS FOR INFORMATION ONLY.

STRUCTURAL STEEL				
UNIT	ITEM	REQ'D	LENGTH	WT. LBS.
SHORT END	TS3"x3"x3/16"	12	5'-6"	678
	W8x18	4	7'-0"	504
	L 2"x2"x1/4"	2	0'-5 1/2"	3
	L 2"x2"x1/4"	2	6'-0"	36
	L 2"x2"x1/4"	2	5'-6 1/2"	35
	3/8" DIA. STUD	12	0'-4"	2
	ANCHOR ASSY.	8	— — —	90
	3/8"x4" PLATE	2	7'-1 3/4"	73
				1423
INTERMEDIATE	TS 3"x3"x3/16"	12	7'-11 3/4"	984
	W8x18	5	7'-0"	630
	L 2"x2"x1/4"	4	0'-5 1/2"	6
	L 2"x2"x1/4"	4	8'-0"	102
	3/8" DIA. STUD	14	0'-4"	2
	ANCHOR ASSY.	10	— — —	113
	3/8"x4" PLATE	2	7'-1 3/4"	73
				1910
STANDARD END	TS 3"x3"x3/16"	12	7'-6"	935
	W8x18	5	7'-0"	630
	L 2"x2"x1/4"	2	0'-5 1/2"	3
	L 2"x2"x1/4"	2	8'-0"	51
	L 2"x2"x1/4"	2	7'-6 1/2"	48
	3/8" DIA. STUD	14	0'-4"	2
	ANCHOR ASSY.	10	— — —	113
	3/8"x4" PLATE	2	7'-1 3/4"	73
				1845

REINFORCING STEEL AND CONCRETE				
UNIT	NO. REQ'D	BAR MARK	WT. LBS.	CONCRETE
SHORT END	7	4078	36	1.68 C.Y.
	10	4056	38	
	8	4014	7	
	6	C3022	6	
	12	C40510	47	
	6	C4030	12	
			145	
INTERMEDIATE	18	4078	92	1.76 C.Y.
	12	C3022	10	
	8	C4030	16	
			180	
STANDARD END	17	4078	87	2.11 C.Y.
	8	4014	7	
	6	C3022	5	
	16	C40510	62	
	6	C4030	12	
			173	



METHOD OF PATCHING AT PRECAST CATTLE GUARDS

HARDWARE				
LOCATION	ITEM	NO. REQ'D	SIZE	LENGTH
WINGS	BOLTS	4	1/2"	8"
	BOLTS	6	1/2"	4"
PER UNIT CONNECTION	BOLTS	8	1/2"	5"
	WASHERS	36	17/32"	"
	NUTS	18	1/2"	"
	BOLTS	2	3/4"	1'-6"
	WASHERS	4	13/16"	"
	NUTS	2	3/4"	"

MATERIAL LIST FOR WINGS				
ITEM	REQ'D	SIZE	LENGTH	WT. LBS
FLAT CROSSARMS	2	1⅝"x3⅜"	1'-10¾"	4
FLAT CROSSARMS	2	1⅝"x⅜"	2'-8½"	6
FLAT CROSSARMS	2	1⅝"x⅜"	3'-8½"	8
BRACES	2	2"x2"x10 GA	1'- 3 3/4"	11
BRACES	2	2"x2"x10 GA	2'- 7 1/4"	23
BRACES	2	2"x2"x10 GA	3'-11"	38
BRACES	2	2"x2"x10 GA	5'- 2 1/2"	45
END BARRIER	4	2"x2"x10 GA	6'- 2 3/4"	107
BARRIER PLATES	2	2½"x2½"x⅜"	0'-5"	1
BARRIER ANGLES	4	2½"x 2½"x¼"	0'-10"	14
UPRIGHT POSTS	2	3"x3"x⅜"	7'-0"	96

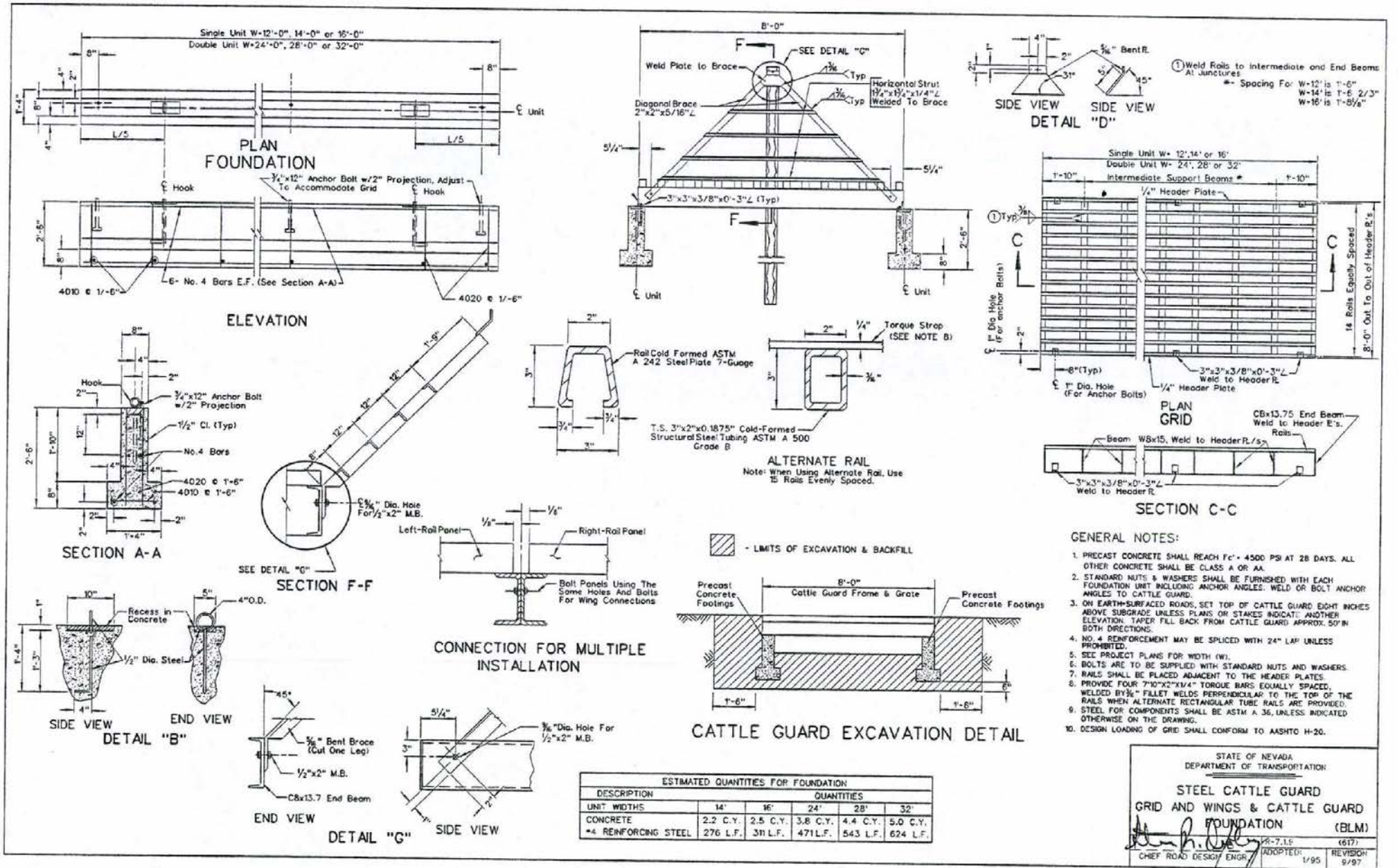
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PRECAST CATTLE GUARD SECTIONS & DETAILS

R-7.1.8 (617)

CHIEF ROAD DESIGN ENGR. ADOPTED: 11/86 REVISION 2/90

R-64



ESTIMATED QUANTITIES FOR FOUNDATION					
DESCRIPTION	QUANTITIES				
UNIT WIDTHS	14'	16'	24'	28'	32'
CONCRETE	2.2 C.Y.	2.5 C.Y.	3.8 C.Y.	4.4 C.Y.	5.0 C.Y.
#4 REINFORCING STEEL	276 L.F.	311 L.F.	471 L.F.	543 L.F.	624 L.F.

GENERAL NOTES:

1. PRECAST CONCRETE SHALL REACH Fc' = 4500 PSI 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 EIGHT INCHES ABOVE SUBGRADE UNLESS PLANS OR STAKES INDICATE ANOTHER ELEVATION. TAPER FILL BACK FROM CATTLE GUARD APPROX. 50' IN BOTH DIRECTIONS.
4. NO. 4 REINFORCEMENT MAY BE SPLICED WITH 24" 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 7'10"X2"X1/4" TORQUE BARS EQUALLY SPACED, WELDED BY 3/16" FILLET WELDS PERPENDICULAR TO THE TOP OF THE RAILS WHEN ALTERNATE RECTANGULAR TUBE RAILS ARE PROVIDED.
9. STEEL FOR COMPONENTS SHALL BE ASTM A 36, UNLESS INDICATED OTHERWISE ON THE DRAWING.
10. DESIGN LOADING OF GRID SHALL CONFORM TO AASHTO H-20.

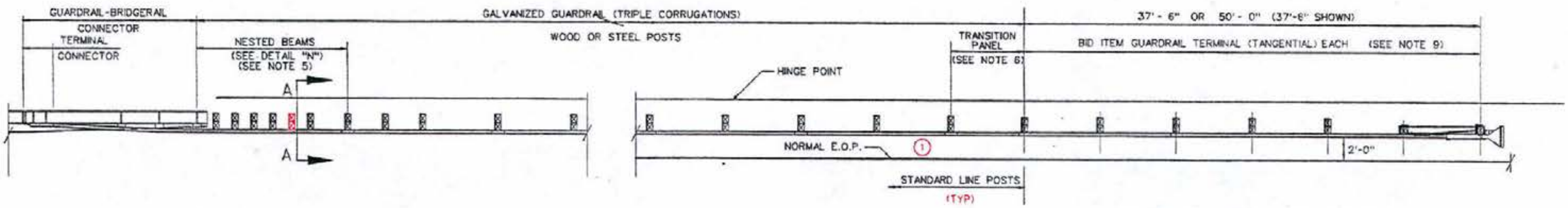
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

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

CHIEF ROAD DESIGN ENGR.

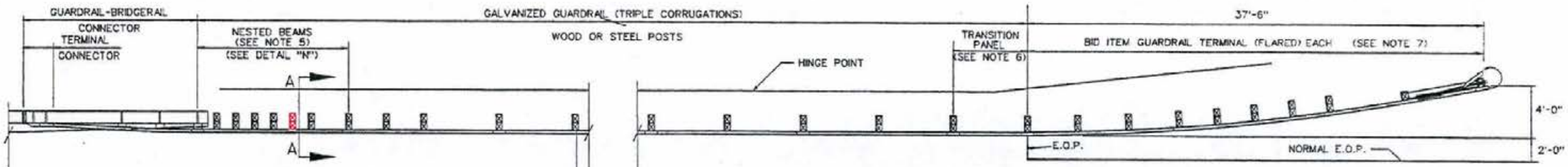
SR-7.1.9	(617)
ADOPTED: 1/95	REVISION 9/97

R-65

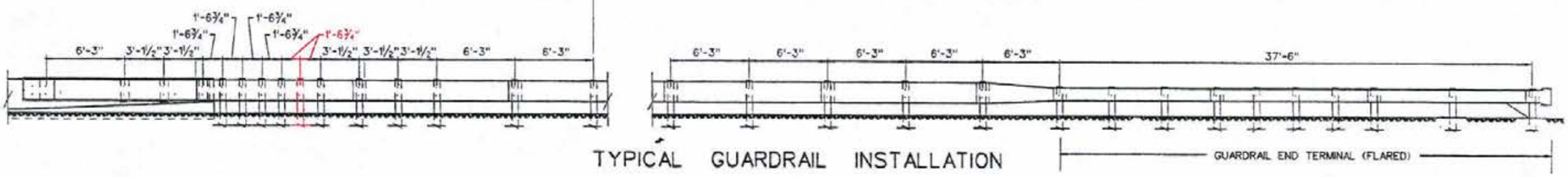


① ON RETROFIT INSTALLATION, PAVING IS OPTIONAL. ON NEW CONSTRUCTION, PAVING IS REQUIRED. SEE R-8.2.1.

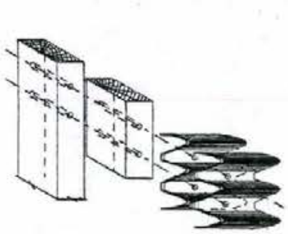
TANGENT END TREATMENT



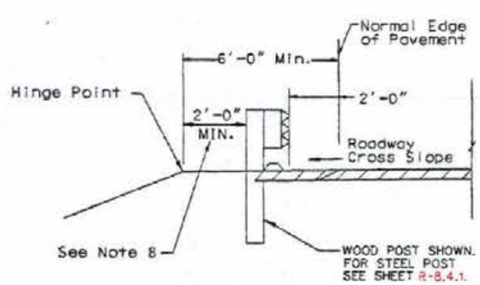
FLARED END TREATMENT



TYPICAL GUARDRAIL INSTALLATION



NESTED BEAMS
DETAIL "N"



SECTION A-A

GENERAL NOTES:

1. FOR DETAILS AND DIMENSIONS NOT SHOWN SEE SHEETS R-8.1.2 THRU R-8.4.3.
2. SEE SHEET T-35.2.1 FOR SPECIAL GUARDRAIL TERMINAL END FOR RAILROAD CROSSING.
3. SEE SHEET R-8.2.2 FOR TRAILING END ANCHOR FOR ONE-WAY ROADS.
4. MINIMUM INSTALLATION:

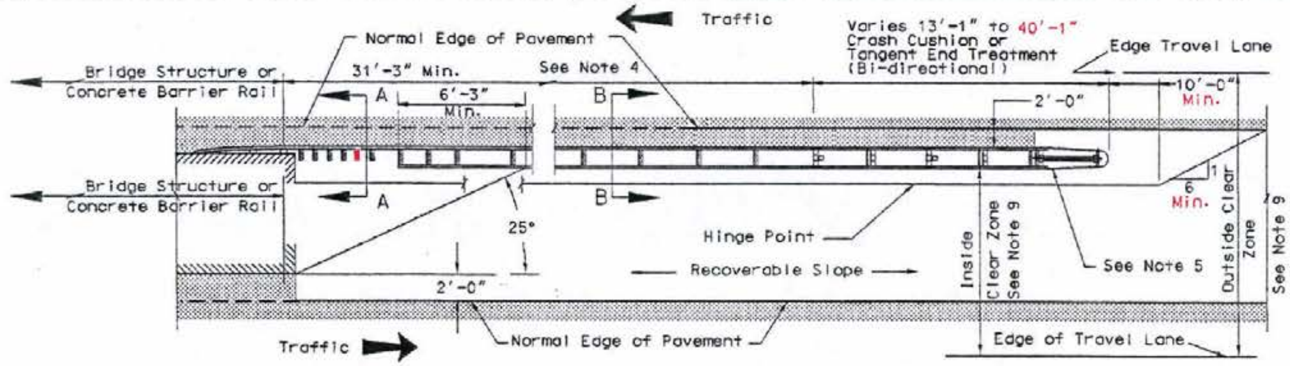
GUARDRAIL-BRIDGERAIL CONNECTOR	-	14'-4¾"
NESTED BEAM SECTION	-	12'-6"
THRIE BEAM SECTION	-	12'-6"
TRANSITION PANEL	-	6'-3"
APPROVED "350" TERMINAL	-	37'-6" OR 50'-0"
		83'-1¾" OR 95'-7¾"

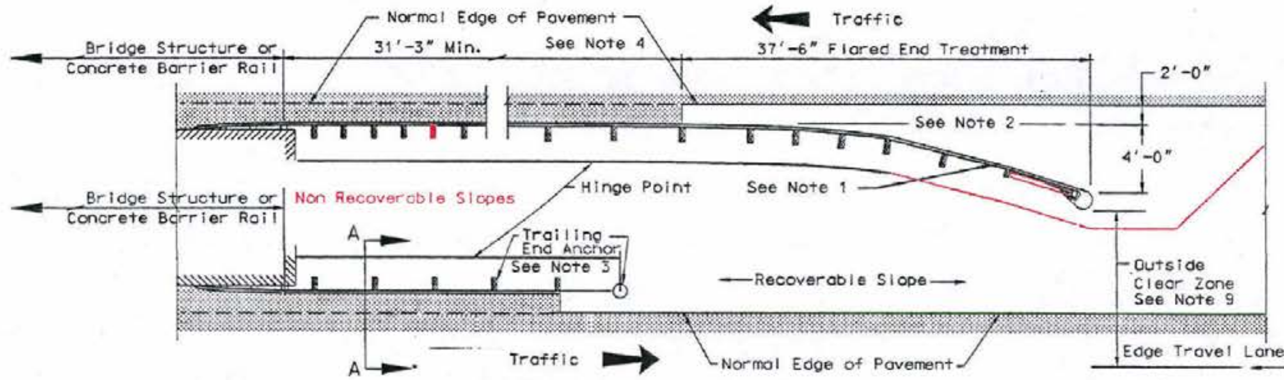
   ANY OTHER VARIATION THAT REDUCES THE MINIMUM LENGTH SHALL REQUIRE APPROVAL OF THE CHIEF ROAD DESIGN ENGINEER.
5. NO DIRECT PAYMENT FOR THE ADDITIONAL GUARDRAIL PANEL.
6. THE LENGTH OF THE TRANSITION PANEL (6' - 3") SHALL BE ADDED TO THE ESTIMATED LENGTH OF THE THRIE BEAM GUARDRAIL. SEE SHEET R-8.4.1.
7. FOR GRADING DETAILS NOT SHOWN, SEE R-8.2.1. 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 2', THE POST SHALL BE LENGTHENED 1' MIN.
9. WHEN GUARDRAIL IS PLACED AT NORMAL EDGE OF PAVEMENT, THE TANGENT END TREATMENT SHALL BE FLARED @ 50:1 TAPER TO GET HEAD PIECE CLEAR OF EDGE OF PAVEMENT.
10. APPROACH GUARDRAIL TERMINALS SHALL BE "NCHRP 350", FHWA, AND NEVADA DOT APPROVED.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL GUARDRAIL INSTALLATION

CHIEF ROAD DESIGN ENGR. | R-8.1.1 | (618)
ADOPTED: 1/89 REVISION: 8/98



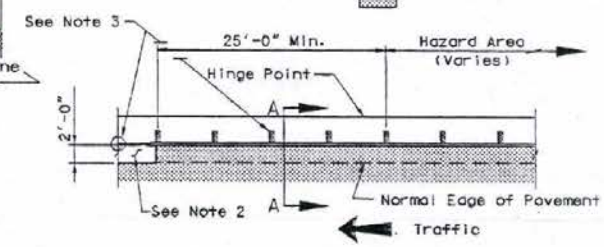


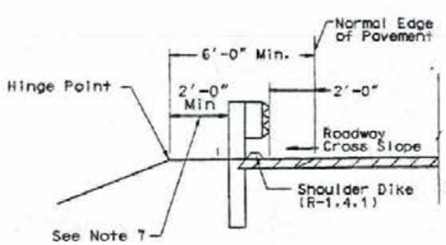
GENERAL NOTES

1. FOR 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. SEE STANDARD DRAWING R-8.2.2 FOR DETAILS NOT SHOWN.
4. GALVANIZED GUARDRAIL (TRIPLE CORRUGATIONS): SEE STANDARD DRAWING R-8.4.1.
5. CRASH CUSHION OR TANGENT END TREATMENT (BI-DIRECTIONAL) CAN BE FLARED AT 50:1 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 2 FEET, THE POST SHALL BE LENGTHENED 1 FOOT 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 4:1 OR FLATTER.
12. APPROACH GUARDRAIL TERMINALS SHALL BE "NCHRP 350", FHWA, AND NEVADA DOT APPROVED.

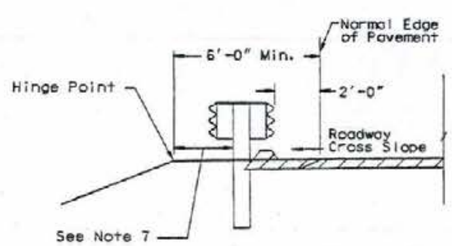
LEGEND

- PAVED AREAS





SECTION A-A



SECTION B-B

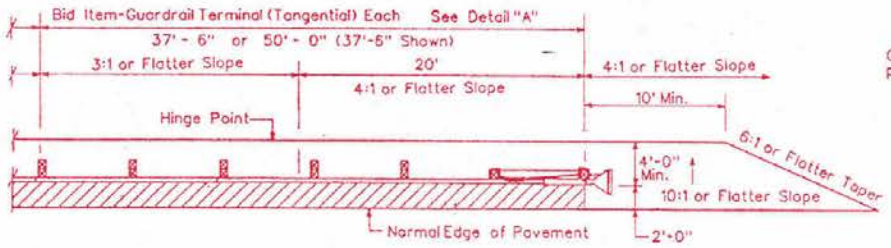
Design Speed (MPH)	Flare Rate
75	16:1
70	15:1
60	13:1
50	11:1
40	9:1
30	7:1

GUARDRAIL FLARE RATES

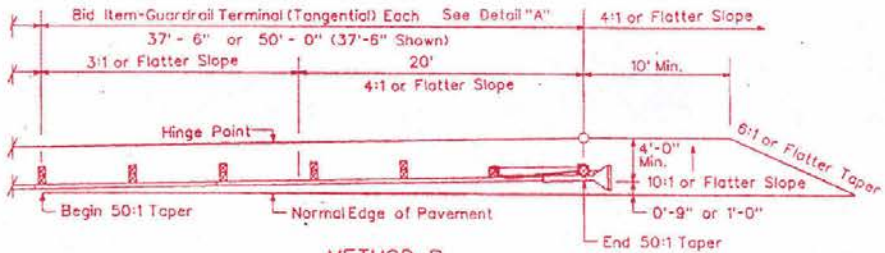
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL GUARDRAIL INSTALLATION

CHIEF ROAD DESIGN ENGR. | R-8.1.2 | (618) | ADOPTED: 07/96 | REVISION 8/98

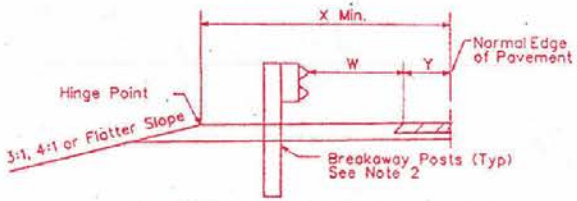


METHOD A (PREFERRED)



METHOD B
Terminal at 50:1 Taper, No Shy Distance

GUARDRAIL TERMINAL (TANGENTIAL)

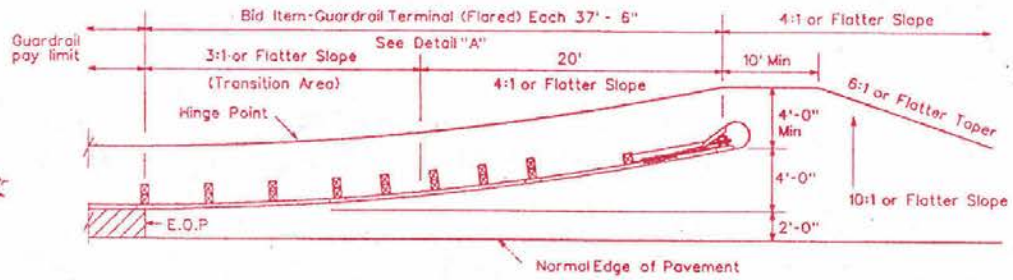


See TABLE 1 on this Drawing for W, X, and Y.

DETAIL "A"

TABLE 1

Terminal Ends	W (Flare)	X (Widening)	Y (Shy)
Method A	0'-0"	6'-0"	2'-0"
Method B	0'-9" or 1'-0"	Varies From 4'-0" To 4'-9" or 5'-0"	0'-0"
Flared End	4'-0"	Varies From 6'-0" To 10'-0"	2'-0"



GUARDRAIL TERMINAL (FLARED)

Paved Areas

GENERAL NOTES:

1. For typical guardrail installation, See R-8.1.1.
2. For details not shown, including heights of posts for soil tube installation see manufacturer's drawings.
3. Approach guardrail terminals shall be "NCHRP 350", FHWA, and Nevada DOT approved.

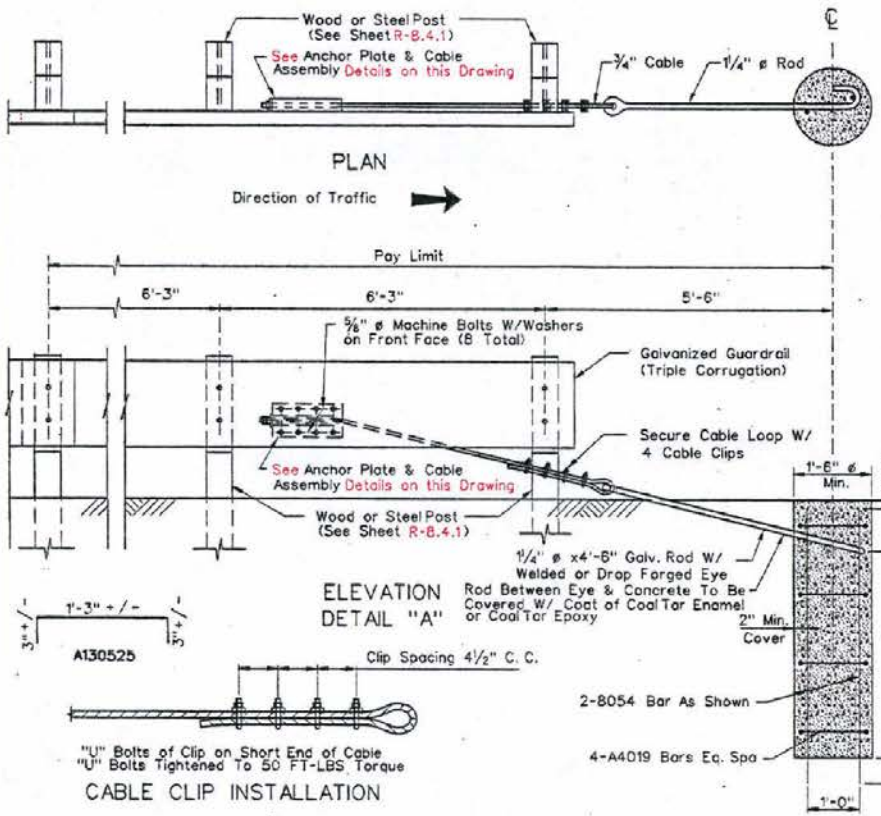
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

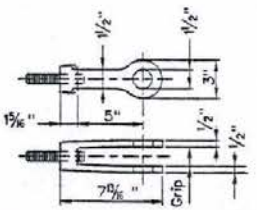
GUARDRAIL TERMINALS
GRADING PLAN

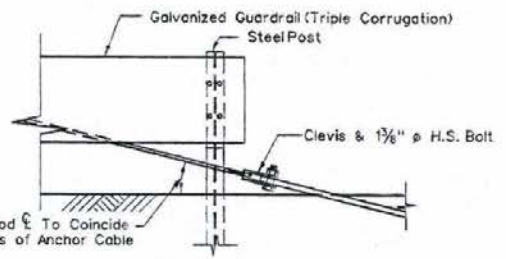
CHIEF ROAD DESIGN ENGR.

R-8.2.1 (618)
ADOPTED: 4/98 REVISION

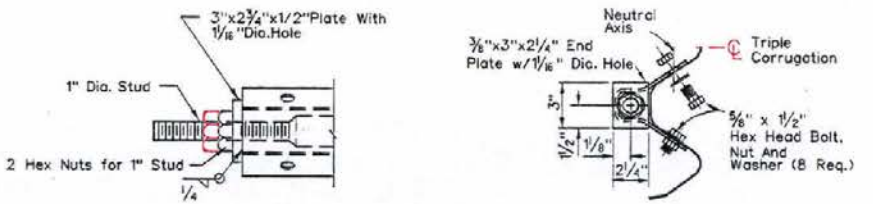
R-68





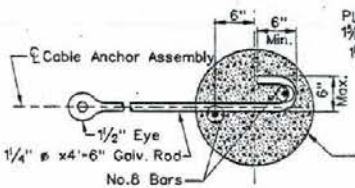


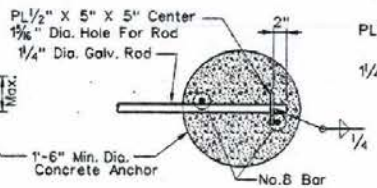
NOTE: Other Alternative For Attaching Cable To Anchor Rod Must Be Approved By The Engineer

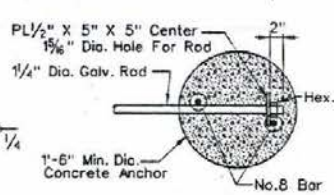


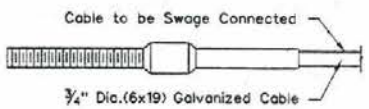
GENERAL NOTES:

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 alternatives for attaching cable to anchor rod must be approved by the engineer.
4. For trailing end anchor concept, refer to plan view shown on Standard Drawing R-8.1.2 and R-8.3.1.
5. Concrete shall be Class A or AA.
6. The trailing end anchor shall be installed only on oneway facilities, outside the clear zone for the opposing traffic.
7. Cable shall be restrained from moving during tightening.









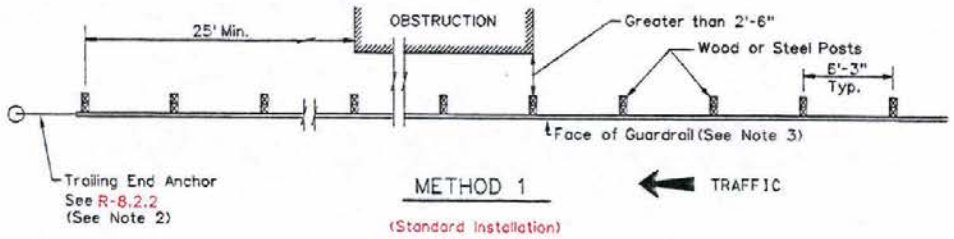
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

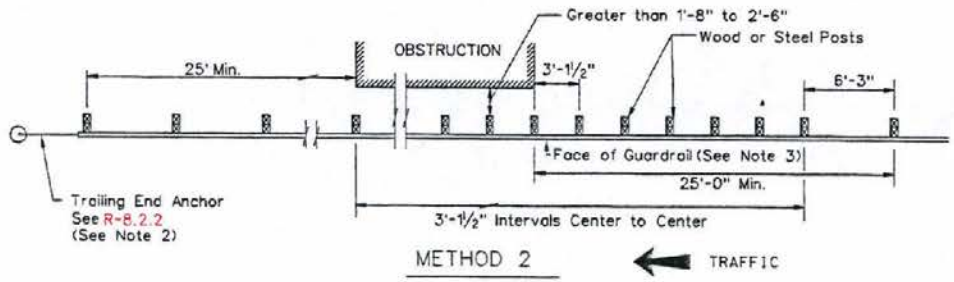
TRAILING END ANCHOR (FOR ONEWAY ROADWAYS ONLY)

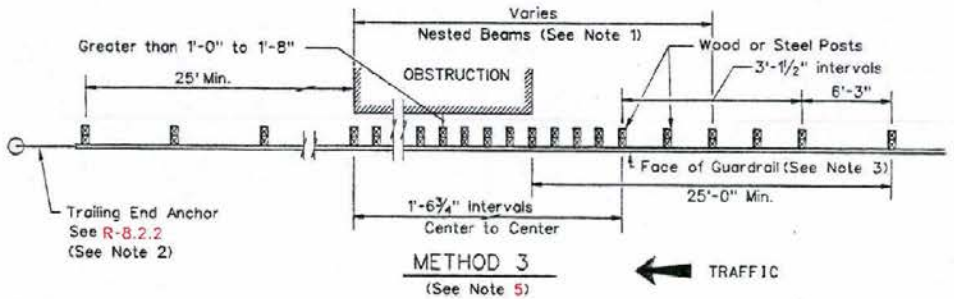
CHIEF ROAD DESIGN ENGR

R-8.2.2 (618)

ADOPTED: 7/96 REVISION 8/98

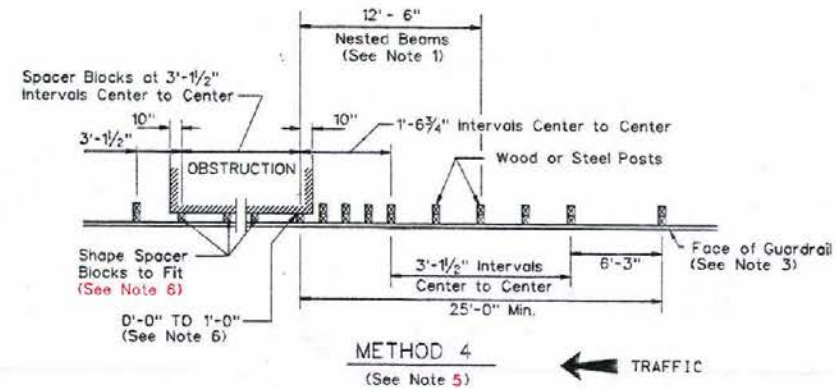






GENERAL NOTES:

1. Use nested thrie beam. See detail "N", Standard Plan Drawing R-8.1.1.
2. A "NCHRP 350", FHWA, and Nevada DOT approved guardrail 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 of triple corrugation guardrail see Standard Plan Drawing R-8.4.1.
4. Refer to AASHTO Roadside Design Guide, 1996 Edition, Section 5.6.1 for design information not shown.
5. If guardrail system is not satisfactory, use concrete barrier rail. Check for vehicle roll angle (top of taller vehicles hitting the obstructions).
6. Spacer material may be "I" beam, wood block or formed structural tubing by prior approval of the engineer. For details of a spacer block see Standard Plan Drawing R-8.4.1. Shy distance can be adjusted upward to fit the spacer block.



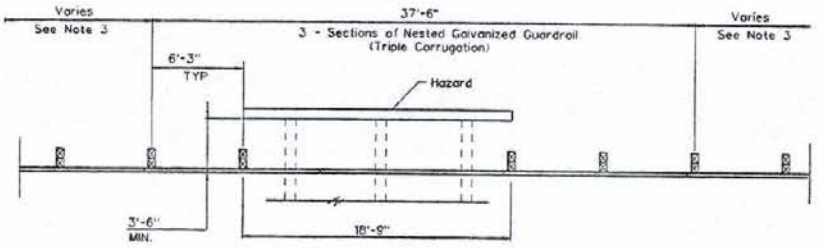
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GUARDRAIL INSTALLATION DEFLECTIONS AND BACK SPACING

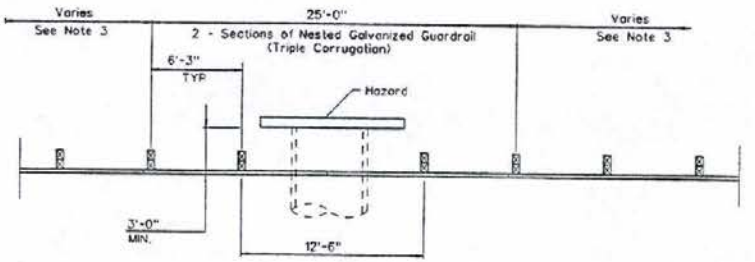
CHIEF ROAD DESIGN ENGR. ADOPTED: 7/96 REVISION 6/98

R-8.3.1 (618)

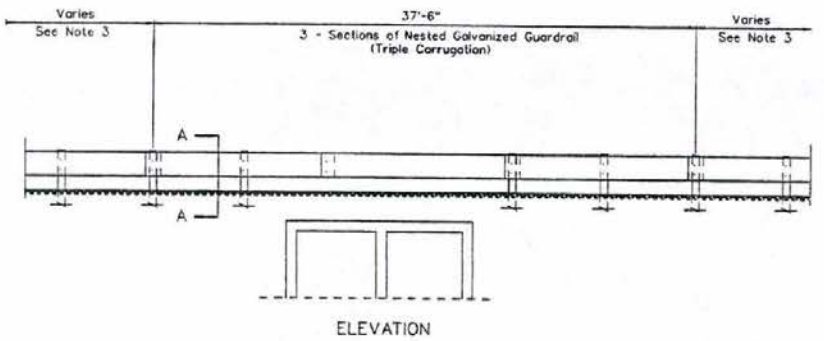
R-70



PLAN



PLAN



ELEVATION

TYPE 2
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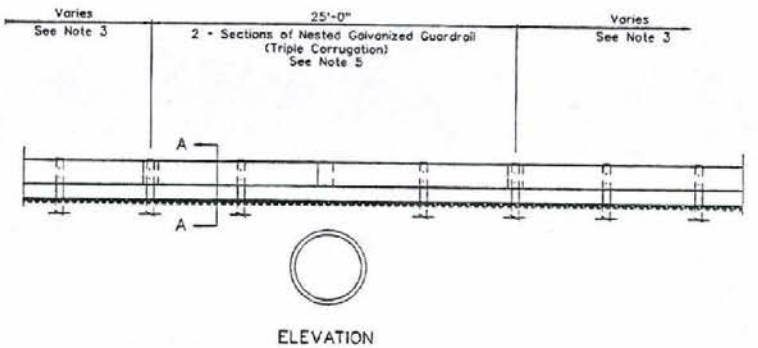
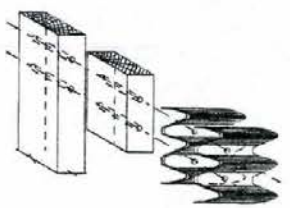


ELEVATION

TYPE 1
(1 Post Missing)



NESTED BEAMS
SECTION "A-A"

GENERAL NOTES:

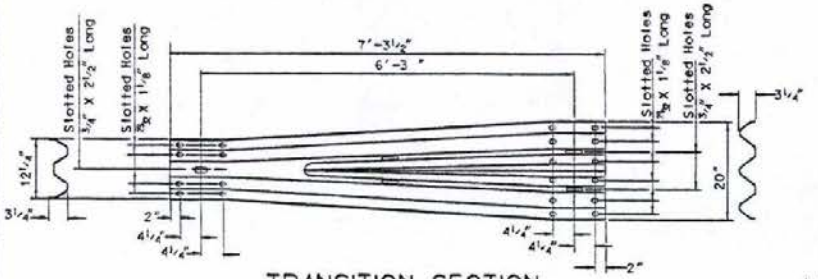
1. THESE DETAILS ARE TO BE USED ONLY WHEN GUARDRAIL POST CANNOT BE INSTALLED TO AVOID UNDERGROUND OBSTRUCTIONS WITH GUARDRAIL POSTS.
2. SEE SHEET R-8.4.1 FOR DETAILS ON GALVANIZED GUARDRAIL (TRIPLE CORRUGATIONS) NOT SHOWN.
3. GUARDRAIL LENGTHS OF NEED SHALL BE BASED ON DESIGN YEAR TRAFFIC VOLUMES. SEE 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 (37'-6") OF NESTED GUARDRAIL ARE REQUIRED, WITH THE MIDDLE SECTION BEING CENTERED AT THE LOCATION OF THE MISSING POST.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GUARDRAIL INSTALLATION MISSING POST

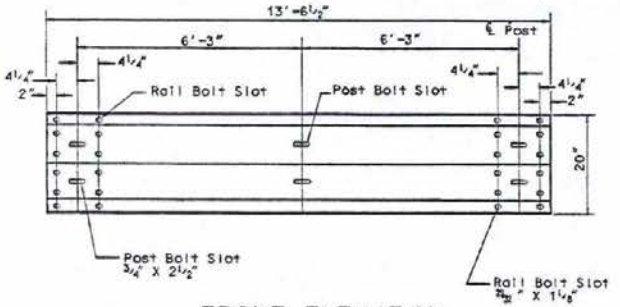
R-8.3.2 (618)

CHIEF ROAD DESIGN ENGR. ADOPTED: 7/96 REVISION 8/95

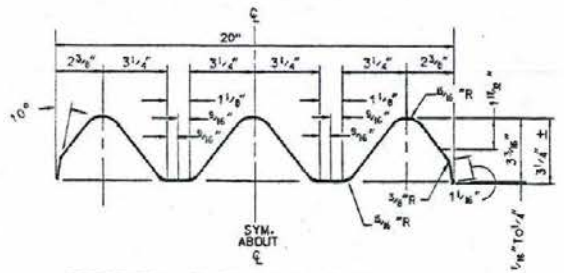


TRANSITION SECTION

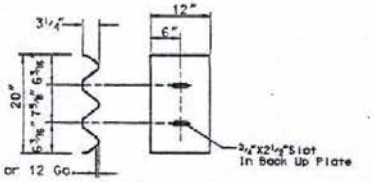
PLAN VIEW



FRONT ELEVATION

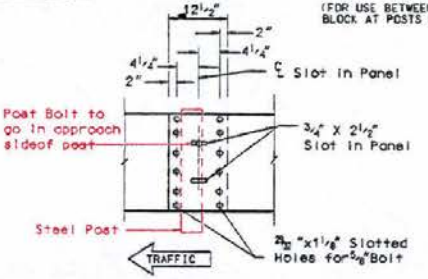


SECTION THROUGH RAIL ELEMENT

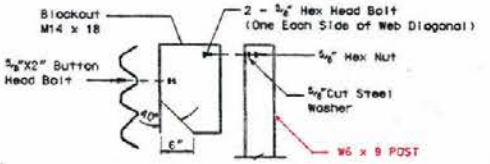


BACK-UP PLATE

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

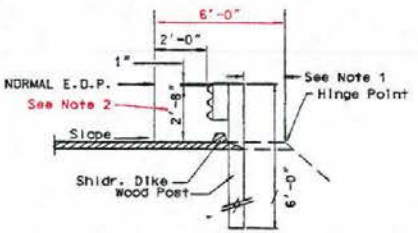


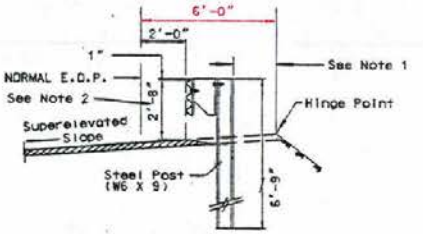
RAIL SPLICE



STEEL POST BOLT HARDWARE AND BLOCKOUT DETAIL

(ALL HARDWARE TO BE GALVANIZED)



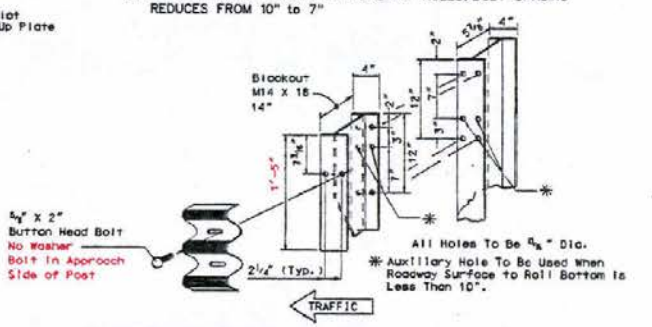


TYPICAL GUARDRAIL INSTALLATIONS

(STEEL POST OR WOOD POST)

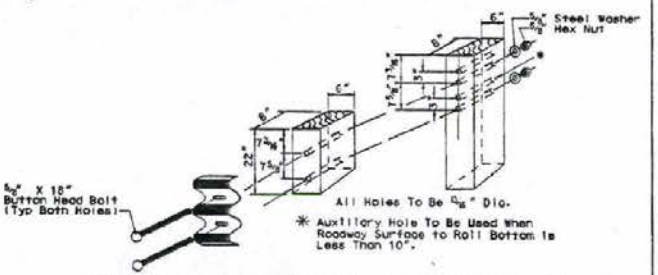
GENERAL NOTES:

1. WHEN DISTANCE BETWEEN BACK OF GUARDRAIL POST AND HINGE POINT IS LESS THAN 2'-0" THE POST SHALL BE LENGTHENED 1'-0" MIN.
2. GUARDRAIL HEIGHTS ON STAGE CONSTRUCTION PROJECTS SHALL BE GOVERNED BY FINAL SURFACING ELEVATIONS.
3. WHEN BLOCKOUT RAISED TO AUXILIARY HOLES, BOLT SPACING REDUCES FROM 10" to 7"



TRIPLE CORRUGATED RAIL-STEEL POST

NTS



TRIPLE CORRUGATED RAIL-WOOD POST

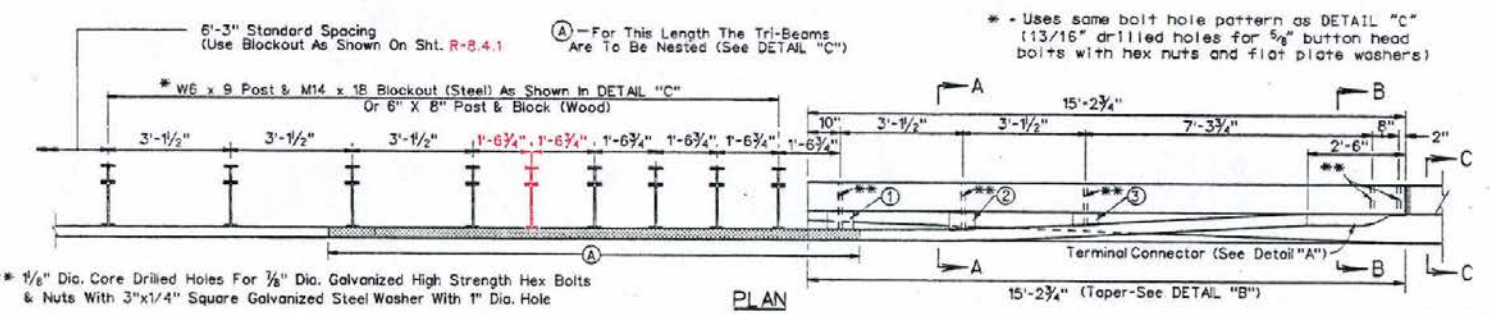
NTS

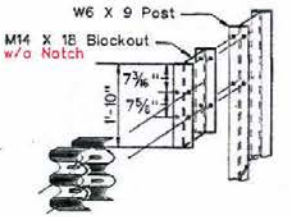
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GALVANIZED GUARDRAIL
(TRIPLE CORRUGATION)

CHIEF ROAD DESIGN/ENGR. ADOPTED: REVISION 10-99

R-72





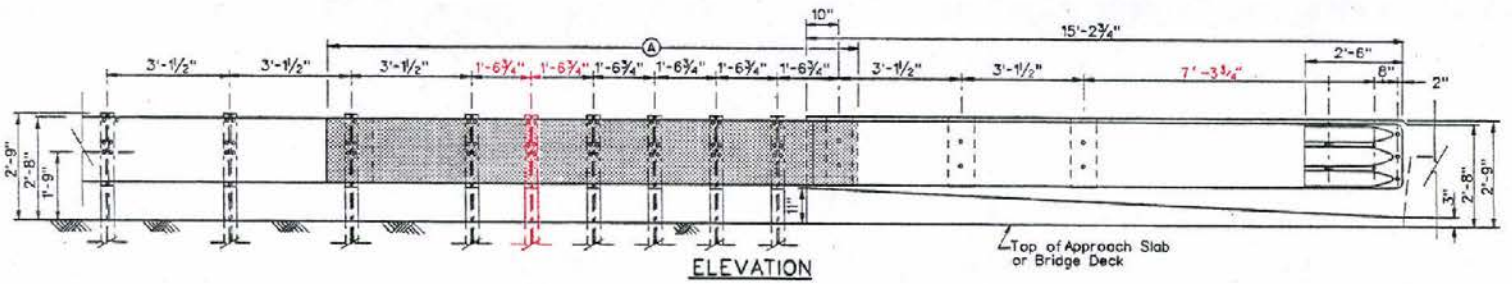
DETAIL "C"

GENERAL NOTES:

1. Wood spacer blocks (of the proper dimensions) may be substituted for the detailed steel blocks.

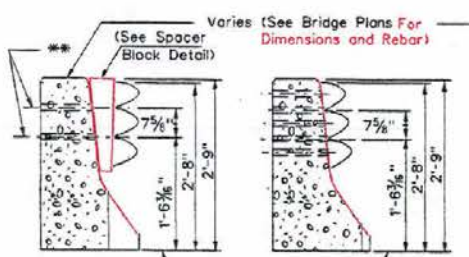
Galvanizing Guardrail (Triple Corrugation) Bid Item

Guardrail Bridge Rail Connection Bid Item



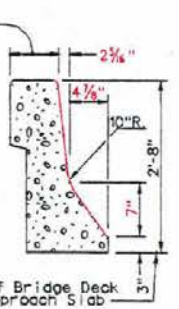
ELEVATION

SPACER BLOCK TABLE				
SPACER BLOCK	A	B	C	D
①	4"	1¾"	1¾"	4"
②	3½"	1¼"	1"	3⅛"
③	2⅛"	¾"	¾"	2⅛"

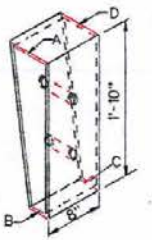


SECTION A-A

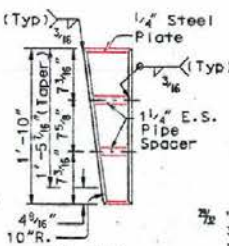
SECTION B-B



SECTION C-C

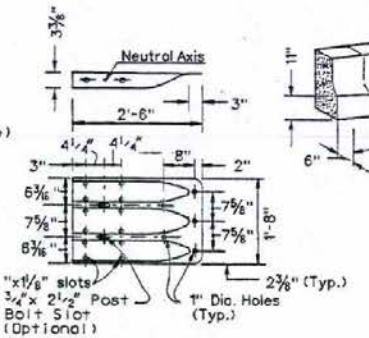


ISOMETRIC

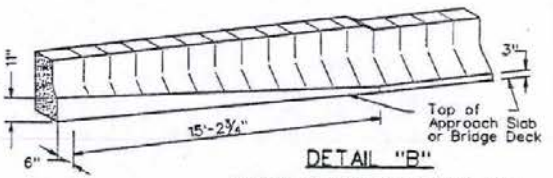


SIDE VIEW

SPACER BLOCK DETAIL



DETAIL "A"



DETAIL "B"

Method of tapering bridge rail for guardrail connections

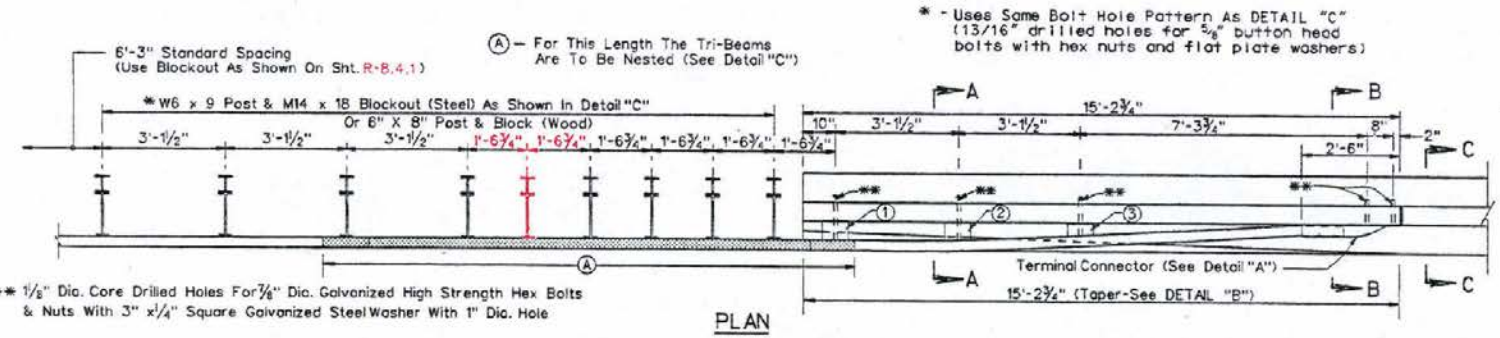
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

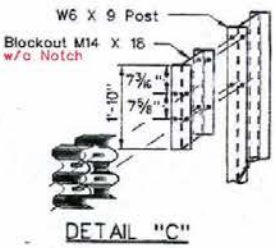
GUARD RAIL-BRIDGE RAIL CONNECTION (TRIPLE CORRUGATION)

CHIEF ROAD DESIGN ENGR. ADOPTED: 11/86 REVISION 6/96

R-8.4.2 (618)

R-73



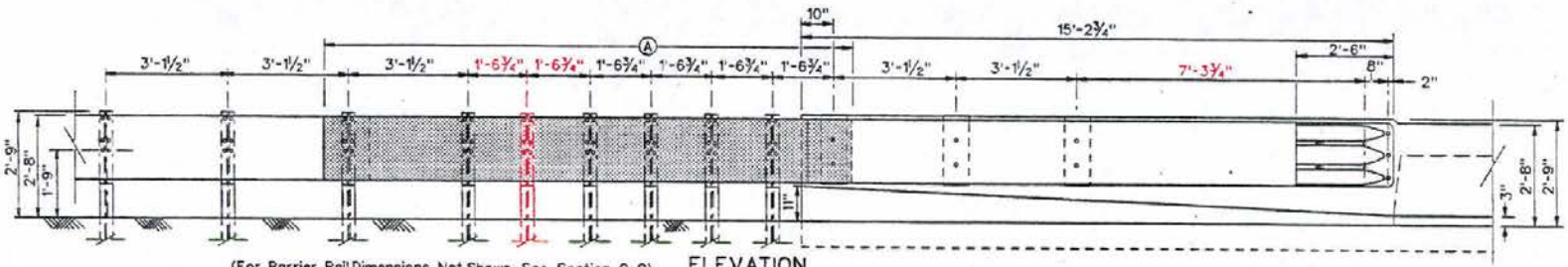


Galvanizing Guardrail (Triple Corrugation)
Bid Item

Guardrail Bridge Rail Connection
Bid Item

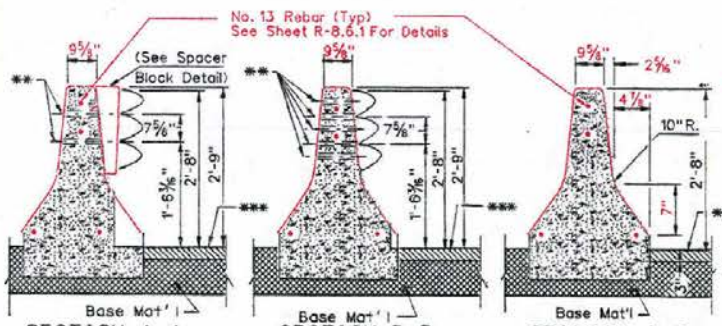
GENERAL NOTES:

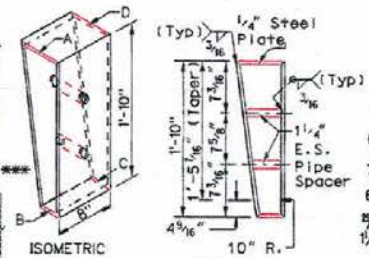
1. Wood spacer blocks (of the proper dimensions) may be substituted for the detailed steel blocks.

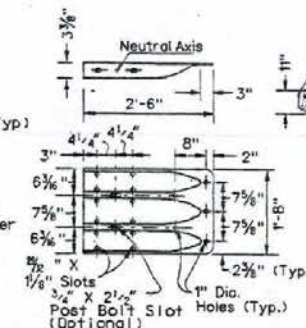


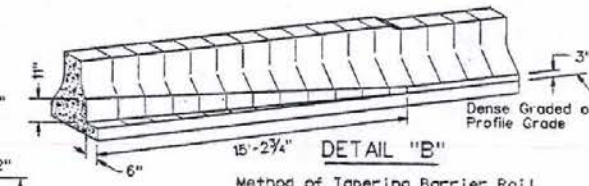
(For Barrier Rail Dimensions Not Shown, See Section C-C)
*** Dense Graded or Profile Grade
ELEVATION

SPACER BLOCK TABLE				
SPACER BLOCK	A	B	C	D
①	4"	1¾"	1¾"	4"
②	3½"	1¼"	1¼"	3½"
③	2⅛"	¾"	¾"	2⅛"









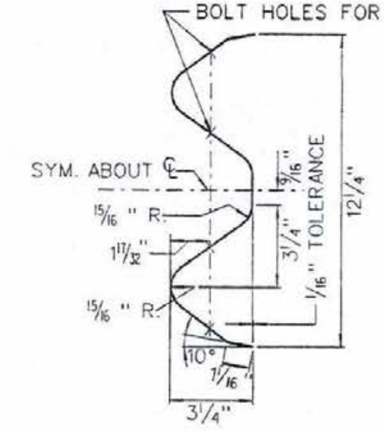
Method of Tapering Barrier Rail For Guardrail Connections

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

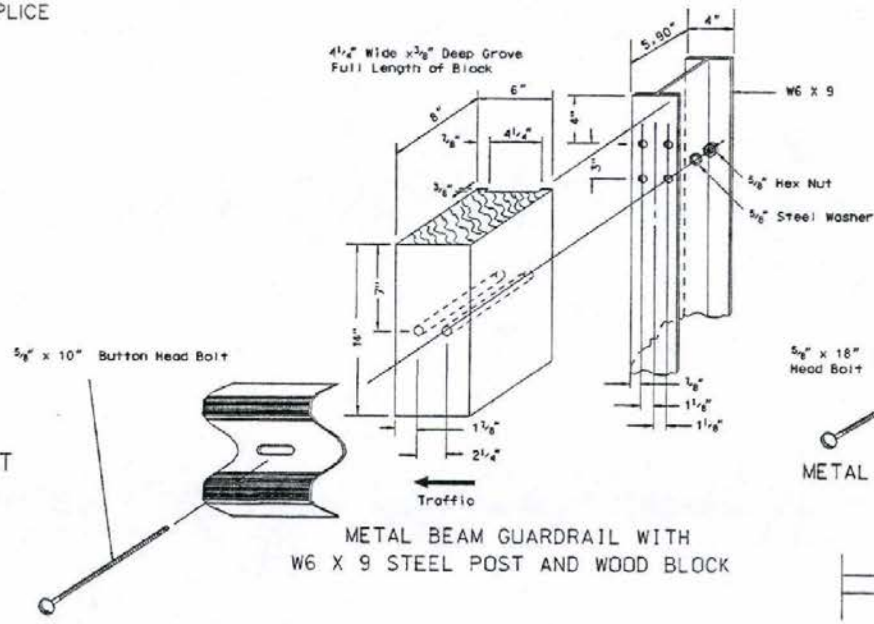
GUARD RAIL-BARRIER RAIL CONNECTION (TRIPLE CORRUGATION)

CHIEF ROAD DESIGN ENGR. | R-8.4.3 | ADOPTED: 11/96 | REVISION 8/98

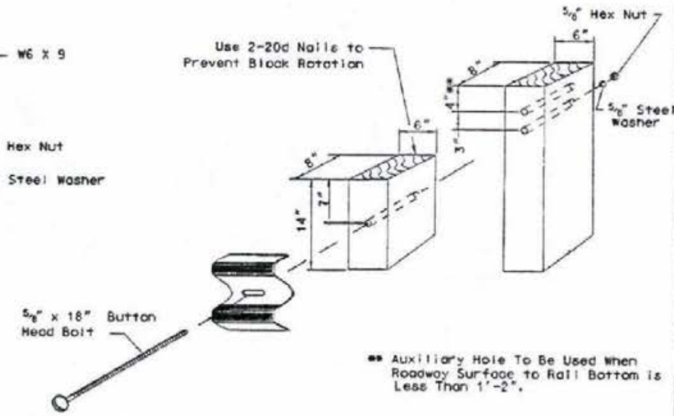
R-74



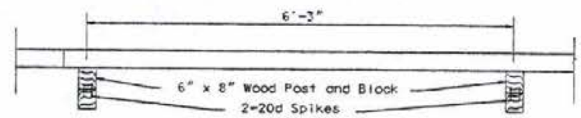
SECTION THRU RAIL ELEMENT



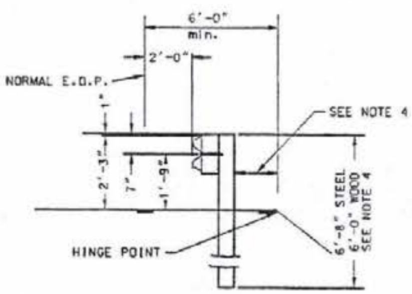
METAL BEAM GUARDRAIL WITH W6 X 9 STEEL POST AND WOOD BLOCK



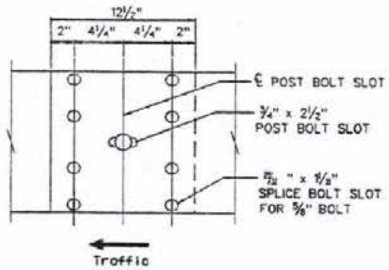
METAL BEAM GUARDRAIL WITH WOOD POSTS & BLOCKS



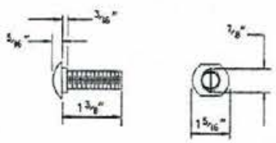
PLAN
(METAL BEAM GUARDRAIL WITH WOOD POST AND BLOCK.)



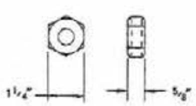
TYPICAL GUARD RAIL INSTALLATION



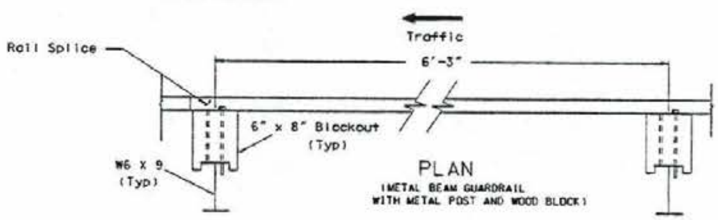
RAIL SPLICE



5/8" SPLICE BOLT



5/8" RECESSED NUT



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

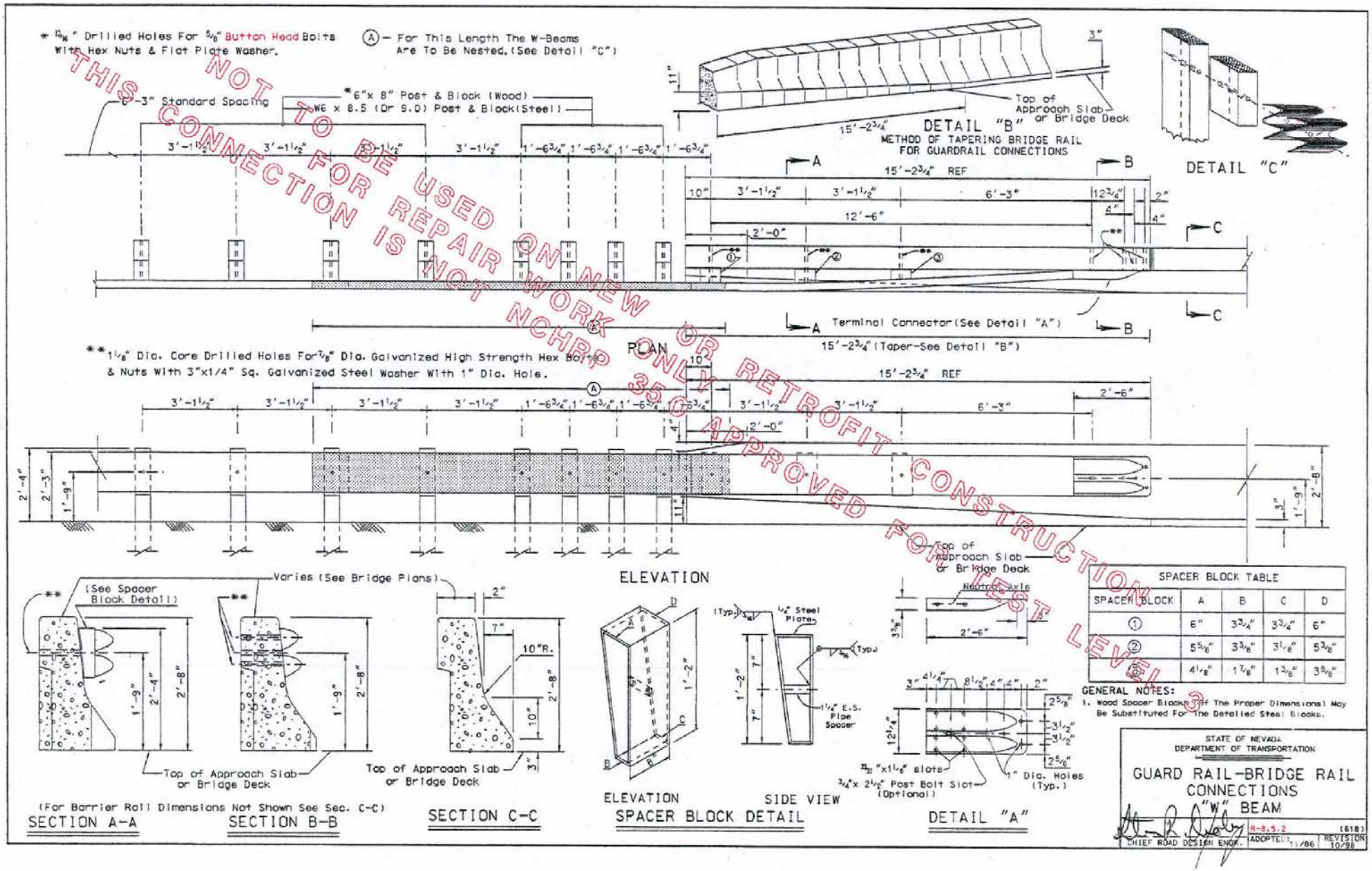
GENERAL NOTES:

1. ALL HOLES 3/4" 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 2'-0". THE POST SHALL BE LENGTHENED 1'-0" MIN.
5. GUARDRAIL HEIGHTS ON STAGED CONSTRUCTIONS PROJECTS SHALL BE GOVERNED BY FINAL SURFACING ELEVATIONS.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GALVANIZED GUARDRAIL
("W" BEAM)

CHIEF ROAD DESIGN ENGR. | R-6.5.1 | (618)
ADOPTED: 2/79 | REVISION 10/98



SPACER BLOCK TABLE				
SPACER BLOCK	A	B	C	D
①	6"	3 3/4"	3 3/4"	6"
②	5 5/8"	3 3/8"	3 1/8"	5 3/8"
③	4 1/8"	1 7/8"	1 3/8"	3 5/8"

GENERAL NOTES:
1. Wood Spacer Blocks (Of The Proper Dimensions) May Be Substituted For The Detailed Steel Blocks.

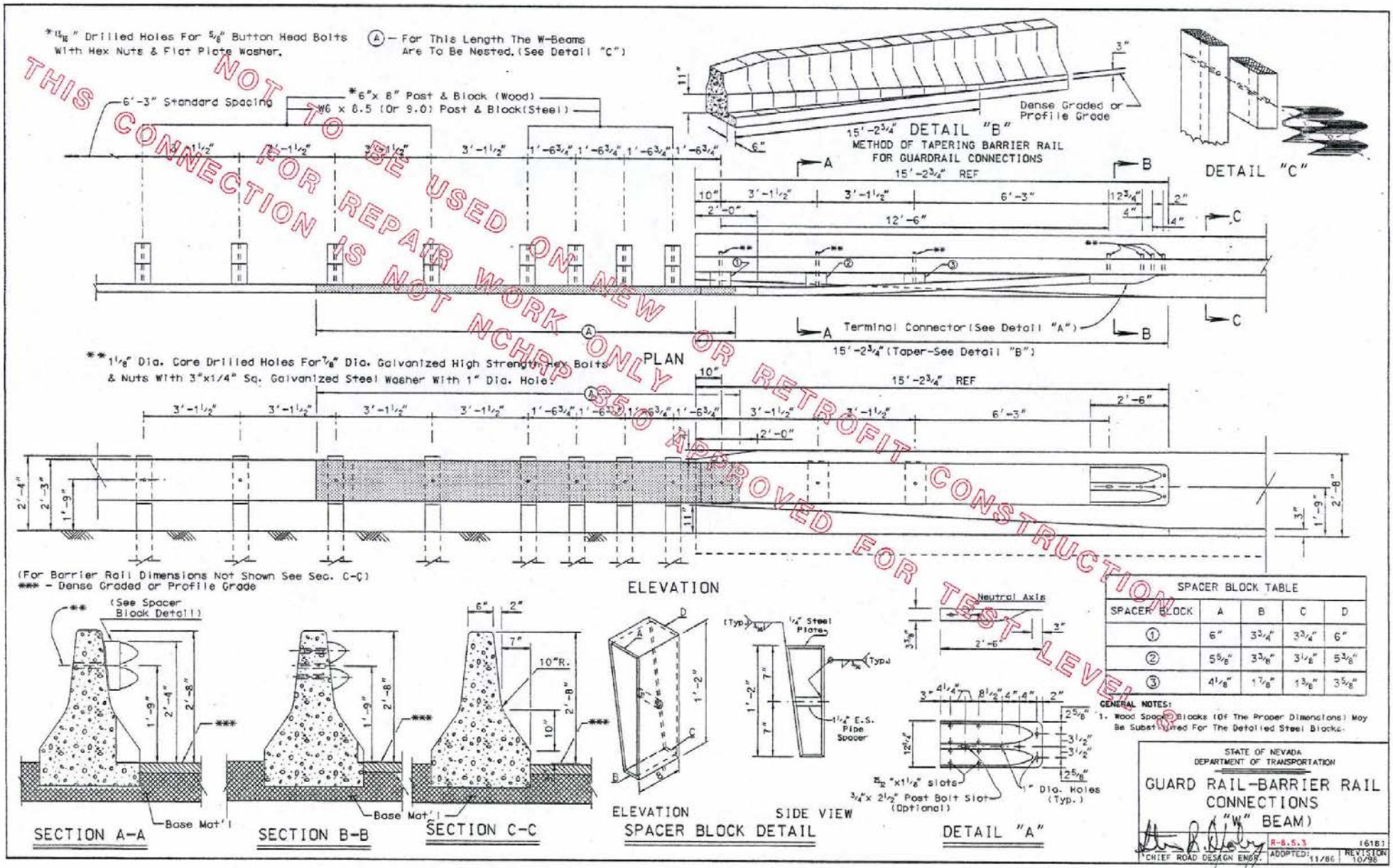
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GUARD RAIL-BRIDGE RAIL CONNECTIONS "W" BEAM

CHIEF ROAD DESIGN ENGR.

R-8.5.2 (818)
ADOPTED 1/1/86 REVISION 10/98

R-76



SPACER BLOCK TABLE				
SPACER BLOCK	A	B	C	D
①	6"	3 3/4"	3 3/4"	6"
②	5 5/8"	3 3/8"	3 1/8"	5 3/8"
③	4 1/8"	1 7/8"	1 3/8"	3 5/8"

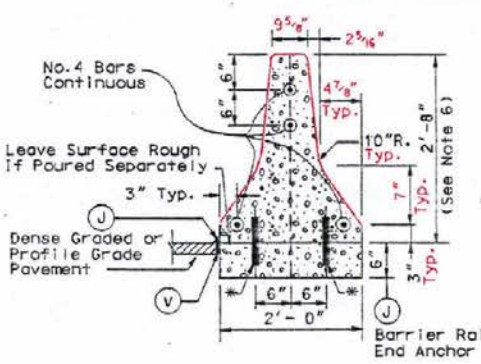
GENERAL NOTES:
1. Wood Spacer Blocks (Of The Proper Dimensions) May Be Substituted For The Detailed Steel Blocks.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

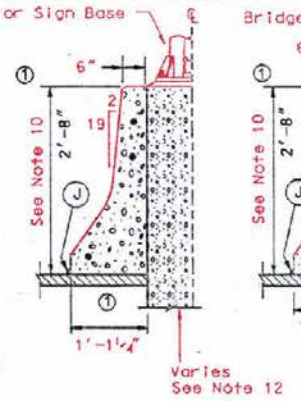
GUARD RAIL-BARRIER RAIL CONNECTIONS ("W" BEAM)

CHIEF ROAD DESIGN ENGR. | R-8.5.3 | (618) | ADOPTED: 11/86 | REVISION 10/98

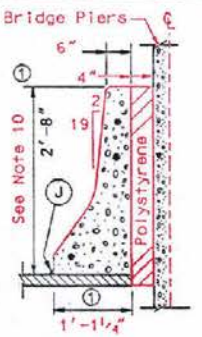
R-77



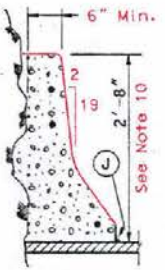
TYPE A



TYPE B



TYPE B



TYPE C

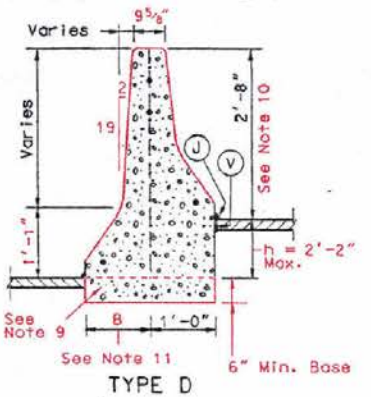
CONCRETE (INFORMATION ONLY)

0.1208 Yd.^{3} Per Ft., Without Base Slab

0.1578 Yd.^{3} Per Ft., With Base Slab

CONCRETE (INFORMATION ONLY)

0.0702 Yd.^{3} Per Ft.



TYPE D

(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 Typ. (See Note 5)

(V) – Vertical Joint Sealer Typ. (See Note 4)

* 1"x 8" Steel Dowel @ 2'-0" Centers (If Needed See Note 3)

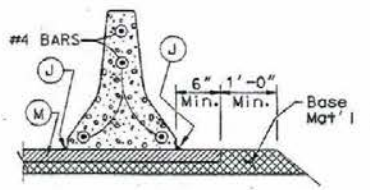
DESIGN SPEED	FLARE RATE
75 MPH	22:1
70 MPH	20:1
60 MPH	17:1
50 MPH	14:1
40 MPH	11:1
30 MPH	8:1

CONCRETE BARRIER RAIL LATERAL FLARE RATES

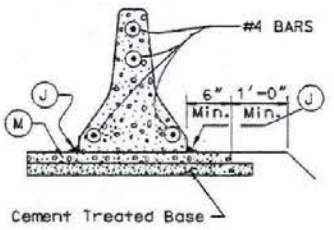
GENERAL NOTES:

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 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 10' of the barrier rail run. At the contractors option, 6" concrete base and barrier rail may be placed monolithically, in which case dowels may be eliminated. See barrier rail end anchor details.

   Concrete paving requirements: dowels shall be required in the first and last 10' 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.
4. Vertical joints shall have hot rubberized asphalt seals full depth of joint.
5. Joint sealer shall be hot rubberized asphalt 1" thick.
6. The height of the barrier rail shall be measured from the top of the plantmix bituminous surface or the top of concrete pavement.
7. For impact attenuator attachment details, see manufacturer's drawings. For guardrail energy absorbing terminal attachment, see Standard Drawing R-8.1.1.
8. All contact joints shall be at planned scored joint location.
9. Depth of 6" base shall be checked and increased as needed for foundation stability. When barrier rail sits on pavement, the base can be eliminated. Barrier rail end anchors may be required.
10. For details not shown, see TYPE A.
11. B = 2/19 x h + 12"
12. See contract plans for exact dimensions.



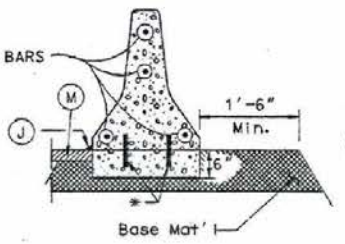
BITUMINOUS SECTION



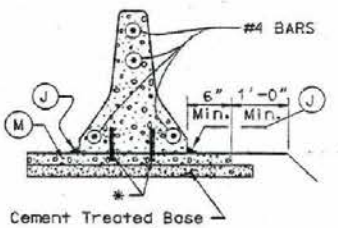
CONCRETE SECTION

NORMAL ROADWAY DETAIL

(1/4" Scored Joints @ 15'-0")



BITUMINOUS SECTION



CONCRETE SECTION

BARRIER RAIL END ANCHOR DETAIL

(First and Last 10')

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

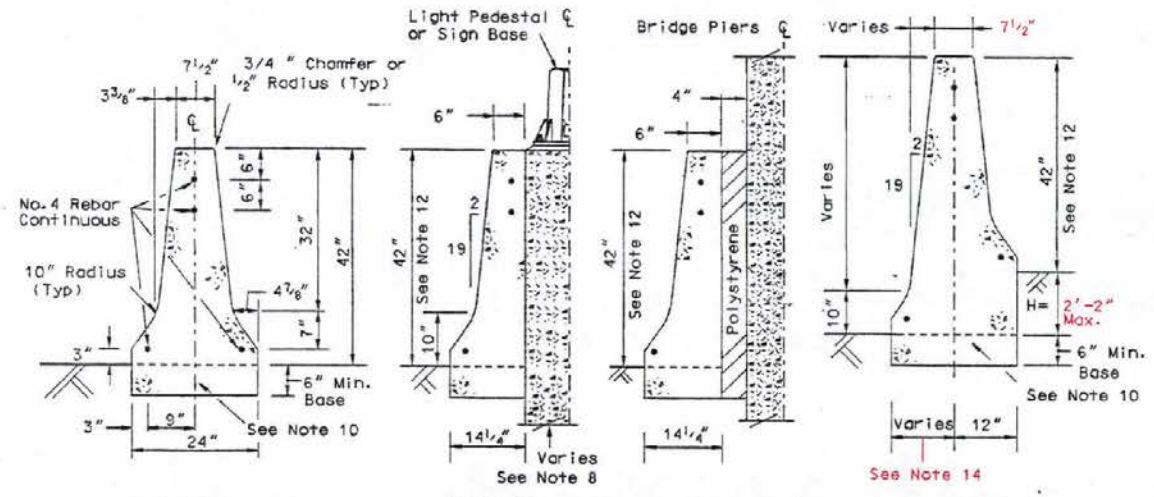
CONCRETE BARRIER RAIL

F-SHAPES

R-8.6.1 (502)

CHIEF ROAD DESIGN ENGR. | ADOPTED: 11/86 | REVISION 10/98

R-78



TYPE FA

TYPE FB

TYPE FB

TYPE FD

CONCRETE (FOR INFORMATION ONLY)

0.1533 yd.^{3} PER LIN. FT. WITH BASE

0.1168 yd.^{3} PER LIN. FT. WITHOUT BASE

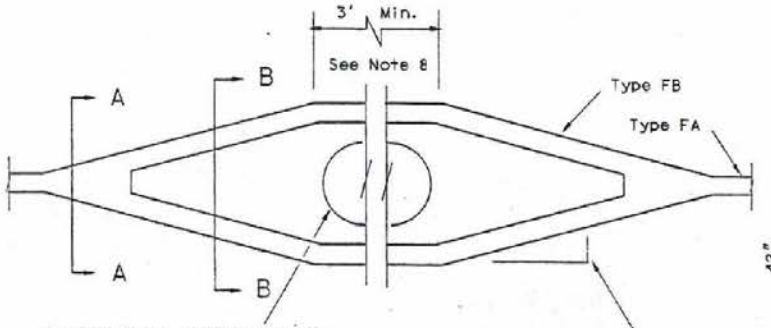
CONCRETE (FOR INFORMATION ONLY)

0.1178 yd.^{3} PER LIN. FT. WITH BASE

0.0958 yd.^{3} PER LIN. FT. WITHOUT BASE

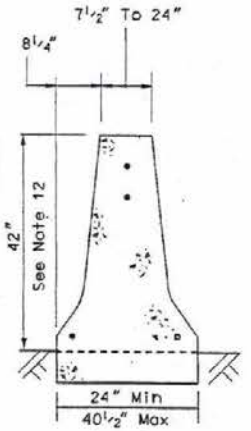
GENERAL NOTES:

1. CONCRETE SHALL BE CLASS A OR AA.
2. MEDIAN BARRIER RAIL SHALL BE SCORED ¼" DEEP EVERY 15'.
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-8.6.1.
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 42" BARRIER RAILS ARE CONSIDERED INNOVATIVE.
10. DEPTH OF 6" BASE SHALL BE CHECKED AND INCREASED AS NEEDED FOR FOUNDATION STABILITY. WHEN BARRIER RAIL SITS ON PAVEMENT, THE BASE CAN BE ELIMINATED. BARRIER RAIL END ANCHORS SHALL BE REQUIRED. SEE DRAWING R-8.6.1.
11. THE 42" TYPE FA BARRIER RAIL MAY ALSO BE CONSIDERED ON THE OUTSIDE CURVE 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.
14. Varies = 2/19 x H + 12"

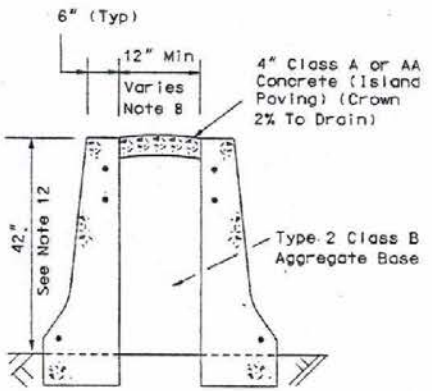


PLAN

NTS



SECTION A-A



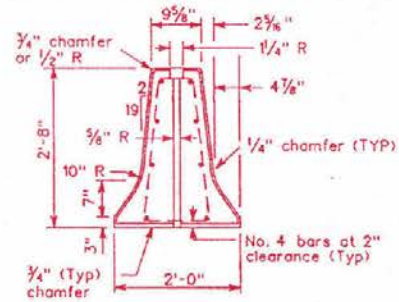
SECTION B-B

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

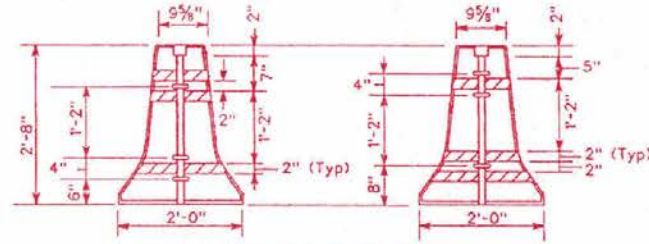
CONCRETE BARRIER RAIL MEDIAN F-SHAPES

CHIEF ROAD DESIGN ENGR | R-8.6.2 | (502) | ADOPTED: 9/97 | REVISION: 10/98

R-79



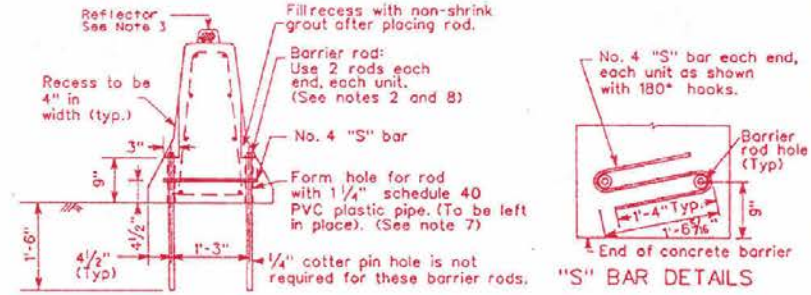
TYPICAL F SHAPE



1½" deep x 2" tall slots
For dimensions not shown see TYPICAL F SHAPE

SECTION A-A

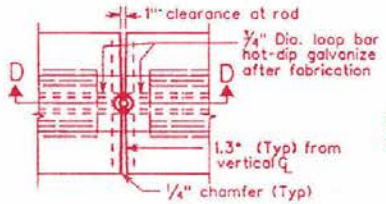
SECTION B-B

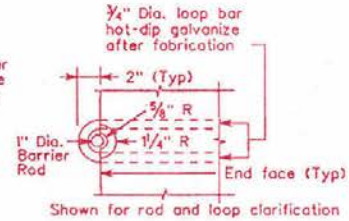


ELEVATION VIEW @ RODS

SECTION C-C

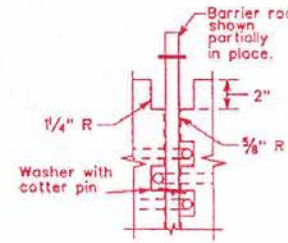
"S" BAR DETAILS





For details not shown, see SECTION A-A and SECTION B-B

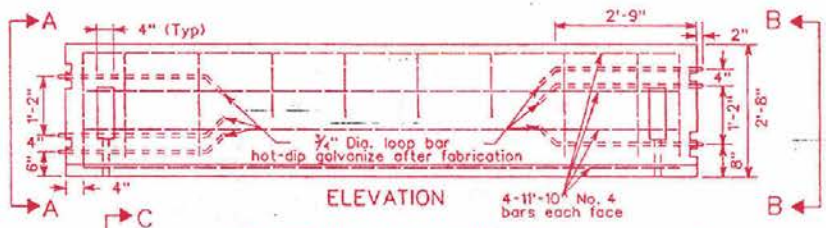
ROD AND LOOP CONNECTION (PLAN VIEW)



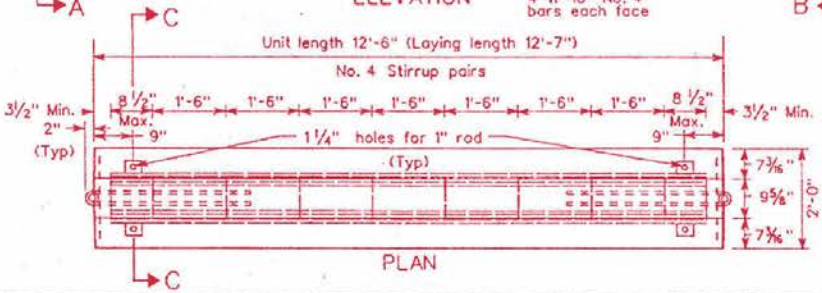
SECTION D-D

Use "BARRIER ROD DETAIL" for both Section C-C and Section D-D

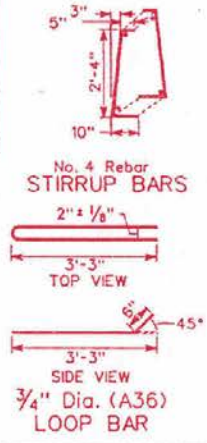
BARRIER ROD DETAIL



ELEVATION



PLAN



¾" Dia. (A36) LOOP BAR

GENERAL NOTES:

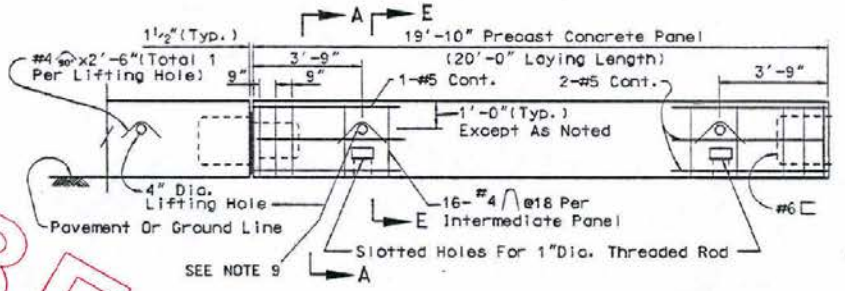
1. Reinforcing steel shall be grade 60.
2. Precast barrier used as a long term (as defined by MUTCD Part 6) median barrier in medians less than 10' in width shall be anchored to the roadway. For edge of bridges, back spacing from the back of the barrier rail to the edge of the bridge shall be 4'. For the edge of shoulders, back spacing shall be 3'.
3. Place reflectors as per drawing R-9.1.1 and R-9.2.2.
4. Top washer shall be forged as integral part of rod or shall be welded as shown.
5. Rods that conform to critical dimensions, (rod length and diameter, washer diameter and thickness) are acceptable if an approved tap configuration for lifting the rod is provided.
6. Concrete shall be Class A or AA.
7. See ASTM D 1785
8. Drill 1" diameter holes, after placement of rail, for barrier rods through the pavement. Drilling operation is not to damage the pavement.
9. The weight per barrier rail panel is approximately 3.0 tons.
10. Pin first and last units of each run (long term as definded by MUTCD, Part 6).

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PORTABLE PRECAST CONCRETE BARRIER RAIL (F-SHAPES)

CHIEF ROAD DESIGN ENGR. | R-8.7.1 (502 625) | ADOPTED: 8/98 | REVISION

R-80



ELEVATION

TYPICAL INTERMEDIATE PANEL

Concrete:	1.93 c.y.	Per Panel
Reinforcing:	169 lbs.	Per Panel
Weight:	3.9 Tons	Per Panel

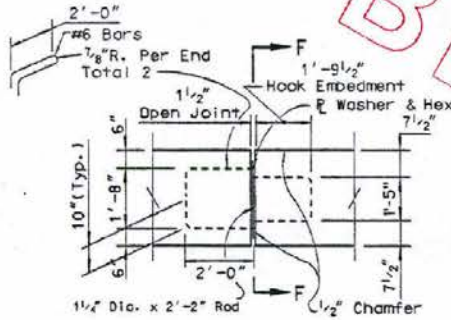
NOTE: #4 @18 May Be Replaced By Welded Wire Fabric Of Equivalent Cross-Sectional Area.

GENERAL NOTES:

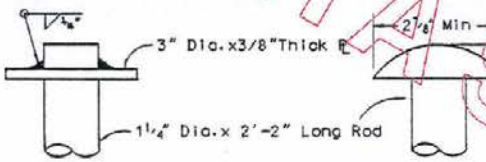
1. SEE PROJECT PLANS OR SPECIAL PROVISIONS FOR LAYOUT OF TEMPORARY RAILINGS.
2. OFFSET FOR TERMINAL SECTIONS AT APPROACH ENDS SHALL BE 8'-0" MIN. FROM EDGE OF ROADWAY, OR AS DIRECTED BY THE ENGINEER.
3. WHERE BARRIERS ARE PLACED ON CURVES AND RADII THAT ARE TOO SEVERE TO PIN THE JOINTS, BARRIERS ARE 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 #5 BARS SHALL BE EQUALLY SPACED FROM THE VERTEX OF THE STIRRUP BARS. ONE #5 BAR SHALL BE TIGHTLY WIRED TO THE STIRRUP BARS AND THE SECOND #5 BAR SHALL BE TACK WELDED TO THE STIRRUP BARS. EACH PROCESS SHALL BE CONTINUOUS FOR EACH #5 BAR.
7. CONCRETE SHALL BE CLASS A OR AA.
8. TWO-WAY REFLECTOR IN CENTER OF EACH BARRIER RAIL SECTION. SEE SHEET R-9.2.2
9. LIFTING HOLES NOT REQUIRED.
10. DYNAMIC DEFLECTION CAN BE UP TO 4' FOR 62 MPH IMPACT.

CONCRETE BARRIER RAIL FLARE RATES

DESIGN SPEED	FLARE RATE
75 MPH	22:1
70 MPH	20:1
60 MPH	17:1
50 MPH	14:1
40 MPH	11:1
30 MPH	8:1

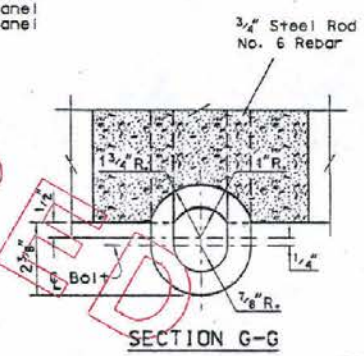


CONNECTION DETAIL

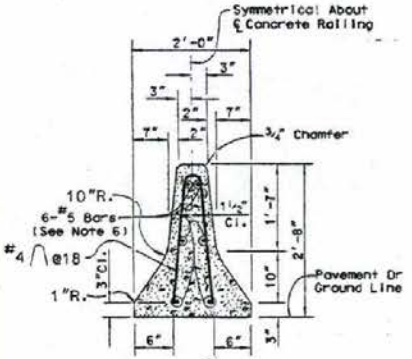


WELDED FORGED

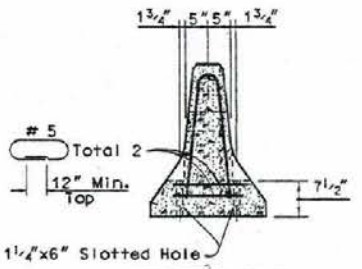
ALTERNATIVE HEAD DETAIL



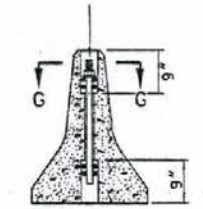
SECTION G-G



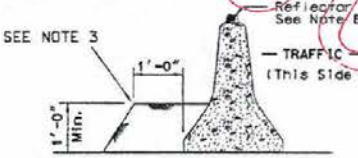
SECTION A-A



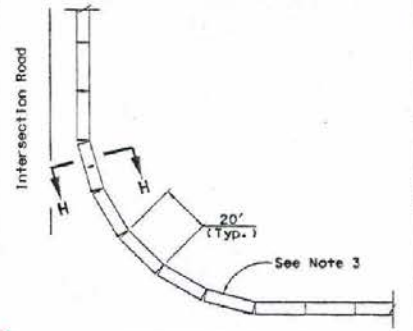
SECTION E-E



SECTION F-F



SECTION H-H



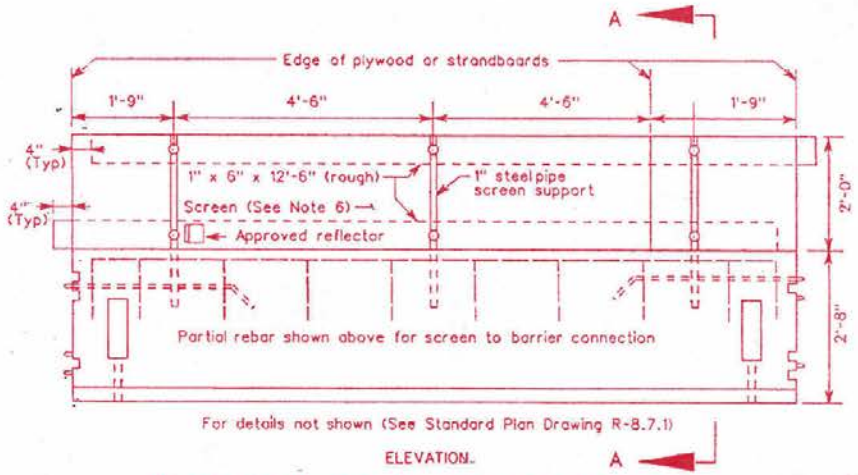
CURVED LAYOUT

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

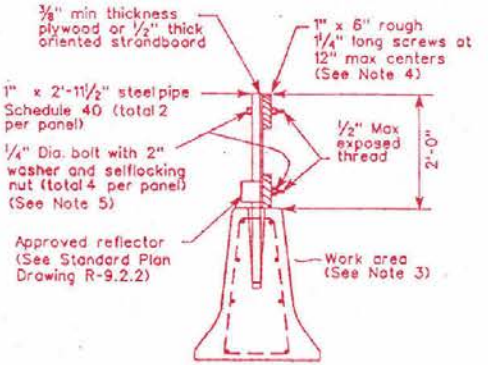
PORTABLE PRECAST CONCRETE BARRIER RAIL

CHIEF ROAD DESIGN ENGR. | R-8.7.2 | ADOPTED: 1/76 | (502 625) REVISION 8/98

R-81



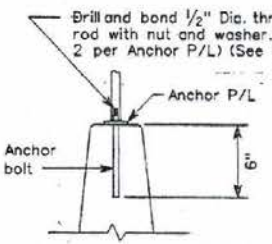
PORTABLE PRECAST BARRIER RAIL F-SHAPES



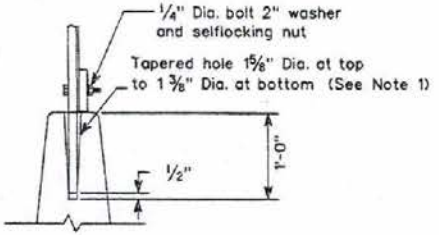
SECTION A-A

GENERAL NOTES:

1. Straight holes 1 1/2" diameter 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. The screen may be placed on either side of the pipe support where traffic will be on both sides of the temporary railing.
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 will only be on one side of the temporary railing.
5. 1/4" u-bolts may be substituted for 1/4" diameter bolts.
6. Openings in the screen area of 3'-0" shall be provided at 200' intervals.

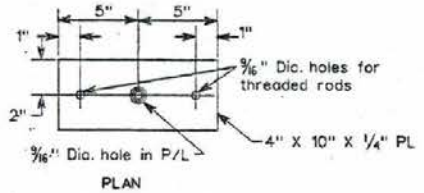


ALTERNATIVE "A"

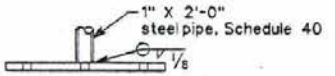


ALTERNATIVE "B"

SCREEN ANCHORAGE DETAILS

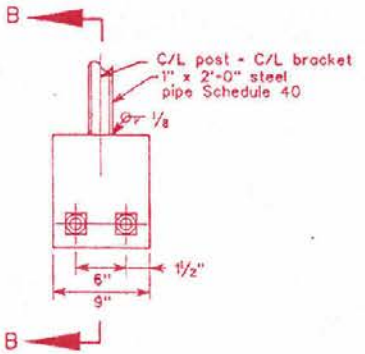


PLAN

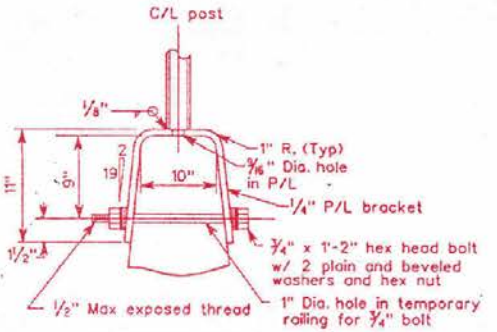


ELEVATION

ANCHOR PLATE DETAIL (ALTERNATIVE "A")



ALTERNATIVE "C"



SECTION B-B

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

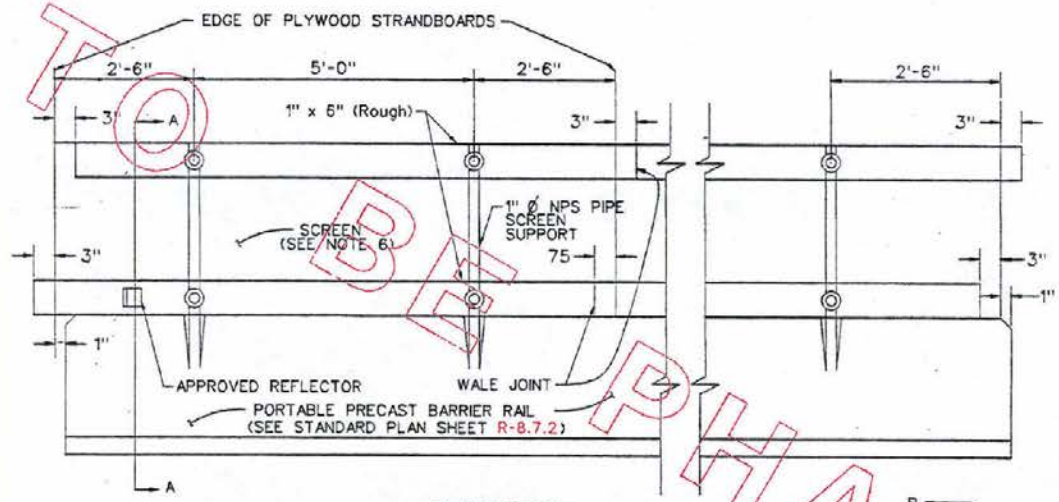
TEMPORARY TRAFFIC SCREEN "F"

CHIEF ROAD DESIGN ENGR.

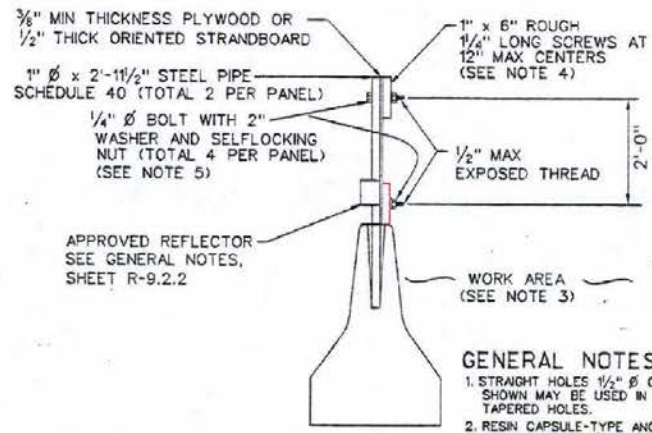
R-8.8.1 (502)

ADOPTED: 8/98 REVISION

R-82



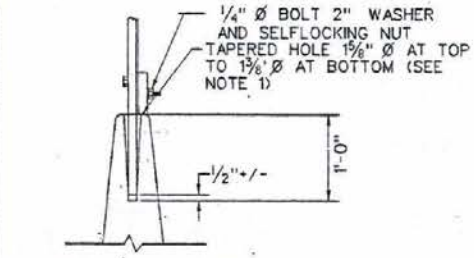
ELEVATION



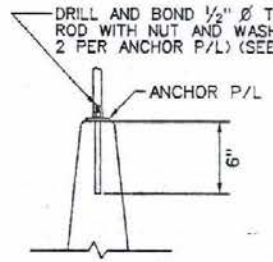
SECTION A-A

GENERAL NOTES:

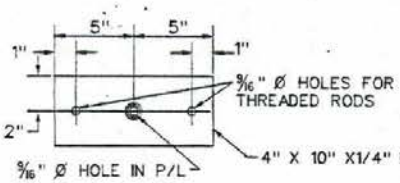
1. STRAIGHT HOLES 1/2" Ø OF THE DEPTH SHOWN MAY BE USED IN LIEU OF THE TAPERED HOLES.
2. RESIN CAPSULE-TYPE ANCHORAGE DEVICES MAY BE SUBSTITUTED FOR THREADED RODS.
3. PLACE SCREEN ON WORK AREA SIDE OF TEMPORARY RAILING WHERE TRAFFIC WILL ONLY BE ON ONE SIDE OF THE TEMPORARY RAILING. WHERE TRAFFIC WILL BE ON BOTH SIDES OF THE TEMPORARY RAILING THE SCREEN MAY BE PLACED ON EITHER SIDE OF THE PIPE SUPPORT.
4. CLINCHED Bd 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. 1/4" U-BOLTS MAY BE SUBSTITUTED FOR 1/4" Ø BOLTS.
6. OPENINGS IN THE SCREEN AREA OF 3'-0" +/- SHALL BE PROVIDED AT 200' +/- INTERVALS.
7. NPS - NOMINAL PIPE SIZE DESIGNATOR, SEE ASTM A53



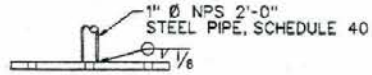
SCREEN ANCHORAGE DETAIL



SCREEN ANCHORAGE DETAIL ALTERNATIVE 'A'

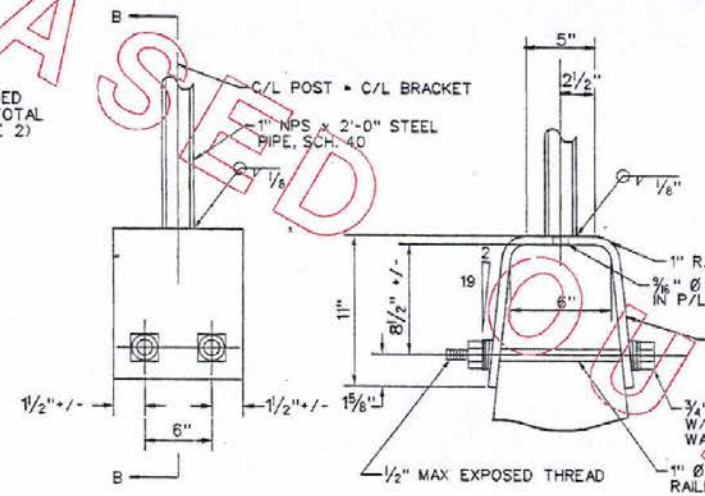


PLAN



ELEVATION

ANCHOR PLATE DETAIL ALTERNATIVE 'A'



ELEVATION

SECTION B-B

SCREEN ANCHORAGE DETAIL ALTERNATIVE 'B'

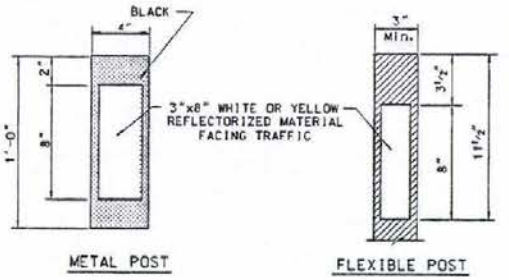
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TEMPORARY TRAFFIC SCREEN

R-8.8.2 (502)

CHIEF ROAD DESIGN ENGR. ADOPTED: 7/96 REVISION 10/98

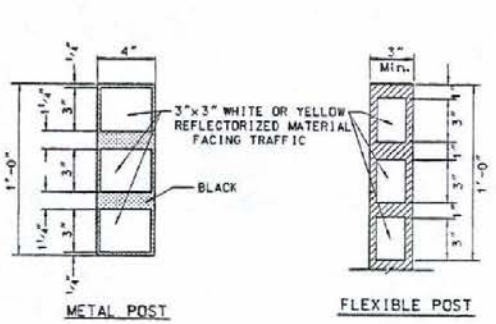
R 83



TYPE 1 REFLECTORS

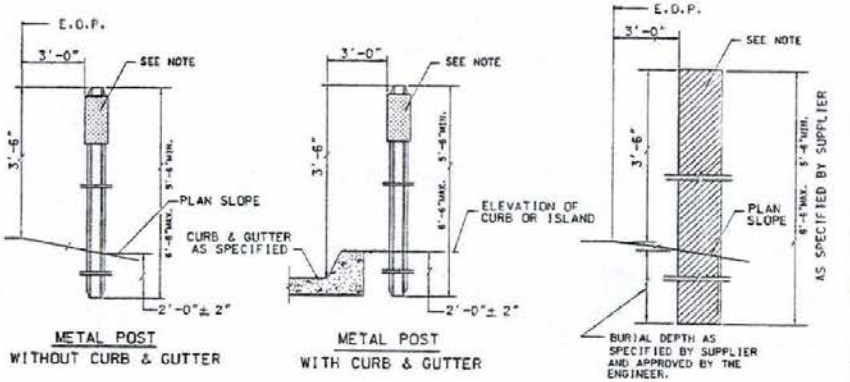
(ROADWAY - RAMPS)

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)



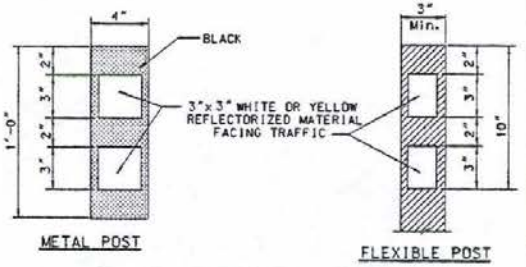
METAL POST
WITHOUT CURB & GUTTER

METAL POST
WITH CURB & GUTTER

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

TYPICAL INSTALLATION

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



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 10,000 FEET

(DISTANCE IN FEET ROUNDED TO THE NEAREST 5 FEET)

RADIUS OF CURVE (R) (FT.)	SPACING ON CURVE (S) (FT.)	SPACING IN ADVANCE OF & BEYOND CURVE (FT.)		
		1ST	2ND	3RD
50	20	40	60	120
150	30	60	90	180
200	35	70	105	210
250	40	80	120	240
300	50	100	150	300
400	55	110	165	300
500	65	130	195	300
600	70	140	210	300
700	75	150	225	300
800	80	160	240	300
900	85	170	255	300
1,000	90	180	270	300
1,200	100	200	300	300
1,400	110	220	300	300
1,600	120	240	300	300
1,800	125	250	300	300
2,000	130	260	300	300
2,500	150	300	300	300
3,000	165	300	300	300
5,000	210	300	300	300
10,000	300	300	300	300

SPACING FOR SPECIFIC RADII NOT SHOWN MAY BE INTERPOLATED FROM TABLE 1 OR COMPUTED FROM THE FORMULA $S=3\sqrt{R-50}$. S REFERS TO THE DELINEATOR SPACING AND R REFERS TO THE RADIUS OF THE CURVE. THE MINIMUM SPACING SHOULD BE 20 FEET. THE MAXIMUM SPACING ON CURVES SHOULD NOT EXCEED 300 FEET. IN ADVANCE OF & BEYOND A CURVE, AND MEASURED PROCEEDING AWAY FROM THE END POINT OF THE CURVE, THE SPACING OF THE FIRST DELINEATOR IS 2S. THE SECOND IS 3S, AND THE THIRD &S, BUT IN NO CASE TO EXCEED 300 FEET.

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 1-Y FOR SINGLE DELINEATOR, YELLOW) IN THE SUMMARY OF GUIDE POST QNLY.

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 ½ 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 10,000 FEET):
   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.

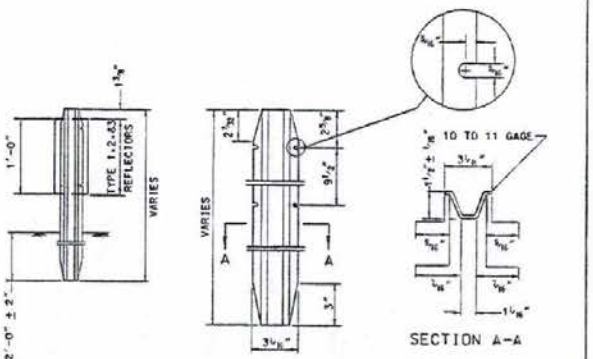
   B. TANGENTS AND CURVES WITH RADIUS GREATER THAN 10,000 FEET:
   SPACING SHALL BE 600 FEET FOR POSTS ON THE MEDIAN SIDE, AND THE MEDIAN GUIDE POSTS SHALL HAVE YELLOW REFLECTORS. SPACING SHALL BE 400 FEET FOR POSTS ON THE OUTER SIDE AND THESE POSTS SHALL HAVE WHITE REFLECTORS.

   C. ACCELERATION AND DECELERATION LANES, AND RAMPS:
   SPACING SHALL BE 100 FEET 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. (POST) SHALL BE INSTALLED ON THE RIGHT SIDE OF THE SHOULDER WITH THE APPROPRIATE COLORED REFLECTORS).

   A. ON CURVES HAVING A RADIUS OF 10,000 FEET 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 300 FEET.

   B. TANGENTS AND CURVES WITH RADIUS GREATER THAN 10,000 FEET:
   SPACING SHALL BE 600 FEET. GUIDE POSTS SHALL HAVE WHITE REFLECTORS.



METAL POST DETAILS

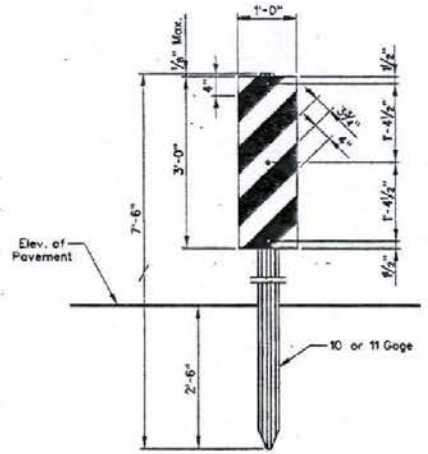
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GUIDE POSTS

R-5.1.1 (619)

CHIEF ROAD DESIGN ENGR. | ADOPTED: 8/69 | REVISION 9/97

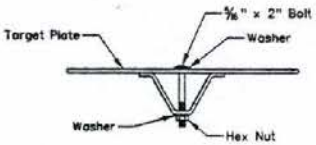
R-84



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.

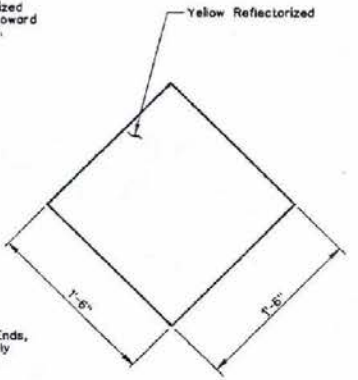
Back: Solid White



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

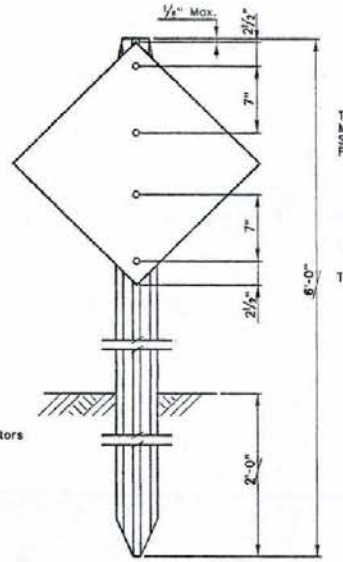
Object Markers Shall be Installed to Delineate Bridge Ends, Underpass Abutments and All Other Obstructions Closely Adjacent to the Edges of the Roadway. They May be Omitted When Guardrail or Barrier Rail Protects the Obstruction.

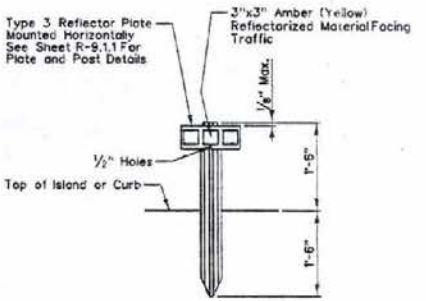
For Post Details See Sheet R-9.1.1



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

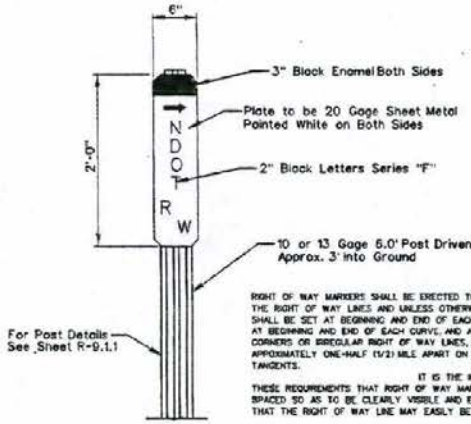
TYPE 1
MEDIAN OBSTRUCTIONS





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

OBJECT MARKERS

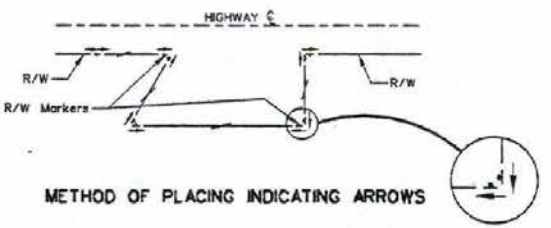


RIGHT OF WAY MARKERS SHALL BE ERECTED TO DEFINE THE RIGHT OF WAY LINES AND UNLESS OTHERWISE SPECIFIED, SHALL BE SET AT BEGINNING AND END OF EACH PROJECT; AT BEGINNING AND END OF EACH CURVE, AND AT ALL CORNERS OR IRREGULAR RIGHT OF WAY LINES, AND APPROXIMATELY ONE-HALF (1/2) MILE APART ON LONG TANGENTS.

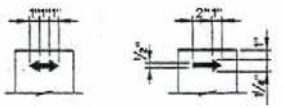
IT IS THE INTENT OF THESE REQUIREMENTS THAT RIGHT OF WAY MARKERS ARE SPACED SO AS TO BE CLEARLY VISIBLE AND ERECTED SO THAT THE RIGHT OF WAY LINE MAY EASILY BE ESTABLISHED.

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

RIGHT OF WAY MARKERS



METHOD OF PLACING INDICATING ARROWS



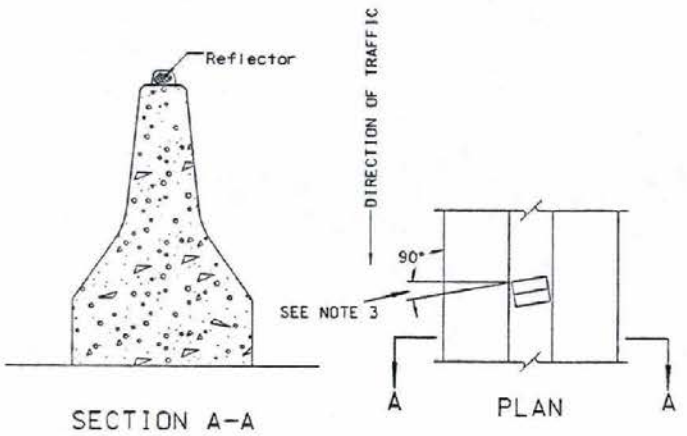
R/W INDICATING ARROWS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

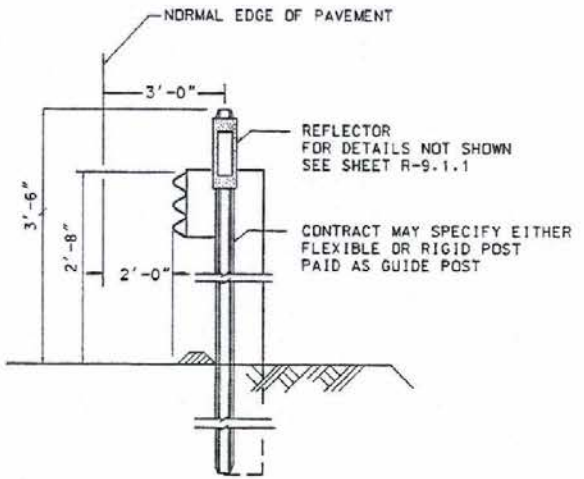
OBJECT MARKERS,
RIGHT OF WAY MARKERS

CHIEF ROAD DESIGN ENGR.

R-9.2.1 (619-620)
ADOPTED: 8/69 REVISION 9/81



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 AT THE ANGLE 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:

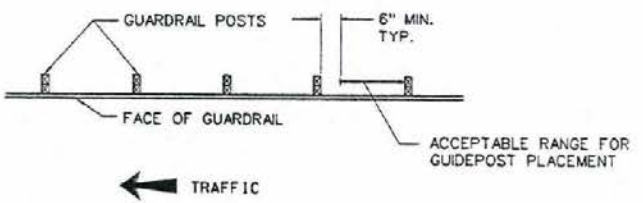
(a) 50 FEET ON TANGENTS AND ON CURVES OF 300 FOOT RADIUS OR GREATER. IF LESS THAN 300 FOOT RADIUS SEE TABLE "A".

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

(c) NO DIRECT PAYMENT FOR REFLECTORS ON BARRIER RAIL.

TABLE "A"

Radius of Curve (In Feet)	Reflector Spacing
≤ 50	20 FT.
150	30 FT.
200	35 FT.
250	40 FT.
≥ 300	50 FT.



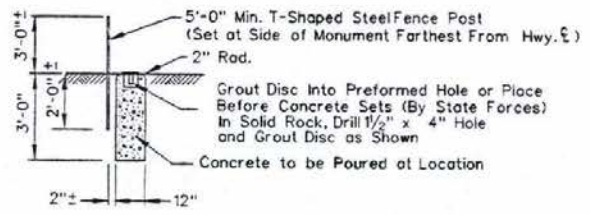
GUARDRAIL-GUIDE POST LOCATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

REFLECTORS
GUARDRAIL-GUIDE POST

CHIEF ROAD DESIGN ENGR. | ADOPTED: 07/96 | R-9.2.2 | (618-619) | REVISION 10/98

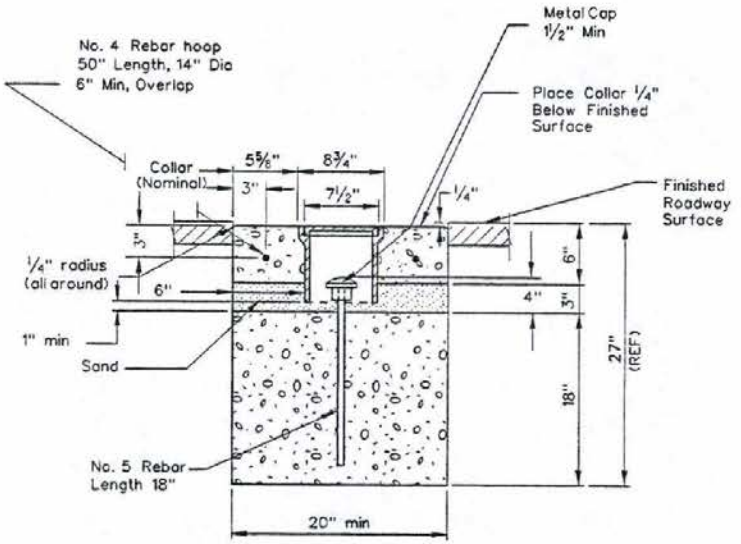
R-86



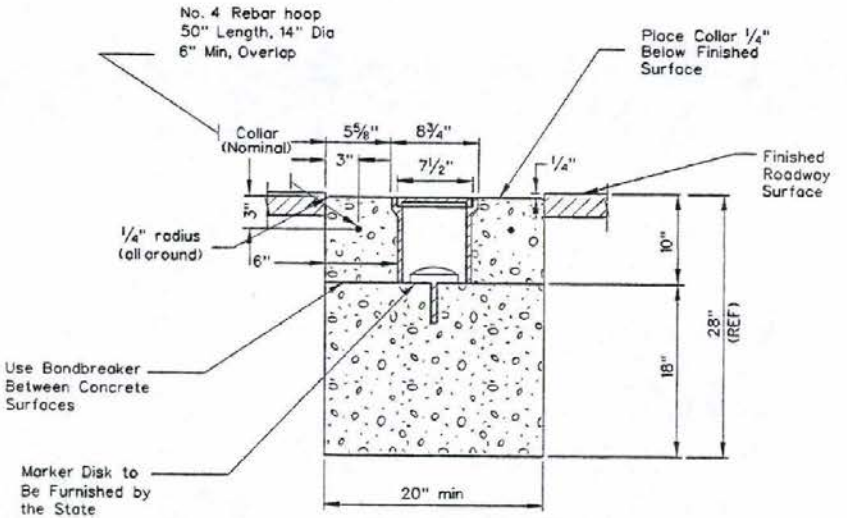
REFERENCE MONUMENT AND MARKER POST

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 ONE HALF (1/2) MILE 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)

SURVEY MONUMENTS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

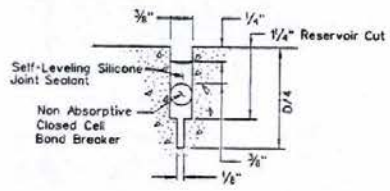
SURVEY MONUMENTS AND REFERENCE MONUMENTS

R-5.3 (621)

CHIEF ROAD DESIGN ENGR. ADOPTED: 7/96 REVISION 9/97

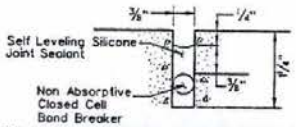
R-87

ALL MEASUREMENT ± 1/16" TOLERANCE



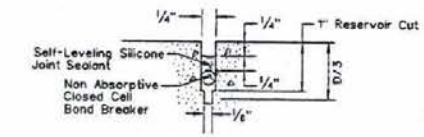
TRANSVERSE WEAKENED PLANE JOINT
DOUBLE SAW CUT

ALL MEASUREMENT ± 1/16" TOLERANCE



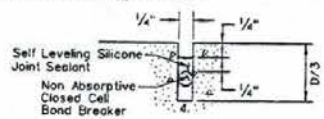
TRANSVERSE CONTACT JOINT
SINGLE SAW CUT

ALL MEASUREMENT ± 1/16" TOLERANCE

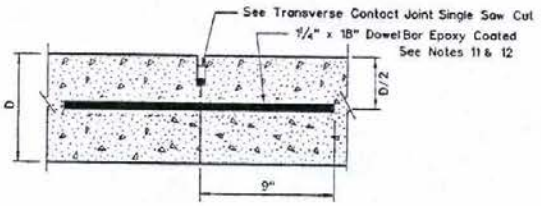


LONGITUDINAL WEAKENED PLANE JOINT
DOUBLE SAW CUT

ALL MEASUREMENT ± 1/16" TOLERANCE

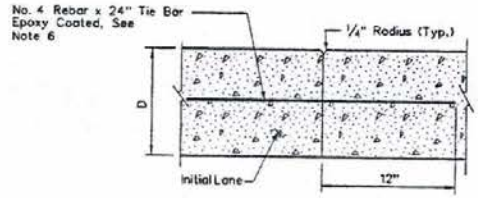


LONGITUDINAL WEAKENED PLANE JOINT
SINGLE SAW CUT

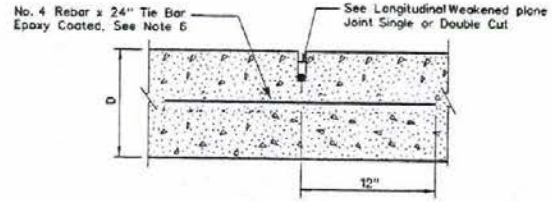


SECTION A-A

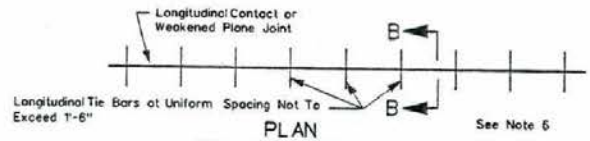
TRANSVERSE CONTACT JOINT WITH DOWEL BARS
See Note 5



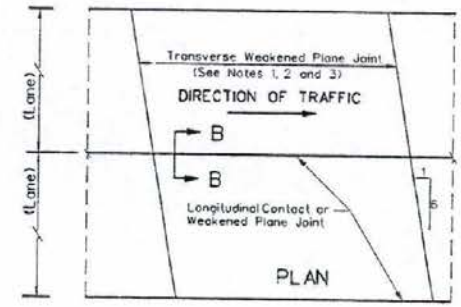
SECTION B-B
LONGITUDINAL CONTACT JOINT

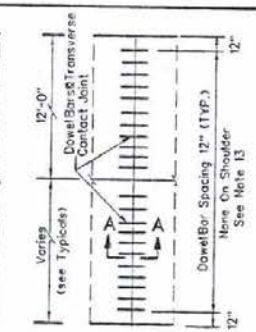


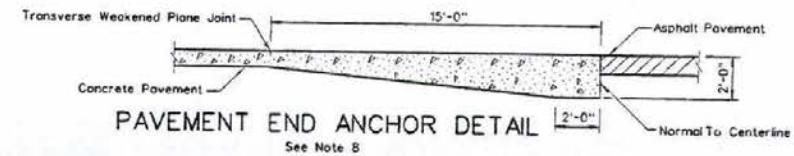
SECTION B-B
LONGITUDINAL WEAKENED PLANE JOINT



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 15'-0", 13'-0", 14'-0", 12'-0" 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 6'-0" 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 16'-0".
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 1/8" 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 1" OF THE PLANNED TRANSVERSE AND DEPTH LOCATION AND WITHIN 2" OF THE PLANNED LONGITUDINAL LOCATION.
12. THE DOWEL BARS SHALL BE PARALLEL TO THE PAVEMENT SURFACE AND CENTERLINE WITHIN A TOLERANCE OF 1/2" IN 18".
13. DOWEL BARS SHALL NOT BE PLACED WITHIN 12" OF LONGITUDINAL JOINTS.
14. D = SLAB THICKNESS.

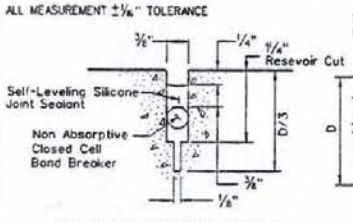
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PLAIN JOINTED CONCRETE PAVEMENT DETAILS

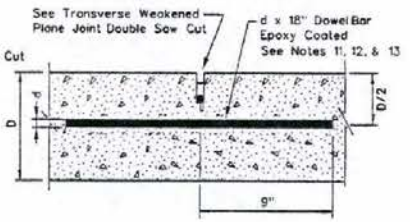
R-88

CHIEF ROAD DESIGN ENGR.

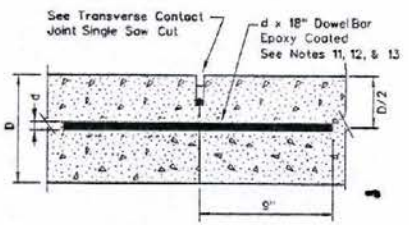
R-88.1 (409)
ADOPTED 07/96 | REVISION 9/97



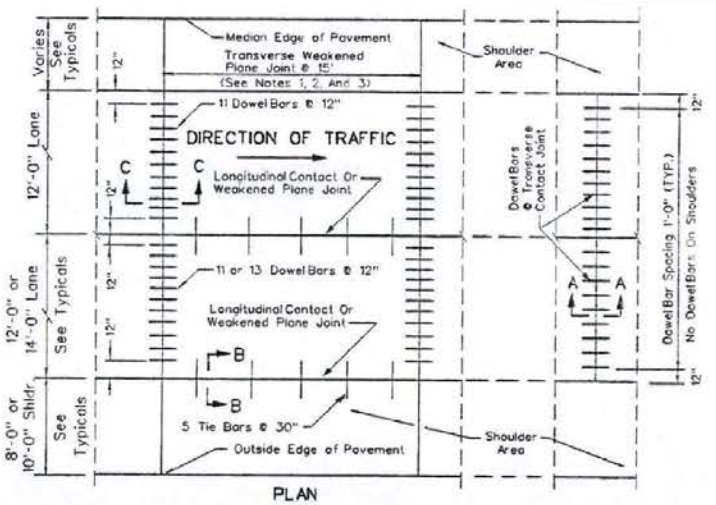
TRANSVERSE WEAKENED PLANE JOINT DOUBLE SAW CUT



SECTION C-C
TRANSVERSE WEAKENED PLANE JOINT

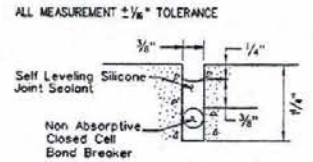


SECTION A-A
TRANSVERSE CONTACT JOINT
See Note 5

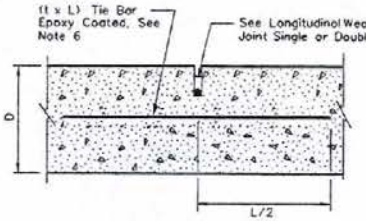


PLAN

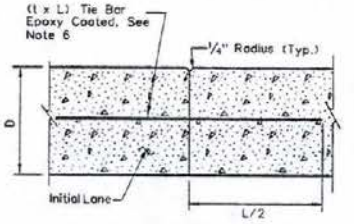
TIE BAR AND DOWEL BAR APPLICATIONS
(TWO LANES SHOWN, TYP. FOR ADDITIONAL LANES)



TRANSVERSE CONTACT JOINT
SINGLE SAW CUT

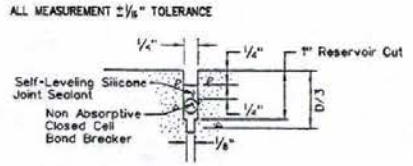


SECTION B-B
LONGITUDINAL WEAKENED PLANE JOINT

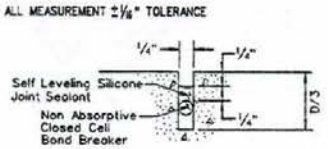


SECTION B-B
LONGITUDINAL CONTACT JOINT

PAVEMENT THICKNESS D IN.	DOWEL BAR DIA. d IN. MIN.	TIE BAR SIZE REBAR	LENGTH OF TIE BAR L IN.
10	1 1/4"	No. 4	24
11	1 3/8"	No. 5	30
12 & 13	1 1/2"	No. 5	30



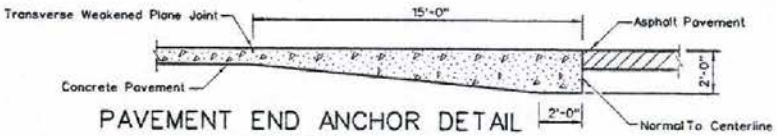
LONGITUDINAL WEAKENED
PLANE JOINT
DOUBLE SAW CUT



LONGITUDINAL WEAKENED
PLANE JOINT
SINGLE SAW CUT

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 15'-0" EXCEPT AT REINFORCED STRUCTURE APPROACHES.
3. TRANSVERSE WEAKENED PLANE JOINTS SHALL BE AT LEAST 6'-0" 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 16'-0".
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 1'-0" 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 1/8" 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 1" OF THE PLANNED TRANSVERSE AND DEPTH LOCATION AND WITHIN 2" OF THE PLANNED LONGITUDINAL LOCATION.
12. DOWEL BARS SHALL BE PARALLEL TO THE PAVEMENT SURFACE AND CENTERLINE WITHIN A TOLERANCE OF 1/2" IN 18".
13. DOWEL BARS SHALL NOT BE PLACED WITHIN 1'-0" OF LONGITUDINAL JOINTS.
14. D = SLAB THICKNESS



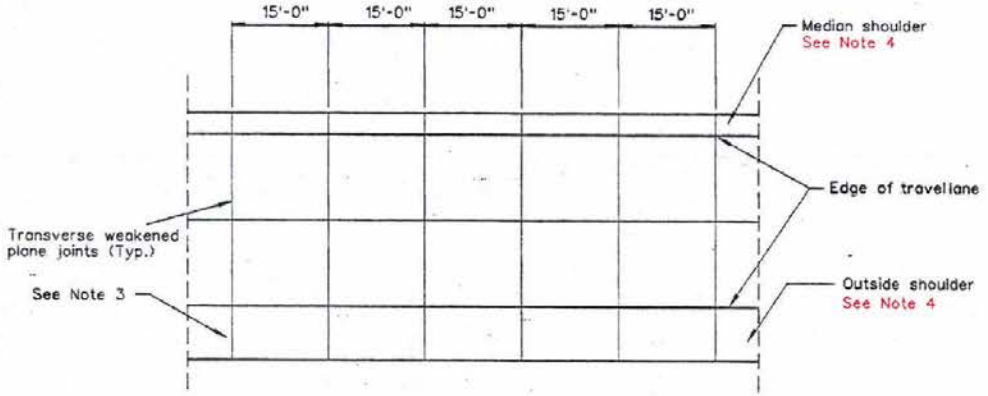
PAVEMENT END ANCHOR DETAIL
See Note 8

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

DOWELED CONCRETE PAVEMENT DETAILS

CHIEF ROAD DESIGN ENGR. | R-10.1.2 | (409) | ADOPTED 07/98 | REVISION 10/98

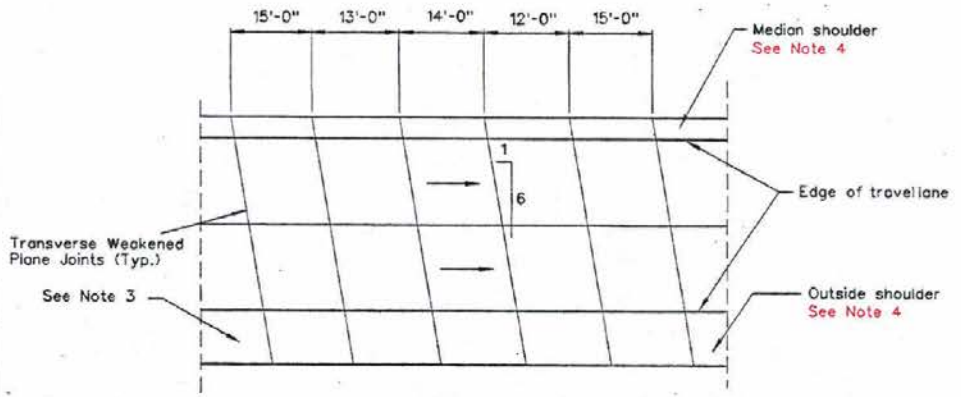
R-89



WEAKENED PLANE JOINTS LOCATION

(Rumble strips shall not be used in urban areas)

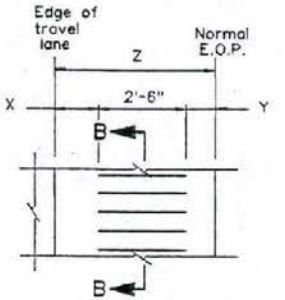
For details not shown See Standard Plan Drawing R-10.1.2



WEAKENED PLANE JOINTS LOCATION

(Rumble strips shall not be used in urban areas)

For details not shown See Standard Plan Drawing R-10.1.1



See Table 1 on this drawing for X, Y, and Z.

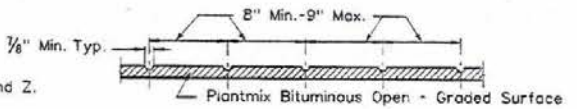
SHOULDER PLAN

TABLE 1

X	Y	Z *
1'-6"	0	4'-0"
2'-0"	1'-6" Min.	6'-0" Min.

* Shoulder width, see typical section

Rumble strip shall be continuous as described on plans



SECTION B-B

RUMBLE STRIPS ON ASPHALT SHOULDERS

(Rumble strips shall not be used in urban areas)

GENERAL NOTES ASPHALT:

1. Do not score thru deceleration and acceleration areas of ramps and tapered approaches. Do not score across minor approaches.

GENERAL NOTES CONCRETE:

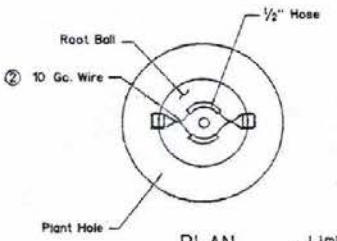
1. Do not score thru deceleration and acceleration areas of ramps and tapered approaches. Do not score across minor approaches.
2. Shoulder transverse joints shall be the same pattern as main roadway.
3. See typical section for width of shoulder and longitudinal weakened plane joint location.
4. See contract plans special detail for concrete rumble strips.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

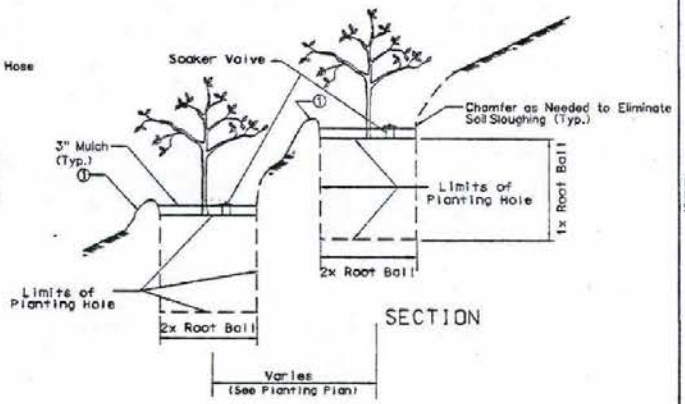
RUMBLE STRIPS
CONCRETE AND ASPHALT

CHIEF ROAD DESIGN ENGR. | ADOPTED 07/96 | R-10.1.3 (403) (409) | REVISION 11/98

R-90



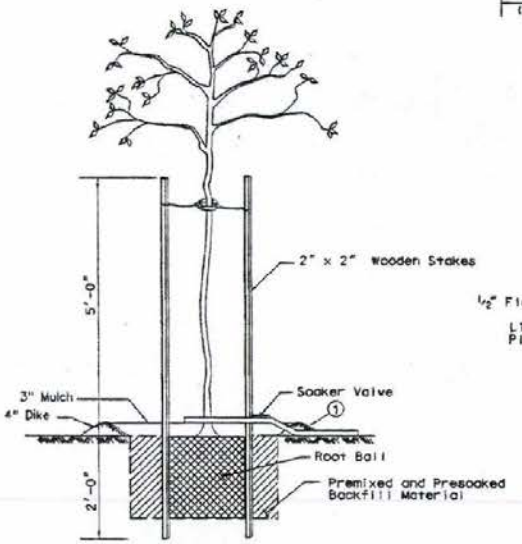
PLAN



SECTION

SLOPING AREAS

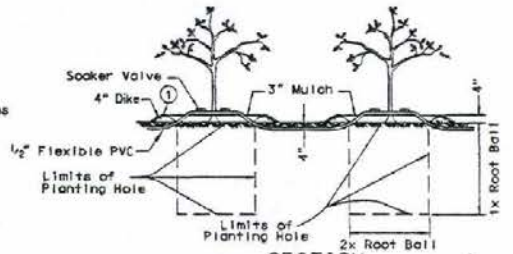
PLANTHOLE & SOAKER IRRIGATION DETAILS



SECTION

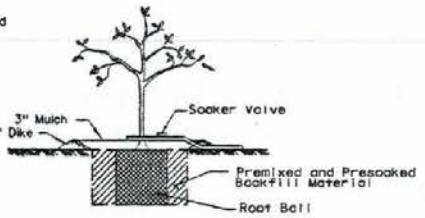
STAKING DETAILS

NOTE:
TOP OF ROOT BALL TO BE 1" ABOVE GRADE.



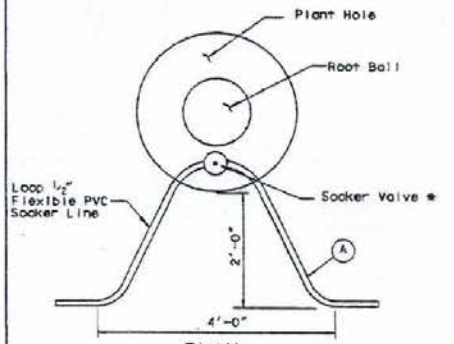
SECTION

LEVEL AREAS



SECTION

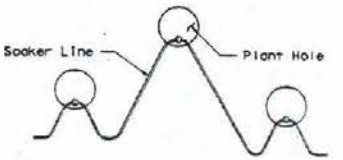
PLANTING TECHNIQUES



PLAN

TYPICAL LOOP INSTALLATION

* - Install One Soaker Valve per Shrub. Set Valve Above Mulch.

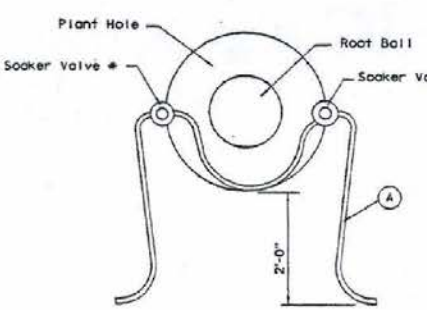


PLAN

TYPICAL MULTIPLE INSTALLATION

Ⓐ Loops Shall Be on Opposite Side of Plant From Travel Way

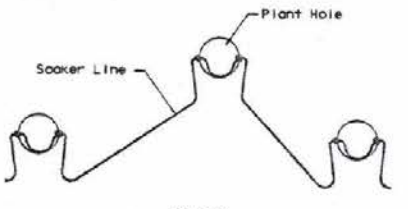
SHRUB



PLAN

TYPICAL LOOP INSTALLATION

* - Install Two Soaker Valves Per Tree. Set Valves Above Mulch.



PLAN

TYPICAL MULTIPLE INSTALLATION

TREE

① Basin To be Constructed of Soil From Plant Hole and Shall be 3'-0" 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
24" BOX	5 TABLETS

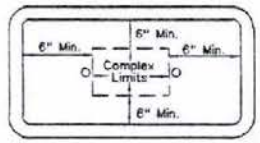
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PLANTING DETAILS

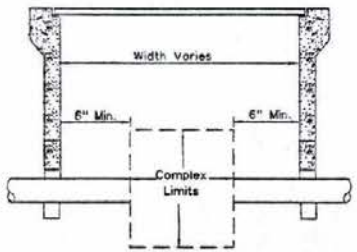
R-11.1.1 (212)

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

R-91

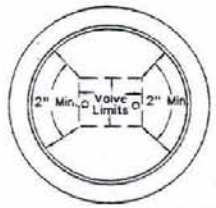


TOP VIEW VALVE BOX

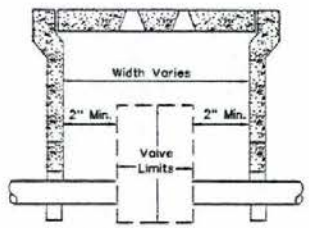


SECTION
VALVE BOX

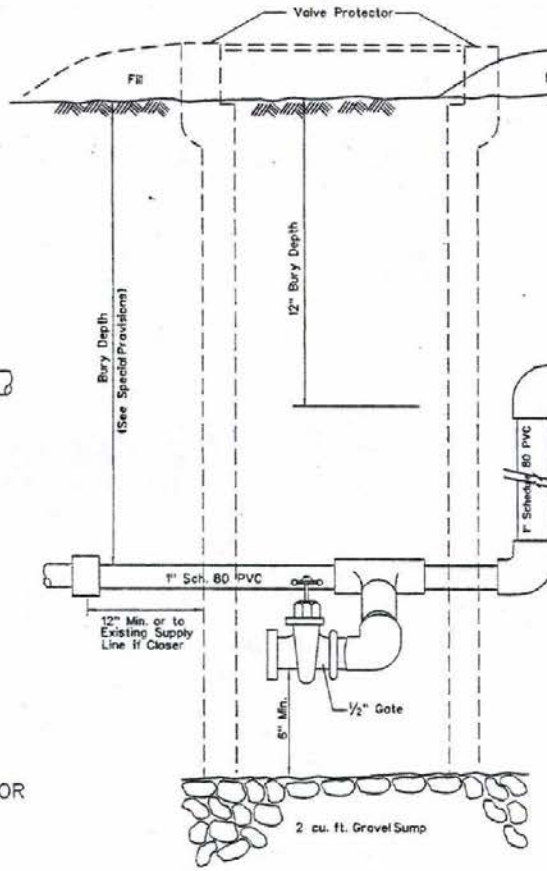
One for Each: Soaker Irrigation Control Unit
Electric Control Valve
Gate Valves 1" & Larger
Filtration Unit.



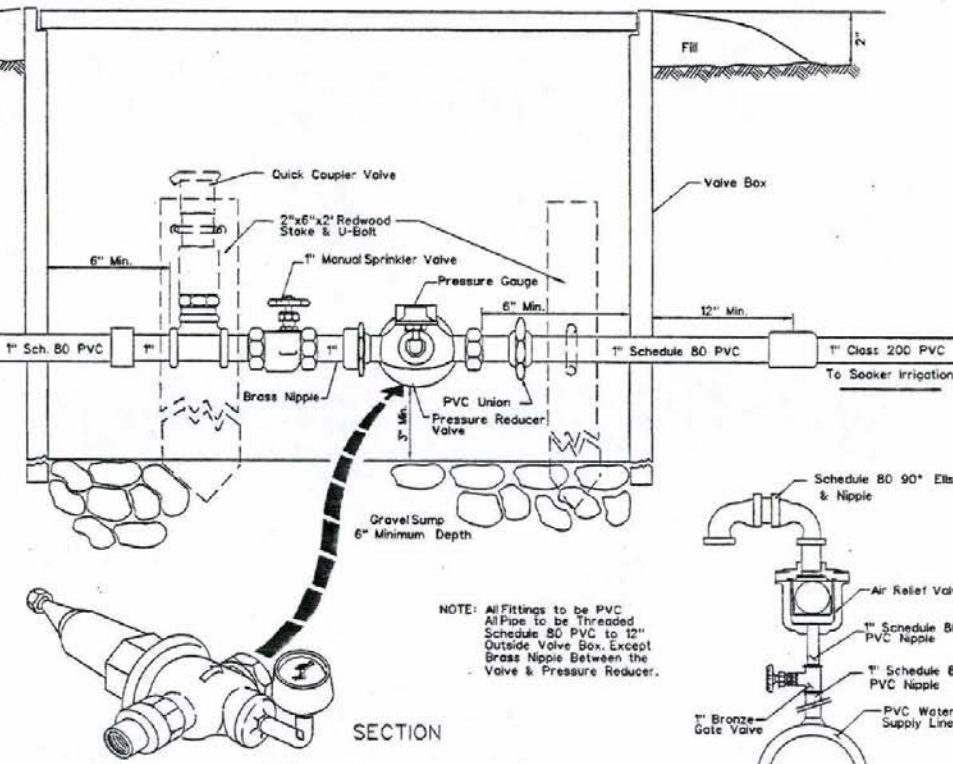
TOP VIEW VALVE PROTECTOR



SECTION
VALVE PROTECTOR
(One For Each ½" Gate Valve)



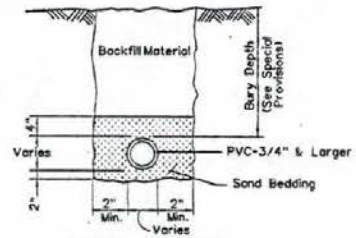
DRAIN DETAIL
(Delete in Las Vegas Area)



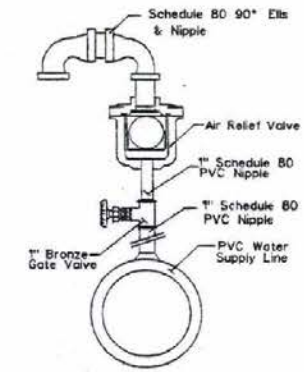
SECTION

SOAKER IRRIGATION CONTROL UNIT
WITH QUICK COUPLER VALVE

NOTE: All Fittings to be PVC
All Pipe to be Threaded
Schedule 80 PVC to 12"
Outside Valve Box. Except
Brass Nipple Between the
Valve & Pressure Reducer.



SAND BEDDING



ELEVATION
AIR RELIEF VALVE UNIT

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SOAKER CONTROL AND VALVE BOX DETAILS

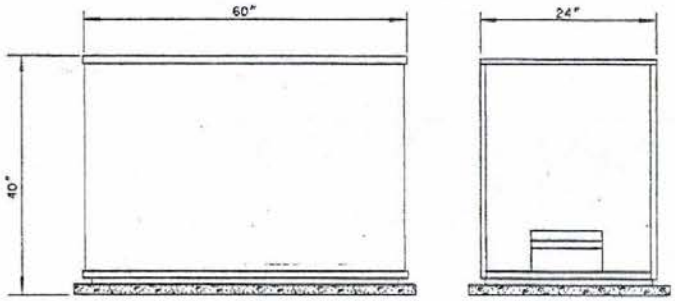
CHIEF ROAD DESIGN ENGR.

R-11.1.2 (213)

ADOPTED: 10/92

REVISION 10/6/94

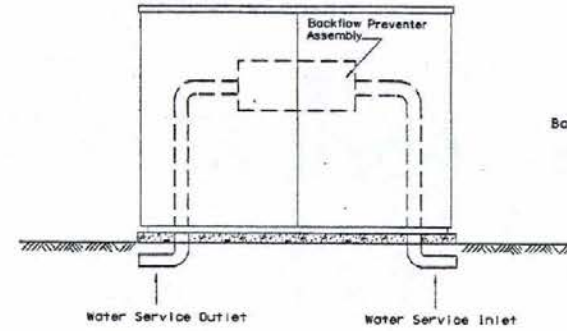
R-92

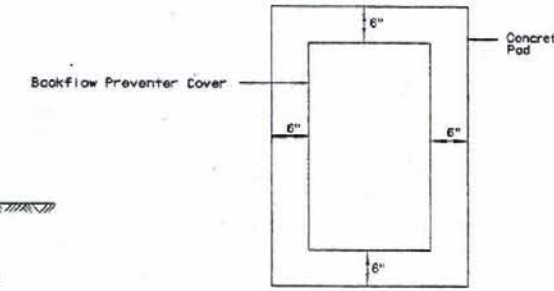


SIDE VIEW

FRONT VIEW

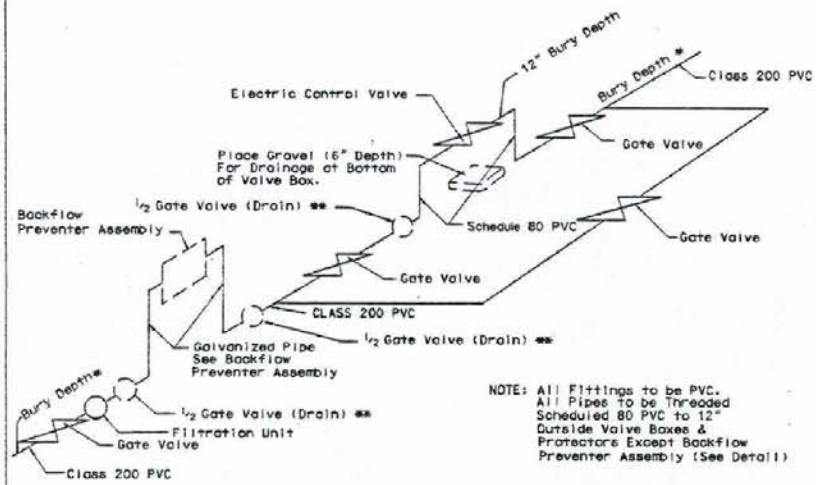
Concrete Shall Be Class A or AA





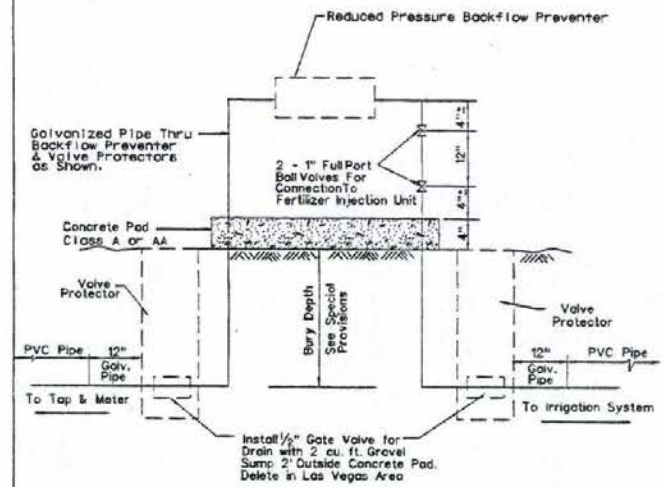
BACKFLOW PREVENTER COVER

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

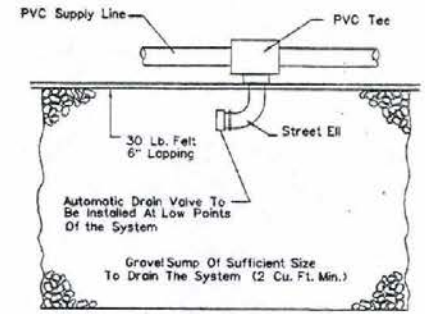


NOTE: All Fittings to be PVC. All Pipes to be Threaded Scheduled 80 PVC to 12" Outside Valve Boxes & Protectors Except Backflow Preventer Assembly (See Detail)

TYPICAL VALVE COMPLEX



BACKFLOW PREVENTER ASSEMBLY



SECTION

AUTOMATIC DRAIN VALVE & SUMP
(Delete in Las Vegas Area)

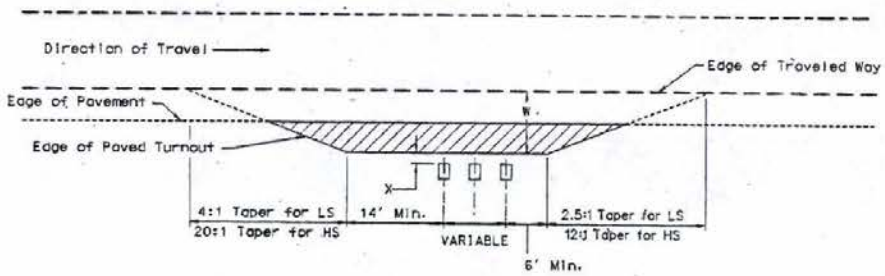
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

BACKFLOW PREVENTER AND VALVE COMPLEX DETAILS

R-11...3 (213)

CHIEF ROAD DESIGN ENGR | ADOPTED: 10/92 | REVISION 10/6/94

R-53



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 12").

MAILBOX TURNOUT

SUGGESTED GUIDELINES FOR LATERAL PLACEMENT OF MAILBOXES

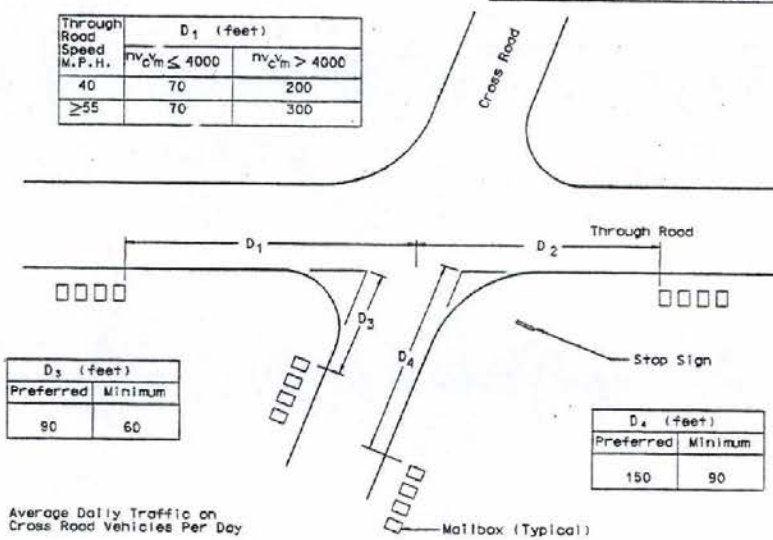
TABLE 1

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 (FT.)	MINIMUM (FT.)	PREFERRED (IN.)	MINIMUM (IN.)
RURAL HIGHWAY ADT= OVER 10000 vpd	> 12	12	8" TO 12"	0
RURAL HIGHWAY ADT= 1,500 TO 10,000 vpd	12	10	8" TO 12"	0
RURAL HIGHWAY ADT= 100 TO 1500 vpd	10	8	8" TO 12"	0
RURAL ROAD ADT= UNDER 100 vpd	8	6	8" TO 12"	8"*
RESIDENT STREET WITHOUT CURB OR ALL WEATHER SHOULDER	6	0	8" TO 12"	8"*
CURBED RESIDENTIAL STREET	N/A	N/A	8" TO 12" BEHIND TRAFFIC FACE OF CURB	6" 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 M.P.H.	D_1 (feet)	
	$n V_c V_m \leq 4000$	$n V_c V_m > 4000$
40	70	200
≥55	70	300

Through Road Speed M.P.H.	D_2 (feet)		
	$\frac{V_c}{1.5n-.5} \leq 50$	$50 < \frac{V_c}{1.5n-.5} \leq 400$	$\frac{V_c}{1.5n-.5} > 400$
40	70	100	100
≥ 55	150	150	200



D_3 (feet)	
Preferred	Minimum
90	60

D_4 (feet)	
Preferred	Minimum
150	90

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:

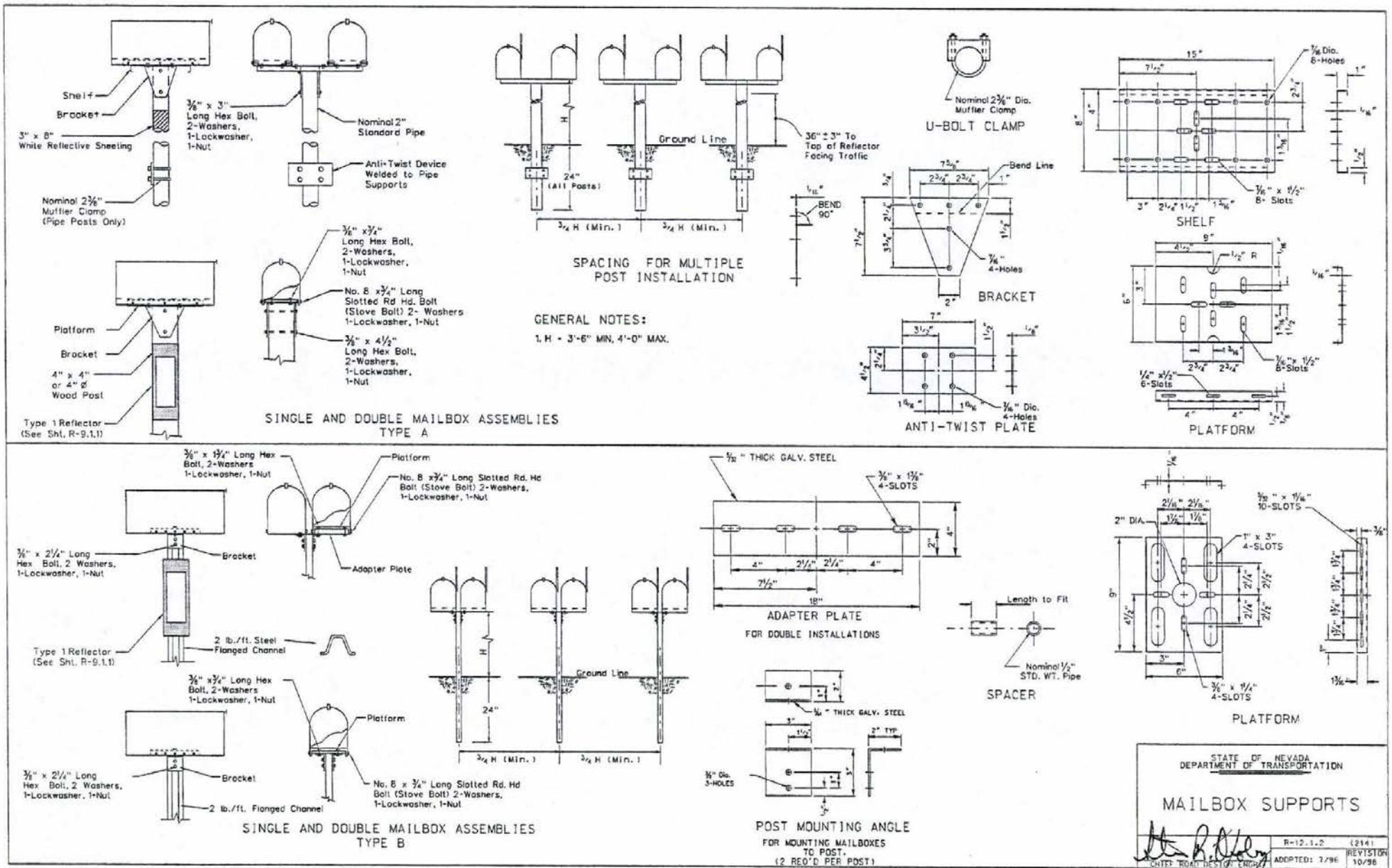
1. For Further Information On Mailboxes See AASHTO "A Guide For Erecting Mailboxes On Highways, 1994 Edition.
2. Mailboxes Within The Clear Zone Shall Be The Types Shown In Sheets R-12.1.2 And R-12.1.3 Or An Approved Equal.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

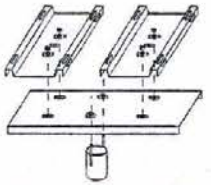
MAILBOX TURNOUTS

CHIEF ROAD DESIGN ENGR.

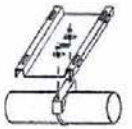
R-12.1.1 (214)
ADOPTED: 7/96 REVISION 10/98


Shelf
Bracket
3" x 8" White Reflective Sheeting
Nominal 2⅜" Muffler Clamp (Pipe Posts Only)
⅜" x 3" Long Hex Bolt, 2-Washers, 1-Nut
Nominal 2" Standard Pipe
Anti-Twist Device Welded to Pipe Supports
⅜" x ¾" Long Hex Bolt, 2-Washers, 1-Nut
No. 8 x ¾" Long Slotted Rd Hd. Bolt (Stove Bolt) 2- Washers 1-Lockwasher, 1-Nut
⅜" x 4½" Long Hex Bolt, 2-Washers, 1-Nut
Platform
Bracket
4" x 4" or 4" ø Wood Post
Type 1 Reflector (See Sht. R-9.1.1)
SINGLE AND DOUBLE MAILBOX ASSEMBLIES TYPE A
H
Ground Line
24" (All Posts)
36" ± 3" To Top of Reflector Facing Traffic
¾ H (Min.)
¾ H (Min.)
SPACING FOR MULTIPLE POST INSTALLATION
GENERAL NOTES:
1. H = 3'-6" MIN, 4'-0" MAX.
Nominal 2⅜" Dia. Muffler Clamp
U-BOLT CLAMP
BEND 90°
Bend Line
⅜" 4-Holes
BRACKET
⅜" Dia. 4-Holes
ANTI-TWIST PLATE
⅜" Dia. 8-Holes
⅜" x 1½" 8-Slots
SHELF
½" R
⅜" x 1½" 8-Slots
⅛" x 2½" 6-Slots
PLATFORM
⅜" x 1¾" Long Hex Bolt, 2-Washers 1-Lockwasher, 1-Nut
No. 8 x ¾" Long Slotted Rd. Hd Bolt (Stove Bolt) 2-Washers, 1-Nut
⅜" x 2¼" Long Hex Bolt, 2 Washers, 1-Lockwasher, 1-Nut
Bracket
Adapter Plate
Type 1 Reflector (See Sht. R-9.1.1)
2 lb./ft. Steel Flanged Channel
⅜" x ¾" Long Hex Bolt, 2-Washers 1-Lockwasher, 1-Nut
Platform
⅜" x 2¼" Long Hex Bolt, 2 Washers, 1-Lockwasher, 1-Nut
Bracket
2 lb./ft. Flanged Channel
No. 8 x ¾" Long Slotted Rd. Hd Bolt (Stove Bolt) 2-Washers, 1-Nut
SINGLE AND DOUBLE MAILBOX ASSEMBLIES TYPE B
H
Ground Line
24"
¾ H (Min.)
¾ H (Min.)
5/32" THICK GALV. STEEL
⅜" x 1⅜" 4-SLOTS
ADAPTER PLATE
FOR DOUBLE INSTALLATIONS
Length to Fit
Nominal ½" STD. WT. Pipe
SPACER
¼" THICK GALV. STEEL
2" TYP.
⅛" Dia. 3-HOLES
POST MOUNTING ANGLE
FOR MOUNTING MAILBOXES TO POST. (2 REQ'D PER POST)
2" DIA.
1" x 3" 4-SLOTS
⅜" x 1¼" 4-SLOTS
PLATFORM
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
MAILBOX SUPPORTS
CHIEF ROAD DESIGN ENGINEER
R-12.1.2
ADOPTED: 7/96
REVISION 10/98

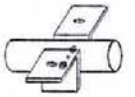
SINGLE MAILBOX MOUNT



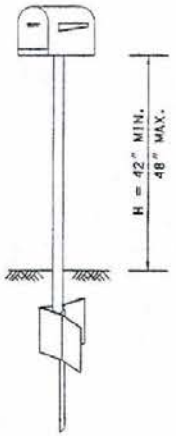
DOUBLE MAILBOX MOUNT



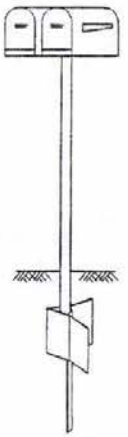
MULTIPLE MAILBOX MOUNT



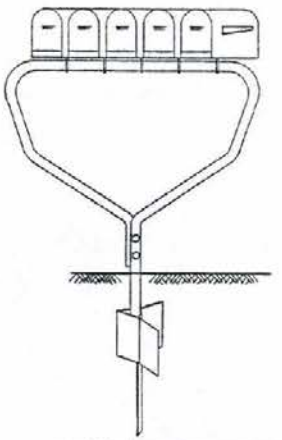
BRACKET MOUNT ALTERNATIVE



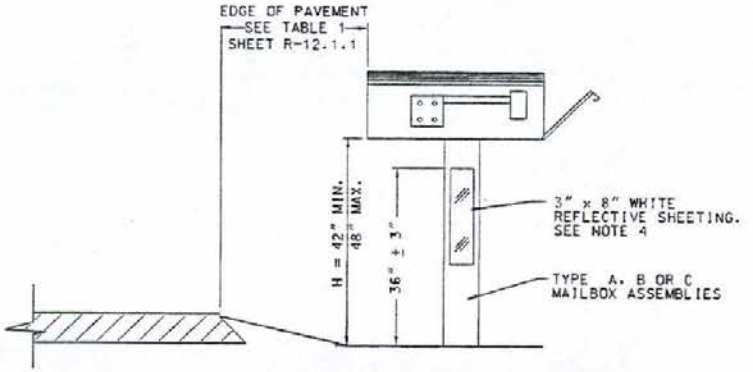
SINGLE SUPPORT SYSTEM



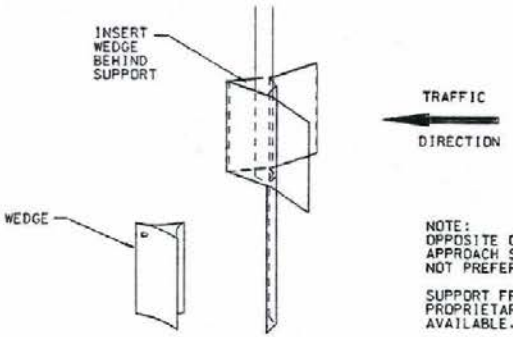
DOUBLE SUPPORT SYSTEM



MULTIPLE SUPPORT SYSTEM



ALTERNATE PLACEMENT
(SEE NOTE 3)



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

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. 3" x 8" WHITE REFLECTORIZED SHEETING SHALL BE PLACED FACING TRAFFIC 36" +/- 3" FROM GROUND ON ALL MAILBOX SUPPORT STRUCTURES.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

MAILBOX SUPPORTS

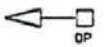
CHIEF ROAD DESIGN ENGR.

R-12.1.3 (214)

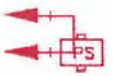
ADOPTED: 7/96

REVISION 10/98

R-96

NEW	EXISTING	DESCRIPTION
		Luminaire
		Light Pole, Type 7
		Light Pole, Type 14
		High Mast Light Pole, (No. of Lamps Indicated on Plans)
		Overhead Sign Light, 150 Watt Lamp
		Underpass Luminaire
		Traffic Signal Head, 3 Section, 1'-0", red, Yellow, and Green Sections,(Unless indicated Otherwise)
		Traffic Signal Head With Back Plate
		Traffic Signal Head, with 1'-0" Green, Yellow and Red Arrow Sections, With Back Plate
		Traffic Signal Head With Optical Detector Unit
		M-5 (Cluster Type Head) 1'-0" Green, Yellow And Red Balls with 1'-0" Green And Yellow Arrows.
		Internally Illuminated Sign
		Pedestrian Signal

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

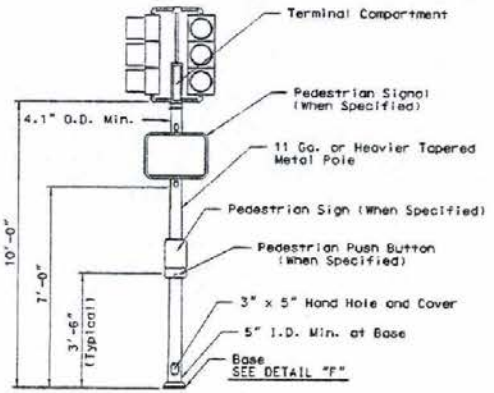
NEW	EXISTING	DESCRIPTION
		Electrical Manhole Cover
		Vehicle Detector-Inductive Loop Unless Otherwise Indicated
		Quadrapole Detector Loop
		Video Detection Camera
		Video Surveillance Camera
		Microwave Antenna
		Pole Designation
		Note Designation
		Conduit Run
		Portable Traffic Signal (Trailer Mount)
		Traffic Signal Sign
ØPPB		Pedestrian Push Button

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SIGNAL AND LIGHTING SYMBOLS

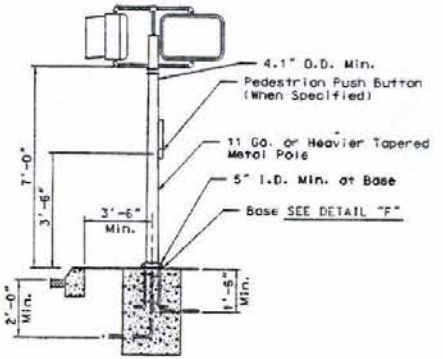
CHIEF TRAFFIC ENGINEER

T-30.1.1 (623)
ADOPTED: 7/96 REVISION 5/98



Foundation Same as Type 1-B

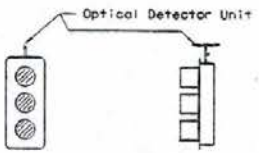
TYPE 1-A



TYPE 1B

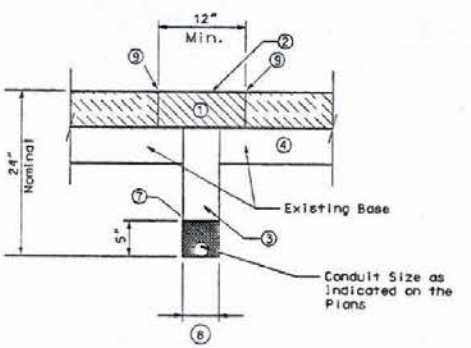
SIGNAL STANDARDS

1. For Pedestrian Push Button And Sign See Sheet T-30.1.3
2. For Foundation Details See Sheet T-30.1.16.
3. Mounting Heights of Signal And Pedestrian Heads And Pedestrian Push Buttons Shall Be Applicable To Installations on Pole Types 26, 30 & 35.



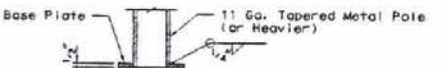
FRONT VIEW SIDE VIEW

MOUNTING DETAIL
OPTICAL DETECTOR

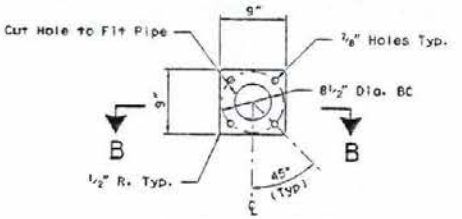


TRENCHING DETAIL

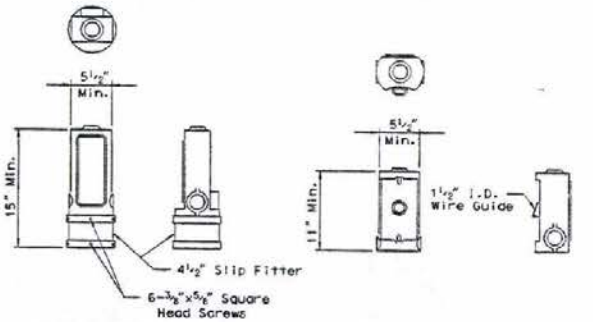
1. Remove And Replace Existing Surface. New Surface Material Shall Be From An Approved Commercial Source.
2. Seal And Sand New Surface. (As Directed By The Engineer)
3. Two Sack Slurry Mix Cement.
4. Recompact Existing Base.
5. All New Surface And Concrete Material Shall Be Approved By Engineer.
6. New 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.



SECTION B-B WITH PIPE



DETAIL "F"



POST TOP MOUNTED SIDE BRACKET MOUNTED

TERMINAL COMPARTMENTS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

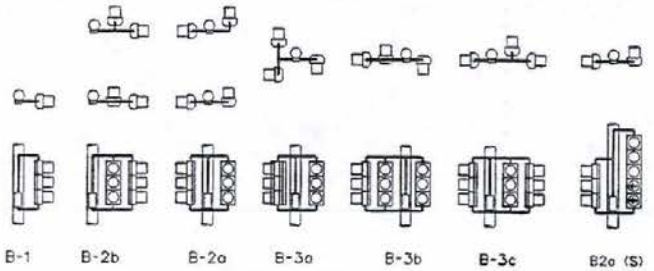
TYPE 1A AND 1B POLES, OPTICAL MOUNT AND TERMINAL COMPARTMENTS

CHIEF TRAFFIC ENGINEER

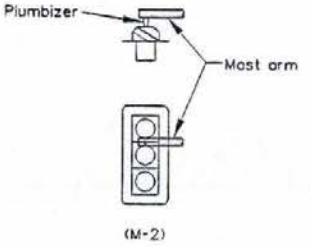
T-30.1.2 (623)

ADOPTED 2/71 REVISION 9/98

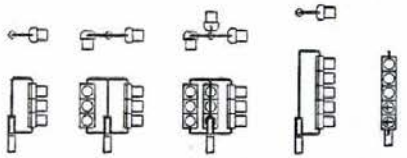
T-2



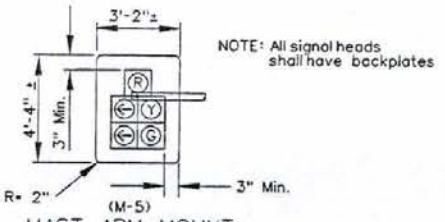
SIDE BRACKET MOUNTINGS



MAST ARM MOUNTINGS

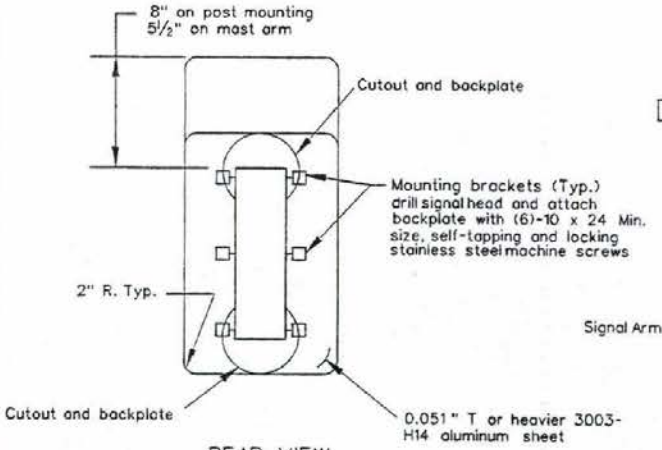


TOP MOUNTINGS



MAST ARM MOUNT
(M-2 Mount)

VEHICULAR SIGNALS AND MOUNTINGS

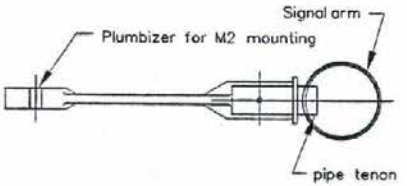


REAR VIEW

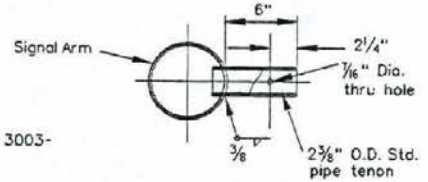
NOTE: No background light to show between plate and head. All mast arm backplates shall be louvered.

BACKPLATE

T= THICKNESS

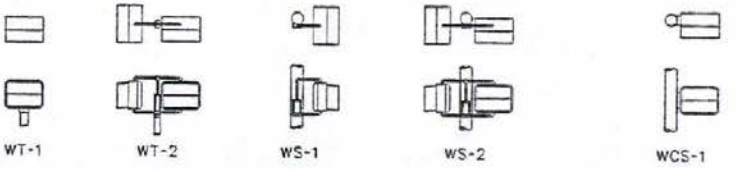


SPECIAL DETAIL
FOR MOUNTING SIGNAL HEAD

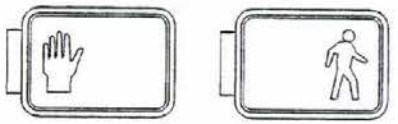


See detail for mounting signal head on Standard Plan Drawing T-30.1.15

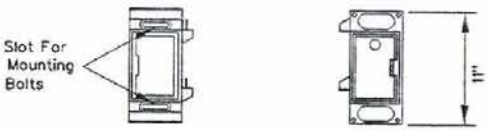
M-2 SIDE MOUNT



TOP MOUNTINGS SIDE MOUNTINGS CLAMSHELL MOUNT



(To be used unless otherwise specified)
PEDESTRIAN SIGNAL-INTERNATIONAL SYMBOL



POLE PLATE

TERMINAL COMPARTMENT

(To be used only when specified)
CLAMSHELL MOUNTING HARDWARE (CS)

PEDESTRIAN SIGNALS AND MOUNTINGS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

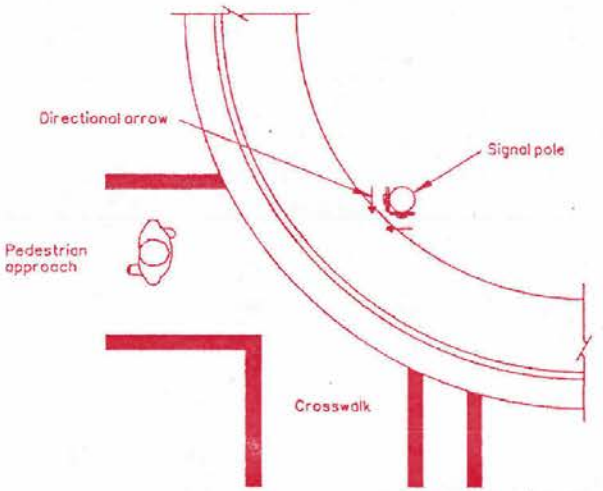
SIGNAL MOUNTING
PEDESTRIAN SIGNALS

CHIEF TRAFFIC ENGINEER

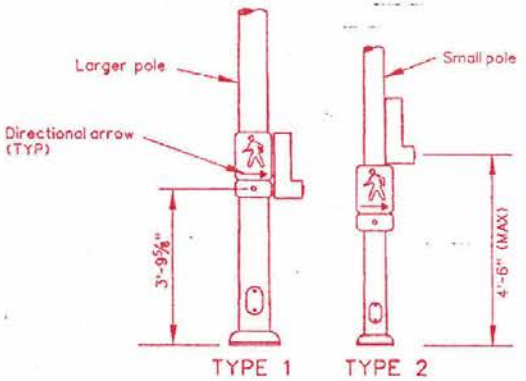
T-30.1.3 (623)

ADOPTED 7/98 REVISION 8/98

T-3



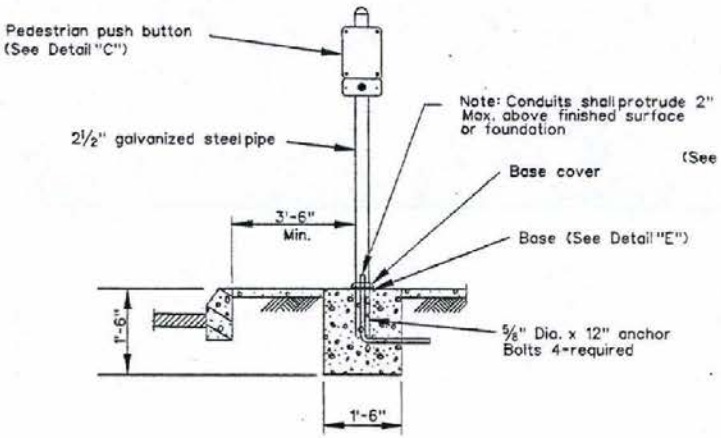
Pedestrian push buttons shall be installed on the crosswalk side of the signal pole, with the proper directional arrow positioned correctly.



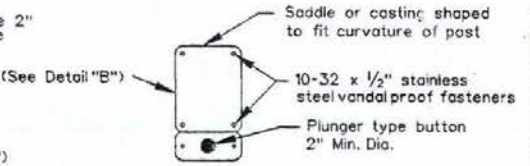
TYPE 1 - Position pedestrian push buttons on signal pole when the width of the pole allows (2) pedestrian heads to be at the same mounting height.

TYPE 2 - Position pedestrian push buttons on signal pole when the width of the pole does not allow (2) pedestrian heads to be mounted at the same height.

PUSH BUTTON POSITIONING DETAIL



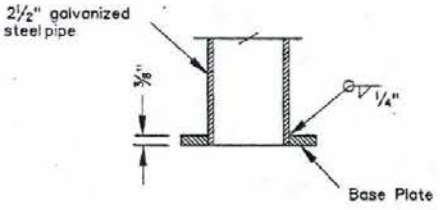
PEDESTRIAN PUSH BUTTON POST



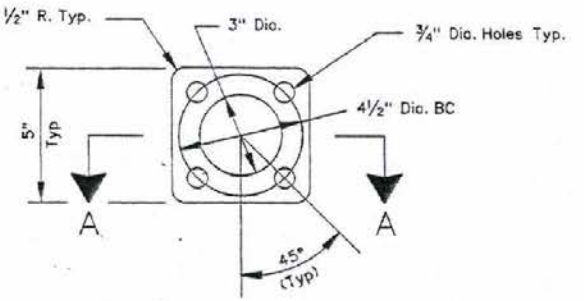
DETAIL "C"

DETAIL "B"

Note: 1. Arrow to be left or right or both as required.
2. Porcelain enameled, 9" x 12" sign, black symbols on white background.



SECTION A-A WITH PIPE



DETAIL-"E"

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

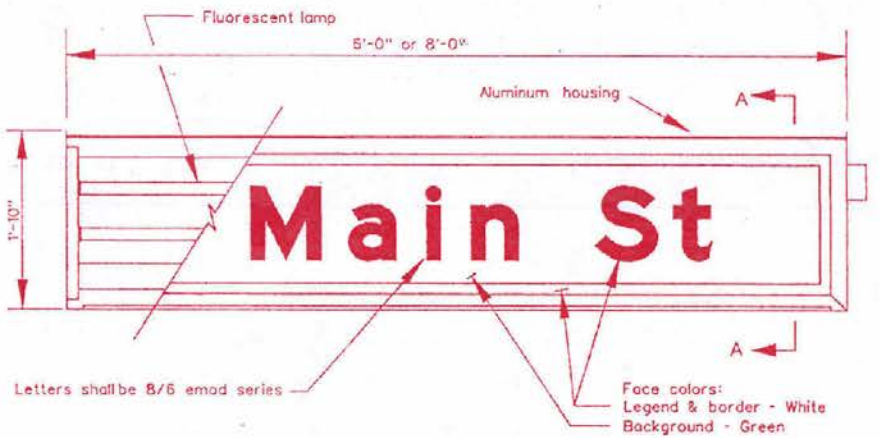
PEDESTRIAN PUSH BUTTON DETAILS

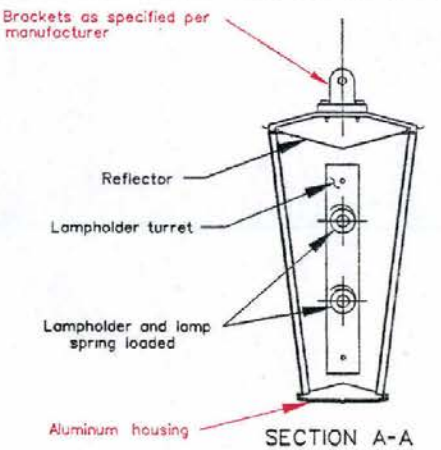
CHIEF TRAFFIC ENGINEER

T-30.1.3.1 (623)

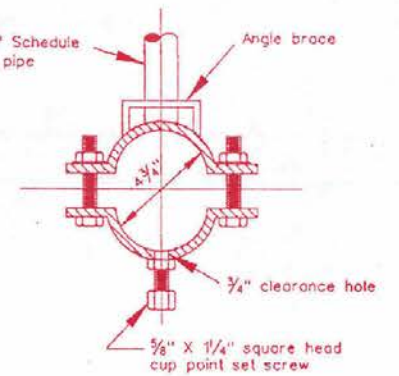
ADOPTED: 8/98 REVISION

T-4

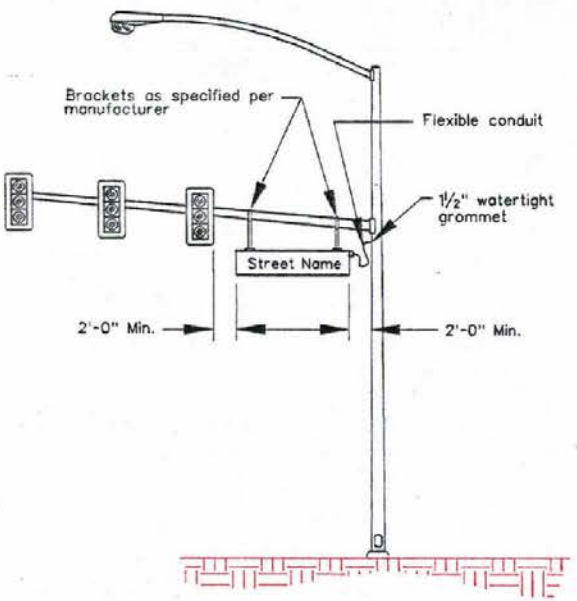




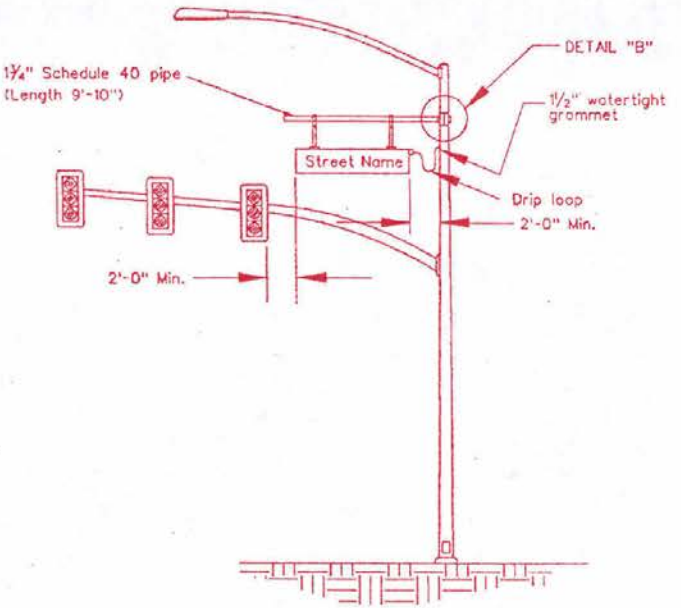
SECTION A-A



DETAIL "B"



INSTALLATION METHOD 1



INSTALLATION METHOD 2

GENERAL NOTES:

1. All fasteners and associated hardware shall be stainless steel.
2. Two (2) No. 12 AWG conductors shall be installed between the internally illuminated street name sign and the pole luminaire. The photo electric (PE) control for the luminaire or electrical service will operate the internally illuminated sign.
3. The ballast will be, high output, "Valmont No. 6G3934WF" or equivalent. Ballasts shall be encased and potted.
4. Fluorescent lighting will be provided by 2-800MA standard lamps. Fluorescent sockets will be d-die snap-in type sockets with a rubber gasket on the lamp mating surface to prevent possible water damage.
5. Wire connections will be made with insulated compression wire nuts.
6. Street name sign wiring to run through two (2) water-tight 90° fittings with flexible conduit. Use a drip loop sufficient enough to allow sign movement. Use watertight rubber grommet or bushing at pole entry.

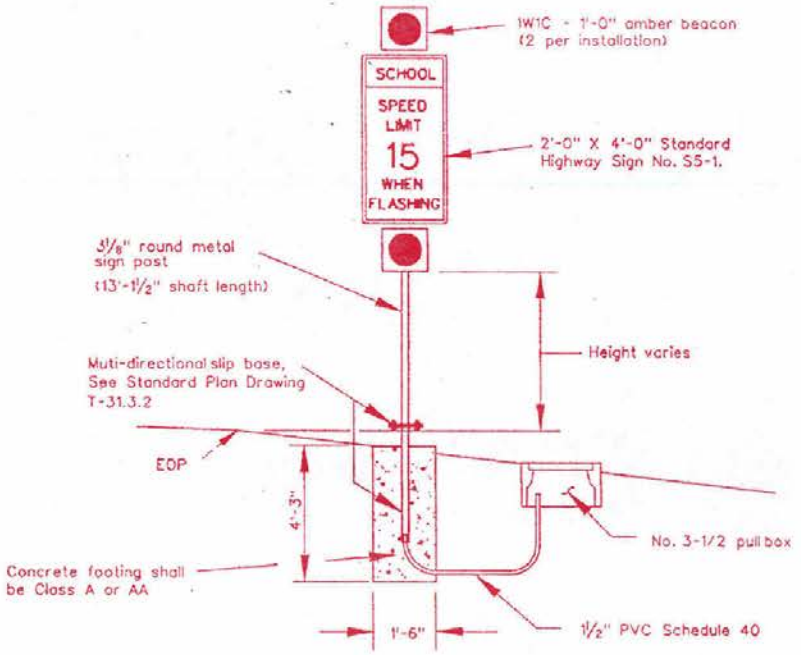
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

INTERNALLY ILLUMINATED STREET NAME SIGNS

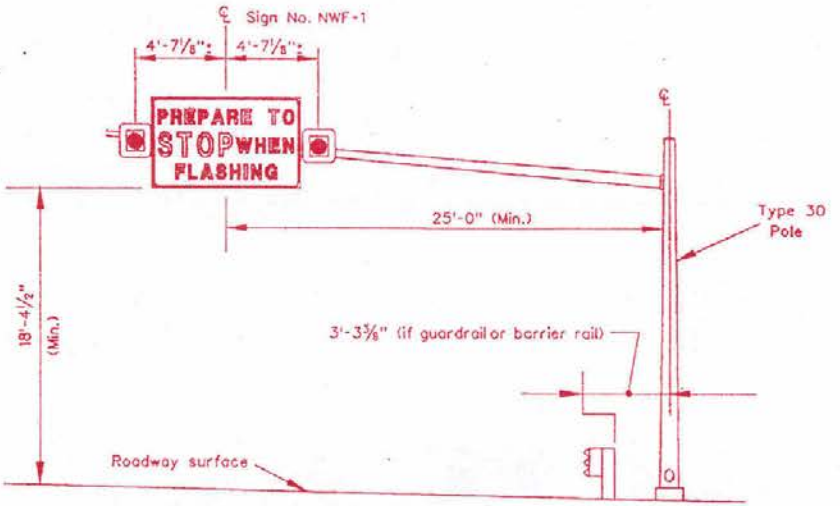
CHIEF TRAFFIC ENGINEER

T-30.1.3.2	(623)
ADOPTED: 8/98	REVISION

T-5



SCHOOL ZONE FLASHER



FLASHING WARNING SIGN DETAIL

Locate NWF-1 signal sign vertically on mast arm no lower than 18'-4½" from the roadway surface. Distance is measured from the bottom edge of the sign to the actual travellane surface. Locate the sign horizontally on mast arm 25'-0" from pole. Distance is measured from the middle of the sign to the perimeter of the Type 30 Pole.

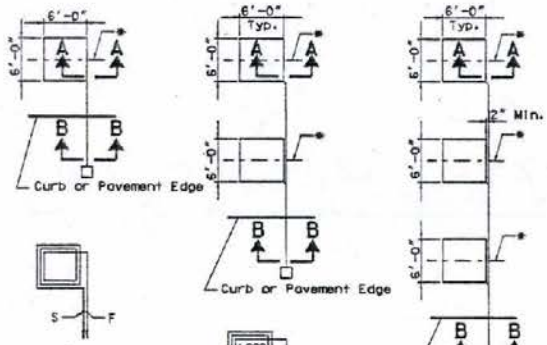
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

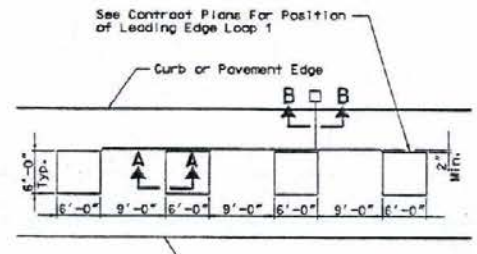
FLASHING WARNING SIGN SCHOOL ZONE FLASHER

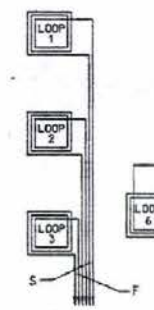
CHIEF TRAFFIC ENGINEER

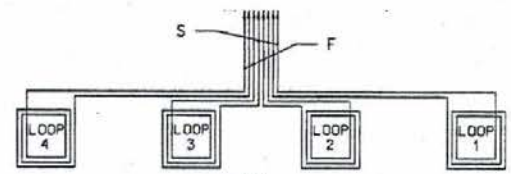
T-30.1.3.3 (623)

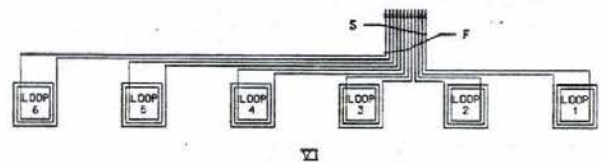
ADOPTED: 5/98 (REVISION)





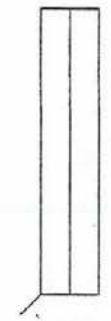






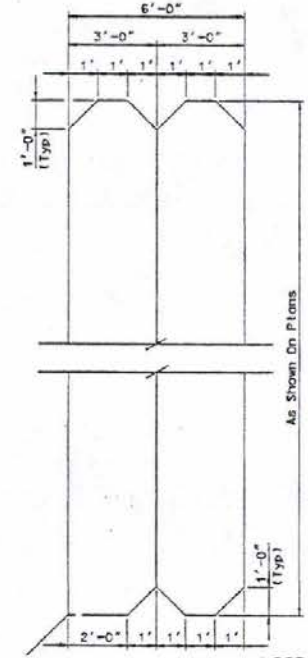
CONDUCTOR IDENTIFICATION IN PULL BOX SHALL INCLUDE THE FOLLOWING:
1. SENSOR NUMBER AND PHASE
2. LOOP NUMBER
3. START (S) AND FINISH (F)

CABLE IDENTIFICATION IN CONTROLLER CABINET SHALL INCLUDE THE FOLLOWING:
1. LOWER CASE LETTER AS SHOWN ON PLANS FOR DETECTOR AMPLIFIER ASSIGNMENT
2. PHASE DESIGNATION

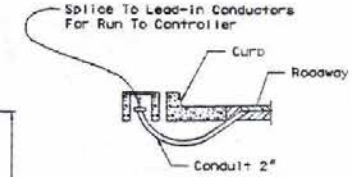


WINDING DETAIL (TWO TURNS)

SAWSLOT DETAIL

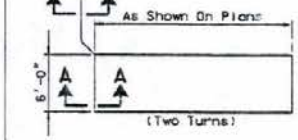


QUADRAPOLE LOOP DETECTOR



CONDUIT INSTALLATION

NOTE:
AT PULLBOX LOCATIONS WHERE THERE IS NO CURB AND GUTTER THE CONDUIT SHALL EXTEND FROM THE PULLBOX TO 12" INSIDE THE EDGE OF THE PAVEMENT.

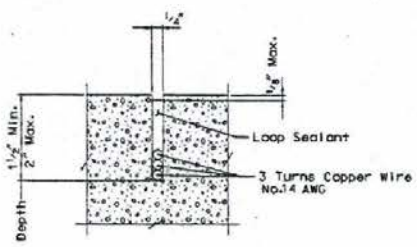


LOOP DETECTOR
6' x 20' AND LONGER

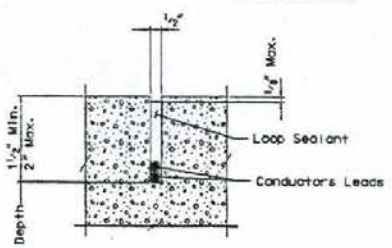
LOOP INSTALLATION PROCEDURE:

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 ¾" TO ½" THICK WOOD PADDLE (SEE "LOOP WINDING PATTERNS"). ALLOW ADDITIONAL LENGTH FOR THE RUN TO TERMINATION PULL BOX PLUS 5 FEET OF SLACK IN PULL BOX. THIS ADDITIONAL LENGTH OF CONDUCTOR FOR EACH LOOP CIRUIT SHALL BE TWISTED TOGETHER INTO A PAIR (AT LEAST 5 TURNS PER FOOT) 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 50/50 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 2'-0" MINIMUM. DISTANCE BETWEEN LEAD-IN SAW CUTS SHALL BE 6" 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 FIVE TURNS PER FOOT BETWEEN LOOP AND PULL BOX.
13. WHERE DETECTOR LOOPS ARE CUT INTO PAVEMENT, 6' ROUND LOOPS MAY BE USED IN LIEU OF 6' X 6' SQUARE LOOP DETECTORS.

DETECTOR LAYOUTS, DIMENSIONS & WIRING PATTERNS



SECTION A-A



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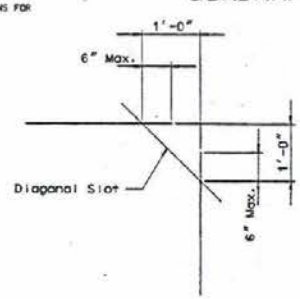


PLAN VIEW OF DIAGONAL SLOT AT CORNERS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

LOOP DETECTORS

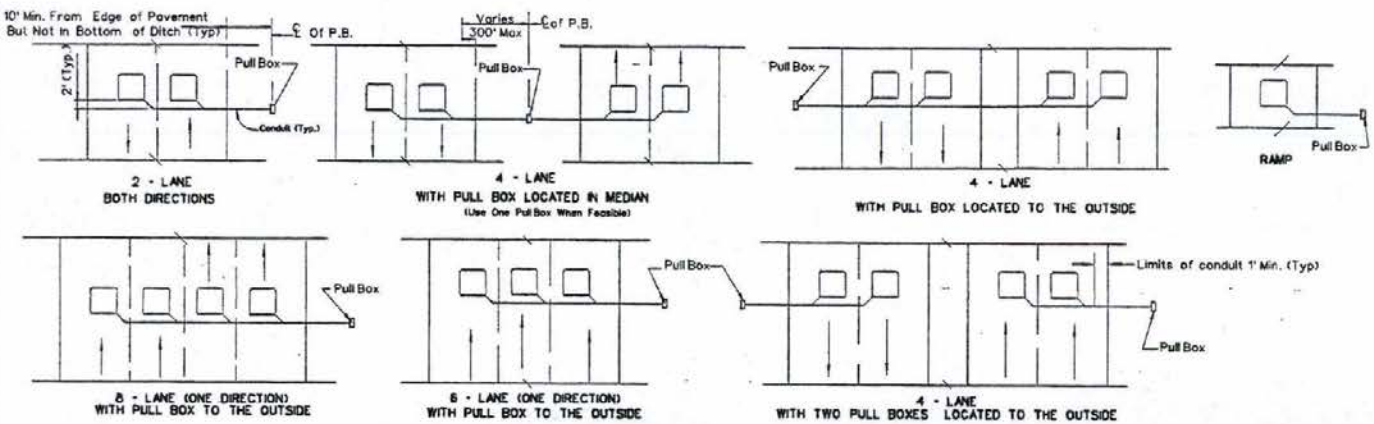
CHIEF TRAFFIC ENGINEER

T-30.1.1 (623)

ADOPTED 12/79

REVISION 10/98

T-1



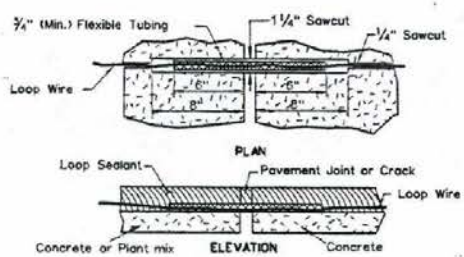
TRAFFIC DETECTOR LOOP

INSTALLATION NOTES

1. EACH LOOP SHALL BE 6 FOOT X 6 FOOT WITH 4 TURNS.
2. DEPTH OF SAW CUT SHALL BE 2½ INCHES MIN. TO 3 INCHES 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.

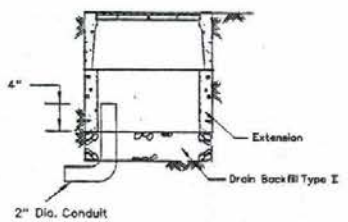
GENERAL NOTES:

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:
   2" DIAMETER CONDUIT
   NO. 5 PULL BOX
   6 FOOT X 6 FOOT DETECTOR LOOPS
3. WHERE DETECTOR LOOPS ARE CUT INTO PAVEMENT. 6' ROUND LOOPS MAY BE USED IN LIEU OF 6' X 6' SQUARE LOOP DETECTORS.

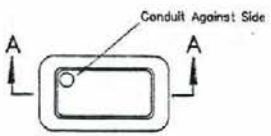


PAVEMENT JOINT CROSSING DETAILS

(NO DIRECT PAYMENT)



SECTION A-A



NO.5 PULL BOX

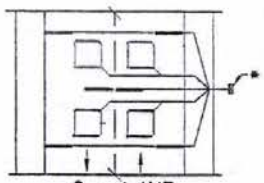
CONDUIT LOCATION (SEE GENERAL NOTES 1 AND 2)

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

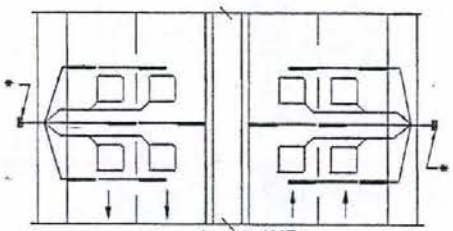
TRAFFIC DETECTOR LOOP

CHIEF TRAFFIC ENGR. | T-30.1.4.1 (623) | ADOPTED: 9/97 | REVISION 10/98

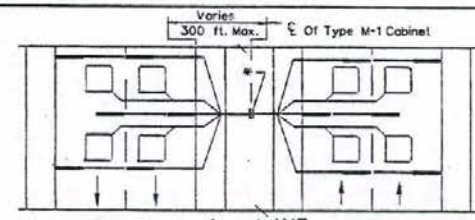
T-8



2 - LANE
BOTH DIRECTIONS



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

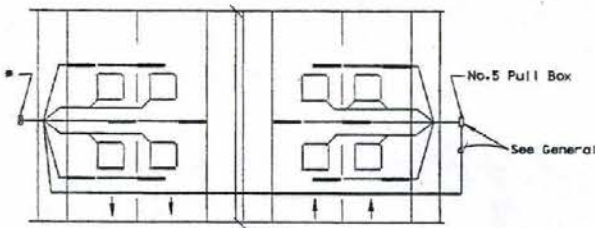


4 - LANE
WITH ONE SPECIAL M-1 CABINET LOCATED IN MEDIAN

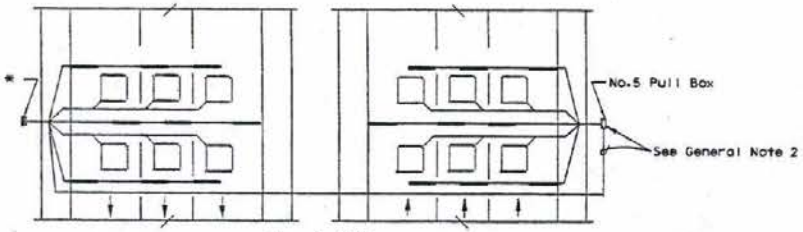
*-Special M-1 Cabinet

INSTALLATION NOTES

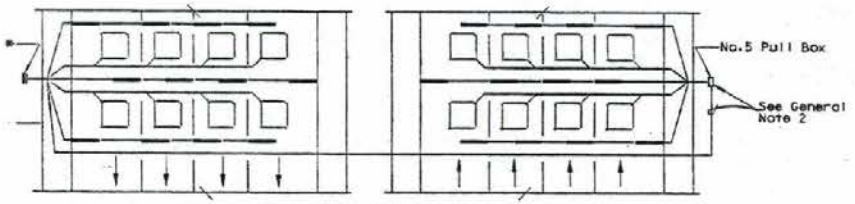
1. EACH LOOP SHALL BE 6 FOOT X 6 FOOT WITH 4 TURNS.
2. DEPTH OF LOOP SAW CUT SHALL BE 2½ INCHES MIN. TO 3 INCHES MAX.
3. LOOPS SHALL BE CENTERED IN ALL TRAVEL AND TURN LANES.
4. LOOP WIRE SHALL BE STRANDED #14 AWG.
5. EACH INDIVIDUAL CONDUCTOR SHALL BE A CONTINUOUS RUN WITH NO SPLICES AND SHALL BE LABELED 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.



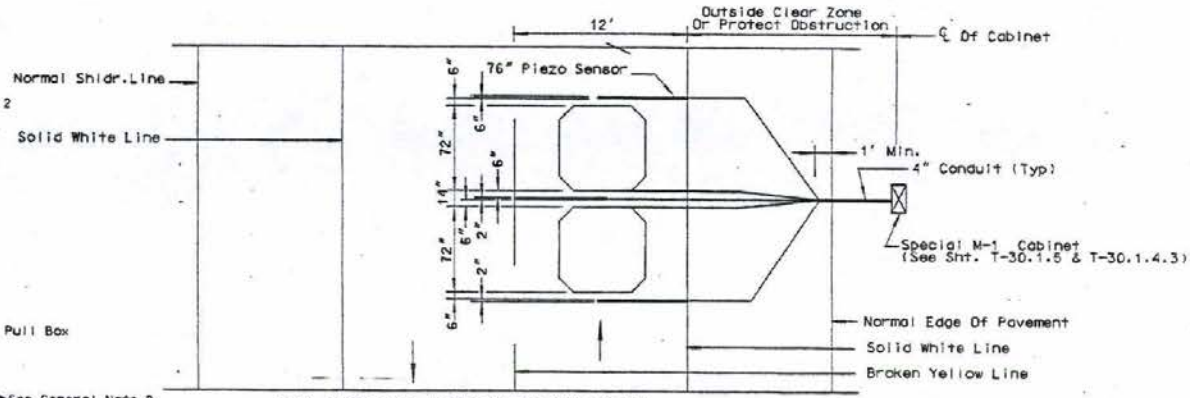
4 - LANE
WITH ONE SPECIAL M-1 CABINET TO THE OUTSIDE



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)

GENERAL NOTES:

1. PAYMENT SHALL BE MADE UNDER THE FOLLOWING ITEMS:
   AVC DETECTOR SYSTEM (EACH)
   TO INCLUDE THREE PIEZOELECTRIC DETECTORS AND TWO 6'X 6' DETECTOR LOOPS.

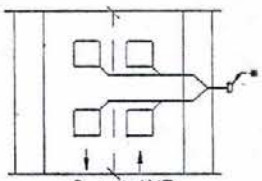
   SPECIAL CABINET (EACH)
   TO INCLUDE CONDUIT.
2. PAYMENT SHALL BE MADE UNDER THE FOLLOWING ITEMS:
   4" DIAMETER CONDUIT
   NO. 5 PULL BOX
3. PIEZOELECTRIC DETECTOR SHALL INCLUDE ALL CONDUCTORS AND SAW CUTTING NECESSARY FOR INSTALLATION.
4. IF GUARDRAIL/BARRIER RAIL IS PROVIDED, THE CABINET SHALL BE PLACED A MINIMUM OF 24" BEHIND RAIL.
5. 300' MAX. FOR PIEZO SENSOR LEADS.
6. SEE SHEET T-30.1.4.1 FOR PAVEMENT JOINT DETAILS.
7. WHERE DETECTOR LOOPS ARE CUT INTO PAVEMENT, 6' ROUND LOOPS MAY BE USED IN LIEU OF 6'X 6' SQUARE LOOP DETECTORS.

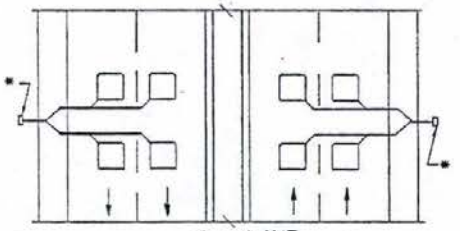
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

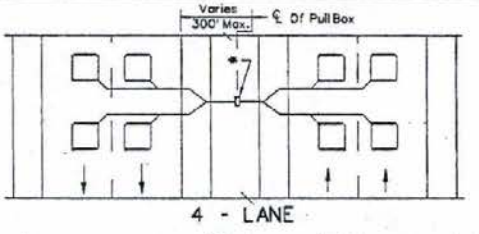
AVC DETECTOR LOOP CONFIGURATIONS AND NOTES

CHIEF TRAFFIC ENGR.	T-30.1.4.2 (623)
	ADOPTED: 9/97 REVISION: 10/98

T-9



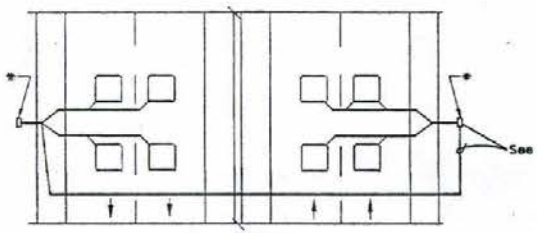


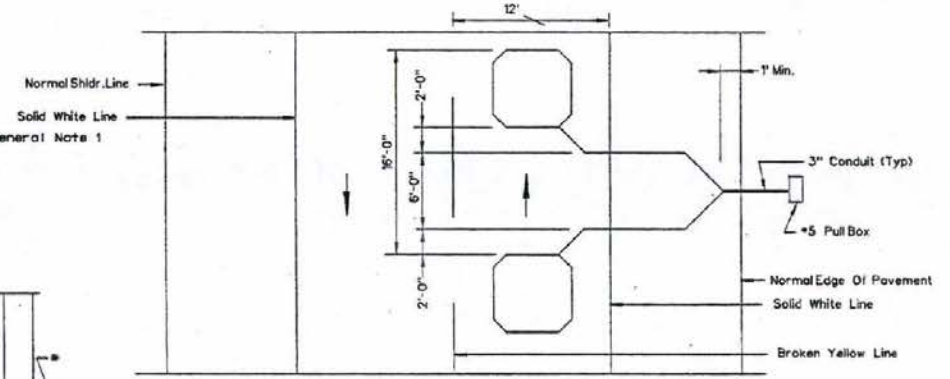


* -#5 Pull Box

INSTALLATION NOTES

1. EACH LOOP SHALL BE 6 FOOT X 6 FOOT WITH 4 TURNS.
2. DEPTH OF LOOP SAW CUT SHALL BE 2 1/2" MIN. TO 3 INCHES 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.

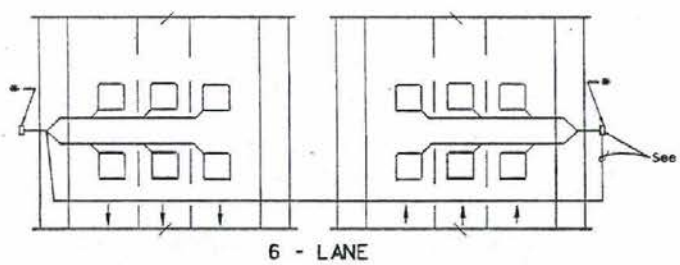


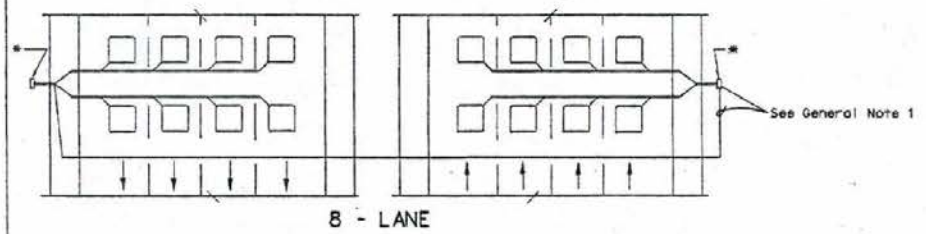


SPEED DETECTOR LOOP PLACEMENT DETAIL
(OPPOSITE LANE LOOPS NOT SHOWN FOR CLARITY)

GENERAL NOTES:

1. PAYMENT SHALL BE MADE UNDER THE FOLLOWING ITEMS:
   No. 5 PULL BOX
   6' X 6' DETECTOR LOOPS.
   3" DIAMETER CONDUIT
2. SEE SHEET T-30.1.4.1 FOR PAVEMENT JOINT DETAILS.



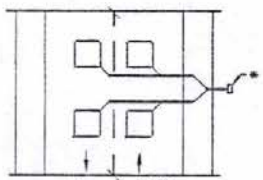


T-10

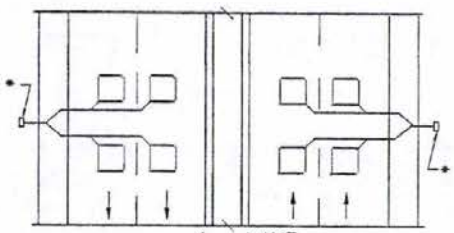
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPEED DETECTOR LOOP
CONFIGURATION AND NOTES

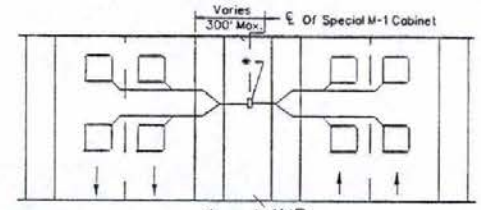
CHIEF TRAFFIC ENGR. | T-30.1.1.3 (623) | ADOPTED: 9/97 | REVISION 10/98



2 - LANE
BOTH DIRECTIONS



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

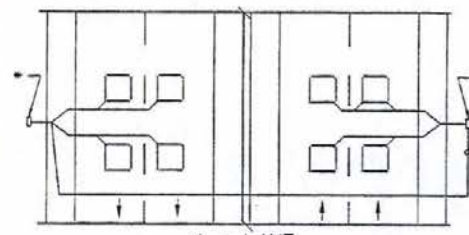


4 - LANE
WITH ONE SPECIAL M-1 CABINET LOCATED IN MEDIAN

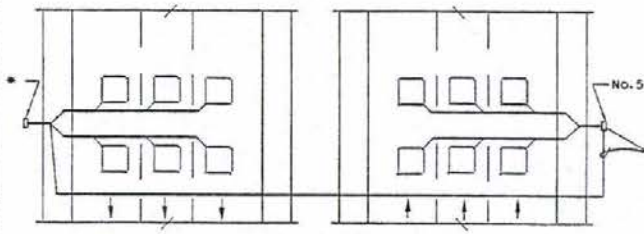
* - Special M-1 Cabinet

INSTALLATION NOTES

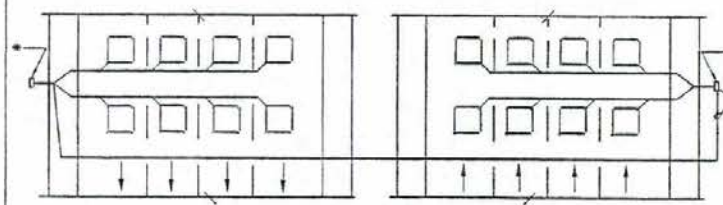
1. EACH LOOP SHALL BE 6 FOOT X 6 FOOT WITH 4 TURNS.
2. DEPTH OF LOOP SAW CUT SHALL BE 2 1/2" MIN. TO 3 INCHES MAX.
3. LOOPS SHALL BE CENTERED IN ALL TRAVEL AND TURN LANES.
4. LOOP WIRE SHALL BE STRANDED #14 AWG.
5. EACH INDIVIDUAL CONDUCTOR SHALL BE A CONTINUOUS RUN WITH NO SPLICES AND SHALL BE LABELED 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.



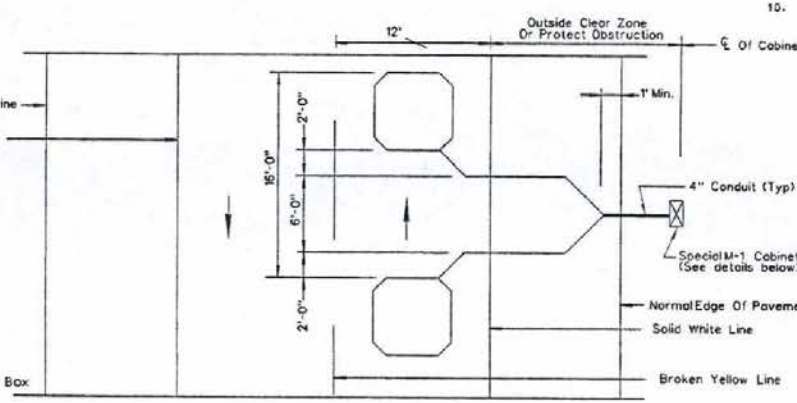
4 - LANE
WITH ONE SPECIAL M-1 CABINET TO THE OUTSIDE



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



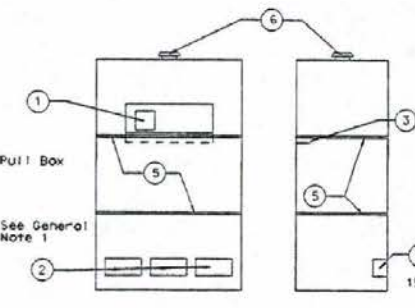
8 - LANE
WITH ONE SPECIAL M-1 CABINET TO THE OUTSIDE



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

GENERAL NOTES:

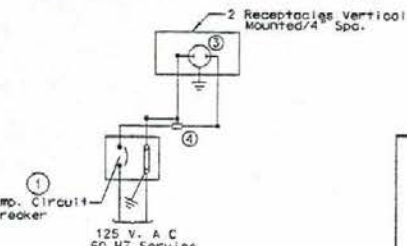
1. PAYMENT SHALL BE MADE UNDER THE FOLLOWING ITEMS:
   SPECIAL CABINET
   6'x 6' DETECTOR LOOPS.
   4" DIAMETER CONDUIT
   NO. 5 PULL BOX
2. IF GUARDRAIL/BARRIER RAIL IS PROVIDED, THE CABINET SHALL BE PLACED A MINIMUM OF 24" BEHIND RAIL.
3. SEE SHEET T-30.1.4.1 FOR PAVEMENT JOINT DETAILS



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.



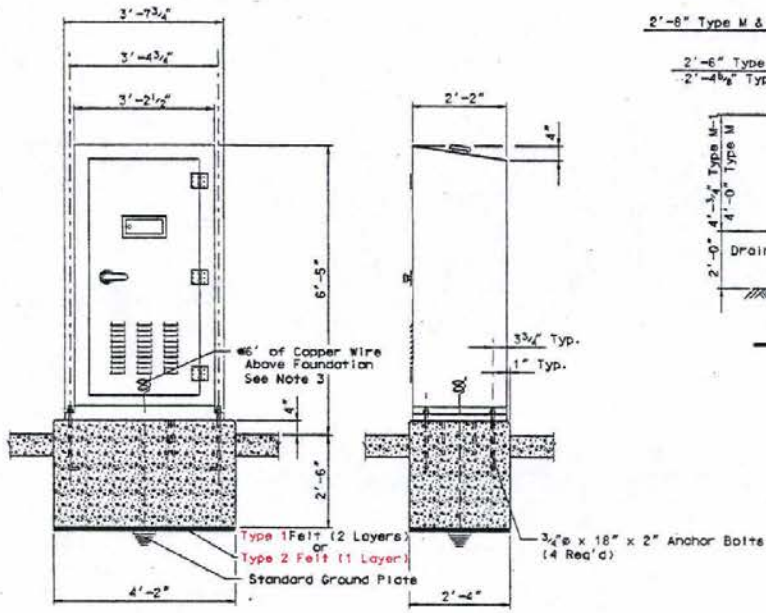
CABINET WIRING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

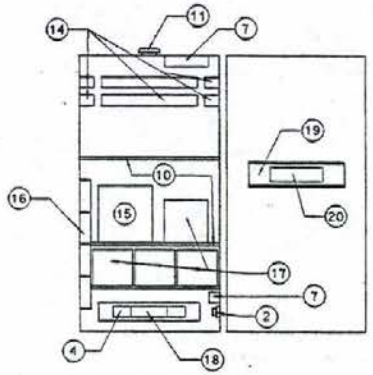
ATR DETECTOR LOOP
CONFIGURATION AND NOTES

CHIEF TRAFFIC ENGR.	T-30.1.4.4 (623)
	ADOPTED: 10/98 REVISION

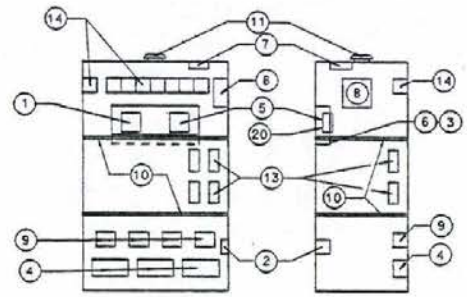
T-11



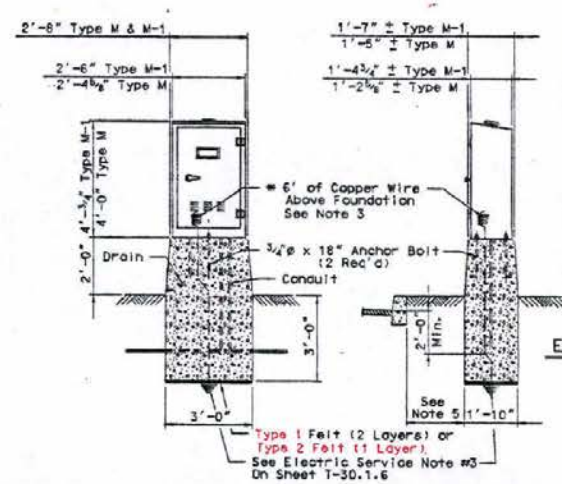
TYPE "R" CABINET



TYPE "R" CABINET



TYPE M & M-1 CABINET

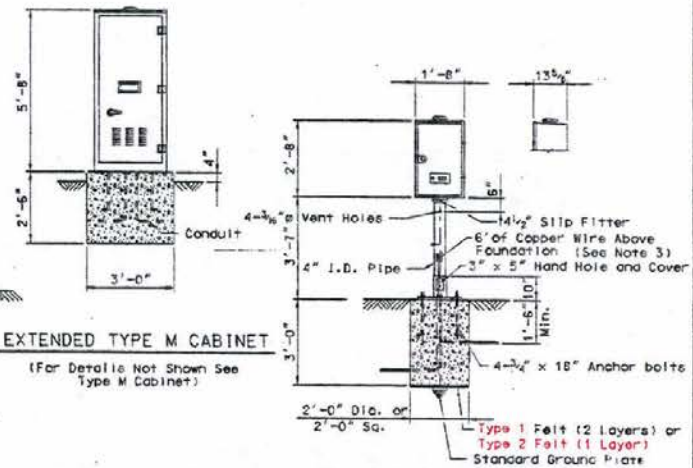


TYPE M & M-1 CABINET

GENERAL NOTES:

1. ALL CONDUITS SHALL EXTEND ABOVE FOUNDATIONS A MINIMUM OF 2".
2. ALL CABINETS SHALL BE PAINTED WHITE ON THE INSIDE AND OUTSIDE UNLESS SPECIFIED IN THE SPECIAL PROVISIONS.
3. ½" X 98" GROUND ROD MAY BE SUBSTITUTED IN LIEU OF COPPER WIRE.
4. CONCRETE SHALL BE CLASS A OR AA.
5. IF A CABINET IS TO BE INSTALLED IN OR NEAR A SIDEWALK AREA, THE HORIZONTAL AND VERTICAL CLEARANCE, AS SHOWN IN R-S.2.1. "TYPICAL SIDEWALK VS. OBSTRUCTION CLEARANCE DETAIL", SHALL BE MET.

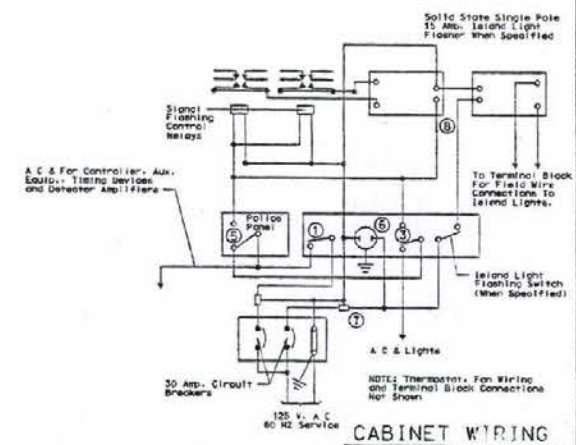
1. MAIN SWITCH.
2. PLUG FUSE.
3. SIGNAL FLASH SWITCH INSIDE CABINET.
4. FIELD WIRE TERMINAL BLOCKS.
5. AUXILIARY DOOR FLASH SWITCH.
6. N.E.M.A. STANDARD PLUG RECEPTACLE WITH GROUNDING CONTACT.
7. RADIO INTERFERENCE SUPRESSOR.
8. SOLID STATE SIGNAL FLASHER (CABINET MFR. TO DETERMINE POLES & CAPACITY. UNLESS OTHERWISE SPECIFIED).
9. EXTERNAL LIGHT RELAYS.
10. SHELF.
11. THERMOSTAT-CONTROLLED FAN WITH 7 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.



EXTENDED TYPE M CABINET

(For Details Not Shown See Type M Cabinet)

TYPE "G" CABINET



CABINET WIRING

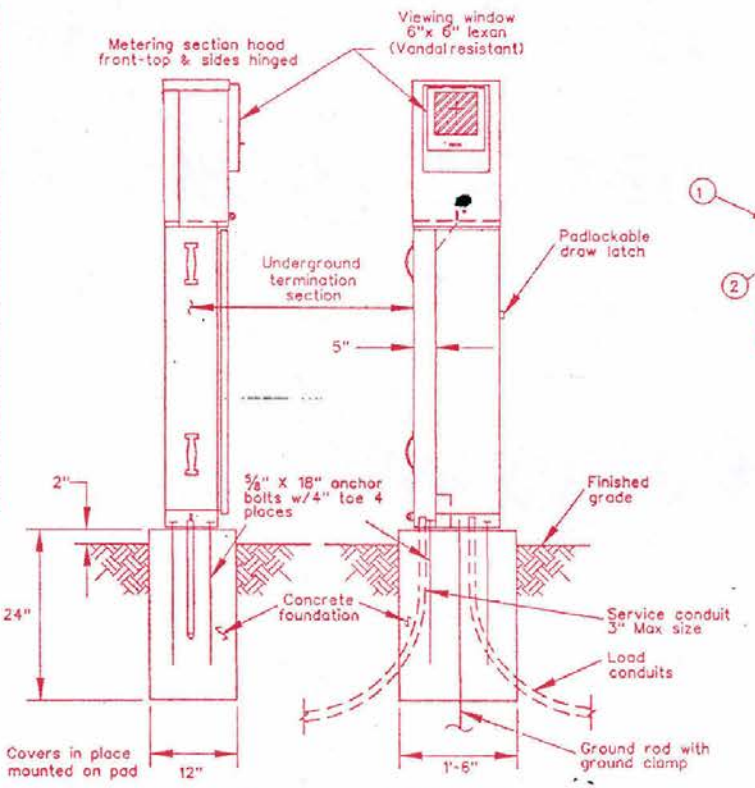
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

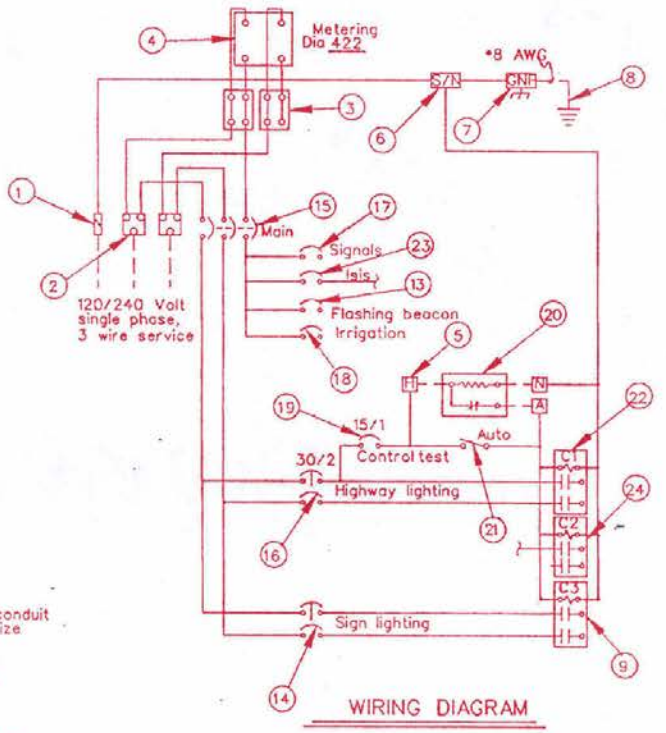
CONTROLLER CABINETS

CHIEF TRAFFIC ENGINEER

T-30.1.5		(623)
ADOPTED: 2/21		REVISED: 10/96

SERVICE (120/240) EQUIPMENT LEGEND		
ITEM	COMPONENT	NAMEPLATE INSCRIPTION
1	Neutral lug	
2	Landing lug	
3	Test bypass facility	
4	Meter socket & support	
5	Terminal blocks	
6	Solid neutral term strip	
7	Ground lug	
8	Ground rod	
9	30A, 2PNO Merc. cont	Sign illumination
10	Photo electric unit	
11	15A, 1P, Test switch	Sign illum. test switch
12	15A, 120V, 1P, CB	Sign illum. control
13	15A, 120V, 1P, CB	Flashing beacon
14	30A, 240V, 2P, CB	Sign illumination
15	100A, 240V, 3P, CB	Service disconnect
16	30A, 240V, 2P, CB	Highway lighting
17	50A, 120V, 1P, CB	Signals
18	20A, 120V, 1P, CB	Irrigation
19	15A, 120V, 1P, CB	Highway lighting control
20	Photo electric unit	
21	15A, 1P, Test switch	Highway lighting test switch
22	60A, 2PNO Merc cont	Highway lighting
23	15A, 120V, 1P, CB	IISNS
24	30A, 2PNO Merc cont	IISNS contactor
25	Flashing beacon controller assembly	
26	Flashing beacon controller assembly w/time clock	





GENERAL NOTES:

1. Service pedestal shall be UL listed "Industrial Control Panel" per UL 508
2. Service pedestal shall meet the electric utility service equipment requirements committee (EUSERC) guidelines.
3. Construction shall be NEMA 3R or 12, rain tight and dust tight. electrically welded and reinforced where required.
4. All nuts, bolts, screws, and hinges shall be stainless steel.
5. Nuts, bolts & screws shall not be visible from outside of enclosure.
6. Nonconductive nameplates shall be provided as required.
7. Circuit breakers shall be cable in-cable out with line on top & load. on the bottom. Handle position up -"ON", middle-"TRIPPED", down-"OFF".
8. A plastic covered wiring diagram shall be attached to the inside of the front door.
9. Enclosure shall be factory wired and conform to required NEMA standards.
10. All cabinets shall be factory powder coated (cabinet fabrication and powder color to be specified)
11. Foundations, including excavation, concrete & anchor bolts, complete in-place and back filled, shall be constructed in accordance with manufacturer's requirements and considered incidental to the service enclosure.

LEGEND	
- - - -	External conductor
———	Tie point
———	Internal conductor or bus
—∿∿—	Contactor coil
—||—	Contactor no contact
H	Terminal block

Note: Wiring diagram also to be used for 200 amp service. 200 amp service to include 200 amp meter socket with test bypass and 200 amp breaker. See Standard Plan Drawing T-30.1.6.1.

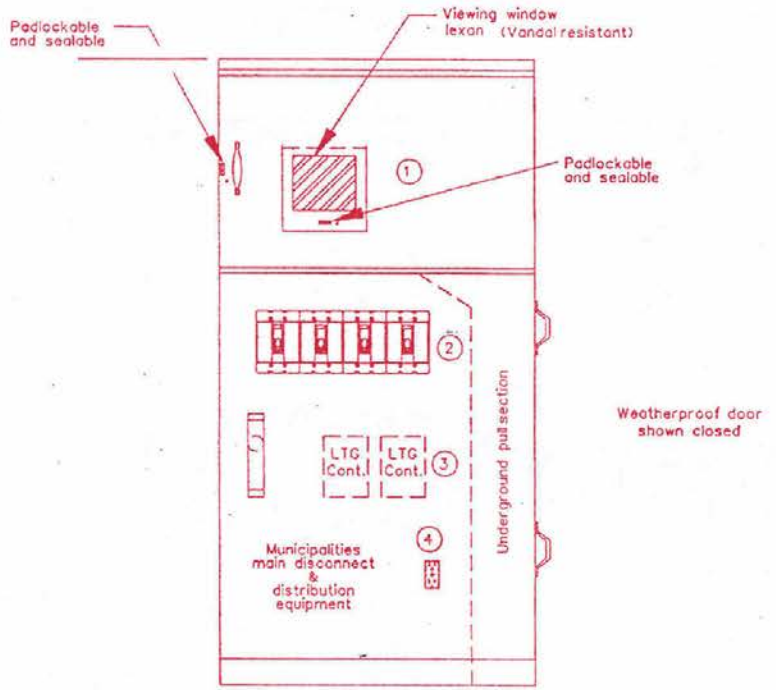
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

100 AMP UNDERGROUND ELECTRICAL SERVICE

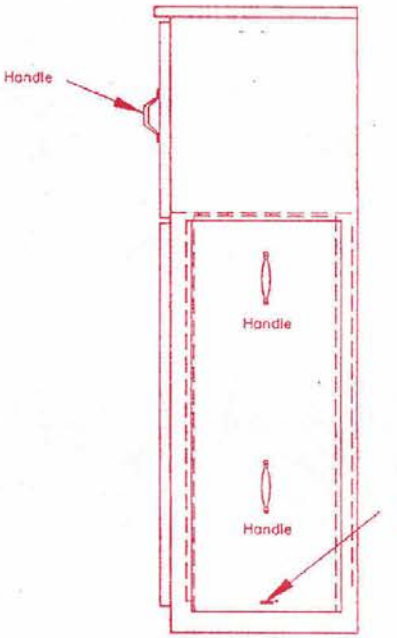
CHIEF TRAFFIC ENGINEER

T-30.1.6	(623)
ADOPTED 12/19	REVISION 8/96

T-13

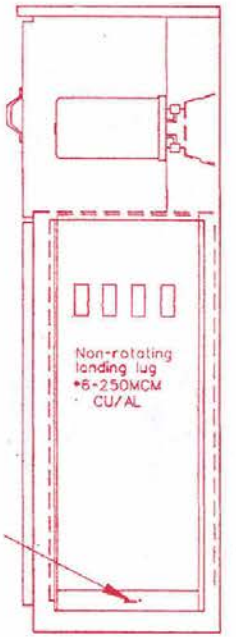


FRONT VIEW



RIGHT SIDE

(Pull section cover in place)



RIGHT SIDE

(Pull section cover removed)
Section thru metering compartment

LEGEND

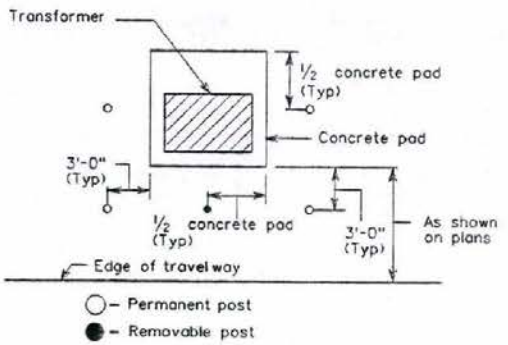
1. 200 amp meter socket with supports
2. 200 amp breaker and distribution
3. Lighting contactors
4. Ground fault receptacles

Note: 200 amp service to include 200 amp meter socket with test bypass and 200 amp breaker. See wiring diagram and General Notes on Standard Plan Drawing T-30.1.6

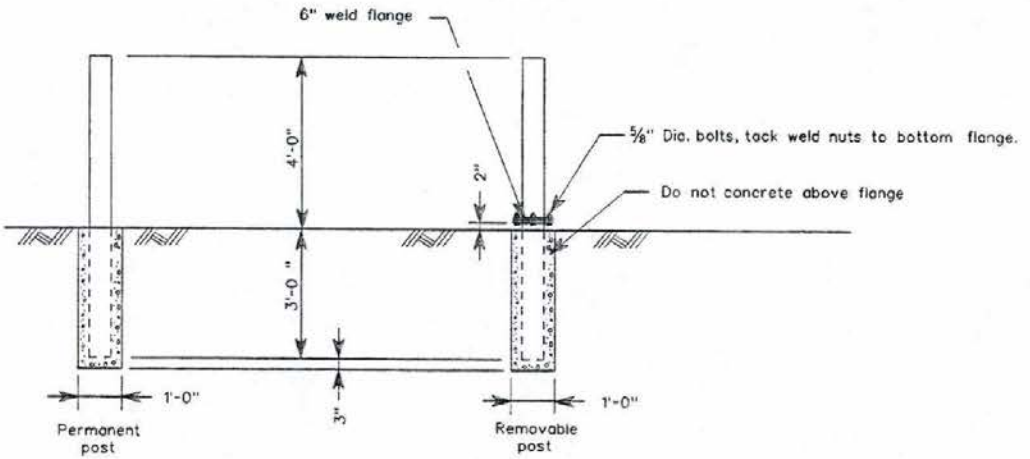
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

200 AMP UNDERGROUND ELECTRICAL SERVICE

CHIEF TRAFFIC ENGINEER	T-30.1.6.1	(623)
	ADOPTED: 8/96	REVISION



TOP VIEW



TRANSFORMER PAD BARRIER POST

GENERAL 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 AA concrete.
3. Post consructed of 6" Standard Pipe (Well Casing) primed and painted yellow, and concrete filled.

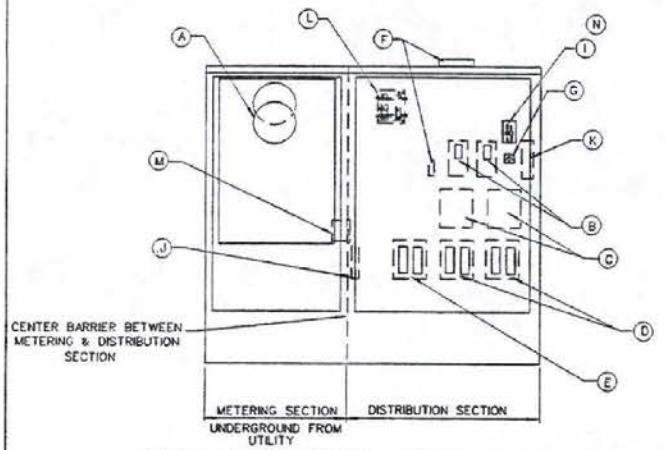
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TRANSFORMER PAD BARRIER POST

CHIEF TRAFFIC ENGINEER

T-30.1.6.2 (623)

ADOPTED: 8/95 REVISION

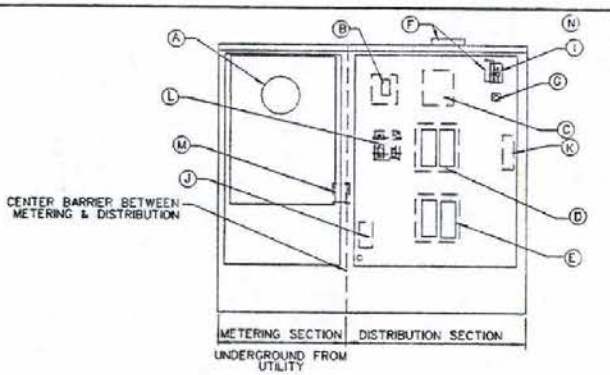


BACK ELEVATION (60" CABINET)

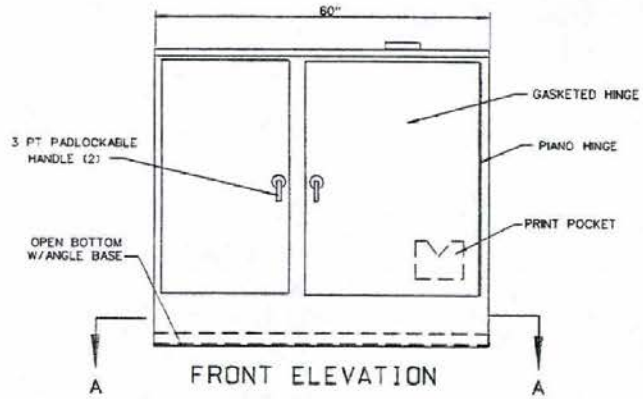
TYPE 3R LIGHTING CABINET NOTES:

LEGEND

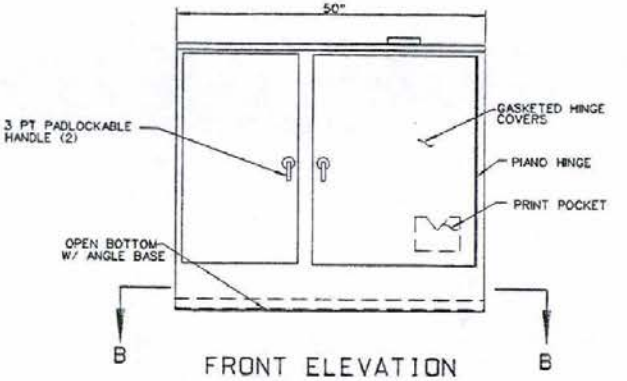
(A) 100 AMP 10 3W 120/240 VOLT METER SOCKET SELF OPERATED. 200 AMP 10 3W 120/240 VOLT METER SOCKET W/TEST BYPASS FACILITIES
(B) 200 AMP 2 POLE CIRCUIT BREAKER.
(C) 200 AMP 2 POLE CONTACTOR 120 VOLTCOIL ELECTRICALLY HELD.
(D) 200 AMP 3W MAIN LUG LOAD CENTER WITH 2 POLE CIRCUIT BREAKERS PER REQUIREMENTS.
(E) 100 AMP 10 3W MAIN LUG LOAD CENTER WITH 1-15 AMP 1POLE AND 3-20 AM 1POLE CIRCUIT BREAKERS.
(F) CABINET FAN WITH T-STAT.
(G) DPDT TOGGLE SWITCH WITH NAMEPLATE.
(H) NOT USED.
(I) 15 AMP GFCI DUPLEX RECEPTACLE.
(J) 6 (200) OR 12 (400) POSITION GROUND BAR.
(K) 12 POSITION WIRING TERMINAL BLOCK.
(L) 2 POLE (200) OR 3 POLE (400) DISTRIBUTION BLOCK.
(M) 2" (200) OR 3" (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 MDT'S. RECOMMENDATION.



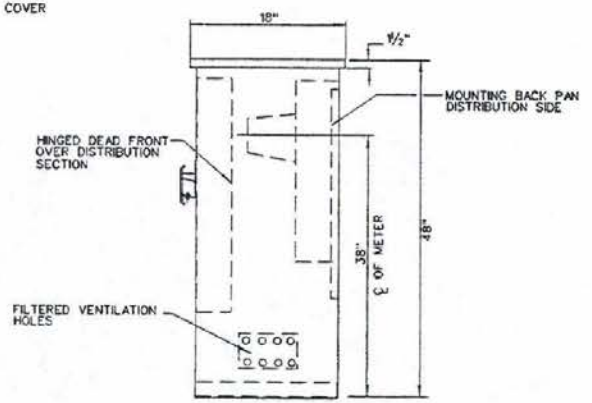
BACK ELEVATION (50" CABINET)



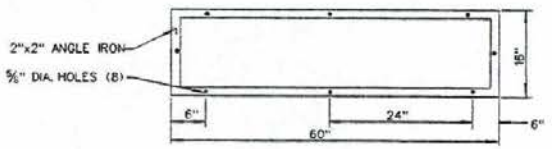
FRONT ELEVATION



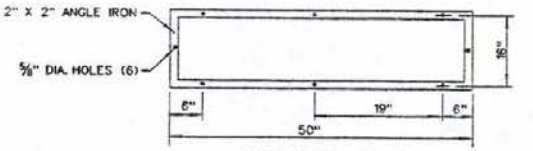
FRONT ELEVATION



SIDE ELEVATION
(50" & 60" CABINET)



SECTION A-A



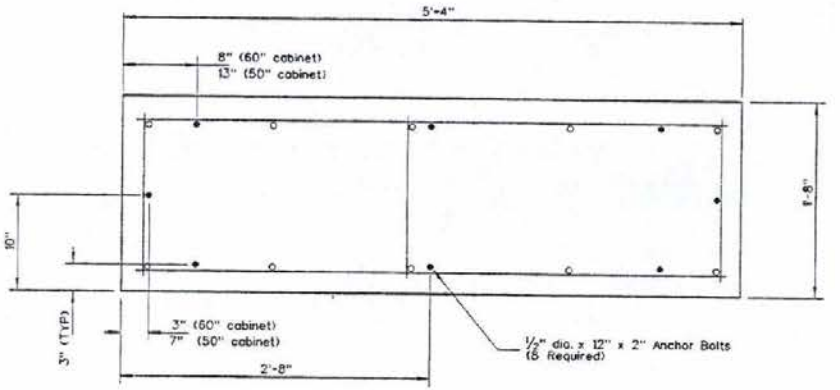
SECTION B-B

CABINETS SHALL BE CONSTRUCTED FROM 10 GUAGE STEEL - ALL SURFACES CLEANED, PRIMED & PAINTED INSIDE & OUT W/2 COATS WHITE ENAMEL.

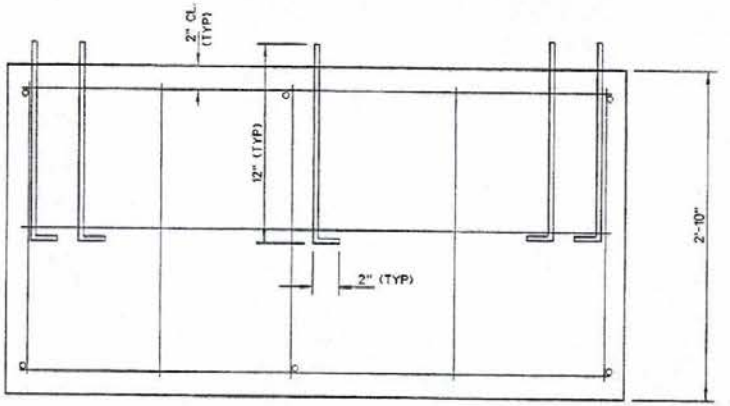
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 3R LIGHTING CABINET

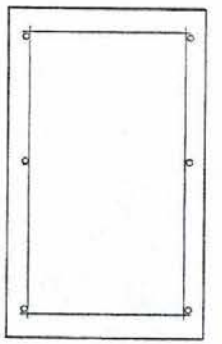
CHIEF TRAFFIC ENGINEER | T-30.1.7.1 (623) | ADOPTED: 10/92 | REVISION 9/97



PLAN VIEW



FRONT VIEW



SIDE VIEW

GENERAL NOTES:

1. The Ultimate Concrete Compressive Strength Shall Be f'c = 4000 psi
2. All Reinforcing Steel Shall Be AASHTO M31 Grade 60. All Reinforcing Steel Shall Be No. 4 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

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

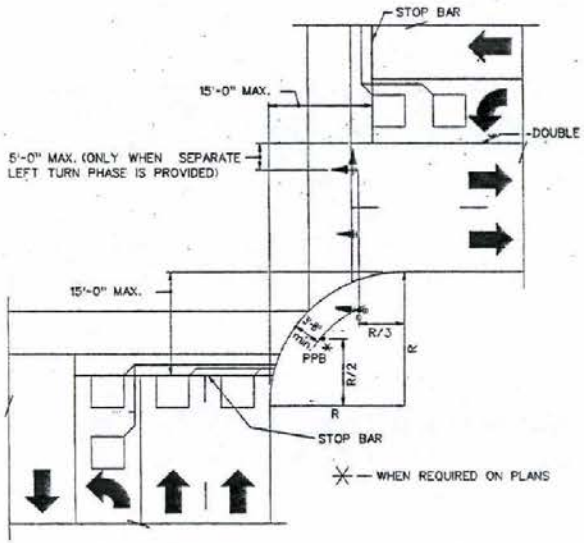
TYPE 3R
LIGHTING CABINET
FOUNDATION PLAN

CHIEF TRAFFIC ENGINEER

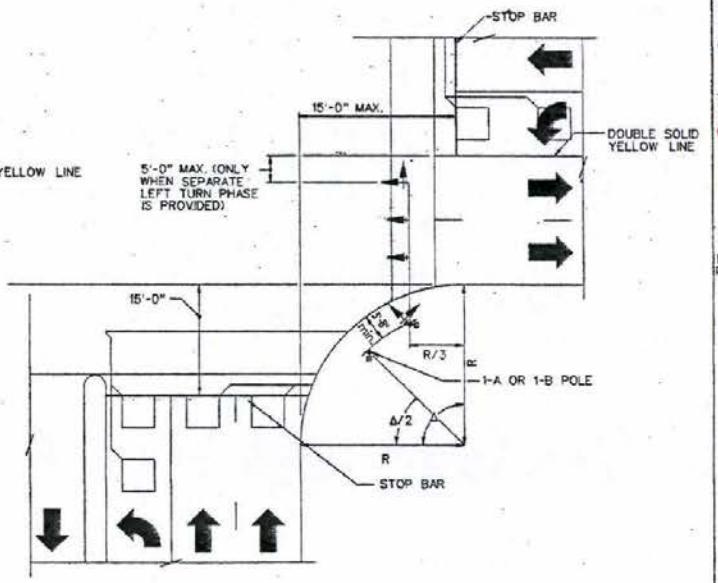
T-30.1.7.2 (623)

ADOPTED: 7/96 REVISION 9/97

T-17



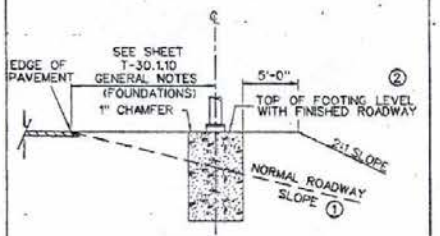
25'-0" AND SMALLER RADII CURB RETURN AND MEDIAN LOCATION



>25'-0" AND LARGER RADII CURB RETURN AND MEDIAN LOCATION

GENERAL NOTES:

1. ISLANDS SHALL BE PLACED ONLY ON SLOPES GREATER THAN 10:1.
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.
4. WHERE DETECTOR LOOPS ARE CUT INTO PAVEMENT, 6' ROUND LOOPS MAY BE USED IN LIEU OF 6' X 6' m SQUARE LOOP DETECTORS.



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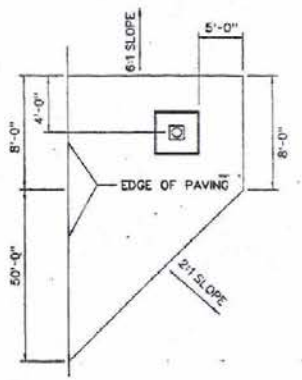


FOUNDATION ISLAND PLAN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

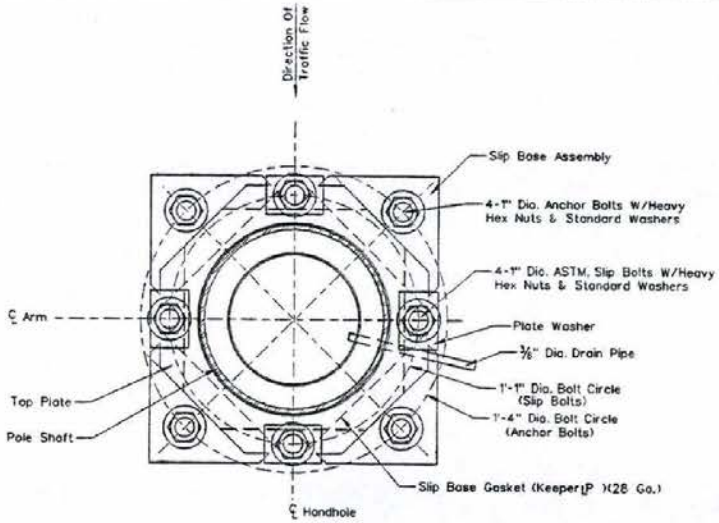
SIGNAL POLE AND LOOP DETECTOR LOCATIONS FOUNDATION ISLAND

CHIEF TRAFFIC ENGINEER

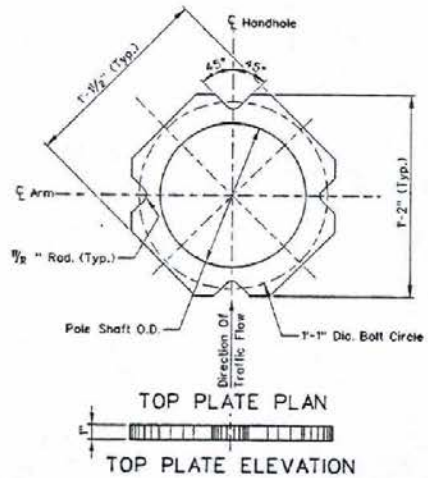
T-30.1.8 (623)

ADOPTED: 7/96 REVISION: 9/98

T-18



SAFETY BASE PLAN



TOP PLATE PLAN

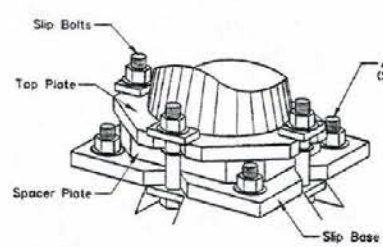
TOP PLATE ELEVATION

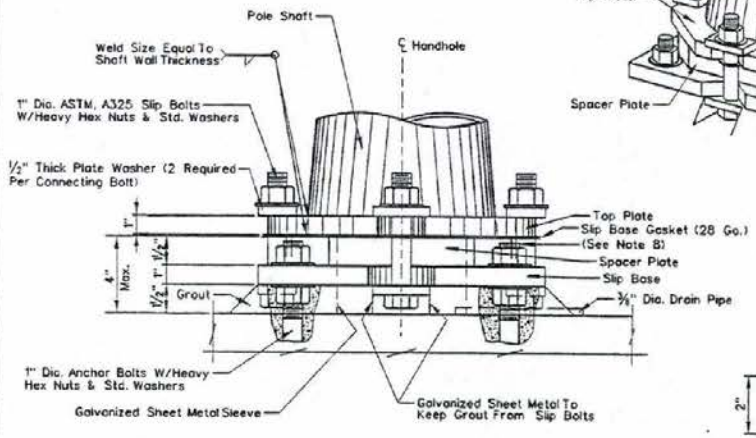
GENERAL NOTES:

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 80 FT. LBS.
   - B. LOOSEN BOLTS.
   - C. RETIGHTEN TO FINAL TORQUE USING THE FOLLOWING SEQUENCES:

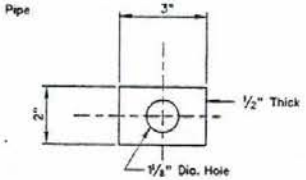
     1, 3, 2, 4

     60 FT. LBS., 65 FT. LBS. THEN 70 FT. LBS., RECHECK EACH BOLT FOR 70 FT. LBS.
   - 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 GALVILITE COLD GALVANIZING COMPOUND OR EQUIVALENT.

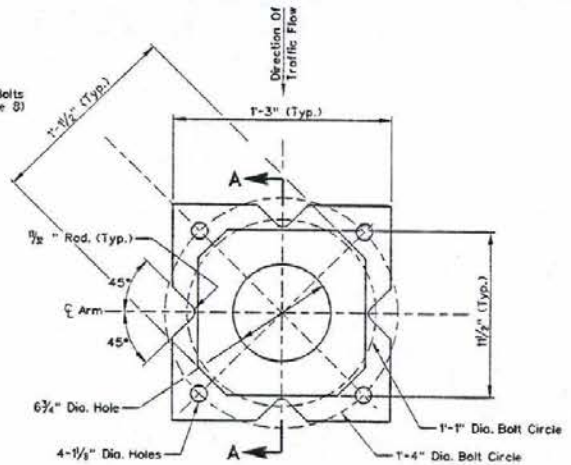




SAFETY BASE ELEVATION

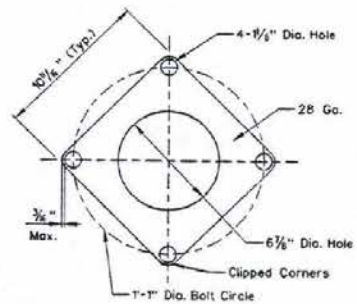


PLAN
PLATE WASHER



SLIP BASE & SPACER PLATE PLAN

SECTION A-A



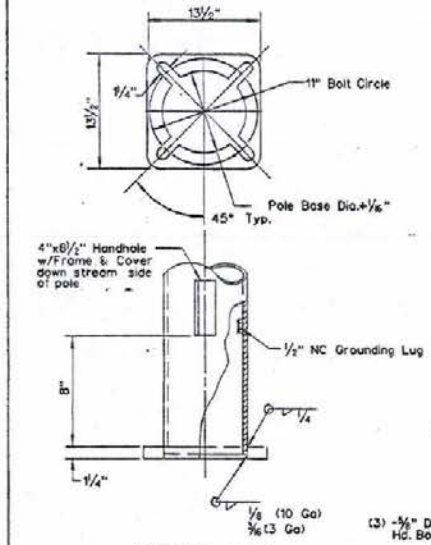
SLIP BASE GASKET

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SAFETY BASE

CHIEF TRAFFIC ENGINEER

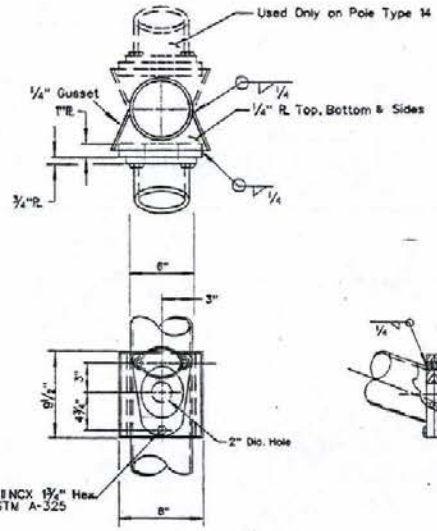
T-30.19	(623)
ADOPTED: 1/91	REVISION 10/98



DETAIL "A"

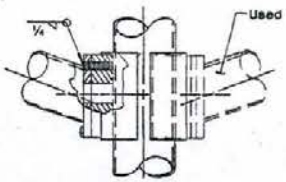
BASE PLATE

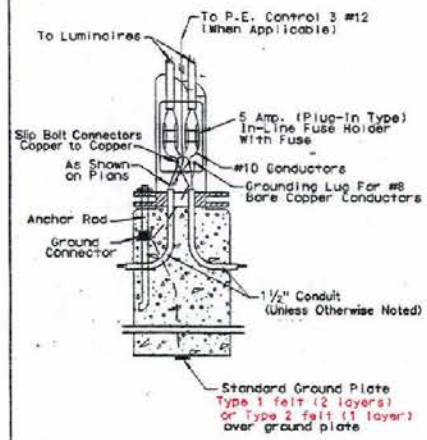
(NOT APPLICABLE WHEN SAFTEY BASES ARE REQ'D.)



DETAIL "C"

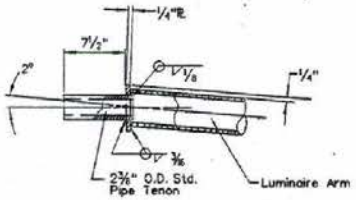
LUMINAIRE ARM CONNECTION





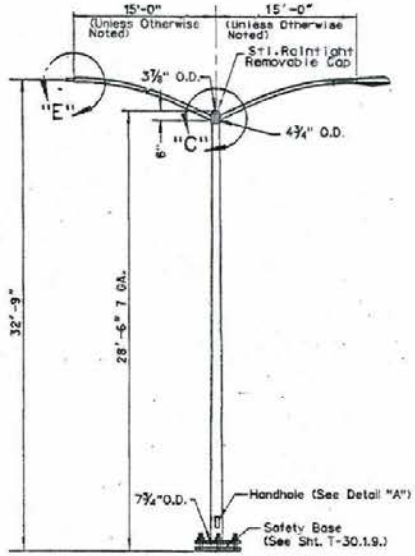
WIRING DIAGRAM FOR

POLE TYPE 7 AND TYPE 14

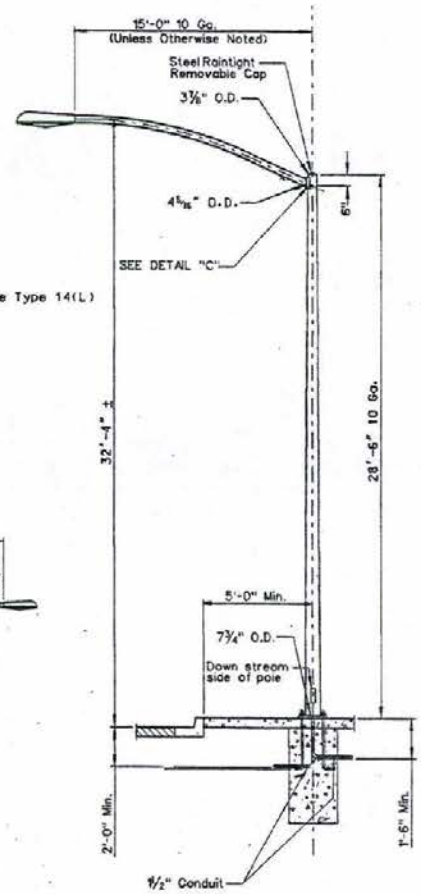


DETAIL "E"

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 3" 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 ARM.

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 6" 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 GAGE FOR SHAFT OF POLE WILL BE ACCEPTABLE ABOVE SIGNAL ARM ATTACHMENT SIMILAR TO POLE TYPE 20.

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 5' BEHIND THE BACK EDGE OF CURB TO CENTER OF POLE. (SEE SHEET T-30.1.6 FOR TYPICAL LOCATIONS.)
2. AT LOCATIONS WITHOUT CURB, POLES SHALL BE PLACED A MINIMUM DISTANCE OF 6' FROM SHOULDER OR A MINIMUM OF 10' FROM TRAVEL WAY, WHICH EVER IS GREATER.
3. FOR FOUNDATION DETAILS SEE SHEET T-30.1.16.
4. FOR FOUNDATION ISLAND SEE SHEET T-30.1.8.
5. CONCRETE SHALL BE CLASS A OR AA.

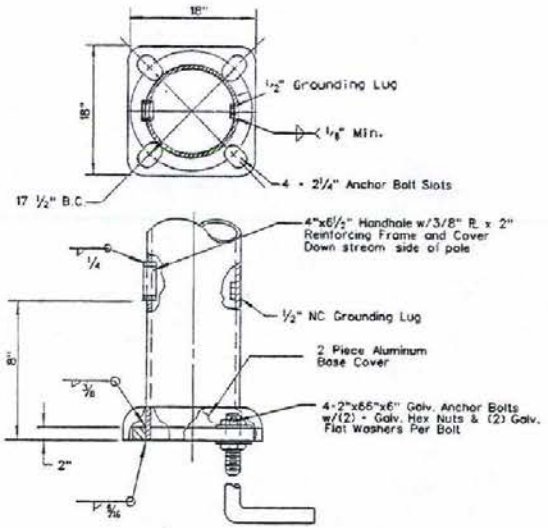
SAFETY BASES

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)

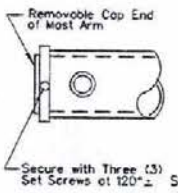
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 7 & 14 POLE LIGHTING & SIGNAL LIGHT POLES

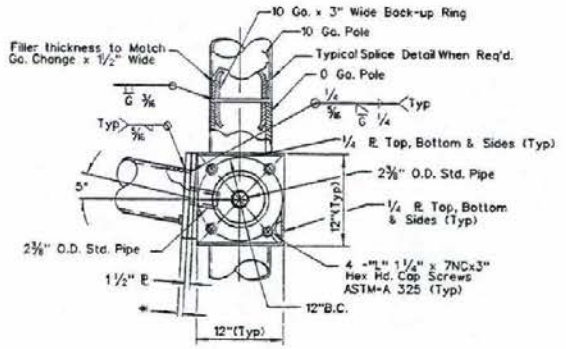
CHIEF TRAFFIC ENGINEER | T-30.1.10 (623) | ADOPTED: 12/79 | REVISION 10/98



DETAIL "B"
POLE BASE

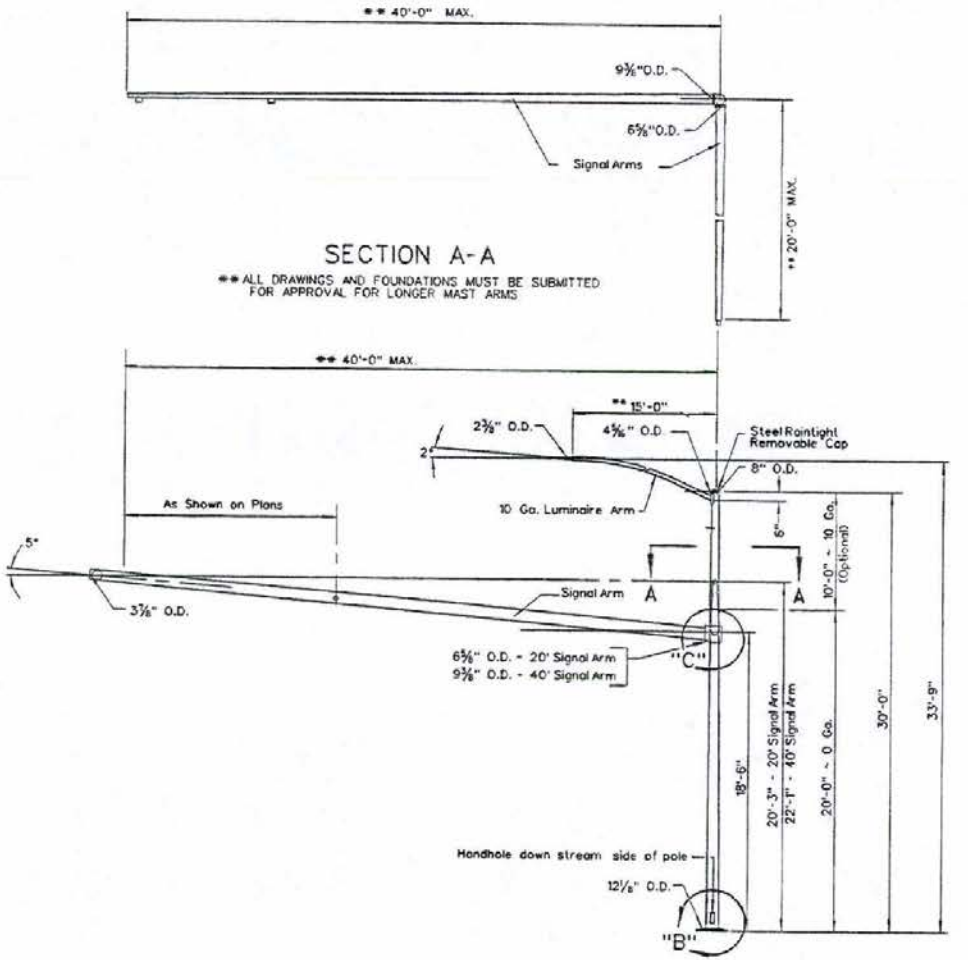


MAST ARM END CAP



DETAIL "C"
SIGNAL ARM CONNECTION

* 1" R. FOR 20' SIGNAL ARM
1¼" R. FOR 40' SIGNAL ARM



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-30.1.16
   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 17'-0".

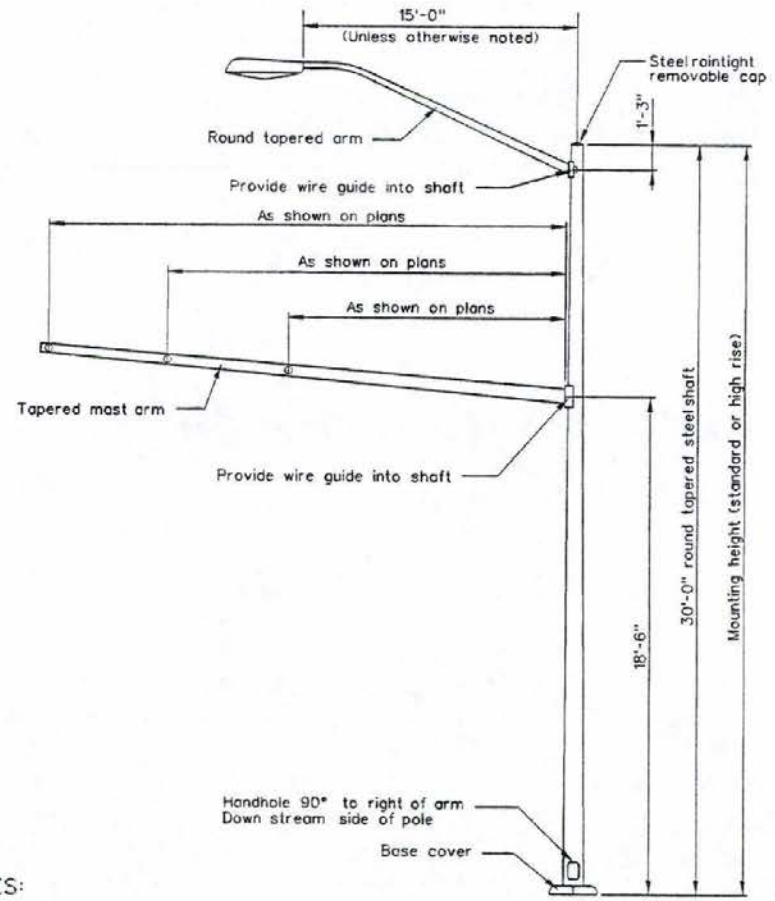
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 28 POLE

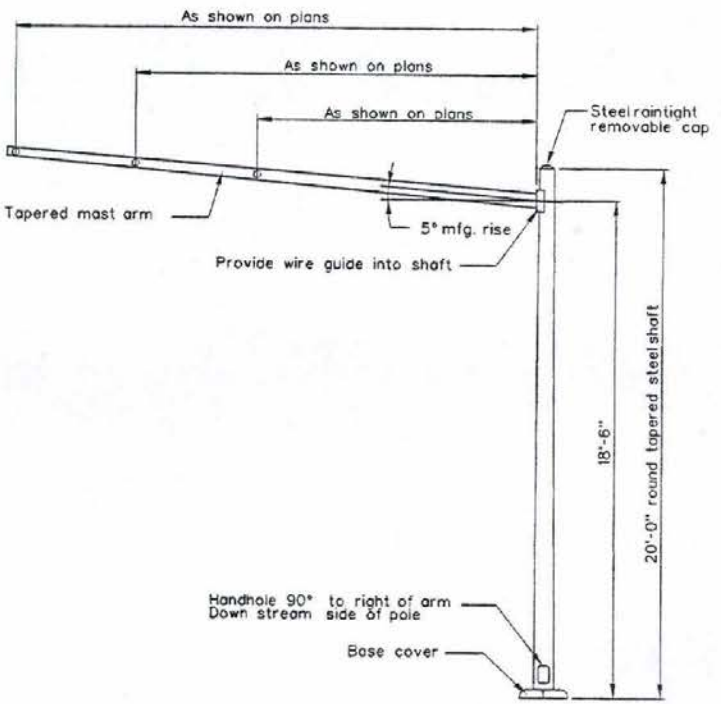
CHIEF TRAFFIC ENGINEER

T-30.1.12 (623)
ADOPTED: 12/79 REVISION 10/98

T-21



POLE TYPE 35 (MAST ARMS 45' AND LESS)
POLE TYPE 35-A (MAST ARMS 50' AND GREATER)



POLE TYPE 30 (MAST ARMS 45' AND LESS)
POLE TYPE 30-A (MAST ARMS 50' AND GREATER)

GENERAL NOTES:

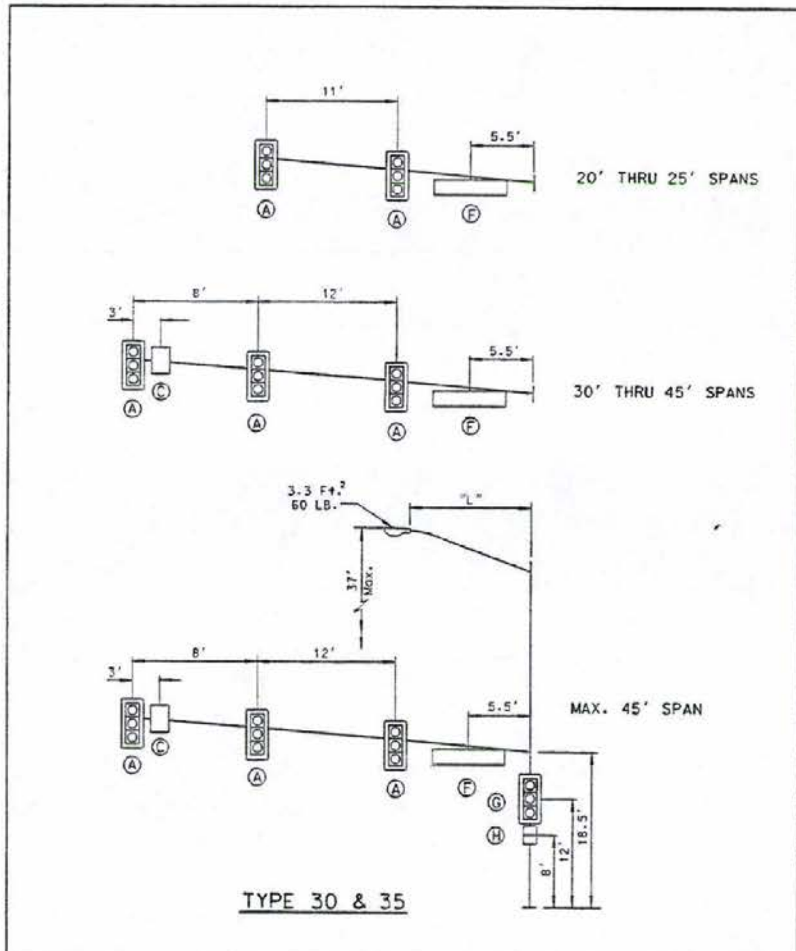
1. Shop drawings and structural calculations shall be submitted and approved, before poles may be utilized on project.
2. If indicated in the plans, all poles shall be prime painted by manufacturer and finish painted by contractor. See Standard Specification Sec. 714.03.01.
3. The distance from the roadway surface to the bottom of the mast arm signal heads shall be 17'-0".
4. See Standard Plan Drawing No. T-30.1.15 for pole base, handhole, signal arm and luminaire attachment details.

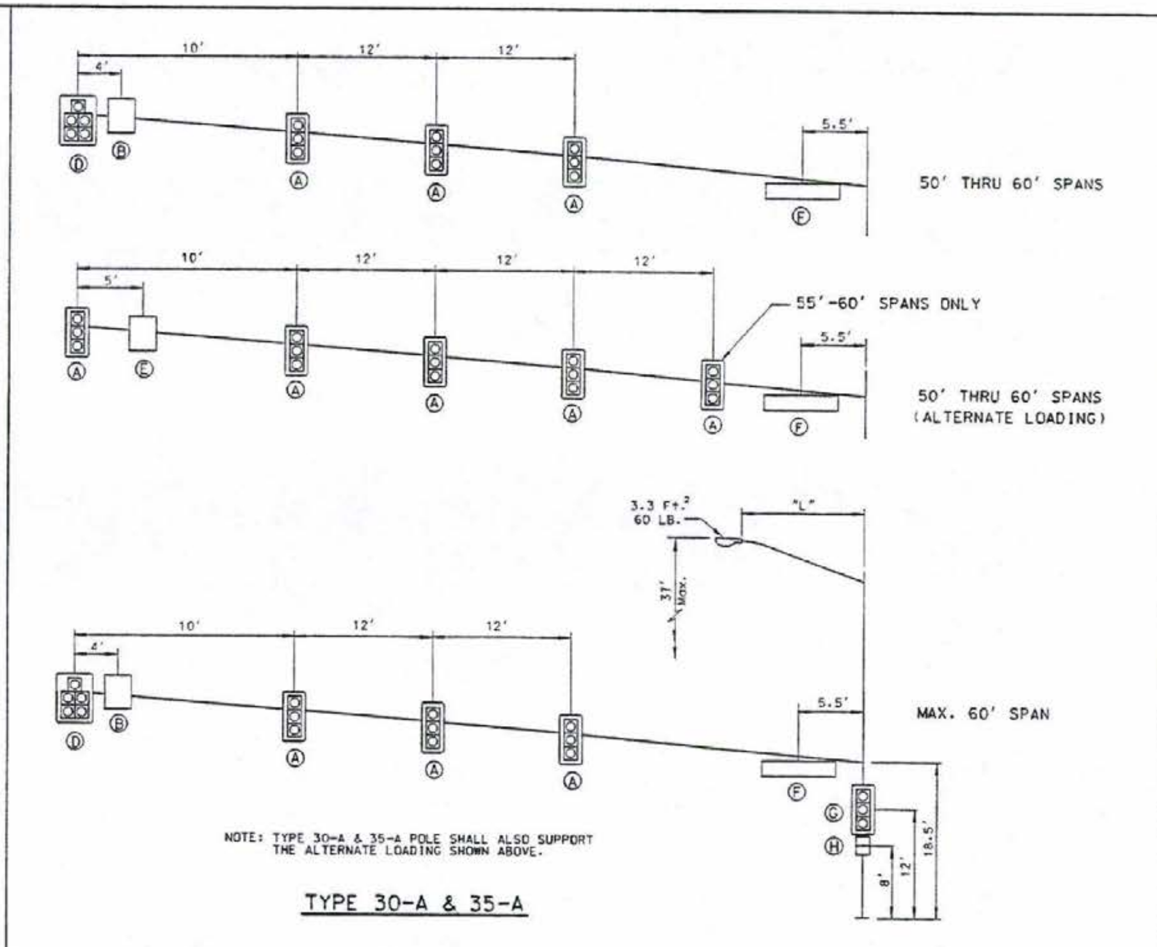
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 30 AND 35 POLES

T-30.1.13 (623)

CHIEF TRAFFIC ENGINEER ADOPTED: 7/96 REVISION: 8/96





DEVICE	DESCRIPTION	PROJECT AREA (Ft.²)	WEIGHT (LBS.)
Ⓐ SIGNAL	12"-3 Sec. w/Backplates (2M)	9.80	40
Ⓑ SIGN	R10-12 24"x30"	5.00	15
Ⓒ SIGN	R3-4 24" x 24"	4.00	10
Ⓓ SIGNAL	12"-5 Sec. w/Backplates	13.68	80
Ⓔ SIGN	R10-5d S 36" x 45"	11.25	30
Ⓕ SIGN	Street Name-Free Swinging 1.66' x 8'	13.44	100
Ⓖ SIGNAL	Dual-12"-3 Sec. w/Backplates	17.34	80
Ⓗ SIGNAL	Dual-Pedestrian	8.00	60

LUMINAIRE ARM DATA

ARM SPAN "L" (FT.)	FIXED END DIA. (IN.)	FREE END DIA. (IN.)	GAUGE	LUMINAIRE MOUNTING HEIGHT	
				Low Rise	High Rise
6	3.42	2.38	11	31'-0"	32'-0"
8	3.75	2.38	11	31'-6"	33'-3"
10	4.16	2.38	11	31'-9"	35'-0"
12	4.52	2.38	11	33'-0"	36'-6"
15	4.95	2.38	11	33'-6"	37'-0"

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 48.000 p.s.i. FOR COLD WORKED MATERIALS AND 50.000 p.s.i. FOR NON-COLD WORKED MATERIALS.

WIND VELOCITY:

80 M.P.H. ISOTACH

STATE OF NEVADA
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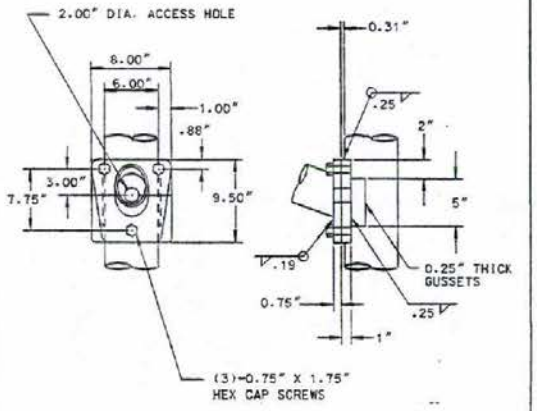
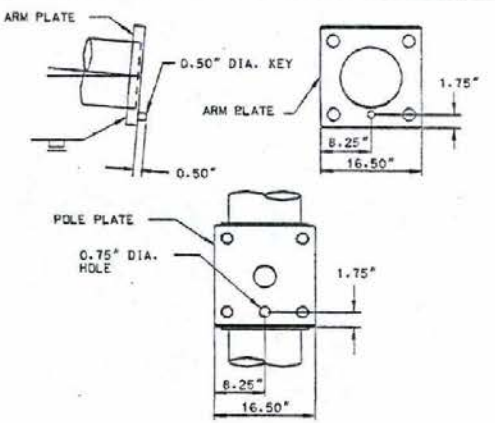
TYPE 30 & 30A 35 & 35A LOADING INFORMATION

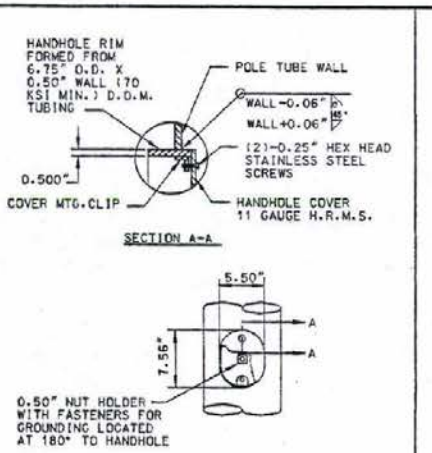
CHIEF TRAFFIC ENGR. | T-30.[illegible].14 | 623
ADOPTED 10/94 REVISION 10/98



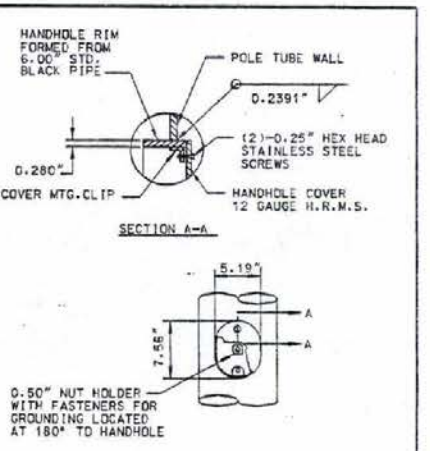
LUMINAIRE ARM ATTACHMENT



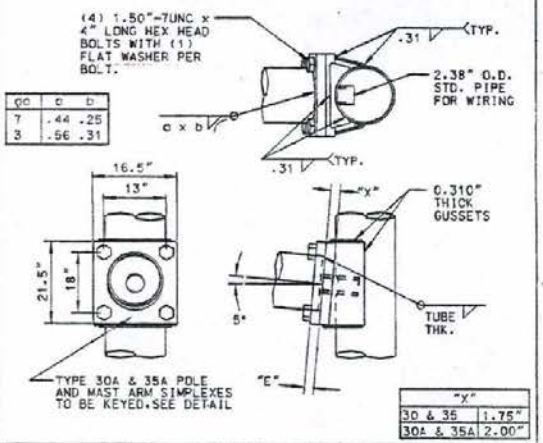
SIGNAL ARM SIMPLEX KEY



TYPE 30-A & 35-A HANDHOLE



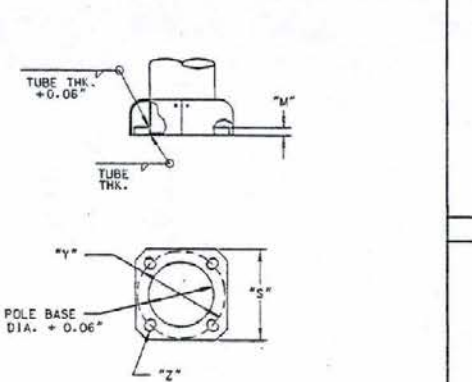
TYPE 30 & 35 HANDHOLE



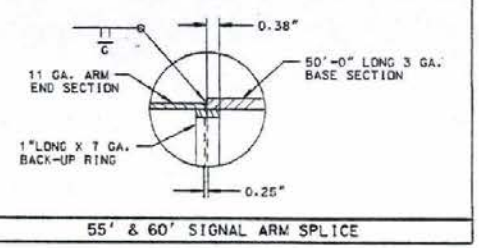
qo	a	b
7	.44	.25
3	.56	.31

"X"	
30 & 35	1.75"
30A & 35A	2.00"

SIGNAL ARM ATTACHMENT



POLE BASE PLATE



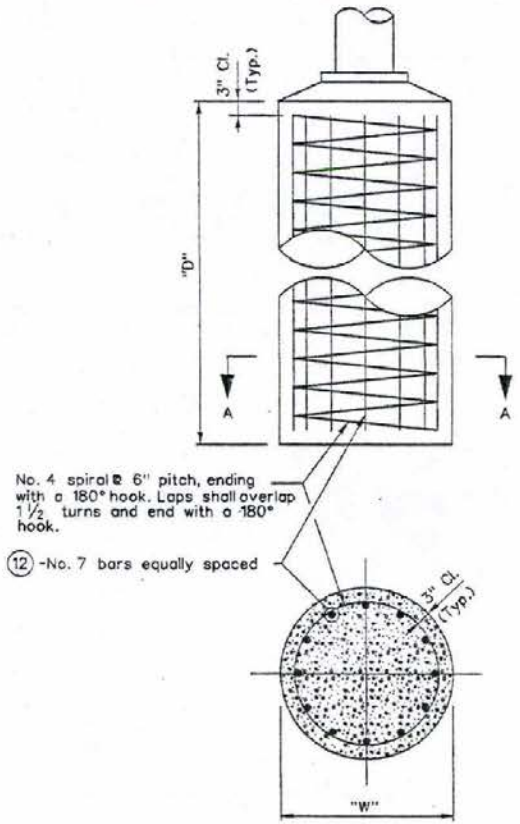
55' & 60' SIGNAL ARM SPLICE

POLE BASE PLATE				
TYPE	SQUARE "S" (in.)	BOLT CIRCLE "Y" (in.)	THK. "M" (in.)	HOLE "Z" (in.)
30 & 35	17.00	16.5	1.50	2.00
30A & 35A	19.00	19.00	1.75	2.25

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 30 & 30A 35 & 35A DETAILS

T-30.1.15 623
CHIEF TRAFFIC ENGR. ADOPTED: 10/94 REVISION: 10/98



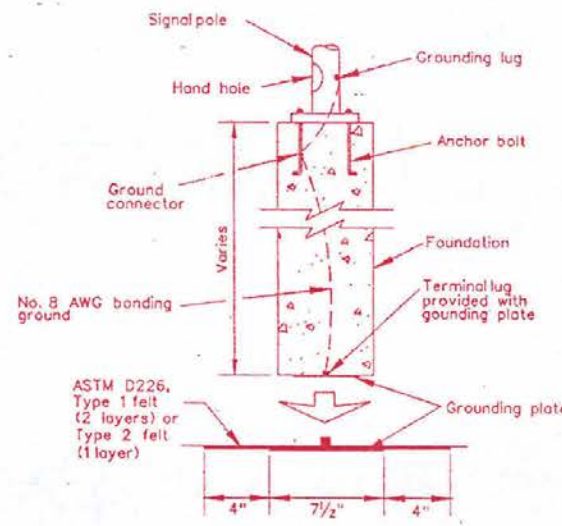
Note: Concrete shall be Class A or AA.

SECTION A-A
PILE FOUNDATION

PILE FOUNDATION TABLE

POLE TYPE	MAST ARM LENGTH	**"D"	**"W" ①	ANCHOR BOLTS (4 EACH)
1A & 1B	N/A	3'-0"	2'-0"	3/4" x 18" x 4"
7 AND 14	ALL	5'-0"	2'-6"	*1" x 36" x 4"
28	ALL	12'-0"	3'-0"	2" x 66" x 6"
30 AND 35	≤ 45'	12'-0"	3'-0"	1 3/4" x 60" x 6"
30A AND 35A	>45'	12'-0"	3'-0"	2" x 66" x 6"

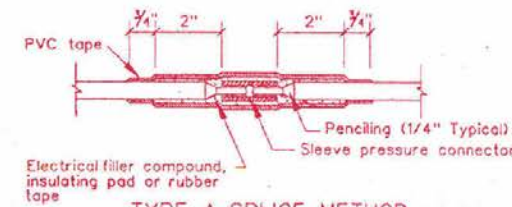
** Unless otherwise shown on plans.
* Not applicable when mounted on structures.
① - When "W" = 2'-0" use 4-No.5 bars equally spaced.
When "W" = 2'-6" use 8-No.5 bars equally spaced.



1. Connect bonding wire to the reinforcing steel cage near the midpoint of the foundation or anchor bolts.
2. Ground plate shall be made of nonferrous material (typically brass or copper). Install "NSI" ground plate or equivalent.

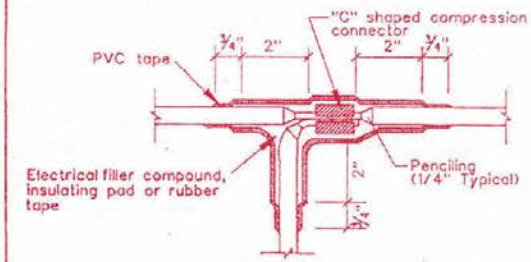
POLE GROUNDING DETAIL

GENERAL NOTES:
1. All dimensions are minimal.
2. Rubber tapes shall be rolled after application.
3. When PVC tape is used as a final layer, paint finished splice with electrical insulating coating.



TYPE A SPLICE METHOD
(TWO FREE ENDS)

1. Completely cover the splice area with an electrical insulating coating and allow to dry.
2. Apply electrical filler compound with minimum thickness of 1/8".
3. Apply 3 layers of half lapped PVC tape.



TYPE B SPLICE METHOD
(THREE FREE ENDS OR ONE FREE END AND ONE THROUGH CONDUCTOR)

1. Completely cover the splice area with an electrical insulating coating and allow to dry.
2. Apply 2 layers of electrical insulating pad with minimum thickness of 1/8" each layer or 2 layes, half lapped, synthetic oil resistant, self fusing rubber tape.
3. Apply 3 layers of half lapped PVC tape.

CONDUCTOR SPLICING METHODS

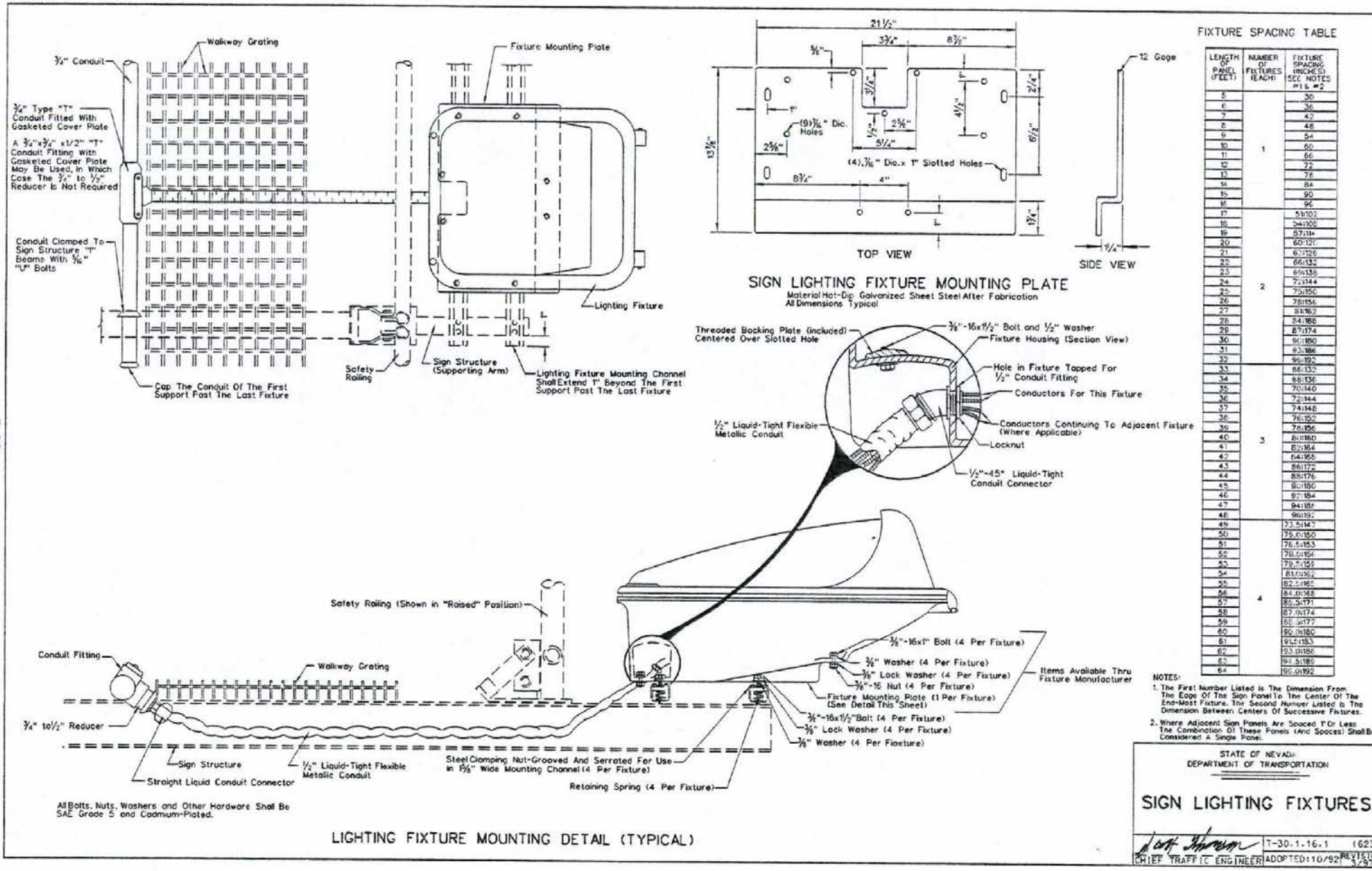
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PILE FOUNDATION, POLE GROUNDING DETAIL, CONDUCTOR SPLICE METHODS

CHIEF TRAFFIC ENGINEER

T-30.1.16	(623)
ADOPTED 8/98	REVISION

T-25



FIXTURE SPACING TABLE

LENGTH OF PANEL (FEET)	NUMBER OF FIXTURES (EACH)	FIXTURE SPACING (INCHES) SEE NOTES #1 & #2
5	1	30
6		36
7		42
8		48
9		54
10		60
11		66
12		72
13		78
14		84
15		90
16		96
17	2	51|102
18		54|108
19		57|114
20		60|120
21		63|126
22		66|132
23		69|138
24		72|144
25		75|150
26		78|156
27		81|162
28		84|168
29		87|174
30		90|180
31		93|186
32		96|192
33	3	66|132
34		68|136
35		70|140
36		72|144
37		74|148
38		76|152
39		78|156
40		80|160
41		82|164
42		84|168
43		86|172
44		88|176
45		90|180
46		92|184
47		94|188
48		96|192
49	4	73.5|147
50		75.0|150
51		76.5|153
52		78.0|156
53		79.5|159
54		81.0|162
55		82.5|165
56		84.0|168
57		85.5|171
58		87.0|174
59		88.5|177
60		90.0|180
61		91.5|183
62		93.0|186
63		94.5|189
64		96.0|192

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 1'Or Less The Combination Of These Panels (And Spaces) Shall Be Considered A Single Panel.

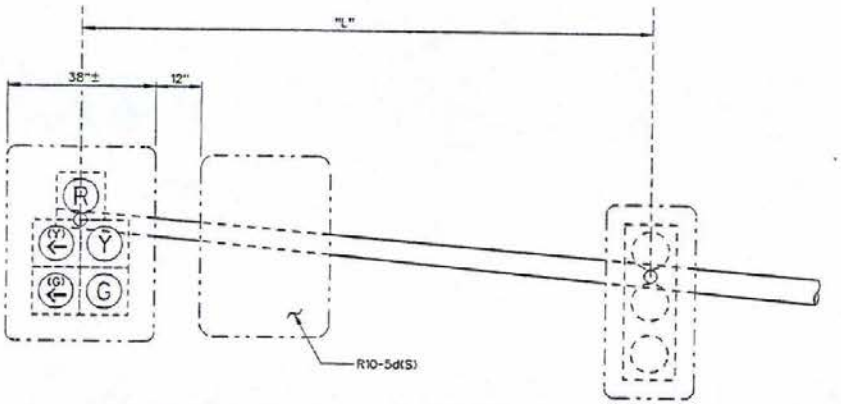
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

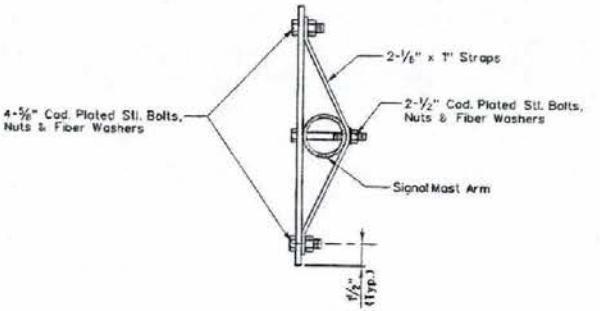
SIGN LIGHTING FIXTURES

CHIEF TRAFFIC ENGINEER

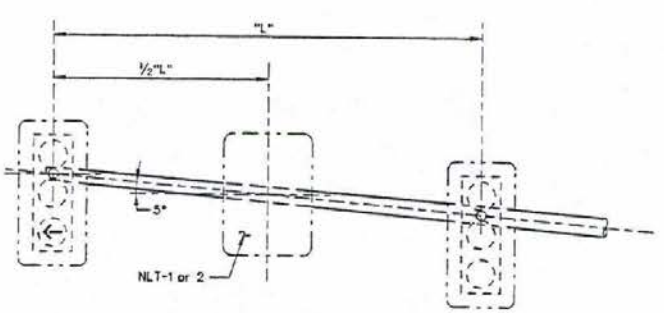
T-30.1.16.1 (623)
ADOPTED: 10/92 REVISION: 5/97

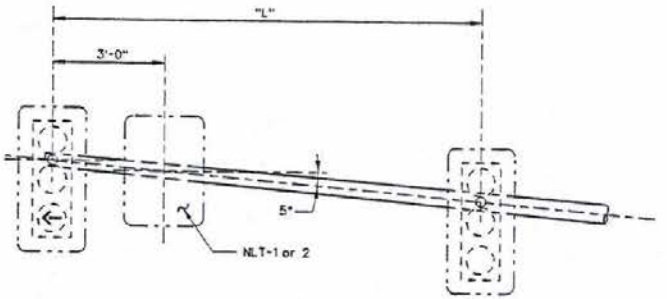
T-26





TYPICAL METHOD OF ATTACHMENT





MAST ARM SIGNAL AND SIGN PLACEMENT

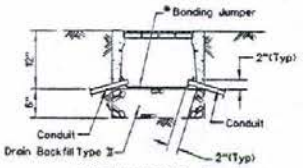
"L" = AS SHOWN ON PLANS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL
SIGN PLACEMENT

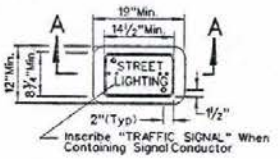
CHIEF TRAFFIC ENGINEER

T-30.1.17 (623)
ADOPTED 12/79 REVISION 3/97

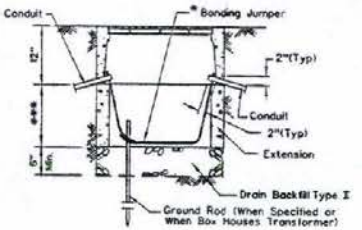


SECTION A-A

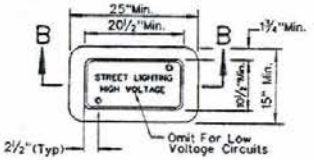
*** NOTE: WHEN CONCRETE PULL BOX IS FURNISHED. EXTENSIONS SHALL BE 10" MIN. WHEN PLASTIC PULL BOXES ARE FURNISHED. EXTENSION SHALL BE 8" MIN.



NO. 3½ PULL BOX

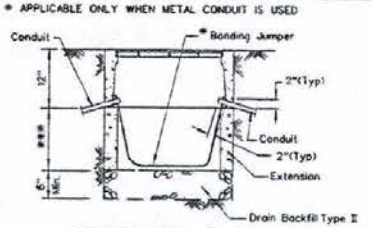


SECTION B-B

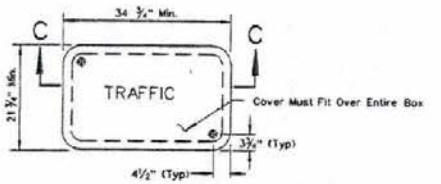


NO.5 PULL BOX

* APPLICABLE ONLY WHEN METAL CONDUIT IS USED

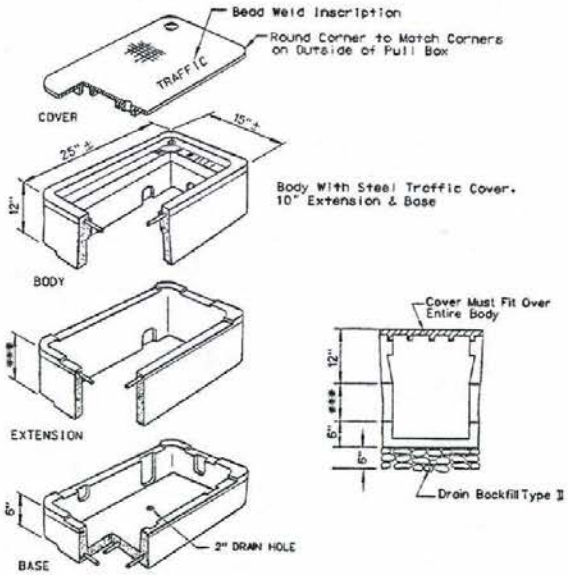


SECTION C-C

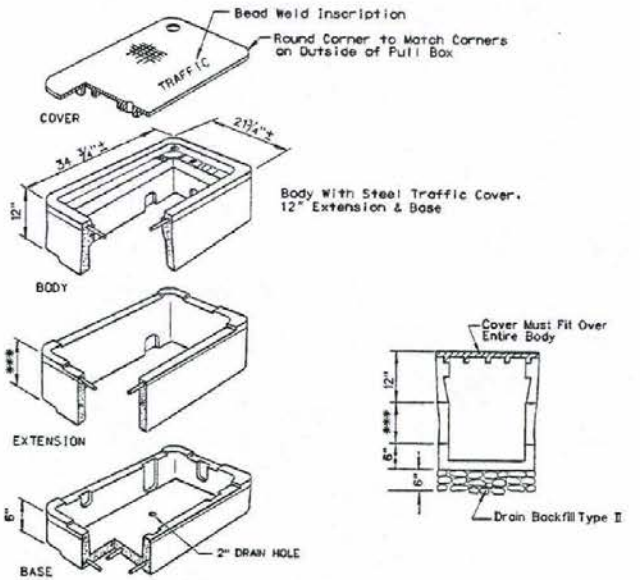


NO.7 PULL BOX

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



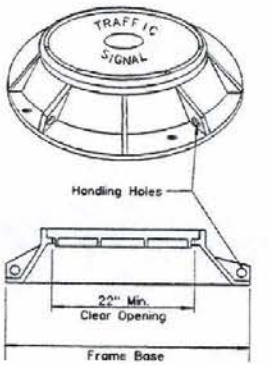
SPECIAL NO.5 PULL BOX



SPECIAL NO.7 PULL BOX

NOTES FOR PULL BOXES

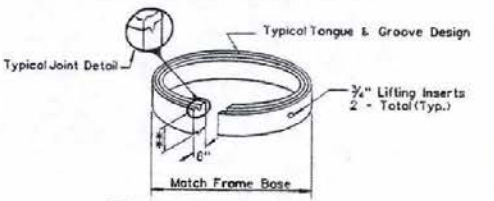
1. USE STEEL COVER WHEN BOX IS SUBJECT TO VEHICULAR TRAFFIC LOADS. HOWEVER, WHEN THE BOX IS LOCATED IN THE TRAVEL WAY, AN ELECTRICAL MANHOLE FRAME AND COVER SHALL BE INSTALLED.
2. WHEN THE PULL BOX IS INSTALLED IN A SIDEWALK AREA OR IN A STRUCTURE, THE DEPTH OF THE TOP OF THE PULL BOX SHALL BE ADJUSTED SO THAT THE TOP OF THE BOX 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 II DRAIN BACKFILL MATERIAL (2 FT. DEPTH ON EACH SIDE & 1 FT. 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 18 INCHES)



** 3", 6", 12" On Plans To Be Shown

COLLAR RISER

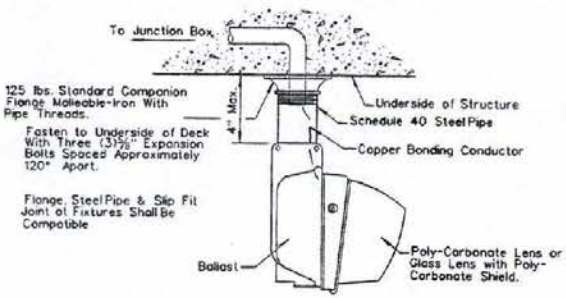
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PULL BOXES & ELECTRICAL MANHOLE FRAME & COVER

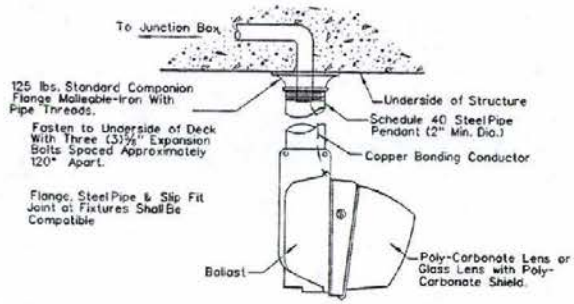
CHIEF TRAFFIC ENGINEER

T-30.1.16 (623)

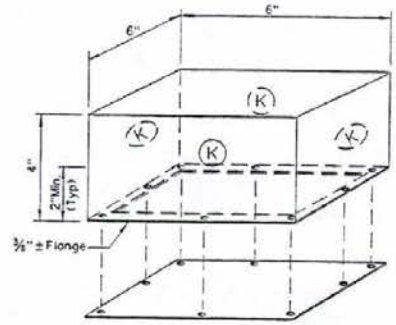
ADOPTED: 7/96 REVISION 6/97



TYPE "A" UNDERPASS LUMINAIRE

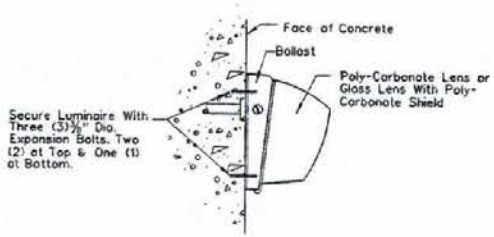


TYPE "C" UNDERPASS LUMINAIRE

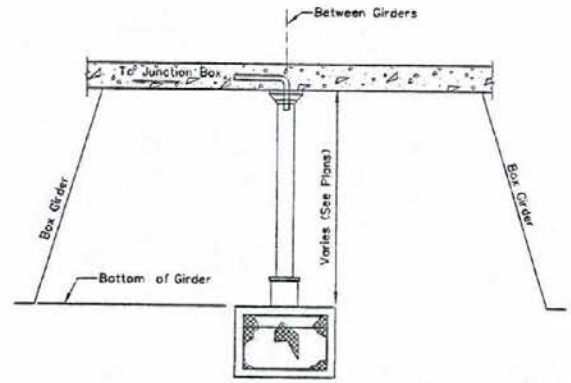


JUNCTION BOX DETAIL (J)

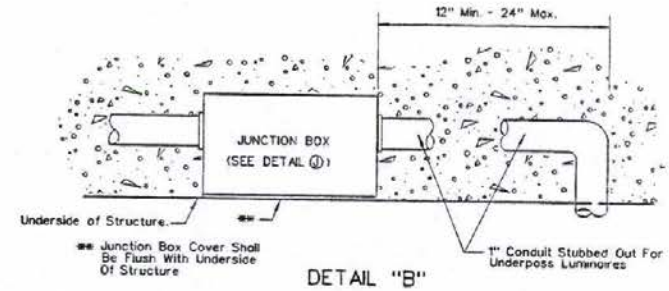
1. JUNCTION BOX AND COVER SHALL BE 16 GA. STEEL.
2. GALVANIZE ASSEMBLY AFTER FABRICATION.
3. BOX SHALL BE FLUSH WITH BOTTOM OF STRUCTURE.
4. FASTEN COVER BY DRILL AND TAP WITH EIGHT (8) #10-24 UNC BRASS SCREWS.
5. COVER SHALL BE ON BOX DURING POURING.
6. AN EQUIVALENT APPROVED MFG. BOX MAY BE USED IN LIEU OF DETAIL (J) JUNCTION BOX.
7. (K) KNOCK OUT FOR 1" CONDUIT. BOTTOM SHALL BE MIN. OF 3½" ABOVE COVER TO CLEAR STRUCTURAL STEEL.



TYPE "B" UNDERPASS LUMINAIRE



PENDANT INSTALLATION
(TYPE "C" UNDERPASS LUMINAIRE)



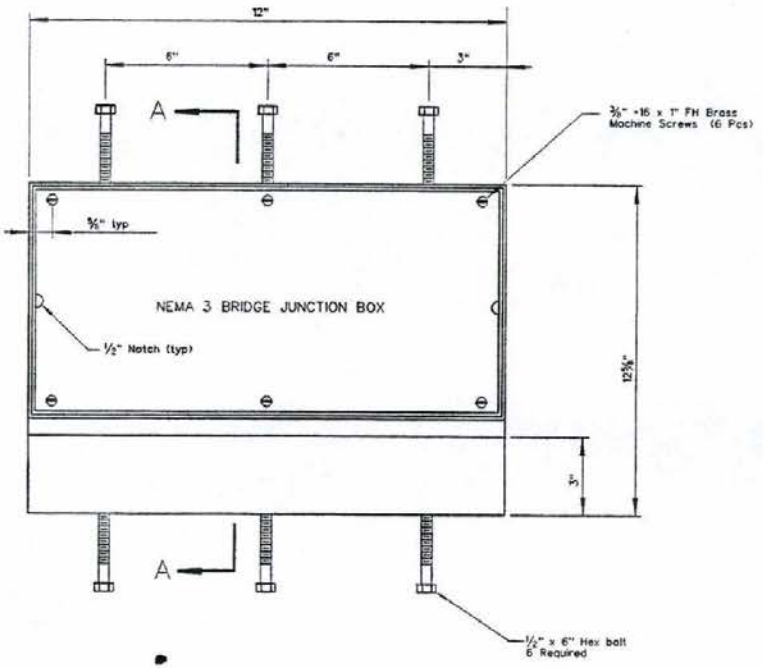
DETAIL "B"

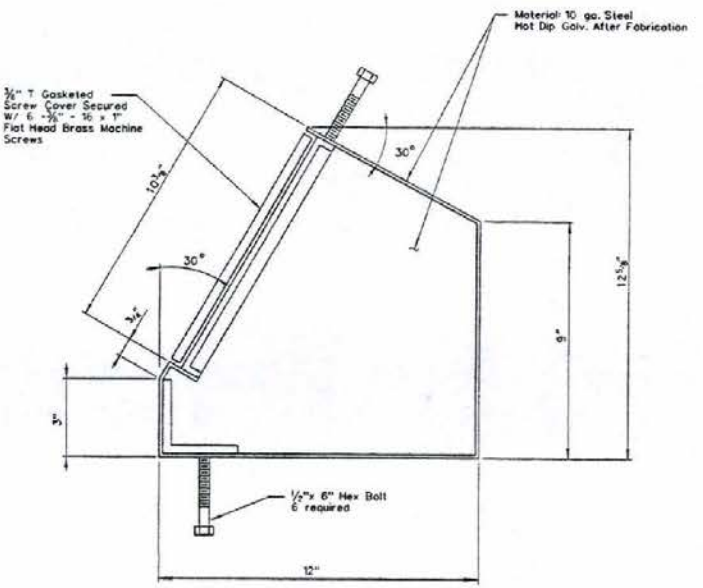
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

UNDERPASS LUMINAIRES & JUNCTION BOX

Jack Thomas — CHIEF TRAFFIC ENGINEER

T-30.1.19 (623)
ADOPTED: 12/79 REVISION 3/87





VIEW A-A

GENERAL NOTES:

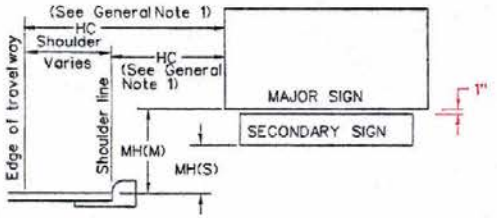
1. SEAM WELD CONSTRUCTION W/ 3/16" DIA FILLET WELD OUTSIDE EDGES. TACK WELD CONSTRUCTION FOR INNER FRAME AND ANGLE 1/4" x 3/4" x 5" CENTERS.
2. GASKET MATERIAL 1/2" x 2" NEOPRENE EPDM AND SBR SPONGE WITH PSA.

T = THICKNESS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

BRIDGE / BARRIER RAIL JUNCTION BOX

CHIEF TRAFFIC ENGINEER	T-30.1.20 ADOPTED: 7/96	623 REVISION 10/98



SIGN LOCATION (GENERAL)

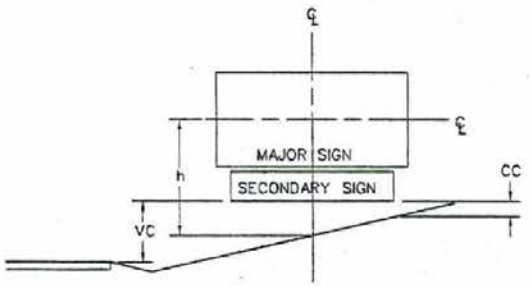
Freeways And Expressways	8' (M) 5' (S)
Commercial, Residential, Curb & Gutter	7' (M) 6' (S)
Rural Roads And Interchange Ramps	7' (M) 6' (S)
Freeway Entrance Assembly	2' (S)

(M) Major Sign (S) Secondary Sign

MINIMUM MOUNTING HEIGHTS (MH)

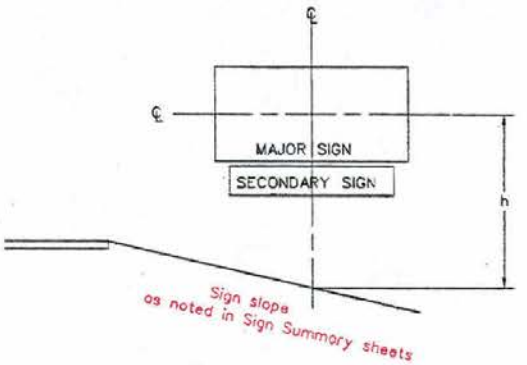
GENERAL NOTES:

1. HC should not be less than 6' from the shoulder line. If no shoulder, HC should not be less than 12' from the edge of travelway. In urban areas, a lesser clearance may be used where necessary.
2. For sign panel bracing details, see T-31.1.4
3. All sign supports shall be of breakaway design.
4. For double post braced supports, maintain HC > clear zone width maximum of 30', except when protected by guardrail or barrier rail. For clear zone widths, refer to AASHTO Roadside Design Guide 1996 Ed. Chapter 3.
5. Sign island required when h>15'-0", or sign slope is steeper than 1:6, or when required in contract plans.
6. See sheet T-31.1.5 for Sign island construction.
7. For sign posts, see Post Selection charts, sheet T-31.1.2.
8. For materials not directly specified, see Standard Specifications, & Special Provisions.
9. Sign panels to be aluminum sheet construction.
10. CC-Corner clearance
    HC-Horizontal clearance
    VC-Vertical clearance
11. Prepaint the exposed portion of fastening hardware on the face of the sign panels with baked enamel to match the sign face.



SIGN IN EXCAVATION

NOTES:
1. Min CC=1.0 '
2. Max VC for single sign=10.0'
3. Max VC for double sign =11.0'
4. Max h=15.0'
5. Special design may be necessary if given limits are exceeded.



SIGN IN EMBANKMENT

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
GENERAL
SIGN LOCATION

CHIEF TRAFFIC ENGR. | T-31.1.1 (627) | ADOPTED: 8/99 | REVISION: 8/99

POST SELECTION CHART

SIGN AREA(a) (SQ. FT.)	h(FT.)					
	0'≤h<8'	8'≤h<10'	10'≤h<12'	12'≤h<14'	14'≤h<15'	15'≤h<17'
0≤a<6.5	A	A	A	A	A	B
6.5≤a<8.5	A	A	A	B	B	C
8.5≤a<11	A	A	B	C	C	C
11≤a<13	A	B	C	C	C	D
13≤a<15	A	C	C	D	D	D
15≤a<17	B	C	C	D	D	F
17≤a<19.5	C	C	D	D	D	F
19.5≤a<21.5	C	C	D	E	F	F
21.5≤a<23.5	C	C	D	E	F	F
23.5≤a<43	C	C	E	E	F	F
43≤a<70	E	E	E	E	F	F
70≤a<140	E	E	E	E	F	F
140≤a<200	E	E	E	F	F	F

POST SELECTION CHART

POST TYPE	DESCRIPTION	REFERENCE SHEET
A	2½" Square Metal Post (12 gage)-single post	T-31.2.1
B	2½" Square Metal Post (10 gage)-single post	T-31.2.1
C	Single Post Unbraced 3" Dia Round Metal Post	T-31.3.1 thru T-31.3.2
D	Double Post Unbraced 3" Dia Round Metal Post	T-31.3.1 thru T-31.3.2
E	Double Post Braced (See Note 3) Post-3" Dia Round Metal Post Brace-3" Dia Round Metal Post	T-31.4.1 thru T-31.4.3
F	Special Design: contact Traffic Engineering	

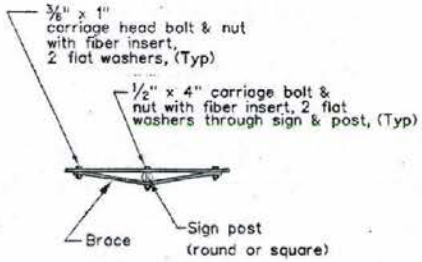
GENERAL NOTES:

1. Sign area is total of Major & Secondary signs.
2. Alternate posts must be approved by Traffic Engineering.
3. For double post braced supports, maintain HC > clear zone width maximum of 30', except when protected by guardrail or barrier rail. For clear zone widths, refer to AASHTO Roadside Design Guide 1996 Ed. Chapter 3.

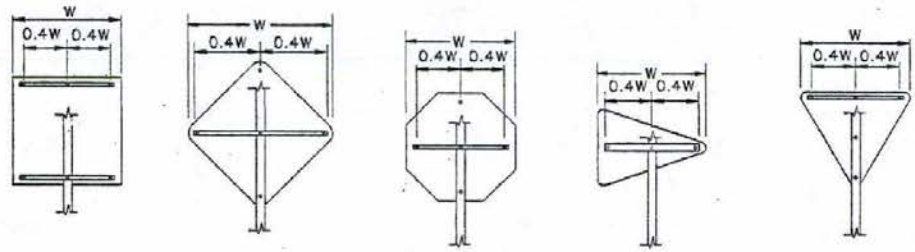
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
GENERAL
POST SELECTION CHARTS

CHIEF TRAFFIC ENGR. | T-31.1.2 (627) | ADOPTED: 7/86 | REVISION: 8/93



TOP VIEW
(ALL PANELS)

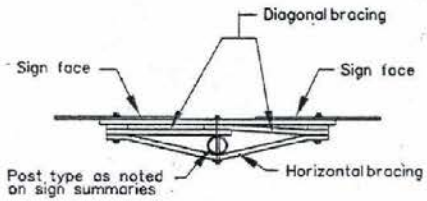


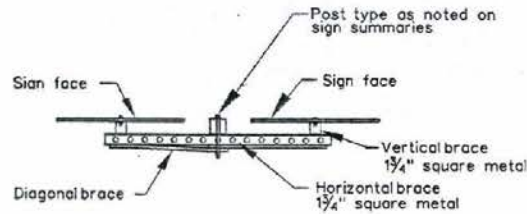
TYPICAL SINGLE PANEL BRACING

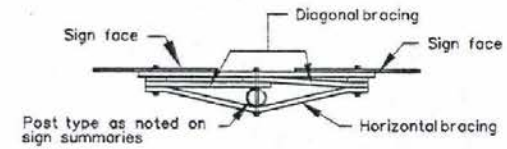
GENERAL NOTES:

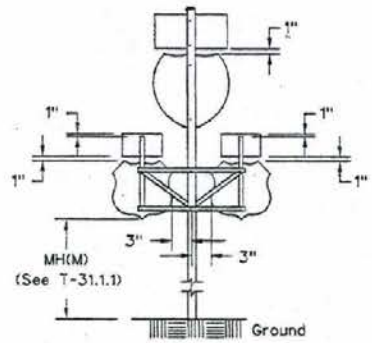
1. Brace(s) required if W>3'-0". Install as shown.
2. Brace: 3/8" x 1 1/4" aluminum alloy.
3. Cost for bracing is included in sign.

TYPICAL MULTIPLE PANEL BRACING

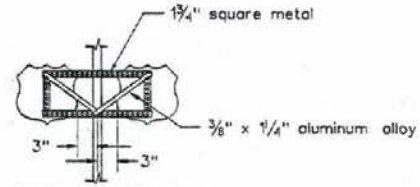




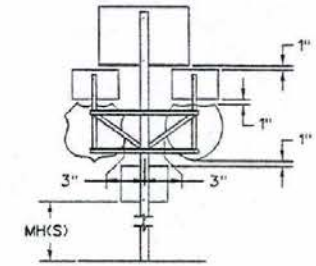




TYPICAL ROUTE MARKER ASSEMBLY



ALTERNATE BRACING
SQUARE METAL POST

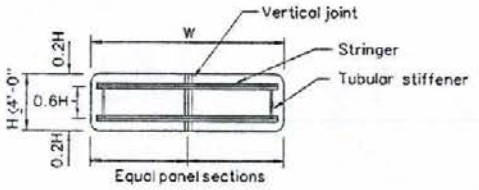


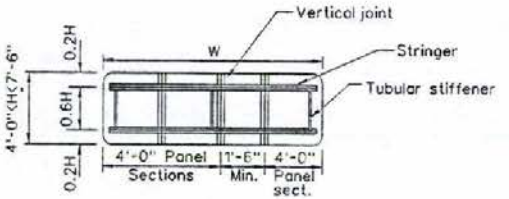
TYPICAL
FREEWAY ENTRANCE

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

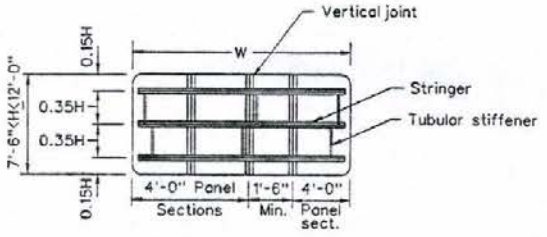
ROADSIDE SIGNS
GENERAL
SIGN PANEL BRACING

CHIEF TRAFFIC ENGR. | T-31.1.3 (627)
ADOPTED: 7/96 REVISION: 8/98

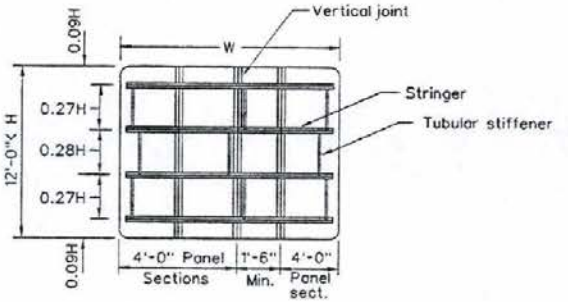




2 STRINGER MOUNTING



3 STRINGER MOUNTING



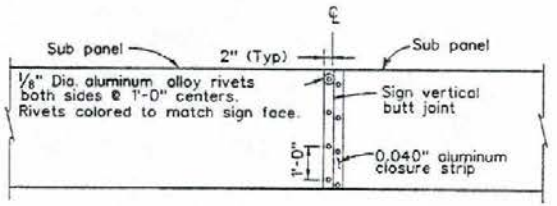
4 STRINGER MOUNTING

NOTE: To obtain desired panel width, Max. of 2 panels may be cut less than 4'-0", (1'-6" Min. each)

GENERAL NOTES:

1. Stringers: 3" X 2 11/16 " X 1/4" or 2-11/16" X 2 11/16 X 1/4" aluminum alloy z-bar.
2. Stringers required on all signs requiring multiple posts.
3. Tubular stiffeners required when W>3.0m
4. Cost for bracing is included in sign.
5. One vertical joint if W exceeds 12'. Two vertical joints if W exceeds 24'.
6. For alternate steel tube bracing, see Standard Plan Drawing T-31.1.5.

SUB PANEL ASSEMBLY & Z BAR BRACING

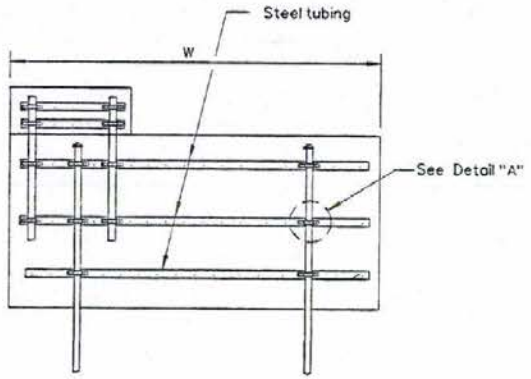


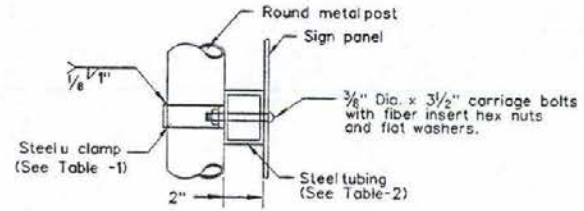
VERTICAL JOINT CLOSURE STRIP

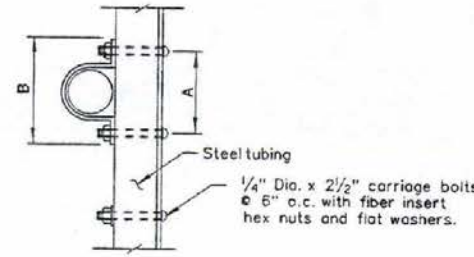
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
GENERAL
SIGN PANEL BRACING

CHIEF TRAFFIC ENGR. | T-31.1.4 (627) | ADOPTED: 8/80 | REVISION: 8/90

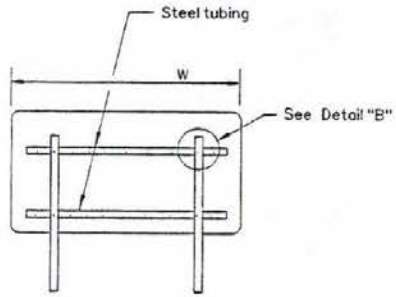


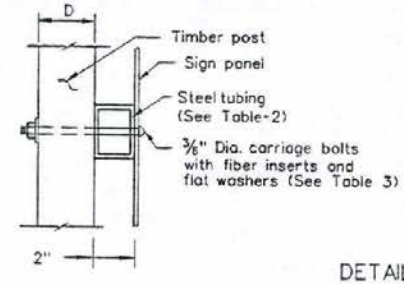


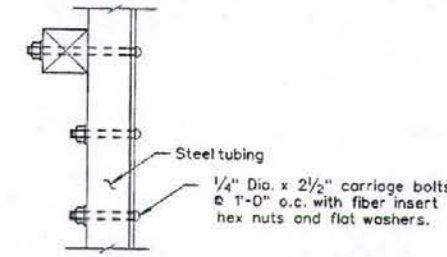


DETAIL "A"

(STEEL TUBE BRACING ON ROUND METAL POSTS)







DETAIL "B"

STEEL TUBE BRACING ON WOOD POSTS

GENERAL NOTES:

1. For sub-panel assembly, & vertical joint closure strip details, see Standard Plan Drawing T-31.1.4.

TABLE - 1 (Clamp Sizes)				
PIPE DIA.	O.D.	A	B	CLAMPSTOCK
3" Nom.	3 1/2"	5 5/16"	6 13/16"	1/4" x 1 1/2"

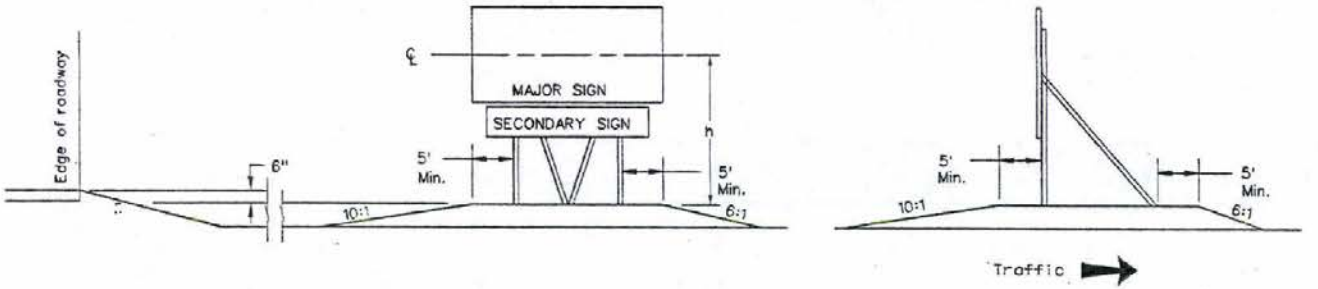
TABLE - 2 (Tubing Size)	
SIGN WIDTH (W)	TUBING SIZE
24' or Less	3"x2"x5/16"
24' to 28'	4"x2"x5/16"

TABLE - 3		
POST SIZE	"D"	BOLT SIZE
4"x4"	3 1/2"	3/8"Dia. x 6 1/4"
4"x6"	5 1/2"	3/8"Dia. x 6 1/4"
6"x6"	5 1/2"	3/8"Dia. x 8 1/4"
6"x8"	7 1/2"	3/8"Dia. x 10 1/4"

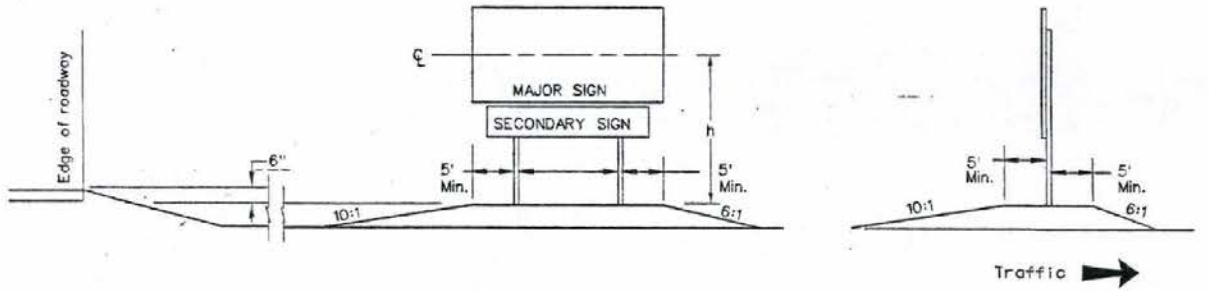
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
GENERAL
SIGN PANEL BRACING

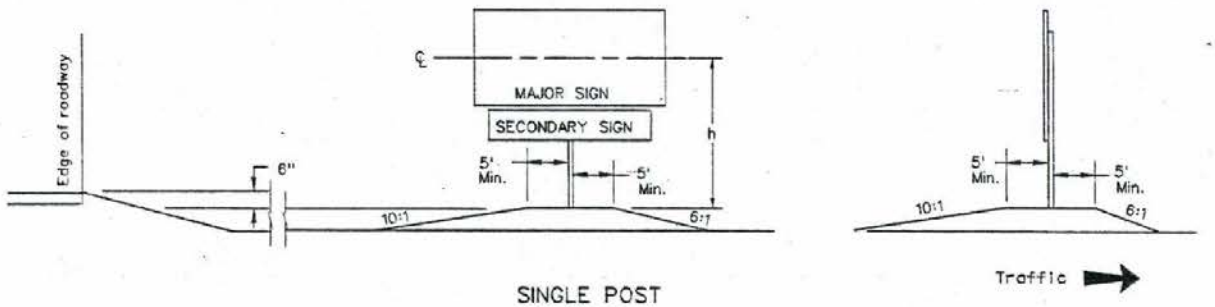
CHIEF TRAFFIC ENGINEER | T-31.1.5 (627) | ADOPTED: 8/82 | REVISION 5/96



DOUBLE POST BRACED



DOUBLE POST UNBRACED



SINGLE POST

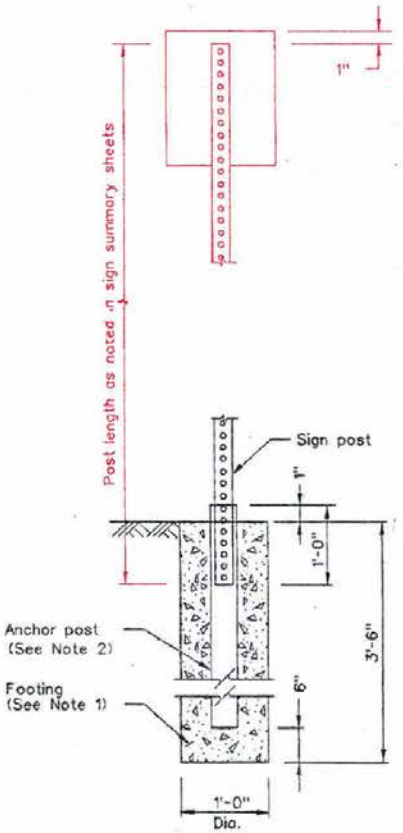
GENERAL NOTES:

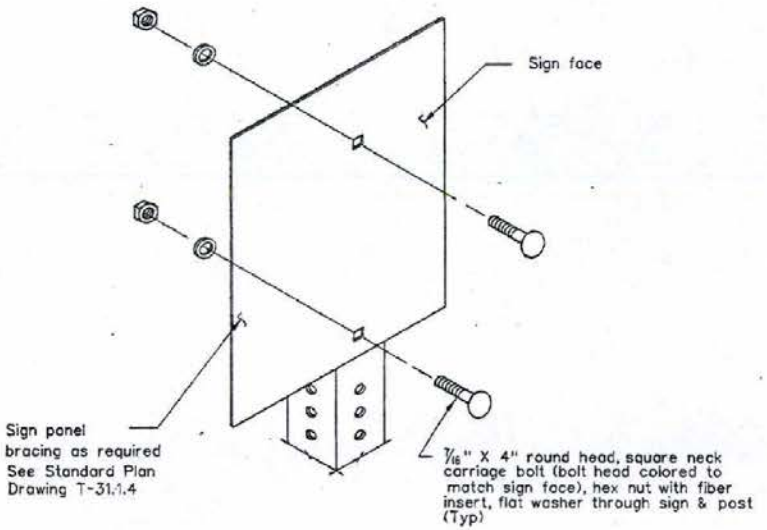
1. Sign islands to be compacted to 95%.
2. Payment for sign island will be as noted in contract plans and Special Provisions.

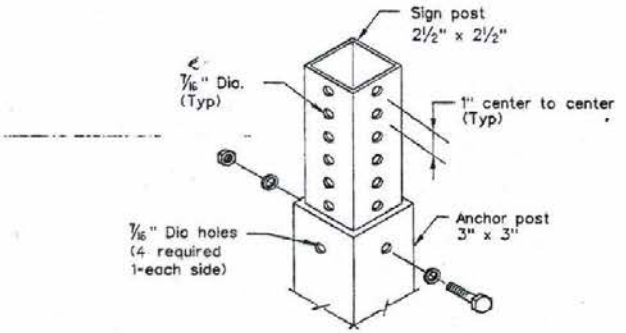
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
GENERAL
SIGN ISLANDS

CHIEF TRAFFIC ENGR. | T-31.1.6 (627) | ADOPTED: 10/88 | REVISION: 8/05







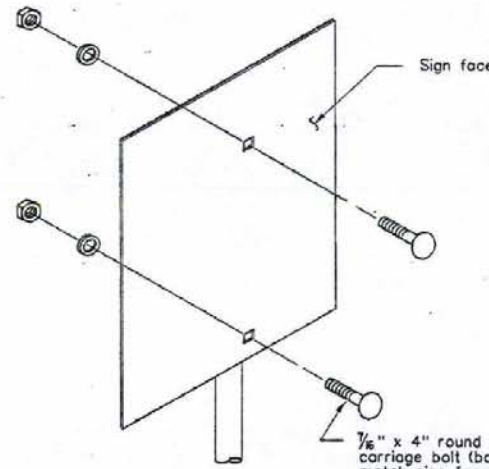
GENERAL NOTES:

1. Footings to be drilled holes as shown, & filled with class A or class AA concrete.
2. Anchor post included in cost of sign post.
3. For details on sign location, post type, panel bracing, and sign islands, See Standard Plan Drawings T-31.1.1 through T-31.1.6.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

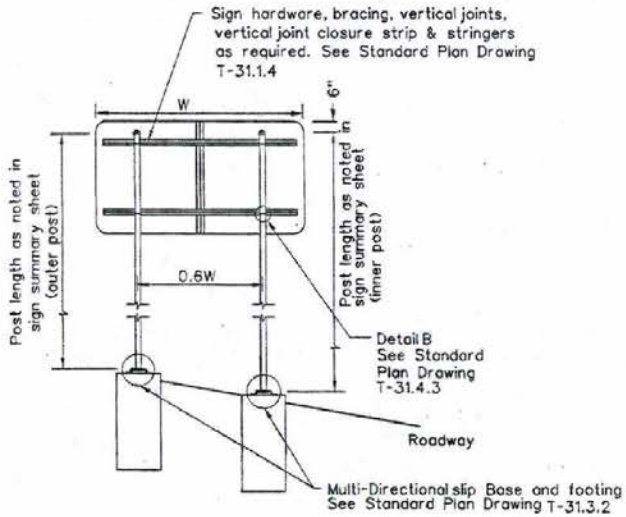
ROADSIDE SIGNS
(SQUARE METAL POSTS)

CHIEF TRAFFIC ENGR	T-31.2.1	(627)
	ADOPTED: 8/98	REVISION

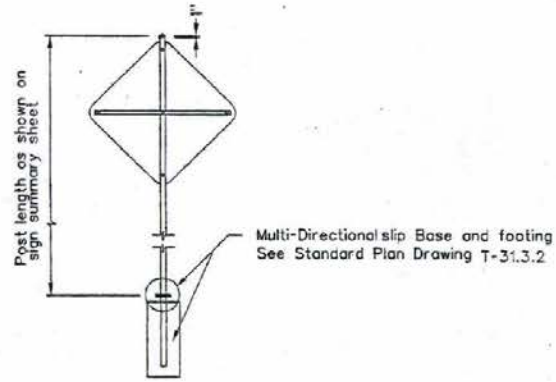


GENERAL NOTES:

1. Anchor post included in cost of sign post.
2. For details on sign location, post type, panel bracing, and sign islands, See Standard Plan Drawings T-31.1.1 through T-31.1.6.
3. Inner posts are those closest to roadway, and the outer posts are those farthest away.



DOUBLE POST UNBRACED

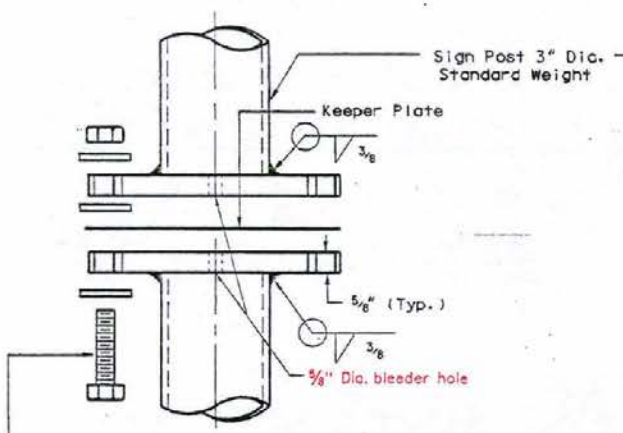


SINGLE POST

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

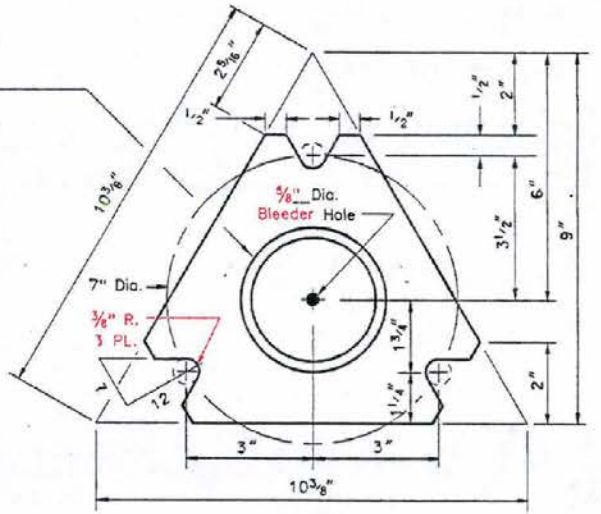
ROADSIDE SIGNS
ROUND METAL POSTS
UNBRACED

CHIEF TRAFFIC ENGR. | T-31.3.1 | ADOPTED: 6/96 | REVISION: | 15277



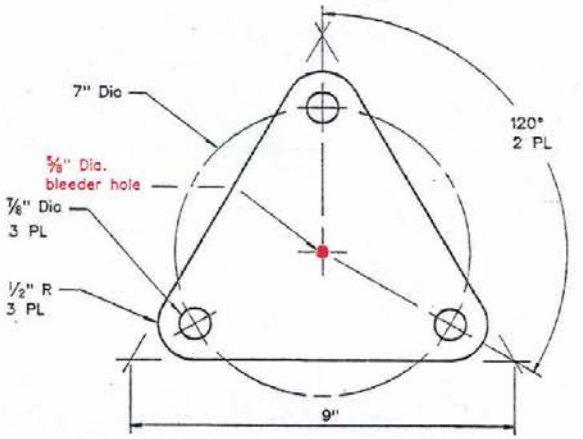
ASSEMBLY ELEVATION VIEW

5/8" -11 x 3 1/4" Bolt. Type 1 ASTM A 325 or Type 1 ASTM A 449 (grade 5); Each With Three USS Through Hardened Washers ASTM F 436 Type 1; And One Nylon Insert Stop Nut ASTM A 563 DH. All Items shall be galvanized as per manufacturer's specifications. Torque within the range of 24 - 29 Ft-Lb. See BOLT DETAIL below.



PLAN VIEW
TOP/BOTTOM PLATE

Plate Thickness = 5/8"



PLAN VIEW
KEEPER PLATE

0.002 to 0.004 in. Thickness
Galvanize After Fabrication

GENERAL NOTE:

1. All parts and hardware shall be galvanized as per Section 715 of the Nevada DOT Standard Specifications, except as noted.
2. Multi-directional slip bases are not required behind concrete barrier rail or behind guardrail where the sign post is greater than 2'-6" from the back side of the guardrail post.
3. For details on sign location, post type, panel bracing, and sign islands, see Standard Plan Drawings T-31.1.1 through T-31.1.6.

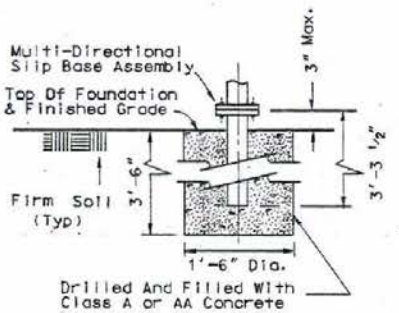
n = A typical manufacturer's identification

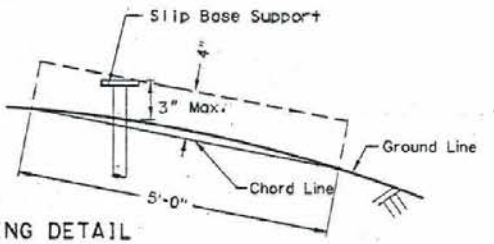
Type 1 ASTM A449
5/8" X 3 1/4" bolt

Type 1 ASTM A325
5/8" X 3 1/4" bolt

TOP VIEW

BOLT DETAIL





FOOTING DETAIL

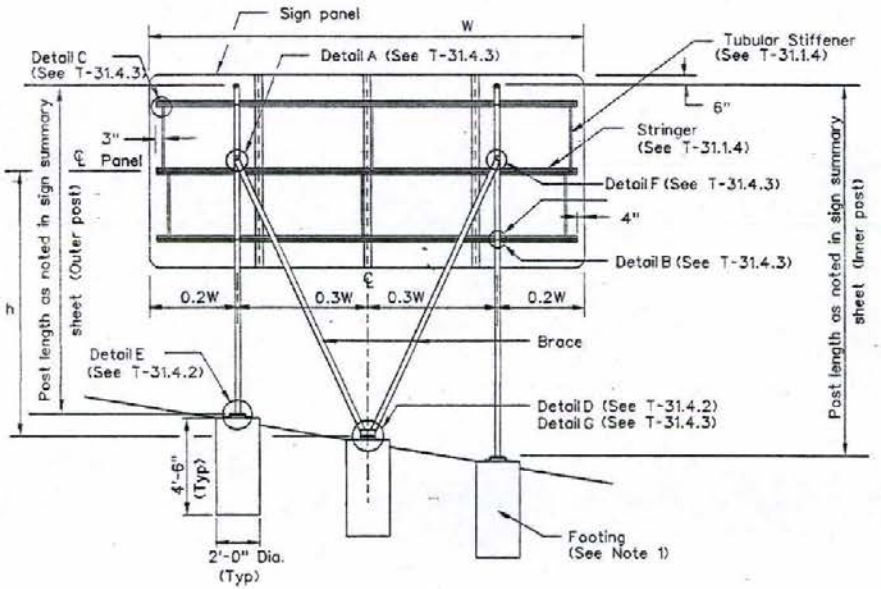
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
ROUND METAL POSTS
MULTI-DIRECTIONAL
SLIP BASE

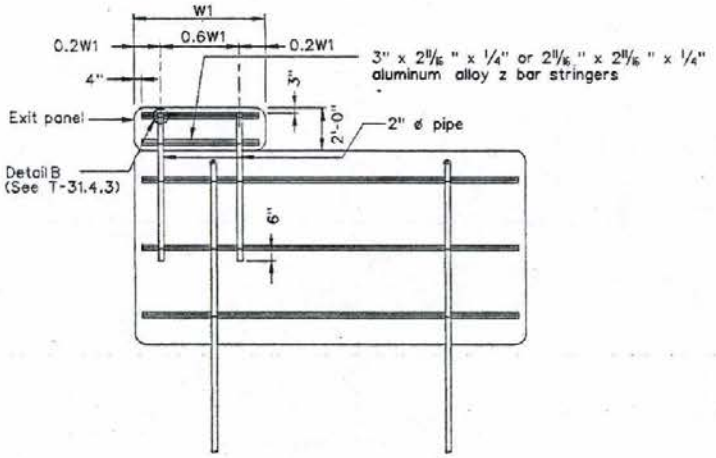
T-31.3.2 (627, 715)

CHIEF TRAFFIC ENG. ADOPTED: 7/98 REVISION: 8/98

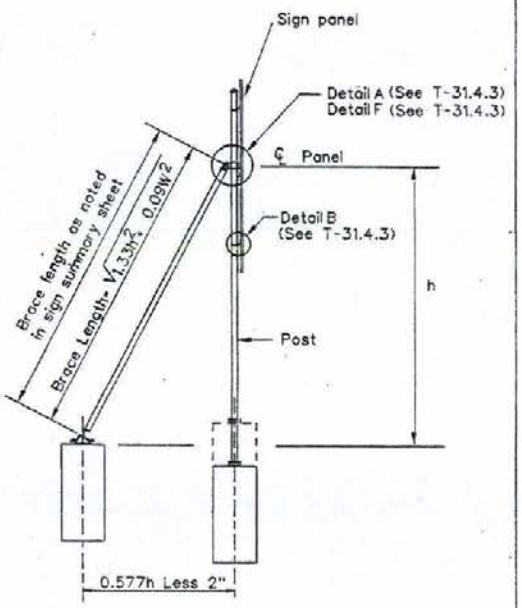
T-39

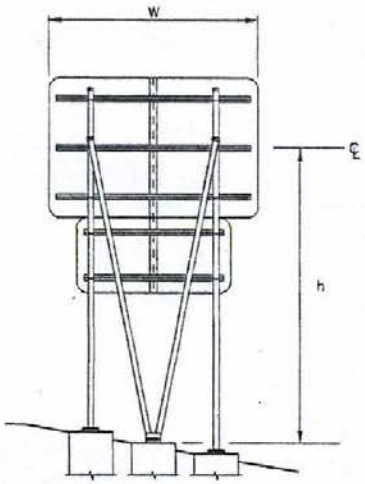


SINGLE SIGN



EXIT PANEL ATTACHMENT





DOUBLE SIGN

GENERAL NOTES:

1. Footings to be drilled holes as shown, & filled with Class A or Class AA concrete.
2. Anchor post & bracing included in cost of sign post.
3. For details on sign location, post type, panel bracing, and sign islands, see Standard Plan Drawings T-31.1.1 through T-31.1.6.
4. Inner posts are those closest to the roadway, and the outer posts are those farthest away.

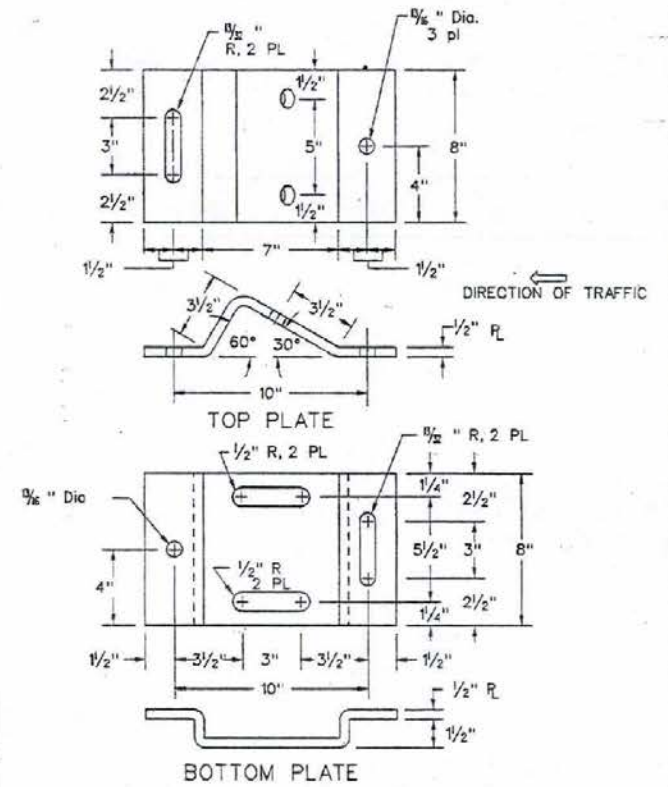
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

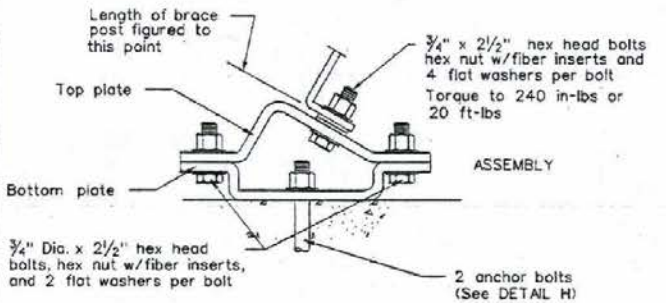
ROADSIDE SIGNS ROUND METAL POSTS BRACED

CHIEF TRAFFIC ENGINEER

T-31.4.1 (627)

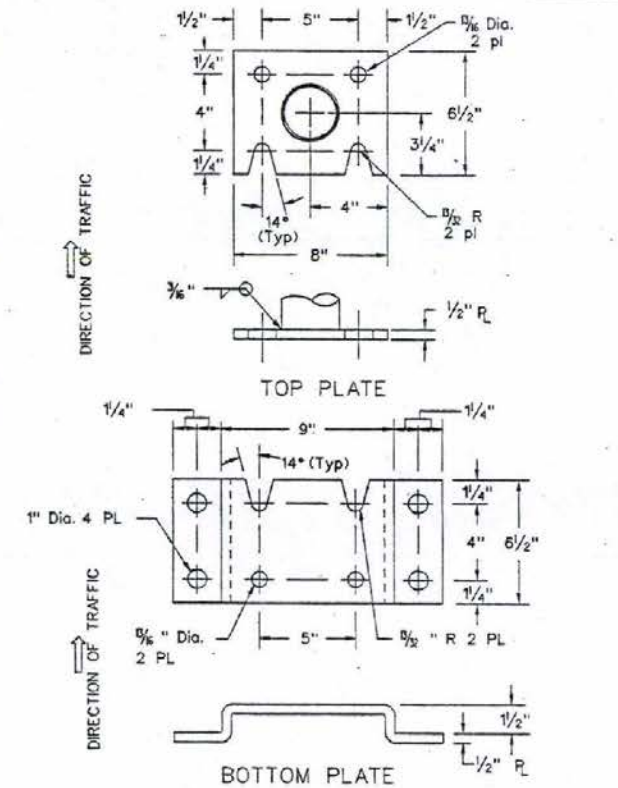
ADOPTED: 8/98 REVISION:

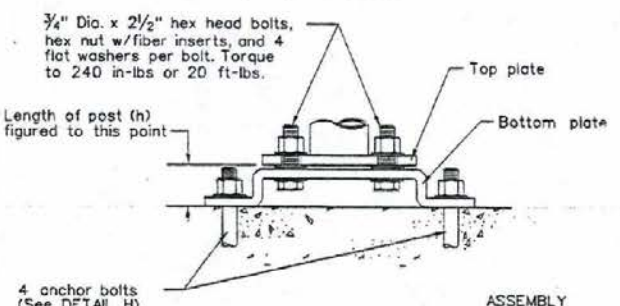




DETAIL "D" (BRACE)

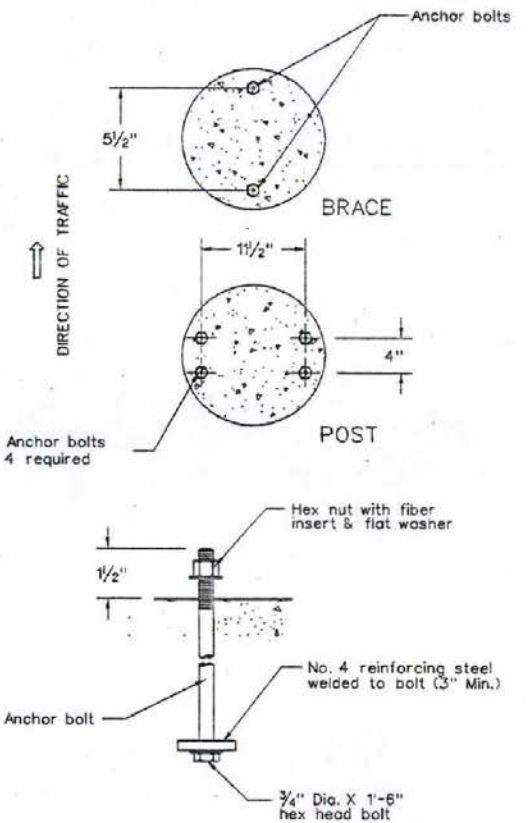
For details on sign location, post type, panel bracing, and sign islands, see Standard Plan Drawings T-31.1.1 through T-31.1.6.





DETAIL "E" (POST)

For details on sign location, post type, panel bracing, and sign islands, see Standard Plan Drawings T-31.1.1 through T-31.1.6.



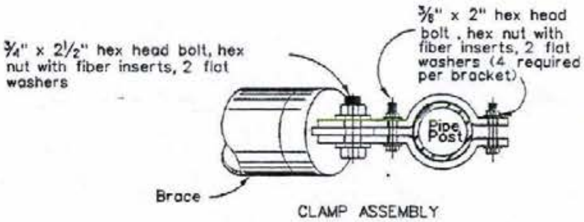
DETAIL "H" (ANCHOR BOLTS)

For details on sign location, post type, panel bracing, and sign islands, see Standard Plan Drawings T-31.1.1 through T-31.1.6.

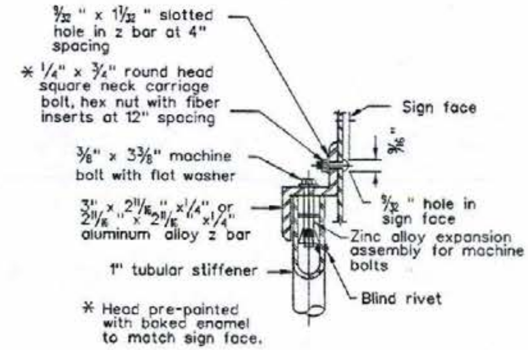
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
ROUND METAL POSTS
BRACED

CHIEF TRAFFIC ENGR. | T-31.4.2 | (6/27) | ADOPTED 6/98 (REVISION)



DETAIL A

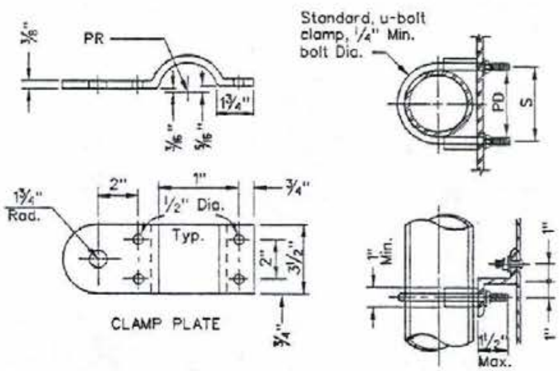


DETAIL C

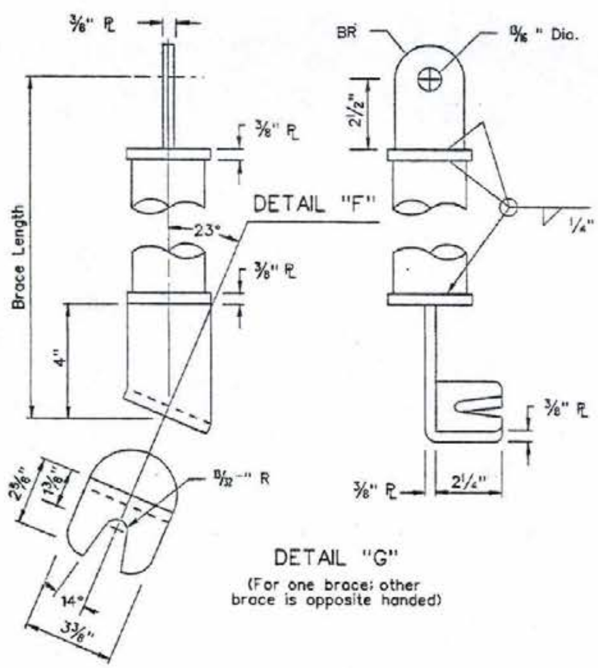
POST Nom. Dia.	PR	PD	S
1"	2/32"	1 5/16"	1 9/16"
2"	1 3/16"	2 3/8"	2 5/8"
3"	1 3/4"	3 1/2"	3 3/4"

GENERAL NOTES:

1. For details on sign location, post type, panel bracing, and sign islands, see Standard Plan Drawings T-31.1.1 through T31.1.6.



DETAIL B



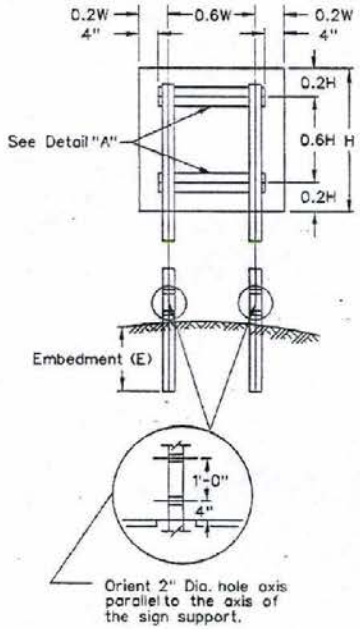
DETAIL "G"

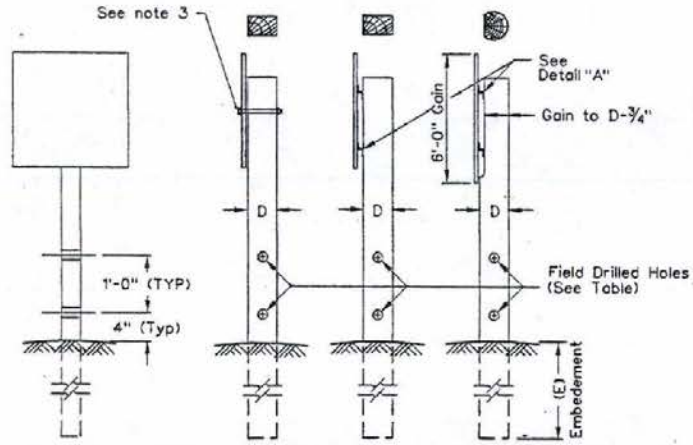
(For one brace; other brace is opposite handed)

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
ROUND METAL POSTS
BRACED

CHIEF TRAFFIC ENGR. | T-31.4.3 | ADOPTED | REVISION

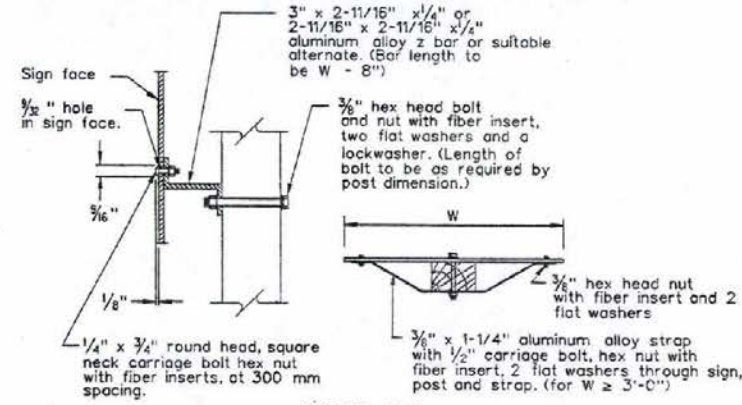




Sign Post Embedments	
4" x 4" = 3'-0"	4" x 6" = 4'-0"
6" x 6" = 5'-0"	6" x 8" = 6'-0"

GENERAL NOTES:

1. All posts with cross sectional area larger than 4" x 4" are to be drilled as shown.
2. For details on sign location, post type, panel bracing, and sign islands, see Standard Plan Drawings T-31.1.1 through T-31.1.6.
3. "Z" bars will be used on all signs requiring two posts.
4. For double post installations, inner posts are those closest to roadway, and outer posts are those farthest away.



DETAIL "A"

RECTANGULAR TIMBER POST SELECTION

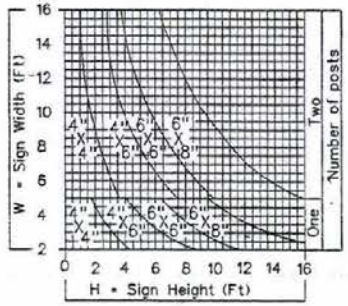


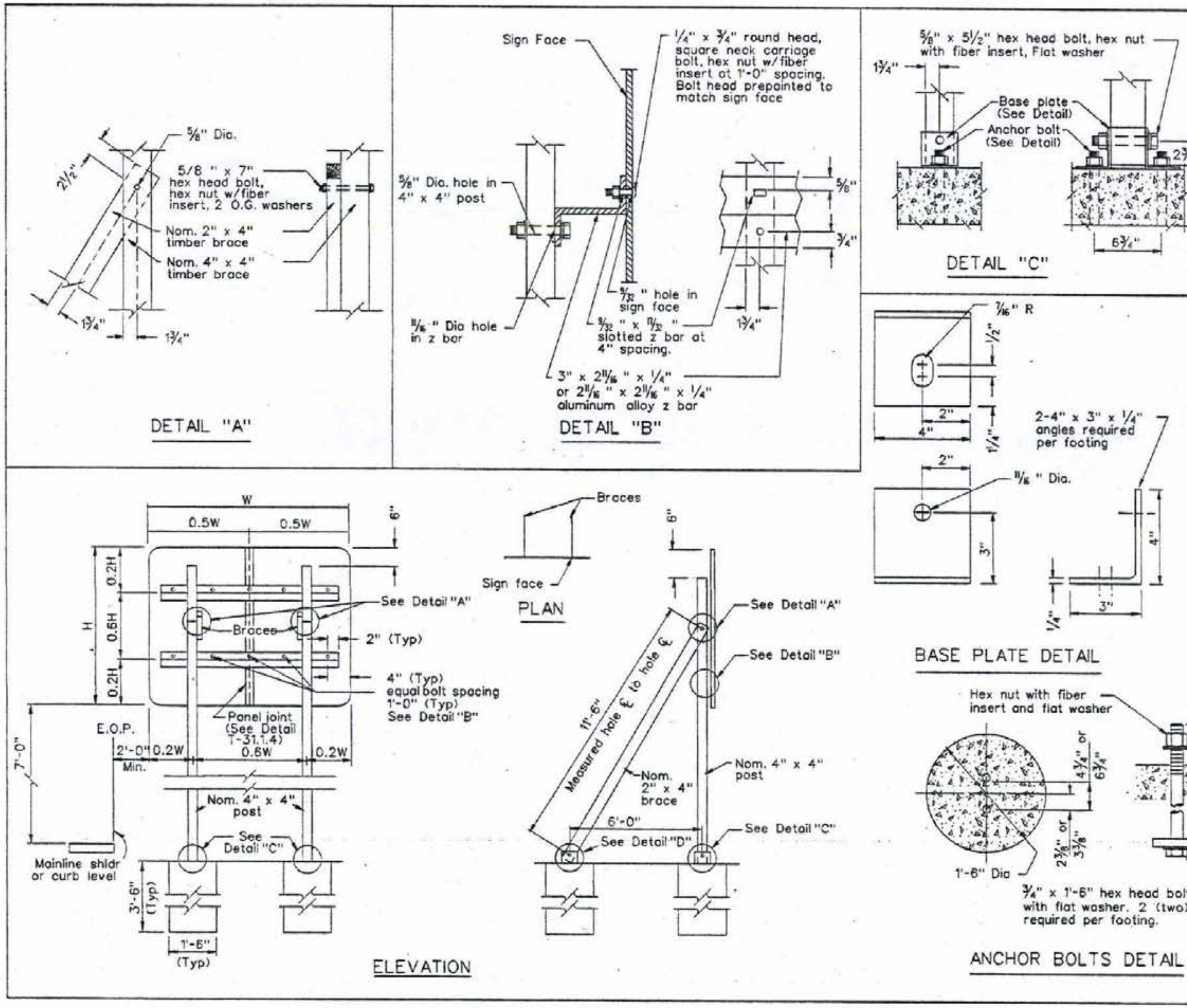
TABLE of HOLE DIAMETERS		
Post Size (D)	< 4" x 4" or 4" Dia.	> 4" x 4" or 4" Dia.
Hole Dia.	No Hole	2"

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
TIMBER
GENERAL

T-31.6.1 (827)

CHIEF TRAFFIC ENGR. | ADOPTED: 8/98 (REVISION)



GENERAL NOTES:

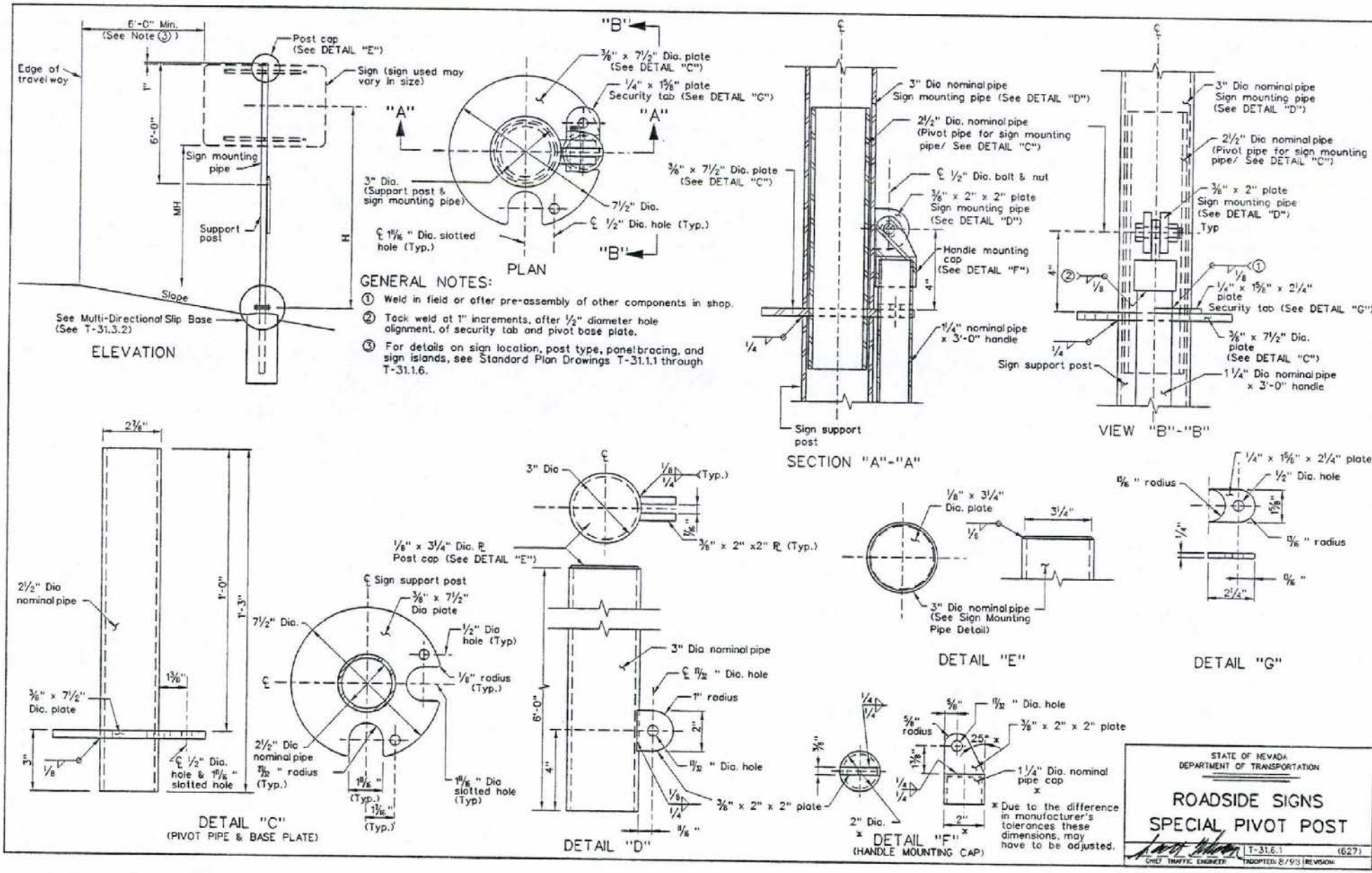
1. All drilled holes in timber to be ⅝" diameter unless otherwise noted.
2. Back brace hole in 4" x 4" post to be drilled and fitted in field. All other holes may be shop drilled in standard position.
3. Footings to be drilled - 1'-6" diameter, 3'-6" deep, filled with Class A, or Class AA concrete.
4. For details on sign location, post type, panel bracing, and sign islands, see Standard Plan Drawings T-31.1.1 through T-31.1.6.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
(TIMBER GORE SIGNS)

T-31.5.2 (627)

CHIEF TRAFFIC ENGR. — ADOPTED: 8/97 REVISION:



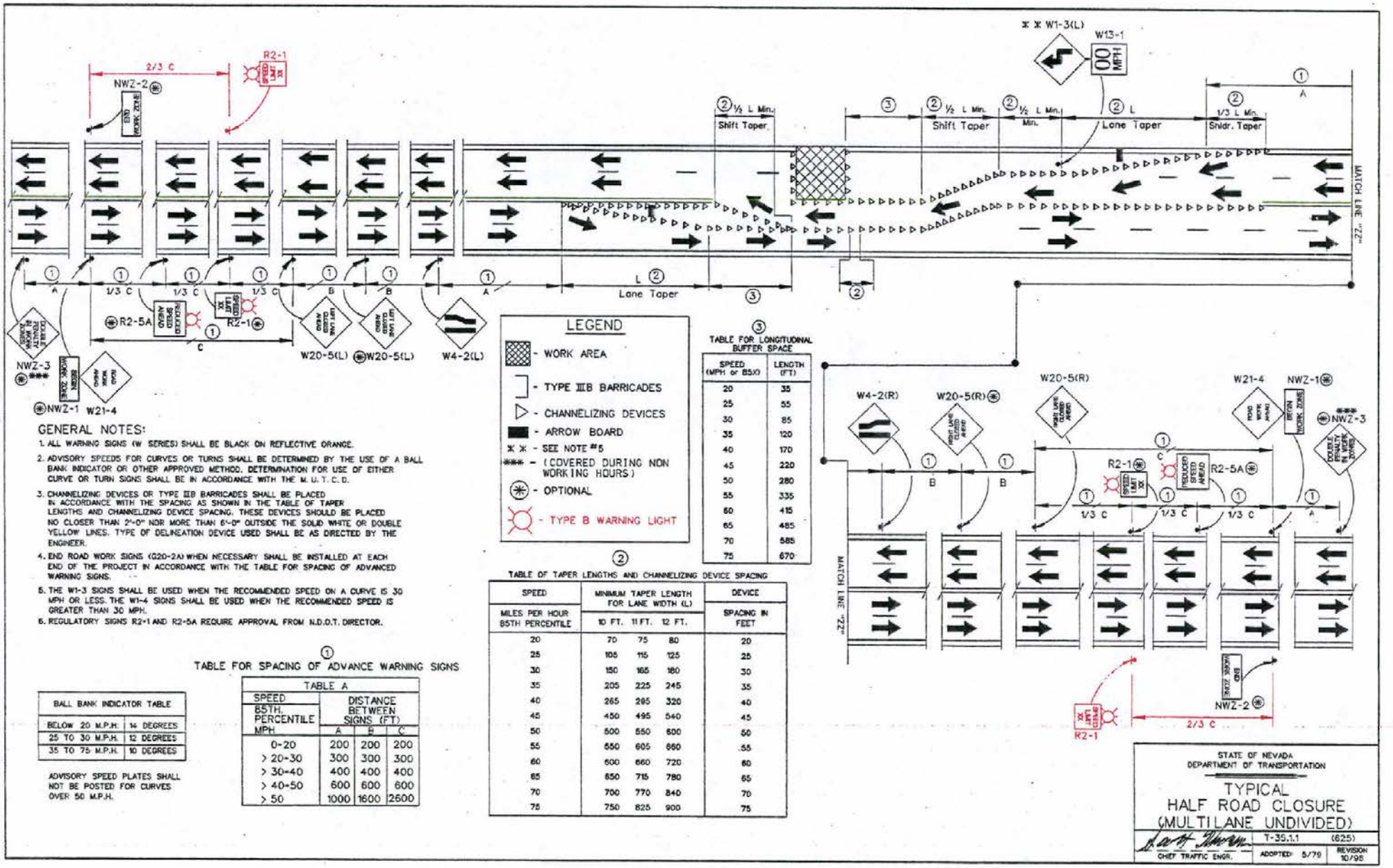
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
SPECIAL PIVOT POST

CHIEF TRAFFIC ENGINEER

T-31.6.1 (627)

ADOPTED: 8/93 REVISION:



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 2'-0" NOR MORE THAN 6'-0" 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 30 MPH OR LESS. THE W1-4 SIGNS SHALL BE USED WHEN THE RECOMMENDED SPEED IS GREATER THAN 30 MPH.
6. REGULATORY SIGNS R2-1 AND R2-5A REQUIRE APPROVAL FROM N.D.O.T. DIRECTOR.

BALL BANK INDICATOR TABLE	
BELOW 20 M.P.H.	14 DEGREES
25 TO 30 M.P.H.	12 DEGREES
35 TO 75 M.P.H.	10 DEGREES

ADVISORY SPEED PLATES SHALL NOT BE POSTED FOR CURVES OVER 50 M.P.H.

① TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A			
SPEED 85TH PERCENTILE MPH	DISTANCE BETWEEN SIGNS (FT) A	B	C
0-20	200	200	200
> 20-30	300	300	300
> 30-40	400	400	400
> 40-50	600	600	600
> 50	1000	1600	2600

② TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED	MINIMUM TAPER LENGTH FOR LANE WIDTH (L)			DEVICE
MILES PER HOUR 85TH PERCENTILE	10 FT.	11 FT.	12 FT.	SPACING IN FEET
20	70	75	80	20
25	105	115	125	25
30	150	165	180	30
35	205	225	245	35
40	265	295	320	40
45	450	495	540	45
50	500	550	600	50
55	550	605	660	55
60	600	660	720	60
65	650	715	780	65
70	700	770	840	70
75	750	825	900	75

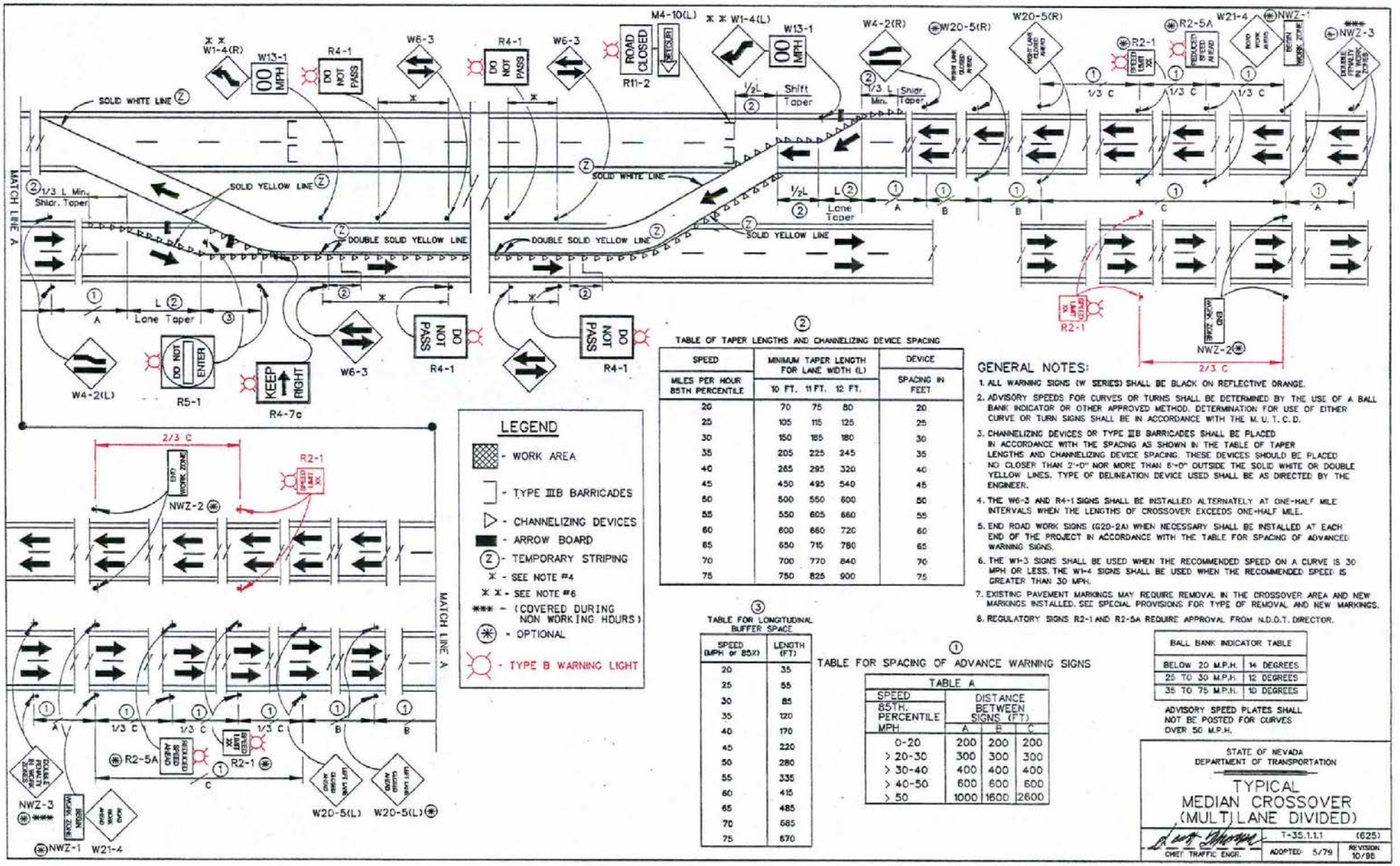
③ TABLE FOR LONGITUDINAL BUFFER SPACE

SPEED (MPH or 85%)	LENGTH (FT)
20	35
25	55
30	85
35	120
40	170
45	220
50	280
55	335
60	415
65	485
70	585
75	670

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL HALF ROAD CLOSURE (MULTILANE UNDIVIDED)

CHIEF TRAFFIC ENGR. | T-39.1.1 (625) | ADOPTED: 5/79 | REVISION 10/98



LEGEND

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

(2) TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED	MINIMUM TAPER LENGTH FOR LANE WIDTH (L)			DEVICE
MILES PER HOUR 85TH PERCENTILE	10 FT.	11 FT.	12 FT.	SPACING IN FEET
20	70	75	80	20
25	105	115	125	25
30	150	165	180	30
35	205	225	245	35
40	265	295	320	40
45	450	495	540	45
50	500	550	600	50
55	550	605	660	55
60	600	660	720	60
65	650	715	780	65
70	700	770	840	70
75	750	825	900	75

(3) TABLE FOR LONGITUDINAL BUFFER SPACE

SPEED (MPH or 85%)	LENGTH (FT)
20	35
25	55
30	85
35	120
40	170
45	220
50	280
55	335
60	415
65	485
70	585
75	670

(1) TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A			
SPEED 85TH. PERCENTILE MPH	DISTANCE BETWEEN SIGNS (FT)		
	A	B	C
0-20	200	200	200
> 20-30	300	300	300
> 30-40	400	400	400
> 40-50	600	600	600
> 50	1000	1600	2600

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 2'-0" NOR MORE THAN 6'-0" 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 ONE-HALF MILE INTERVALS WHEN THE LENGTHS OF CROSSOVER EXCEEDS ONE-HALF MILE.
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 30 MPH OR LESS. THE W1-4 SIGNS SHALL BE USED WHEN THE RECOMMENDED SPEED IS GREATER THAN 30 MPH.
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.

BALL BANK INDICATOR TABLE	
BELOW 20 M.P.H.	14 DEGREES
25 TO 30 M.P.H.	12 DEGREES
35 TO 75 M.P.H.	10 DEGREES

ADVISORY SPEED PLATES SHALL NOT BE POSTED FOR CURVES OVER 50 M.P.H.

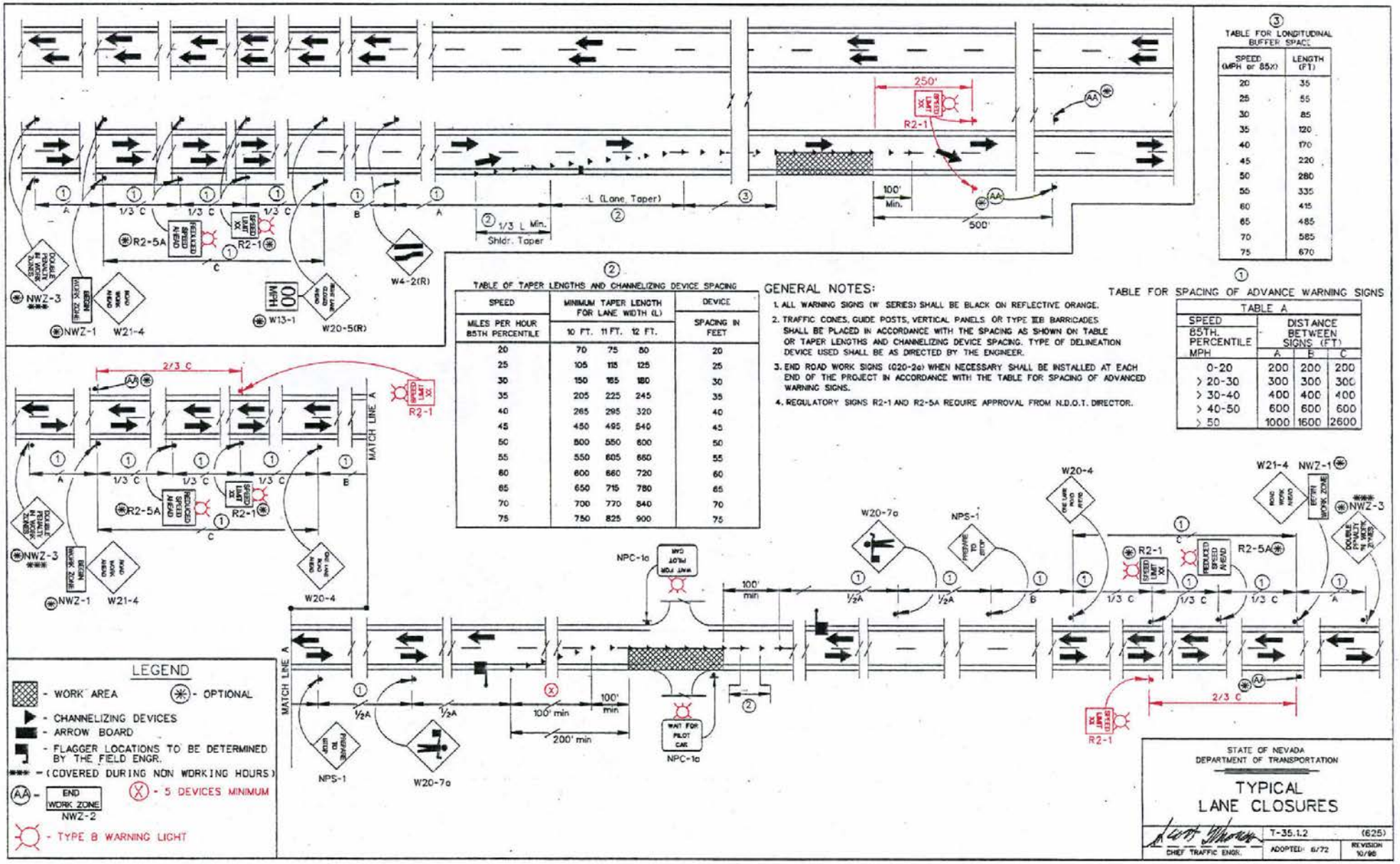
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL MEDIAN CROSSOVER (MULTI) LANE DIVIDED

CHIEF TRAFFIC ENGR.

T-35.1.1.1 (625)

ADOPTED: 5/79 REVISION 10/98



(3) TABLE FOR LONGITUDINAL BUFFER SPACE

SPEED (MPH or 85%)	LENGTH (FT)
20	35
25	55
30	85
35	120
40	170
45	220
50	280
55	335
60	415
65	485
70	585
75	670

(2) TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED	MINIMUM TAPER LENGTH FOR LANE WIDTH (L)			DEVICE
MILES PER HOUR 85TH PERCENTILE	10 FT.	11 FT.	12 FT.	SPACING IN FEET
20	70	75	80	20
25	105	115	125	25
30	150	165	180	30
35	205	225	245	35
40	265	295	320	40
45	450	495	540	45
50	500	550	600	50
55	550	605	660	55
60	600	660	720	60
65	650	715	780	65
70	700	770	840	70
75	750	825	900	75

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.

(1) TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A

SPEED 85TH. PERCENTILE MPH	DISTANCE BETWEEN SIGNS (FT) A	B	C
0-20	200	200	200
> 20-30	300	300	300
> 30-40	400	400	400
> 40-50	600	600	600
> 50	1000	1600	2600

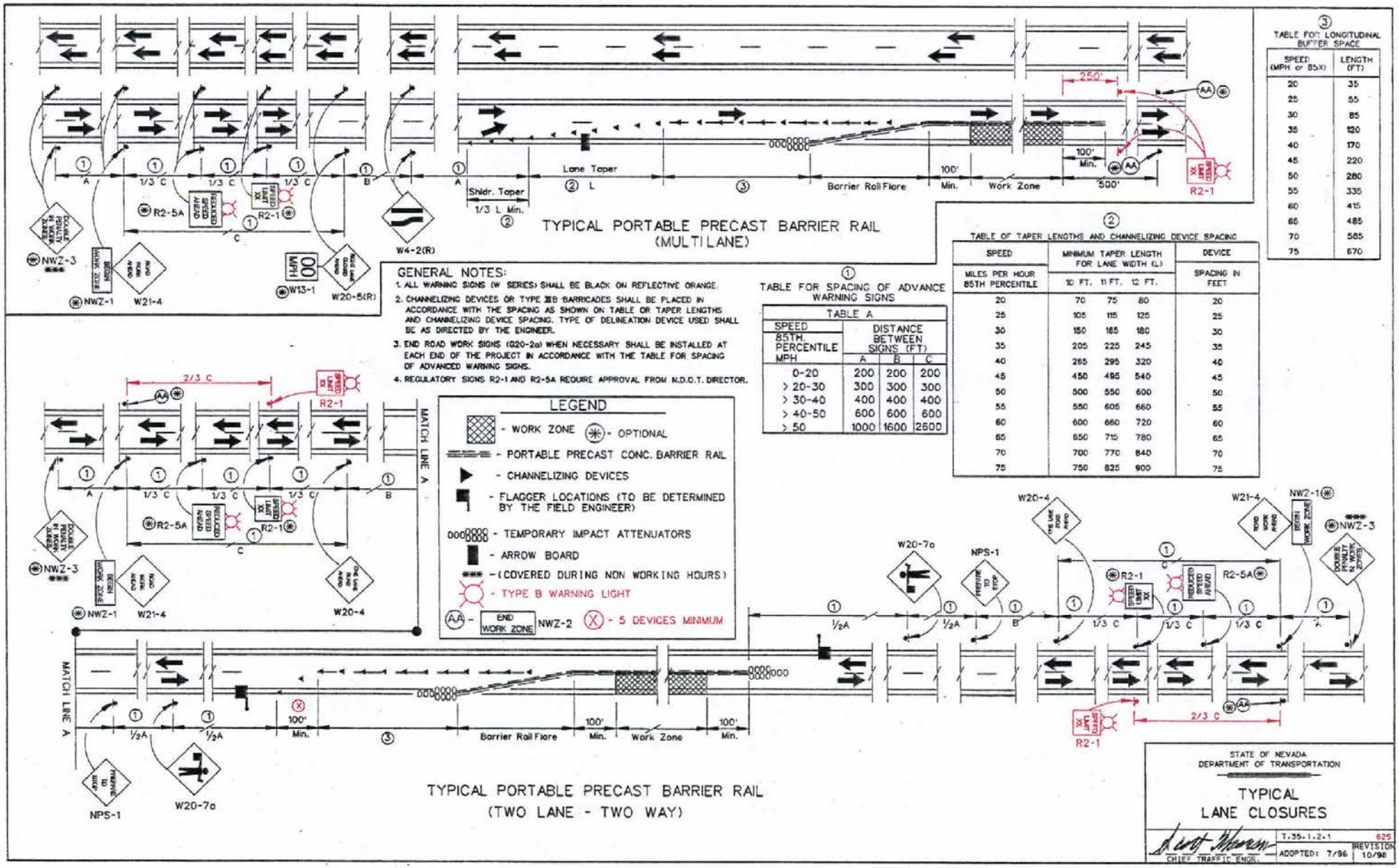
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL LANE CLOSURES

CHIEF TRAFFIC ENGR.

T-35.1.2 (625)

ADOPTED: 6/72 REVISION 10/98



GENERAL NOTES:

1. ALL WARNING SIGNS (W SERIES) SHALL BE BLACK ON REFLECTIVE ORANGE.
2. CHANNELIZING DEVICES 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.

(1) TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A

SPEED 85TH. PERCENTILE MPH	DISTANCE BETWEEN SIGNS (FT) A	B	C
0-20	200	200	200
> 20-30	300	300	300
> 30-40	400	400	400
> 40-50	600	600	600
> 50	1000	1600	2500

(2) TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED MILES PER HOUR 85TH PERCENTILE	MINIMUM TAPER LENGTH FOR LANE WIDTH (L) 10 FT.	11 FT.	12 FT.	DEVICE SPACING IN FEET
20	70	75	80	20
25	105	115	125	25
30	150	165	180	30
35	205	225	245	35
40	265	295	320	40
45	450	495	540	45
50	500	550	600	50
55	550	605	660	55
60	600	660	720	60
65	650	715	780	65
70	700	770	840	70
75	750	825	900	75

(3) TABLE FOR LONGITUDINAL BUFFER SPACE

SPEED (MPH or 85%)	LENGTH (FT)
20	35
25	55
30	85
35	120
40	170
45	220
50	280
55	335
60	415
65	485
70	585
75	670

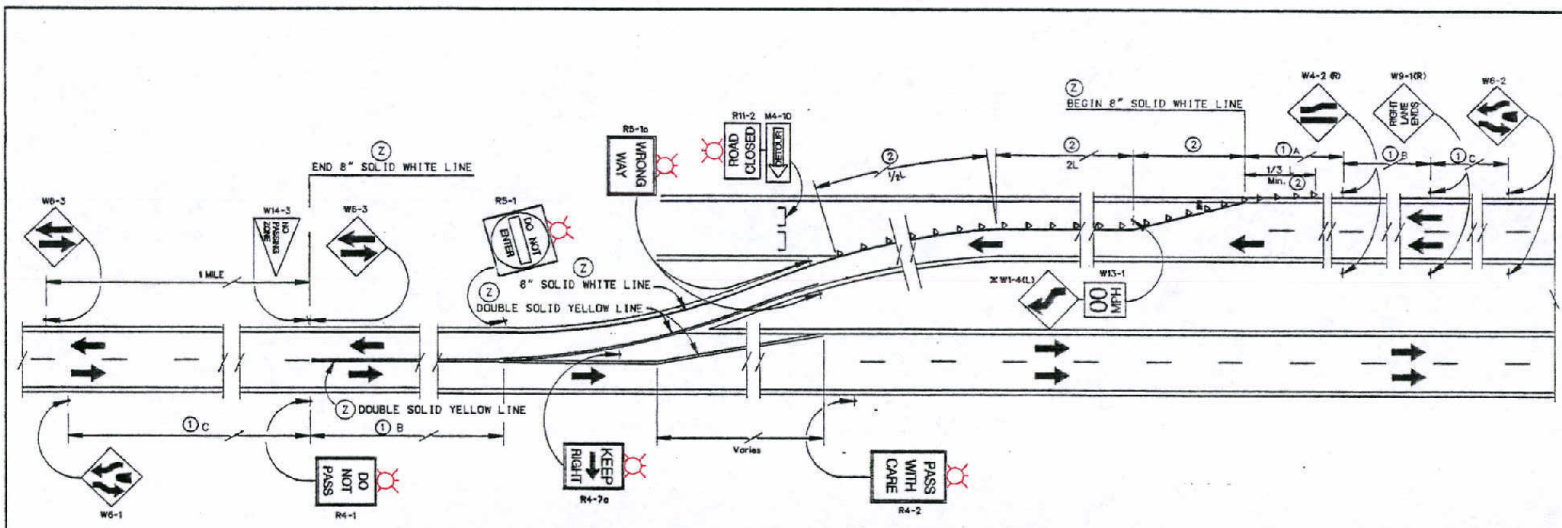
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL LANE CLOSURES

CHIEF TRAFFIC ENGR.

T.35.1.2.1 825

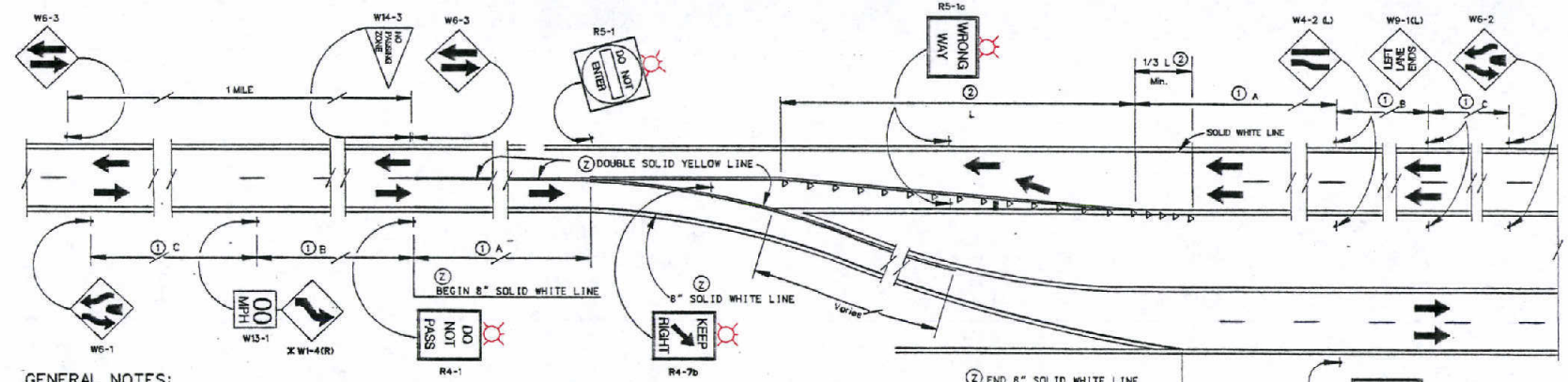
ADOPTED: 7/96 REVISION 10/98



(2)

TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED	MINIMUM TAPER LENGTH FOR LANE WIDTH (L)			DEVICE
MILES PER HOUR 85TH PERCENTILE	10 FT.	11 FT.	12 FT.	SPACING IN FEET
20	70	75	80	20
25	105	115	125	25
30	150	165	180	30
35	205	225	245	35
40	265	295	320	40
45	450	495	540	45
50	500	550	600	50
55	550	605	660	55
60	600	660	720	60
65	650	715	780	65
70	700	770	840	70
75	750	825	900	75



(3)

TABLE FOR LONGITUDINAL BUFFER SPACE

SPEED (MPH or 85%)	LENGTH (FT)
20	35
25	55
30	85
35	120
40	170
45	220
50	280
55	335
60	415
65	485
70	585
75	670

BALL BANK INDICATOR TABLE

BELOW 20 M.P.H.	14 DEGREES
25 TO 30 M.P.H.	12 DEGREES
35 TO 75 M.P.H.	10 DEGREES

ADVISORY SPEED PLATES SHALL NOT BE POSTED FOR CURVES OVER 50 M.P.H.

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. TRAFFIC CONES, GUIDE POSTS, VERTICAL PANELS 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 2'-0" NOR MORE THAN 6'-0" 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 30 MPH OR LESS. THE W1-4 SIGNS SHALL BE USED WHEN THE RECOMMENDED SPEED IS GREATER THAN 30 MPH.

LEGEND

-] - TYPE IIIB BARRICADES
- ▷ - CHANNELIZING DEVICES
- ■ - ARROW BOARD
- ✳ - SEE NOTE #5
- (Z) - TEMPORARY STRIPING
- ☼ - TYPE B WARNING LIGHT

(1)

TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A

SPEED 85TH. PERCENTILE MPH	DISTANCE BETWEEN SIGNS (FT) A	B	C
0-20	200	200	200
> 20-30	300	300	300
> 30-40	400	400	400
> 40-50	600	600	600
> 50	1000	1600	2600

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL 2 LANE TO 4 LANE CONNECTION SIGNING (RURAL)

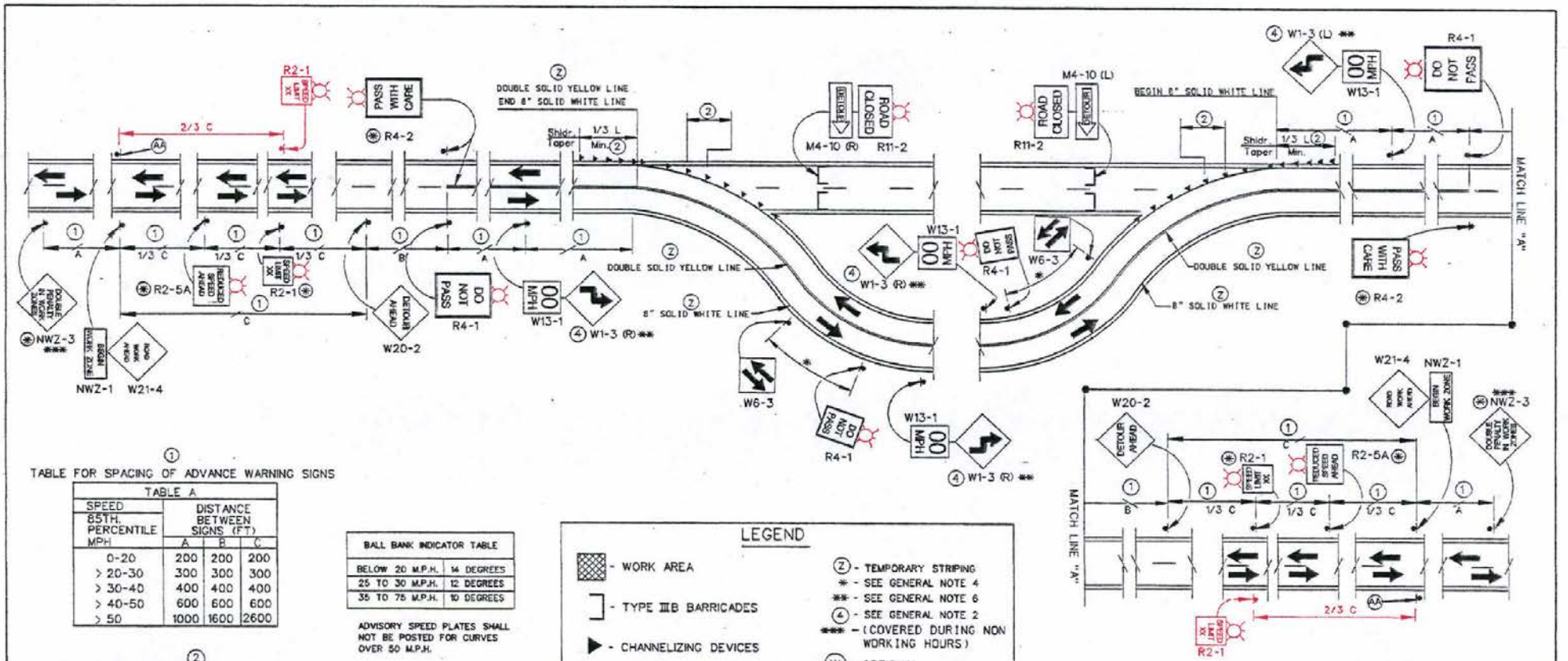
CHIEF TRAFFIC ENGR.

T-35.1.3 (625)

ADOPTED: 6/72

REVISION 10/98

T-50



(1)

TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A			
SPEED 85TH. PERCENTILE MPH	DISTANCE BETWEEN SIGNS (FT) A	B	C
0-20	200	200	200
> 20-30	300	300	300
> 30-40	400	400	400
> 40-50	600	600	600
> 50	1000	1600	2600

BALL BANK INDICATOR TABLE	
BELOW 20 M.P.H.	14 DEGREES
25 TO 30 M.P.H.	12 DEGREES
35 TO 75 M.P.H.	10 DEGREES

ADVISORY SPEED PLATES SHALL NOT BE POSTED FOR CURVES OVER 50 M.P.H.

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
- TYPE B WARNING LIGHT

(2)

TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED MILES PER HOUR 85TH PERCENTILE	MINIMUM TAPER LENGTH FOR LANE WIDTH (L) 10 FT.	11 FT.	12 FT.	DEVICE SPACING IN FEET
20	70	75	80	20
25	105	115	125	25
30	150	165	180	30
35	205	225	245	35
40	265	295	320	40
45	450	495	540	45
50	500	550	600	50
55	550	605	660	55
60	600	660	720	60
65	650	715	780	65
70	700	770	840	70
75	750	825	900	75

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. TRAFFIC CONES, GUIDE POSTS, VERTICAL PANELS 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 2'-0" NOR MORE THAN 6'-0" 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 ONE HALF MILE INTERVALS WHEN THE LENGTH OF CROSSOVER EXCEEDS ONE-HALF MILE.
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 30 MPH OR LESS. THE W1-4 SIGNS SHALL BE USED WHEN THE RECOMMENDED SPEED IS GREATER THAN 30 MPH.
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.

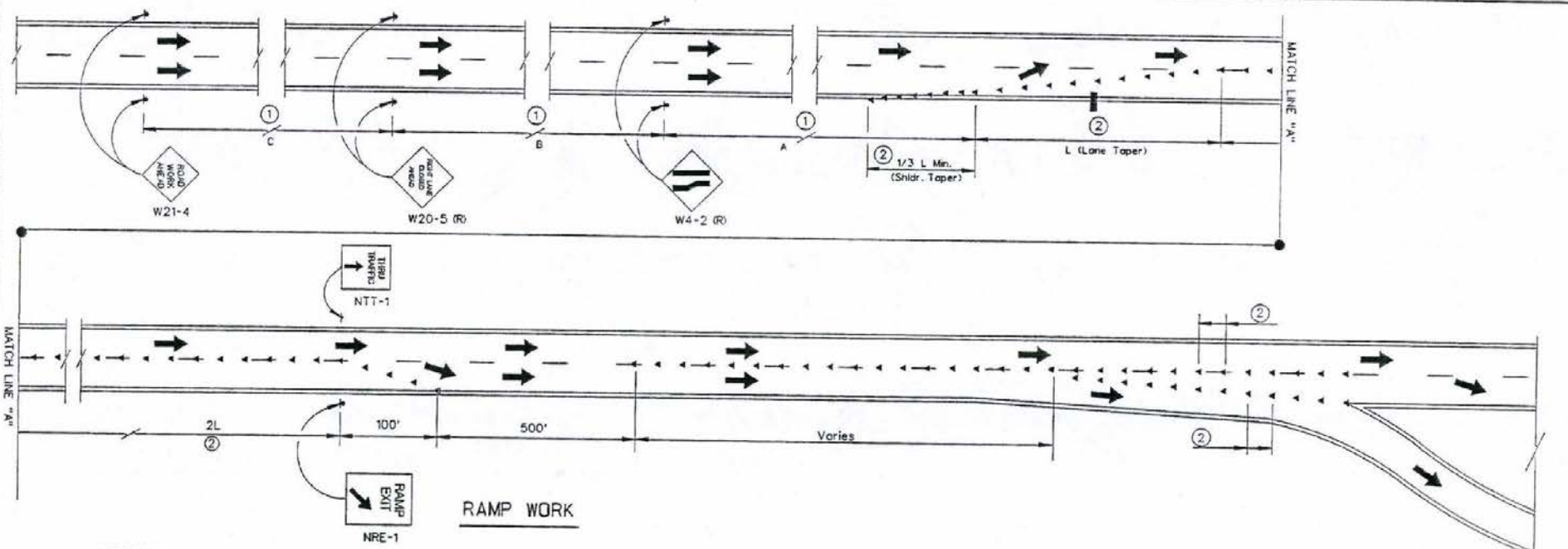
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL ROAD CLOSURE DETOUR

CHIEF TRAFFIC ENGR.

T-35.1.4 (625)

ADOPTED: 6/72 REVISION 10/98



RAMP WORK

LEGEND

▶ - CHANNELIZING DEVICES

■ - ARROW BOARD

GENERAL NOTES:

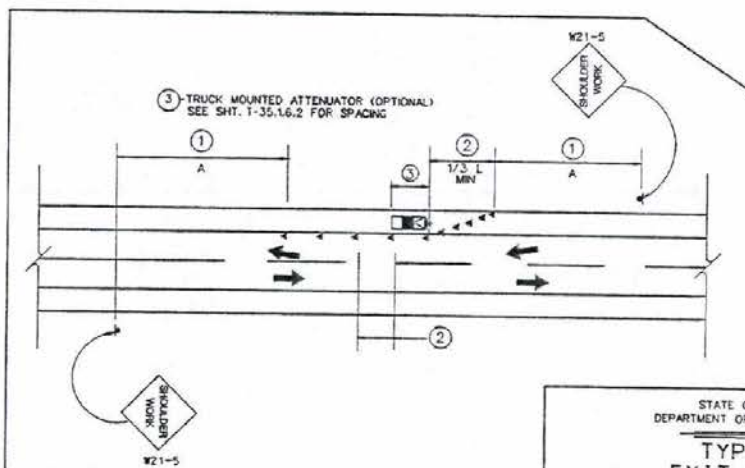
1. ALL WARNING SIGNS (W SERIES) SHALL BE BLACK ON REFLECTIVE ORANGE.
2. TRAFFIC CONES, GUIDE POSTS, VERTICAL PANELS OR TYPE IIB BARRICADES SHALL BE PLACED IN ACCORDANCE WITH THE SPACING AS SHOWN ON TABLE OR TAPER LENGTHS AND CHANNELIZING DEVICE SPACING. TYPE OF DELINEATION DEVICE USED SHALL BE AS DIRECTED 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
MILES PER HOUR 85TH PERCENTILE	10 FT.	11 FT.	12 FT.	SPACING IN FEET
20	70	75	80	20
25	105	115	125	25
30	150	165	180	30
35	205	225	245	35
40	265	295	320	40
45	450	495	540	45
50	500	550	600	50
55	550	605	660	55
60	600	660	720	60
65	650	715	780	65
70	700	770	840	70
75	750	825	900	75

① TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A			
SPEED 85TH. PERCENTILE MPH	DISTANCE BETWEEN SIGNS (FT)		
	A	B	C
0-20	200	200	200
> 20-30	300	300	300
> 30-40	400	400	400
> 40-50	600	600	600
> 50	1000	1600	2600



SHOULDER WORK

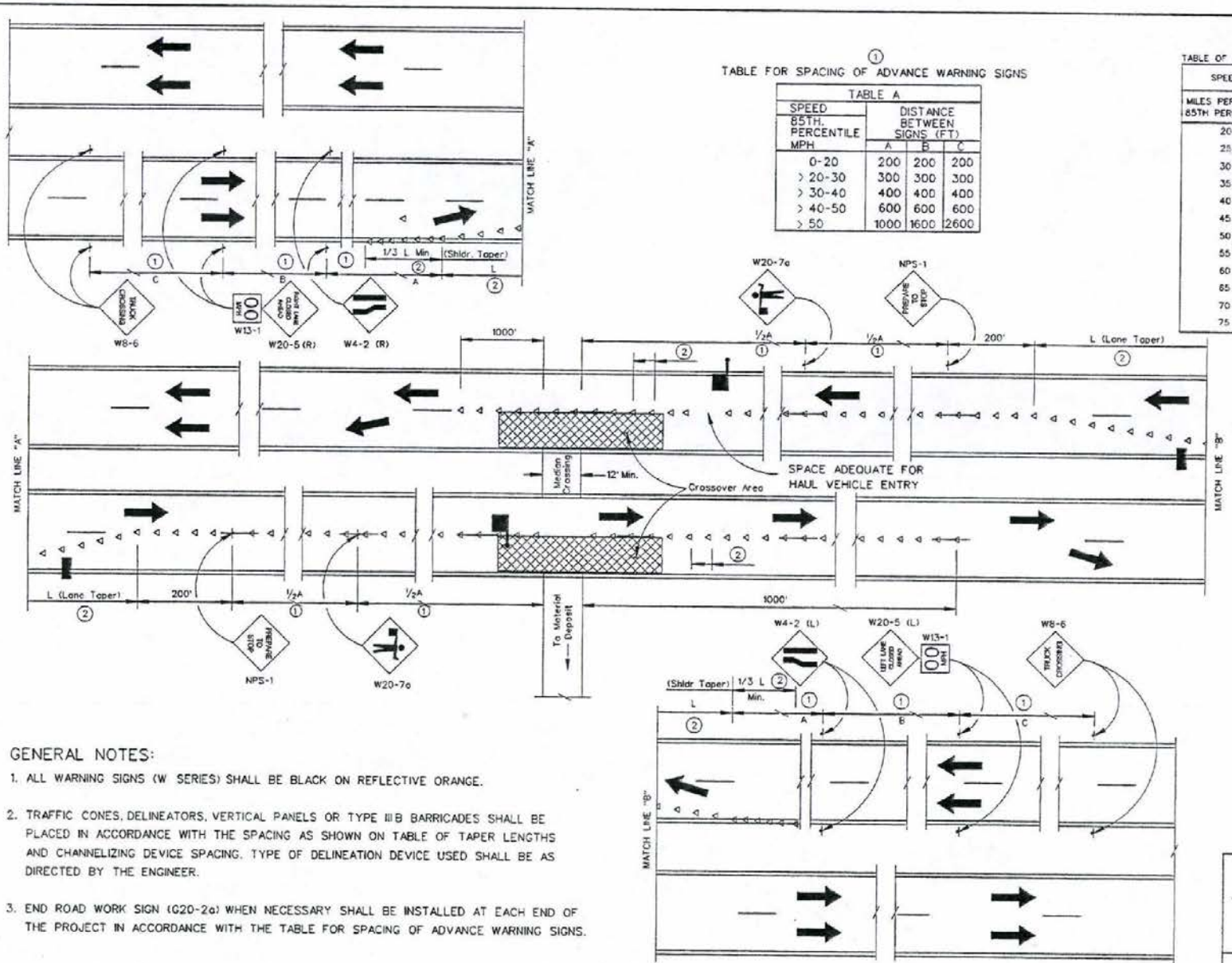
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL EXIT RAMP & SHOULDER WORK

CHIEF TRAFFIC ENGR.

T-35.1.5 (625)

ADOPTED: 12/79 REVISION 9/97



① TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A			
SPEED 85TH. PERCENTILE MPH	DISTANCE BETWEEN SIGNS (FT)		
	A	B	C
0-20	200	200	200
> 20-30	300	300	300
> 30-40	400	400	400
> 40-50	600	600	600
> 50	1000	1600	2600

② TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED	MINIMUM TAPER LENGTH FOR LANE WIDTH (L)			DEVICE
MILES PER HOUR 85TH PERCENTILE	10 FT.	11 FT.	12 FT.	SPACING IN FEET
20	70	75	80	20
25	105	115	125	25
30	150	165	180	30
35	205	225	245	35
40	265	295	320	40
45	450	495	540	45
50	500	550	600	50
55	550	605	660	55
60	600	660	720	60
65	650	715	780	65
70	700	770	840	70
75	750	825	900	75

GENERAL NOTES:

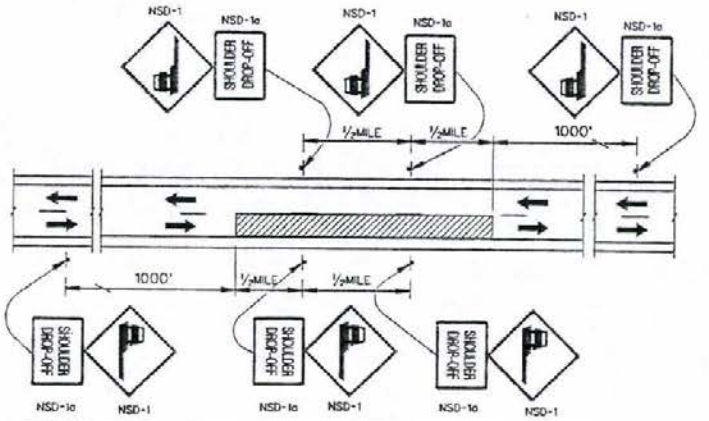
1. ALL WARNING SIGNS (W SERIES) SHALL BE BLACK ON REFLECTIVE ORANGE.
2. TRAFFIC CONES, DELINEATORS, VERTICAL PANELS OR TYPE IIIB BARRICADES SHALL BE PLACED IN ACCORDANCE WITH THE SPACING AS SHOWN ON TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING. TYPE OF DELINEATION DEVICE USED SHALL BE AS DIRECTED 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.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL TRAFFIC CONTROL FOR HAUL ROAD (MULTILANE)

CHIEF TRAFFIC ENGR.

T-35.1.6	(625)
ADOPTED: 8/82	REVISION 9/97

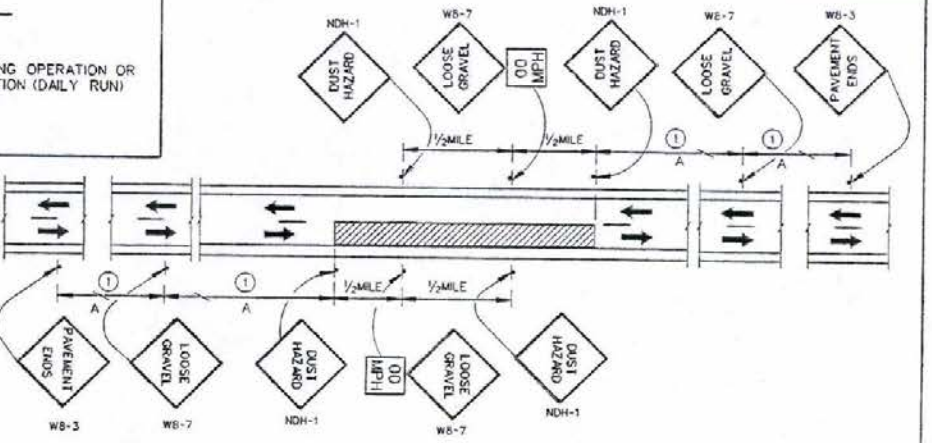


TYPICAL PLACEMENT OF SHOULDER DROP OFF SIGNS
(PLACED WHEN SHOULDER DROP-OFF EXIST DURING NON-WORKING HOURS)

NOTE: THE "SHOULDER DROP-OFF" SYMBOL SIGN AND PLAQUE ARE TO BE USED IN ALL CASES WHERE THERE IS A VERTICAL DIFFERENCE OF 2" OR GREATER AT THE SHOULDER. THE "SHOULDER DROP-OFF" PLAQUE SHALL ONLY BE USED WITH THE "SHOULDER DROP-OFF" SYMBOL SIGN.

LEGEND

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

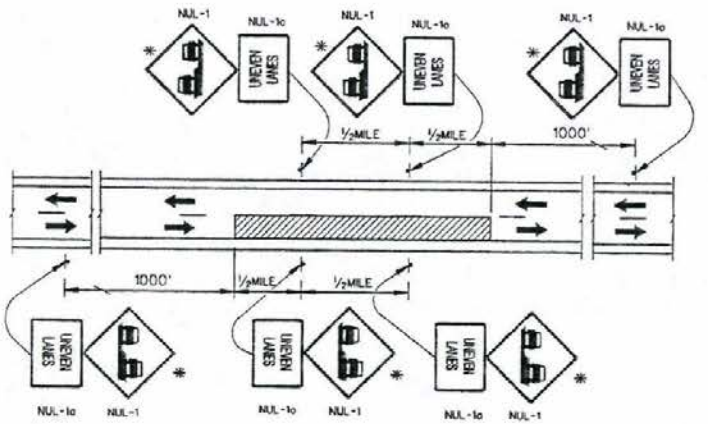


TYPICAL PLACEMENT OF LOOSE GRAVEL/DUST HAZARD (ALTERNATING) SIGNS

LEGEND

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

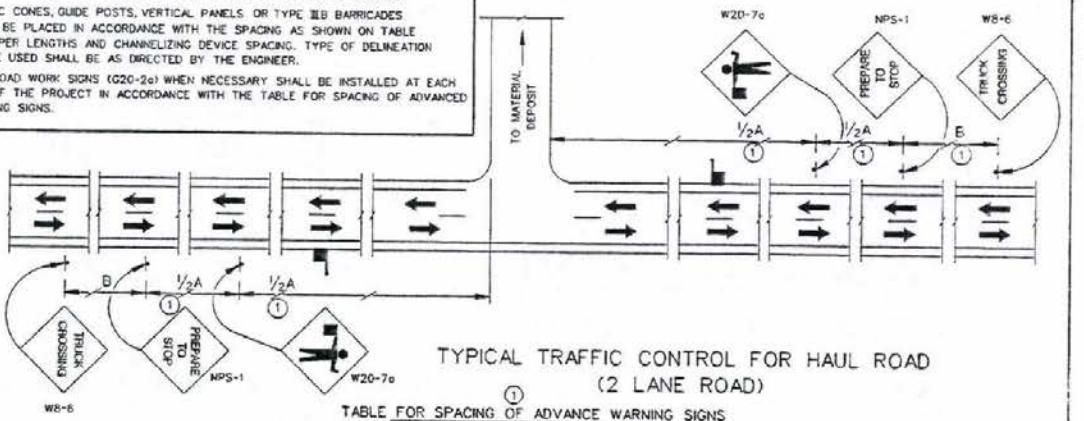
NOTE: THE "UNEVEN LANES" SYMBOL SIGN AND PLAQUE ARE TO BE USED IN ALL CASES WHERE THERE IS A VERTICAL DIFFERENCE OF 1" TO 3" BETWEEN THE TRAVEL LANES. THE "UNEVEN LANES" PLAQUE SHALL ONLY BE USED WITH THE "UNEVEN LANES" SYMBOL SIGN.



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 IIB 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 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)

① TABLE FOR SPACING OF ADVANCE WARNING SIGNS

TABLE A

SPEED 85TH. PERCENTILE MPH	DISTANCE BETWEEN SIGNS (FT) A	B	C
0-20	200	200	200
> 20-30	300	300	300
> 30-40	400	400	400
> 40-50	600	600	600
> 50	1000	1600	2600

LEGEND

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

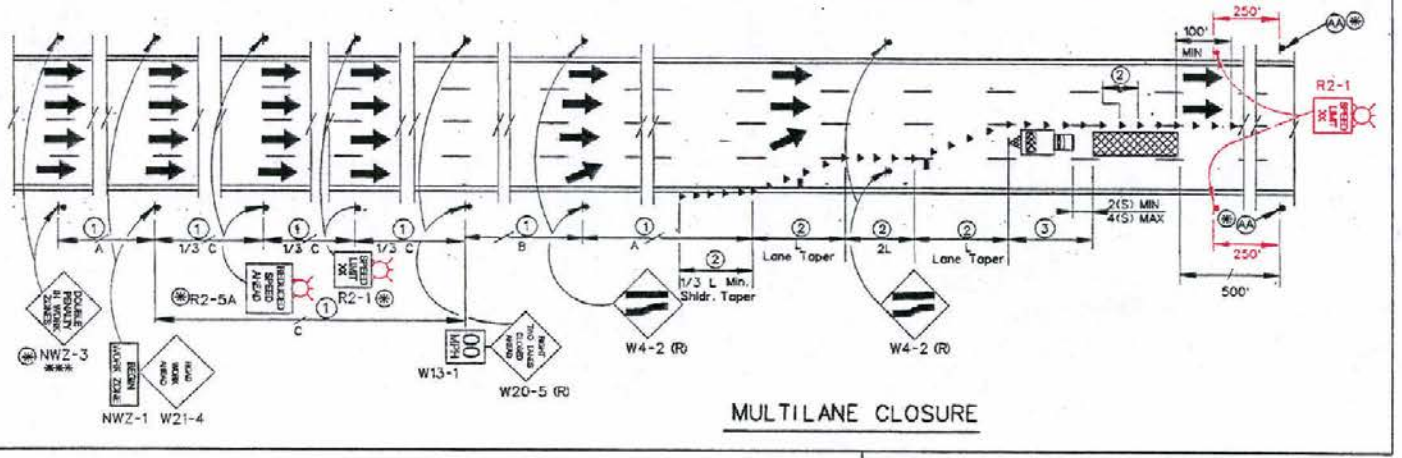
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL
TRAFFIC CONTROL
SIGNING

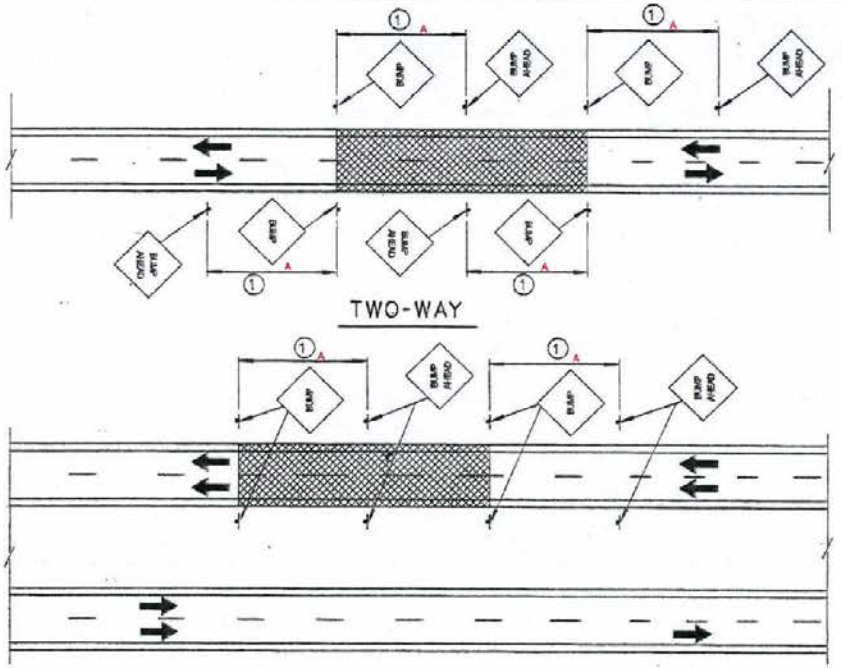
CHIEF TRAFFIC ENGR.

T-38.16.1 (625)

ADOPTED: 4/85 REVISION 9/97



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.

LEGEND

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

(2)

TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED (S)	MINIMUM TAPER LENGTH FOR LANE WIDTH (L)			DEVICE
MILES PER HOUR 85TH PERCENTILE	10 FT.	11 FT.	12 FT.	SPACING IN FEET
20	70	75	80	20
25	105	115	125	25
30	150	165	180	30
35	205	225	245	35
40	265	295	320	40
45	450	495	540	45
50	500	550	600	50
55	550	605	660	55
60	600	660	720	60
65	650	715	780	65
70	700	770	840	70
75	750	825	900	75

(1)

TABLE FOR SPACING OF ADVANC WARNING SIGNS

TABLE A			
SPEED 85TH. PERCENTILE MPH	DISTANCE BETWEEN SIGNS (FT)		
	A	B	C
0-20	200	200	200
> 20-30	300	300	300
> 30-40	400	400	400
> 40-50	600	600	600
> 50	1000	1600	2600

(3)

TABLE FOR LONGITUDINAL BUFFER SPACE

SPEED (MPH or 85%)	LENGTH (FT)
20	35
25	55
30	85
35	120
40	170
45	220
50	280
55	335
60	415
65	485
70	585
75	670

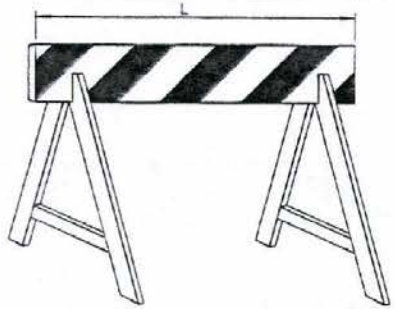
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL TRAFFIC CONTROL SIGNING

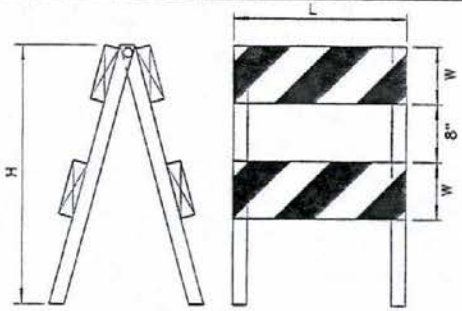
CHIEF TRAFFIC ENGR.

T-35.1.6.2 625

ADOPTED: 7/96 REVISION 10/98



TYPE I BARRICADE

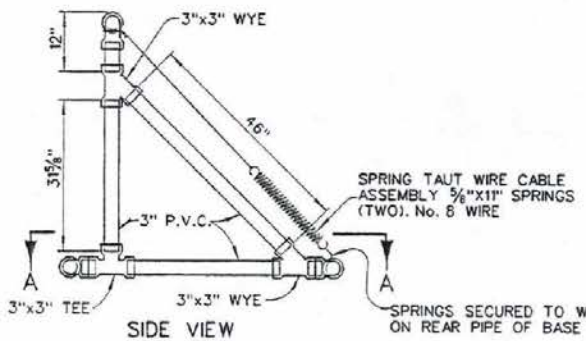


TYPE II BARRICADE
(FRAMEWORK TO BE WHITE)

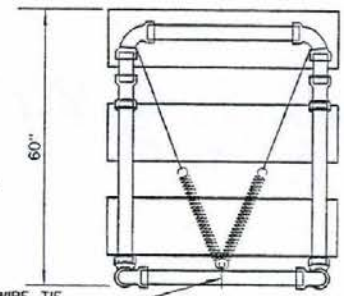
NOTE: TYPE ☐☐ B BARRICADES USED FOR TEMPORARY SIGN SUPPORTS. SIGNS SHALL BE MOUNTED 1.0' MIN. FROM GROUND.

BARRICADE CHARACTERISTICS

	TYPE I BARRICADE	TYPE II BARRICADE
W= Width of Rail	8" Min. - 11" Max.	8" Min. -12" Max.
L= Length of Rail	2' Min.	2' Min.
Width of Stripes	Rail Length< 3' = 4" Rail Length≥ 3' = 6"	Rail Length< 3' = 4" Rail Length≤ 3' = 6"
H= Height	3' Min.	3' Min.
Number of Retroreflective Rail faces	2 (One each Direction)	4 (Two each Direction)

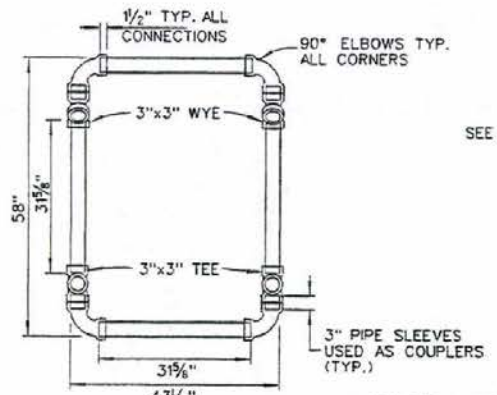


SIDE VIEW

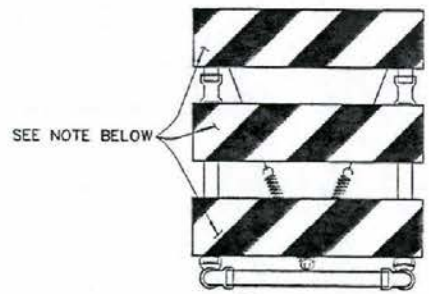


BACK VIEW

Markings for barrier rails and vertical panels shall be alternate retroreflective orange and retroreflective white stripes sloping downward at an angle of 45 degrees in the direction of traffic.



SECTION A-A



FRONT VIEW

NOTE: 9"x48" BARRICADE HAZARD PANELS ORANGE AND WHITE RIGHT OR LEFT. (.025" ANODIZED ALUMINUM) PANELS ATTACHED WITH 1" No. 14 PAN HEAD METAL SCREW OR 0.125" POLYETHYLENE WITH PLASTIC RIVETS

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

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

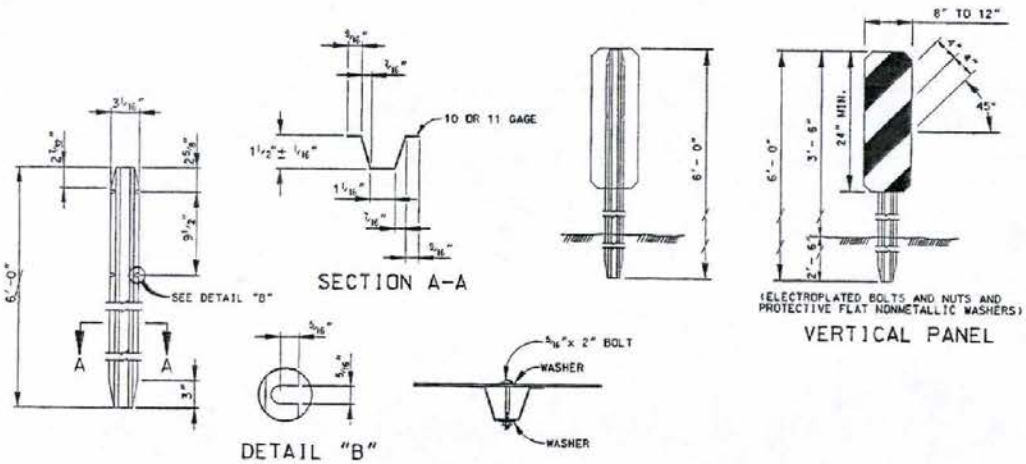
BARRICADES

CHIEF TRAFFIC ENGR.

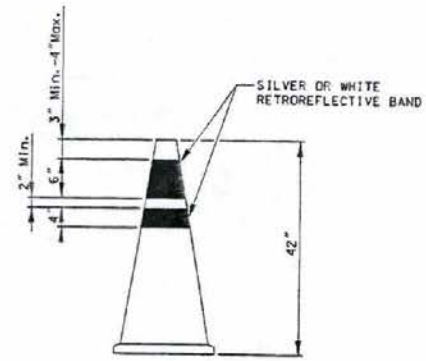
T-35.1.7 (625)

ADOPTED: 8/82 REVISION 9/97

T-56

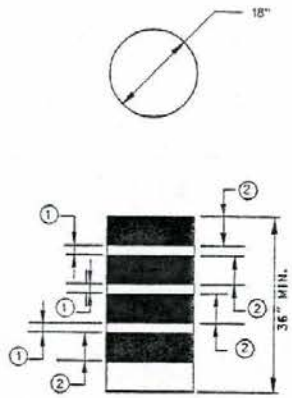


POST DETAILS



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

①-2" MAX. NON RETROREFLECTIVE MATERIAL
②-4" MIN.- 6"MAX. RETROREFLECTIVE MATERIAL

NOTE: DRUMS/BARRELS SHALL HAVE A MIN. OF 2 WHITE AND 2 ORANGE RETROREFLECTIVE BANDS AND 18" WIDTH REGARDLESS OF ORIENTATION

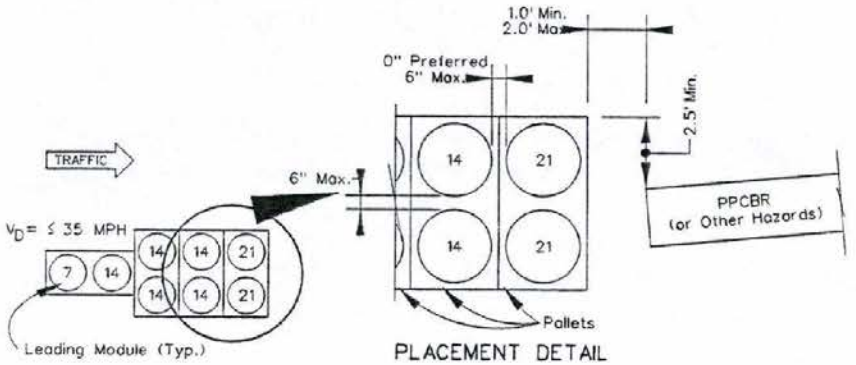
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

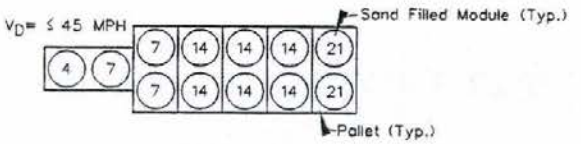
TRAFFIC CONES, DRUMS, BARRELS AND VERTICAL PANELS

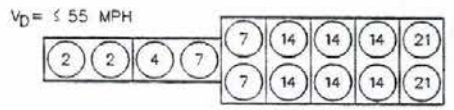
CHIEF TRAFFIC ENGR.

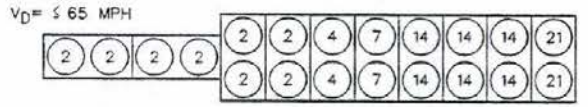
T-35.1.7.1 (625)

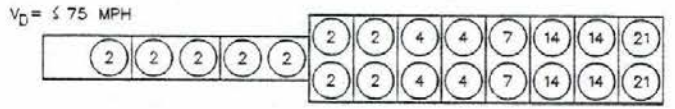
ADOPTED: 10/92 REVISION 9/97



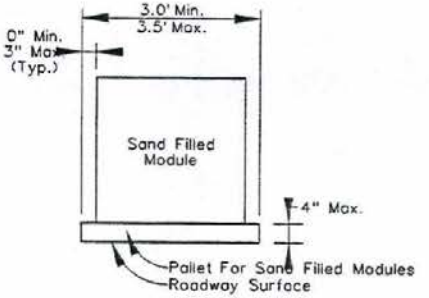


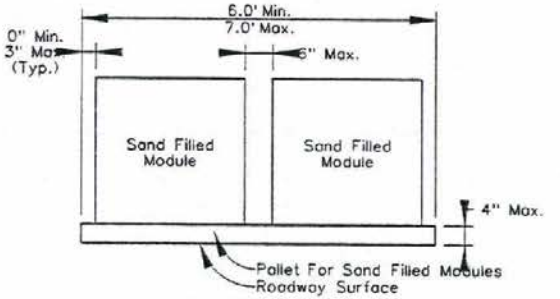






TYPICAL LAYOUTS





PALLET DETAILS

GENERAL NOTES:

1. (XX) INDICATES THE WEIGHT IN HUNDREDS OF POUNDS OF THAT SAND FILLED MODULE. WEIGHTS 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 FREEZING CONDITIONS, 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 0.04 +/- INCH THICK ALUMINUM SHEETING APPROXIMATELY 30 INCHES SQUARE. THE PANEL IS COVERED WITH YELLOW REFLECTIVE SHEETING WITH BLACK STRIPES 5 INCHES WIDE. BLACK STRIPES SHALL BE AT 45 DEGREES WITH 4 INCHES 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 UP TO 0 TO 5 DEGREES TO FIT FIELD CONDITIONS.
10. THE ALTERNATING BLACK AND RETROREFLECTIVE YELLOW STRIPE SHALL BE SLOPED DOWN TOWARD THE SIDE WHICH TRAFFIC WILL PASS.

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

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

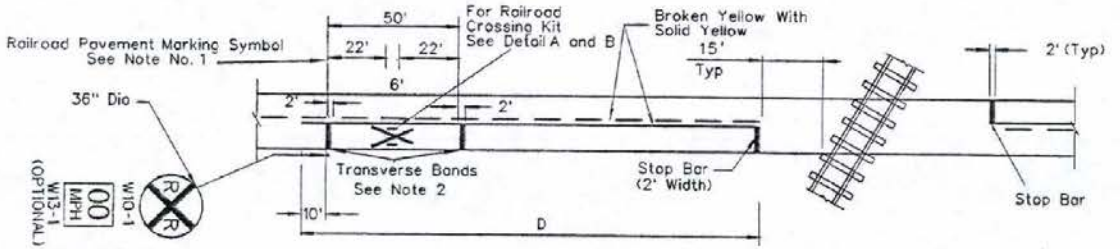
TYPICAL TRAFFIC CONTROL TEMPORARY IMPACT ATTENUATORS SAND FILLED MODULES

CHIEF TRAFFIC ENGINEER

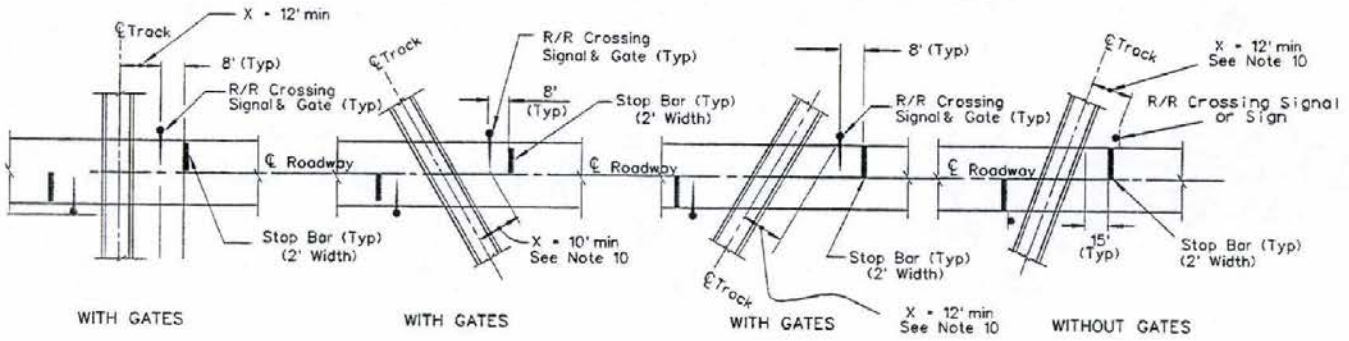
T-35.1.6 (625)

ADOPTED: 3/97

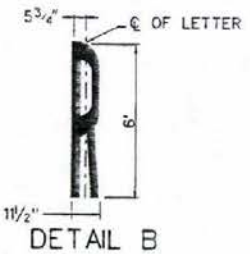
REVISED: 10/98



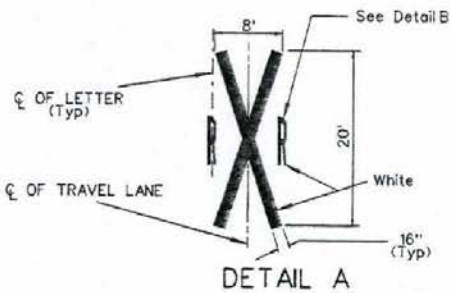
TYPICAL SIGN & MARKING PLAN



R/R STOP BAR, SIGNAL & GATE PLACEMENT



DETAIL B



DETAIL A

RAILROAD CROSSING KIT
One Set of Markers Per Travel Lane (70 ft²)
See Note 5

D
Table For Minimum Spacing of Advance Warning Sign

SPEED (MPH)	SPACING (ft)
20	100
25	100
30	100
35	150
40	225
45	300
50	375
55	450
60	550

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 50 FEET FROM THE STOP BAR.
3. A THREE-LANE ROADWAY SHOULD BE MARKED WITH A CENTERLINE FOR TWO-LANE APPROACH OPERATION ON THE APPROACH 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-31.1.3, T-31.1.6, AND T-31.2.1.
9. REFER TO STANDARD ALPHABET FOR HIGHWAY SIGNS AND MARKINGS FOR RXR SYMBOL DETAILS.
10. THE DISTANCE X SHALL BE NOTED IN THE PLANS AND/OR STRUCTURE LIST.

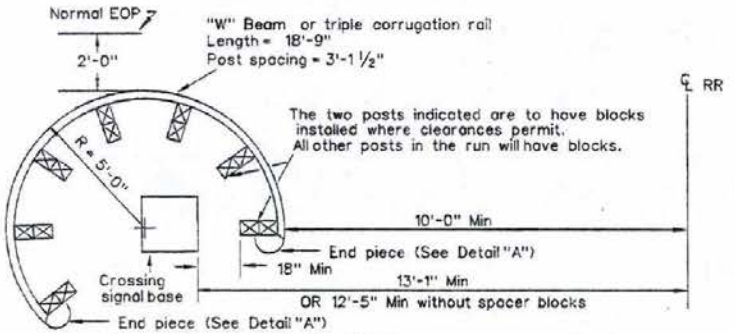
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RAILROAD CROSSING MARKING DETAILS

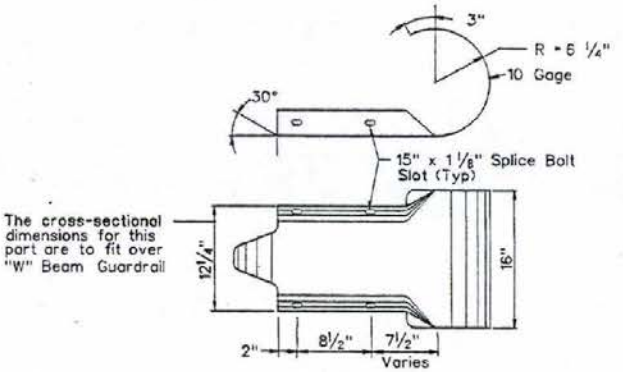
CHIEF TRAFFIC ENGINEER

T-35.2 (627, 634)

ADOPTED: 7/96 REVISION 9/97



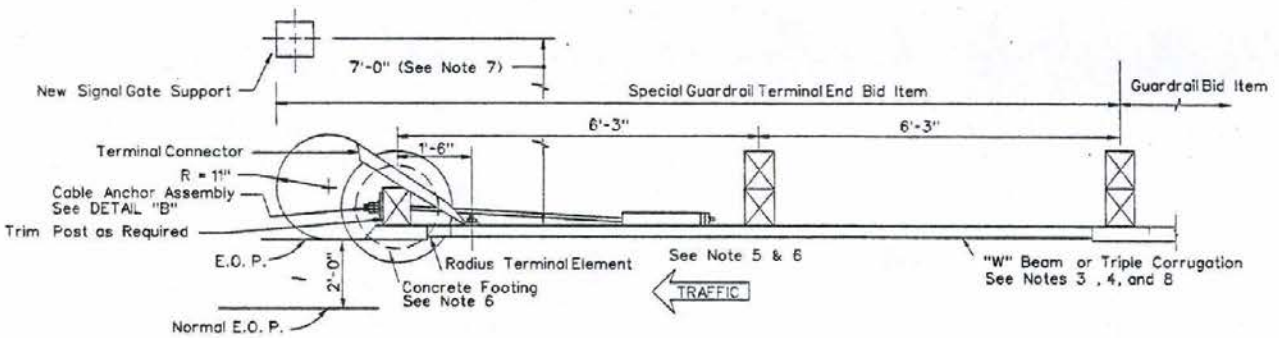
URBAN INSTALLATION

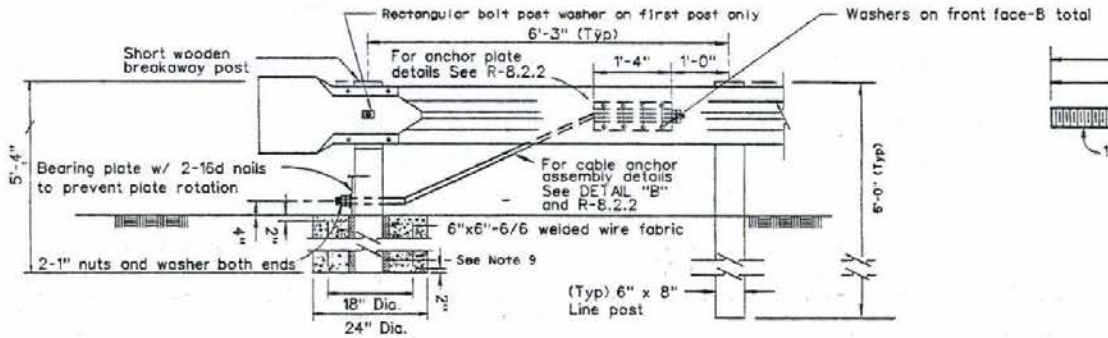


DETAIL "A"

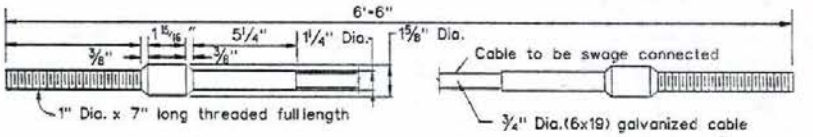
GENERAL NOTES:

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 railroad-highway grade crossings marking details refer to Standard Plan Drawing T-35.2.
3. For "W" beam guardrail details see Standard Plan Drawing R-8.5.1.
4. For triple corrugation guardrail details see Standard Plan Drawing R-8.4.1.
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 7 feet, refer to Drawing R-8.3.1 and 1996 AASHTO Roadside Design Guide TABLE 5.3 for alternate post spacing.
8. For triple corrugation terminal connector details not shown refer to standardized highway barrier hardware by AASHTO-AGC-ARTEA Report May 1995.
9. Form concrete around 6" x 8" post wrapped with 1 layer of 1/4" to 1/2" thick expanded polystyrene foam sheeting. Don't nail polystyrene foam to post.





SPECIAL GUARDRAIL TERMINAL END



DETAIL "B"

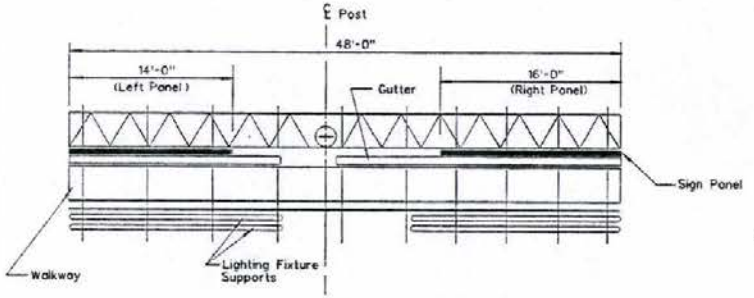
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RAILROAD CROSSINGS GUARDRAIL DETAILS

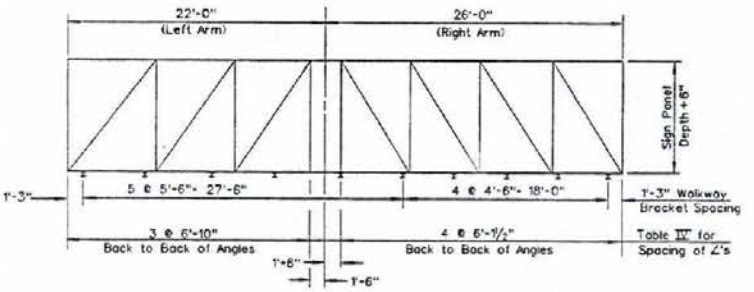
T-35.2.1 (618)

CHIEF TRAFFIC ENGINEER | ADOPTED: 7/96 | REVISION 10/96

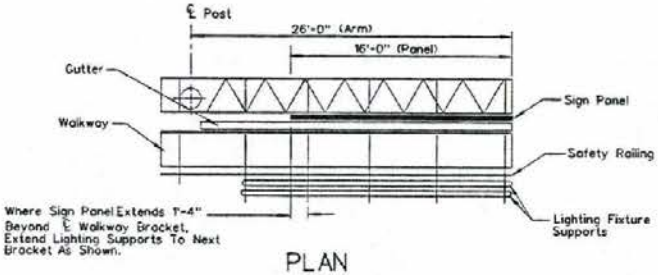
T-60



PLAN



UNBALANCED SINGLE POST TYPE
EXAMPLE NO. 1



PLAN
CANTILEVER SINGLE
POST TYPE
EXAMPLE NO. 2

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 I 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.

GENERAL NOTES:

SPECIFICATIONS:

DESIGN: A.A.S.H.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: 30 P.S.F.
Transverse to Face of Sign: 0.2 of Normal Force.

WALKWAY LOADING: Dead Load + 500 Lbs. Concentrated Live Load.

UNIT STRESSES:

STRUCTURAL STEEL:	Fs = 20,000 P.S.I.
REINFORCED CONCRETE:	Fs = 20,000 P.S.I. Fc = 1200 P.S.I.
FOOTING SOIL PRESSURE:	1¼ Tons/Sq.Ft.

MINIMUM CLEARANCE: Vertical Roadway Clearance 18'-0"

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.

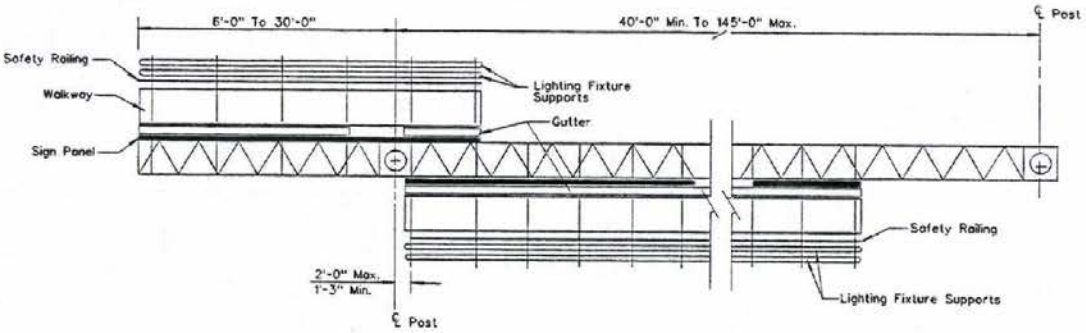
FINISH: All Steel Parts to be Hot-Dipped Galvanized After Fabrication Except As Shown on Plans Or As Called For In Special Provisions.

WALKWAY BRACKETS: Maintain Uniform Spacing Where Possible. Maximum Spacing Shall Not Exceed 5'-6".

LIGHTING FIXTURE SUPPORTS: Where Distance From Walkway Bracket To End of Sign Panel Exceeds 1'-4", 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 11' 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.



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

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

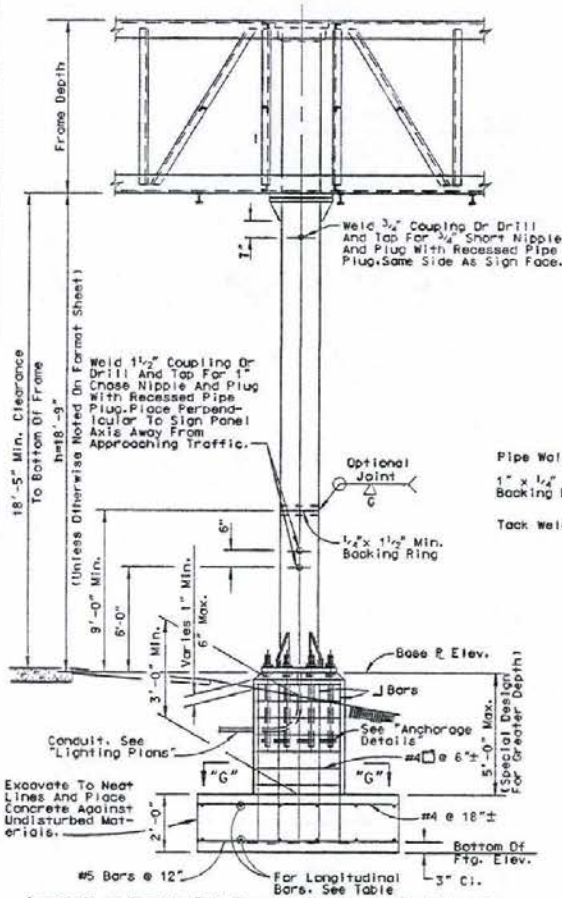
OVERHEAD SIGNS
INSTRUCTIONS & EXAMPLES

CHIEF TRAFFIC ENGINEER

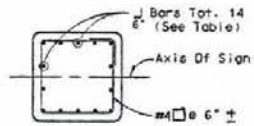
T-36.1.1 (627)

ADOPTED: 11/95 REVISION 3/97

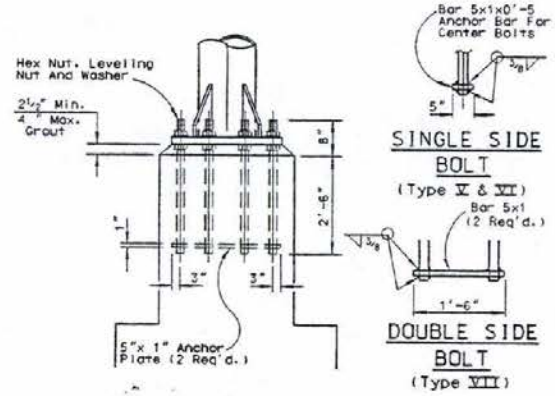
T-61



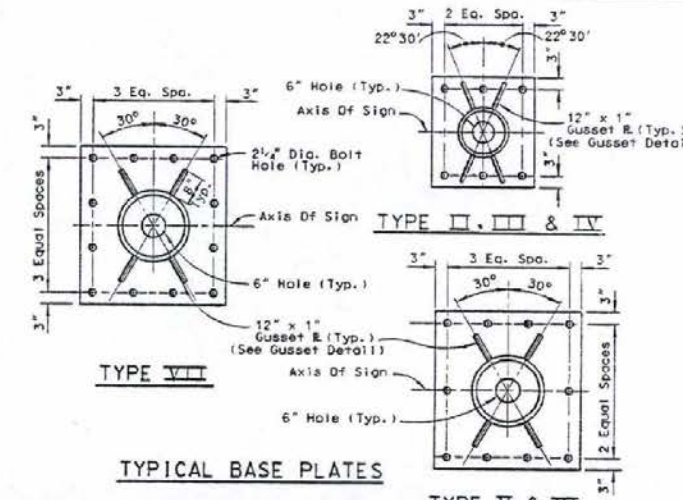
ELEVATION



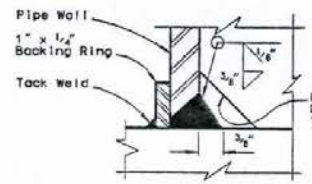
SECTION "G"-"G"



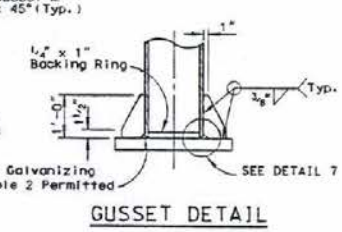
ANCHORAGE DETAILS



TYPICAL BASE PLATES



DETAIL 7
THRU POST @ BASE ℝ

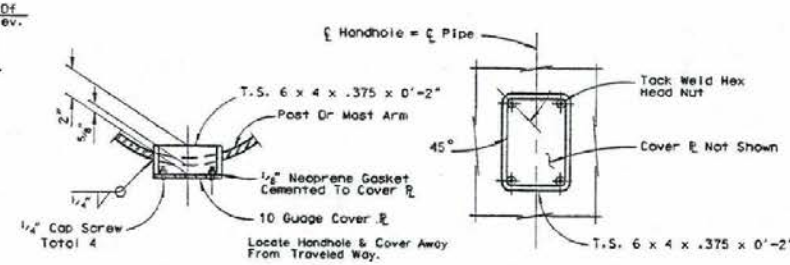


GUSSET DETAIL

Post Type	Pipe Size	Cap Plate Size	Base Plate Size (Note 2)	2"ϕ Anchor Bolts	Pedestal Size (Note 2)	Footing Size (Note 2)	Longitudinal Footing Reinforcement Top	Longitudinal Footing Reinforcement Bottom	J Bars
II	12" Std. ø 49.56	1'-7"x1'-7"x 3/8"	2'-4"x2'-1"x2"	6	2'-11"x2'-0"	7'-10"x10'-0"	6-#4 Bars	9-#5 Bars	#6
III	14" O.D. ø 72.08	1'-8"x1'-8"x 3/8"	2'-7"x2'-3"x2"	6	3'-2"x2'-10"	8'-0"x12'-0"	8-#5 Bars	8-#7 Bars	#6
IV	16" O.D. ø 82.71	1'-10"x1'-10"x 3/8"	3'-1"x2'-9"x2"	6	3'-6"x3'-4"	8'-0"x14'-0"	9-#5 Bars	9-#8 Bars	#6
V	18" O.D. ø 93.45	2'-0"x2'-0"x 3/8"	3'-3"x3'-0"x2"	10	3'-10"x3'-7"	9'-0"x15'-0"	9-#5 Bars	9-#9 Bars	#7
VI	20" O.D. ø 104.13	2'-2"x2'-2"x1"	3'-3"x3'-0"x2"	10	3'-10"x3'-7"	9'-0"x16'-0"	8-#6 Bars	8-#10 Bars	#8
VII	24" O.D. ø125.49	2'-6"x2'-6"x1"	3'-7"x3'-6"x2"	12	4'-3"x3'-11"	10'-0"x12'-0"	10-#6 Bars	10-#10 Bars	#10

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 8" Of Anchor Bolts And Galvanize Upper 1'-0".
5. Spread Footing Shown. Alternate Pile Foundation Is Optional.
6. For Reinforcement, Embedment Is Clear To Outside Of Bar And Is 2" 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.



HANDHOLE AND COVER DETAILS

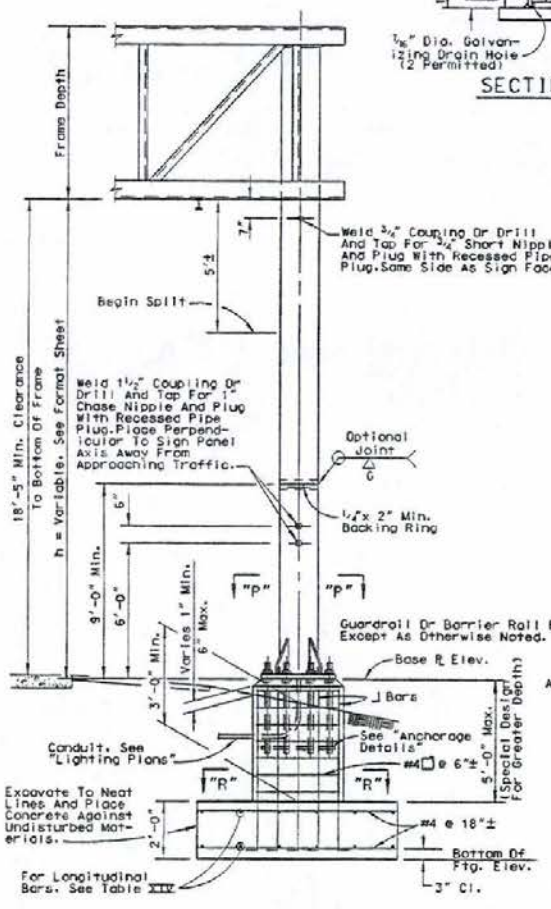
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS SINGLE POST TYPES II THRU VII

CHIEF TRAFFIC ENG.

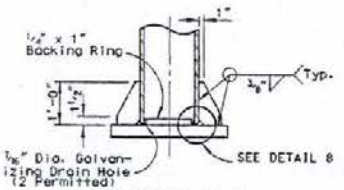
T-36.1.2 (627)
ADOPTED 7/96 REVISION 3/97

T-62

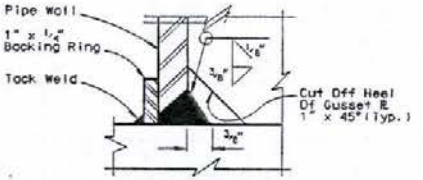


ELEVATION

NOTE: Post Without Cantilever Is Shown.

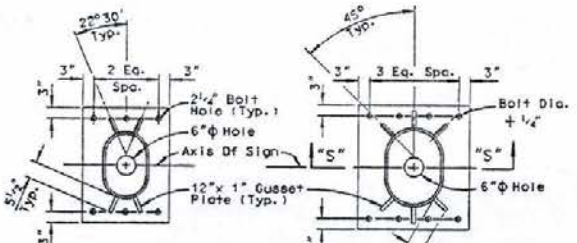


SECTION S-S



DETAIL 8

TABLE XIV								
Post Type	Pipe Size	Split	Base Plate Size (Note 2)	Anchor Bolts	Pedestal Size (Note 2)	Footing Size (Note 2)	Longitudinal Footing Reinforcement Top : Bottom	J Bars
I-S	10" Std. @ 40.48	4"	2'-3"x1'-9"x 2"	6-2" Φ	2'-9"x2'-3"	5'-0"x10'-0"	5-#4 Bars : 5-#6 Bars	#6
II-S	12" Std. @ 45.56	8"	2'-6"x1'-11"x 2"	6-2" Φ	3'-0"x2'-6"	6'-0"x11'-0"	6-#4 Bars : 6-#7 Bars	#6
III-S	14" O.D. @ 72.06	5"	2'-9"x2'-0"x 2"	6-2" Φ	3'-4"x2'-7"	7'-0"x13'-0"	7-#4 Bars : 7-#8 Bars	#8
IV-S	16" O.D. @ 82.77	6"	2'-11"x2'-7"x 2"	8-2" Φ	3'-6"x3'-2"	8'-0"x14'-0"	8-#5 Bars : 8-#9 Bars	#8
V-S	18" O.D. @ 93.45	7"	3'-1"x2'-9"x 2"	8-2" Φ	3'-8"x3'-4"	8'-0"x16'-0"	8-#5 Bars : 8-#9 Bars	#9
VI-S	20" O.D. @ 104.13	8"	3'-5"x2'-8"x 2"	8-2" Φ	4'-0"x3'-4"	9'-0"x17'-0"	9-#5 Bars : 9-#10 Bars	#10
VII-S	24" O.D. @125.49	8"	3'-9"x3'-3"x 2"	8-2 1/4" Φ	4'-5"x3'-11"	10'-0"x18'-0"	10-#6 Bars : 10-#11 Bars	#11

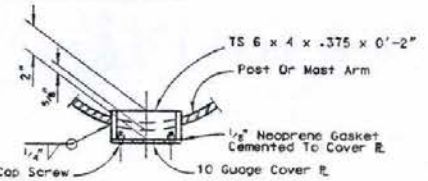


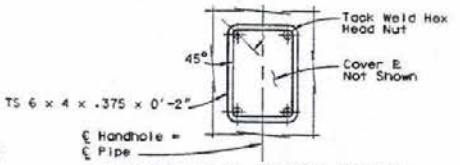
6 ANCHOR TYPE 8 ANCHOR TYPE

TYPICAL BASE PLATES

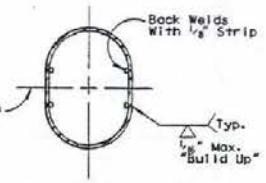
NOTES:

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 8" Of Anchor Bolts And Galvanize Upper 1'-0".
5. Spread Footing Shown. Alternate Pile Foundation Is Optional.
6. For Reinforcement, Embedment Is Clear To Outside Of Bar And Is 2" 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.

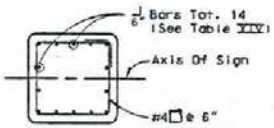




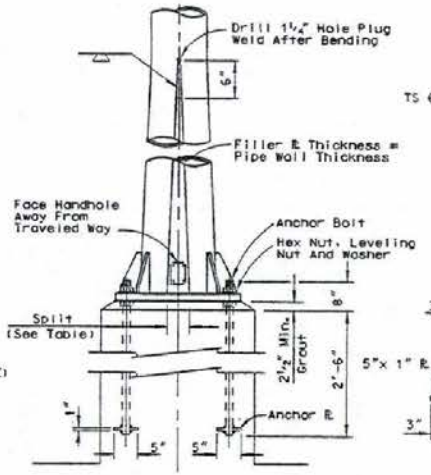
HANDHOLE & COVER DETAIL



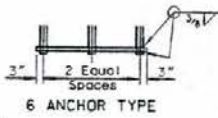
SECTION "P"-"P"



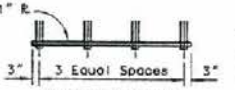
SECTION "R"-"R"



ANCHORAGE DETAILS



6 ANCHOR TYPE



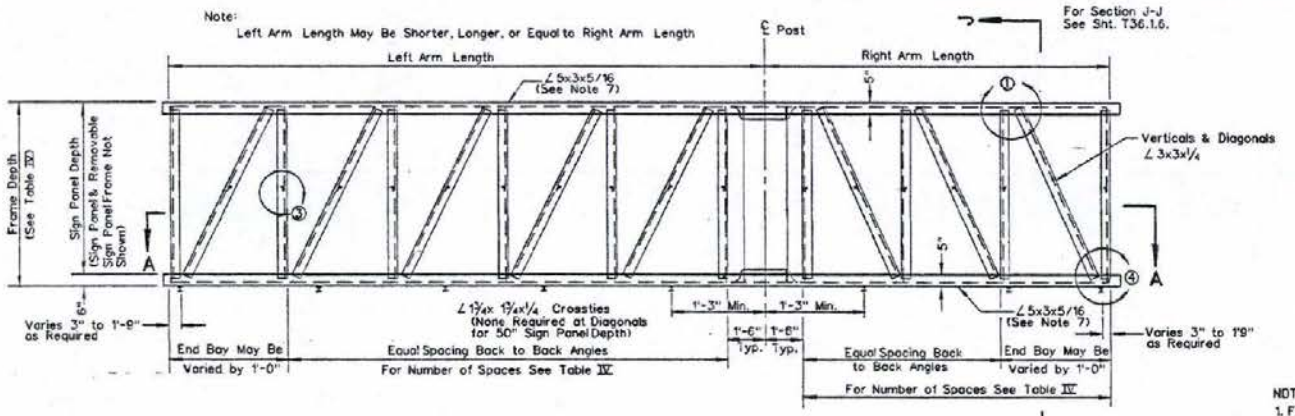
8 ANCHOR TYPE

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

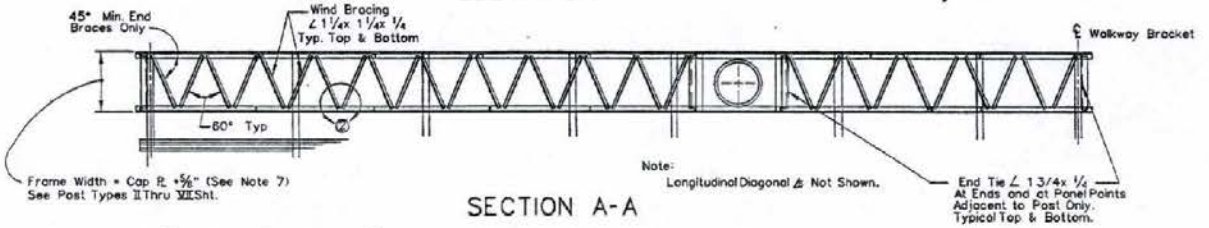
OVERHEAD SIGNS TWO POST TYPES I-S THRU VII-S

CHIEF TRAFFIC ENGR.

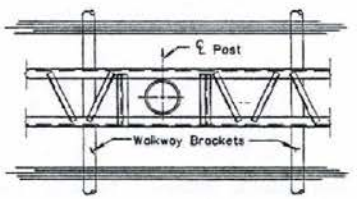
T-36.1.3 (627)
ADOPTED 11/95 REVISION 3/97



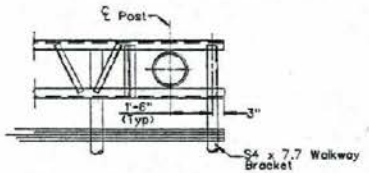
ELEVATION



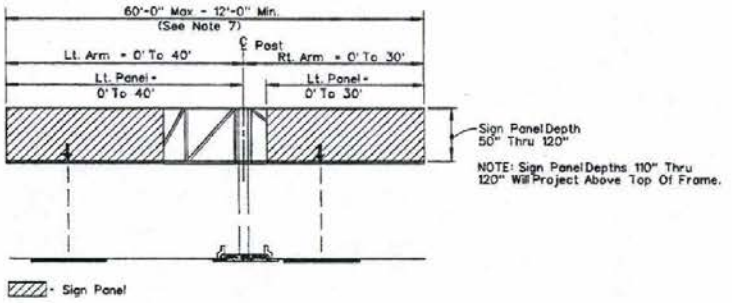
SECTION A-A



PART PLAN OF DOUBLE FACED TYPE AT POST



PART PLAN OF CANTILEVER TYPE AT POST



NOTE: Sign Panel Depths 110" Thru 120" Will Project Above Top Of Frame.

LIMITING DIMENSIONS OF FRAME & SIGN PANEL

TABLE IV

Sign Panel Depth	Frame Depth	Maximum Vertical ∠ Spacing	Arm Length, See Note No. 10
60"	5'-6"	5'-0"	4'
70"	6'-4"	5'-6"	4'
80"	7'-2"	6'-0"	5'
90"	8'-0"	7'-0"	5'
100"	8'-10"	7'-0"	6'
110"	8'-10"	7'-6"	6'
120"	8'-10"	7'-6"	6'

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 = 12'-0". MAXIMUM LENGTH OF FRAME = 60'-0".
7. FOR ARM LENGTHS 35' TO 40' AND SIGN DEPTHS 80" THRU 120" :
   A. USE 5x3x3/16 CHORD ∠'S.
   B. FRAME WIDTH = CAP R.+7/8".
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.

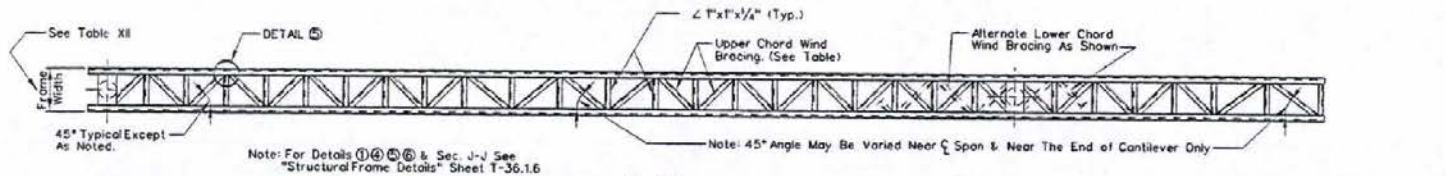
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS-SINGLE POST STRUCTURAL FRAME MEMBERS

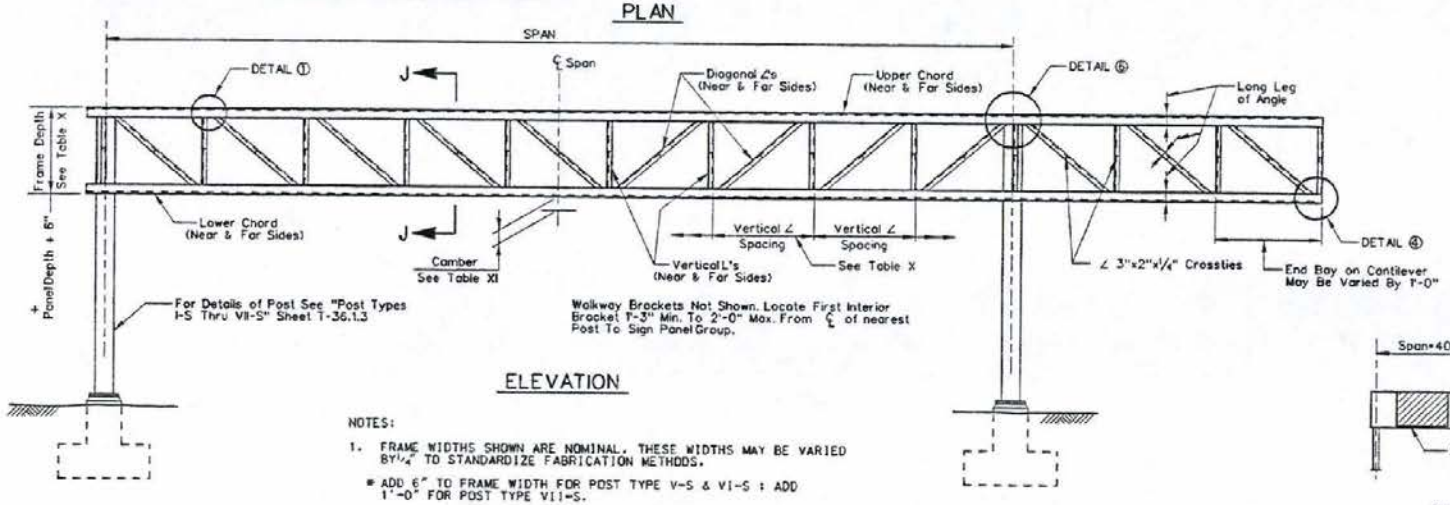
CHIEF TRAFFIC ENGINEER

T-36.1.4 (627)

ADOPTED: 11/95 REVISION 10/98



PLAN



ELEVATION

NOTES:

1. FRAME WIDTHS SHOWN ARE NOMINAL. THESE WIDTHS MAY BE VARIED BY 1/4" TO STANDARDIZE FABRICATION METHODS.

* ADD 6" TO FRAME WIDTH FOR POST TYPE V-S & VI-S ; ADD 1'-0" FOR POST TYPE VII-S.

** ADD 6" TO FRAME WIDTH FOR POST TYPE VII-S.

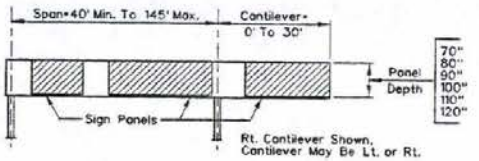
PANEL DEPTH	FRAME DEPTH	MAX VERTICAL ∠ SPACING
70"	6'-4"	72"
80"	7'-4"	72"
90"	8'-4"	90"
100"	9'-4"	90"
110"	9'-10"	120"
120"	10'-10"	120"

TABLE X

CAMBER FOR FABRICATION AT ℄ SPAN	
SPAN	CAMBER
40' - 50'	1/2"
51' - 100'	1"
101' - 145'	1 1/2"

FABRICATE CAMBER TO APPROXIMATE PARABOLA. CAMBER OF CANTILEVER ARM = +1/2" FOR ARMS GREATER THAN 10'.

TABLE XI



RANGE OF STRUCTURE SIZES

NOTE: Sign Panel Depths 110" And 120" Will Project Above Top Of Frame.

Span	70" Panel Depth					80" PANEL DEPTH					90" PANEL DEPTH				
	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
40'-50'	2'-0"*	5x3 1/2x5/16	3x3x1/4	3x3x1/4	1 1/4x1 1/4x1/4	2'-0"*	5x3 1/2x5/16	3x3x1/4	3x3x1/4	1 1/4x1 1/4x1/4	2'-0"*	5x3 1/2x5/16	3x3x5/16	3x3x5/16	1 1/4x1 1/4x1/4
51'-60'	2'-0"*	5x3 1/2x5/16			1 1/4x1 1/4x1/4	2'-0"*	5x3 1/2x5/16			1 1/4x1 1/4x1/4	2'-0"*	5x3 1/2x5/16			1 1/4x1 1/4x1/4
61'-70'	2'-6"**	5x3 1/2x5/16			1 1/4x1 1/4x1/4	2'-6"**	5x3 1/2x5/16			1 1/4x1 1/4x1/4	2'-6"**	5x3 1/2x5/16			1 1/4x1 1/4x1/4
71'-80'	3'-0"	6x4x3/8			1 1/4x1 1/4x1/4	3'-0"	6x4x3/8			1 1/4x1 1/4x1/4	3'-0"	6x4x3/8			1 1/4x1 1/4x1/4
81'-90'	3'-0"	6x4x3/8			1 1/2x1 1/2x1/4	3'-0"	6x4x3/8			1 1/2x1 1/2x1/4	3'-0"	6x4x3/8			1 1/2x1 1/2x1/4
91'-100'	3'-0"	6x4x3/8			1 1/2x1 1/2x1/4	3'-0"	6x4x3/8			1 1/2x1 1/2x1/4	3'-0"	6x4x3/8			1 1/2x1 1/2x1/4
101'-110'	3'-0"	7x4x1/16			1 1/4x1 1/4x1/2	3'-0"	7x4x1/16			1 3/4x1 3/4x1/4	3'-0"	7x4x1/16			1 3/4x1 3/4x1/4
111'-120'	3'-0"	7x4x1/16			1 3/4x1 3/4x1/4	3'-0"	7x4x1/16			1 3/4x1 3/4x1/4	3'-0"	7x4x1/16			1 3/4x1 3/4x1/4
121'-132'	3'-0"	8x4x1/2			1 3/4x1 3/4x1/4	3'-0"	8x4x1/2			1 3/4x1 3/4x1/4	3'-0"	8x4x1/2			1 3/4x1 3/4x1/4
133'-145'	3'-0"	8x4x1/2			1 3/4x1 3/4x1/4	3'-0"	8x4x5/8			1 3/4x1 3/4x1/4	3'-6"	8x4x5/8			2x2x1/4
															2x2x1/4

Span	100" Panel Depth					110" PANEL DEPTH					120" PANEL DEPTH				
	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
40'-50'	2'-0"*	5x3 1/2x5/16	3x3x5/16	3x3x5/16	1 1/4x1 1/4x1/4	2'-0"*	5x3 1/2x5/16	3 1/2x3 1/2x5/16	3 1/2x3 1/2x5/16	1 1/4x1 1/4x1/4	2'-0"*	5x3 1/2x5/16	3 1/2x3 1/2x5/16	4x3 1/2x5/16	1 1/4x1 1/4x1/4
51'-60'	2'-0"*	5x3 1/2x5/16			1 1/4x1 1/4x1/4	2'-6"**	5x3 1/2x5/16			1 1/4x1 1/4x1/4	2'-6"**	5x3 1/2x5/16			1 1/2x1 1/2x1/4
61'-70'	2'-6"**	5x3 1/2x5/16			1 1/2x1 1/2x1/4	3'-0"	6x4x3/8			1 1/2x1 1/2x1/4	3'-0"	6x4x3/8			1 3/4x1 3/4x1/4
71'-80'	3'-0"	6x4x3/8			1 3/4x1 3/4x1/4	3'-0"	6x4x3/8			2x2x1/4	3'-6"	6x4x3/8			2x2x1/4
81'-90'	3'-0"	6x4x3/8			1 3/4x1 3/4x1/4	3'-6"	6x4x5/8			2x2x1/4	3'-6"	6x4x5/8			2x2x1/4
91'-100'	3'-0"	6x4x3/8			1 3/4x1 3/4x1/4	3'-6"	6x4x5/8			2x2x1/4	3'-6"	6x4x5/8			2x2x1/4
101'-110'	3'-0"	7x4x1/16			2x2x1/4	3'-6"	7x4x1/16			2x2x1/4	3'-6"	7x4x1/16			2x2x1/4
111'-120'	3'-0"	7x4x1/16			2x2x1/4	3'-6"	7x4x1/16			2x2x1/4	3'-6"	7x4x1/16			2x2x1/4
121'-132'	3'-0"	8x4x1/2			2x2x1/4	3'-6"	8x4x1/2			2x2x1/4	3'-6"	8x4x1/2			2 1/2x2 1/2x1/4
133'-145'	3'-6"	8x4x5/8			2x2x1/4	3'-6"	8x4x5/8			2 1/2x2 1/2x1/4	3'-6"	8x4x5/8			2 1/2x2 1/2x1/4

TABLE XII

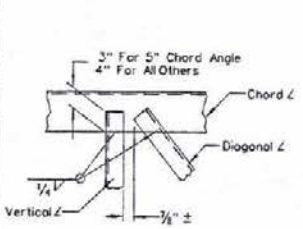
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS-TWO POST STRUCTURAL FRAME MEMBERS

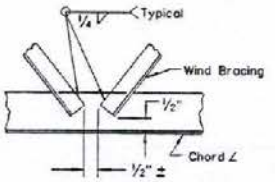
CHIEF TRAFFIC ENGINEER

T-36.1.5 (627)

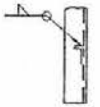
ADOPTED: 11/95 REVISION: 3/97



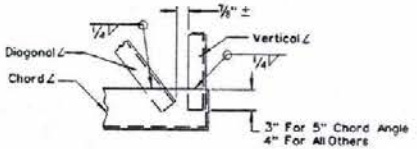
DETAIL ①



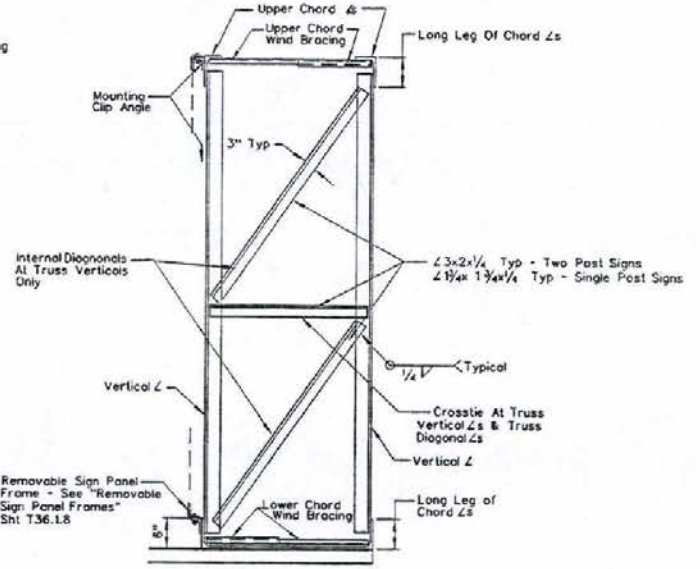
DETAIL ②



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.

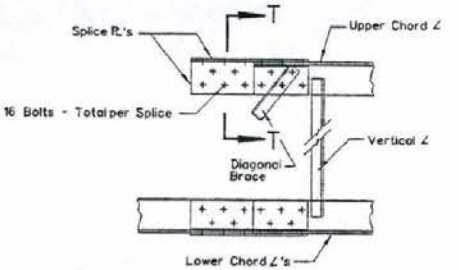
SPLICE NOTES:

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

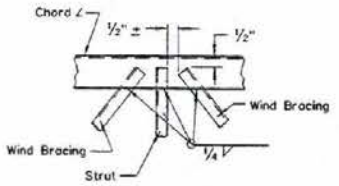
Location of Splices:
The Splice Shall Be Located So As Not To Interfere With Mounting The Walkway Brackets Or The Clip Angles For The Removable Sign Panel Frame. The Wind Bracing In The Area Of The Bolted Chord Splice Shall Be Bolted To The Chord Angles With a ⅜" Unfinished Bolt, With Hex Head and Nut, 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.

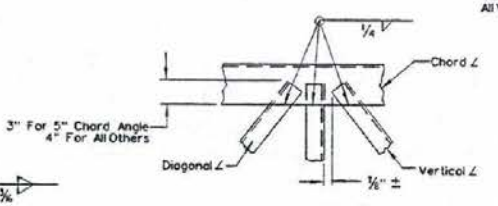
Filler PL:
The Plates Welded To The Angle Legs On The Inside Shall Be Welded Before Punching The Bolt Holes. They Shall Be The Same Length As The Cover Plates. The Plates Are Not Necessary On The Single Post Signs If The Splice Is Located Over ⅓ Of The Cantilever Length From The Post Alternative Splice Details May Be Used If Approved By The Engineer.



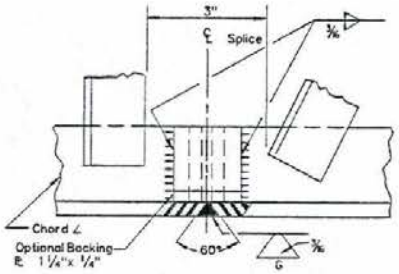
OPTIONAL
BOLTED CHORD SPLICE



DETAIL ⑤

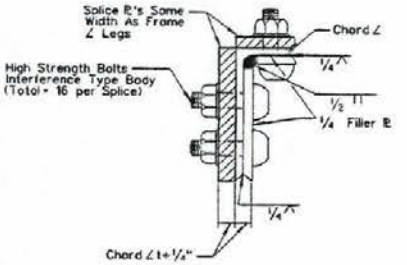


DETAIL ⑥



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

BOLTED CHORD SPLICE TWO POST SIGNS	
Chord ∠	Nominal Bolt Diam.
5x3½x⅝	¾"
6x4x⅝	⅞"
7x4x ⅝	1"
8x4x ½	1⅛"
8x4x⅝"	1¼"
9x4x⅝"	1¼"
SINGLE POST SIGNS	
Chord ∠	Nominal Bolt Diam.
5x3x⅝	¾"
5x3x½	¾"

STATE OF NEVADA
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OVERHEAD SIGNS
STRUCTURAL FRAME DETAILS

CHIEF TRAFFIC ENGINEER

T-36.1.6 (627)

ADOPTED: 7/96 REVISION 5/97

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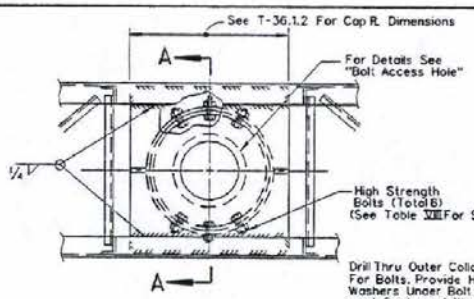
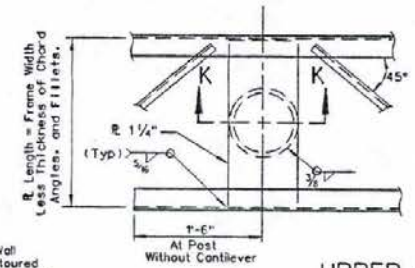
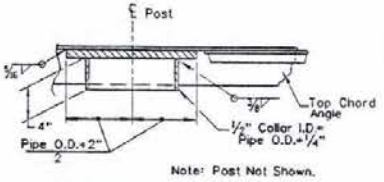
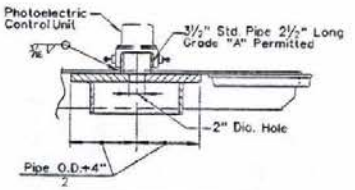


PLAN



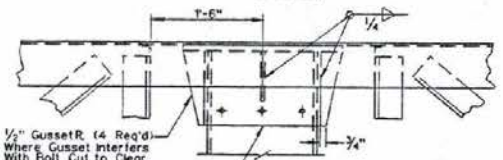


SECTION K-K
WITHOUT PHOTOELECTRIC CONTROL UNIT

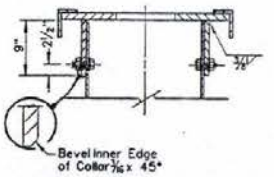


SECTION K-K
WITH PHOTOELECTRIC CONTROL UNIT

UPPER CHORD CONNECTION TO POST
TWO POST TYPE

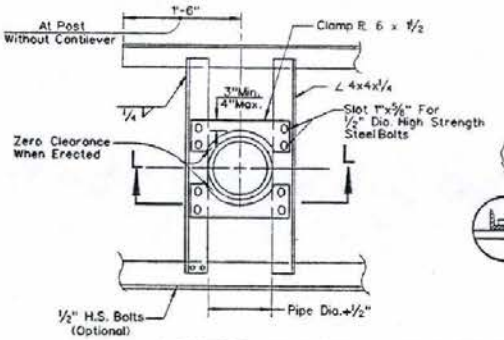


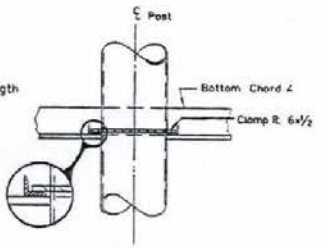
ELEVATION



SECTION A-A

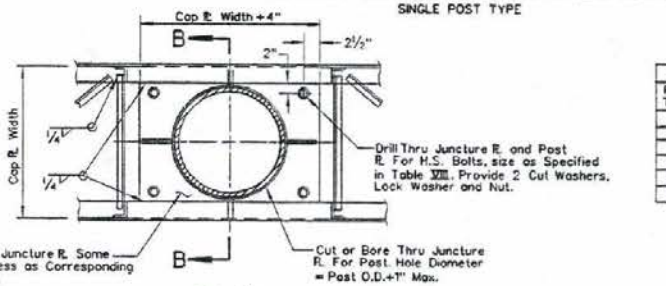
UPPER JUNCTURE CONNECTION
SINGLE POST TYPE





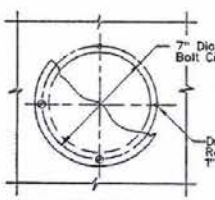
SECTION L-L

LOWER CHORD CONNECTION TO POST
TWO POST TYPE



PLAN

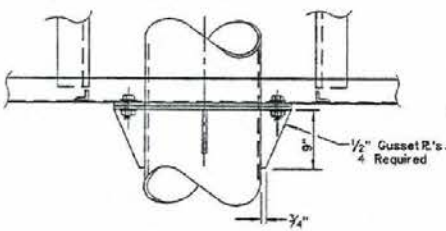
TABLE VIII	
Post Type	Bolt Size
III	7/8"
IV	1"
V	1 1/8"
VI	1 1/4"
VII	1 1/4"



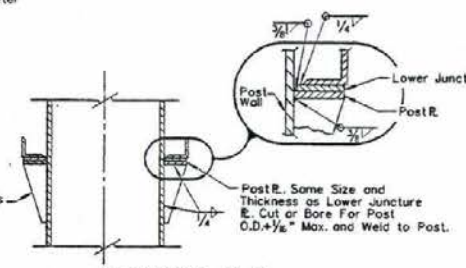
PLAN

NOTES: (SINGLE POST TYPE)

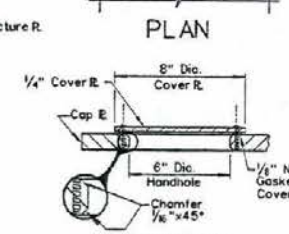
1. Drilled Holes for Unfinished Bolts Shall Not Exceed Nominal Bolt Diameter by More Than 1/16".
2. All Bolts, Nuts and Washers Shall Be Galvanized.
3. In All Cases, Sign Frame Shall Be Supported At Top of Post. Bearing Surface at Top of Post Shall Be Finished True.
4. At Lower Juncture Connection, Shims Shall Be Used Where Any Clearance Exists Between Bottom of Frame and Post R. Prior to Tightening of Bolts in Lower Connection. Shims May be Galvanized Steel Cut Washers.



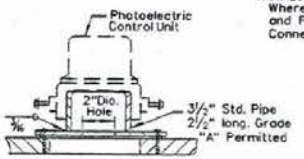
ELEVATION
LOWER JUNCTURE CONNECTION
SINGLE POST TYPE



SECTION B-B



SECTION
WITHOUT PHOTOELECTRIC CONTROL UNIT



SECTION
WITH PHOTOELECTRIC CONTROL UNIT

BOLT ACCESS HOLE
SINGLE POST TYPE

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
FRAME JUNCTURE DETAILS

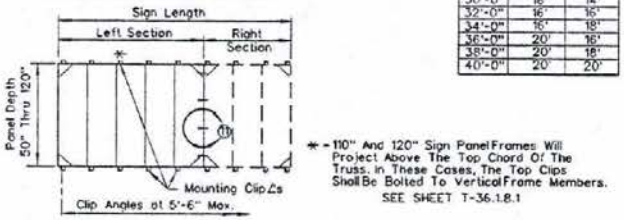
Scott Thomas
CHIEF TRAFFIC ENGINEER

T-36.1.7 (627)
ADOPTED: 7/96 REVISION 3/97

NOTES:
Frames for Signs Greater than 20'-0" in Length Shall be Fabricated in Two Sections With Left Section A Multiple of 4'-0" 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	Left Section	Right Section
22'-0"	12'	10'
24'-0"	12'	12'
26'-0"	12'	14'
28'-0"	16'	12'
30'-0"	16'	14'
32'-0"	16'	16'
34'-0"	16'	18'
36'-0"	20'	16'
38'-0"	20'	18'
40'-0"	20'	20'



* = 110" And 120" 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 20'-0"

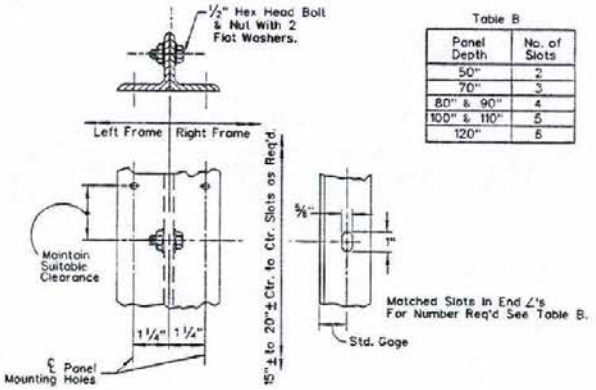


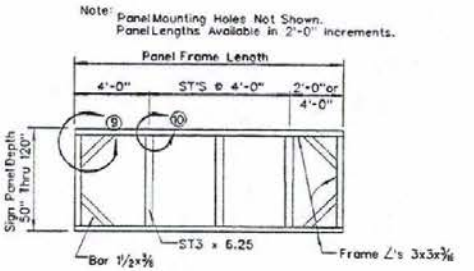
Table B

Panel Depth	No. of Slots
50"	2
70"	3
80" & 90"	4
100" & 110"	5
120"	6

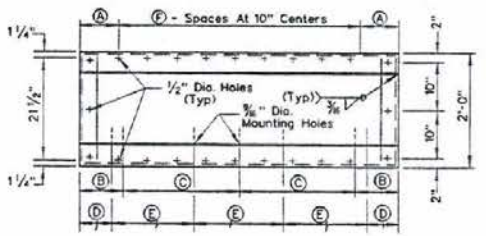
Matched Slots In End ∠'s For Number Req'd See Table B.

DETAIL (11)

Note: Panel Mounting Holes Not Shown.
Panel Lengths Available in 2'-0" Increments.



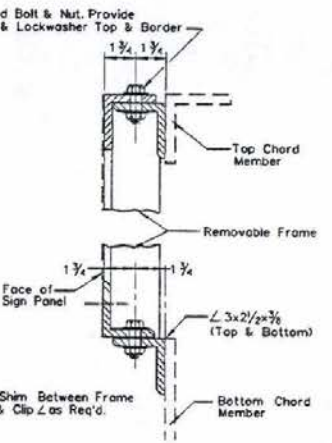
TYPICAL REMOVABLE FRAME
(4'-0" THRU 20'-0")



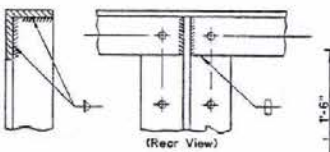
Frame Width	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ
5'-6"	0'-8"	0'-9"	2'-0"	—	—	5
7'-0"	0'-7"	1'-6"	2'-0"	—	—	7
8'-6"	0'-6"	—	—	1'-3"	2'-0"	9

NOTES:
1. Frame ∠s Shall Be 3"x3"x3/16" ASTM-A36
2. ½" Panel Mounting Holes Shall Be Drilled With Templates.
3. Holes For Mounting Sign May Be Slotted 1".
4. Mount Exit Frame At Right Edge of Removable Frame So Front Faces Are Flush.

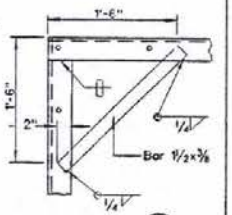
TYPICAL EXIT PANEL FRAMES



NOTES:
1. Frames Shall Be All-Welded Construction
2. ½" Panel Mounting Holes Shall Be Drilled By Template. Sign Panel May Be Considered a Template.
3. Drilled and Tapped Holes (1/4" -20 N.C.) May Be Used Where Interference Due To Welds or Structural Members Is Encountered.
4. ST3x6.25 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 1" Maximum Parallel to the Axis of The Sign.
7. ST3x6.25 May Be Crimped at Ends to Join Frame Angles. Fillet Weld All Around.
8. Panels Shall Be 2'-0" Minimum and 4'-0" Maximum.

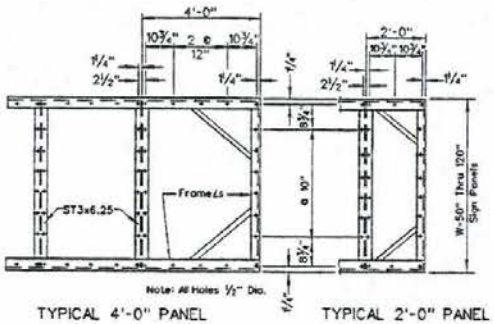


DETAIL (10)



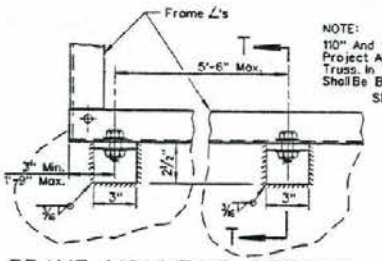
DETAIL (9)

TYPICAL JOINT DETAILS



TYPICAL 4'-0" PANEL TYPICAL 2'-0" PANEL

MOUNTING HOLE SPACING FOR SIGN PANEL & FRAME



NOTE:
110" And 120" 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

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
REMOVABLE SIGN PANEL FRAMES

CHIEF TRAFFIC ENGINEER

T-36.1.8 (627)
ADOPTED: 7/96 REVISION 3/97

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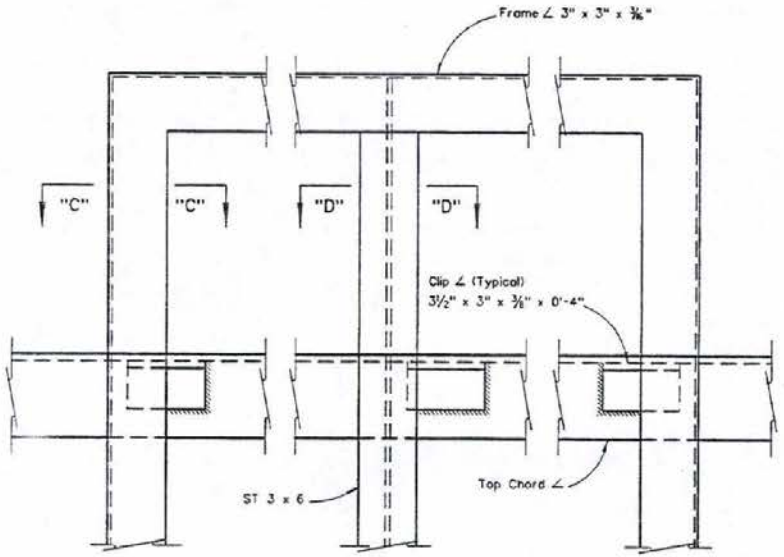
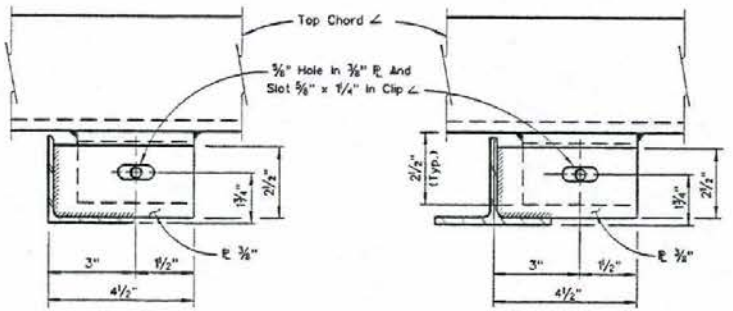
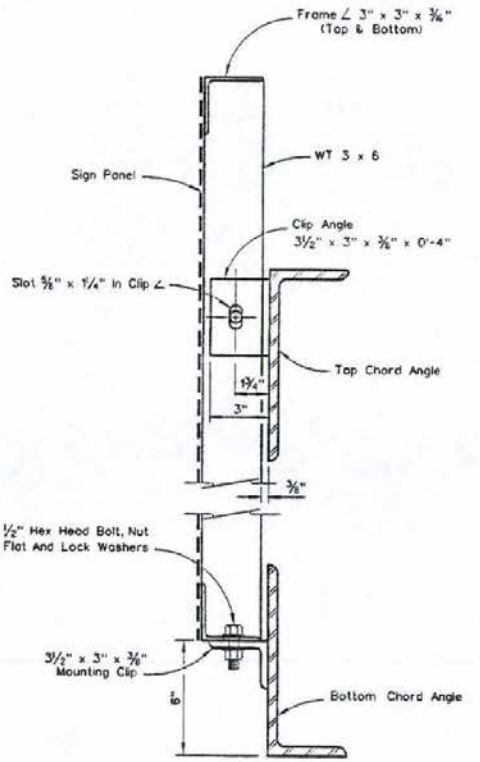
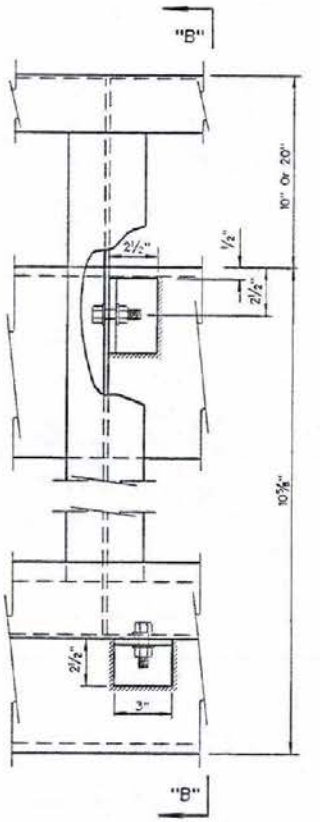




SECTION "C"-"C" SECTION "D"-"D"

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 ¼" For Clip Angles Welded To Chord Member Of Truss.
3. Maximum Spacing Of Bottom Clip Angle Is 5'-6".
4. Top Clip Required For Each Vertical Member Or Removable Sign Panel Frame.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS

REMOVABLE SIGN PANEL FRAMES
110" AND 120" SIGN PANELS

CHIEF TRAFFIC ENGINEER | T-36.1.8.1 (627) | ADOPTED: 7/96 | REVISION 3/97

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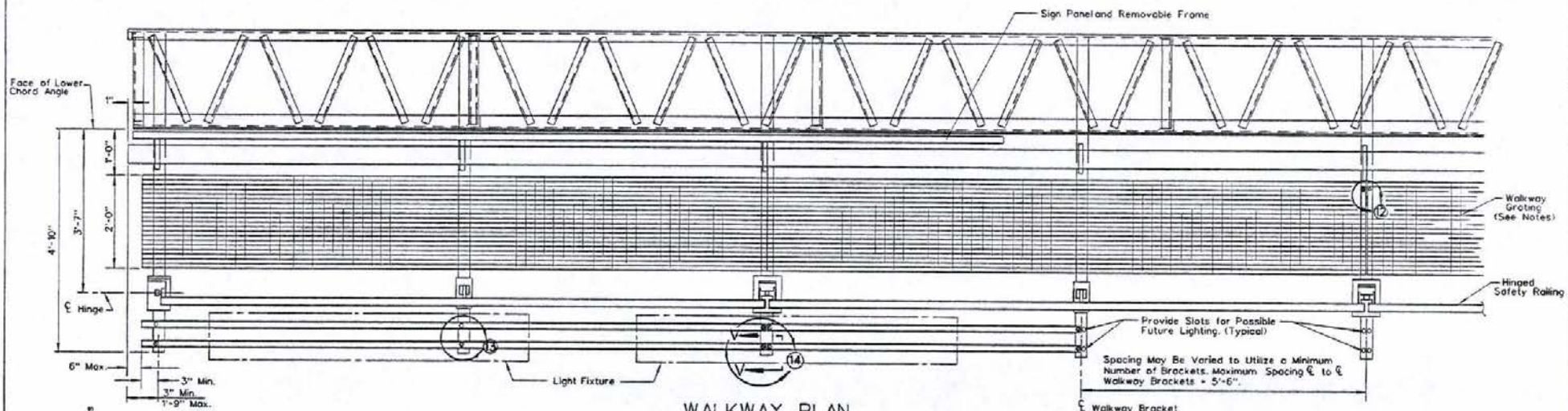
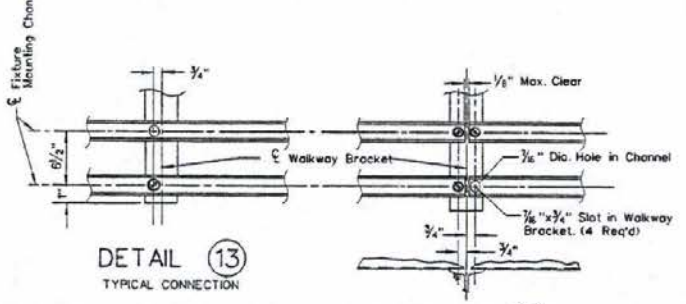
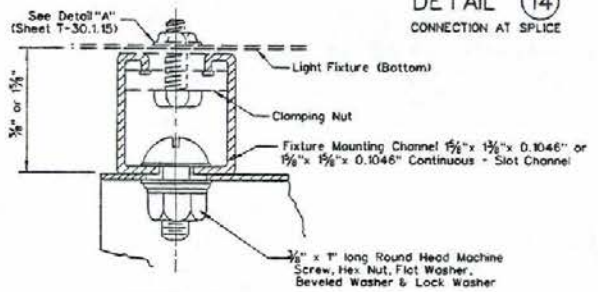


WALKWAY PLAN

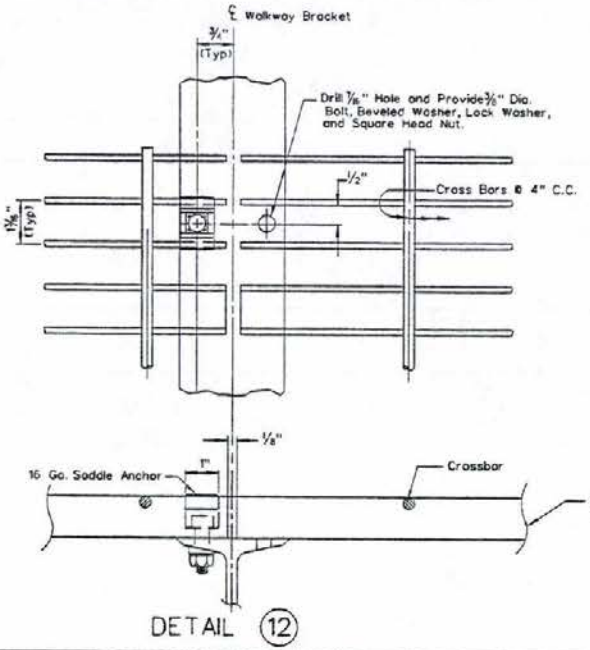


DETAIL (13)
TYPICAL CONNECTION

DETAIL (14)
CONNECTION AT SPLICE



SECTION V-V



DETAIL (12)

NOTES:

1. Welded-Type Grating Shall Have 1 1/2" x 1/8" Bearing Bars @ 1 7/16" Centers with 1/4" Diameter (or Equal) Cross Bars @ 4" 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.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
WALKWAY DETAILS NO. 1

CHIEF TRAFFIC ENGINEER | ADOPTED: 11/95 | REVISION 10/98 | T-36.1.9 (627)

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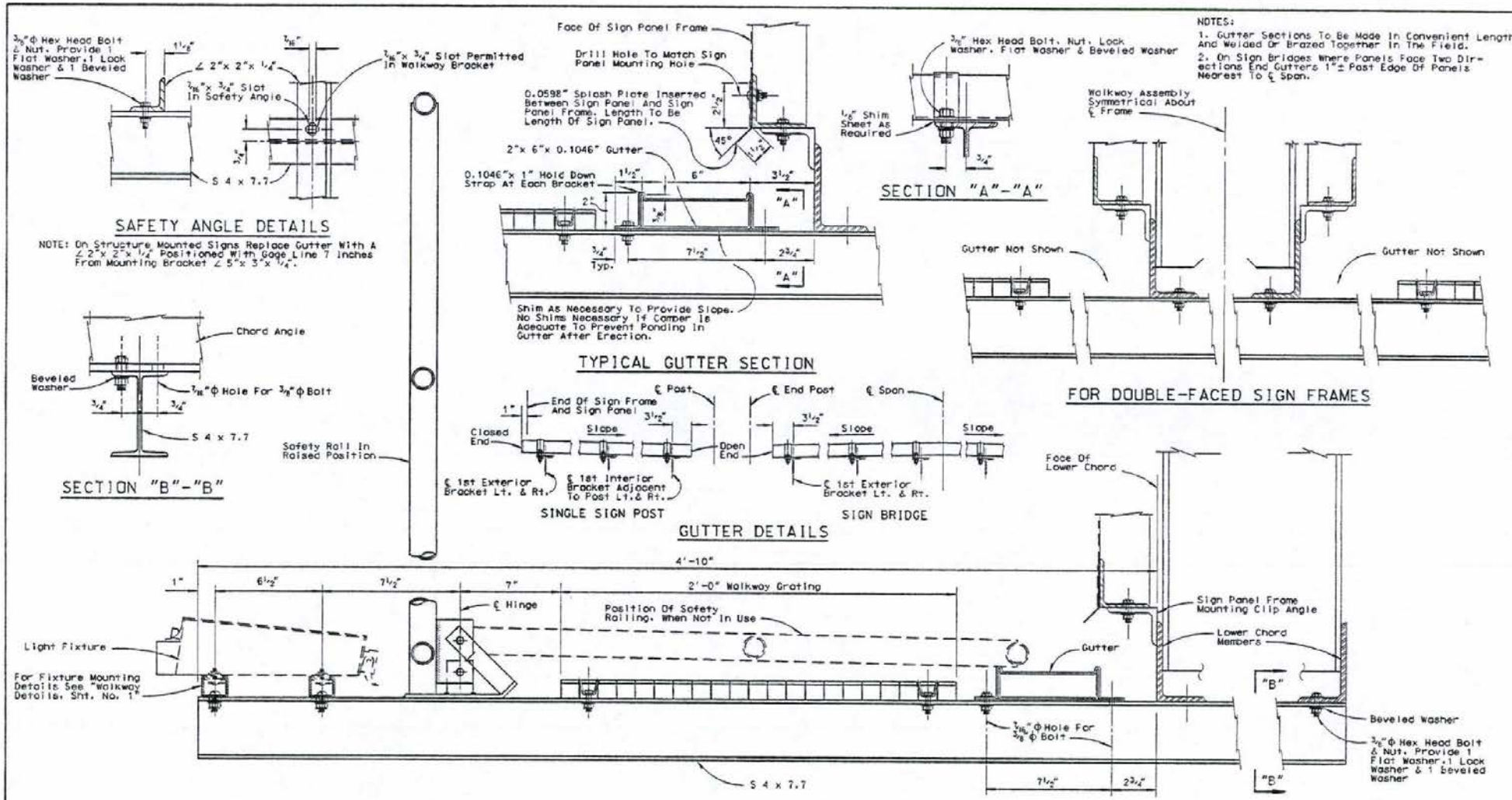
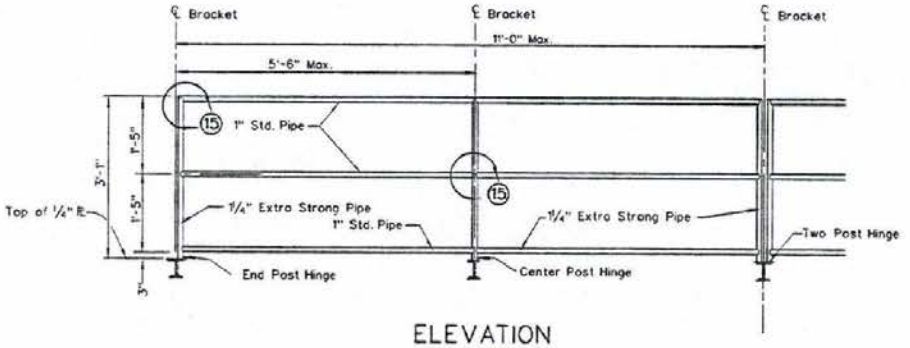
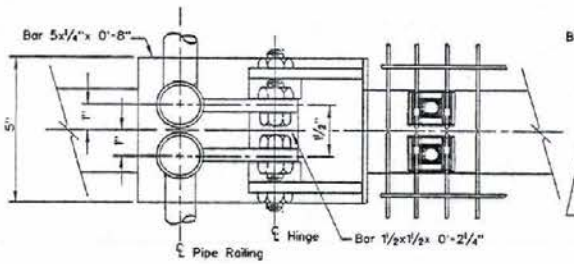
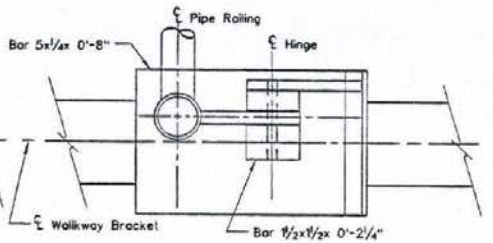

NOTES:
1. Gutter Sections To Be Made In Convenient Lengths And Welded Or Brazed Together In The Field.
2. On Sign Bridges Where Panels Face Two Directions End Gutters 1" ± Past Edge Of Panels Nearest To ℄ Span.
SAFETY ANGLE DETAILS
NOTE: On Structure Mounted Signs Replace Gutter With A ∠ 2"x 2"x 1/4" Positioned With Gage Line 7 Inches From Mounting Bracket ∠ 5"x 3"x 1/4".
S 4 x 7.7
SECTION "B"-"B"
Chord Angle
Beveled Washer
Safety Rail In Raised Position
Face Of Sign Panel Frame
Drill Hole To Match Sign Panel Mounting Hole
0.0598" Splash Plate Inserted Between Sign Panel And Sign Panel Frame. Length To Be Length Of Sign Panel.
2"x 6"x 0.1046" Gutter
0.1046"x 1" Hold Down Strap At Each Bracket
Shim As Necessary To Provide Slope. No Shims Necessary If Camber Is Adequate To Prevent Ponding In Gutter After Erection.
TYPICAL GUTTER SECTION
SECTION "A"-"A"
Walkway Assembly Symmetrical About ℄ Frame
Gutter Not Shown
FOR DOUBLE-FACED SIGN FRAMES
End Of Sign Frame And Sign Panel
Closed End
Open End
℄ 1st Exterior Bracket Lt. & Rt.
℄ 1st Interior Bracket Adjacent To Post Lt.& Rt.
SINGLE SIGN POST
SIGN BRIDGE
GUTTER DETAILS
2'-0" Walkway Grating
℄ Hinge
Position Of Safety Railing, When Not In Use
Light Fixture
For Fixture Mounting Details See "Walkway Details, Sht. No. 1"
Face Of Lower Chord
Sign Panel Frame Mounting Clip Angle
Lower Chord Members
Gutter
Beveled Washer
WALKWAY ASSEMBLY
NOTE: For Spacing Of Lighting Fixtures, See Table Of Spacing On "Sign Lighting Fixtures" Sheet T-30.1.16.1
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
OVERHEAD SIGNS
WALKWAY DETAILS NO. 2
T-30.1.10 (627)
CHIEF TRAFFIC ENGR.
ADOPTED 11/95 REVISION 3/97



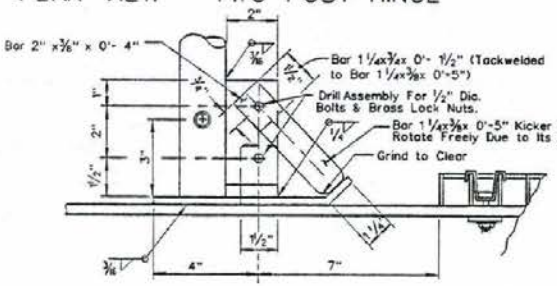
ELEVATION



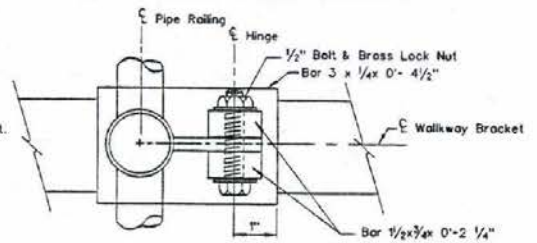
PLAN VIEW - TWO POST HINGE



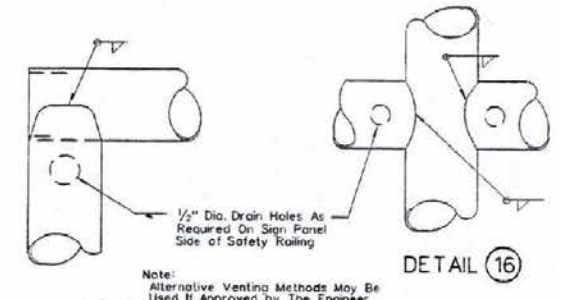
PLAN VIEW - END POST HINGE



ELEVATION



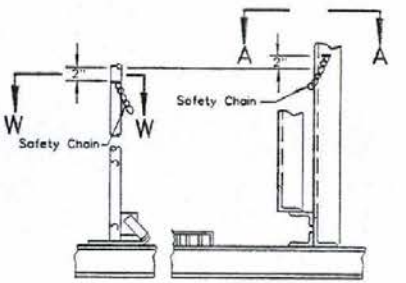
PLAN VIEW - CENTER POST HINGE

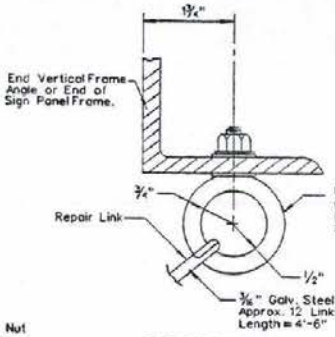


DETAIL (15)

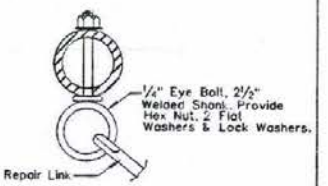
Note:
Alternative Venting Methods May Be Used If Approved by The Engineer.

DETAIL (16)





SECTION A-A



SECTION W-W

CHAIN ASSEMBLY

NOTES:

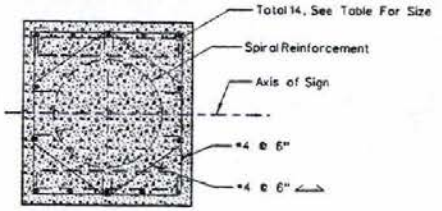
1. Special Care Shall Be Taken to Insure That The Completed Hinge and Latch Assembly Will Hold The Safety Railing In A Steady Manner, Free of Wobble While in the Raised Position. Maximum Allowable Displacement From Vertical at Top of Railing When Latched Shall Be 1".
2. Details For Bolting Hinge Base R. to Walkway Bracket May Be Submitted for Approval.
3. Alternative Details Approved By The Engineer May Be Substituted For The Safety Chain Connections Shown.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

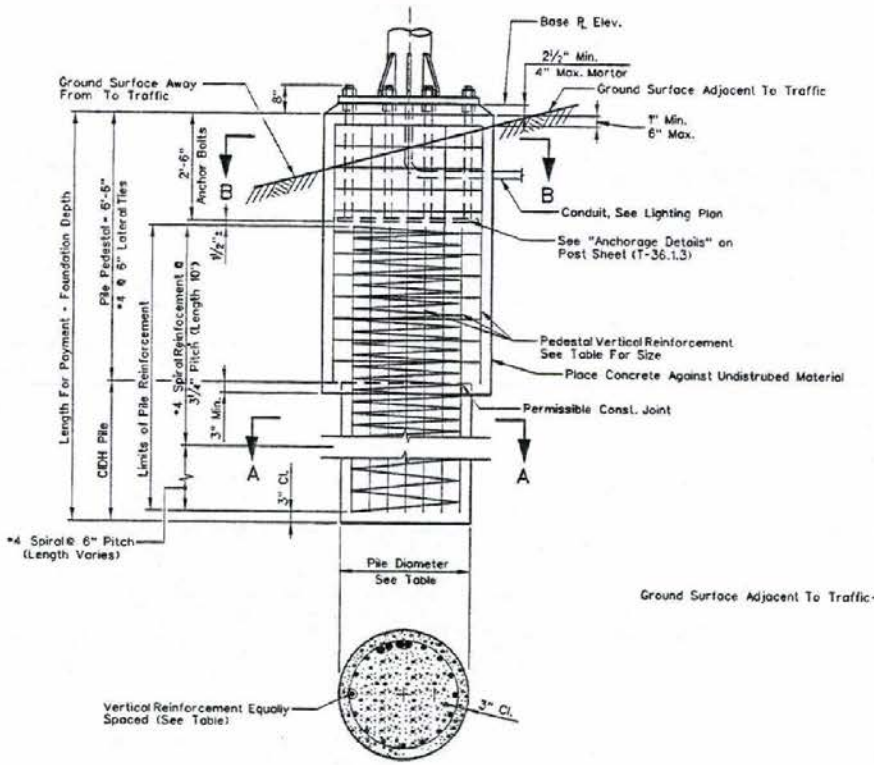
OVERHEAD SIGNS
WALKWAY SAFETY RAILING DETAILS

Jack Thomas — CHIEF TRAFFIC ENGINEER

T-36.1.11 (627)
ADOPTED: 11/95 REVISION 3/97



SECTION B-B



SECTION A-A

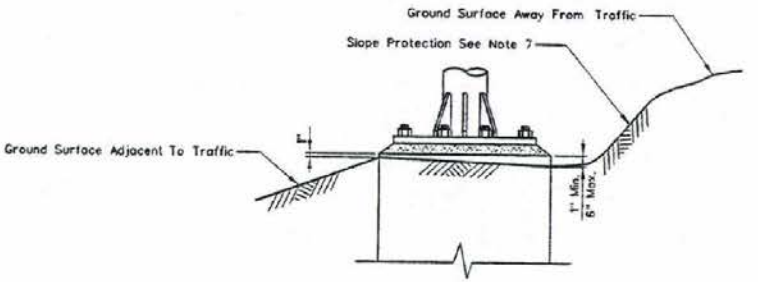
POST TYPE	ANCHOR BOLTS	PEDESTAL SIZE	REINFORCING STEEL VERTICAL	PILE DIAMETER	FOUNDATION DEPTH **
II	6 - 2"	2'-11" X 2'-10"	14 - # 7	30"	14'
III	6 - 2"	3'-2" X 2'-10"	14 - # 8	30"	14'
IV	6 - 2"	3'-8" X 3'-4"	16 - # 8	36"	14'
V	10- 2"	3'-10" X 3'-7"	16 - # 9	36"	17'
VI	10- 2"	3'-10" X 3'-7"	16 - #10	36"	18'
VII	12- 2"	4'-3" X 3'-11"	16 - #11	36"	21'
I-S	6 - 2"	2'-10" X 2'-10"	14 - # 7	30"	14'
II-S	6 - 2"	3'-1" X 2'-10"	14 - # 8	30"	16'
III-S	6 - 2"	3'-4" X 2'-10"	14 - #10	30"	18'
IV-S	8 - 2"	3'-6" X 3'-4"	16 - #10	36"	19'
V-S	8 - 2"	3'-9" X 3'-4"	16 - #11	36"	22'
VI-S	8 - 2"	4'-1" X 3'-4"	16 - #11	36"	23'
VII-S	8 - 21/4"	4'-5" X 3'-11"	* 24 - #11	36"	25'

** 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 ℄ 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 6" MIN. BELOW GROUND SURFACE. REMAINDER TO BE PLACED AGAINST UNDISTURBED MATERIAL.
7. SLOPE PROTECTION REQUIRED WHEN INDICATED ON THE ROAD PLANS.

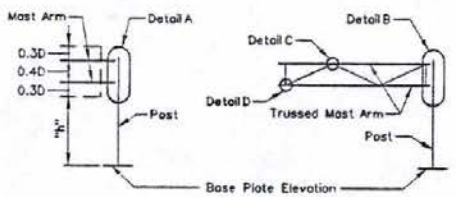


DETAIL C

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

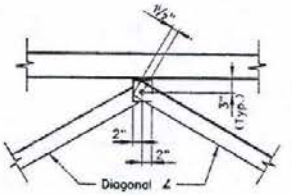
OVERHEAD SIGNS
ALTERNATE PILE FOUNDATION

CHIEF TRAFFIC ENGINEER | T-36.1.12 | (627) | ADOPTED: 7-91 | REVISION 3/97

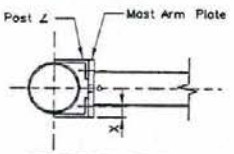


DOUBLE MAST ARM SERIES TRUSSED MAST ARM SERIES

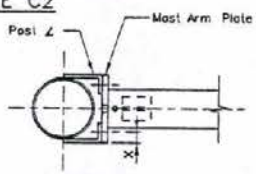
TYPE C1 TYPE C2



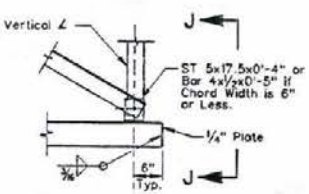
DETAIL C



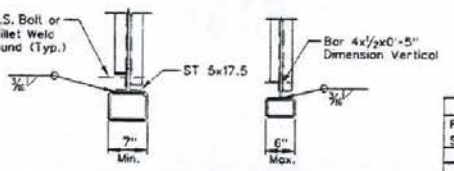
SECTION F-F



SECTION G-G

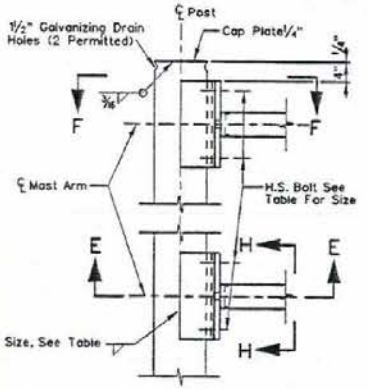


DETAIL D

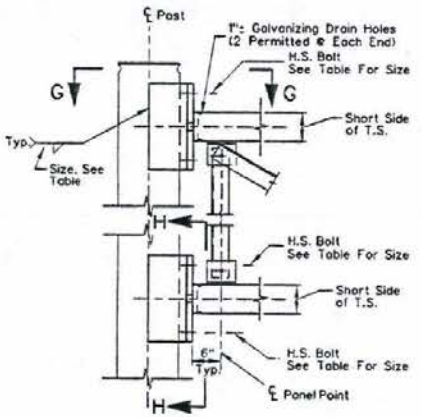


VIEW J-J

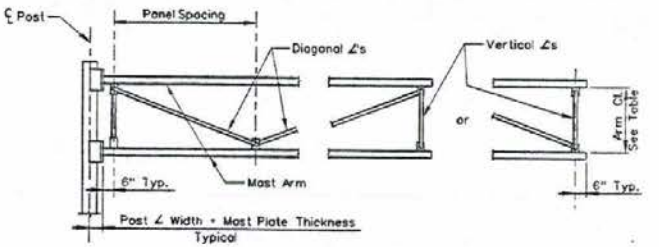
POST ANGLES			
POST SIZE	ANGLE	X	WELD
6	∠5X3X½	1⅜"	¼
8	∠6X4X⅝	2¼"	¼
10	∠7X4X⅝	2¼"	¼
12	∠8X4X⅝	2¼"	5/16
14	∠8X4X¾	2¼"	5/16



DETAIL A



DETAIL B



MAST ARM PLATE			
TWO ARMS	TRUSSED ARMS	PLATE	H.S. BOLT
TS 3X3X8.80		3/4"	1/2"
TS 4X4X12.02		1"	5/8"
TS 5X5X15.42		1"	3/4"
TS 6X6X18.82		1"	3/4"
TS 7X7X22.04	TS 5X3X16.84	1 1/4"	3/4"
	TS 6X4X21.94	1 1/4"	7/8"
	TS 7X5X27.04	1 1/4"	7/8"
	TS 8X6X31.73	1 1/4"	7/8"
	TS 10X6X36.83	1 1/4"	1"

POST TO ARM FRAMING DATA

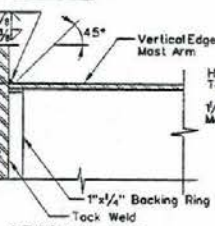
SIGN DEPTH INCHES	ARM CLEARANCE	MAX. PANEL SPACING	VERTICAL ANGLE	DIAGONAL ANGLE
D=40"-70"	2'-0"	4'-4"	∠ 2X2X¼	∠2X2X¼
D=80"-100"	3'-0"	6'-6"	∠ 3 1/2X2 1/2X¼ *	∠3 1/2X2 1/2X¼ *

* Short Leg Outstanding

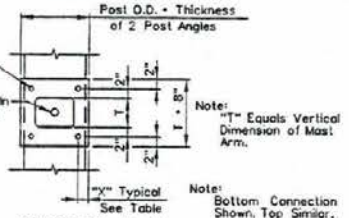
TRUSS FRAMING DATA

NOTES:

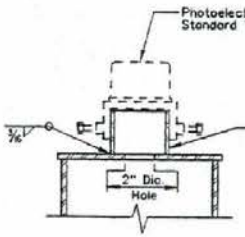
1. For Post Connection To Base Plate See T-36.1.16
2. For Mast Arm Length And Mast Arm To Sign Panel Connections See T-36.1.14



SECTION E-E



SECTION H-H



PHOTOELECTRIC CONTROL UNIT

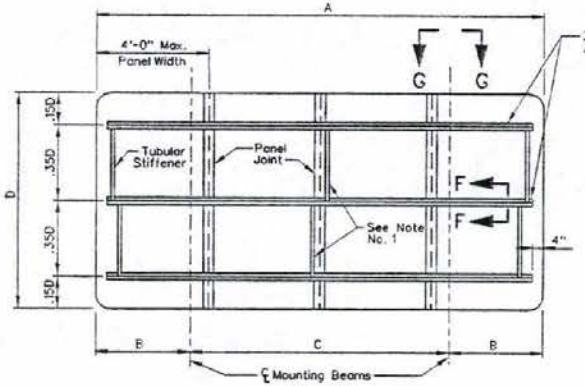
For General Notes See T-36.1.16

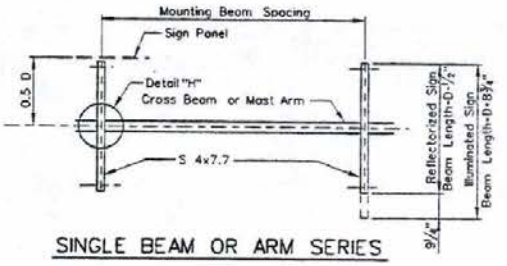
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
LIGHTWEIGHT
TYPE C
CONNECTION DETAILS

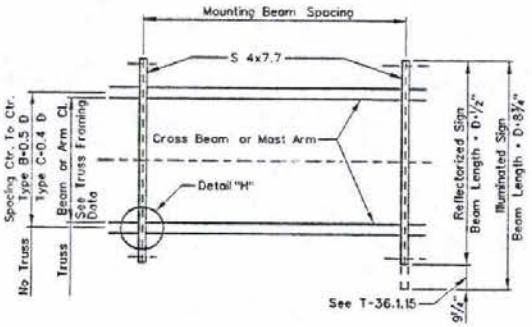
T-36.1.13 (627)

CHIEF TRAFFIC ENGINEER | ADOPTED: 11/95 | REVISION: 9/97

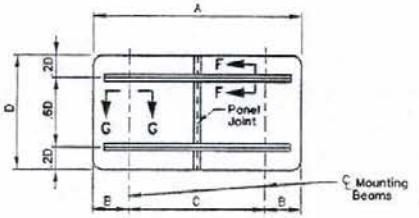


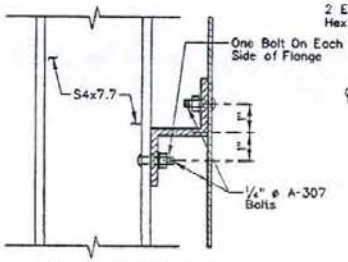


SINGLE BEAM OR ARM SERIES

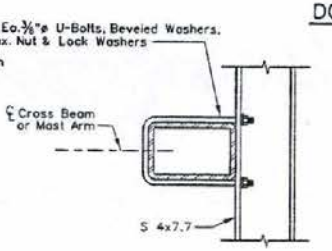


DOUBLE BEAM OR ARM SERIES





SECTION F-F

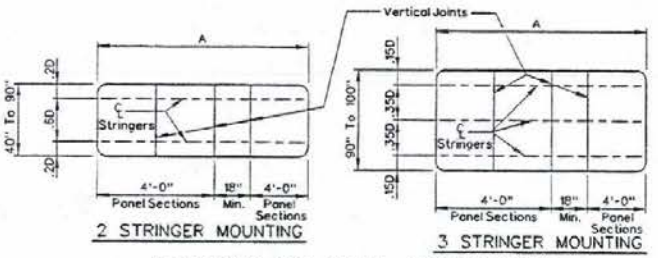


SECTION J-J

SIGN PANEL LENGTH	NUMBER MOUNTING BEAMS	SIGN PANEL OVERHANG	MOUNTING BEAM SPACING
A		B	C
5'-0"	2	9"	3'-6"
6'-0"	2	12"	4'-0"
7'-0"	2	15"	4'-6"
8'-0"	2	18"	5'-0"
9'-0"	2	21"	5'-6"
10'-0"	2	24"	6'-0"
11'-0"	2	27"	6'-6"
12'-0"	2	30"	7'-0"
13'-0"	2	30"	8'-0"
14'-0"	2	30"	9'-0"
15'-0"	2	36"	9'-0"
16'-0"	2	36"	10'-0" *
17'-0"	2	39"	10'-6" *
18'-0"	2	42"	11'-0" *

*- CENTER MOUNT REQUIRED. DIVIDE "C" SPACING BY 2.

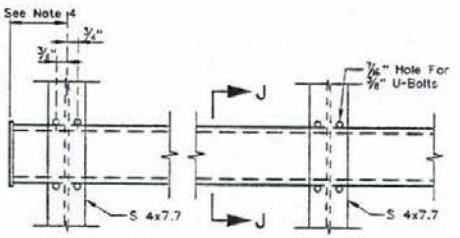
MOUNTING BEAM SPACING



2 STRINGER MOUNTING

3 STRINGER MOUNTING

STRINGER AND PANEL ARRANGEMENT

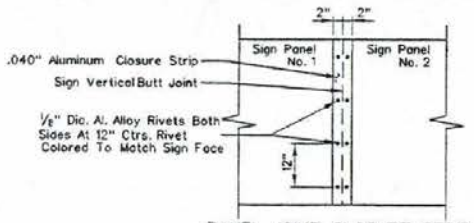


END ARM DETAIL SINGLE POST SIGNS

DETAIL H

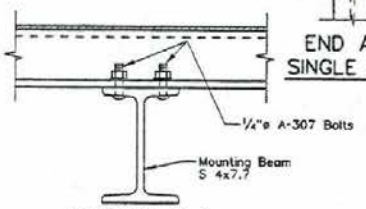
NOTES:

1. TUBULAR STIFFENERS TO BE ADDED WHEN "A" EXCEEDS 10'-0".
2. POSITION SIGN PANEL SO THAT MOUNTING BEAMS WILL CLEAR TRUSS CONNECTIONS AND ARM TO POST JOINTS. WHERE INTERFERENCE CANNOT BE AVOIDED, ½"ø HOLES TO PASS THE ⅜"ø U-BOLTS MAY BE DRILLED THROUGH MAST ARM ANGLES OR TRUSS CONNECTION MEMBERS AS NECESSARY.
3. TORQUE ALUMINUM SIGN PANEL MOUNTING BOLT TO 100 IN.-LBS.
4. 11" FOR TYPE C-1 AND C-2. OTHERS 4".
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 4'-0" (12" MIN. EACH).
8. TUBULAR STIFFENERS REQUIRED ONLY WHEN PANEL OVERHANG EXCEEDS 2'-0".



PANEL JOINT CLOSURE STRIP

ALUMINUM SHEET CONSTRUCTION



SECTION G-G

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

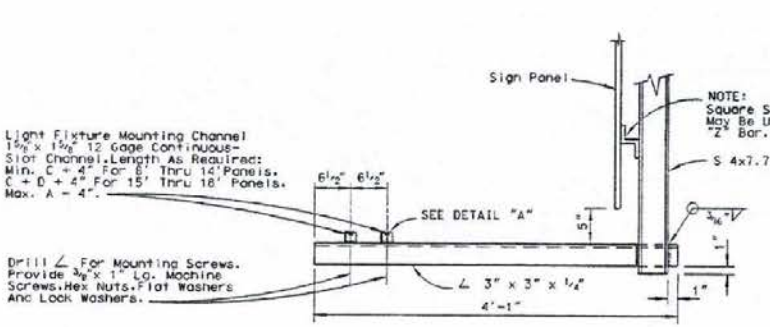
OVERHEAD SIGNS LIGHTWEIGHT SIGN PANEL MOUNTING DETAILS

CHIEF TRAFFIC ENGINEER

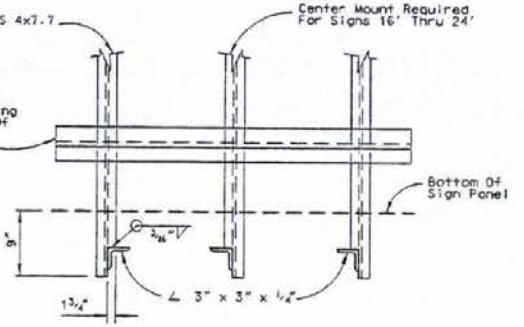
T-36.1.14 (627)

ADOPTED 11/95 REVISION 9/97

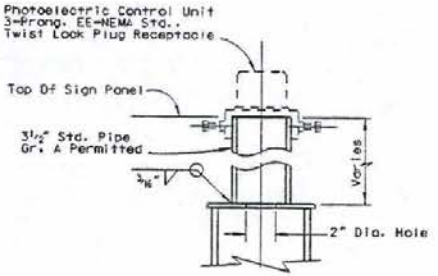
T-75



SIDE VIEW - SINGLE FACED SIGN TYPE A

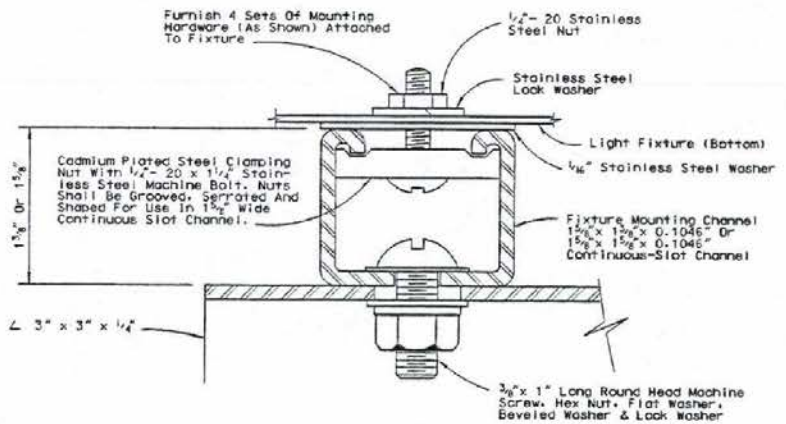


FRONT VIEW



PHOTOELECTRIC
CONTROL UNIT

LIGHT FIXTURE MOUNTING DETAIL

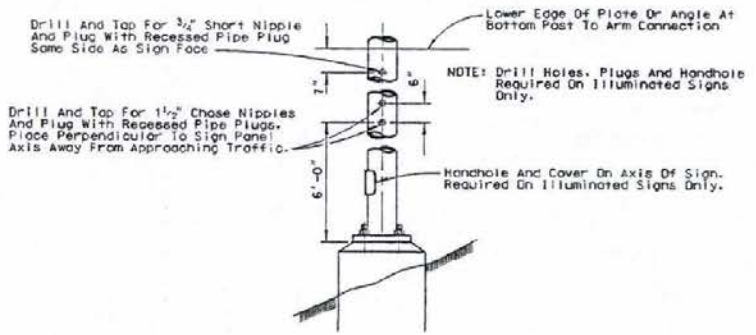


DETAIL "A"

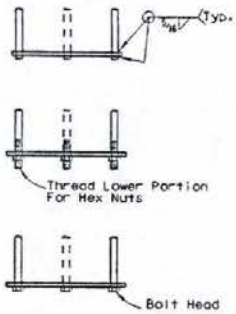
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
LIGHTWEIGHT
(LIGHT FIXTURE MOUNTING DETAILS)

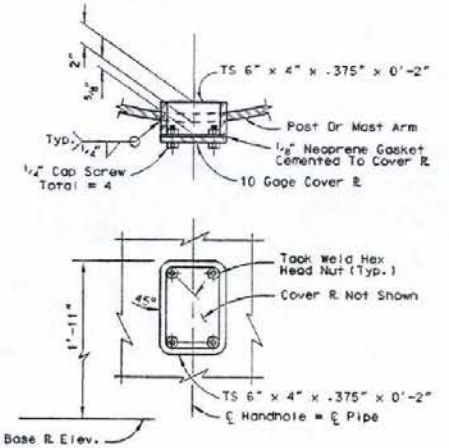
CHIEF TRAFFIC ENGR. | T-36.1.15 (627)
ADOPTED 7/96 REVISION 3/97



ELEVATION

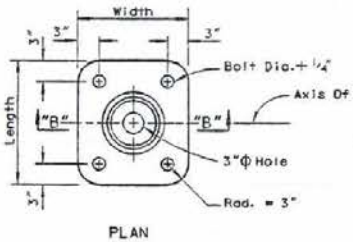


ALTERNATIVE BAR CONNECTIONS

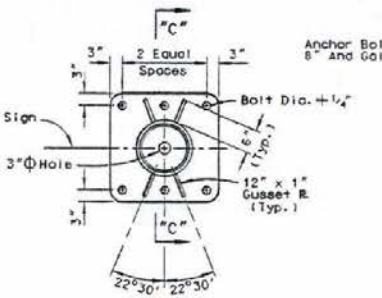


HANDHOLE AND COVER DETAILS

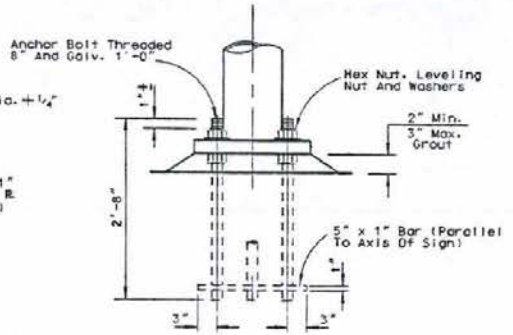
POST SIZE	BASE PLATE	ANCHOR BOLTS (Min.)
6 @ 16.97	1'-2"x 1'-2"x 1 1/2"	4-1 1/4"
6 @ 26.57	1'-2"x 1'-2"x 1 1/2"	4-1 1/2"
8 @ 28.55	1'-6"x 1'-6"x 1 1/2"	4-1 3/4"
8 @ 43.39	1'-6"x 1'-6"x 2"	4-2"
10 @ 54.74	1'-8"x 1'-8"x 2"	4-2 1/4"
12 @ 65.42	1'-8"x 1'-8"x 2"	4-2 1/2"
14 @ 72.09	2'-4"x 2'-4"x 2"	6-2"
14 @ 106.13	2'-4"x 2'-4"x 2"	6-2 1/4"



PLAN



PLAN



ANCHOR BOLT

NOTES:

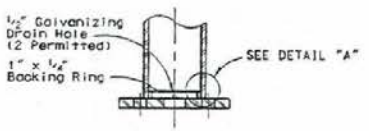
1. Footings Shall Be Placed With Long Dimensions Normal To Axis Of Sign.
2. On Single Post Signs The Post Shall Be Raked Out Of Plumb With The Use Of The Leveling Nuts To Make The Bottom Of The Sign Frame Level.
3. 2"ϕ Anchor Bolts May Be Substituted For 1 3/4"ϕ Bolts. 2 1/2"ϕ Anchor Bolts May Be Substituted For 2 1/4"ϕ Bolts.

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 1975. Revised 1979.

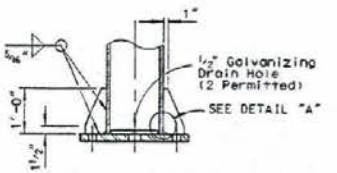
CONSTRUCTION: Standard Specifications For Road And Bridge Construction, Current Edition And Supplements There To.

WELDING: All Welding Continuous Unless Otherwise Noted On The Plans. All Welding To Be Done In Accordance With The Standard Specifications.



SECTION "B"-"B"

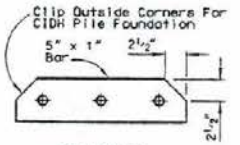
6" THRU 12" POST



SECTION "C"-"C"

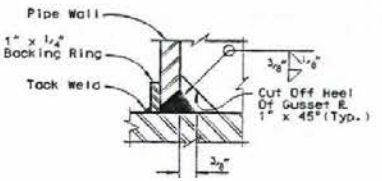
14" POST

BASE PLATE DETAILS



BAR PLAN

ANCHORAGE DETAILS



DETAIL "A"

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

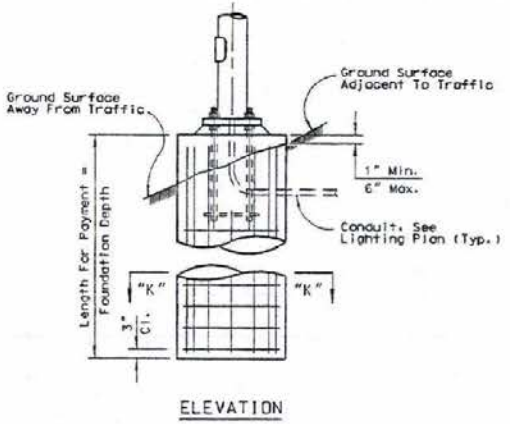
OVERHEAD SIGNS LIGHTWEIGHT POST DETAILS

CHIEF TRAFFIC ENGR. T-36.1.16 (627)
ADOPTED 1/95 REVISION 3/97

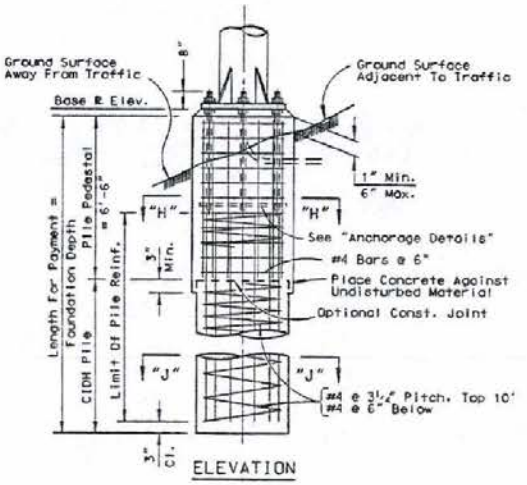
POST SIZE	PILE FOUNDATION				SPREAD FOOTING				
	Pedestal	Pile Dia.	Fdn. Depth	Reinf. Size	Pedestal	Footing	Reinf. Top	Reinf. Bot.	Reinf. J Bar
6 @ 18.97		24"	8'	#5	1'-10"x 1'-10"	4'-0"x 6'-0"	#4	#4	#5
6 @ 28.57		24"	9'	#5	1'-10"x 1'-10"	4'-0"x 7'-0"	#4	#4	#5
8 @ 28.55		30"	9'	#6	2'-2"x 2'-2"	5'-0"x 8'-0"	#4	#4	#5
8 @ 43.39		30"	11'	#7	2'-2"x 2'-2"	6'-0"x 9'-0"	#4	#5	#5
10 @ 54.74	2'-10"x 2'-10"	30"	13'	#8	2'-4"x 2'-4"	7'-0"x 10'-0"	#5	#7	#7
12 @ 65.42	2'-10"x 2'-10"	30"	15'	#10	2'-4"x 2'-4"	7'-0"x 12'-0"	#6	#8	#8
14 @ 72.09	3'-4"x 3'-4"	36"	15'	#10	2'-11"x 2'-11"	7'-0"x 13'-0"	#7	#9	#8
14 @ 106.13	3'-4"x 3'-4"	36"	16'	#10	2'-11"x 2'-11"	8'-0"x 14'-0"	#7	#9	#8

NOTES:

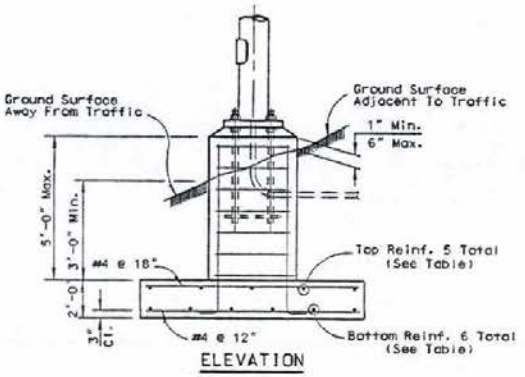
1. Backfill Shall Be In Place Prior To Erection Of Post.
2. Slope Protection Required When Indicated On The Plans.
3. Pile Pedestal Shall Be Formed 6" Min. Below Ground Surface. Remainder Shall Be Placed Against Undisturbed Material.



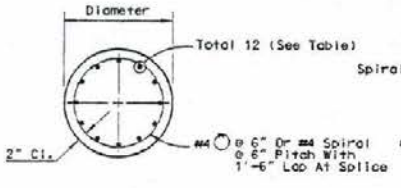
ELEVATION



ELEVATION

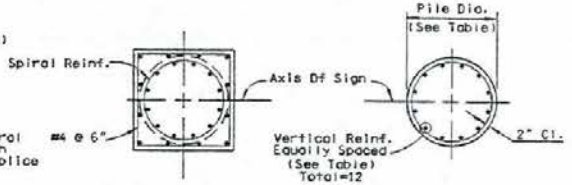


ELEVATION



SECTION "K"-"K"

6" AND 8" POSTS

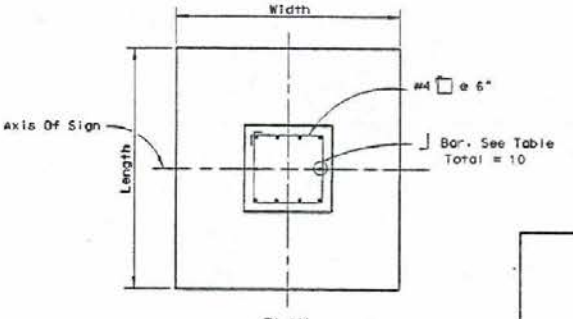


SECTION "H"-"H"

SECTION "J"-"J"

10" THRU 14" POSTS

PILE FOUNDATION



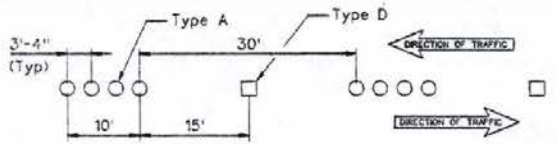
PLAN

SPREAD FOOTING

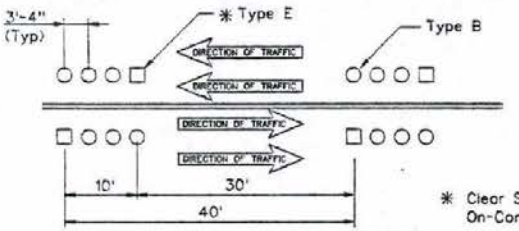
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS LIGHTWEIGHT FOUNDATION

CHIEF TRAFFIC ENGR. T-3.1.17 (627)
ADOPTED 1/95 REVISION 9/97

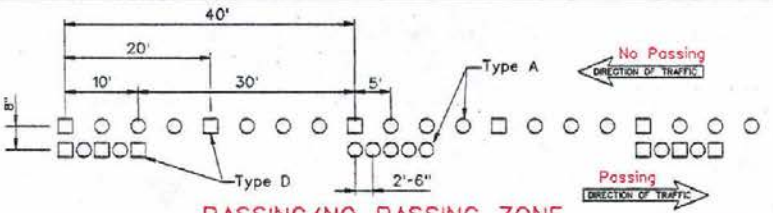


CENTER LANE TWO WAY TRAFFIC

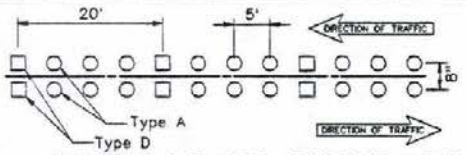


* Clear Side Shall Face On-Coming Traffic.

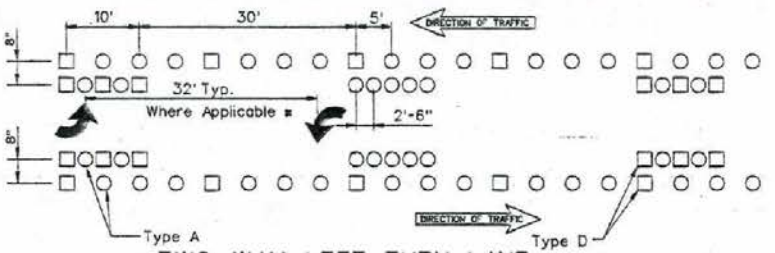
BROKEN WHITE LINE



PASSING/NO PASSING ZONE

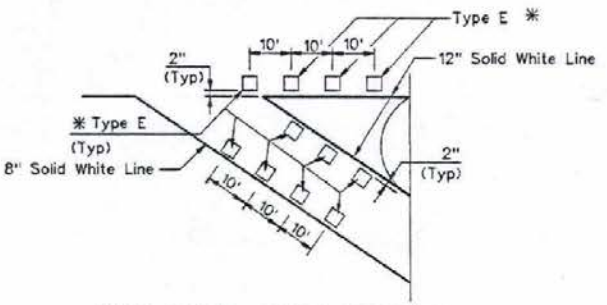


DOUBLE YELLOW CENTER LINE

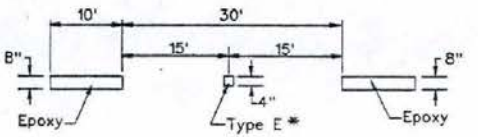


TWO WAY LEFT TURN LANE * See Plan Sheets for Location

*Red Side Shall Face Wrong Way Traffic.

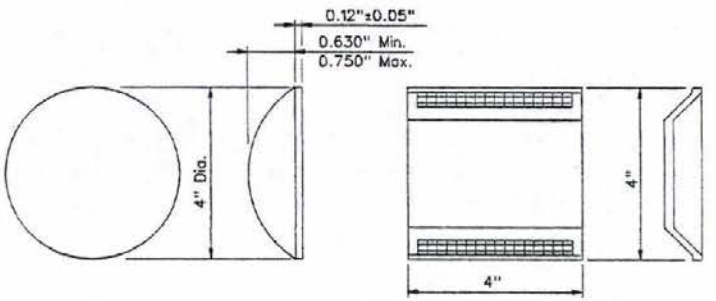


EXIT RAMP GORE STRIPING



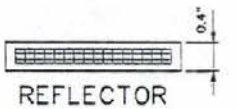
*Red Side Shall Face Wrong Way Traffic.

LANE LINE (FREEWAY)



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

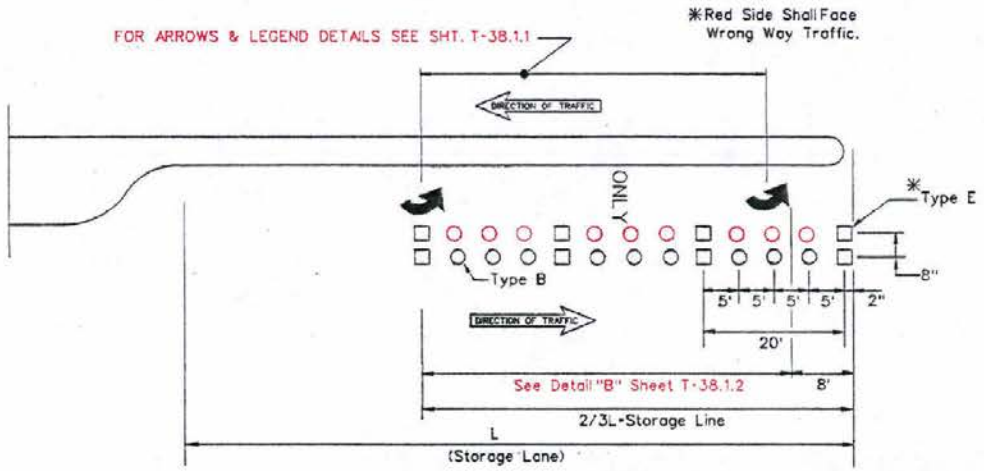


REFLECTOR

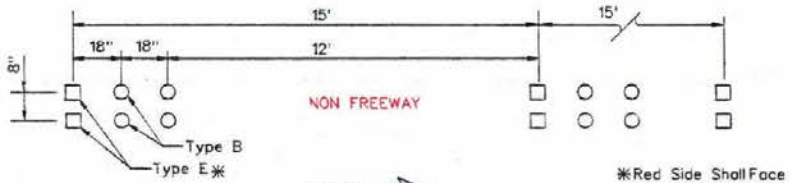
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

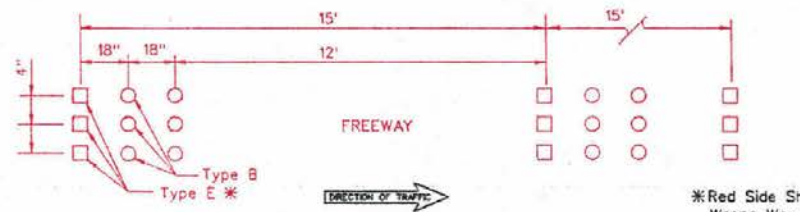
PERMANENT RAISED PAVEMENT MARKERS

CHIEF TRAFFIC ENGR | T-37.1.1 | (633)
ADOPTED: 2/79 | REVISION 5/95

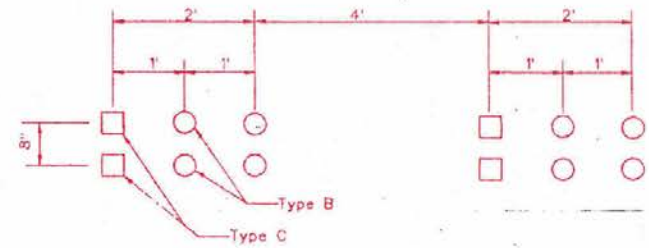


STORAGE LINE

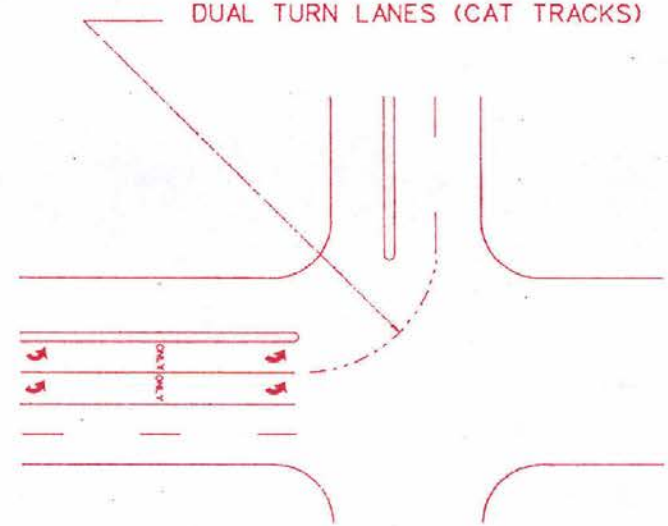




DOTTED WHITE
AUXILIARY LANES, LANE DROP



DOTTED WHITE--INTERSECTIONS
DUAL TURN LANES (CAT TRACKS)



STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PERMANENT RAISED
PAVEMENT MARKERS

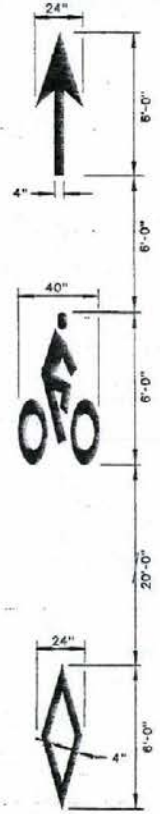
CHIEF TRAFFIC ENGR | T-37.1.2 | (633)
ADOPTED 2/79 | REVISION 8/86

T-80

LEGENDS

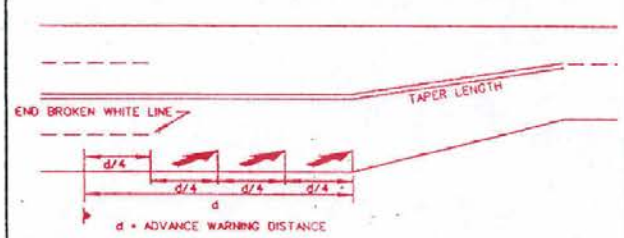
XING 48"
ONLY 48"

NOTE: THESE LEGENDS AS SHOWN ARE FOR BIKE LANE USE.



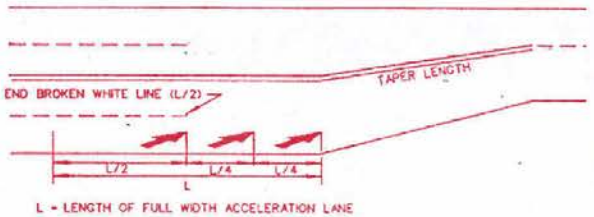
BICYCLE PAVEMENT MARKINGS

PLACEMENT OF MERGE ARROWS



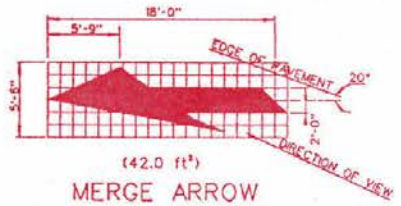
TYPICAL LANE REDUCTION

For further details on "LANE REDUCTION" See Part II of the MUTCD



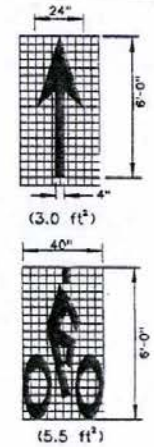
TYPICAL PARALLEL ACCELERATION LANE

For further details on "PARALLEL ACCELERATION LANE" See Part II of the MUTCD

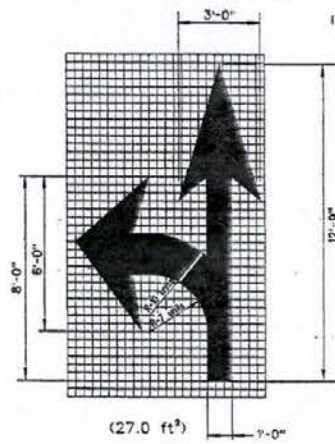


(42.0 ft²)

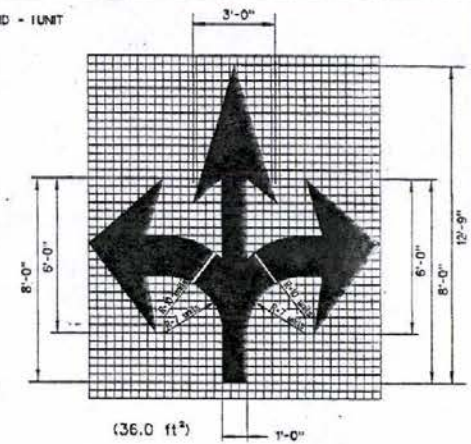
MERGE ARROW



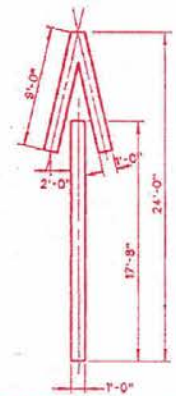
BIKE LANE



LEFT/STRAIGHT ARROW

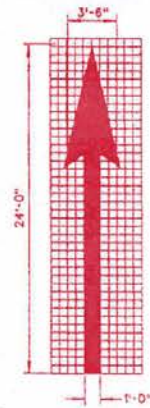


LEFT/STRAIGHT/RIGHT ARROW



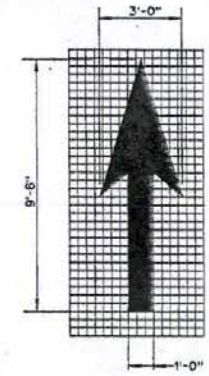
WRONG WAY ARROW

(33.0 ft²)



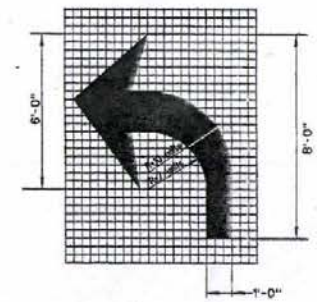
EXIT ARROW

(31.0 ft²)



STRAIGHT ARROW

(12.5 ft²)



TURN ARROW

(15.5 ft²)

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PERMANENT PAVEMENT MARKING

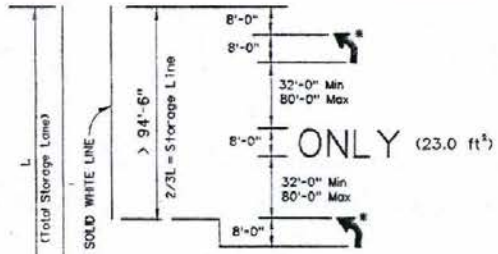
CHIEF TRAFFIC ENGINEER

T-38.1.1 (634)

ADOPTED: 7/96

REVISION 8/98

T-81



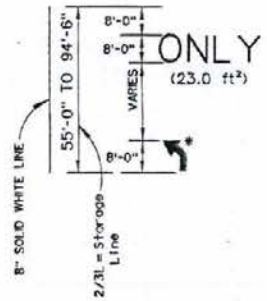
DETAIL "B" (> 94'-6")

(STORAGE LINE, TURN ARROWS, & LEGEND)

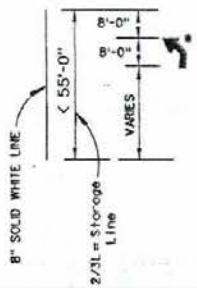
* Right Arrows Where Applicable

DETAIL "A"

(STORAGE LANE)

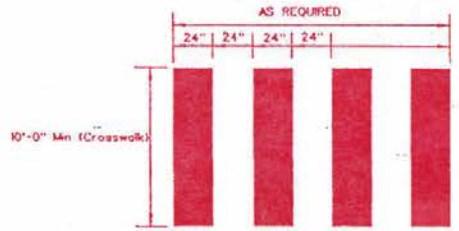


DETAIL "B"
(55'-0"TO 94'-6")

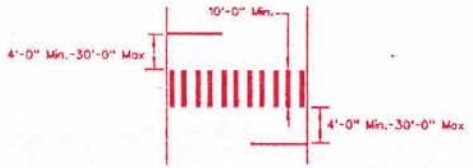


DETAIL "B"
(< 55'-0")

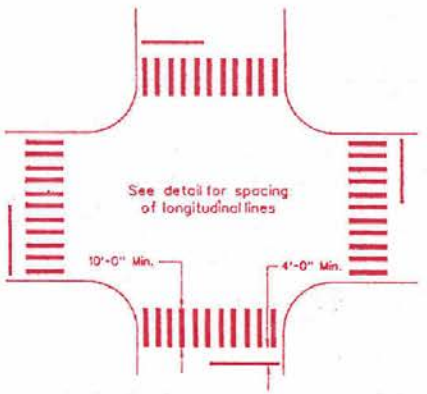
NOTE : All Stop Bars Shall Be 12" -24" Max. See Striping Details In Contract Plans For Final Dimensions.



LONGITUDINAL LINE DETAIL

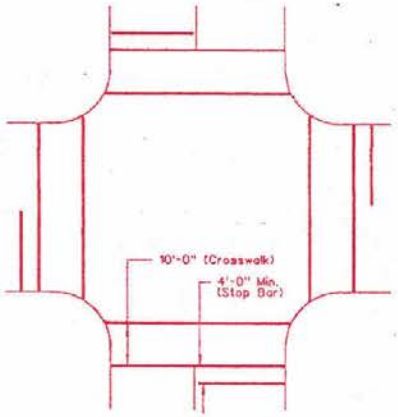


TYPICAL MIDBLOCK WITH LONGITUDINAL LINES



TYPICAL INTERSECTION WITH LONGITUDINAL LINES

NOTE: All Stop Bars and Crosswalk Lines Shall Be 12" Wide Unless Otherwise Noted.



TYPICAL INTERSECTION WITHOUT LONGITUDINAL LINES

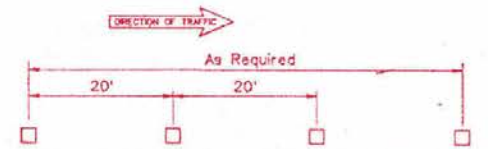
NOTE: INSTALLATION OF MARKING FILM SHALL BE PERFORMED BY THE CONTRACTOR UNLESS OTHERWISE NOTED. FOR FINAL LOCATIONS, SEE STRIPING DETAILS.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

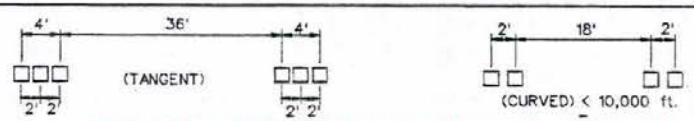
PERMANENT PAVEMENT MARKING

CHIEF TRAFFIC ENGINEER	ADOPTED: 8/98	T-38.1.2 (634)	REVISION

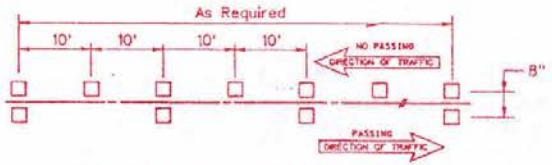
T-82



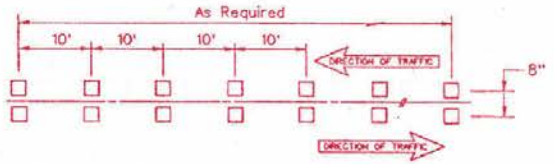
SHOULDER LINE (WHITE OR YELLOW)



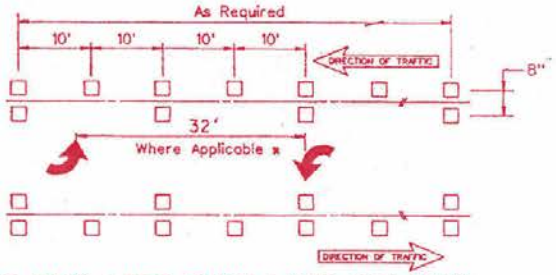
CENTER LANE TWO WAY TRAFFIC (YELLOW)
OR
BROKEN WHITE LINE



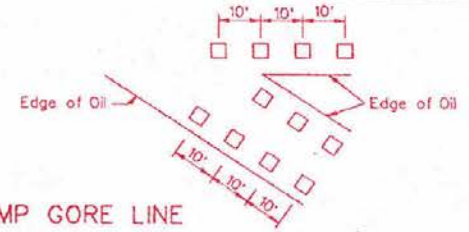
PASSING/NO PASSING ZONE



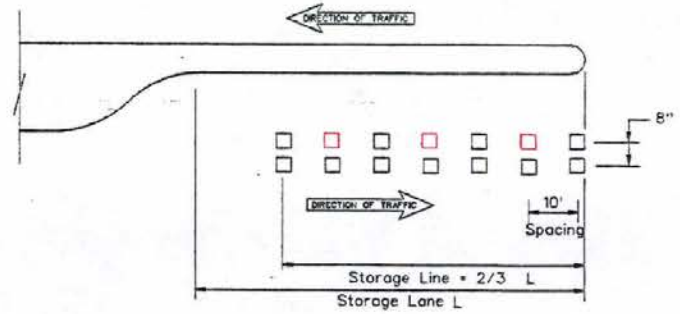
DOUBLE YELLOW CENTER LINE



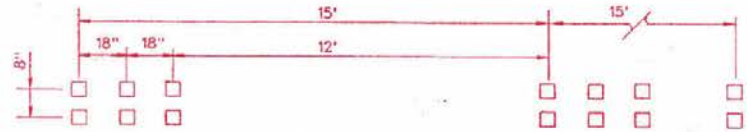
TWO WAY LEFT TURN LANE (YELLOW)



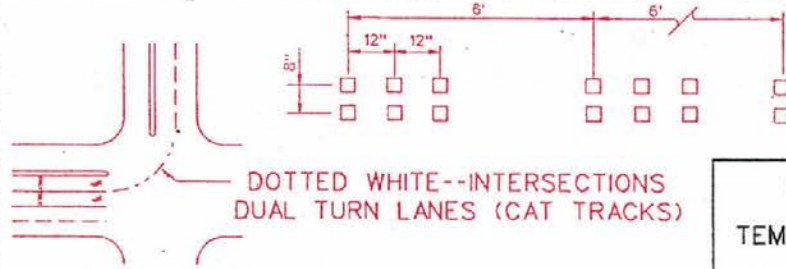
EXIT RAMP GORE LINE



STORAGE LINE (WHITE)



DOTTED WHITE--AUXILIARY LANE, LANE DROP



DOTTED WHITE--INTERSECTIONS
DUAL TURN LANES (CAT TRACKS)

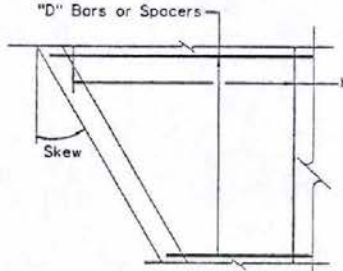
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TEMPORARY PAVEMENT MARKERS

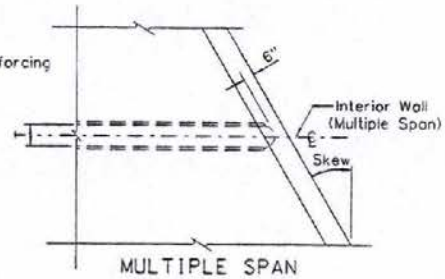
CHIEF TRAFFIC ENGINEER

T-38.2.1 (634)
ADOPTED: 8/98 REVISION

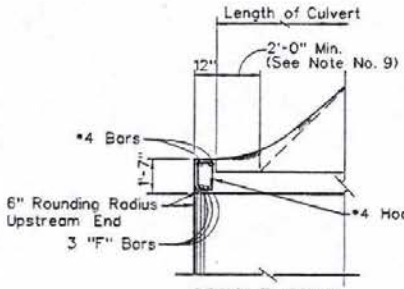
T-83



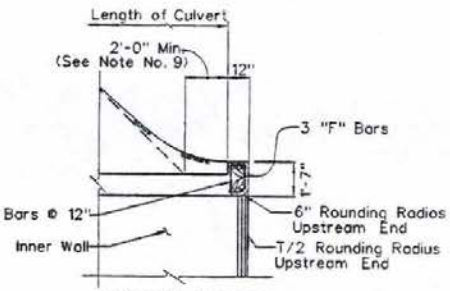
SINGLE SPAN
PLAN



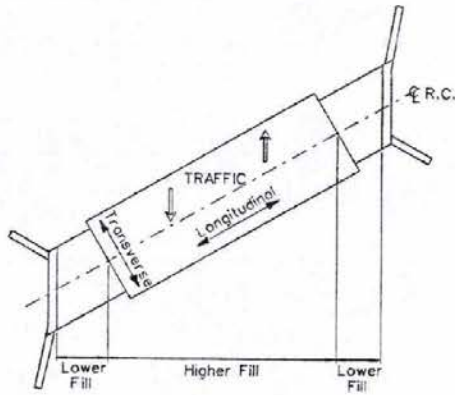
MULTIPLE SPAN
PLAN



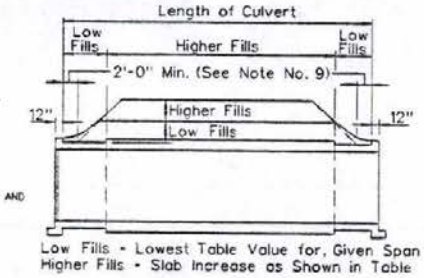
SINGLE SPAN
ELEVATION



MULTIPLE SPAN
ELEVATION



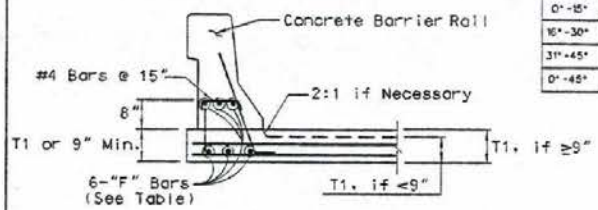
PLAN - SKEWED



Low Fills - Lowest Table Value for, Given Span
Higher Fills - Slab Increase as Shown in Table

ELEVATION

FILL HEIGHT TRANSITIONS



PARAPET DETAILS

COPING REINFORCING INCLUDED IN THE HEADWALL QUANTITIES

SKEWED PARAPETS									
SKEW ANGLE	SPAN		5	6	7	8	10	12	14
0°-15°	#5 BARS	BAR NO.	4	5	5	6	7	8	8
16°-30°		BAR NO.	5	6	6	7	8	8	8
31°-45°		BAR NO.	6	6	6	7	8	8	8
0°-45°	*4 HOOPS		12" CTRS.						

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 THERTO.
3) LOADING: LIVE LOAD: STANDARD HS20-44 OR ALTERNATE FHWA MILITARY LOADING, IMPACT FOR TOP SLAB IS 30% UP TO 3 FT. COVER, NO IMPACT ABOVE 3 FT. COVER. NO IMPACT FOR INVERT. NO SURCHARGE FOR WALLS. EARTH LOAD: EQUIVALENT FLUID PRESSURE FOR TWO CONDITIONS. 1) 140 LBS./CU. FT. VERTICAL, 42 LBS./CU. FT. HORIZONTAL. 2) 140 LBS./CU. FT. VERTICAL, 140 LBS./CU. FT. HORIZONTAL. LOAD FACTORS: 1.50 + 1.5E + 2.5 (L+I).
4) CONCRETE: THE CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3,250 PSI. MAXIMUM ALLOWABLE SHEAR, Vc = 3.5 f'c, PSI. TAKEN AT A DISTANCE "d" FROM THE SUPPORTING MEMBER.
5) REINFORCING STEEL: ALL REINFORCING STEEL TO BE ASTM A615 GRADE 60. MAIN REINFORCEMENT IS TO BE PLACED IN THE TRANSVERSE DIRECTION. STAGGER SPLICES NOT SHOWN. HOOKS MAY BE ROTATED OR TILTED, AS NECESSARY, FOR CLEARANCE. REINFORCEMENT SHALL HAVE A 2-1/2 INCH CLEARANCE ON BOTTOM OF BOTTOM SLAB AND 2 INCH CLEARANCE ON REMAINDER OF STRUCTURE AND ITS APPURTENANCES UNLESS OTHERWISE NOTED ON THE PLANS.
6) FOUNDATION PRESSURE: THE RCB CULVERTS ARE DESIGNED TO THE FOLLOWING SOIL BEARING PRESSURES:

COVER HEIGHTS	10 FT.	20 FT.
RCB HEIGHT	TON/SQ.FT.	
6 FT.	1.0	1.6
8 FT.	1.1	1.7
10 FT.	1.2	1.8
12 FT.	1.3	1.9
14 FT.	1.4	2.0

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 (10' x 8' x 196' RCB).
9) ADDITIONAL LENGTH: LENGTH OF CULVERT SHALL BE INCREASED AS FOLLOWS: ADD 2.0 FT. TO EACH END WHEN COVER AT SHOULDER IS 0.0 TO 5.0 FEET. ADD AN ADDITIONAL 1.0 FT. TO EACH END FOR EACH SUCCEEDING 5.0 FT. 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.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

R.C.B., CULVERTS, GENERAL NOTES

CHIEF BRIDGE ENGR.

B-20.1.1 (502)
ADOPTED-11/73
REVISION 8/97

B-1

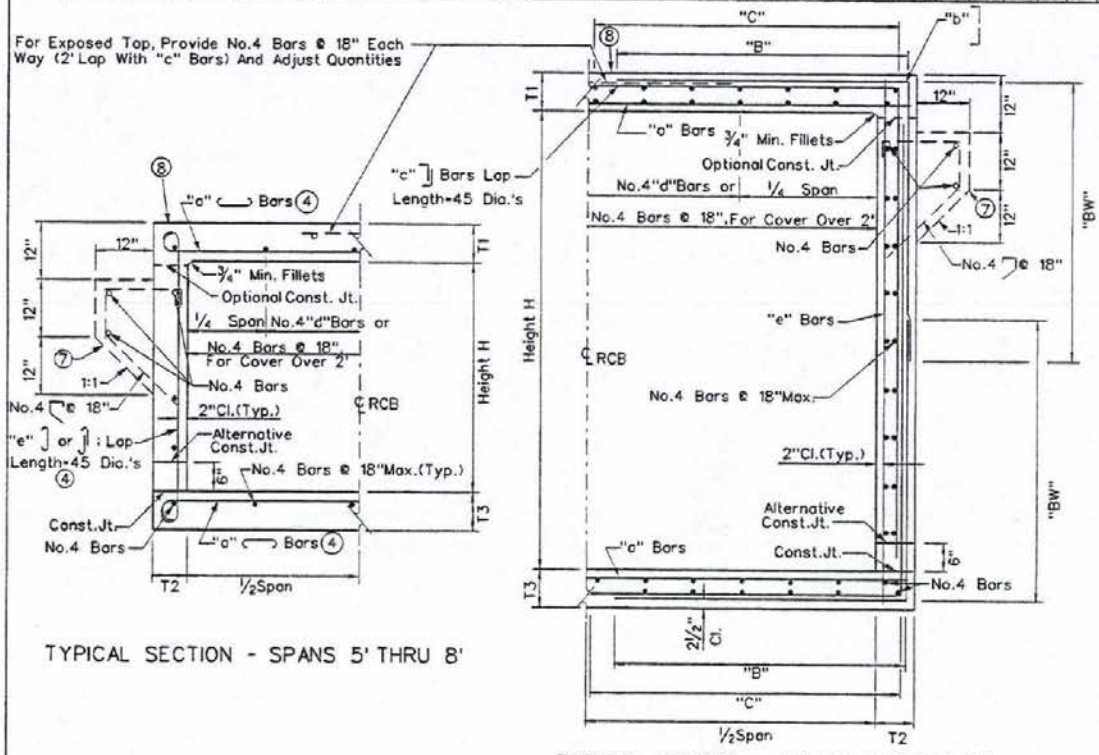
	SPAN FT.	3		4		5		6						7						8					
	HEIGHT FT.	3		4		5		3	4	5	6			3	4	5	6	7		3	4	5	6	7	8
	MAXIMUM EARTH COVER FT.	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
CONC.	ROOF T1 INCH	7½	7½	7½	7½	7½	7½	8	8	8	8	8	8	8	8	9	8	9	8	8½	9	8½	9	8½	9	8½	9½	8½	9½	8½	9½	8½	10
	WALLS T2 INCH	6	6	6	7	6½	7½	6	6	6	7	6½	7½	7	8½	6	6	6	7	6½	7½	6	6	7	6½	7½	7	8½	8	9½	8½	10½		
	INVERT T3 INCH	6½	7	6½	7	6½	7	7	8	7	8	7	8	8	9	8	9	8	9	8	9	8	9	8	9	8	9½	8	9½	8	10	8	10		
REINF.	SPACING INCH	8½	8½	8½	8½	8½	8½	7½	7½	7½	7½	7½	7½	6½	6½	5	6½	4½	6½	5½	6½	5½	6½	5½	6½	5½	6	5	6	4½	6	5	6	4½
	"e" BAR NO.	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	"e" BAR NO.	4	4	5	5	6	6	4	4	5	5	6	6	7	6	4	4	5	5	6	6	7	7	7	7	5	5	5	5	6	6	6	6	7	7
QUAN.	CONCRETE CF/LF	10.0	10.2	11.0	12.0	12.5	13.7	11.7	12.3	12.7	14.2	14.2	15.9	15.9	16.3	13.7	14.9	14.6	16.8	16.1	18.5	18.1	21.0	20.7	23.8	15.4	16.0	16.4	19.0	17.9	21.1	19.5	24.1	22.1	26.9
	REINFORCEMENT LBS/LF	58	68	67	81	82	105	70	81	82	96	97	120	124	148	94	94	105	118	121	147	130	177	160	192	115	139	123	151	131	171	137	198	160	215

	SPAN FT.	10																																			
	HEIGHT FT.	3		4		5		6		7		8		9		10		4		5		6		7		8		9		10		11		12			
	MAXIMUM EARTH COVER FT.	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20		
CONC.	ROOF T1 INCH	8	10½	8	10½	8	10½	8	10½	8	10½	8	10½	8	10½	8	10½	8½	11	8½	12	8½	12	8½	12	8½	12	8½	12	8½	12	9½	12	9½	12		
	WALLS T2 INCH	8	8	8	8	8	8	8	9	8	9	8	10	8½	11½	9½	12½	8	10	8	10	8	10	8	10	8	10	8½	10½	8½	11½	9	12½	10½	13½		
	INVERT T3 INCH	8	11	8	11	8	11	8	11	8	11	8	11	8	11	8½	11	8½	12½	8½	12½	8½	12½	9	12½	9	12½	9	12½	9	12½	9½	13	10	13		
REINFORCEMENT	SPACING INCH	13	12	13	12	13	12	12	12	11	11	10	11	11	10	11	10	9	10	9	10	9	10	9	10	9	10	9	10	9	10	8	10	8	10		
	"e" ⑥ BAR NO.	6	7	6	7	6	7	6	7	6	7	6	7	6	6	6	6	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7		
	"b" BAR NO.	6	7	6	7	6	7	6	7	6	7	6	7	6	6	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7		
	"b" DIMENSION "B" FT.- INCH	2-10	2-11	2-10	2-11	2-11	2-11	2-11	2-11	3-0	2-11	3-9	2-11	3-9	2-11	3-9	2-11	3-9	2-11	3-9	3-1	3-2	3-1	3-2	3-1	3-2	3-9	3-9	3-9	3-9	3-7	3-9	3-7	4-4	3-7	4-4	4-4
	"b" DIMENSION "BW"FT.- INCH	2-10	3-0	2-10	3-0	4-10	5-0	4-10	5-0	4-10	5-0	4-10	5-0	4-10	5-0	4-7	4-7	4-7	4-7	4-0	4-0	4-0	4-0	6-0	5-10	6-2	6-7	6-2	6-7	4-11	4-11	4-11	4-11	4-11	4-11	4-4	4-4
	"c" BAR NO.	6	7	6	7	6	7	6	7	6	7	6	7	7	7	7	7	6	7	6	7	6	7	6	7	6	7	7	7	7	7	7	7	7	7	7	8
	"c" DIMENSION "C" FT.- INCH	3-4	3-4	3-4	3-4	3-4	3-4	7-4	4-8	7-7	4-8	8-2	4-8	7-7	4-8	7-7	4-8	4-4	4-4	4-4	4-4	4-4	3-7	8-1	5-7	8-1	5-7	8-1	5-7	8-1	5-7	8-1	5-7	8-1	5-7	4-0	4-2
	"e" ⑤ BAR NO.	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	4	4
QUAN.	CONCRETE CF/LF	19.1	24.3	20.4	25.6	21.6	26.8	23.0	29.5	24.3	31.0	25.6	34.1	27.8	37.7	32.1	42.3	24.2	34.6	25.5	36.2	26.8	37.7	29.3	40.1	30.3	41.9	32.2	45.4	34.5	49.8	40.7	54.2	45.4	59.8	36.2	51.0
	REINFORCEMENT LBS/LF	161	230	169	237	191	267	233	285	260	325	300	339	314	327	360	373	271	331	278	339	295	362	353	409	365	420	402	413	415	424	440	471	466	534	374	471

	SPAN FT.	14																																			
	HEIGHT FT.	7		8		9		10		11		12		13		14																					
	MAXIMUM EARTH COVER FT.	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
CONC.	ROOF T1 INCH	9	14	9½	14	9½	14	9½	14	10	14	10	14	10½	14	1'	14																				
	WALLS T2 INCH	9	11	9½	11½	9½	11½	9½	11½	10	12½	10½	13½	11½	15	12½	16½	13½	17½																		
	INVERT T3 INCH	10	14½	10	14½	10	14½	10	14½	10½	14½	10½	15	11	15	11½	15																				
REINFORCEMENT	SPACING INCH	10	14½	10	14½	10	14½	10	14½	10½	14½	10½	15	11	15	11½	15																				
	"e" ⑥ BAR NO.	7	7	7	7	7	7	7	7	7	7	7	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7
	"b" BAR NO.	7	7	7	7	7	7	7	7	7	7	7	7	6	8	7	8	7	8																		
	"b" DIMENSION "B" FT.- INCH	4-6	3-6	4-6	3-6	4-6	3-6	4-6	3-6	4-6	3-6	4-6	3-6	4-6	3-6	4-6	3-6	4-6	3-6	4-6	3-6	4-6	3-6	4-6	3-6	4-6	3-6	4-6	3-6	4-6	3-6	4-6	3-6	4-6	3-6	4-6	3-6
	"b" DIMENSION "BW"FT.- INCH	4-11	4-4	4-11	4-4	4-11	4-4	4-11	4-4	4-11	4-4	4-11	4-4	4-11	4-4	4-11	4-4	4-11	4-4	4-11	4-4	4-11	4-4	4-11	4-4	4-11	4-4	4-11	4-4	4-11	4-4	4-11	4-4	4-11	4-4	4-11	4-4
	"c" BAR NO.	7	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8	8	8																		
	"c" DIMENSION "C" FT.- INCH	4-0	4-2	6-9	6-9	5-10	5-10	6-0	6-4	8-11	6-4	8-11	6-4	8-11	6-4	8-11	6-4	8-11	6-4	8-11	6-4	8-11	6-4	8-11	6-4	8-11	6-4	8-11	6-4	8-11	6-4	8-11	6-4	8-11	6-4	8-11	6-4
	"e" ⑤ BAR NO.	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
QUAN.	CONCRETE CF/LF	40.7	54.2	45.4	59.8	36.2	51.0	37.8	53.1	39.5	54.9	41.9	56.7	45.9	64.1	49.9	69.5	55.6	75.8	61.6	81.3																
	REINFORCEMENT LBS/LF	374	471	449	522	446	587	449	580	492	596	537	605	564	634	604	759																				

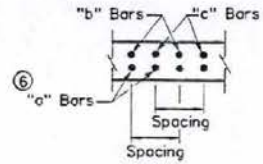
"e" BARS FOR EARTH COVERS OF 2' AND LESS TO BE PLACED IN TOP SLAB ONLY

SPAN	5'	6'	7'	8'	10'	12'	14'
NUMBER of BARS	6	7	8	9	10	12	16

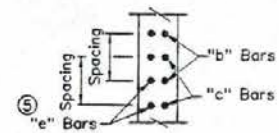


TYPICAL SECTION - SPANS 5' THRU 8'

TYPICAL SECTION - SPANS 10' THRU 14'



ROOF SECTION
SPANS 10' THRU 14'
Invert Similar



WALL SECTION
SPANS 10'THRU 14'

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.

⑥ "a" BARS ARE AT HALF SPACING.

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=4500 PSI, OR "A", f'c=4000 PSI, AS DETERMINED BY THE ENGINEER. IF "EA" CONCRETE IS TO BE USED, THE TOP SLAB REINFORCING STEEL SHALL HAVE AN EPOXY COATING.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SINGLE RCB CULVERTS

B-20.1.2 (502)

CHIEF BRIDGE DESIGN ENGR. ADOPTED 11/70 REVISION 3-3/82

B-2

SPAN	FT.	5						6							
HEIGHT	FT.	3		4		5		3		4		5		6	
MAXIMUM EARTH COVER	FT.	10	20	10	20	10	20	10	20	10	20	10	20	10	20
CONC. ROOF T1	INCH	7	7 1/2	7	7 1/2	7	7 1/2	7	9	7	9	7	9	7	9
CONC. EXTERIOR WALL T2	INCH	6	6	6	7	6 1/2	7 1/2	6	6	6	7	6 1/2	8	7	8 1/2
CONC. INVERT T3	INCH	7	8	7	8	7	8	7	9	7	8	7	9	7	9
REINFORCEMENT SPACING	INCH	11 1/2	14	11 1/2	14	11 1/2	15	11 1/2	12	11 1/2	12	11 1/2	12	11 1/2	12
"g" BAR NO.		4	7	4	7	4	7	6	7	6	7	6	7	6	7
"f" BAR NO.		5	5	5	5	5	5	5	5	5	5	5	5	5	5
"a" BAR NO.		6	4	6	4	6	4	7	4	7	4	7	4	7	4
"e" (5) BAR NO.		4	5	5	6	5	7	4	5	4	6	5	6	6	7
QUAN. CONCRETE	CF/LF	17.6	19.3	19.3	21.6	21.3	23.8	20.1	24.6	21.6	27.0	23.6	29.7	25.6	32.2
QUAN. REINFORCEMENT	LBS/LF	122	121	134	137	145	162	186	162	192	179	206	190	227	212

SPAN	FT.	7									
HEIGHT	FT.	3		4		5		6		7	
MAXIMUM EARTH COVER	FT.	10	20	10	20	10	20	10	20	10	20
CONC. ROOF T1	INCH	7 1/2	10	7 1/2	10	7 1/2	10	7 1/2	10	8	10
CONC. EXTERIOR WALL T2	INCH	6	6	6	7	6 1/2	7 1/2	7	9	8	9 1/2
CONC. INVERT T3	INCH	7 1/2	10 1/2	7 1/2	10 1/2	7 1/2	10 1/2	7 1/2	10 1/2	7 1/2	10 1/2
REINFORCEMENT SPACING	INCH	11	10 1/2	11	10 1/2	11	10 1/2	11	10 1/2	11	10 1/2
"g" BAR NO.		6	7	6	7	6	7	6	7	6	7
"f" BAR NO.		6	5	6	5	6	5	6	5	6	5
"a" BAR NO.		6	4	6	4	6	4	6	4	6	4
"e" (5) BAR NO.		4	5	5	5	6	6	6	7	6	7
QUAN. CONCRETE	CF/LF	23.7	30.6	25.2	33.3	27.2	35.5	29.4	39.1	32.4	41.8
QUAN. REINFORCEMENT	LBS/LF	207	197	220	208	227	228	252	262	260	276

SPAN	FT.	8											
HEIGHT	FT.	3		4		5		6		7		8	
MAXIMUM EARTH COVER	FT.	10	20	10	20	10	20	10	20	10	20	10	20
CONC. ROOF T1	INCH	8	11	8	11	8	11	8	11	8	11	8	11
CONC. EXTERIOR WALL T2	INCH	6	7 1/2	6	7 1/2	6 1/2	8	7	9	8	10	8 1/2	11
CONC. INVERT T3	INCH	8	11 1/2	8	11 1/2	8	11 1/2	8	11 1/2	8	11 1/2	8	11 1/2
REINFORCEMENT SPACING	INCH	9	10	9	10	9	10	9	10	9	10	9	10
"g" BAR NO.		7	7	7	7	7	7	7	7	7	7	7	7
"f" BAR NO.		5	5	5	5	5	5	5	5	5	5	5	5
"a" BAR NO.		6	4	6	4	6	4	6	4	6	4	6	4
"e" (5) BAR NO.		4	5	4	5	5	6	6	6	6	7	6	7
QUAN. CONCRETE	CF/LF	27.8	36.5	29.2	40.1	31.2	42.4	33.4	45.5	36.4	48.9	39.0	52.6
QUAN. REINFORCEMENT	LBS/LF	270	224	283	237	302	266	340	279	350	312	360	326

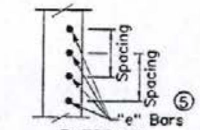
SPAN	FT.	10															
HEIGHT	FT.	3		4		5		6		7		8		9		10	
MAXIMUM EARTH COVER	FT.	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
CONC. ROOF T1	INCH	9	12 1/2	9	12 1/2	9	12 1/2	9	12 1/2	9	12 1/2	9	12 1/2	9 1/2	12 1/2	9 1/2	12 1/2
CONC. EXTERIOR WALLS T2	INCH	8	8	8	8	8	8	8	8 1/2	8	9 1/2	8	10 1/2	8 1/2	11 1/2	8 1/2	12 1/2
CONC. INVERT T3	INCH	9	12 1/2	9	12 1/2	9	12 1/2	9	12 1/2	9	12 1/2	9	12 1/2	9	12 1/2	9	12 1/2
REINFORCEMENT SPACING	INCH	11	7 1/2	11	7 1/2	11	7 1/2	10 1/2	7 1/2	10	8	10	8	10 1/2	8	10 1/2	8 1/2
"g" BAR NO.		7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
"f" BAR NO.		7	5	7	5	7	5	6	5	6	5	6	4	6	5	6	5
"a" BAR NO.		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
"b" BAR NO.		5	5	5	5	5	5	4	5	5	5	6	5	6	6	6	6
"b" DIMENSION "B"	FT.-INCH	1-9	2-7	1-9	2-7	1-9	2-7	2-0	2-9	2-5	2-9	2-7	3-1	2-7	3-1	2-7	3-1
"b" DIMENSION "Bw"	FT.-INCH	3-6	3-10	3-6	3-10	4-0	4-11	4-0	4-11	4-0	4-11	4-0	4-11	4-0	4-11	4-0	4-11
"c" BAR NO.		5	6	5	6	5	5	6	6	6	6	6	6	7	6	7	6
"c" DIMENSION "C"	FT.-INCH	3-0	2-9	3-0	2-9	3-1	2-9	3-9	3-5	4-6	4-3	5-6	4-6	6-0	4-9	6-0	4-9
"e" (5) BAR NO.		4	4	4	2	4	4	2	4	4	4	4	4	4	4	4	5
QUAN. CONCRETE	CF/LF	39.0	51.6	41.0	53.6	42.7	55.6	44.7	58.2	46.7	61.8	48.7	65.6	52.5	70.0	56.3	74.5
QUAN. REINFORCEMENT	LBS/LF	339	415	349	428	370	456	381	494	418	494	460	510	486	550	518	566

SPAN	FT.	12																	
HEIGHT	FT.	4		5		6		7		8		9		10		11		12	
MAXIMUM EARTH COVER	FT.	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
CONC. ROOF T1	INCH	10	14 1/2	10	14 1/2	10	14 1/2	10	14 1/2	10	14 1/2	10	14 1/2	10	14 1/2	10	14 1/2	10	14 1/2
CONC. EXTERIOR WALLS T2	INCH	8	8 1/2	8	8 1/2	8	8 1/2	8	9	8 1/2	10 1/2	9	11 1/2	9 1/2	12 1/2	10	14	11	15
CONC. INVERT T3	INCH	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15
REINFORCEMENT SPACING	INCH	9	8	9	8	9	8	9	8	8	7 1/2	8	7 1/2	8 1/2	7 1/2	8 1/2	8	8 1/2	8
"g" BAR NO.		7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
"f" BAR NO.		7	7	7	7	7	7	7	7	6	6	6	6	6	6	6	6	6	6
"a" BAR NO.		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
"b" BAR NO.		5	5	5	5	5	5	5	6	5	6	5	6	6	6	5	6	6	6
"b" DIMENSION "B"	FT.-INCH	2-7	3-1	2-7	3-1	2-7	3-1	3-0	3-5	3-6	3-7	3-6	3-4	[illegible]	3-4	3-9	3-4	3-5	3-4
"b" DIMENSION "Bw"	FT.-INCH	4-1	3-7	4-1	3-2	4-1	3-2	4-1	3-4	4-1	3-4	4-1	3-7	[illegible]	3-7	3-9	[illegible]	3-9	3-9
"c" BAR NO.		6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7	7
"c" DIMENSION "C"	FT.-INCH	3-10	3-7	3-10	3-7	3-10	3-7	4-6	4-4	5-1	5-0	6-6	5-2	7-2	5-4	7-5	5-7	7-5	5-7
"e" (5) BAR NO.		4	4	4	4	7	4	4	4	4	4	4	4	2	2	5	5	5	5
QUAN. CONCRETE	CF/LF	51.3	72.4	53.3	73.4	55.0	76.3	57.0	79.1	59.8	83.8	62.7	86.1	65.9	92.7	69.1	96.8	73.7	104
QUAN. REINFORCEMENT	LBS/LF	505	567	514	577	543	604	563	646	600	663	614	688	627	691	701	749	733	764

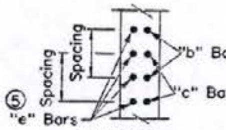
SPAN	FT.	14															
HEIGHT	FT.	7		8		9		10		11		12		13		14	
MAXIMUM EARTH COVER	FT.	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
CONC. ROOF T1	INCH	11 1/2	16 1/2	11 1/2	16 1/2	11 1/2	16 1/2	11 1/2	16 1/2	11 1/2	16 1/2	11 1/2	16 1/2	11 1/2	16 1/2	11 1/2	16 1/2
CONC. EXTERIOR WALLS T2	INCH	8 1/2	9 1/2	8 1/2	10 1/2	9	11 1/2	9 1/2	12 1/2	10 1/2	14	11 1/2	15	12 1/2	16 1/2	15	17 1/2
CONC. INVERT T3	INCH	11 1/2	17	11 1/2	17	11 1/2	17	11 1/2	17	11 1/2	17	11 1/2	17	11 1/2	17	11 1/2	17
REINFORCEMENT SPACING	INCH	8 1/2	8	8 1/2	8	8 1/2	8	8 1/2	8	8 1/2	8	8 1/2	8	9	8	9	8
"g" BAR NO.		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
"f" BAR NO.		6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
"a" BAR NO.		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
"b" BAR NO.		5	6	6	6	5	6	6	6	6	6	6	7	7	7	7	7
"b" DIMENSION "B"	FT.-INCH	2-7	2-7	3-3	3-3	4-0	4-0	4-0	4-0	4-7	4-4	4-7	4-4	4-7	4-4	4-7	4-4
"b" DIMENSION "Bw"	FT.-INCH	5-0	3-9	5-0	4-6	5-0	5-0	5-0	5-0	4-9	5-6	4-5	5-6	4-6	5-6	4-4	5-6
"c" BAR NO.		6	6	6	7	7	7	7	7	7	7	7	7	7	7	8	8
"c" DIMENSION "C"	FT.-INCH	4-3	3-11	5-6	4-6	7-0	5-0	7-9	5-9	8-6	6-3	9-0	6-9	9-3	6-9	9-3	6-9
"e" (5) BAR NO.		4	4	4	4	4	4	4	4	4	4	5	5	5	5	6	6
QUAN. CONCRETE	CF/LF	71.8	95.7	73.9	104	76.9	108	80.0	113	84.2	119	88.8	124	94.1	131	98.1	137
QUAN. REINFORCEMENT	LBS/LF	662	710	715	783	756	820	807	846	833	873	881	958	884	976	1002	1110

"d" BARS, FOR EARTH COVERS OF 2' AND LESS TO BE PLACED IN TOP SLAB ONLY

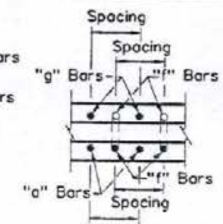
SPAN	5'	6'	7'	8'	10'	12'	14'
# /CELL	5	6	8	10	11	13	16



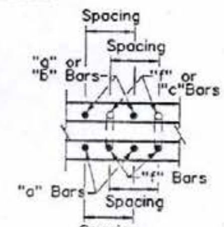
EXTERIOR WALL SECTION SPANS 5' THRU 8'



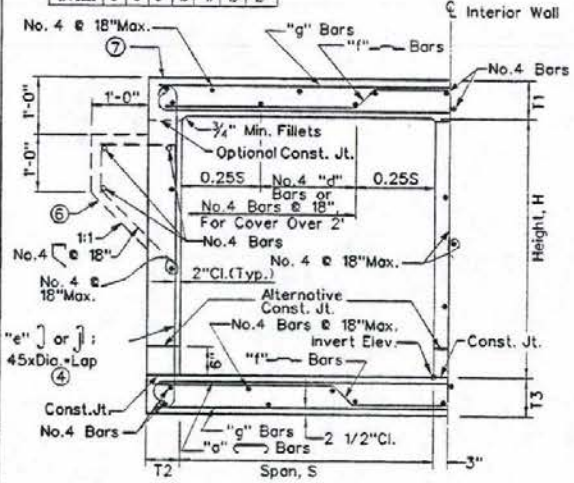
EXTERIOR WALL SECTION SPANS 10' THRU 14'



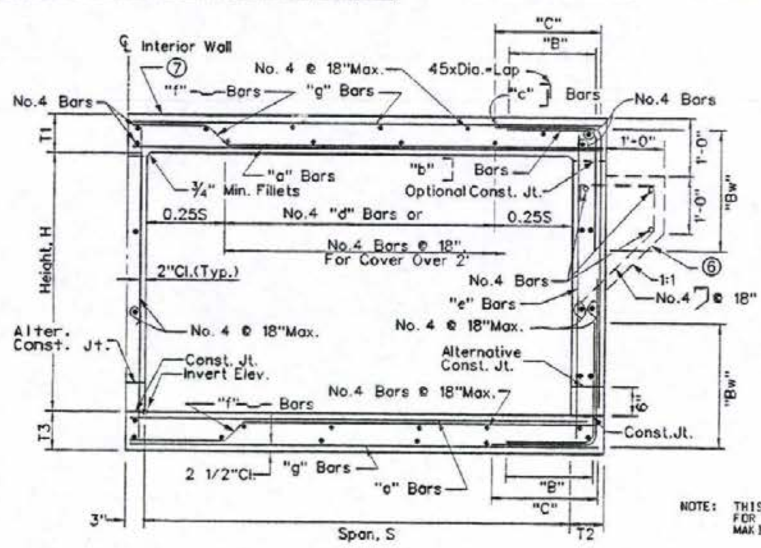
ROOF SECTION SPANS 5' THRU 8' INVERT SIMILAR



ROOF SECTION SPANS 10' THRU 14' INVERT SIMILAR



TYPICAL SECTION - SPANS 5' THRU 8'



TYPICAL SECTION - SPANS 10' THRU 14'

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=4500 PSI, OR "A", f'c=4000 PSI, AS DETERMINED BY THE ENGINEER. IF "EA" CONCRETE IS TO BE USED, THE TOP SLAB REINFORCING STEEL SHALL HAVE AN EPOXY COATING.

NOTE: THIS PLAN SHEET MAY BE USED FOR MULTIPLE CELL CULVERTS BY MAKING NECESSARY ADJUSTMENTS.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

DOUBLE RCB CULVERTS

CHIEF BRIDGE DESIGN ENGR. | ADOPTED 11/70 | B-20.1.3 | (502) | REVISION 3-3/82

SPAN	FT	5						6								7										8									
HEIGHT	FT	4		5		6		3		4		5		6		3		4		5		6		7		3		4		5		6		7	
MAXIMUM EARTH COVER	FT	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
CONCRETE	CF/LF	7.9	8.6	8.4	9.1	8.9	9.6	9.1	11.3	9.6	11.8	10.1	12.3	10.6	12.8	10.5	14.3	11.4	14.8	11.9	15.3	12.4	15.8	13.2	16.3	12.8	17.4	13.3	17.9	13.8	18.4	14.3	18.9	14.8	19.4	15.3	19.9
REINF.	LBS/LF	56	54	58	57	60	56	81	68	83	70	86	73	88	75	102	94	104	96	107	98	109	100	110	101	133	106	135	108	137	111	139	113	140	114	142	116

SPAN	FT	9										10										11										12									
HEIGHT	FT	4		5		6		7		8		9		10		4		5		6		7		8		9		10		11		12		7		8		9		10	
MAXIMUM EARTH COVER	FT	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
CONCRETE	CF/LF	18.0	24.2	18.7	24.9	19.3	25.6	20.0	26.2	20.7	26.9	21.3	27.6	22.6	28.2	25.1	28.9	23.8	33.8	24.4	34.5	25.1	35.1	25.8	35.8	26.4	36.5	27.1	37.1	27.8	37.8	28.4	36.5	29.1	39.1	32.8	45.6	33.4	46.3	34.1	46.9
REINFORCEMENT	LBS/LF	141	160	142	161	144	163	139	165	145	158	147	160	144	162	145	156	196	219	198	221	201	223	201	224	203	216	205	218	196	219	199	210	201	212	246	261	249	264	251	266

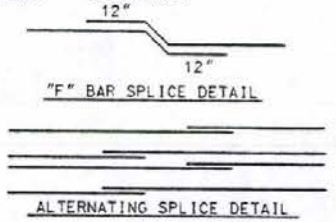
SPAN	FT	14													
HEIGHT	FT	8		9		10		11		12		13		14	
MAXIMUM EARTH COVER	FT	10	20	10	20	10	20	10	20	10	20	10	20	10	20
CONCRETE	CF/LF	34.8	47.6	35.4	48.3	36.1	48.9	36.8	49.6	37.4	50.3				
REINFORCEMENT	LBS/LF	252	267	254	269	256	271	246	272	248	274				

NOTES:

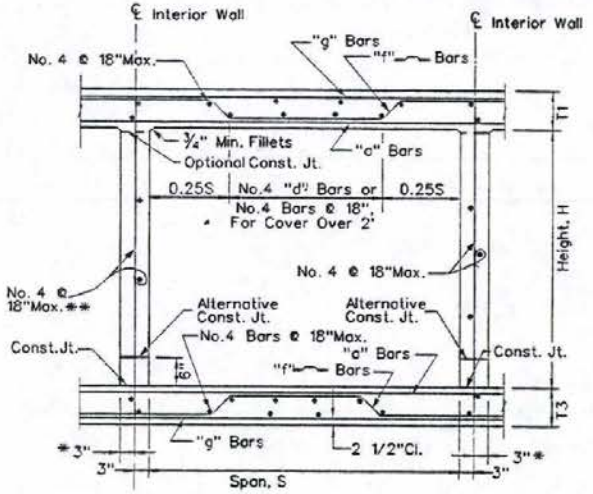
① NOTES ON ①, ②, ③ & ⑦ OF SHEET B-20.1.3 SHALL APPLY.

② WHEN THE ADDITION OF CELLS CAUSES THE LENGTHS OF THE "a", "f" AND "g" BARS TO EXCEED 60 FEET. 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:

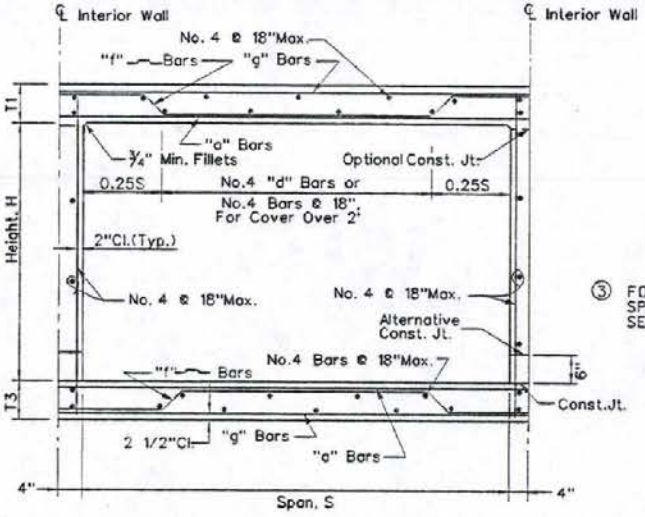
NO.4 BARS - 16 INCHES
NO.6 BARS - 24 INCHES
NO.7 BARS - 31 INCHES
NO.8 BARS - 40 INCHES



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 5' THRU 8'



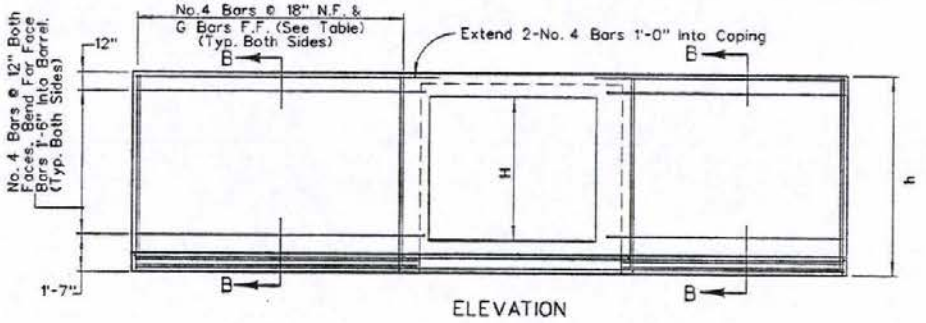
TYPICAL SECTION - SPANS 10' THRU 14'

* - CONCRETE FOR THIS PORTION IS INCLUDED IN QUANTITIES OF ADJOINING CELLS.
** - REINFORCING STEEL INCLUDED IN PREVIOUS CELLS QUANTITIES.

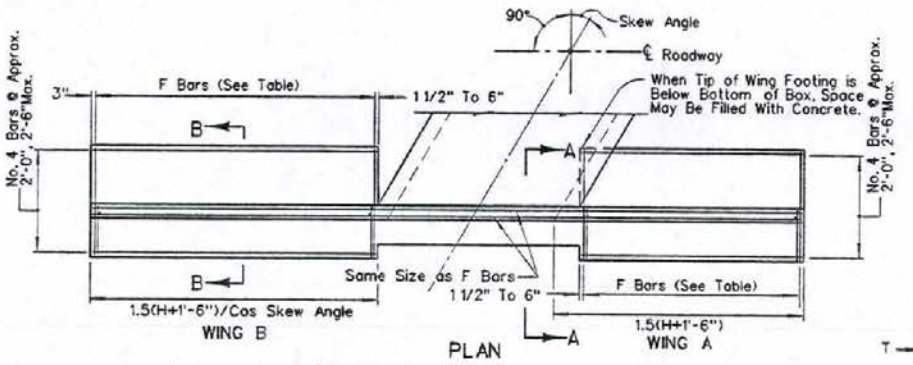
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ADDITIONAL CELLS TO BE USED WITH DOUBLE RCB CULVERTS TO PROVIDE FOR MULTIPLE CELL CULVERTS

CHIEF BRIDGE DESIGN ENGR. | ADOPTED: 8/84 | B-20.1.3.1 (502) | REVISION



ELEVATION



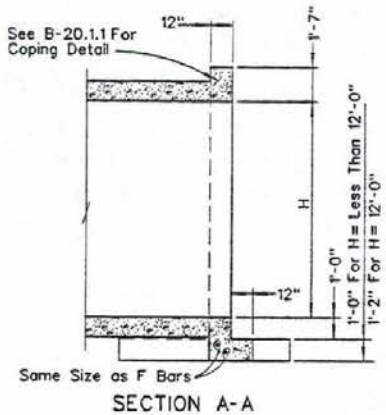
PLAN

TABLE

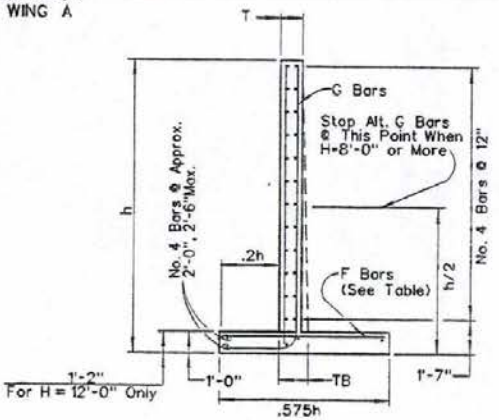
H = HEIGHT	T = INCHES	TB = INCHES	G. BARS		F BARS	
			SIZE NO.	SPACE IN.	SIZE NO.	SPACE IN.
3	8	8	5	9 1/2	4	12
4	8	8	5	9 1/2	4	12
5	9	9	6	9 1/2	4	11
6	10	10	7	10	4	6 1/2
7	12	12	7	8 1/2	5	7 1/2
8	12	13	7	6 1/2	6	8
9	12	14	7	7	6	7 1/2
10	12	16	8	6 1/2	8	10
12	12	20	9	7	8	8 1/2

NOTES:

1. FOR GENERAL NOTES SEE SHEET B-20.1.1
2. FOR QUANTITIES SEE SHEET B-20.1.4.1



SECTION A-A



SECTION B-B

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RCB CULVERTS TYPE II HEADWALLS

CHIEF BRIDGE DESIGN ENGR.

B-20.1.4 (502)

ADOPTED 11/79 REVISION

SHEET 1 OF 2

B-5

① - QUANTITIES SHOWN ARE FOR HEADWALLS AT THE INLET AND OUTLET

CUBIC YARDS OF CONCRETE AND POUNDS OF REINFORCING FOR TWO TYPE II HEADWALLS ①

SPAN	HEIGHT	SINGLE BOX								DOUBLE BOX								TRIPLE BOX								HEIGHT	SPAN
		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.		
5	3	9.4	871	9.4	888	10.2	947	11.5	1.073	11.4	991	11.6	1.013	12.4	1.085	14.3	1.243									3	
	4	12.8	1.141	12.8	1.163	13.5	1.237	15.6	1.399	14.8	1.261	15.0	1.287	15.9	1.376	18.6	1.568	16.8	1.367	17.0	1.397	18.5	1.498	21.4	1.718	4	5
	5	16.4	1.676	16.6	1.707	17.5	1.813	19.8	2.044	18.6	1.795	18.6	1.831	19.9	1.952	22.8	2.214	20.6	1.901	20.8	1.941	22.3	2.074	25.6	2.364	5	
6	3	9.8	886	9.8	904	10.6	963	12.1	1.094	12.2	1.094	12.2	1.119	13.2	1.204	15.3	1.389									3	
	4	13.2	1.155	13.2	1.178	14.1	1.254	16.2	1.419	15.4	1.364	15.6	1.393	16.7	1.495	19.4	1.714	17.8	1.636	18.0	1.572	19.5	1.693	22.8	1.967	4	
	5	16.6	1.690	16.8	1.725	18.9	1.830	20.5	2.064	20.0	1.898	20.4	1.937	21.7	2.071	24.8	2.360	22.4	2.070	22.8	2.116	24.5	2.269	28.2	2.603	5	6
	6	25.8	2.598	26.1	2.646	27.6	2.806	31.1	3.160	27.8	2.806	28.5	2.861	30.2	3.049	34.5	3.496	30.4	2.978	31.1	3.040	33.0	3.247	38.3	3.699	6	
	7	32.0	3.666	32.3	3.733	34.2	3.960	38.6	4.453																	7	
7	3	10.2	900	10.2	918	11.0	980	12.5	1.114																	3	
	4	13.6	1.170	13.6	1.193	14.5	1.270	16.6	1.439																	4	
	5	17.2	1.704	17.3	1.736	19.3	1.846	20.9	2.085																	5	7
	6	29.2	2.612	29.3	2.660	28.0	2.824	31.7	3.181																	6	
	7	37.2	3.682	37.7	3.750	34.6	3.978	39.0	4.485																	7	
8	3	10.6	914	10.6	933	11.4	996	13.1	1.134	13.8	1.296	14.0	1.328	15.2	1.437	17.1	1.675									3	
	4	14.0	1.184	14.0	1.207	14.9	1.287	17.0	1.460	17.0	1.566	17.2	1.602	18.5	1.726	21.6	2.000	20.2	1.830	20.4	1.876	24.1	2.033	26.0	2.373	4	
	5	17.6	1.718	17.7	1.751	18.8	1.863	21.3	2.105	20.8	2.100	20.9	2.146	22.6	2.304	25.9	2.646	24.8	2.364	25.1	2.420	27.0	2.609	31.5	3.019	5	
	6	26.4	2.626	26.7	2.675	28.4	2.841	32.1	3.201	25.2	3.008	25.9	3.070	27.8	3.282	32.5	3.742	32.4	3.272	33.1	3.344	35.4	3.587	40.9	4.115	6	8
	7	33.8	3.697	33.9	3.765	34.9	3.995	38.3	4.496	35.8	4.067	36.2	4.141	38.5	4.402	44.7	5.019	39.0	4.431	39.6	4.421	42.3	4.727	48.3	5.392	7	
	8	40.4	4.979	40.8	5.070	43.3	5.377	48.8	6.046	43.8	5.332	44.2	5.434	47.1	5.785	54.3	6.546	47.0	5.596	47.6	5.706	50.9	6.190	57.9	6.919	8	
10	3	11.4	943	11.4	962	12.5	1.029	14.3	1.174	14.8	1.604	15.0	1.648	16.3	1.793	18.9	2.116									3	
	4	14.6	1.212	14.7	1.237	15.8	1.320	18.1	1.500	18.2	1.874	18.3	1.922	19.8	2.084	24.1	2.435									4	
	5	18.4	1.747	18.5	1.781	19.8	1.895	22.5	2.145	20.4	2.408	22.0	2.466	23.9	2.660	26.8	3.081	25.6	2.836	25.9	2.909	28.2	3.154	32.9	3.686	5	
	6	27.0	2.656	27.2	2.705	28.9	2.874	32.8	3.241	30.4	3.316	31.2	3.390	33.1	3.638	38.0	4.117	34.1	3.744	36.0	3.813	37.5	4.132	45.4	4.782	6	
	7	34.4	3.726	33.6	3.788	36.1	4.033	40.9	4.542	37.2	4.375	37.6	4.467	40.1	4.778	45.7	5.454	41.0	4.803	41.6	4.910	44.5	5.212	51.1	6.059	7	10
	8	41.2	5.015	41.5	5.107	44.0	5.419	48.6	6.097	44.4	5.640	44.7	5.724	47.8	6.141	54.2	6.981	46.4	6.068	48.9	6.197	52.2	6.635	59.8	7.586	8	
	9	45.8	5.687	50.2	5.781	53.1	6.144	59.9	6.906																	9	
	10	61.0	8.535	61.4	8.650	65.2	9.216	73.2	10.358	65.2	9.109	65.8	9.285	70.2	9.878	79.2	11.169	69.6	9.537	70.4	9.728	75.2	10.372	85.4	11.774	10	
12	4	15.4	1.241	15.5	1.268	16.5	1.356	19.1	1.540	19.6	2.290	19.9	2.352	21.4	2.564	26.6	3.023									4	
	5	18.8	1.775	18.9	1.810	20.2	1.929	22.9	2.185	23.0	2.824	23.1	2.896	25.0	3.140	28.9	3.669									5	
	6	26.0	2.683	26.2	2.734	29.9	2.908	33.9	3.281	32.2	3.732	33.6	3.820	35.1	4.118	40.1	4.766	36.8	4.381	37.4	4.492	40.3	4.867	45.7	5.683	6	
	7	34.2	3.761	33.8	3.831	36.5	4.069	41.3	4.586	36.4	4.791	39.0	4.897	41.6	5.258	47.5	6.042	43.0	5.440	43.8	5.569	47.0	6.007	54.1	6.960	7	
	8	42.0	5.050	42.1	5.143	44.8	5.459	50.6	6.147	46.6	6.056	46.9	6.140	50.2	6.621	56.0	7.569	51.2	6.705	51.7	6.856	55.6	7.370	63.6	8.487	8	12
	9	50.4	5.722	50.8	5.828	53.8	6.187	60.6	6.959	55.2	6.726	55.8	6.869	59.4	7.346	67.4	8.381	60.0	7.377	60.8	7.541	65.0	8.095	74.2	9.299	9	
	10	61.8	6.580	62.3	6.736	65.8	9.267	74.3	10.421	66.6	9.525	67.1	9.715	71.7	10.358	81.1	11.757	71.4	10.174	72.3	10.387	77.5	11.107	88.1	12.675	10	
	12	88.0	12.939	88.8	13.172	94.0	13.963	105.7	15.662	93.2	13.884	94.2	14.150	99.8	15.054	113.1	17.018	98.0	14.533	99.2	14.822	105.6	15.803	119.4	17.936	12	

B-6

SHEET 2 OF 2

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RCB CULVERTS
TYPE II HEADWALLS

CHIEF BRIDGE DESIGN ENGR.

B-20.1.4.1 (502)
ADOPTED: 11/70
REVISION: 3/97

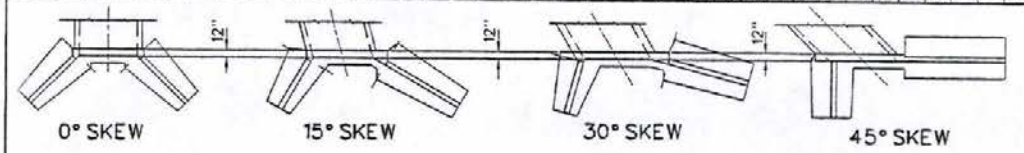
TYPE I HEADWALL DIMENSIONS AND REINFORCING STEEL

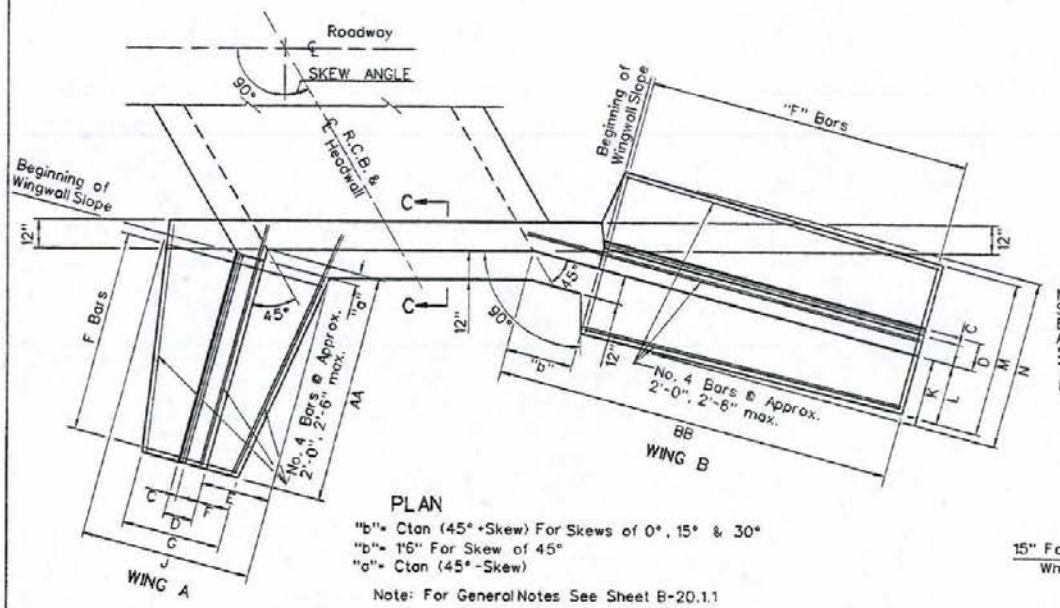
H-Height In Feet	h- All Wings Except For 45° Skew	0° SKEW									WINGS A&B G BARS		WINGS A&B F BARS	
		AA & BB	CC & DD	C & D	E & K	F & L	G & M	J & N	SIZE	SPACING	SIZE	SPACING
3	6-7	4-0	4-2	8	1-4	0-10	2-1	3-4	4	12	4	12
4	7-7	5-0	5-8	8	1-6	1-2	2-10	3-10	4	12	4	12
5	8-7	6-2	6-2	8	1-9	1-3	3-1	4-4	4	12	4	12
6	9-7	7-2	6-8	8	1-11	1-4	3-4	4-10	4	10½	4	12
7	10-7	8-4	7-3	8	2-2	1-6	3-8	5-4	4	7	4	12
8	11-7	9-4	7-9	8	2-4	1-7	3-11	5-10	6	10½	4	11
9	12-7	10-5	8-3	9	2-6	1-8	4-2	6-4	6	9	4	9
10	13-7	11-6	8-10	10	2-9	1-9	4-5	6-10	6	7½	4	6½
12	15-7	13-7	9-11	12	3-2	2-0	5-0	7-10	7	7	5	6½

H-Height In Feet	15° SKEW														WING A G BARS		WING A F BARS		WING B G BARS		WING B F BARS	
	AA	BB	CC	DD	C	D	E & K	F	G	J & N	L	M	SIZE	SPACING	SIZE	SPACING	SIZE	SPACING	SIZE	SPACING
3	3-7	4-8	4-11	5-7	8	8	1-4	1-0	2-6	3-4	1-2	2-10	4	12	4	12	4	12	4	12
4	4-6	5-11	5-4	6-2	8	8	1-6	1-1	2-8	3-10	1-3	3-1	4	12	4	12	4	12	4	12
5	5-6	7-2	5-9	6-9	8	8	1-9	1-2	2-11	4-4	1-4	3-5	4	12	4	12	4	10	4	12
6	6-5	8-5	6-3	7-4	8	8	1-11	1-3	3-2	4-10	1-6	3-8	4	12	4	12	4	6½	4	12
7	7-6	9-9	6-9	8-0	8	8	2-2	1-4	3-5	5-4	1-7	4-0	4	8½	4	12	6	10	4	12
8	8-5	11-0	7-2	8-7	9	9	2-4	1-5	3-7	5-10	1-8	4-4	6	12	4	12	6	8	4	9½
9	9-4	12-3	7-7	9-2	9	10	2-6	1-6	3-10	6-4	1-10	4-7	6	10	4	10	7	9	4	8
10	10-4	13-6	8-0	9-9	10	12	2-9	1-7	4-1	6-10	2-0	5-0	6	8	4	8½	7	7½	4	6
12	12-3	15-11	9-1	11-4	11	15	3-2	1-10	4-7	7-10	2-3	5-8	7	7½	5	6½	7	6	5	6

H-Height In Feet	30° SKEW														WING A G BARS		WING A F BARS		WING B G BARS		WING B F BARS	
	AA	BB	CC	DD	C	D	E & K	F	G	J & N	L	M	SIZE	SPACING	SIZE	SPACING	SIZE	SPACING	SIZE	SPACING
3	3-4	5-10	4-8	6-2	8	8	1-4	0-11	2-4	3-4	1-3	3-4	4	12	4	12	4	12	4	12
4	4-3	7-5	5-2	6-11	8	8	1-6	1-0	2-7	3-10	1-6	3-10	4	12	4	12	4	12	4	8½
5	5-2	8-11	5-6	7-8	8	8	1-9	1-1	2-9	4-4	1-9	4-4	4	12	4	12	4	12	4	6½
6	6-1	10-6	5-11	8-4	8	8	1-11	1-2	3-0	4-10	1-8	4-10	4	12	4	12	6	12	4	12
7	7-0	12-2	6-5	9-3	9	9	2-2	1-4	3-3	5-4	1-10	5-4	4	10½	4	12	6	8½	4	10½
8	7-11	13-9	6-10	10-0	9	9	2-4	1-5	3-5	5-10	2-4	5-10	4	6	4	12	6	7	4	7½
9	8-10	15-3	7-3	10-9	9	12	2-6	1-6	3-10	6-4	2-6	6-4	5	7½	4	9	7	8	5	7
10	9-9	16-10	7-8	11-7	9	13	2-8	1-7	3-10	6-10	2-9	6-10	6	9	4	7½	7	6½	6	7½
12	11-8	19-11	8-7	13-3	11	16	3-2	1-9	4-4	7-10	3-2	7-10	7	9	5	7½	8	6½	6	7½

H-Height In Feet	45° SKEW																WING B		WING A C BARS		WING A F BARS		WING B G BARS		WING B F BARS	
	AA	BB	CC	DD	C	D	E & K & L	F	G	J & M & N	h	DD	SIZE	SPACING	SIZE	SPACING	SIZE	SPACING	SIZE	SPACING	SIZE	SPACING	SIZE	SPACING
3	3-4	8-4	4-7	6-7	8	8	1-4	0-11	2-4	3-4	6-7	6-7	4	12	4	12	4	12	4	12	4	12	4	12
4	4-2	10-5	5-0	7-7	8	8	1-6	1-0	2-6	3-10	7-7	7-7	4	12	4	12	5	9½	4	12	4	12	4	12
5	5-1	12-7	5-5	8-7	9	9	1-9	1-1	2-9	4-4	8-7	8-7	4	12	4	12	6	9½	4	12	4	12	4	11
6	5-11	14-8	5-11	9-7	10	10	1-11	1-2	2-11	4-10	9-7	9-7	4	12	4	12	7	10	4	6½	6	12	4	10
7	6-10	17-0	6-3	10-7	12	12	2-2	1-3	3-2	5-4	10-7	10-7	4	10½	4	12	7	8½	4	10½	6	11	4	7
8	7-10	19-1	6-8	11-7	12	12	2-4	1-4	3-4	5-10	11-7	11-7	4	7	4	12	7	6½	4	8½	6	10	4	7
9	8-7	21-2	7-1	12-7	12	14	2-6	1-5	3-7	6-4	12-7	12-7	5	8	4	10	7	6	6	7½	6	9	4	6
10	9-6	23-4	7-6	13-7	9	16	2-9	1-6	3-9	6-10	13-7	13-7	6	9½	4	7½	8	6½	6	7½	7	8	5	6
12	11-3	27-7	9-5	15-9	11	20	3-2	1-8	4-2	7-10	15-9	15-9	7	9	5	7	7	8	6	8½	8	8	6	5

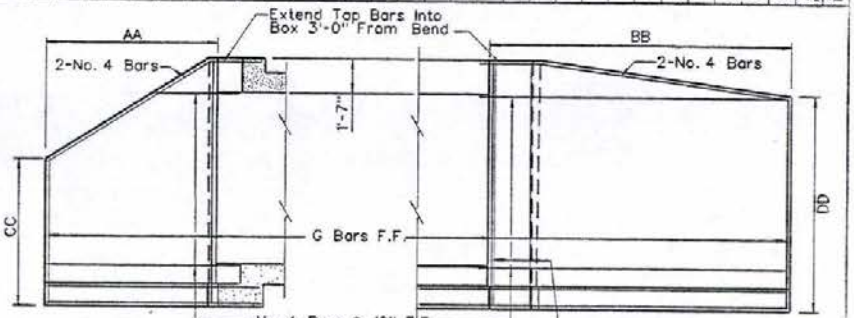




PLAN

"b"= Ctan (45° +Skew) For Skews of 0°, 15° & 30°
"b"= 1'6" For Skew of 45°
"a"= Ctan (45° -Skew)

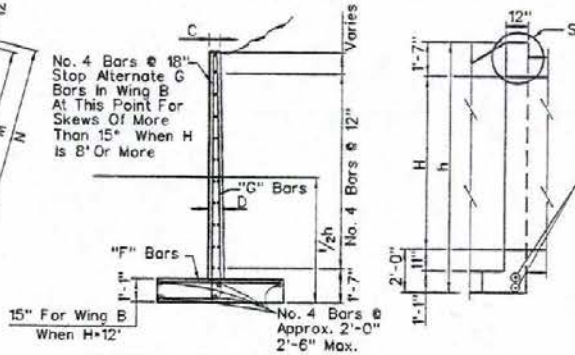
Note: For General Notes See Sheet B-20.1.1



NOTE: For Boxes With 0° Skew Both Wings Are As Shown For Wing A.

SECTION WING A

SECTION WING B



SECTION OF WINGS A AND B

SECTION C-C

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RCB CULVERTS
TYPE I HEADWALLS

CHIEF BRIDGE ENGR.

B-20.1.5	(502)
ADOPTED-11/70	REVISION 1-12/90

CUBIC YARDS OF CONCRETE AND POUNDS OF REINFORCING FOR TWO TYPE I HEADWALLS ①

SPAN	HEIGHT	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.
5	3	5.6	393	6.4	476	7.2	563	8.9	739	7.7	508	8.5	597	9.5	700	11.8	910								
	4	7.6	609	8.0	644	9.6	774	11.6	946	9.7	726	10.1	767	12.0	912	14.6	1119	11.8	842	12.3	886	14.4	1045	17.6	1280
	5	9.6	705	10.2	782	11.8	942	15.0	1238	11.7	825	12.4	908	14.3	1085	18.0	1414	13.9	944	14.6	1030	16.8	1220	21.0	1578
6	3	6.0	418	6.8	504	7.6	595	9.4	779	8.3	600	9.2	699	10.3	817	12.7	1062								
	4	7.9	637	8.3	673	10.0	807	12.1	985	10.3	821	10.8	869	12.7	1032	15.5	1270	12.6	1004	13.2	1058	15.4	1243	18.8	1525
	5	9.9	730	10.6	809	12.2	974	15.4	1278	12.3	917	13.0	1009	15.0	1203	18.8	1566	14.7	1103	15.5	1199	17.7	1413	22.1	1823
	6	12.4	983	12.6	1106	15.5	1505	20.4	2158	14.8	1173	15.0	1310	18.3	1740	23.7	2449	17.2	1361	17.5	1502	21.0	1951	27.1	2708
	7	15.3	1400	16.0	1601	19.8	2155	26.5	3104																
7	3	6.3	442	7.1	532	8.0	626	9.9	820																
	4	8.3	665	8.7	702	10.4	839	12.6	1025																
	5	10.3	756	10.9	837	12.6	1006	15.9	1319																
	6	12.8	1011	12.9	1137	15.9	1544	20.8	2209																
	7	15.6	1432	16.3	1637	20.2	2199	27.0	3161																
8	3	6.7	467	7.5	559	8.4	658	10.4	861	7.8	817	10.7	1064	11.8	1109	14.5	1268								
	4	8.6	693	9.1	731	10.8	872	13.1	1065	11.8	1045	12.3	1078	14.3	1238	17.3	1475	14.9	1320	15.5	1365	17.8	1558	21.4	1858
	5	10.6	782	11.3	864	13.0	1038	16.4	1360	13.8	1137	14.5	1216	16.6	1405	20.6	1773	17.0	1414	17.8	1501	20.2	1720	25.0	2159
	6	13.1	1039	13.3	1169	16.3	1583	21.3	2261	16.4	1401	16.6	1525	19.9	1958	25.6	2676	19.6	1677	19.9	1814	23.6	2276	29.9	3065
	7	16.0	1464	16.7	1673	20.6	2242	27.5	3219	19.2	1824	21.0	2133	24.3	2620	31.8	3637	22.5	2107	24.4	2428	28.0	2946	36.1	4029
	8	17.9	1904	20.2	2234	24.2	2778	33.1	3938	21.2	2267	23.6	2552	27.9	3051	39.5	4359	24.5	2552	27.0	2850	31.7	3381	43.9	4753
10	3	7.3	515	8.2	612	9.2	721	11.4	942	11.2	1111	12.2	1227	13.6	1383	16.8	1734								
	4	9.3	749	9.8	789	11.6	936	14.1	1144	13.2	1348	13.8	1396	16.1	1608	19.6	1939								
	5	11.3	833	12.0	920	13.8	1101	17.4	1441	15.2	1434	16.1	1531	18.4	1770	23.0	2239	19.2	1876	20.1	1985	22.9	2274	28.5	2857
	6	13.8	1093	14.0	1233	17.1	1661	22.3	2365	17.8	1697	18.1	1775	21.7	2187	28.0	3165	21.8	2141	22.2	2219	26.3	2666	33.6	3786
	7	16.6	1528	17.4	1745	21.4	2329	28.4	3334	20.7	2135	21.6	2359	26.1	3006	34.1	4137	24.7	2582	25.8	2821	30.7	3519	39.8	4761
	8	18.6	1978	20.9	2314	25.0	2870	34.1	4054	22.7	2587	25.2	2935	29.7	3544	39.9	4860	26.8	3037	29.4	3399	34.4	4057	45.6	5486
	9	23.2	2117	25.4	2482	31.1	3244	41.4	4597																
	10	29.5	3352	31.6	3598	38.6	4397	51.7	5892	33.7	3967	36.0	4217	43.5	5077	57.6	6703	37.8	4422	40.3	4688	48.3	5598	63.5	7335
12	4	10.0	804	10.5	848	12.4	1001	15.1	1224	14.6	1732	15.2	1806	17.6	2090	21.5	2449								
	5	12.0	884	12.7	975	14.6	1165	18.4	1522	16.6	1815	17.5	1941	20.0	2247	24.9	2849								
	6	14.8	1148	14.7	1296	17.9	1738	23.3	2469	19.2	2086	19.6	2244	23.3	2817	29.9	3799	23.9	2744	24.4	2922	28.7	3576	36.5	4733
	7	17.3	1591	18.1	1817	22.2	2416	29.4	3449	22.1	2531	23.0	2775	27.7	3497	36.1	4782	26.8	3195	27.9	3460	33.1	4261	42.8	5719
	8	18.3	1945	21.8	2404	25.8	2962	35.1	4171	23.1	2884	26.7	3396	31.3	4048	41.8	5506	27.8	3554	31.6	4094	36.8	4830	48.6	6446
	9	23.9	2181	26.1	2553	31.9	3327	42.4	4704	28.7	3123	31.1	3522	37.5	4414	49.2	6042	33.5	3796	36.1	4216	43.0	5191	56.1	6984
	10	30.2	3429	32.3	3680	39.4	4486	52.7	6003	35.0	4373	37.4	4646	45.1	5580	59.6	7344	39.9	5045	42.4	5341	50.7	6353	66.5	8289
	12	42.8	5137	47.2	5372	56.4	6075	80.1	8124	47.8	6087	52.3	6340	62.2	7141	87.2	9470	52.7	6768	57.5	7045	67.9	7930	94.2	10.420

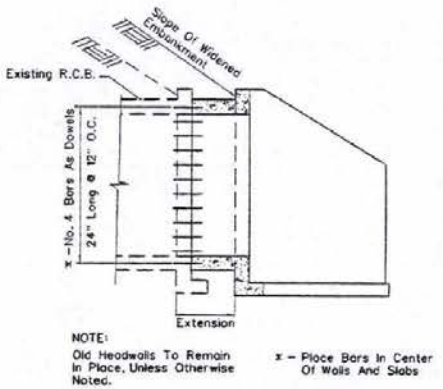
① -QUANTITIES SHOWN ARE FOR HEADWALLS AT THE INLET AND OUTLET

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

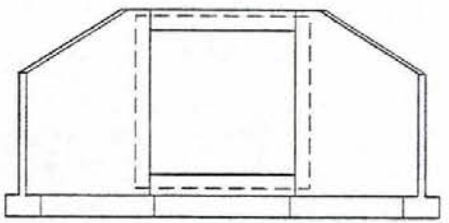
ESTIMATE OF QUANTITIES
TYPE I HEADWALLS

B-20.1.6 (502)

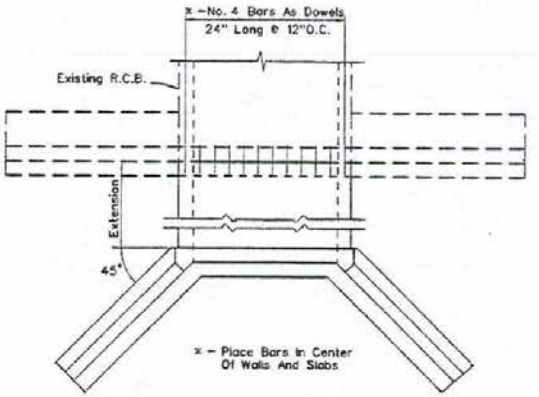
CHIEF BRIDGE DESIGN ENGR. ADOPTED: 11/70 REVISION: 3/97



PART LONGITUDINAL SECTION



ELEVATION

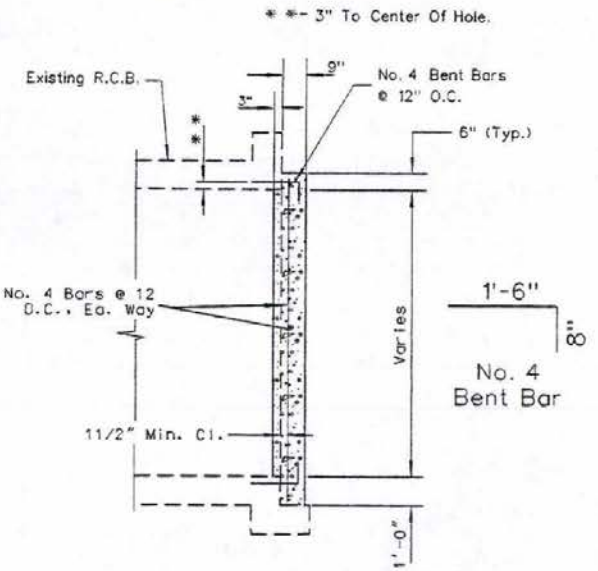


PLAN

R.C.B. CULVERT EXTENSION

NOTES:

1. FOR GENERAL NOTES SEE SHEET B-20.1.1.
2. DOWELLING: DOWEL HOLES SHALL BE DRILLED 12" INTO EXISTING CONCRETE. DIAMETER OF HOLE SHALL BE ¼" 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

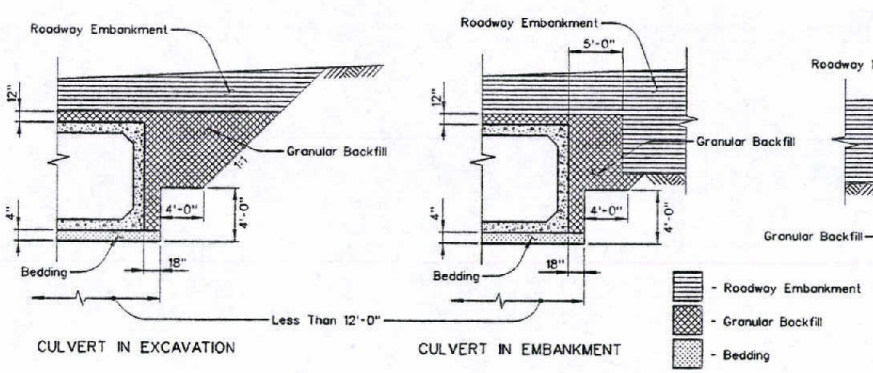
METHOD OF PLUGGING R.C.B.
NOTE: Width And Height Varies.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

METHOD OF EXTENDING R.C.B. CULVERTS

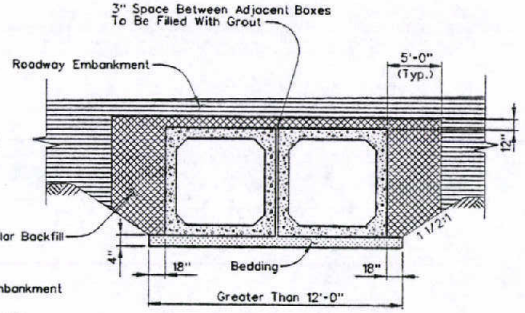
CHIEF BRIDGE ENGR.

B-20.1.7 (502)
ADOPTED-11/70 REVISION 1-12/90



CULVERT IN EXCAVATION

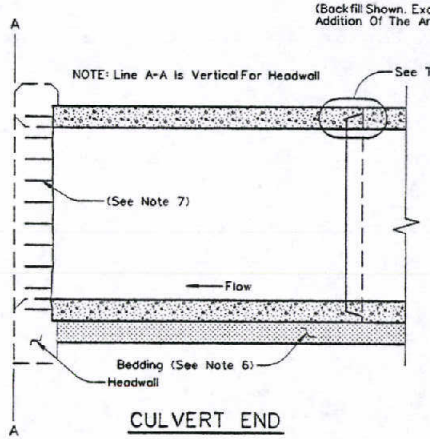
CULVERT IN EMBANKMENT



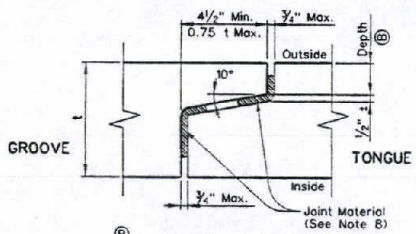
CULVERT IN EXCAVATION OR EMBANKMENT
(SHOWING A DOUBLE CULVERT INSTALLATION)

EXCAVATION AND BACKFILL

(Backfill Shown. Excavation As Shown On Sheet R-1.1.4 With The Addition Of The Area For Bedding.)

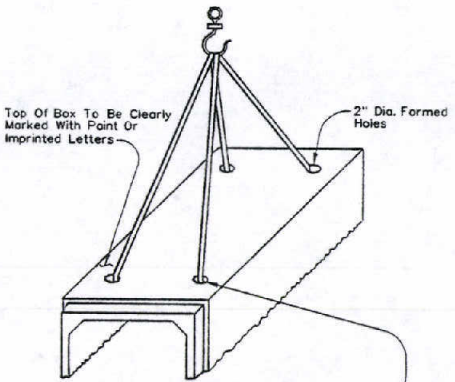


CULVERT END



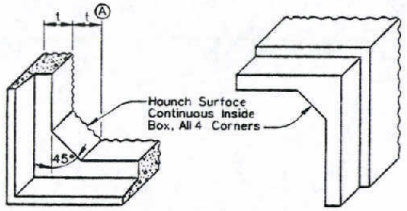
Ⓑ For Spans Thru 8', Dmin.=2"
For Spans Over 8', Dmin.=3¼"

TYPICAL JOINT DETAIL



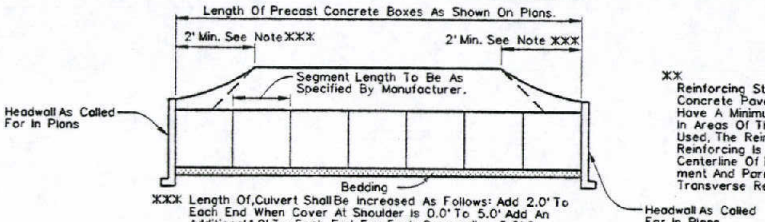
Lifting Holes (Located By Mfr.) Cylindrical Hole Shall Be Filled With An Approved Epoxy Non-Shrink Grout. Hole With An Approved Conical Shape For The Bottom 3" May Be Filled With A Concrete Grout Composed Of One Part By Volume Of Cement To Two Parts By Volume Of Sand With Only Enough Water To Permit Placing & Tamping. An Approved Custom Plug May Be Used. (An Optional Method Of Lifting May Be Used As Approved By The Engineer.)

LIFTING



Ⓐ - t Min. Shall Equal The Wall Thickness t Max. Shall Be 8" For Spans Thru 8' & 12" For Spans Over 8'.

CORNERS



*** Length Of Culvert Shall Be Increased As Follows: Add 2.0' To Each End When Cover At Shoulder Is 0.0' To 5.0' Add An Additional 1.0' To Each End For Each Succeeding 5.0' On Cover Or Portion Thereof.

TYPICAL CULVERT INSTALLATION

1) Design Specifications: AASHTO "Standard Specifications for Highway Bridges", and AASHTO M259 or M273 (ASTM C789 or C850) as indicated by the following:

Condition	Min. Cover*	AASHTO	Equiv. ASTM
2 ft. or more cover	2 ft.	M259, Table 2	C789, Table 2
Less than 2 ft. cover	0 ft.	M273 Table 2	C850, 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 Load: Interstate loading conditions (Table 2). (Standard H520-44 and FHWA alternate military loading.)

4) Concrete: Concrete shall be as specified in AASHTO M259 or M273 (ASTM C789 or C850), as modified in subsection 502.03.24 of the Standard Specifications and the Special Provisions.

5) Reinforcing Steel: Reinforcing steel shall be AASHTO M31 (ASTM A615) Grade 60. Welded wire fabric shall be AASHTO M55 (ASTM A185) (smooth wire), or AASHTO M32 (ASTM A497) (deformed wire). Reinforcing steel in the top slab shall have an epoxy coating conforming to AASHTO M284 (ASTM D3963), when there is 6 inches or less of cover on the RCB (Clark County excluded).

6) Bedding: Bedding material shall be either 4 inches of granular backfill or 4 inches of type 2 class B aggregate. Choice of bedding will be at the Contractors option. Excavation for bedding shall be paid for as 4 inches of structure excavation, and bedding material shall be paid for as 4 inches 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 #4 bars at 12 inch spacings or exposure of the double cage of welded wire fabric. The #4 bars shall be cast a min. of 18 inches into the precast box segment. Both the #4 bar or welded wire fabric shall extend a min. of 12 inches into the cast in place headwall.

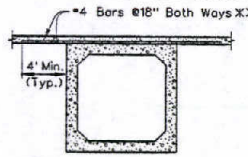
8) Joint Material: Joint material shall be a preformed joint material meeting AASHTO M198 type B. The material shall be installed in accordance with the manufacturers recommendations. A double application of joint material shall be used. One application shall be applied to the tongue and the other to the groove. The minimum size of joint material shall be 1-1/4 inches. Any joint material extruding from the interior of the joint shall be removed flush with the box wall.

9) Special Design: A special design of the precast box shall be required for the following conditions:

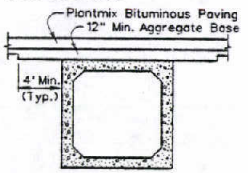
a. RCBs requiring the use of approach slabs.
b. RCBs requiring the use of bridge rail.
c. RCBs requiring the use of guardrail where the height of cover is less than the embedment length of the guardrail post.

10) Marking: 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



CONCRETE PAVING



BITUMINOUS PAVING

** Reinforcing Steel Shall Extend Full Width Of Concrete Pavement. The Reinforcement Shall Have A Minimum Clearance Of 3" 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.

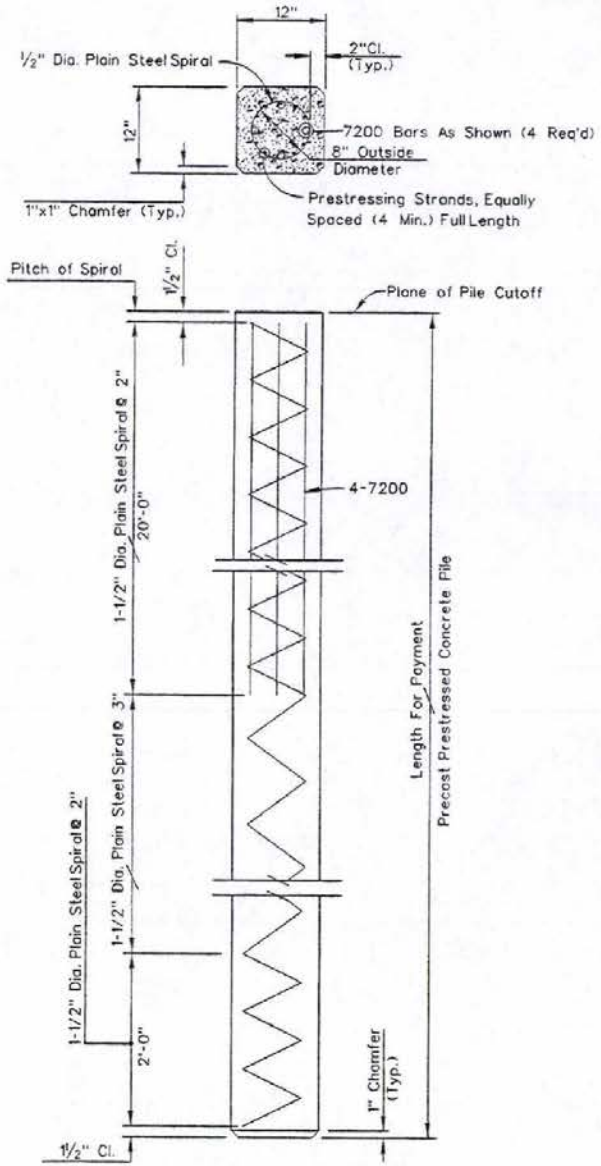
Designer To Investigate The Availability Of The Required Box Size.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

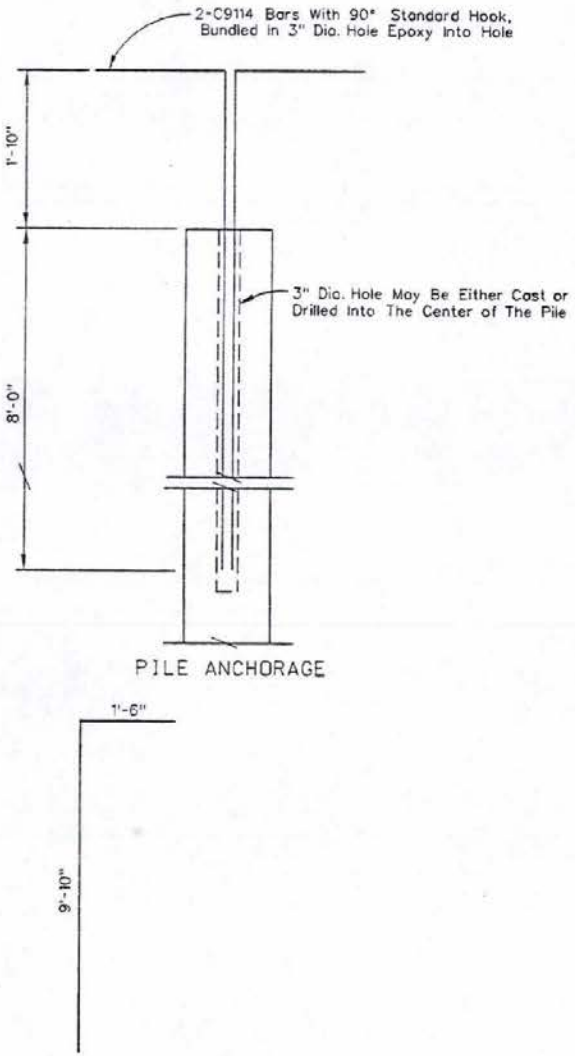
PRECAST CONCRETE BOX CULVERT

CHIEF BRIDGE ENGINEER

B-20.1.8 (502)
ADOPTED: 4/85 REVISION: 8/97



TYPICAL PRECAST PRESTRESSED PILE



PILE ANCHORAGE

C9114

GENERAL NOTES:

1. CONCRETE: ALL CONCRETE IN PRECAST PRESTRESSED PILES SHALL BE CLASS PAA CONCRETE. EXCEPT THE MIX SHALL CONTAIN NOT LESS THAN 8 SACKS OF CEMENT PER CUBIC YARD. AIR ENTRAINMENT SHALL BE 0% TO 4%. MINIMUM ULTIMATE COMPRESSIVE STRENGTH SHALL BE:
   F'ci AT TRANSFER - 4000 PSI
   F'c AT 28 DAYS - 6000 PSI
2. FINAL FORCE: THE FORCE REMAINING IN THE PILES AFTER ALL LOSSES IN THE PRESTRESSING STEEL SHALL BE 100 KIPS. (700 PSI CONCRETE STRESS). TOTAL LOSSES IN PRESTRESSING STEEL SHALL BE TAKEN AS 40 KSI.
3. PRESTRESSING STEEL: PRESTRESSING STEEL SHALL BE HIGH-TENSILE STRENGTH SEVEN WIRE STRAND CONFORMING TO THE REQUIREMENTS OF ASTM A416.
4. REINFORCEMENT: ALL REINFORCING STEEL SHALL BE AASHTO M31 GRADE 60. 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 6 INCH 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 10'-0".
4. PRECAST PRESTRESSED CONCRETE PILES SHALL BE SUPPLIED FULL LENGTH. SPLICES SHALL NOT BE ALLOWED.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PRECAST PRESTRESSED CONCRETE PILE DETAILS

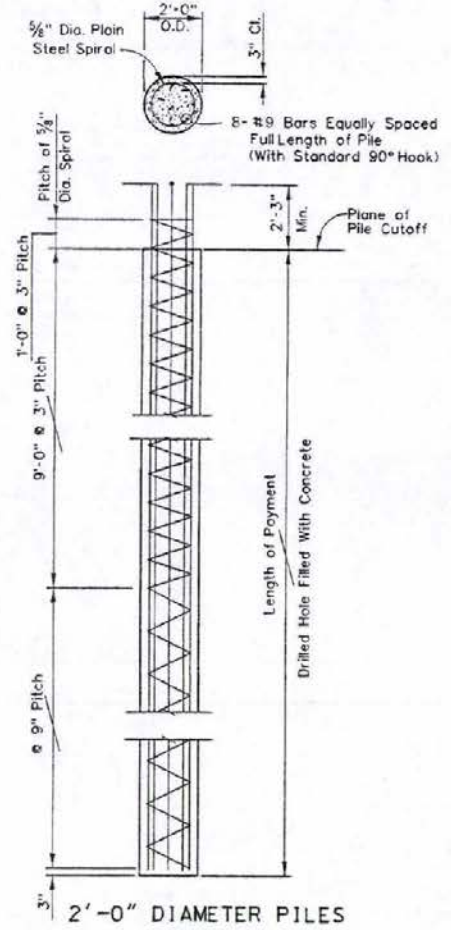
CHIEF BRIDGE ENGR.

E-23.1.1 (508)

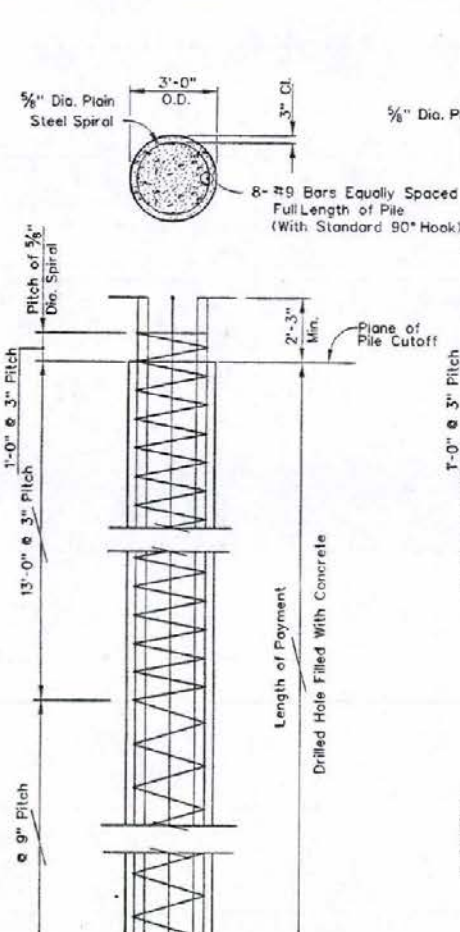
ADOPTED: 12-98

REVISION: 8/97

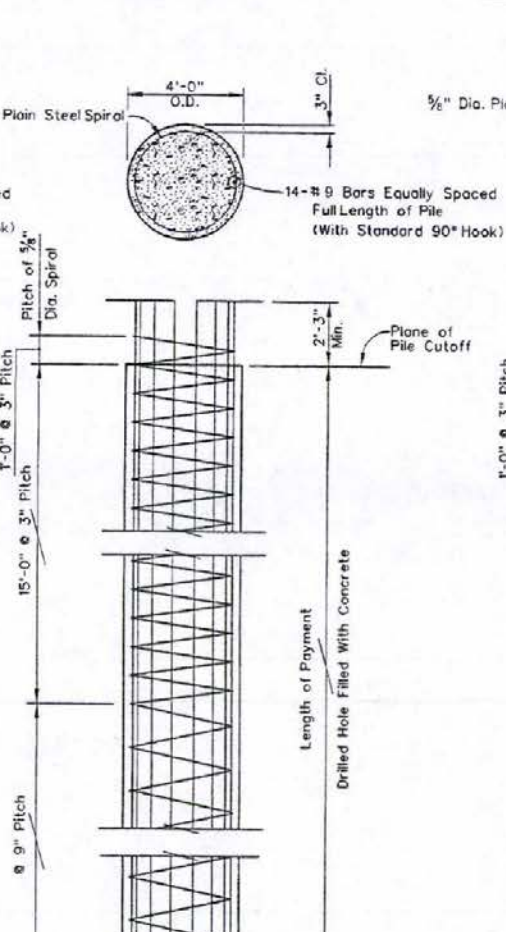
B-11



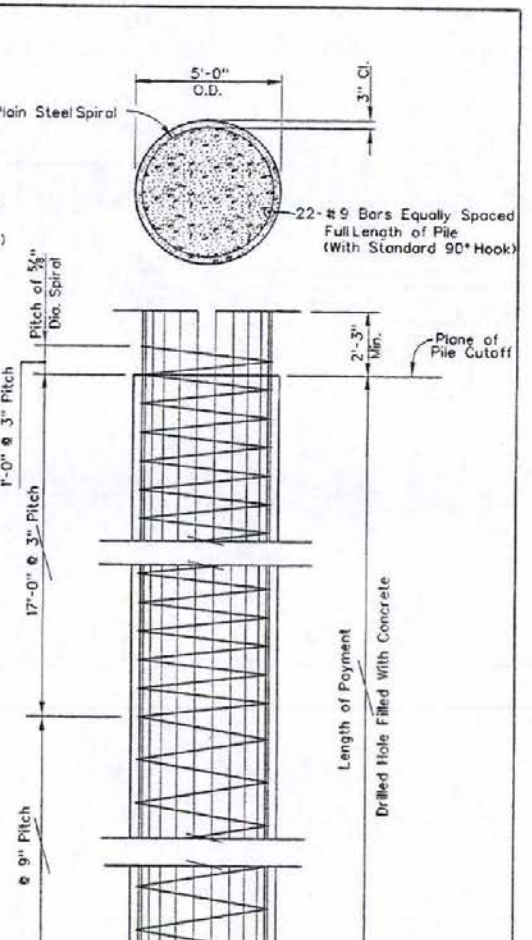
2'-0" DIAMETER PILES



3'-0" DIAMETER PILES



4'-0" DIAMETER PILES



5'-0" DIAMETER PILES

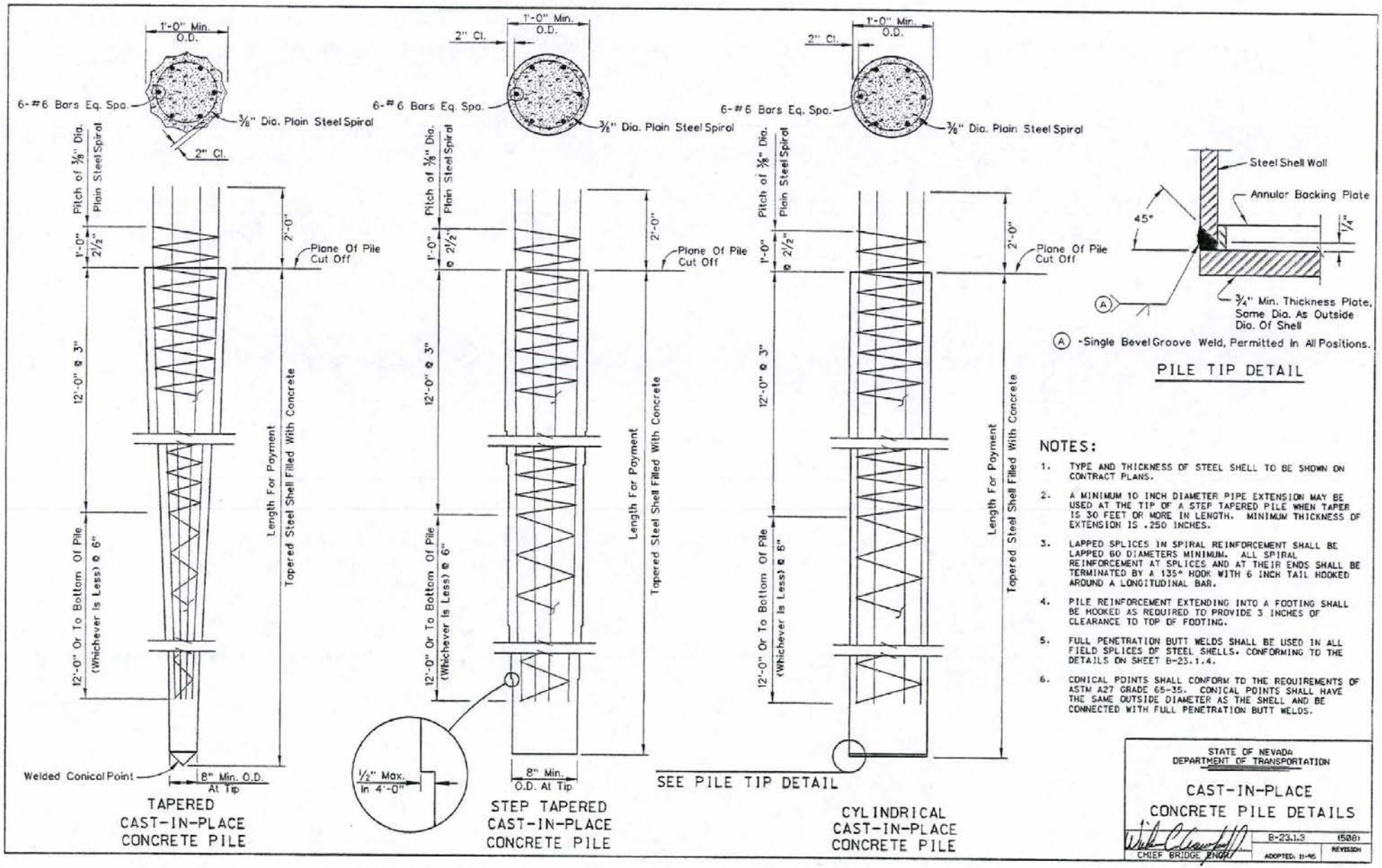
NOTES:

1. SPLICES IN LONGITUDINAL REINFORCEMENT NOT ALLOWED WITHIN UPPER 25 FEET OF PILE. MINIMUM LAP SPLICE FOR #9 BARS IS 5'-5".
2. LONGITUDINAL PILE REINFORCEMENT EXTENDING INTO THE FOOTING SHALL PROVIDE 3 INCHES 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 6 INCH TAIL HOOKED AROUND A LONGITUDINAL BAR.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CAST IN DRILLED HOLE CONCRETE PILE DETAILS

CHIEF BRIDGE ENGR. | 8-22-12 | ADOPTED: 12-98 | (588) | REVISION 7/94



NOTES:

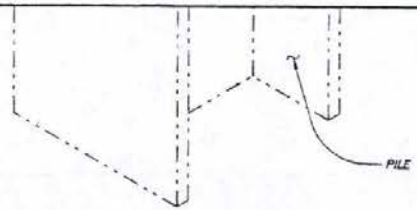
1. TYPE AND THICKNESS OF STEEL SHELL TO BE SHOWN ON CONTRACT PLANS.
2. A MINIMUM 10 INCH DIAMETER PIPE EXTENSION MAY BE USED AT THE TIP OF A STEP TAPERED PILE WHEN TAPER IS 30 FEET OR MORE IN LENGTH. MINIMUM THICKNESS OF EXTENSION IS .250 INCHES.
3. LAPPED SPLICES IN SPIRAL REINFORCEMENT SHALL BE LAPPED 60 DIAMETERS MINIMUM. ALL SPIRAL REINFORCEMENT AT SPLICES AND AT THEIR ENDS SHALL BE TERMINATED BY A 135° HOOK WITH 6 INCH TAIL HOOKED AROUND A LONGITUDINAL BAR.
4. PILE REINFORCEMENT EXTENDING INTO A FOOTING SHALL BE HOOKED AS REQUIRED TO PROVIDE 3 INCHES 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 A27 GRADE 65-35. CONICAL POINTS SHALL HAVE THE SAME OUTSIDE DIAMETER AS THE SHELL AND BE CONNECTED WITH FULL PENETRATION BUTT WELDS.

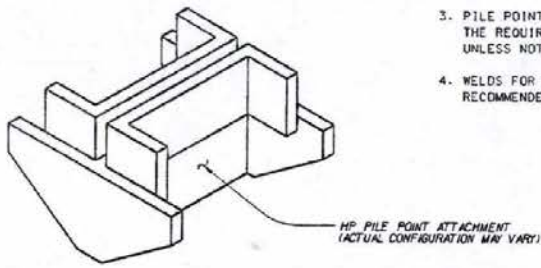
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CAST-IN-PLACE CONCRETE PILE DETAILS

CHIEF BRIDGE ENGR.

B-23.1.3 (508)
ADOPTED: 11-95 REVISION

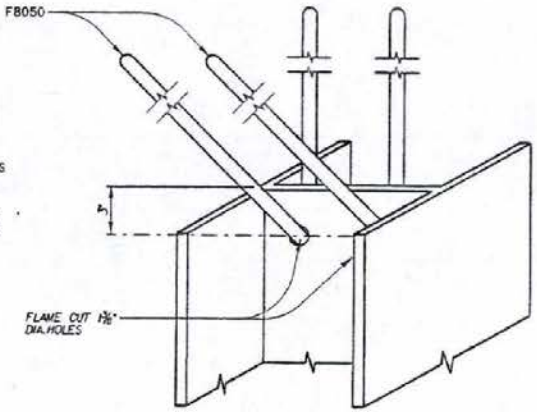




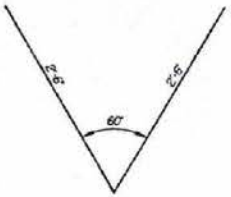
TYPICAL HP PILE POINT DETAIL

HP PILE POINT ATTACHMENT NOTES:

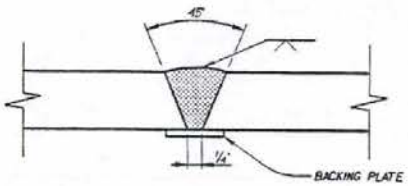
1. HP PILE POINT ATTACHMENTS ARE REQUIRED ONLY WHEN SHOWN ON THE PLANS OR IN THE SPECIAL PROVISIONS.
2. THE PILE POINT CONFIGURATION SHALL BE AS SHOWN ON PLANS.
3. PILE POINT ATTACHMENTS SHALL CONFORM TO THE REQUIRMENTS OF ASTM A27 GRADE 65-35 UNLESS NOTED OTHERWISE.
4. WELDS FOR ATTACHMENTS SHALL BE AS RECOMMENDED BY THE MANUFACTURER.



HP PILE ANCHORAGE DETAIL

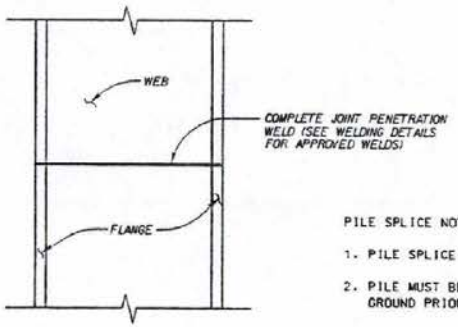


2-F8050



SINGLE VEE-GROOVE BUTT WELD

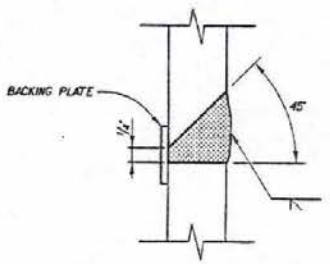
PERMITTED FOR ALL POSITIONS



PILE SPLICE NOTES:

1. PILE SPLICE WELDS SHALL CONFORM TO AWS D1.1.
2. PILE MUST BE STOPPED AT LEAST 3'-0" ABOVE GROUND PRIOR TO SPLICING.

HP PILE SPLICE DETAIL



SINGLE BEVEL-GROOVE BUTT WELD

PERMITTED IN HORIZONTAL POSITION ONLY

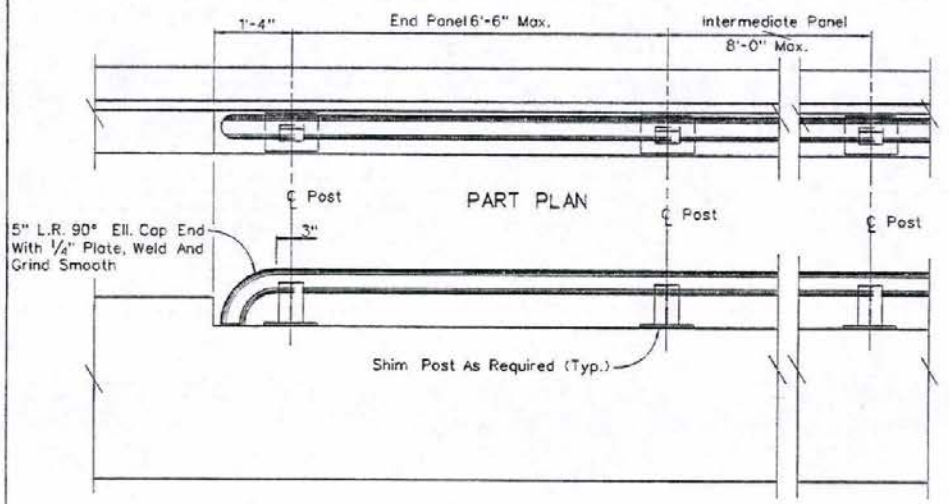
PILE SPLICE WELDING DETAILS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

"HP" PILE DETAILS

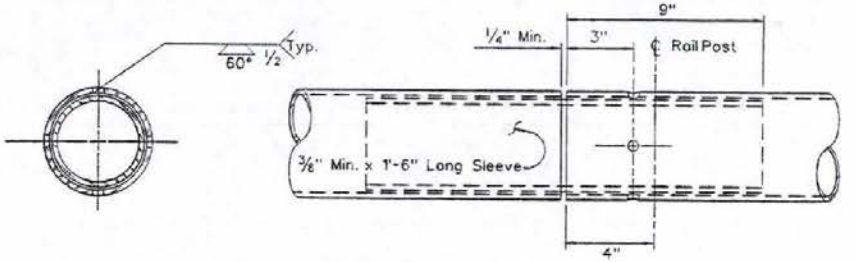
William C. Crawford
CHIEF BRIDGE ENGINEER

B-23.1.4 (508)
ADOPTED-12/93 REVISION

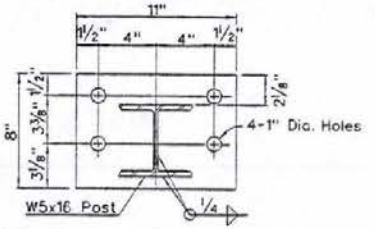


PART PLAN

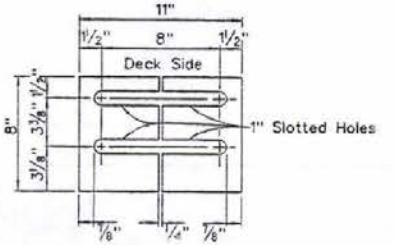
PART ELEVATION



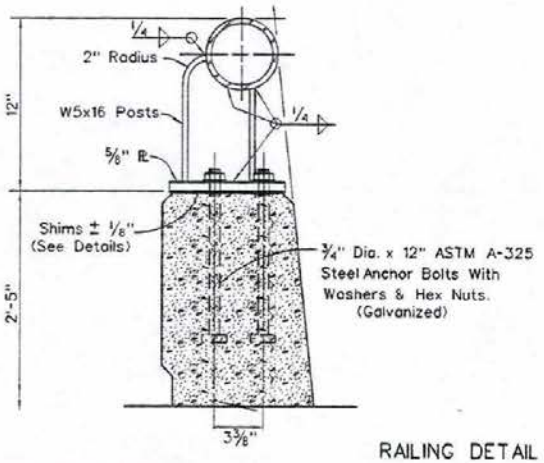
SLIP JOINT DETAIL



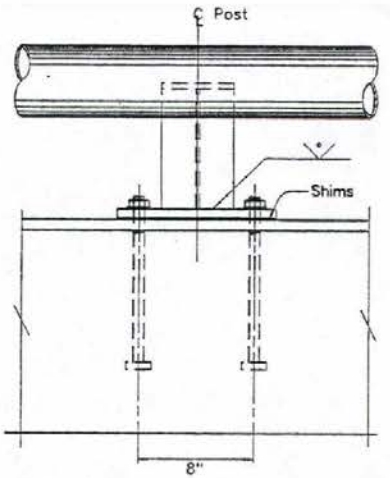
ANCHOR PLATE DETAIL



SHIM DETAIL



RAILING DETAIL



GENERAL NOTES:

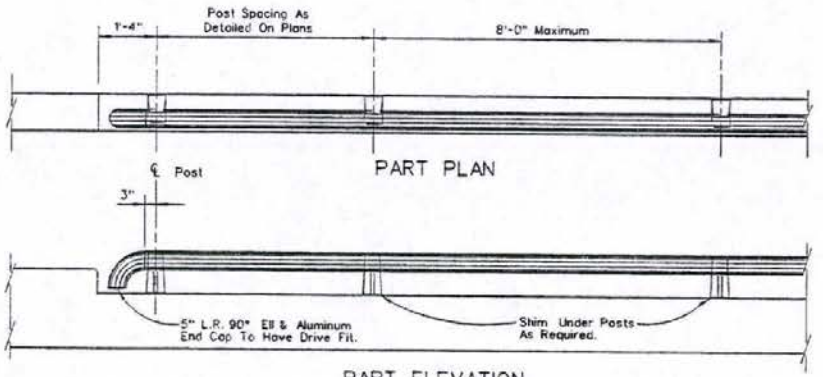
1. RAILING TO CONFORM TO VERTICAL AND HORIZONTAL ALIGNMENT.
2. JOINTS TO BE SPACED 40'-0" CENTER TO CENTER. MAXIMUM.
3. SLIP JOINTS TO BE PLACED IN PANELS TO MATCH EXPANSION JOINTS IN DECK. THE 1/4" FOR MOVEMENT WILL BE CHANGED TO MATCH ALLOWANCE FOR MOVEMENT IN THE DECK AND CURB.
4. DESIGN WEIGHT: 17 LBS. PER FT.
5. RAILING ASSEMBLY SHALL BE GALVANIZED AFTER FABRICATION.
6. ALL EXPOSED SURFACES OF RAILING ASSEMBLY SHALL BE PAINTED WHITE.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

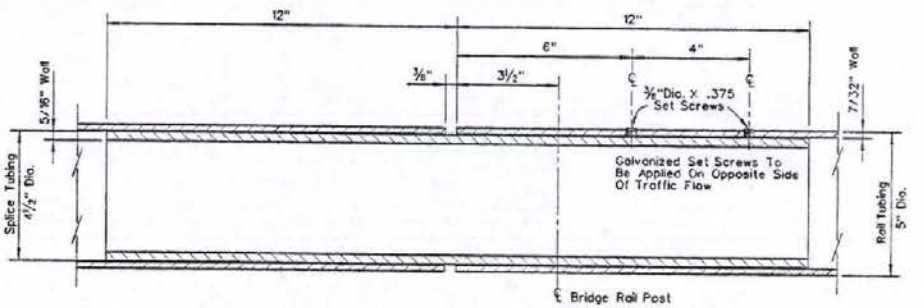
STEEL BRIDGE RAIL TYPE "H"

CHIEF BRIDGE ENGR.

B-25.12 (506)
ADOPTED-11/78 REVISION



PART ELEVATION



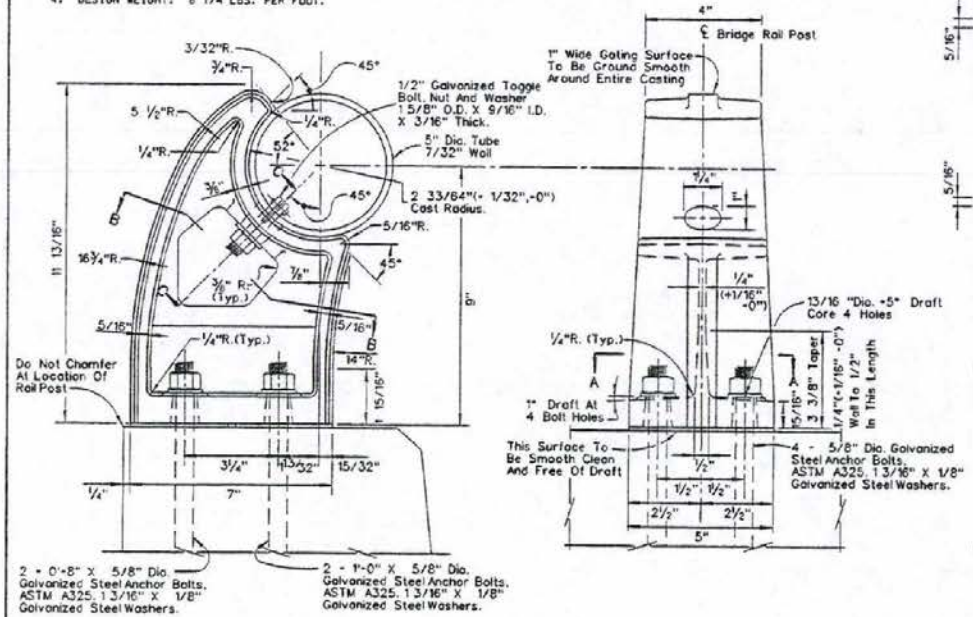
INSIDE SPLICE DETAIL

GENERAL NOTES:

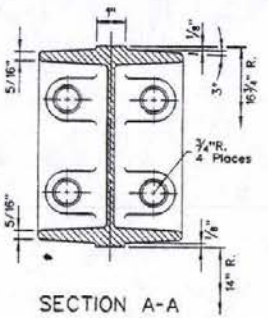
1. RAILING TO CONFORM TO VERTICAL AND HORIZONTAL ALIGNMENT.
2. JOINT TO BE PLACED 25'0" CENTER TO CENTER, MAX.
3. SLIP JOINT TO BE PLACED IN PANELS TO MATCH EXPANSION JOINTS IN DECK. THE 3/8" FOR MOVEMENT WILL BE CHANGED TO MATCH ALLOWANCES FOR MOVEMENT IN THE DECK AND CURB.
4. DESIGN WEIGHT: 6 1/4 LBS. PER FOOT.

NOTE:

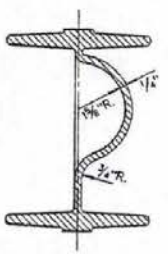
UNLESS OTHERWISE SPECIFIED ALL DRAFT TO BE 3°.
ALL UNMARKED RADII TO BE 1/8" R.



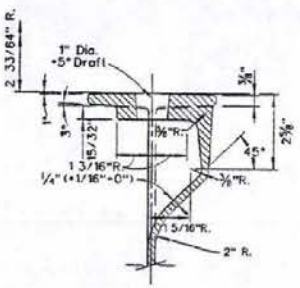
RAILING DETAILS



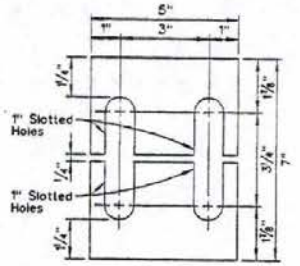
SECTION A-A



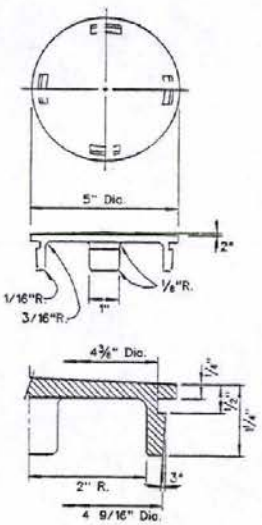
SECTION B-B



SECTION C-C



SHIM DETAIL



RAIL END CAP DETAILS

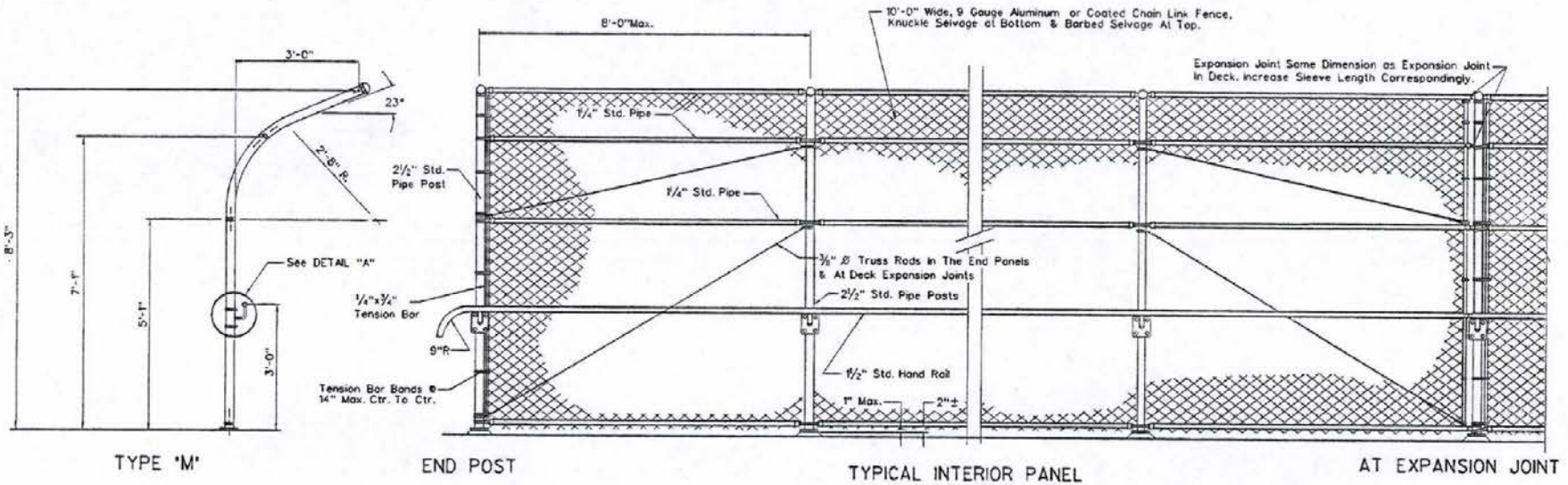
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ALUMINUM BRIDGE RAIL TYPE "H"

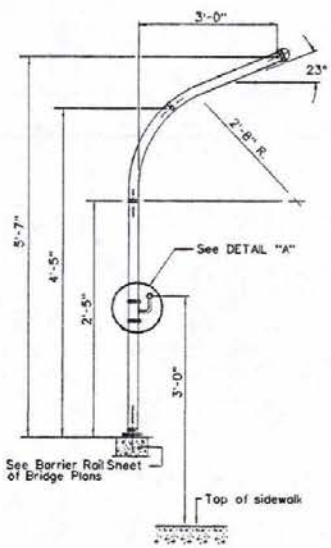
CHIEF ENGINEER

B-25.1.3 (506)
ADOPTED: 11/78 REVISION

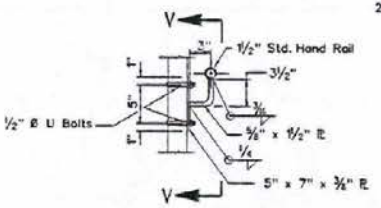
91-8



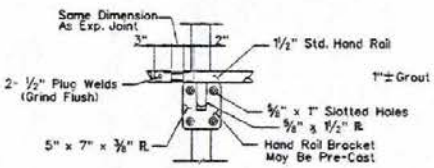
TYPE 'M' | END POST | TYPICAL INTERIOR PANEL | AT EXPANSION JOINT



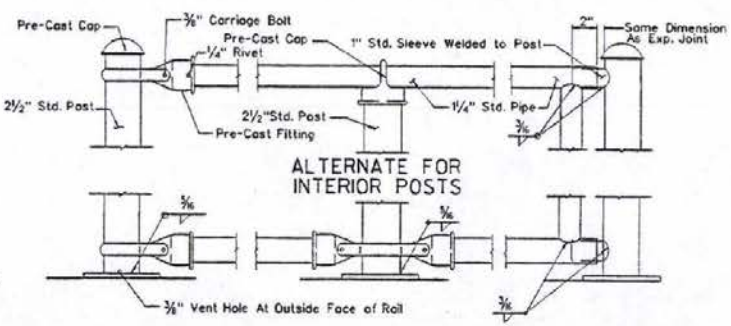
TYPE 'M' (MODIFIED)



DETAIL 'A'

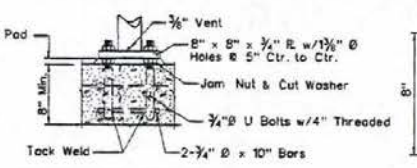


VIEW V-V

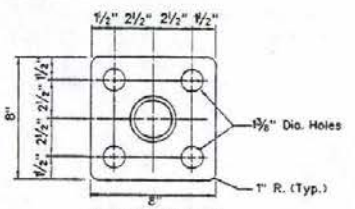


ALTERNATE FOR INTERIOR POSTS

TYPICAL CONNECTION DETAILS



ANCHORAGE DETAILS



BASE PLATE

GENERAL NOTES:

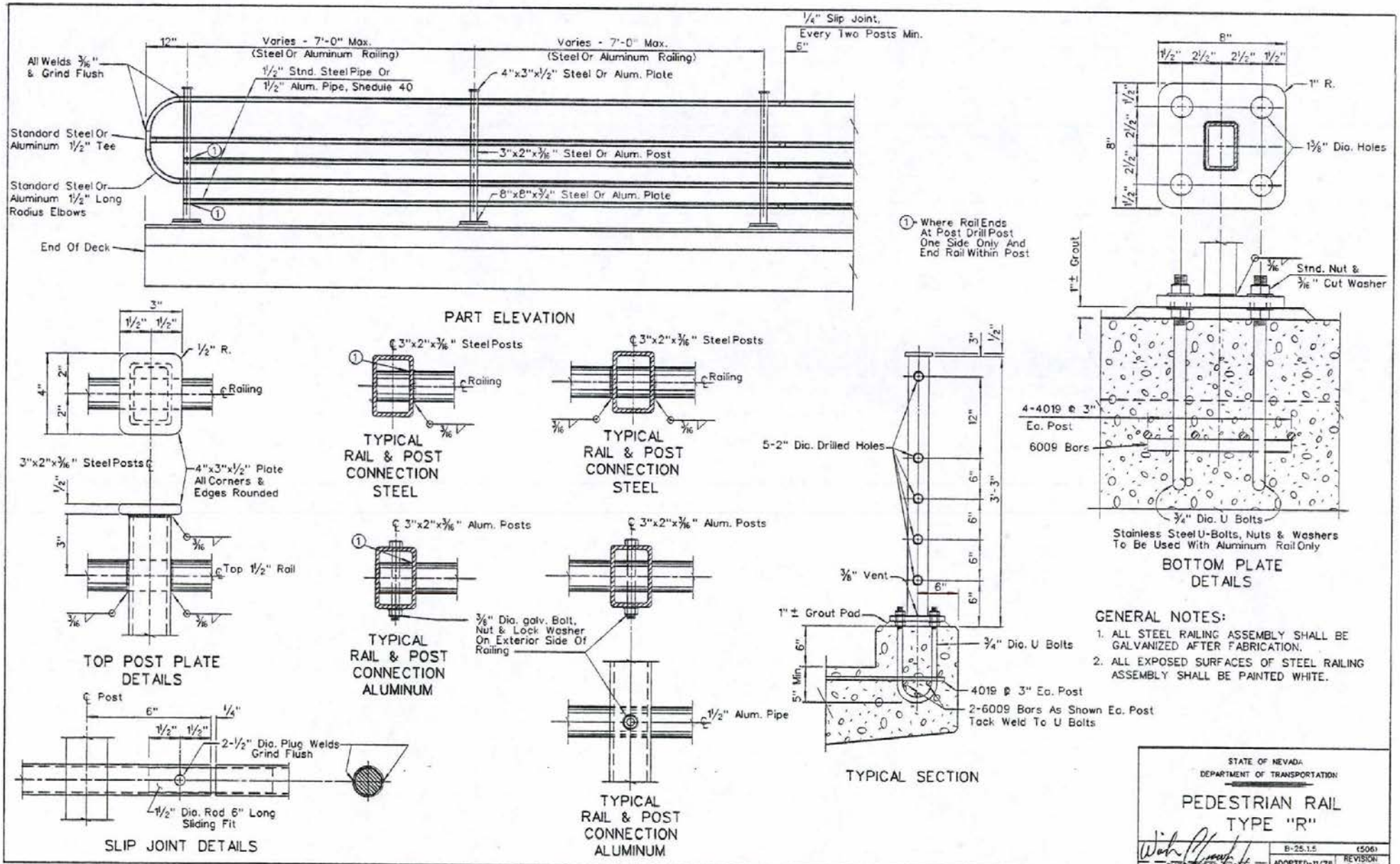
1. RAILING ASSEMBLY EXCEPT CHAIN LINK FABRIC. TO BE GALVANIZED AFTER FABRICATION.
2. RAILING SHALL CONFORM TO HORIZONTAL AND VERTICAL ALIGNMENTS. POSTS SHALL BE VERTICAL. TOP, INTERMEDIATE AND BOTTOM PIPES SHALL BE BENT IF THE RADIUS IS 150' OR LESS: MAY BE ON 8' CHORDS IF RADIUS IS OVER 150'.
3. SPACE POSTS TO CLEAR EXPANSION JOINTS JOINTS BY 6" MIN. TO CENTERLINE POSTS.
4. ALL EXPOSED CORNERS TO BE SMOOTH.
5. PEEN ALL ⅜" BOLTS.
6. WHEN FENCE IS ON SLOPE THE 10'-0" FABRIC SHALL BE PLACED PARALLEL TO THE SLOPE.
7. ALTERNATIVE DETAILS MAY BE SUBMITTED BY THE CONTRACTOR FOR THE ENGINEERS APPROVAL.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PEDESTRIAN RAIL
TYPE "M"

CHIEF BRIDGE ENGR.

B-25.1.4 (506)
ADOPTED: 8-85 REVISION 10-93



GENERAL NOTES:

1. ALL STEEL RAILING ASSEMBLY SHALL BE GALVANIZED AFTER FABRICATION.
2. ALL EXPOSED SURFACES OF STEEL RAILING ASSEMBLY SHALL BE PAINTED WHITE.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

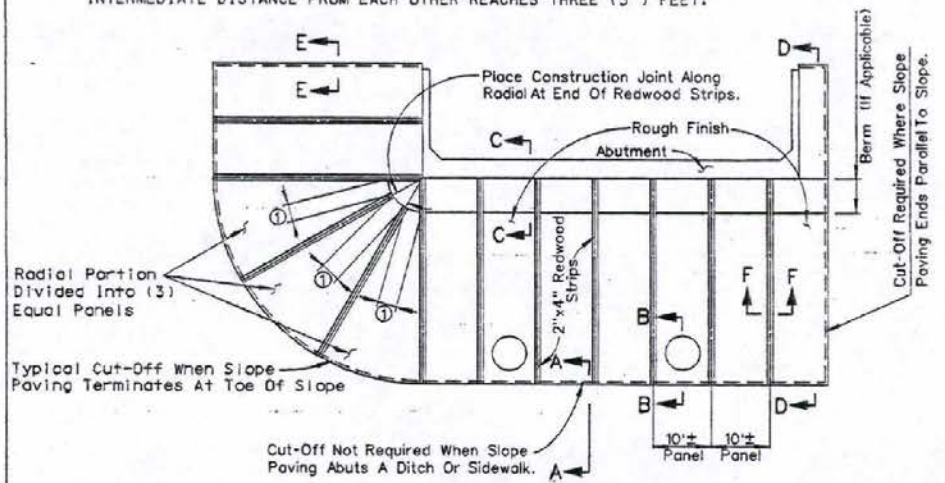
PEDESTRIAN RAIL TYPE "R"

CHIEF BRIDGE ENGR.

B-25.1.5	(506)
ADOPTED-11/78	REVISION 3/27/97

B-18

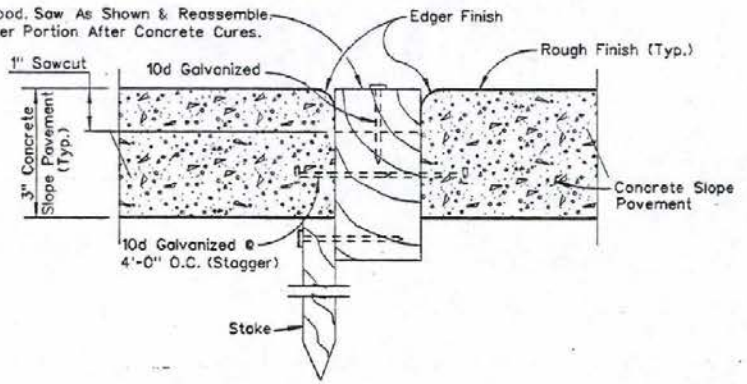
① END REDWOOD STRIPS AT TOP OF RADIAL SECTION WHEN THEIR INTERMEDIATE DISTANCE FROM EACH OTHER REACHES THREE (3') FEET.



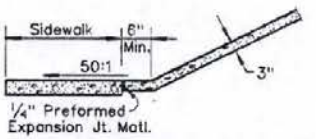
PLAN VIEW

NOTES:

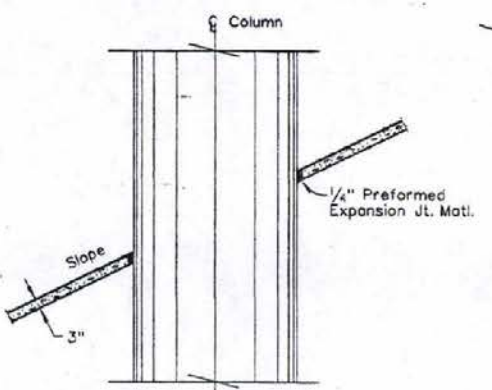
1. SLOPE PAVING IS TO BE DIVIDED INTO EQUALLY SPACED PANELS. THE WIDTH OF EACH PANEL IS TO BE AS NEARLY 10' AS SITE DIMENSIONS WILL PERMIT.
2. THESE DETAILS WILL NOT APPLY IN TOTAL TO ANY ONE SITE, BUT ARE INTENDED TO BE GENERAL ENOUGH TO COVER ALL POSSIBILITIES. TO OBTAIN LIMITS OF SLOPE PAVING FOR A SPECIFIC SITE, CONSULT THE PLAN SHEETS.
3. CONCRETE SHALL BE CLASS A OR AA WITH FIBER REINFORCING.



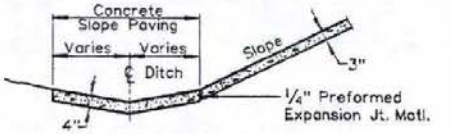
SECTION F-F



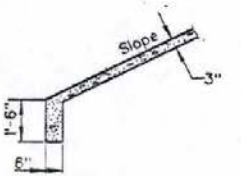
SECTION A-A
(WITH SIDEWALK)



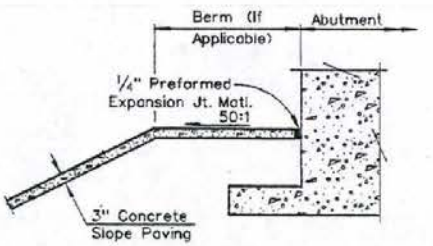
SECTION B-B
(AT PIER)



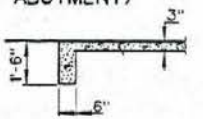
SECTION A-A
(WITH DITCH)



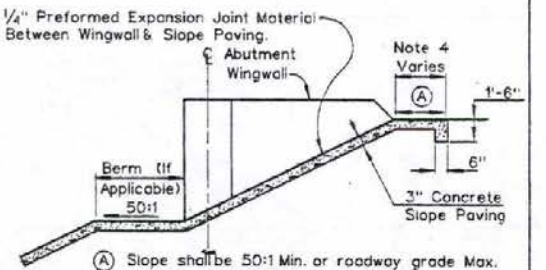
SECTION A-A
(TOE OF SLOPE)



SECTION C-C
(AT ABUTMENT)



SECTION E-E
(EDGE OF SLOPE)



Ⓐ Slope shall be 50:1 Min. or roadway grade Max.

SECTION D-D
(AT WINGWALL)

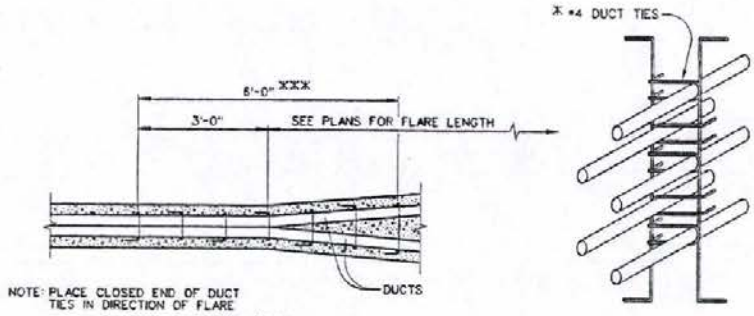
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CONCRETE SLOPE PAVING DETAILS

CHIEF BRIDGE ENGR.

B-26.1.1	(611)
ADOPTED-11/78	REVISION 10/90

B-8



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:

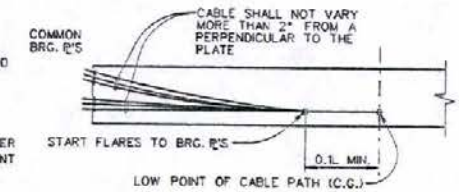
NO MORE THAN 1/2 OF THE PRESTRESSING FORCE IN ANY GIRDER MAY BE STRESSED BEFORE AN EQUAL FORCE IS STRESSED IN THE ADJACENT GIRDERS. AT NO TIME DURING THE STRESSING OPERATIONS WILL MORE THAN 1/6 OF THE TOTAL PRESTRESSING FORCE BE APPLIED ECCENTRICALLY ABOUT THE CENTERLINE OF THE STRUCTURE.

GIRDER STEM SHALL BE FLARED NEAR ANCHORAGE TO PROVIDE A MINIMUM OF 1-1/2" 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.

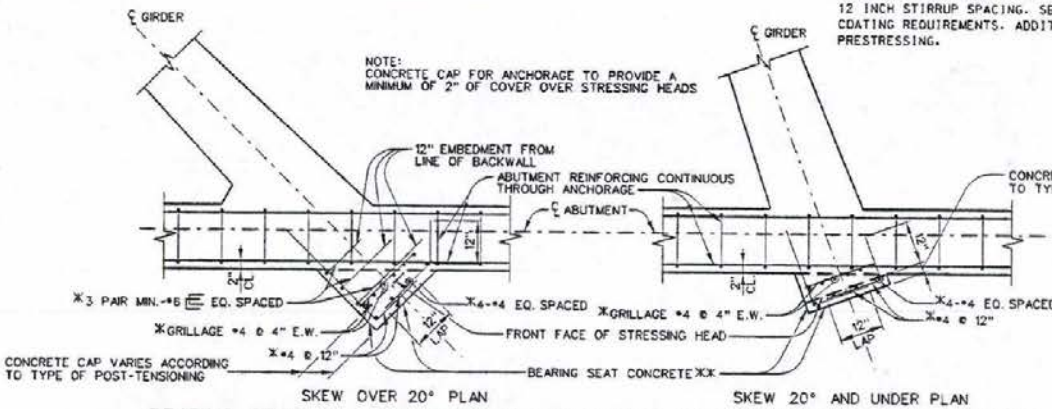
* BARS MARKED THUSLY ARE TO BE INCLUDED IN THE COST OF PRESTRESSING CAST-IN-PLACE CONCRETE.

** CONCRETE USED IN THE BEARING SEATS IS TO BE INCLUDED IN THE COST OF PRESTRESSING CAST-IN-PLACE CONCRETE.

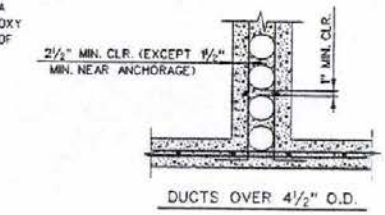
*** ADD ADDITIONAL #4 STIRRUP BARS, IN PAIRS, AS NECESSARY TO MAINTAIN A 12 INCH STIRRUP SPACING. SEE PLANS FOR STIRRUP BENDING DIMENSIONS AND EPOXY COATING REQUIREMENTS. ADDITIONAL #4 STIRRUP BARS TO BE INCLUDED IN COST OF PRESTRESSING.

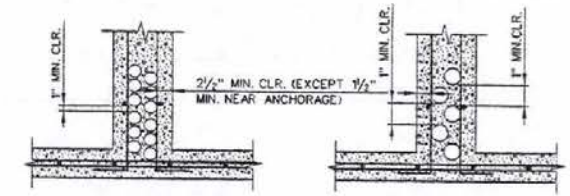


COMMON BEARING PLATE PRESTRESSING PATH



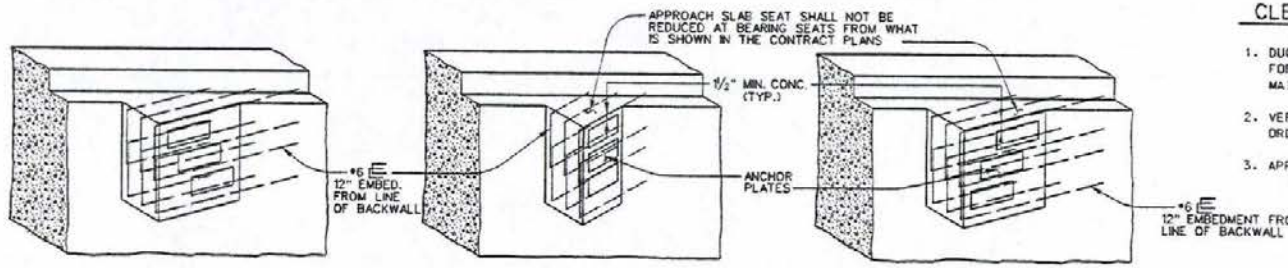
BEARING SEAT FOR PRESTRESSED ANCHORAGE AT DIAPHRAGM TYPE ABUTMENTS





CLEARANCE REQUIREMENTS FOR DUCTS

1. DUCT PATTERNS SHOWN ARE FOR 12" 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.



NOTE: DETAILS MAY BE MODIFIED TO SUIT SPECIFIC ANCHORAGE

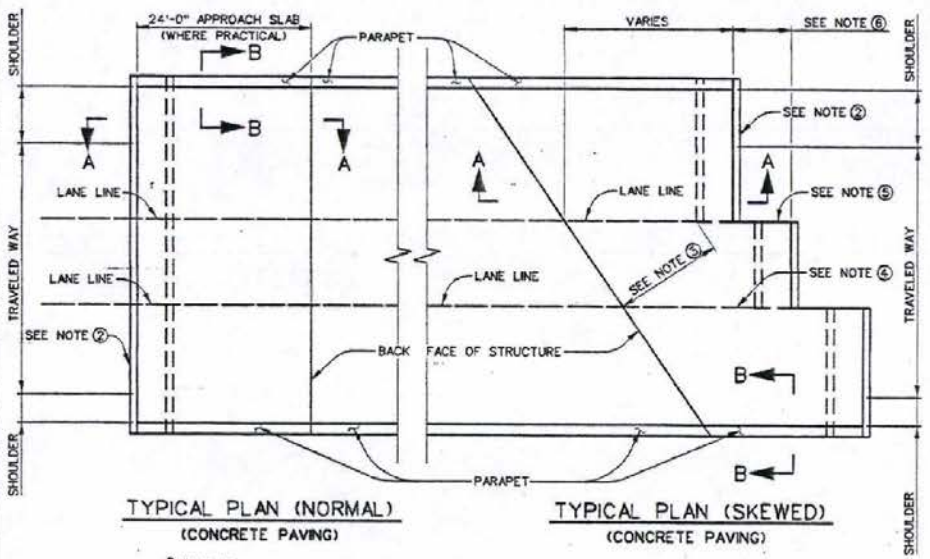
TYPICAL BEARING SEAT ILLUSTRATIONS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CAST-IN-PLACE PRESTRESSED GIRDER DETAILS

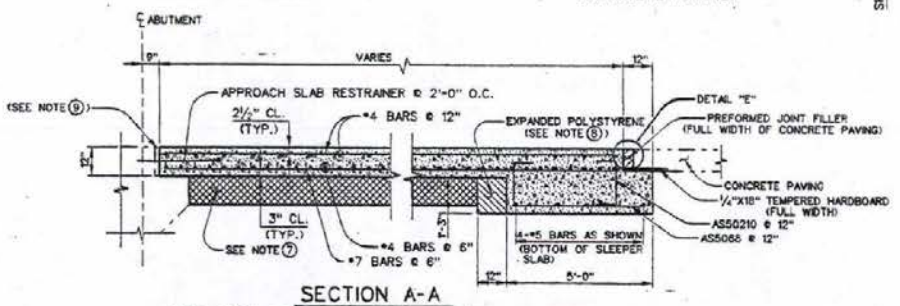
CHIEF BRIDGE ENGINEER

B-28.1.1 (503)
ADOPTED 3/85 REVISION 3/97

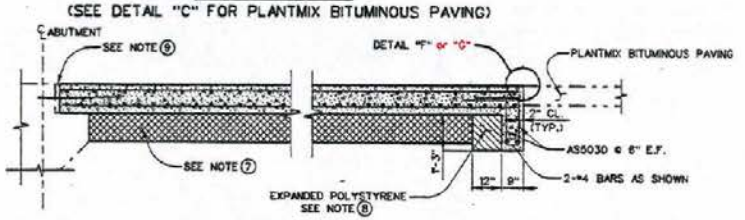


TYPICAL PLAN (NORMAL)
(CONCRETE PAVING)

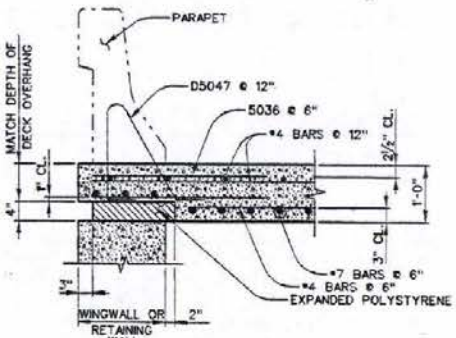
TYPICAL PLAN (SKEWED)
(CONCRETE PAVING)



SECTION A-A
(SEE DETAIL "C" FOR PLANTMIX BITUMINOUS PAVING)

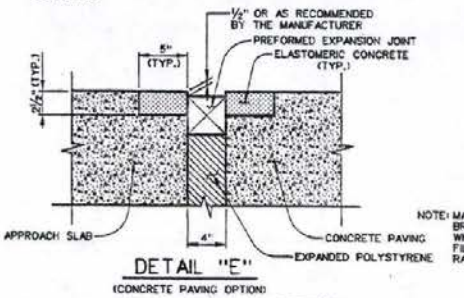


DETAIL "C"
(PLANTMIX BITUMINOUS PAVING)
NOTE: FOR INFORMATION & DIMENSIONS NOT SHOWN SEE SECTION A-A



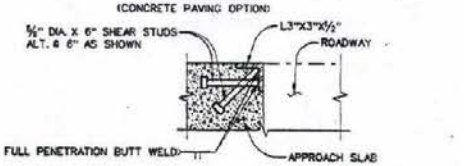
SECTION B-B

A) WHEN THE APPROACH SLAB EXTENDS BEYOND THE WINGWALLS, EXTEND THE EXPANDED POLYSTYRENE 2 INCHES BEYOND THE WINGWALL ENDS. ADJUST THE APPROACH SLAB TO ITS FULL DEPTH, AND ELIMINATE THE 5036 BARS.

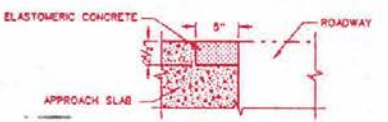


DETAIL "E"
(CONCRETE PAVING OPTION)

NOTE: MAINTAIN 4" GAP BETWEEN BRIDGE RAIL AND BARRIER RAIL WHEN APPLICABLE. INSTALL JOINT FILLER UP INTERIOR FACE OF RAIL A MINIMUM OF 6".



DETAIL "F"
(APPROACH SLAB JOINT PROTECTION-PLANTMIX BITUMINOUS PAVING)

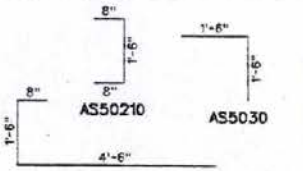


DETAIL "G"
(APPROACH SLAB JOINT PROTECTION-PLANTMIX BITUMINOUS PAVING)

GENERAL NOTES:

1. THE CONCRETE SHALL BE "EA" - F'c=4500 PSI, OR "A" F'c=4000 PSI, 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 15 FEET.
4. LONGITUDINAL CONSTRUCTION JOINTS IN THE APPROACH SLAB MAY BE LOCATED ON LANE LINES WHEN PERMITTED BY THE ENGINEER.
5. PLACE 1/4-INCH EXPANSION JOINT MATERIAL BETWEEN THE CONCRETE PAVEMENT AND THE LONGITUDINAL FACE OF THE APPROACH SLAB. THE EXPANSION JOINT MATERIAL IS TO BE RECESSED 1/2-INCH 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 12'-0" MINIMUM TO 15'-0" MAXIMUM OR INCREMENTAL INTERVALS (24'-0" MIN. TO 30'-0" MAX...) TO MAINTAIN A 12'-0" MINIMUM TO 15'-0" MAXIMUM SPACING OF THE TRANSVERSE WEAKENED PLANE JOINTS IN THE CONCRETE PAVEMENT. SEE SECTION 405.03.09 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.

THIS SHEET IS FOR GENERAL INFORMATION FOR ACTUAL DIMENSIONS AND REINFORCING STEEL LAYOUTS, SEE CONTRACT PLANS.



BENT BARS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

APPROACH SLAB

CHIEF BRIDGE ENGINEER

B-29.1.1 (502)
ADOPTED: 12/90 REVISION: 8/98

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