STANDARD PLANS

FOR

ROAD AND BRIDGE

CONSTRUCTION

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

January 1980

INTRODUCTION

The standards contained in this publication have been formally approved for State highway construction and to be instigated for use on all future roadway construction projects.

The user of this publication is cautioned to consult other contractual documents (special provisions, plans, Standard Specifications, etc.) for additional details which may be pertinent to the application of specific standard plans to any given project.

Additional copies of this standard book and full size sheets may be obtained from the Headquarters Building, State of Nevada, Department of Transportation, 1263 South Stewart Street, Carson City, Nevada, 89712 at the following costs:

Book of Standards----------$3.00
Full Size Standards (22" X 36")--------$0.50

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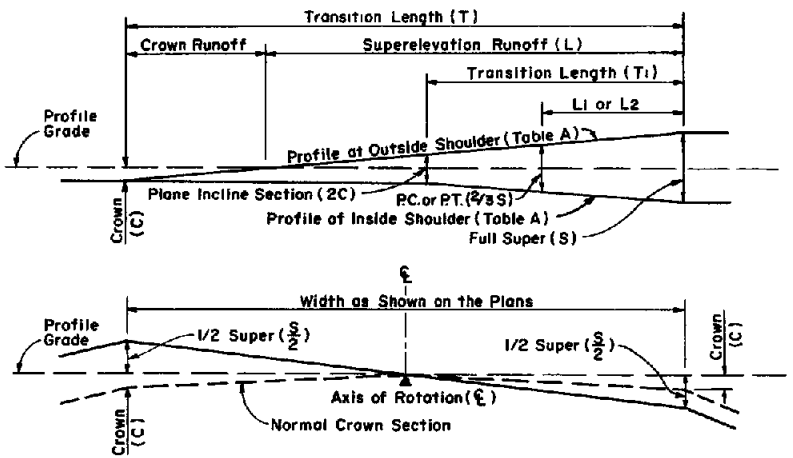
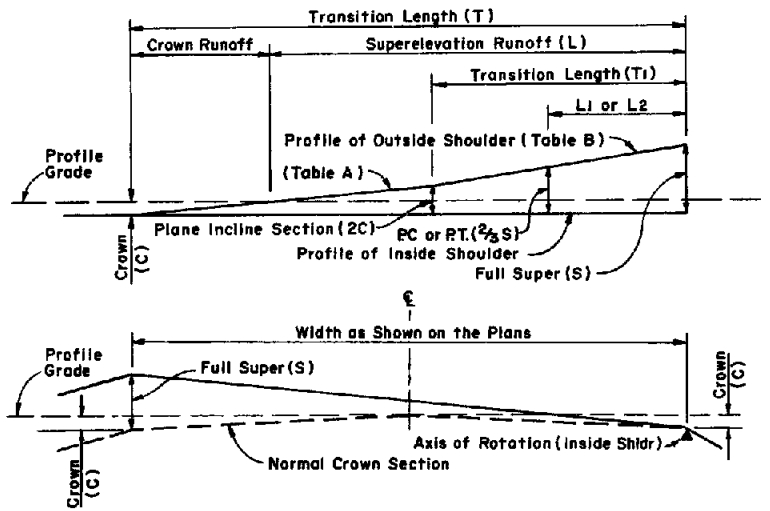


CASE NO. 1 — ROTATION ABOUT CENTER LINE



CASE NO. 2 — ROTATION ABOUT INSIDE SHOULDER

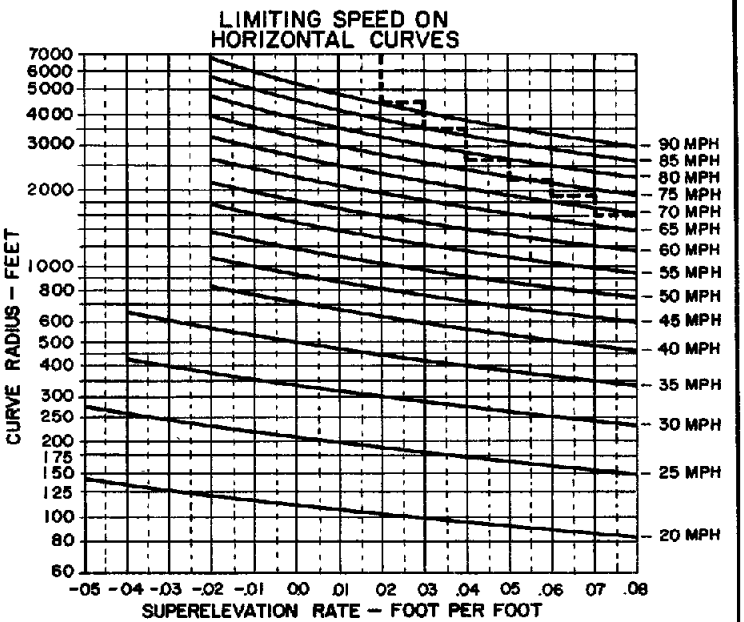
SUPERELEVATION TRANSITION

FORMULAE

Rate of Easement TABLE A Ft. per Ft.	TABLE B Ft per Ft.	Length in Feet
004	.008	$T=250(\frac{S}{2}+C)$
.004	.008	$T=250(\frac{S}{2}-C)$
.004	.008	$L=125\ S$
.004	.008	$L_1=\frac{S}{.024}$
.004	—	$L_2=T-250(\frac{2}{3}S)$

WHERE
S=FULL SUPERELEVATION (FT)
C=CROWN (FT)
T=TOTAL LENGTH OF TRANSITION
T_1=TRANSITION LENGTH-PLANE INCLINE SECTION TO FULL SUPER
L=TOTAL LENGTH OF SUPERELEVATION RUNOFF
L_1=LENGTH FROM P C. TO P T TO FULL SUPERELEVATION WHERE SUPER RATE IS 03 FT PER FT OR GREATER.
L_2=LENGTH FROM P.C. OR P.T TO FULL SUPERELEVATION WHERE SUPER RATE IS LESS THAN .03 FT. PER FT.

SPEED	FRICTION FACTOR
30	0.16
40	0.15
50	0.14
60	0.13
70	0.12
80	0.11
90	0.10 (EXTRAPOLATED)



NOTE BROKEN LINE INDICATES STANDARD SUPERELEVATION RATE. HIGHER VALUE AT STEPS IS THE PROPER SUPERELEVATION FOR INDICATED CURVE RADIUS

DESIGN SPEED (MPH)	MINIMUM RADIUS USING MAXIMUM SUPER. (.08) (FEET)	*MINIMUM RADIUS USING NORMAL CROWN (-2%) (FEET)
30	250	430
40	464	820
50	758	1390
60	1143	2180
70	1633	3270
80	2245	4740

*NORMAL CROWN MAY BE USED ON CITY STREETS WHERE SPEED IS CONTROLLED

1 ALL CURVES SHALL BE SUPERELEVATED AS SHOWN UNLESS OTHERWISE NOTED ON PLANS

2 THE AXIS OF ROTATION SHALL BE THE CENTER LINE OF THE ROADBED ON GRADES OF ONE PERCENT OR GREATER AND SHALL BE THE INSIDE SHOULDER ON GRADES FLATTER THAN ONE PERCENT

3 SUPERELEVATION MAY CAUSE DRAINAGE POCKETS WHERE EASEMENT OCCURS. DRAINAGE SHALL BE CHECKED AND POCKETS ELIMINATED BY CONSTRUCTING ROADWAY DITCHES TO GRADE, CHANGING THE AXIS OF ROTATION, OR, IN EXTREME CASES, BY INSTALLING PIPE CULVERTS

4. SHORT VERTICAL CURVES SHALL BE INSERTED BY EYE ADJUSTMENT OF STAKES AT BEGINNING AND END OF EASEMENT

5 WHEN THE TANGENT BETWEEN CURVES IS TOO SHORT TO PERMIT EASEMENT LENGTHS SHOWN, THE TRANSITION MAY BE EXTENDED ONTO THE CURVE OR THE EASEMENT LENGTH MAY BE DECREASED

$$E+F=\frac{0.067V^2}{R}$$

E=SUPERELEVATION
F=FRICTION FACTOR
V=SPEED IN MILES PER HOUR
R=RADIUS IN FEET

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

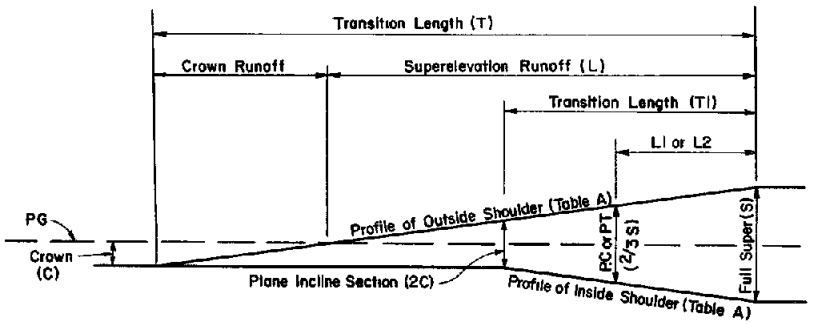
SUPERELEVATION 2-LANE

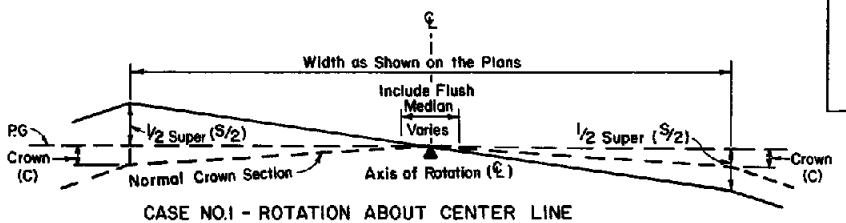
CHIEF ROAD DESIGN ENGR

R-S1.1-(000)

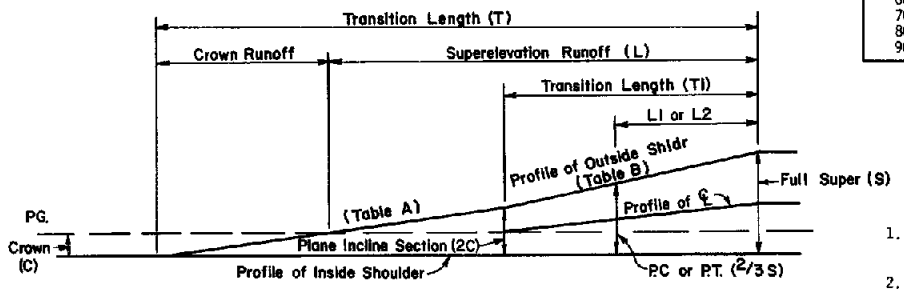
ADOPTED: 1/79 REVISION 1

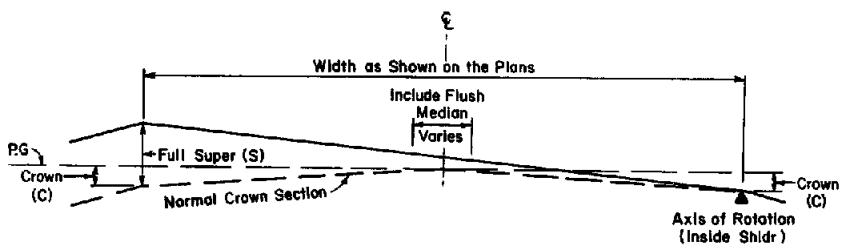
R1





CASE NO.1 - ROTATION ABOUT CENTER LINE





CASE NO.2 - ROTATION ABOUT INSIDE SHOULDER

SUPERELEVATION TRANSITION

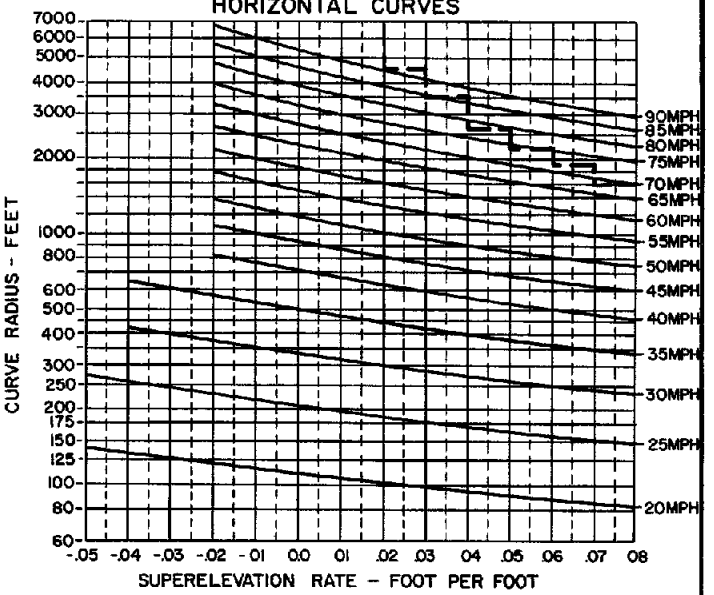
FORMULAE

Rate of Easement TABLE A ft per ft	Rate of Easement TABLE B ft per ft	Length in Feet
.005	01	$T = 200(S/2 + C)$
.005	01	$TI = 200(S/2 - C)$
005	01	$L = 100\ S$
.005	01	$LI = S/03$
.005	—	$L2 = 200(2/3\ S)$

WHERE
S=FULL SUPERELEVATION (FT)
C=CROWN (FT.)
T=TOTAL LENGTH OF TRANSITION
T_1=TRANSITION LENGTH-PLANE INCLINE SECTION TO FULL SUPER.
L=TOTAL LENGTH OF SUPERELEVATION RUNOFF
L_1=LENGTH FROM P C OR P.T. TO FULL SUPERELEVATION WHERE SUPER RATE IS .03 FT PER FT OR GREATER
L_2=LENGTH FROM P C OR P.T. TO FULL SUPERELEVATION WHERE SUPER RATE IS LESS THAN 03 FT PER FT.

SPEED	FRICTION FACTOR
30	0 16
40	0.15
50	0.14
60	0.13
70	0.12
80	0.11
90	0.10(EXTRAPOLATED)

LIMITING SPEED ON HORIZONTAL CURVES



NOTE. BROKEN LINE INDICATES STANDARD SUPERELEVATION RATE. HIGHER VALUE AT STEPS IS THE PROPER SUPERELEVATION FOR INDICATED CURVE RADIUS

DESIGN SPEED (MPH)	MINIMUM RADIUS USING MAXIMUM SUPER (08) (FEET)	*MINIMUM RADIUS USING NORMAL CROWN (-2%) (FEET)
30	250	430
40	464	820
50	758	1390
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70	1633	3270
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$$E+F=\frac{0.067V^2}{R}$$

E=SUPERELEVATION
F=FRICTION FACTOR
V=SPEED IN MILES PER HOUR
R=RADIUS IN FEET

1. ALL CURVES SHALL BE SUPERELEVATED AS SHOWN UNLESS OTHERWISE NOTED ON PLANS.
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4. SHORT VERTICAL CURVES SHALL BE INSERTED BY EYE ADJUSTMENT OF STAKES AT BEGINNING AND END OF EASEMENT
5. WHEN THE TANGENT BETWEEN CURVES IS TOO SHORT TO PERMIT EASEMENT LENGTHS SHOWN, THE TRANSITION MAY BE EXTENDED ONTO THE CURVE OR THE EASEMENT LENGTH MAY BE DECREASED.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SUPERELEVATION
4 LANE, UNDIVIDED

CHIEF ROAD DESIGN ENGR

R-S1.2-(000)
ADOPTED: 1/79
REVISION 2

R2

DESIGN SPEED (MPH)	MINIMUM RADIUS USING MAXIMUM SUPER. (.08) (FEET)	*MINIMUM RADIUS USING NORMAL CROWN (-2%) (FEET)
30	250	430
40	464	820
50	758	1390
60	1143	2180
70	1633	3270
80	2245	4740

*NORMAL CROWN MAY BE USED ON CITY STREETS WHERE SPEED IS CONTROLLED

GENERAL NOTES

1. ALL CURVES SHALL BE SUPERELEVATED AS SHOWN UNLESS OTHERWISE NOTED ON PLANS.
2. SUPERELEVATION MAY CAUSE DRAINAGE POCKETS WHERE EASEMENT OCCURS. DRAINAGE SHALL BE CHECKED AND POCKETS ELIMINATED BY CONSTRUCTING ROADWAY DITCHES TO GRADE, CHANGING THE AXIS OF ROTATION, OR, IN EXTREME CASES, BY INSTALLING PIPE CULVERTS.
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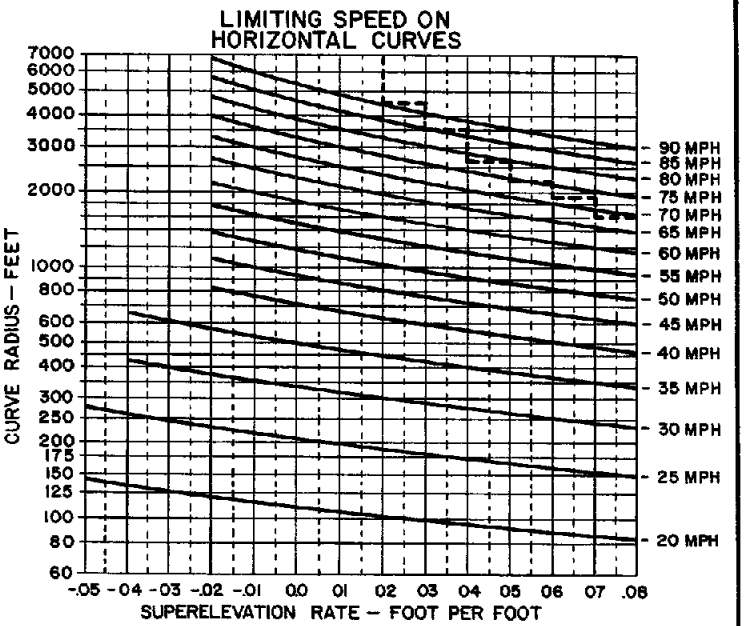
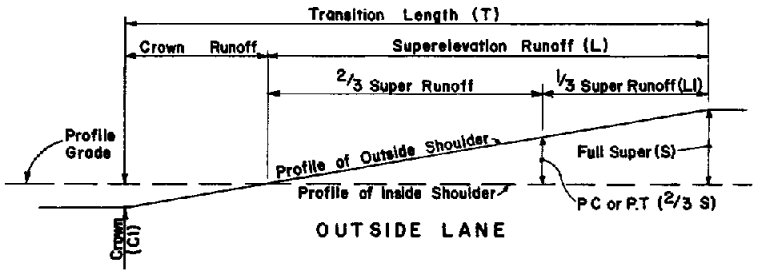


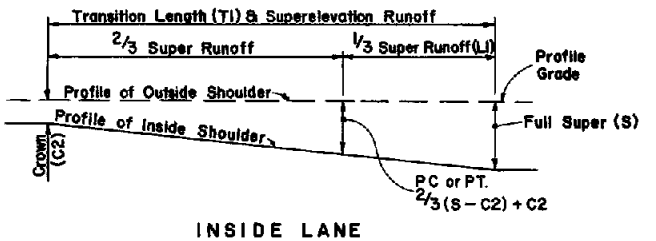
NOTE BROKEN LINE INDICATES STANDARD SUPERELEVATION RATE. HIGHER VALUE AT STEPS IS THE PROPER SUPERELEVATION FOR INDICATED CURVE RADIUS.

FORMULAE

WHERE:
- S - FULL SUPERELEVATION (FT.)
- C_1 & C_2 - CROWN (FT.)
- T - TOTAL LENGTH OF TRANSITION
- T_1 - TOTAL LENGTH OF TRANSITION AND SUPERELEVATION RUNOFF
- L - TOTAL LENGTH OF SUPERELEVATION RUNOFF
- L_1 - LENGTH FROM P.C. OR P.T. TO FULL SUPERELEVATION

OUTSIDE LANE		INSIDE LANE	
Rate of Easement	Length in Feet	Rate of Easement	Length in Feet
005	T=200(S+C1)	.005	T1=200(S-C2)
005	L=200 S	.005	$L1=\frac{S-C2}{.015}$
.005	$L1=\frac{S}{.015}$		





$$E+F=\frac{0.067V^2}{R}$$

E = SUPERELEVATION
F = FRICTION FACTOR
V = SPEED IN MILES PER HOUR
R = RADIUS IN FEET

SPEED	FRICTION FACTOR
30	0.16
40	0.15
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60	0.13
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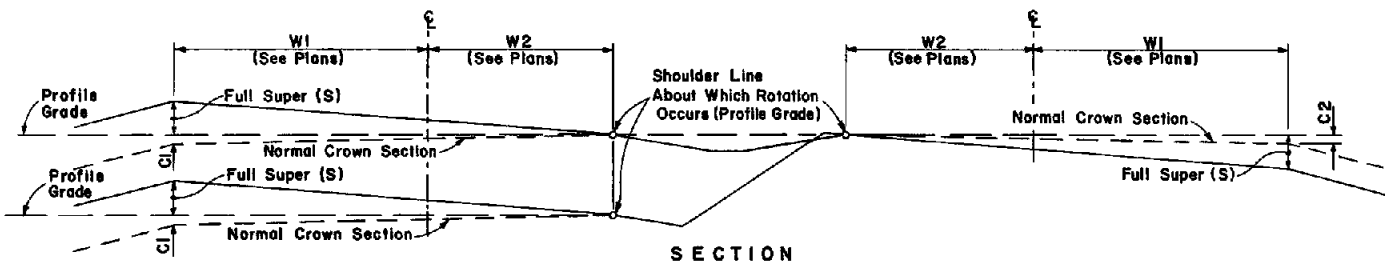


SUPERELEVATION TRANSITION

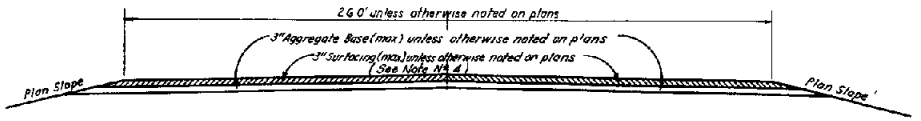
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SUPERELEVATION
4-LANE, DIVIDED

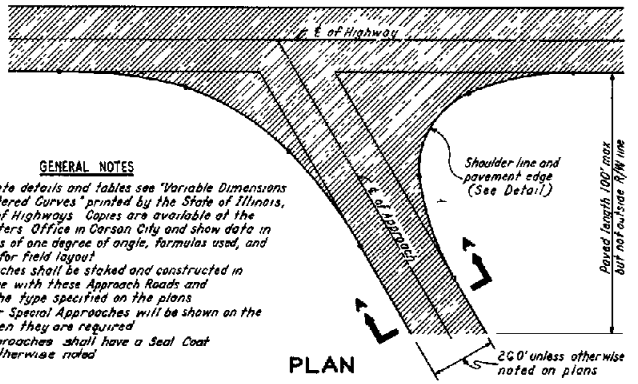
CHIEF ROAD DESIGN ENGR

R-S1.3-(000)
ADOPTED: 1/79
REVISION 1

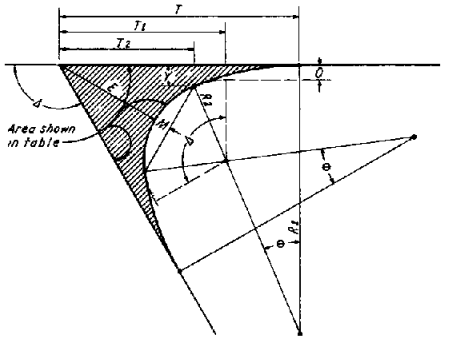
R3



SECTION A-A



PLAN



DETAIL OF PAVEMENT EDGE

GENERAL NOTES

1- For complete details and tables see "Variable Dimensions of 3-Centered Curves" printed by the State of Illinois, Division of Highways. Copies are available at the Headquarters Office in Carson City and show data in increments of one degree of angle, formulas used, and a method for field layout.
2- All approaches shall be staked and constructed in accordance with these Approach Roads and shall be the type specified on the plans.
3- Details for Special Approaches will be shown on the plans when they are required.
4- Paved Approaches shall have a Seal Coat unless otherwise noted.

TYPE 1 APPROACH

DIMENSIONS FOR 3-CENTERED CURVES

TYPE 1-P APPROACH (PASSENGER)

Δ DEGREE	Δ DEGREE	R1	R2	Q	Y	T2	T1	T	E	M	AREA A SQ FT	AREA A SQ YD
					LENGTH IN FEET							
60	19°15'56"	100	25	2.0	5.67	9.46	5.59	32.79	5.18	.06	0.8.5	12.1
70	19°15'56"	100	25	2.0	5.67	9.46	5.59	38.26	7.25	.08	423.1	15.0
80	19°15'56"	100	25	2.0	5.67	9.46	5.59	43.72	9.25	.10	483.6	17.2
90	19°21'12"	100	25	2.0	5.67	14.82	22.46	53.45	10.25	.12	1305.5	47.2
90	19°21'12"	100	20	2.5	3.13	17.54	22.50	49.54	11.82	.12	2165.6	80.1
100	19°21'18"	100	20	2.5	3.13	21.85	26.8	55.86	13.80	.14	2788.8	81.0
110	19°21'18"	100	20	2.5	3.13	26.17	31.13	61.88	15.83	.16	3583.5	103.4
120	19°21'24"	100	20	2.0	2.50	35.66	38.17	73.83	21.00	.20	4317.0	134.5

TYPE 1-SU APPROACH (SINGLE UNIT)

Δ DEGREE	Δ DEGREE	R1	R2	Q	Y	T2	T1	T	E	M	AREA A SQ FT	AREA A SQ YD
					LENGTH IN FEET							
60	19°15'56"	120	45	2.0	3.20	15.25	21.14	44.34	8.27	.91	2240	24.9
70	19°15'56"	120	45	2.0	3.20	22.39	28.91	50.11	12.38	1.20	3187	35.4
80	19°15'56"	120	45	2.0	3.20	29.12	35.64	56.64	16.55	1.87	4488	49.9
90	19°20'54"	120	40	2.0	3.00	33.11	42.00	63.16	19.40	2.16	5130	57.7
100	19°21'24"	100	35	3.0	4.62	34.78	46.23	64.81	24.12	2.43	5651	62.8
110	19°21'30"	100	35	3.0	4.62	43.76	54.27	78.28	31.26	3.24	9035	100.4
120	21°41'24"	100	30	5.0	7.14	49.49	60.82	86.60	40.00	4.43	12254	136.2

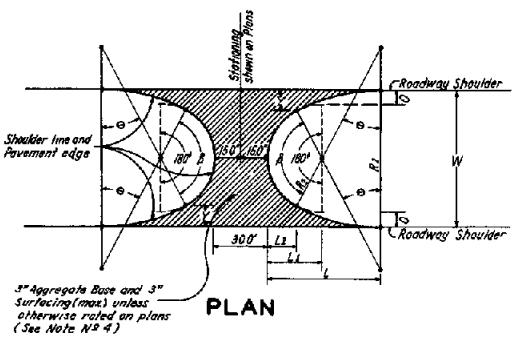
TYPE 1-C43 APPROACH (SEMITRAILER COMBINATION INTERMEDIATE)

Δ DEGREE	Δ DEGREE	R1	R2	Q	Y	T2	T1	T	E	M	AREA A SQ FT	AREA A SQ YD
					LENGTH IN FEET							
60	19°41'30"	120	45	4.0	6.40	13.79	28.29	52.45	11.58	0.85	3500	38.9
70	19°41'30"	120	45	4.0	6.40	13.81	34.3	58.48	14.80	1.13	4548	50.1
80	19°41'30"	120	45	4.0	6.40	24.62	41.12	65.28	18.87	1.45	6252	69.5
90	20°21'36"	120	40	5.0	7.60	31.09	45.90	72.84	23.64	1.85	7154	79.5
100	23°53'20"	100	35	5.0	7.68	34.21	47.07	72.47	27.83	2.82	8735	97.1
110	23°53'20"	100	35	5.0	7.68	43.19	57.13	87.13	34.78	3.64	11448	127.2
120	23°53'24"	100	30	8.5	7.88	49.85	61.89	85.63	41.00	5.04	12951	143.9

TYPE 1-C50 APPROACH (SEMITRAILER COMBINATION LARGE)

Δ DEGREE	Δ DEGREE	R1	R2	Q	Y	T2	T1	T	E	M	AREA A SQ FT	AREA A SQ YD
					LENGTH IN FEET							
60	19°55'40"	200	75	3.5	5.00	27.70	45.55	74.70	5.68	3.05	6381	71.0
70	11°06'40"	150	50	6.5	8.25	22.21	38.86	71.57	7.75	1.92	6756	75.3
80	11°06'40"	150	50	6.5	8.25	30.22	46.87	79.58	10.43	2.55	8174	91.1
90	11°11'10"	150	50	5.0	7.50	38.18	55.00	85.63	13.12	3.37	11144	123.5
100	11°41'10"	150	40	6.5	8.36	41.87	58.42	92.67	17.38	5.43	12480.0	138.4
110	11°41'10"	150	40	6.5	8.36	52.36	68.41	103.66	21.07	7.32	15811.5	175.5
120	23°54'40"	120	35	7.0	9.38	58.84	72.75	104.55	43.00	6.30	18600.0	206.7

* Total approach area equals area shown in table for Δ plus area shown for 180° minus Δ plus pavement area for rectangular portion of approach



3" Aggregate Base and 3" Surfacing (max) unless otherwise noted on plans (See Note No 4)

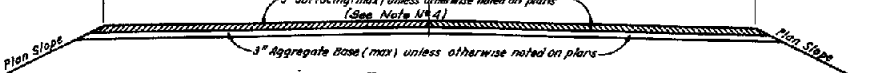
PLAN

DIMENSIONS FOR 3 CENTERED CURVES FOR MEDIAN U-TURN

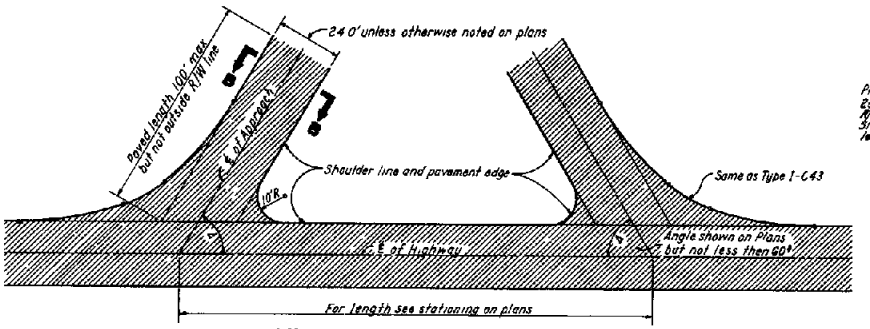
W	Δ	Δ	R1	R2	Q	Y	T2	L1	L	AREA**	AREA**
UNIT	DEGREE	DEGREE			LENGTH IN FEET					SQ FT	SQ YD
58.0	180°00'00"	90°00'00"	75'	20'	5.01'	6.68"	10.83'	30.00'	44.88'	4501.2	166.7
76.0	180°00'00"	90°00'00"	100'	20'	5.01'	11.49'	15.01'	30.00'	52.80'	6171.1	228.6
100.0	180°00'00"	90°00'00"	100'	40'	10.01'	10.67'	17.85'	40.00'	78.17'	6085.3	675.8

** Area shown is total area for Median U Turn

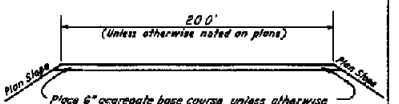
MEDIAN U-TURN



SECTION B-B

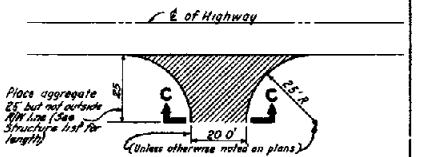


SERVICE TYPE APPROACH



SECTION C-C

Type 2& 3 - Place aggregate base course only
Type 3 - Grade approach area only



TYPE 2 & 3 APPROACHES

STATE OF NEVADA
DEPARTMENT OF HIGHWAYS

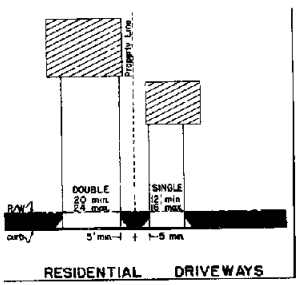
TYPES 1, 2 AND 3 APPROACH ROADS

CHIEF ROAD DESIGN ENGR.

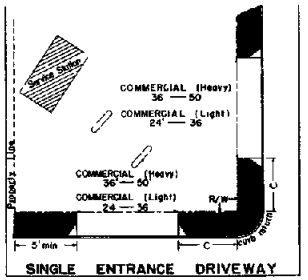
R-521-(000)

ADOPTED 8/69 REVISION

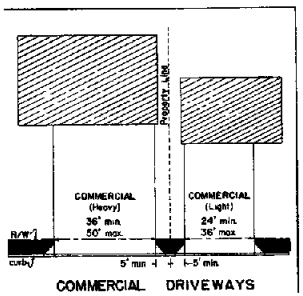
R 4



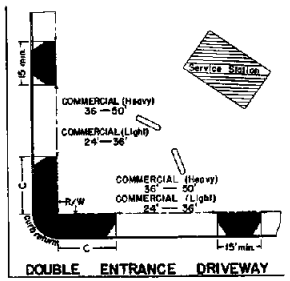
RESIDENTIAL DRIVEWAYS



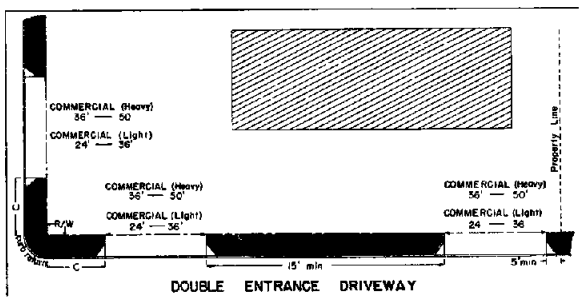
SINGLE ENTRANCE DRIVEWAY



COMMERCIAL DRIVEWAYS



DOUBLE ENTRANCE DRIVEWAY



DOUBLE ENTRANCE DRIVEWAY

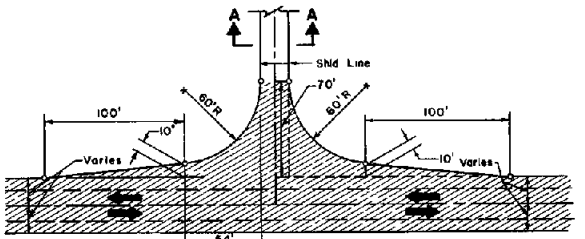
CORNER CLEARANCE (C)

CURB RADIUS	CLEARANCE (C)
Under 25	10'
25' to 60	5'
Over 60	0'

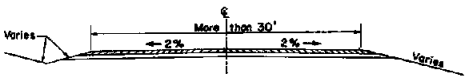
1 REFER TO STANDARD SHEET R-S 1 1 FOR DESIGN AND TYPES OF CURB AND GUTTER AND DRIVEWAYS

☐ Sidewalk Limits

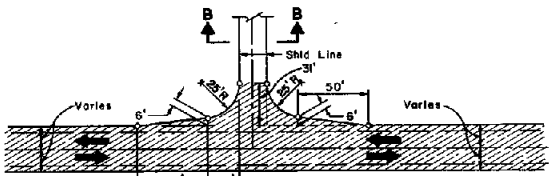
URBAN DRIVEWAYS



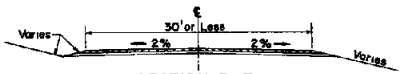
TYPE 4 TYPICAL PLAN



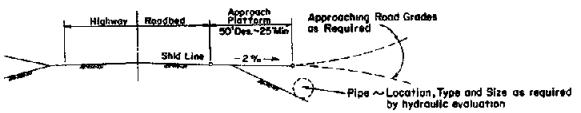
SECTION A-A



TYPE 5 TYPICAL PLAN



SECTION B-B



TYPE 4 & 5 TYPICAL PROFILE
RIGHT ANGLE ROAD CONNECTION

TYPE 4 AND 5 APPROACHES

1 REFER TO STANDARD SHEET R-S 2 1 FOR TYPE 1, 2 AND 3 APPROACH DESIGN

2 MINIMUM DEPTH OF BASE AND SURFACE SHALL BE 4 INCHES AND 3 INCHES RESPECTIVELY THICKER LIFTS SHALL BE SHOWN IN THE PLANS

3 APPROACHES TO BE PAVED TO THE THROAT OR RIGHT OF WAY, WHICHEVER OCCURS FIRST UNLESS OTHERWISE NOTED ON THE PLANS

4 APPROACHES MAY REQUIRE THE STANDARD STOP SIGNS AND STOP BARS AS DIRECTED BY ENGINEER

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

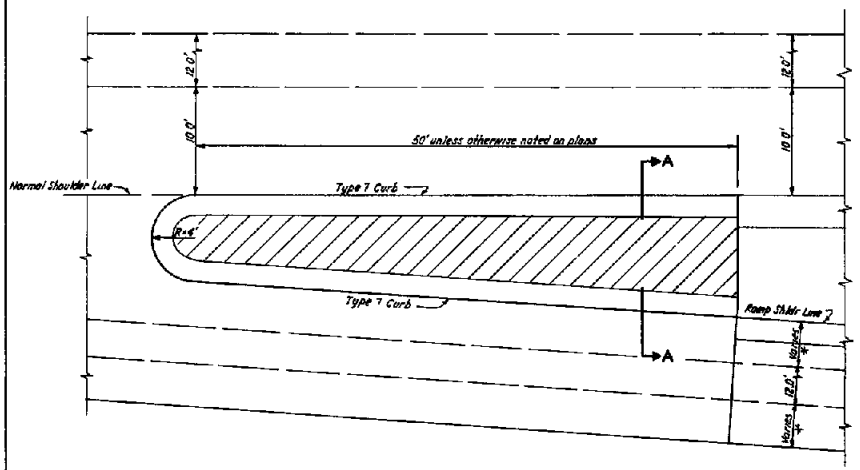
TYPE 4 AND TYPE 5 APPROACH ROAD - URBAN DRIVEWAY LOCATION DETAILS

CHIEF ROAD DESIGN ENGR

R-S 2 2 (000)

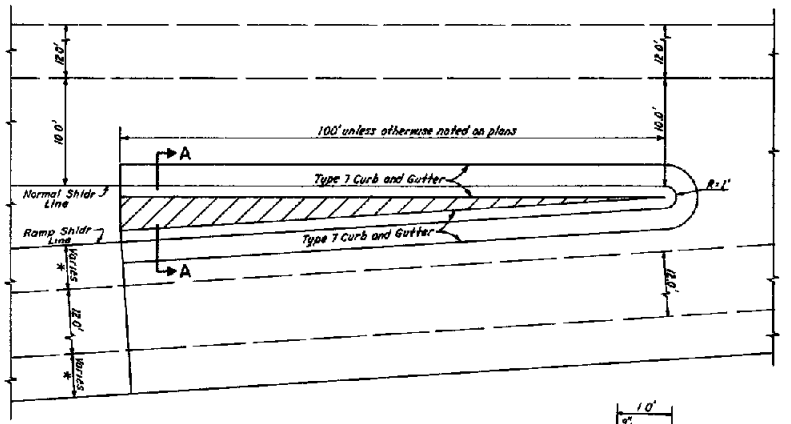
ADOPTED 6/75 REVISION 1 9/78

R5

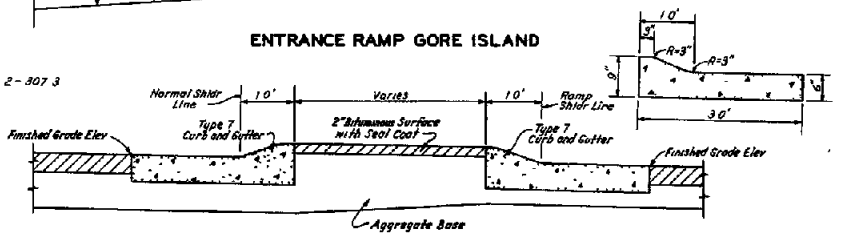


EXIT RAMP GORE ISLAND

* See Design Manual 2-307.3



ENTRANCE RAMP GORE ISLAND



SECTION A-A

FOR INFORMATION ONLY	
TYPE	AMOUNT OF CONCRETE
7 C & G	0.0613 CU YD PER FT

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

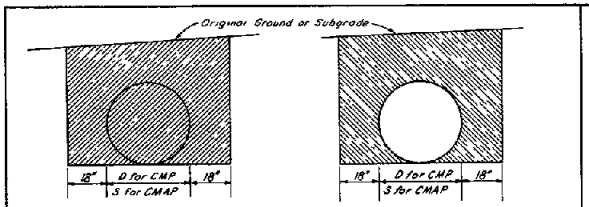
EXIT AND ENTRANCE GORE ISLANDS

CHIEF ROAD DESIGN ENGR.

R-S3.1-(000)

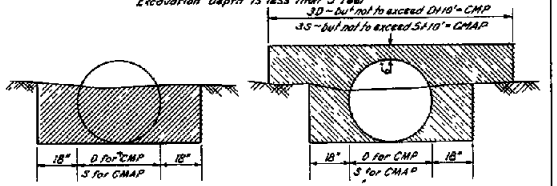
ADOPTED: 8/73

REVISION 1-1/79



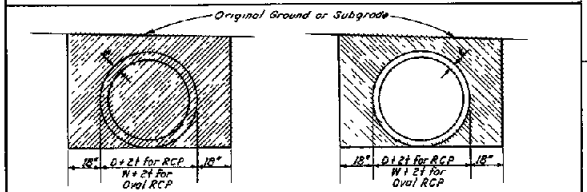
CULVERT IN EXCAVATION

Excavation Depth is less than 5 feet



CULVERT IN EMBANKMENT

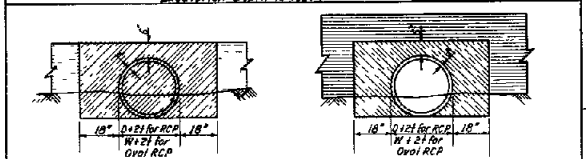
CMP OR CMAP CULVERTS



CONCRETE PIPE CULVERT IN EXCAVATION

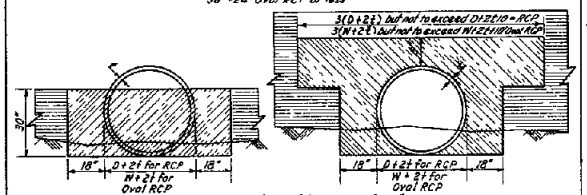
All RCP and Oval RCP sizes

Excavation Depth is less than 5 feet



24" RCP or less

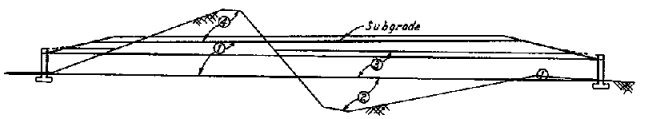
38" x 24" Oval RCP or less



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

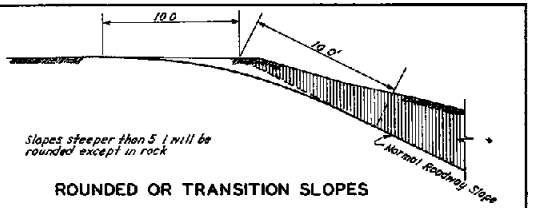
CULVERT INSTALLATION IN ROUGH TERRAIN

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 12" below the bottom of the pipe grade and the trench backfilled with suitable material. In no place shall the pipe be laid directly on unsuitable material

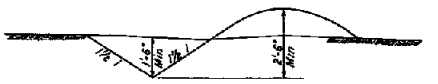
⑦ No additional excavation is necessary under headwalls when rock or other hard material is encountered

⑧ When a firm foundation is not encountered, any 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

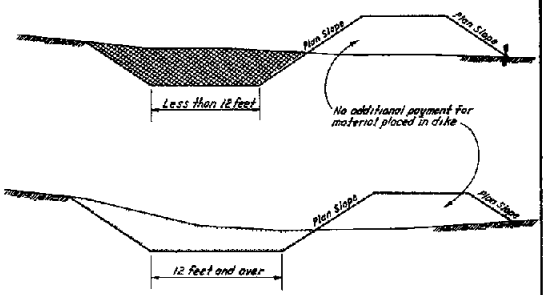


ROUNDED OR TRANSITION SLOPES



Dike material placed on the downhill side is included in the price for ditching

V-TYPE DITCH AND DIKE



FLAT BOTTOM DITCH EXCAVATION

GENERAL NOTES

1 Excavation for multiple pipe or RCB, installations exceeding 12 feet in width will be paid as Channel or Roadway Excavation

LEGEND

- Structure Excavation
- Backfill
- Roadway Excavation
- Channel Excavation
- Drainage Excavation
- Roadway Embankment

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STRUCTURE EXCAVATION AND BACKFILL

(METHOD OF MEASUREMENT)

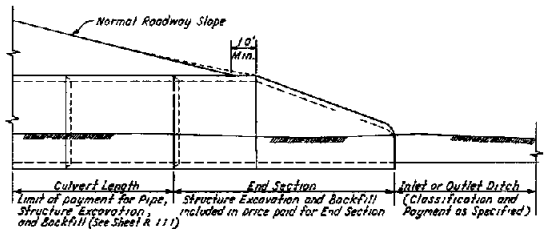
Robert F. Hayes
CHIEF ROAD DESIGN ENGR

R-111-(206,207)

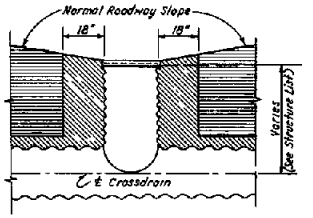
ADOPTED 8/69

REVISION 3 1/79

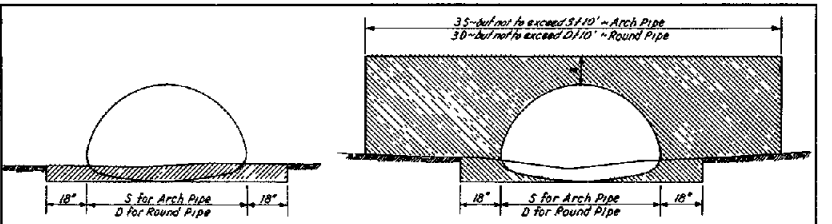
R7



PRECAST CONCRETE END SECTIONS

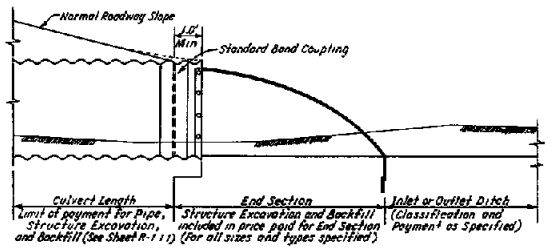


MEDIAN RISER

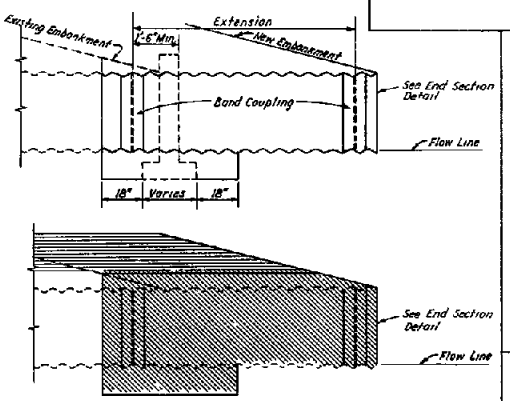


A = Minimum Height of Cover = $\frac{\text{Span}}{8}$ (but not less than 1 foot)

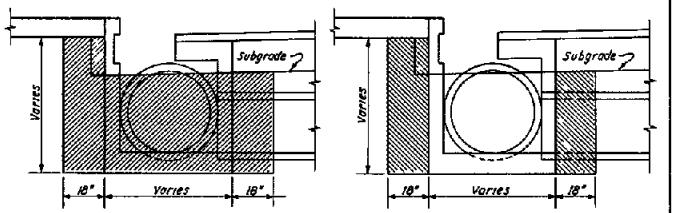
STRUCTURAL PLATE PIPE



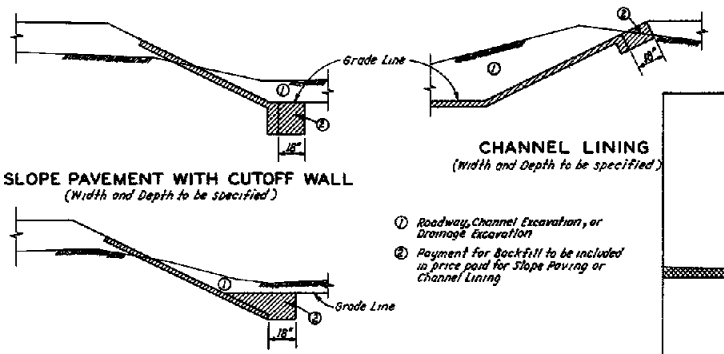
PREFABRICATED METAL END SECTION
(Type 3 Connection used for illustration)



CULVERT EXTENSION



DROP INLETS IN EXCAVATION
(Type 3 Drop Inlet Illustrated)



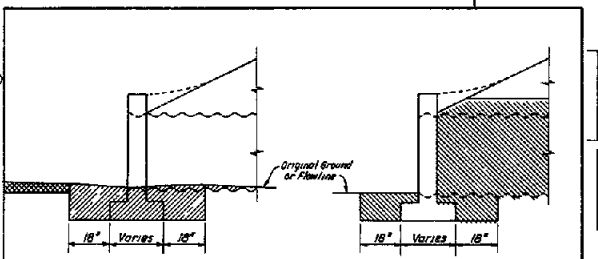
SLOPE PAVEMENT WITH CUTOFF WALL
(Width and Depth to be specified)

CONCRETE APRON
(Width and Depth to be specified)

① Roadway, Channel Excavation, or Drainage Excavation

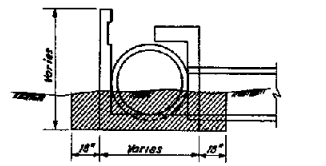
② Payment for Backfill to be included in price paid for Slope Paving or Channel Lining

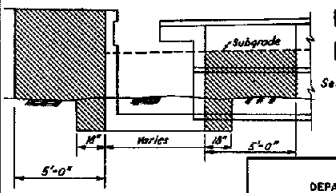
CHANNEL LINING AND SLOPE PAVEMENT



IN EXCAVATION IN EMBANKMENT

CULVERT HEADWALLS





DROP INLETS IN EMBANKMENT
(Type 3 Drop Inlet Illustrated)

LEGEND

- Structure Excavation
- Backfill
- Roadway Excavation
- Channel Excavation
- Drainage Excavation
- Roadway Embankment

See R-111 for General Notes

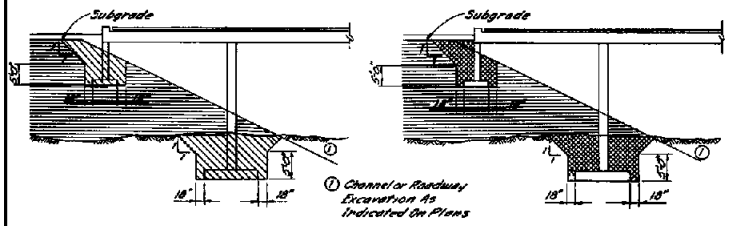
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STRUCTURE EXCAVATION AND BACKFILL
(METHOD OF MEASUREMENT)

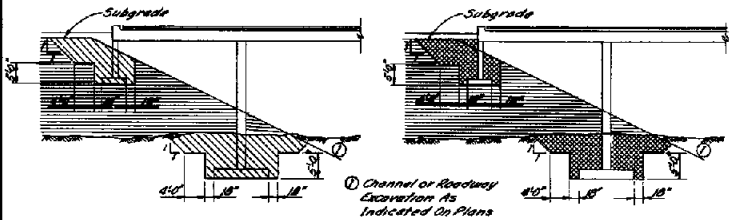
CHIEF ROAD DESIGN ENGR

R-11.2-(206,207)
ADOPTED 6/69 REVISION 4-2/79

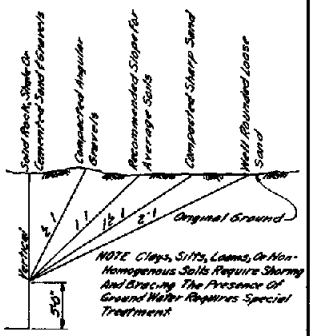
R8



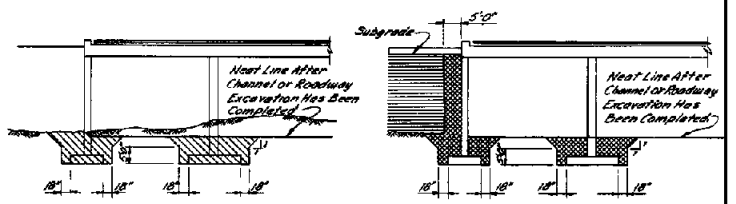
OPEN ABUTMENT BRIDGES
FOOTING WIDTH IS 6 FEET OR LESS



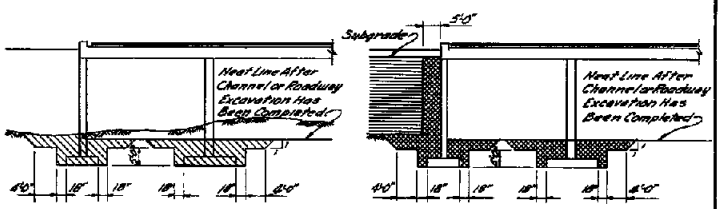
OPEN ABUTMENT BRIDGES
FOOTING WIDTH IS GREATER THAN 6 FEET



APPROXIMATE ANGLE OF REPOSE FOR SLOPING OF SIDES OF EXCAVATIONS



CLOSED ABUTMENT BRIDGES
FOOTING WIDTH IS 6 FEET OR LESS



CLOSED ABUTMENT BRIDGES
FOOTING WIDTH IS GREATER THAN 6 FEET

GENERAL NOTES

1) TRENCHES MORE THAN 5 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

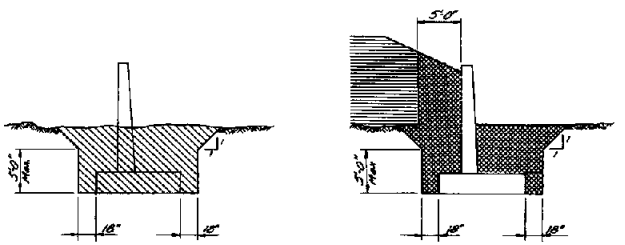
2) IF HAZARDOUS FIELD CONDITIONS INDICATE GROUND MOVEMENT MAY BE EXPECTED, TRENCHES LESS THAN 5 FEET DEEP SHALL ALSO BE PROTECTED AS INDICATED IN NOTE 1

3) FOR THE PURPOSE OF PAYMENT, STRUCTURE EXCAVATION AND BACKFILL QUANTITIES ARE BASED ON THESE STANDARD DRAWINGS AND NO ADDITIONAL PAYMENT WILL BE MADE

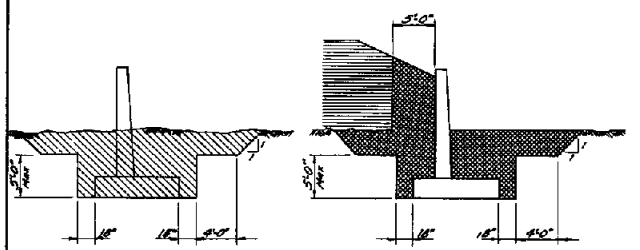
4) IF SHORING IS USED, PAYMENT WILL BE MADE FOR STRUCTURE EXCAVATION AND BACKFILL BASED ON THESE STANDARD DRAWINGS AND NO ADDITIONAL PAYMENT WILL BE MADE FOR SHORING

5) MINIMUM REQUIREMENTS FOR SHORING ARE AS SHOWN IN THE TABLE ON SHEET R-11.4

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



RETAINING WALLS
FOOTING WIDTH IS 6 FEET OR LESS



RETAINING WALLS
FOOTING WIDTH IS GREATER THAN 6 FEET

Structure Excavation

Backfill

Roadway Embankment

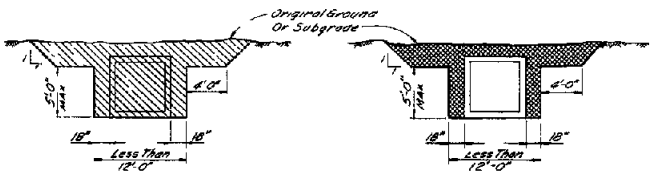
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STRUCTURE EXCAVATION AND BACKFILL (METHOD OF MEASUREMENT)

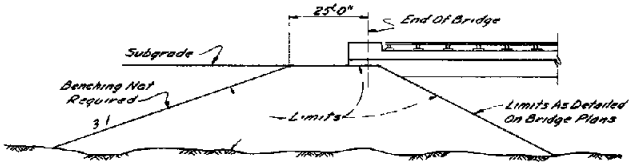
CHIEF ROADWAY DESIGN ENGR.

R-11.3 (206,207)
ADOPTED 11/73 REVISION
R-1-1/76

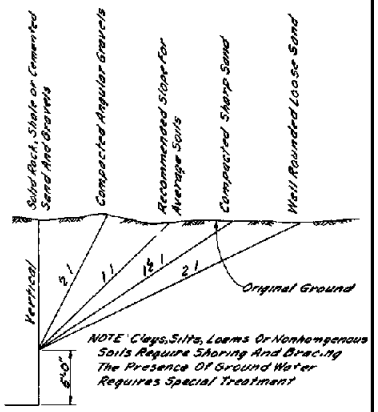
R9



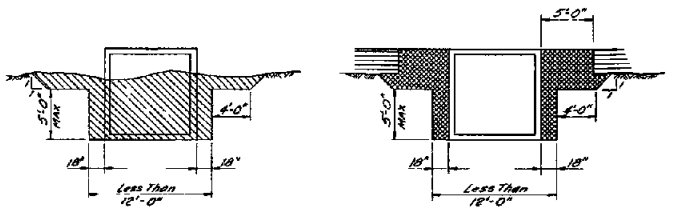
CULVERT IN EXCAVATION



LIMITS OF SELECTED BORROW AT BRIDGE ABUTMENTS



APPROXIMATE ANGLE OF REPOSE FOR SLOPING OF SIDES OF EXCAVATIONS

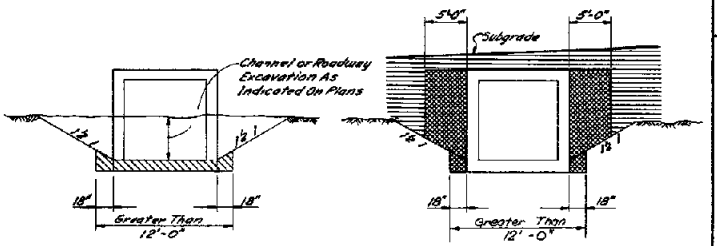


CULVERT IN EMBANKMENT

TRENCH SHORING - MINIMUM REQUIREMENTS

Depth of Trench	Kind or condition of earth	Size and spacing of members										
		Uprights		Stringers		Cross Braces					Maximum Spacing	
						Width of Trench						
		Min Dim	Max Spac	Min Dim	Max Spac	Up to 3 Ft.	3 to 6 Ft.	6 to 9 Ft.	9 to 12 Ft.	12 to 15 Ft.	Vert	Horiz
Feet		Inches	Feet	Inches	Feet	Inches	Inches	Inches	Inches	Inches	Feet	Feet
5 to 10	Hard, compact	3x6 or 2x8	6	----	----	2x6	4x4	4x6	6x6	6x8	4	6
	Likely to crack	3x6 or 2x8	3	4x6	6	2x6	4x4	4x6	6x6	6x8	4	6
	Soft, sandy, or filled	3x6 or 2x8	Close Sheeting	4x6	4	4x4	4x6	6x6	6x8	6x8	4	6
	Hydrostatic pressure	3x6 or 2x8	Close Sheeting	6x8	4	4x4	4x6	6x6	6x8	6x8	4	b
10 to 15	Hard	3x6 or 2x8	4	4x6	4	4x4	4x6	6x6	6x8	6x8	4	6
	Likely to crack	3x6 or 2x8	2	4x6	4	4x4	4x6	6x6	6x8	6x8	4	6
	Soft, sandy, or filled	3x6 or 2x8	Close Sheeting	4x6	4	4x6	6x6	6x8	8x8	8x10	4	6
	Hydrostatic pressure	3x6	Close Sheeting	8x10	4	4x6	6x6	6x8	8x8	8x10	4	6
15 to 20	All kinds or conditions	3x6	Close Sheeting	4x12	4	4x12	6x6	8x8	8x10	10x10	4	6
Over 20	All kinds or conditions	3x6	Close Sheeting	6x8	4	4x12	8x8	8x10	10x10	10x12	4	b

Trench jacks may be used in lieu of, or in combination with, cross braces
Shoring is not required in solid rock, hard shale, or hard slag
Where desirable, steel sheet piling and bracing of equal strength may be substituted for wood



CULVERT IN EXCAVATION OR EMBANKMENT

Structure Excavation

Backfill

Roadway Embankment

GENERAL NOTES

1) TRENCHES MORE THAN 5 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 5 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

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) MINIMUM REQUIREMENTS FOR SHORING ARE AS SHOWN IN THE TABLE ON THIS SHEET

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.

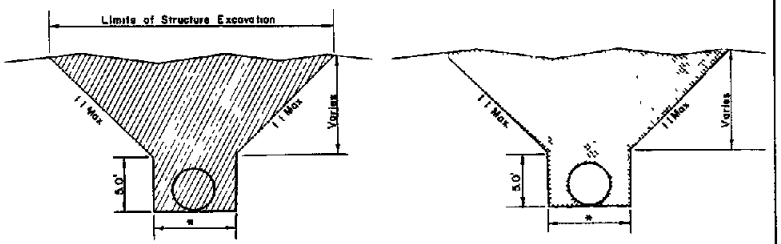
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STRUCTURE EXCAVATION AND BACKFILL (METHOD OF MEASUREMENT)

R-11.4-(206.207)

ADOPTED 11/73 REVISION 1-0-78

R10



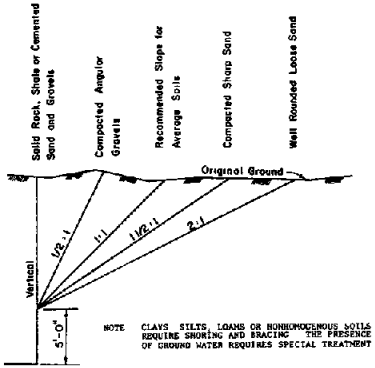
* D+3 0' FOR C M P.
S+3 0' FOR C M A P
D+2t+3 0' FOR R C P
W+2t+3 0' FOR OVAL R.C P

OUTSIDE DIAMETER IS 6 FEET OR LESS

TRENCH SHORING - MINIMUM REQUIREMENTS

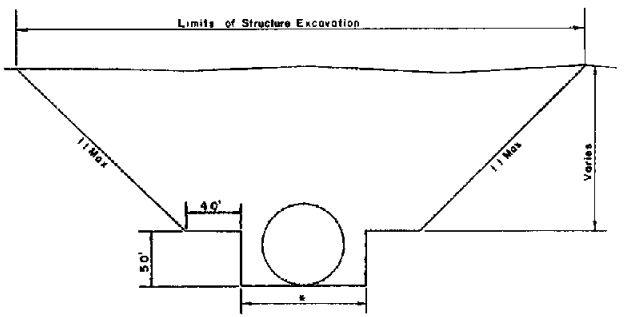
Depth of Trench	Kind or Condition of Earth	Size and Spacing of Members										
		Uprights		Stringers		Cross Braces					Maximum Spacing	
		Min Dim.	Max. Spac.	Min. Dim.	Max. Spac	Width of Trench						
						Up to 3 Ft	3 to 6 Ft	6 to 9 Ft	9 to 12 Ft	12 to 15 Ft	Vert.	Horiz
Feet		Inches	Feet	Inches	Feet	Inches	Inches	Inches	Inches	Inches	Feet	Feet
5 to 10	Hard, compact	3x6 to 2x8	6	---	---	2x6	4x6	4x6	6x6	6x8	4	6
	Likely to crack	3x6 to 2x8	3	4x6	4	2x6	4x6	4x6	6x6	6x8	4	6
	Soft, sandy or filled	3x6 or 2x6	Close Sheeting	4x6	4	4x6	4x6	6x6	6x8	8x8	4	4
	Hydrostatic pressure	3x6 or 2x8	Close Sheeting	6x8	4	4x6	4x6	6x6	6x8	8x8	4	6
10 to 15	Hard	3x6 or 2x8	4	4x6	4	4x6	4x6	6x6	6x8	8x8	4	6
	Likely to crack	3x6 or 2x8	2	4x6	4	6x6	6x8	6x6	8x8	8x8	4	6
	Soft, sandy or filled	3x6 or 2x6	Close Sheeting	4x6	4	6x8	6x8	8x8	8x8	8x10	4	6
	Hydrostatic pressure	3x6	Close Sheeting	6x10	4	4x6	6x6	6x8	8x8	8x10	4	6
15 to 20	All kinds or conditions	3x6	Close Sheeting	4x12	4	4x12	6x8	8x8	8x10	10x10	4	6
Over 20	All kinds or conditions	3x6	Close Sheeting	6x8	4	4x12	6x8	8x10	10x10	10x12	4	6

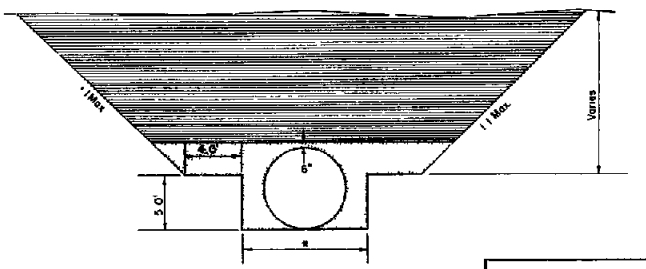
Trench jacks may be used in lieu of, or in combination with, cross braces
Shoring is not required in solid rock, hard shale, or hard slag
Where desirable, steel sheet piling and bracing of equal strength may be substituted for wood



NOTE CLAYS SILTS LOAMS OR NONHOMOGENEOUS SOILS REQUIRE SHORING AND BRACING THE PRESENCE OF GROUND WATER REQUIRES SPECIAL TREATMENT

APPROXIMATE ANGLE OF REPOSE FOR SLOPING OF SIDES OF EXCAVATION





* D+3 0' FOR C M P
S+3 0' FOR C M A P
D+2t+3 0' FOR R C P
W+2t+3 0' FOR OVAL R.C P

OUTSIDE DIAMETER IS GREATER THAN 6 FEET

GENERAL NOTES

1) TRENCHES MORE THAN 5 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 5 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
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) MINIMUM REQUIREMENTS FOR SHORING ARE AS SHOWN IN THE TABLE ON THIS SHEET
6) THE QUANTITY OF STRUCTURE EXCAVATION AND BACKFILL MEASURED FOR PAYMENT SHALL BE THE NUMBER OF CUBIC YARDS CALCULATED WITHIN ANY DUPLICATION OF LIMITS WHICH OVERLAP
7) GRANULAR BACKFILL IS TO BE PLACED FOR A DEPTH OF 6" ABOVE THE TOP OF THE PIPE FOR THE WIDTH OF THE TRENCH

LEGEND

- Structure Excavation
- Granular Backfill
- Roadway Embankment

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

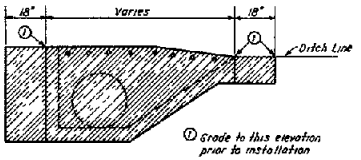
STRUCTURE EXCAVATION AND BACKFILL (METHOD OF MEASUREMENT)

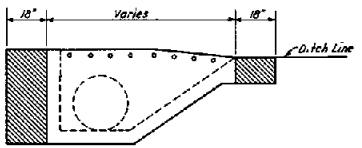
CHIEF ROAD DESIGN ENGR

R-115 (206, 207)

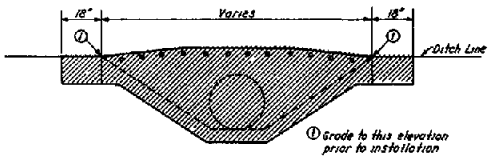
ADOPTED: 10/72 REVISION 5-7/77

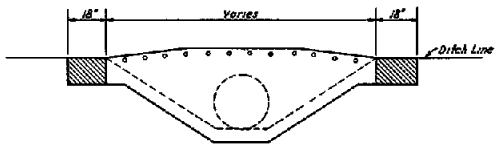
R 11



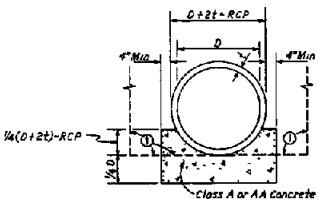


TYPE 7 DROP INLET



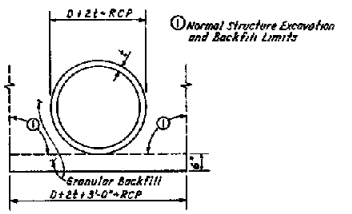


TYPE 8 DROP INLET



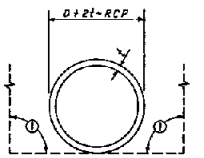
CLASS A BEDDING

Payment for excavated area below the bottom of the pipe grade to be included in the unit bid price per cubic yard of concrete



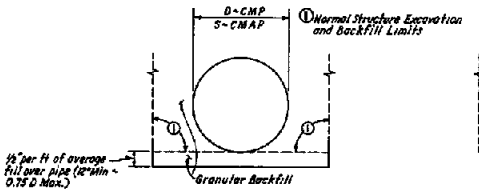
CLASS B BEDDING

Payment for excavated area below the bottom of the pipe grade and the backfill indicated above the flow line is to be included in the unit bid price for granular backfill. Bedding shall be carefully shaped to fit pipe prior to installation. No direct payment for shaping the trench



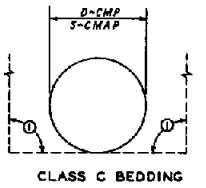
CLASS C BEDDING

BEDDING FOR CONCRETE CULVERT



CLASS B BEDDING

Payment for excavated area below the bottom of the pipe grade and the backfill indicated above the flow line is to be included in the unit bid price for granular backfill. Bedding shall be carefully shaped to fit pipe prior to installation. No direct payment for shaping the trench



CLASS C BEDDING

BEDDING FOR CMP OR CMAP

GENERAL NOTES

1. Minimum depths as specified in "Culvert Installation with Unsuitable Foundations" on Sheet R-111, Notes #2 C and B will prevail when these conditions are encountered.
2. Excavation for multiple pipe or RCB installations exceeding 12 feet in width shall be paid for as channel excavation or roadway excavation

LEGEND

- Structure Excavation
- Backfill
- Roadway Excavation
- Channel Excavation
- Drainage Excavation
- Roadway Embankment

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STRUCTURE EXCAVATION AND BACKFILL

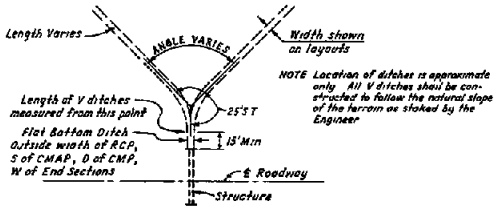
(METHOD OF MEASUREMENT)

CHIEF ROAD DESIGN ENGR.

R-116-(206, 207)

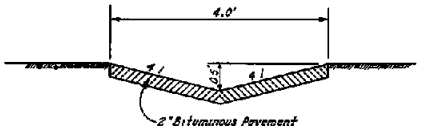
ADOPTED 6/89 | REVISION 4 5/18

R12



PLAN

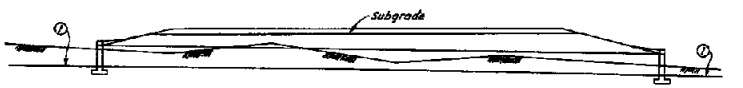
DRAINAGE DITCHES



SECTION

BITUMINOUS TURNOUT DITCH

(Plantmix or Roadmix with Seal Coat)

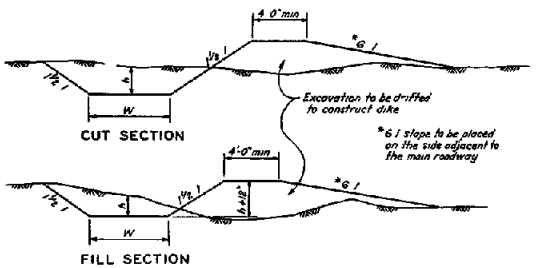


① Inlet and Outlet Ditches to be on same grade as culvert for a distance of 25' minimum.

(See detail below for design of ditches)

CULVERT INSTALLATION

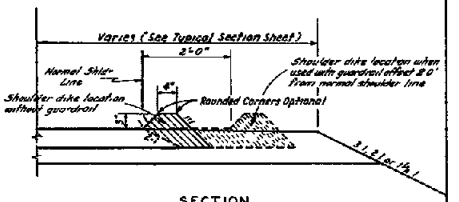
(PREFERRED)



FLAT BOTTOM DITCH AND DIKE

h = Depth of ditch or height of dike as indicated on the plans or as directed by the Engineer

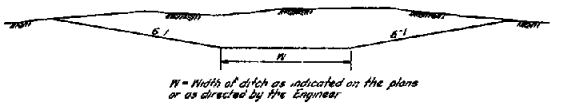
W = Width of ditch as indicated on the plans or as directed by the Engineer



SECTION

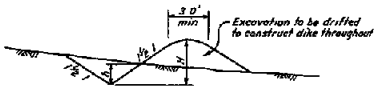
BITUMINOUS SHOULDER DIKE

(Plantmix or Roadmix with Seal Coat)



W = Width of ditch as indicated on the plans or as directed by the Engineer

INLET, OUTLET, AND MEDIAN DITCH DETAILS



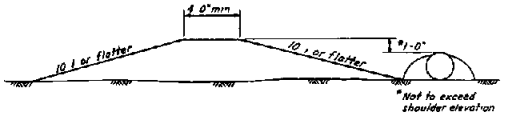
SECTION

V TYPE DITCH

To be used for surface ditches and where ordered by the Engineer

h = Depth as ordered by the Engineer (1'-6" min.)

W = Height as ordered by the Engineer (2'-6" min.)



DIKE DETAIL

Inlet and outlet dikes within 30' of roadway shoulder and median dikes Location as indicated on plans

Note Dimensions relating 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-1.2 I-(203)

ADOPTED 8/68 REVISION 6-1-79

R13

R 14

2 2/3" X 1/2" 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	58	
60	18				33	34	
66	24					31	
72	24					28	

3" X 1" ROUND CORRUGATED ALUMINUM PIPE

PIPE DIAMETER	MIN 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	31	31	51	56	70	
36	12	28	28	54	47	58	
42	18	24	24	40	41	52	
48	18	21	21	35	36	48	50
54	18	18	18	23	31	46	47
60	24	17	17	21	28	28	45
66	24			19	25	38	44
72	24			17	23	35	44
78	24				22	33	42
84	24				20	30	39
90	24				19	28	36
96	24				18	26	34
102	30					25	32
108	30					24	30
114	30						29
120	30						27

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	24	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	

CORRUGATED ALUMINUM ALLOY 3 IN. X 1 IN. CORRUGATIONS

PIPE DIMENSIONS SPAN-RISE	FILL COVER	CORNER RADIUS*	MIN THICKNESS	MAX COVER FOR CORNER PRESSURE 2 TONS PER SQ FT
INCHES	INCHES	INCHES	INCHES	FEET
18 x 11	18	1	0.010	15
22 x 13	18	4	0.060	14
25 x 16	18	4	0.060	12
29 x 18	18	4½	0.060	10
36 x 22	18	5	0.060	9
43 x 27	18	5½	0.075	9
50 x 31	18	6	0.105	8
58 x 36	18	7	0.135	8
65 x 40	18	8	0.135	8
72 x 44	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		AL
	ZN COAT	UN-COATED	
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	
6	0.218	0.2145	
5	0.249	0.2451	
4	0.280	0.2758	

MAXIMUM HEIGHT COVER FOR STRUCTURAL ALUMINUM PLATE PIPE

9" X 2½" CORRUGATION

Diam Inches	Min Cover	Min Ga	Metal Thickness -- (Inches)								
			100	125	150	175	200	225	250	275	300
60	1 0	100	28	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	66	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	29	33	38	41	45	50	54
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

MAXIMUM HEIGHT OF COVER
FOR ALUMINUM STRUCTURAL PLATE PIPE ARCH

51 8" CORNER RADIUS

Span Ft	Min Cover	Height of Cover (Feet)																									
		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	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	150	150	150	150	150	175	175	200	225	230	250	300	300	300
8-0	2 0'		125	100	100	100	100	100	100	100	100	100	125	125	125	150	150	150	175	175	175	200	223	250	275	275	300	300	500
9-0	2 0'		125	100	100	100	100	100	100	100	100	125	125	125	150	150	150	175	175	200	223	250							
10-0	2 0'		125	100	100	100	100	100	100	100	100	125	125	150	150	150	175	175	200	225	250	275							
11-0	2 0'		150	125	100	100	100	100	100	100	125	125	150	150	150	150	175	200	225	250	275								
12-0	2 0'		175	150	125	100	100	100	100	100	100	125	125	150	175	200	225	250										
13-0	2 0'		175	150	125	125	125	125	125	125	125	150	150	175	200	225	250											
14-0	2 0'		175	150	125	125	125	125	125	125	150	175	175	200	225	250												
15-0	2 0'		175	150	150	150	150	150	150	150	150	175	200	225	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 rise structure required EXAMPLE - If you need a 10'-8" span X 7'-5" rise structure, use the line for span 11'-0"

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ALLOWABLE FILL HEIGHTS FOR ALUMINUM CULVERTS

CHIEF ROAD DESIGN ENGR

R-13.1 (601,605)
ADOPTED 12/19/78 REVISION

R15

"ROUND CORRUGATED STEEL PIPE
2 2/3" X 1/2" 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		24		46	72	48	76	60	80
48	12		35		38	45	63	46	67	57	70
54	12				34	43	56	44	59	53	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	34	44
84	12								40	31	42

"ROUND CORRUGATED STEEL PIPE
2 2/3" X 1/2" 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									
36	12	37	38	46	48	73	73	83	88	96	100
42	12	33	35	42	44	62	72	69	84	76	87
48	12	30	31	38	41	58	64	59	77	66	79
54	12	27	28	36	38	50	58	57	64	65	71
60	12	25	26	32	34	50	53	51	56	56	64
66	12	23	23	29	31	45	46	46	52	53	58
72	12	21	22	28	29	43	44	45	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					28	28	34	35	38	41
108	24					27	26	32	34	35	37
114	24					21	23	31	32	34	36
120	24					20	22	29	30	32	32

***CORRUGATED STEEL PIPE ARCH**
2 2/3" X 1/2" CORRUGATION

PIPE DIMENSIONS SPAN-RISE	** MIN COVER	CORNER RADIUS	MIN. THICKNESS	MAX COVER FOR CORNER PRESSURES IN TONS PER SQ FT.	
				2 TONS	*** 3 TONS
INCHES	INCHES	INCHES	INCHES		
17 X 13	18	3	0.064	13	19
21 X 15	18	3	0.064	12	18
24 X 18	18	3	0.064	10	16
28 X 20	18	3	0.064	10	15
35 X 24	18	3	0.064	9	14
42 X 29	18	3½	0.064	9	13
49 X 33	18	4	0.079	8	12
57 X 38	18	5	0.109	8	12
64 X 43	18	6	0.109	8	12
71 X 47	18	7	0.138	8	12
77 X 52	18	8	0.168	8	12
83 X 57	18	9	0.168	9	13

***CORRUGATED STEEL PIPE ARCH**
3 X 1" CORRUGATIONS

PIPE DIMENSIONS SPAN-RISE	** MIN COVER	CORNER RADIUS	MIN THICKNESS	MAX COVER FOR CORNER PRESSURES IN TONS PER SQ FT	
				2 TONS	*** 3 TONS
INCHES	INCHES	INCHES	INCHES		
83 X 27	18	7 5/8	0.064	12	18
98 X 31	18	9	0.064	12	18
98 X 36	18	10 1/2	0.064	12	18
85 X 40	18	12	0.064	12	18
72 X 44	18	13 1/4	0.064	12	18
73 X 55	18	18	0.064	14	22
81 X 59	18	18	0.079	15	21
87 X 63	18	18	0.079	14	20
95 X 67	18	18	0.109	13	18
103 X 71	24	18	0.109	12	17
113 X 75	24	18	0.109	11	16
117 X 79	24	18	0.109	10	15
128 X 83	24	18	0.138	9	14

+ 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

MAXIMUM HEIGHT OF COVER

FOR STRUCTURAL STEEL PLATE PIPE (5% ELONGATION)

6" x 2" CORRUGATION

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 0.280
60	12	42	62	80	93		
66	12	38	57	73	85		
72	12	35	52	67	78	96	
78	12	32	48	62	72	87	
84	18	30	45	57	67	80	95
90	18	28	42	54	62	75	88
96	18	27	39	50	58	70	83
102	24	25	37	47	55	66	78
108	24	24	35	45	51	63	74
114	24	22	33	42	48	59	70
120	24	21	31	40	45	56	66
126	24	20	30	38	43	54	63
132	24	19	28	37	41	51	60
138	24	18	27	35	40	49	58
144	24	18	26	34	39	47	55
150	24	17	25	32	38	45	53
156	24	16	24	33	36	44	51
162	24	16	23	30	35	42	49
168	24	15	22	29	34	40	47
174	24	15	22	28	32	39	46
180	36	14	21	27	31	38	44
186	36	14	20	26	30	36	43
192	36		20	25	29	35	42
198	36		19	25	29	34	40

MAXIMUM HEIGHT OF COVER

FOR STRUCTURAL STEEL PLATE PIPE ARCH WITH 31" CORNER RADIUS

6" x 2" CORRUGATIONS

Span	Rise	Min Cover Inches	ALLOWABLE FILL HEIGHTS IN FEET							
			2 TONS/SQ. FT. BEARING PRESSURE				3½ 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	12				17			
14'-2"	9'-10"	36	11				17			
15'-4"	10'-4"	36		10				16		
16'-7"	10'-10"	36		9				14		
17'-2"	11'-4"	36		9				13		
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 RADIUS

6" x 2" CORRUGATIONS

Span	Rise	Min Cover Inches	ALLOWABLE FILL HEIGHTS IN FEET							
			2 TONS/SQ FT BEARING PRESSURE				3½ 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"	18	15							
7'-0"	5'-1"	18	13							
7'-11"	5'-7"	18	12				18			
8'-10"	6'-1"	24	10				16			
9'-8"	6'-7"	24	9				15			
10'-11"	7'-1"	24	8				13			
12'-10"	8'-4"	24	6				11			
14'-1"	8'-9"	24	7				11			
15'-4"	9'-3"	24						10		
16'-10"	9'-10"	24						9		
18'-7"	10'-1"	36						8		

*May be used only when supported by Foundation Study

EQUIVALENT GAGE NUMBERS

GAGE NUMBER	THICKNESS IN INCHES		
	STEEL		AL.
	GV 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	0.2758	

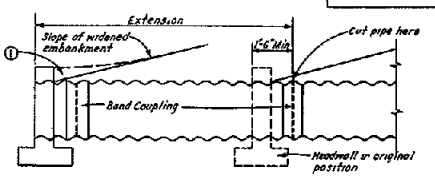
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ALLOWABLE FILL HEIGHTS FOR STEEL CULVERTS

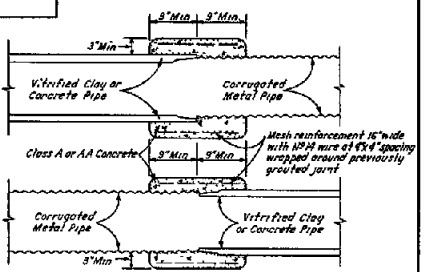
CHIEF ROAD DESIGN ENGR

R-1.3 | 2 (601, 604, 606)
ADOPTED 7/73 | REVISION 1 12/78

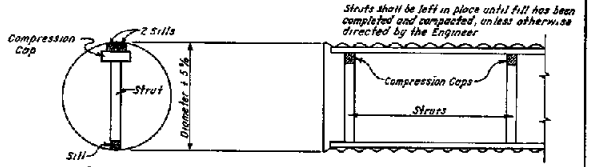
R16



PIPE CULVERT EXTENSION
(Headwall to be moved and reset)

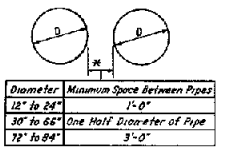


CONCRETE COLLAR
(CMP to RCP or Vitrified Pipe Extensions)



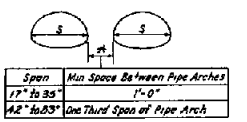
FIELD STRUTTING CMP

Note: For strut, cap, sill size and spacing use manufacturers recommendations. Struts, caps and sills to be the same dimension



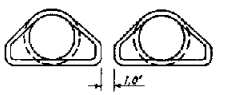
Diameter	Minimum Space Between Pipes
12" to 24"	1'-0"
30" to 66"	One Half Diameter of Pipe
72" to 84"	3'-0"

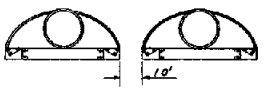
* When headwalls are used or anticipated for future use, space as per headwalls standard



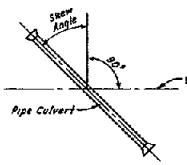
Span	Min Space Between Pipe Arches
17" to 35"	1'-0"
42" to 83"	One Third Span of Pipe Arch

MULTIPLE INSTALLATIONS WITHOUT HEADWALLS

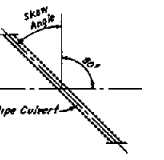




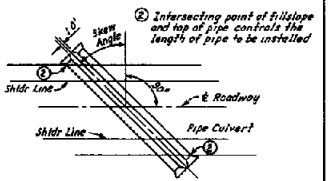
MULTIPLE INSTALLATIONS WITH END SECTIONS



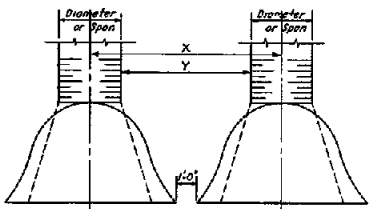
SINGLE CULVERT WITH END SECTIONS



SINGLE CULVERT WITH HEADWALLS



MULTIPLE CULVERT WITH END SECTIONS



Note: When Y distance exceeds 3'-0", Structure Excavation and Backfill quantities shall be calculated for each culvert.

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'-9"	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'-8"	83"X57"	15'-6"	8'-7"			
72"	14'-6"	8'-6"						
78"	15'-0"	8'-6"						
84"	15'-6"	8'-8"						

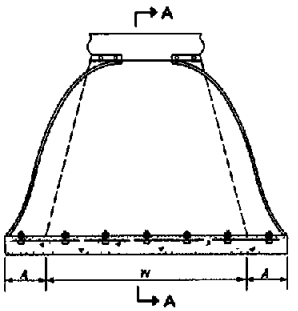
TABLE OF SEPARATION FOR MULTIPLE INSTALLATIONS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT INSTALLATION

CHIEF ROAD DESIGN ENGR

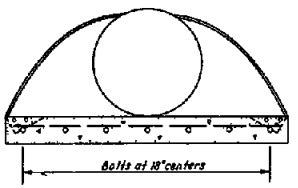
R-211 (601 THRU 606)
ADOPTED 8/69
REVISION 4 2/79



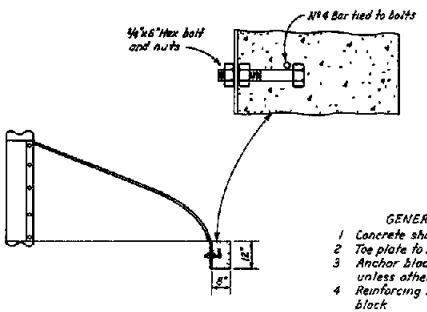
PLAN

DIMENSIONS				* Concrete Cu Yd
Pipe Diam	Gage	A (1" Tol)	W (2" Tol)	
48"	12	18"	90"	0 26
54"	12	18"	102"	0 29
60"	12	18"	114"	0 31
66"	12	18"	120"	0 32
72"	12	18"	126"	0 34
78"	12	18"	132"	0 35
84"	12	18"	138"	0 36

*For information only



ELEVATION



SECTION A-A

GENERAL NOTES

1 Concrete shall be Class A or AA
2 Toe plate to be eliminated when anchor block is used
3 Anchor block is to be installed on inlet end only, unless otherwise specified.
4 Reinforcing steel bar to clear 2" on ends of concrete block

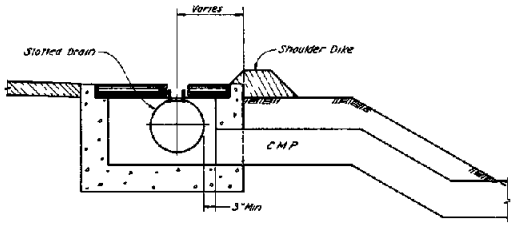
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT INSTALLATION
ANCHOR BLOCK FOR CULVERTS 48" TO 84"

CHIEF ROAD DESIGN ENGR.

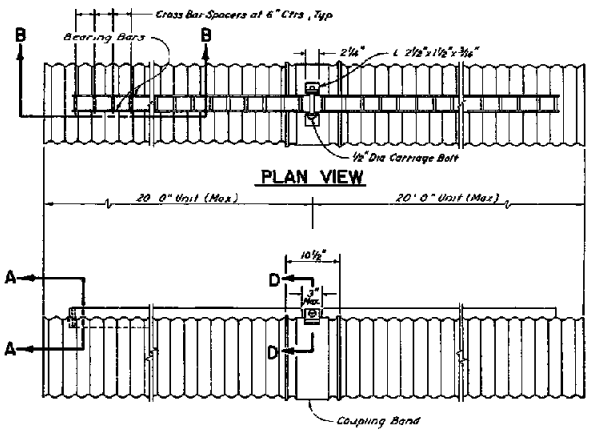
R-212-(604)
ADOPTED 8/69 REVISION

R17



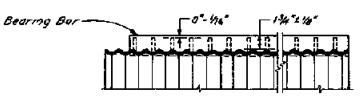
EMBANKMENT PROTECTOR & SLOTTED DRAIN

TYPE 4 SHOWN - OTHERS MAY BE SUBSTITUTED

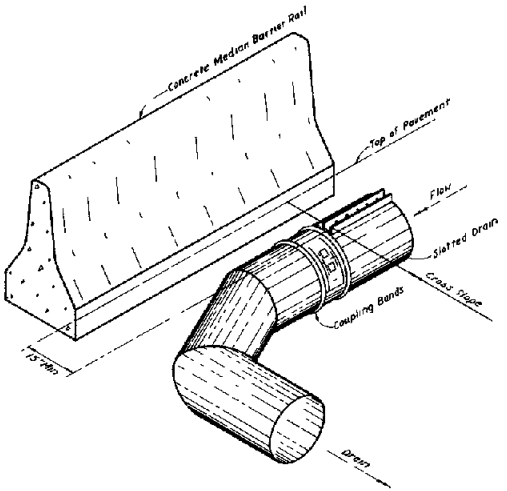


PLAN VIEW

SLOTTED DRAIN DETAIL

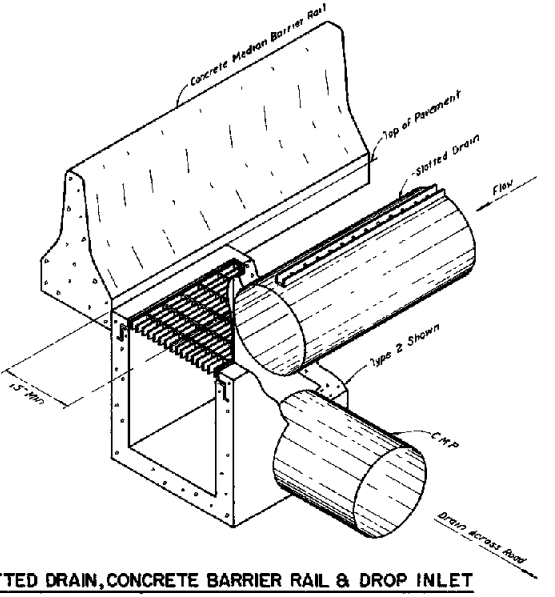


SECTION B-B

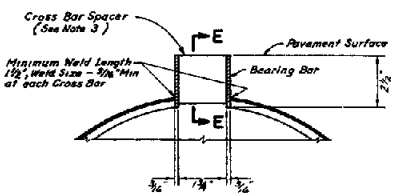


45° ANGLE SLOTTED DRAIN & CONCRETE BARRIER RAIL

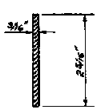
(CAN BE USED WITH SHOULDER DIKE)



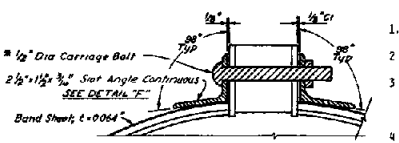
SLOTTED DRAIN, CONCRETE BARRIER RAIL & DROP INLET



SECTION A-A

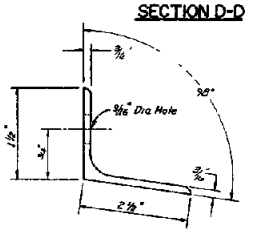


SECTION E-E



* Angle Slot to be attached to Pipe every 4 Corrugations

SECTION D-D



DETAIL "F"

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 FEET.
5. ALL COUPLING BAND CONNECTIONS MAY BE GALVANIZED OR COATED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.
6. SPOT WELDS 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

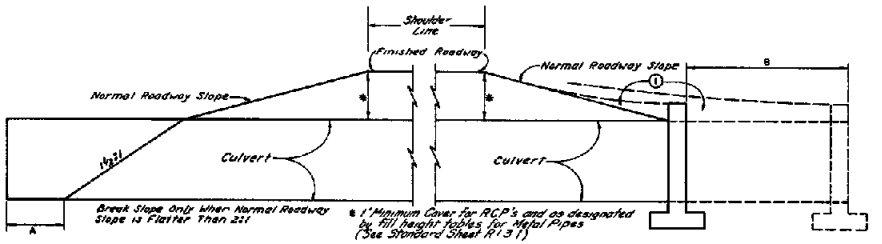
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SLOTTED C.M.P. DRAIN DETAILS

CHIEF ROAD DESIGN ENGR	R-213(604) ADOPTED 5-71	REVISION 1-9-78

R 18

R19

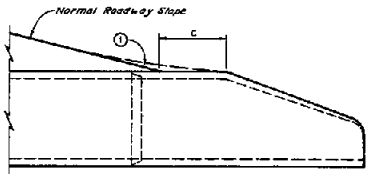


WITHOUT HEADWALL **WITH CONCRETE HEADWALL**

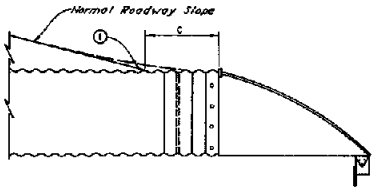
A - LENGTH OF CULVERT SHALL BE INCREASED AS FOLLOWS, CONSIDER EACH SIDE SEPARATELY MEASURE PIPE FROM ROADBED CENTERLINE TO THE INTERSECTION OF PIPE FLOW LINE AND FILLSLOPE. TO THIS DIMENSION ADD 2 0' WHEN COVER AT SHOULDER IS 1 0' TO 10.0', ADD AN ADDITIONAL 0 5' FOR EACH SUCCEEDING 5 0' OF COVER OR PORTION THEREOF

B - 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

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



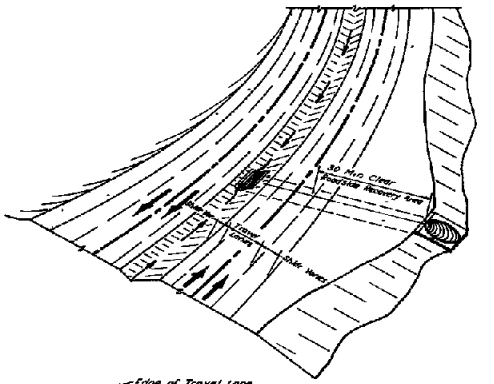
PRECAST CONCRETE END SECTION

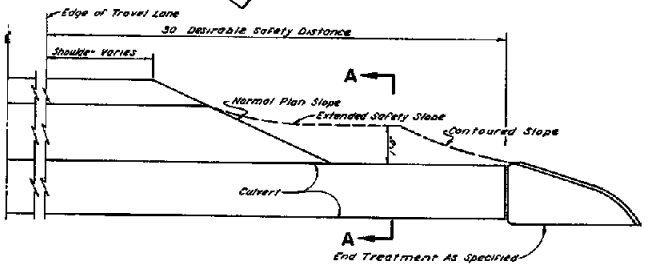


METAL END SECTION

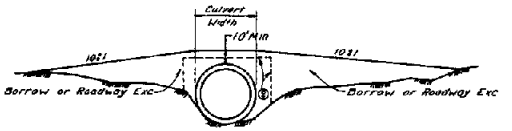
C - LENGTH OF CULVERT SHALL BE INCREASED AS FOLLOWS, CONSIDER EACH SIDE SEPARATELY MEASURE PIPE FROM ROADWAY CENTERLINE TO THE INTERSECTION OF THE TOP OF PIPE AND FILLSLOPE TO THIS DIMENSION ADD 1 0' WHEN COVER AT SHOULDER IS 1 0' TO 10.0', ADD AN ADDITIONAL 0.5' FOR EACH SUCCEEDING 5 0' OR PORTION THEREOF

MINIMUM CULVERT INSTALLATION





METHOD OF CONTOURING OVER CULVERTS



SECTION A-A

SAFETY CULVERT INSTALLATION
(TO PROVIDE OBSTRUCTION CLEARANCE)

NOTE 1 SOMETIMES DUE TO THE RIGHT OF WAY LIMITS OR DRAINAGE CONTROLS, A CULVERT MAY BE LENGTHENED A SAFE DISTANCE, AS NOTED ON THE PLANS, AND THE FILL SLOPE WARPED FOR SAFETY AND A PLEASING APPEARANCE, BUT NOT MEET THE 30 MINIMUM SAFETY REQUIREMENTS IF SUCH CONSTRUCTION IS NOT POSSIBLE, THEN VEHICLES MAY BE PROTECTED BY GUARDRAIL OR SOME OTHER TYPE OF BARRIER

2 NORMAL STRUCTURE EXCAVATION AND BACKFILL LIMITS

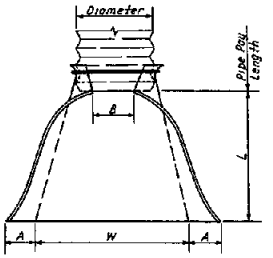
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT INSTALLATION

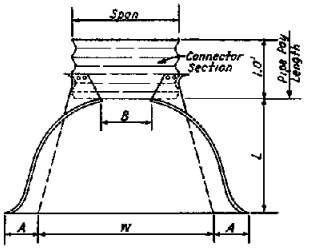
CHIEF ROAD DESIGN ENGINEER	A-214 (601 THRU 606)
	ADOPTED 6/72
	REVISION 6-4-75

TYPE CONNECTION	PIPE DIAM	GAGE	DIMENSIONS A 1" TOL	B MAX	H 1" TOL	L 1½" TOL	W 2" TOL	APPROX SLOPE
TYPE 1	12"	16	6"	6"	6"	21"	24"	2½ :1
	15"	16	7"	8	6"	26"	30"	2½ :1
	18	16	8"	10"	6"	31"	36"	2½ :1
	21	16	9"	12	6"	36"	42"	2½ :1
	24"	16	10"	13"	6"	41"	48"	2½ :1
TYPE 2	30"	14	12"	16"	8"	51"	60"	2½ :1
	36"	14	14"	18"	9"	60"	72	2½ :1
TYPE 3	42"	12	16"	22"	11"	69"	84"	2½ :1
	48"	12	18"	27"	12"	78"	90"	2¼ :1
	54"	12	18"	30"	12"	84"	102"	2 :1
	60"	12	19"	33	12"	87"	114"	1¾ :1
	66"	12	18"	36"	12"	87"	120"	1½ :1
	72	12	18"	39"	12"	87"	126"	1⅓ :1
	78"	12	18"	42"	12"	87"	132"	1¼ :1
	84"	12	18"	45"	12"	87"	138"	1⅛ :1

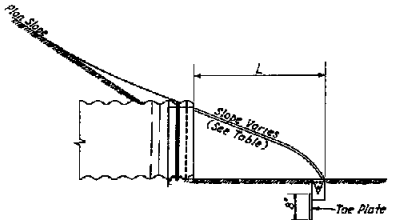
TYPE CONNECTION	PIPE ARCH DIMENSIONS SPAN	RISE	GAGE	DIMENSIONS A 1" TOL	B MAX	H 1" TOL	L 1½" TOL	W 2" TOL	APPROX SLOPE
TYPE 2	17"	13"	16	7"	5"	6"	19"	30"	2½ :1
	21"	15"	16	7"	10"	6	23"	36"	2½ :1
	24"	18"	16	8"	12"	6"	28"	42"	2½ :1
	28"	20"	16	9"	14"	6	32"	48"	2½ :1
	35"	24"	14	10"	16	6"	39"	60"	2½ :1
	42"	29"	14	12"	18"	8"	46"	75"	2½ :1
	49"	33"	12	13"	21"	9"	53"	86	2½ :1
	57"	38"	12	18	26	12"	63"	90"	2½ :1
TYPE 3	64"	43"	12	18	30"	12"	70"	102"	2¼ :1
	71"	47"	12	18"	33"	12"	77"	114"	2¼ :1
	77"	52	12	18"	36"	12"	77"	126"	2 :1
	83"	57"	12	18"	39"	12"	77"	138"	2 :1



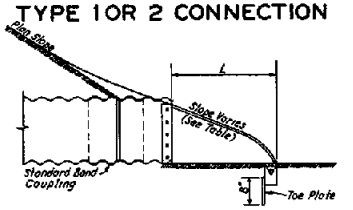
PLAN



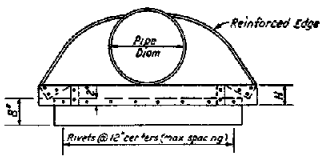
PLAN



SECTION
TYPE 1 OR 2 CONNECTION

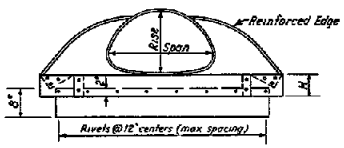


SECTION
TYPE 3 CONNECTION



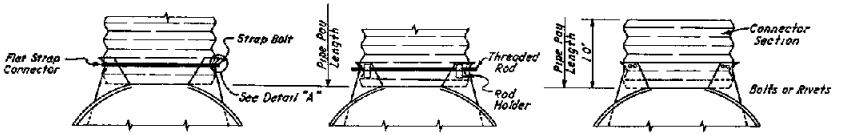
Length of toe plate to be W + 10" Min. for 12" to 30" diameter pipe inclusive and W + 22" Min. for 36" diameter pipes and larger

ELEVATION



Length of toe plate to be W + 10" Min. for pipe arches with rise of 13" to 29" inclusive and W + 16" Min for pipe arches with rise of 33" and larger

ELEVATION

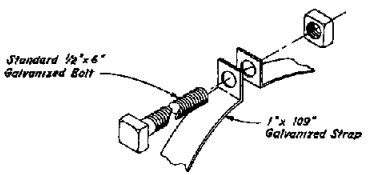


TYPE 1
For 12" CMP through 24" CMP only

TYPE 2
For 30" CMP through 36" CMP only
For 17" x 13" CMAP through 57" x 38" CMAP only

TYPE 3
For 42" CMP through 84" CMP only
For 64" x 43" CMAP through 83" x 57" CMAP only

STANDARD CONNECTIONS



DETAIL "A"

GENERAL NOTES

1. THE CULVERT LENGTHS SHOWN ON THE PLANS AND STRUCTURE LIST SHALL BE THE FAU LENGTH AS INDICATED ON THE STANDARD SHEET INCLUDING CONNECTOR SECTION LENGTHS WHEN USED
2. PIPE ON SKEW SHALL NOT 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 PLATE 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 2 1/2" X 2 1/2" X 1/4" FOR 78" AND 84" ROUND. THE ANGLES TO BE ATTACHED BY 3/8" GALVANIZED NUTS AND BOLTS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

METAL END SECTIONS
12" CMP TO 84" CMP AND 17" X 13" CMAP TO 83" X 57" CMAP

CHIEF ROAD DESIGN ENGR

R-221-(604)

ADOPTED 8/75 | REVISION 1 3/78

R20

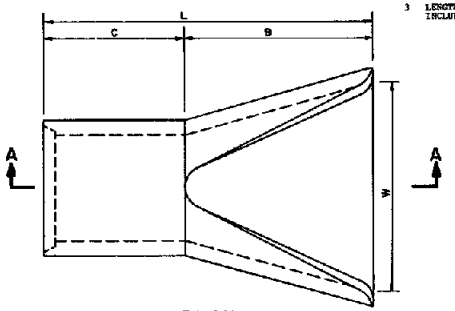
DIAMETER	WEIGHT	A	B	C	L	W
18"	670	9"	2'-1"	2'-1"	6'-2"	3'-0"
24"	1300	9"	3'-6"	2'-6"	6'-0"	4'-0"
30"	1850	1'-0"	4'-3"	2'-8"	6'-11"	5'-0"
36"	3500	1'-3"	5'-2"	2'-11"	8'-1"	6'-0"
42"	4850	1'-6"	5'-10"	3'-1"	8'-3"	7'-0"
48"	6200	2'-0"	6'-10"	2'-9"	8'-3"	7'-10"
54"	7150	2'-3"	5'-6"	2'-9"	8'-3"	6'-10"

GENERAL NOTES

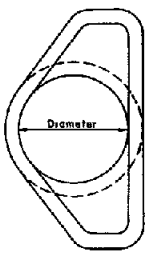
1 CLASS AND TYPE OF CONCRETE SHALL BE AS SPECIFIED FOR REINFORCED CONCRETE PIPE.

2 STRUCTURAL DESIGN OF END SECTION SHALL CONFORM TO THAT OF STANDARD REINFORCED CONCRETE CULVERT PIPE.

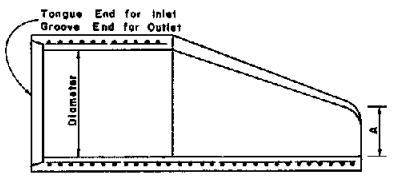
3 LENGTH OF PIPE SHOWN ON THE PLANS DOES NOT INCLUDE CONNECTOR SECTION (LENGTH C)



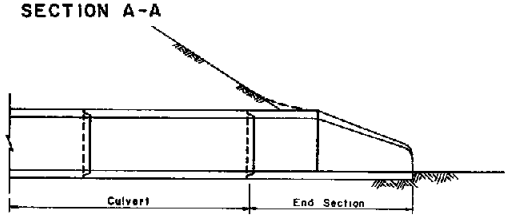
PLAN



END VIEW

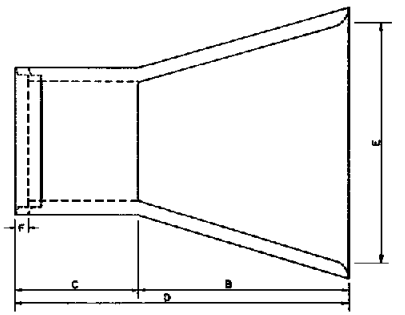


SECTION A-A

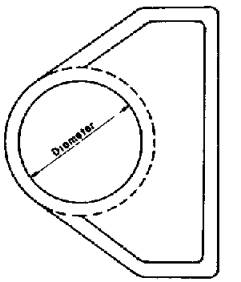


CROSS SECTION VIEW

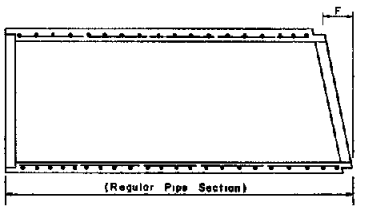
18" RCP TO 54" RCP

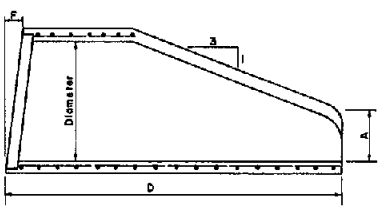


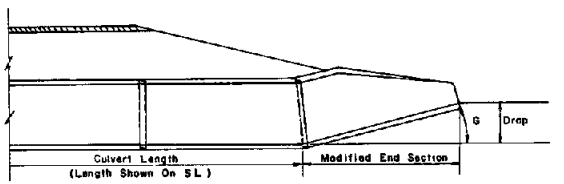
PLAN



END VIEW







MODIFIED END SECTION

MODIFIED END SECTION DIMENSIONS AND WEIGHTS

Dia	Wt	A	B	C	D	E	F	G	Drop
36"	3500	1'3"	5'2"	2'11"	8'1"	6.0'	5-3/8"	10½"	1'6"
48"	6200	2'-"	6'10"	2'9"	8'2"	7'0"	5-7/8"	14"	2'0"

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RCP END SECTION

CHIEF ROAD DESIGN ENGR

R-231-(603)

ADOPTED: 1/75 REVISION

R21

CMP SIZE D	CORR CMAP S X R	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	36	0 93	37	0 94	37	0 99	39	1 21	46	1 30	49	1 35	50	1 43	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 86	78	2 12	83	2 16	84	2 25	86	2 58	95	2 73	100	2 84	103	3 08	108
30"	36"X22"	4 91	8'-0"	2 61	103	2 85	111	2 90	112	3 01	115	3 39	126	3 65	132	3 79	136	4 11	142
36"	43"X27"	7 07	9'-6"	3 36	122	3 66	128	3 72	131	3 86	134	4 34	147	4 68	155	4 86	158	5 28	167
42"	50"X31"	9 62	11'-0"	4 10	167	4 56	177	4 64	179	4 81	182	5 39	196	5 81	206	6 03	210	6 52	220

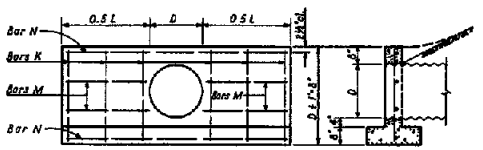
Quantities shown above are for two headwalls

Quantities shown below are for one headwall

LENGTH OF REINFORCING BARS

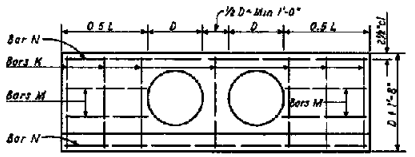
CMP SIZE D	SINGLE CMP					SINGLE OR DOUBLE CMP								DOUBLE CMP				
	0°-45°	0°	15°	30°	45°	0°	15°		30°		45°			0°-45°	0°	15°	30°	45°
	NO 4	NO 5	NO 5	NO 5	NO 5	NO 4	NO 4	NO 4	NO 4	NO 4	NO 4	NO 4	NO 4	NO. 4	NO 5	NO 5	NO 5	NO 5
	K	N	N	N	N	M	M	Q	M	Q	M	Q		K	N	N	N	N
12"	4@2'-5"	2@4'-3"	2@4'-8"	2@4'-9"	2@5'-0"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

PLAN
SINGLE CMP

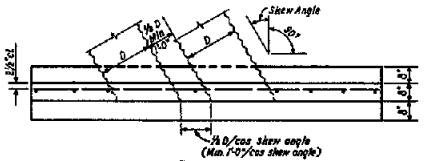


ELEVATION
SINGLE CMP

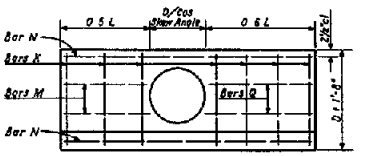
SECTION
(For All Headwalls)



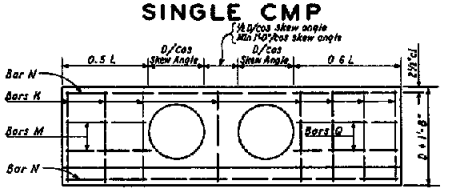
ELEVATION
DOUBLE CMP
0° SKEW



PLAN
DOUBLE CMP



ELEVATION
SINGLE CMP



ELEVATION
DOUBLE CMP
15° TO 45° SKEW

GENERAL NOTES

1 ~ Concrete shall be Class A or AA
2 ~ Reinforcing steel shall be deformed bars with maximum spacing of 18" set 2½" clear of surface of concrete except as noted Bar ends shall be kept 1½" 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 0°, 15° 30° or 45° where it is feasible.

R22

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS
12" CMP TO 42" CMP

William L. Hall
CHIEF ROAD DESIGN ENGR.

R-2.4.1- (502)
ADOPTED 8/65 | REVISION

CMP SIZE D	CORR CMAP S X R	CMP AREA SQ FT	L	SINGLE CMP 0° SKEW CONC CU YD	SINGLE CMP 0° SKEW STEEL LB	SINGLE CMP 15° SKEW CONC CU YD	SINGLE CMP 15° SKEW STEEL LB	SINGLE CMP 30° SKEW CONC CU YD	SINGLE CMP 30° SKEW STEEL LB	SINGLE CMP 45° SKEW CONC CU YD	SINGLE CMP 45° SKEW STEEL LB	DOUBLE CMP 0° SKEW CONC CU YD	DOUBLE CMP 0° SKEW STEEL LB	DOUBLE CMP 15° SKEW CONC CU YD	DOUBLE CMP 15° SKEW STEEL LB	DOUBLE CMP 30° SKEW CONC LB	DOUBLE CMP 30° SKEW STEEL LB	DOUBLE CMP 45° SKEW CONC CU YD	DOUBLE CMP 45° SKEW STEEL LB
48"	58" X 36"	12.57	12'-6"	6.72	537	7.31	651	7.45	656	7.75	636	8.76	715	9.43	772	9.66	815	10.65	874
54"	65" X 40"	15.90	14'-0"	7.80	706	8.60	766	8.76	802	9.10	814	10.28	841	11.07	904	11.51	950	12.47	1045
60"	72" X 44"	19.64	15'-6"	10.17	893	11.07	1089	11.28	1095	11.74	1147	13.28	1229	14.30	1328	14.97	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

Quantities shown above are for two headwalls

Quantities shown below are for one headwall

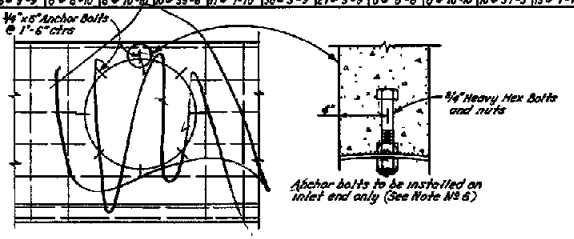
LENGTH OF REINFORCING BARS

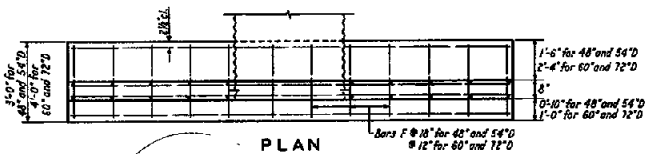
SINGLE CMP

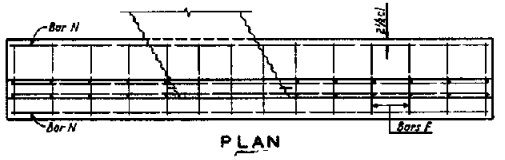
CMP SIZE D	0° SKEW NO 5 F	0° SKEW NO 5 G	0° SKEW NO 4 M	0° SKEW NO 4 N	0° SKEW NO 4 K	15° SKEW NO 5 F	15° SKEW NO 5 G	15° SKEW NO 4 M	15° SKEW NO 4 Q	15° SKEW NO 4 N	15° SKEW NO 4 K	30° SKEW NO 5 F	30° SKEW NO 5 G	30° SKEW NO 4 M	30° SKEW NO 4 Q	30° SKEW NO 4 N	30° SKEW NO 4 K	45° SKEW NO 5 F	45° SKEW NO 5 G	45° SKEW NO 4 M	45° SKEW NO 4 Q	45° SKEW NO 4 N	45° SKEW NO 4 K
48"	12 @ 2'-9"	10 @ 7'-7"	12 @ 6'-0"	8 @ 16'-3"	10 @ 5'-10"	13 @ 2'-9"	11 @ 7'-7"	6 @ 5'-10"	6 @ 7'-3"	8 @ 11'-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 @ 6'-1"	12 @ 6'-9"	9 @ 18'-3"	12 @ 6'-4"	14 @ 2'-9"	13 @ 8'-1"	6 @ 6'-7"	6 @ 8'-1"	9 @ 18'-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'-9"	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 @ 8'-10"	8 @ 10'-10"	10 @ 25'-6"	15 @ 7'-10"	28 @ 3'-9"	23 @ 9'-9"	8 @ 8'-2"	8 @ 10'-10"	10 @ 27'-0"	15 @ 7'-10"	29 @ 3'-9"	24 @ 9'-9"	8 @ 8'-6"	8 @ 10'-10"	10 @ 28'-7"	17 @ 7'-10"

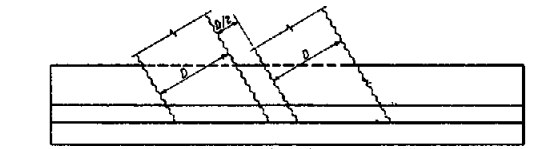
DOUBLE CMP

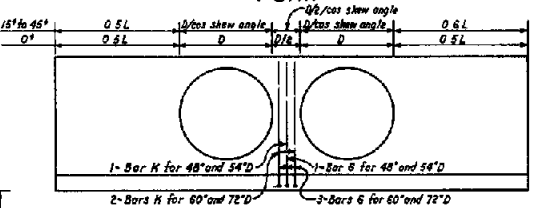
CMP SIZE D	0° SKEW NO 5 F	0° SKEW NO 5 G	0° SKEW NO 4 M	0° SKEW NO 4 N	0° SKEW NO 4 K	15° SKEW NO 5 F	15° SKEW NO 5 G	15° SKEW NO 4 M	15° SKEW NO 4 Q	15° SKEW NO 4 N	15° SKEW NO 4 K	30° SKEW NO 5 F	30° SKEW NO 5 G	30° SKEW NO 4 M	30° SKEW NO 4 Q	30° SKEW NO 4 N	30° SKEW NO 4 K	45° SKEW NO 5 F	45° SKEW NO 5 G	45° SKEW NO 4 M	45° SKEW NO 4 Q	45° SKEW NO 4 N	45° SKEW NO 4 K
48"	16 @ 2'-9"	11 @ 7'-7"	12 @ 6'-0"	3 @ 22'-3"	11 @ 5'-10"	17 @ 2'-9"	12 @ 7'-7"	6 @ 5'-10"	6 @ 7'-3"	9 @ 23'-10"	12 @ 5'-10"	16 @ 2'-9"	13 @ 7'-7"	6 @ 5'-8"	6 @ 7'-3"	3 @ 25'-1"	13 @ 5'-10"	19 @ 2'-9"	14 @ 7'-7"	6 @ 5'-6"	6 @ 7'-3"	3 @ 27'-8"	14 @ 5'-10"
54"	18 @ 2'-9"	13 @ 8'-1"	12 @ 6'-9"	3 @ 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"	28 @ 3'-9"	21 @ 8'-9"	12 @ 7'-6"	10 @ 27'-3"	14 @ 5'-10"	31 @ 3'-9"	23 @ 8'-9"	6 @ 7'-4"	6 @ 9'-0"	10 @ 28'-5"	15 @ 6'-10"	32 @ 3'-9"	24 @ 8'-9"	6 @ 7'-2"	6 @ 9'-0"	10 @ 31'-5"	18 @ 6'-10"	33 @ 3'-9"	28 @ 8'-9"	6 @ 7'-0"	6 @ 9'-0"	10 @ 34'-8"	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 @ 8'-10"	8 @ 10'-10"	10 @ 35'-6"	17 @ 7'-10"	38 @ 3'-9"	27 @ 9'-9"	8 @ 8'-8"	8 @ 10'-10"	10 @ 37'-5"	19 @ 7'-10"	42 @ 3'-9"	31 @ 9'-9"	8 @ 8'-6"	8 @ 10'-10"	10 @ 41'-6"	21 @ 7'-10"



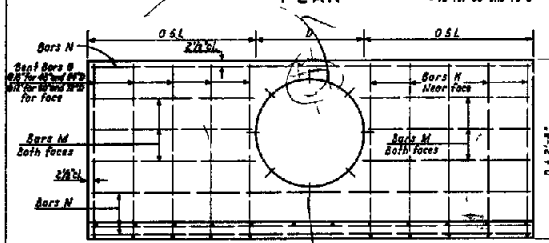




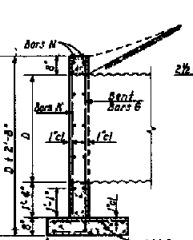




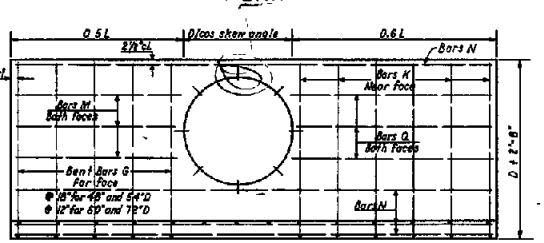
ELEVATION
DOUBLE CMP
0° TO 45° SKEW
NOTE: For details of other reinforcing bars see Single Culvert Headwalls



ELEVATION
SINGLE CMP
0° SKEW



SECTION



ELEVATION
SINGLE CMP
15° TO 45° SKEW

GENERAL NOTES

1 - Concrete shall be Class A or AA

2 - Reinforcing steel shall be deformed bars with maximum spacing of 18" at 2½" clear of surface of concrete except as noted. Bar ends shall be kept 1½" 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 65° - Use quantities for 45° skew.
Over 55° - Calculate quantities required
Culverts should be installed on 0°, 15°, 30° or 45° where it is feasible

6 - No Direct Payment for anchor bolts

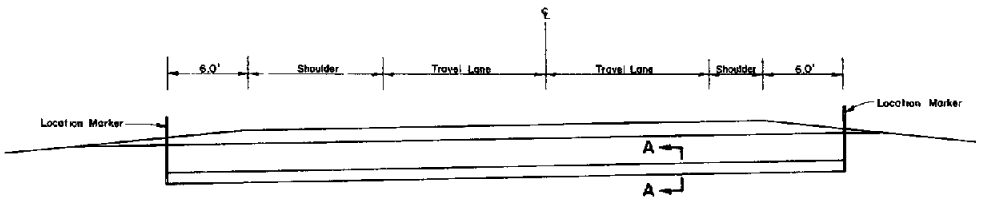
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS
48" CMP TO 72" CMP

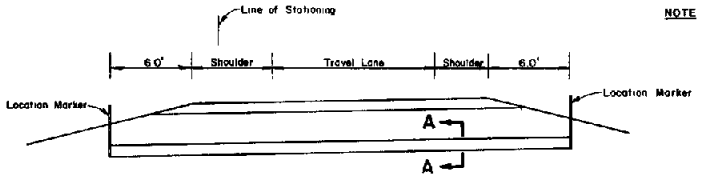
CHIEF ROAD DESIGN ENGR

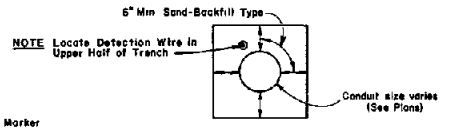
R-2.4.2-(502)
ADOPTED 8/69
REVISION

R23



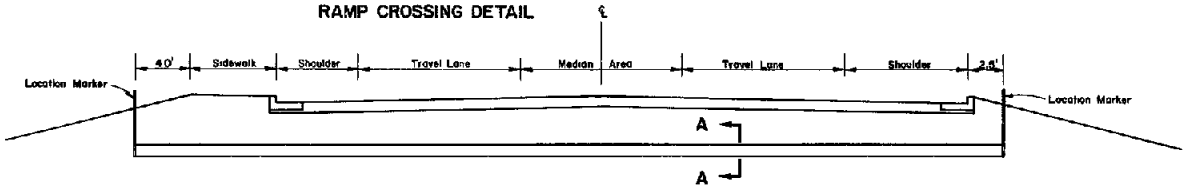
FREEWAY CROSSING DETAIL



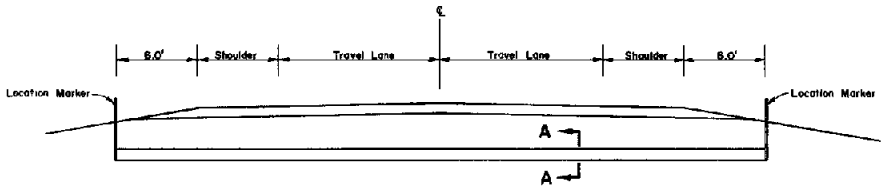


SECTION A-A

RAMP CROSSING DETAIL



CROSSROAD DETAIL



FRONTAGE ROAD DETAIL

GENERAL NOTES

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

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CONDUIT INSTALLATION FOR FUTURE WATER LINES

CHIEF ROAD DESIGN ENGR

R-243(213)
ADOPTED 5/73 REVISION 1-9/78

R24

Quantities shown below are for two headwalls

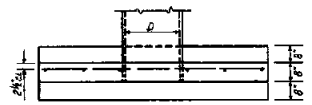
RCP SIZE D	RCP AREA SQ FT	SINGLE RCP 0° SKEW CONC CU YD	0° SKEW STEEL LB	15° SKEW CONC CU YD	15° SKEW STEEL LB	30° SKEW CONC CU YD	30° SKEW STEEL LB	45° SKEW CONC CU YD	45° SKEW STEEL LB	DOUBLE RCP 0° SKEW CONC CU YD	0° SKEW STEEL LB	15° SKEW CONC CU YD	15° SKEW STEEL LB	30° SKEW CONC CU YD	30° SKEW 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"	1.28	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 3/4"	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	86	2.59	98	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	3.89	137	4.21	144	0'-11"	1'-3"	8'-0"	4'-5"
30"	4.91	3.08	117	3.37	123	3.41	124	3.44	127	4.07	141	4.36	148	4.55	152	4.90	159	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	141	4.29	149	4.34	151	4.47	154	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

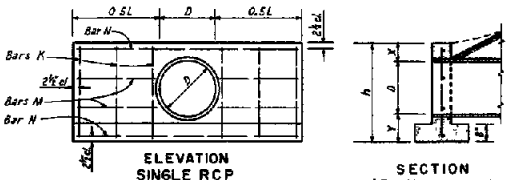
RCP SIZE	LENGTH OF REINFORCING BARS SINGLE 0° To 45°	SINGLE 0°	SINGLE 15°	SINGLE 30°	SINGLE 45°	SINGLE OR DOUBLE 0°	SINGLE OR DOUBLE 15°		SINGLE OR DOUBLE 30°		SINGLE OR DOUBLE 45°		DOUBLE 0° To 45°	DOUBLE 0°	DOUBLE 15°	DOUBLE 30°	DOUBLE 45°
	Nº 4	Nº 6	Nº 5	Nº 5	Nº 5	Nº 4	Nº 4	Nº 4	Nº 4	Nº 4	Nº 4	Nº 4	Nº 4	Nº 5	Nº 5	Nº 5	Nº 5
	K	N	N	N	N	M	M	Q	M	Q	M	Q	K	N	N	N	N
12"	6@2'-9"	2@4'-9"	2@ 5'-2"	2@ 5'-4"	2@ 5'-7"	2@1'-7"	1@1'-5"	1@2'-1"	1@1'-4"	1@2'-2	1@1'-1"	1@2'-5"	7@2'-5"	2@ 7'-0"	2@ 7'-6"	2@ 7'-11"	2@ 8'-5"
15"	6@3'-1"	2@6'-0"	2@ 6'-6"	2@ 6'-8"	2@ 7'-0"	2@2'-1"	1@1'-11"	1@2'-8"	1@1'10"	1@2'-9"	1@1'-7"	1@3'-0"	7@3'-1	2@ 8'-6"	2@ 9'-2"	2@ 9'-7"	2@10'-7"
18"	6@3'-4"	2@7'-0"	2@ 7'-6"	2@ 7'-10"	2@ 8'-2"	4@2'-5"	2@2'-3"	2@3'-1"	2@2'-2"	2@3'-2"	2@1'11"	2@3'-5"	7@3'-4"	2@ 9'-5"	2@10'-6"	2@11'-0"	2@12'-1"
21"	6@3'-8"	2@8'-0"	2@ 8'-5"	2@ 8'-11"	2@ 9'-5	4@2'-9"	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'-9"	4@3'6"	2@3'-4"	2@4'-4"	2@3'-3"	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'-9"	2@5'-1"	2@3'-6"	2@5'-4"	9@4'-6"	2@16'-3"	2@16'-11"	2@17'-9"	2@19'-7"
33"	8@4'-10"	2@12'-3"	2@13'-4	2@13'-8"	2@14'-4"	4@4'-5"	2@4'-1"	2@5'-3"	2@4'-0"	2@5'-6"	2@3'-9"	2@5'-7"	9@4'10"	2@17'-3"	2@18'-6"	2@19'-6"	2@21'-5"
36"	10@3'-1"	2@13'-3	2@14'-5"	2@14'-9"	2@15'-7"	6@4'-8"	3@4'-6"	2@5'-9"	3@4'-5"	3@5'-10"	3@4'-2"	3@6'-1"	11@3'-1"	2@18'-8"	2@20'0"	2@21'-0"	2@22'-2"

GENERAL NOTES

1 - Concrete shall be Class A or AA
2 - Reinforcing steel shall be deformed bars with maximum spacing of 18" set 2½" clear of surface of concrete except as noted Bar ends shall be kept 1½" 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 0°, 15°, 30° or 45° where it is feasible.
6 - Dimensions X, Y, L and h to remain constant regardless of inner variations in wall thickness due to class of pipe used

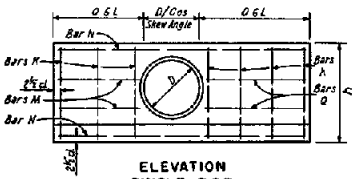


PLAN

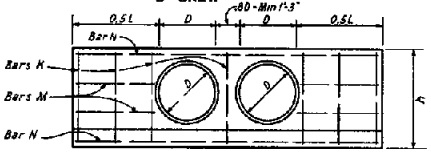


ELEVATION
SINGLE RCP
0° SKEW

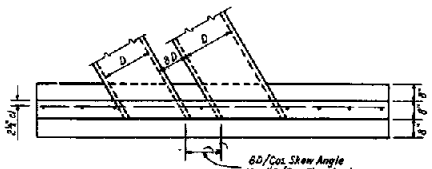
SECTION
(For All Headwalls)



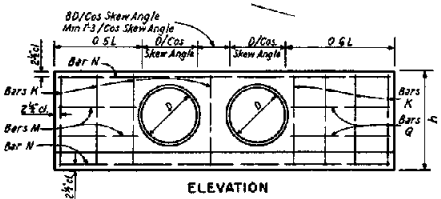
ELEVATION
SINGLE RCP
15° TO 45° SKEW



ELEVATION
DOUBLE RCP
0° SKEW



PLAN



ELEVATION
DOUBLE RCP
15° TO 45° SKEW

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS
12" RCP TO 36" RCP

CHIEF ROAD DESIGN ENGR.

R-2.5.1-(502)
ADOPTED 8/69 | REVISION

R25

Quantities shown below are for two headwalls

RCP SIZE D	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	RCP SIZE D
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'-0⅛"	2'-0⅛"	12'-0"	6'-6⅛"	42"
48"	12.57	7.41	688	8.10	746	8.21	781	8.46	798	9.58	829	10.65	883	11.07	935	11.96	1030	1'-1"	2'-1"	13'-9"	7'-2"	48"
54"	15.90	9.81	390	10.71	1091	10.87	1036	11.21	1146	13.11	1236	14.12	1340	14.68	1395	15.86	1562	1'-1⅞"	2'-1⅞"	15'-6"	7'-9"	54"
60"	19.64	11.89	1137	12.38	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"	60"
72"	28.27	15.62	1825	17.05	2002	17.30	2045	17.83	2170	20.87	2247	22.43	2464	23.36	2596	25.26	2881	1'-3"	2'-3"	20'-8"	9'-6"	72"

Quantities shown below are for one headwall

LENGTH OF REINFORCING BARS

SINGLE RCP

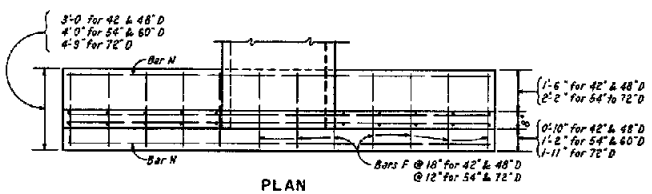
RCP SIZE	0° SKEW №5 F	0° SKEW №5 G	0° SKEW №4 M	0° SKEW №4 N	0° SKEW №4 K	15° SKEW №5 F	15° SKEW №5 G	15° SKEW №4 M	15° SKEW №4 Q	15° SKEW №4 N	15° SKEW №4 K	30° SKEW №5 F	30° SKEW №5 G	30° SKEW №4 M	30° SKEW №4 Q	30° SKEW №4 N	30° SKEW №4 K	45° SKEW №5 F	45° SKEW №5 G	45° SKEW №4 M	45° SKEW №4 Q	45° SKEW №4 N	45° SKEW №4 K
42"	12@2'-9"	10@7'-6"	12@5'-5	9@15'-3"	10@5'-8"	13@2'-9"	11@7'-6"	6@5'-3"	6@6'-6"	9@16'-7"	11@5'-8"	13@2'-9"	11@7'-6"	6@5'-1"	6@6'-6"	9@17'-0"	11@5'-8"	14@2'-9"	12@7'-6"	6@4'-11"	6@6'-6"	9@17'-11"	12@5'-8"
48"	13@2'-9"	12@8'-1"	12@6'-3"	9@17'-6"	12@6'-3"	14@2'-8"	13@8'-1"	6@6'-1"	6@7'-5"	9@19'-0"	13@6'-3"	15@2'-9"	14@8'-1"	6@5'-11"	6@7'-5"	9@19'-6"	14@6'-3"	15@2'-9"	14@8'-1"	6@5'-9"	6@7'-5"	9@20'-6"	14@6'-3"
54"	21@3'-9"	16@9'-1"	16@7'-1"	10@19'-9"	12@6'-10"	23@3'-8"	18@3'-1"	8@6'-11"	8@8'-5"	10@21'-6"	13@6'10"	23@3'-8"	18@9'-1"	8@6'-9	8@8'-5	10@22'-0"	13@6'10"	24@3'-9"	19@9'-1"	8@6'-7"	8@8'-5"	10@23'-2"	14@6'10"
60"	23@3'-9"	18@9'-5"	16@7'-9"	10@21'-9"	14@7'-5"	25@3'-9"	20@9'-8"	8@7'-7"	8@9'-4"	10@23'-8"	15@7'-5"	25@3'-9"	20@9'-8"	8@7'-5"	8@9'-4	10@24'-5"	15@7'-5"	27@3'-9"	22@9'-8"	8@7'-3"	8@9'-4"	10@25'-6"	16@7'-5"
72"	27@4'-6"	30@11'-7"	20@8'-11"	12@26'-0"	16@8'-7"	25@4'-6"	33@11'-7"	10@5'-2"	10@11'-3"	12@28'-3"	18@8'-7"	30@4'-6"	34@11'-7"	10@5'-0"	10@11'-3"	12@29'-0"	18@8'-7"	32@4'-6"	37@11'-7"	10@8'10"	10@11'-3"	12@30'-6"	19@8'-7"

DOUBLE RCP

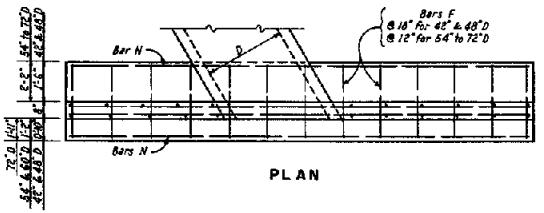
RCP SIZE	F	G	M	N	K	F	G	M	Q	N	K	F	G	M	Q	N	K	F	G	M	Q	N	K
42"	16@2'-9"	11@7'-6"	12@5'5"	9@21'-6"	11@5'-8"	17@2'-9"	12@7'-6"	6@5'-3"	6@6'-6"	9@23'-1"	12@5'-8"	18@2'-9"	13@7'-6"	6@5'-1"	6@6'-6"	9@24'-8"	13@5'-8"	20@2'-9"	15@7'-6"	6@4'-11"	6@6'-6"	9@26'-10"	15@5'-8"
48"	18@2'-9"	13@8'-1"	12@6'-3"	9@24'-9"	13@6'-3"	19@2'-8"	14@8'-1"	6@6'-1"	6@7'-5"	9@26'-6"	14@6'-3"	20@2'-9"	15@8'-1"	6@5'11"	6@7'-5"	9@27'10"	15@6'-3"	22@2'-9"	17@8'-1"	6@5'-9"	6@7'-5"	9@30'9"	17@6'-3"
54"	29@3'-9"	19@9'-1"	16@7'-0"	10@27'-10"	14@6'-10"	31@3'-9"	21@9'-1"	8@6'-11"	8@8'-5"	10@29'-10"	15@6'10"	32@3'-9"	22@9'-1"	8@6'-9"	8@8'-5"	10@31'-4"	16@6'10"	36@3'-9"	26@9'-1"	8@6'7"	8@8'-5"	10@34'-6"	18@6'10"
60"	32@3'-9"	21@9'-8"	16@7'-9"	10@30'-9"	14@7'-5"	35@3'-9"	24@9'-8"	8@7'-7	8@9'-4"	10@33'-0"	16@7'-5"	36@3'-9"	25@9'-8"	8@7'-5"	8@9'-4"	10@34'-8"	17@7'-5"	40@3'-9"	29@9'-8"	8@7'-3"	8@9'-4	10@36'-3"	19@7'-5"
72"	37@4'-6"	35@11'-7"	20@9'-11"	12@36'-10"	19@8'-7"	40@4'-6"	39@11'-7"	10@5'-2"	10@11'-3"	12@39'-6"	21@8'-7"	42@4'-6"	42@11'-7"	10@5'-0"	10@11'-3"	12@41'-5"	22@8'-7"	46@4'-6	48@11'-7"	10@8'10"	10@11'-3"	12@45'10"	25@8'-7"

GENERAL NOTES

1 - Concrete shall be class A or A4
2 - Reinforcing steel shall be deformed bars with maximum spacing of 18" and 2"± clear of surface of concrete except as noted. Bar ends shall be kept 1"± 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
40° to 55° - Use quantities for 45° skew
Over 55° - Calculate quantities required.
Culverts should be installed on 0°, 15°, 30°, or 45° 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



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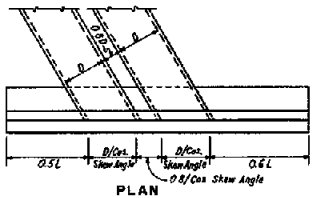
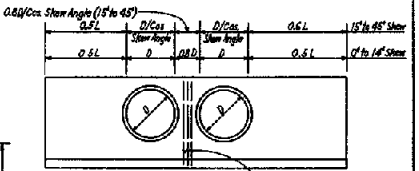
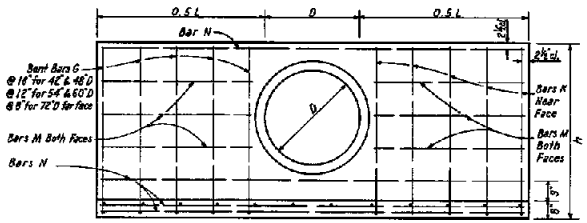


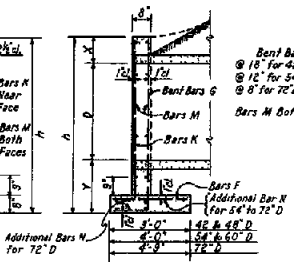
PLAN



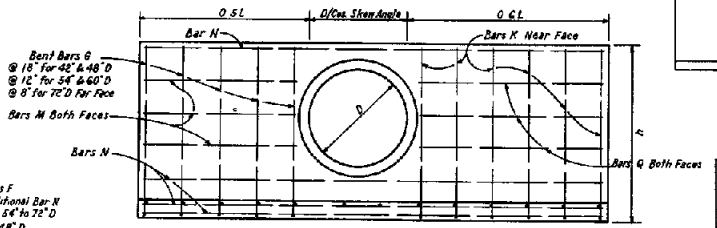
ELEVATION
DOUBLE RCP
0° TO 45° SKEW



ELEVATION
SINGLE RCP
0° SKEW



SECTION



ELEVATION
SINGLE RCP
15° TO 45° SKEW

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS
42" RCP TO 72" RCP

CHIEF ROAD DESIGN ENGR.

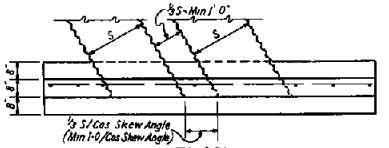
R-252-(502)
ADOPTED 8/69
REVISION

R26

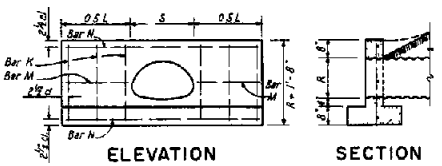
CMAP SIZE S X R	CMP DIA	CMAP AREA SQ. FT	L	SINGLE CMAP 0° SKEW CONC CU YD	0° SKEW STEEL LB	15° SKEW CONC CU YD	15° SKEW STEEL LB	30° SKEW CONC CU YD	30° SKEW STEEL LB	45° SKEW CONC CU YD	45° SKEW STEEL LB	DOUBLE CMAP 0° SKEW CONC CU YD	0° SKEW STEEL LB	15° SKEW CONC CU YD	15° SKEW STEEL LB	30° SKEW CONC CU YD.	30° SKEW STEEL LB	45° SKEW CONC CU YD	45° SKEW STEEL LB
17" X 13"	15"	1.1	31'3"	0.82	35	0.84	37	0.97	38	1.02	36	1.38	48	1.88	51	1.66	53	1.85	51
21" X 15"	18"	1.6	34'9"	1.05	40	1.13	42	1.17	44	1.26	45	1.54	55	1.66	58	1.74	60	1.96	65
24" X 18"	21"	2.3	41'9"	1.45	50	1.52	54	1.58	56	1.67	55	1.99	66	2.13	69	2.24	72	2.67	78
28" X 20"	24	2.9	5'0"	1.31	39	1.64	63	1.68	64	1.79	66	2.13	77	2.29	81	2.40	86	2.97	90
35" X 24"	30"	4.6	5'0"	1.93	70	2.09	76	2.13	75	2.28	79	2.67	91	2.86	95	3.00	99	3.32	106
42" X 29"	36"	6.6	7'3"	2.60	101	2.70	107	2.78	108	2.96	112	3.41	126	3.56	132	3.86	136	4.26	143
49" X 33"	42"	8.5	8'3"	2.99	116	3.25	122	3.34	122	3.52	127	4.10	143	4.39	150	4.61	155	5.08	165
57 X 38"	48"	11.6	9'6"	3.69	130	4.00	137	4.10	140	4.33	143	5.03	165	5.39	171	5.66	177	6.26	189
64" X 43"	54"	14.5	10'6	4.27	156	4.63	166	4.75	168	5.01	172	6.06	199	6.26	208	6.53	216	7.23	228
71" X 47"	60"	17.5	11'6	4.90	186	5.32	196	5.45	197	5.74	204	6.66	231	7.14	242	7.49	249	8.26	265
77" X 52"	66"	21.2	12'6	5.81	216	6.33	235	5.68	228	6.82	235	8.39	265	8.46	275	8.68	286	8.74	302
83 X 57"	72"	25.0	13'6"	6.81	246	7.38	256	7.23	260	7.72	267	9.44	296	9.57	308	10.00	318	10.38	339

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

PLAN
SINGLE CMAP

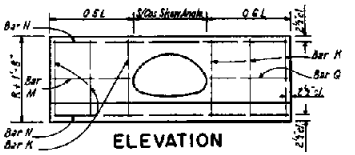


PLAN
DOUBLE CMAP

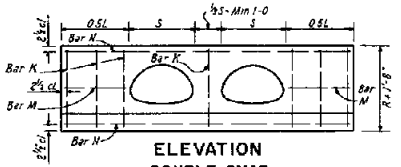


ELEVATION
SINGLE CMAP

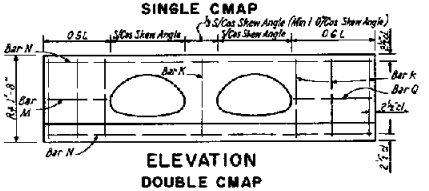
SECTION
(For all Headwalls)



ELEVATION
SINGLE CMAP



ELEVATION
DOUBLE CMAP
0° SKEW



ELEVATION
DOUBLE CMAP
15° TO 45° SKEW

GENERAL NOTES

1 - Concrete shall be class A or AA
2 - Reinforcing steel shall be deformed bars with maximum spacing of 18" set 2½" clear of surface of concrete except as noted Bar ends shall be kept 1½" 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 0°, 15°, 30° or 45° where it is feasible

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS

17"X13" CMAP TO 83"X57" CMAP

CHIEF ROAD DESIGN ENGR.

R-2 6 1. (502)
ADOPTED 6/66 REVISION

R27

Quantities shown below are for two headwalls

OVAL RCP SIZE W & 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"x 14"	18"	1 82	1 37	57	1 49	60	1 52	61	1 60	63	1 34	74	2 08	77	2 18	80	2 40	86	10¾"	1'-2¼"	4'-9"	3'-3½"
30"x 19"	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	11¼"	1'-3¼"	6'-3"	3'-9½"
34"x 22"	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	11¼"	1'-3¼"	7'-0"	4'-1"
38"x 24"	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 28	137	11⅝"	1'-3¾"	7'-6"	4'-3½"
42"x 27"	33"	6 39	2 94	113	3 20	120	3 26	121	3 40	125	4 00	141	4 30	148	4 49	153	2 91	162	11⅝"	1'-3¾"	8'-3"	4'-8⅞"
45"x 29"	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'-0⅛"	1'-4⅛"	9'-0"	4'-10"
53"x 34"	42"	10 15	4 06	164	4 42	173	4 50	175	4 68	180	5 48	193	5 90	203	6 14	214	6 69	226	1'-1"	1'-5"	10'-3"	5'-4"
60"x 38"	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'-1⅞"	1'-5⅛"	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	0° No 5	15° No 5	30° No 5	45° No 5	SINGLE OR DOUBLE OVAL RCP 0° No 4	15° No 4	15° No 4	30° No 4	30° No 4	45° No 4	45° No 4	DOUBLE OVAL RCP 0°-45° No 4	0° No 5	15° No 5	30° No 5	45° No 5
	K	N	N	N	N	M	M	Q	M	Q	M	Q	K	N	N	N	N
23"x 14"	6@3-1	2@6-5"	2@ 7'-0"	2@ 7'-2"	2@ 7'-8"	2@1-11"	1@1'-5"	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"x 19"	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"x 22"	6@3-10"	2@3'-7"	2@10'-6"	2@10'-9"	2@11'-5"	4@3'-0"	2@2'-10"	2@3'-5"	2@2'-5"	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"x 24"	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"x 27"	8@4-6"	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"x 29"	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"x 34"	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"x 38"	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

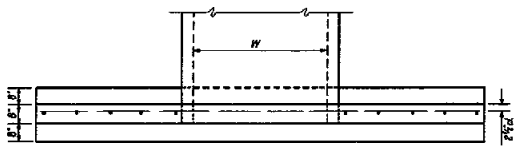
2 Reinforcing steel shall be deformed bars with maximum spacing of 18" set 2½ clear of surface of concrete except as noted Bar ends shall be kept 1½ clear of surface of concrete Reinforcing bars may be cut and bent in field

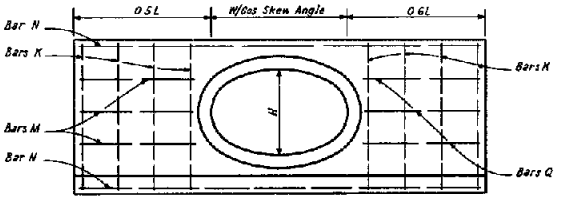
3- Footings shown are of minimum depth and shall be extended if soil is unsuitable or liable to scour

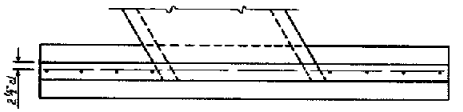
4- Culvert pipes to be set on a skew shall be mitered when headwalls are constructed When headwalls are not constructed the pipes shall not be mitered except in overflow section

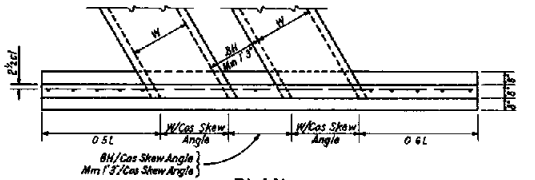
5- Dimension X, Y, L and h to remain constant regardless of minor variations in wall thickness due to class of pipe used

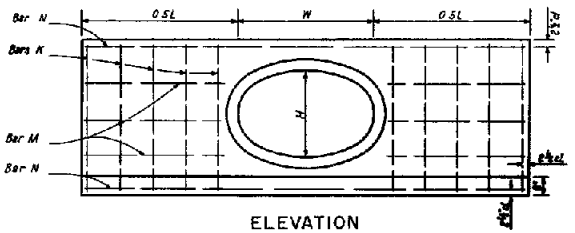
6- For estimating headwall quantities on skewed culverts
0° to 10° - Use quantities for 0° skew.
11° to 25° - Use quantities for 15° skew
26° to 40° - Use quantities for 30° skew.
41° to 55° - Use quantities for 45° skew
Over 55° - Calculate quantities required
Culverts should be installed on 0°, 15°, 30° or 45° where it is feasible

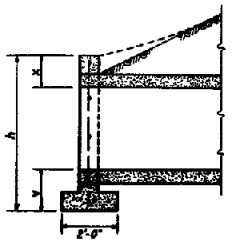


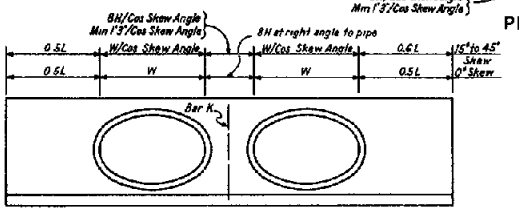












NOTE For Details of other Reinforcing Bars, See Single Culvert Headwalls

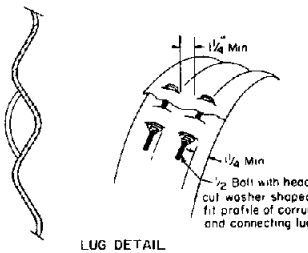
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CULVERT HEADWALLS
23"X14" OVAL RCP TO 60"X38" OVAL RCP

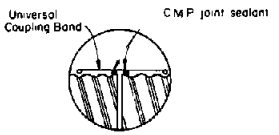
William L. Maxwell
CHIEF ROAD DESIGN ENGR

R-2.71-(502)
ADOPTED 8/69 REVISION

R 28

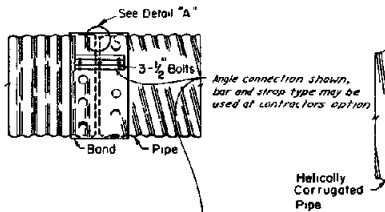


LUG DETAIL



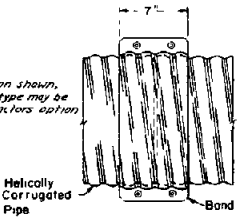
DETAIL "A"

NOTE For HCMP Overside Drains and Slotted Drains

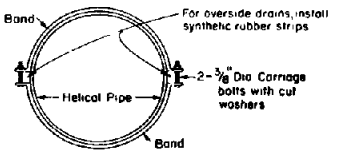


SECTION THRU DIMPLES

UNIVERSAL COUPLING BAND FOR USE ON CMP THRU 36" INCLUSIVE

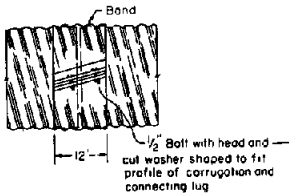


TOP VIEW

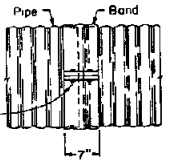


END VIEW

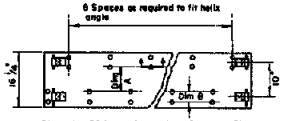
TWO PIECE INTEGRAL FLANGE DIE FORMED FOR USE ON 6",8"&10" HCMP



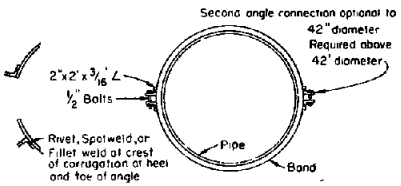
12" HELICALLY CORRUGATED BAND WITH INTEGRAL FORMED CONNECTING LUG FOR USE ON 12"-24" HCMP



7" WIDE COUPLING BAND WITH INTEGRAL FORMED CONNECTING LUGS FOR USE ON CMP THRU 30" INCLUSIVE

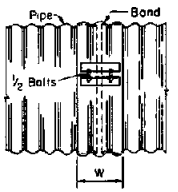


UNIVERSAL COUPLING BAND FOR USE ON CSP 42" THRU 60" INCLUSIVE

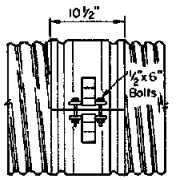


CONNECTION ANGLE DETAIL

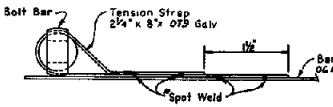
TYPICAL COUPLING BAND



ANNULAR COUPLING BAND

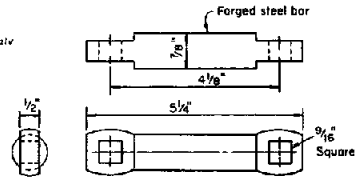


ALTERNATIVE ANNULAR COUPLING BAND FOR HCMP THRU 84"



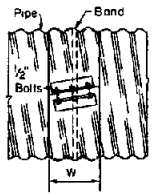
STRAP DETAIL

*Spot welds shall develop full strength of strap



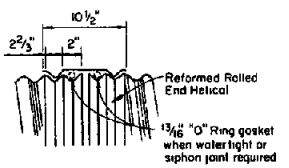
LEFT SIDE VIEW FRONT VIEW

BAR DETAIL

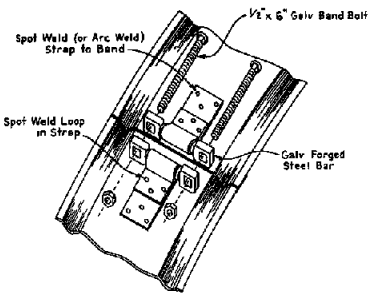


HELICAL COUPLING BAND

ANNULAR COUPLING BAND			
CORRUGATION	PIPE SIZE	W (In Min.)	½" BOLTS (No. each connection)
2⅔" x ½"	Thru 30"	7	2
2⅔" x ½"	Thru 60"	12	3
2⅔" x ½"	Thru 84"	24	5
3" x 1"	54" thru 60"	14	3
3" x 1"	Thru 96"	26	5
HELICAL COUPLING BAND			
2⅔" x ½"	12" thru 60"	12	3
2⅔" x ½"	Thru 84"	24	5



JOINT CROSS SECTION ALTERNATIVE ANNULAR COUPLING BAND FOR HELICAL WELD SEAM ONLY



BAR & STRAP CONNECTOR

GENERAL NOTES

1. All coupling band connecting hardware shall be galvanized
2. For helically corrugated coupling bands, the connection angles may be oriented parallel to the pipe axis, provided connecting holes are slotted lengthwise sufficiently to allow adjustment for the helix angle
3. For pipe arches use same width band as for round pipe of equal perimeter
4. For watertight and siphon joints on alternative annular coupling band place mastic sealant strip ⅜" thick x 1½" wide x 8" long in lap between bands
5. For alternative annular coupling band, 2 bar and strap assemblies required for pipe greater than 42" diameter, Optional for sizes less than 42"

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

COUPLING BAND DETAILS CMP AND PIPE ARCHES

CHIEF ROAD DESIGN ENGR

R-2.81-(604)
ADOPTED 6/71
REVISION

R30

Quantities shown below are for two headwalls

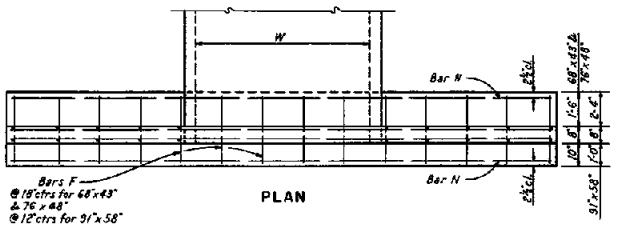
OVAL RCP SIZE W & H	RCP SIZE	OVAL RCP AREA SQ FT	SINGLE OVAL RCP 0° SKEW CONC CU YD	0° SKEW STEEL LB	15° SKEW CONC CU YD	15° SKEW STEEL LB	30° SKEW CONC CU YD	30° SKEW STEEL LB	45° SKEW CONC CU YD	45° SKEW STEEL LB	DOUBLE OVAL RCP 0° SKEW CONC CU YD	0° SKEW STEEL LB	15° SKEW CONC CU YD	15° SKEW STEEL LB	30° SKEW CONC CU YD	30° SKEW STEEL LB	45° SKEW CONC CU YD	45° SKEW STEEL LB	X	Y	L	h
68"x 43"	54"	16 62	7 19	628	7 82	683	7 96	720	8.34	767	9 86	789	10.58	848	11 07	897	12 11	1031	1'-2½"	2'-2"	12'-9"	6'-11"
76"x 48"	60"	20 55	8 39	746	9 13	805	9 32	813	9 71	869	11 47	921	12.31	985	13 06	1075	15 66	1207	1'-2½"	2'-2½"	14'-3"	7'-5"
91"x 58"	72"	29 71	12 11	1168	13 18	1273	13 43	1321	14 02	1412	16 59	1495	17 82	1616	18.61	1730	20 36	1965	1'-3½"	2'-3½"	17'-0"	8'-5"

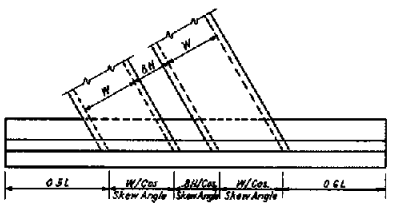
Quantities shown below are for one headwall

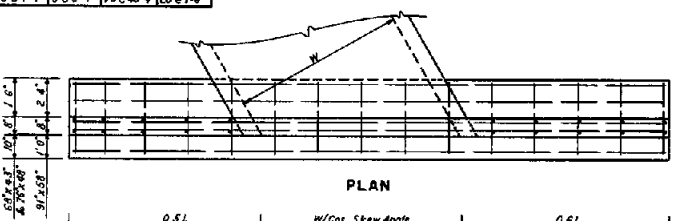
OVAL RCP SIZE W & H	LENGTH OF REINFORCING BARS SINGLE OVAL RCP 0° SKEW Nº 5 F	Nº 5 G	Nº 4 M	Nº 4 N	Nº 4 K	15° SKEW Nº 6 F	Nº 6 G	Nº 4 M	Nº 4 Q	Nº 4 N	Nº 4 K	30° SKEW Nº 6 F	Nº 6 G	Nº 4 M	Nº 4 Q	Nº 4 N	Nº 4 K	45° SKEW Nº 5 F	Nº 5 G	Nº 4 M	Nº 4 Q	Nº 4 N	Nº 4 K
68"x 43"	13@2'-9"	10@7'-10"	12@5'-8"	9@16'-2"	10@6'-0"	14@2'-9"	12@7'-10"	6@5'-6"	6@6'-10"	9@13'-8"	11@6'-0"	15@2'-8"	12@7'10"	6@5'-4"	6@6'-10"	9@20'-6"	12@6'-0"	16@2'-9"	13@7'-10"	6@5'-2"	6@6'-10"	8@21'-10"	13@6'-0"
76"x 48"	15@2'-5"	12@8'-4"	12@6'-4"	9@20'-4"	12@6'-6"	16@2'-9"	13@8'-4"	6@6'-2"	6@7'-7"	9@22'-0"	13@6'-6"	16@2'-8"	13@8'-4"	6@6'-0"	6@7'-7"	9@22'-5"	13@6'-6"	17@2'-9"	15@8'-4"	6@5'-10"	6@7'-7"	9@24'-5"	16@6'-6"
91"x 58"	25@3'-5"	18@9'-8"	16@7'-7"	10@20'-4"	12@7'-6"	21@3'-5"	20@9'-8"	8@7'-5"	8@9' 1"	10@26'-4"	13@7'-6"	25@3'-5"	21@9'-8"	8@7'-5"	8@9'-1"	10@27'9"	14@7'-6"	30@3'-9"	23@9'-8"	8@7'-1"	8@9'-1"	10@25'-2"	15@7'-6"
DOUBLE OVAL RCP																							
68"x 43"	15@2'-9"	11@7'-10"	12@6'-8"	9@26'-8"	11@6'-0"	20@2'-5"	12@7'-10"	6@5'-6"	6@6'-10"	9@26'-6"	12@6'-0"	21@2'-8"	13@7'10"	6@5'-4"	6@6'-11"	9@30'-2"	13@6'-0"	24@2'-8"	16@7'-10"	6@5'-2"	6@6'-10"	9@33'-10"	16@6'-0"
76"x 48"	21@2'-9"	13@8'-4"	12@6'-4"	9@29'-10"	13@6'-6"	22@2'-8"	14@8'-4"	6@6'-2"	6@7'-7"	9@33'-10"	14@6'-6"	24@2'-8"	16@8'-4"	6@6'-0"	6@7'-7"	9@34'-2"	13@6'-6"	26@2'-8"	19@8'-4"	6@5'-10"	6@7'-7"	9@37'-10"	19@6'-6"
91"x 58"	37@3'-5"	21@3'-8"	16@7'-7"	10@35'-5"	14@7'-6"	33@3'-5"	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'-5"	31@3'-8"	8@7'-1"	8@9'-1"	10@46'-4"	20@7'-6"

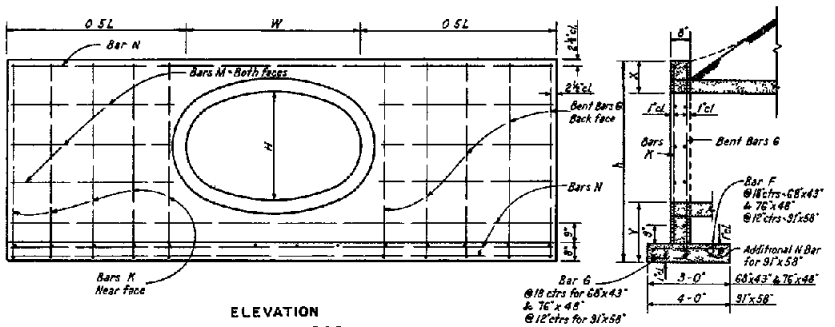
GENERAL NOTES

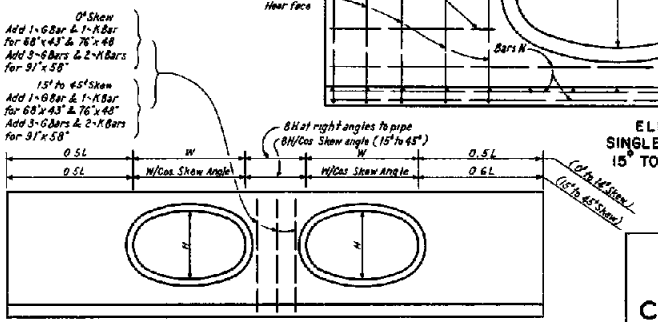
1- Concrete shall be class A or AA
2- Reinforcing steel shall be deformed bars with maximum spacing of 18" set 2½" clear of surface of concrete except as noted Bar ends shall be kept 1½" clear of surface of concrete Reinforcing bars may be cut and bent in field
3- Footings shown are of minimum depth 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 0°, 15°, 30° or 45° where it is feasible

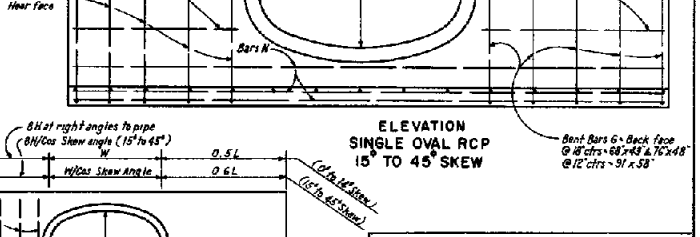












NOTE For Details of other Reinforcing Bars, See Single Culvert Headwalls

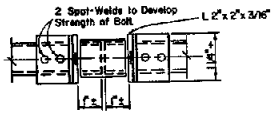
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

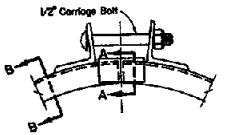
CULVERT HEADWALLS
68" X 43" OVAL RCP TO 91" X 58" OVAL RCP

William L. Maple
CHIEF ROAD DESIGN ENGR.

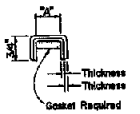
R-2.7.2-(502)
ADOPTED 8/69
REVISION

R 29





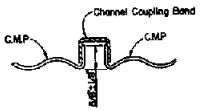
CHANNEL COUPLING BAND
FOR USE ON FLANGED END C.M.P.
(CHANNEL COUPLING BANDS SHALL BE TWO PIECE)



NOMINAL DIMENSIONS

THICKNESS	"A"	FOR USE WITH C.M.P.
0.075"	3/4"	0.109" THICK or LIGHTER
0.109"	1"	0.138" THICK or HEAVIER

SECTION A-A



SECTION B-B

SPIRAL C.M.P.
REFORMED TO ACCEPT FLANGE, ANNULAR, DIMPLE & HUGGER COUPLERS

C.M.P. COUPLING BAND DETAILS

CHANNEL COUPLING BAND FOR USE ON FLANGED END C.M.P. TO 30" DIAMETER
(CHANNEL COUPLING BANDS SHALL BE TWO PIECE)

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

C.M.P.
COUPLING BAND
DETAILS

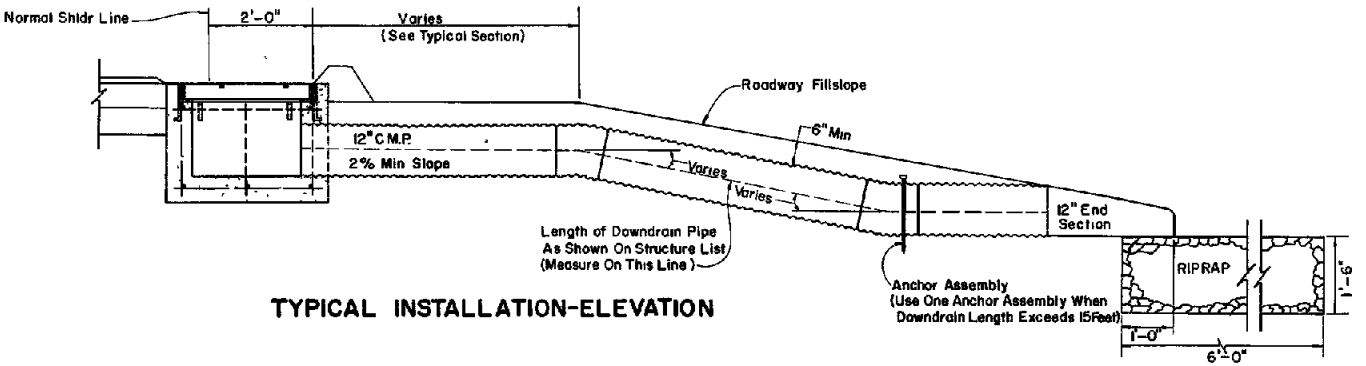
CHIEF ROAD DESIGN ENGR.

R-2.6.2 (604)
ADOPTED: 1/76
REVISION 1-3/93

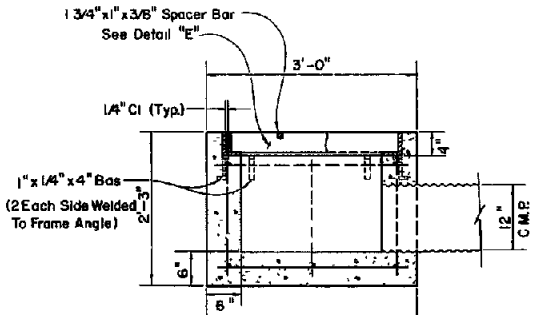
QUANTITIES*

CONCRETE	REINFORCING STEEL	STRUCTURAL STEEL
0.37 CU YD.	25 LBS	112 LBS.

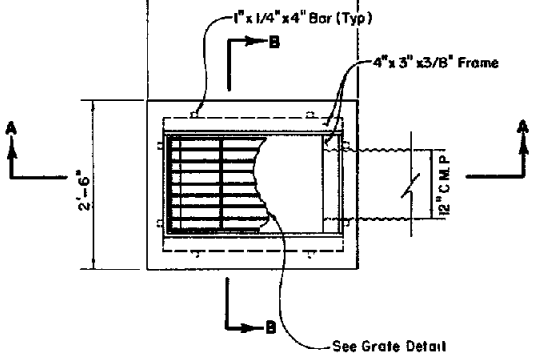
* FOR INFORMATION ONLY



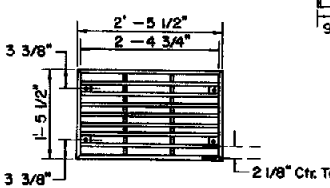
TYPICAL INSTALLATION-ELEVATION



SECTION A-A

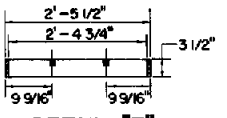


PLAN

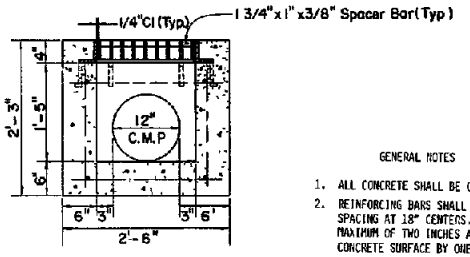


GRATE DETAIL

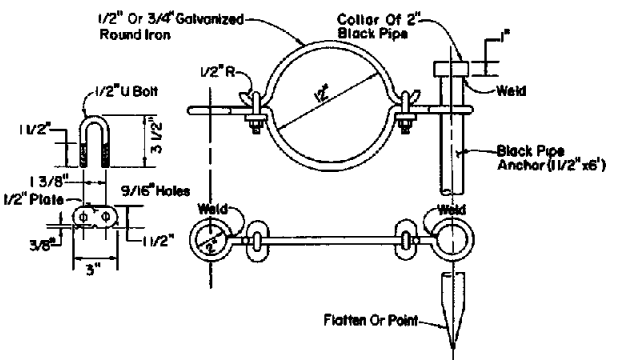
GRATE TO BE FASTENED WITH ½" X 1½" HEX. BOLT AND NUTS TO THE FRAME (SEE GRATE ATTACHMENT DETAILS 1 & 2)



DETAIL "E"



SECTION B-B



ANCHOR ASSEMBLY DETAIL

(FOR CIRCUMFERENTIALLY CORRUGATED PIPE)

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 MAXIMUM OF TWO INCHES AND BAR ENDS MUST CLEAR CONCRETE SURFACE BY ONE AND ONE HALF INCH.
3. ALL EXPOSED CONCRETE EDGES SHALL BE CHAMFERED ONE - INCH.
4. GRATE AND FRAME ANGLES TO BE WELDED AT ALL CONTACT POINTS.
5. FOR DETAILS NOT SHOWN SEE SHEET NO R-3.1 1

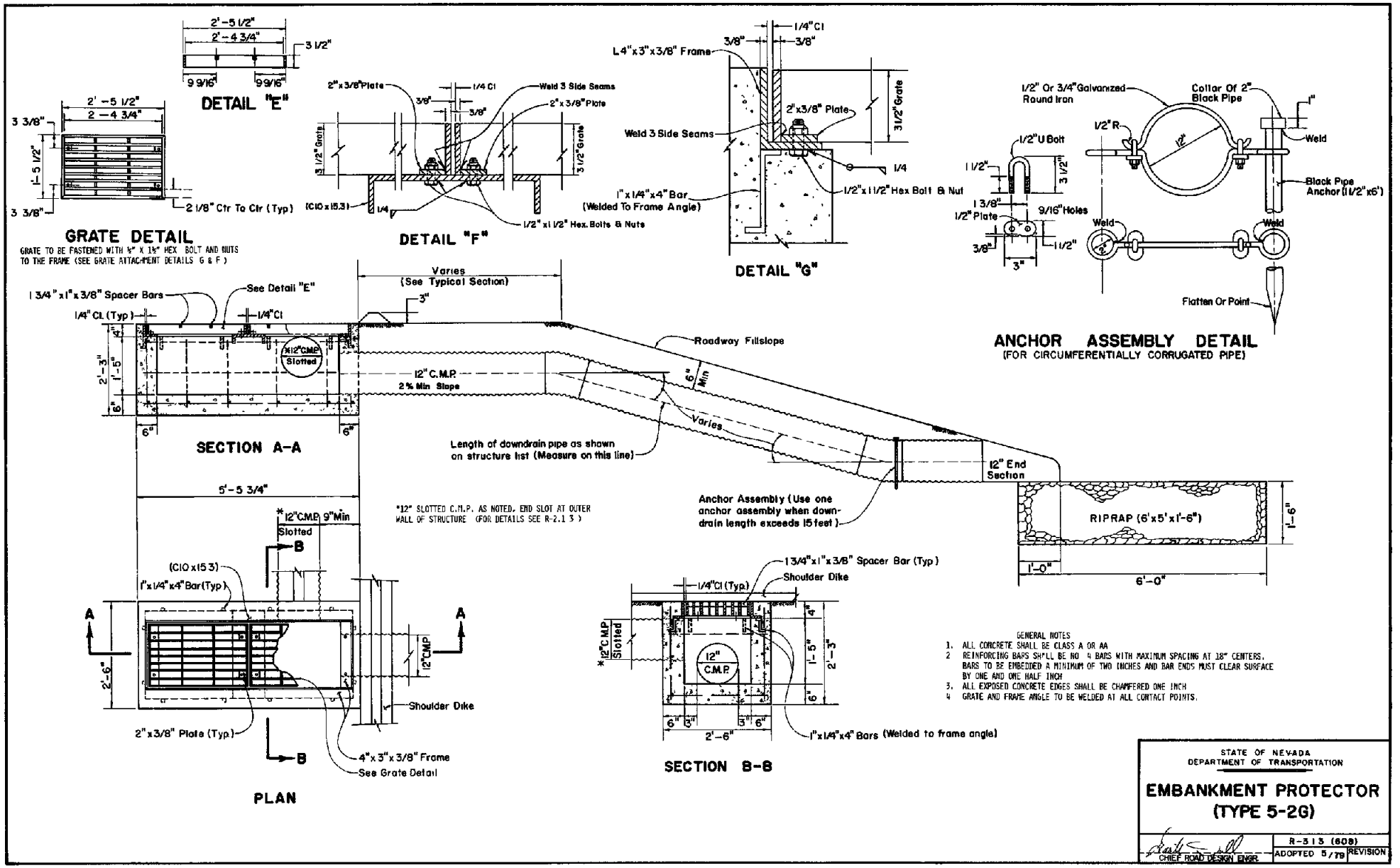
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

EMBANKMENT PROTECTOR (TYPE 5)

CHIEF ROAD DESIGN ENGR.

R-3 1 2 (608)
ADOPTED: 5/79 REVISION

R 32



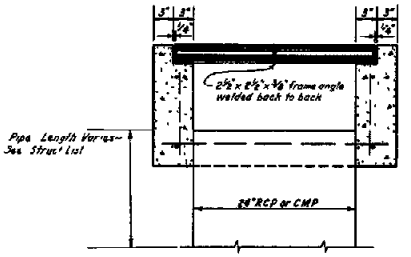
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

EMBANKMENT PROTECTOR (TYPE 5-2G)

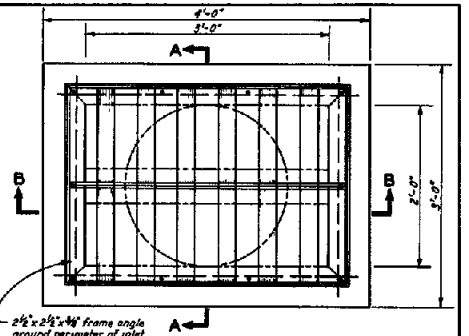
CHIEF ROAD DESIGN ENGR.

R-313 (608)
ADOPTED 5/79 REVISION

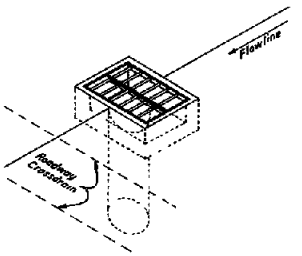
R33



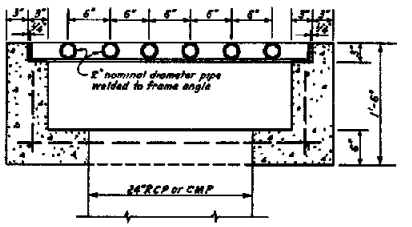
SECTION A-A



PLAN



TYPICAL INSTALLATION



SECTION B-B

QUANTITIES *		
Concrete	Reinf. Steel	Struct. Steel
0.36 cu. yd.	23 lbs	170 lbs

* For Information Only

GENERAL NOTES

1. All concrete shall be Class A or AA.
2. Reinforcing bars shall be #9 4 bars with maximum spacing at 18" centers Bars to be embedded a minimum of two inches and bar ends must clear concrete surfaces by one and one half inch
3. All exposed concrete edges shall be chamfered one inch
4. Structural steel weight includes the 2" pipe and the 2½" x 2½" x ⅜" frame angles

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

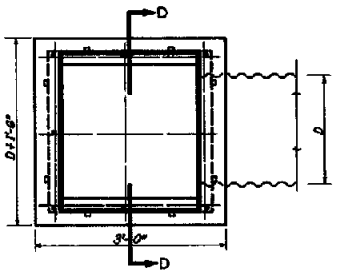
PIPE RISER INLET
(TYPE 3)

CHIEF ROAD DESIGN ENGR

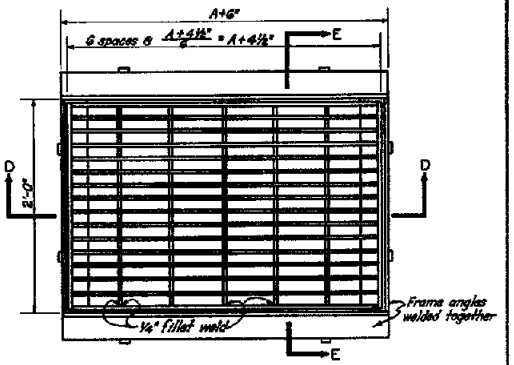
R-4.1.2-(609)

ADOPTED 6/89 | REVISION 2

R34



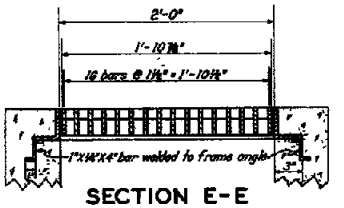
PLAN



PLAN

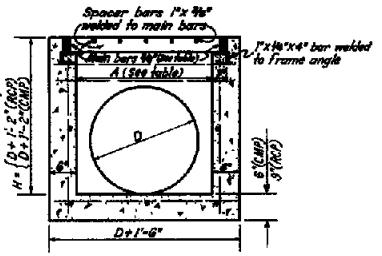
BILL OF MATERIALS

CMP size	Concrete cu. yd	Reinf lb.	A	RCP size	Concrete cu yd	Reinf lb.	A	Main bars, each	Frame Angles inches	Grate lb.	Frame lb.	Total lb.
18"	0.62	39	2'-0"	18"	0.58	40	2'-0"	8-½"x⅜"	2-2"x2"x¼"	140	67	207
24"	0.77	44	2'-6"	24"	0.76	55	2'-6"	8-½"x⅜"	2-2½"x2½"x¼"	197	88	285
30"	0.93	59	3'-0"	30"	0.89	60	3'-0"	8-½"x⅜"	2-3"x3"x¼"	264	96	360
36"	1.11	64	3'-6"	36"	1.17	65	3'-6"	8-½"x⅜"	2-3½"x3½"x¼"	347	118	464
42"	1.29	68	4'-0"	42"	1.35	70	4'-0"	8-½"x⅜"	2-4"x4"x¼"	382	122	504



SECTION E-E

STANDARD STRUCTURAL STEEL GRATE AND FRAME



SECTION D-D

TYPE 2 DROP INLET

GENERAL NOTES

1- All concrete shall be Class A or AA.
2- Reinforcing Steel shall be N°4 bars with maximum space of 18" centers, wired tightly at all intersections, and embedded at least one inch clear of concrete surface.
3- Exposed edges of concrete shall be chamfered one inch.
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 Plate-welded grating shown above

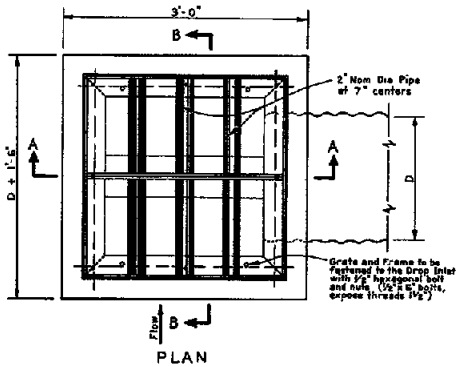
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 2 DROP INLET

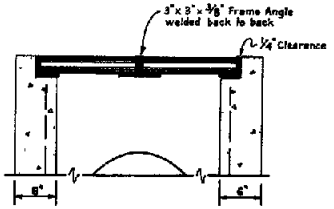
CHIEF ROAD DESIGN ENGR.

R-4 2.1-(609)
ADOPTED 8/69
REVISION 3-11/79

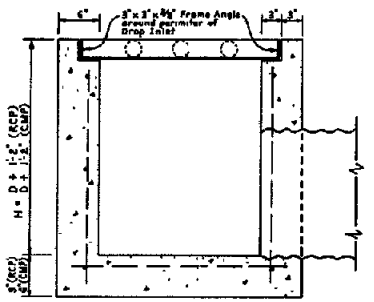
R 35



PLAN



SECTION B-B



SECTION A-A

CMP Size	Concrete Cu Yd	Reinf Lb	Struct 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	69	170

RCP Size	Concrete Cu. Yd.	Reinf Lb	Struct Steel Lb
18"	0.68	40	120
24"	0 84	45	132
30"	0 88	60	145
36"	1.17	65	156
42"	1 35	70	170

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 concrete surfaces by one and one half inch.

3 All exposed concrete edges shall be chamfered one inch

4 Structural steel weight includes the 2" pipe and the 3" 3" x 3/8" frame angles

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

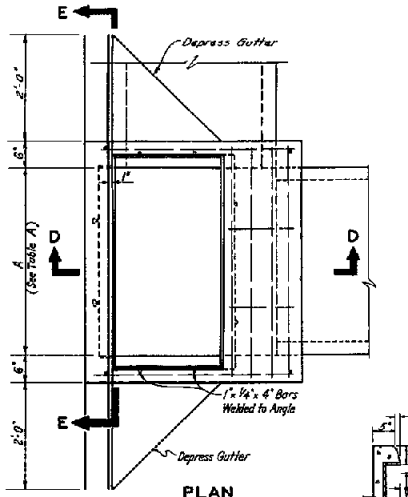
TYPE 2A DROP INLET

CHIEF ROAD DESIGN ENGR.

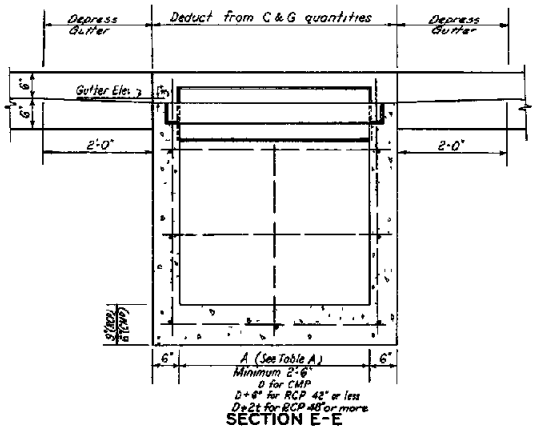
R-422-(609)

ADOPTED. 11/70

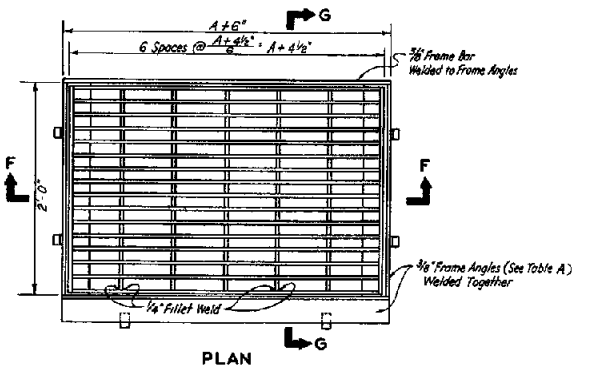
REVISION 1-1/75



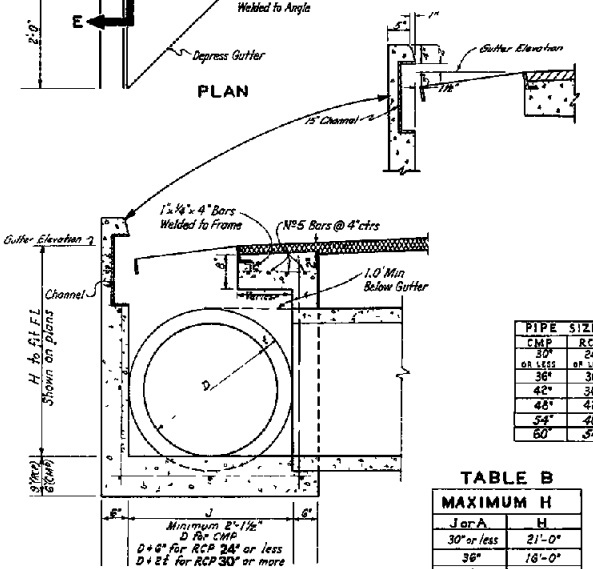
PLAN



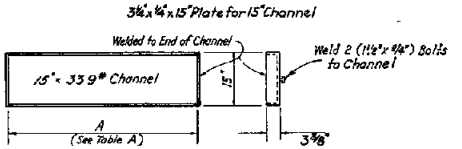
SECTION E-E



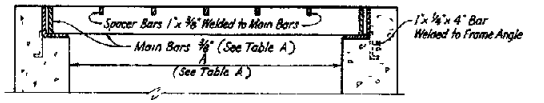
PLAN



SECTION D-D



CHANNEL DETAIL



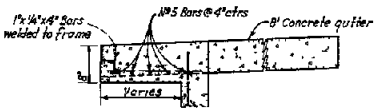
SECTION F-F

STRUCTURAL STEEL (TABLE A)

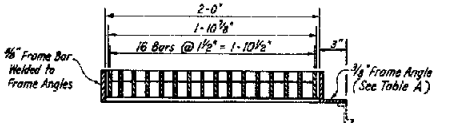
PIPE SIZE CMP	PIPE SIZE RCP	A	MAIN BARS	FRAME ANGLES	FRAME BAR	GRATE LBS	FRAME LBS	CHANNEL & PLATES, LBS	TOTAL LBS
30" OR LESS	24" OR LESS	2'-6"	3"x 3/8"	3½"x3"x 3/8"	3½"x 3/8"	128	67	107	373
36"	30"	3'-0"	3½"x 3/8"	4"x 3"x 3/8"	4"x 3/8"	265	79	123	467
42"	36"	3'-6"	4"x 3/8"	4½"x 3"x 3/8"	4½"x 3/8"	348	96	141	585
48"	42"	4'-0"	4"x 3/8"	4½"x 3"x 3/8"	4½"x 3/8"	367	103	150	620
54"	48"	4'-6"	4½"x 3/8"	5"x 3"x 3/8"	5"x 3/8"	413	119	175	707
60"	54"	5'-0"	5"x 3/8"	5½"x 3"x 3/8"	5½"x 3/8"	515	137	202	914

TABLE B

MAXIMUM H	
J or A	H
30" or less	21'-0"
36"	18'-0"
42"	12'-0"
48"	9'-0"
54"	7'-0"
60"	7'-0" (With #4 bars @ 12" centers)



SECTION
8' CONCRETE GUTTER



SECTION G-G

GRATE AND FRAME DETAIL

GENERAL NOTES

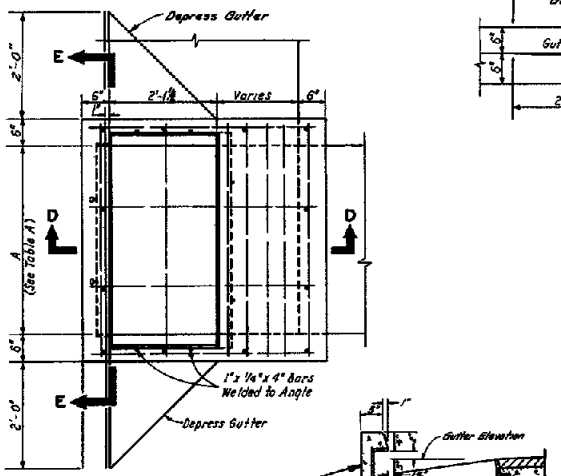
1 All concrete shall be Class A or AA.
2 All reinforcing steel shall be tightly wired and embedded 1½" clear of concrete surface Except as noted, all reinforcing steel shall be №4 bars with maximum space at 18" centers, for all values of H to the maximum as shown in table B If H exceeds these maximums, 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 $\frac{J}{\cos \text{SKEW } Z}$ Redesign for skews of A

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

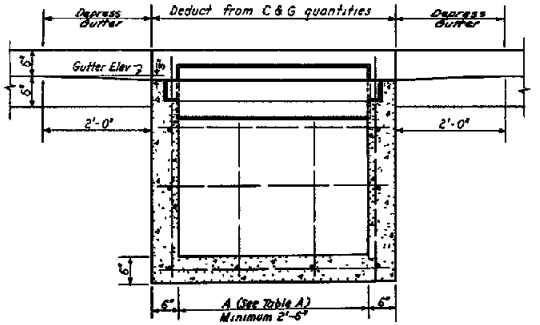
TYPE 3 DROP INLET

CHIEF ROAD DESIGN ENGR

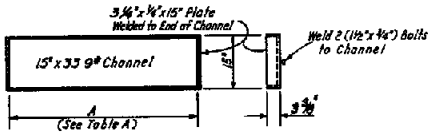
R-431-(609)
ADOPTED 8/69
REVISION 3-11/79



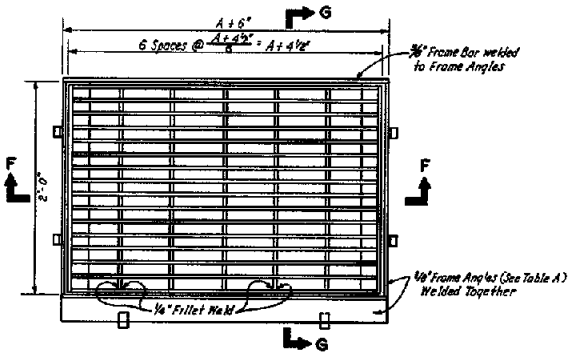
PLAN



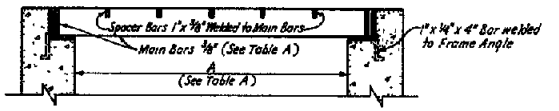
SECTION E-E



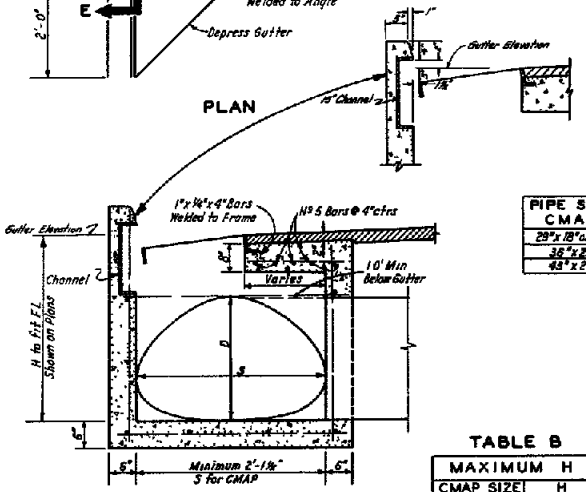
CHANNEL DETAIL



PLAN



SECTION F-F



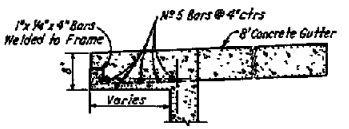
SECTION D-D

STRUCTURAL STEEL (TABLE A)

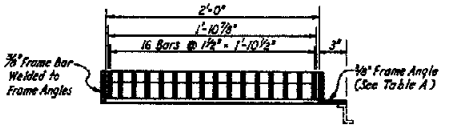
PIPE SIZE CMAP	A	MAIN BARS	FRAME ANGLES	FRAME BAR	GRATE LBS	FRAME LBS	CHANNEL & PLATES, LBS	TOTAL LBS
29"x 18" or Less	2'-6"	3" x ⅜"	3½" x 3½" x ⅜"	3½" x ⅜"	193	67	107	375
36" x 22"	3'-0"	3½" x ⅜"	4" x 3½" x ⅜"	4" x ⅜"	265	79	123	467
43" x 27"	3'-6"	4" x ⅜"	4½" x 3½" x ⅜"	4½" x ⅜"	346	96	141	583

TABLE B

MAXIMUM H	
CMAP SIZE	H
29" x 18" or Less	21'-0"
36" x 22"	16'-0"
43" x 27"	12'-0"



SECTION
8' CONCRETE GUTTER



SECTION G-G

GRATE AND FRAME DETAIL

GENERAL NOTES

1. All concrete shall be Class A or AA
2. Exposed edges of concrete shall be chamfered one inch.
3. All reinforcing steel shall be tightly wired and embedded 1½" clear of concrete surface. Except as noted, all reinforcing steel shall be No 4 bars with maximum space at 18" centers.
4. If H exceeds maximum shown on Table B, drop inlet will require special design.

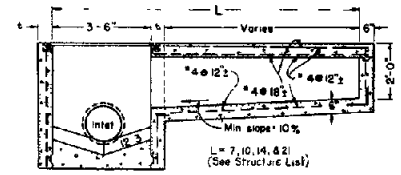
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 3A DROP INLET

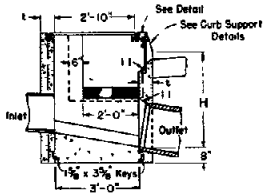
CHIEF ROAD DESIGN ENGR.

R-4.4.1-(609)
ADOPTED: 6/69
REVISION 2

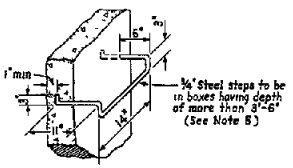
R38



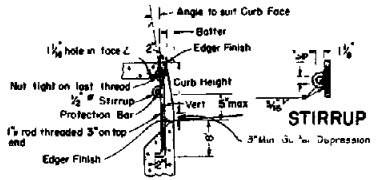
SECTION A-A



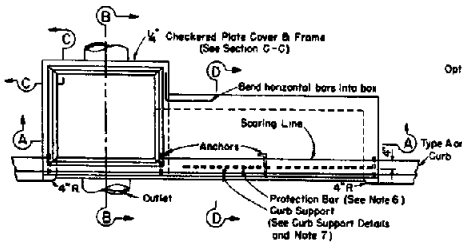
SECTION B-B



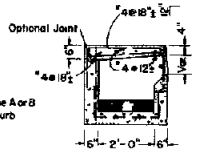
STEP DETAIL



CURB SUPPORT DETAILS

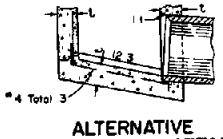


PLAN

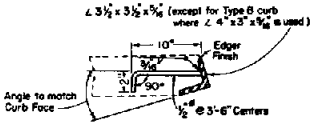


SECTION D-D

TYPE 4 DROP INLET



ALTERNATIVE REINFORCED BOTTOM



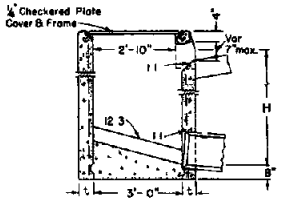
FACE ANGLE ANCHOR DETAIL

GENERAL NOTES

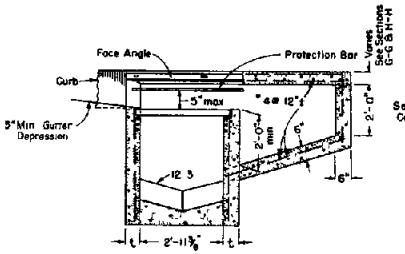
1 "H" is the difference in elevation between the outlet pipe flow line and the normal gutter grade line undepressed at the curb face
2 For "t" wall thickness see Table
3 Height of curb opening will vary with the type of curb and the depth of the local depression
4 Reinforcing steel in walls shall be #4 bars @ 18" centers placed 1½" clear to inside of box unless otherwise shown
5 Steps - None required where "H" is 3'-6" or less Install one step 16" above floor when "H" is more than 3'-6" and less than 5'-0" Where "H" is more than 5'-0" steps shall be evenly spaced @ 12" intervals from 16" above floor to within 12" of the top of the box Place steps in wall without pipe openings
6 When shown on the details, Place a "6 protection bar horizontally across the entire length of the opening and bend back 4" into the inlet wall on each side
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 Curb section shall match adjacent curb
10 Except for inlets used as junction boxes, basin floors shall have a minimum slope of 12 3 from all directions toward outlet pipe and shall have a wood trowel finish
11 Galvanizing See Standard Specifications or Special Provisions
12 Commercial prefabricated gratings approved by the Engineer may be used in lieu of those shown
13 Full penetration butt welds may be substituted for the fillet welds on all anchors
14 Standard square, hexagon, round or equivalent headed anchors may be substituted for the right angle hooks on the anchors shown on this plan

H	t
3'-0" or Less	6"
3'-1" to 20'-0"	8"

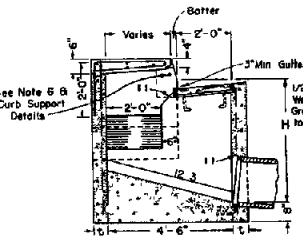
Length of Curb Opening	No of Anchors
3'-6" or less	2
7'-0"	3
10'-0"	4
14'-0"	5
21'-0"	7



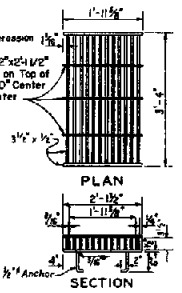
SECTION E-E

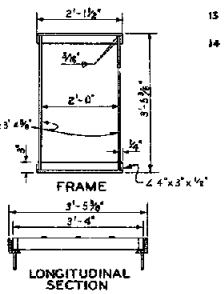


SECTION F-F



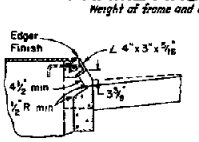
SECTION G-G

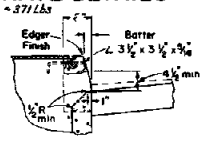




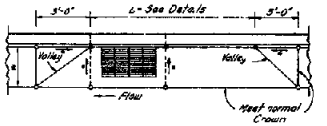
FRAME AND GRATE DETAILS

Weight of frame and Grate = 371 Lbs



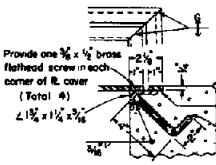


CURB OPENING DETAILS

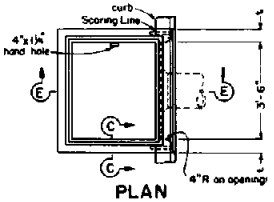


DROP INLET

o = Depressed elevation
o = Normal crown or gutter flowline elevation
w = Normal gutter width

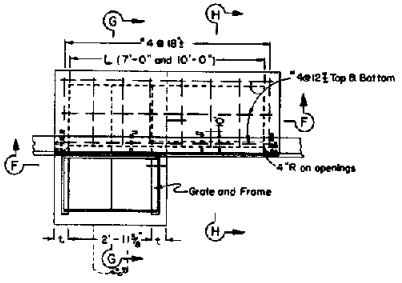


SECTION C-C



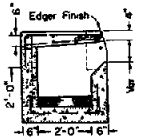
PLAN

TYPE 5 DROP INLET



PLAN

TYPE 6 DROP INLET



SECTION H-H

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 4, 5 & 6 DROP INLETS

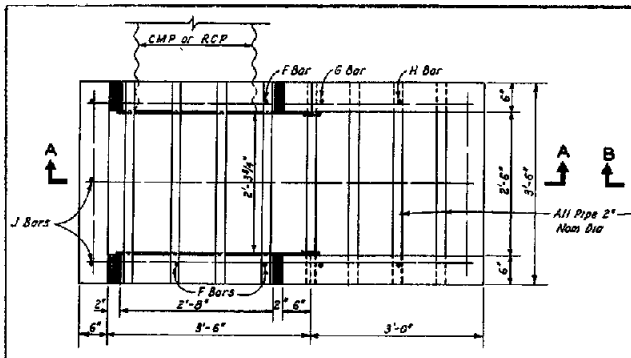
Robert D. Sharp
CHIEF ROAD DESIGN ENGR.

R-451-(609)

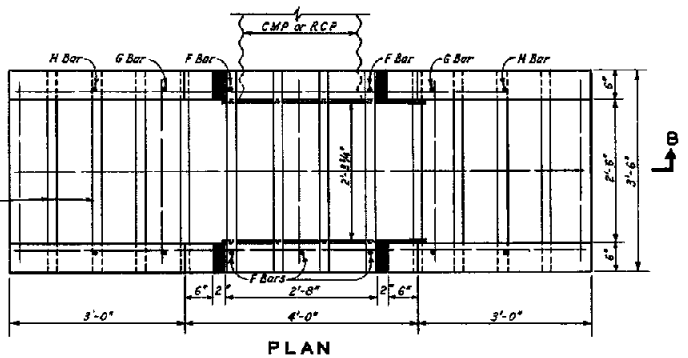
ADOPTED 5-7

REVISION 2 1-76

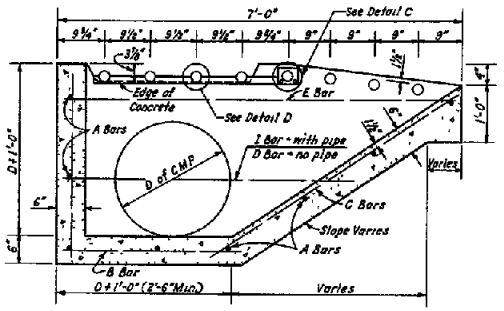
609



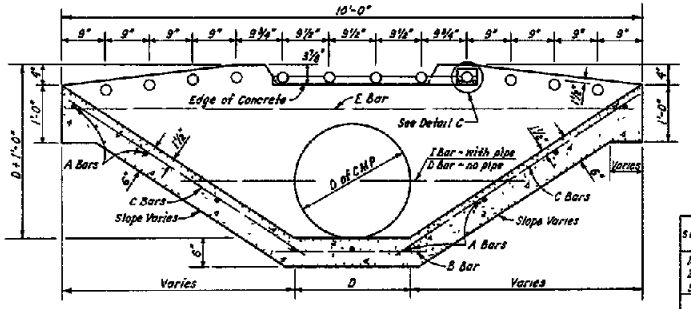
PLAN



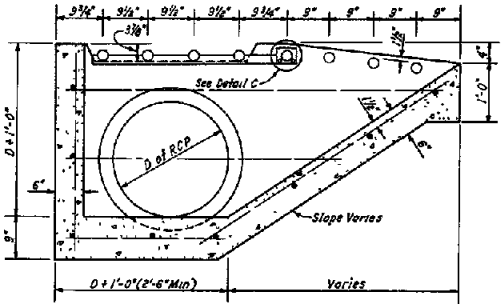
PLAN



SECTION A-A

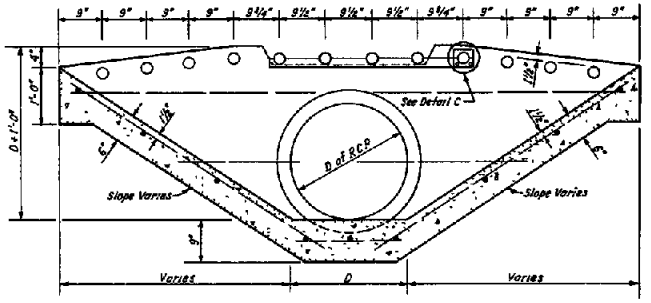


SECTION B-B



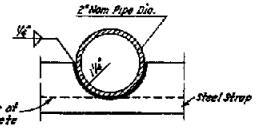
SECTION A-A

TYPE 7 DROP INLET

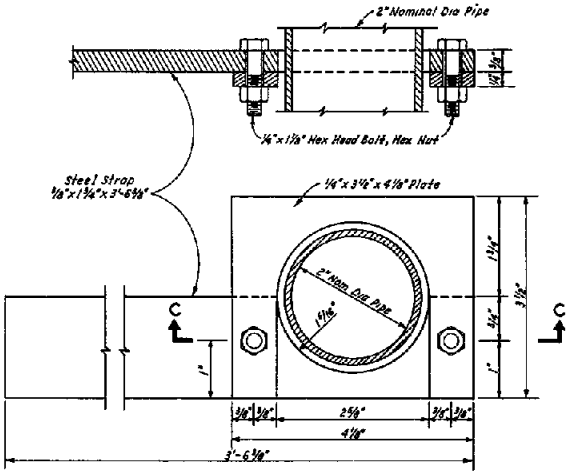


SECTION B-B

TYPE 8 DROP INLET



DETAIL D



DETAIL C

TABLE OF QUANTITIES
TYPE 7 DROP INLET

CMP

SIZE	A	B	C	D	E	F	G	H	I	J	CONC. CU YD.	REINF. STEEL LB.	STR STEEL GRATE LB
18"	8 @ 3'-2"	3 @ 2'-3"	3 @ 4'-9"	1 @ 5'-0"	2 @ 6'-8"	3 @ 2'-8"	2 @ 1'-10"	2 @ 1'-2"	1 @ 2'-4"	3 @ 2'-8"	1.11	61	117
24"	8 @ 3'-2"	3 @ 2'-3"	3 @ 4'-9"	1 @ 5'-0"	2 @ 6'-8"	3 @ 2'-8"	2 @ 2'-0"	2 @ 1'-4"	1 @ 2'-5"	3 @ 3'-2"	1.21	63	117
30"	8 @ 3'-2"	3 @ 3'-4"	3 @ 5'-3"	1 @ 5'-4"	2 @ 6'-8"	3 @ 3'-3"	2 @ 2'-8"	2 @ 1'-9"	1 @ 1'-10"	3 @ 3'-6"	1.34	67	117
RCP													
18"	8 @ 3'-2"	3 @ 3'-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 @ 3'-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

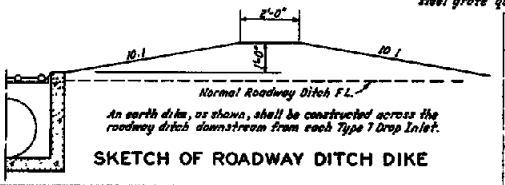
TYPE 8 DROP INLET

CMP

18"	9 @ 3'-2"	3 @ 2'-0"	6 @ 4'-8"	1 @ 6'-6"	2 @ 8'-8"	5 @ 2'-3"	4 @ 1'-10"	4 @ 1'-2"	2 @ 2'-4"		1.33	78	168
24"	9 @ 3'-2"	3 @ 2'-6"	6 @ 4'-8"	1 @ 6'-10"	2 @ 8'-8"	5 @ 2'-8"	4 @ 2'-0"	4 @ 1'-4"	2 @ 2'-5"		1.45	82	168
30"	9 @ 3'-2"	3 @ 3'-0"	6 @ 4'-8"	1 @ 7'-0"	2 @ 9'-8"	5 @ 3'-3"	4 @ 2'-8"	4 @ 1'-9"	2 @ 1'-10"		1.59	87	168
RCP													
18"	5 @ 3'-2"	3 @ 2'-0"	6 @ 5'-0"	1 @ 6'-6"	2 @ 8'-8"	5 @ 2'-6"	4 @ 1'-10"	4 @ 1'-2"	2 @ 2'-1"	Not Applicable	1.35	80	168
24"	9 @ 3'-2"	3 @ 2'-6"	6 @ 5'-0"	1 @ 6'-10"	2 @ 8'-8"	5 @ 3'-0"	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

GENERAL NOTES

1 - All concrete shall be Class A or AA
2 - Reinforcing steel shall be #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 varried 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.



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

SKETCH OF ROADWAY DITCH DIKE

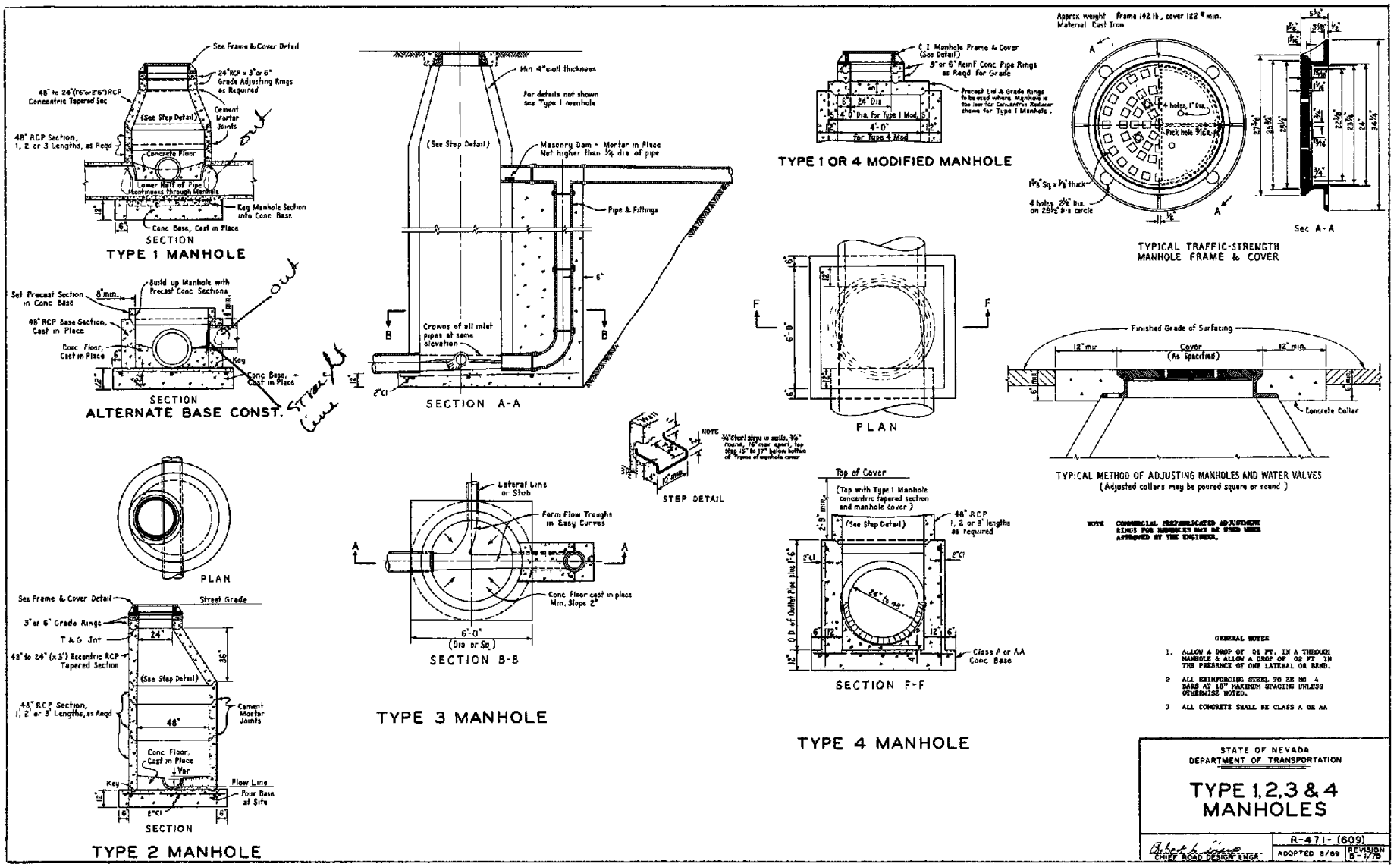
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE 7 & 8 DROP INLETS

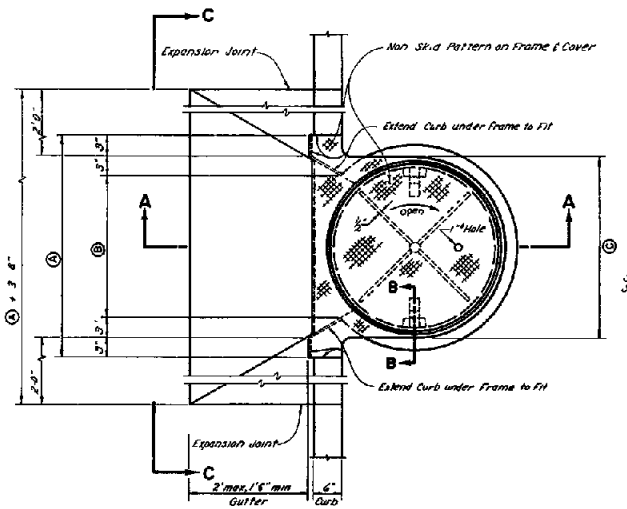
Robert F. Lobaugh
CHIEF ROAD DESIGN ENGR.

R-461-(609)
ADOPTED 8/69
REVISION 1

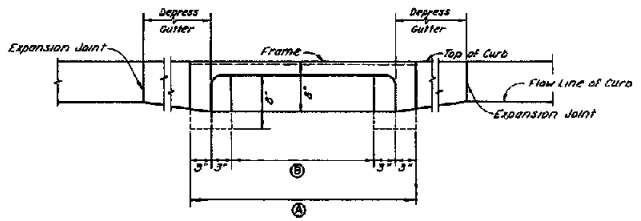
R40


See Frame & Cover Detail
24" RCP x 3" or 6" Grade Adjusting Rings as Required
48" to 24" (16"w x 24"h) RCP Concentric Tapered Sec
(See Step Detail)
Cement Mortar Joints
48" RCP Section, 1, 2 or 3 Lengths, as Reqd
Concrete Floor
Lower Half of Pipe Continuous through Manhole
Key Manhole Section into Conc Base
Conc Base, Cast in Place
SECTION
TYPE 1 MANHOLE
Set Precast Section in Conc Base
Build up Manholes with Precast Conc Sections
48" RCP Base Section, Cast in Place
Conc Floor, Cast in Place
Key
Conc Base, Cast in Place
SECTION
ALTERNATE BASE CONST.
Min 4" wall thickness
For details not shown see Type 1 manhole
(See Step Detail)
Masonry Dam - Mortar in Place Not higher than ¼ dia of pipe
Pipe & Fittings
Crowns of all inlet pipes at same elevation
SECTION A-A
C.I. Manhole Frame & Cover (See Detail)
9" or 6" Reinf Conc Pipe Rings as Reqd for Grade
Precast Lid & Grade Rings to be used where Manhole is too low for Concentric Reducer shown for Type 1 Manhole.
24" Dia
4'-0" Dia. for Type 1 Mod.
4'-0" for Type 4 Mod
TYPE 1 OR 4 MODIFIED MANHOLE
Approx weight Frame 142 lb., cover 122 # min.
Material Cast Iron
4 holes, 1" Dia.
Pick hole 9/16Ø
19⅝" Sq x ⅝" thick
4 holes .78" Dia. on 29½" Dia circle
Sec A-A
TYPICAL TRAFFIC-STRENGTH MANHOLE FRAME & COVER
PLAN
Finished Grade of Surfacing
12" min
Cover (As Specified)
12" min
Concrete Collar
TYPICAL METHOD OF ADJUSTING MANHOLES AND WATER VALVES
(Adjusted collars may be poured square or round)
NOTE
STEP DETAIL
Lateral Line or Stub
Form Flow Trought in Easy Curves
Conc Floor cast in place Min. Slope 2"
6'-0" (Dia or Sq.)
SECTION B-B
TYPE 3 MANHOLE
Top of Cover
(Top with Type 1 Manhole concentric tapered section and manhole cover)
(See Step Detail)
48" RCP 1, 2 or 3' lengths as required
2'-9" min
2"Cl
24" to 48"
O.D. of Outlet Pipe plus 1'-6"
Class A or AA Conc Base
SECTION F-F
TYPE 4 MANHOLE
PLAN
See Frame & Cover Detail
Street Grade
3" or 6" Grade Rings
T & G Jnt
48" to 24" (x 3') Eccentric RCP Tapered Section
(See Step Detail)
48" RCP Section, 1, 2 or 3' Lengths, as Reqd
Cement Mortar Joints
48"
Conc Floor, Cast in Place
Key
Flow Line
Pour Base at Site
2"Cl
SECTION
TYPE 2 MANHOLE
GENERAL NOTES
1. ALLOW A DROP OF 01 FT. IN A THROUGH MANHOLE & ALLOW A DROP OF 02 FT IN THE PRESENCE OF ONE LATERAL OR BEND.
2 ALL REINFORCING STEEL TO BE NO 4 BARS AT 18" MAXIMUM SPACING UNLESS OTHERWISE NOTED.
3 ALL CONCRETE SHALL BE CLASS A OR AA
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
TYPE 1, 2, 3 & 4 MANHOLES
CHIEF ROAD DESIGN ENGR.
R-471- (609)
ADOPTED 8/69
REVISION 8-1-79

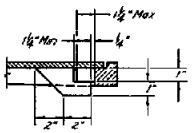
R41



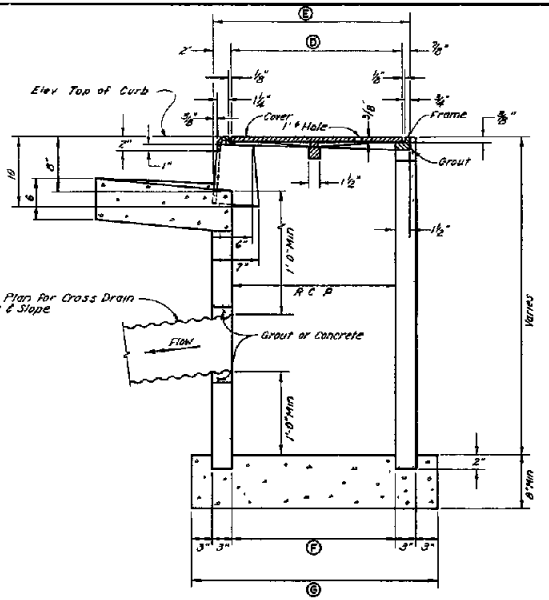
PLAN VIEW



VIEW C-C



SECTION B-B
WEDGE LOCK HOLD DOWN



SECTION A-A

DROP INLET	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ
TYPE 10	2'-9"	1'-9"	2'-3"	25¼"	28⅞"	24"	36"

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

* For Info Only

GENERAL NOTES

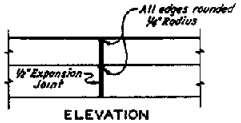
1. All Concrete Shall be A or AA
2. Forming of the Base Will not be Required

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

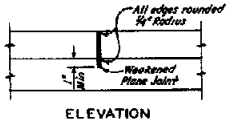
DROP INLET
TYPE 10

CHIEF ROAD DESIGN ENGR	R-481 ADOPTED 10/71	(609) REVISION

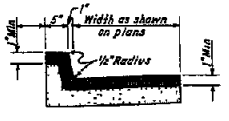
R42



ELEVATION
EXPANSION JOINT

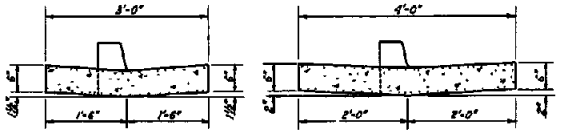


ELEVATION



END VIEW

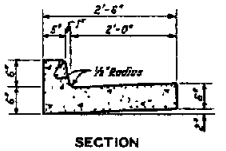
WEAKENED PLANE JOINT
For use in concrete curb and gutter



SECTION
TYPE 1
(0.0556 cu yd per ft)

SECTION
TYPE 2
(0.07407 cu yd per ft)

VALLEY GUTTER



SECTION
TYPE 1
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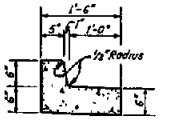
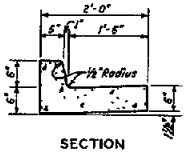
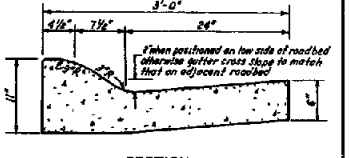


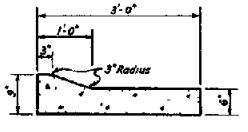
SECTION
TYPE 4
(0.03627 cu yd per ft)



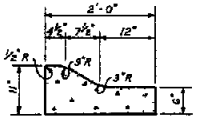
SECTION
TYPE 5
(0.04552 cu yd per ft)



SECTION
TYPE 6
(0.06599 cu yd per ft)

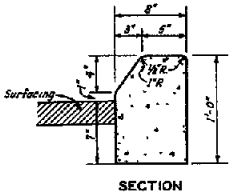


SECTION
TYPE 7
(0.0613 cu yd per ft)

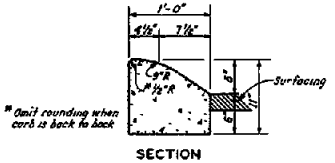


SECTION
TYPE 8
(0.04747 cu yd per ft)

CURB AND GUTTER

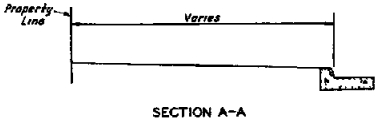


SECTION
TYPE 2
(0.02315 cu yd per ft)

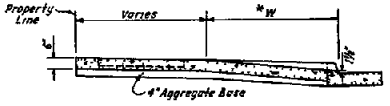


SECTION
TYPE 3
(0.02894 cu yd per ft)

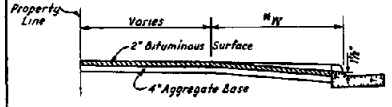
CURB



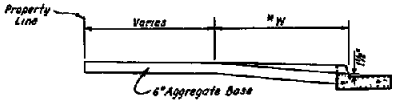
SECTION A-A



SEC B-B (CONCRETE)

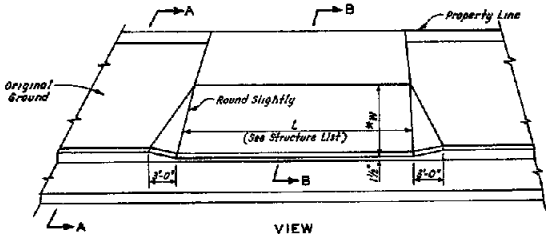


SEC B-B (BITUMINOUS SURFACE)

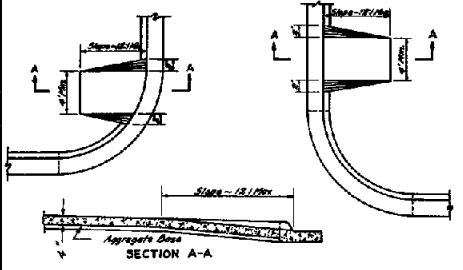


SEC B-B (AGGREGATE)

* W = See Project Typical Sections



VIEW
DRIVEWAYS



SECTION A-A
CURB CUT RAMPS

GENERAL NOTES

1. Curb cuts can be varied to fit the needs of a particular location
2. Curb cut ramps should be located closely adjacent to an outfall marked crosswalk to ensure their use as part of the established pedestrian control at the intersection. Specific location should be adapted to site conditions

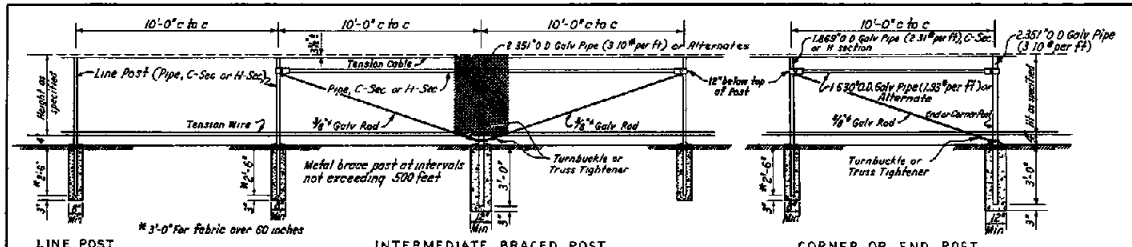
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CURB AND GUTTER AND DRIVEWAYS

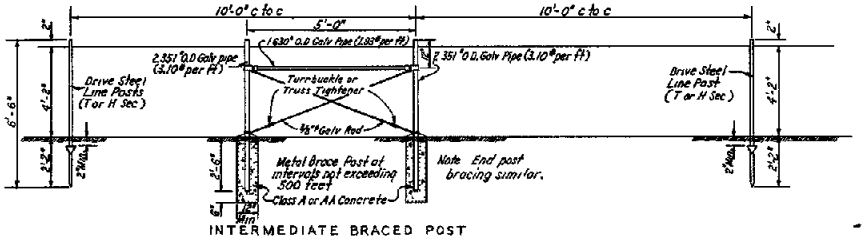
Robert L. Thomas
CHIEF ROAD DESIGN ENGR

R-511-(613)
ADOPTED 8/69
REVISION 1 12/79

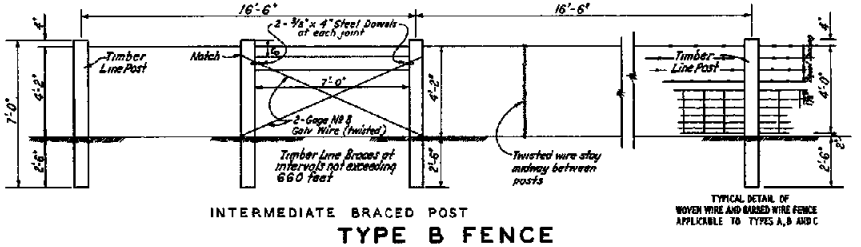
R 43



TYPICAL CHAIN LINK FENCE

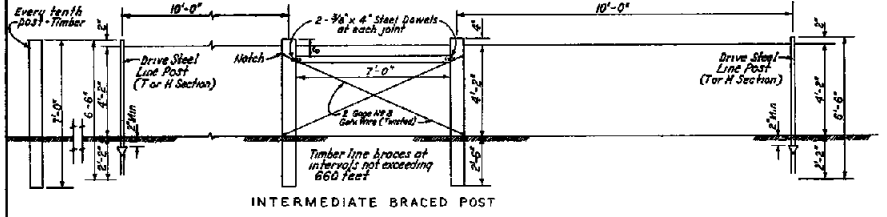


TYPE A FENCE

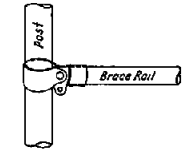


TYPICAL DETAIL OF WOVEN WIRE AND BARBED WIRE FENCE APPLICABLE TO TYPES A, B AND C

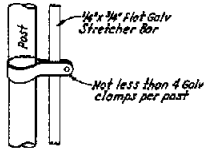
TYPE B FENCE



TYPE C FENCE

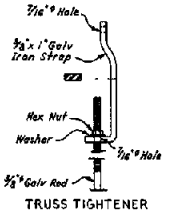


BRACE CLAMP

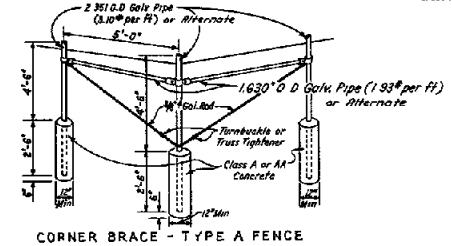


STRETCHER BAR CLAMP

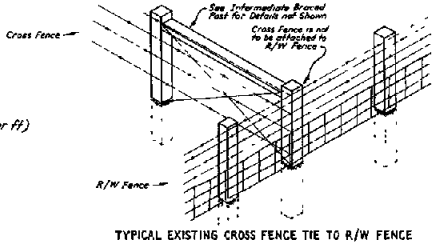
GALVANIZED PIPE POST DETAILS



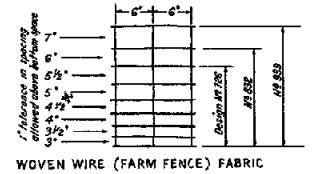
TRUSS TIGHTENER



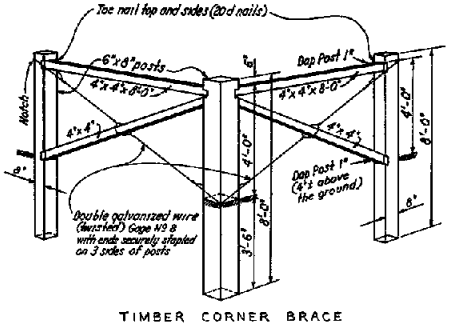
CORNER BRACE - TYPE A FENCE



TYPICAL EXISTING CROSS FENCE TIE TO R/W FENCE



WOVEN WIRE (FARM FENCE) FABRIC



TIMBER CORNER BRACE

GENERAL NOTES

1 FENCE POSTS AND MATERIALS SHALL CONFORM TO THE REQUIREMENTS OF STANDARD SPECIFICATIONS AND SUPPLEMENTS

2 FENCING SHALL BE (A) STANDARD (B) CHAIN-LINK

(A) 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

(B) CHAIN-LINK FENCING SHALL CONSIST OF GALVANIZED CHAIN-LINK FABRIC ON STEEL POSTS (H-COLUMN TUBULAR, OR C-COLUMN)

3 BARBED WIRE SHALL BE SPACED AS FOLLOWS

3 WIRES BOTTOM WIRE 18" ABOVE GROUND OTHER SPACING 16"
4 WIRES BOTTOM WIRE 15½" ABOVE GROUND, OTHER SPACING 11½"
5 WIRES 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 CHAIN-LINK FENCE

(A) ALL POSTS SHALL BE SET IN CLASS A OR AA CONCRETE
(B) ALL POST TOPS SHALL BE FITTED WITH SUITABLE FINIALS
(C) 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
(D) ALL FITTINGS SHALL BE HOT-DIPPED GALVANIZED MALLEABLE CAST IRON OR PRESSED STEEL
(E) FABRIC SHALL BE FASTENED TO LINE POSTS WITH FABRIC BANDS SPACED APPROXIMATELY 14" APART AND TO TOP TENSION CABLE AND BOTTOM TENSION WIRE WITH HOG RINGS OR TIE WIRES SPACED APPROXIMATELY 24" APART
(F) FOR ALTERNATE POST AND BRACERAIL DETAILS SPB SHEETS NO R-6 3 1 THROUGH R-6 3 3

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FENCE DETAILS

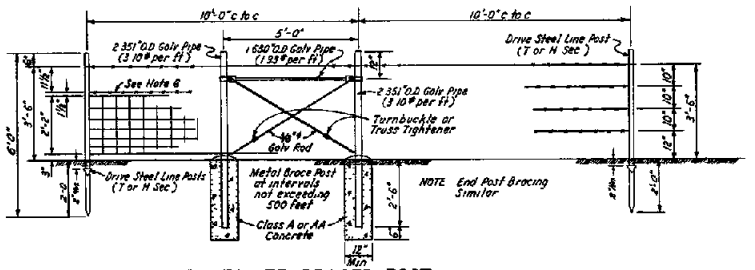
R-6.1.1- (616)

CHIEF ROAD DESIGN ENGR

ADOPTED 8/69

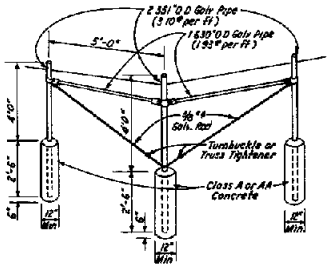
REVISION 4 - 7/78

R 44

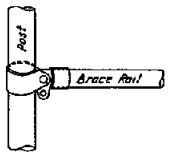


INTERMEDIATE BRACED POST

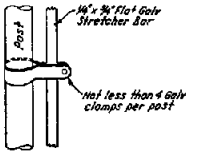
TYPE DA FENCE



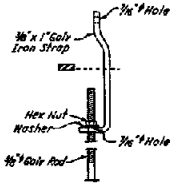
CORNER BRACE- TYPE DA FENCE



BRACE CLAMP



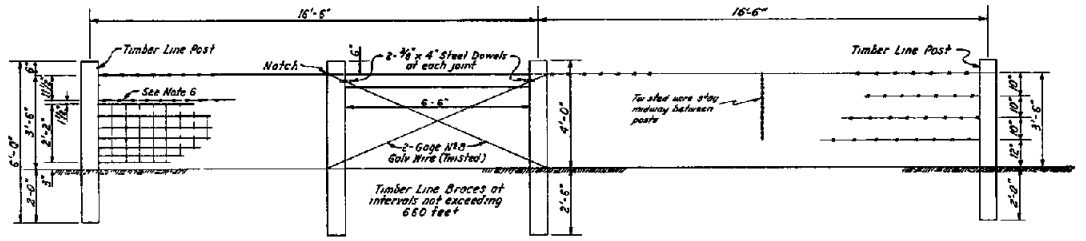
STRETCHER BAR CLAMP



TRUSS TIGHTENER

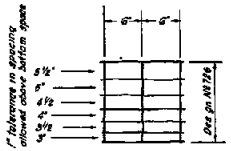
GENERAL NOTES

1. Fence posts and material 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 combination of posts
3. Barbed wire shall be spaced as follows
   Type BA, BB, BC
   3 wires: bottom wire 16" above ground, others spacing 10"
4. Standard fencing will be designated by type, design of fabric and/or number of barbed wires, thus:
   Type BA-726-6B designates metal posts, 26" woven (farm) wire and 2 barbed wires;
   Type BB-726-6B designates wooden posts, 26" woven (farm) wire and 2 barbed wires,
   Type BC-726-6B designates combination of wood and metal posts, 26" woven (farm) wire, and 2 barbed wires
5. Use dama size mates and gate posts as shown on Sheet R-6 I 5
6. The first line of barbed wire above the wire mesh shall be tied to the top wire of the wire mesh with 12 gage galvanized steel wire or 9 gage aluminum hog rings One tie to be made midway between 17' post spacing and two ties to be equally spaced for 16'-6" post spacing

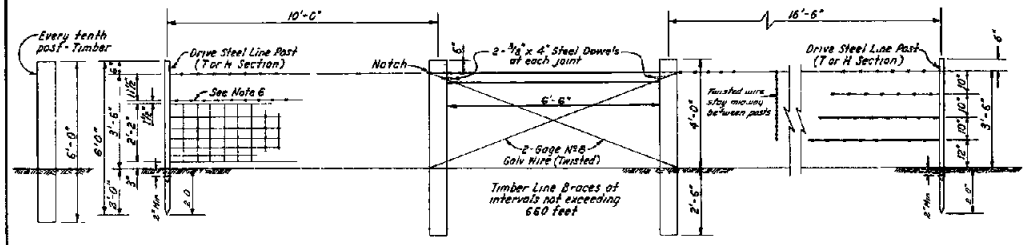


INTERMEDIATE BRACED POST

TYPE DB FENCE

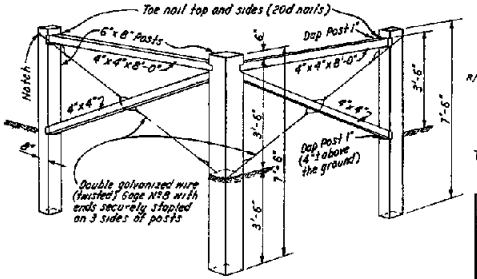


WOVEN WIRE (FARM FENCE) FABRIC

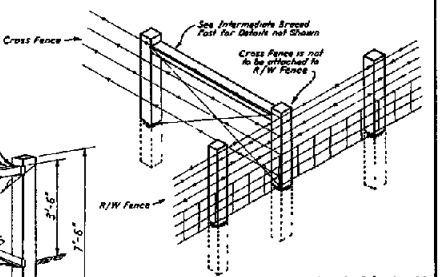


INTERMEDIATE BRACED POST

TYPE DC FENCE



TIMBER CORNER BRACE



TYPICAL EXISTING CROSS FENCE TIE TO R/W FENCE

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FENCE DETAILS

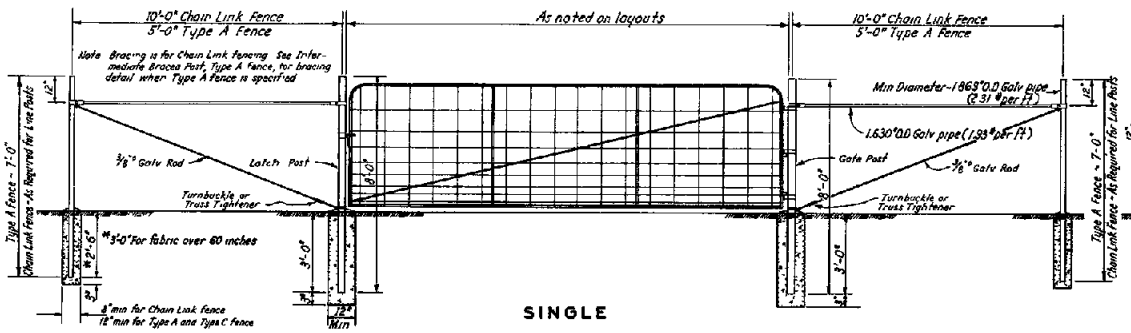
CHIEF ROAD DESIGN ENGR

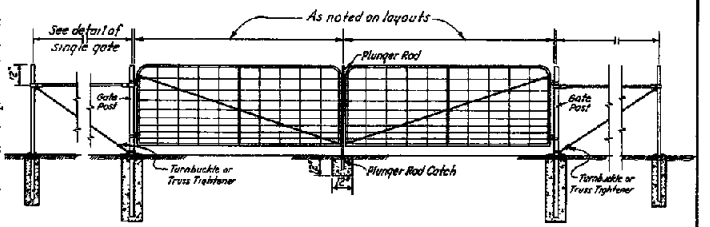
R-6.1.2- (616)

ADOPTED- 8/69

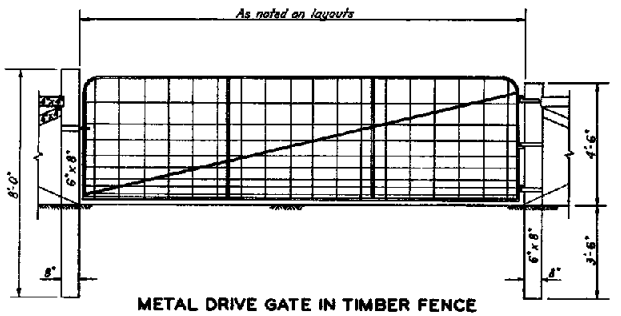
REVISION 4 11/79

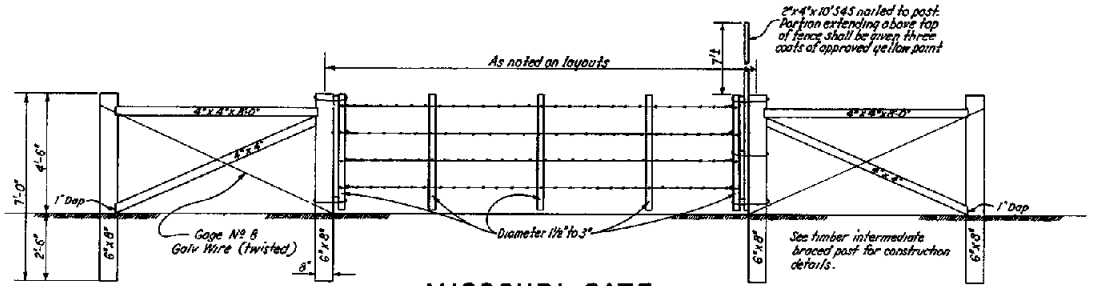
R.45

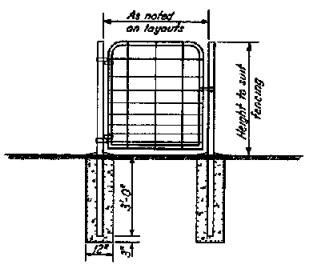




METAL DRIVE GATES







GENERAL NOTES

1. Standard gates chain link gates, and walk gates shall be constructed as specified in the Standard Specifications
2. Gate posts, 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

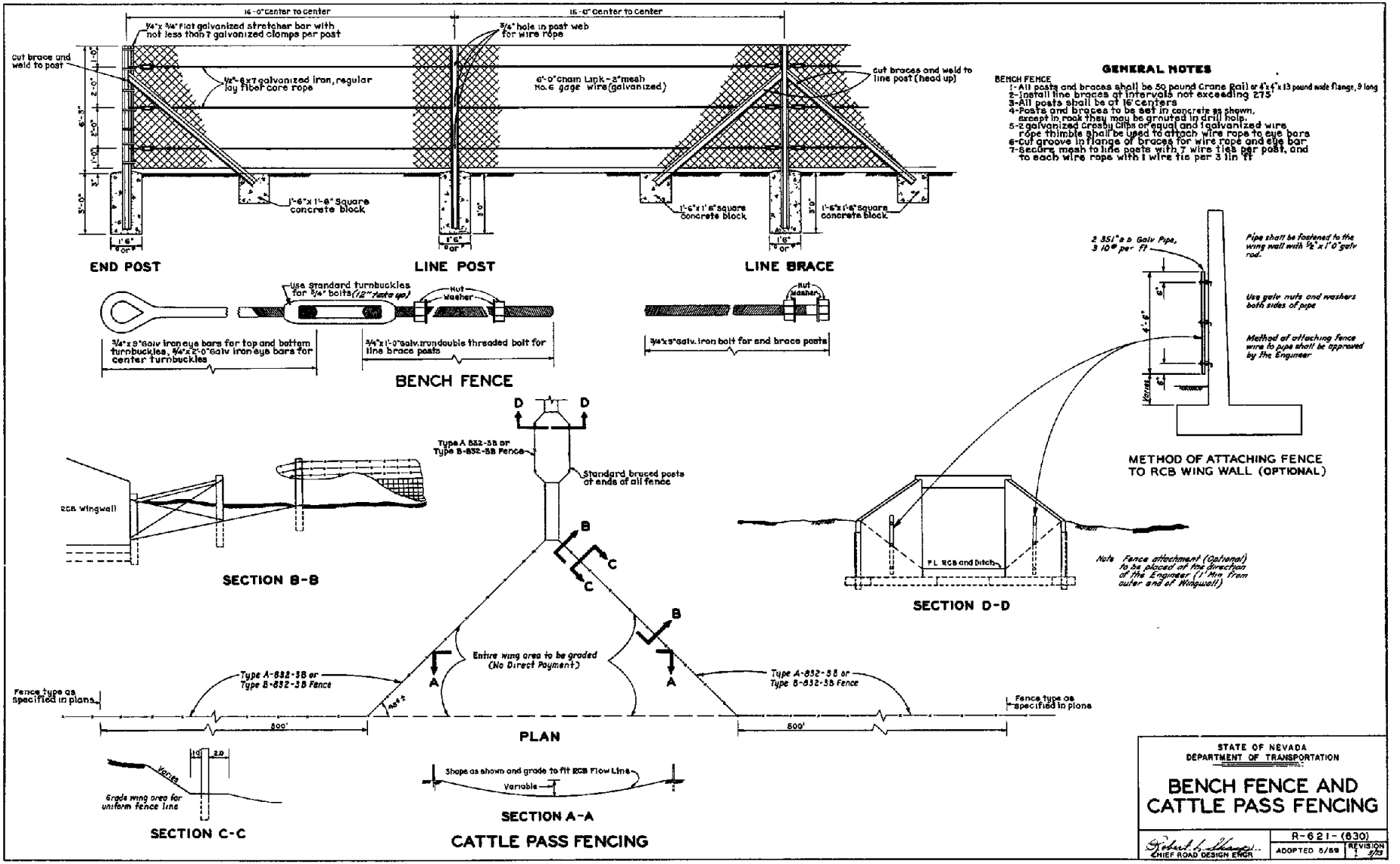
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FENCE DETAILS

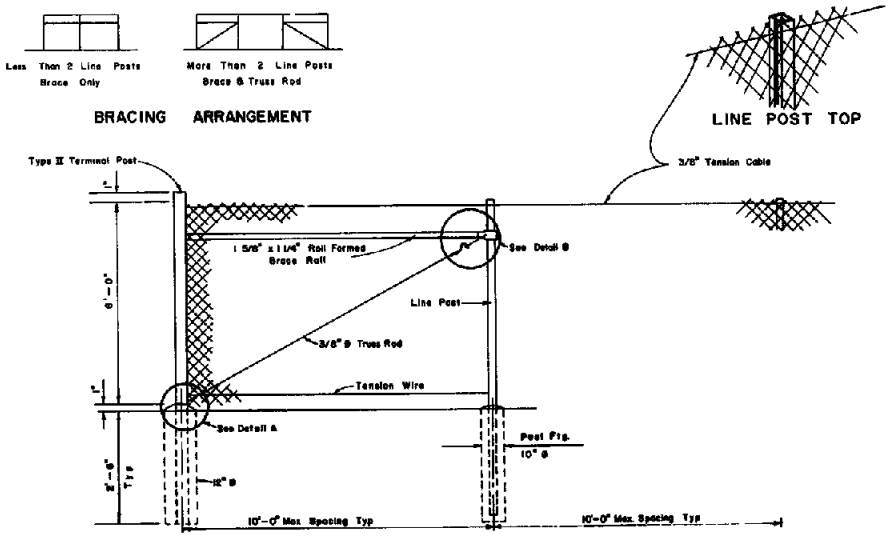
CHIEF ROAD DESIGN ENGR

R-6.1.3 - (616)
ADOPTED 8/69 REVISION 2 5/79

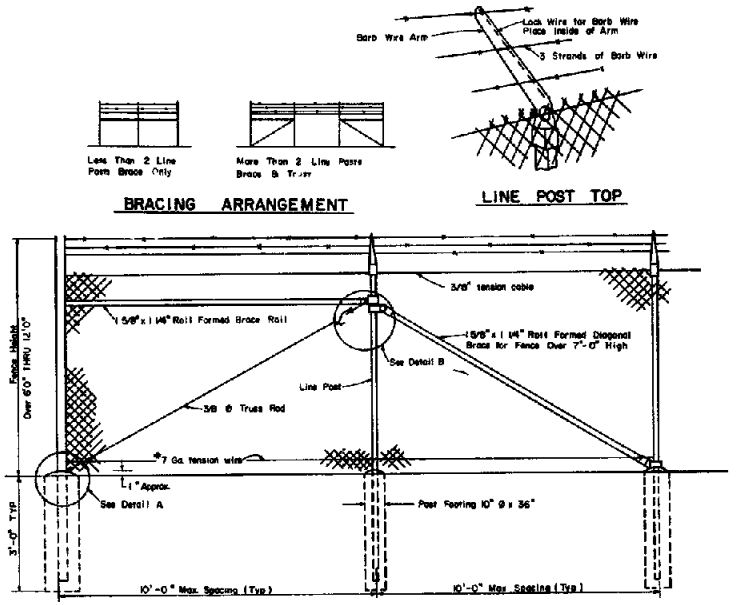
R46


16'-0" center to center
16'-0" center to center
¾"x ¾" Flat galvanized stretcher bar with not less than 7 galvanized clamps per post
⅝" hole in post web for wire rope
cut brace and weld to post
½"-6x7 galvanized iron, regular lay fiber core rope
6'-0" chain Link - 2" mesh No. 6 gage wire (galvanized)
cut braces and weld to line post (head up)
1'-6"x 1'-6" Square concrete block
1'-6"x 1'-6" Square concrete block
1'-6"x 1'-6" Square concrete block
END POST
LINE POST
LINE BRACE
Use standard turnbuckles for ¾" bolts (1/2" rods up)
Nut
Washer
¾"x 8"galv iron eye bars for top and bottom turnbuckles, ¾"x 2'-0"galv iron eye bars for center turnbuckles
¾"x 1'-0"galv. iron double threaded bolt for line brace posts
¾"x 9"galv. iron bolt for end brace posts
BENCH FENCE
GENERAL NOTES
BENCH FENCE
1-All posts and braces shall be 50 pound Crane Rail or 4"x 4"x 13 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.
5-2 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 ft
2 3.51" o.d. Galv Pipe, 3.10# per ft
Pipe shall be fastened to the wing wall with ½"x 1'-0" galv rod.
Use galv nuts and washers both sides of pipe
Method of attaching fence wire to pipe shall be approved by the Engineer
4'-0"
Varies
METHOD OF ATTACHING FENCE TO RCB WING WALL (OPTIONAL)
D
D
Type A 832-SB or Type B-832-SB Fence
Standard braced posts at ends of all fence
RCB Wingwall
SECTION B-B
B
C
C
B
A
A
Entire wing area to be graded (No Direct Payment)
Type A-832-SB or Type B-832-SB Fence
Type A-832-SB or Type B-832-SB Fence
Fence type as specified in plans
Fence type as specified in plans
Add 2'
500'
500'
PLAN
F.L. RCB and Ditch
Note Fence attachment (Optional) to be placed at the direction of the Engineer (1' Min. from outer end of Wingwall)
SECTION D-D
1:0
2:0
Varies
Grade wing area for uniform fence line
SECTION C-C
Shape as shown and grade to fit RCB Flow Line
Variable
SECTION A-A
CATTLE PASS FENCING
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
BENCH FENCE AND CATTLE PASS FENCING
Robert L. Thompson
CHIEF ROAD DESIGN ENGR
R-621-(630)
ADOPTED 5/59
REVISION

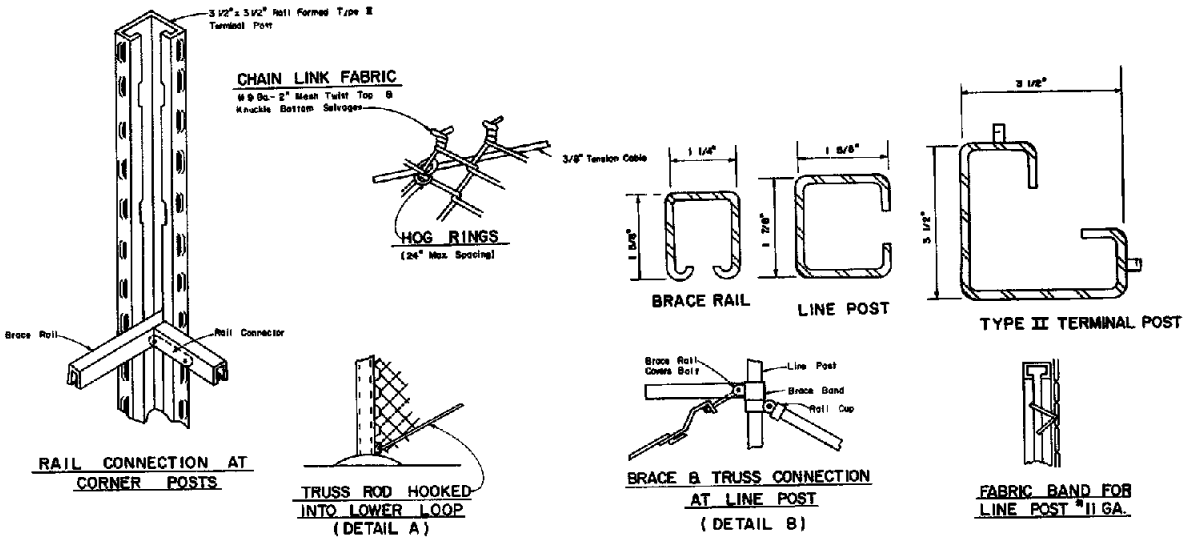
R 47



72-INCH CHAIN LINK FENCE



VARIABLE HEIGHT CHAIN LINK 3B FENCE



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 (H-COLUMN, TUBULAR OR C-COLUMN)

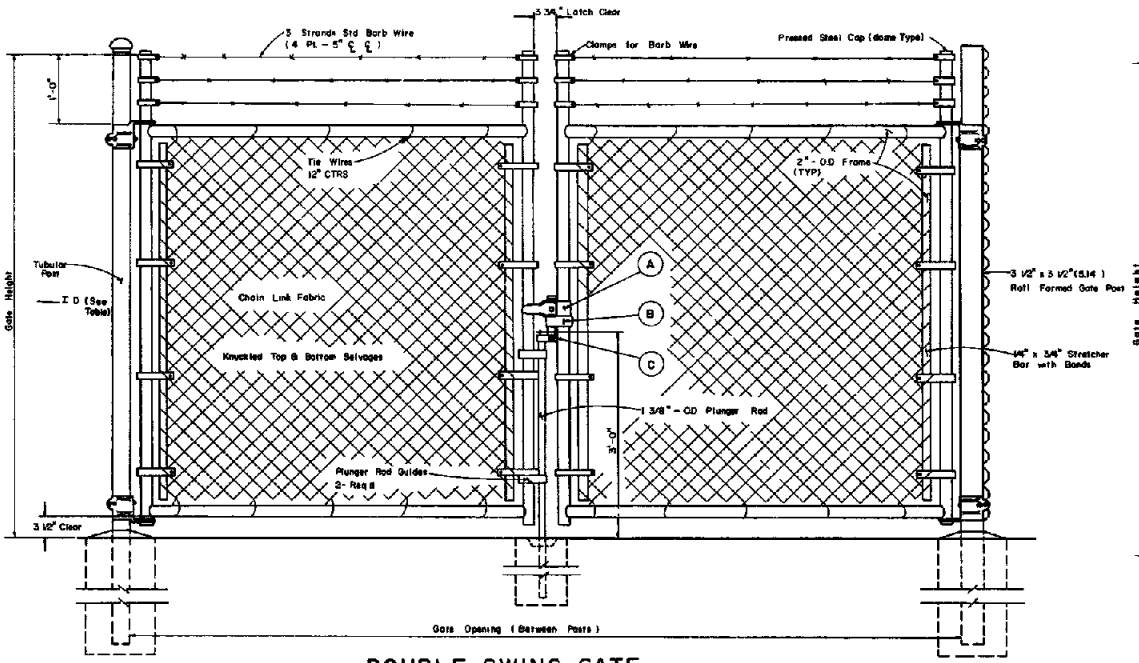
3 (A) ALL POSTS SHALL BE SET IN CLASS A OR AA CONCRETE
(B) BRACES SHALL BE SPACED APPROXIMATELY 12" BELOW TOP OF TERMINAL POSTS AND SHALL EXTEND FROM END, GATE OR CORNER POSTS TO FIRST ADJACENT LINE POST.
(C) ALL FITTINGS SHALL BE HOT DIPPED GALVANIZED MALLEABLE, CAST IRON, OR PRESSED STEEL
(D) FABRIC SHALL BE FASTENED TO LINE POSTS WITH FABRIC BANDS SPACED APPROXIMATELY 14" APART, AND TO TOP TENSION CABLE AND BOTTOM TENSION WITH HOG RINGS OR TIE WIRES SPACED APPROXIMATELY 24" APART
(E) FOR TUBULAR POST AND BRACERAIL DETAILS, SEE SHEET NO R-6 1 1.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

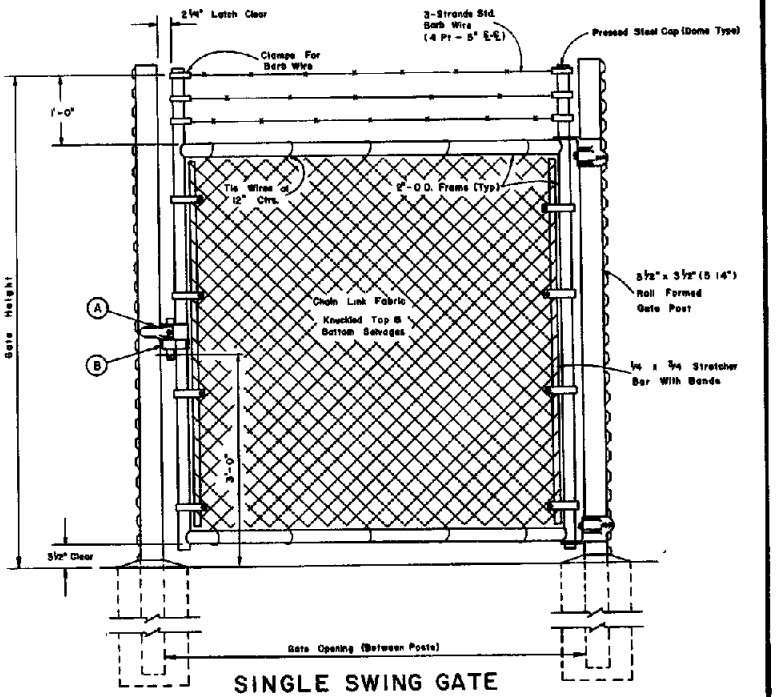
FENCE DETAILS
CHAIN LINK WITH C-TYPE POST

CHIEF ROAD DESIGN ENGR.

R-6 3.1	(616)
ADOPTED 3/79	REVISION



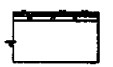
DOUBLE SWING GATE



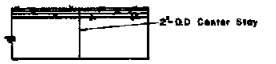
SINGLE SWING GATE

FRAME CONSTRUCTION GATES THRU 20'-0" OPENING

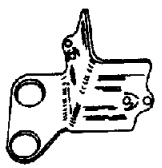
FRAME CONSTRUCTION GATES OVER 20'-0" OPENING



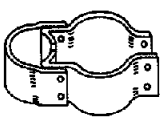
FRAME CONSTRUCTION GATES THRU 10'-0" OPENING



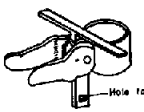
FRAME CONSTRUCTION GATES OVER 10'-0" OPENING



HINGE FOR ROLL FORM POST & 3"-O.D. POST

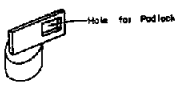


HINGE FOR 4"-O.D & LARGER TUBULAR POSTS



(A) LOCK KEEPER

(B) LOCK KEEPER GUIDE



(C) PLUNGER ROD CAP

GATE POSTS		
HEIGHT	GATE WIDTH	ROUND (I.D)
6' and less	Up thru 6'	2½"
	7' thru 13'	3½"
	14' thru 18'	6"
	Over 18'	8"
Over 6'	Up thru 6'	3"
	7' thru 13'	4"
	14' thru 18'	6"
	Over 18'	8"

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FENCE DETAILS
SWING GATES FOR VARIABLE HEIGHT CHAIN LINK 3B FENCE

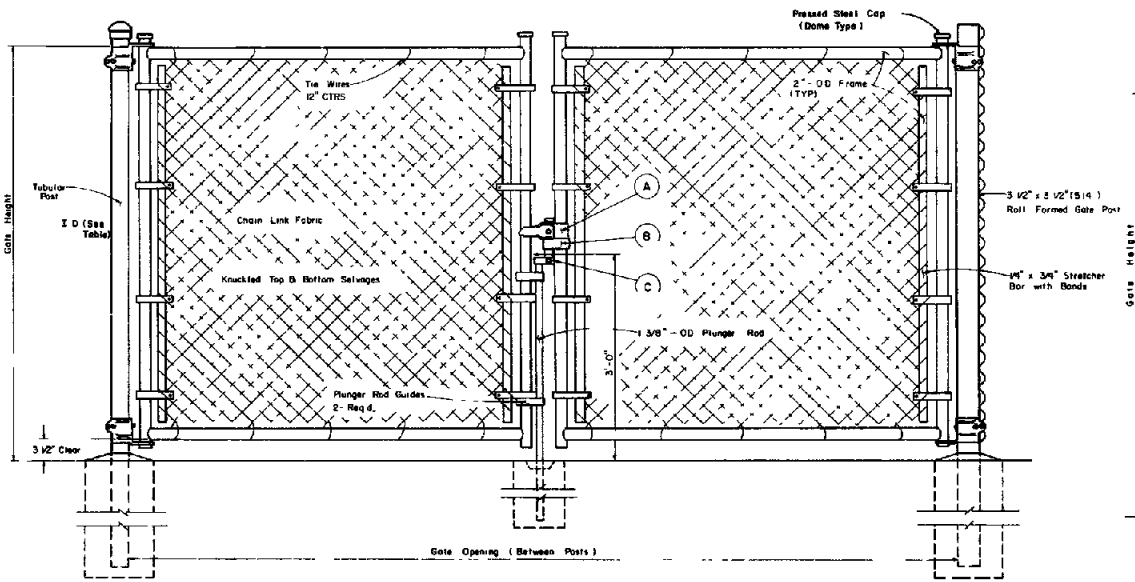
CHIEF ROAD DESIGN ENGR

R-6.3.2 (616)

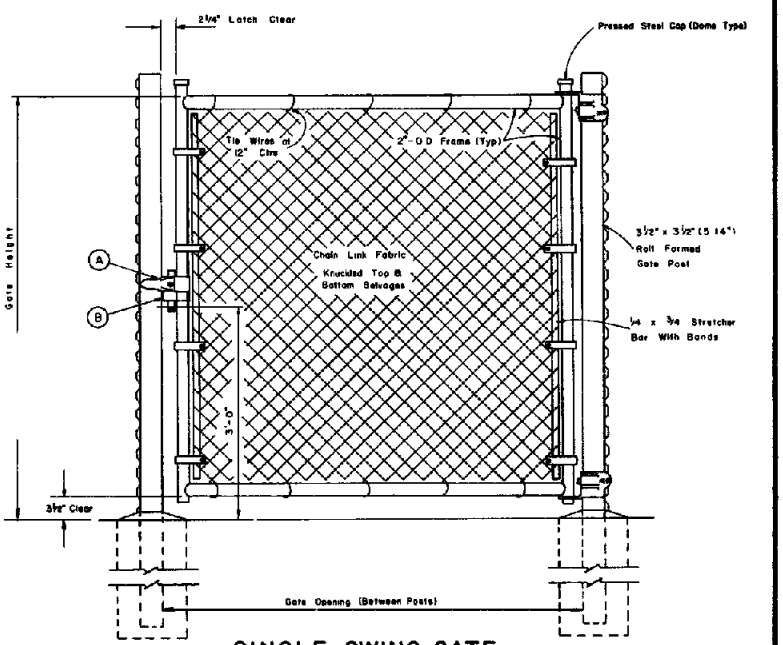
ADOPTED 3/79 REVISION

R49

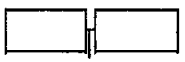
R50



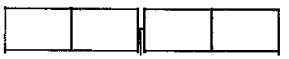
DOUBLE SWING GATE



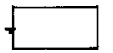
SINGLE SWING GATE



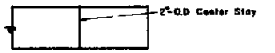
FRAME CONSTRUCTION GATES THRU 20'-0" OPENING



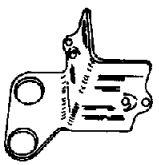
FRAME CONSTRUCTION GATES OVER 20'-0" OPENING



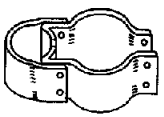
FRAME CONSTRUCTION GATES THRU 10'-0" OPENING



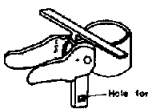
FRAME CONSTRUCTION GATES OVER 10'-0" OPENING



HINGE FOR ROLL FORM POST & 3"-OD POST



HINGE FOR 4"-OD & LARGER TUBULAR POSTS



(A) LOCK KEEPER

(B) LOCK KEEPER GUIDE

(C) PLUNGER ROD CAP

GATE POSTS		
HEIGHT	GATE WIDTH	ROUND (I D)
6' and less	Up thru 6'	2½"
	7' thru 13'	3½"
	14' thru 18'	6"
	Over 18'	8"
Over 6'	Up thru 6'	3"
	7' thru 13'	4"
	14' thru 18'	6"
	Over 18'	8"

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FENCE DETAILS SWING GATES FOR 72-INCH CHAIN LINK FENCE

CHIEF ROAD DESIGN ENGR.

R-6.3.3 (616)

ADOPTED: 3/79 REVISION

BILL OF MATERIALS

DOUGLAS FIR

ITEM	NO REQ'D	SIZE	LENGTH	FT B.M
Wheel Guards	2	6"x6"	7'-3"	43.5
Wing Slope	4	8"x6"	8'-0"	32.0
Wing Slope	2	2"x6"	6'-4½"	12.8
Wing Braces	2	2"x6"	3'-4"	6.7
Wing Braces	4	2"x6"	5'-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

HARDWARE

ITEM	NO REQ'D	SIZE	LENGTH	WT LBS
Bolts	8	¾"ø	12"	15
Washers	8	¾"		6
Nails	50	40d		3
Nails	72	20d		2¼
TOTAL				26¼

STRUCTURAL STEEL

12' ROADBED

ITEM	NO REQ'D	SIZE	LENGTH	WT LBS
I Beams	13	54X7.7	13'-0"	1301
I Beams	6	57X15.3	7'-3"	666
Spacers	72	2½"x⅝"	0'-6⅞"	109
Anchor Bolts	12	⅝"	0'-9"	12
End Plates	2	7"x¼"	13'-0"	155
TOTAL				2243

14' ROADBED

ITEM	NO REQ'D	SIZE	LENGTH	WT LBS
I Beams	13	54X7.7	15'-0"	1502
I Beams	7	57X15.3	7'-3"	776
Spacers	84	2½"x⅝"	0'-6⅞"	127
Anchor Bolts	14	⅝"	0'-9"	14
End Plates	2	7"x¼"	15'-0"	178
TOTAL				2597

16' ROADBED

ITEM	NO REQ'D	SIZE	LENGTH	WT LBS
I Beams	13	54X7.7	17'-0"	1702
I Beams	8	57X15.3	7'-3"	887
Spacers	84	2½"x⅝"	0'-6⅞"	127
Anchor Bolts	14	⅝"	0'-9"	14
End Plates	2	7"x¼"	17'-0"	211
TOTAL				2941

20' ROADBED

ITEM	NO REQ'D	SIZE	LENGTH	WT LBS
I Beams	13	54X7.7	21'-0"	2102
I Beams	9	57X15.3	7'-3"	996
Spacers	108	2½"x⅝"	0'-6⅞"	165
Anchor Bolts	18	⅝"	0'-9"	18
End Plates	2	7"x¼"	21'-0"	250
TOTAL				3531

REINFORCING

12' ROADBED

ITEM	NO REQ'D	SIZE	LENGTH	WT LBS
* Horizontal Bars	12	No 4	12'-8"	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	26	No 6	12'-1"	471
TOTAL				865

14' ROADBED

ITEM	NO REQ'D	SIZE	LENGTH	WT LBS
* Horizontal Bars	12	No 4	14'-6"	116
Horizontal Bars	13	No. 4	7'-0"	61
Horizontal Bars	18	No 4	18'-8"	225
Vertical Bars	22	No 4	2'-3"	40
U-Bars	29	No 6	12'-1"	526
TOTAL				968

16' ROADBED

ITEM	NO REQ'D	SIZE	LENGTH	WT LBS
* Horizontal Bars	12	No 4	16'-6"	132
Horizontal Bars	13	No. 4	7'-0"	70
Horizontal Bars	18	No 4	20'-9"	249
Vertical Bars	26	No 4	2'-3"	48
U-Bars	32	No 6	12'-1"	580
TOTAL				1079

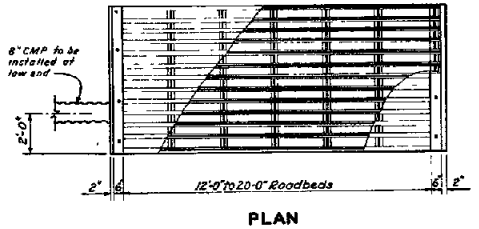
20' ROADBED

ITEM	NO REQ'D	SIZE	LENGTH	WT LBS
* Horizontal Bars	12	No 4	20'-6"	164
Horizontal Bars	17	No 4	7'-0"	79
Horizontal Bars	18	No 4	24'-9"	297
Vertical Bars	30	No 4	2'-3"	55
U-Bars	39	No 6	12'-1"	707
TOTAL				1302

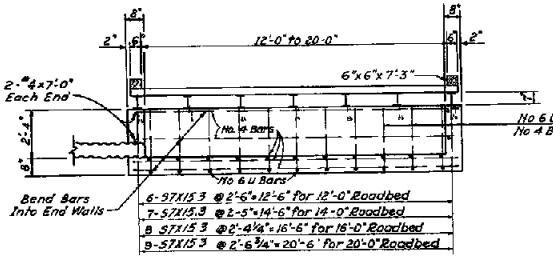
CONCRETE

12' Roadbed	5.00 Cu Yd
14' Roadbed	5.59 Cu Yd
16' Roadbed	6.17 Cu Yd
20' Roadbed	7.35 Cu Yd

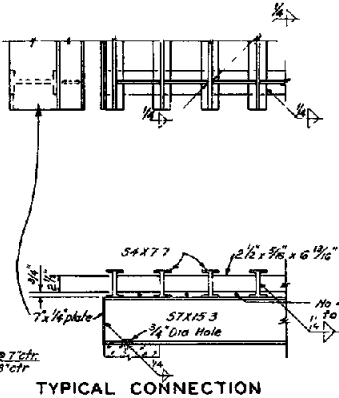
*No 4 Bars welded to 7" I Beams



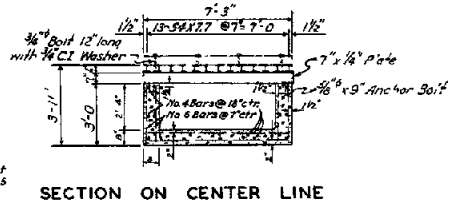
PLAN



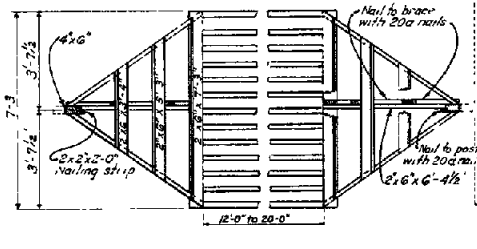
SECTION



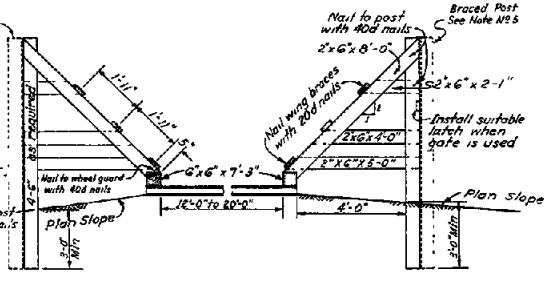
TYPICAL CONNECTION



SECTION ON CENTER LINE



PLAN OF WINGS



ELEVATION OF WINGS

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 ~
5 ~ When a 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

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STEEL CATTLE GUARD
12' TO 20' ROADBED

Robert F. Knapp
CHIEF ROAD DESIGN ENGR.

R-711- (617)
ADOPTED 8/69
REVISION 2 11/78

R51

BILL OF MATERIALS

DOUGLAS FIR

ITEM	NO REQ'D	SIZE	LENGTH	F T B M
Wheel Guards	2	6" x 6"	1'-3"	43.5
Wing Slope	4	2" x 6"	8'-0"	32.0
Wing Slope	2	2" x 6"	6'-4½"	12.6
Wing Braces	2	2" x 6"	3'-2"	6.7
Wing Braces	4	2" x 6"	3'-3"	21.0
Wing Braces	2	2" x 6"	7'-3"	14.5
Wing Braces	2	2" x 6"	2'-1"	4.2
Wing Braces	2	2" x 6"	4'-0"	8.0
Wing Braces	2	2" x 6"	5'-0"	10.0
Wing Post	2	4" x 6"	As Required	
Nailing Strip	2	2" x 2"	2'-0"	1.3

HARDWARE

ITEM	NO REQ'D	SIZE	LENGTH	WT LBS
Bolts	8	¾" ø	12"	15
Washers	8	¾"		6
Nails	50	40d		3
Nails	72	20d		2½
TOTAL				26½

STRUCTURAL STEEL

26' ROADBED

ITEM	NO REQ'D	SIZE	LENGTH	WT LBS
I Beams	26	54 x 77	13'-5½"	2699
I Beams	12	57 x 15.3	7'-3"	1331
Spacers	144	2⅛ x ⅜	0'-6⅞"	217
Anchor Bolts	24	⅜" ø	0'-9"	23
End Plates	4	7" x ¼"	13'-6"	320
TOTAL				4590

32' ROADBED

ITEM	NO REQ'D	SIZE	LENGTH	WT LBS
I Beams	26	54 x 77	16'-5½"	3299
I Beams	14	57 x 15.3	7'-3"	1533
Spacers	168	2⅛ x ⅜	0'-6⅞"	254
Anchor Bolts	28	⅜" ø	0'-9"	27
End Plates	4	7" x ¼"	16'-6"	392
TOTAL				5525

40' ROADBED

ITEM	NO REQ'D	SIZE	LENGTH	WT LBS
I Beams	26	54 x 77	20'-5½"	4100
I Beams	18	57 x 15.3	7'-3"	1997
Spacers	216	2⅛ x ⅜	0'-6⅞"	326
Anchor Bolts	36	⅜" ø	0'-9"	35
End Plates	4	7" x ¼"	20'-6"	487
TOTAL				6985

REINFORCING

26' ROADBED

ITEM	NO REQ'D	SIZE	LENGTH	WT LBS.
* Horizontal Bars	24	No 4	13'-3"	212
Horizontal Bars	22	No 4	7'-0"	103
Horizontal Bars	18	No 4	30'-9"	370
Vertical Bars	40	No 4	2'-9"	74
U-Bars	30	No 6	12'-1"	907
TOTAL				1666

32' ROADBED

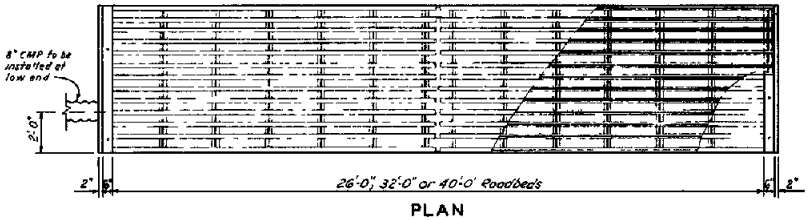
ITEM	NO REQ'D	SIZE	LENGTH	WT LBS.
* Horizontal Bars	24	No 4	16'-3"	260
Horizontal Bars	26	No 4	7'-0"	122
Horizontal Bars	18	No 4	36'-9"	442
Vertical Bars	48	No 4	2'-9"	88
U-Bars	60	No 6	12'-1"	1088
TOTAL				2000

40' ROADBED

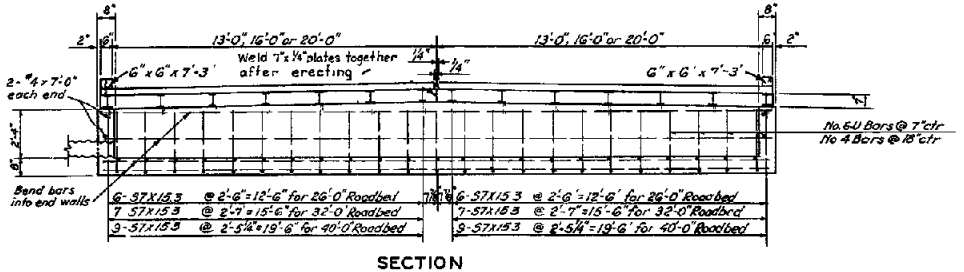
ITEM	NO REQ'D	SIZE	LENGTH	WT LBS.
* Horizontal Bars	24	No 4	20'-3"	325
Horizontal Bars	31	No 4	7'-0"	145
Horizontal Bars	18	No 4	44'-9"	536
Vertical Bars	58	No 4	2'-9"	107
U-Bars	74	No 6	12'-1"	1344
TOTAL				2459

CONCRETE

26' Roadbed	9.36 Cu. Yd
32' Roadbed	11.25 Cu. Yd
40' Roadbed	13.74 Cu. Yd

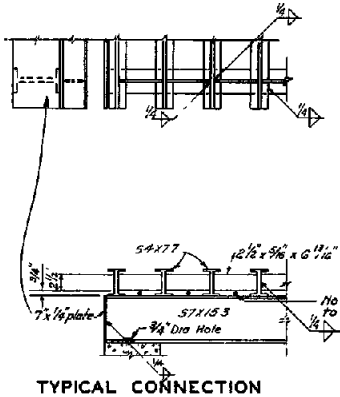


PLAN

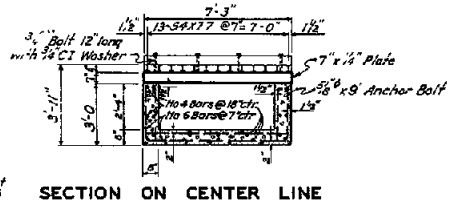


SECTION

NOTE- Slope top of footing to fit crown of roadway.



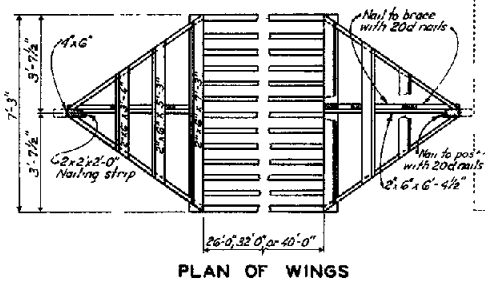
TYPICAL CONNECTION



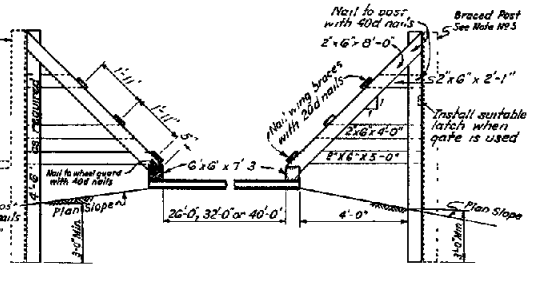
SECTION ON CENTER LINE

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-
5- When a gate is not specified Install the required type of Intermediate Bracee Post adjacent to the Wing Post Fence wires to be tied to Braced Post only



PLAN OF WINGS



ELEVATION OF WINGS

*No 4 Bars welded to 7" I Beams

R52

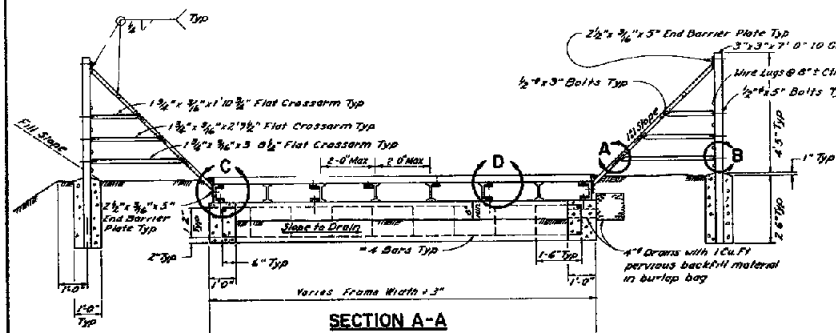
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STEEL CATTLE GUARD
26 TO 40' ROADBED

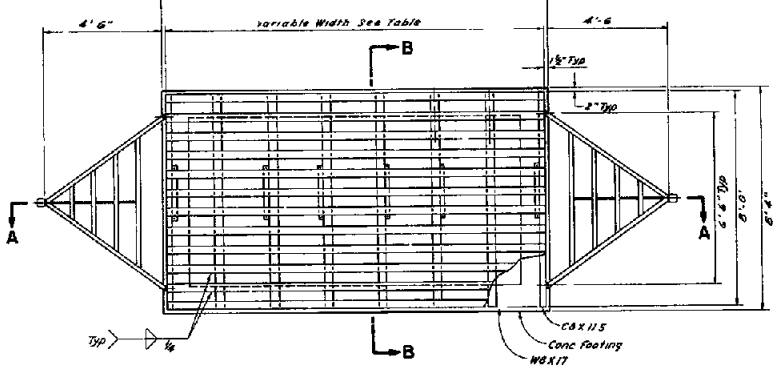
Robert L. Sharp
CHIEF ROAD DESIGN ENGR

R - 7.1.2 - (817)
ADOPTED 8/65
REVISION 2 11/69

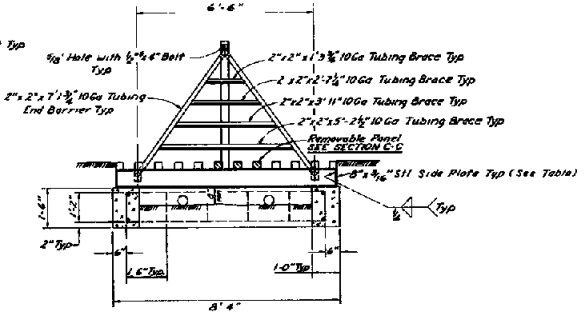
RS3



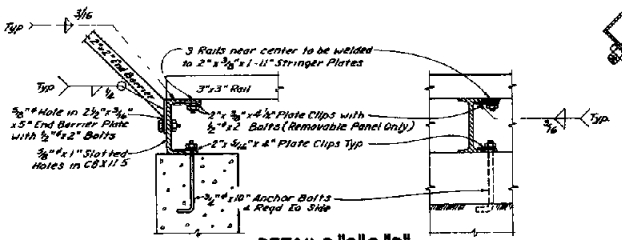
SECTION A-A



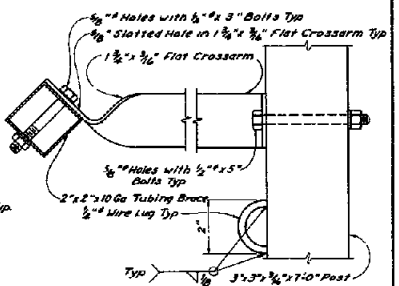
PLAN VIEW



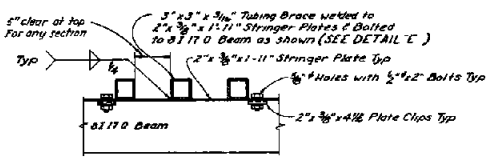
SECTION B-B



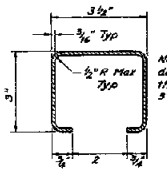
DETAILS "C" & "D"



DETAILS "A" & "B"



SECTION C-C
SHOWING REMOVABLE PANEL



DETAIL "E"

Note: A welded or rolled unit of equivalent design loading capacity, may submitted to the engineer for approval in place of 3" x 3" x 3/16" Tubing

BILL OF MATERIALS

FRAME SIZE		LONGITUDINAL STRINGERS				STRUCTURAL STEEL					
LENGTH	WIDTH	NO REQD	SIZE	SPACING	WT LBS	ITEM	NO. REQD	SIZE	LENGTH	WT LBS
6'0"	14'0"	6	W8X17	EQUAL	816	RAILS	13	3"x3"x5/16"	40'0	1264
						SIDE PLATES	2	8"x5/16"	12'0"	163
8'0"	12'0"	5	W8X17	EQUAL	680	RAILS	13	3"x3"x5/16"	12'0"	1320
						SIDE PLATES	2	8"x5/16"	12'0"	182
8'0"	13'0"	4	W8X17	EQUAL	544	RAILS	13	3"x3"x3/16"	10'0"	892
						SIDE PLATES	2	8"x3/16"	10'0"	102
8'0"	8'0"	3	W8X17	EQUAL	408	RAILS	13	3"x3"x3/16"	8'0"	713
						SIDE PLATES	2	8"x3/16"	8'0"	82

HARDWARE			
ITEM	NO. REQD	SIZE	LENGTH
BOLTS	6	1/2" ø	3"
BOLTS	18	1/2" ø	4"
BOLTS	5	1/2" ø	5"
WASHERS	55	3 1/16"	
WASHERS	14	13/16"	
NUTS	29	1/2" ø	
NUTS	14	3/4" ø	
ANCHOR BOLTS	14	3/4" ø	

MATERIAL LIST FOR ALL SIZES					
ITEM	NO. REQD.	SIZE	LENGTH	WT. LBS.
CHANNELS	2	C8X11.5	8'0"	184
STRINGER PLATES	10	8"x3/8"	1'11"	30
PLATE CLIPS	12	2"x3/8"	4½"	5
ANCHOR BOLT CLIPS	14	2"x5/16"	4"	10

CONCRETE		REINFORCING STEEL
LENGTH	CU. YDS.	WT LBS
14'0"	2.00	88
12'0"	2.05	75
10'0"	1.84	57
8'0"	1.62	50

MATERIAL LIST FOR WINGS				
ITEM	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"	5
FLAT CROSSARMS	2	1 3/4"x3/16"	3' 3 1/4"	8
BRACES	2	2"x2"x10Ga	1' 3 3/4"	13
BRACES	2	2"x2"x10Ga	2' 7 1/2"	23
BRACES	2	2"x2"x10Ga	3' 11"	34
BRACES	2	2"x2"x10Ga	5' 2 1/2"	45
END BARRIER	4	2"x2"x10Ga	7' 1 3/4"	123
END BARRIER PLATES	6	2 1/2"x3/16"	5"	4
UPRIGHT POST	2	3"x3"x3/16"	7' 0"	96

NOTE MATERIAL LIST IS FOR INFORMATION ONLY

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 H20
4. CATTLE GUARD SLOPE IS TO CONFORM TO THE ROADWAY CROSS SLOPE AND GRADE
5. SEE SPECIAL PROVISIONS FOR PROTECTIVE FINISH
6. "FRAME WIDTH" COMBINATIONS MAY BE VARIED TO OBTAIN THE SPECIFIED WIDTH OF CATTLE GUARDS
7. USE SELF-LOCKING NUTS ON REMOVABLE PANEL

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STEEL CATTLE GUARD
(TYPE B)

CHIEF ROAD DESIGN ENGR

R-T 15-(617)
ADOPTED: 3-71
REVISION 2

BILL OF MATERIALS

TIMBER

ITEM	No REQD	SIZE	LENGTH	B. 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'-4½"	12.8
Wing Braces	2	2"x6"	3'-4"	6.7
Wing Braces	4	2"x6"	5'-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"x8"	As Required	13
Nailing Strip	2	2"x2"	2'-0"	

HARDWARE

ITEM	No REQD	SIZE	LENGTH	WT LBS
Bolts	8	¾"ø	12"	15
Washers	8	¼"		6
Nails	50	40d		3
Nails	72	20d		2½
Total				26½

STRUCTURAL STEEL (1-10'-0" COMPONENT)

ITEM	No REQ'D	SIZE	LENGTH	WT LBS
Beams	5	S7X15.3	7'-3"	554.6
Structural Tubing	18	4"x2"x¼"	9'-11½"	1139.3
Spacer Plate	60	2½"x 4⅛"	0'-5"	67.0
Anchor Bolts	10	⅝"	0'-9"	9.0
End Plates	2	7"x⅛"	9'-11½"	118.5
Pipe Sleeves	8	2"	0'-6"	14.6
Connection Plates	As Reqd	5"x6"x¼"		
Connection Bolts	As Reqd	1"	15"	

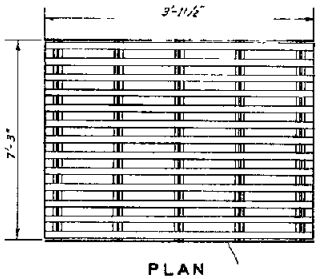
REINFORCING STEEL (1-10'-0" COMPONENT)

ITEM	No REQD	SIZE	LENGTH	WT LBS
* Horizontal Bars	12	No 4	9'-6"	76
Horizontal Bars	18	No 4	6'-9"	117
Horizontal Bars	18	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"	259
Total				580

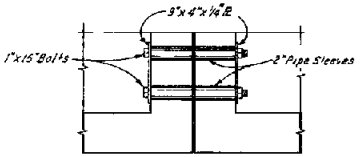
CONCRETE

1-10'-0" Component — 1.94 cu yd

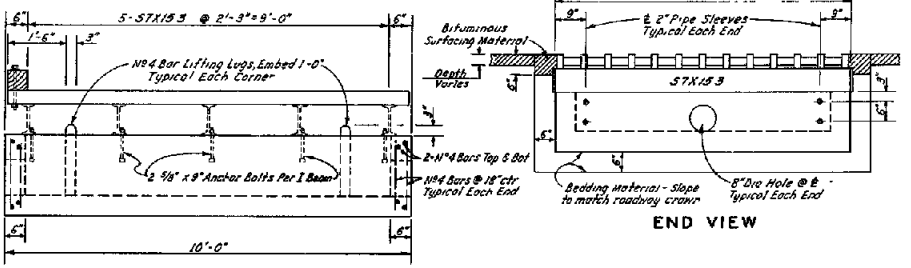
* No 4 Bars welded to I Beams



PLAN

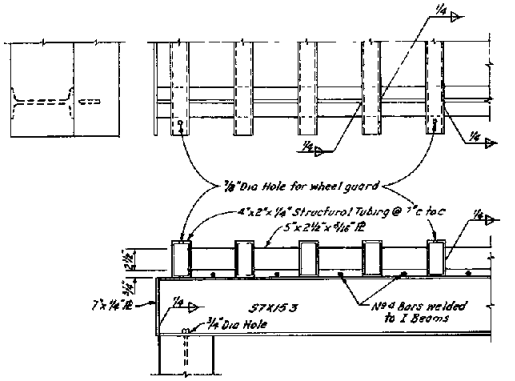


CONNECTION DETAIL

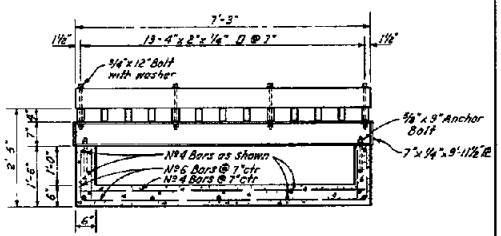


ELEVATION

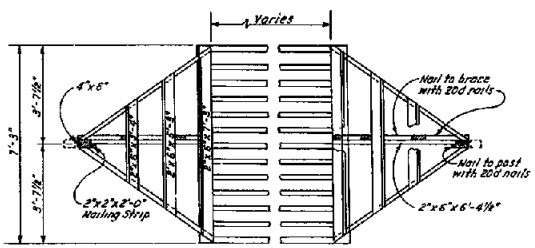
END VIEW



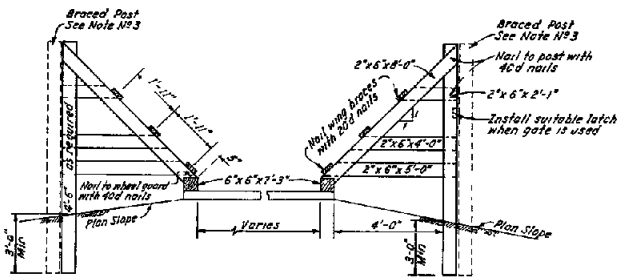
TYPICAL CONNECTION



SECTION



PLAN



ELEVATION

TIMBER WINGS

GENERAL NOTES

1 All concrete to be Class DA
2 All connections to be welded
3 When a 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

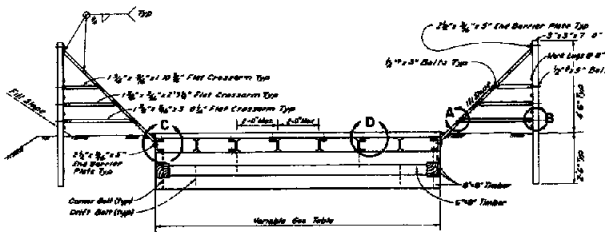
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STEEL CATTLE GUARD (TYPE C)

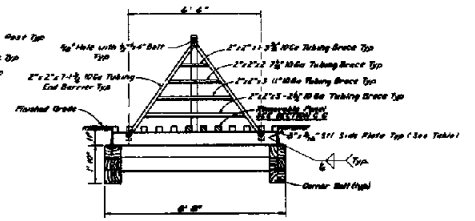
Robert L Hupp — CHIEF ROAD DESIGN ENGR

R-7.1.4-(617)
ADOPTED- 10/70
REVISION 2 4/75

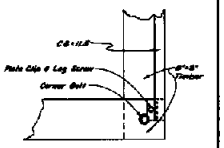
R94



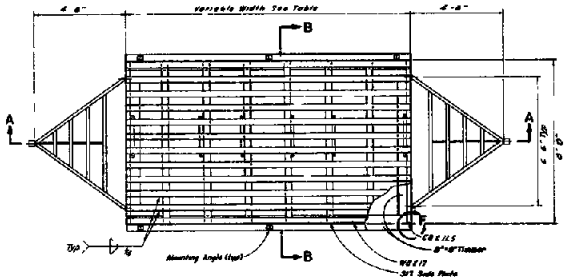
SECTION A-A
(SIDE ELEVATION)



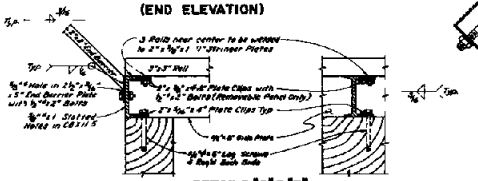
SECTION B-B
(END ELEVATION)



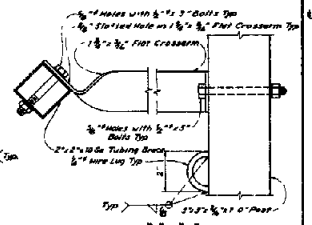
DETAIL "F"



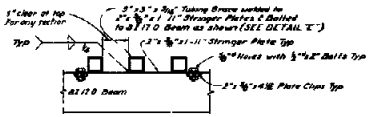
PLAN



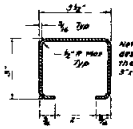
DETAILS "C" & "D"



DETAILS "A" & "B"



SECTION C-C
SHOWING REMOVABLE PANEL



DETAIL "E"

GENERAL NOTES

1. ALTERNATE DESIGN MAY BE SUBSTITUTED BY THE CONTRACTOR FOR APPROVAL BY THE ENGINEER.
2. LIVE LOADING H 20.
3. CATTLE GUARD IS TO BE PLACED IN ON LEVEL GRADE ACROSS ROADWAY. ROADWAY CROSS SLOPE IS TO TRANSITION FROM NORMAL REGIONS TO LEVEL REGIONS IN BACK OF WING AND IS AREAS OF LOSS FROM EDGE OF CATTLE GUARD.
4. "FRAME WIDTH" COMBINATIONS MAY BE VARIED TO OBTAIN THE SPECIFIED WIDTH OF CATTLE GUARD. USE BOLT LOCKING NUTS ON REMOVABLE PANEL.

BILL OF MATERIALS

FRAME SIZE LENGTH	FRAME SIZE WIDTH	LONGITUDINAL STRINGERS NO. REQ'D	LONGITUDINAL STRINGERS SIZE	LONGITUDINAL STRINGERS SPACING	LONGITUDINAL STRINGERS WT. LBS./	STRUCTURAL STEEL ITEM	STRUCTURAL STEEL NO. REQ'D	STRUCTURAL STEEL SIZE	STRUCTURAL STEEL LENGTH	STRUCTURAL STEEL WT. LBS.
8'-0"	14'-0"	4	W8X17	EQUAL	918	ANGLE	12	3 x3 x5/16	1'-6"	190
						SIDE PLATES	2	8 x5/16	1'-6"	15
8'-0"	18'-0"	5	W8X17	EQUAL	1085	ANGLE	12	4"x3"x5/16"	2'-0"	136
						SIDE PLATES	2	8 x5/16	1'-6"	15
8'-0"	10'-0"	4	W8X17	EQUAL	544	ANGLE	12	3"x3"x5/16	1'-0"	102
						SIDE PLATES	2	8 x5/16	1'-6"	15
8'-0"	8'-0"	3	W8X17	EQUAL	408	ANGLE	12	3"x3"x5/16"	1'-0"	102
						SIDE PLATES	2	8 x5/16	1'-6"	15

HARDWARE

ITEM	NO. REQ'D	SIZE	LENGTH
BOLTS	6	1/2"x	2"
BOLTS	4	1/2"x	3"
BOLTS	16	1/2"x	2"
WASHERS	26	5/16"x	
WASHERS	14	13/16"x	
NUTS	26	5/16"x	
NUTS	26	1/2"x	
LAG SCREWS	16	3/8"x	6"

MATERIAL LIST FOR ALL SIZES

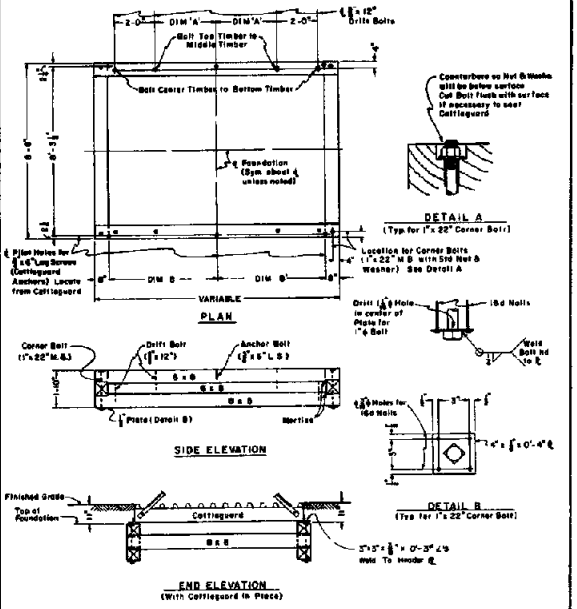
ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
CHANNELS	2	C8x11.5	8'-0"	184
STIFFENER PLATES	4	8"x5/16"	1'-11"	10
PLATE CLIPS	4	2"x5/16"	1'-0"	5
ANCHOR BOLT SLEEVES	16	2"x5/16"	1'-0"	10

MATERIAL LIST FOR WINGS

ITEM	NO. REQ'D	SIZE	LENGTH	WT. LBS.
CROSSBEAM	2	L 3/4"x3"x5/16"	1' 10 3/4"	4
CROSSBEAM FLAT	2	L 3/4"x3"x5/16"	9' 9 1/2"	6
CROSSBEAM	2	L 3/4"x3"x5/16"	3' 3 1/4"	8
BRACES	2	L 2"x2"x106c	3' 3 1/4"	11
BRACES	2	L 2"x2"x106c	4' 1 1/4"	13
BRACES	2	L 2"x2"x106c	5' 2 1/2"	16
BRACES	2	L 2"x2"x106c	7' 1 1/2"	23
RAIL	4	C x2"x106c	7' 1 3/4"	523
WALKING SURFACE PLATES	6	2'-1 7/8"x3/16"	5'"	4
RUNNING RAIL	2	3"x3"x5/16"	5'	50

NOTE: MATERIAL LIST IS FOR INFORMATION ONLY.

STEEL CATTLE GUARD DETAILS



PLAN

DETAIL A
(Typ for 1"x 22" Corner Bolt)

SIDE ELEVATION

DETAIL B
(Typ for 1"x 22" Corner Bolt)

END ELEVATION
(With Cattleguard in Place)

FRAME SIZE Length	Width	DIM A	DIM B
8'-8"	14'-0"	4'-0"	5'-4"
8'-8"	18'-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 FOUNDATION UNIT FOR EACH CATTLE GUARD FRAME
2. TIMBERS USED IN FOUNDATIONS SHALL BE TREATED

TIMBER FOUNDATION DETAILS

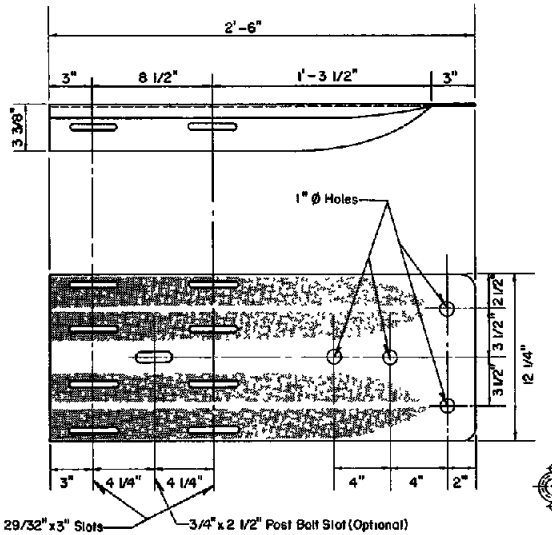
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

STEEL CATTLE GUARD
TIMBER FOUNDATION

CHIEF ROAD DESIGN ENGR | R-715 (617) | ADOPTED: 7/77 | REVISION

R55

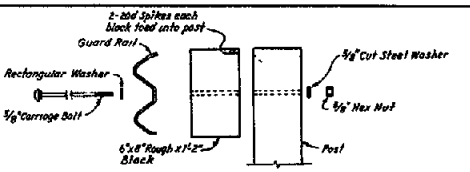
NOTES 1 THICKNESS SHALL BE .1382"
2 ALL DIMENSIONS SUBJECT TO MANUFACTURING TOLERANCES



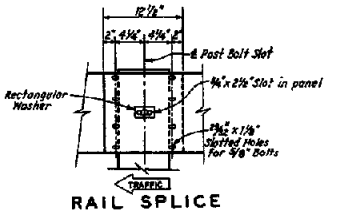
TERMINAL CONNECTOR

WHEN CONNECTOR IS ATTACHED TO BRIDGE PARAPET WHICH HAS AN EXPANSION JOINT, THE BOLTS SHALL BE PROVIDED WITH A LOCKNUT OR DOUBLE NUT AND SHALL BE TIGHTENED ONLY TO THE POINT THAT WILL ALLOW GUARDRAIL MOVEMENT

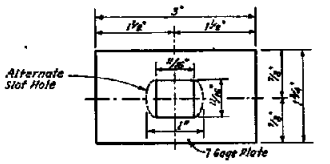
ALL BOLTS THROUGH SLOTTED HOLES SHOULD BE TORQUED TO 240 INCH-POUNDS, OR 20 FOOT-POUNDS.



POST BOLT HARDWARE
(Galvanized)



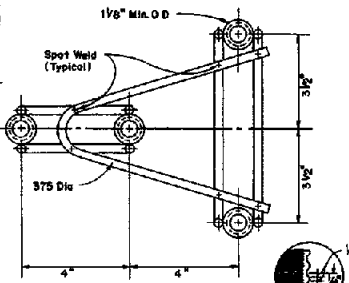
RAIL SPLICE

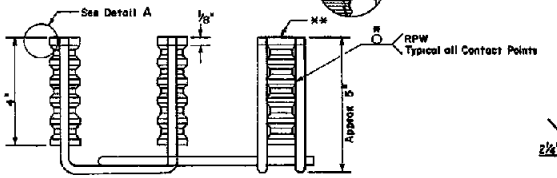


RECTANGULAR POST BOLT WASHER
(Galvanized)

NOTE- Post bolt similar except length

BOLT & NUT



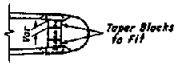


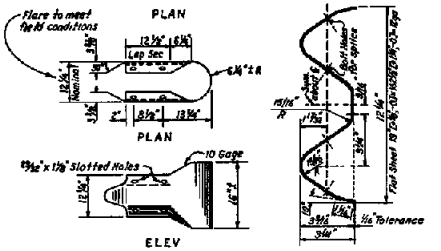
TERMINAL CONNECTOR ANCHOR ASSEMBLY

* EACH WELDED ATTACHMENT OF WIRE TO FERRULE SHALL DEVELOP THE TENSILE STRENGTH OF THE WIRE

** THREADED STEEL INSERT WITH SOLID BOTTOM TAPPED TO A MINIMUM THREADED DEPTH OF 2-1/2 FOR USE WITH 7/8" -9 X 2-1/2 GALVANIZED H S NEA BOLT AND A 15/16 I D 2-1/4" O D , 5/32 THK TYPE A PLAIN WASHER

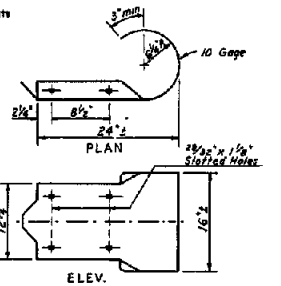
FOUR BOLTS AND FOUR WASHERS TO BE PROVIDED WITH EACH ASSEMBLY





TERMINAL RETURN SECTION

SECTION THRU RAIL ELEMENT



TERMINAL SECTION

GUIDEPOST PLACEMENT ALONG GUARDRAIL

SPACING SHALL BE AS SHOWN ON SHEET R-9 1 1 EXCEPT

(a) 50 FEET ON TANGENTS AND ON CURVES OF 300 FEET RADIUS OR GREATER

(b) ON CURVES OF LESSER RADII THE PLACEMENT SHALL BE AS INDICATED ON TABLE 1 SHEET R-9 1 1

(c) GUIDE POSTS SHALL BE OMITTED ON THE FLARED SECTIONS OF GUARDRAIL

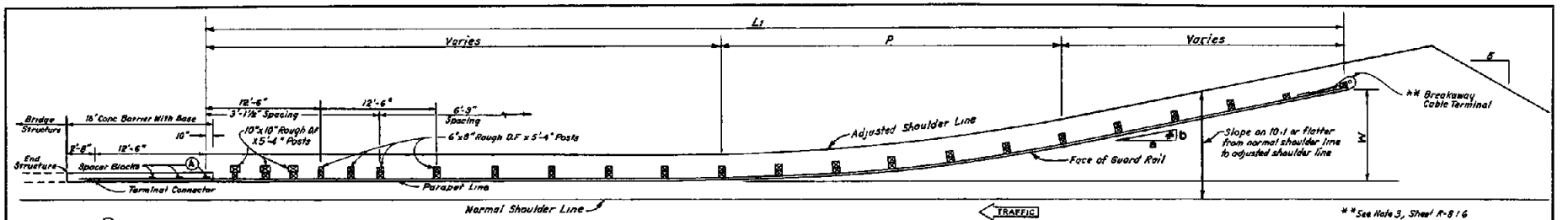
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GUARDRAIL COMPONENTS

CHIEF ROAD DESIGN ENGR

R-8.11-(618)
ADOPTED 9/73 REVISION 3-2/80

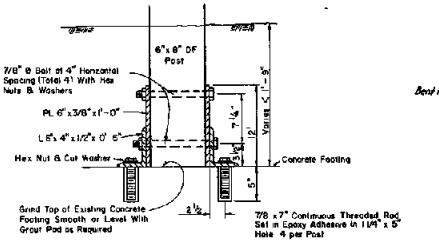
R56



Notes: (A) For Spacer Block Details See R-832
Douglas Fir Posts are shown above. The Acceptable Alternates For Each Type of Post are Listed Below

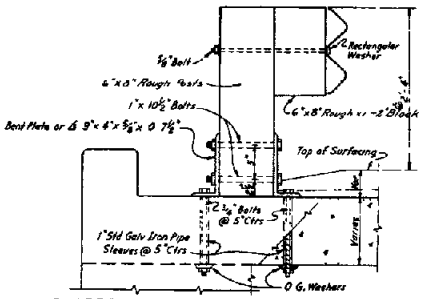
Normal Installation	Acceptable Alternates
Post. 10"x 10"x 5'-4" D F	W6 x 15.5 x 6'-0" Steel
Block 6"x 8"x 1'-2" D F	W6 x 8.5 (or 9.0) x 1'-2" Steel
Post 6"x 8"x 5'-4" D F	W6 x 8.5 (or 9.0) x 6'-0" Steel or 3¼"x 5⅝"x 3/16"x 6'-0" C Steel
Block. 6"x 8"x 1'-2" D F	W6 x 8.5 (or 9.0) x 1'-2" Steel or 3¼"x 5⅝"x 3/16"x 1'-2" C Steel

TYPICAL APPROACH INSTALLATION

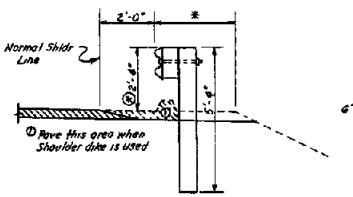


POST FOOTING CONNECTION

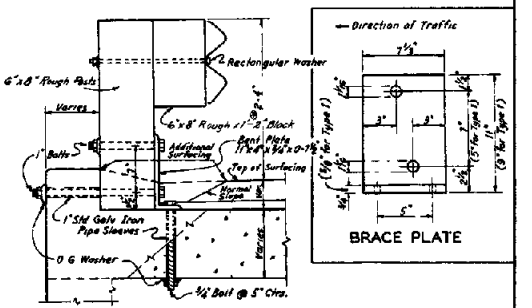
USE WHEN CONCRETE INTERFERES WITH FULL LENGTH POST



GUARDRAIL ON STRUCTURES - TYPE 1 MOUNT



EMBANKMENT INSTALLATION

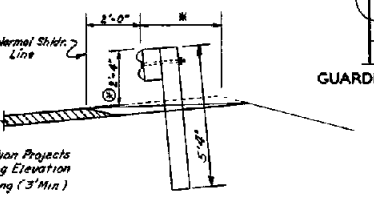


GUARDRAIL ON STRUCTURES - TYPE 2 MOUNT

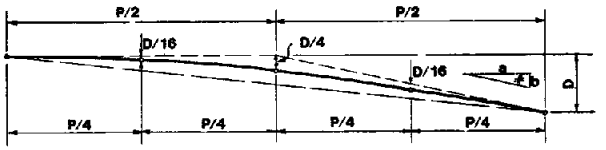
BRACE PLATE

GUARD RAIL FLARE RATES (*)	
Operating Speed	Flare Rate
70	15:1 max.
60	13:1
50	11:1
40	9:1

In cases where taper is too gradual to be practical, lesser flares may be used with prior approval of the Chief Road Design Engineer



SUPERELEVATED INSTALLATION



PARABOLIC LAYOUT

(*) Guardrail Heights on Stage Construction Projects Shall be Governed by Final Surfacing Elevation

* See Project Typical Sections for Widening (3' Min.)

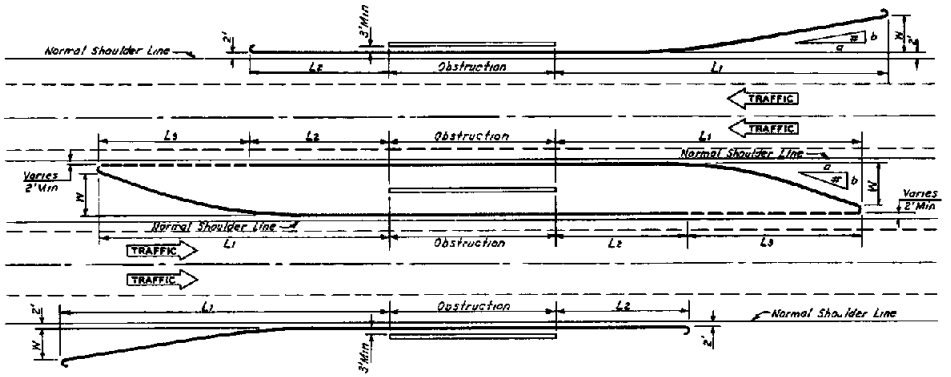
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GUARDRAIL INSTALLATION

CHIEF ROAD DESIGN ENGR.

R-8.1.2 -(618)
ADOPTED: 8/69
REVISION 6-2/80

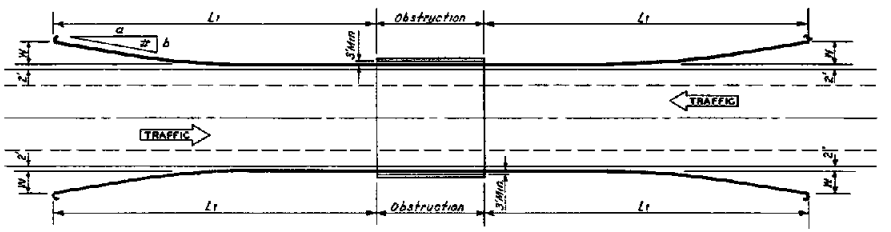
R 57



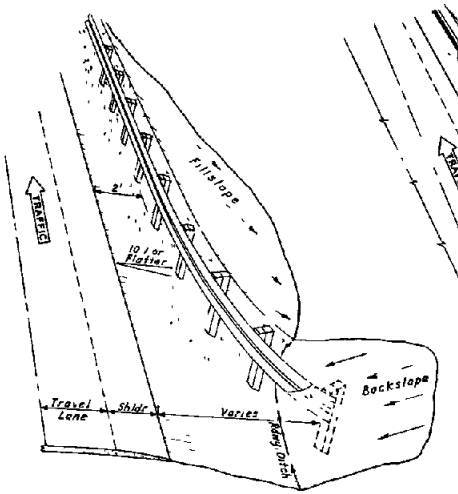
4 LANE DIVIDED HIGHWAY

GUARD RAIL FLARE RATES #	
Operating Speed	Flare Rate
70	16:1 max.
60	12:1
50	11:1
40	9:1

In cases where taper is too gradual to be practical, lesser flares may be used with prior approval of the Chief Road Design Engineer

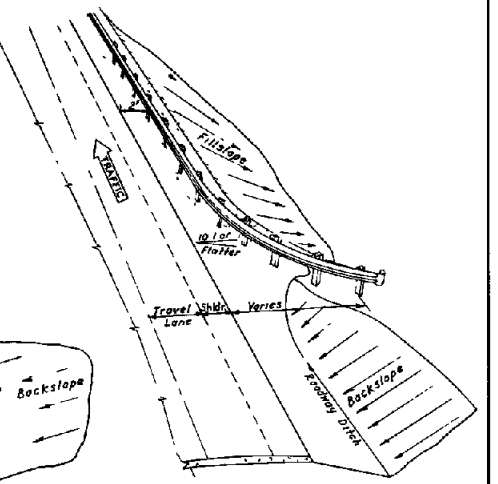


2 LANE HIGHWAY

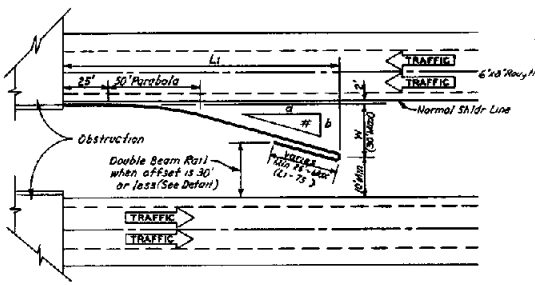


APPROACH END BURIED IN BACKSLOPE

Breakaway Cable Terminal Shall Be Eliminated When Guardrail is Buried in the Backslope

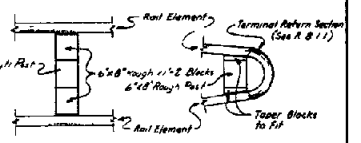


APPROACH END POSITIONED BEHIND BACKSLOPE



DUAL BRIDGE WITH OPEN MEDIAN

(Median Slopes ≈ 10:1 or flatter)



DOUBLE BEAM RAIL DETAIL

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GUARDRAIL INSTALLATION

CHIEF ROAD DESIGN ENGR

R-8.1.3 -(6|8)

ADOPTED 8/69

REVISION 5 4/79

R 58

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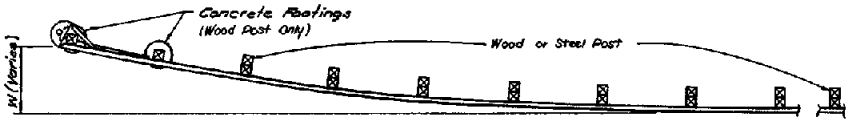
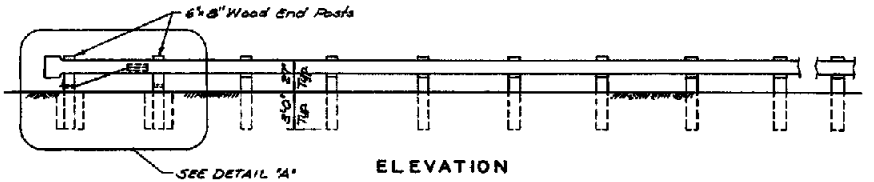
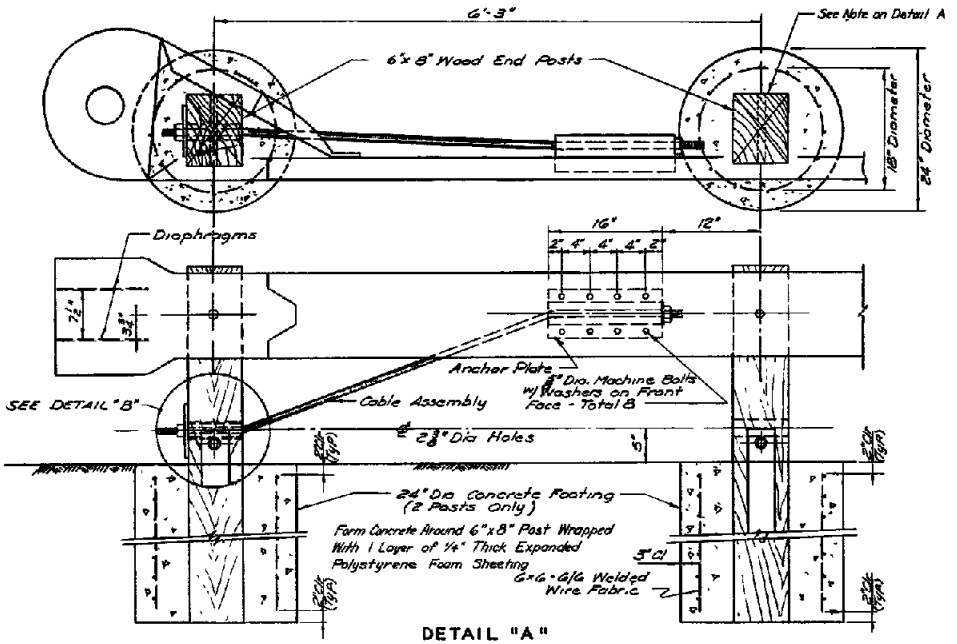


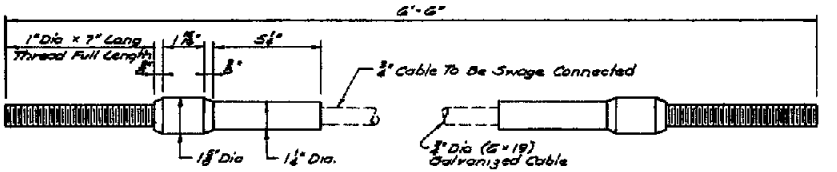
PLAN



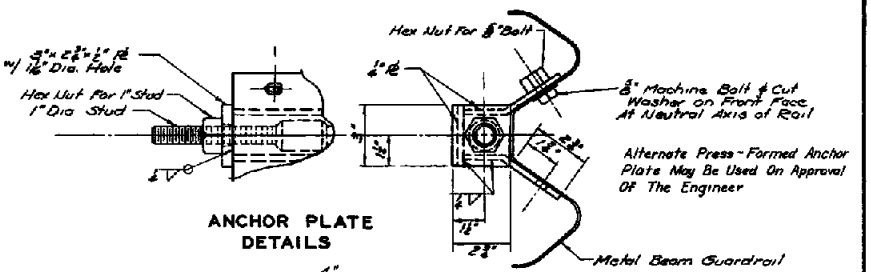
ELEVATION



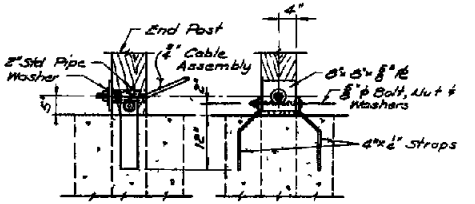
DETAIL "A"



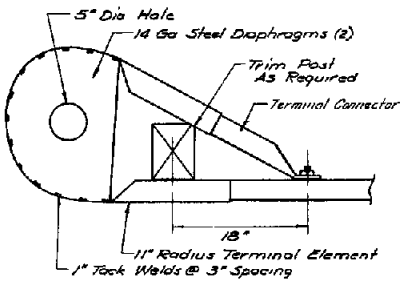
CABLE ASSEMBLY



ANCHOR PLATE DETAILS



DETAIL "B"



DIAPHRAGM DETAILS

— GENERAL NOTES —

1. POST SPACING SHALL BE 6' - 3" EXCEPT AS OTHERWISE NOTED
2. FOR DETAIL NOT SHOWN REFER TO STANDARD GUARDRAIL SHEETS.
3. TERMINAL MAY BE OMITTED WHEN END OF GUARDRAIL IS BURIED IN BACKSLOPE

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

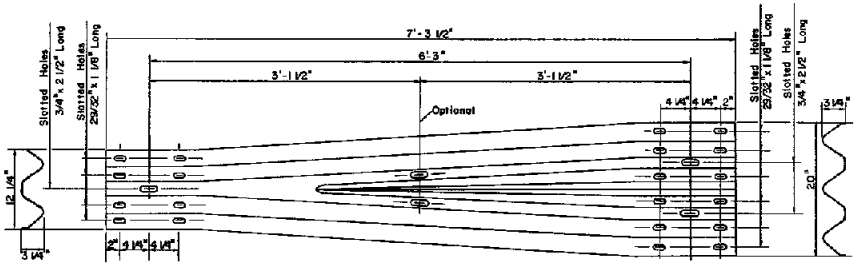
BREAKAWAY CABLE TERMINAL

CHIEF ROAD DESIGN ENGR

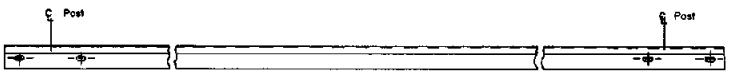
R-8.1.6 (618)
ADOPTED 7/73 REVISION 1-2/80

REF

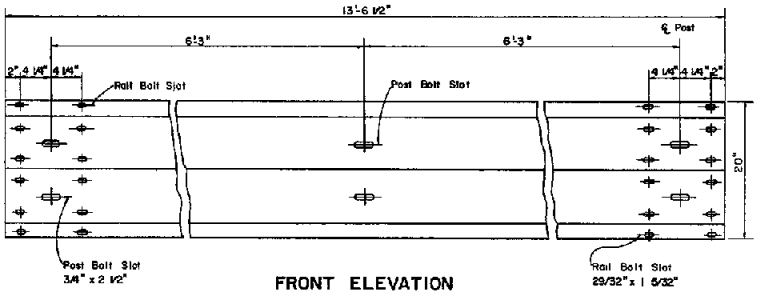
R62



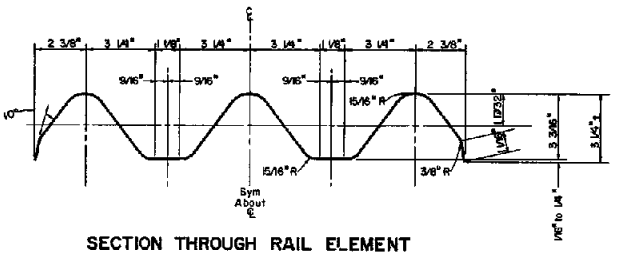
TRANSITION SECTION



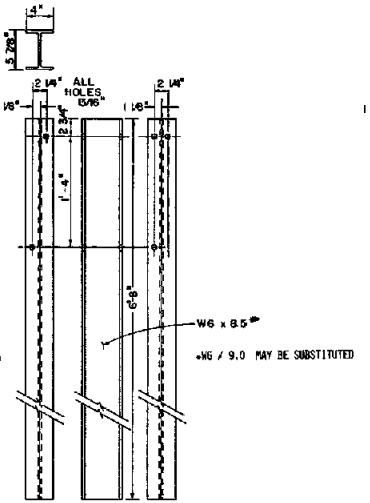
PLAN VIEW



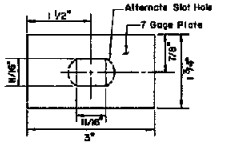
FRONT ELEVATION



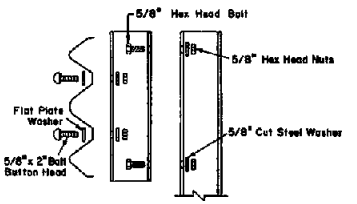
SECTION THROUGH RAIL ELEMENT



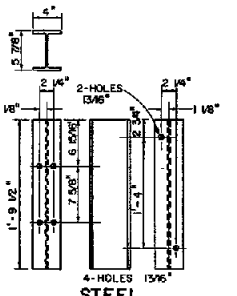
STEEL POST



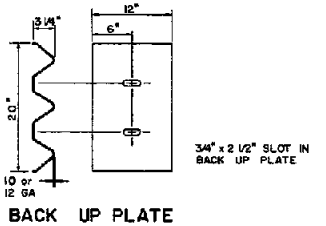
FLAT PLATE WASHER
(GALVANIZED)



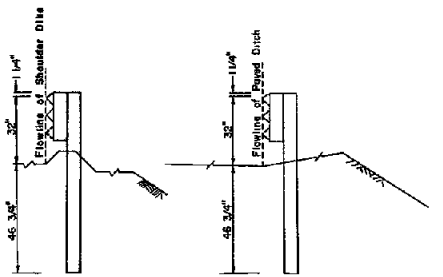
POST BOLT HARDWARE
(GALVANIZED)



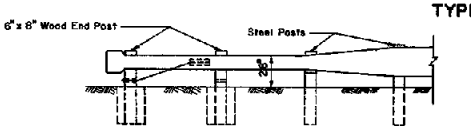
STEEL OFFSET BLOCK



BACK UP PLATE



TYPICAL GUARDRAIL INSTALLATIONS



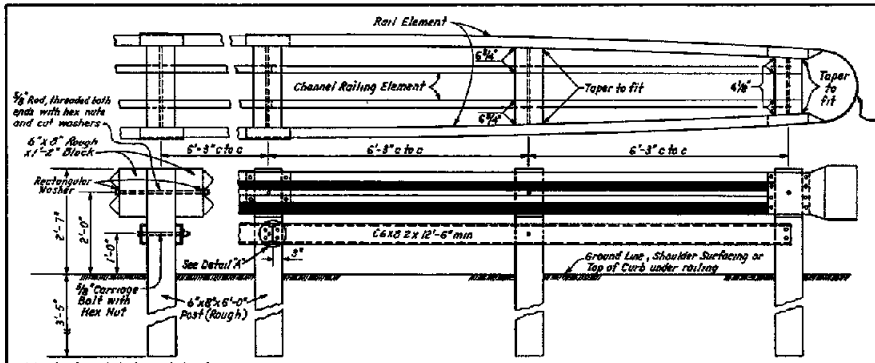
TRANSITION FOR BREAKAWAY CABLE TERMINALS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GALVANIZED GUARDRAIL
TRIPLE CORRUGATIONS

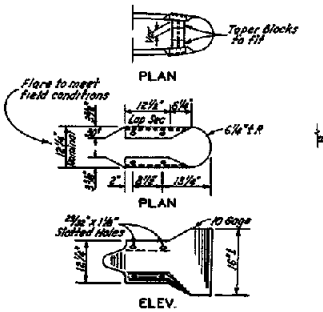
CHIEF ROAD DESIGN ENGR.

R-8.1.7 (618)
ADOPTED 8 12/78 REVISION

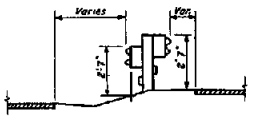


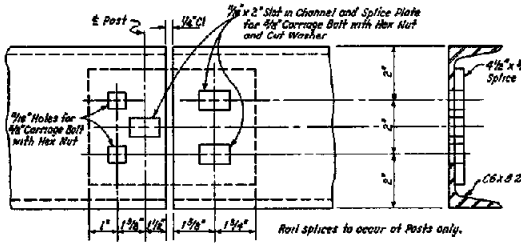
TIMBER POST MEDIAN BARRIER RAIL

For vehicular impact attenuator options, see manufacturer's design manuals.

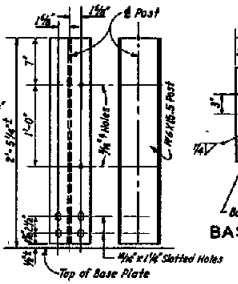


TERMINAL RETURN SECTION

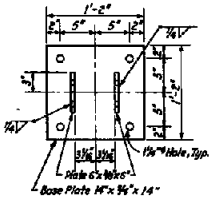




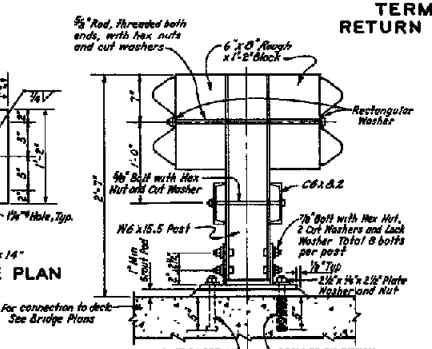
DETAIL 'A' – CHANNEL RAIL SPLICE



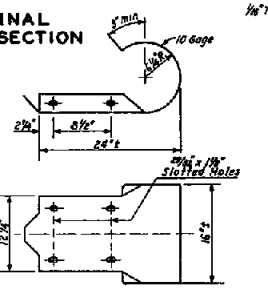
POST DETAILS



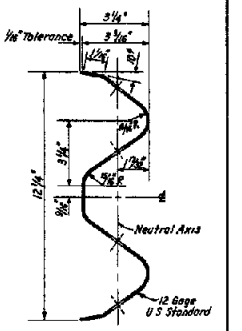
BASE PLATE PLAN



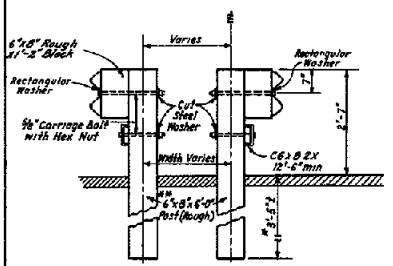
METAL POST MEDIAN BARRIER RAIL



TERMINAL SECTION

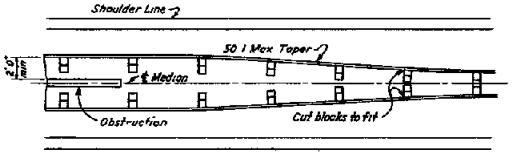


SECTION THRU RAIL ELEMENT

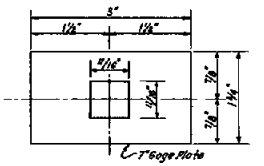


* Depth varies where bridge piers are located on continuous footings
** On bridge deck use W6X15.5 Post (See Double Rail Detail for applicable details)

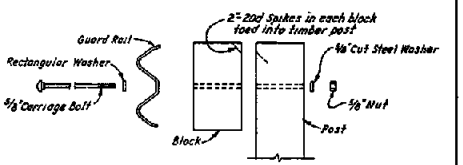
SINGLE METAL BEAM BARRIER RAIL



METAL BEAM BARRIER RAIL
PLAN AT MEDIAN OBSTRUCTIONS



RECTANGULAR POST BOLT WASHER



POST BOLT HARDWARE
(Galvanized)

NOTE. See Sheet R-8 1 2, "Typical Approach Installation" for method of attachment to structures.

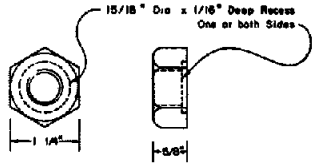
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

METAL BEAM BARRIER RAIL

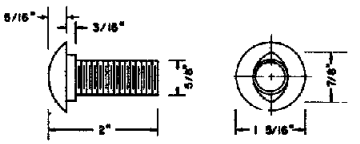
CHIEF ROAD DESIGN ENGR.

R-8.2.1-(618)
ADOPTED 8/69
REVISION 5-4/79

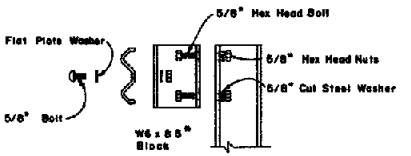
R63



5/8" RECESS NUT

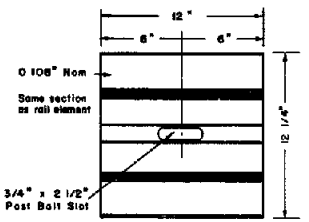


5/8" BUTTON HEAD BOLT

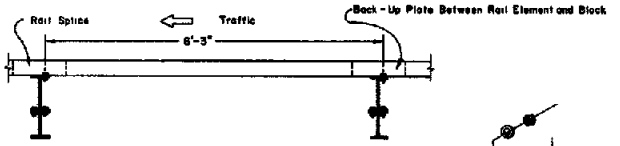


POST BOLT HARDWARE
(GALVANIZED)

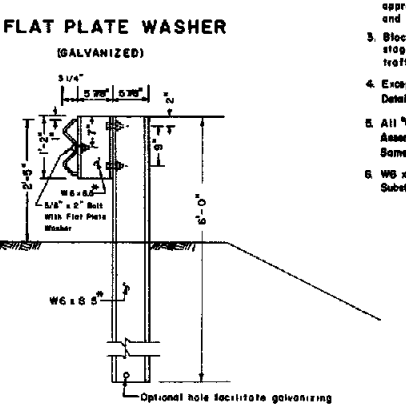
* See Note 6



BACK – UP PLATE
(For use between guard rail and steel block at posts between rail splices)



PLAN

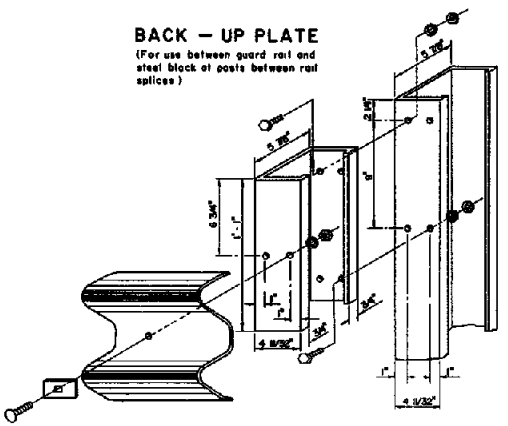


FLAT PLATE WASHER
(GALVANIZED)

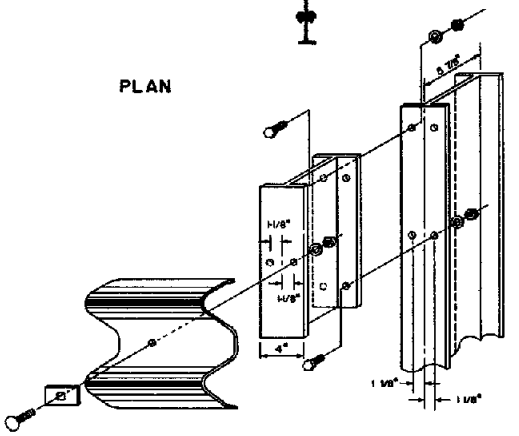
POST DETAIL

NOTES:

1. All holes 3/4" ϕ
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
4. Except For Alternate Bolt Placement Detail, All Views Show W6 x 8.5 Details.
5. All "C" Type Posts And Blocks Must Be Assembled With The Open Ends In The Same Direction
6. W6 x 80 Steel Posts and Blocks May be Substituted.



ALTERNATE BOLT PLACEMENT
"C" TYPE POST AND BLOCK



BOLT PLACEMENT DETAIL

METAL BEAM GUARDRAIL WITH W6 x 8.5*
OR "C" TYPE ALTERNATE STEEL POSTS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

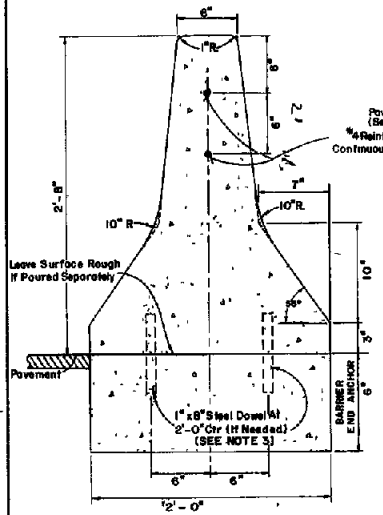
STEEL POST
METAL BEAM GUARDRAIL

CHIEF ROAD DESIGN ENGR

R-8.2.2 (6.18)
ADOPTED 2/79 REVISION 1- 2.80

FOR SNOWPOLE MARKER/DELINEATOR DETAILS, SEE SHEET R-8 3.3.

FOR SPACING OF DELINEATORS, SEE SHEETS R-8 1.1 & R-8.1.1.



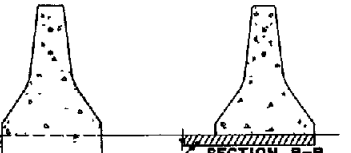
SECTION

TYPE A

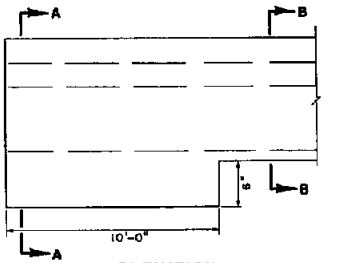
CONCRETE (INFORMATION ONLY)

0.1032 CU. YD PER LIN. FT WITHOUT BASE SLAB

0.1402CU YD PER LIN FT WITH BASE SLAB



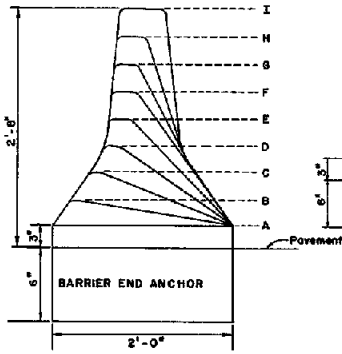
SECTION A-A



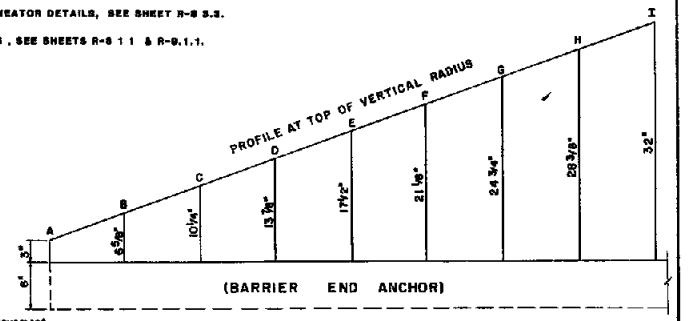
ELEVATION

BARRIER END ANCHOR

(SEE NOTE 3)



TRANSITION DETAIL



TRANSITION OF END OF BARRIER

APPROACH END 8 EQUAL SPACES - 80'-0"

TRAILING END 8 EQUAL SPACES - 20'-0"

MAX.- TO BE CONSTRUCTED ONLY WITH PRIOR APPROVAL OF CHIEF ROAD DESIGNER.

GENERAL NOTES

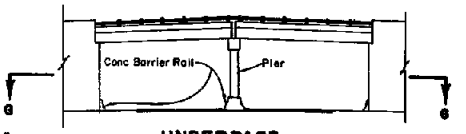
1 CONCRETE SHALL BE CLASS A OR AA AND SHALL BE FINE SURFACE FINISHED

2 TRANSVERSE JOINTS WITH 1" PREMOLDED EXPANSION JOINT FILLER OR 1 OPEN TRANSVERSE JOINTS SHALL BE PLACED AT STRUCTURES JOINTS IN BARRIER RAIL OVER A STRUCTURE SHALL BE AT THE SAME LOCATION AND OF THE SAME DIMENSION AS THOSE IN THE STRUCTURE

3 BITUMINOUS PAVING REQUIRED PAVING SHALL BUTT AGAINST THE BARRIER RAIL END ANCHOR SECTION AND SHALL EXTEND FULL WIDTH UNDER THE NORMAL BARRIER RAIL SECTION 6-INCH BARRIER END ANCHORS SHALL BE CONSTRUCTED IN THE FIRST AND LAST 10 LINEAR FEET OF THE FULL HEIGHT BARRIER RAIL RUN IF TRANSITIONS ARE USED, THE ANCHOR SHALL BE EXTENDED UNDER THE TRANSITION CONCRETE PAVING REQUIRED THE NORMAL BARRIER RAIL SECTION MAY BE PLACED ON THE CONCRETE PAVEMENT DOWELS SHALL BE REQUIRED IN THE FIRST AND LAST 10 LINEAR FEET OF THE FULL HEIGHT BARRIER RAIL AND THROUGH TRANSITION SECTIONS THE SURFACE OF THE CONCRETE SHALL BE CLEAN PRIOR TO PLACEMENT OF BARRIER RAIL AT THE CONTRACTORS OPTION, CONCRETE PAVEMENT AND BARRIER RAIL MAY BE PLACED MONOLITHICALLY, IN WHICH CASE DOWELS MAY BE ELIMINATED

4 FOR GLARE SCREEN DETAILS SEE STANDARD SHEET R-8 4 1 THRU R-8 4 5

5 FOR VEHICULAR IMPACT ATTENUATOR OPTIONS SEE MANUFACTURER'S DESIGN MANUALS



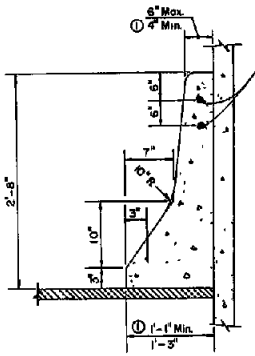
UNDERPASS

CONCRETE BARRIER RAIL

FLARE RATES

OPERATING SPEED	FLARE RATE *
70	20 1 MAX
60	17 1
50	14 1
40	11 1

IN CASES WHERE TAPER IS TOO GRADUAL TO BE PRACTICAL, 10 1 TO 15:1 FLARE MAY BE USED WITH PRIOR APPROVAL OF THE CHIEF ROAD DESIGN ENGINEER

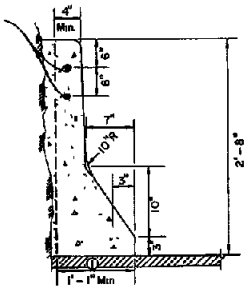


TYPE B

CONCRETE (INFORMATION ONLY)

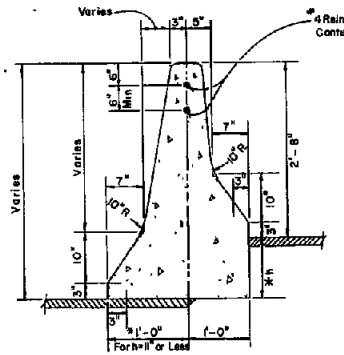
4" MIN 0.0698 CU. YD. PER LIN FT

6" MIN 0.0765 CU. YD PER LIN FT



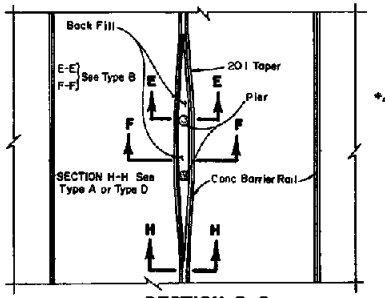
TYPE C

① DIMENSION USED WHEN BARRIER IS PLACED AGAINST ROCK OR SOLID OBJECT SUCH AS A RETAINING WALL.



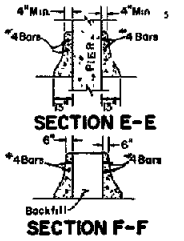
TYPE D

"H" WITH EACH 6" INCREASE IN "H" ELEVATION, THE BASE WIDTH WILL INCREASE 2" OVER THE NORMAL 1'-0" DIM



SECTION G-G

TREATMENT AT UNDERPASS PIERS



STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

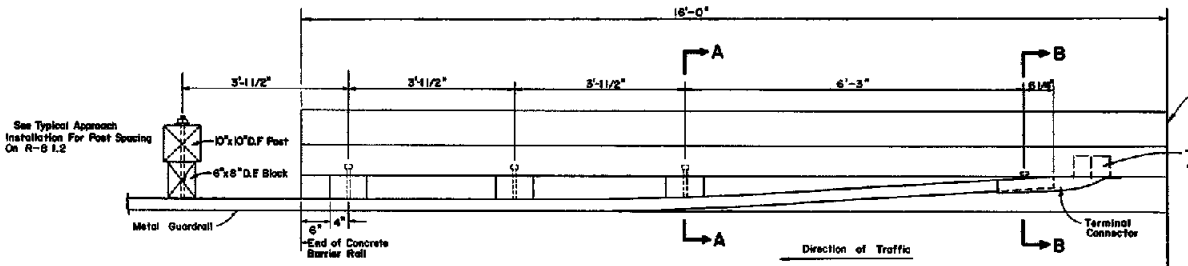
CONCRETE BARRIER RAIL

CHIEF ROAD DESIGN ENGR

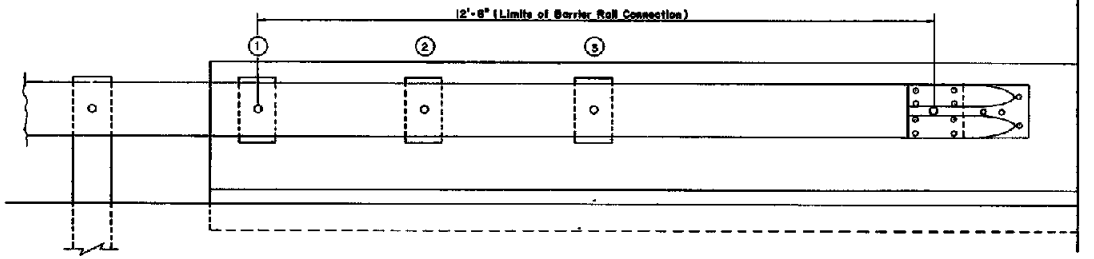
R-8.3.1 (502)

ADOPTED 11/70 REVISION 7 2/80

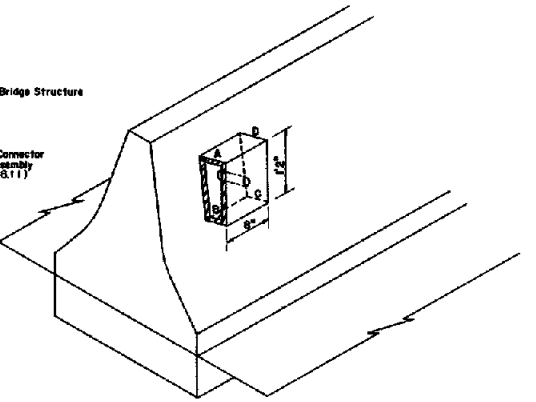
R85

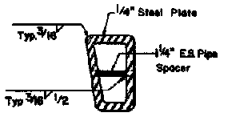


PLAN



ELEVATION



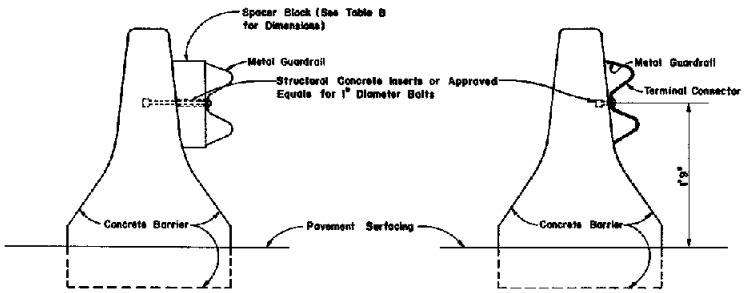


END VIEW
SPACER BLOCK

TABLE B

No.	A	B	C	D
1	6"	2 3/4"	2 3/4"	6"
2	5 5/8"	2 3/4"	3 1/8"	5 3/4"
3	4 1/8"	1 7/8"	4 1/8"	3 7/8"

SPACE DIMENSIONS



SECTION A-A SECTION B-B

GENERAL NOTES

1. FOR CONCRETE BARRIER RAIL DETAILS, SEE STANDARD SHEET NUMBER R-8 1 1
2. FOR GUARDRAIL DETAILS, POST SPACING AND INSTALLATION PROCEDURES, SEE STANDARD SHEET NUMBERS R-8 1 1 THRU R-8 1 2

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

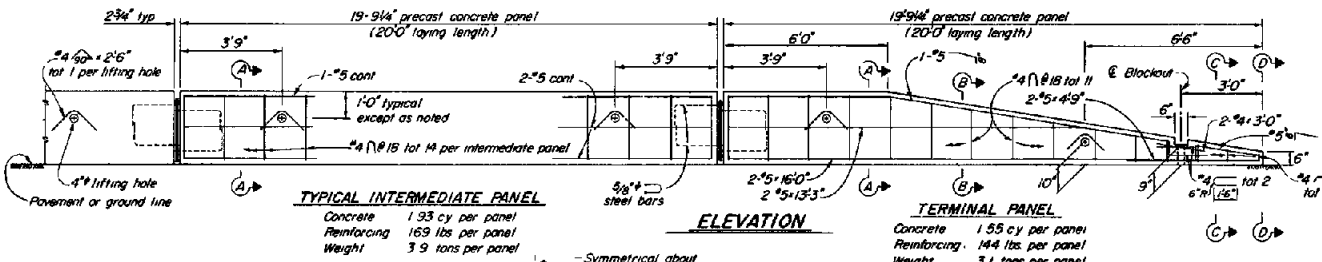
GUARD RAIL - BARRIER RAIL CONNECTION

CHIEF ROAD DESIGN ENGR

R-8 3.2.(502)

ADOPTED: 8/78 REVISION 1-1/80

R66



TYPICAL INTERMEDIATE PANEL

Concrete	1.93 cy per panel
Reinforcing	169 lbs per panel
Weight	3.9 tons per panel

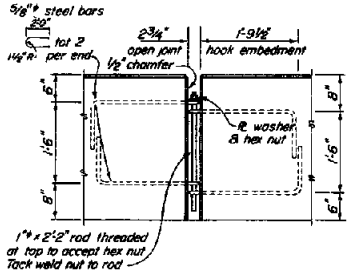
ELEVATION

TERMINAL PANEL

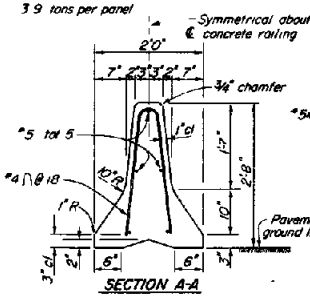
Concrete	1.55 cy per panel
Reinforcing	144 lbs per panel
Weight	3.1 tons per panel

Note: #4 ∩ @ 18 and #4 ⌒ @ 14 may be replaced by welded wire fabric of equivalent cross-sectional area

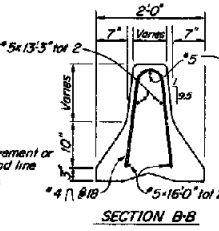
For details not shown in Sections B-B, C-C, & D-D, see Section A-A



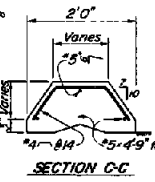
PIN CONNECTION DETAIL



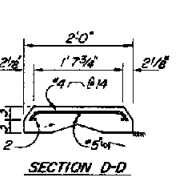
SECTION A-A



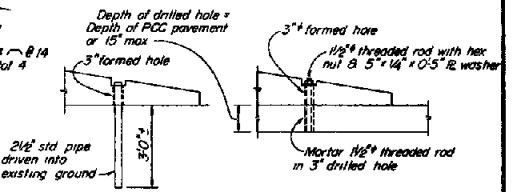
SECTION B-B



SECTION C-C



SECTION D-D



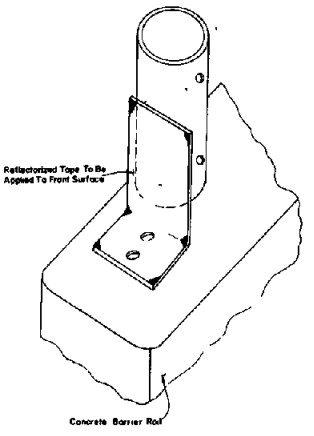
GROUND ANCHORAGE

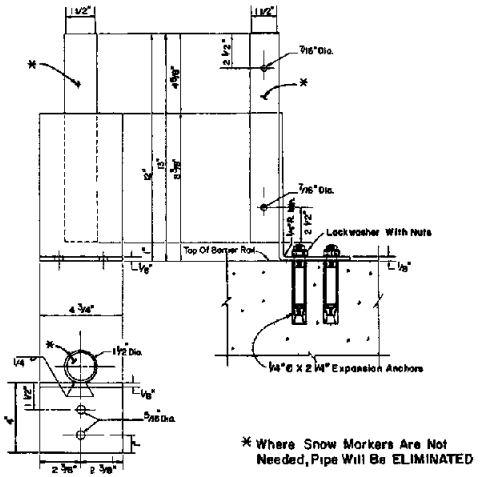
PCC PAVEMENT ANCHORAGE

GENERAL NOTES:

1. All bolts to have cut washer unless otherwise stated.
2. Alternative details for lifting the precast concrete panels of the Temporary Railing may be submitted by the Contractor for the Engineer's approval.

TEMPORARY RAILING





* Where Snow Markers Are Not Needed, Pipe Will Be ELIMINATED

SNOWPOLE MARKER DELINEATOR

FOR PERMANENT BARRIERS ONLY

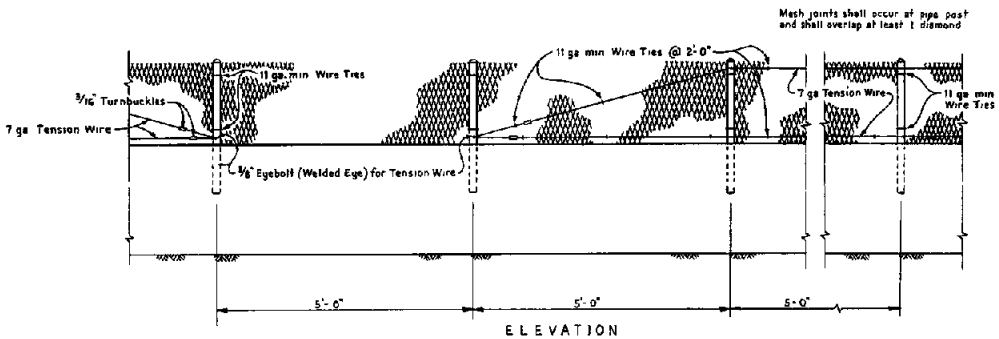
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PORTABLE PRECAST CONCRETE BARRIER RAIL
SNOWPOLEMARKER/DELINEATOR

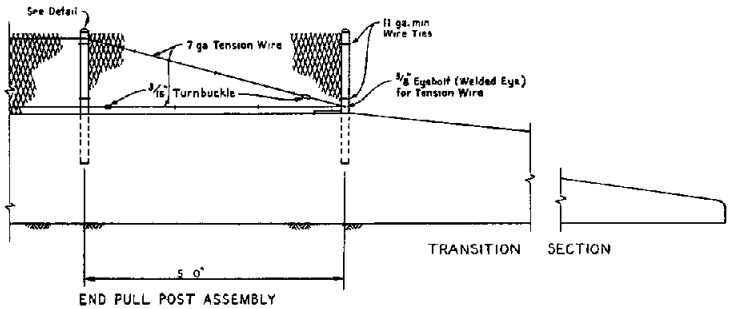
CHIEF ROAD DESIGN ENGR

R-833 (502.616)
ADOPTED: 1/76 REVISION: 1-12-06

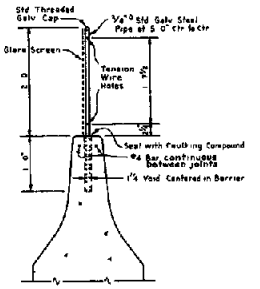
R87



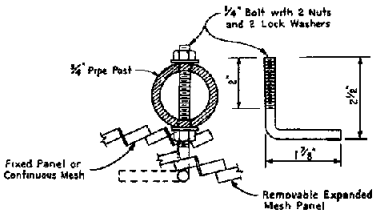
ELEVATION



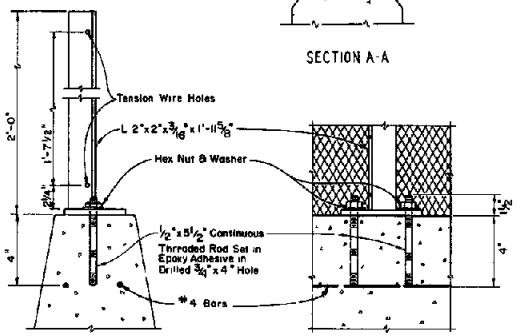
END PULL POST ASSEMBLY

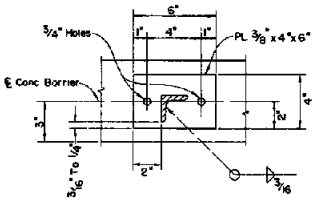


SECTION A-A



DETAIL D





ALTERNATE GLARE SCREEN POST ANCHORAGE

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

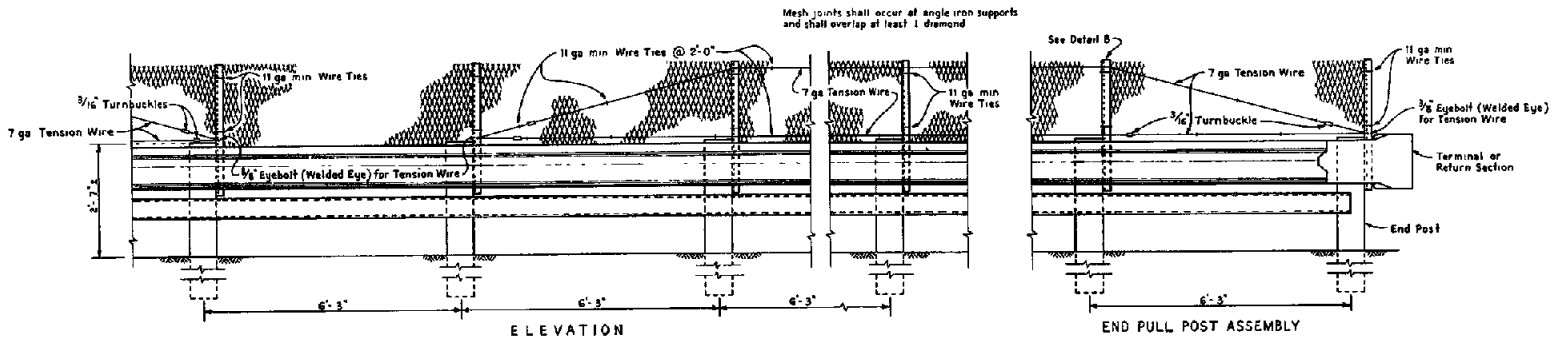
HEADLIGHT GLARE SCREEN
(TYPE B)

Robert L. Shaw
CHIEF ROAD DESIGN ENGR.

R-8.4.1 (632)
ADOPTED 5/70 REVISION 1-1/76

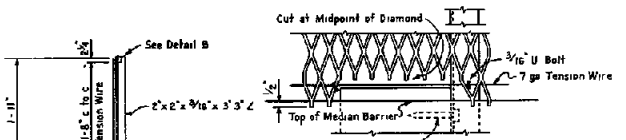
R68

R69

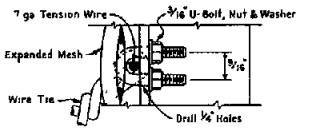


ELEVATION

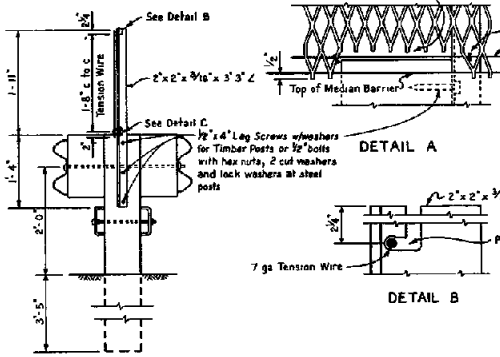
END PULL POST ASSEMBLY



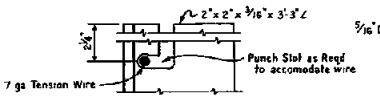
DETAIL A



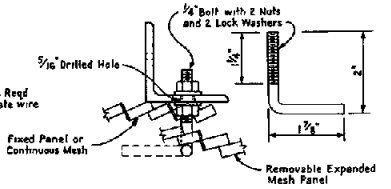
DETAIL C



SEC. A-A



DETAIL B



DETAIL D

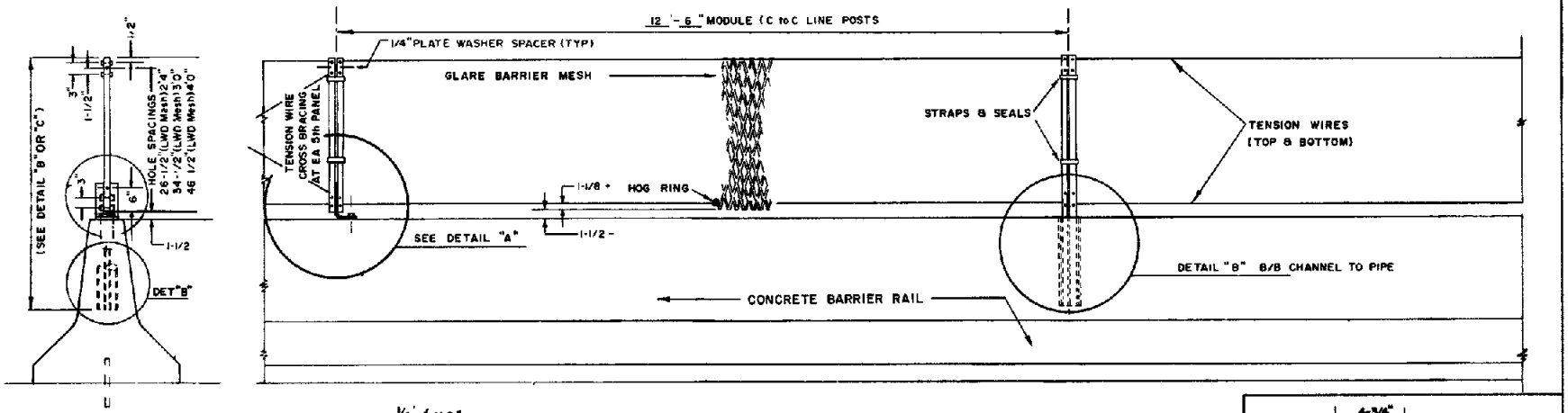
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

HEADLIGHT GLARE SCREEN (TYPE A)

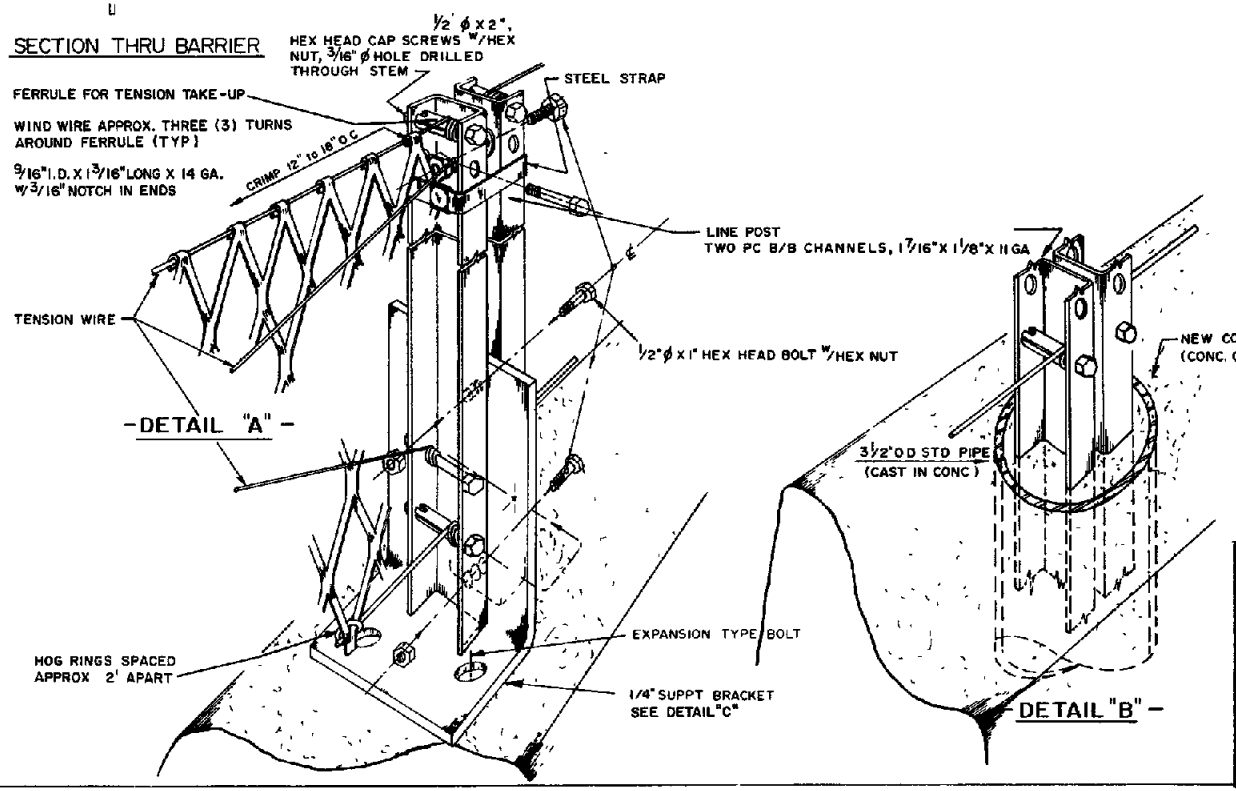
CHIEF ROAD DESIGN ENGR

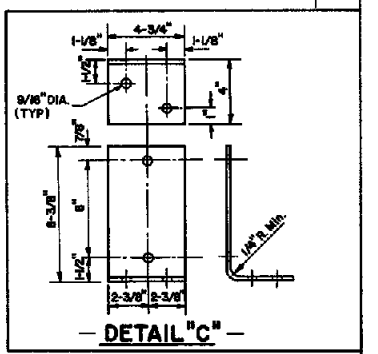
R-842 (632)

ADOPTED 7/69 REVISION 1-1/76



SECTION THRU BARRIER





-DETAIL "C"-

GENERAL NOTES

1 SEE SHEET R-83.1 & R-84.1 FOR CONCRETE BARRIER RAIL DETAILS.

2. METHOD OF ATTACHING GLARE SCREEN TO CONCRETE BARRIER RAIL IS OPTIONAL (EITHER DETAIL "A" OR DETAIL "B")

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

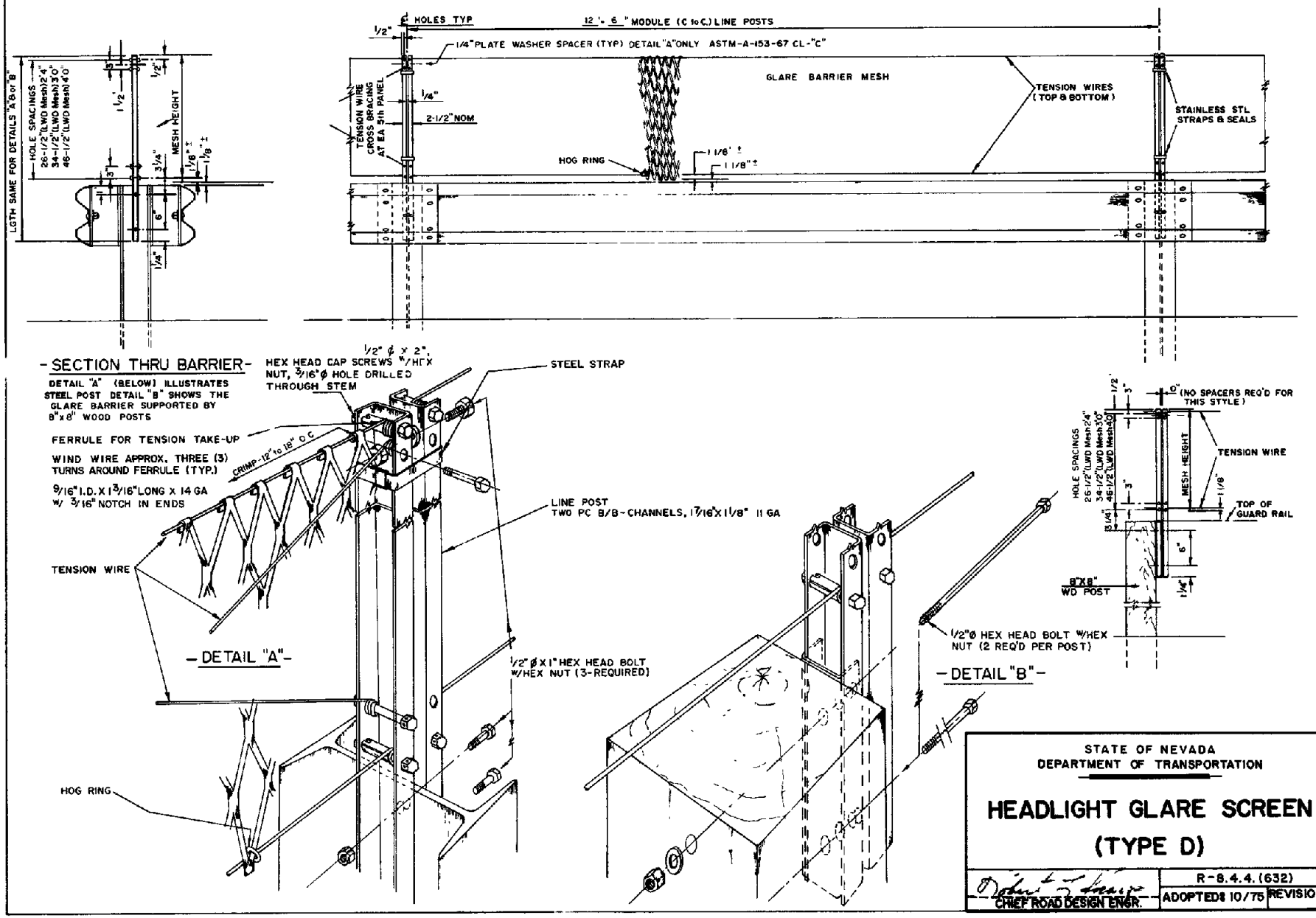
HEADLIGHT GLARE SCREEN (TYPE C)

CHIEF ROAD DESIGN ENGR.

R-8 4.3. (632)

ADOPTED: 10/78 REVISION:

R70



R71

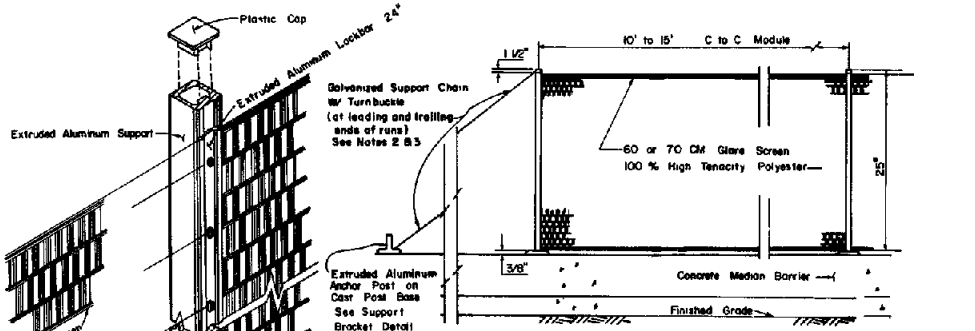
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

HEADLIGHT GLARE SCREEN (TYPE D)

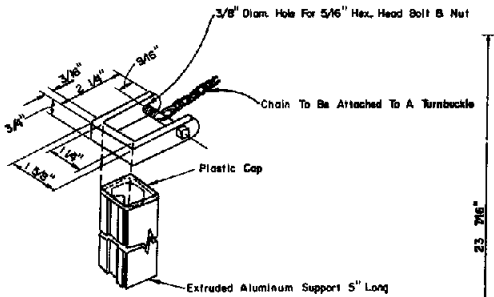
CHIEF ROAD DESIGN ENGR.

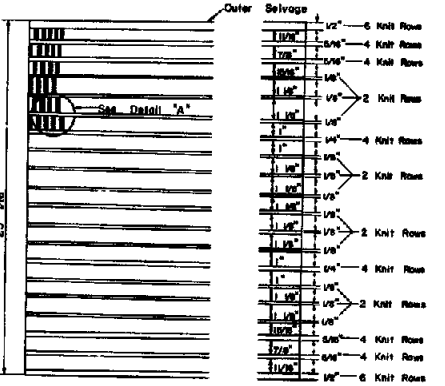
R-8.4.4.(632)

ADOPTED: 10/75 REVISION

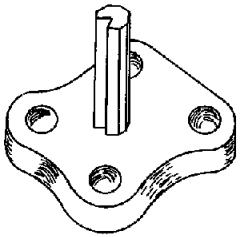


GLARE SCREEN ON CONCRETE MEDIAN BARRIER



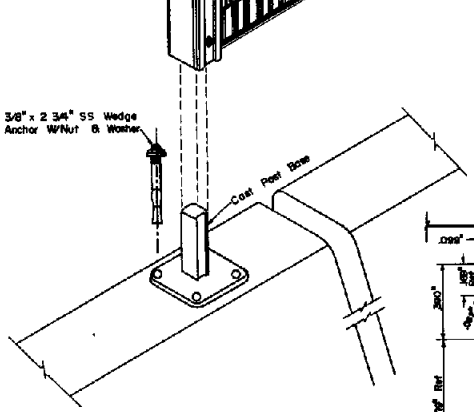


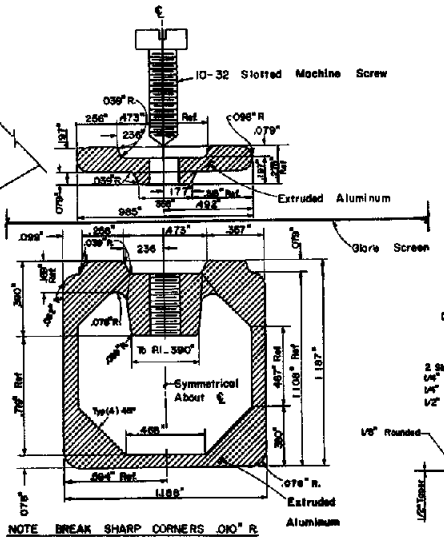
MESH DETAILS



SUPPORT BRACKET

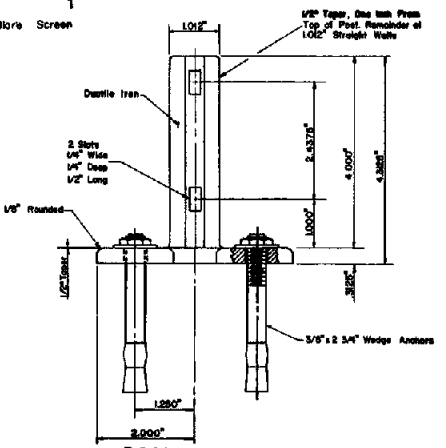
DETAIL "A"



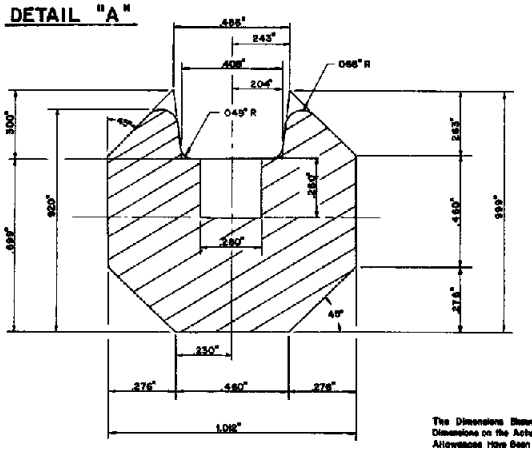


NOTE BREAK SHARP CORNERS .010" R

SUPPORT POST and LOCK BAR

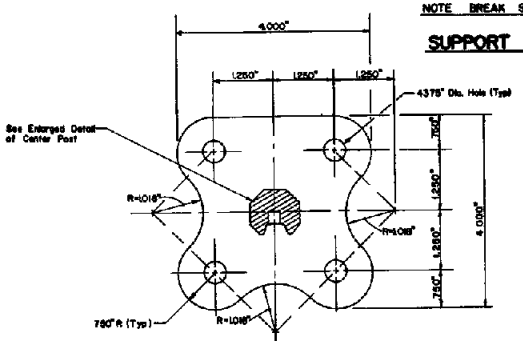


POST BASE SIDE VIEW



DETAIL OF BASE POST

The Dimensions Shown are the Required Dimensions on the Actual Casting Allowances Have Been Made for Galvanized Coatings and Fit
Break Sharp Corners .010" R



POST BASE TOP VIEW

GENERAL NOTES

1 THE 24" SCREEN REQUIRES A POST OF 25" ± 1/4" (EST WEIGHT 7.13 LB/FT) AND A LOCKBAR OF 24" ± 1/8" (EST WEIGHT 0.194 LB/FT) MESH TENSION OF 400 LBS

2 SUPPORT CHAIN IS A 1/0 DOUBLE LOOP COIL CHAIN, HOT DIP GALVANIZED, WITH A WORKING LOAD OF 200 LBS. IT IS TENSIONED WITH A 3/8" X 4" GALVANIZED OR STAINLESS TURNBUCKLE

3 END ANCHOR CONSISTS OF 5" OF SUPPORT POST INSTALLED ON THE POST BASE AND SECURED WITH TWO 5/8" SCREWS USED AS SET SCREWS. THEN USE A SQUARE GALVANIZED BRACKET TO CLAMP TO BASE POST AND JOINT WITH SUPPORT CHAIN TO AN IDENTICAL BRACKET AT TOP OF END SUPPORT POST.

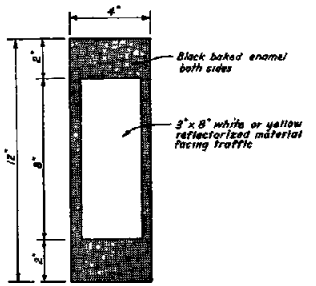
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

HEADLIGHT GLARE SCREEN (TYPE F)

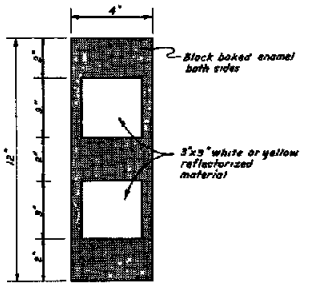
CHIEF ROAD DESIGN ENGR.

R-8.4.5 (632)
ADOPTED 8-2/79 REVISION

R72

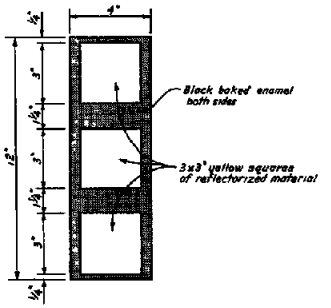


TYPE 1
(Roadway)

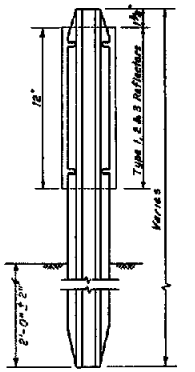


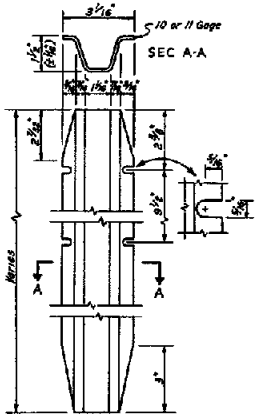
REFLECTORS

TYPE 2
(Ramps or Approaches)



TYPE 3
(Islands, Curbs, Shoulder Dikes)





POST DETAILS

Multi-Lane Divided Highway, Ramps, Narrowing Roadways
(Freeway Standards)

Unless otherwise noted on plans guide posts shall be set as follows:

a) On tangents guide posts of the appropriate color shall be installed along the sides of the through roadways at approximately 800-foot spacing along the median side and 400-foot spacing on the outside shoulder The posts on the median side shall be placed opposite those on the outer shoulder

b) See Table 1 for spacing on curves

c) Narrowing pavements guide posts of appropriate color shall be placed adjacent to the lane for the full length of the convergence

Two Lane and Four Lane Undivided Highways
(Secondary and Primary)

a) White reflectorized guide posts shall be installed on the right side of the roadbed facing traffic at 500-foot intervals on tangents and on curves having a radius greater than 10 000 feet

b) See Table 1 for spacing on curves

Multi-Lane Divided Highways
(Freeway Standards)

a) At interchanges guide posts with appropriately colored reflectors shall be installed at a maximum spacing of 100' along the acceleration or deceleration lanes and in accordance with Table 1 on turning ramps

b) In rural areas where median crossovers are provided for official or emergency use, 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

TYPE 3
(Islands Curbs, Shoulder Dikes)

General

a) At traffic islands, curbs, shoulder dikes etc , a single guide post with triple amber reflectors shall be installed

b) 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

The color of delineators SHALL be white on the right shoulder installations and yellow on the left edge of divided or one-way roadways The colors shall be denoted by a Letter Code (eg Type I-Y for single delineator, Yellow) in the Summary of Guide Post Only

MAXIMUM SPACING FOR HIGHWAY DELINEATORS
ON HORIZONTAL CURVES

(Distance in Feet Rounded to the Nearest 5 Feet)

RADIUS OF CURVE (IN FEET)	SPACING OF CURVE (IN FEET)	SPACING IN ADVANCE & BEYOND CURVE (IN FEET) 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 or computed from the formula $S=\frac{1}{2}VR-50$ The minimum spacing should be 20 feet The spacing on curves should not exceed 300 feet The spacing of the first delineator approaching a curve is 2 S the second 1 S and the third 6S but not to exceed 300 feet If a spacing less than 300 feet is used approaching the curve, the distance shown above should be adjusted accordingly

TABLE 1

Placement of Guide Posts on Curves

Multi-Lane Divided Highways
(Freeway Standards)

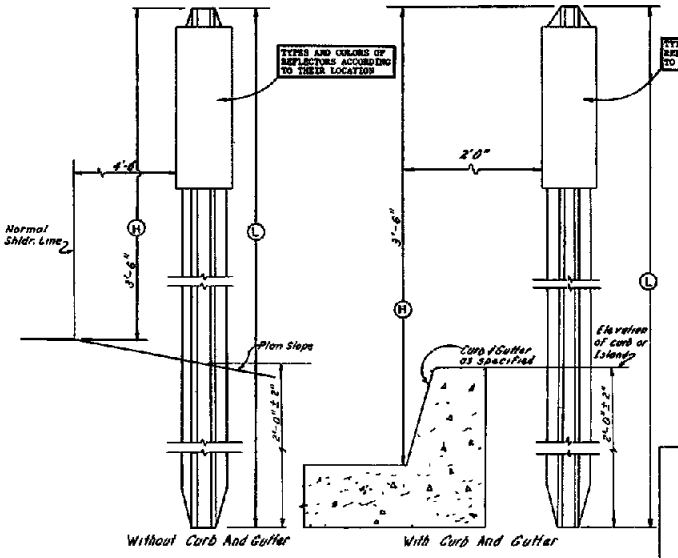
a) On curves they shall be installed along both sides of the through roadways at 400-foot spacing on the outside shoulder and 800-foot spacing on the median shoulder for curves having a radius of more than 10,000 feet For curves of 10 000 feet radius or less, they shall be spaced as shown in Table 1 The posts on the median side shall be placed directly opposite those along the outer shoulder The spacing on the median side shall be adjusted where approaching or leaving a curve to accomplish the alternated spacing to be used on all tangents

Two Lane and Four Lane Undivided Highways
(Secondary and Primary)

a) On curves having a radius of 10 000 feet or less, white guide posts shall 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

b) Post spacing on recreational roadways may be varied to accommodate design considerations

NOTE Guide posts shall be installed at the beginning and end of each curve and the spacing adjusted, through the length of the curve, into equal spacing nearest to that specified in Table 1



TYPICAL INSTALLATION

FOR DETAILS NOT SHOWN, SEE 1978 MUTCD - SECTION 3D.

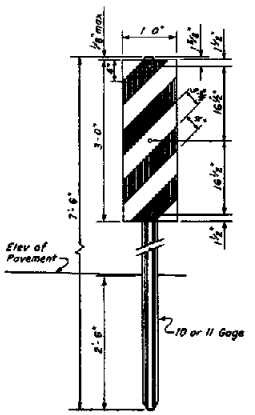
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GUIDE POSTS

CHIEF ROAD DESIGN ENGR

R-911-(619)
ADOPTED: 8/69 REVISION 3-1978

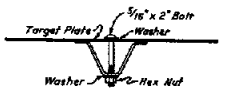
RT3



TYPE 3
Bridges, Piers, Abutments

Front Facing traffic, alternating black and reflectorized white stripes sloping down at an angle of 45° toward edge of obstruction on which traffic will pass

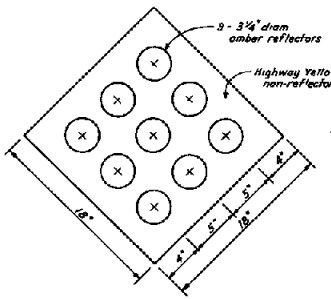
Back Solid white



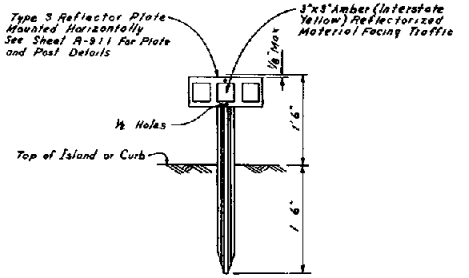
(Electroplated bolts and nuts and protective flat non-metallic washers)

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 on the approach end of the guardrail when a flare is used

For post details see Sheet R-911



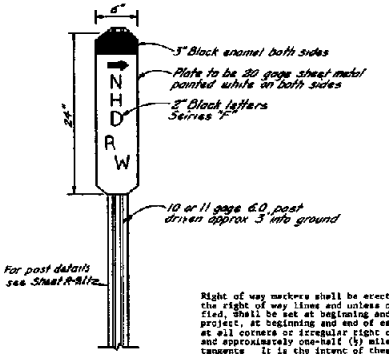
TYPE 1
Median Obstructions



TYPE 2
Curbs or Inlets

OBJECT MARKERS

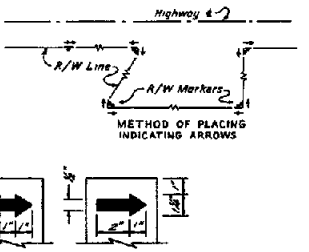
R24



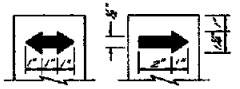
Right of way markers shall be erected to define the right of way lines and unless otherwise specified, shall be set at beginning and end of each project, at beginning and end of each curve, and at all corners or irregular right of way lines, and approximately one-half (½) mile apart on long tangents. 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 be easily established

Right of way markers shall be omitted where right of way line is fenced

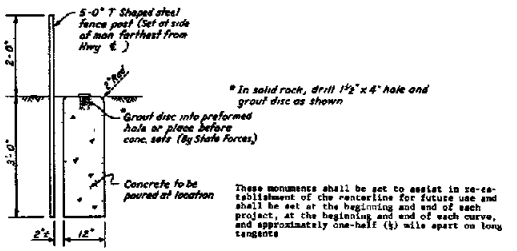
RIGHT OF WAY MARKERS



METHOD OF PLACING INDICATING ARROWS



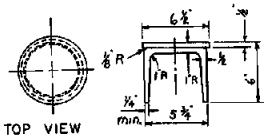
R/W INDICATING ARROWS



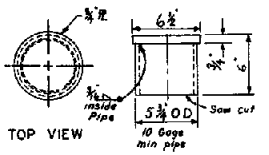
* In solid rock, drill 1½" x 4" hole and grout disc as shown

These monuments shall be set to assist in re-establishment of the centerline for future use and shall be set at the beginning and end of each project, at the beginning and end of each curve, and approximately one-half (½) mile apart on long tangents

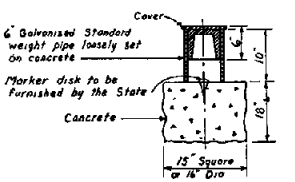
REFERENCE MONUMENT AND MARKER POST



CAST COVER DETAIL



WELDED COVER DETAIL



SURVEY MONUMENTS

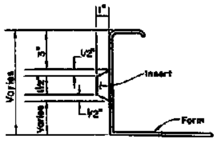
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OBJECT MARKERS, RIGHT OF WAY MARKERS, SURVEY MONUMENTS AND REFERENCE MONUMENTS

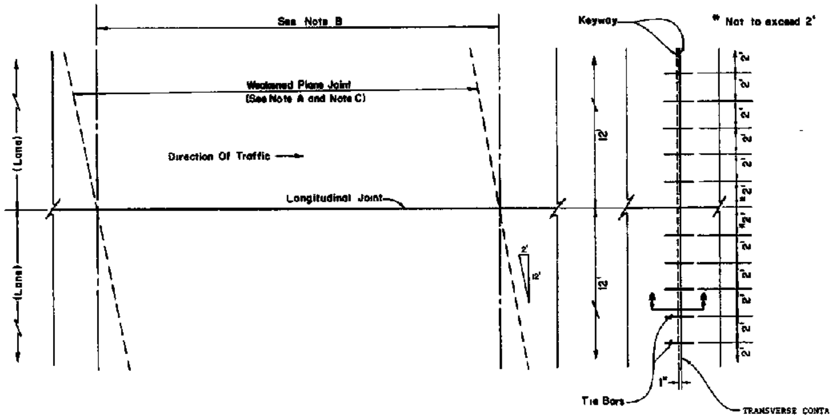
R-921-(619 THRU 621)

Robert E. Hanes
CHIEF ROAD DESIGN ENGR

ADOPTED 6/69 | REVISION 1-1-70



DETAIL OF METAL OR WOODEN INSERT TO BE PLACED ON FORM



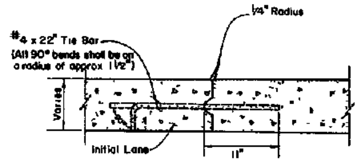
TRANSVERSE CONTACT JOINT WITH KEYWAY AND TIE BARS SHALL BE PLACED AT LEAST 5' FROM THE LOCATION OF ANY WEAKENED PLANE JOINT

PLAN

NOTE A 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 NORMAL AS DIRECTED BY THE ENGINEER OFFSET = 2' IN 12 AND SKEWED COUNTERCLOCKWISE

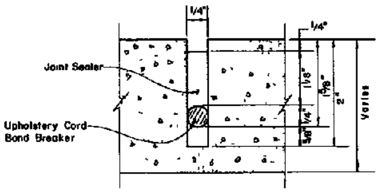
NOTE B SPACING OF WEAKENED PLANE JOINTS SHALL BE SUCCESSIVELY 13 19 18' 12 AND REPEAT EXCEPT FOR THE FIRST JOINT AT PAVEMENT END ANCHORS AND AT REINFORCED STRUCTURE APPROACHES

NOTE C WEAKENED PLANE JOINTS SHALL BE CONSTRUCTED AT LEAST 5' FROM ANY TRANSVERSE CONTACT JOINT

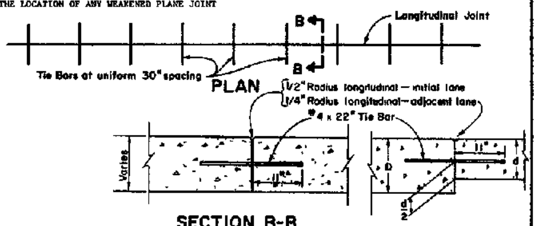


SECTION A-A
(TIE BAR)
TRANSVERSE CONTACT JOINT WITH KEYWAY AND TIE BARS

NOTE TRANSVERSE CONTACT JOINTS WITH KEYWAY AND TIE BARS SHALL BE USED AT ALL CONSTRUCTION JOINTS AND ELSEWHERE IF ORDERED BY THE ENGINEER TIE BARS TO BE PLACED IN THE MIDDLE 1/3 OF THE SLAB THICKNESS

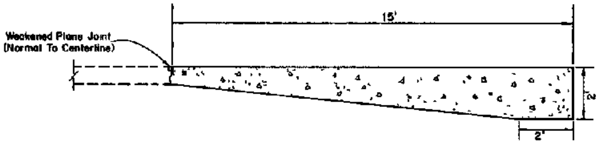


TRANSVERSE WEAKENED PLANE JOINT
(SINGLE SAW CUT)



SECTION B-B
LONGITUDINAL CONTACT JOINT WITHOUT KEYWAY
(TIE BAR TO BE PLACED IN MIDDLE 1/3 OF SLAB)

TIE BAR DETAIL

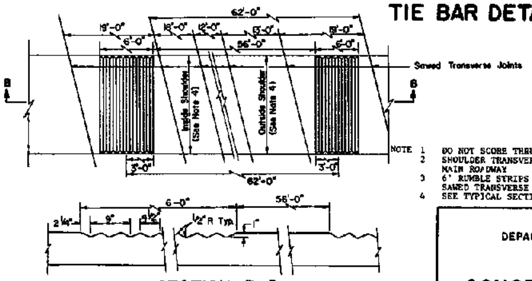


PAVEMENT END ANCHOR DETAIL

NOTE PAVEMENT END ANCHORS SHALL BE CONSTRUCTED AS THE TERMINAL PANELS OF ALL PAVEMENT NOT ABUTTING EXISTING PAVEMENTS OR STRUCTURES AND ELSEWHERE IF ORDERED BY THE ENGINEER

GENERAL NOTES

1 REFER TO STANDARD PLAN SHEET FOR 'APPROACH SLAB DETAILS'



SECTION B-B
RUMBLE STRIPS ON CONCRETE SHOULDERS

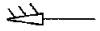
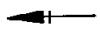
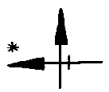
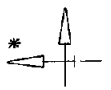
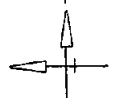
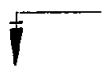
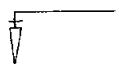
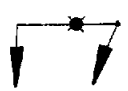
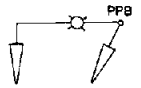
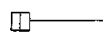
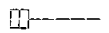
NOTE
1 DO NOT SCORE THRU RAMP DECELERATION AND ACCELERATION AREAS
2 SHOULDER TRANSVERSE JOINTS SHALL BE THE SAME PATTERN AS MAIN ROADWAY
3 6' RUMBLE STRIPS SHALL BE SCORED BETWEEN THE 19' DIAGONALLY SAWED TRANSVERSE JOINTS
4 SEE TYPICAL SECTION FOR WIDTH OF SHOULDER

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CONCRETE PAVEMENT

CHIEF ROAD DESIGN ENGR
R-10 1 1 (409)
ADOPTED: 8/69
REVISION 6-7/78

blank

NEW	EXISTING	DESCRIPTION
		Luminaire
		Electrolier
		Underpass Luminaire
		Traffic Signal Head, 3 Section, 12" Red, Yellow and Green Sections
		Traffic Signal Head with All Sections Louvered
		Traffic Signal Head with Back Plate
		Traffic Signal Head, Programmed Visability, 12" Green Arrow, 12" Solid Yellow and Red Sections, with Back Plate
		Traffic Signal Head with 12" Green, Yellow and Red Arrow Sections, with Back Plate
		Mast Arm Signal with Back Plate
		Combination Traffic Signal Standard with Luminaire and Signal Mast Arms and Attached Heads (all 12"), with Back Plate PPB = Pedestrian Push Button and Sign
		Pedestrian Signal (Walk - Don't Walk)
		Vehicle Detector - Inductive Loop Unless Otherwise Indicated (See Sheet T 301 - for information on Identification and Configuration)
		Quadrapole Detector Loop

NEW	EXISTING	DESCRIPTION
		Pull Box
		Controller Cabinet
		Service (120-240 V A C Unless Otherwise Specified)
		Transformer Pad
		Power Source
		Conduit
		Conduit (Jacked)
		Pole Designation
		Conduit Run
		Junction Box
		Wood Power Pole

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

LIGHTING AND SIGNALS

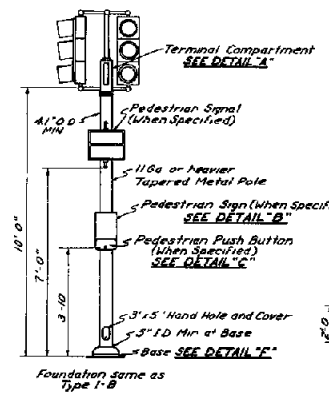
TRAFFIC SIGNAL AND LIGHTING SYMBOLS

CHIEF TRAFFIC ENGINEER

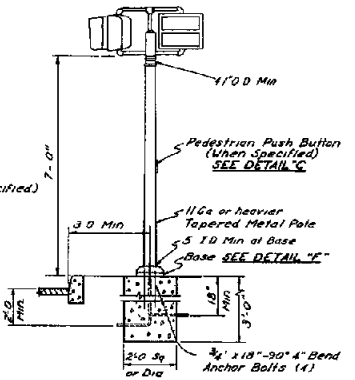
T-301

ADOPTED: 12/79

REVISION

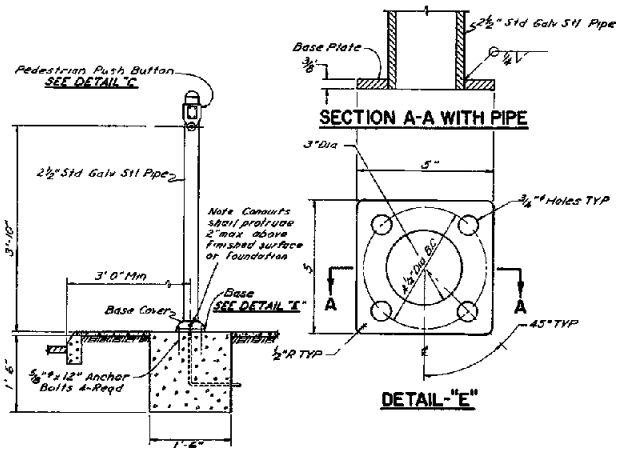


TYPE I-A



TYPE I-B

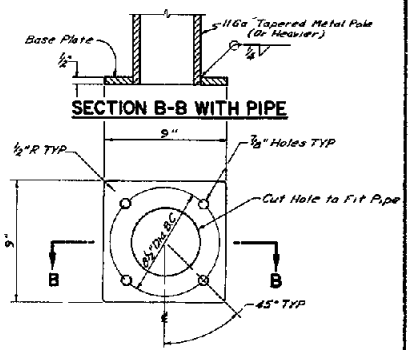
SIGNAL STANDARDS



PEDESTRIAN PUSH BUTTON POST

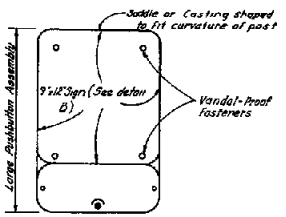
SECTION A-A WITH PIPE

DETAIL-"E"

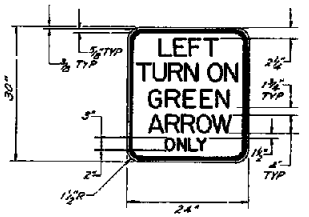


SECTION B-B WITH PIPE

DETAIL-"F"



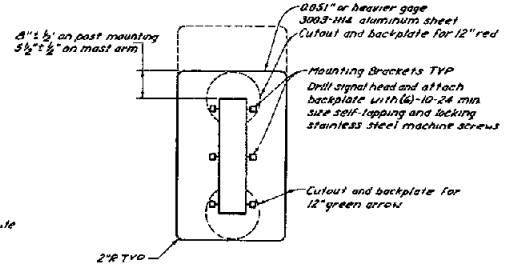
DETAIL-"C"



DETAIL-"D"

Note: All Pedestrian Push Buttons mounted on poles shall have a mounted height of 9'-10"

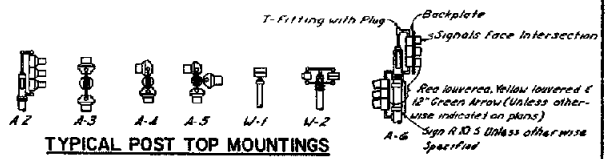
Note: Sign R10-5 to be Black on Reflectorized White



REAR VIEW

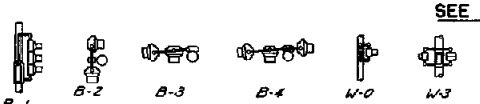
Note2: No background light to show between plate and head. Mast Arm Backplates shall be louvered

DETAIL-"G"

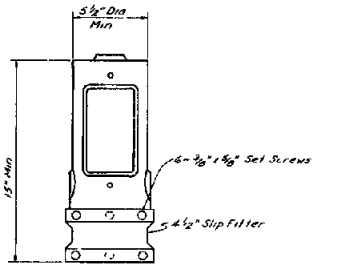


TYPICAL POST TOP MOUNTINGS

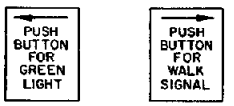
SEE DETAIL "D"



TYPICAL BRACKET MOUNTINGS



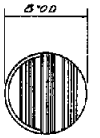
DETAIL-"A"



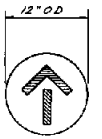
(For 3 Light Signal) (For Walk Signal)

NOTES:
1 Arrow to be left or right or both as required
2 Porcelain enameled, 9"x12" sign, Black letters on White background

DETAIL-"B"



TYPICAL DIRECTIONAL LOUVER



TYPICAL ARROW LENS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

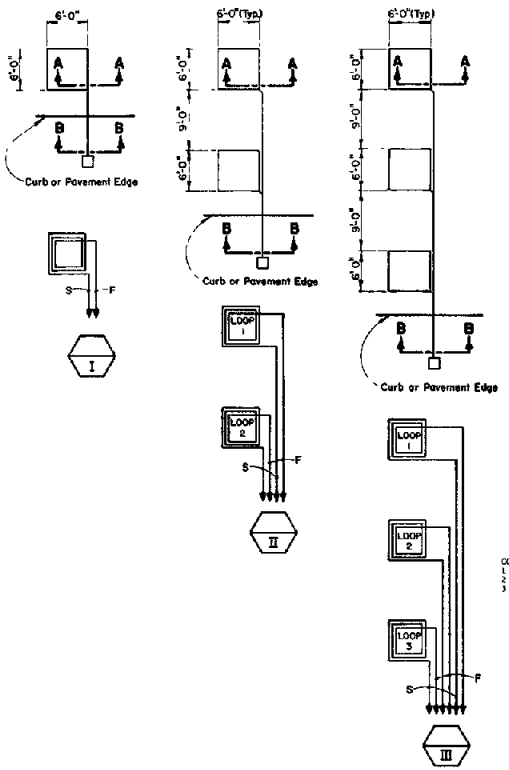
LIGHTING AND SIGNALS

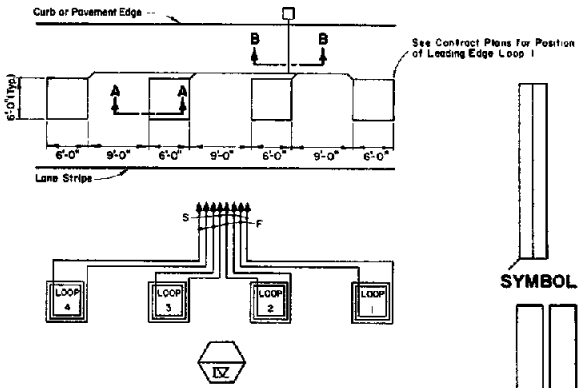
POLE TYPES I-A AND I-B SIGNAL HEAD MOUNTING DETAILS

Russell C. Hill
CHIEF TRAFFIC ENGR

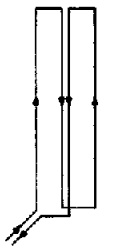
T-3012 (623)
ADOPTED: 2/71
REVISION 6-12/79

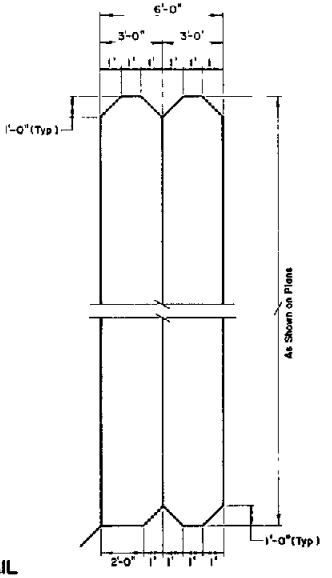
T 2





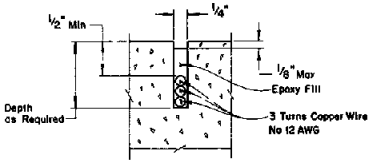
CONDUCTOR IDENTIFICATION SHALL INCLUDE THE FOLLOWING
1 SENSOR NUMBER AND PHASE
2 LOOP NUMBER
3 START (S) OR FINISH (F)



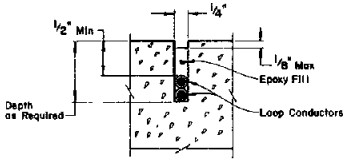


QUADRAPOLE DETECTOR LOOP(A)

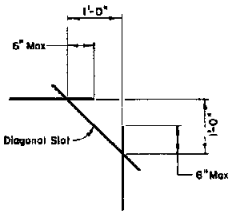
DETECTOR LAYOUTS, DIMENSIONS & WIRING PATTERNS



SECTION A-A



SECTION B-B



PLAN VIEW OF DIAGONAL SLOT AT CORNERS

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 #12 AWG LOOP CONDUCTOR IN SLOTS USING A 3/16" TO 1/4" 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 CIRCUIT SHALL BE TWISTED TOGETHER INTO A PAIR (AT LEAST 2 TURNS PER FOOT) BEFORE BEING RUN TO PULL BOX.
4 IDENTIFY LOOP CIRCUIT PAIRS. IDENTIFY START OF CONDUCTOR
5 SPLICE LOOP CONDUCTORS TO LEAD IN CABLE. ALL SPLICES SHALL BE SOLDERED USING ROSIN CORE SOLDER.
6 WHERE LOOP CONDUCTORS ARE NOT TO BE SPLICED TO A LEAD-IN CABLE, ENDS OF CONDUCTORS SHALL BE TAPED.
7 FILL SLOTS AS SHOWN IN DETAILS
8 NO MORE THAN FOUR LOOP DETECTOR CONDUCTORS SHALL BE INSTALLED IN ONE SAWED SLOT.
9 LEAD-IN CABLE SHALL NOT BE SPLICED BETWEEN THE TERMINATION PULL BOX AND THE CONTROLLER CABINET.
10 DISTANCE BETWEEN SIDE OF LOOP AND LEAD-IN SAW CUT SHALL BE 2' MINIMUM. DISTANCE BETWEEN LEAD-IN SAW CUTS SHALL BE 6" MINIMUM.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

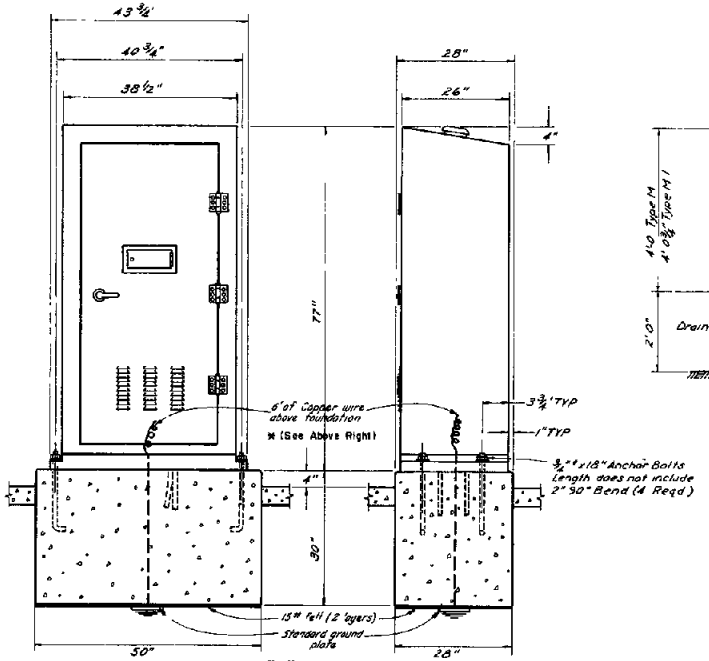
LIGHTING AND SIGNALS

DETECTORS

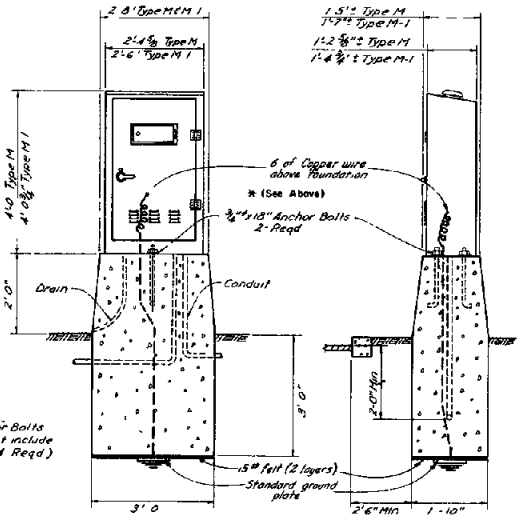
CHIEF TRAFFIC ENGR

T-30.13 (623)
ADOPTED 12/79 REVISION

T13

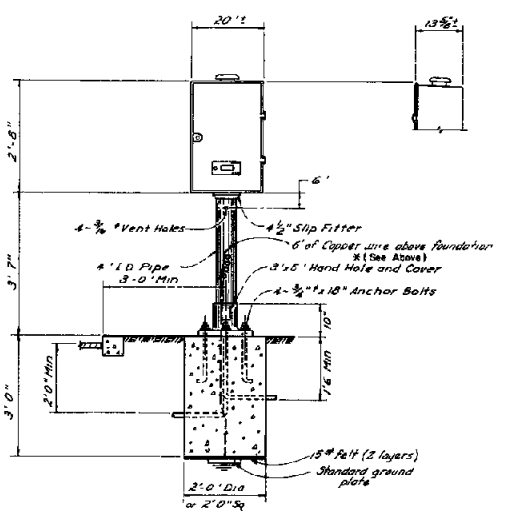


TYPE "R" CABINET



TYPE M & M-1 CABINET

* 1/2" X 8' Ground Rod May be Substituted In Lieu of Copper Wire



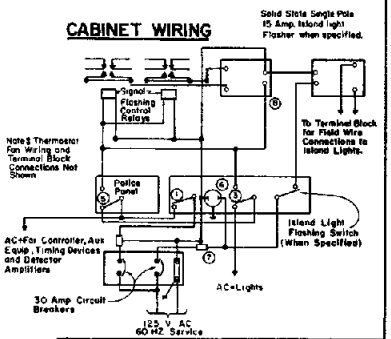
TYPE "G" CABINET

NOTES FOR TYPE M-1:

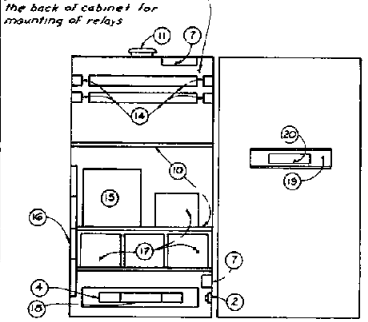
1. Material shall be 14 Ga. sheet steel
2. Door shall lock at three points

1. Main Switch
2. Plug Fuse
3. Signal Flash Switch Inside Cabinet
4. Field Wire Terminal Blocks
5. Auxiliary Door Flash Switch
6. NEMA Standard Plug Receptacle with Grounding Contact
7. Radio Interference Suppressor
8. Solid State Signal Flasher (Cabinet Mfr. To Determine Poles & Capacity, Unless Otherwise Specified)
9. External Light Relays
10. Shelf
11. Thermostat-Controlled Fan with T vent
12. Eight ½" Screened vent Holes
13. Instrument Terminal Strip
14. Control Relays
15. Dispatcher Unit
16. Internal Interconnect Terminal Strips
17. Minor Movement Units
18. Slant Panel
19. Police Panel
20. Internal Power Panel and Recall Switches for all Detected Phases

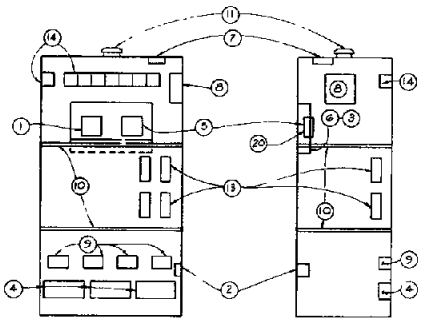
CABINET WIRING



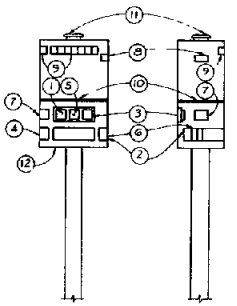
½" Marine Plywood Backpanel painted black and installed in the back of cabinet for mounting of relays



TYPE "R" CABINET



TYPE M & M-1 CABINET



TYPE "G" CABINET

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

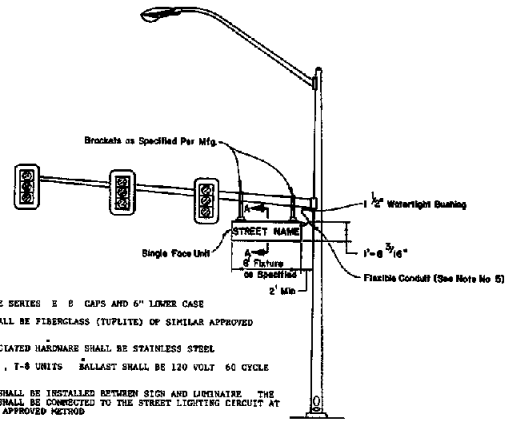
LIGHTING AND SIGNALS

CONTROLLER CABINET DETAILS

Russell S. Hall
CHIEF TRAFFIC ENGR

T-3014 (623)
ADOPTED 2/71
REVISION 3-12/79

T4



NOTES

1 LEGEND ON SIGN SHALL BE SERIES E B CAPS AND 6" LOWER CASE

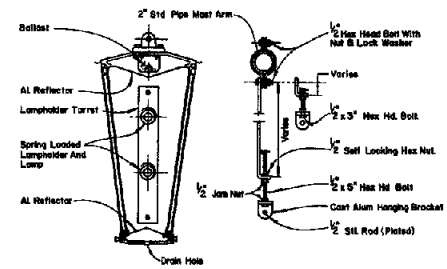
2 SIGN PANEL MATERIAL SHALL BE FIBERGLASS (TUPLITE) OR SIMILAR APPROVED MATERIAL

3 ALL FASTENERS AND ASSOCIATED HARDWARE SHALL BE STAINLESS STEEL

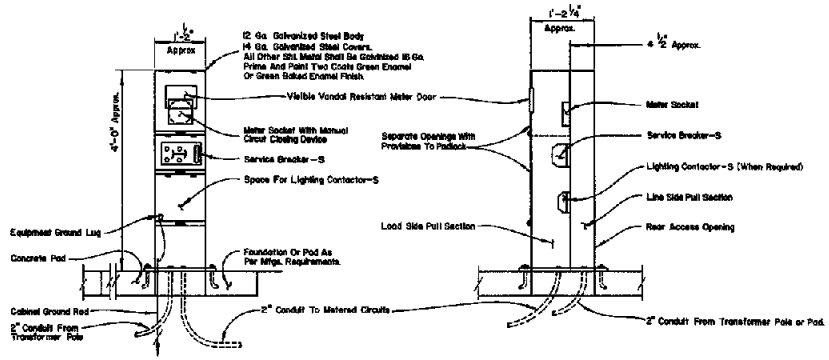
4 LAMPS SHALL BE 300 M A , T-8 UNITS BALLAST SHALL BE 120 VOLT 60 CYCLE 02 STARTING

5 TWO NO 12 CONDUCTORS SHALL BE INSTALLED BETWEEN SIGN AND LUMINAIRE THE SIGN LIGHTING CIRCUIT SHALL BE CONNECTED TO THE STREET LIGHTING CIRCUIT AT THE P E CONTROL BY AN APPROVED METHOD

6 SIGN CLAMPS SHALL BE SIZED TO FIT RESPECTIVE SIGNAL ARMS



SECTION A-A



FRONT VIEW SIDE VIEW

UNDERGROUND SERVICE PEDESTAL

NOTES

1 CONDUIT MUST EXTEND UP INTO CABINET A MINIMUM OF 2' ABOVE CONCRETE PAD

2 SEE PLANS FOR LOAD RATING PANEL DISTRIBUTION AND CIRCUIT BREAKERS REQUIRED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

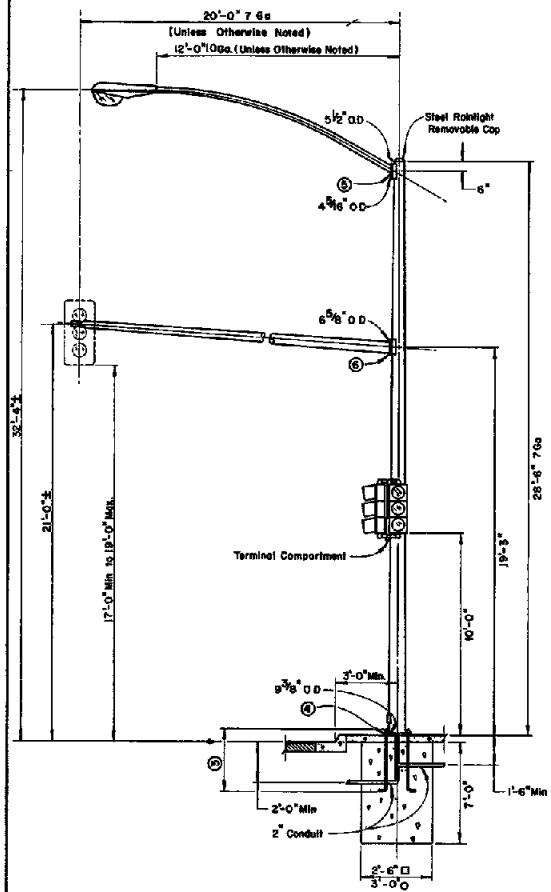
LIGHTING AND SIGNALS

Russell "Red" Hall
CHIEF TRAFFIC ENGR

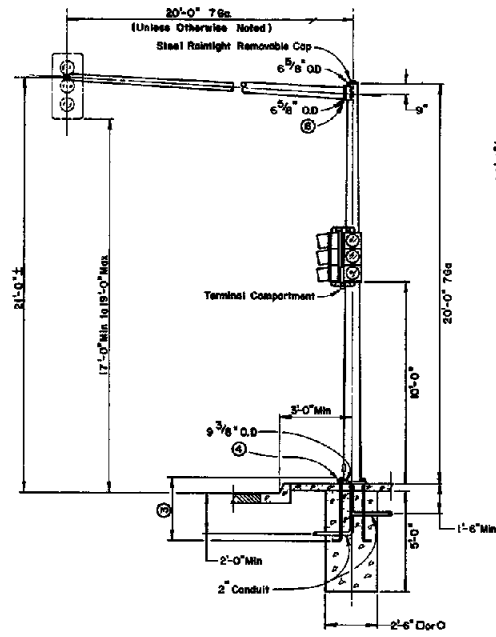
T-3015 (623)
ADOPTED: 12/79 REVISION

ELECTRICAL SERVICES AND INTERNALLY ILLUMINATED SIGN DETAILS

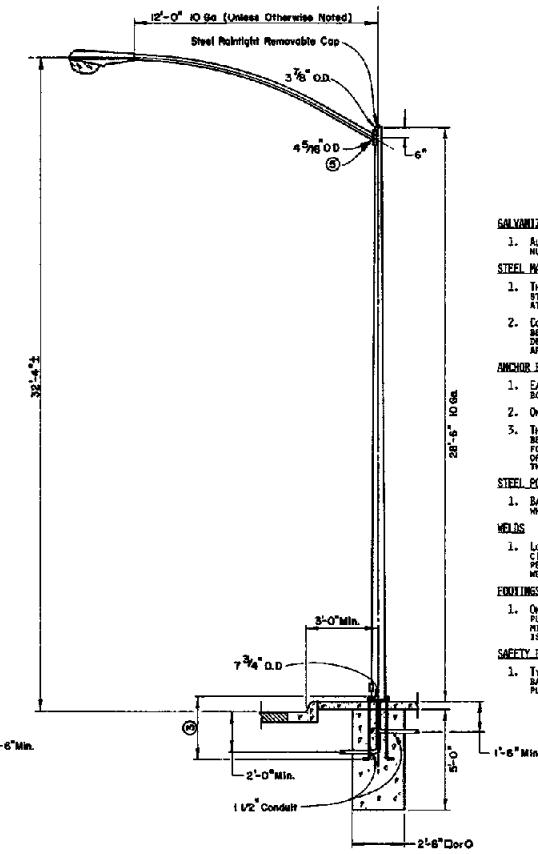
T5



POLE TYPE 6-A



POLE TYPE 5-A



POLE TYPE 7

GENERAL NOTES

GALVANIZING

1. ALL STEEL POLES, MAST ARMS, BOLTS, SCREWS NUTS, AND WASHERS SHALL BE GALVANIZED.

STEEL MAST ARMS

1. THE LAST 3" OF THE LUMINAIRE ARM SHALL BE STRAIGHT AND HORIZONTAL WITH LUMINAIRE ATTACHED.
2. CONNECTION BETWEEN MAST ARM AND POLE SHALL BE MADE BY MEANS OF A RAINTIGHT SOCKET OR A DESIGN PERMITTING SIMPLE REMOVAL OF THE MAST ARM.

ANCHOR BOLTS

1. EACH STANDARD SHALL BE SUPPLIED WITH 4 ANCHOR BOLTS AS SHOWN ON STANDARD PLAN SHEETS.
2. ONE ANCHOR BOLT SHALL BE BONDED TO CONDUIT.
3. 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 AND FURNISHED WITH TWO NUTS AND TWO WASHERS.

STEEL POLES

1. BASE COVERS REQUIRED ON ALL POLES EXCEPT WHERE SAFETY BASE IS SPECIFIED

WELDS

1. LONGITUDINAL WELDS BY SUBMERGED ARC. CIRCUMFERENTIAL BUTT WELDS SHALL HAVE PERMANENT BACK-UP RINGS. ALL EXPOSED BUTT WELDS GROUND FLUSH.

FOOTINGS

1. ON SECTIONS WITHOUT CURB, BASES SHALL BE PLACED A MINIMUM OF 6' FROM SHOULDER OR A MINIMUM OF 10' FROM TRAVELED WAY, WHICHEVER IS GREATER

SAFETY BASE

1. TYPE 7 AND TYPE 14 POLES WILL REQUIRE SAFETY BASE ASSEMBLY UNLESS OTHERWISE NOTED ON PLANS

(1) FOR FOUNDATION ISLAND, SEE DETAIL 'B' SHEET T-30 1 8
(2) FOR SAFETY BASE SEE SHEET T-30 1 7
(3) FOR ANCHOR BOLT LENGTHS AND DIMENSIONS SEE SHEET T-30 1 8
(4) FOR BASE PLATE DETAIL SEE DETAIL 'A', SHEET T-30 1 8
(5) FOR LUMINAIRE ARM CONNECTION SEE DETAIL "C" SHEET T-30 1 8
(6) FOR SIGNAL ARM CONNECTION, SEE DETAIL 'D' SHEET T-30 1 8

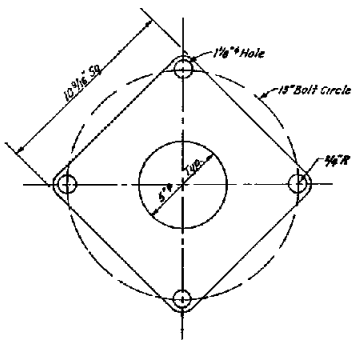
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

LIGHTING AND SIGNALS

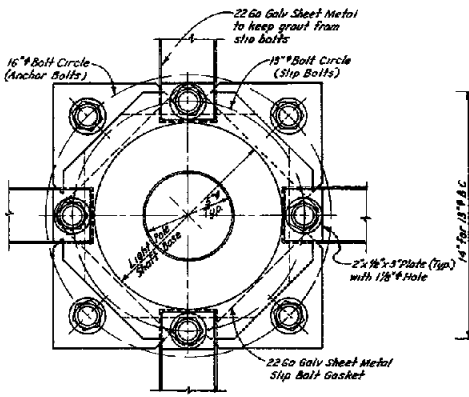
POLE TYPES 5-A, 6-A AND 7

Russell "Bud" Hill
CHIEF TRAFFIC ENGR

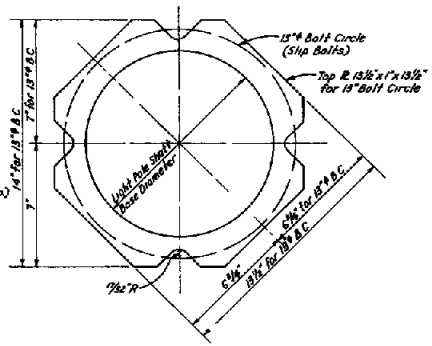
T-30 1 6 (623)
ADOPTED: 2/71
REVISION 1-12-73



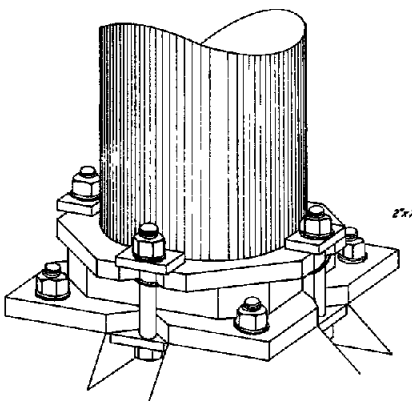
SLIP BOLT GASKET
22 Gage Galvanized Sheet Metal

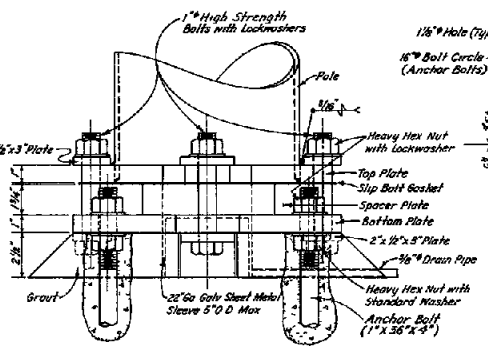


PLAN

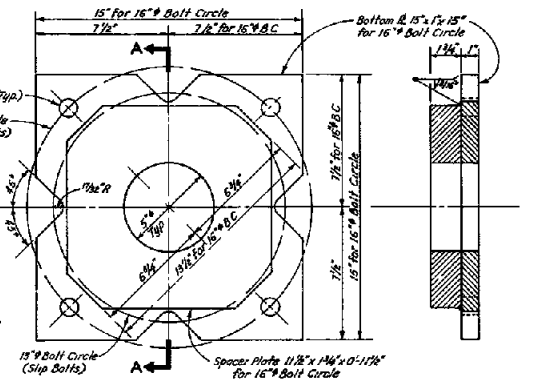


PLAN OF TOP PLATE





LIGHT POLE BASE



PLAN OF BOTTOM AND SPACER PLATE

SAFETY BASE NOTES
FOR POLE TYPES 7 & 14

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. Erect light pole and secure with 1"ø high strength bolts. Bolts shall be installed in the slots so that the bolt shanks are in contact with the plates
4. All steel plate assemblies shall be hot-dip galvanized after fabrication
5. All nuts, bolts and washers shall be electro-plated cadmium in accordance with ASTM A 165, Type TS.
6. All contact areas of plates shall be free of galvanizing beads or runs
7. Safety bases shall be utilized on all steel light poles except on structures or unless otherwise noted on the plans
8. Slip bolts shall be torqued to 150 foot pounds or 1800 inch pounds
9. Grouting shall be done after light pole has been located in final position

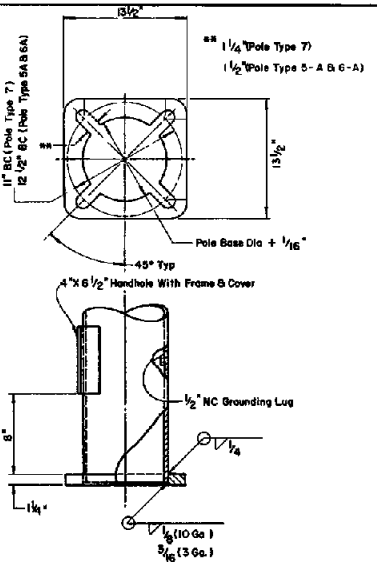
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

LIGHTING AND SIGNALS

SAFETY BASE DETAILS

Russell C. Hill
CHIEF TRAFFIC ENGR

T-3017 (623)
ADOPTED 2/71
REVISION 2-12-79

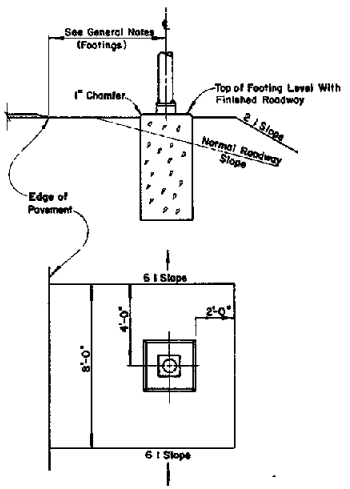


DETAIL "A"
BASE PLATE
(POLE TYPE 5-A & 6-A)

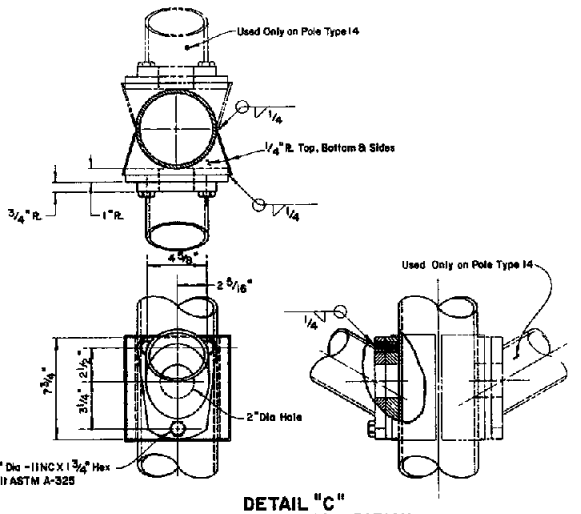
(USED ON POLE TYPE 7 WHEN MOUNTED ON A STRUCTURE OR WHEN A SAFETY BASE IS NOT REQUIRED)

POLE TYPE	ANCHOR BOLT SIZE
5-A	1 1/4" x 44" x 4"
6-A	1 1/4 x 44" x 4
*7	1" x 36" x 4

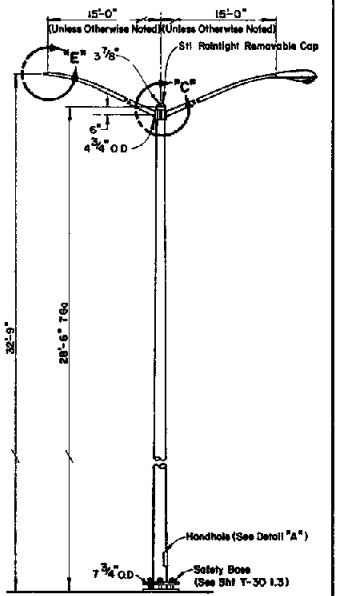
*WHEN MOUNTED ON A STRUCTURE OR WHEN A SAFETY BASE IS NOT REQUIRED



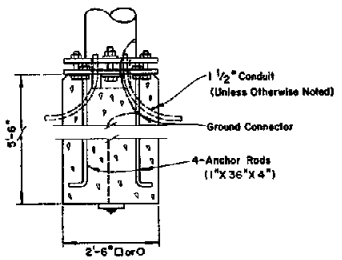
DETAIL "B"
TYPICAL FOUNDATION ISLAND
(POLE TYPE 7)



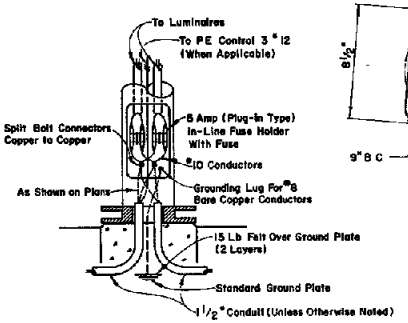
DETAIL "C"
LUMINAIRE ARM CONNECTION
(POLE TYPE 6-A, 7 & 14)



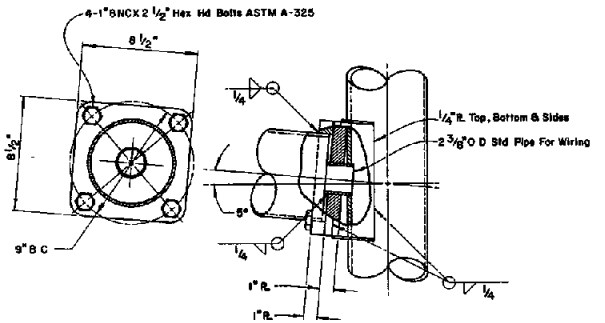
POLE TYPE 14



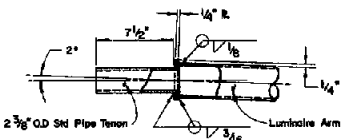
FOUNDATION DETAIL
FOR POLE TYPE 14



WIRING DIAGRAM FOR POLE TYPE 14



DETAIL "D"
SIGNAL ARM CONNECTION
(POLE TYPE 5-A & 6-A)



DETAIL "E"
LUMINAIRE TENON DETAIL

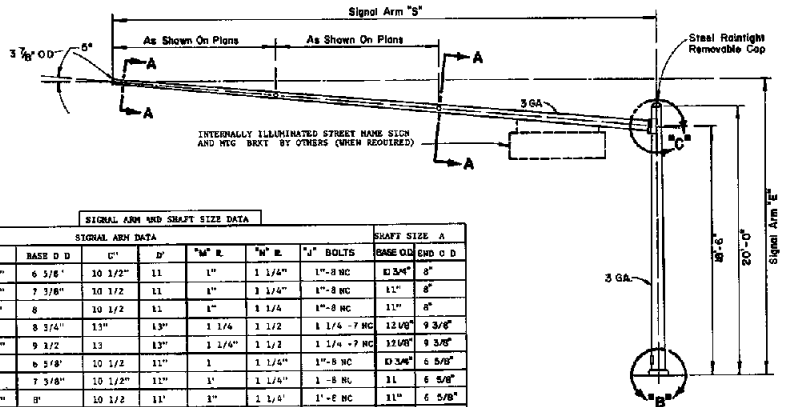
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

LIGHTING AND SIGNALS

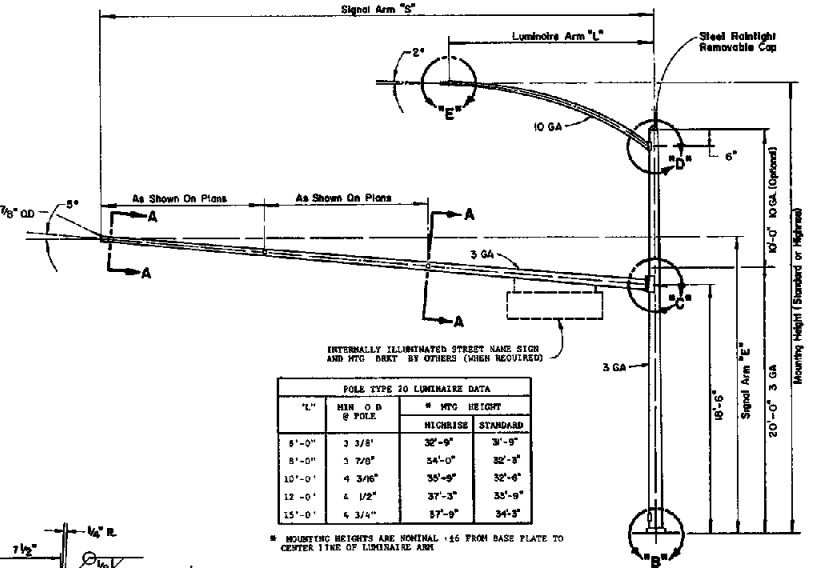
Russell Bud Hill
CHIEF TRAFFIC ENGR

T-301 8
ADOPTED: 12/79
REVISION

POLE TYPE 14 AND 5-A, 6-A, 7 & 14 MAST ARM MOUNTING DETAILS



POLE TYPE 10



SIGNAL ARM AND SHAFT SIZE DATA

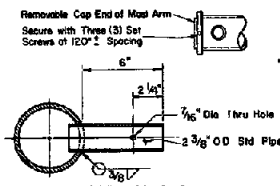
POLE TYPE	SIGNAL ARM DATA								SHAFT SIZE A	
	"S"	"E"	BASE O D	C"	D"	"M" R	"N" R	"J" BOLTS	BASE O D	END O D
10	20 -0"	20'-3"	6 5/8"	10 1/2"	11	1"	1 1/4"	1"-8 NC	10 3/4"	8"
	25 -0	20'-8"	7 3/8"	10 1/2	11	1"	1 1/4"	1"-8 NC	11"	8"
	30 -0	21'-4"	8	10 1/2	11	1"	1 1/4	1"-8 NC	11"	8"
	35'-0	21'-6	8 3/4"	13"	13"	1 1/4	1 1/2	1 1/4 -7 NC	12 1/8"	9 3/8"
	40'-0"	22'-0"	9 1/2	13	13"	1 1/4"	1 1/2	1 1/4 -7 NC	12 1/8"	9 3/8"
20	20 -0'	20 -3	6 5/8'	10 1/2	11"	1	1 1/4"	1"-8 NC	10 3/4"	6 5/8"
	25 -0"	20 -8	7 3/8"	10 1/2"	11"	1'	1 1/4"	1 -8 NC	11	6 5/8"
	30'-0"	21'-2"	8'	10 1/2	11'	1"	1 1/4'	1'-8 NC	11"	6 5/8"
	35 -0	21'-6"	8 3/4	13'	13	1 1/4"	1 1/2"	1 1/4"-7 NC	12 1/8"	8"
	40 -0	22'-0'	9 1/2"	13"	13	1 1/4"	1 1/2	1 1/4"-7 NC	12 1/8"	8"

POLE TYPE 20 LUMINAIRE DATA

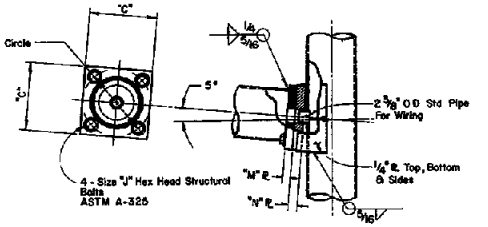
"L"	MIN O D @ POLE	* MTG HEIGHT	
		HIGHRISE	STANDARD
5'-0"	3 3/8'	32'-9"	31'-9"
8'-0"	3 7/8"	34'-0"	32'-8"
10'-0'	4 3/16"	35'-9"	33'-6"
12 -0'	4 1/2"	37'-3"	35'-9"
15'-0'	4 3/4"	37'-9"	34'-3"

* MOUNTING HEIGHTS ARE NOMINAL ±6 FROM BASE PLATE TO CENTER LINE OF LUMINAIRE ARM

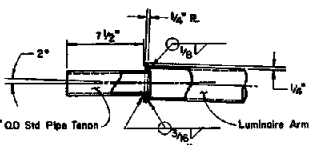
POLE TYPE 20



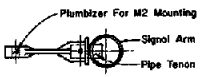
SECTION A-A
SIGNAL TENON ATTACHMENT



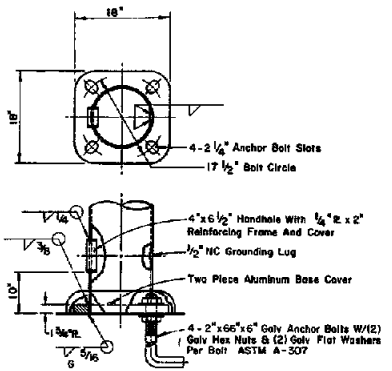
DETAIL "C"
SIGNAL ARM CONNECTION



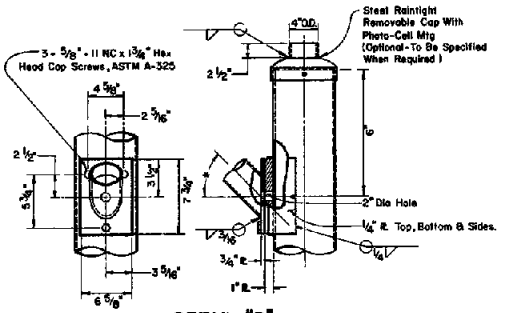
DETAIL "E"
LUMINAIRE TENON DETAIL



SPECIAL DETAIL
FOR MOUNTING SIGNAL HEAD



DETAIL "B"
POLE BASE



DETAIL "D"
LUMINAIRE ARM CONNECTION

* Highrise - 45°, Standard - 26°

GENERAL NOTES

1. FOR WELD SIZES NOT SHOWN, USE MINIMUM SIZE WELD AS SPECIFIED BY THE LATEST WELDING CODE
2. BREAK ALL SHARP EDGES FOR WIRE PROTECTION
3. SEE STANDARD SHEET T-30 1 15 FOR FOUNDATION
4. A REDUCED GAGE FOR SHAFT OR POLE WILL BE ACCEPTABLE ABOVE SIGNAL ARM ATTACHMENT SIMILAR TO POLE TYPE 45
5. POLES GALVANIZED PER ASTM A-123. HARDWARE GALVANIZED PER ASTM A-153

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

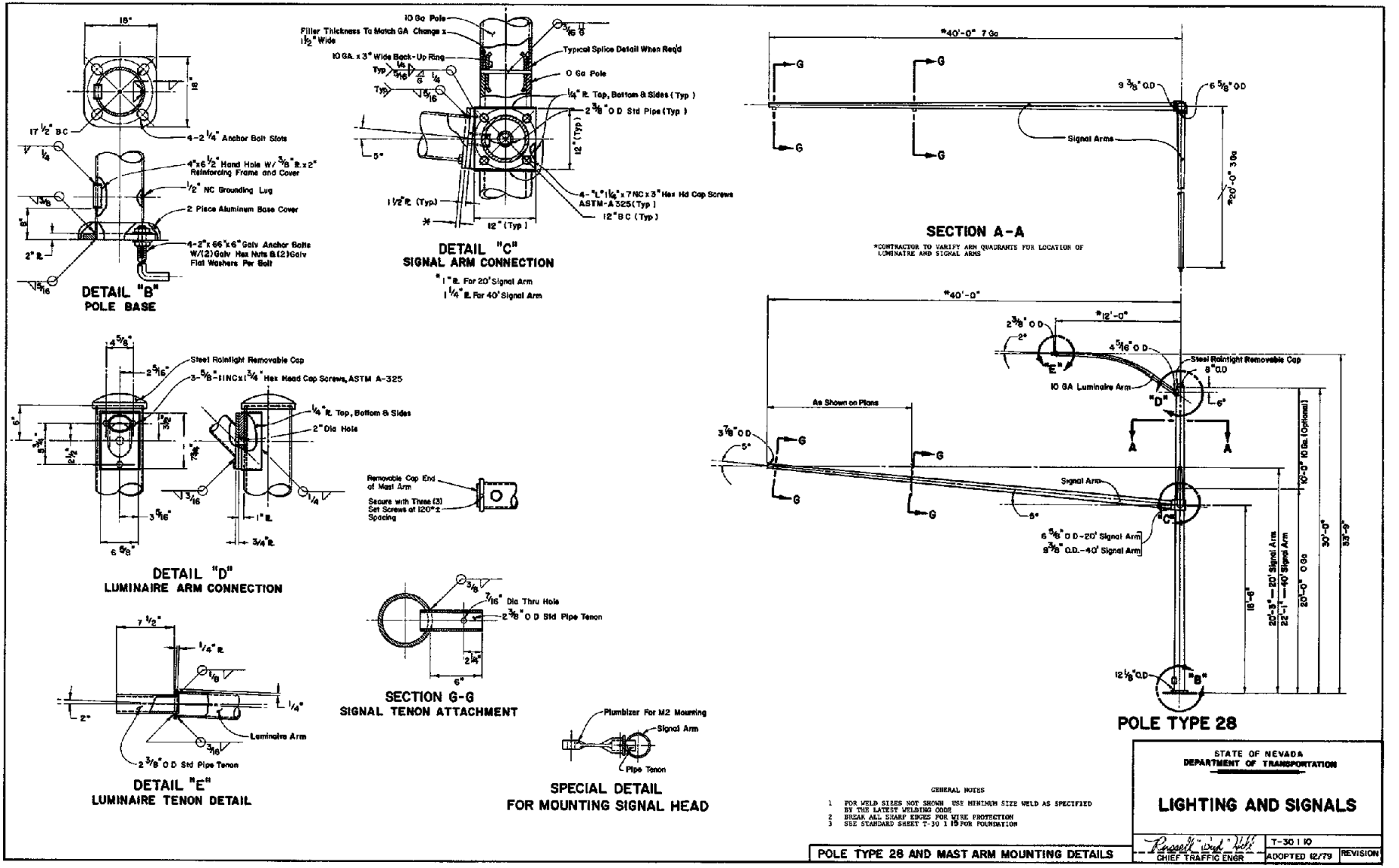
LIGHTING AND SIGNALS

POLE TYPES 10 AND 20

CHIEF TRAFFIC ENGR

T-30 1 9

ADOPTED 12/79 REVISION



GENERAL NOTES

1. FOR WELD SIZES NOT SHOWN USE MINIMUM SIZE WELD AS SPECIFIED BY THE LATEST WELDING CODE
2. BREAK ALL SHARP EDGES FOR WIRE PROTECTION
3. SEE STANDARD SHEET T-30 1 19 FOR FOUNDATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

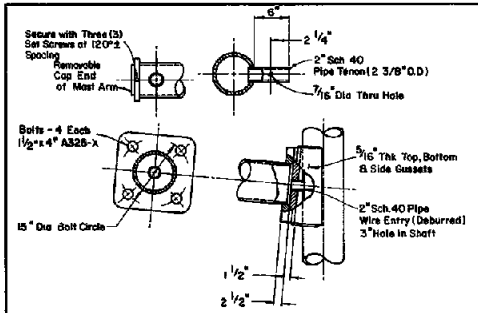
LIGHTING AND SIGNALS

POLE TYPE 28 AND MAST ARM MOUNTING DETAILS

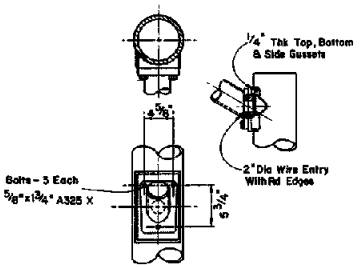
Russell "Bud" Hill
CHIEF TRAFFIC ENGR

T-30 1 10
ADOPTED 12/79
REVISION

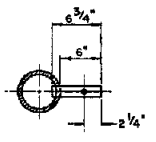
T10



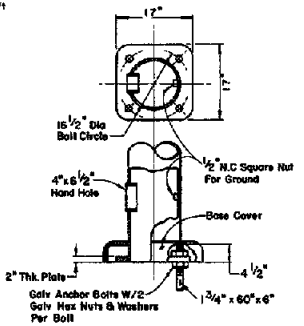
SIGNAL ARM ATTACHMENT



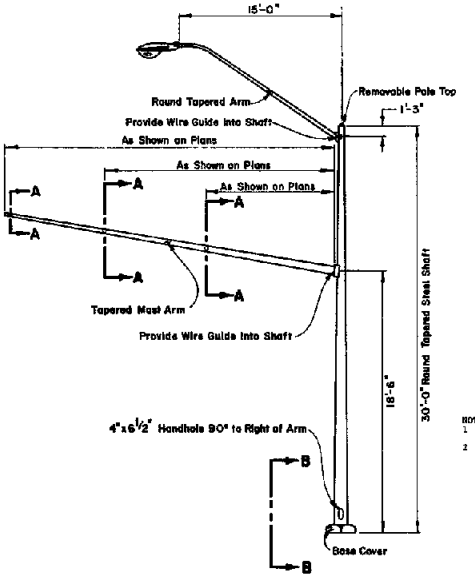
LUMINAIRE ARM ATTACHMENT



SECTION A-A

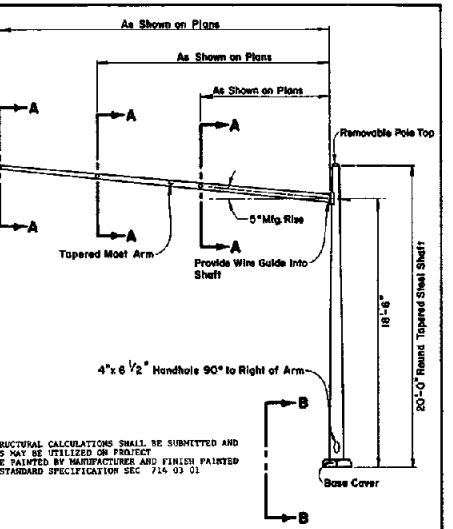


VIEW B-B



POLE TYPE 35

(FOR FOUNDATION SEE DETAIL "I", SHEET T-30.1.15)



NOTES
1. SHOP DRAWINGS AND STRUCTURAL CALCULATIONS SHALL BE SUBMITTED AND APPROVED BEFORE POLES MAY BE UTILIZED ON PROJECT
2. ALL POLES TO BE PRIME PAINTED BY MANUFACTURER AND FINISH PAINTED BY CONTRACTOR SEE STANDARD SPECIFICATION SEC 714.03.01

POLE TYPE 30

(USE SAME FOUNDATION AS POLE TYPE 35)

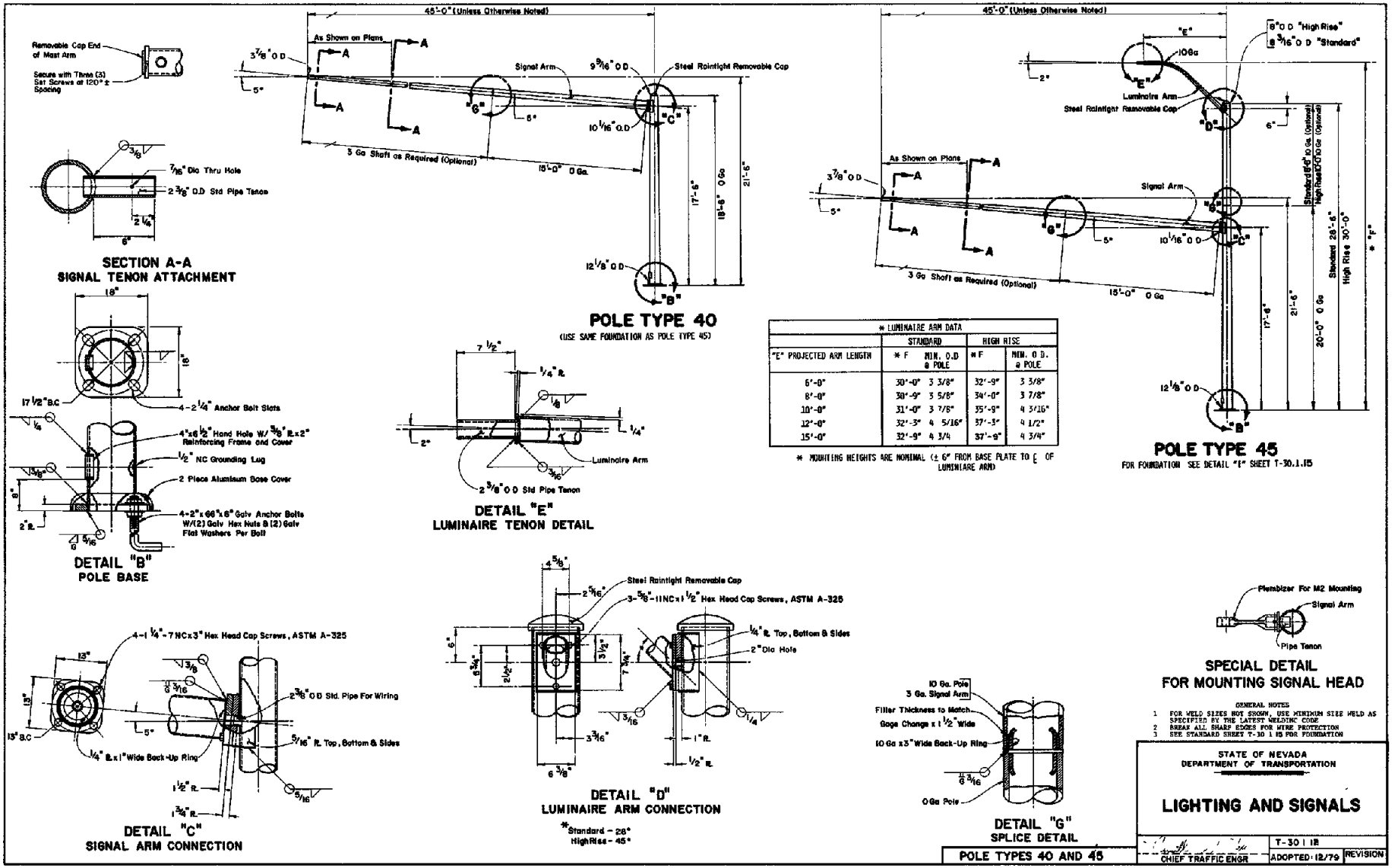
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

LIGHTING AND SIGNALS

POLE TYPES 30 AND 35

Russell "Bud" Hill
CHIEF TRAFFIC ENGR

T-30.1.11 (623)
ADOPTED 2/79 REVISION



* LUMINAIRE ARM DATA				
	STANDARD		HIGH RISE	
"E" PROJECTED ARM LENGTH	* F	MIN. O.D @ POLE	* F	MIN. O.D. @ POLE
6'-0"	30'-0"	3 3/8"	32'-9"	3 3/8"
8'-0"	30'-9"	3 5/8"	34'-0"	3 7/8"
10'-0"	31'-0"	3 7/8"	35'-9"	4 3/16"
12'-0"	32'-3"	4 5/16"	37'-3"	4 1/2"
15'-0"	32'-9"	4 3/4	37'-9"	4 3/4"

* MOUNTING HEIGHTS ARE NOMINAL (± 6" FROM BASE PLATE TO ℄ OF LUMINAIRE ARM)

GENERAL NOTES
1 FOR WELD SIZES NOT SHOWN, USE MINIMUM SIZE WELD AS SPECIFIED BY THE LATEST WELDING CODE
2 BREAK ALL SHARP EDGES FOR WIRE PROTECTION
3 SEE STANDARD SHEET T-30 1 15 FOR FOUNDATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

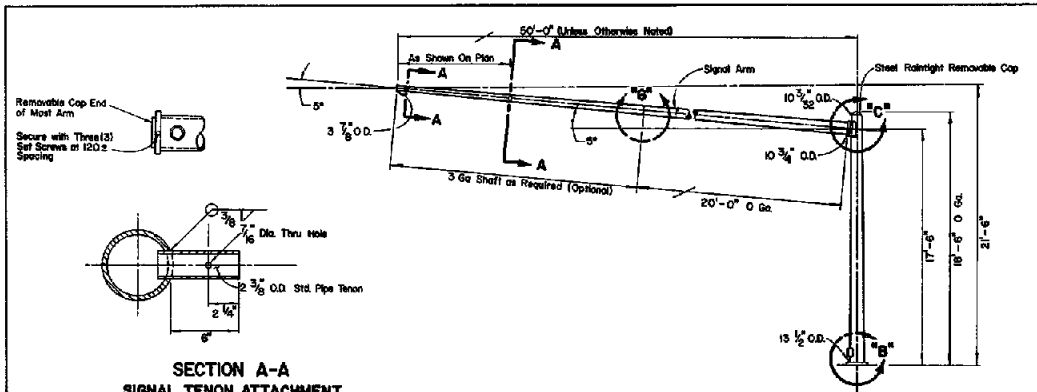
LIGHTING AND SIGNALS

POLE TYPES 40 AND 45

T-30 1 12

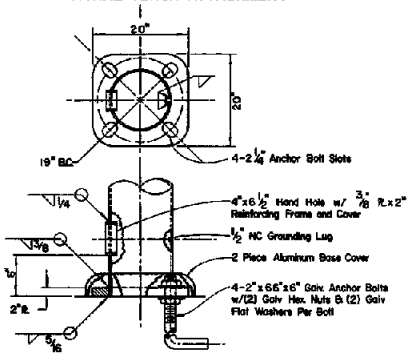
CHIEF TRAFFIC ENGR | ADOPTED: 12/79 | REVISION

712

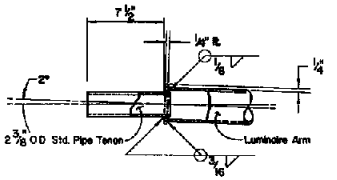


POLE TYPE 49

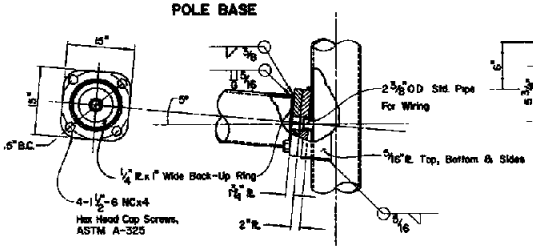
SECTION A-A
SIGNAL TENON ATTACHMENT



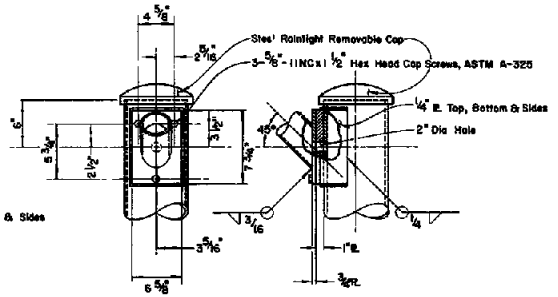
DETAIL "B"
POLE BASE



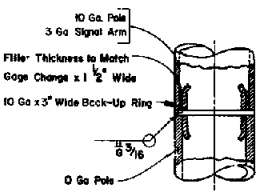
DETAIL "E"
LUMINAIRE TENON DETAIL



DETAIL "C"
SIGNAL ARM CONNECTION

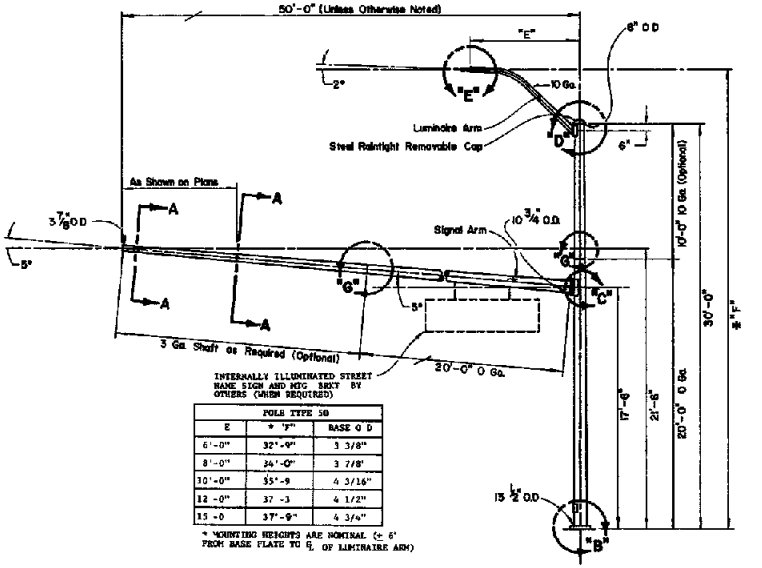


DETAIL "D"
LUMINAIRE ARM CONNECTION



DETAIL "G"
SPLICE DETAIL

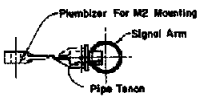
NOTE USED ONLY WHEN REDUCED GAGE OPTION IS USED



POLE TYPE 50		
E	* "F"	BASE O.D.
6'-0"	32'-9"	3 3/8"
8'-0"	34'-0"	3 7/8"
10'-0"	35'-9	4 3/16"
12 -0"	37 -3	4 1/2"
15 -0	37'-9"	4 3/4"

* MOUNTING HEIGHTS ARE NOMINAL (± 6" FROM BASE PLATE TO ℄ OF LUMINAIRE ARM)

POLE TYPE 50



SPECIAL DETAIL
FOR MOUNTING SIGNAL HEAD

GENERAL NOTES

NOTE
1 FOR WELD SIZES NOT SHOWN USE MINIMUM SIZE WELD AS SPECIFIED BY THE LATEST WELDING CODE
2 BREAK ALL SHARP EDGES FOR WIRE PROTECTION
3 SEE STANDARD SHEET T-3D 1 IS FOR FOUNDATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

LIGHTING AND SIGNALS

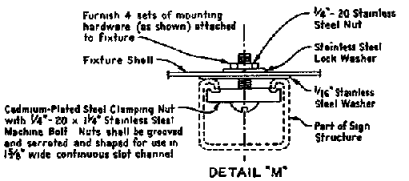
POLE TYPE 49 & 50 AND MAST ARM MOUNTING DETAILS

CHIEF TRAFFIC ENGR

T-30.15

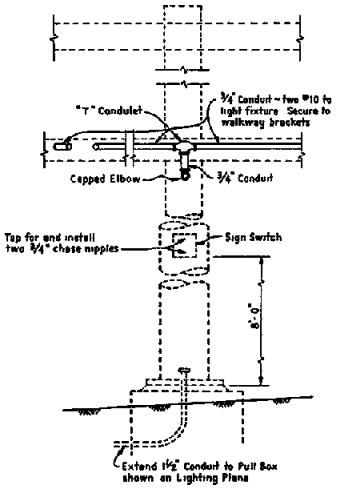
ADOPTED 12/79 REVISION

T15

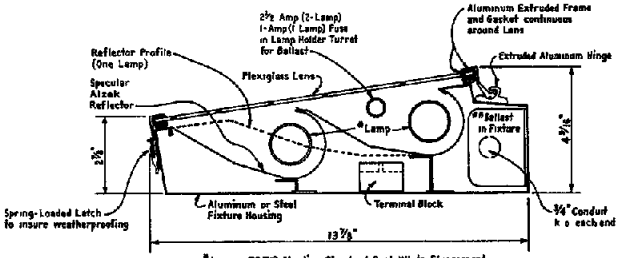


DETAIL "M"

FIXTURE MOUNTING ON CONTINUOUS SLOT CHANNEL



DETAILS OF TYPICAL WIRING AND SIGN SWITCH INSTALLATION



*Lamp- 72 T12 Slimline Standard Cool White Fluorescent.
**Ballast, 425 ma 240 V A C

SECTION - LIGHTING FIXTURE

LIGHTING FIXTURE DATA

LENGTH OF PANEL (FEET)	HEIGHT OF PANEL (INCHES)	NUMBER OF FIXTURES	NUMBER OF LAMPS	CONSECUTIVE SPACING FROM LEFT EDGE OF PANEL TO CENTER OF FIXTURES (INCHES)
10	40-70 80-120	1	1 2	60
12	40-70 80-120	2	2 4	36.5 - 74
14	40-70 80-120	2	2 4	42 - 84
16	40-70 80-120	2	2 4	47.5 - 97
18	40-70 80-120	3	3 6	36.5 - 74 - 74
20	40-70 80-120	3	3 6	40 - 80 - 80
22	40-70 80-120	3	3 6	44 - 88 - 88
24	40-70 80-120	4	4 8	36.5 - 74 - 74 - 74
26	40-70 80-120	4	4 8	39 - 78 - 78 - 78
28	40-70 80-120	4	4 8	42 - 84 - 84 - 84
30	40-70 80-120	4	4 8	45 - 90 - 90 - 90
32	40-70 80-120	5	5 10	38 - 77 - 77 - 77 - 77
34	40-70 80-120	5	5 10	42 - 81 - 81 - 81 - 81
36	40-70 80-120	5	5 10	44 - 86 - 86 - 86 - 86
38	40-70 80-120	6	6 12	38 - 76 - 76 - 76 - 76 - 76
40	40-70 80-120	6	6 12	40 - 80 - 80 - 80 - 80 - 80
42	40-70 80-120	6	6 12	42 - 84 - 84 - 84 - 84 - 84 - 84
44	40-70 80-120	7	7 14	38 - 76 - 76 - 76 - 76 - 76 - 76
46	40-70 80-120	7	7 14	36.5 - 80 - 80 - 80 - 80 - 80 - 80

GENERAL NOTES

1. Where steel is indicated, part shall be hot-dipped galvanized after fabrication.
   Where sheet steel is indicated, part shall be fabricated from hot-dipped galvanized sheet steel After fabrication, edges and flaws in galvanizing shall be cleaned and painted with two coats of Mil Spec Mil-P-21035. Other metal parts shall be made of bronze, phosphor bronze, brass, copper beryllium or AISI Type 316 stainless steel, unless otherwise noted
2. Wiring between fixtures shall be run in 3/4" liquid-tight flexible conduit. Flexible conduit shall be secured to nearest walkway structural member bracket using galvanized bonding strap and brass machine screws.
3. Two lamp fixtures shall be used for signs over 70" vertical dimension and one lamp fixture shall be used for signs with vertical dimension of 70" and less
4. Alternate fixture fabrication methods and design details may be acceptable provided the light distribution, lamp size, mounting details and integral ballast are equivalent to the fixture shown. All variations must be approved by the Engineer.
5. Manufacturer shall submit five copies of shop drawings to the Engineer for approval prior to fabrication if fixtures have not previously been approved.
6. For method of mounting fluorescent fixtures see walkway plan titled "Walkway Details NS 1" and "Walkway Details NS 2" (T-36.1 9 and T-36 1 10).
7. See sign layout sheets for size of panels.

T14

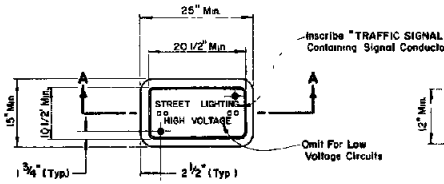
SIGN LIGHTING FIXTURES

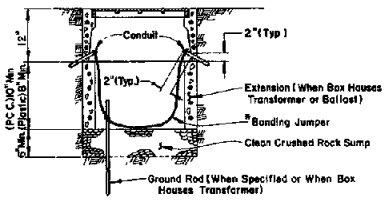
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

LIGHTING AND SIGNALS

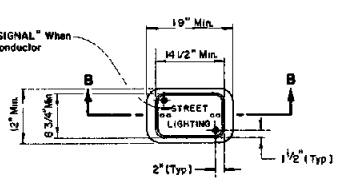
Russell S. Hill
CHIEF TRAFFIC ENGR.

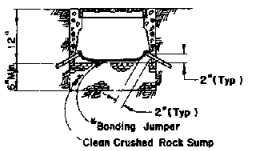
T - 30.1.14 - (823)
ADOPTED 1/73 REVISION 1 - 12/78





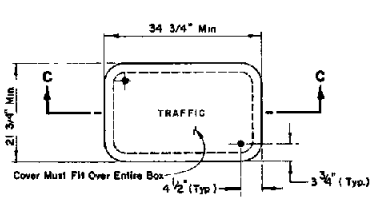
SECTION A-A
PULL BOX NO. 5

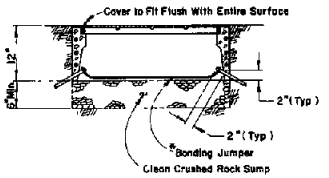




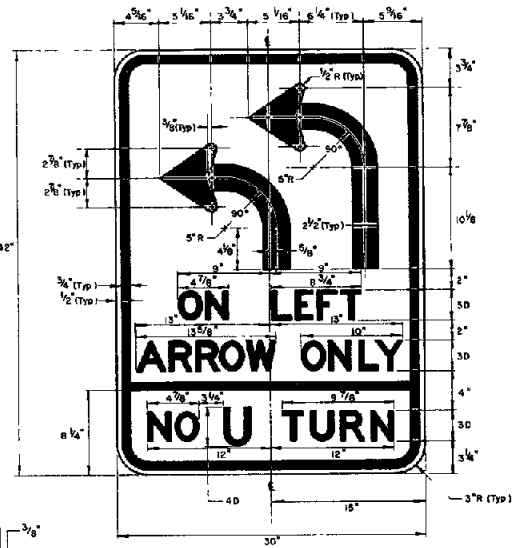
SECTION B-B
PULL BOX NO.3 1/2

*APPLICABLE ONLY WHEN METAL CONDUIT IS USED

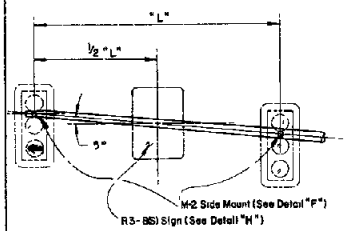


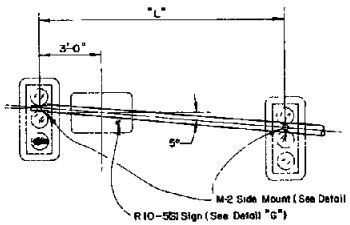


SECTION C-C
PULL BOX NO 7

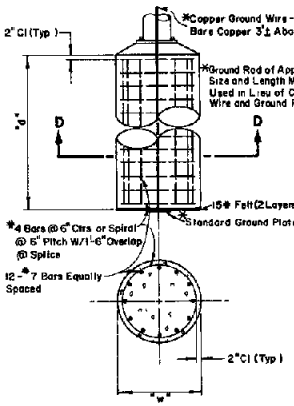


DETAIL "H"
SIGN R3-8(S)
BACKGROUND-WHITE(REFL.)
LEGEND, BORDER-BLACK(NON-REFL.)





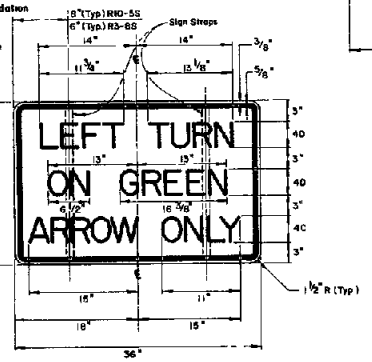
MAST ARM SIGNAL AND SIGN PLACEMENT
"L" = AS SHOWN ON PLANS



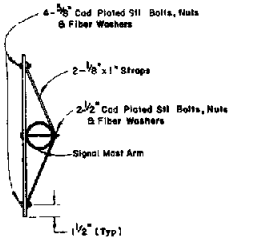
SECTION D-D
PILE FOUNDATION

POLE TYPE	SIGNAL ARM LENGTH	"d"	W
10 AND 20	≤30	8 - 6	30
10 AND 20	>30	10'-6"	36
28 35 AND 45	ALL	12 - 0	36
50	ALL	13'-0"	36"

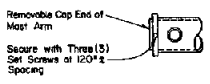
DETAIL "I"
* When Specified

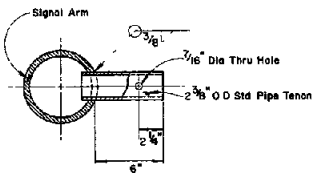


DETAIL "G"
SIGN R10-5(S)
BACKGROUND-WHITE(REFL.)
LEGEND, BORDER-BLACK(NON-REFL.)



TYPICAL METHOD OF ATTACHMENT





DETAIL "F"
M-2 SIDE MOUNT

GENERAL NOTES

1. ALL BOXES WILL HAVE 2-3/8 BRASS STUD BOLTS NUTS AND WASHERS COVER SHALL BE RECESSED FOR NUTS
2. ALL BOXES AND EXTENSIONS SHALL BE PRECAST REINFORCED CONCRETE
3. HOLES SHALL BE SEALED WITH MORTAR WHERE CONDUIT ENTERS BOX
4. SIGN R10-5(S) SHALL BE USED WHEN A SINGLE LEFT TURN LANE IS REQUIRED AND SIGN R3-8(S) SHALL BE USED WHEN TWO LEFT TURN LANES ARE REQUIRED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

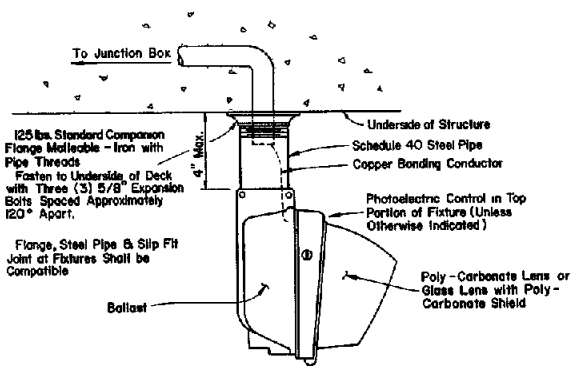
LIGHTING AND SIGNALS

PILE FOUNDATIONS, TRAFFIC SIGNAL SIGNS, PULL BOXES

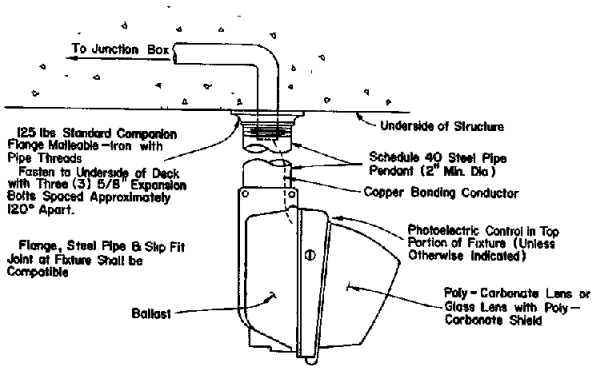
Russell Rud Hall
CHIEF TRAFFIC ENGR.

T-5011 5
ADOPTED 12/79
REVISION

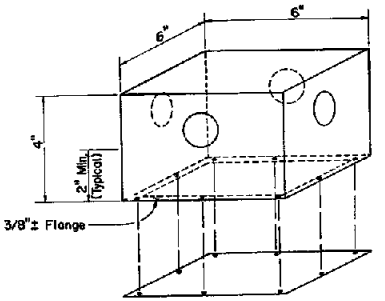
T15



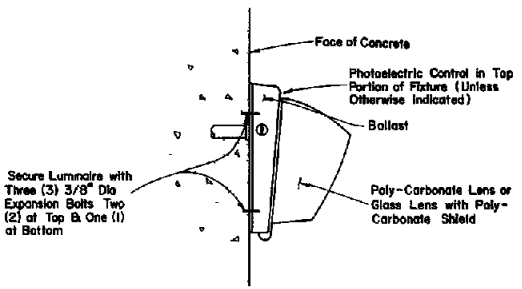
TYPE "A" UNDERPASS LUMINAIRE



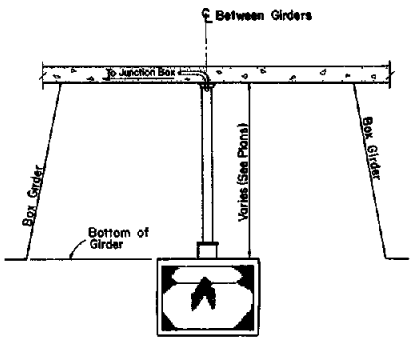
TYPE "C" UNDERPASS LUMINAIRE



JUNCTION BOX DETAIL (J)

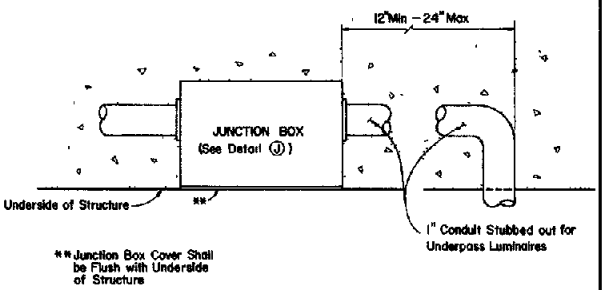


TYPE "B" UNDERPASS LUMINAIRE



DETAIL

PENDANT INSTALLATION
(TYPE "C" UNDERPASS LUMINAIRE)



** Junction Box Cover Shall be Flush with Underside of Structure

DETAIL "B"

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

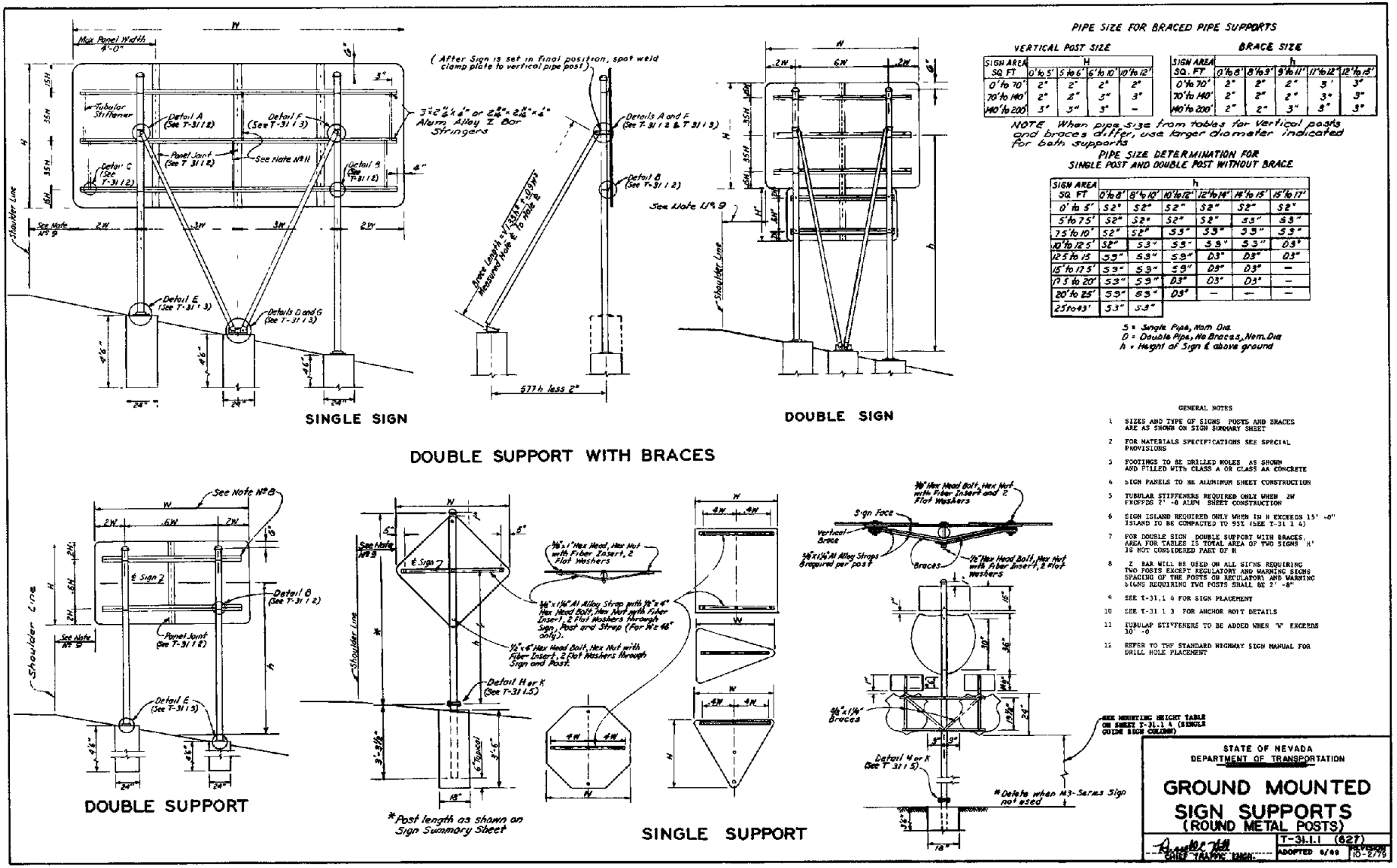
LIGHTING & SIGNALS

UNDERPASS LUMINAIRES & JUNCTION BOX

CHIEF TRAFFIC ENGR

T-3016 (623)

ADOPTED: 12/79 REVISION



PIPE SIZE FOR BRACED PIPE SUPPORTS

VERTICAL POST SIZE

SIGN AREA SQ FT	H 0'to 5'	5'to 6'	6'to 10'	10'to 12'
0'to 70'	2"	2"	2"	2"
70'to 140'	2"	2"	3"	3"
140'to 200'	3"	3"	3"	–

BRACE SIZE

SIGN AREA SQ. FT	h 0'to 8'	8'to 9'	9'to 11'	11'to 12'	12'to 15'
0'to 70'	2"	2"	2"	3'	3"
70'to 140'	2"	2"	2"	3"	3"
140'to 200'	2"	2"	3"	3"	3"

NOTE When pipe size from tables for vertical posts and braces differ, use larger diameter indicated for both supports

PIPE SIZE DETERMINATION FOR SINGLE POST AND DOUBLE POST WITHOUT BRACE

SIGN AREA SQ. FT	h 0'to 8'	8'to 10'	10'to 12'	12'to 14'	14'to 15'	15'to 17'
0' to 5'	52"	52"	52"	52"	52"	52"
5'to 75'	52"	52"	52"	52"	53"	53"
75'to 10'	52"	52"	53"	53"	53"	53"
10'to 125'	52"	53"	53"	53"	53"	03"
125 to 15	53"	53"	53"	03"	03"	03"
15'to 17.5'	53"	53"	53"	03"	03"	–
17.5 to 20'	53"	53"	03"	03"	03"	–
20'to 25'	53"	63"	03"	–	–	–
25'to 43'	53"	53"				

S = Single Pipe, Nom Dia
D = Double Pipe, No Braces, Nom Dia
h = Height of Sign ℄ above ground

GENERAL NOTES

1 SIZES AND TYPE OF SIGNS, POSTS AND BRACES ARE AS SHOWN ON SIGN SUMMARY SHEET

2 FOR MATERIALS SPECIFICATIONS SEE SPECIAL PROVISIONS

3 FOOTINGS TO BE DRILLED HOLES AS SHOWN AND FILLED WITH CLASS A OR CLASS AA CONCRETE

4 SIGN PANELS TO BE ALUMINUM SHEET CONSTRUCTION

5 TUBULAR STIFFENERS REQUIRED ONLY WHEN 2W PROFDS 3' -0 ALUM SHEET CONSTRUCTION

6 SIGN ISLAND REQUIRED ONLY WHEN IN H EXCEEDS 15' -0" ISLAND TO BE COMPACTED TO 95% (SEE T-31 1 4)

7 FOR DOUBLE SIGN DOUBLE SUPPORT WITH BRACES, AREA FOR TABLES IS TOTAL AREA OF TWO SIGNS 'H' IS NOT CONSIDERED PART OF H

8 Z BAR WILL BE USED ON ALL SIGNS REQUIRING TWO POSTS EXCEPT REGULATORY AND WARNING SIGNS SPACING OF THE POSTS OR REGULATORY AND WARNING SIGNS REQUIRING TWO POSTS SHALL BE 2' -8"

9 SEE T-31.1 4 FOR SIGN PLACEMENT

10 SEE T-31 1 3 FOR ANCHOR BOLT DETAILS

11 TUBULAR STIFFENERS TO BE ADDED WHEN 'W' EXCEEDS 10' -0

12 REFER TO THE STANDARD HIGHWAY SIGN MANUAL FOR DRILL HOLE PLACEMENT

SEE MOUNTING HEIGHT TABLE ON SHEET T-31.1 4 (SINGLE GUIDE SIGN COLUMN)

*Delete when M3-Series Sign not used

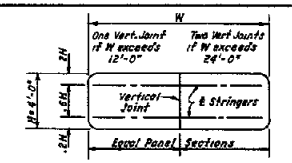
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

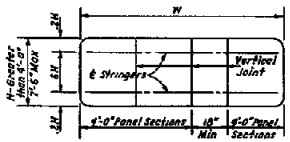
GROUND MOUNTED SIGN SUPPORTS (ROUND METAL POSTS)

CHIEF TRAFFIC ENGR.

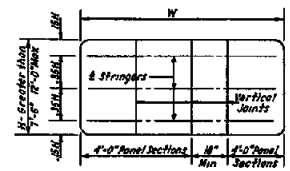
T-31.1.1 (627)

ADOPTED 6/99 REVISION 10-2779

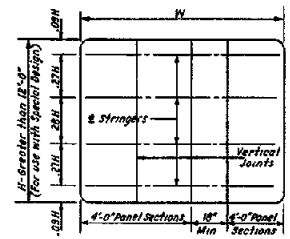




2 STRINGER MOUNTING



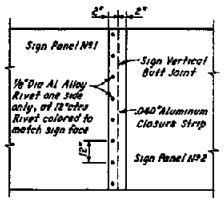
3 STRINGER MOUNTING



4 STRINGER MOUNTING

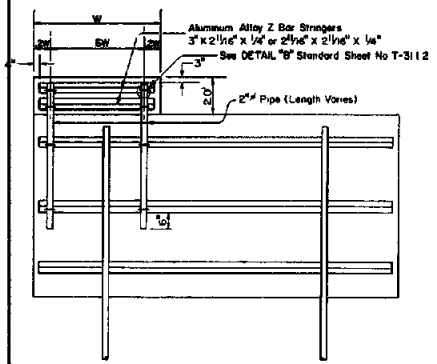
Note To obtain desired panel width Max of 2 panels may be cut less than 4'-0" (18" Min each).

STRINGER AND PANEL ARRANGEMENT

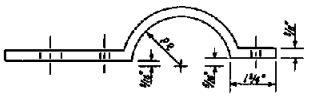


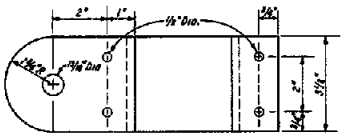
PANEL JOINT CLOSURE STRIP

ALUMINUM SHEET CONSTRUCTION

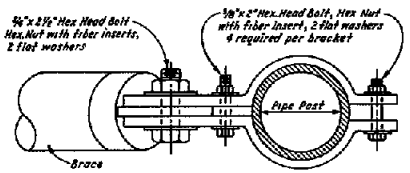


EXIT PANEL ATTACHMENT





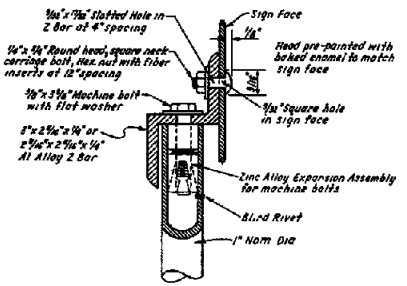
CLAMP PLATE



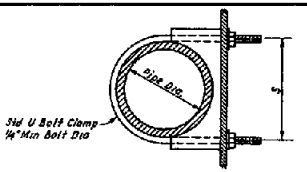
CLAMP ASSEMBLY

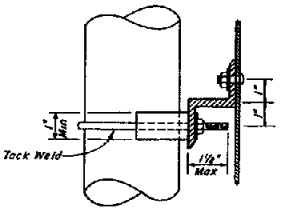
DETAIL A

(After Sign is set in final position, spot-weld clamp plate to vertical pipe post)



DETAIL C





DETAIL B

POST NOM DIA.	PR	PD	S
2"	1 11/16"	2 5/8"	2 5/8"
3"	1 3/4"	3 1/2"	3 3/4"

GENERAL NOTES

1- For materials not directly specified, See Special Provisions

2- Flat washers required on all bolts, 1 or 2 as necessary.

3- All nuts to have fiber inserts.

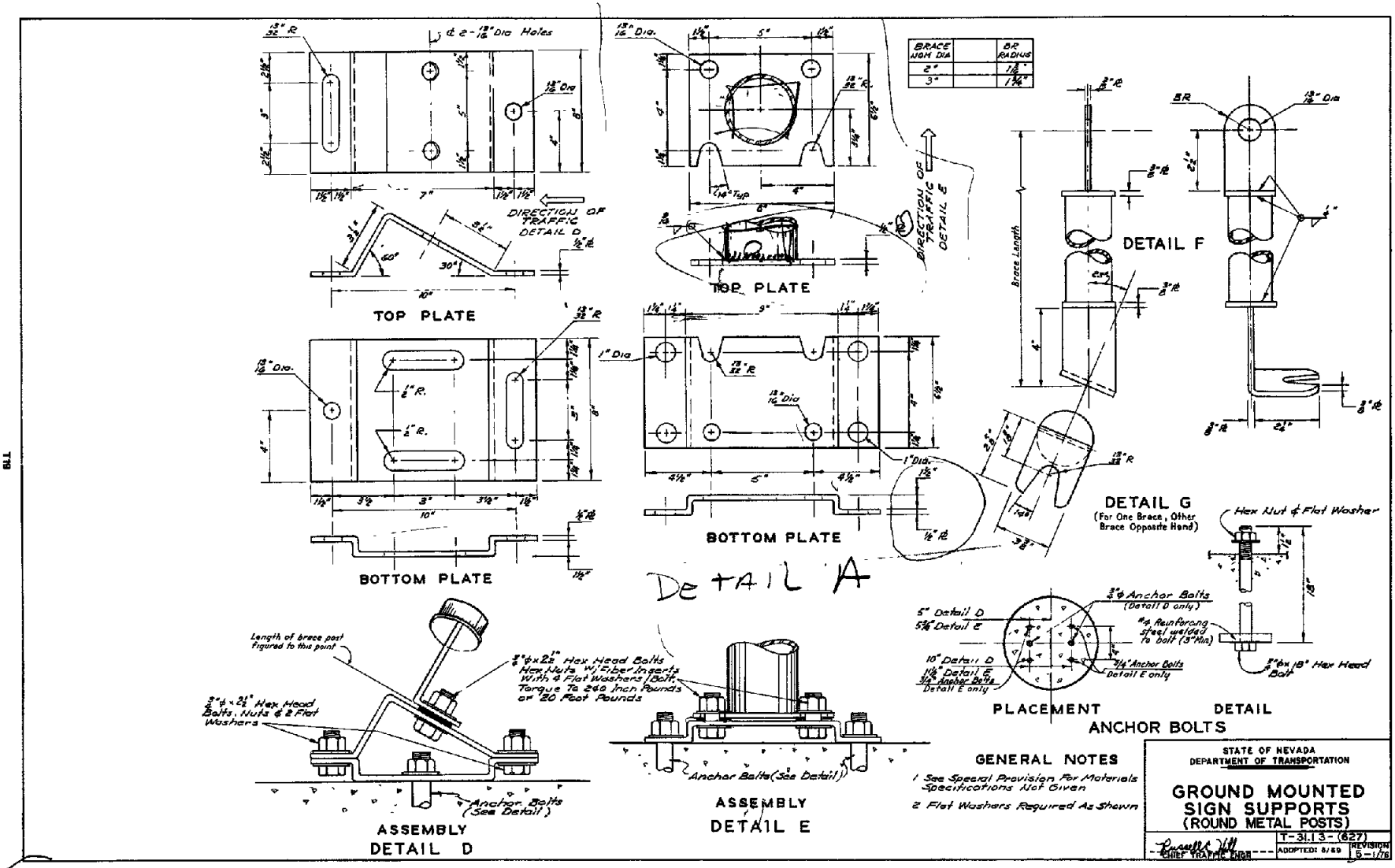
4- To obtain desired panel width, Max of 2 panels may be cut less than 4'-0" (18" Min each).

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GROUND MOUNTED SIGN SUPPORTS (ROUND METAL POSTS)

Russell Hill
CHIEF TRAFFIC ENGR

T-31.1.2 - (627)
ADOPTED 8/69
REVISION 5-2/79



BRACE NOM DIA		BR RADIUS
2"		1⅛"
3"		1¾"

GENERAL NOTES

1 See Special Provision For Materials Specifications Not Given

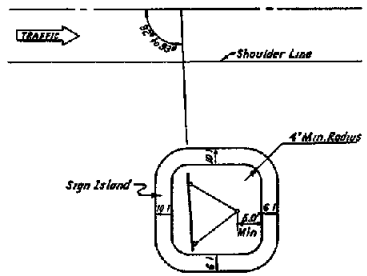
2 Flat Washers Required As Shown

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

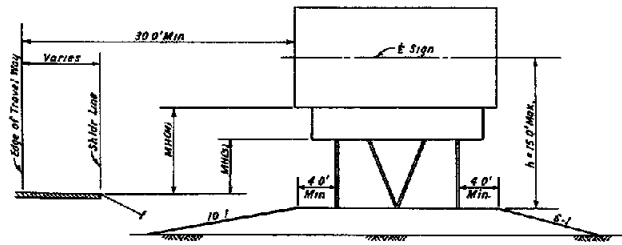
GROUND MOUNTED SIGN SUPPORTS (ROUND METAL POSTS)

T-31.13-(627)

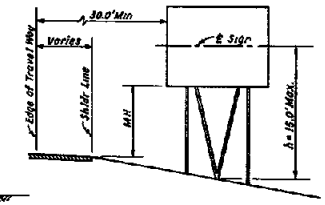
CHIEF TRAFFIC ENGR. — ADOPTED: 8/69 — REVISION 5-1/76



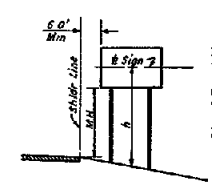
PLAN



LEVEL

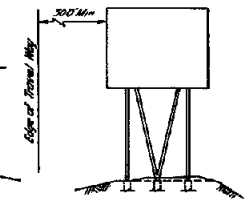


BRACED

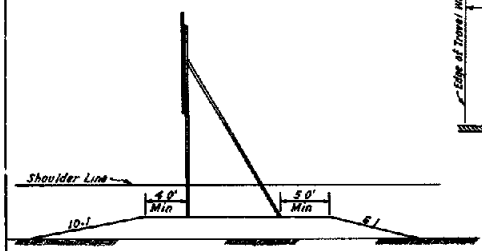


UNBRACED

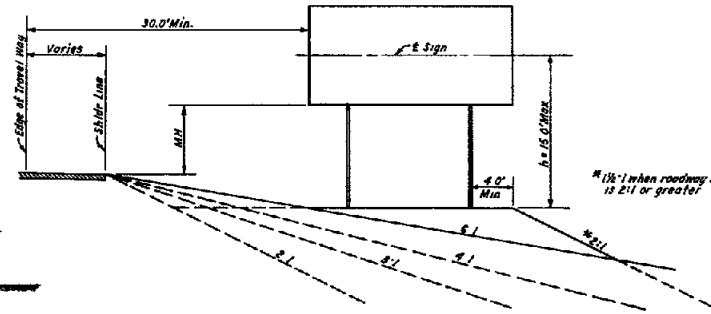
EMBANKMENT
(WITHOUT SIGN ISLAND)



When the sign location is on original ground, the area between the supports and the braces shall be levelled to maintain identical post lengths (No Direct Payment for The Leveling)

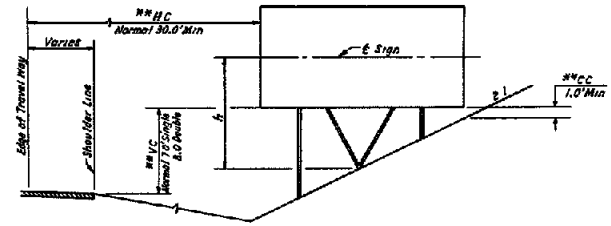


ELEVATION



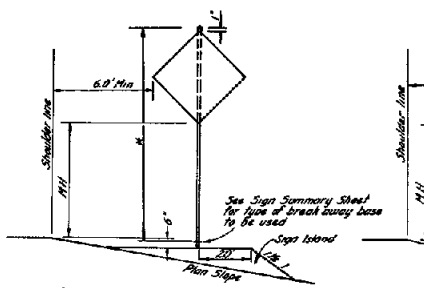
*1½:1 when roadway slope is 2:1 or greater

EMBANKMENT

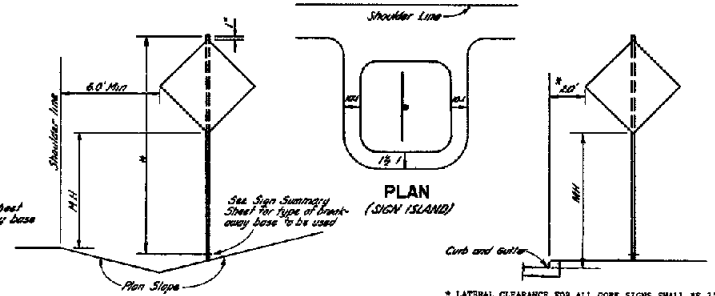


**NOTE: If CC is less than 1.0' Minimum
(1) Raise sign until CC=1.0' or VC=10.0' Max for single sign, VC=11.0' Max for double sign, or h=15.0' Max
(2) Maintain VC=10.0' or 11.0' and move sign toward shoulder until CC=1.0', HC=16.0' Min., or h=15.0' Max
(3) Special consideration is necessary if given limits are exceeded.

EXCAVATION



* Post length as shown on Sign Summary Sheet. Post length calculations are based on use of sign island. Sign island shall be used except when signpost is located in backslope



TYPICAL SINGLE SIGN SUPPORT

PLAN
(SIGN ISLAND)

* LATERAL CLEARANCE FOR ALL CORE SIGNS SHALL BE 2'-0" EITHER FROM CURB FACE OR NORMAL SHOULDER LINE

GENERAL NOTES

1. SIGN ISLAND FOR TWO POST SIGNS REQUIRED ONLY WHEN h EXCEEDS 15.0'. ISLAND TO BE COMPACTED TO 95%.
2. FOOTING AND SIGN DETAILS SHOWN ON SHEETS T-31.1.1, T-31.1.2, T-31.1.3.
3. 30.0' MIN. DISTANCE FROM EDGE OF TRAVEL WAY TO EDGE OF SIGN PANEL MAY BE REDUCED TO 16.0' MIN. IN SPECIAL SITUATIONS.
4. ALL SIGN SUPPORTS SHALL BE OF BREAK-AWAY DESIGN.
5. SIGNS SHOULD NOT BE CLOSER THAN 6 FT. FROM THE EDGE OF THE SHOULDER OR IF NONE, 12 FT. FROM THE EDGE OF THE TRAVELED WAY. IN URBAN AREAS A LESSER CLEARANCE MAY BE USED WHERE NECESSARY.

MINIMUM MOUNTING HEIGHTS (MH) FOR SIGNS

	*SINGLE GUIDE SIGNS	*DOUBLE GUIDE SIGNS	ROUTE MARKERS REGULATORY AND WARNING SIGNS
FREEWAYS AND EXPRESSWAYS	7'	8' (M) 5' (S)	6'
COMMERCIAL, RESIDENTIAL CURB AND GUTTER	7'	7'	7'
RURAL ROADS AND INTERCHANGE RAMPS	5	5	5'
FREEWAY ENTRANCE AND DO NOT ENTER - WRONG WAY ASSEMBLIES			2'

(M) MAJOR SIGN (S) SECONDARY SIGN

NOTE FOR MOUNTING HEIGHTS (MH) FOR CONSTRUCTION SIGNS AND TEMPORARY SIGNS, (SEE SHEET T-31.1.6)

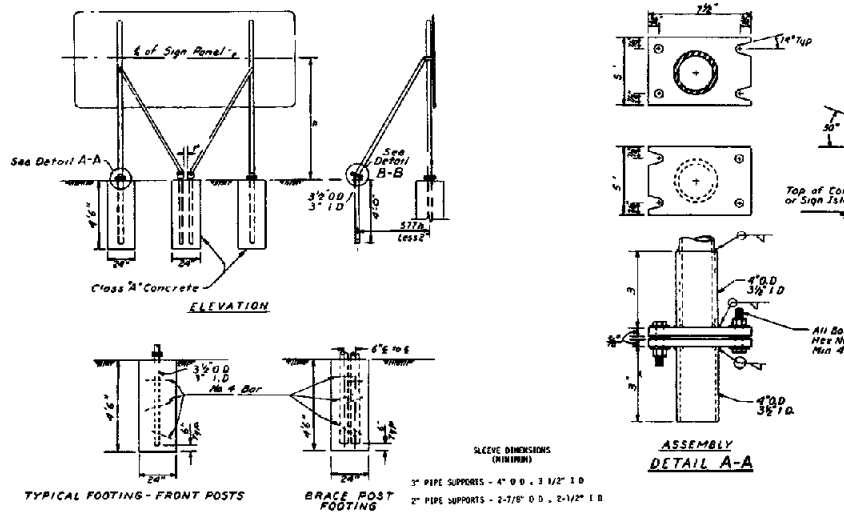
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GROUND MOUNTED SIGN SUPPORTS (ROUND METAL POSTS)

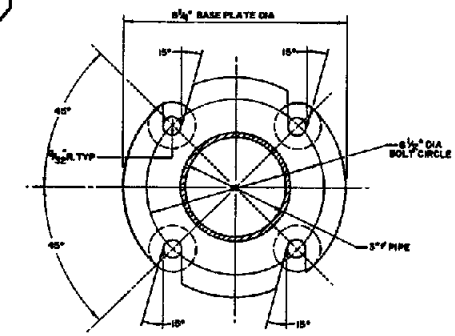
Russell C. Hill
CHIEF TRAFFIC ENGR.

T-31.1.4 - (627)
ADOPTED: 8/69
REVISION 11 2/79

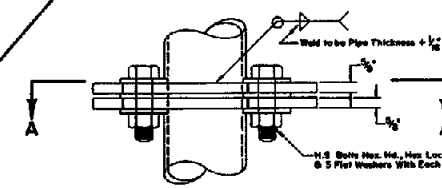
120



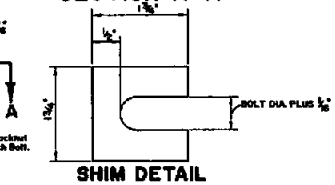
ALTERNATE DOUBLE SUPPORT WITH BRACES



SECTION A-A



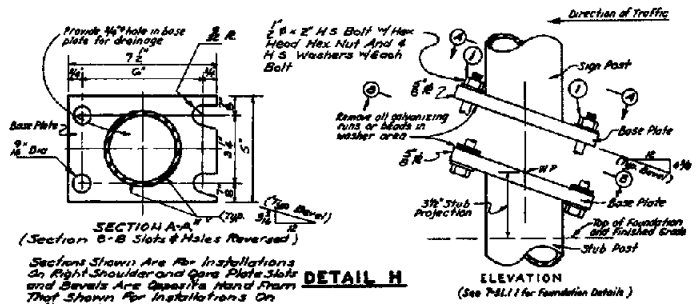
ELEVATION



SHIM DETAIL

FURNISH 2 SHIMS 012ø THICK AND 2 SHIMS 032ø THICK PER POST. SHIMS SHALL BE FABRICATED FROM BRASS SHIM STOCK OR STRIP CONFORMING TO ASTM B36.

TYPE K BASE



Seefront Shown Are For Installations On Right Shoulder and Open Plate Slots and Bevels Are Opposite Hand From That Shown For Installations On Left Shoulder

DETAIL H

BREAKAWAY SIGN SUPPORTS FOR PIPE

MONO-DIRECTIONAL SLIP BASE

(To be used on all 3" pipe located on main lines and portions of entrance and exit ramps)

TYPE H BASE

—GENERAL NOTES—

1. AT THE OPTION OF THE CONTRACTOR, PIPE SUPPORT SLEEVES MAY BE ELIMINATED AND THE SUPPORT PIPE MAY BE WELDED DIRECTLY TO THE SLIP BASE.
2. SEE STANDARD SHEETS T-31.1.1 THROUGH T-31.1.4 FOR DETAILS NOT SHOWN
3. ALTERNATE DOUBLE POST SUPPORTS TO BE USED ONLY WHEN NOTED ON PLANS

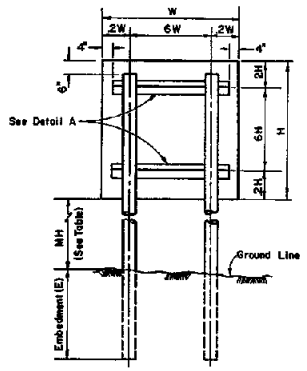
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GROUND MOUNTED SIGN SUPPORTS

CHIEF TRAFFIC ENGR.

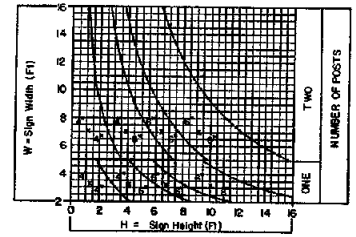
T-31.1.5-(627)
ADOPTED 9/72
REVISION 3-4/79

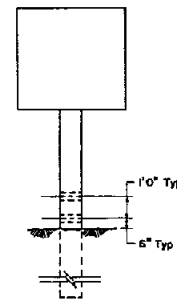
T21



SIGN POST EMBEDMENTS	
4" x 4" = 3'-0"	4" x 6" = 4'-0"
6" x 6" = 5'-0"	6" x 8" = 6'-0"

RECTANGULAR TIMBER POST SELECTION





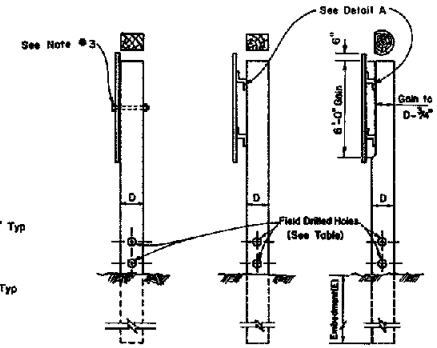
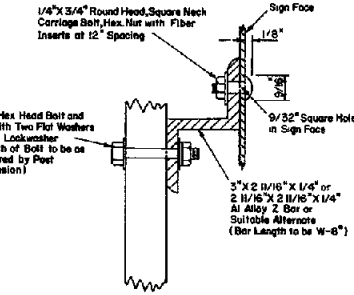
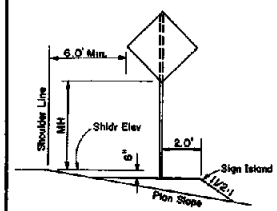


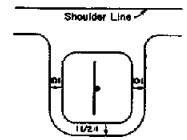
TABLE OF HOLE DIAMETERS			
POST SIZE	LESS THAN 6"x6"	6" x 6" OR 6" ø	
HOLE DIA	NO HOLE	2"	

TIMBER POST SIGN SUPPORT



DETAIL A





PLAN

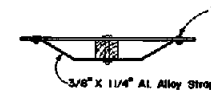
SIGN ISLAND

POST LENGTH AS SHOWN ON SIGN SUMMARY SHEET. POST LENGTH CALCULATIONS ARE BASED ON USE OF SIGN ISLAND. SIGN ISLAND SHALL BE USED EXCEPT WHEN SIGN POST IS LOCATED IN BACKSLOPE. SIGN ISLANDS TO BE USED FOR ALL TEMPORARY SIGNS AND CONSTRUCTION SIGNS G-20-1, G-20-2, AND INFORMATIONAL SIGNS G-25, G-26 and G-27

MINIMUM MOUNTING HEIGHTS (MH) FOR SIGNS

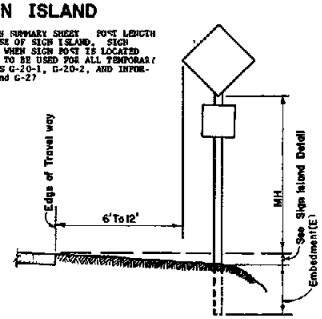
	*SINGLE GUIDE SIGNS	*DOUBLE GUIDE SIGNS	ROUTE MARKERS REGULATORY AND WARNING SIGNS
FREEWAYS AND EXPRESSWAYS	7'	8' (M) 5' (S)	6'
COMMERCIAL, RESIDENTIAL, CURB AND GUTTER	7'	7'	7'
RURAL ROADS AND INTERCHANGE RAMPS	5	5'	5'
BARRICADE AND TRIPOD MOUNTING			1'

(M) MAJOR SIGN (S) SECONDARY SIGN

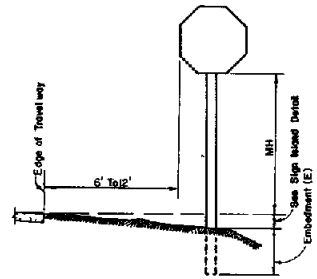


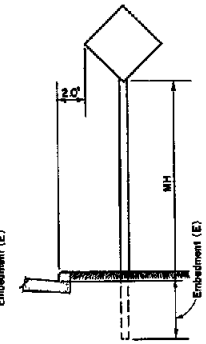
GENERAL NOTES

1. ALL BOLTS, NUTS AND WASHERS TO BE GALVANIZED
2. ALL POSTS WITH CROSS SECTIONAL AREA LARGER THAN 24 SQUARE INCHES ARE TO BE DRILLED AS SHOWN
3. '2' BARS WILL BE USED ON ALL SIGNS REQUIRING TWO POSTS EXCEPT CONSTRUCTION REGULATORY AND WARNING SIGNS. SPACING OF THE POSTS ON REGULATORY AND WARNING SIGNS REQUIRING TWO POSTS SHALL BE 2 -8"
4. CONSTRUCTION SIGNS REQUIRING PORTABILITY MAY BE MOUNTED ON TRIPODS

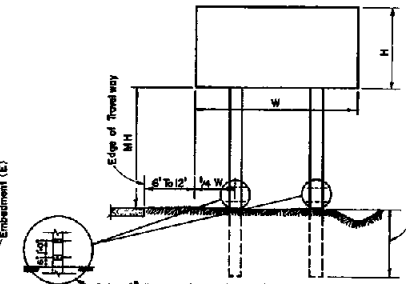


RURAL AREA





URBAN AREA



RURAL AND URBAN

ERECTION- RIGHT-HAND SIDE OF ROADWAY, FACING AND AT RIGHT ANGLES TO DIRECTION OF TRAFFIC.

TYPICAL SIGN ERECTION

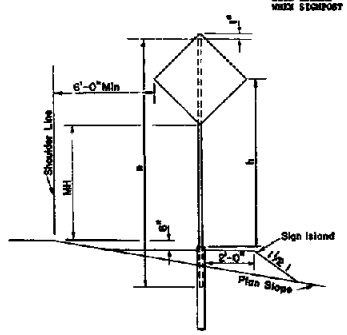
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GROUND MOUNTED SIGN SUPPORTS (TIMBER POSTS)

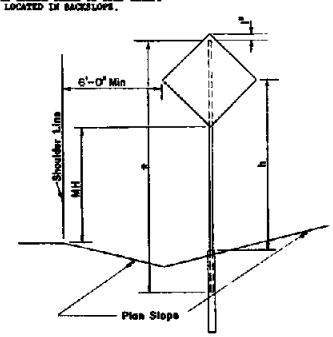
CHIEF TRAFFIC ENGR	T-3116 (625)
	ADOPTED 8/73 REVISION 3- 2/78

722

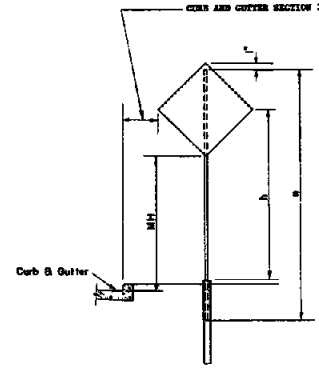
*POST LENGTH AS SHOWN ON SIGN SUMMARY SHEET
POST LENGTH CALCULATIONS ARE BASED ON USE OF SIGN ISLAND. SIGN ISLAND SHALL BE USED EXCEPT WHEN SIGNPOST IS LOCATED IN BACKSLOPE.



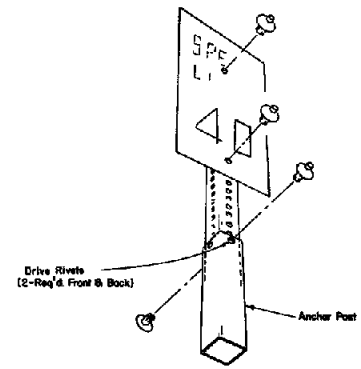
ELEVATION



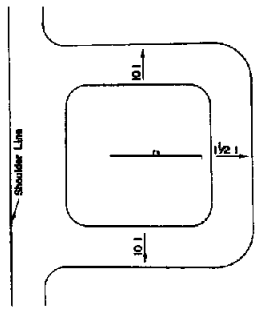
SIGN ON BACKSLOPE



SIGN ON GORE

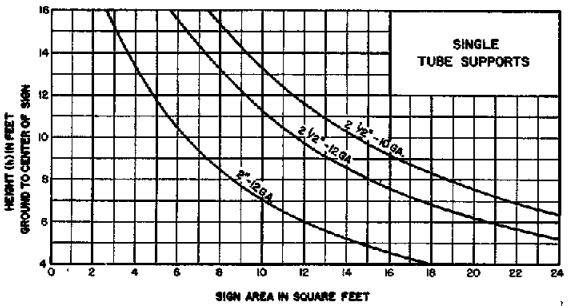


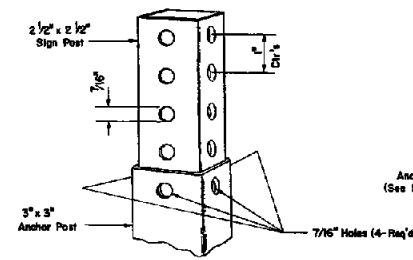
MINIMUM MOUNTING HEIGHTS (MH) FOR SIGNS	
	ALL SIGNS
FREEWAYS AND EXPRESSWAYS	5
COMMERCIAL RESIDENTIALS CURB AND GUTTER	7
RURAL ROADS AND INTERCHANGE RAMPS	5'

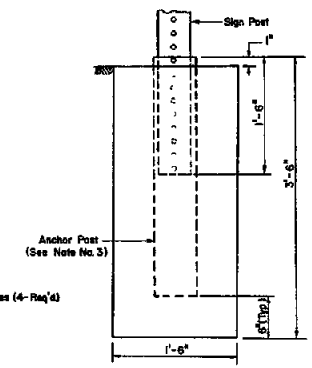


PLAN

SIGN ON SIGN ISLAND







GENERAL NOTES

1. SIGN ISLAND TO BE COMPACTED TO 95%
2. SIGNS SHOULD NOT BE CLOSER THAN 6 FT. FROM THE EDGE OF THE SHOULDER, OR IF NONE 12 FT FROM THE EDGE OF THE TRAVELED WAY. IN URBAN AREAS A LESSER CLEARANCE MAY BE USED WHERE NECESSARY
3. ANCHOR POST TO BE INCLUDED IN COST OF POST LENGTH AS SHOWN ON THE SIGN SUMMARY SHEET
4. FOOTINGS TO BE DRILLED HOLES, AS SHOWN, AND FILLED WITH CLASS A OR CLASS AA CONCRETE

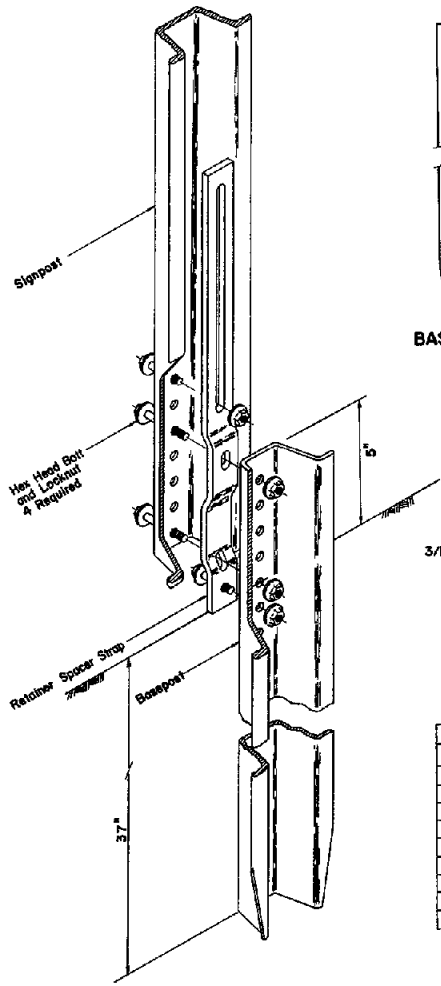
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

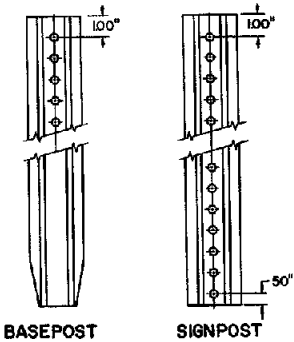
GROUND MOUNTED SIGN SUPPORTS (SQUARE METAL POSTS)

Russell C. Hill
CHIEF TRAFFIC ENG

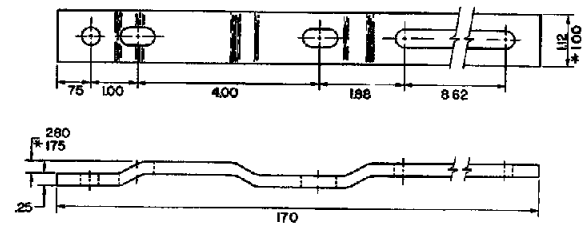
T-3117(625)
ADOPTED 1/76
REVISION 1-2/79

T26



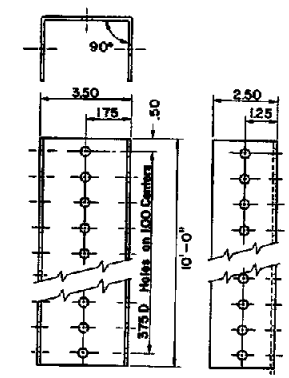


BASEPOST SIGNPOST

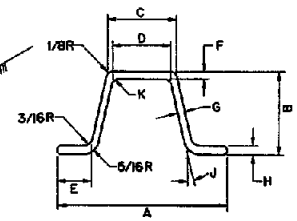


RETAINER – SPACER STRAP FOR 4.0 LB. POST

*DIMENSIONS FOR 2.5 LB POST



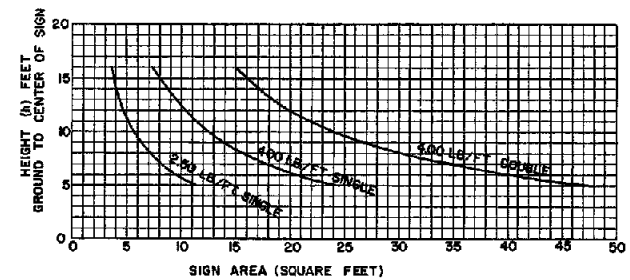
FORMED CHANNEL SIGN MOUNT



SIGNPOST AND BASEPOST

SIGN POST AND BASE POST DIMENSIONS

	2.50 LB/FT	4.00 LB/FT
A	3 1/8"	3⅛"
B	1.562	1.750"
C	1¼"	1.43/64
D	1 1/16	1.15/32"
E	5/8"	23/32"
F	0.149	0.230"
G	0.132	0.175"
H	0.164	0.250
J (ANGLE)	12½°	11½°
K (RADIUS)	1/8"	3/16"



STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

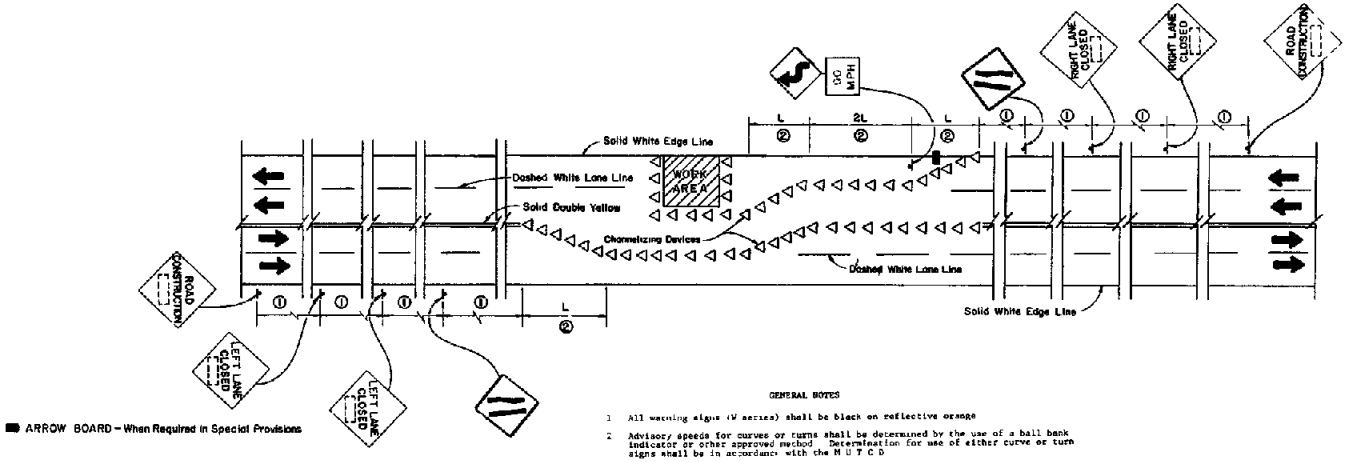
GROUND MOUNTED SIGN SUPPORTS

FLANGED CHANNEL STEEL POSTS

Russell Bud Hill
CHIEF TRAFFIC ENGR

T 3118 (625)
ADOPTED 3/79 REVISION

T24



■ ARROW BOARD – When Required in Special Provisions

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, Delineators, Vertical Panels or Type III B 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 5'-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 sign shall be installed at one mile intervals when the lengths of crossover exceeds one-half mile
5. End Construction Signs (G20-2) when necessary shall be installed at each end of the project in accordance with the Table for spacing of Advanced Warning Singe

①

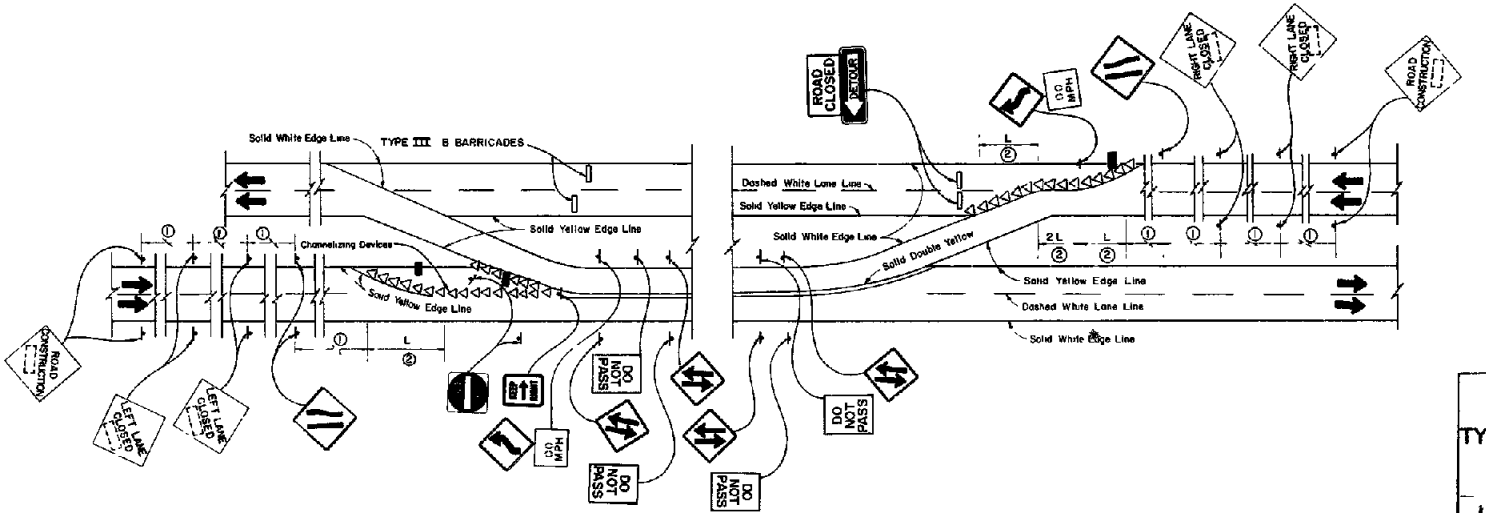
TABLE FOR SPACING OF ADVANCE WARNING SIGNS

SPEED	MINIMUM SPACING	
MILES PER HOUR 85th Percentile	BETWEEN SIGNS	FROM LAST SIGN TO TAPER
0-20	200	200
25-30	300	300
30-35	400	400
40-45	600	600
50-60	1000	1000

②

TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED	MINIMUM TAPER LENGTH FOR LANE WIDTH			DEVICE
MILES PER HOUR 85th Percentile	10 FT	11 FT	12 FT	SPACING IN FEET
20	70	75	80	20
25	105	115	55	25
30	130	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



BALL BANK INDICATOR TABLE

BELOW 20 MPH	14 DEGREES
25 TO 30 MPH	12 DEGREES
35 TO 60 MPH	10 DEGREES

ADVISORY SPEED PLATED SHALL NOT BE POSTED FOR CURVES OVER 50 MPH

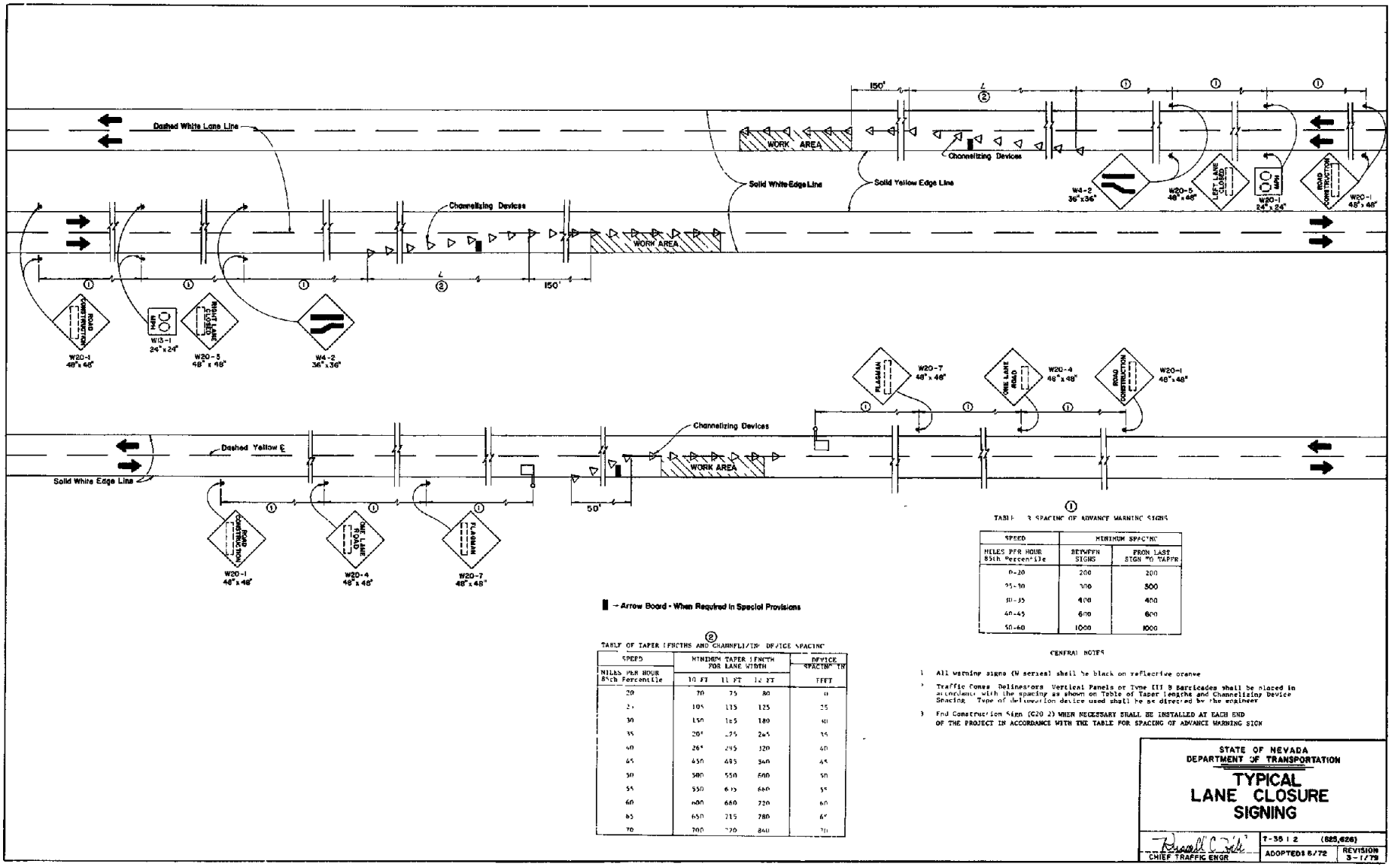
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL ROAD CONSTRUCTION SIGNING

Russell "Red" Hill
CHIEF TRAFFIC ENGR

T-351.1 (625 626)
ADOPTED 5/79 | REVISION

T25



▮ → Arrow Board - When Required in Special Provisions

(1)

TABLE OF SPACING OF ADVANCE WARNING SIGNS

SPEED	MINIMUM SPACING	
MILES PER HOUR 85th Percentile	BETWEEN SIGNS	FROM LAST SIGN TO TAPER
0-20	200	200
25-30	300	500
35-35	400	400
40-45	600	600
50-60	1000	1000

(2)

TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED	MINIMUM TAPER LENGTH FOR LANE WIDTH			DEVICE SPACING IN
MILES PER HOUR 85th Percentile	10 FT	11 FT	12 FT	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

GENERAL NOTES

1. All warning signs (W series) shall be black on reflective orange
2. Traffic Cones, Delineators, Vertical Panels or Type III B 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 Construction Sign (G20-2) WHEN NECESSARY SHALL BE INSTALLED AT EACH END OF THE PROJECT IN ACCORDANCE WITH THE TABLE FOR SPACING OF ADVANCE WARNING SIGN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL LANE CLOSURE SIGNING

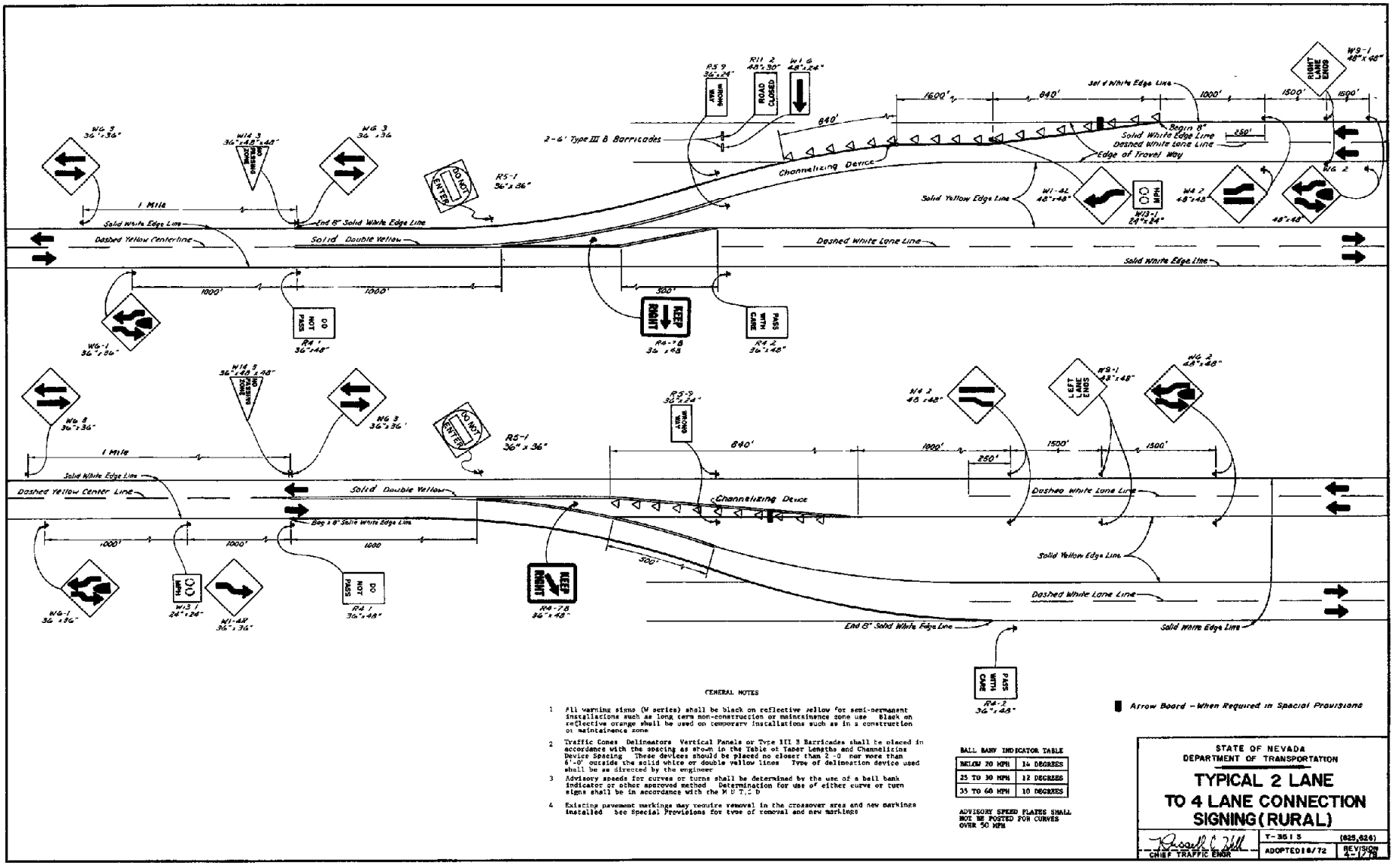
CHIEF TRAFFIC ENGR

T-38 | 2 (SS,626)

ADOPTED 8/72

REVISION 3-1/79

T28



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, Delineators, Vertical Panels or Type III B 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.

BALL BANK INDICATOR TABLE

BELOW 20 MPH	14 DEGREES
25 TO 30 MPH	12 DEGREES
35 TO 60 MPH	10 DEGREES

ADVISORY SPEED PLATES SHALL NOT BE POSTED FOR CURVES OVER 50 MPH

■ Arrow Board – When Required in Special Provisions

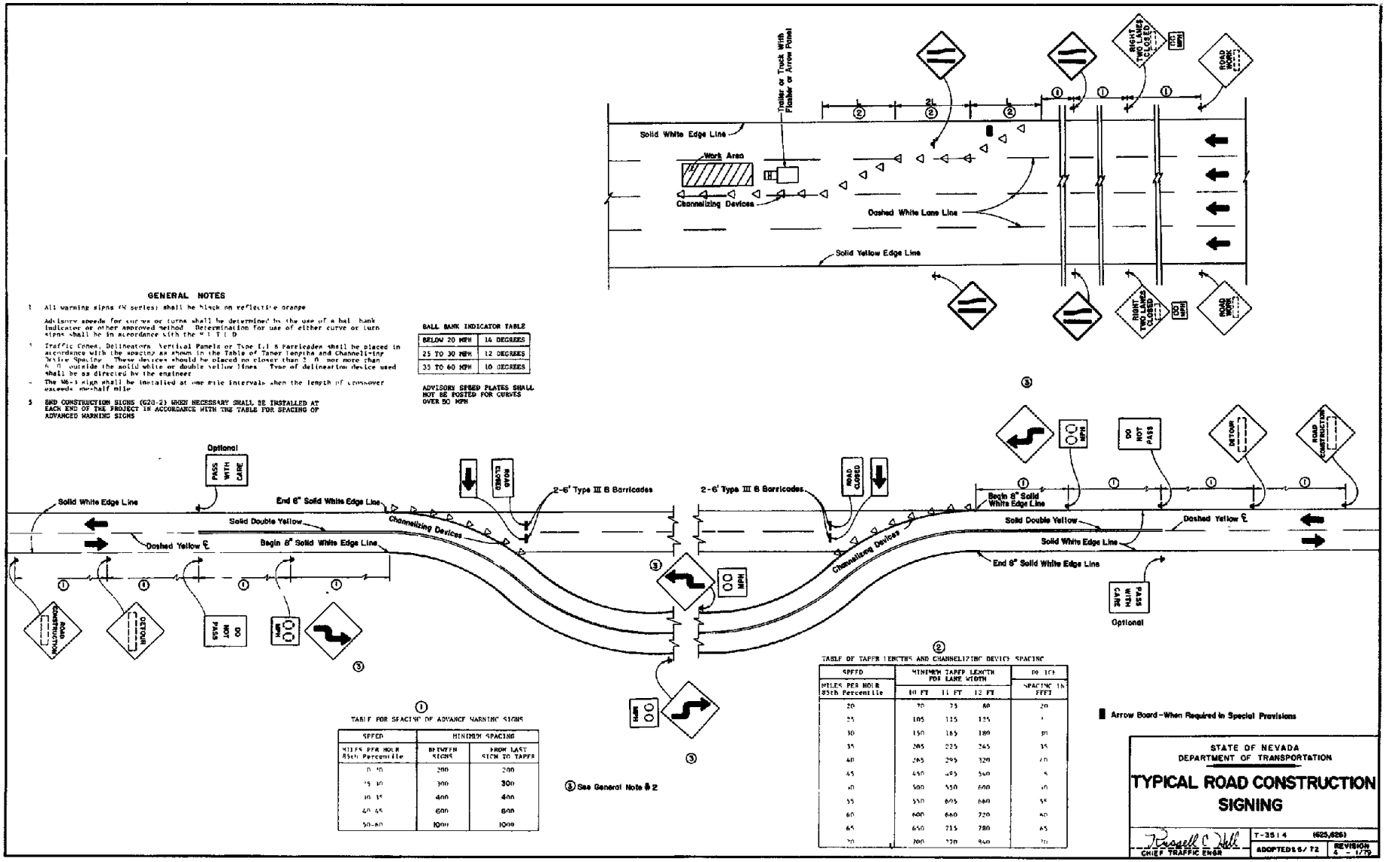
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL 2 LANE TO 4 LANE CONNECTION SIGNING (RURAL)

CHIEF TRAFFIC ENGR

T-361 S	(625,626)
ADOPTED 8/6/72	REVISION 4-1-78

127



GENERAL NOTES

1. All warning signs (W series) shall be black on reflective orange.

   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.

2. Traffic Cones, Delineators, Vertical Panels or Type I, II & III 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. The W6-1 sign shall be installed at one mile intervals when the length of crossover exceeds one-half mile.

4. END CONSTRUCTION SIGNS (G20-2) WHEN NECESSARY SHALL BE INSTALLED AT EACH END OF THE PROJECT IN ACCORDANCE WITH THE TABLE FOR SPACING OF ADVANCED WARNING SIGNS.

BALL BANK INDICATOR TABLE

BELOW 20 MPH	14 DEGREES
25 TO 30 MPH	12 DEGREES
35 TO 60 MPH	10 DEGREES

ADVISORY SPEED PLATES SHALL NOT BE POSTED FOR CURVES OVER 50 MPH

① TABLE FOR SPACING OF ADVANCE WARNING SIGNS

SPEED	MINIMUM SPACING	
MILES PER HOUR 85th Percentile	BETWEEN SIGNS	FROM LAST SIGN TO TAPER
0-30	200	200
35-50	300	300
55-65	400	400
70-75	600	600
80-85	1000	1000

③ See General Note # 2

② TABLE OF TAPER LENGTHS AND CHANNELIZING DEVICE SPACING

SPEED	MINIMUM TAPER LENGTH FOR LANE WIDTH			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

■ Arrow Board – When Required in Special Provisions

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL ROAD CONSTRUCTION SIGNING

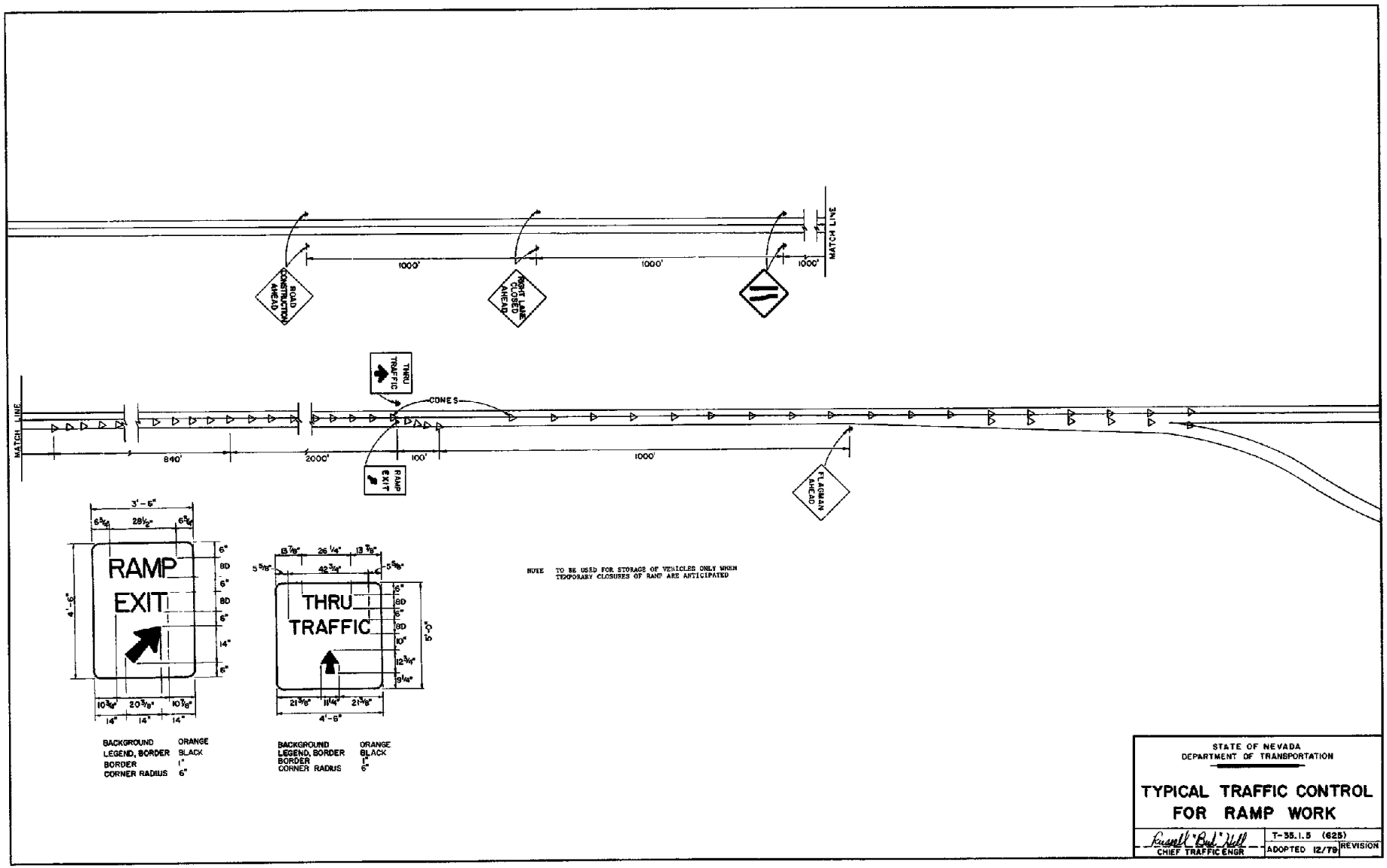
Russell C. Hill
CHIEF TRAFFIC ENGR

T-3514 (625,626)

ADOPTED 6/72

REVISION 4 - 1/79

T28



BACKGROUND	ORANGE
LEGEND, BORDER	BLACK
BORDER	1"
CORNER RADIUS	6"

BACKGROUND	ORANGE
LEGEND, BORDER	BLACK
BORDER	1"
CORNER RADIUS	6"

NOTE TO BE USED FOR STORAGE OF VEHICLES ONLY WHEN TEMPORARY CLOSURES OF RAMP ARE ANTICIPATED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPICAL TRAFFIC CONTROL FOR RAMP WORK

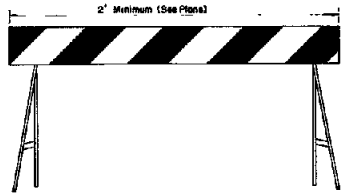
Russell "Bud" Hall
CHIEF TRAFFIC ENGR

T-35.1.5 (625)
ADOPTED 12/79 REVISION

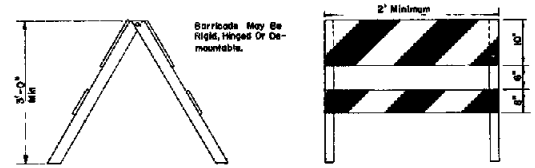
T 281

blank

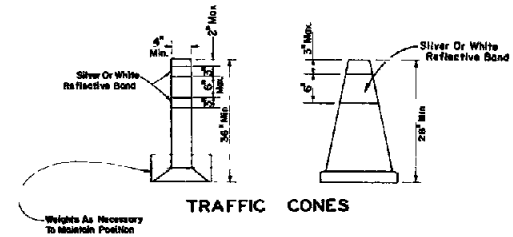
T29



TYPE I BARRICADE



TYPE II BARRICADE
(FRAMEWORK TO BE PAINTED WHITE)

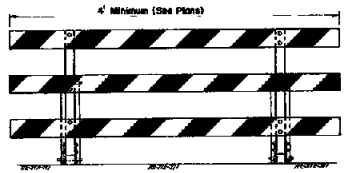


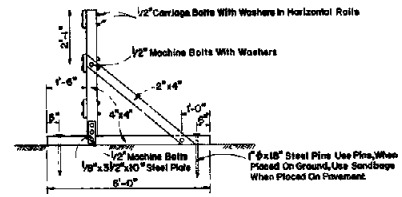
TRAFFIC CONES

1 CONES TO BE PREDOMINATELY ORANGE
2 CONES TO BE USED DURING HOURS OF DARKNESS SHALL BE REFLECTORIZED AS SHOWN ABOVE
3 CONES SHALL HAVE WEIGHTED BASES. HOWEVER, IF THE CONTRACTOR WISHES IN LIEU OF WEIGHTED BASES, HE MAY EPOXY OR NAIL THE CONES IN PLACE.

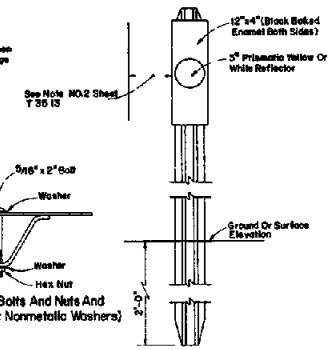
GENERAL NOTES

1 SUITABLE ALTERNATES WHICH MAINTAIN THE BASIC DESIGN CONCEPT WILL BE ACCEPTABLE WHEN APPROVED BY THE ENGINEER

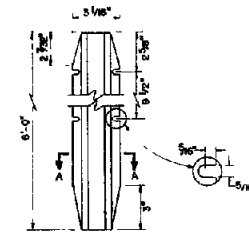


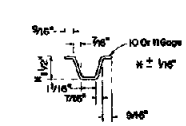


TYPE III A BARRICADE

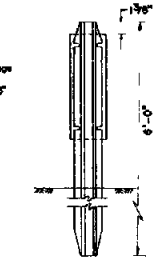


TRAFFIC DELINEATOR





SECTION A-A

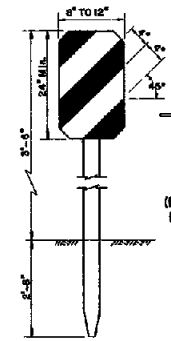


POST DETAILS

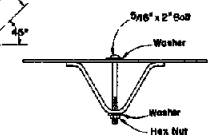
BARRICADE CHARACTERISTICS

TYPE	I	II	III
WIDTH OF RAIL	8" MIN - 12" MAX	8" MIN -- 12 MAX	8 MIN -- 12 MAX
LENGTH OF RAIL	4' MIN	2 MIN	4 MIN
WIDTH OF STRIPES	RAIL LENGTH < 3' - 4" RAIL LENGTH 3' OR > - 6"	RAIL LENGTH < 3' - 4 RAIL LENGTH 3' OR > - 6	6
HEIGHT	3' MIN	3 MIN	3' MIN
NUMBER OF REFLECTORIZED RAIL FACES	2 (ONE EACH DIRECTION)	4 (TWO EACH DIRECTION)	3 IF FACING TRAFFIC IN ONE DIRECTION 6 IF FACING TRAFFIC IN TWO DIRECTIONS

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



VERTICAL PANEL



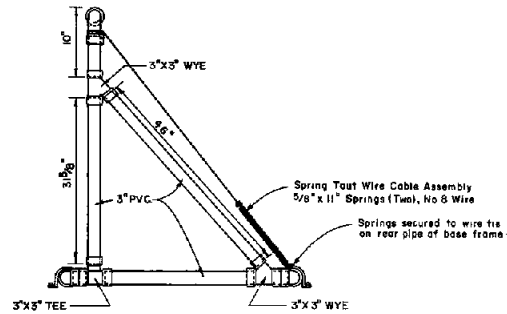
(Electroplated Bolts And Nuts And Protective Flat Nonmetallic Washers)

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

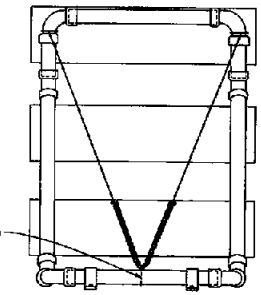
BARRICADES

Russell C. Hill
CHIEF TRAFFIC ENGINEER

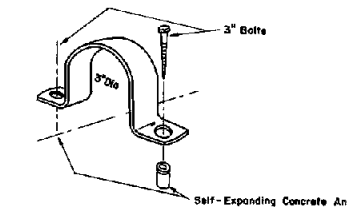
T-55 | 5 (625-626)
ADOPTED 6/72
REVISED 5-2-78



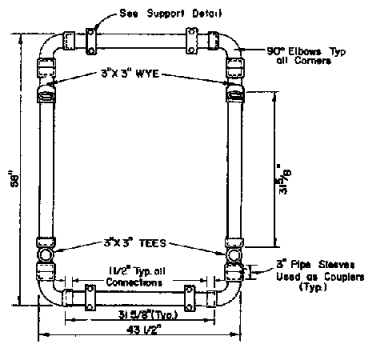
SIDE VIEW



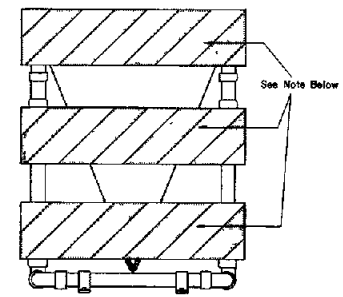
BACK VIEW



3" PIPE SUPPORT



TOP VIEW OF
BASE



Note: 9"X 48" Barricade Hazard Panels Orange and
White Right or Left (.025 Anodized Aluminum)
Panels Attached with 1" No. 14 Pan Head Metal
Screw

FRONT VIEW

NOTE: For Details not shown, See Sheet T-35 1 5

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TYPE III B BARRICADE

CHIEF TRAFFIC ENGR

T-35 U6 (625, 626)

ADOPTED 1/76 REVISION 1 1/78

T30

T31

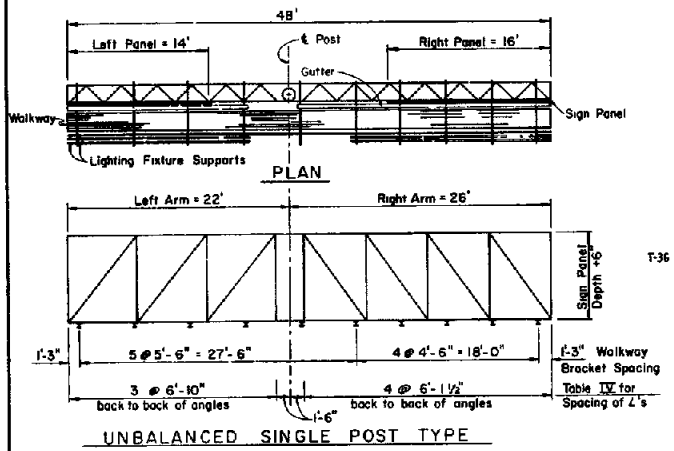
INSTRUCTIONS TO FABRICATOR

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 11 - Instructions and examples
T-36.12 - Post type II thru VIII
T-36.13 - Post type I-s thru VIII-s
T-36 14 - Structural frame members (single post type)
T-36 15 - Structural frame members (two post type)
T-36.16 - Structural frame details
T-36 17 - Frame juncture details
T-36 18 - Removable sign panel frames
T-36 19 & T-36 110 - Walkway details no. 1 & no 2
T-36 111 - Walkway safety railing details
T-36 112 - Alternate pile foundations.



UNBALANCED SINGLE POST TYPE

EXAMPLE NO 1

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 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

GENERAL NOTES

SPECIFICATIONS

DESIGN AASHO Specifications for the design and construction of structural supports for highway signs, dated 1968

CONSTRUCTION Standard Specifications for Road and Bridge Construction Current Edition and Supplements There to

LOADING

WIND LOADING Normal to face of sign 30 PSF Transverse to face of sign 0.2 of normal force

WALKWAY LOADING Dead load + 500 lbs concentrated live load

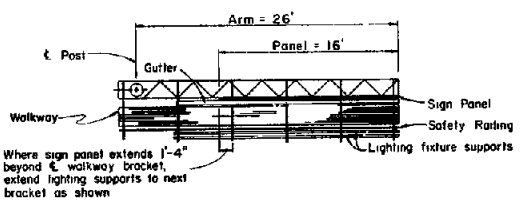
UNIT STRESSES

STRUCTURAL STEEL	Fs = 20,000 PSI
REINFORCED CONCRETE	Fs = 20,000 PSI, Fc = 1,200 PSI
FOOTING SOIL PRESSURE	1¼ tons/sq ft

MINIMUM CLEARANCE Vertical roadway clearance 16'-0"

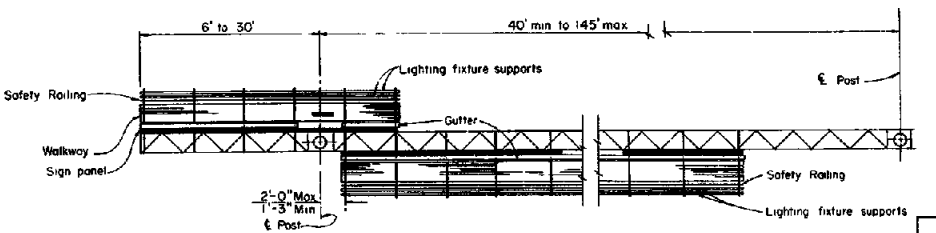
WELDING All welding continuous unless otherwise noted on the plans All welding to be done in accordance with the standard specifications for road and bridge construction

FINISH All steel parts to be hot-dipped galvanized after fabrication except as shown on plans or as called for in special provisions



PLAN
CANTILEVER SINGLE POST TYPE

EXAMPLE NO 2



PLAN
TWO POST TYPE WITH CANTILEVER (PART DOUBLE-FACED)

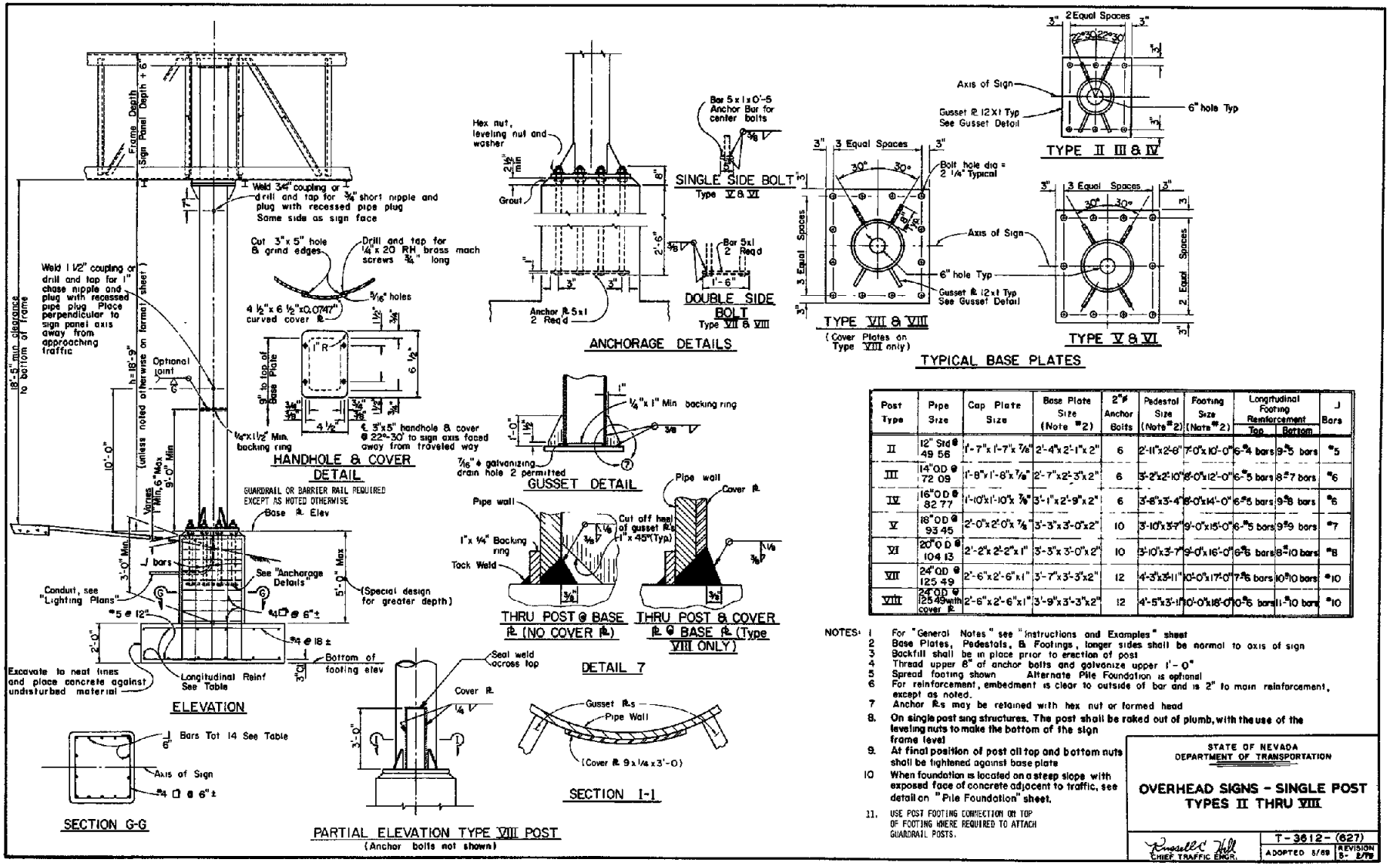
EXAMPLE NO 3

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS INSTRUCTIONS & EXAMPLES

Russell C. Hill
CHIEF TRAFFIC ENGR.

T-3611- (627)
ADOPTED 2/69 REVISION 2-1-74



Post Type	Pipe Size	Cap Plate Size	Base Plate Size (Note #2)	2"ø Anchor Bolts	Pedestal Size (Note #2)	Footing Size (Note #2)	Longitudinal Footing Reinforcement Top	Longitudinal Footing Reinforcement Bottom	J Bars
II	12" Std @ 49 56	1'-7"x 1'-7"x 7/8"	2'-4"x 2'-1"x 2"	6	2'-11"x 2'-6"	7'-0"x 10'-0"	6-#4 bars	9-#5 bars	#5
III	14"OD @ 72 09	1'-8"x 1'-8"x 7/8"	2'-7"x 2'-3"x 2"	6	3'-2"x 2'-10"	8'-0"x 12'-0"	6-#5 bars	8-#7 bars	#6
IV	16"OD @ 82 77	1'-10"x 1'-10"x 7/8"	3'-1"x 2'-9"x 2"	6	3'-8"x 3'-4"	8'-0"x 14'-0"	6-#6 bars	9-#8 bars	#6
V	18"OD @ 93 45	2'-0"x 2'-0"x 7/8"	3'-3"x 3'-0"x 2"	10	3'-10"x 3'-7"	9'-0"x 15'-0"	6-#5 bars	9-#9 bars	#7
VI	20"O D @ 104 13	2'-2"x 2'-2"x 1"	3'-3"x 3'-0"x 2"	10	3'-10"x 3'-7"	9'-0"x 16'-0"	6-#6 bars	8-#10 bars	#8
VII	24"OD @ 125 49	2'-6"x 2'-6"x 1"	3'-7"x 3'-3"x 2"	12	4'-3"x 3'-11"	10'-0"x 17'-0"	7-#6 bars	10-#10 bars	#10
VIII	24"OD @ 125 49 with cover PL	2'-6"x 2'-6"x 1"	3'-9"x 3'-3"x 2"	12	4'-5"x 3'-1"	10'-0"x 18'-0"	10-#6 bars	11-#10 bars	#10

NOTES:
1. For "General Notes" see "Instructions and Examples" sheet
2. Base Plates, Pedestals, & Footings, longer sides shall be normal to axis of sign
3. Backfill shall be in place prior to erection of post
4. Thread upper 6" 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 PLs may be retained with hex nut or formed head
8. On single post sng 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. 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.

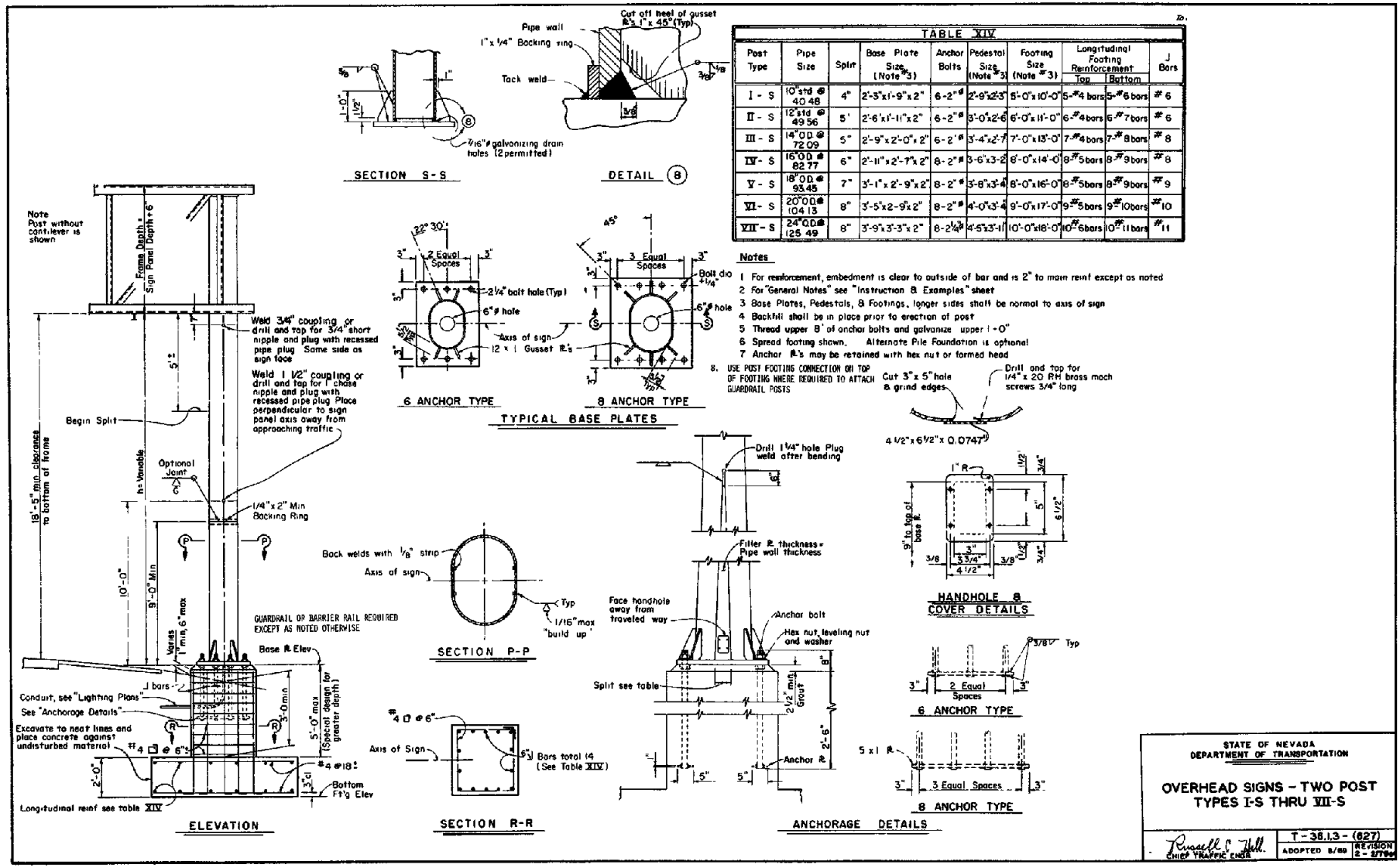
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - SINGLE POST TYPES II THRU VIII

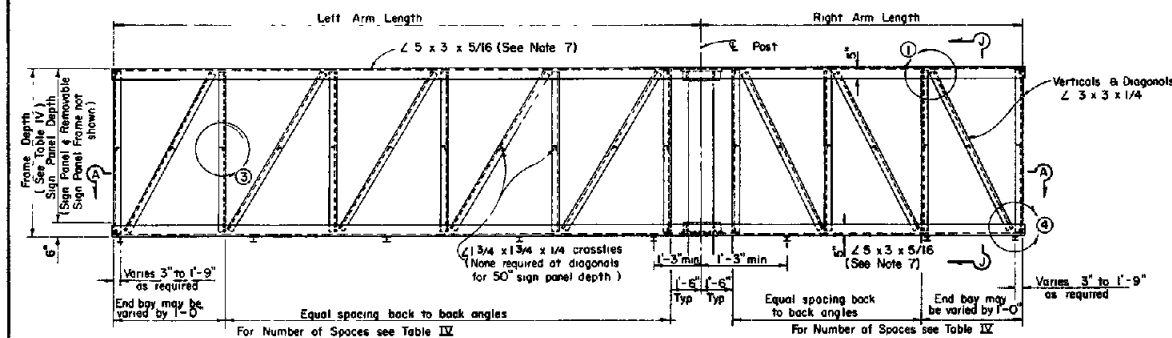
Russell C. Hill
CHIEF TRAFFIC ENGR.

T-3612-(627)
ADOPTED 5/89 REVISION 5-2/98

T32

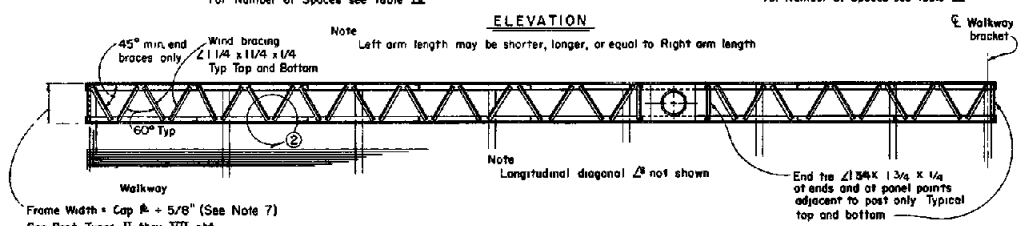

SECTION S-S
DETAIL (8)
Pipe wall
1" x 1/4" Backing ring
Tack weld
Cut off heel of gusset ℓ's 1" x 45° (Typ)
7/16" ø galvonizing drain holes (2 permitted)
TABLE XIV
Post Type | Pipe Size | Split | Base Plate Size (Note #3) | Anchor Bolts | Pedestal Size (Note #3) | Footing Size (Note #3) | Longitudinal Footing Reinforcement Top | Bottom | J Bars
I - S | 10" std @ 40.48 | 4" | 2'-3"x1'-9"x2" | 6-2" ø | 2'-9"x2'-3" | 5'-0"x10'-0" | 5-#4 bars | 5-#6 bars | #6
II - S | 12" std @ 49.56 | 5' | 2'-6"x1'-11"x2" | 6-2" ø | 3'-0"x2'-6" | 6'-0"x11'-0" | 6-#4 bars | 6-#7 bars | #6
III - S | 14" OD @ 72.09 | 5" | 2'-9"x2'-0"x2" | 6-2' ø | 3'-4"x2'-7" | 7'-0"x13'-0" | 7-#4 bars | 7-#8 bars | #8
IV - S | 16" OD @ 82.77 | 6" | 2'-11"x2'-7"x2" | 8-2" ø | 3'-6"x3'-2" | 8'-0"x14'-0" | 8-#5 bars | 8-#9 bars | #8
V - S | 18" OD @ 93.45 | 7" | 3'-1"x2'-9"x2" | 8-2" ø | 3'-8"x3'-4" | 8'-0"x16'-0" | 8-#5 bars | 8-#9 bars | #9
VI - S | 20" OD @ 104.13 | 8" | 3'-5"x2-9"x2" | 8-2" ø | 4'-0"x3'-4" | 9'-0"x17'-0" | 9-#5 bars | 9-#10 bars | #10
VII - S | 24" OD @ 125.49 | 8" | 3'-9"x3'-3"x2" | 8-2 1/4" ø | 4'-5"x3'-11" | 10'-0"x18'-0" | 10-#6 bars | 10-#11 bars | #11
Notes
1 For reinforcement, embedment is clear to outside of bar and is 2" to main reinf except as noted
2 For "General Notes" see "Instruction & Examples" sheet
3 Base Plates, Pedestals, & Footings, longer sides shall be normal to axis of sign
4 Backfill shall be in place prior to erection of post
5 Thread upper 8' of anchor bolts and galvanize upper 1'-0"
6 Spread footing shown. Alternate Pile Foundation is optional
7 Anchor ℓ's may be retained with hex nut or formed head
8. USE POST FOOTING CONNECTION ON TOP OF FOOTING WHERE REQUIRED TO ATTACH GUARDRAIL POSTS
6 ANCHOR TYPE
8 ANCHOR TYPE
TYPICAL BASE PLATES
Cut 3" x 5" hole & grind edges
Drill and tap for 1/4" x 20 RH brass mach screws 3/4" long
4 1/2" x 6 1/2" x 0.0747"
HANDHOLE & COVER DETAILS
Note Post without cantilever is shown
Frame Depth + Sign Panel Depth + 6"
Weld 3/4" coupling or drill and tap for 3/4" short nipple and plug with recessed pipe plug Same side as sign face
Weld 1 1/2" coupling or drill and tap for 1" chase nipple and plug with recessed pipe plug Place perpendicular to sign panel axis away from approaching traffic
Begin Split
Optional Joint
h = Variable
1/4" x 2" Min Backing Ring
18'-5" min clearance to bottom of frame
10'-0"
9'-0" Min
Varies 1" min, 6" max
GUARDRAIL OR BARRIER RAIL REQUIRED EXCEPT AS NOTED OTHERWISE
Base ℓ Elev
J bars
Conduit, see "Lighting Plans"
See "Anchorage Details"
Excavate to neat lines and place concrete against undisturbed material
3'-0" min
5'-0" max (Special design for greater depth)
2'-0"
3'-0"
Bottom Ftg Elev
Longitudinal reinf see table XIV
ELEVATION
Back welds with 1/8" strip
Axis of sign
Typ
1/16" max "build up"
SECTION P-P
Axis of Sign
Bars total 14 (See Table XIV)
SECTION R-R
Drill 1 1/4" hole Plug weld after bending
Filler ℓ thickness = Pipe wall thickness
Face handhole away from traveled way
Anchor bolt
Hex nut, leveling nut and washer
Split see table
2 1/2" min Grout
Anchor ℓ
ANCHORAGE DETAILS
6 ANCHOR TYPE
8 ANCHOR TYPE
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
OVERHEAD SIGNS - TWO POST
TYPES I-S THRU VII-S
Russell C. Hall
CHIEF TRAFFIC ENGR
T-38.1.3-(627)
ADOPTED 8/88
REVISION 2-27-96

T33



ELEVATION

Note
Left arm length may be shorter, longer, or equal to Right arm length

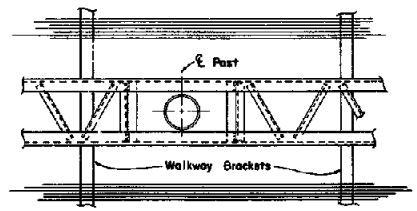


SECTION A-A

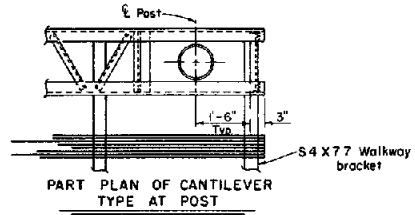
Sign Depth	Frame Depth	Maximum Vertical ∠ Spacing	Arm Length	
60"	5'-6"	5'-0"	4'	
70"	6'-4"	5'-6"	4'	
80"	7'-2"	6'-0"	5'	
90"	8'-0"	7'-0"	5'	
100"	8'-10"	7'-0"	6'	
110"	9'-8"	7'-6"	6'	
120"	10'-6"	7'-6"	6'	

No. depends required

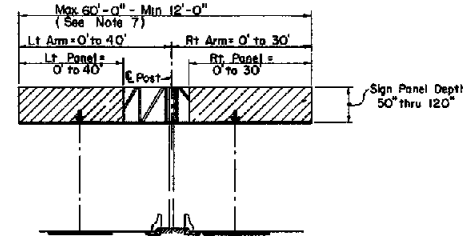
TABLE IV



PART PLAN OF DOUBLE FACED TYPE AT POST



PART PLAN OF CANTILEVER TYPE AT POST



▨ = Sign Panel

LIMITING DIMENSIONS OF FRAME & SIGN PANEL

NOTES:

1. For Details ① thru ④ see "Structural Frame Details" sheet
2. For sign panel frames see "Removable Sign Panel Frames" sheet
3. For connection of frame to post see Frame Juncture Details sheet
4. For walkway see "Standard Walkway Details" 1 and "2" sheets
5. For typical walkway arrangement, special instructions and examples, see "Instructions and Examples" sheet (T-36.1 1).
6. Minimum length of frame = 12'-0"
7. For arm lengths 35' to 40' and sign depths 80" thru 120"
   a. Use 6x3x5/16 chord ∠'s
   b. Frame width = Cap ℄ + 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

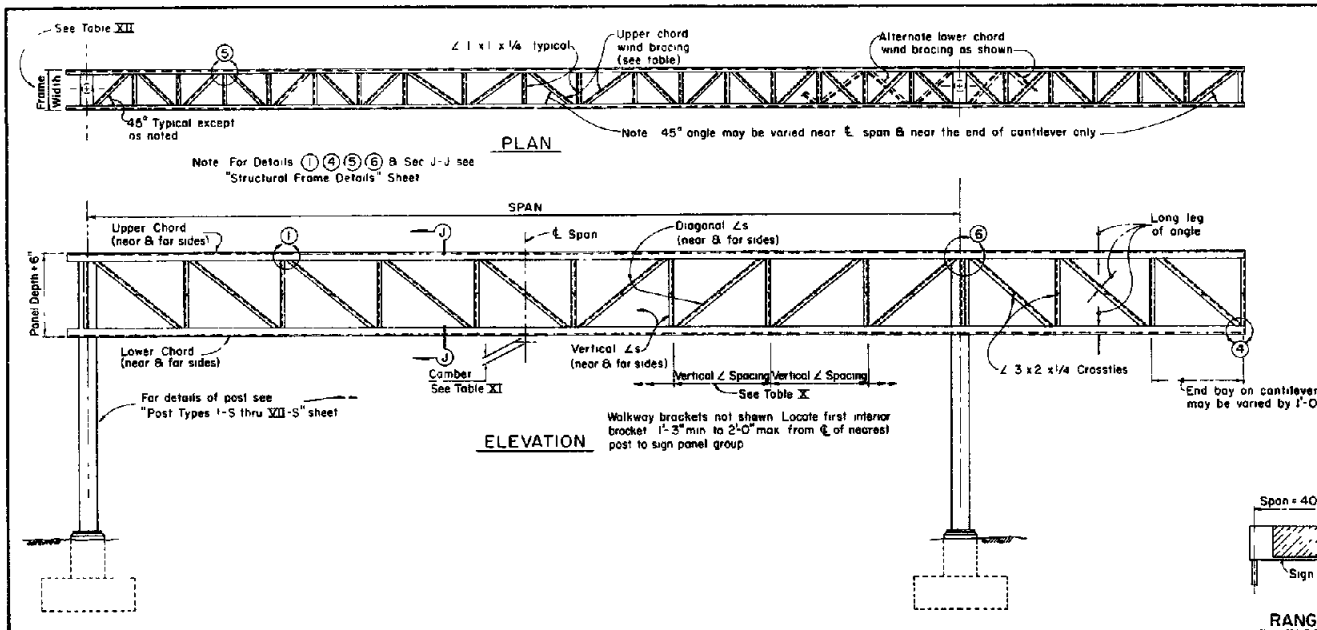
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

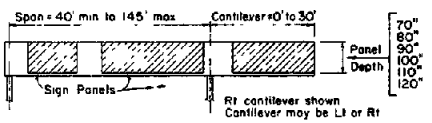
OVERHEAD SIGNS - SINGLE POST STRUCTURAL FRAME MEMBERS

Russell C Hill
CHIEF TRAFFIC ENGR.

T - 36.1 4 - (627)
ADOPTED 8/69
REVISION 4 - 2/78

T54





RANGE OF STRUCTURE SIZES

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"●	5x3½x5/16	3x3x1/4	3x3x1/4	1¼x1¼x1/4	2'-0"●	5x3½x5/16	3x3x1/4	3x3x1/4	1¼x1¼x1/4	2'-0"●	5x3½x5/16	3x3x5/16	3x3x5/16	1¼x1¼x1/4
51'-60'	2'-0"●	5x3½x5/16			1¼x1¼x1/4	2'-0"●	5x3½x5/16			1¼x1¼x1/4	2'-0"●	5x3½x5/16			1¼x1¼x1/4
61'-70'	2'-6"●	5x3½x5/16			1¼x1¼x1/4	2'-6"●	5x3½x5/16			1¼x1¼x1/4	2'-6"●	5x3½x5/16			1¼x1½x1/4
71'-80'	2'-6"●	6x4x3/8			1¼x1¼x1/4	2'-6"●	6x4x3/8			1¼x1¼x1/4	3'-0"	6x4x3/8			1½x1½x1/4
81'-90'	3'-0"	6x4x3/8			1½x1½x1/4	3'-0"	6x4x3/8			1½x1½x1/4	3'-0"	6x4x3/8			1¾x1¾x1/4
91'-100'	3'-0"	6x4x3/8			1½x1½x1/4	3'-0"	6x4x3/8			1½x1½x1/4	3'-0"	6x4x3/8			1¾x1¾x1/4
101'-110'	3'-0"	7x4x7/16			1¾x1¾x1/4	3'-0"	7x4x7/16			1¾x1¾x1/4	3'-0"	7x4x7/16			1¾x1¾x1/4
111'-120'	3'-0"	7x4x7/16			1¾x1¾x1/4	3'-0"	7x4x7/16			1¾x1¾x1/4	3'-0"	8x4x1/2			1¾x1¾x1/4
121'-132'	3'-0"	8x4x1/2			1¾x1¾x1/4	3'-0"	8x4x1/2			1¾x1¾x1/4	3'-6"	8x4x1/2			2x2x1/4
133'-145'	3'-0"	8x4x1/2	↓	↓	1¾x1¾x1/4	3'-0"	8x4x5/8	↓	↓	1¾x1¾x1/4	3'-6"	8x4x5/8	↓	↓	2x2x1/4

TABLE XII

Panel Depth	Frame Depth	Max Vertical ∠ Spacing
70"	6'-4"	72"
80"	7'-2"	72"
90"	8'-0"	90"
100"	8'-10"	90"
110"	9'-8"	120"
120"	10'-6"	120"

TABLE X

NOTE

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 X-S & XI-S, Add 1'-0" for Post Type VII-S

● Add 6" to frame width for Post Type VII-S

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"●	5x3½x5/16	3x3x5/16	3x3x5/16	1¼x1¼x1/4	2'-0"●	5x3½x5/16	3½x3½x5/16	3½x3½x5/16	1¼x1¼x1/4	2'-0"●	5x3½x5/16	3½x3½x5/16	4x3½x5/16	1¼x1¼x1/4
51'-60'	2'-0"●	5x3½x5/16			1¼x1½x1/4	2'-6"●	5x3½x5/16			1¼x1¼x1/4	2'-6"●	5x3½x5/16			1½x1½x1/4
61'-70'	2'-6"●	5x3½x5/16			1½x1½x1/4	3'-0"	5x3½x5/16			1½x1½x1/4	3'-0"	6x4x3/8			1¾x1¾x1/4
71'-80'	3'-0"	6x4x3/8			1¾x1¾x1/4	3'-6"	6x4x3/8			2x2x1/4	3'-6"	6x4x3/8			2x2x1/4
81'-90'	3'-0"	6x4x3/8			1¾x1¾x1/4	3'-6"	6x4x3/8			2x2x1/4	3'-6"	6x4x5/8			2x2x1/4
91'-100'	3'-0"	6x4x3/8			1¾x1¾x1/4	3'-6"	6x4x3/8			2x2x1/4	3'-6"	7x4x7/16			2x2x1/4
101'-110'	3'-6"	7x4x7/16			2x2x1/4	3'-6"	7x4x7/16			2x2x1/4	3'-6"	7x4x7/16			2x2x1/4
111'-120'	3'-6"	7x4x7/16			2x2x1/4	3'-6"	8x4x1/2			2x2x1/4	3'-6"	8x4x1/2			2½x2½x1/4
121'-132'	3'-6"	8x4x1/2			2x2x1/4	3'-6"	8x4x5/8			2½x2½x1/4	3'-6"	8x4x5/8			2½x2½x1/4
133'-145'	3'-6"	8x4x5/8	↓	↓	2x2x1/4	3'-6"	8x4x5/8	↓	↓	2½x2½x1/4	3'-6"	8x4x5/8	↓	↓	2½x2½x1/4

TABLE XII

Camber For Fabrication At ℄ Span	
Span	Camber
40' - 50'	½"
51' - 100'	1"
101' - 145'	1½"

Fabricate camber to approximate parabola. Camber of cantilever arm = 1/2" for arms greater than 10'

TABLE XI

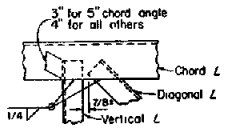
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS - TWO POST STRUCTURAL FRAME MEMBERS

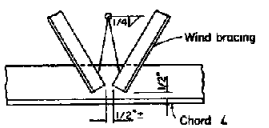
Russell C. Hill
CHIEF TRAFFIC ENGR.

T - 36.1.5 - (627)
ADOPTED 8/69 REVISION

T35



DETAIL (1)



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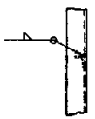

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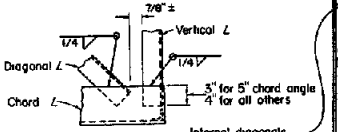

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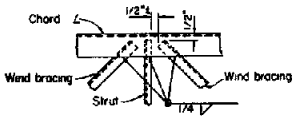

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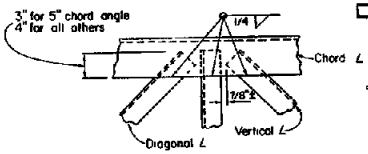

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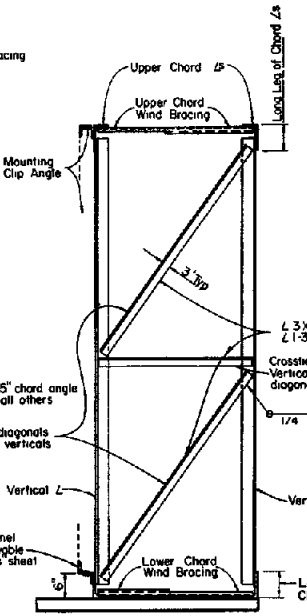
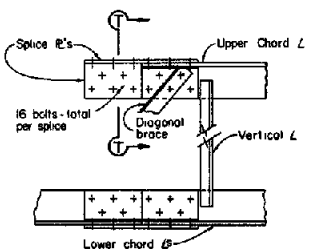
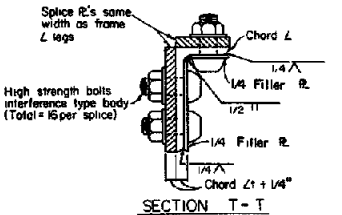


TYPICAL SECTION J-J

Note
Diagonal ℄s in plane of truss, not shown Bracing shown is at all vertical ℄s of truss

OPTIONAL
BOLTED CHORD SPLICE





SECTION T-T

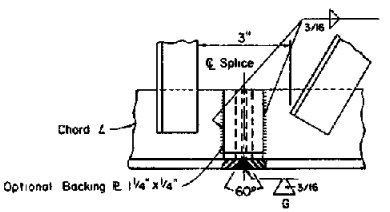
SPLICE NOTES

Specifications
The bolted splice shall conform to current "Specifications for Structural Joints Using ASTM A325 Bolts", approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation

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 will be bolted to the chord angles with a 3/8" 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 ℄
The plates welded to the angle legs on the inside shall be welded before punching the bolt holes. They shall be the same length as the cover plates. The plates are not necessary on the single post signs if the splice is located over 1/3 of the cantilever length from the post. Alternative splice details may be used if approved by the Engineer



WELDED CHORD SPLICE

Note
1 Prepare edges by beveling to angle shown
2 Weld to 100% full penetration
3 Grind flush with base metal

BOLTED CHORD SPLICE	
TWO POST SIGNS	
Chord ∠	Nominal Bolt Diam
5 X 3 1/2 X 5/16	3/4"
6 X 4 X 3/8	7/8"
7 X 4 X 7/16	1"
8 X 4 X 1/2	1 1/8"
8 X 4 X 5/8	1 1/4"

SINGLE POST SIGNS	
Chord ∠	Nominal Bolt Diam
5 X 3 X 5/16	3/4"
6 X 3 X 7/16	3/4"

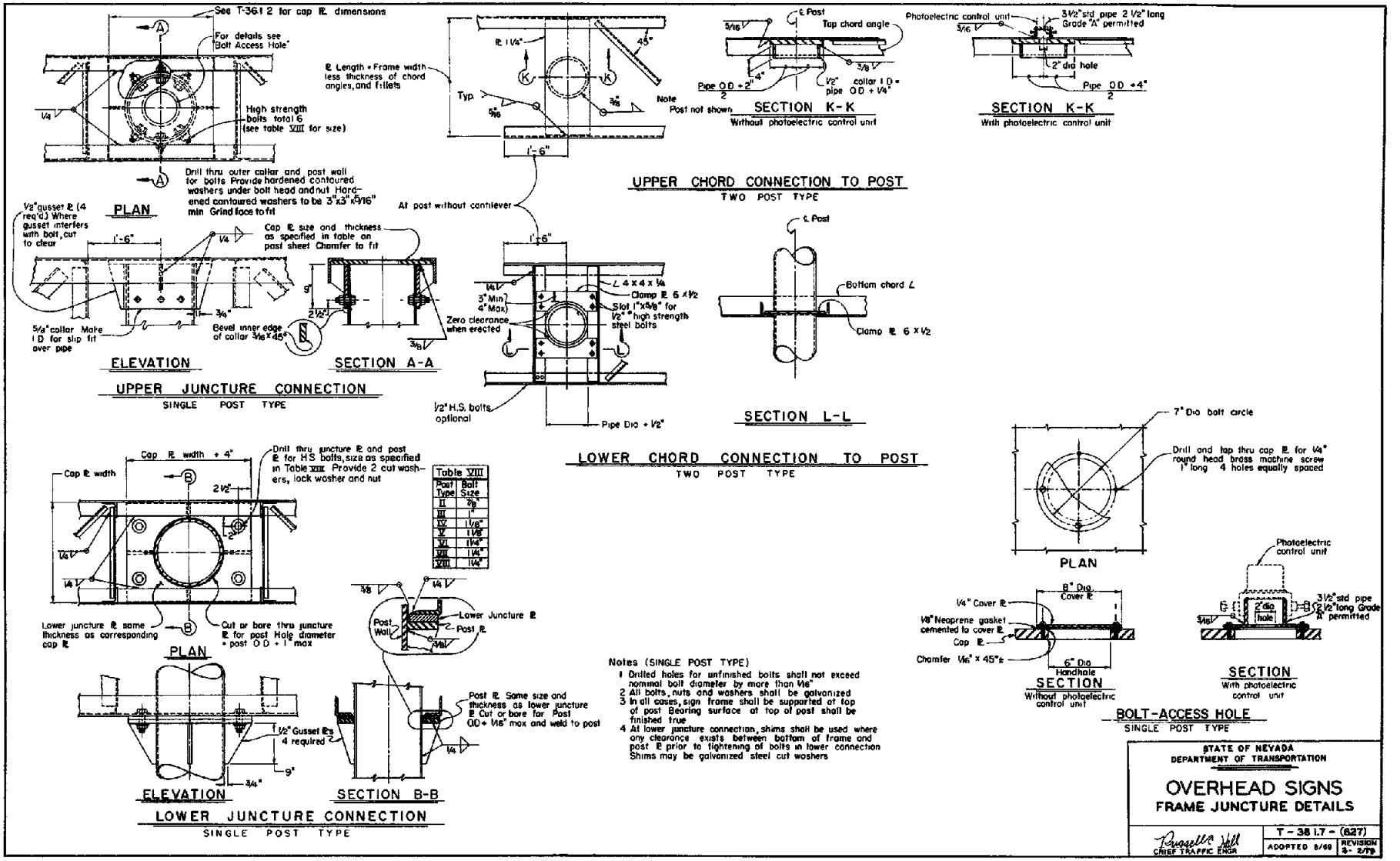
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
STRUCTURAL FRAME DETAILS

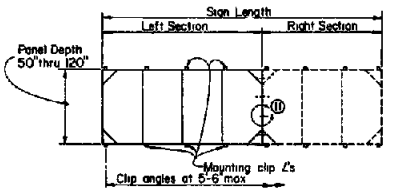
Russell C. Hall
CHIEF TRAFFIC ENGR.

T - 3616 - (827)
ADOPTED 5/80
REVISION 2- 2/79

T36

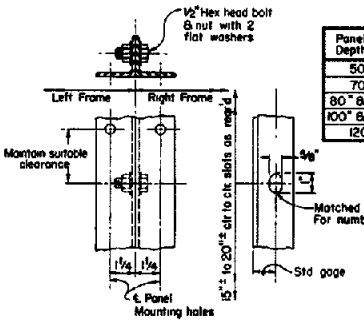

See T-36.12 for cap ℄ dimensions
For details see "Bolt Access Hole"
High strength bolts total 6 (see table VIII for size)
Drill thru outer collar and post wall for bolts Provide hardened contoured washers under bolt head and nut Hardened contoured washers to be 3"x3"x5/16" min Grind face to fit
PLAN
½"gusset ℄ (4 req'd) Where gusset interferes with bolt, cut to clear
Cap ℄ size and thickness as specified in table on post sheet Chamfer to fit
5/8" collar Make I D for slip fit over pipe
Bevel inner edge of collar 3/16"x45°
ELEVATION
SECTION A-A
UPPER JUNCTURE CONNECTION
SINGLE POST TYPE
℄ Length = Frame width less thickness of chord angles, and fillets
Typ
Note Post not shown
1'-6"
UPPER CHORD CONNECTION TO POST
TWO POST TYPE
At post without cantilever
∠ 4 x 4 x ¼
Clamp ℄ 6 x ½
Slot 1"x⅜" for ½" ℄ high strength steel bolts
3" Min 4" Max
Zero clearance when erected
½" H.S. bolts optional
Pipe Dia + ½"
LOWER CHORD CONNECTION TO POST
TWO POST TYPE
℄ Post
Top chord angle
Pipe OD + 2" / 2
4"
½" collar I D = pipe OD + ¼"
SECTION K-K
Without photoelectric control unit
Photoelectric control unit
3½"std pipe 2 ½" long Grade "A" permitted
2" dia hole
Pipe OD + 4" / 2
SECTION K-K
With photoelectric control unit
Bottom chord ∠
Clamp ℄ 6 x ½
SECTION L-L
Cap ℄ width + 4"
Cap ℄ width
Drill thru juncture ℄ and post ℄ for HS bolts, size as specified in Table VIII Provide 2 cut washers, lock washer and nut
Lower juncture ℄ same thickness as corresponding cap ℄
Cut or bore thru juncture ℄ for post Hole diameter = post OD + 1" max
PLAN
Table VIII
Post Type / Bolt Size
II ⅞"
III 1"
IV 1⅛"
V 1⅛"
VI 1¼"
VII 1¼"
VIII 1¼"
Lower Juncture ℄
Post ℄
Post Wall
Post ℄ Same size and thickness as lower juncture ℄ Cut or bore for Post OD + 1/16" max and weld to post
½" Gusset ℄'s 4 required
9"
ELEVATION
SECTION B-B
LOWER JUNCTURE CONNECTION
SINGLE POST TYPE
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 ℄ prior to tightening of bolts in lower connection Shims may be galvanized steel cut washers
7" Dia bolt circle
Drill and tap thru cap ℄ for ¼" round head brass machine screw 1" long 4 holes equally spaced
PLAN
8" Dia Cover ℄
¼" Cover ℄
⅛" Neoprene gasket cemented to cover ℄
Cap ℄
Chamfer 1/16" x 45°±
6" Dia Handhole
SECTION
Without photoelectric control unit
Photoelectric control unit
2" dia hole
3½"std pipe 2½"long Grade A permitted
SECTION
With photoelectric control unit
BOLT-ACCESS HOLE
SINGLE POST TYPE
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
OVERHEAD SIGNS
FRAME JUNCTURE DETAILS
CHIEF TRAFFIC ENGR
T - 38.17 - (627)
ADOPTED 8/98
REVISION 3- 2/99
137

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 above
- 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



REMOVABLE FRAME GREATER THAN 20'-0"

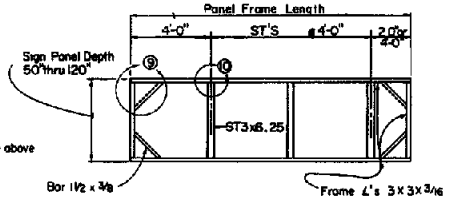
Sign Length	Left Section	Right Section
22'-0"	12'	10'
24'-0"	12'	12'
26'-0"	12'	14'
28'-0"	16'	12'
30'-0"	16'	14'
32'-0"	16'	16'
34'-0"	16'	18'
36'-0"	20'	16'
38'-0"	20'	18'
40'-0"	20'	20'



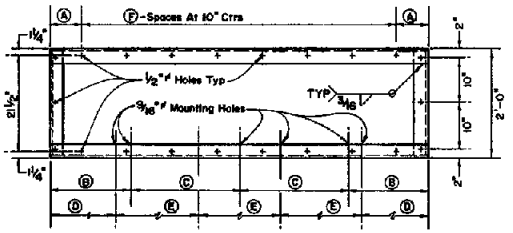
Panel Depth	No of slots
50"	2
70"	3
80" & 90"	4
100" & 110"	5
120"	6

DETAIL (11)
No Scale

Note
Panel mounting holes not shown
Panel lengths available in 2'-0" increments



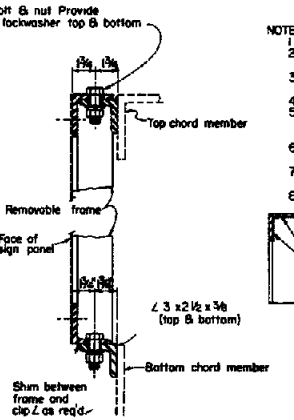
TYPICAL REMOVABLE FRAME
(4'-0" thru 20'-0")



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

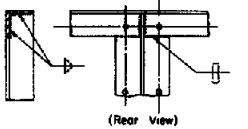
NOTES.
1. Frame Ls Shall Be 3" X 3" X 3/16" ASTM-A36
2. ½" Panel Mounting Holes Shall Be Drilled With Templates
3. Holes For Mounting Sign May Be Slotted 1".
4. Mount Exit Frame At Right Edge Of Removable Frame So Front Faces Are Flush

TYPICAL EXIT PANEL FRAMES

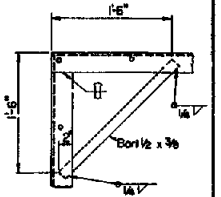


SECTION T-T

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 (⅜"-20 NC) 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 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

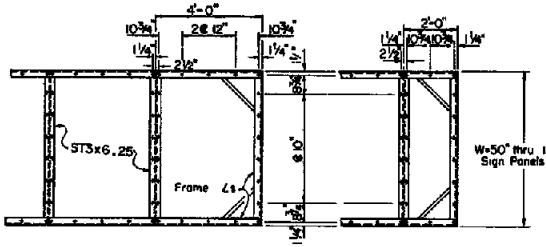


DETAIL (10)



DETAIL (9)

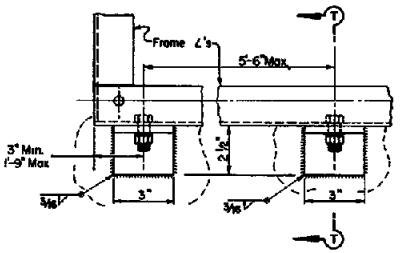
TYPICAL JOINT DETAILS



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

Note All holes ½" diameter

MOUNTING HOLE SPACING FOR SIGN PANEL & FRAME
Scale ½" = 1'-0"



FRAME MOUNTING DETAILS
No Scale

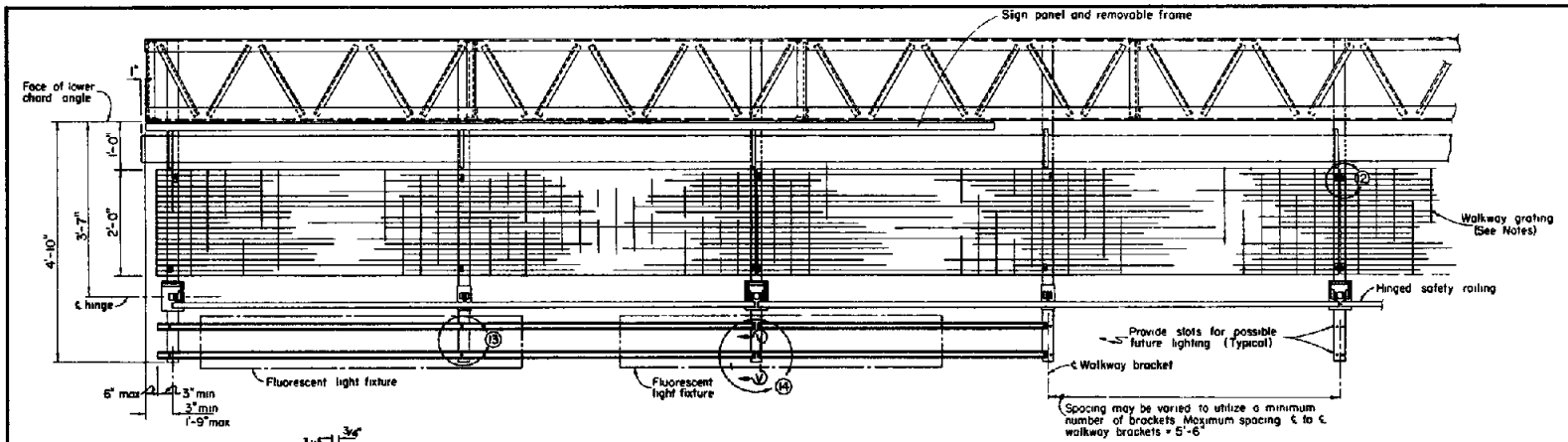
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
REMOVABLE SIGN PANEL FRAMES

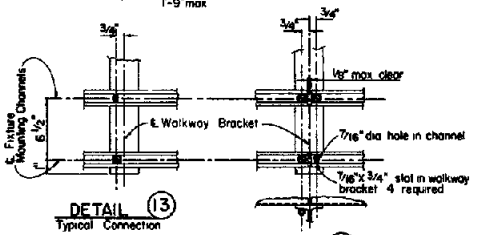
CHIEF TRAFFIC ENGR.

T - 36.18 - (627)
ADOPTED: 8/69 REVISION 2 - 8/79

T38



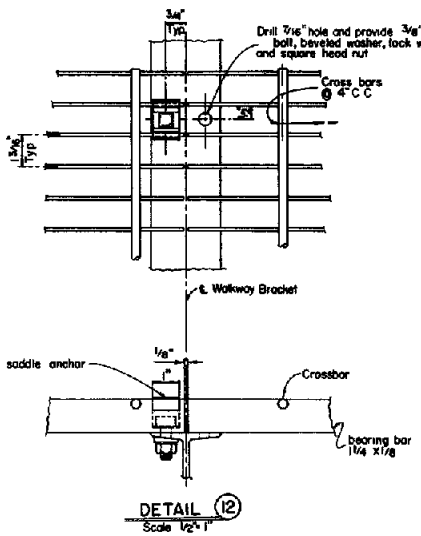
WALKWAY PLAN
Scale 1" = 1'-0"



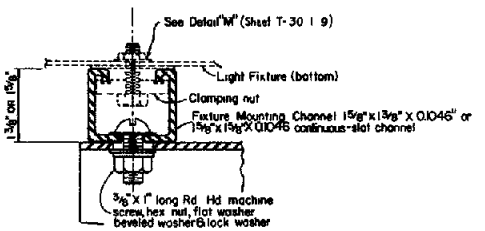
DETAIL (13)
Typical Connection

DETAIL (14)
Connection at Splice

1. Welded-type grating shall have 1/4" x 1/8" bearing bars @ 1 3/16" 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



DETAIL (12)
Scale 1/2" = 1"



SECTION V-V
Full Scale

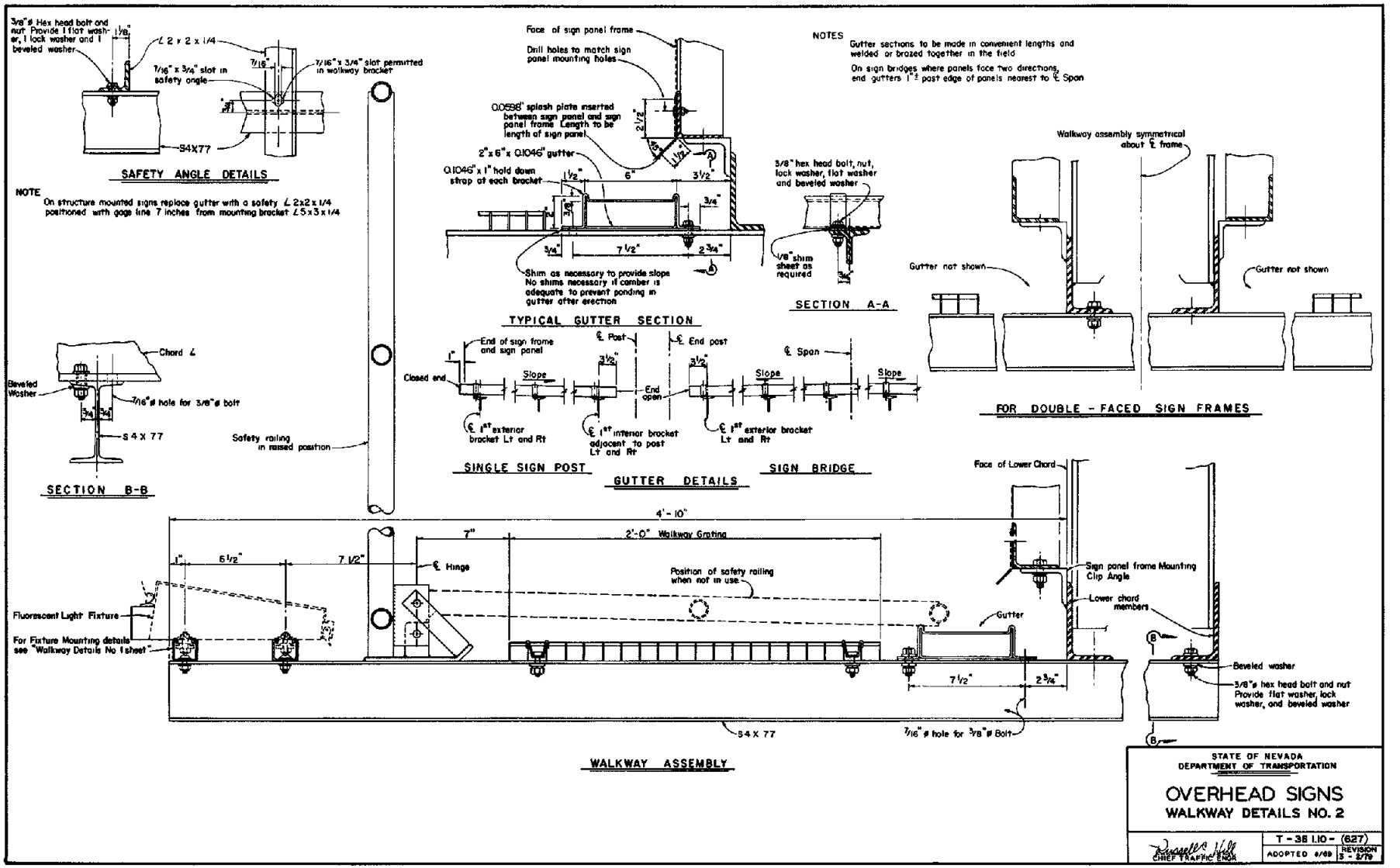
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

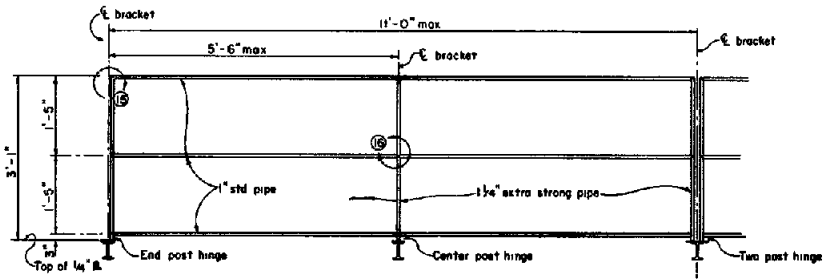
OVERHEAD SIGNS
WALKWAY DETAILS NO. 1

Russell C Hill
CHIEF TRAFFIC ENGR.

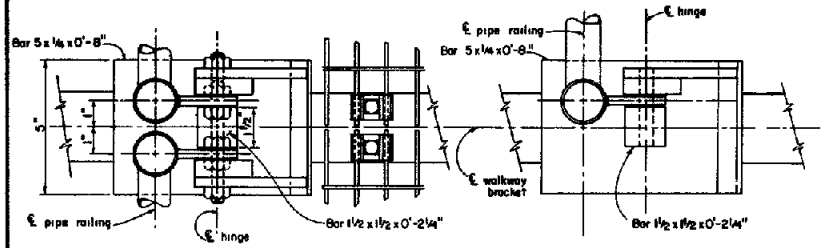
T - 36.1 9 - (627)
ADOPTED 8/69
REVISION 5 - 2/79

T-36


3/8"ø Hex head bolt and nut Provide 1 flat washer, 1 lock washer and 1 beveled washer
1⅛"
L 2 x 2 x 1/4
7/16"
7/16" x 3/4" slot in safety angle
7/16" x 3/4" slot permitted in walkway bracket
S4X77
SAFETY ANGLE DETAILS
NOTE
On structure mounted signs replace gutter with a safety L 2x2x1/4 positioned with gage line 7 inches from mounting bracket L 5x3x1/4
Face of sign panel frame
Drill holes to match sign panel mounting holes
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
1½"
6"
3½"
2½"
1½"
3/4"
7½"
2¾"
Shim as necessary to provide slope No shims necessary if camber is adequate to prevent ponding in gutter after erection
TYPICAL GUTTER SECTION
3/8" hex head bolt, nut, lock washer, flat washer and beveled washer
1/8" shim sheet as required
SECTION A-A
NOTES
Gutter sections to be made in convenient lengths and welded or brazed together in the field
On sign bridges where panels face two directions, end gutters 1" ± past edge of panels nearest to ℄ Span
Walkway assembly symmetrical about ℄ frame
Gutter not shown
Gutter not shown
FOR DOUBLE - FACED SIGN FRAMES
Chord L
Beveled Washer
7/16"ø hole for 3/8"ø bolt
S 4 X 77
SECTION B-B
Safety railing in raised position
End of sign frame and sign panel
℄ Post
℄ End post
℄ Span
1"
Closed end
Slope
3½"
End open
Slope
Slope
℄ 1st exterior bracket Lt and Rt
℄ 1st interior bracket adjacent to post Lt and Rt
℄ 1st exterior bracket Lt and Rt
SINGLE SIGN POST
GUTTER DETAILS
SIGN BRIDGE
Face of Lower Chord
4'-10"
7"
2'-0" Walkway Grating
1"
6½"
7½"
℄ Hinge
Position of safety railing when not in use
Fluorescent Light Fixture
For Fixture Mounting details see "Walkway Details No 1 sheet"
Gutter
Sign panel frame Mounting Clip Angle
Lower chord members
Beveled washer
3/8"ø hex head bolt and nut Provide flat washer, lock washer, and beveled washer
7½"
2¾"
S4 X 77
7/16"ø hole for 3/8"ø Bolt
WALKWAY ASSEMBLY
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
OVERHEAD SIGNS
WALKWAY DETAILS NO. 2
CHIEF TRAFFIC ENGR.
T-38 1.10 - (627)
ADOPTED 6/69
REVISION 3 - 2/79

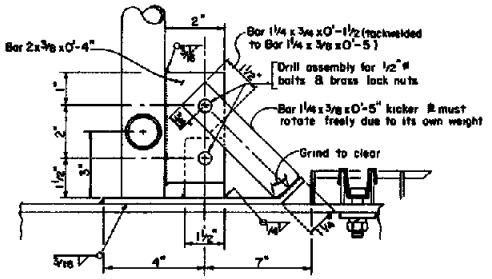


ELEVATION

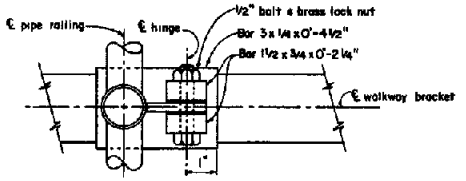


PLAN VIEW – TWO POST HINGE

PLAN VIEW – END POST HINGE



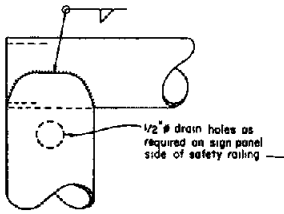
ELEVATION



PLAN VIEW – CENTER POST HINGE

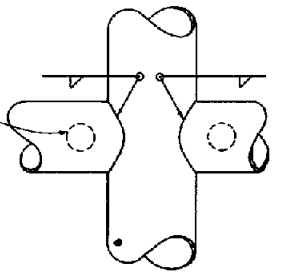
Note

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 ℄ to walkway bracket may be submitted for approval
3. Alternative details approved by the Engineer may be substituted for the safety chain connections shown

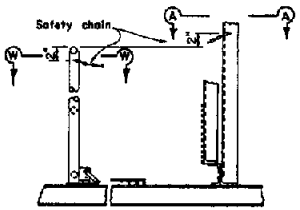


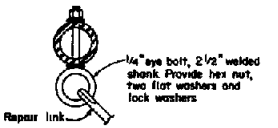
DETAIL (15)

Note Alternative venting methods may be used if approved by the Engineer

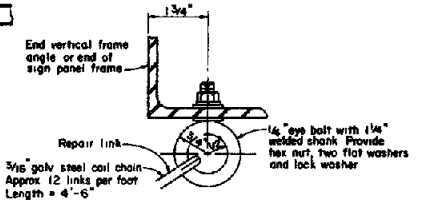


DETAIL (16)





SECTION W-W



SECTION A-A

CHAIN ASSEMBLY

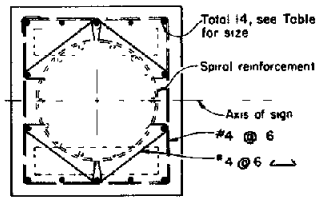
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
WALKWAY SAFETY RAILING DETAILS

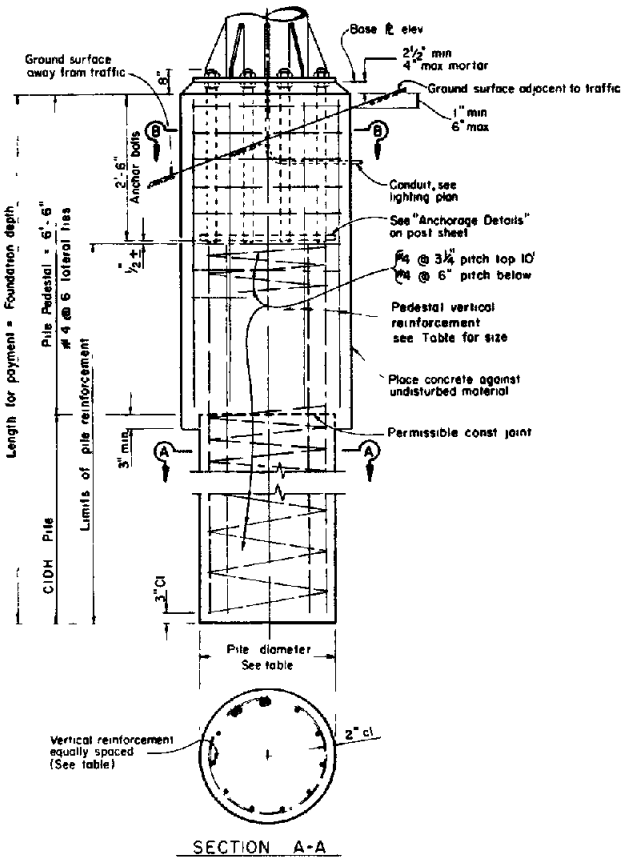
Russell C. Hill
CHIEF TRAFFIC ENGR.

T-36 III-(627)

ADOPTED 8/66 REVISION 2-2/78



SECTION B-B



SECTION A-A

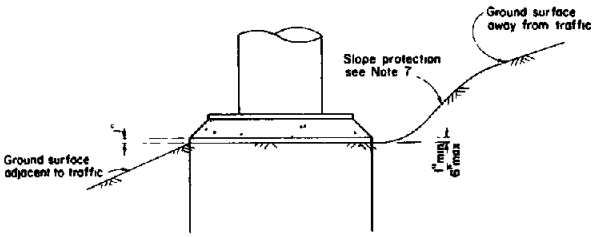
Post Type	Anchor Bolts	Pedestal Size	Reinforcing Steel Vertical	Pile Diameter	Foundation Depth**
II	6 - 2"	2'-11" x 2'-10"	14 - # 7	30"	14'
III	6 - 2"	3'- 2" x 2'-10"	14 - # 8	30"	14'
IV	6 - 2"	3'- 8" x 3'- 4"	16 - # 8	36"	14'
V	10 - 2"	3'-10" x 3'- 7"	16 - # 9	36"	17'
VI	10 - 2"	3'-10" x 3'- 7"	16 - #10	36"	18'
VII	12 - 2"	4'- 3" x 3'-11"	16 - #11	36"	21'
VIII	12 - 2"	4'- 5" x 3'-11"	24* - #11	36"	22'
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 - 2¼"	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
2. For "Base ℄ Elev" see "Format" Sheet
3. Pedestal 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

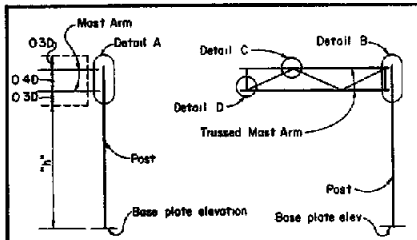
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
ALTERNATE PILE FOUNDATION

Russell "Bud" Hill
CHIEF TRAFFIC ENGR.

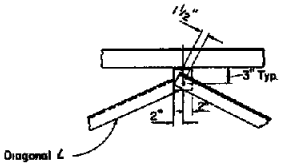
T-36 1.12 (SET)
ADOPTED 8/88 REVISED 1-3-92

T42

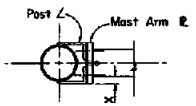


DOUBLE MAST ARM SERIES
TYPE C-1

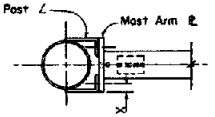
TRUSSED MAST ARM SERIES
TYPE C-2



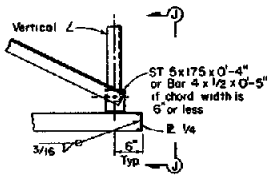
DETAIL C



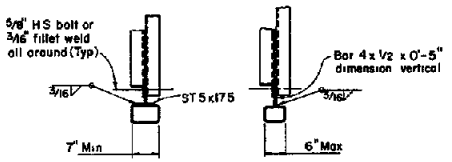
SECTION F-F



SECTION G-G

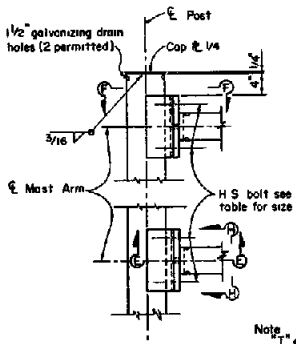


DETAIL D



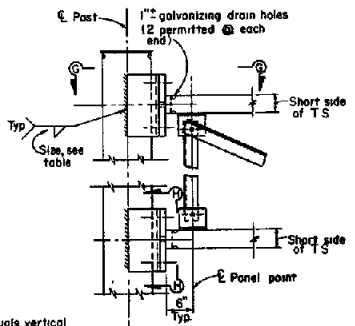
VIEW J-J

POST ANGLES			
POST SIZE	ANGLE	X	WELD
6	∠5 x 3 x 1/2	1 3/16"	1/4
8	∠6 x 4 x 5/8	2 1/16"	1/4
10	∠7 x 4 x 5/8	2 1/16"	1/4
12	∠8 x 4 x 3/4	2 1/16"	5/16
14	∠8 x 4 x 3/4	2 1/16"	5/16

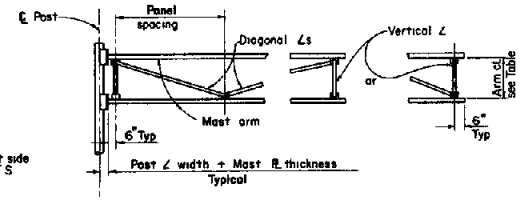


DETAIL A

Note
"T" equals vertical dimension of mast arm



DETAIL B



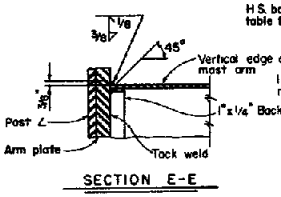
SIGN DEPTH INCHES	ARM CLEARANCE	MAX PANEL SPACING	VERTICAL ANGLE	DIAGONAL ANGLE
D = 40"- 70"	2'- 0"	4'- 4"	∠2 x 2 x 1/4	∠2 x 2 x 1/4
D = 80"- 100"	3'- 0"	6'- 6"	∠3 1/2 x 2 1/2 x 1/4	∠3 1/2 x 2) 2 x 1/4

*Short leg outstanding

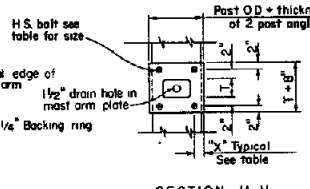
TRUSS FRAMING DATA

MAST ARM PLATE			
TWO ARMS	TRUSSED ARMS	PLATE	H.S. BOLT
TS 3 x 3 x 8 80		3/4"	1/2"
TS 4 x 4 x 12 02		1"	5/8"
TS 5 x 5 x 15 42		1"	3/4"
TS 6 x 6 x 18 82		1"	3/4"
TS 7 x 7 x 22 04	TS 5 x 3 x 16.84	1 1/4"	3/4"
	TS 6 x 4 x 21 94	1 1/4"	7/8"
	TS 7 x 5 x 27 04	1 1/4"	7/8"
	TS 8 x 6 x 31 73	1 1/4"	7/8"
	TS 10 x 6 x 36 83	1 1/4"	1"

POST TO ARM FRAMING DATA



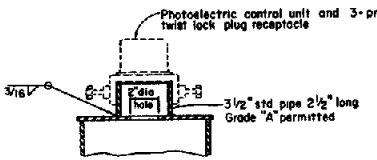
SECTION E-E



SECTION H-H

Note
"T" equals vertical dimension of mast arm

Note
Bottom connection shown. Top similar



PHOTOELECTRIC CONTROL UNIT

Note
For post connection to base ℄ see T-36.1.16

For mast arm length and mast-arm-to sign panel connections see T-36.1.14

For General Notes see T-36.1.16

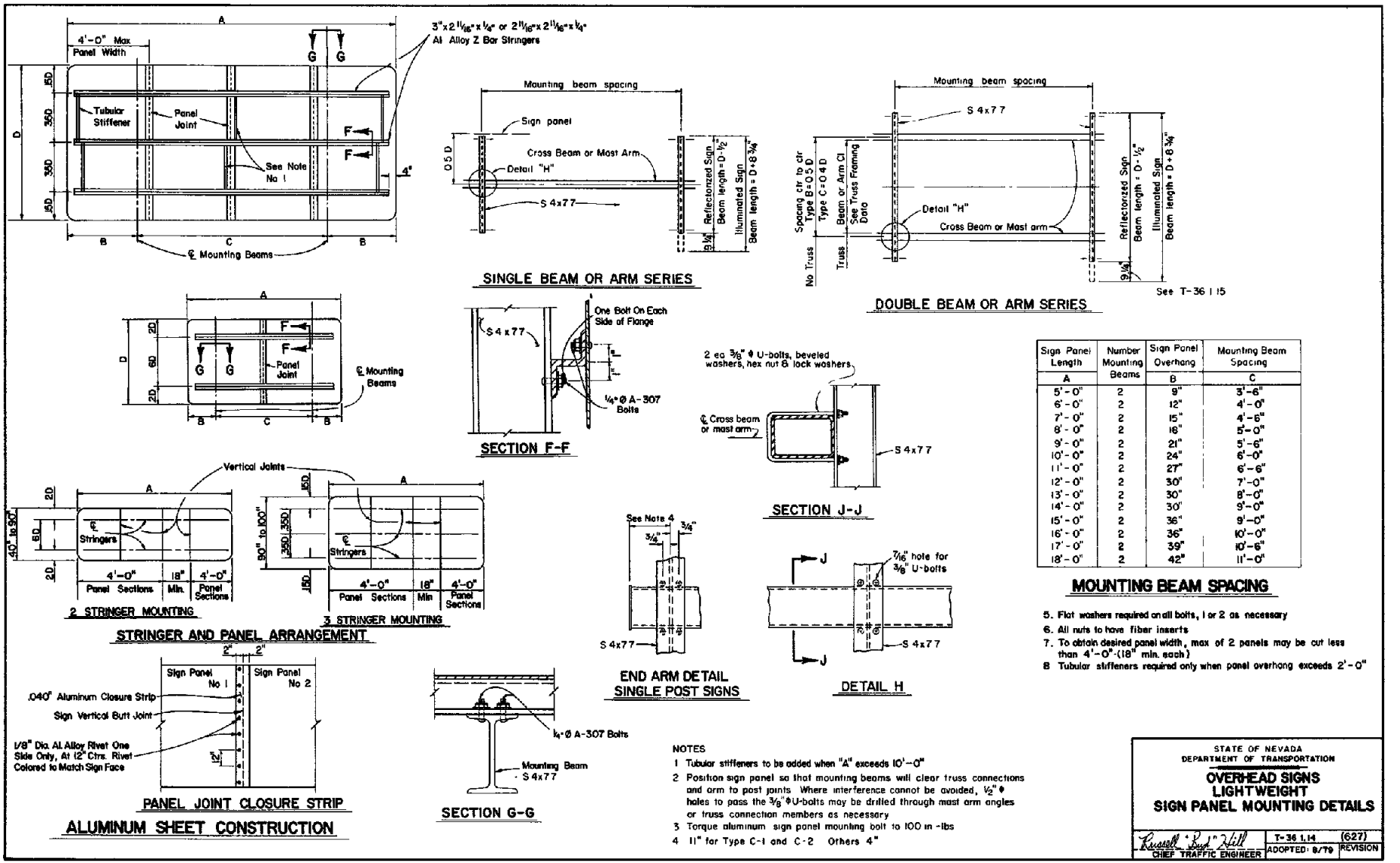
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS LIGHTWEIGHT TYPE C CONNECTION DETAILS

Russell "Rud" Hall
CHIEF TRAFFIC ENGR

T-36.1.13 (627)
ADOPTED: 6/79
REVISION

T43



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"

MOUNTING BEAM SPACING

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"-(18" min. each)
8. Tubular stiffeners required only when panel overhang exceeds 2'-0"

NOTES

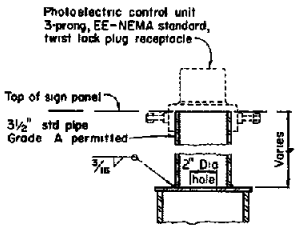
1. Tubular stiffeners to be added when "A" exceeds 10'-0"
2. Position sign panel so that mounting beams will clear truss connections and arm to post joints. Where interference cannot be avoided, ½" Ø holes to pass the 3/8" Ø U-bolts may be drilled through mast arm angles or truss connection members as necessary
3. Torque aluminum sign panel mounting bolt to 100 in-lbs
4. 11" for Type C-1 and C-2 Others 4"

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

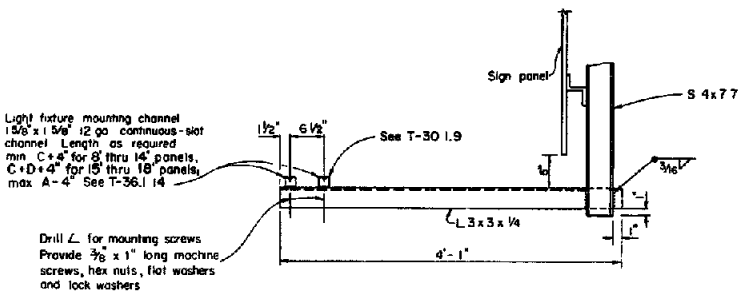
OVERHEAD SIGNS LIGHTWEIGHT SIGN PANEL MOUNTING DETAILS

Russell "Bud" Hill
CHIEF TRAFFIC ENGINEER

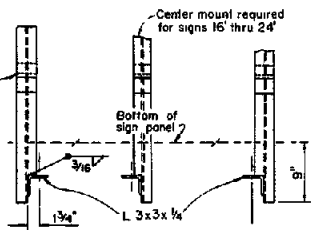
T-36 1.14 (627)
ADOPTED: 8/79 REVISION



PHOTOELECTRIC
CONTROL UNIT



SIDE VIEW - SINGLE FACED SIGN TYPES A, B & C
LIGHT FIXTURE MOUNTING DETAIL
SIGNS GREATER THAN 5'-6" IN LENGTH



FRONT VIEW

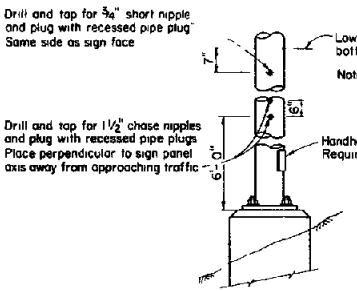
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
LIGHTWEIGHT
LIGHT FIXTURE MOUNTING DETAILS

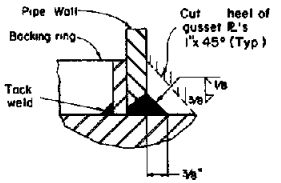
Russell T. Hill
CHIEF TRAFFIC ENGINEER

T-36.1.15 (627)
ADOPTED: 8/79 REVISION

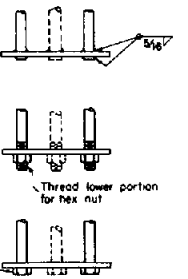
T45



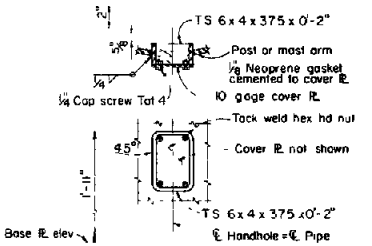
ELEVATION



DETAIL A

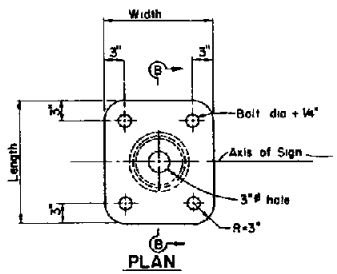


ALTERNATIVE BAR CONNECTIONS

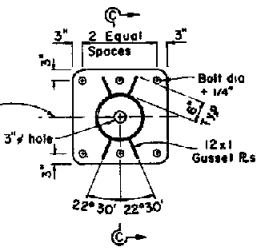


HANDHOLE & COVER DETAILS

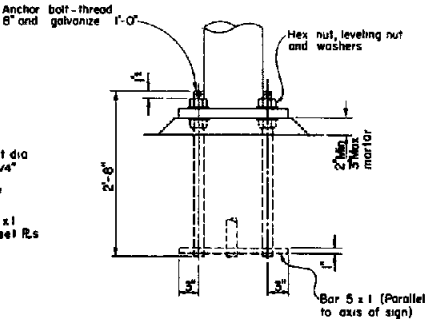
POST SIZE	BASE PLATE	ANCHOR BOLTS (Min.)
6 @ 18 97	1½" x 1'-2" x 1'-2"	4 - 1¼"
6 @ 28 57	1½" x 1'-2" x 1'-2"	4 - 1½"
8 @ 28 55	1½" x 1'-6" x 1'-6"	4 - 1¾"
8 @ 43 39	2" x 1'-6" x 1'-6"	4 - 2"
10 @ 54 74	2" x 1'-8" x 1'-8"	4 - 2 ¼"
12 @ 65 42	2" x 1'-8" x 1'-8"	4 - 2 ½"
14 @ 72 09	2" x 2'-4" x 2'-4"	6 - 2"
14 @ 89 30	2" x 2'-4" x 2'-4"	6 - 2 ¼"



PLAN



PLAN

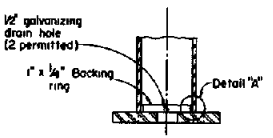


ANCHOR BOLT

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"ø anchor bolts may be substituted for 1¾" ø bolts
2 ½" ø anchor bolts may be substituted for 2 ¼" ø bolts

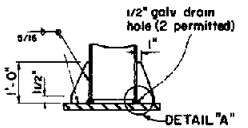
GENERAL NOTES

DESIGN:	A A S H T O SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES AND TRAFFIC SIGNALS, DATED 1975 REVISED 1979.
CONSTRUCTION	STANDARD SPECIFICATIONS, DIVISION OF HIGHWAYS DATED 1976 AND THE SPECIAL PROVISION
WELDING	ALL WELDING CONTINOUS UNLESS OTHERWISE NOTED ON THE PLANS ALL WELDING TO BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS



SECTION B-B

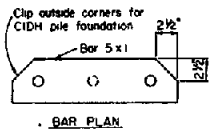
6" THRU 12" POSTS



SECTION C-C

14" POST

BASE PLATE DETAILS



BAR PLAN

ANCHORAGE DETAILS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

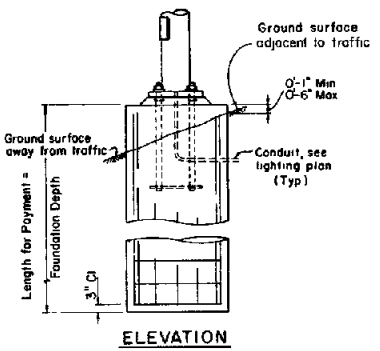
OVERHEAD SIGNS LIGHTWEIGHT POST DETAILS

CHIEF TRAFFIC ENGR

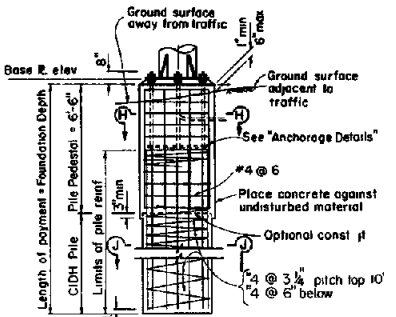
T-36 1.15 (627)

ADOPTED 8/79 REVISION

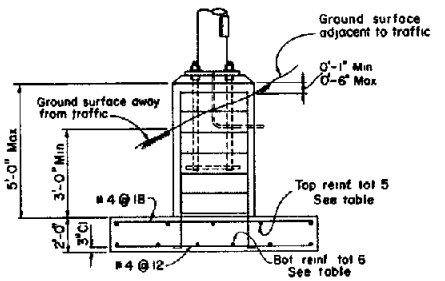
POST SIZE	PILE FOUNDATION				SPREAD FOOTING				
	Pedestal	Pile Dia	Found Depth	Reinf Size	Pedestal	Footing	Reinf Top	Reinf Bot	Reinf L Bar
6 @ 18 97		24"	8'	#5	1'-10" x 1'-10"	4'-0" x 6'-0"	#4	#4	#5
6 @ 28 57		24"	9'	#5	1'-10" x 1'-10"	4'-0" x 7'-0"	#4	#4	#5
8 @ 28 55		30"	9'	#6	2'-2" x 2'-2"	5'-0" x 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 @ 89 30	3'-4" x 3'-4"	36"	16'	#10	2'-11" x 2'-11"	8'-0" x 14'-0"	#7	#9	#8



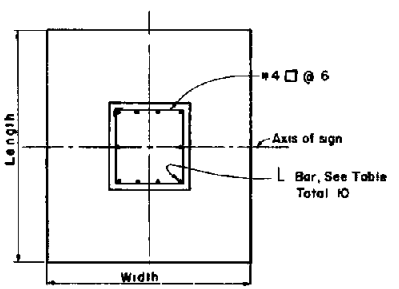
ELEVATION



ELEVATION

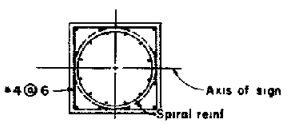


ELEVATION

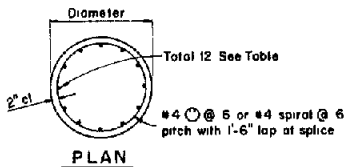


PLAN

SPREAD FOOTING

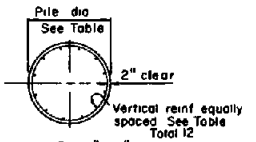


SECTION "H-H"



PLAN

6" & 8" POSTS



SECTION "J-J"

10" THRU 14" POSTS

PILE FOUNDATION

NOTES

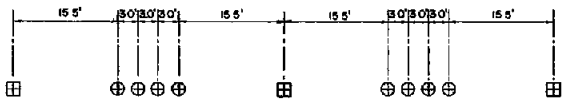
1 Backfill shall be in place prior to erection of post
2 Slope protection required when indicated on the plans
3 Pile pedestal shall be formed 6" min below ground surface Remainder to be placed against undisturbed material

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

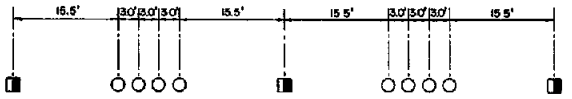
OVERHEAD SIGNS LIGHTWEIGHT FOUNDATION

Russell "Bob" Hill
CHIEF TRAFFIC ENGR.

T-361 17 (627)
ADOPTED 8/79 REVISION



PATTERN (1)



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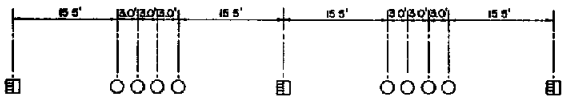

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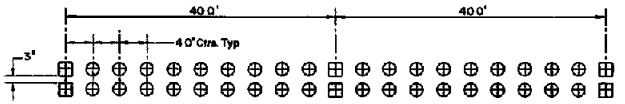

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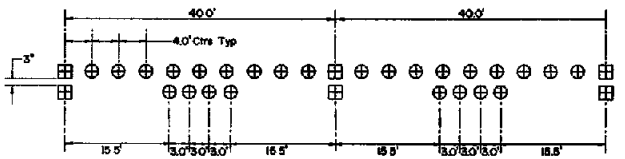

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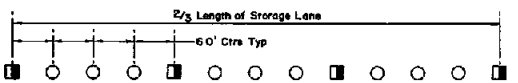

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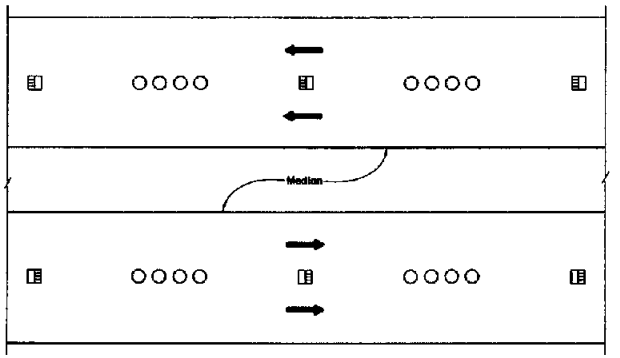
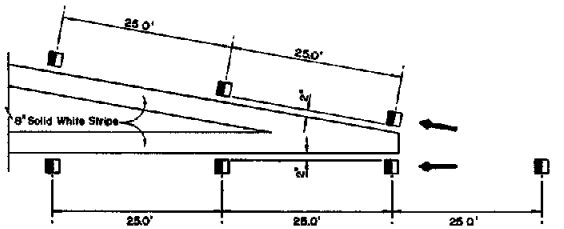
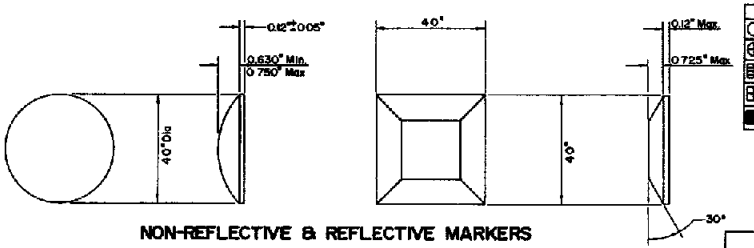


TYPICAL FREEWAY STRIPING



EXIT RAMP GORE STRIPING



NON-REFLECTIVE & REFLECTIVE MARKERS

Type A - Non-Reflective Yellow Marker
Type B - Non-Reflective White Marker
Type C - Red Clear Reflective Marker
Type D - Two Way Yellow Reflective Marker
Type E - One Way Clear Reflective Marker

LEGEND
4" PLAIN WHITE
4" PLAIN YELLOW
4" RED CLEAR
4" TWO WAY YELLOW
4" ONE WAY CLEAR

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PAVEMENT MARKER DETAILS

Russell "Bud" Hall
CHIEF TRAFFIC ENGR

T-3711 (633)
ADOPTED: 2-79 REVISION

T48

STANDARD RCB GENERAL NOTES REVISED 1979

DESIGN SPECIFICATIONS AASHO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES," TENTH EDITION, DATED 1969 FOR CULVERTS ON PILES OR ROCK FOUNDATIONS SPECIAL DESIGN MAY BE REQUIRED

CONSTRUCTION SPECIFICATIONS STANDARD SPECIFICATIONS, STATE OF NEVADA DEPARTMENT OF HIGHWAYS, CURRENT EDITION, AND SPECIAL PROVISIONS ACCOMPANYING PLANS

LOADING LIVE LOAD HS 20-44 OR INTERSTATE ALTERNATE LOADING
DEAD LOAD EARTH LOAD BASED ON 120 LBS PER CU FT AND HORIZONTAL EQUIVALENT FLUID PRESSURE OF 36 LBS PER SQ FT, CONCRETE 150 LBS PER CU FT

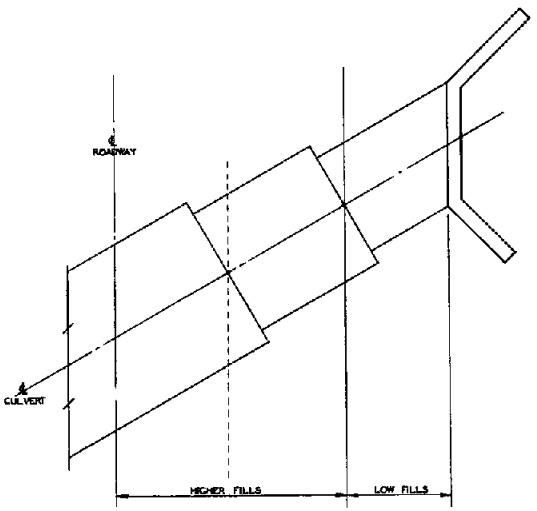
UNIT STRESSES F_s = 20,000 P S I , n = 10, F_c = 1200 P S I

HEADWALLS ALL RCB CULVERTS SHALL HAVE TYPE 7 HEADWALLS UNLESS OTHERWISE NOTED ON THE PLANS

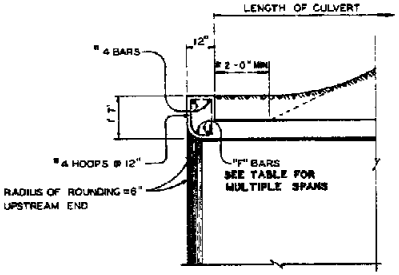
DESIGNATION SHOW ON PLANS AS SPAN X HEIGHT X LENGTH

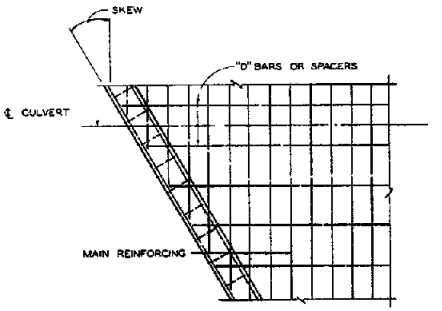
* ADDITIONAL LENGTH LENGTH OF CULVERT SHALL BE INCREASED AS FOLLOWS ADD 2'0" TO EACH END AS SHOWN ON PLAN MAIN COVER AT SHOULDER IS 0' TO 5' ADD AN ADDITIONAL 1'0 TO EACH END FOR EACH SUCCEEDING 5'0" OF COVER OR PORTION THEREOF

REINFORCEMENT CLEARANCE REINFORCEMENT EMBEDMENT IS 2 1/2" CLEAR ON BOTTOM OF BOTTOM SLAB AND 1 1/2" CLEAR ON REMAINDER OF STRUCTURE AND ITS APPURTENANCES EXCEPT AS NOTED

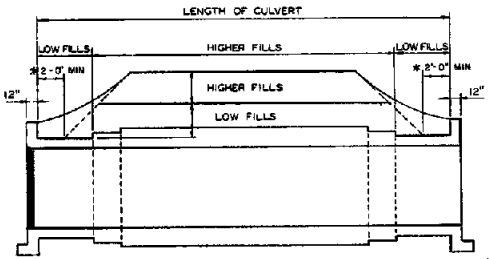


PLAN VIEW ON A SKEW



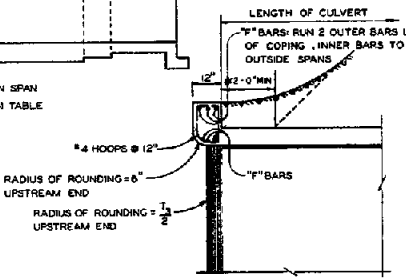


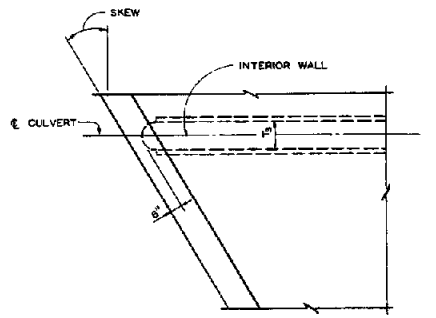
PARAPET DETAILS FOR SINGLE SPAN CULVERTS



LOW FILLS=LOWEST TABLE VALUE FOR GIVEN SPAN
HIGHER FILLS=SLAB INCREASE AS SHOWN IN TABLE

COPING REINFORCING QUANTITIES INCLUDED IN THE HEADWALL QUANTITIES





PARAPET DETAILS FOR MULTIPLE SPAN CULVERTS

SKEWED PARAPETS								
SKEW ANGLE	SPAN	3	4	5	6	8	10	12
0°-15°	BAR NO.	4	4	5	6	6	7	8
	NUMBER OF BARS	2	2	2	2	3	3	3
16°-30°	BAR NO.	4	4	5	6	7	8	8
	NUMBER OF BARS	2	3	3	3	3	3	3
31°-45°	BAR NO	4	4	6	6	7	8	8
	NUMBER OF BARS	3	3	3	3	3	3	3
0°-45°	#4 HOOPS	12" CTRS.						

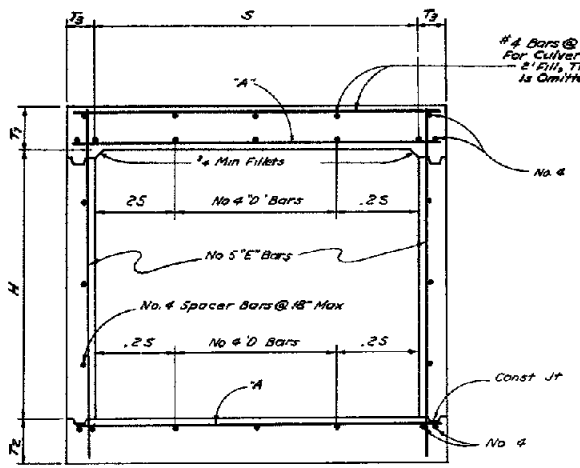
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RCB CULVERTS, GENERAL NOTES

Hugh E. Brenan
CHIEF BRIDGE ENGR.

B-20.1.1-(502)
ADOPTED 1/79
REVISION 7-2-79

SPAN			5'														6'																					
HEIGHT			3'				4'				5'						3'				4'				5'				6'					7'				
MAX FILL OVER TOP			2	11	26	35	46	2	11	26	35	46	2	11	25	35	46	2	10	18	25	2	10	18	25	2	9	18	25	36	2	9	17	25	36	45	2	9	17	25	36	45
CONC	TOP SLAB	T_1	7½	7½	8	9½	10½	7½	7½	8	9½	10½	7½	7½	8	9½	10½	8½	8½	8½	9½	8½	8½	8½	9½	8½	8½	8½	9½	11	8½	8½	8½	9½	11	12	8½	8½	8½	9½	11	12
	BOTTOM SLAB	T_2	7	7	9	11	11⅜	7	7	9	11	11⅜	7	7	9	11	11⅜	7⅜	7⅜	9	10⅜	7⅜	7⅜	9	10⅜	8½	8½	9½	11	12½	8½	8½	9½	11½	12½	13½	8½	8½	9½	11½	12½	13½
	SIDEWALLS	T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6½	7	6	6	6	6½	7	7⅜	6	6	6	6½	7	7⅜
REINFORCING STEEL	"A"	SIZE BAR NO.	5	5	5	6	6	5	5	5	6	6	5	5	5	6	6	5	5	5	6	5	5	5	6	5	5	5	6	6	5	5	5	6	7	7	5	5	5	6	7	7
		SPACING	4	4	4	5	4½	4	4	4	5	4½	4	4	4	5	4½	4	4	4	5	4	4	4	5	4	4	4	5	4½	4	4	4	5	5½	5	4	4	4	5	5½	5
		LENGTH	5-9	5-9	5-9	5-9	5-9	5-9	5-9	5-9	5-9	5-9	5-9	5-9	5-9	5-9	5-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-11	6-9	6-9	6-9	6-9	6-9	6-11
	"D" DIST	TOP SLAB NO. OF	7	3	3	3	3	7	3	3	3	3	7	3	3	3	3	7	4	4	4	7	4	4	4	7	4	4	4	4	7	4	4	4	4	4	7	4	4	4	4	4	4
	BARS	BOT SLAB NO. OF	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	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
	"E" BARS	SPACING	18	18	17	13	11	18	18	17	13	11	18	18	12	8½	6½	18	18	18	17	18	18	18	17	18	18	15½	11½	8½	17	17	10½	7½	6	5	12	12	7½	7	5	4½
	SPACERS	NUMBER	12	12	12	12	12	12	14	14	14	14	16	16	16	16	16	12	12	12	12	14	14	14	14	16	16	16	16	16	16	16	16	16	16	16	18	18	18	18	18	18
QUAN	CONCRETE CY PER LIN FT		.38	.38	.43	.50	.53	.42	.42	.47	.53	.56	.45	.45	.50	.57	.60	.46	.46	.49	.55	.50	.50	.53	.58	.55	.55	.57	.63	.69	.58	.58	.60	.67	.74	.82	.62	.62	.64	.73	.82	.91
	REINFORCING LBS. PER LIN FT		65	57	57	65	72	70	59	60	68	75	70	63	65	77	87	75	66	65	71	78	69	67	74	79	70	70	80	91	79	73	78	98	112	127	90	81	90	99	126	139



#4 Bars @ 18" Maximum Spacing. For Culverts With More Than 2' Fill, The Top Mat Of Steel Is Omitted.

NOTE:
For Boxes Of Height Less Than That Shown In Table, Use Next Greater Table Height Slabs, Wall Dimensions And Reinforcing Steel, And Make Necessary Changes In Bar Lengths, Number Of Spacers And Quantities

For General Notes See Sheet B-201.1

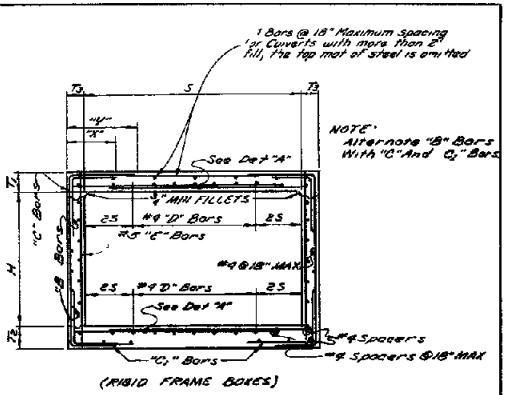
TYPICAL SECTION 5' AND 6' SPANS

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SINGLE RCB CULVERTS
5' AND 6' SPANS

Hugh C. Brimer
CHIEF BRIDGE ENGR.

B-201.2-(502)
ADOPTED 11/70
REVISION 2 4/79



(RIGID FRAME BOXES)

TYPICAL SECTION 7' THRU 12' SPANS

SPAN		7'												8'											
HEIGHT		3'		4'		5'		6'		7'				3'		4'		5'		6'		7'		8'	
MAX FILL OVER TOP		0	16	56	0	16	56	0	16	56	35	0	16	0	13	0	2	3	31	0	12	7	0	13	31
CONC	TOP SLAB T_1	7½	8	8½	7½	7½	8½	7½	8	8½	9½	7½	8	8½	9½	7½	8	8½	9½	7½	8	8½	10½	7½	8
	BOTTOM SLAB T_2	8½	8½	9½	8½	8½	9½	8½	8½	9½	11½	8½	8½	9½	11½	8½	8½	9½	11½	8½	8½	9½	12½	8½	8½
	SIDEWALLS T_3	7	7	7	7	7	7	7	7	8½	7	7	7	7	8½	7	7	7	8½	7	7	7½	9½	7	7
REINFORCING STEEL	"A" SIZE BAR NO	5	5	5	5	5	5	5	5	6	5	5	5	5	6	5	5	5	6	5	5	5	6	5	5
	"A" SPACING	9	9	7	9	9	7	9	9	7	9	9	9	9	7	9	9	7	9	9	9	7	9	9	9
	"A" LENGTH	6-8	6-8	6-9	6-8	6-8	6-9	6-8	6-8	6-9	6-10	6-8	6-8	6-9	6-10	7-2	7-2	7-8	7-7	7-7	7-8	7-7	7-8	7-7	7-8
	"B" SIZE BAR NO	5	5	5	5	5	5	5	5	6	5	5	5	5	6	5	5	5	6	5	5	5	6	5	5
	"B" SPACING	9	9	7	9	9	7	9	9	7	9	9	9	9	7	9	9	7	9	9	9	7	9	9	9
	"B" DIMENSION "X"	1-3	1-3	1-6	1-3	1-3	1-6	1-3	1-3	1-6	1-9	1-3	1-3	1-6	1-9	1-3	1-3	1-6	1-9	1-3	1-3	1-6	1-9	1-3	1-3
	"B" LENGTH	3-1	3-1	3-2	3-1	3-1	3-2	3-1	3-1	3-2	3-10	3-1	3-1	3-2	3-10	3-4	3-4	3-5	3-4	3-4	3-4	3-5	3-5	3-4	3-4
	"C" SIZE BAR NO	5	5	5	5	5	5	5	5	6	5	5	5	5	6	5	5	5	6	5	5	5	6	5	5
	"C" SPACING	9	9	7	9	9	7	9	9	7	9	9	9	9	7	9	9	7	9	9	9	7	9	9	9
	"C" DIMENSION "Y"	1-10	1-10	2-1	1-10	1-10	2-1	1-10	1-10	2-1	2-3	1-10	1-10	2-1	2-3	1-10	1-10	2-1	2-3	2-0	2-0	2-5	2-0	2-0	2-0
	"C" LENGTH	6-2	6-2	6-4	6-2	6-2	6-4	7-2	7-2	7-4	7-10	8-2	8-2	8-8	8-10	9-2	9-2	9-8	9-10	5-4	5-4	5-10	6-4	6-2	6-4
	"C1" SIZE BAR NO	5	5	5	5	5	5	5	5	6	5	5	5	5	6	5	5	5	6	5	5	5	6	5	5
	"C1" SPACING	9	9	7	9	9	7	9	9	7	9	9	9	9	7	9	9	7	9	9	9	7	9	9	9
	"C1" DIMENSION "Y"	1-10	1-11	2-1	1-10	1-10	2-1	1-10	1-10	2-1	2-3	1-10	1-10	2-1	2-3	1-10	1-10	2-1	2-3	2-0	2-0	2-5	2-0	2-0	2-0
	"C1" LENGTH	3-8	3-8	3-10	3-8	3-8	3-10	3-8	3-8	3-10	4-6	3-8	3-8	3-10	4-6	3-8	3-8	3-10	4-6	3-9	3-9	4-5	3-9	3-9	3-9
	"D" DIST TOP SLAB-TOT NO.	7	4	8	7	4	8	7	4	8	8	7	4	8	8	7	4	8	8	7	5	8	8	7	5
	"D" BARS BOT SLAB-TOT NO	4	4	8	4	4	8	4	4	8	8	4	4	8	8	4	4	8	8	5	5	8	8	5	5
	"E" BARS SPACING	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
	SPACERS TOTAL NO	24		28		28		32		36		24		28		32		32		36		40		40	
SUMM	CONC CY PER LIN FT	53	53	59	53	53	63	62	62	67	82	66	66	72	87	70	70	76	92	57	57	69	80	62	73
	REINF. LBS PER LIN FT	116	109	128	123	119	138	127	118	143	168	134	125	150	176	141	132	158	184	129	118	148	136	125	134

SPAN		10'																														12'											
HEIGHT		3'			4'			5'			6'			7'			8'			9'			10'			4'			5'			6'			7'			8'			9'			10'			12'		
MAX FILL OVER TOP		2	9	18	2	9	18	2	9	18	2	9	18	2	9	18	2	8	18	28	2	8	18	28	2	6	18	28	2	5	16	2	5	16	2	5	16	2	5	16	24	2	5	16	24	2	5	16	24
CONC	TOP SLAB T_1	8	8	9½	8	8	9½	8½	8½	9½	8½	8½	9½	8½	8½	9½	8½	8½	9½	12½	8½	8½	9½	12½	8½	8½	9½	12½	8½	8½	11½	8½	8½	11½	8½	8½	11½	8½	8½	11½	9	9	11½	13½	9	9	11½	13½	9	9	11½	13½
	BOTTOM SLAB T_2	9½	9½	11½	9½	9½	11½	10	10	11½	10	10	11½	10½	10½	12	10½	10½	12	14½	10½	10½	12	14½	10½	10½	12	14½	9½	9½	13½	9½	9½	13½	9½	9½	13½	9½	9½	13½	10	10	15½	15½	10	10	13½	15½	10	10	13½	15½
	SIDEWALLS T_3	7½	7½	9½	7½	7½	9½	7½	7½	9½	7½	7½	9½	7½	7½	9½	11½	8	8	9½	11½	9	9	11½	7½	7½	10½	7½	7½	10½	7½	7½	10½	7½	7½	10½	8	8	10½	12½	9	9	10½	12½	9	9	10½	12½	9	9	10½	12½
REINFORCING STEEL	"A" SIZE BAR NO	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	6	6	6	7	6	6	6	7	6	6	7	6	6	7	6	6	7	6	6	7	7	6	6	7	7	6	6	7	7	6	6	7	7
	"A" SPACING	11	11	8	11	11	8	11	11	8	11	11	8	11	11	8	11	11	8	9	11	11	8	9	11	11	8	9	11	11	10	11	11	10	11	11	10	11	11	10	8	11	11	10	8	11	11	10	8	11	11	10	8
	"A" LENGTH	9-5	9-5	9-8	9-5	9-5	9-8	9-5	9-5	9-8	9-5	9-5	9-8	9-5	9-5	9-8	9-5	9-5	9-8	9-9	9-6	9-6	9-8	9-9	9-7	9-7	9-8	9-9	11-3	11-3	11-6	11-3	11-3	11-6	11-3	11-3	11-6	11-3	11-3	11-6	11-8	11-4	11-4	11-6	11-8	11-5	11-5	11-6	11-8	11-5	11-5	11-6	11-8
	"B" SIZE BAR NO	5	5	6	5	5	6	5	5	6	5	5	6	5	5	6	6	5	5	6	6	5	5	6	6	5	5	6	6	6	7	6	6	7	6	6	7	6	6	7	7	6	6	7	7	6	6	7	7	6	6	7	7
	"B" SPACING	11	11	8	11	11	8	11	11	8	11	11	8	11	11	8	9	11	11	8	9	11	11	8	9	11	11	10	11	11	10	11	11	10	11	11	10	11	11	10	8	11	11	10	8	11	11	10	8	11	11	10	8
	"B" DIMENSION "X"	2-0	2-0	2-2	2-0	2-0	2-2	2-0	2-0	2-2	2-0	2-0	2-2	2-0	2-0	2-2	2-0	2-0	2-2	2-4	2-0	2-0	2-2	2-4	2-0	2-0	2-2	2-4	2-8	2-8	3-0	2-8	2-8	3-0	2-8	2-8	3-0	2-8	2-8	3-0	3-2	2-8	2-8	3-0	3-2	2-8	2-8	3-0	3-2	2-8	2-8	3-0	3-2
	"B" LENGTH	3-10	3-10	4-2	3-10	3-10	4-2	3-10	3-10	4-2	3-10	3-10	4-2	3-10	3-10	4-2	3-10	3-10	4-2	4-8	3-10	3-10	4-2	4-8	3-10	3-10	4-2	4-8	4-10	4-10	5-7	4-10	4-10	5-7	4-10	4-10	5-7	4-10	4-10	5-7	5-7	4-10	4-10	5-7	5-7	4-10	4-10	5-7	5-7	4-10	4-10	5-7	5-7
	"C" SIZE BAR NO	5	5	6	5	5	6	5	5	6	5	5	6	5	5	6	6	5	5	6	6	5	5	6	6	5	5	6	6	6	7	6	6	7	6	6	7	6	6	7	7	6	6	7	7	6	6	7	7	6	6	7	7
	"C" SPACING	11	11	8	11	11	8	11	11	8	11	11	8	11	11	8	9	11	11	8	9	11	11	8	9	11	11	10	11	11	10	11	11	10	11	11	10	11	11	10	8	11	11	10	8	11	11	10	8	11	11	10	8
	"C" DIMENSION "Y"	2-8	2-8	3-4	2-8	2-8	3-4	2-8	2-8	3-4	2-8	2-8	3-4	2-8	2-8	3-4	3-4	2-8	2-8	3-4	3-4	2-8	2-8	3-4	3-4	2-8	2-8	3-4	3-4	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9
	"C" LENGTH	5-11	5-11	6-11	6-11	6-11	7-10	6-11	6-11	7-10	8-1	8-1	9-1	9-1	9-10	10-1	10-1	10-10	11-1	11-10	12-3	12-1	12-10	13-3	13-1	13-1	13-10	14-3	8-2	8-2	8-9	9-2	9-2	9-9	10-2	10-2	10-9	11-2	11-2	11-9	12-2	12-2	12-8	13-2	13-2	13-9	14-2	14-2	14-9	15-2	15-2	15-9	16-6
	"C1" SIZE BAR NO	5	5	5	5	5	6	5	5	6	5	5	6	5	5	6	6	5	5	6	6	5	5	6	6	5	5	6	6	6	7	6	6	7	6	6	7	6	6	7	7	6	6	7	7	6	6	7	7	6	6	7	7
	"C1" SPACING	11	11	8	11	11	8	11	11	8	11	11	8	11	11	8	9	11	11	8	9	11	11	8	9	11	11	10	11	11	10	11	11	10	11	11	10	11	11	10	8	11	11	10	8	11	11	10	8	11	11	10	8
	"C1" DIMENSION "Y"	2-8	2-8	3-4	2-8	2-8	3-4	2-8	2-8	3-4	2-8	2-8	3-4	2-8	2-8	3-4	3-4	2-8	2-8	3-4	3-4	2-8	2-8	3-4	3-4	2-8	2-8	3-4	3-4	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9
	"C1" LENGTH	4-7	4-7	5-8	4-7	4-7	5-8	4-7	4-7	5-8	4-7	4-7	5-8	4-7	4-7	5-8	6-0	4-7	4-7	5-8	6-0	4-7	4-7	5-8	6-0	4-7	4-7	5-8	6-2	5-11	5-11	6-5	5-11	5-11	6-5	5-11	5-11	6-5	5-11	5-11	6-6	5-11	5-11	6-6	6-8	5-11	5-11	6-6	6-8	5-11	5-11	6-6	6-8
	"D" DIST TOP SLAB-TOT NO	9	5	5	9	5	5	9	5	5	9	5	5	9	5	5	9	5	5	5	5	9	5	5	5	5	9	5	5	10	6	6	10	6	6	10	6	6	10	6	6	10	6	6	10	6	6	10	6	6	10	6	6
	"D" BARS BOT SLAB-TOT NO	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	"E" BARS SPACING	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
	SPACERS TOTAL NO	30			32			34			36			40			40			44			48			32			36			40			44			44			48			52								
SUMM	CONC CY PER LIN FT	.75	.75	.93	.80	.80	.99	.86	.86	1.07	.90	.90	1.12	.97	.97	1.19	1.01	1.01	1.25	1.35	1.10	1.10	1.31	1.62	1.23	1.23	1.37	1.70	.95	.95	1.30	.99	.99	1.37	1.04	1.04	1.43	1.08	1.08	1.50	1.13	1.13	1.57	1.23	1.23	1.64	1.96	1.35	1.35	1.72	2.04	1.46	1.46	1.83	2.10
	REINF LBS PER LIN FT	150	137	215	156	143	221	161	148	228	167	154	235	173	160	244	177	164	250	265	183	170	259	278	191	176	267	281	205	190	288	213	198	287	218	203	293	228	213	304	233	218	311	238	223	317	307	246	231	326	397	256	245	341	415

DETAIL "A"

Note

For boxes of height less than that shown in table, use next greater table height slabs, wall dimensions and reinforcing steel, and make necessary changes in bar lengths, number of spacers and quantities.

For general notes see Sheet B-20 1 1

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SINGLE RCB CULVERTS 7' TO 12' SPANS

Floyd L. Brown
CHIEF BRIDGE ENGR.

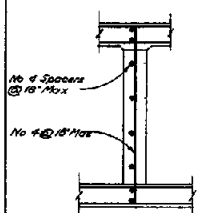
B-20 1 3-(502)

ADOPTED 11/70

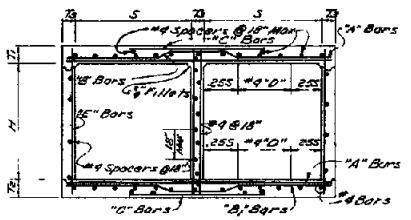
REVISION 3 11/73

SPAN	5'												6'												8'											
HEIGHT	3'				4'				5'				3'				4'				5'				6'				3'				4'			
MAX FILL OVER TOP	2	6	24	36	2	6	23	39	46	2	6	23	39	46	2	4	20	34	2	4	20	34	2	4	19	32	45	2	4	19	33	43	2	14	25	
CONC. TOP SLAB T_1	6¾	6¾	7¼	9¼	7	7	7¾	9	10¼	7	7	7¾	9¼	10¼	7¼	7¼	8¼	10¼	7¼	7¼	8¼	10¼	7¼	7¼	8¼	10¼	12	7¼	7¼	8¼	10¼	12	8¼	8¼	9¼	12
CONC. BOTTOM SLAB T_2	7½	7½	9¼	11¼	8	8	9¼	11	12¼	8	8	9¼	11¼	12¼	8¼	8¼	10¼	12¼	8¼	8¼	10¼	12¼	8¼	8¼	10¼	12¼	13¾	8¼	8¼	10¼	12¼	13¾	8¼	8¼	11¼	13¾
CONC. SIDEWALLS T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
REINFORCING STEEL "A" SIZE BAR NO	5	5	4	4	5	5	4	4	4	5	5	4	4	4	5	5	4	4	5	5	4	4	5	5	4	4	4	5	5	4	4	4	6	4	4	6
REINFORCING STEEL "A" SPACING	10	10	8½	10	10	10	8½	10	9	10	10	8½	10½	9	9½	9½	11	8½	9½	9½	11	8½	9½	9½	11	8½	10½	9½	9½	11	8½	10½	12	9½	10½
REINFORCING STEEL "A" LENGTH	11-3	11-3	11-2	11-2	11-8	11-3	11-3	11-3	11-3	11-3	11-3	11-3	11-3	11-3	14-8	13-3	14-2	13-2	13-3	13-3	13-3	13-3	13-3	13-3	13-3	13-3	13-3	13-3	13-3	13-3	13-3	13-3	17-3	17-3	17-3	17-3
REINFORCING STEEL "B" SIZE BAR NO	5	5	5	6	5	5	5	6	6	5	5	5	6	6	5	5	6	6	5	5	6	6	5	5	6	6	7	5	5	6	6	7	6	6	6	7
REINFORCING STEEL "B" SPACING	10	10	8½	10	10	10	8½	10	9	10	10	8½	10½	9	9½	9½	11	8½	9½	9½	11	8½	9½	9½	11	8½	10½	9½	9½	11	8½	10½	12	9½	10½
REINFORCING STEEL "B" LENGTH "B"	11-3	11-3	11-6	11-7	11-5	11-5	11-6	11-7	11-8	11-5	11-5	11-5	11-7	11-8	13-6	13-6	13-6	13-6	13-6	13-6	13-6	13-6	13-6	13-6	13-6	13-6	13-6	13-6	13-6	13-6	13-6	13-6	17-7	17-7	17-8	17-8
REINFORCING STEEL "B₁" LENGTH "B₁"	11-4	11-4	11-6	11-7	11-5	11-5	11-6	11-7	11-8	11-5	11-5	11-6	11-7	11-8	13-3	13-5	13-7	13-8	13-5	13-5	13-6	13-8	13-5	13-5	13-6	13-8	13-9	13-5	13-5	13-6	13-8	13-9	17-5	17-5	17-7	17-8
REINFORCING STEEL "C" SIZE BAR NO	4	4	5	6	4	4	5	6	6	4	4	5	6	6	4	4	6	6	4	4	6	6	4	4	6	6	7	4	4	6	6	7	4	4	6	7
REINFORCING STEEL "C" SPACING	10	10	8½	10	10	10	8½	10	9	10	10	8½	10½	9	9½	9½	11	8½	9½	9½	11	8½	9½	9½	11	8½	10½	9½	9½	11	8½	10½	12	9½	10½
REINFORCING STEEL "C" LENGTH	11-3	5-6	5-6	5-8	11-3	5-6	5-6	5-8	11-3	5-6	5-6	5-8	5-6	11-3	13-3	8-6	8-6	8-6	13-3	6-6	6-6	6-6	13-3	6-6	6-6	6-6	6-6	13-3	8-6	8-6	8-6	8-6	17-3	8-6	8-6	8-6
REINFORCING STEEL "D" DIST BARS TOP SLAB TOT NO	12	6	6	6	12	6	6	6	6	12	6	6	6	6	12	6	6	6	12	6	5	6	12	6	6	6	6	12	6	6	5	6	16	8	8	8
REINFORCING STEEL "D" DIST BARS BOT SLAB TOT NO	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	6	6	6	6	6	6	8	8	8	8	8	8	8	8	8
REINFORCING STEEL "E" BARS SIZE BAR NO	4	4	4	4	4	4	4	5	6	4	4	4	4	6	4	4	4	4	4	4	4	5	5	4	4	5	6	6	4	4	4	5	6	4	4	5
REINFORCING STEEL "E" BARS SPACING	18	18	18	16	18	18	18	12	10½	18	18	18	9	9	18	18	18	16	18	18	18	14	18	18	18	12	7	18	18	18	12	8½	18	18	18	12
REINFORCING STEEL "E" BARS NUMBER	30		36		28		29		36			36			34		30		37		33		40		36		42		36		44		38			
QUAN. CONCRETE CY PER LIN FT	0.68	0.68	0.78	0.98	0.76	0.76	0.85	0.94	1.03	0.81	0.81	0.90	1.01	1.08	0.82	0.82	0.92	0.95	1.13	0.91	0.93	1.01	1.18	0.83	0.88	1.06	1.23	1.36	0.95	0.98	1.16	1.30	1.38	1.08	1.30	1.56
QUAN. REINFORCING LBS. PER LIN FT	110	109	109	118	113	106	109	119	139	116	109	115	128	148	129	121	118	147	134	125	124	155	156	128	131	164	175	187	129	137	177	201	177	178	197	190

SPAN	8'				10'																		12'															
HEIGHT	8'				3'			4'		5'			6'			7'			8'			10'			4'			5'			6'			7'			8'		
MAX FILL OVER TOP	2	9	19	25	37	2	17	30	2	17	30	2	17	30	2	17	30	2	16	22	30	2	16	23	36	2	14	2	2	14	26	2	13	26	2	14	26	36
CONC. TOP SLAB T_1	8¼	8¼	9¼	12¼	14¼	8¼	12¼	16	8¼	12¼	16	8¼	12¼	16	8¼	12¼	16	8¼	12¼	16	17¼	8¼	12¼	16	17¼	10	14	10	14	17½	10	14	17½	10	14	17½	20¾	10	14	17½	20¾	10	14	17½	20¾	24
CONC. BOTTOM SLAB T_2	8¼	8¼	11¼	14	16¼	8¼	12¼	16	8¼	12¼	16	8¼	12¼	16	8¼	12¼	16	8¼	12¼	16	17¼	8¼	12¼	16	17¼	10¼	15¼	10	15¼	19	10	15¼	19	10	15¼	19	20¾	11	16	19¾	22¼	11	16	19¾	22¼	23
CONC. SIDEWALLS T_3	7	7	7	8	8¼	6	6	6	6	6	6	6	6	6	6	6	6	6½	7	7	7	7½	8	8	8	9	10	6	6½	6	6	6½	6	6	6½	7	7	7	8	9	8½	9	9	9	10	9	9	9½	11	9	10	11	12
REINFORCING STEEL "A" SIZE BAR NO.	6	6	4	4	4	6	4	4	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4	5	6	4	4	4	5	6	4	4	5	6	4	4	5	6	4	4	5	6	4	4	5	6	4	4	5	6	4	4
REINFORCING STEEL "A" SPACING	11½	11½	8½	10	8½	1	10	10	1	10	10	1	10	10	9½	10	11	9½	10	11	10	9	10	10	9	5	11½	5	5	11½	5	5	11½	5	5	11½	5	5	11	8½	5	5	11	8½	5	5	11	8½	5	5	11	8½	5
REINFORCING STEEL "A" LENGTH	18-7	11-6	11-6	11-9	11-10	21-3	21-3	21-3	21-3	21-3	21-3	21-3	21-3	21-3	24-3	24-3	24-3	24-3	24-3	24-3	24-3	24-3	24-3	24-3	24-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3	25-3
REINFORCING STEEL "B" SIZE BAR NO	6	6	6	7	7	6	7	8	6	7	8	6	7	8	6	7	9	6	7	9	8	6	7	9	8	6	8	6	6	8	6	6	8	6	6	8	6	6	8	6	6	8	6	6	8	6	6	8	6	6	8	6	6	8
REINFORCING STEEL "B" SPACING	11½	11½	9½	10	8½	1	10	10	1	10	10	1	10	10	9½	10	11	9½	10	11	10	9	10	10	9	5	11½	5	5	11½	5	5	11½	5	5	11½	5	5	11	8½	5	5	11	8½	5	5	11	8½	5	5	11	8½	5
REINFORCING STEEL "B" LENGTH "B"	17-0	11-10	11-10	12-3	12-6	21-7	21-10	22-0	21-7	21-10	22-0	21-7	21-10	22-0	21-7	21-10	22-0	21-7	21-10	22-0	22-3	22-1	22-4	22-9	23-1	25-5	25-10	25-5	25-5	25-10	25-5	25-5	25-10	25-5	25-5	25-10	25-5	25-5	25-10	25-5	25-5	25-10	25-5	25-5	25-10	25-5	25-5	25-10	25-5	25-5	25-10	25-5
REINFORCING STEEL "B₁" LENGTH "B₁"	17-9	17-3	17-11	18-0	18-7	21-3	21-10	22-0	21-3	21-10	22-0	21-3	21-10	22-0	21-3	21-10	22-0	21-3	21-10	22-0	22-3	22-1	22-4	22-9	23-1	25-5	25-10	25-5	25-5	25-10	25-5	25-5	25-10	25-5	25-5	25-10	25-5	25-5	25-10	25-5	25-5	25-10	25-5	25-5	25-10	25-5	25-5	25-10	25-5	25-5	25-10	25-5
REINFORCING STEEL "C" SIZE BAR NO	4	4	6	7	7	6	7	9	6	7	9	6	7	9	6	7	9	6	7	9	8	6	7	9	8	5	8	5	5	8	5	5	8	5	5	8	5	5	8	5	5	8	5	5	8	5	5	8	5	5	8	5	5	8
REINFORCING STEEL "C" SPACING	11½	11½	9½	10	8½	1	10	10	1	10	10	1	10	10	9½	10	11	9½	10	11	10	9	10	10	9	5	11½	5	5	11½	5	5	11½	5	5	11½	5	5	11	8½	5	5	11	8½	5	5	11	8½	5	5	11	8½	5
REINFORCING STEEL "C" LENGTH	17-3	5-11	6-1	6-4	6-9	21-3	10-6	10-8	21-3	10-6	10-8	21-3	10-6	10-8	21-3	10-6	10-8	21-3	10-6	10-8	11-0	21-3	10-6	10-9	11-1	10-8	12-6	10-8	10-8	12-6	10-8	10-8	12-6	10-8	10-8	12-6	10-8	10-8	12-6	10-8	10-8	12-6	10-8	10-8	12-6	10-8	10-8	12-6	10-8	10-8	12-6	10-8
REINFORCING STEEL "D" DIST BARS TOP SLAB TOT NO	16	8	8	8	9	13	10	10	13	10	10	13	10	10	13	10	10	13	10	10	10	13	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
REINFORCING STEEL "D" DIST BARS BOT SLAB TOT NO	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
REINFORCING STEEL "E" SIZE BAR NO	4	4	5	5	5	4	4	5	4	4	5	4	4	5	4	4	5	4	4	5	6	4	4	5	6	4	5	4	4	5	4	4	5	4	5	7	5	4	7	5	4	7	5	4	7	5	4	7	5	4	7	5	4	7
REINFORCING STEEL "E" SPACING	11½	11½	8½	10	8½	18	13	18	18	13	18	17	9	10	18	9	10	18	9	10	10	18	9	10	10	10	6½	18	18	6½	18	18	6½	18	18	6½	18	18	6½	18	18	6½	18	18	6½	18	18	6½	18	18	6½	18	18	6½
REINFORCING STEEL "E" BARS NUMBER	36		52		30	15	42		53	40		48			49			51			54		68		73	45		56	48		52		55			58			58			72			"A"					
QUAN. CONCRETE CY PER LIN FT	1.25	1.45	1.65	2.06	2.34	1.87	1.93	2.11	1.98	2.03	2.21	1.98	2.03	2.21	1.98	2.03	2.21	1.98	2.03	2.25	2.35	1.98	2.03	2.20	2.30	2.11	2.82	2.51	2.13	2.89	2.51	2.13	2.89	2.51	2.13	2.89	2.67	2.96	3.38	2.78	2.96	3.38	2.78	2.96	3.38	2.78	2.96	3.38	2.78	2.96	3.38	2.78
QUAN. REINFORCING LBS. PER LIN FT	233	231	237	279	294	178	218	270	225	248	295	225	248	295	225	248	295	225	248	295	313	225	248	295	313	189	272	319	193	279	319	193	279	319	193	279	319	193	279	319	193	279	319	193	279	319	193	279	319	193	279	319	193	279



Reinforcement For Interior Walls Under 8'



Reinforcement For Interior Walls 8' And Over

TYPICAL SECTION

NOTE!
For Boxes With Height Less Than That Shown In Table, Use Next Greater Table Height, Slabs, Wall Dimensions, And Reinforcing Steel, and Make Necessary Changes In Bar Lengths, Number of Spacers And Quantities

NOTE "B" And "B₁" Bars To Be Spaced Alternately With "A" And "C" Bars

Extended "C" Bars Are NOT Included In Boxes Shown

NOTE: For General Notes See Sheet B-20.11

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

DOUBLE RCB CULVERTS

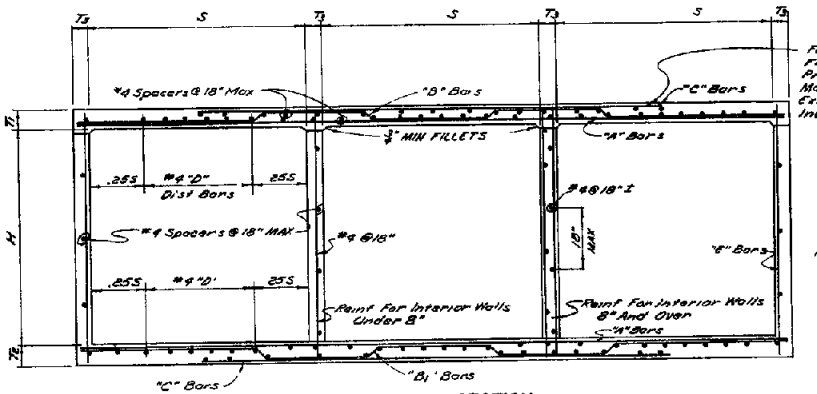
Hugh E. Brown
CHIEF BRIDGE ENGR.

B-20.14-(502)
ADOPTED 11/70
REVISION 2 11/73

SPAN		5'								6'								8'														10'											
HEIGHT		4'			5'					4'			5'			6'			4'			5'			6'			7'			8'				5'			6'			7'			8'			10'		
MAX. FILL OVER TOP		6	12	26	35	6	12	26	35	3	13	23	3	13	23	30	3	13	23	30	-	11	20	-	11	30	3	7	20	2	11	20	28	2	11	20	*	11	20	28	2	11	20	28	2	11	20	28
CONC.	TOP SLAB T_1	7	7	7½	8½	7	-	7½	8½	7½	7½	8½	7½	7½	8½	9½	7½	7½	8½	9½	8½	8½	10½	8½	9½	10½	8½	8½	10½	8½	9½	11½	8½	8½	10½	11½	9	10	12	9	10	12	9	10	12	9	10	12	9	10	12
	BOTTOM SLAB T_2	7½	8½	9½	10½	8	8½	9½	10½	8	9½	10½	8	9	10½	11	8	9	10½	11½	8	10	12	8	10½	12	8	10½	12	8	10½	12	13½	8	11	12	13½	8½	11½	14	8½	11½	14	16½	8½	11½	14	16½	8½	11½	14	16½
	SIDEWALLS T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
REINFORCING STEEL	"A" SIZE BAR NO.	5	6	5	5	5	6	5	5	6	5	5	6	5	5	5	6	5	5	5	6	5	5	6	5	5	6	5	5	6	5	5	6	5	5	6	5	5	6	5	5	6	5	5	6	5	5	6	5	5	6
	SPACING	10	11	18	11½	10	11	18	11½	13	14	11½	13	14	11½	10	13	14	11½	10	11½	12	12	11½	12	12	11½	12	12	11½	12	12	10½	11½	11½	12	10½	13	10	10½	13	10	10½	13	10	10½	13	10	10½	13	10	11
	LENGTH	16-9	16-8	16-8	16-9	16-9	16-8	16-9	16-9	19-0	18-9	19-9	19-0	18-9	19-9	19-9	19-0	18-9	19-9	19-9	19-0	19-9	19-9	19-0	19-9	19-9	19-0	19-9	19-9	19-0	19-9	19-9	19-9	20-10	20-9	20-9	20-10	20-9	20-9	20-10	20-9	20-9	20-10	20-9	20-9	20-10	20-9	20-9	20-10	20-9	20-9
	"B" SIZE BAR NO.	5	5	6	6	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	6	6	7	6	6	7	6	6	7	7	6	6	7	7	6	7	7	6	7	7	6	7	7	8	6	7	7	8
	SPACING	10	11	18	11½	10	11	18	11½	13	14	11½	13	14	11½	10	13	14	11½	10	11½	12	12	11½	12	12	11½	12	12	11½	12	12	10½	11½	11½	12	10½	13	10	10½	13	10	10½	13	10	10½	13	10	10½	13	10	11
	LENGTH "B"	17-3	17-3	17-3	17-5	17-3	17-3	17-3	17-5	20-3	20-3	20-6	20-3	20-3	20-6	20-5	20-3	20-3	20-6	20-5	20-6	20-6	20-7	20-6	20-6	20-7	20-6	20-6	20-7	20-6	20-6	20-7	20-7	26-5	26-5	26-7	26-5	26-5	26-7	26-5	26-5	26-7	26-5	26-5	26-7	26-5	26-5	26-7	26-5	26-5	26-7
	"B_1" LENGTH "B_1"	17-0	17-2	17-4	17-5	17-0	17-2	17-4	17-5	20-0	20-2	20-3	20-0	20-2	20-3	20-3	20-0	20-2	20-3	20-3	20-0	20-3	20-5	20-0	20-3	20-5	20-0	20-3	20-5	20-0	20-3	20-5	20-7	26-0	26-4	26-7	26-0	26-3	26-7	26-0	26-3	26-7	26-0	26-3	26-7	26-0	26-3	26-7	26-0	26-3	26-7
	"C" SIZE BAR NO.	4	5	6	6	4	5	6	6	4	6	6	4	6	6	6	4	6	6	6	4	6	7	4	6	7	4	6	7	4	6	7	7	4	6	7	7	5	7	7	5	7	7	5	7	7	8	7	7	7	8
	SPACING	10	11	18	11½	10	11	18	11½	13	14	11½	13	14	11½	10	13	14	11½	10	11½	12	12	11½	12	12	11½	12	12	11½	12	12	10½	11½	11½	12	10½	13	10	10½	13	10	10½	13	10	10½	13	10	10½	13	10	11
	LENGTH	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0
	"D" DIST BARS TOP SLAB-TOT NO.	18	9	9	9	18	9	9	9	18	9	9	18	9	9	9	18	9	9	9	24	12	12	24	12	12	24	18	12	24	12	12	12	27	15	15	27	15	15	27	15	15	27	15	15	27	15	15	27	15	15
	BOT. SLAB-TOT NO.	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	18	12	12	18	12	12	18	12	12	18	12	12	12	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
	"E" SIZE BAR NO	4	4	4	5	4	4	4	5	4	4	4	4	4	4	5	5	4	4	6	6	4	4	4	4	5	4	5	6	4	6	7	7	4	6	7	7	4	4	5	4	5	6	4	6	7	8	5	6	8	8
	BARS SPACING	18	12	11½	11½	18	11	7	11½	18	18	11½	18	11½	12	10	18	8	12	10	18	18	12	18	12	12	18	12	12	11½	12	12	10½	11½	11½	12	10½	15	13	10	15	13	10	15	13	10	10½	12	10	11	10½	9	10	9
	SPACERS NUMBER	36			42					40			44			48					58			62			66			70			85	68			72			76			94			102				
QUAN.	CONCRETE CY PER LIN. FT	1.04	1.10	1.19	1.30	1.16	1.19	1.27	1.37	1.26	1.30	1.44	1.33	1.39	1.52	1.62	1.41	1.47	1.59	1.71	1.60	1.77	2.09	1.68	1.86	2.16	1.75	1.98	2.23	1.83	2.01	2.36	2.50	2.02	2.20	2.56	2.89	2.10	2.52	2.94	2.18	2.60	3.02	2.25	2.67	3.15	2.47	2.89	3.35	2.81	3.31	3.87	4.35
	REINFORCING LBS. PER LIN. FT	153	136	161	181	161	143	171	192	183	170	200	187	177	209	234	198	187	221	249	241	250	301	266	291	310	267	264	320	276	277	336	409	293	293	347	441	308	372	470	339	379	482	367	391	502	371	402	514	390	421	493	577	632

SPAN		12'																		
HEIGHT		6'			7'			8'			9'			10'			12'			
MAX. FILL OVER TOP		2	10	18	2	10	18	2	10	18	2	11	20	30	2	11	20	30	2	11	20	30
CONC.	TOP SLAB T_1	10½	11½	14	10½	11½	14	10½	11½	14	10½	12	14½	17½	10½	12	14½	17½	10½	12	14½	17½
	BOTTOM SLAB T_2	9½	13	15½	9½	13	15½	9½	13	15½	9½	13½	16½	19½	9½	13½	16½	19½	10	13½	16½	19½
	SIDEWALLS T_3	6	6	6½	6	6	7	7	7	8	8	8	9	10	8	8	9	10½	9	9	10½	12
REINFORCING STEEL	"A" SIZE BAR NO	7	6	7	7	6	7	7	6	7	7	6	7	8	7	6	7	8	7	6	7	8
	SPACING	12	11	11½	12	11	11½	12	11	11½	12	10½	11	11½	12	10½	11	11½	12	10½	11	11½
	LENGTH	38-1	37-10	38-3	38-1	37-10	38-5	38-5	38-2	38-7	38-9	38-6	39-1	39-10	38-9	38-6	39-1	40-0	39-1	38-10	39-7	40-6
	'B' SIZE BAR NO.	7	7	8	7	7	8	7	7	8	7	7	8	9	7	7	8	9	7	7	8	9
	SPACING	12	11	11½	12	11	11½	12	11	11½	12	10½	11	11½	12	10½	11	11½	12	10½	11	11½
	LENGTH "B"	38-7	38-9	39-3	38-7	38-9	39-5	39-1	39-1	39-7	39-3	39-6	40-2	40-10	39-3	39-6	40-2	41-0	39-7	39-10	40-8	41-6
	"B_1" LENGTH "B_1"	38-3	38-7	39-2	38-3	38-9	39-5	38-7	39-1	39-7	39-0	39-6	40-2	40-10	39-0	39-6	40-2	41-0	39-4	39-10	40-9	41-6
	'C' SIZE BAR NO	6	7	8	6	7	8	6	7	8	6	7	8	9	6	7	8	9	6	7	8	9
	SPACING	12	11	11½	12	11	11½	12	11	11½	12	10½	11	11½	12	10½	11	11½	12	10½	11	11½
	LENGTH	25-0	25-0	25-1	25-0	25-0	25-2	25-2	25-2	25-3	25-4	25-4	25-6	25-8	25-4	25-4	25-6	25-9	25-6	25-6	25-9	26-0
	"D" DIST. BARS TOP SLAB-TOT NO.	36	15	15	36	15	15	36	15	15	36	15	15	15	36	15	15	15	36	15	15	15
	BOT. SLAB-TOT NO.	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
	"E" SIZE BAR NO	4	4	6	4	4	6	4	4	6	4	6	7	8	5	7	8	8	6	7	9	9
	BARS SPACING	18	7	11½	12	6½	11½	9	6½	9	10	10½	11	11½	12	10½	11	6½	12	9	11	9
	SPACERS NUMBER	76			80			84			104				110				118			
QUAN.	CONCRETE CY PER LIN FT	2.74	3.32	3.96	2.84	3.40	4.13	3.03	3.59	4.28	3.26	3.96	4.72	5.61	3.38	4.04	4.88	5.81	3.78	4.44	5.40	6.35
	REINFORCING LBS. PER LIN.FT	409	393	428	497	518	697	523	527	658	536	582	719	872	648	606	745	939	575	636	793	963

NOTE
For Boxes of Height Less Than That Shown in Table, Use Next Greater Table Height Slabs, Wall Dimensions And Reinforcing Steel, And Make Necessary Changes In Bar Lengths, Number of Spaces And Quantities



TYPICAL SECTION

NOTE "B" And "B_1" Bars To Be Spaced Alternately With "A" And "C" Bars

NOTE
For General Notes See Sheet B-20.1.1

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

TRIPLE RCB CULVERTS

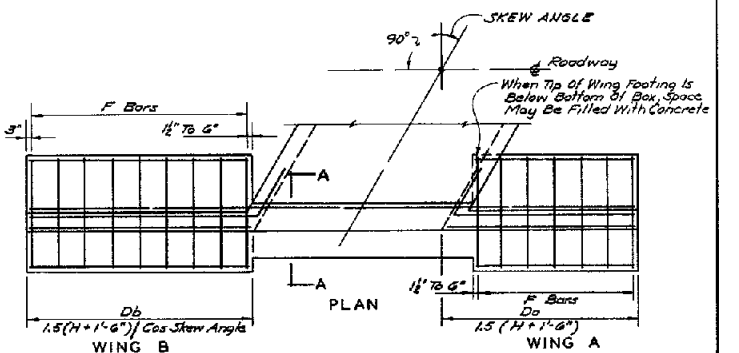
Hugh E. Brown
CHIEF BRIDGE ENGR.

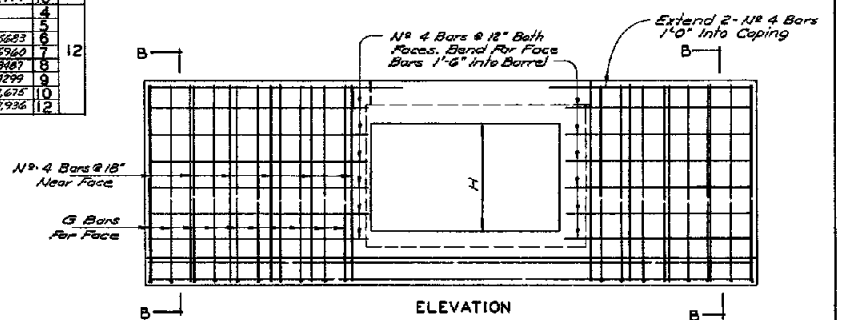
B-2015-(502)
ADOPTED 11/70
REVISION 1 11/73

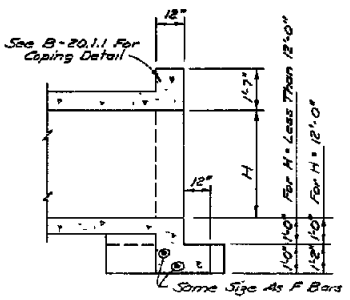
CUBIC YARDS OF CONCRETE AND POUNDS OF REINFORCING FOR TWO TYPE II HEADWALLS

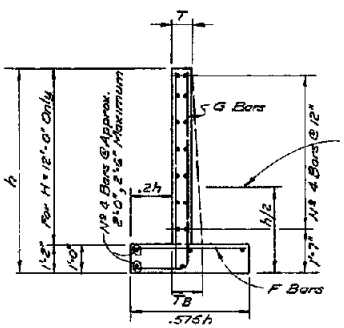
SPAN	HEIGHT	SINGLE BOX								DOUBLE BOX								TRIPLE BOX								HEIGHT	SPAN
		0 SKEW		15 SKEW		30 SKEW		45 SKEW		0 SKEW		15 SKEW		30 SKEW		45 SKEW		0 SKEW		15 SKEW		30 SKEW		45 SKEW			
		CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.	CONC.	REINF.		
5	3	9.4	871	9.4	888	10.2	947	11.5	1073	11.4	991	11.6	1013	12.4	1085	14.2	1248									3	
	4	12.3	1141	12.5	1163	13.5	1249	15.6	1399	14.8	1261	15.0	1297	15.9	1376	18.6	1568	16.8	1367	17.0	1397	18.5	1498	21.4	1718	4	5
	5	16.4	1676	16.6	1707	17.5	1813	19.8	2046	18.6	1795	18.6	1831	19.9	1952	22.8	2214	20.6	1901	20.8	1941	22.3	2074	25.6	2364	5	
6	3	9.8	884	9.8	903	10.6	963	12.1	1094	12.2	1094	12.2	1119	13.2	1204	15.3	1389									3	
	4	13.2	1165	13.2	1198	14.1	1284	16.2	1478	15.4	1364	15.6	1393	16.7	1495	19.6	1714	17.8	1576	18.0	1612	19.5	1693	22.5	1951	4	6
	5	16.8	1690	17.0	1722	18.9	1830	20.5	2069	19.0	1898	19.4	1937	21.3	2071	24.8	2350	22.4	2070	22.8	2116	24.5	2269	28.2	2603	5	
	6	25.8	2598	26.1	2646	27.6	2808	31.1	3160	27.8	2806	28.5	2861	30.2	3049	34.5	3456	30.4	2978	31.1	3040	33.0	3241	38.3	3699	6	
	7	32.0	3266	32.3	3283	34.2	3460	38.6	4053																	7	
7	3	10.2	900	10.2	918	11.0	980	12.5	1114																	3	
	4	13.6	1170	13.6	1193	14.5	1270	16.6	1439																	4	
	5	17.2	1704	17.3	1736	19.3	1846	20.9	2085																	5	7
	6	26.2	2612	26.3	2660	28.0	2824	31.7	3181																	6	
	7	32.5	3282	32.7	3350	34.6	3518	39.0	4085																	7	
8	3	10.6	914	10.6	933	11.4	996	13.1	1134	13.8	1296	14.0	1328	15.2	1437	17.1	1675									3	
	4	14.0	1184	14.0	1207	14.9	1287	17.0	1460	17.0	1566	17.2	1602	18.5	1728	21.6	2000	20.2	1830	20.4	1876	24.1	2035	26.0	2373	4	
	5	17.6	1718	17.7	1751	18.8	1863	21.3	2105	20.8	2100	20.9	2146	22.6	2304	25.9	2646	24.8	2364	25.1	2420	27.0	2609	31.5	3019	5	
	6	26.8	2626	26.7	2675	28.4	2841	32.1	3201	29.2	3008	29.9	3070	31.8	3282	36.3	3742	32.4	3272	33.1	3344	35.4	3587	40.9	4115	6	8
	7	32.8	3267	33.0	3765	34.9	3995	39.3	4496	35.8	4067	36.2	4147	38.5	4422	43.7	5019	39.0	4281	39.6	4421	42.3	4727	48.3	5392	7	
	8	40.4	4979	40.8	5020	43.3	5377	48.8	6046	43.6	5332	44.2	5434	47.1	5785	53.3	6546	47.0	5596	47.6	5708	50.9	6190	57.9	6919	8	
10	3	11.4	943	11.4	962	12.5	1029	14.3	1174	14.6	1604	15.0	1648	16.3	1793	18.9	2110									3	
	4	14.6	1212	14.7	1237	15.8	1320	18.1	1509	18.2	1874	18.3	1922	19.8	2084	24.1	2485									4	
	5	18.4	1747	18.5	1781	19.8	1895	22.5	2145	20.4	2408	22.0	2466	23.9	2660	26.8	3081	25.6	2936	25.9	2989	28.2	3154	32.9	3686	5	
	6	27.0	2655	27.2	2705	28.9	2878	32.8	3241	30.4	3316	31.2	3390	33.1	3638	38.0	4117	34.1	3744	35.0	3833	37.5	4132	43.4	4782	6	10
	7	33.4	3729	33.8	3799	36.1	4033	40.9	4542	37.2	4375	37.6	4467	40.1	4778	45.7	5454	41.0	4803	41.6	4910	44.5	5272	51.1	6059	7	
	8	41.2	5015	41.5	5107	44.0	5419	48.6	6079	44.4	5640	44.7	5784	47.8	6141	54.2	6981	48.4	6068	48.9	6197	52.2	6635	59.8	7586	8	
	9	49.8	5687	50.2	5791	53.1	6143	59.5	6909																	9	
	10	61.0	6935	61.4	6990	65.2	7216	73.2	10,328	65.2	9109	66.8	9285	70.2	9870	79.2	11,169	69.6	9587	70.4	9728	75.2	10,372	85.4	11,774	10	
12	4	16.4	1261	16.5	1246	16.6	1356	19.1	1540	19.6	2296	19.9	2352	21.4	2564	24.9	3023									4	
	5	18.8	1775	18.9	1810	20.2	1929	22.9	2185	23.0	2824	23.1	2896	25.0	3140	28.9	3649									5	
	6	28.0	2689	28.2	2734	29.9	2908	33.9	3281	32.2	3722	32.8	3820	35.1	4118	40.1	4766	36.8	4351	37.4	4492	40.3	4867	46.7	5683	6	
	7	34.2	3261	33.8	3891	36.5	4069	41.3	4696	38.4	4791	39.0	4897	41.6	5288	47.5	6042	43.0	5440	43.8	5569	47.0	6007	54.1	6960	7	12
	8	42.0	5050	42.1	5143	44.8	5459	50.6	6147	46.6	6056	46.9	6140	50.2	6621	56.0	7369	51.2	6705	51.7	6856	55.6	7370	63.6	8487	8	
	9	50.4	5722	50.8	5828	53.8	6187	60.6	6959	55.2	6728	55.8	6869	59.4	7346	67.4	8381	60.0	7377	60.8	7541	65.0	8095	74.2	9299	9	
	10	61.8	6990	62.3	8736	65.9	9267	74.3	10,421	66.6	9525	67.1	9715	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	86.0	12,939	86.8	13,172	94.0	13,963	106.7	15,682	93.2	13,884	94.2	14,150	98.8	15,052	113.1	17,018	98.0	14,593	99.8	14,822	105.8	15,803	119.4	17,936	12	

H - FEET	T - INCHES	TB - INCHES	G BARS SIZE NO.	G BARS SPACE IN.	F BARS SIZE NO.	F BARS SPACE IN.
3	3	8	5	9½	4	12
4	3	8	5	9½	4	12
5	9	9	6	9½	4	11
6	10	10	7	10	4	6½
7	12	12	7	8½	5	7½
8	12	13	7	6½	6	8
9	12	14	7	7	6	7½
10	12	16	8	6½	8	10
12	12	20	9	7	8	8½









NOTE: For General Notes See Sheet B-20.1.1

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RCB CULVERTS TYPE II HEADWALLS

W. Glen Clark
CHIEF BRIDGE ENGR.

B-2016 - (502)
ADOPTED 11/70
REVISION

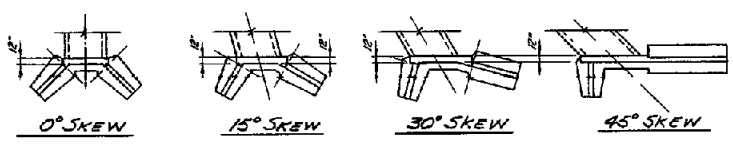
TYPE I HEADWALL DIMENSIONS AND REINFORCING STEEL

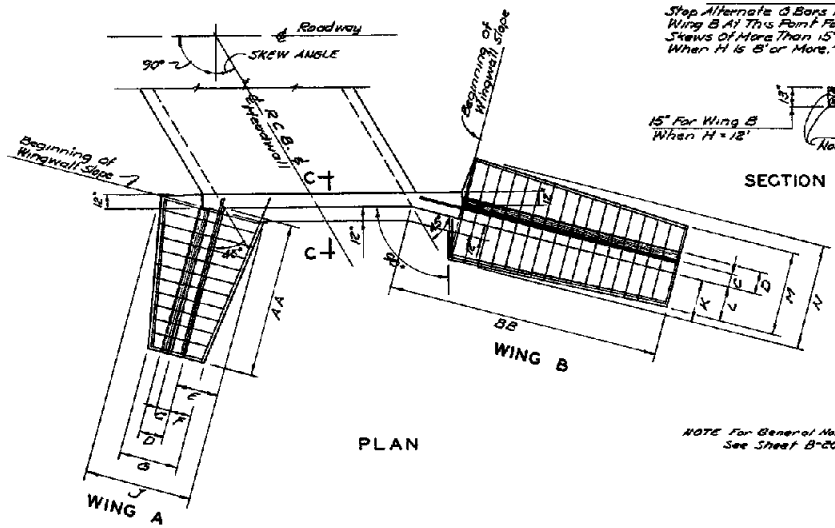
H = Height in Feet	h = All Wings Except 45° Skew	0° SKEW: AA & BB	CC & DD	C & D	E & K	F & L	G & M	J & N	WINGS A & B: G BARS SIZE	G BARS SPACING	F BARS SIZE	F BARS SPACING
3	6-7	4-0	4-2	0-8	1-4	0-10½	2-1	3-4	4	12	4	12
4	7-7	5-0	5-9	0-8	1-6	1-2	2-10	3-10	4	12	4	12
5	8-7	6-2	6-8	0-8	1-9	1-3	3-1	4-4	4	12	4	12
6	9-7	7-2	7-8	0-8	1-11	1-4	3-4	4-10	4	10½	4	12
7	10-7	8-4	7-8	0-8	2-2	1-6	3-8	5-4	4	7	4	12
8	11-7	9-4	7-8	0-8	2-4	1-7	3-11	5-10	6	10½	4	11
9	12-7	10-5	8-3	0-9	2-6	1-8	4-2	6-4	6	9	4	9
10	13-7	11-6	8-10	0-10	2-9	1-9	4-5	6-10	6	7½	4	6½
12	15-7	13-7	9-11	1-2	3-2	2-0	5-0	7-10	7	7	5	6½

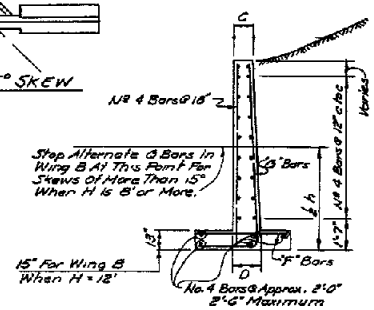
15° SKEW: AA	BB	CC	DD	C	D	E & K	F	G	J & N	L	M	WING A: G BARS SIZE	G BARS SPACING	F BARS SIZE	F BARS SPACING	WING B: G BARS SIZE	G BARS SPACING	F BARS SIZE	F BARS SPACING
3-7	4-8	4-11	5-7	0-8	0-8	1-4	1-10	2-6	3-4	1-2	2-10	4	12	4	12	4	18	4	18
4-6	5-11	5-4	6-2	0-8	0-8	1-6	1-7	2-8	3-10	1-3	3-1	4	12	4	12	4	12	4	18
5-4	7-2	5-9	6-9	0-8	0-8	1-9	1-11	2-11	4-4	1-4	3-5	4	12	4	12	4	10	4	18
6-5	8-5	6-3	7-4	0-8	0-8	1-11	1-11	3-2	4-10	1-5	3-8	4	12	4	12	4	6½	4	12
7-6	9-9	6-9	8-0	0-8	0-8	2-2	1-11	3-5	5-4	1-7	4-0	4	8½	4	12	6	10	4	12
8-5	11-0	7-2	8-7	0-9	0-9	2-4	1-11	3-7	5-10	1-8	4-4	6	12	4	12	6	8	4	9½
9-4	12-3	7-7	9-2	0-9	0-10	2-6	1-11	3-10	6-4	1-10	4-7	6	10	4	10	7	7½	4	8
10-3	13-7	8-1	9-11	0-9	0-12	2-9	1-11	4-1	6-10	2-0	5-0	6	8	4	8½	7	7½	4	6
12-3	15-11	9-1	11-4	0-11	1-5	3-2	1-11	4-7	7-10	2-3	5-8	7	7½	5	6½	7	6	5	6

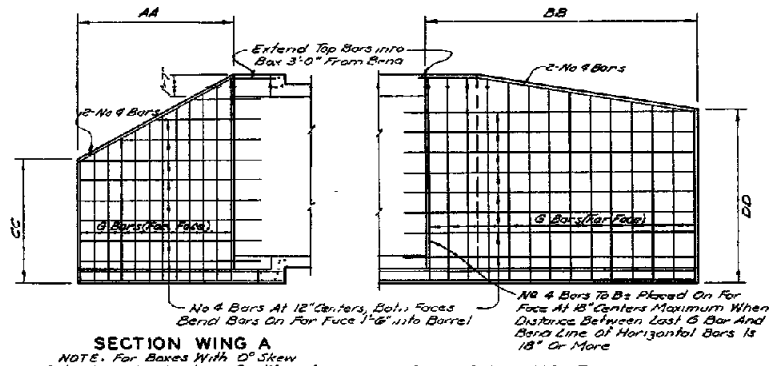
30° SKEW: AA	BB	CC	DD	C	D	E & K	F	G	J & N	L	M	WING A: G BARS SIZE	G BARS SPACING	F BARS SIZE	F BARS SPACING	WING B: G BARS SIZE	G BARS SPACING	F BARS SIZE	F BARS SPACING
3-4	5-10	4-8	6-2	0-8	0-8	1-0	0-11	2-0	3-4	0-11	3-0	4	12	4	12	4	12	4	12
4-3	7-5	5-2	6-11	0-8	0-8	1-6	1-0	2-7	3-10	1-0	3-10	4	12	4	12	4	8½	4	12
5-2	8-11	5-8	7-8	0-8	0-8	1-9	1-1	2-9	4-4	1-1	4-4	4	12	4	12	4	6½	4	12
6-1	10-6	6-3	8-4	0-8	0-8	1-11	1-2	3-0	4-10	1-2	4-10	4	12	4	12	6	12	4	12
7-0	12-2	6-9	9-3	0-9	0-9	2-2	1-4	3-3	5-4	1-4	5-4	4	10½	4	12	6	8½	4	12
7-11	13-9	6-10	10-0	0-9	0-9	2-4	1-5	3-5	5-10	1-5	5-10	4	6	4	12	6	7	4	7½
8-10	15-3	7-3	10-9	0-9	0-12	2-6	1-6	3-8	6-4	1-6	6-4	5	7½	4	9	7	6	5	7
9-9	16-10	7-8	11-7	0-9	1-0	2-9	1-7	3-11	6-10	1-7	6-10	6	9	4	7½	7	6½	6	7½
10-8	18-4	8-1	12-4	0-9	1-2	3-0	1-8	4-2	7-4	1-8	7-4	6	8	4	6½	7	6	6	6
12-7	21-5	9-1	13-11	0-9	1-5	3-5	1-8	4-8	8-2	1-9	8-2	7	7½	5	6	7	5½	6	6

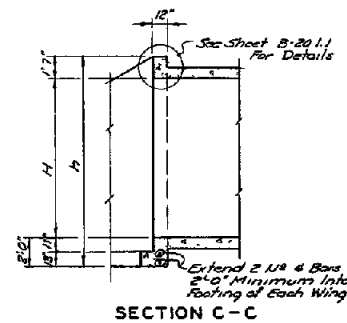
45° SKEW: AA	BB	CC	DD	C	D	E & K & L	F	G	J & M & N	WING B: h	DD	WING A: G BARS SIZE	G BARS SPACING	F BARS SIZE	F BARS SPACING	WING B: G BARS SIZE	G BARS SPACING	F BARS SIZE	F BARS SPACING	H = Height in Feet
3-4	5-4	4-7	6-7	0-8	0-8	1-4	0-11	2-0	3-4	6-7	6-7	4	12	4	12	4	12	4	12	3
4-2	6-5	5-0	7-7	0-8	0-8	1-6	1-0	2-6	3-10	7-7	7-7	4	12	4	12	5	9½	4	12	4
5-1	7-6	5-5	8-7	0-9	0-9	1-9	1-1	2-9	4-4	8-7	8-7	4	12	4	12	6	9½	4	11	5
5-11	8-6	5-10	9-7	0-10	0-10	1-11	1-2	2-11	4-10	9-7	9-7	4	12	4	12	7	10	4	6½	6
6-10	9-7	6-3	10-7	0-12	0-12	2-2	1-3	3-2	5-4	10-7	10-7	4	10½	4	12	7	8½	5	7½	7
7-9	9-9	6-8	11-7	1-0	1-0	2-4	1-4	3-4	5-10	11-7	11-7	4	7	4	12	7	6½	6	8	8
8-7	10-8	7-1	12-7	1-2	1-2	2-6	1-5	3-6	6-4	12-7	12-7	5	7½	4	9	7	6	6	7½	9
9-6	11-9	7-6	13-7	1-3	1-3	2-9	1-6	3-9	6-10	13-7	13-7	6	9½	4	7½	8	6½	6	10	10
11-3	13-7	8-6	15-9	1-6	1-6	3-2	1-8	4-2	7-10	15-9	15-9	7	9	5	7	7	8	8	8½	12

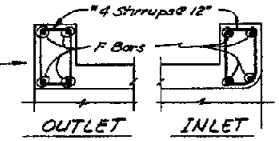












NOTE For General Notes See Sheet B-20.1.1

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

RCB CULVERTS TYPE I HEADWALLS

M. Allen Cook
CHIEF BRIDGE ENGR.

B-2017-(502)
ADOPTED 1/70 | REVISION

87

CUBIC YARDS OF CONCRETE AND POUNDS OF REINFORCING FOR TWO TYPE I HEADWALLS

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	6.9	476	7.2	563	8.9	739	7.7	508	8.5	597	9.5	700	11.8	940								
	4	7.6	609	8.0	699	9.6	774	11.6	946	9.7	726	10.1	767	12.0	913	14.6	1119	11.8	892	12.3	856	14.4	1045	17.6	1280
	5	9.6	705	10.2	782	11.8	942	15.0	1238	11.7	825	12.9	906	14.3	1085	18.0	1414	13.9	944	14.6	1030	16.8	1220	21.0	1578
6	3	6.0	418	6.6	504	7.6	595	9.4	779	8.3	600	9.2	699	10.3	817	12.7	1062								
	4	7.9	637	8.9	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	2156	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	15.3	1319																
	6	12.8	1011	13.9	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	8.9	658	10.9	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	21.9	1858
	5	10.6	782	11.3	869	13.0	1038	16.9	1360	13.8	1137	14.5	1216	16.6	1405	20.6	1723	17.0	1414	17.8	1501	20.2	1720	25.0	2159
	6	13.1	1039	13.3	1169	16.3	1583	21.3	2264	16.4	1401	16.6	1585	19.9	1958	25.6	2676	19.6	1677	19.9	1814	23.6	2276	29.9	3065
	7	16.0	1469	16.7	1673	20.6	2292	27.5	3219	19.2	1824	21.0	2133	24.3	2620	31.8	3637	22.5	2107	24.9	2928	28.0	2946	36.1	4029
	8	17.9	1904	20.2	2234	24.2	2778	33.1	3938	21.2	2247	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	545	8.2	612	9.2	721	11.9	962	11.2	1111	12.2	1227	13.6	1383	16.8	1734								
	4	9.3	749	9.8	789	11.6	936	14.1	1184	13.2	1346	13.8	1396	16.1	1608	19.6	1939								
	5	11.3	833	12.0	920	13.8	1101	17.9	1441	15.2	1434	16.1	1537	18.9	1770	23.0	2239	19.2	1876	20.1	1965	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	3339	20.7	2133	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	5496
	9	23.2	2117	25.4	2482	31.1	3244	41.8	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	809	10.5	898	12.9	1001	15.1	1224	14.6	1732	15.2	1806	17.6	2090	21.5	2549								
	5	12.0	999	12.7	975	14.6	1165	18.9	1528	16.6	1815	17.5	1941	20.0	2247	24.9	2849								
	6	14.5	1148	14.7	1296	17.9	1738	23.3	2469	19.2	2084	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	3499	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	2869	24.7	3396	31.3	4048	41.8	5506	27.8	3559	31.4	4094	38.8	4830	48.4	6496
	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	4218	43.0	5191	56.1	6984
	10	30.2	3439	32.3	3680	39.9	4488	52.7	6003	35.0	4373	37.9	4846	45.1	5580	58.6	7344	39.9	5099	42.9	5341	50.7	6353	66.5	8289
	12	42.8	5137	47.2	5372	56.9	6075	80.1	8124	47.8	6087	52.3	6380	62.2	7141	82.2	9470	52.7	6768	57.5	7045	67.9	7930	89.2	10,420

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ESTIMATE OF QUANTITIES
TYPE I HEADWALLS

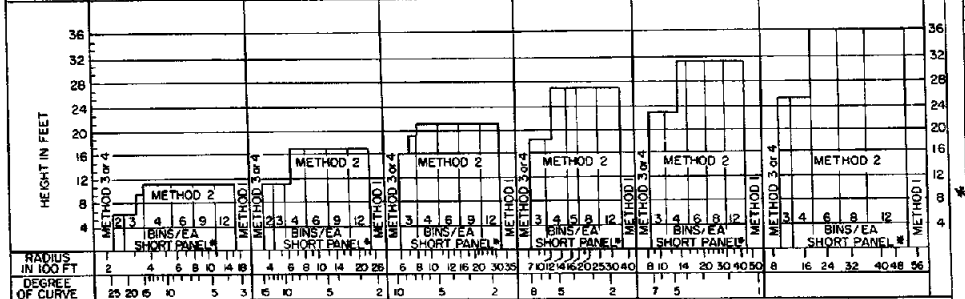
W. Thom Dahl
CHIEF BRIDGE ENGR.

B-2018-(502)
ADOPTED 11/70 REVISION

CURVATURE CHART - 1 TO 6 BATTER

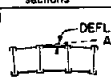
THIS DATA, OMITTING HEIGHT RESTRICTIONS, CAN BE USED FOR VERTICAL WALLS

DESIGN	A BASE WIDTH 5.5'	B BASE WIDTH 7.7'	C BASE WIDTH 9.9'	D BASE WIDTH 12.1'	E BASE WIDTH 14.3'	F BASE WIDTH 16.5'
METHOD 1 ANGLE	0° to 0°-26'	0° to 0°-20'	0° to 0°-14'	0° to 0°-12'	0° to 0°-10'	0° to 0°-8'
METHOD 2 ANGLE	44.59' to 5°-25'	3°-34' to 3°-54'	2°-47' to 3°-01'	2°-16' to 2°-28'	1°-55' to 2°-05'	1°-18' to 1°-26'



EXAMPLE - To build a Design "D" wall 20.00' high on a 1400' radius curve, use Method 2 with one set of short stringers in each group of five panel sections

METHOD 1



Use normal play in bolt holes of standard parts. Maximum deflection shown at top of table can be obtained at each column in vertical or battered walls. Chart shows smallest radius which can be used for each design of wall

METHOD 2

Use short panel sections (9'-6" face or rear) in addition to play in bolt holes. Curvature chart indicates numbers of bins in each group, including a modified bin, necessary to build a curved wall of a required height and radius

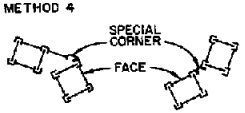
Right angle turns in vertical walls can be made by starting a new wall at the rear of the first wall and using the end transverse section for a face panel

NOTE - Use Chart X and Table Y shown on Construction Details B-2.1 2 to determine base width to height ratio for the various surcharges on both vertical and battered walls

METHOD 3

Use stringers field cut (with saber saw) and drilled to fit wall dimensions as it is assembled. Any radius can be fitted on any height of wall, battered or vertical. Generally standard panels are used between field cut panels. With very short radii the spacing of the transverse sections can be shortened so that two pieces can be cut from each stringer. This method is applicable to large single deflections

METHOD 4



Use special shop fabricated corner connection pieces. Batter, height, angle, direction of turn, and base width determine the dimension limitations applicable on this method. Manufacturer should be contacted before detailing design for a specific turn. Rear stringers are omitted and it may be necessary to increase the base width of adjacent bins to provide needed stability. This method is an alternate for method 3

UNITS REQUIRED PER SHORT PANEL SECTION

WALL HEIGHT	SHORT STRINGERS IN FRONT OF WALL										SHORT STRINGERS IN REAR OF WALL									
	16 Ga		14 Ga		12 Ga		10 Ga		Str'l		16 Ga		14 Ga		12 Ga		10 Ga		Str'l	
	Std	Short	Std	Short	Std	Short	Std	Short	Str		Std	Short	Std	Short	Std	Short	Std	Short	Str	
FEET	9.5'	9.0'	9.5'	9.0'	9.5'	9.0'	9.5'	9.0'	9.5'		9.5'	9.0'	9.5'	9.0'	9.5'	9.0'	9.5'	9.0'	9.5'	
4.00	1	3							1	1	3	1							1	1
5.33	2	4							1	1	4	2							1	1
6.67	3	5							1	1	5	3							1	1
8.00	4	6							1	1	6	4							1	1
9.33	5	6	1						1	1	6	5	1						1	1
10.67	6	6	2						1	1	6	6	2						1	1
12.00	6	6	1	3					1	1	6	6	3	1					1	1
13.33	6	6	2	3	1				1	1	6	6	3	2					1	1
14.67	6	6	3	3	2				1	1	6	6	3	3	2				1	1
16.00	6	6	4	3	3				1	1	6	6	3	4	3				1	1
17.33	6	6	4	3	4	1			1	1	6	6	3	4	4	1			1	1
18.67	6	6	4	3	5	2			1	1	6	6	3	4	5	2			1	1
20.00	6	6	4	3	5	3	1		1	1	6	6	3	4	5	3	1		1	1
21.33	6	6	4	3	5	4	2		1	1	6	6	3	4	5	4	2		1	1
22.67	6	6	4	3	5	5	3		1	1	6	6	3	4	5	5	3		1	1
* 24.00	6	6	4	3	6	5	3		1	1	6	6	3	4	5	6	3		1	1
25.33	6	6	4	3	7	5	3		1	1	6	6	3	4	5	7	3		1	1
26.67	6	6	4	3	7	5	3	1	1	1	6	6	3	4	5	7	3	1	1	1
28.00	6	6	4	3	7	5	3	2	1	1	6	6	3	4	5	7	3	2	1	1
29.33	6	6	4	3	7	5	3	3	1	1	6	6	3	4	5	7	3	3	1	1
30.67	6	6	4	3	7	5	4	3	1	1	6	6	3	4	5	7	3	4	1	1
32.00	6	6	4	3	7	5	5	3	1	1	6	6	3	4	5	7	3	5	1	1
33.33	6	6	4	3	7	5	6	3	1	1	6	6	3	4	5	7	3	6	1	1
34.67	6	6	4	3	7	5	7	3	1	1	6	6	3	4	5	7	3	7	1	1
36.00	6	6	4	3	7	5	8	3	1	1	6	6	3	4	5	7	3	8	1	1

NOTE - This table applies only to short panel sections for curved walls and includes units for both front and rear of a 9.5' element of wall

* Start 8 ga panels in front of wall at 24.00 foot wall height

NOTE - This table applies only to standard panel sections and includes units for the front of a 10' element of wall

NOTE - This table applies only to standard panel sections and includes units for the rear of a 10' element of wall

UNITS REQUIRED PER TRANSVERSE SECTION

WALL HEIGHT	BEARING PLATE	FRONT COLUMN HEIGHT IN FEET				REAR COLUMN HEIGHT IN FEET				Total Col Length in Feet	Column Splice	Column Cap	SPACERS Gage & Length						BOT SPACER Gage & Length						STRINGERS					Str'l	WALL HEIGHT
FEET	16" x 22"	1st Lift	2nd Lift	3rd Lift	Total Height	1st Lift	2nd Lift	3rd Lift	Total Height				16	16	14	12	12	12	16	16	14	12	12	12	16 Ga	14 Ga	12 Ga	10 Ga	8 Ga	Str'l	FEET
													5.2	7.4	9.6	11.8	14.0	16.2	5.2	7.4	9.6	11.8	14.0	16.2	9.5'	9.5'	9.5'	9.5'	9.5'	9.5'	
4.00	2	4.00			4.00	1.33			5.33																3					1	4.00
5.33	2	5.33			5.33	2.67			8.00																4					1	5.33
6.67	2	6.67			6.67	4.00			10.67																5					1	6.67
8.00	2	8.00			8.00	5.33			13.33																6					1	8.00
9.33	2	9.33			9.33	6.67			16.00																6	1				1	9.33
10.67	2	10.67			10.67	8.00			18.67																6	2				1	10.67
12.00	2	12.00			12.00	9.33			21.33																6	3				1	12.00
13.33	2	8.00	5.33		13.33	10.67			24.00	1															6	3	1			1	13.33
14.67	2	8.00	6.67		14.67	12.00			26.67	1															6	3	2			1	14.67
16.00	2	8.00	8.00		16.00	8.00	5.33		29.33	2															6	3	3			1	16.00
17.33	2	12.00	5.33		17.33	8.00	6.67		32.00	2															6	3	4			1	17.33
18.67	2	12.00	6.67		18.67	8.00	8.00		34.67	2															6	3	5			1	18.67
20.00	2	12.00	8.00		20.00	12.00	5.33		37.33	2															6	3	5	1		1	20.00
21.33	2	12.00	9.33		21.33	12.00	6.67		40.00	2															6	3	5	2		1	21.33
22.67	2	12.00	10.67		22.67	12.00	8.00		42.67	2															6	3	5	3		1	22.67
24.00	2	12.00	12.00		24.00	12.00	9.33		45.33	2															6	3	5	3	1	1	24.00
25.33	2	12.00	8.00	5.33	25.33	12.00	10.67		48.00	3															6	3	5	3	2	1	25.33
26.67	2	12.00	8.00	6.67	26.67	12.00	12.00		50.67	3															6	3	5	3	3	1	26.67
28.00	2	12.00	8.00	8.00	28.00	12.00	8.00	5.33	25.33	53.33	4														6	3	5	3	4	1	28.00
29.33	2	12.00	12.00	5.33	29.33	12.00	8.00	6.67	26.67	56.00	4														6	3	5	3	5	1	29.33
30.67	2	12.00	12.00	6.67	30.67	12.00	8.00	8.00	28.00	58.67	4														6	3	5	3	6	1	30.67
32.00	2	12.00	12.00	8.00	32.00	12.00	12.00	5.33	29.33	61.34	4								21						6	3	5	3	7	1	32.00
33.33	2	12.00	12.00	9.33	33.33	12.00	12.00	6.67	30.67	64.01	4								22						6	3	5	3	8	1	33.33
34.67	2	12.00	12.00	10.67	34.67	12.00	12.00	8.00	32.00	66.68	4								23						6	3	5	3	9	1	34.67
36.00	2	12.00	12.00	12.00	36.00	12.00	12.00	9.33	33.33	69.35	4								24						6	3	5	3	10	1	36.00

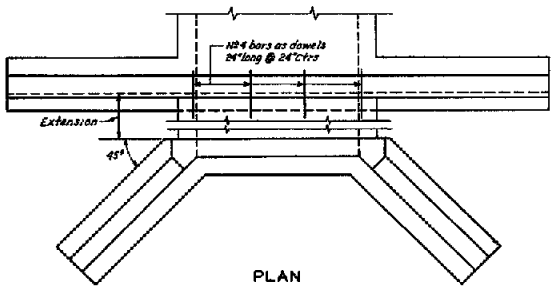
NOTE - For Construction Details See B 2.1 1 2

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

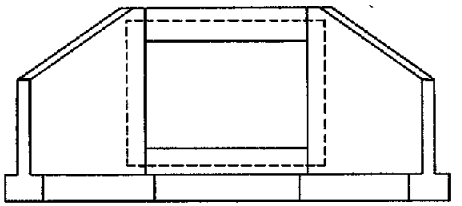
DESIGN DATA FOR METAL RETAINING WALL

B-2.1.1.1 -(6.12)

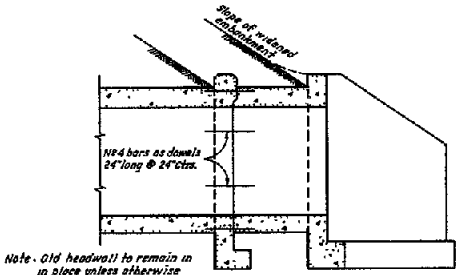
M. Glenn Cahill — CHIEF BRIDGE ENGR. — ADOPTED: 12/78 — REVISION



PLAN

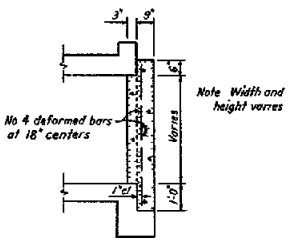


ELEVATION



PART LONGITUDINAL SECTION

R C B CULVERT EXTENSION



METHOD OF PLUGGING RCB'S

GENERAL NOTES

1 - All concrete shall be Class A or AA

2 - Reinforcing steel shall be deformed bars wired tightly at all intersections and embedded at least 1" clear of concrete surface except as noted

3 - Footings shown are at minimum depth and shall be extended if soil is unstable

4 - Dowel holes shall be drilled to full depth and dowels carefully grouted in place with a thin neat cement mortar.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

METHOD OF EXTENDING R C B CULVERTS

M. Allen Cobb
CHIEF BRIDGE ENGR

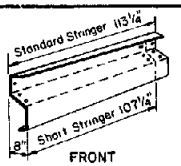
B-20.19-(502)
ADOPTED 11/70 | REVISION

68

Surcharge / Batter	Level No Live Load	With Superimposed Load
Wall On 1:6 Batter	①	②
Wall Vertical	③	④

① Curve number

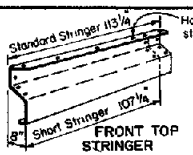
TABLE Y



FRONT INTERMEDIATE STRINGER

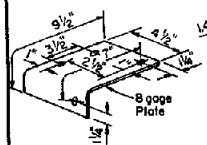
COLUMN SPLICE PLATE 10 GA

COLUMN CAP - 12 GA

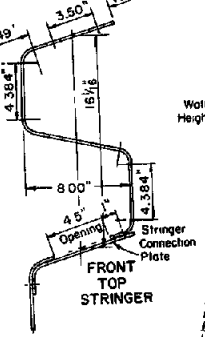


FRONT TOP STRINGER

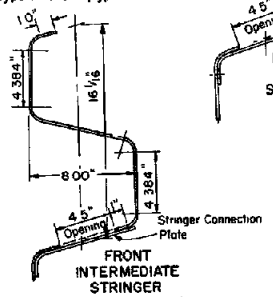
STRINGER STIFFENER - 8 GA



STRINGER CONNECTION PLATES "A" and "B"
Type "A" shown, Type "B" similar



FRONT TOP STRINGER



FRONT INTERMEDIATE STRINGER
(Except Top Stringer)

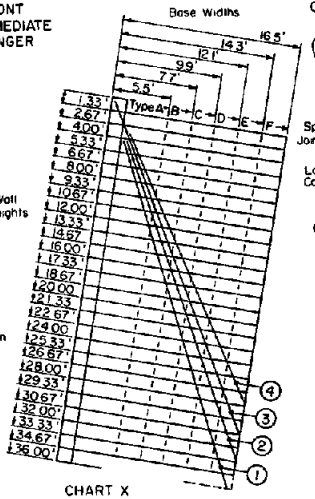
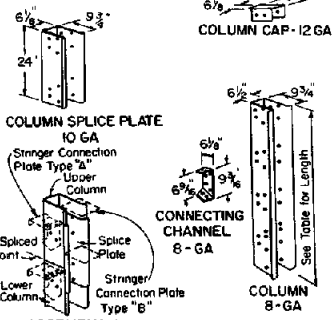


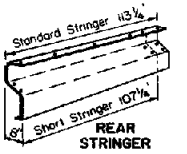
CHART X



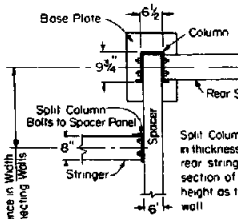
ASSEMBLY at COLUMN SPLICE

CONNECTING CHANNEL 8 - GA

COLUMN 8 - GA



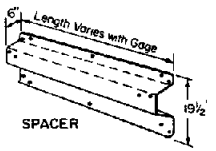
REAR STRINGER



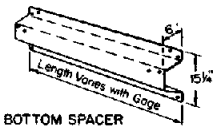
DETAIL SPLIT COLUMN ATTACHMENT

NOTE

Split Columns are used where changes in thickness of wall are made to connect rear stringers of thinner wall to transverse section of thicker wall. They are the same height as the rear columns for the thinner wall

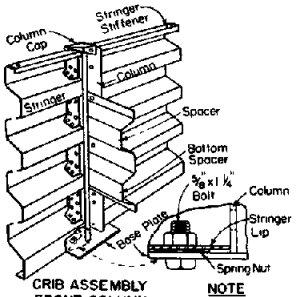


SPACER



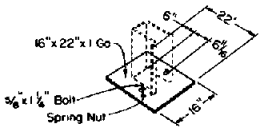
BOTTOM SPACER

NOTE - See Table on Sheet 1 for Gage and Length

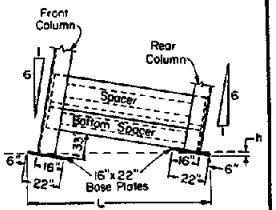


CRIB ASSEMBLY FRONT COLUMN
Rear Column Similar

NOTE
Before Setting Base Plate, insert Bolt and Fasten with Spring Nut



BASE PLATE ARRANGEMENT



DETAIL - BASE PLATE PLACEMENT

HOW TO USE - Select proper circled number in Table (Y) according to batter and surcharge conditions in Chart (X), determine where the line with that number intercepts the desired height

Example - Wall on 1:6 batter, with live load, wall height 18 ft These conditions are found as (2) in table. In chart, line (2) intercepts the 18-ft height line about midway of Type "C" which has a base width of 9.9 feet

WALL WIDTH TYPE	h	L
"A"	* 3"	6'-7⅜"
"B"	1⅜"	8'-9⅝"
"C"	5⅝"	10'-11⅝"
"D"	10⅜"	13'-2⅛"
"E"	14⅝"	15'-4⅝"
"F"	18¾"	17'-8½"

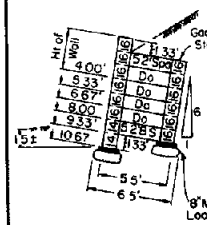
* NOTE - Distance "h" for Type "A" is a Minus Quantity - thats, Front Column Base is LOWER than Rear Column Base

All bolts to be ⅝" with a minimum length of 1¾"

GENERAL NOTES

Design "Type" to be shown on all crib layouts

For Design Data see 8-21.1 1



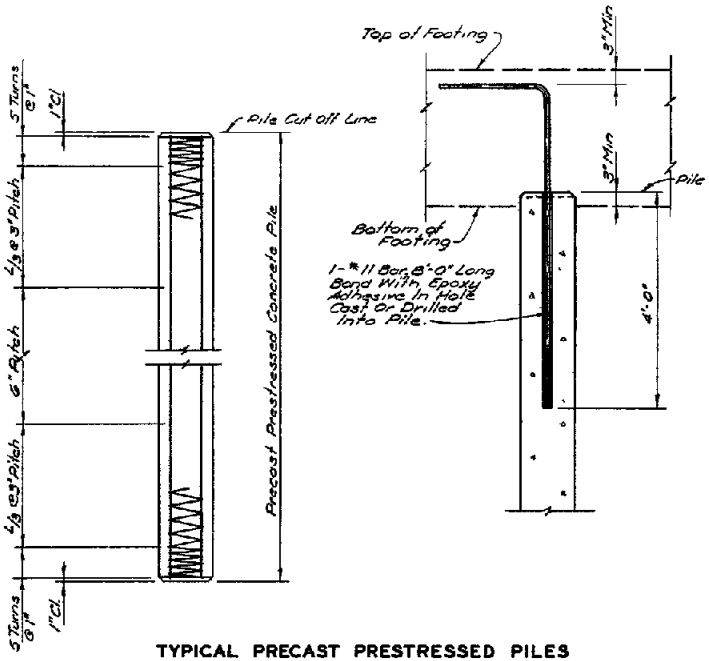
TYPE "A" TYPE "B" TYPE "C" TYPE "D" TYPE "E" TYPE "F"

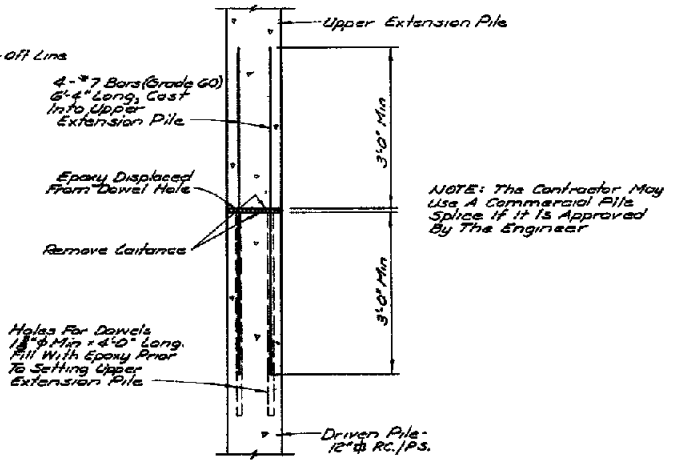
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CONSTRUCTION DETAILS FOR METAL RETAINING WALL

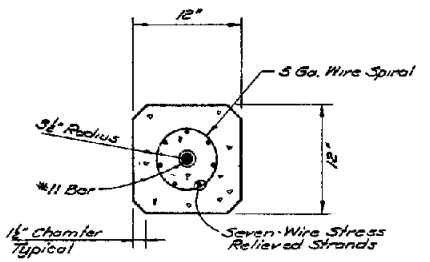
M. Glen Cobb
CHIEF BRIDGE ENGR

B-21.1.2 (6) 12	
ADOPTED 1/88	REVISION

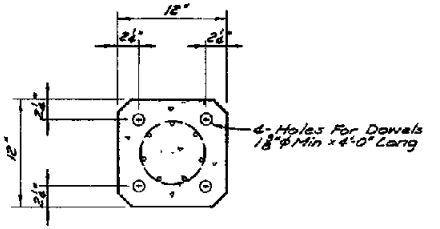




TYPICAL PRECAST PRESTRESSED PILES



SECTION



PILE SPLICE DETAILS

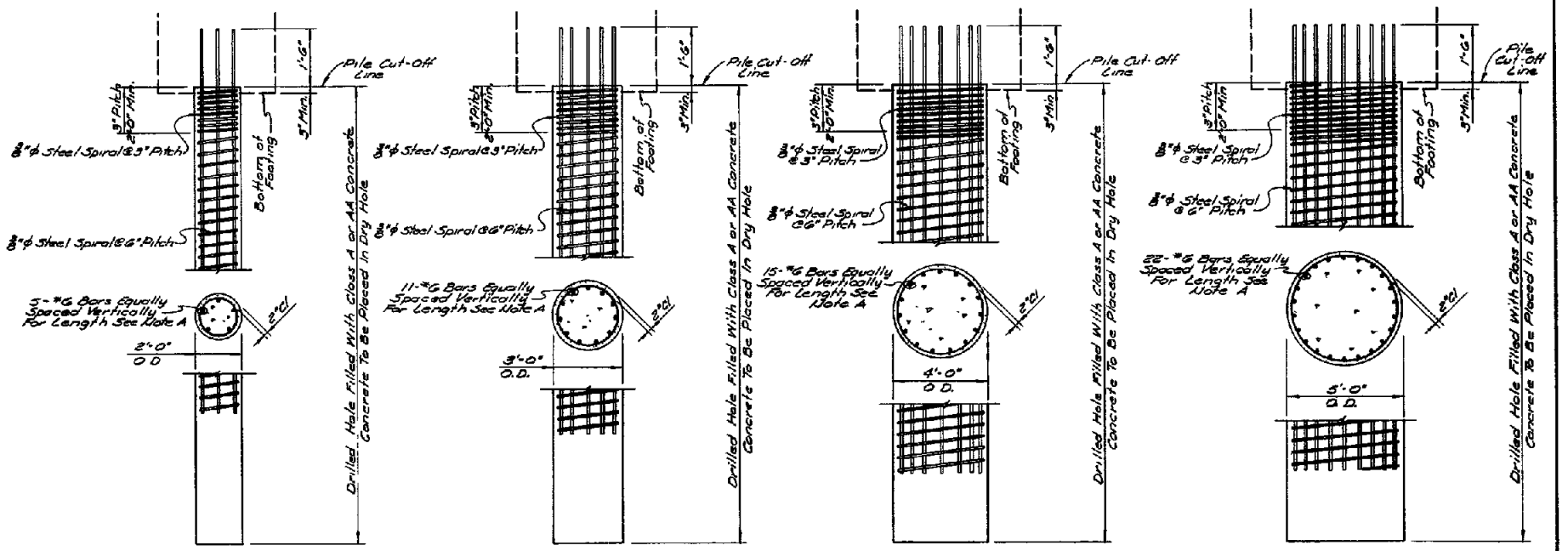
— GENERAL NOTES —

1. AASHO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES 1969 EDITION, INTERIM SPECIFICATIONS AASHO 1971 - PRESTRESSED CONCRETE.
2. THE UNIT PRESTRESS AFTER LOSSES SHALL BE NOT LESS THAN 700 p.s.i.
3. CONCRETE STRENGTH f'_{ci} = 4,000 p.s.i
   f'_c = 6,000 p.s.i
4. PRESTRESSING REINFORCEMENT SEVEN-WIRE STRESS RELIEVED STRANDS CONFORMING TO THE REQUIREMENTS OF ASTM DESIGNATION A416 SHALL BE USED
5. STRANDS TO BE BURNED FLUSH
6. CONCRETE MIX ALL CONCRETE IN PILES AND PILE EXTENSIONS SHALL CONTAIN NOT LESS THAN 6 SACKS OF CEMENT PER CUBIC YARD. IF THE CLEARANCE TO ANY STEEL FROM THE SURFACE OF THE CONCRETE IS INCREASED TO 3", 7 SACKS OF CEMENT PER CUBIC YARD MAY BE USED

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PRECAST PRESTRESSED CONCRETE PILE DETAILS

Hugh E. Brown CHIEF BRIDGE ENGR.	B-23 1.1 - (808) ADOPTED 11/73	REVISION 1



2'-0" DIAMETER PILES

3'-0" DIAMETER PILES

4'-0" DIAMETER PILES

5'-0" DIAMETER PILES

NOTE A. THE #6 BARS SHALL EXTEND TO

1) 12' - 0" BELOW THE LOWEST OF THE FOLLOWING

A) BOTTOM OF FOOTING

B) TOP OF FINAL GROUND SURFACE

C) TOP OF ORIGINAL GROUND SURFACE WHEN HOLES ARE DRILLED THROUGH EMBANKMENT CONSTRUCTED BY CONTRACTOR

2) TO THE ELEVATION SHOWN ON THE PLANS OR SPECIFIED IN THE SPECIAL PROVISIONS

NOTE B ALL BARS EXTENDED INTO SLAB OR FOOTING SHALL BE HOOKED AS REQUIRED TO PROVIDE 2" MINIMUM CLEARANCE

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

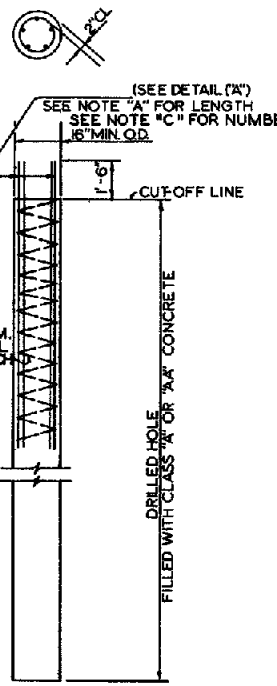
CAST-IN-DRILLED HOLE CONCRETE PILE DETAILS

Hugh L. Brown
CHIEF BRIDGE ENGR.

B-23 1.2-(808)

ADOPTED: 11/76

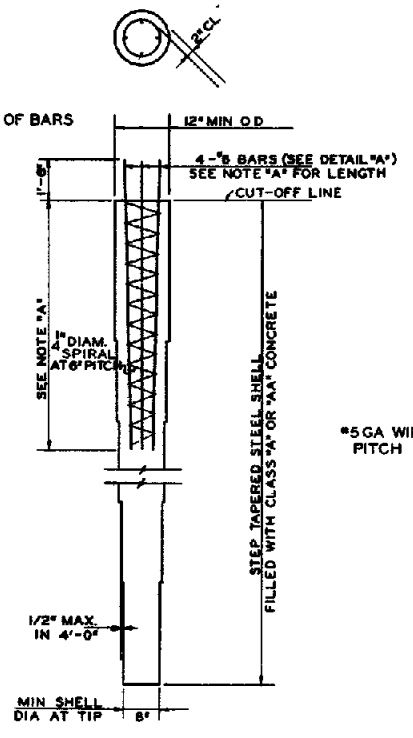
REVISION 1



TO BE USED AS AN OPTION ONLY IF SPECIFIED ON THE PLANS.

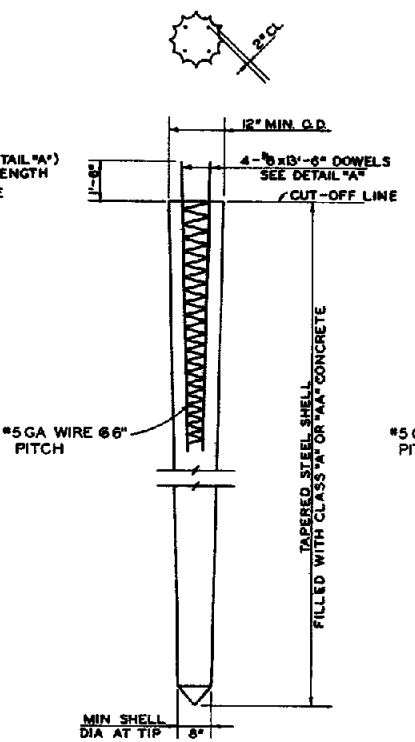
NOTE "A" THE BARS SHALL EXTEND A MINIMUM OF 12'-0" BELOW THE LOWEST OF THE FOLLOWING
1 BOTTOM OF FOOTING
2 TOP OF FINAL GROUND SURFACE
3 TOP OF ORIGINAL GROUND SURFACE WHEN PILES ARE DRILLED THROUGH FILL
NOTE "B" CONCRETE TO BE PLACED IN DRY HOLE
NOTE "C" THE MINIMUM AREA OF REBAR SHALL BE 0.005 TIMES THE GROSS CROSS SECTION OF THE CONCRETE
THE MINIMUM NUMBER OF BARS SHALL BE 5

CAST-IN-DRILLED HOLE CONCRETE PILE



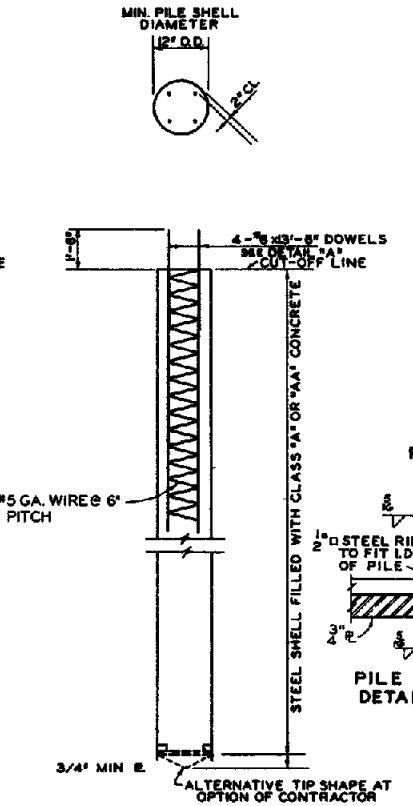
NOTE "A" THE NO 6 BARS SHALL EXTEND A MINIMUM OF 12' BELOW THE LOWEST OF THE FOLLOWING
1 BOTTOM OF FOOTING
2 TOP OF FINAL GROUND SURFACE
3 TOP OF ORIGINAL GROUND SURFACE WHEN PILES ARE DRIVEN THRU FILLS
NOTE "B" 10" MIN. DIA PIPE EXTENSION MAY BE USED WHEN STEP TAPER IS 30' OR MORE IN LENGTH MINIMUM LENGTH OF EXTENSION IS 15' MINIMUM THICKNESS OF PIPE EXTENSION = 0.1793"
NOTE "C" CONTRACTOR TO BE RESPONSIBLE FOR FURNISHING SHELLS OF SUFFICIENT STRENGTH TO DRIVE WITHOUT DISTORTION

CAST-IN-PLACE CONCRETE PILE ALTERNATE "A"



CONTRACTOR TO BE RESPONSIBLE FOR FURNISHING SHELLS OF SUFFICIENT THICKNESS TO DRIVE WITHOUT DISTORTION

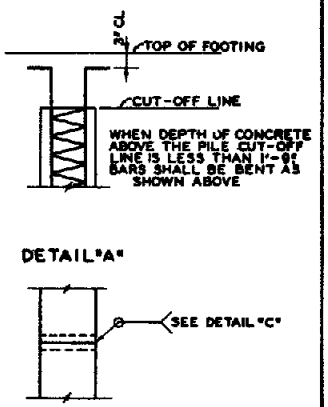
CAST-IN-PLACE CONCRETE PILE ALTERNATE "B"



MINIMUM SHELL THICKNESS — 1/4"

CONTRACTOR TO BE RESPONSIBLE FOR FURNISHING SHELLS OF SUFFICIENT THICKNESS TO DRIVE WITHOUT DISTORTION

CAST-IN-PLACE CONCRETE PILE



NOTES

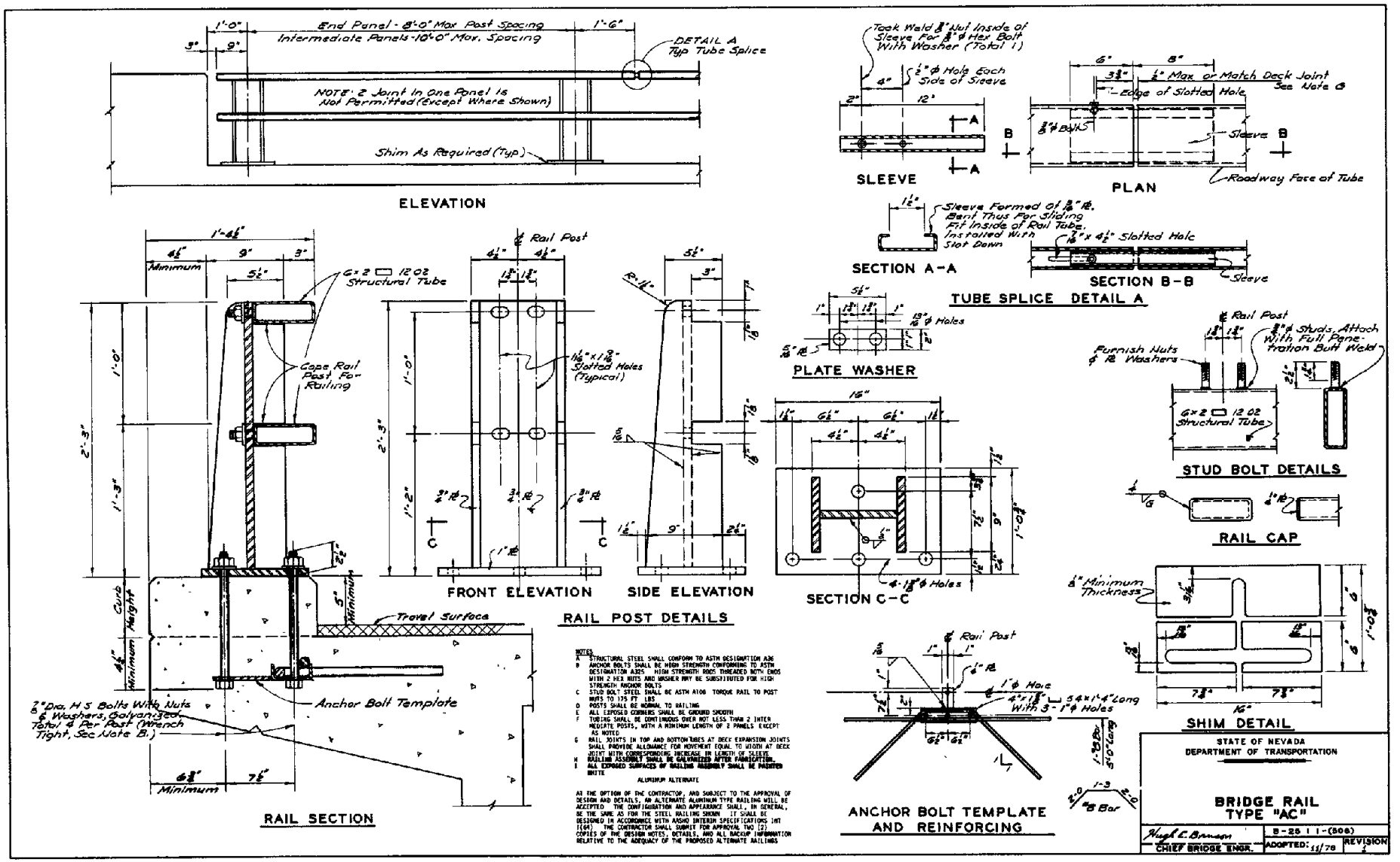
1 ALL REINFORCING SHOWN SHALL BE INCLUDED IN THE CONTRACT PRICE FOR "FURNISHING STEEL SHELL FOR PILES"
2 IF LOAD TESTS ARE REQUIRED THE CONTRACTOR SHALL SUBMIT FOR APPROVAL DETAILED PLANS OF HIS PROPOSED TESTING METHOD

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CONCRETE PILE DETAILS

Hugh E. Brown
CHIEF BRIDGE ENGR

B-23 1 3-(308)
ADOPTED 11/76
REVISION 1



NOTES

A STRUCTURAL STEEL SHALL CONFORM TO ASTM DESIGNATION A36
B ANCHOR BOLTS SHALL BE HIGH STRENGTH CONFORMING TO ASTM DESIGNATION A325. HIGH STRENGTH RODS THREADED BOTH ENDS WITH 2 HEX NUTS AND WASHER MAY BE SUBSTITUTED FOR HIGH STRENGTH ANCHOR BOLTS
C STUD BOLT STEEL SHALL BE ASTM A108 TORQUE RAIL TO POST NUTS TO 175 FT LBS
D POSTS SHALL BE NORMAL TO RAILING
E ALL EXPOSED CORNERS SHALL BE GROUND SMOOTH
F TUBING SHALL BE CONTINUOUS OVER NOT LESS THAN 2 INTERMEDIATE POSTS, WITH A MINIMUM LENGTH OF 2 PANELS EXCEPT AS NOTED
G RAIL JOINTS IN TOP AND BOTTOM TUBES AT DECK EXPANSION JOINTS SHALL PROVIDE ALLOWANCE FOR MOVEMENT EQUAL TO WIDTH AT DECK JOINT WITH CORRESPONDING INCREASE IN LENGTH OF SLEEVE
H RAILING ASSEMBLY SHALL BE GALVANIZED AFTER FABRICATION.
I ALL EXPOSED SURFACES OF RAILING ASSEMBLY SHALL BE PAINTED WHITE

ALUMINUM ALTERNATE

AT THE OPTION OF THE CONTRACTOR, AND SUBJECT TO THE APPROVAL OF DESIGN AND DETAILS, AN ALTERNATE ALUMINUM TYPE RAILING WILL BE ACCEPTED. THE CONFIGURATION AND APPEARANCE SHALL, IN GENERAL, BE THE SAME AS FOR THE STEEL RAILING SHOWN. IT SHALL BE DESIGNED IN ACCORDANCE WITH AASHO INTERIM SPECIFICATIONS INT (69). THE CONTRACTOR SHALL SUBMIT FOR APPROVAL TWO (2) COPIES OF THE DESIGN NOTES, DETAILS, AND ALL BACKUP INFORMATION RELATIVE TO THE ADEQUACY OF THE PROPOSED ALTERNATE RAILINGS

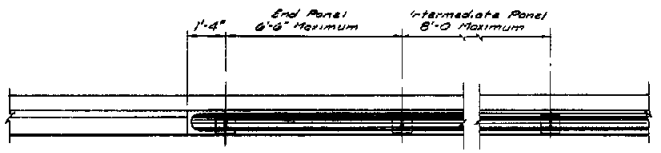
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

BRIDGE RAIL TYPE "AC"

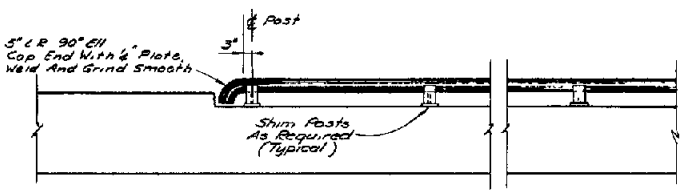
Hugh C. Brennan
CHIEF BRIDGE ENGR.

B-25 1 1-(506)
ADOPTED: 11/78
REVISION

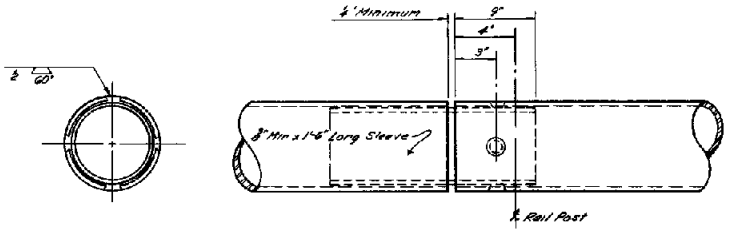
B-15



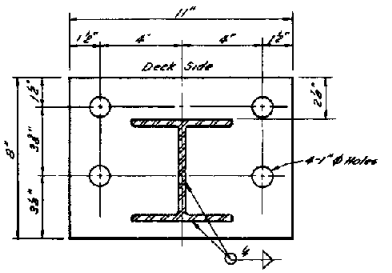
PART PLAN



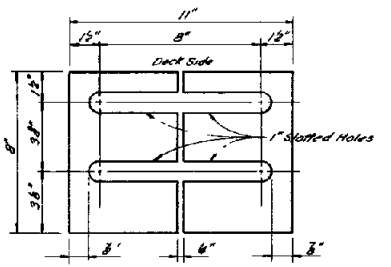
PART ELEVATION



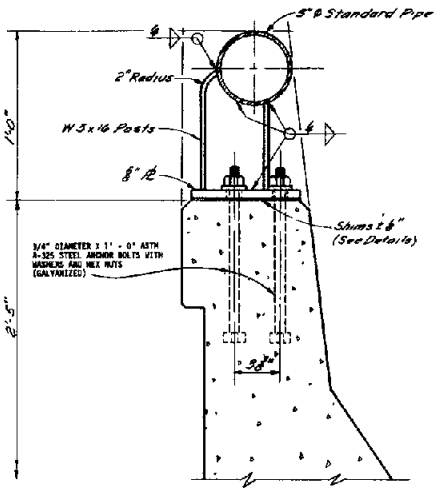
SLIP JOINT DETAIL

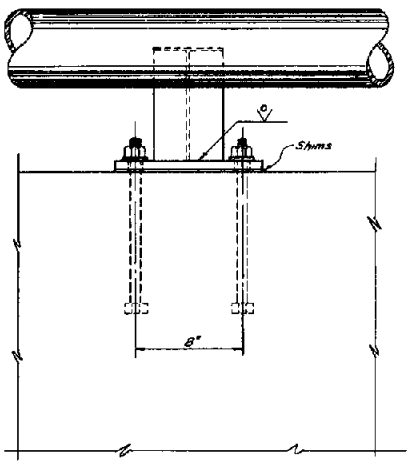


ANCHOR PLATE DETAIL



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 ALLOWABLE 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

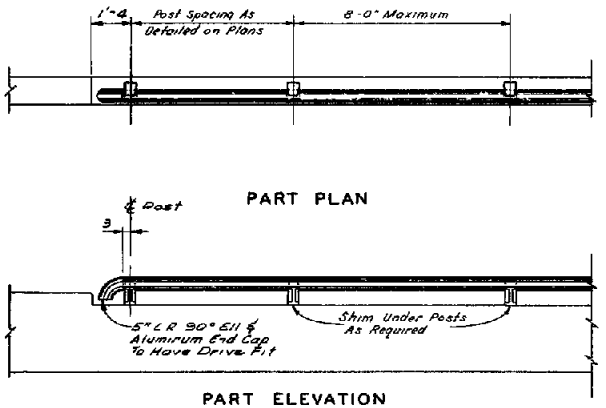
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

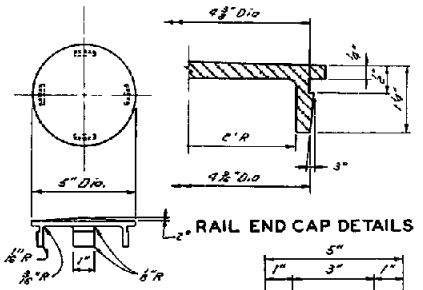
STEEL BRIDGE RAIL TYPE "H"

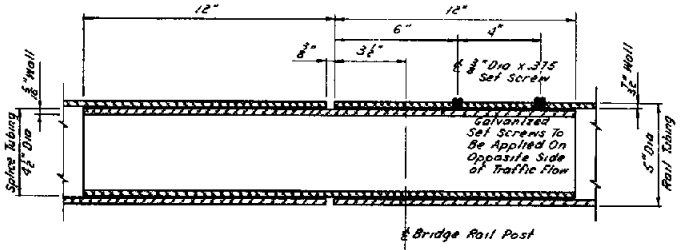
Hugh E. Briscoe
CHIEF BRIDGE ENGR

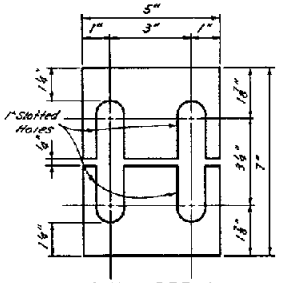
B-25 | 2-506
ADOPTED 11/78 | REVISION

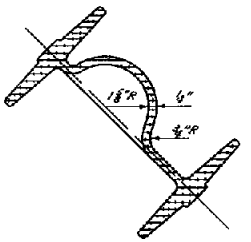
B-16

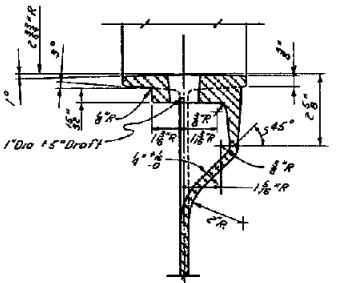


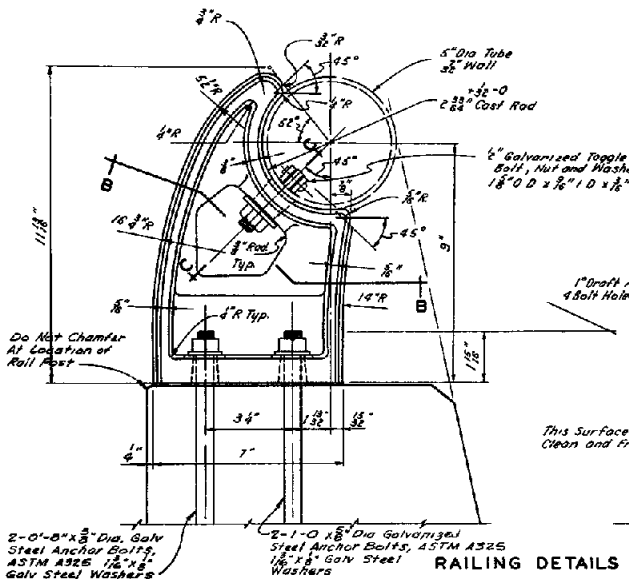


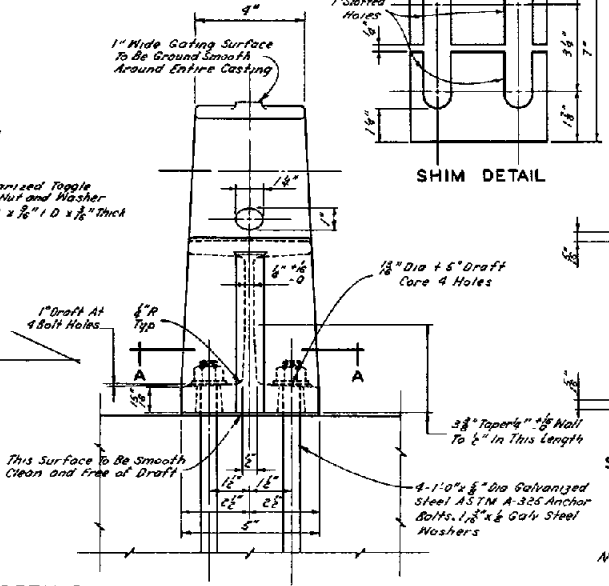


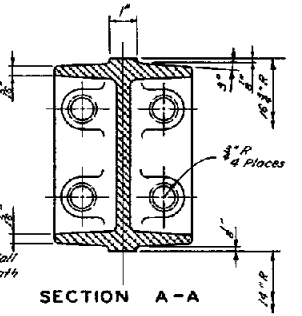












NOTE -
Unless Otherwise Specified
All Draft to be 3°

All Unmarked Radii To Be 3/4"R

GENERAL NOTES

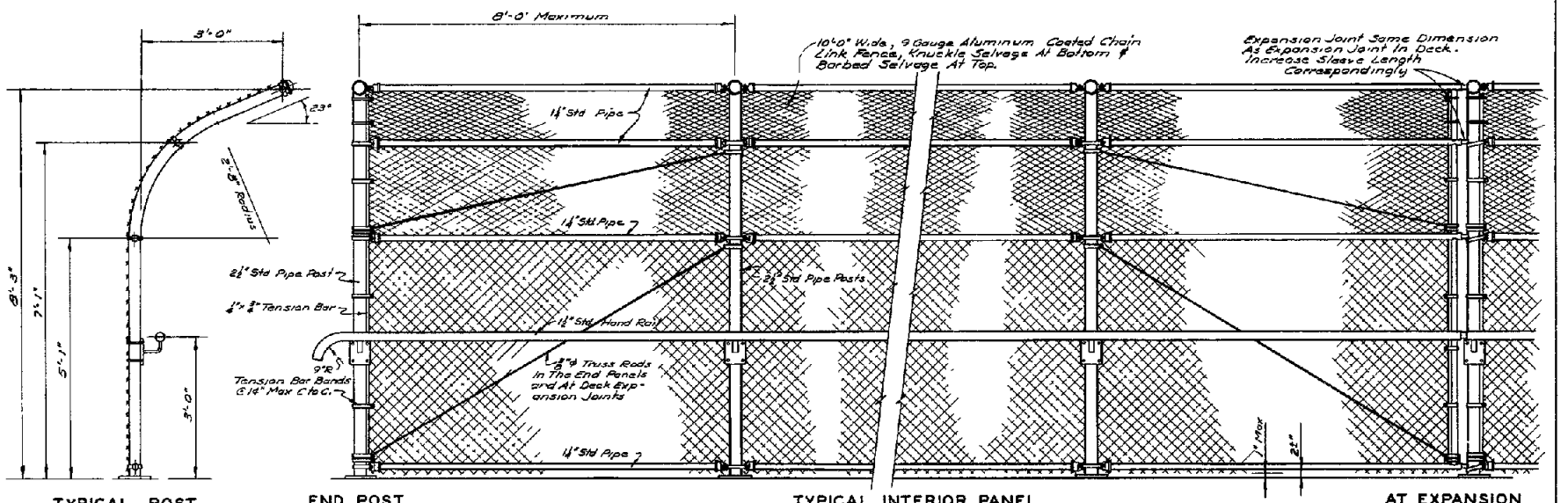
1. Railing To Conform To Vertical and Horizontal Alignment
2. Joint To Be Placed 25'-0" Center To Center, Max
3. Slip Joint To Be Placed in Panels To Match Expansion Joints in Deck The 3/8" For Movement Will Be Changed To Match Allowances for Movement in The Deck and Curb
4. Design Weight: 6.4 Lbs Per Foot

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ALUMINUM BRIDGE RAIL TYPE "H"

Hugh E. Briggs
CHIEF BRIDGE ENGR

B-25 | 3-(506)
ADOPTED: 11/78
REVISION

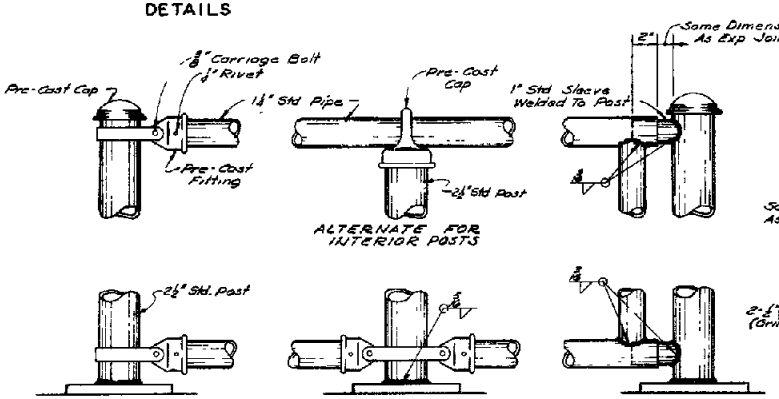


TYPICAL POST DETAILS

END POST

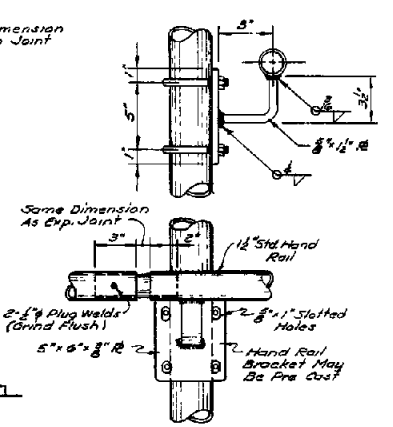
TYPICAL INTERIOR PANEL

AT EXPANSION JOINT

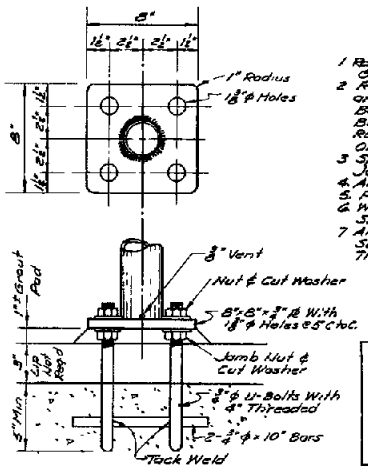


ALTERNATE FOR INTERIOR POSTS

TYPICAL CONNECTION DETAILS



HAND RAIL BRACKET



ANCHORAGE DETAILS

— GENERAL NOTES —

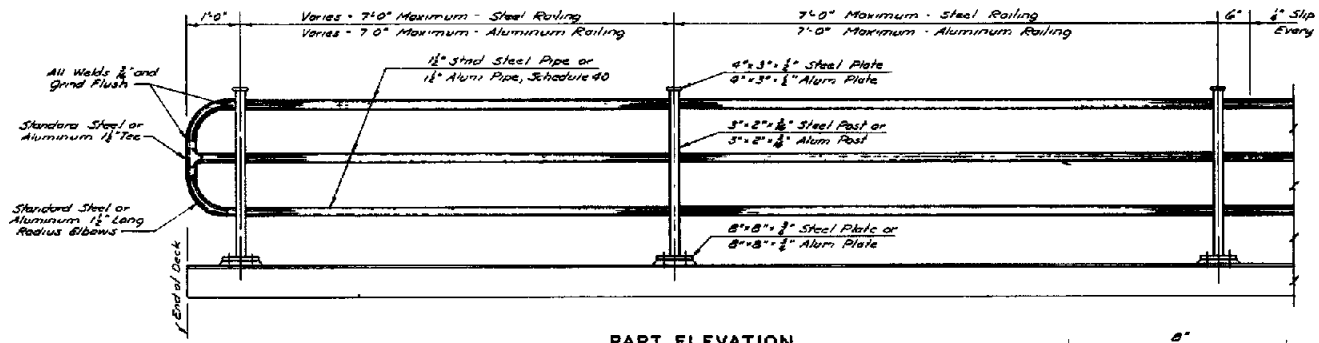
1 Railing Assembly, except Chain Link Fabric, To Be Galvanized After Fabrication
2 Railing Shall Conform To Horizontal and Vertical Alignment Posts Shall Be Vertical. Top, Intermediate and Bottom Pipes Shall Be Bent If The Radius Is 150' or Less) May Be On 8° Chords If Radius Is Over 150'
3 Space Posts To Clear Expansion Joints By 6" Minimum To ¢ Posts
4 All Exposed Corners To Be Smooth
5 Ream All ⅝" Bolts
6 When Fence Is On Slope The 10' Fabric Shall Be Placed Parallel To The Slope
7 Alternative Details May Be Submitted By The Contractor For The Engineer's Approval

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

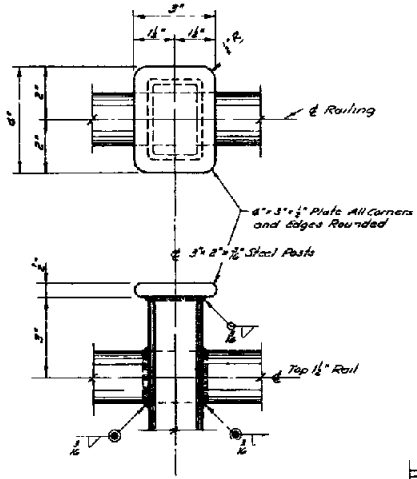
PEDESTRIAN RAIL TYPE "M"

Hugh E. Brown	B-25 | 4-(808)
CHIEF BRIDGE ENGR	ADOPTED 11/76 REVISION 2

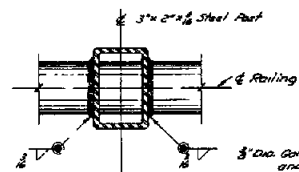
1. All Steel Railing Assembly Shall Be Galvanized After Fabrication
2. All Exposed Surfaces of Steel Railing Assembly Shall Be Painted White



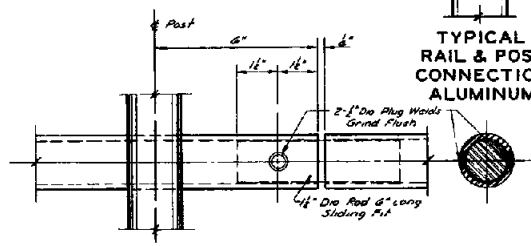
PART ELEVATION



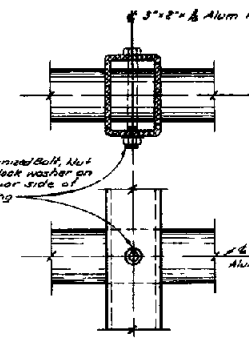
TOP POST PLATE DETAILS



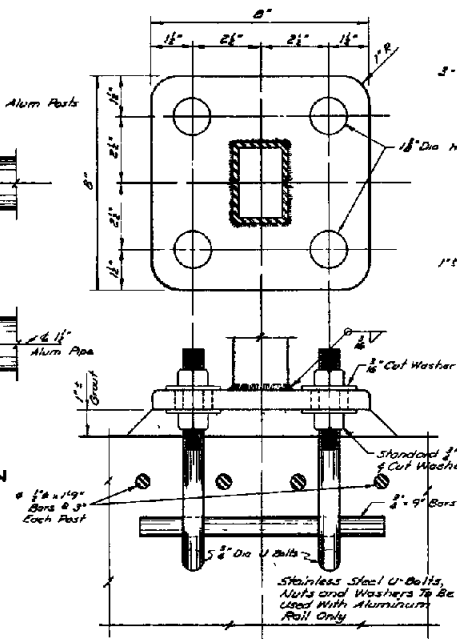
TYPICAL RAIL & POST CONNECTION STEEL



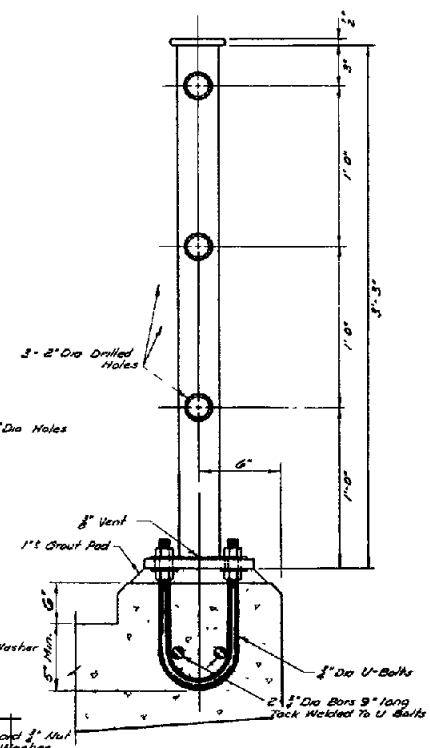
SLIP JOINT DETAILS



TYPICAL RAIL & POST CONNECTION ALUMINUM



BOTTOM PLATE DETAILS



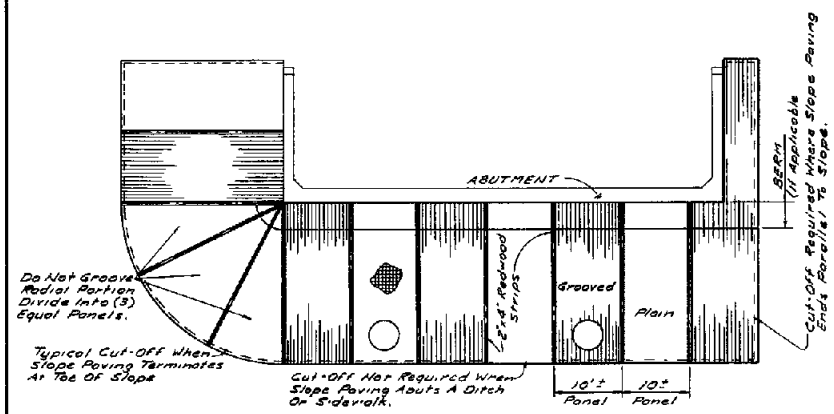
TYPICAL SECTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

PEDESTRIAN RAIL TYPE "R"

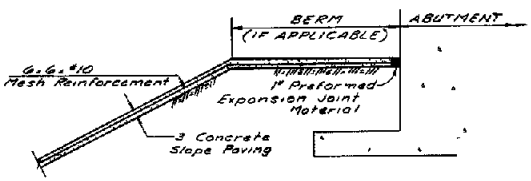
Hugh E. Brinson
CHIEF BRIDGE ENGR.

B-25 1.5-(308)
ADOPTED: 11/78
REVISION 1

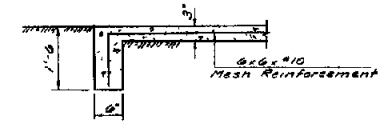


PLAN VIEW

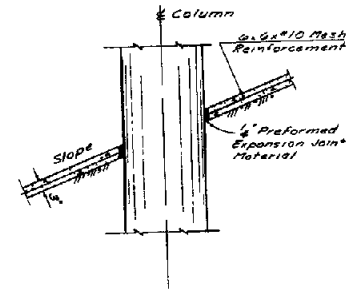
NOTE SLOPE PAVING IS TO BE DIVIDED INTO EQUALLY SPACED PANELS THE WIDTH OF EACH PANEL IS TO BE AS NEARLY 10' AS SITE DIMENSIONS WILL PERMIT. FOR PANELS WITH A GROOVED FINISH, CONCRETE MORTAR SHALL BE USED. IF ALTERNATELY GROOVED PANELS ARE CALLED FOR ON BRIDGE PLANS, THEN THE PANELS DIRECTLY BELOW STRUCTURE SHALL BE ALTERNATELY GROOVED AND PLAIN, SUCH THAT THE OUTER PANELS SHALL BE GROOVED.



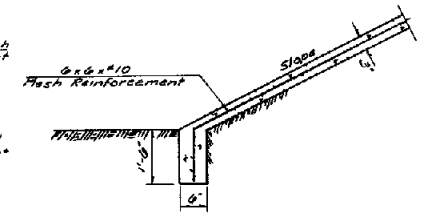
SECTION AT ABUTMENT



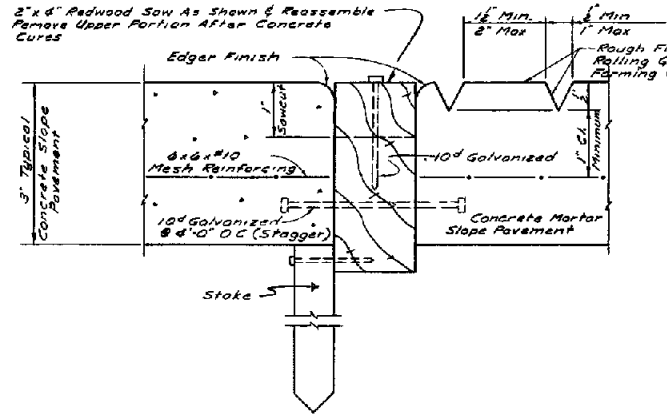
CUT-OFF AT EDGE OF SLOPE



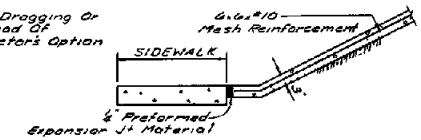
SECTION AT PIER



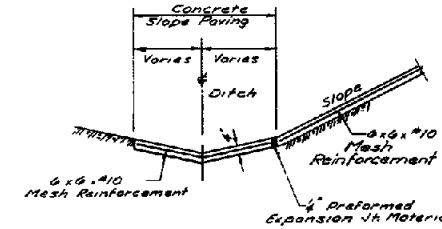
CUT-OFF AT TOE OF SLOPE



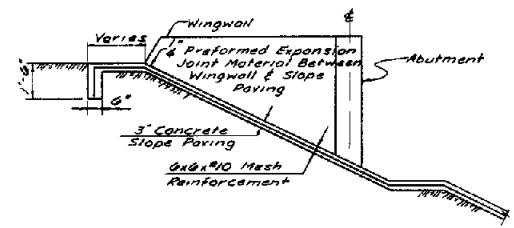
TYPICAL SECTION



SECTION AT SIDEWALK



SECTION AT DITCH



SECTION AT WINGWALL

NOTE 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 DESIGN SHEETS.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

CONCRETE SLOPE PAVING DETAILS

Hugh E. Bruner
CHIEF BRIDGE ENGR.

B-20 1 1-(81)
ADOPTED 11/75
REVISION 1

B-20