STANDARD PLANS

STATE OF CALIFORNIA
TRANSPORTATION AGENCY

DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

FEBRUARY, 1968

RONALD REAGAN
GOVERNOR

GORDON C. LUCE
ADMINISTRATOR—TRANSPORTATION AGENCY

ISSUED BY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

SAMUEL B. NELSON
Director of Public Works

J. A. LEGARRA
State Highway Engineer

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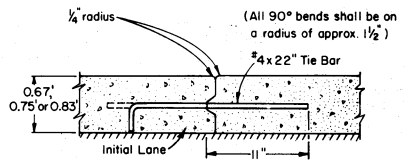
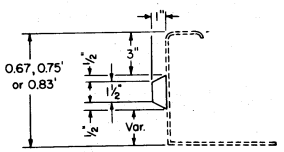
GENERAL ROAD WORK



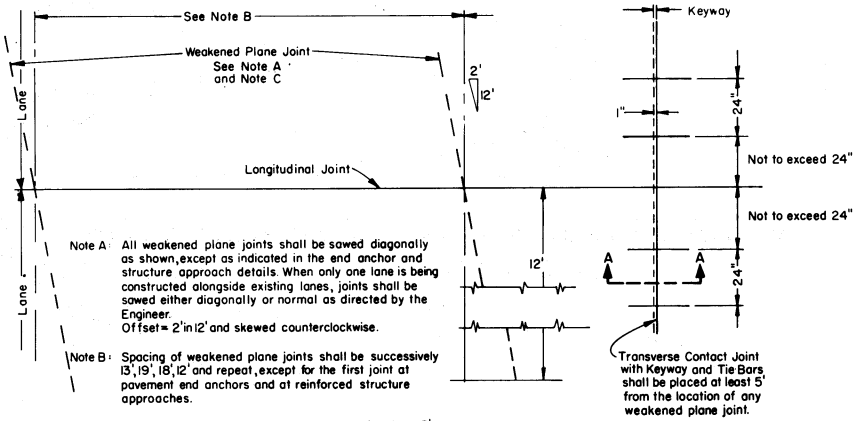
SECTION A-A
TIE BAR

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.



DETAIL OF METAL OR WOODEN INSERT TO BE PLACED ON FORM

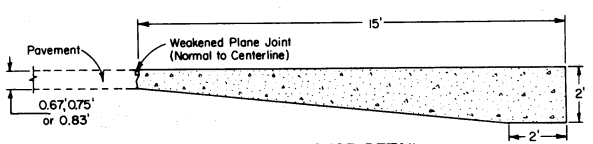


Note A: All weakened plane joints shall be sawed diagonally as shown, except as indicated in the end anchor and structure approach details. When only one lane is being constructed alongside existing lanes, joints shall be sawed either diagonally or normal as directed by the Engineer.
Offset = 2' in 12' 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.

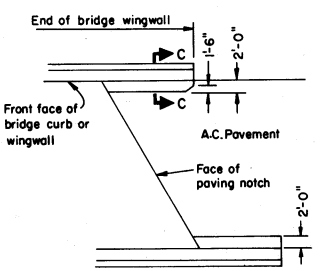
Note C: Weakened plane joints shall be constructed at least 5' from any transverse contact joint.

PLAN

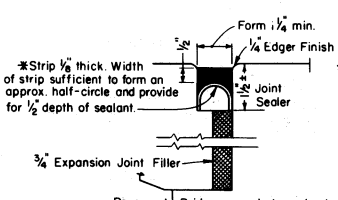


PAVEMENT END ANCHOR DETAIL

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.

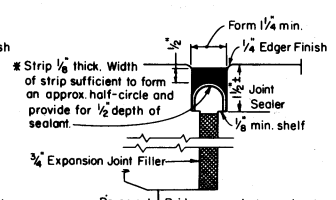


A.C. PAVEMENT APPROACHES



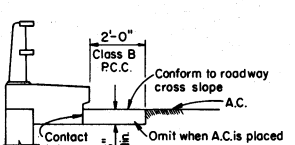
SEALED EXPANSION JOINT
Detail A

NOTE - To be used only when the bridge abutment does not provide the shelf shown on Detail B



SEALED EXPANSION JOINT
Detail B

* Strip material: See Standard Specifications or Special Provisions.



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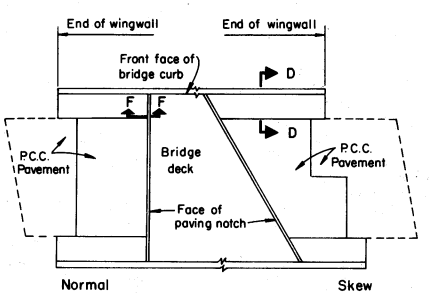


PLAN

P.C.C. PAVEMENT APPROACHES

To accompany plans dated _____

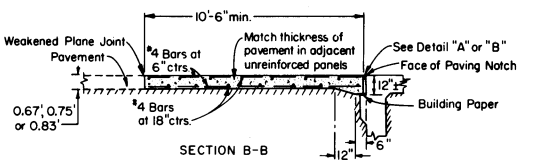
DISTRICT	COUNTY	ROUTE	P.M. Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Engineer of Design
Registered Civil Engineer No. 9837

Approved December 6, 1967

State Highway Engineer
Registered Civil Engineer No. 5645



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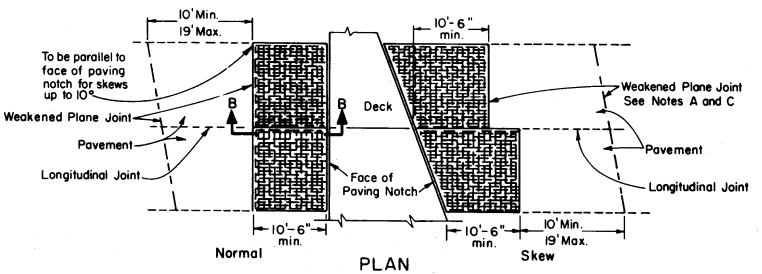
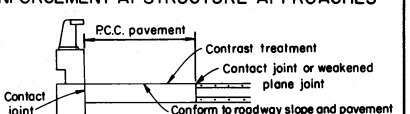
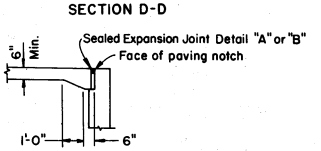


PLAN

DETAIL OF PAVEMENT REINFORCEMENT AT STRUCTURE APPROACHES



SECTION D-D



SECTION F-F

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

P.C.C. PAVING DETAILS AND BRIDGE APPROACHES

A35-7

A35-7

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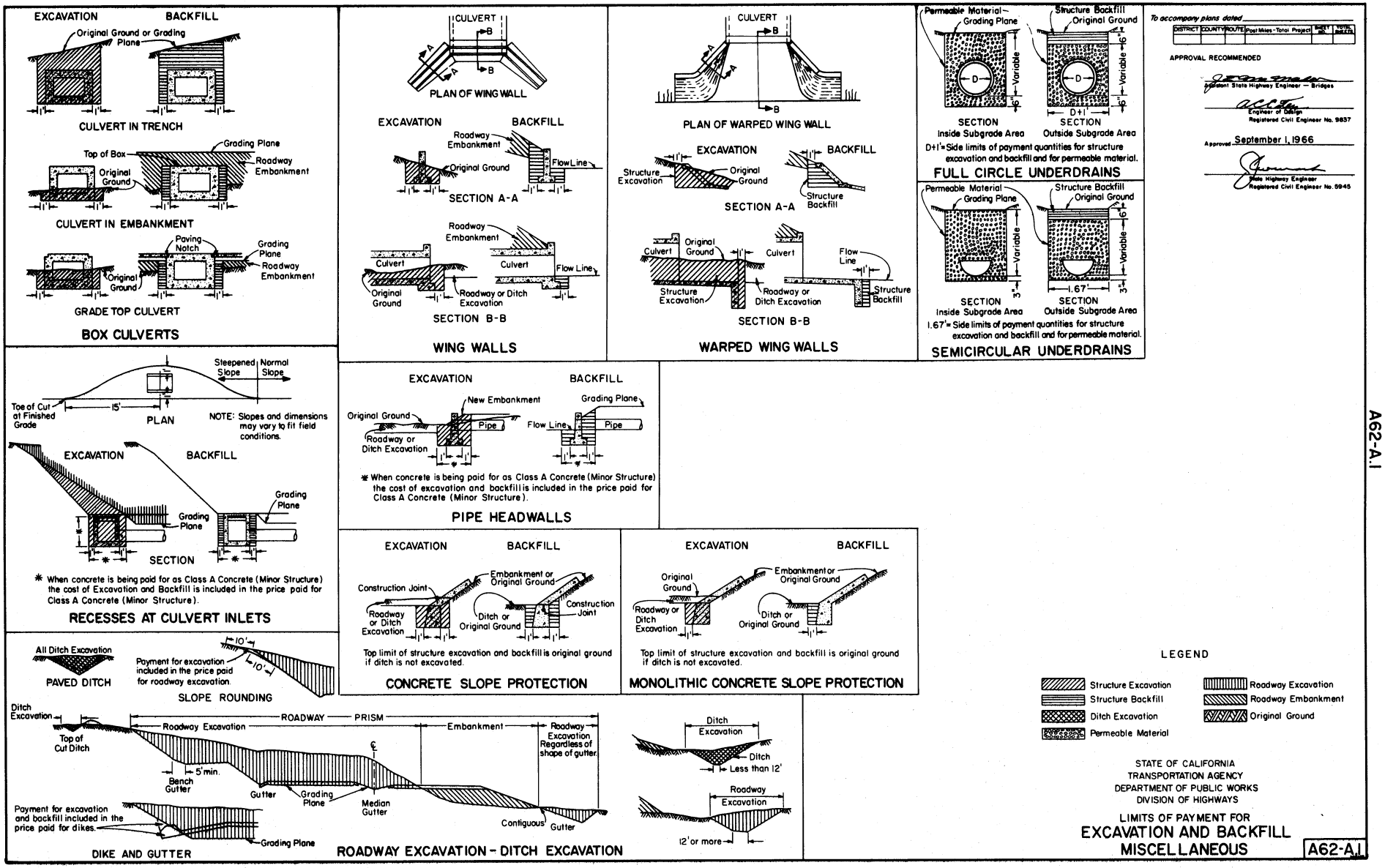

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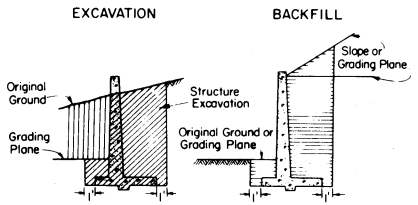
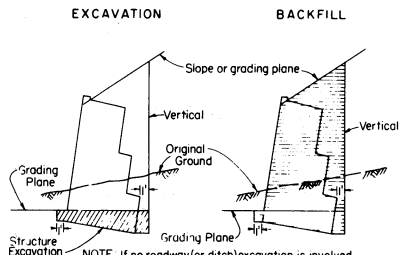


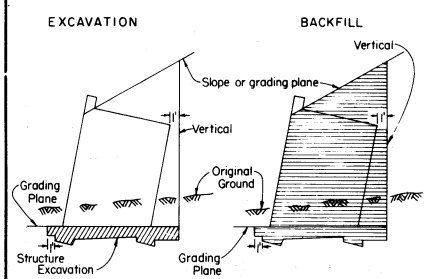
NOTE If no roadway excavation is involved at the wall, structure excavation will be measured from the original ground

RETAINING WALLS



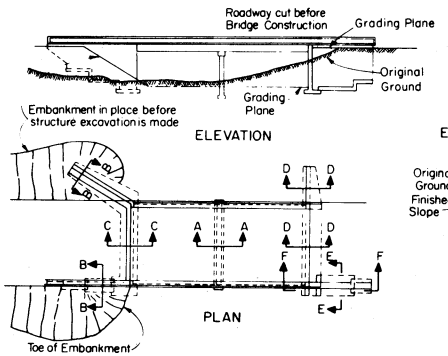
NOTE If no roadway (or ditch) excavation is involved at the wall, structure excavation will be measured from the original ground.

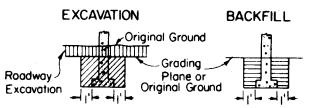
REINFORCED CONCRETE or TIMBER CRIB WALL



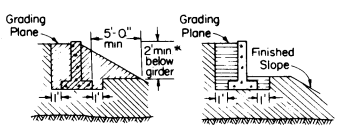
NOTE: If no roadway (or ditch) excavation is involved at the wall, structure excavation will be measured from the original ground.

METAL CRIB WALL



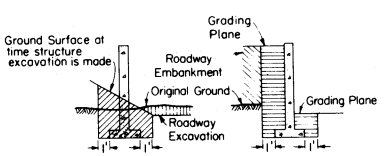


SECTION A-A

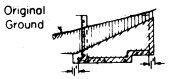


* or as shown on details

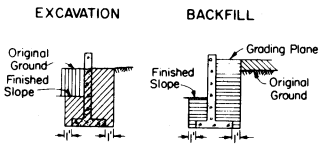
ABUTMENT IN EMBANKMENT
(Plan view not shown)



SECTION C-C
ABUTMENT IN ORIGINAL GROUND



SECTION F-F



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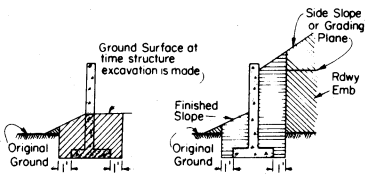
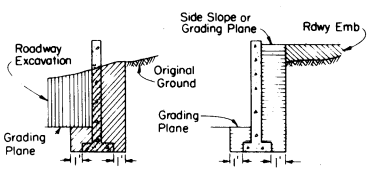


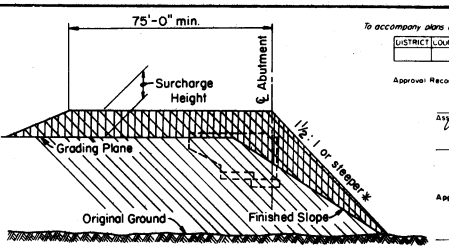
SECTION B-B



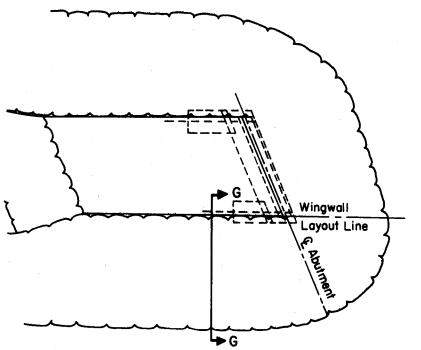
SECTION D-D

NOTES 1 If no roadway excavation or embankment is involved at bridge, structure excavation will be measured from the original ground
2 Quantities of pervious backfill material which are specified elsewhere and are within the limits of payment for structure backfill will not be included in the quantity of structure backfill to be paid for

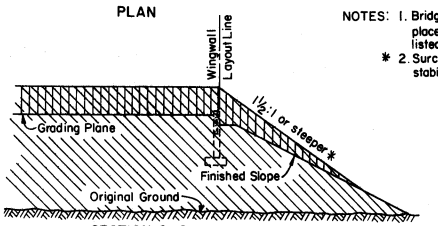
BRIDGE PIERS, ABUTMENTS & ADJOINING WING WALLS



ELEVATION



PLAN



SECTION G-G

NOTES: 1. Bridge embankment surcharges to be placed at locations and to the heights listed in the special provisions.
* 2. Surcharge slopes to be as steep as stability of material permits.

BRIDGE EMBANKMENT SURCHARGE

LEGEND

- Structure Excavation
- Structure Backfill
- Original Ground
- Roadway Excavation
- Roadway Embankment
- Bridge Embankment Surcharge

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	Sheet No.	Total Sheets

Approval Recommended

Assistant State Highway Engineer - Bridges

Engineer of Design
Registered Civil Engineer No. 9837

Approved November 28, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

LIMITS OF PAYMENT FOR

EXCAVATION AND BACKFILL BRIDGES AND WALLS

A62-B.2

A62-B.2

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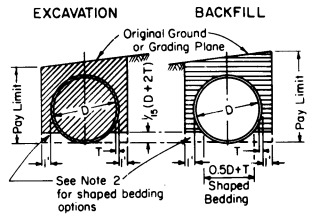
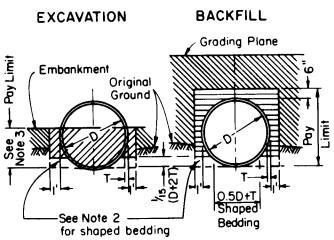


Pipes 42" diameter and less than 72" diameter with 50' or more depth of cover. Pipes 72" diameter and over, with any depth of cover.

SHAPED BEDDING

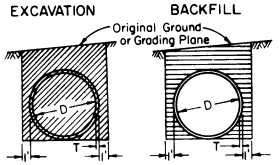
IN TRENCH



Pipes 42" diameter and less than 72" diameter with 50' or more depth of cover. Pipes 72" diameter and over, with any depth of cover.

SHAPED BEDDING

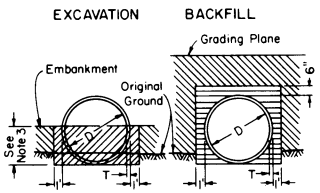
IN EMBANKMENT



Pipes less than 42" diameter. Pipes 42" diameter and less than 72" diameter with less than 50' depth of cover.

FLAT BEDDING

IN TRENCH

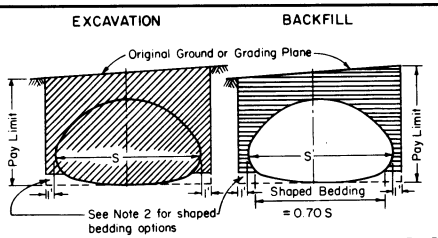


Pipes less than 42" diameter. Pipes 42" diameter and less than 72" diameter with less than 50' depth of cover. Rods and deadmen.

FLAT BEDDING

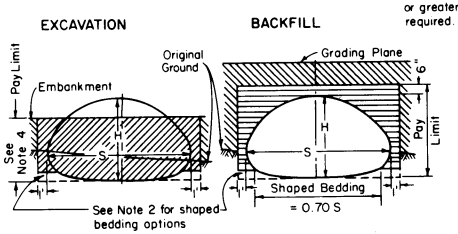
IN EMBANKMENT

CIRCULAR PIPES



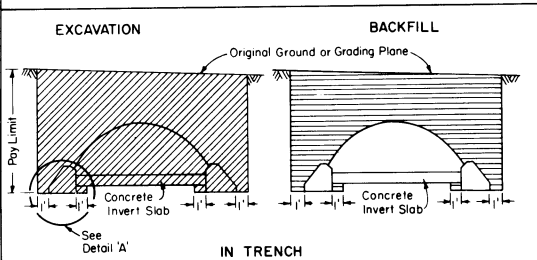
IN TRENCH

For Pipe arch, Structural plate pipe-arch and Vehicular underpass with S equal to or greater than 72", shaped bedding is required.

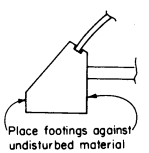


IN EMBANKMENT

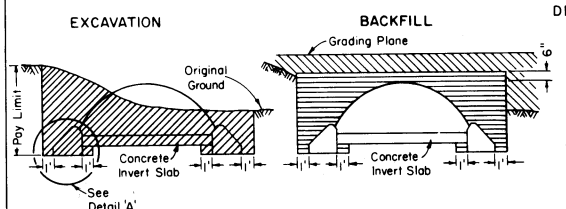
STRUCTURAL PLATE PIPE-ARCHES, AND VEHICULAR UNDERPASSES



IN TRENCH



DETAIL 'A'



IN EMBANKMENT

STRUCTURAL PLATE ARCHES

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

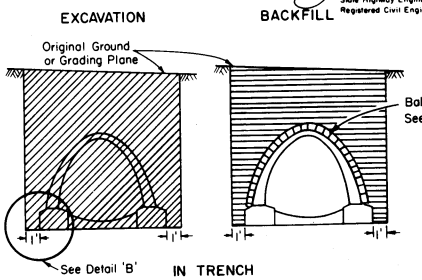
APPROVAL RECOMMENDED

Assistant State Highway Engineer — Bridges

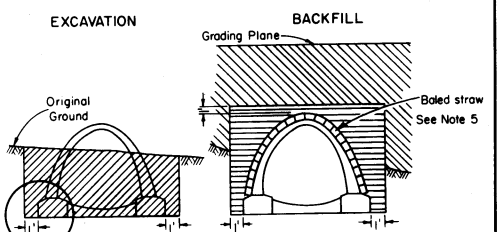
Engineer of Design
Registered Civil Engineer No. 9837

Approved May 5, 1967

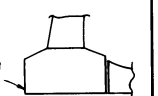
State Highway Engineer
Registered Civil Engineer No. 5945



IN TRENCH



IN EMBANKMENT



DETAIL 'B'

R.C. ARCH CULVERTS

NOTES

1. For payment quantities excavation and backfill concrete pipe, T = minimum wall thickness as shown in A.A.S.H.O. M170 for Class III Pipe, Wall A.
   For C.M.P. and S.P.P. T = 0.00
2. Shaped Bedding
   Option 1 – Provide shaped bedding in excavation.
   Option 2 – Excavate full depth, backfill and shape bedding in backfill material.
3. Embankment 6" above top of pipe for diameters of 24" and less. 30" minimum for diameters from 27" to 42" inclusive.
   $\frac{2}{3}$ D for diameters of 45" or more.
4. Embankment 6" above top of pipe, arch for height (H) less than 27". 30" minimum for height (H) from 27" to 57" inclusive.
   $\frac{1}{2}$ H for heights of 60" and over.
5. Depth of Baled straw = One bale in depth. Omit Baled straw where fill depth over crown is less than 30'.
6. Corrugated metal pipe-arches and structural plate pedestrian underpasses to be placed in flat bedding, pay limit is to the flow line of the pipe.
7. Diagrams for circular pipes, above, do not apply to overside drains.

LEGEND

- Structure Excavation
- Structure Backfill
- Baled Straw
- Roadway Excavation
- Roadway Embankment
- Original Ground

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

LIMITS OF PAYMENT FOR
EXCAVATION AND BACKFILL CULVERT, PIPE and ARCH

A62-C.2

A62-C.2

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DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

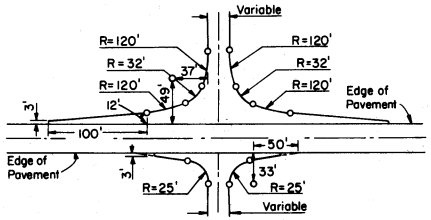
Traffic Engineer
Registered Civil Engineer No. 9618

Engineer of Design
Registered Civil Engineer No. 9837

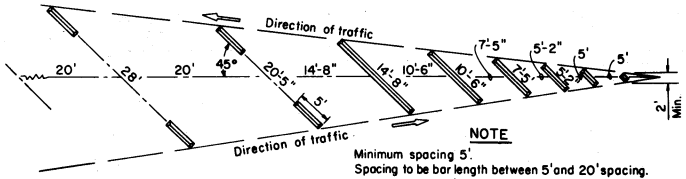
Approved December 20, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

PUBLIC ROAD INTERSECTION



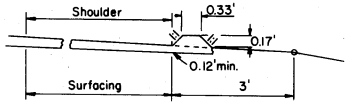
PRIVATE ROAD INTERSECTION



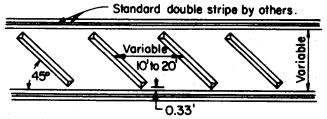
NOTE

Minimum spacing 5'.
Spacing to be bar length between 5' and 20' spacing.
When length is 15' or more a 5' bar shall be used at each end.

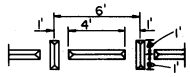
TRANSITION 2 TO 4 LANE



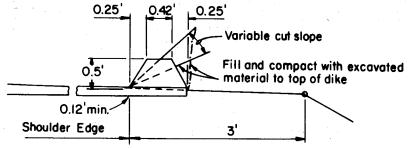
0.17' DIKE



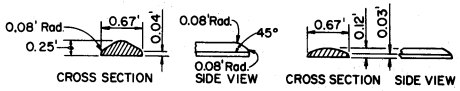
DIAGONAL RAISED BARS



T-TRAFFIC BARS

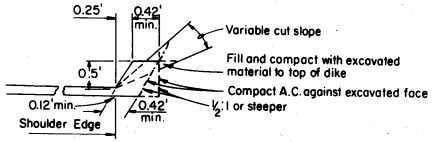


0.5' DIKE - TYPE A

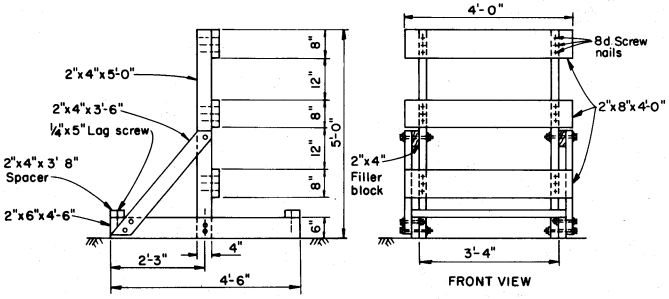


TYPE A TYPE B

RAISED TRAFFIC BARS



0.5' DIKE - TYPE B



END VIEW CLASS I FRONT VIEW

PORTABLE TIMBER BARRICADE

NOTE:

Where weight needed to resist overturning by wind use sand filled bags.
All timber to be S4S.
Use ⅜" Machine bolts with nuts and cut washers.
Use 8d. Screw nails for fastening 2"x8" horizontal boards to 2"x4" vertical posts.
Use ¼"x5" Lag screws for fastening 2"x4" spacer to 2"x6" bottom support.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TIMBER BARRICADE, RAISED TRAFFIC BARS, DIKES AND ROAD INTERSECTIONS

A73-6

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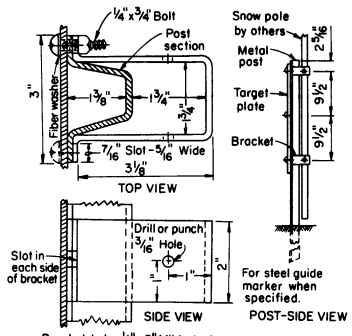
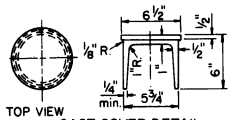
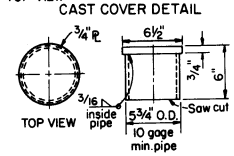
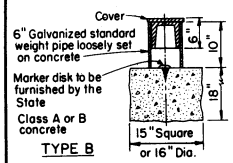
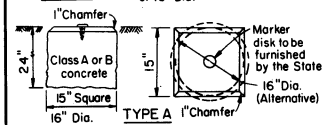


SNOW POLE BRACKET

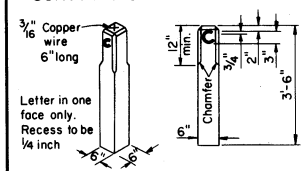




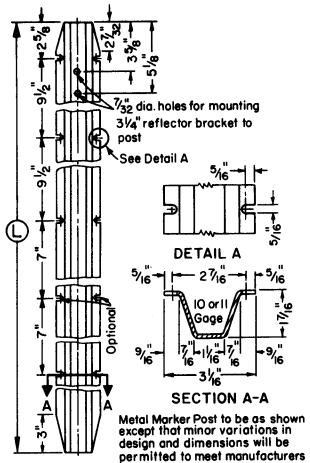




SURVEY MONUMENTS

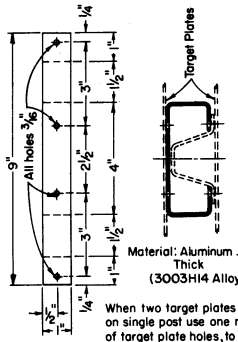


R/W AND ACCESS OPENING MONUMENTS



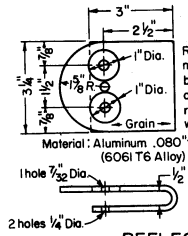
Metal Marker Post to be as shown except that minor variations in design and dimensions will be permitted to meet manufacturers standards.

METAL MARKER POST



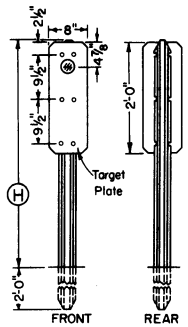
When two target plates are mounted on single post use one mount per set of target plate holes, to be attached with 3/16" blind aluminum rivets.

TWO PLATE POST MOUNT

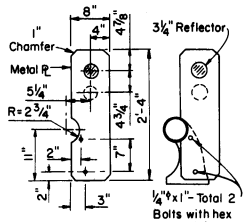


Reflector bracket used to mount 3 1/4" Reflector to back of Guide Marker Post on curves. Brackets and reflectors to be attached with 3/16" blind aluminum rivets.

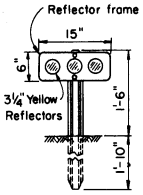
REFLECTOR BRACKET



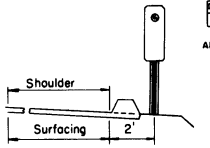
GUIDE MARKER



BRIDGE RAIL MARKER AND MILEPOST MARKER



HORIZONTAL REFLECTOR MARKER W6IR



MARKER AT DIKE

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

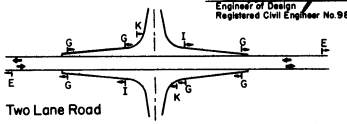
APPROVAL RECOMMENDED

Traffic Engineer
Registered Civil Engineer No. 9618

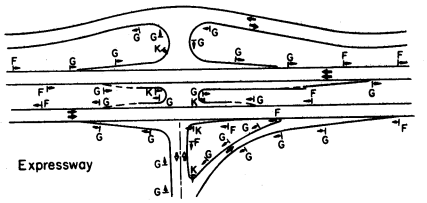
APPROVED December 20, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

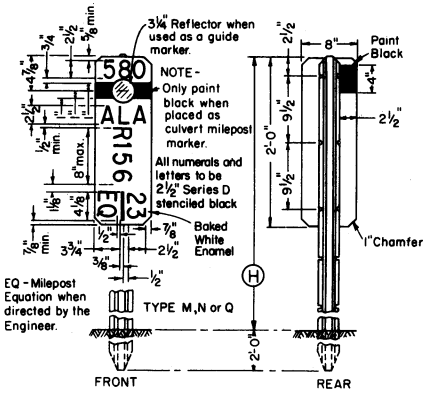
Engineer of Design
Registered Civil Engineer No. 9837



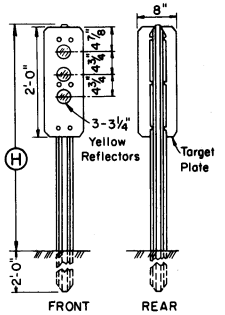
DELINEATION OF ROAD INTERSECTIONS



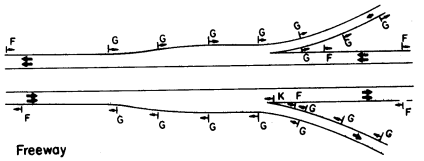
DELINEATION OF TRAFFIC ISLANDS



MILEPOST MARKER



CLEARANCE MARKER



Type F Markers with single 3 1/4" clear reflectors shall be installed at standard spacing on curves; On interstate routes the spacing shall not exceed 528' on level mainline sections as directed by the Engineer.

Type G Markers with double 3 1/4" reflectors shall be installed on right of acceleration and deceleration lanes and tangent ramp sections at 100' spacings and on outside of ramp curves at standard spacing as directed by the Engineer.

DELINEATION OF RAMPS

NOTE

(L) = 5'-0" when (H) is 3'-0".
(L) = 6'-0" when (H) is 4'-0"

(H) = 4'-0" Standard height.

(H) = 3'-0" Height when specified in the Special Provisions.

Reflectors to be center mounted.

Bridge Rail Markers to be coded Type E-Br.M, Type G-Br.M etc.

Milepost Markers to be coded Type M-MM or M-CMM etc. Type N-MM, Type Q-MM etc.

GUIDE MARKERS				
Type	Plate Height	REFLECTORS		
		COLOR	FRONT	BACK
A	2'-0"		None	None
E	2'-0"	Clear	1-3 1/4"	1-3 1/4"
F	2'-0"	Clear	1-3 1/4"	None
G	2'-0"	Yellow	2-3 1/4"	None
I	2'-0"	Yellow	2-3 1/4"	1-3 1/4"
Horizontal Reflector Marker W6IR				
K	0'-6"	Yellow	3-3 1/4"	None
Clearance Marker				
L	2'-0"	Yellow	3-3 1/4"	None
Milepost Marker - Culvert Milepost Marker				
M	2'-0"		None	None
N	2'-0"	Clear	1-3 1/4"	None
Q	2'-0"	Clear	1-3 1/4"	1-3 1/4"

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

MONUMENTS AND MARKERS | A74-13

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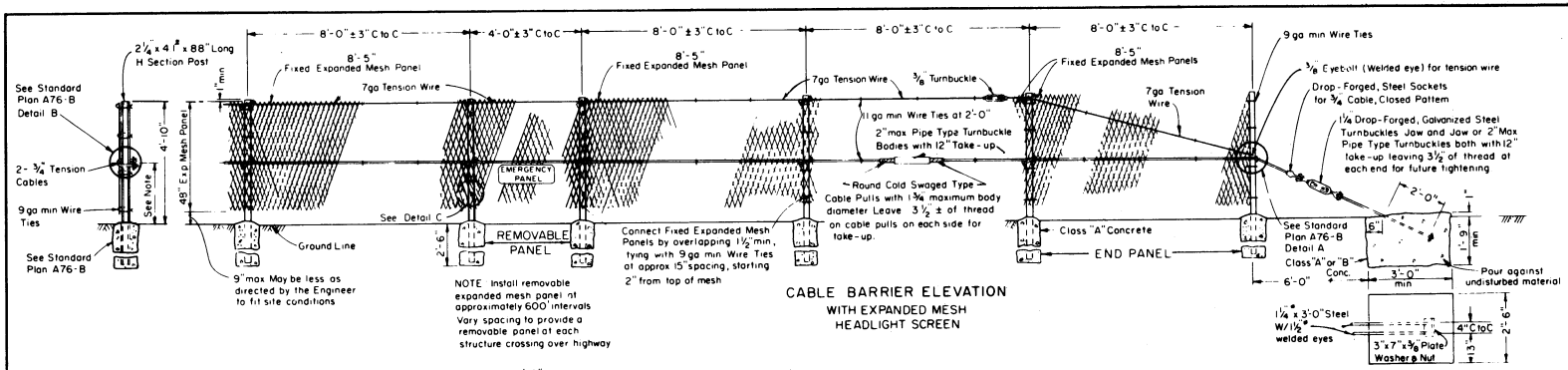
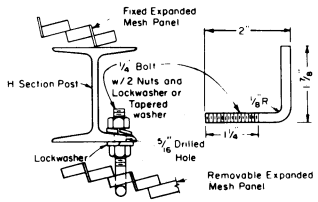
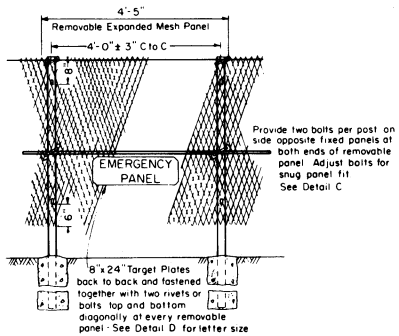


CABLE BARRIER ELEVATION
WITH EXPANDED MESH
HEADLIGHT SCREEN

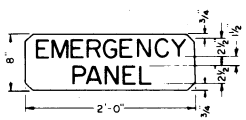
ANCHOR BLOCK PLAN



DETAIL C

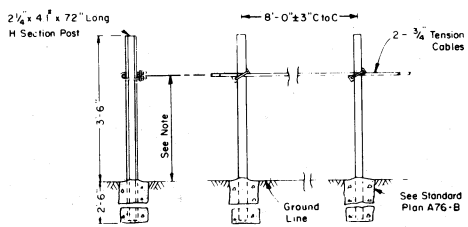


REMOVABLE EXPANDED MESH PANEL DETAIL



DETAIL D

NOTE Normal height 2'-3" to 2'-4", 2'-6" for special cases where directed by the Engineer



CABLE BARRIER
WITHOUT EXPANDED MESH
HEADLIGHT SCREEN

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Mile	Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Traffic Engineer
Registered Civil Engineer No. 9818

Approved November 27, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

CABLE BARRIER

A76-A.2

A76-A.2

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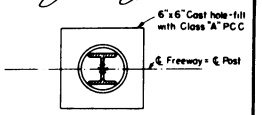
To Accompany Plans Dated _____

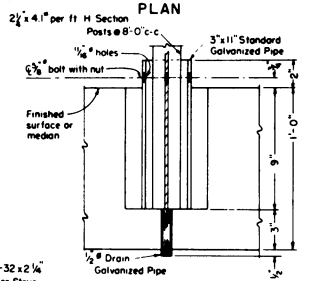
DISTRICT	COUNTY	ROUTE	Post Miles — Total Project	Sheet No.	Total Sheets

Traffic Engineer
Registered Civil Engineer No. 9618
Approved November 27, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

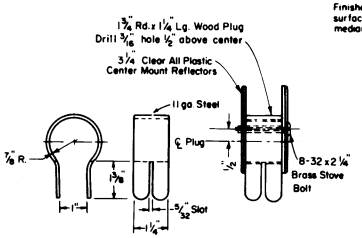


PLAN

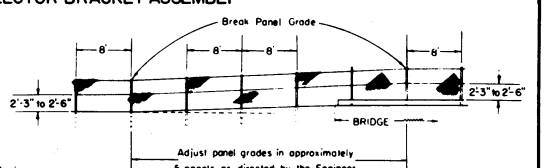


ELEVATION

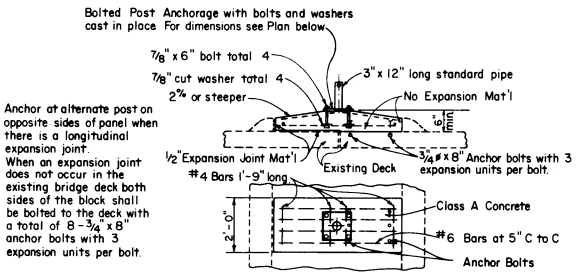
POST ANCHORAGE FOR NEW STRUCTURES



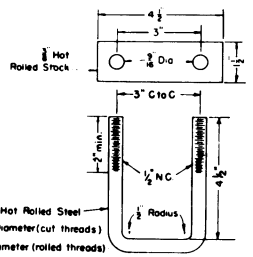
REFLECTOR BRACKET ASSEMBLY



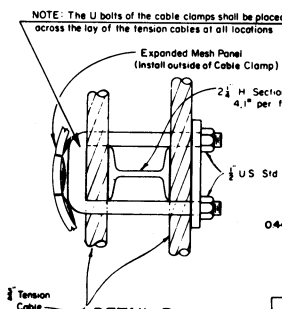
TRANSITION
MEDIAN GRADE TO MEDIAN CURB ON BRIDGE DECK



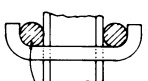
CONCRETE PAD ANCHORAGE FOR EXISTING STRUCTURES
(Use only with curbed median)



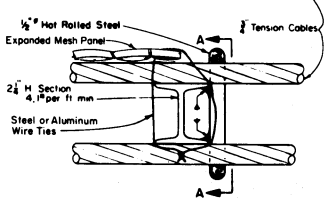
CABLE CLAMP DETAIL



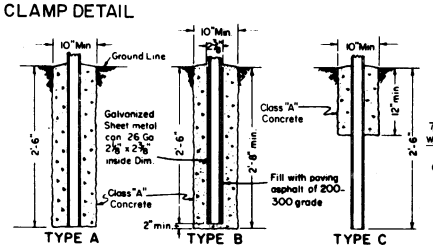
DETAIL B
LINE POST ASSEMBLY



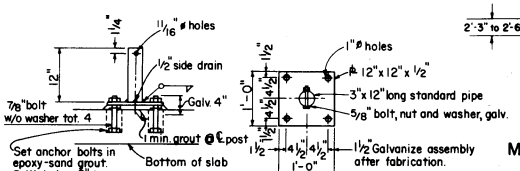
SECTION A-A



DETAIL A
END POST ASSEMBLY

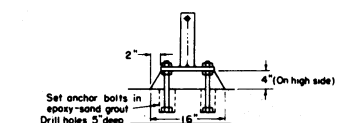


POST FOOTINGS



ELEVATION PLAN

BOLTED POST ANCHORAGE FOR EXISTING STRUCTURES
(When longitudinal joint is located on ℄ of freeway offset anchorage 9")



CURB ON STRUCTURE
(To be used only when drainage is across median)

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

CABLE BARRIER

A76-B.1

A76-B.1

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GENERAL NOTES

Except where noted, cut washers are required at all bolt installations where nut or bolt head would bear on wood or metal rail.

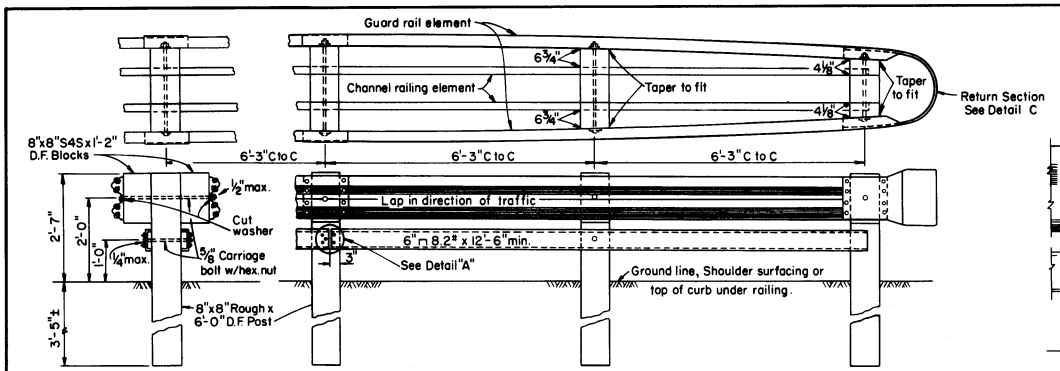
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Traffic Engineer
Registered Civil Engineer No. 9618

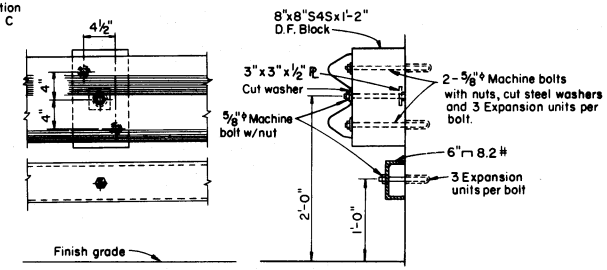
APPROVED November 27, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

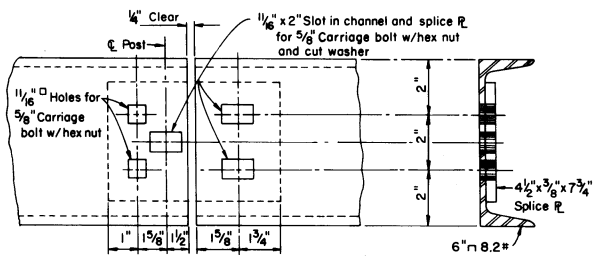


All nuts shown to be hex and placed on outside except rail splice bolts.

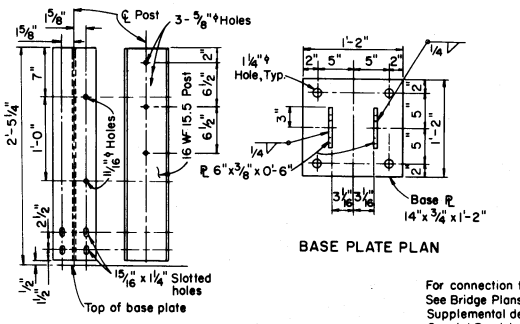
DOUBLE METAL BEAM BARRIER



DETAIL B
(Used only when necessary)

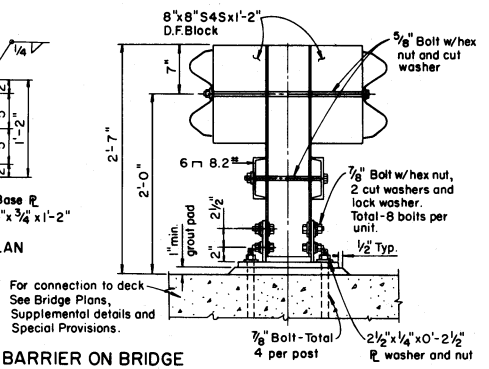


DETAIL "A" OF BOTTOM RAIL SPLICE
(Rail splices to occur at posts only)

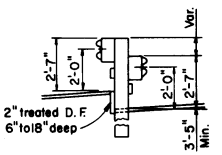


POST DETAILS

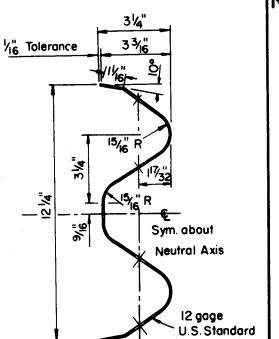
BASE PLATE PLAN



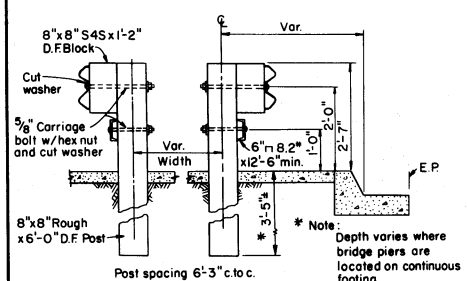
DOUBLE METAL BEAM BARRIER ON BRIDGE



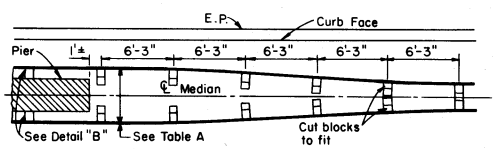
SAW TOOTH INSTALLATIONS



SECTION THRU RAIL ELEMENT



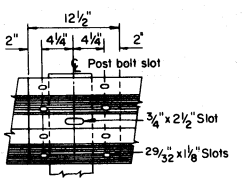
SINGLE METAL BEAM BARRIER



METAL BEAM BARRIER OBSTRUCTION DEFLECTOR
PLAN AT BRIDGE PIERS OR MEDIAN OBSTRUCTIONS

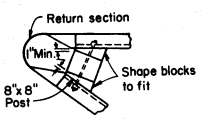
TABLE A

Median Width Ft.	Deflector Width-Ft.
22	6
23	7
24	8
25	9
26 and over	10



5/8"x1¼" Button head oval shoulder bolts with 1¼" recessed hex. nuts-Total: 8 per splice and 4 per terminal section.

RAIL SPLICE



DETAIL C

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

METAL BEAM BARRIER A77-A.2

A77-A.2

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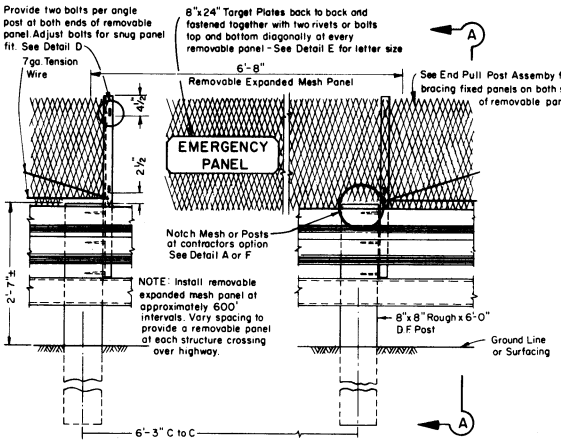
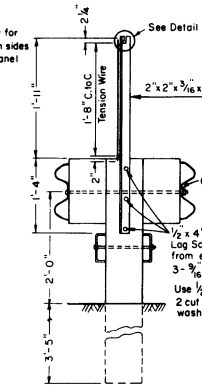
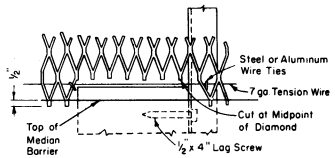


REMOVABLE EXPANDED MESH PANEL DETAIL

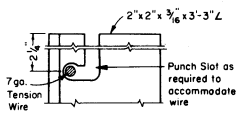


SECTION A-A

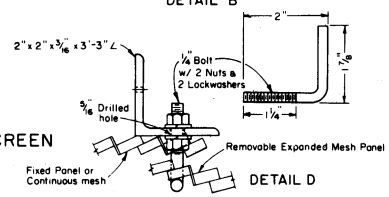
HEADLIGHT GLARE SCREEN



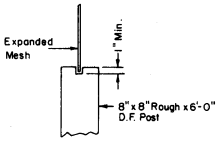
DETAIL A



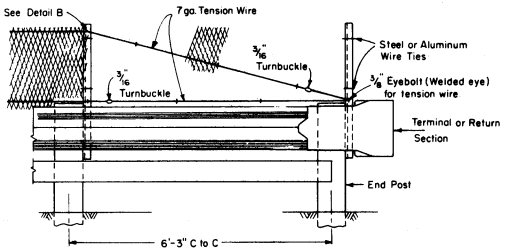
DETAIL B



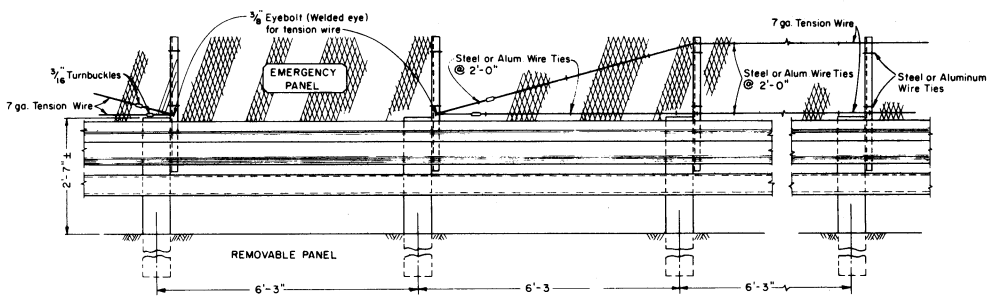
DETAIL D



DETAIL F

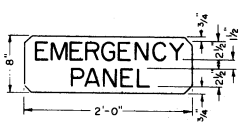


END PULL POST ASSEMBLY FOR HEADLIGHT GLARE SCREEN



ELEVATION
HEADLIGHT GLARE SCREEN

Mesh joints shall occur at angle iron supports and shall overlap at least 2 diamonds.



DETAIL E

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Traffic Engineer
Registered Civil Engineer No. 9618

Approved November 27, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

METAL BEAM BARRIER A77-B.2

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DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

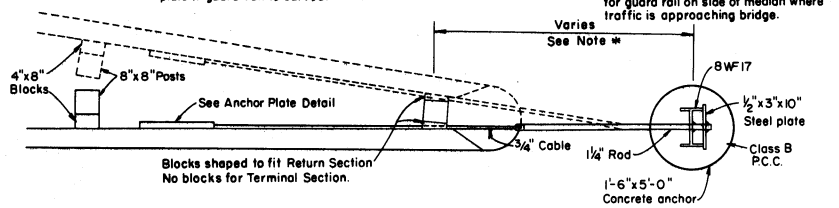
Traffic Engineer
Registered Civil Engineer No. 9618

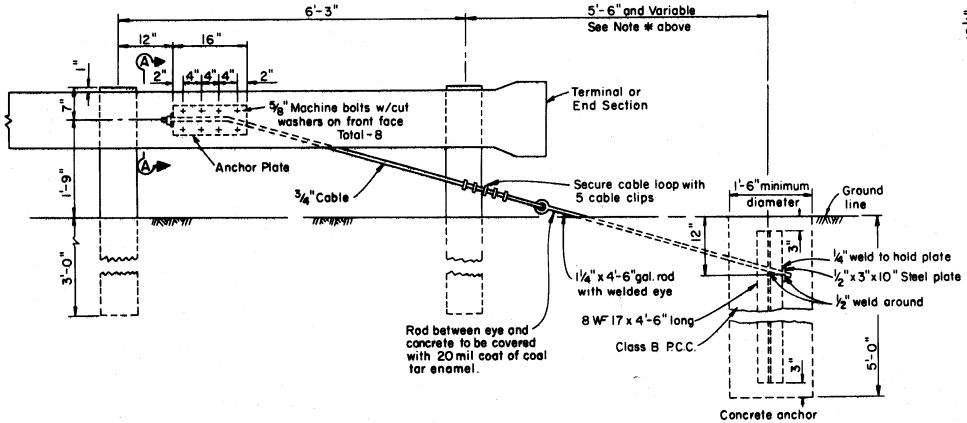
APPROVED November 27, 1967

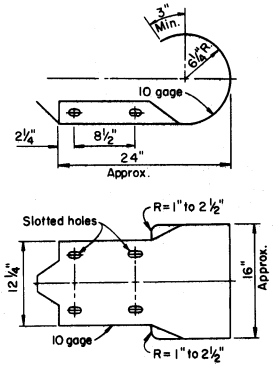
State Highway Engineer
Registered Civil Engineer No. 5645

Note:
Cable to be parallel to guard rail for straight runs of rail. Cable may have angle point at anchor plate if guard rail is curved.

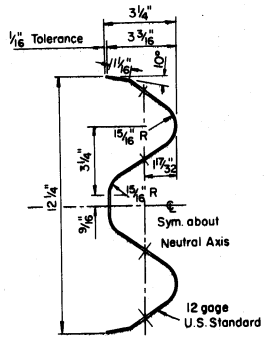
* NOTE: 5'-6" with terminal section. May be less with return sections if separate rods connect to concrete anchor. For Type 3 Flare, anchorage is only required for guard rail on side of median where traffic is approaching bridge.



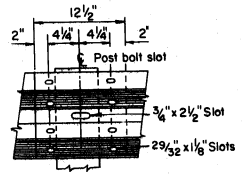




TERMINAL SECTION

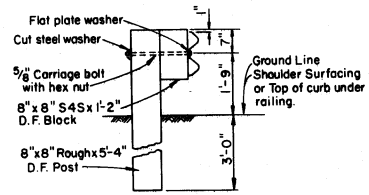


SECTION THRU RAIL ELEMENT

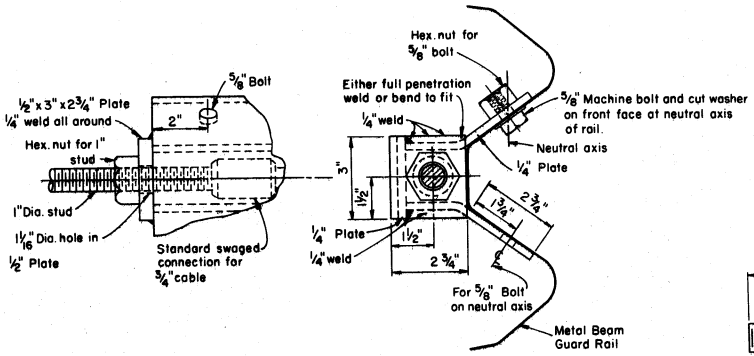


5/8"x1 1/4" Button head oval shoulder bolts with 1/4" recessed hex. nuts - Total: 8 per splice and 4 per terminal section.

RAIL SPLICE

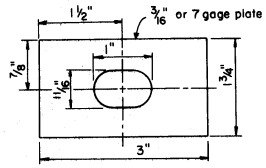


Typical post spacing 6'-3" C. to C.

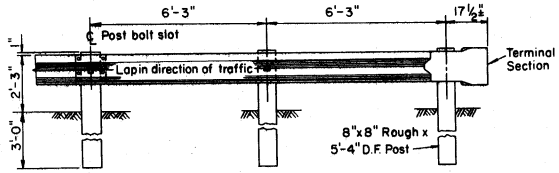


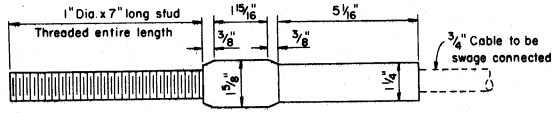
SECTION A-A

ANCHOR PLATE DETAILS



FLAT PLATE WASHER





STANDARD SWAGED FITTING AND STUD

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

METAL BEAM GUARD RAILING AND CABLE END ANCHORS

A77-C

A77-C

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To accompany plans dated

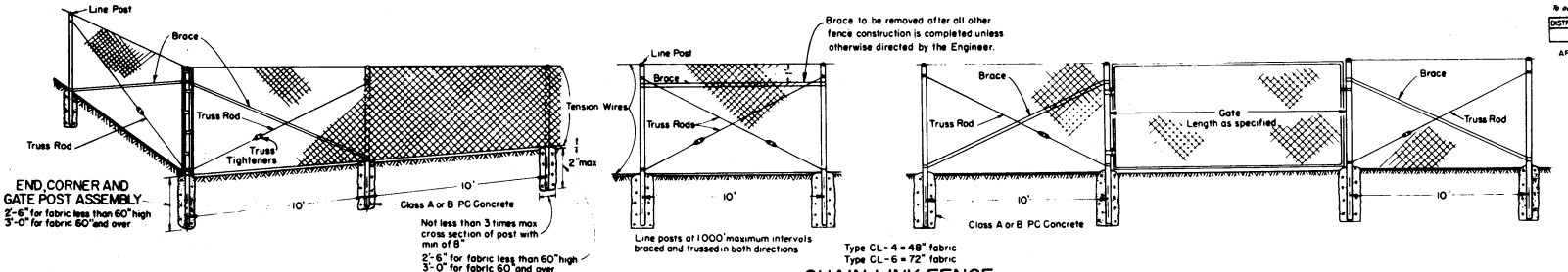
DISTRICT	COUNTY	ROUTE	Post Miles – Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

Engineer of Design
Registered Civil Engineer No. 9837

APPROVED September 1, 1966

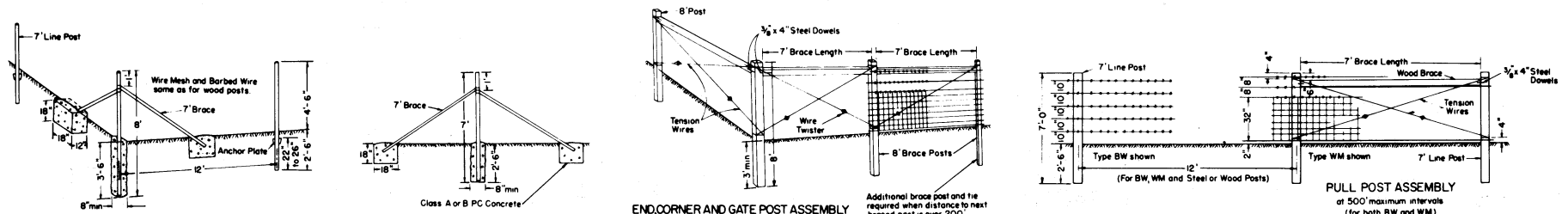
State Highway Engineer
Registered Civil Engineer No. 5945



Type CL-4 = 48" fabric
Type CL-6 = 72" fabric

CHAIN LINK FENCE

FREEWAY OR PROPERTY

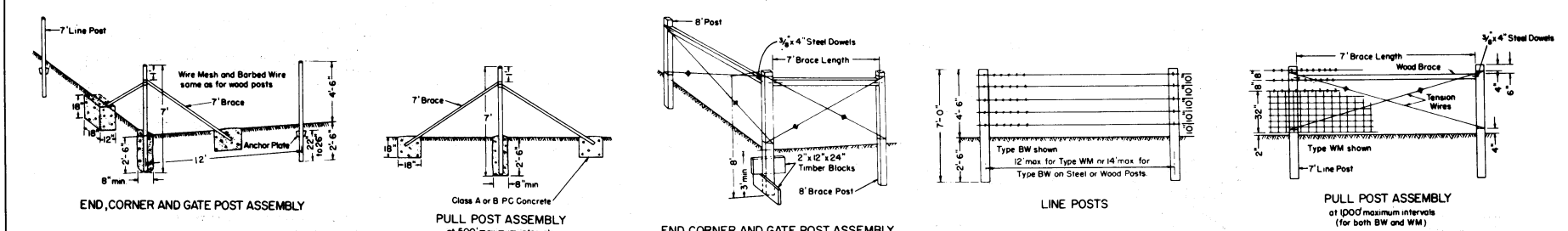


METAL POST INSTALLATION

Type BW = 5 lines of barbed wire
Type WM = Wire mesh and 3 lines of barbed wire

FREEWAY FENCE

WOOD POST INSTALLATION

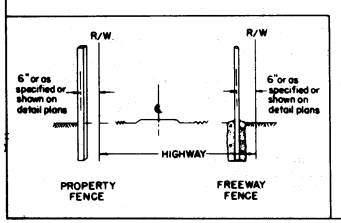


METAL POST INSTALLATION

Type BW = 5 lines of barbed wire
Type WM = Wire mesh and 3 lines of barbed wire

PROPERTY FENCE

WOOD POST INSTALLATION



STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

FENCES

A78-2

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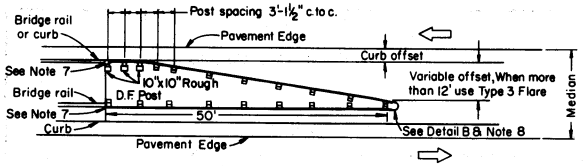
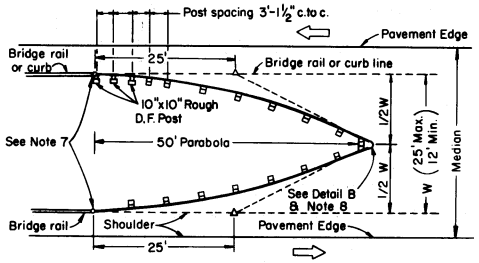


TYPE 4 FLARE



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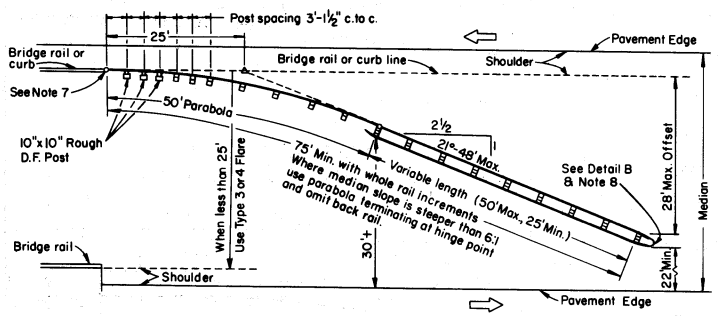
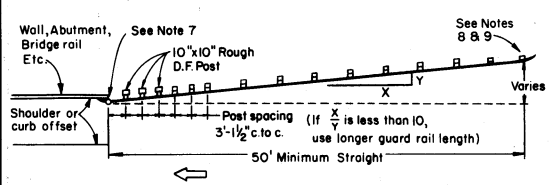
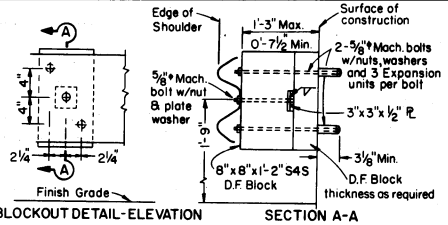


TYPE 2 FLARE



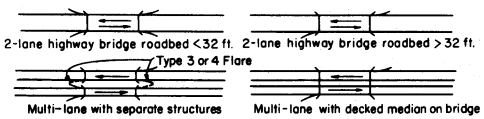
TYPE 1 FLARE

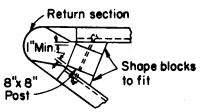
SHOULDER ENCROACHMENTS (RT. or LT.)



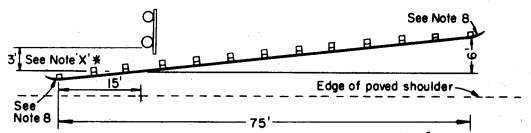
BLOCKOUT DETAIL-ELEVATION SECTION A-A

METAL BEAM RAIL OBSTRUCTION DETAIL A





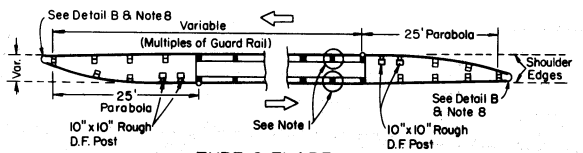
DETAIL B



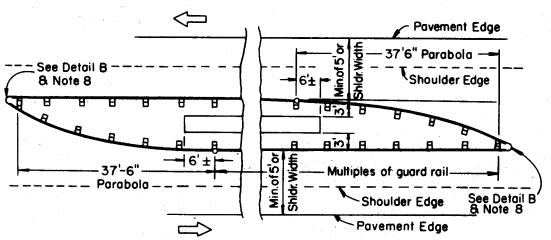
* NOTE 'X': When 3' offset causes rail to encroach on shoulder install guard rail at edge of shoulder.

TYPE 7 FLARE

SHOULDER INSTALLATION AT SIGN STANDARDS



TYPE 6 FLARE



TYPE 5 FLARE

MEDIAN INSTALLATION AT BRIDGE AND/OR SIGN STANDARDS

Where clearance shown cannot be obtained use Type 6 Flare.

GENERAL NOTES

1. Use timber shims without posts where rail to pier clearance is less than 15" (See Detail A)
2. On median installations where footing is between 2' and 3' of surface, post may be embedded less than 3' but not less than 2'. When footings are less than 2' from surface, attach to piers using Detail A
3. All posts and blocks to be as shown on Standard Plan A77 except as noted.
4. All guard rail post spacing to be 6'-3" center to center except as noted.
5. Height of rail 27" above ground and parallel to grade of shoulder.
6. Direction of traffic indicated by arrow ⇨
7. For connection details see Standard Plan A79-C or A79-D.
8. For cable anchor details see Standard Plan A77-C
9. For embankments steeper than 6:1, place endpost at hinge point see Standard Plan A79-B.
10. Use Type 8 Flare where obstruction is at least 3' from both shoulder edges. Use Type 9 Flare where clearance is available to one shoulder edge only. Otherwise, Use Type 10 Flare.

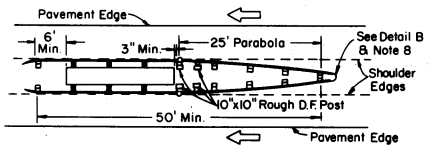
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

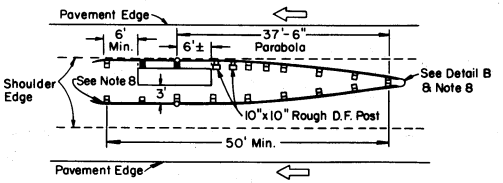
Traffic Engineer
Registered Civil Engineer No 9618

APPROVED November 27, 1967

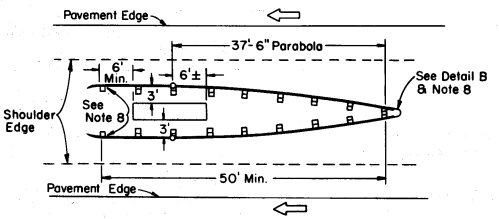
State Highway Engineer
Registered Civil Engineer No 5645



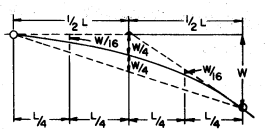
TYPE 10 FLARE



TYPE 9 FLARE



TYPE 8 FLARE



TYPICAL PARABOLIC LAYOUT

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

GUARD RAIL FLARES

A79-A.I

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To accompany plans dated _____

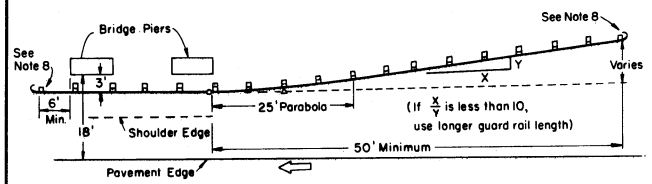
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Traffic Engineer
Registered Civil Engineer No. 9618

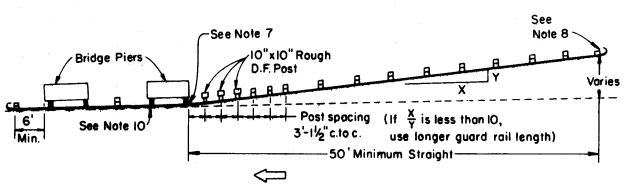
Approved November 27, 1967

State Highway Engineer
Registered Civil Engineer No. 5645



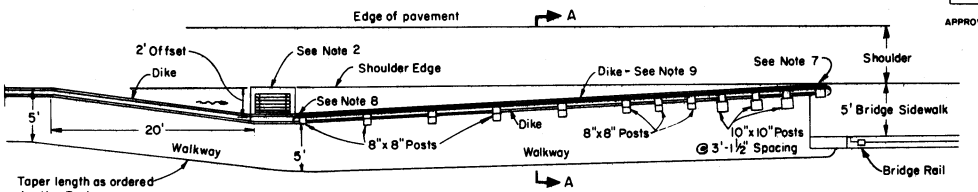
Use where obstruction is at least 18' from edge of pavement.

TYPE 12 FLARE

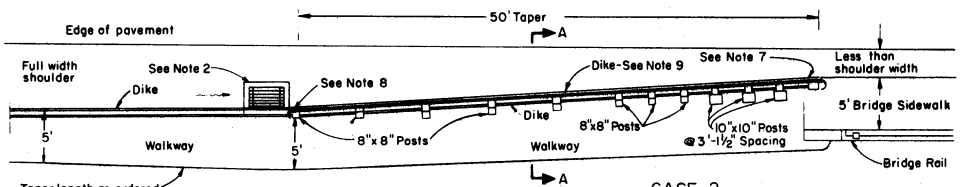


Use where obstruction is less than 18' from edge of pavement.

TYPE 11 FLARE



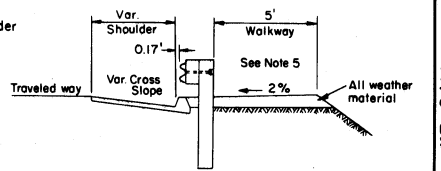
CASE 1
Full Width Bridge Shoulder



CASE 2
Partial Width Bridge Shoulder

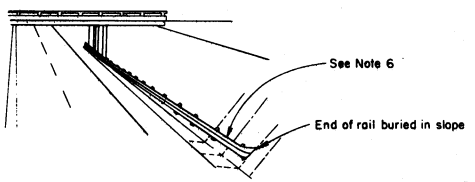
NOTES:

1 - For guard rail details see Standard Plan A77-C
2 - Depress grate 0.2 foot.
3 - Walkway outside edge of shoulder to be paved when shown on Typical Cross Section.
4 - Guard rail post spacing to be 6'-3" center to center.
5 - Countersink nut and washer and ends of bolts shall be flush with post.
6 - Top of rail to be 27" above ground.
7 - For connection details, see Standard Plan A79-C or A79-D.
8 - For cable end anchor, see Standard Plan A77-C.
9 - When necessary to place dike in front of guard rail, only the 0.17' high dike may be used.
10 - Use timber shims without posts where rail to pier clearance is less than 15", see Standard Plan A79-A (Detail "A")

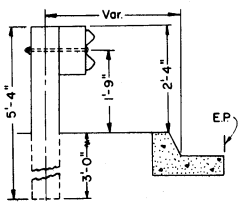


SECTION A-A
(Both Cases)

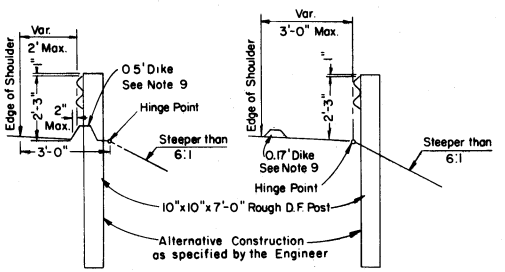
PEDESTRIAN WALKWAY APPROACH TO BRIDGE SIDEWALK



GUARD RAIL IN CUT

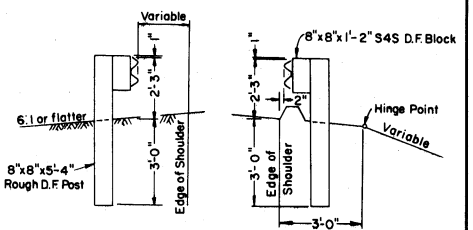


METAL BEAM GUARD RAILING AT CURB



For anchor details see Standard Plan A77-C

TERMINAL POSTS IN FILL SLOPES STEEPER THAN 6:1



For dike details see Standard Plan A73

LINE POSTS
6'-3" C to C

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

GUARD RAIL FLARES AND MISCELLANEOUS GUARD RAIL DETAILS

A79-B.1

A79-B.1

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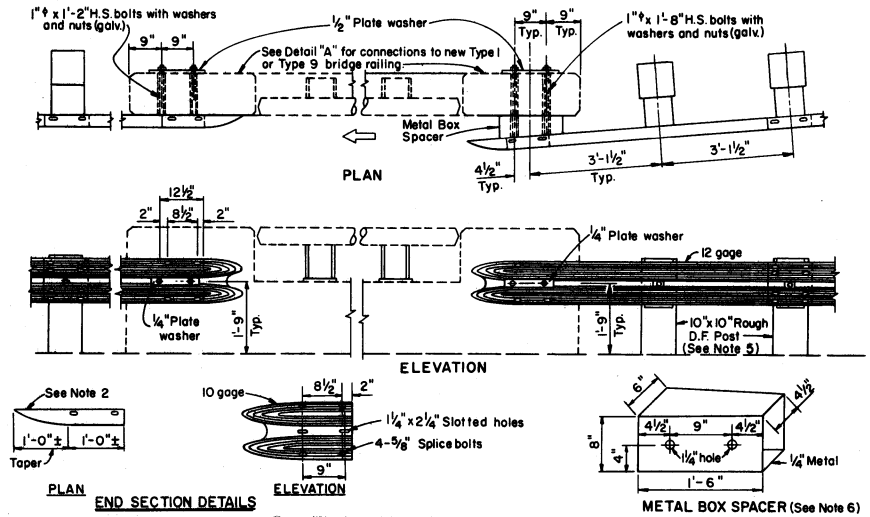

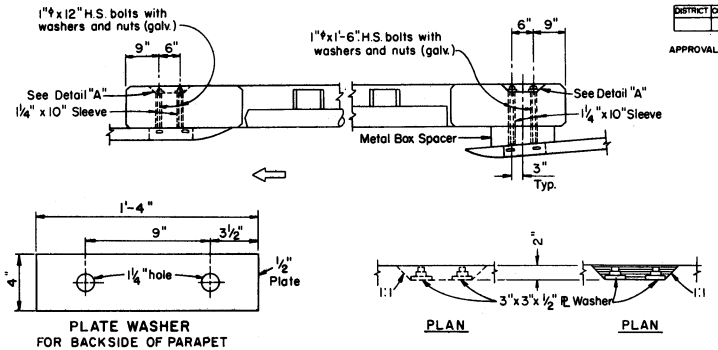

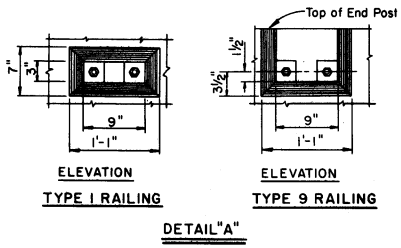

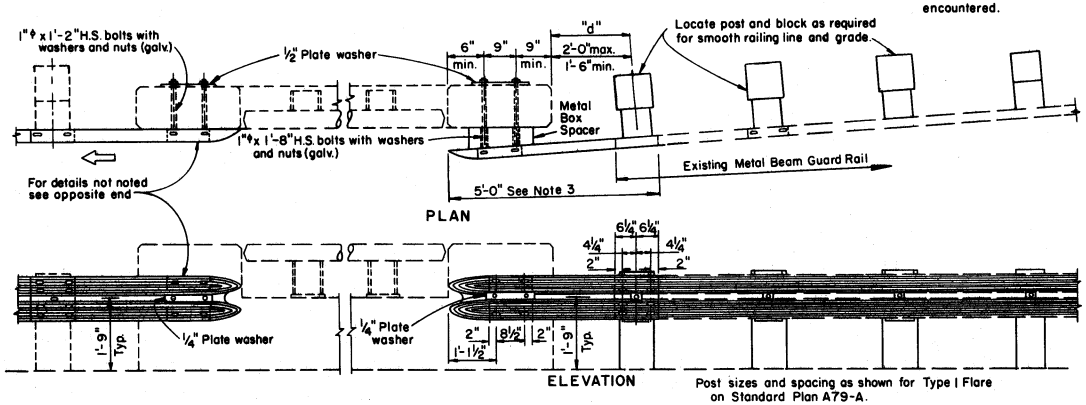

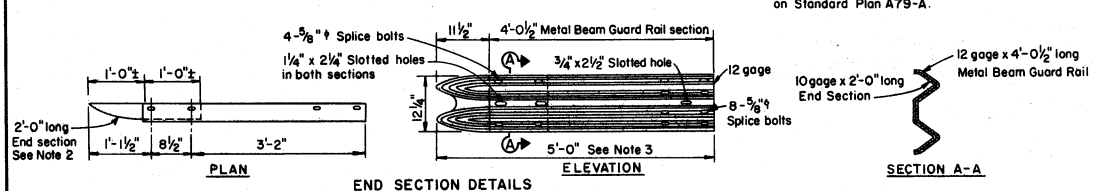

EXISTING STRUCTURE AND EXISTING GUARD RAIL

DISTRICT	COUNTY	ROUTE	Post Miles-Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Traffic Engineer
Registered Civil Engineer No. 9618

APPROVED November 27, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

GENERAL NOTES

1. These connection details apply to bridge rails, abutments, piers, retaining walls and other flat surface concrete objects.
2. End sections may be cut from standard terminal sections or fabricated.
3. The 5'-0" end section makes provision for a variable dimension "d". If the limits are exceeded at existing installations the Metal Beam Guard Rail end section must be modified to fit:
4. Direction of traffic indicated by ⇨
5. For post size and spacing See Type I Flare on Standard Plan A79-A.
6. When metal box spacer is installed, place 1 1/4" x 5" and 1 1/4" x 4" pipe spacers on 1" bolts passing through interior of box.

SPECIAL DETAILS

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

GUARD RAIL CONNECTIONS TO BRIDGE RAILS, RETAINING WALLS, ABUTMENTS AND OTHER FLAT CONCRETE SURFACES

A79-C

A79-C

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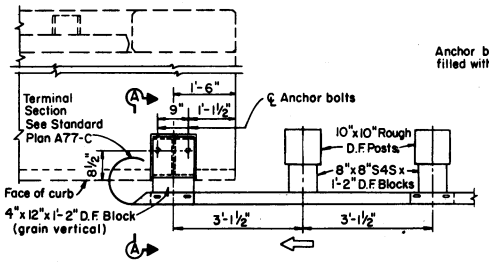
DISTRICT	COUNTY	ROUTE	Post Miles-Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

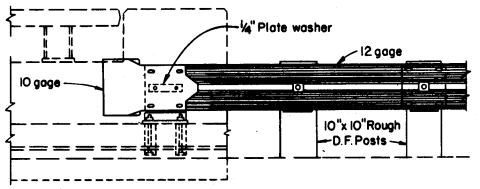
Traffic Engineer
Registered Civil Engineer No. 9618

APPROVED November 27, 1967

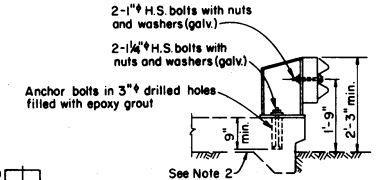
State Highway Engineer
Registered Civil Engineer No. 5645



PLAN



ELEVATION



SECTION A-A

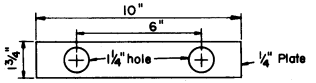
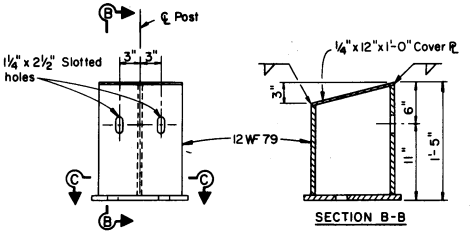


PLATE WASHER

DETAIL A

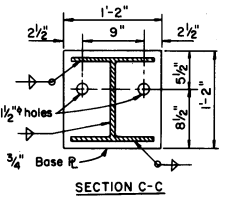


ASSEMBLY

SECTION B-B

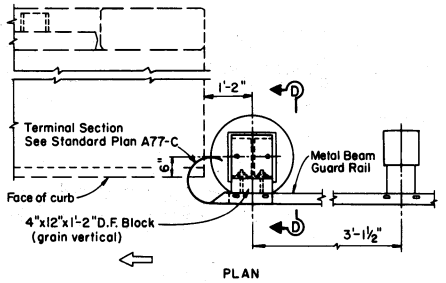
Note:
Rail post assembly to be galvanized after fabrication.

When sidewalk depth is less than 9" use Detail B.

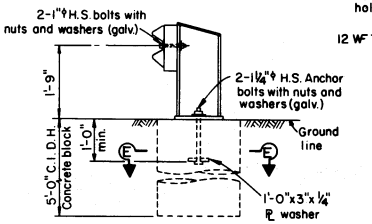


SECTION C-C

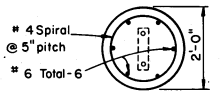
RAIL POST DETAILS



PLAN

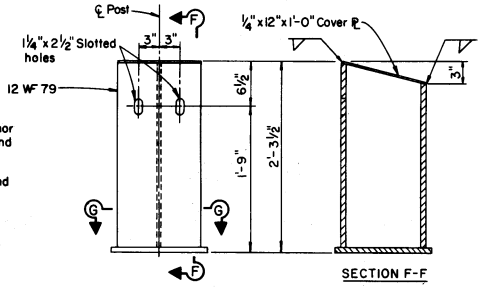


SECTION D-D



SECTION E-E

DETAIL B

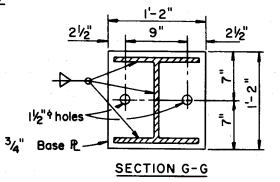


ASSEMBLY

SECTION F-F

Note:
Rail post assembly to be galvanized after fabrication.

Use these details only when sidewalk depth is less than 9".



SECTION G-G

RAIL POST DETAILS

GENERAL NOTES

1. These details apply to upstream traffic end of bridges. For downstream side, use flush bridge rail connection shown on Standard Plan A79-C.
2. When curb or sidewalk depth is less than 9", use Detail B.
3. Direction of traffic indicated by ⇨

SPECIAL DETAILS

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

GUARD RAIL CONNECTIONS TO BRIDGE SIDEWALKS AND CURBS

A79-D

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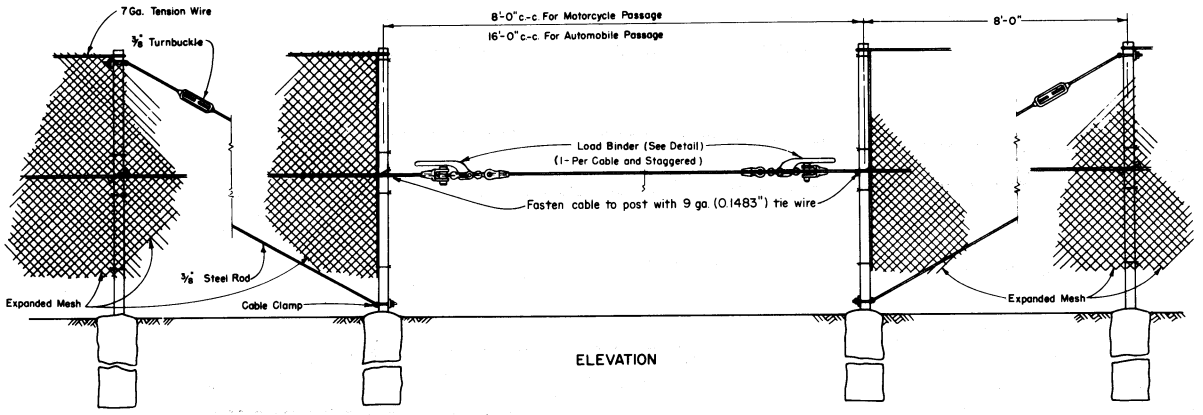


PASSAGEWAY IN CABLE MEDIAN BARRIER

To accompany plans dated _____

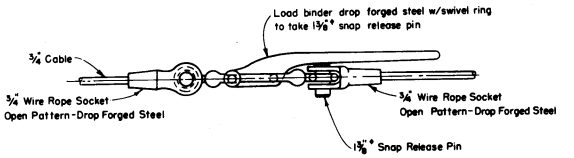
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	NO. SHEETS

Engineer of Design
Registered Civil Engineer License No. 9837

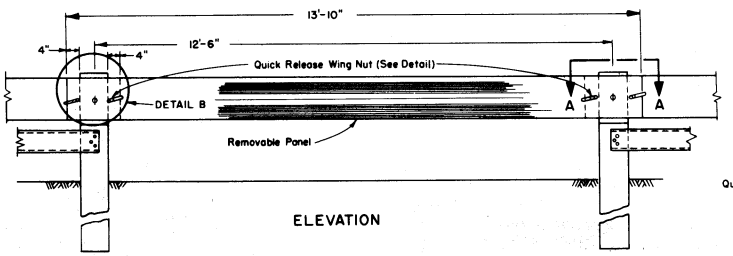
Traffic Engineer
Registered Civil Engineer License No. 8586

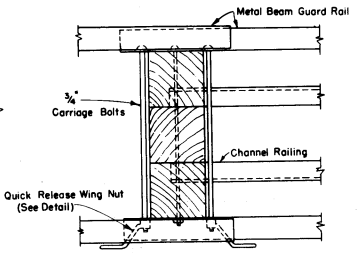
Approved September 1, 1966

State Highway Engineer
Registered Civil Engineer License No. 5945

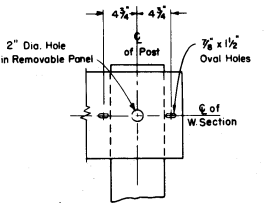


LOAD BINDER CABLE RELEASE

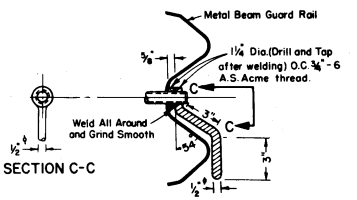




SECTION A-A



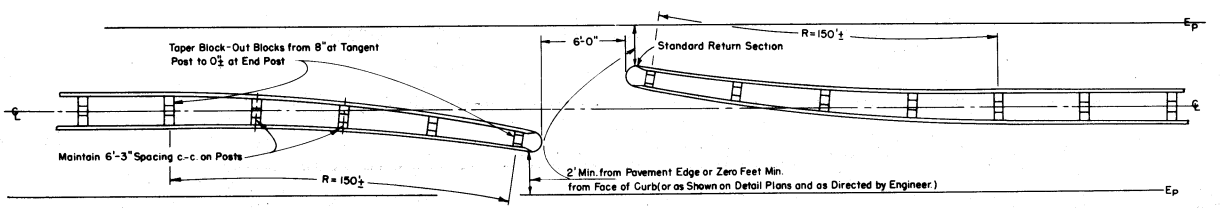
DETAIL B



SECTION C-C

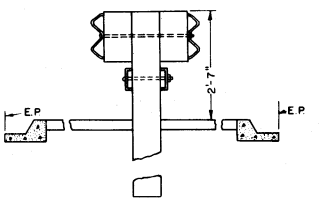
QUICK RELEASE WING NUT

PASSAGEWAY IN METAL BEAM MEDIAN BARRIER



PLAN VIEW

MOTORCYCLE PASSAGEWAY IN METAL BEAM MEDIAN BARRIER



TYPICAL SECTION

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

EMERGENCY PASSAGEWAYS A80-1

A80-1

Return to Table of Contents

GENERAL NOTES

1. Space blocks to fit.
2. Use Detail B only where there is insufficient clearance for post and block.

To accompany plans dated _____

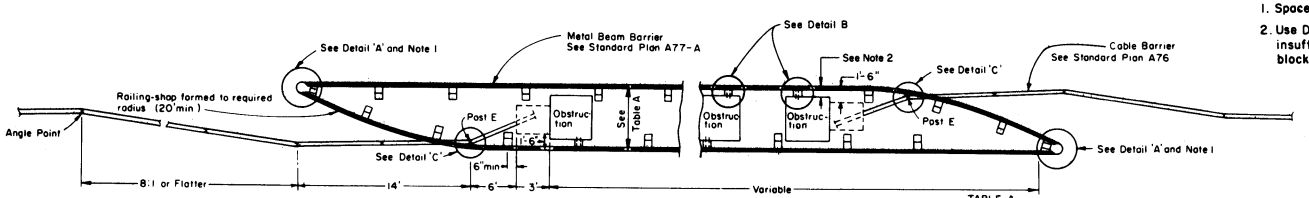
DISTRICT	COUNTY	ROUTE	Post Mile	Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

Traffic Engineer
Registered Civil Engineer No. 9618

Approved November 27, 1967

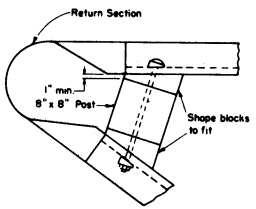
State Highway Engineer
Registered Civil Engineer No. 5645



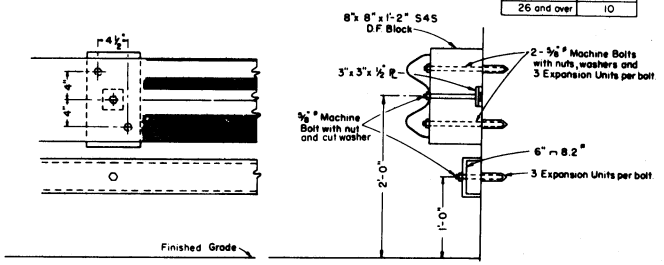
MEDIAN OBSTRUCTION DEFLECTOR

TABLE A

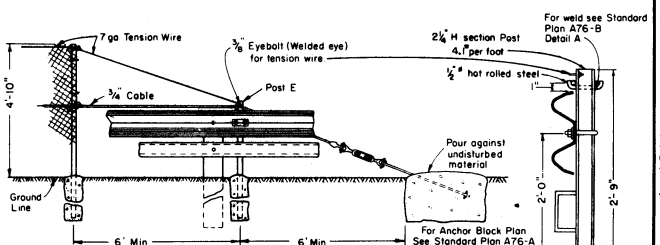
Median Width Ft.	Deflector Width - Ft.
22	6
23	7
24	8
25	9
26 and over	10



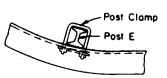
DETAIL A



DETAIL B
(Used only where necessary)

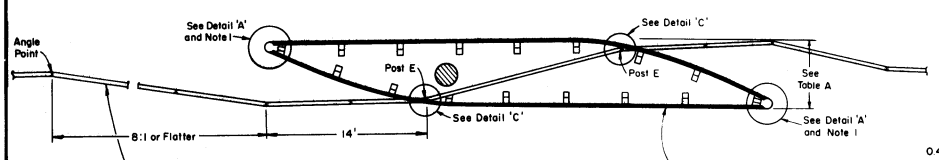


ELEVATION

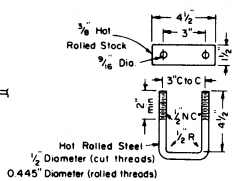


DETAIL C

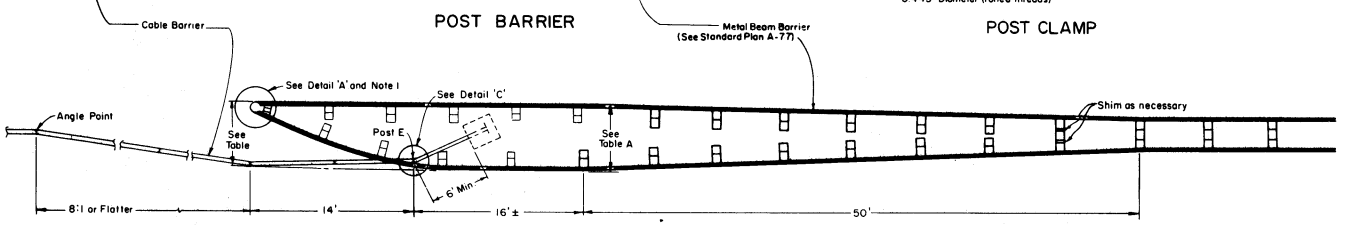
DETAIL OF POST E



POST BARRIER



POST CLAMP



TRANSITION - CABLE TO METAL BEAM BARRIERS

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

OBSTRUCTION DEFLECTORS AND METAL BEAM BARRIER TRANSITIONS | A81-4

A81-4

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To accompany plans dated _____

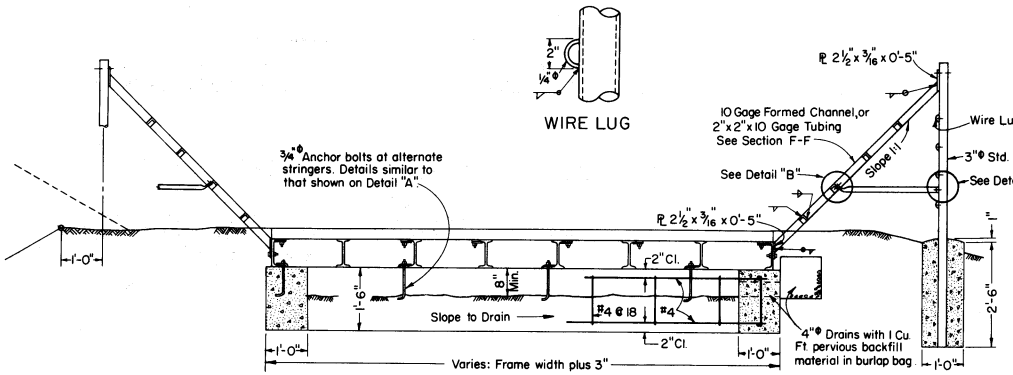
DISTRICT	COUNTY	ROUTE	Post-Miles – Total Project	SHEET	TOTAL SHEETS

APPROVAL RECOMMENDED

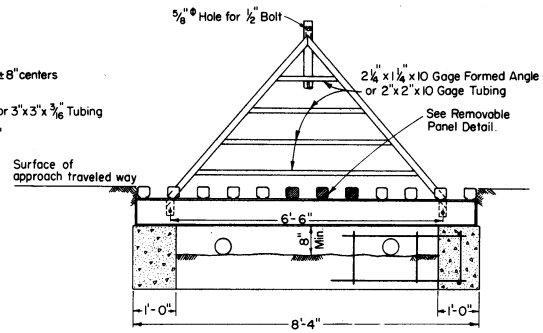
Engineer of Design
Civil Engineer License No. 38357

Approved September 1, 1966

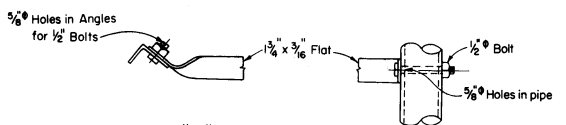
State Highway Engineer
Civil Engineer License No. 5945



SECTION B-B

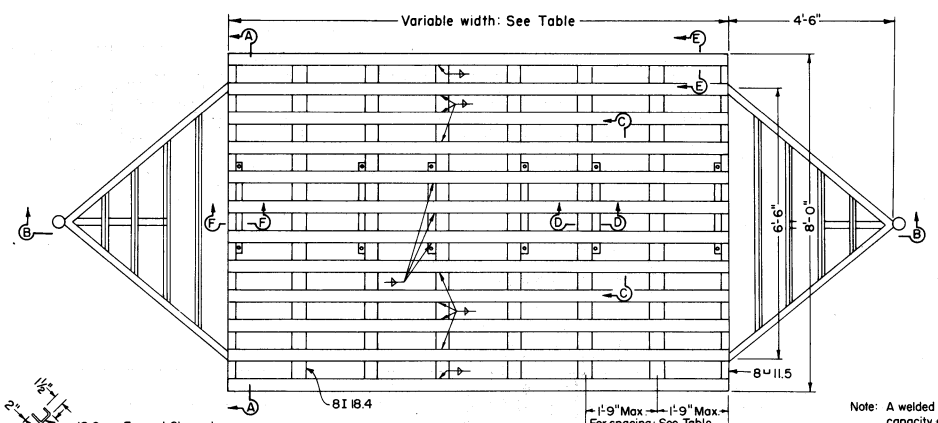


SECTION A-A

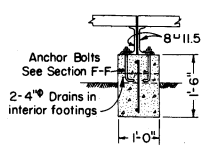


DETAIL "B"

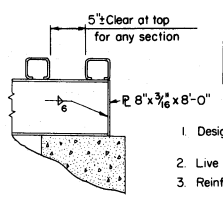
DETAIL "C"



PLAN (SHOWN FOR 8'x12')



ADDITIONAL LONGITUDINAL FOOTING FOR MULTI-UNIT WIDTHS



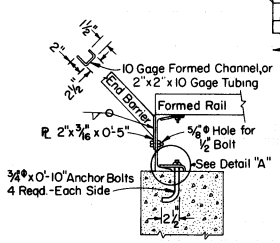
SECTION E-E

FRAME SIZE		LONGITUDINAL STRINGERS			RAILS	
					SECTION DETAILED	TUBING
Length	Width	No.	Size	Spacing	No.	No.
8'-0"	8'-0"	4	8" I 18.4#	19 1/4"	12	13
8'-0"	10'-0"	5	"	20"	"	"
8'-0"	12'-0"	6	"	20 1/2"	"	"
8'-0"	14'-0"	7	"	21"	"	"

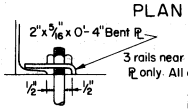
GENERAL NOTES

1. Design: A.A.S.H.O. Dated 1961 with revisions and as supplemented by Bridge Planning and Design Manual.
2. Live Loading: H20
3. Reinforced Concrete: F_s = 20,000 P.S.I., N = 10
   F_c = 1,200 P.S.I.
4. Structural Steel: F_s = 20,000 P.S.I.
5. Footing Pressure: Design, 1.5 Tons P.S.F.
6. Alternative design may be substituted by the contractor for approval by the Engineer.
7. All Concrete: To be Class B.
8. For Finish see Special Provisions
9. Warp crowned approaches to meet plane of single frame width. Double frame widths shall be set to the cross slopes of the approach traveled way.
10. Grades to be established by the Engineer.

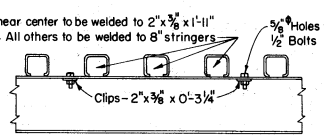
Note: A welded or rolled unit of equivalent design loading capacity, either a trapezoidal section or 3"x3"x 3/16" tubing may be submitted by the fabricator for approval by the Engineer.



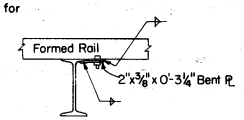
SECTION F-F



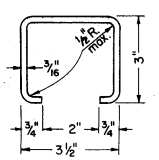
DETAIL "A"



SECTION C-C



SECTION D-D



RAIL SECTION

REMOVABLE PANEL DETAIL

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

CATTLE GUARDS (METAL) A82

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To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles — Total Project	Sheet No.	Total Sheets

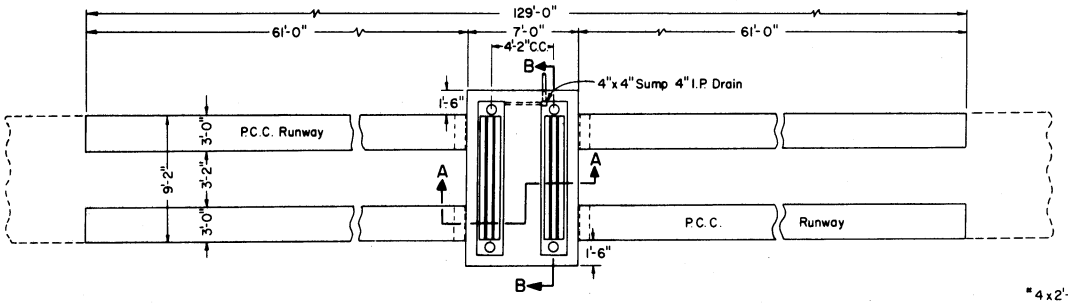
APPROVAL RECOMMENDED

Assistant State Highway Engineer
Civil Engineer License No. 6692

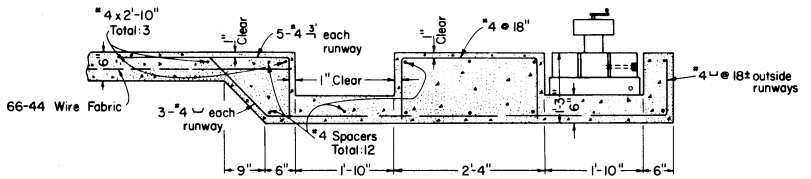
Approved September 1, 1966

State Highway Engineer
Civil Engineer License No. 5945

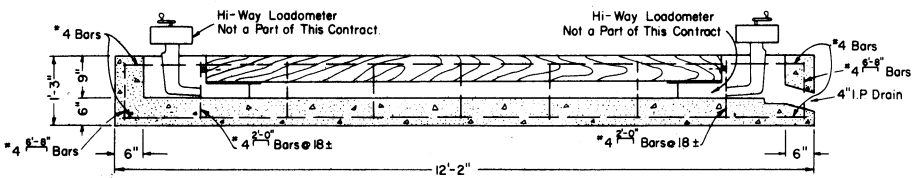
Note: Installation to be level in all directions for full length of runways.



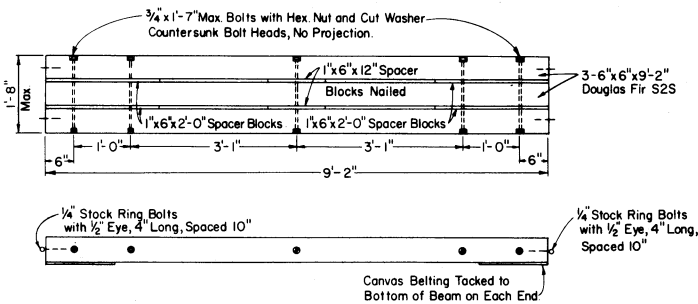
PLAN VIEW



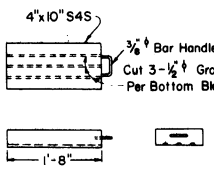
SECTION A-A



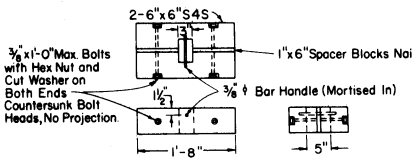
SECTION B-B



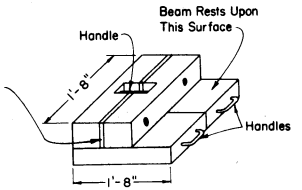
DETAILS OF BEAM CONSTRUCTION



TIMBER FILLER BLOCK
(Make - 8 per installation)



TIMBER FILLER BLOCK
(Make - 4 per installation)



FILLER BLOCK ASSEMBLY

To fill space when Loadometer is not in use.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

LOADOMETER SCALE PIT

A83

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To accompany plans dated					
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

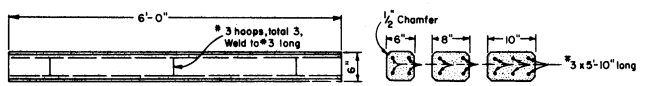
Engineer of Design
Registered Civil Engineer No. 9837

Approved September 1, 1966

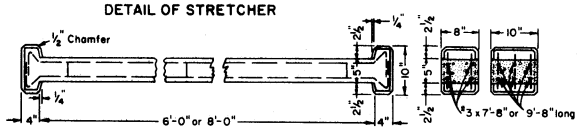
State Highway Engineer
Registered Civil Engineer No. 5945

NUMBER OF UNITS REQUIRED FOR ONE INTERMEDIATE 6' PANEL OF HEIGHTS AS SHOWN

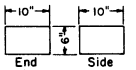
HEIGHT OF WALL	FRONT CRIB						1ST. ANCHOR CRIB			2ND. ANC. CR		ONE COMPLETE PANEL					
	HEADERS		STRETCHERS			BLOCKS	HDRS.	STRETCHERS		HDRS.	STRS.	HEADERS		STRETCHERS			BLOCKS
	8"x5"	10"x5"	6"x6"	8"x6"	10"x6"	10"x6"x10"	10"x5"	8"x6"	10"x6"	10"x5"	10"x6"	8"x5"	10"x5"	6"x6"	8"x6"	10"x6"	10"x6"x10"
3'-3"	3		9									3		9			
4-2	4		11									4		11			
5-1	4	1	13									4	1	13			
6-0	4	2	15									4	2	15			
6-11	4	3	17									4	3	17			
7-10	4	4	19									4	4	19			
8-9	4	5	17	4								4	5	17	4		
9-8	4	6	17	6								4	6	17	6		
10-7	4	7	17	9		1						4	7	17	9		1
11-6	4	8	17	11								4	8	17	11		
12-5	4	9	17	13		2						4	9	17	13		2
13-4	4	10	17	15		3						4	10	17	15		3
14-3	4	11	17	17		4						4	11	17	17		4
15-2	4	12	17	19		5						4	12	17	19		5
16-1	4	13	17	11	10		6	7				4	19	17	18	10	
17-0	4	14	17	11	12		7	8				4	21	17	19	12	
17-11	4	15	17	11	14		8	9				4	23	17	20	14	
18-10	4	16	17	11	16		9	10				4	25	17	21	16	
19-9	4	17	17	11	18	1	10	11				4	27	17	22	18	1
20-8	4	18	17	11	20	2	11	12				4	29	17	23	20	2
21-7	4	19	17	11	23	3	12	10	3	2	3	4	33	17	21	23	3
22-6	4	20	17	11	25	4	13	10	4	2	3	4	35	17	21	32	4
23-5	4	21	17	11	27	5	14	10	5	3	4	4	38	17	21	36	5
24-4	4	22	17	11	29	6	15	10	6	4	5	4	41	17	21	40	6
25-3	4	23	17	11	31	7	16	10	7	5	6	4	44	17	21	44	7
26-2	4	24	17	11	33	9	17	10	8	6	7	4	47	17	21	48	9
27-1	4	25	17	11	35	11	18	10	9	7	8	4	50	17	21	52	11
28-0	4	26	17	11	37	13	19	10	10	8	9	4	53	17	21	56	13
28-11	4	27	17	11	39	15	20	10	11	9	10	4	56	17	21	60	15
29-10	4	28	17	11	41	17	21	10	12	10	11	4	59	17	21	64	17



DETAIL OF STRETCHER



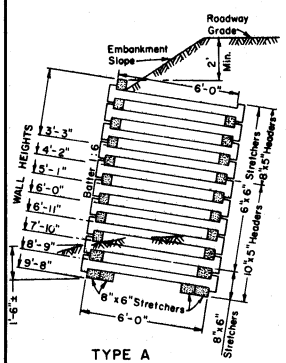
DETAIL OF HEADER



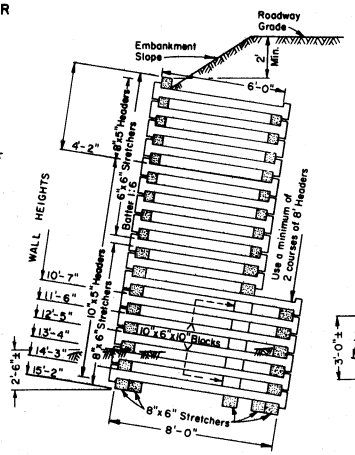
DETAIL OF FILLER BLOCK

GENERAL NOTES

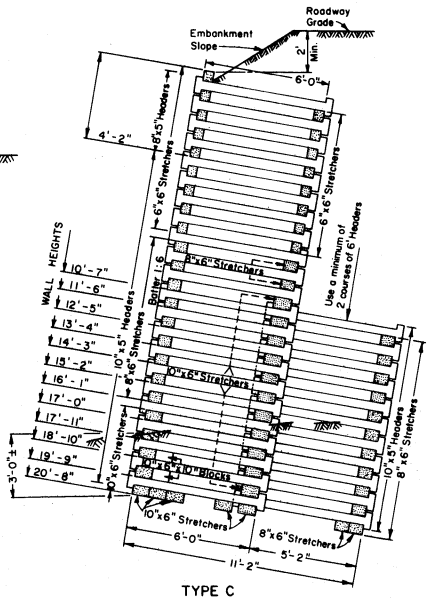
1. Walls 12'-5" or less in height may be constructed with no batter.
2. Units shown in Table are for intermediate Panels. In computing a wall of say 7 panels, it is necessary to remember that 7+1 or 8 vertical rows of headers are required. In addition, another vertical row of headers must be added whenever in the case of long walls, the wall is "broken" at panel points of approximately 96 feet.



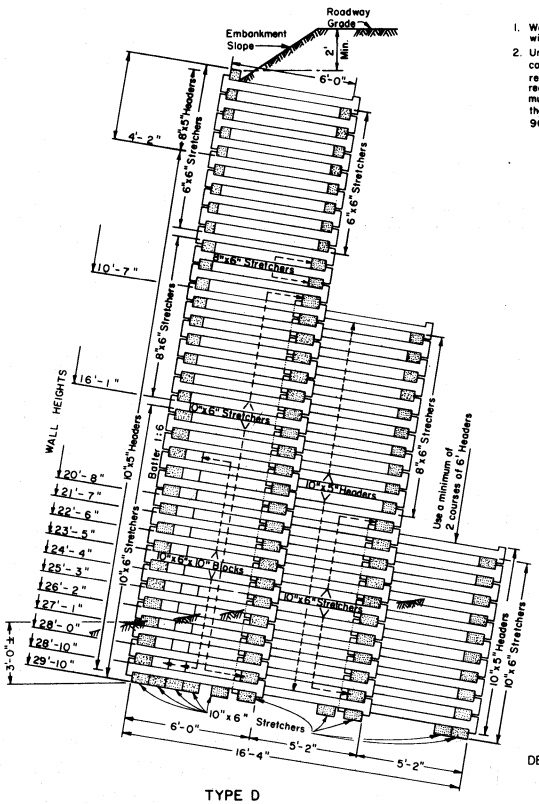
TYPE A
Walls 9'-8" or less in height



TYPE B
Walls between 10'-7" and 15'-2" in height



TYPE C
Walls between 16'-1" and 20'-8" in height



TYPE D
Walls between 21'-7" and 29'-10" in height

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

REINFORCED CONCRETE CRIB WALL

C7-2

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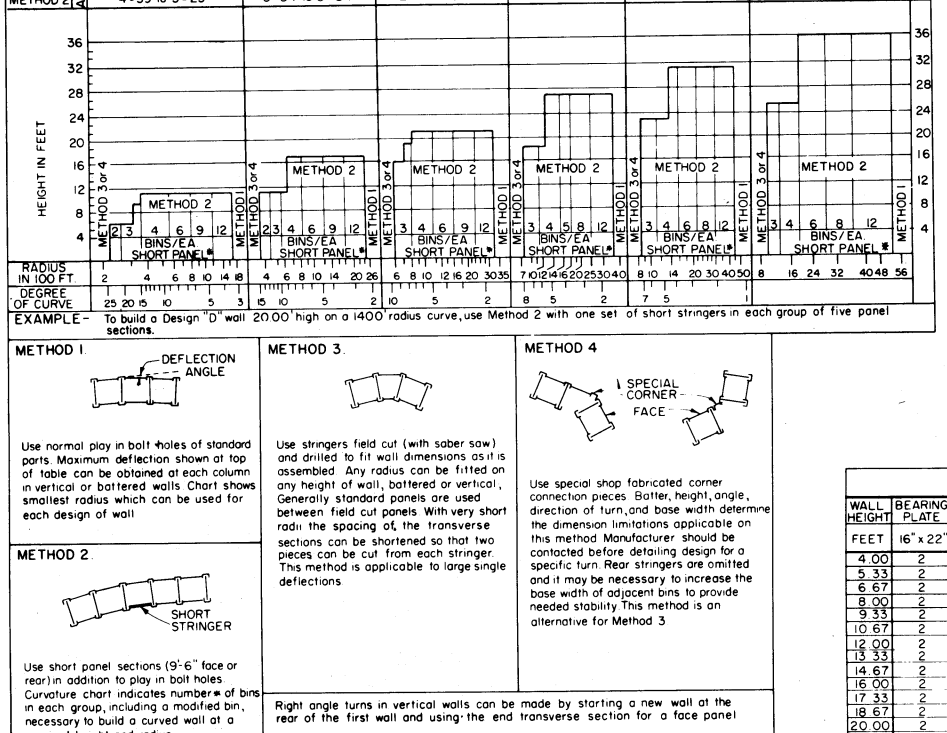
CURVATURE CHART - 1 TO 6 BATTER

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)	4°-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 number * of bins in each group, including a modified bin, necessary to build a curved wall at a required height and radius.

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 alternative for Method 3.

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.

Right angle turns in battered walls can be made by erecting one complete bin vertically in the corner.

NOTE- Use Chart X and Table Y shown on Standard Plan C8-B.1 to determine base width to height ratio for the various surcharges on both vertical and batter walls.

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		Sh't	16 Ga		14 Ga		12 Ga		10 Ga		Sh'd
FEET	St'd 9.5'	Short 9.0'	St'd 9.5'	Short 9.0'	St'd 9.5'	Short 9.0'	St'd 9.5'	Short 9.0'	Str St'f	St'd 9.5'	Short 9.0'	St'd 9.5'	Short 9.0'	St'd 9.5'	Short 9.0'	St'd 9.5'	Short 9.0'	Str St'f
4.00	1	3							1	3	1							1
5.33	2	4							1	4	2							1
6.67	3	5							1	5	3							1
8.00	4	6							1	6	4							1
9.33	5	7							1	7	5							1
10.67	6	8							1	8	6							1
12.00	6	8							1	8	6							1
13.33	6	8	2	2					1	8	6	2	2					1
14.67	6	8	3	3					1	8	6	3	3					1
16.00	6	8	4	4					1	8	6	4	4					1
17.33	6	8	4	4	1	1			1	8	6	4	4	1	1			1
18.67	6	8	4	4	2	2			1	8	6	4	4	2	2			1
20.00	6	8	4	4	3	3			1	8	6	4	4	3	3			1
21.33	6	8	4	4	4	4			1	8	6	4	4	4	4			1
22.67	6	8	4	4	5	5			1	8	6	4	4	5	5			1
24.00	6	8	4	4	6	6			1	8	6	4	4	6	6			1
25.33	6	8	4	4	7	7			1	8	6	4	4	7	7			1
26.67	6	8	4	4	7	7	1	1	1	8	6	4	4	7	7	1	1	1
28.00	6	8	4	4	7	7	2	2	1	8	6	4	4	7	7	2	2	1
29.33	6	8	4	4	7	7	3	3	1	8	6	4	4	7	7	3	3	1
30.67	6	8	4	4	7	7	4	4	1	8	6	4	4	7	7	4	4	1
32.00	6	8	4	4	7	7	5	5	1	8	6	4	4	7	7	5	5	1
33.33	6	8	4	4	7	7	6	6	1	8	6	4	4	7	7	6	6	1
34.67	6	8	4	4	7	7	7	7	1	8	6	4	4	7	7	7	7	1
36.00	6	8	4	4	7	7	8	8	1	8	6	4	4	7	7	8	8	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.

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						UNITS REQUIRED PER PANEL SECTION: STRINGERS					Str St'f	WALL HEIGHT
FEET	16"x22"	1st Lift	2nd Lift	3rd Lift	Total Height	1st Lift	2nd Lift	3rd Lift	Total Height				16 52	16 74	14 96	14 118	12 140	12 162	16 52	16 74	14 96	14 118	12 140	12 162	16 Ga 9.5'	14 Ga 9.5'	12 Ga 9.5'	10 Ga 9.5'		9.5'	FEET
4.00	2	4.00			4.00	1.33			1.33	5.33		1							1						4					1	4.00
5.33	2	5.33			5.33	2.67			2.67	8.00		1	1						1						6					1	5.33
6.67	2	6.67			6.67	4.00			4.00	10.67		1	2						1						8					1	6.67
8.00	2	8.00			8.00	5.33			5.33	13.33		1	3						1						10					1	8.00
9.33	2	9.33			9.33	6.67			6.67	16.00		1	4						1						12					1	9.33
10.67	2	10.67			10.67	8.00			8.00	18.67		1	5	5					1	1					14					1	10.67
12.00	2	12.00			12.00	9.33			9.33	21.33		1		6						1					14	2				1	12.00
13.33	2	8.00	5.33		13.33	10.67			10.67	24.00	1	1		7						1					14	4				1	13.33
14.67	2	8.00	6.67		14.67	12.00			12.00	26.67	1	1		8	8					1	1				14	6				1	14.67
16.00	2	8.00	8.00		16.00	8.00	5.33		13.33	29.33	2	1		9	9					1	1				14	8				1	16.00
17.33	2	12.00	5.33		17.33	8.00	6.67		14.67	32.00	2	1		10	10					1	1				14	8	2			1	17.33
18.67	2	12.00	6.67		18.67	8.00	8.00		16.00	34.67	2	1			11	11						1	1		14	8	4			1	18.67
20.00	2	12.00	8.00		20.00	12.00	5.33		17.33	37.33	2	1			12	12						1	1		14	8	6			1	20.00
21.33	2	12.00	9.33		21.33	12.00	6.67		18.67	40.00	2	1			13	13						1	1		14	8	8			1	21.33
22.67	2	12.00	10.67		22.67	12.00	8.00		20.67	42.67	2	1				14	14						1	1	14	8	10			1	22.67
24.00	2	12.00	12.00		24.00	12.00	9.33		21.33	45.33	2	1				15	15						1	1	14	8	12			1	24.00
25.33	2	12.00	8.00	5.33	25.33	12.00	10.67		22.67	48.00	3	1				16	16						1	1	14	8	14			1	25.33
26.67	2	12.00	8.00	6.67	26.67	12.00	12.00		24.00	50.67	3	1				17	17						1	1	14	8	14	2		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	1					18	18						1	14	8	14	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	1					19	19						1	14	8	14	6		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	1					20	20						1	14	8	14	8		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	1						21						1	14	8	14	10		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	1						22						1	14	8	14	12		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	1						23						1	14	8	14	14		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	1						24						1	14	8	14	16		1	36.00

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

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

Assistant State Highway Engineer
Registered Civil Engineer No. 5390

APPROVED October 20, 1967

J. A. Legarra
State Highway Engineer
Registered Civil Engineer No. 5645

By Sam Hebner
Deputy State Highway Engineer
Registered Civil Engineer No. 5835

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

DESIGN DATA FOR

METAL CRIB WALL C8-A.2

NOTE- For Construction Details See Standard Plan C8-B.1

C8-A.2

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Batter \ Surcharge	Level No Live Load	With Superimposed Load
Wall On 1:6 Batter	① 7'	② 5'
Wall Vertical	③ 7'	④ 5'

① Curve number

TABLE Y

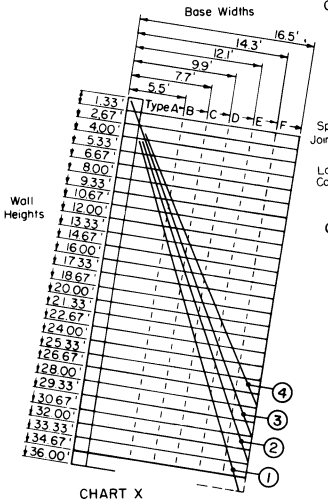
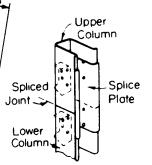


CHART X

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.

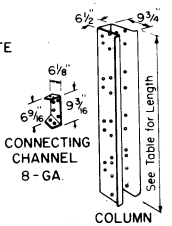
Example - Wall on 1:6 batter, with live load Wall height 18 ft. These conditions are found as (2) in table in chart, line (2) intercepts the 18 ft height line about midway of Type "C" which has a base width of 9.9 feet

COLUMN SPLICE PLATE
10 GA.



ASSEMBLY at COLUMN SPLICE

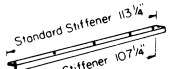
* COLUMN CAP - 12 GA



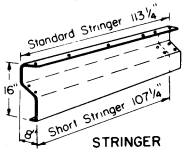
CONNECTING CHANNEL 8 - GA.

COLUMN 8-GA.

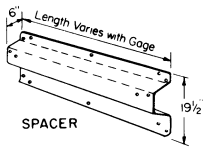
* Column Cap to be placed if requested by Engineer



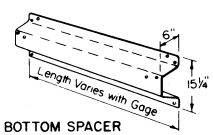
STRINGER STIFFENER - 8 GA.



STRINGER

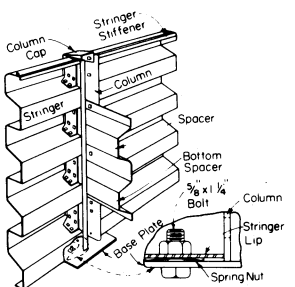


SPACER



BOTTOM SPACER

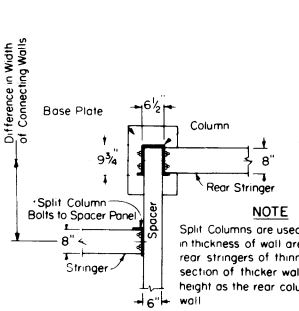
NOTE - See Table on Standard Plan C8-A.2 for Gage and Length



CRIB ASSEMBLY FRONT COLUMN
Rear Column Similar

NOTE

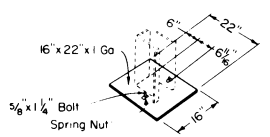
Before Setting Base Plate, insert Bolt and Fasten with Spring Nut



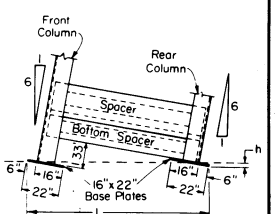
NOTE

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

DETAIL
SPLIT COLUMN ATTACHMENT



BASE PLATE ARRANGEMENT



DETAIL - BASE PLATE PLACEMENT

WALL WIDTH TYPE	h	L
"A"	* 3"	6'-7 5/8"
"B"	1 3/8"	8'-9 5/8"
"C"	5 13/16"	10'-11 13/16"
"D"	10 3/16"	13'-2 1/16"
"E"	14 5/8"	15'-4 5/16"
"F"	18 3/4"	17'-8 1/2"

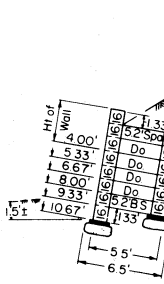
* NOTE - Distance "h" for Type "A" is a Minus Quantity --- that is, Front Column Base is LOWER than Rear Column Base

All bolts to be 5/8" with a minimum length of 1 1/4"

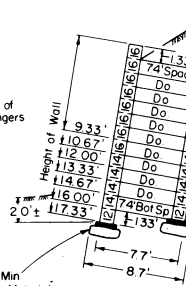
GENERAL NOTES

Design "Type" to be shown on all crib layouts.

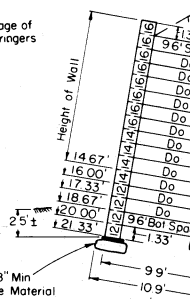
For Design Data see Standard Plan C8-A.2



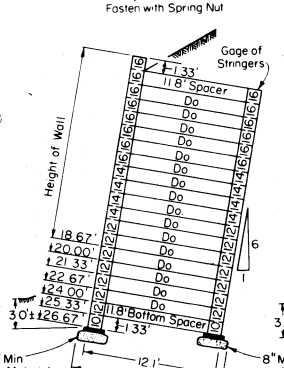
TYPE "A"



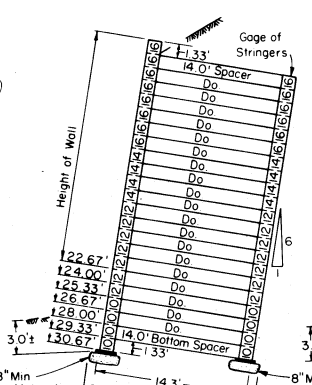
TYPE "B"



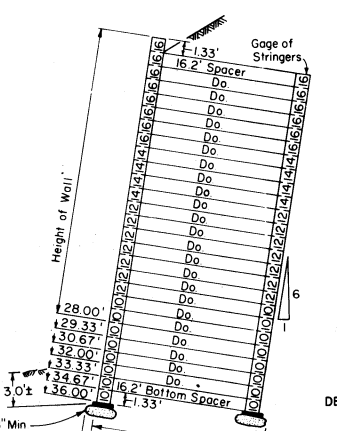
TYPE "C"



TYPE "D"



TYPE "E"



TYPE "F"

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

Asst. State Highway Engineer
Registered Civil Engineer No. 5390

Approved October 20, 1967

J. A. Legarra
State Highway Engineer
Registered Civil Engineer No. 5645

By: Sam Helmer
Deputy State Highway Engineer
Registered Civil Engineer No. 5835

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

CONSTRUCTION DETAILS FOR

METAL CRIB WALL C8-B.1

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To accompany plans dated _____

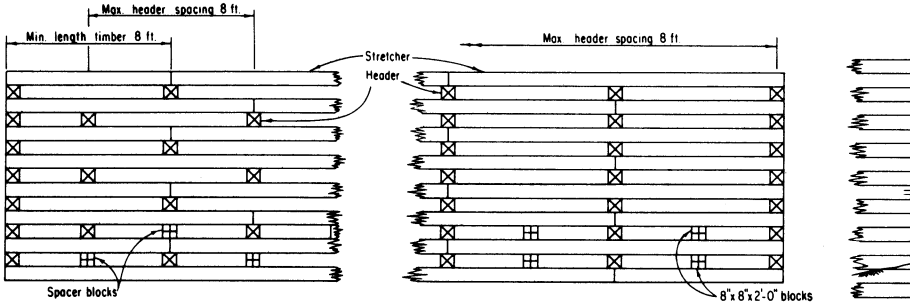
DISTRICT	COUNTY	ROUTE	Post Miles	Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

Engineer of Design
Civil Engineer License No

Approved September 1, 1966

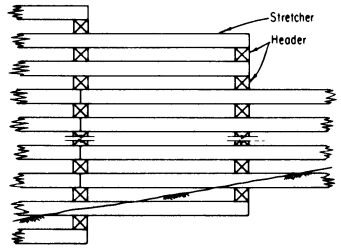
State Highway Engineer
Civil Engineer License No 5946



HEADERS STAGGERED (ALTERNATIVE)

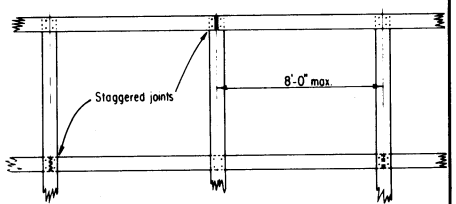
HEADERS IN LINE (ALTERNATIVE)

OPEN FACE CRIB ELEVATION

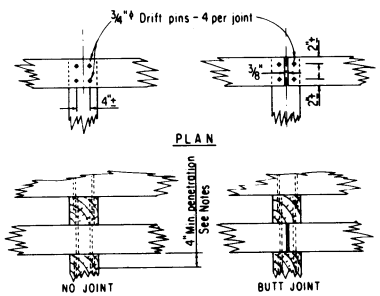


WALL STEP DETAILS

Wall stability based on 1½ : 1 unlimited sloping surcharge

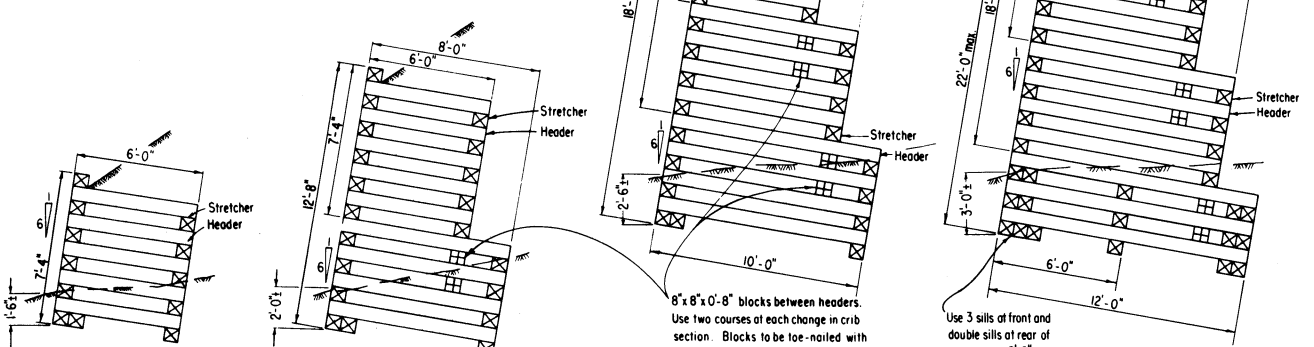


TYPICAL PLAN VIEW



TYPICAL END CONNECTIONS

TIMBER PER 8 FT. CRIB SECTION					
HEIGHT OF WALL	HEADERS 6'-0"	8'-0"	10'-0"	12'-0"	STRETCHERS
4'-8"	3				7
6'-0"	4				9
7'-4"	5				11
8'-8"	4	2			13
10'-0"	5	2			15
11'-4"	5	3			17
12'-8"	5	4			20
14'-0"	5	3	2		22
15'-4"	5	4	2		24
16'-8"	5	4	3		26
18'-0"	5	4	4		28
19'-4"	5	4	3	2	32
20'-8"	5	4	4	2	38
22'-0"	5	4	4	3	43



TYPE A

TYPE B

TYPE C

TYPE D

NOTES:

1. All timber to be 8"x8" rough, construction grade Douglas Fir, treated after fabrication. All required cuts or bored holes to be swabbed with 2 coats of the same type of preservative used for treating the timber.
2. Drift pins and holes to be ¾" ϕ
3. Drift pins to be of sufficient length to penetrate thru 2 members and 4" min. into the third member.
4. All stretchers to be laid horizontal
5. Walls 12'-8" or less in height may be constructed with no batter.
6. Maximum allowable wall height is 22'-0"
7. All walls 18'-0" high or under shall have double sills at front and single sill at rear. When wall exceeds 7'-4", 12'-8" or 18'-0", use a minimum of two courses of next longer headers.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TIMBER CRIB WALL

C9-1

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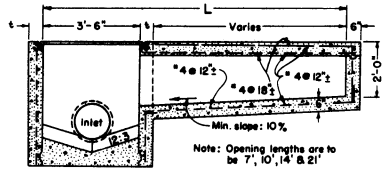
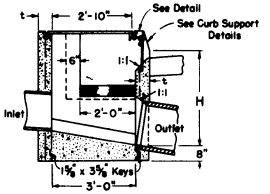
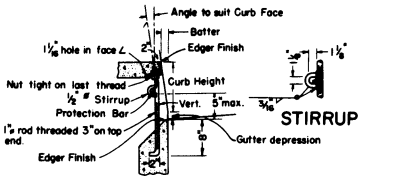


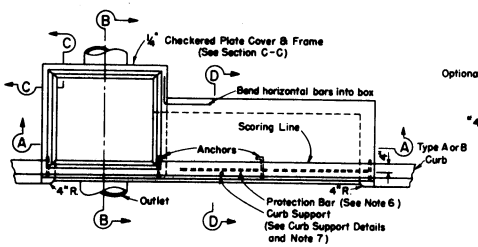
SECTION A-A



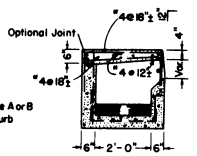
SECTION B-B



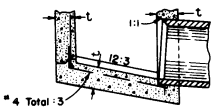
CURB SUPPORT DETAILS
(Shown for Type A Curbs)



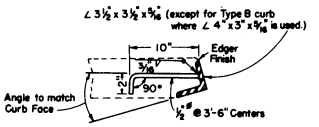
PLAN



SECTION D-D

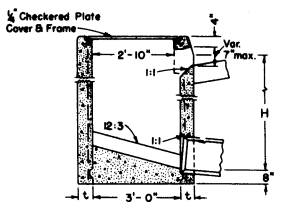


ALTERNATIVE REINFORCED BOTTOM



FACE ANGLE ANCHOR DETAIL

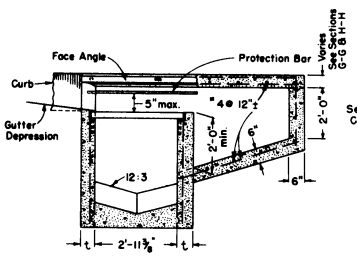
INLET TYPE OL



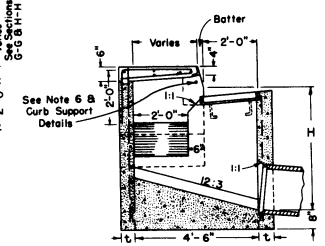
SECTION E-E

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

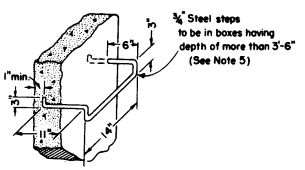
Length of Curb Opening	No. of Anchors
3'-6" or less	2
7'-0"	3
10'-0"	4
14'-0"	5
21'-0"	7



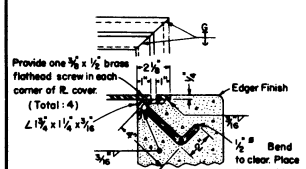
SECTION F-F



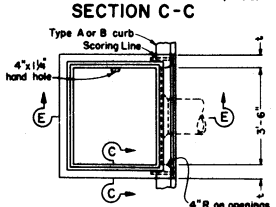
SECTION G-G



STEP DETAIL

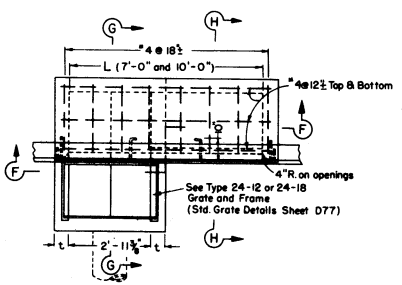


SECTION C-C



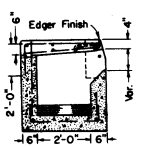
PLAN

INLET TYPE OS

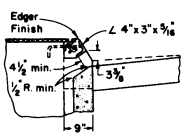


PLAN

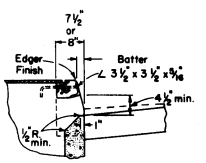
INLET TYPE GOL



SECTION H-H



TYPE B CURBS



TYPE A CURBS

CURB OPENING DETAILS

To accompany plans dated

DISTRICT	COUNTY	ROUTE	Post Miles-Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

Engineer of Design
Registered Civil Engineer No. 9837

APPROVED September 1, 1966

State Highway Engineer
Registered Civil Engineer No. 5945

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 project plans, 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. See "Standard Grate Details" D77- for Grate and Frame Details and Weights of Miscellaneous Iron and Steel.
13. See Standard Plan D78- or D79- for Depression Details.
14. Full penetration butt welds may be substituted for the fillet welds on all anchors.
15. Standard square, hexagon, round or equivalent headed anchors may be substituted for the right angle hooks on the anchors shown on this plan.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

STORM DRAIN INLETS D72-5

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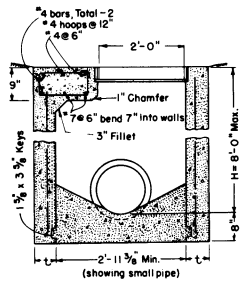

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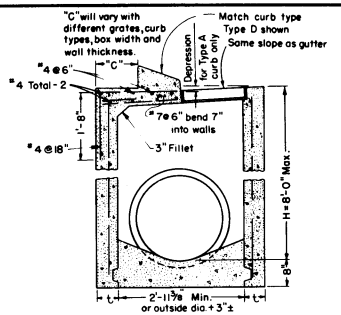

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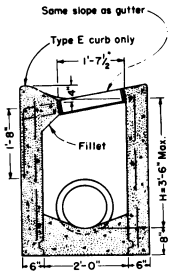

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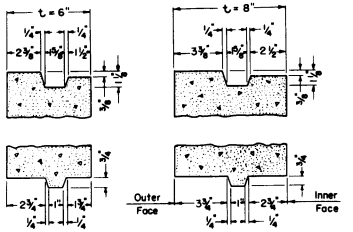
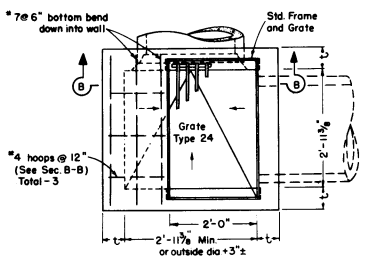


JOINT DETAIL

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

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. Reinforcing steel in walls shall be #4 bars @ 18" centers, placed 1 1/2" clear to inside of box unless otherwise shown.
4. 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.
5. Details shown apply to both metal and concrete pipe.
6. Pipe(s) can be placed in any wall.
7. Curb section shall match adjacent curb.
8. Basin floors shall have wood trowel finish and a minimum slope of 12:3 from all directions toward outlet pipe.
9. Galvanizing - See Standard Specifications or Special Provisions.
10. Cast-In-Place or Precast alternative is optional with Contractor.
11. Set inlet so that grate bars are parallel to direction of principal surface flow.
12. See "Standard Grate Details" D77-for Grate and Frame details and Weights of Miscellaneous Iron and Steel.



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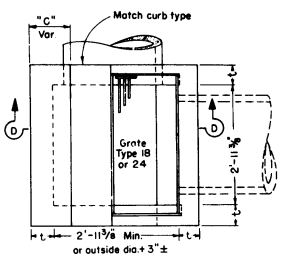

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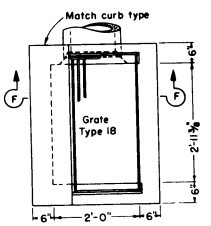

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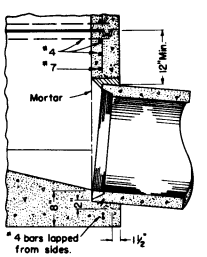
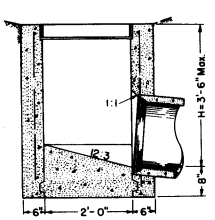
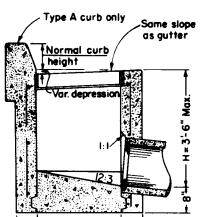


SECTION G-G



SECTION A-A



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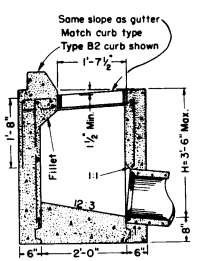

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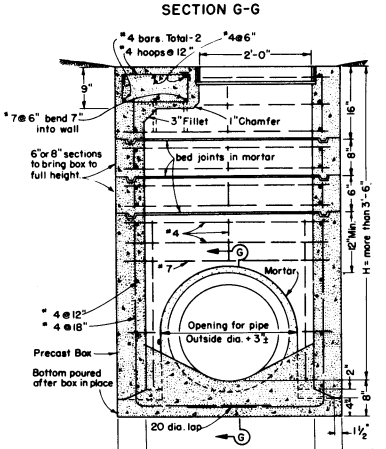

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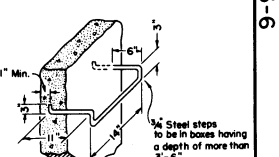

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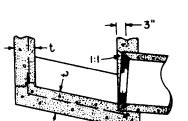
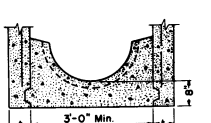


ALTERNATIVE REINFORCED BOTTOM



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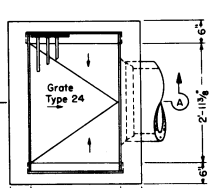

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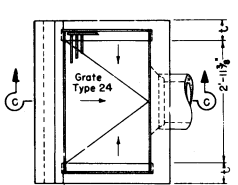

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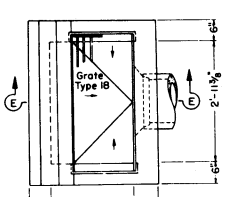

TYPE G5

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles-Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

Engineer of Design
Registered Civil Engineer No. 9837

Approved September 1, 1966

State Highway Engineer
Registered Civil Engineer No. 5945

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

STORM DRAIN INLETS

D73-6

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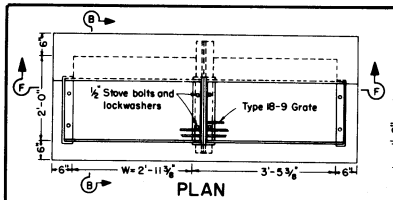

PLAN
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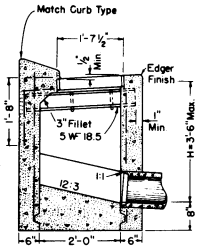
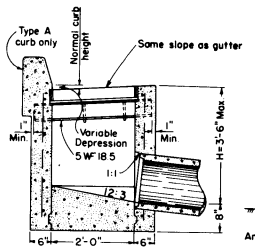


SECTION B-B



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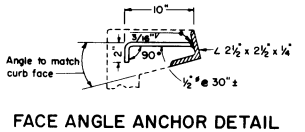
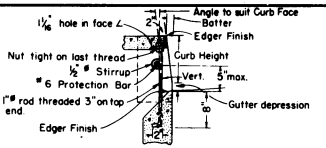
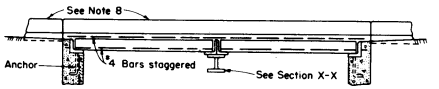


FACE ANGLE ANCHOR DETAIL



PROTECTION BAR DETAIL
(See Note No.6)



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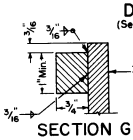

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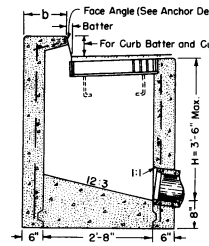

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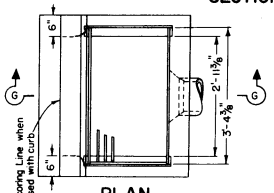
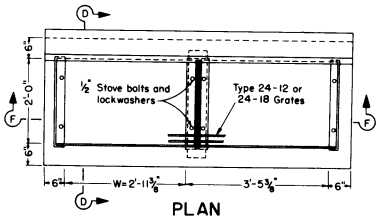


PLAN

TYPE GO



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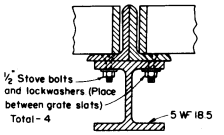

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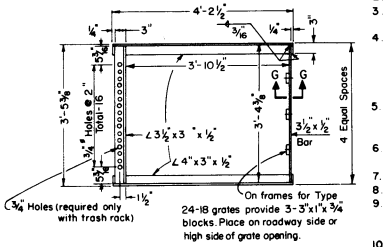

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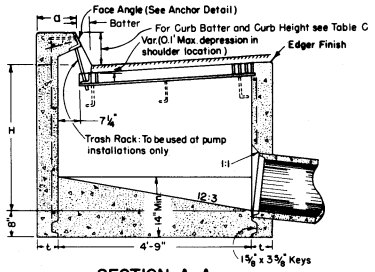


SECTION A-A

TABLE A

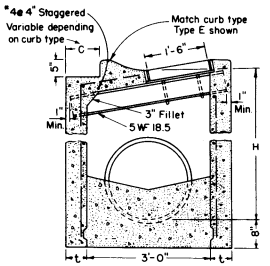
H	t
8'-0" or less	6"
8'-1" to 20'-0"	8"

TABLE B

Curb Type	Normal Curb Height	Curb Batter	b
A-6	6"	1½"	12½"
A-8	8"	2"	12"
B	6"	4"	10"

TABLE C

Curb Type	Normal Curb Height	Curb Batter	a
A-6	6"	1½"	t+9"
A-8	8"	2"	t+8½"
B	6"	4"	t+6½"
Dike	6"	3"	t+7½"



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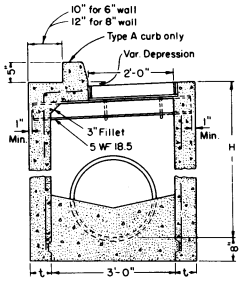

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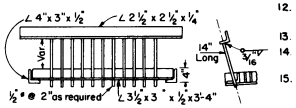
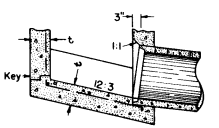
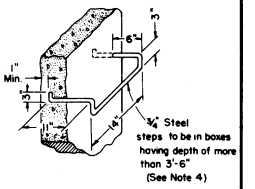


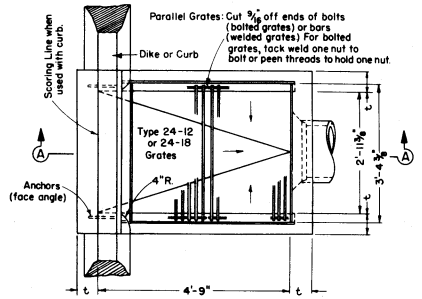
TRASH RACK
(For use with pump installation)



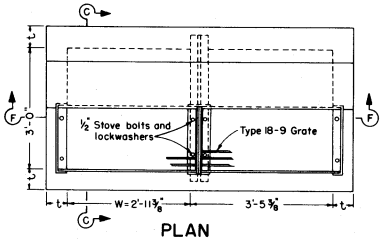
ALTERNATIVE
REINFORCED BOTTOM



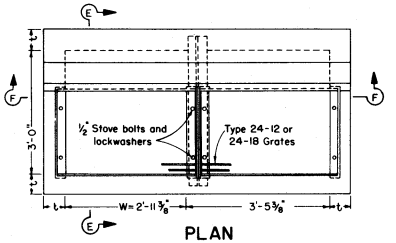
STEP DETAIL



PLAN
TYPE GDO



PLAN
TYPE GT2



PLAN
TYPE GT4

To accompany plans dated

DISTRICT	COUNTY	ROUTE	Post Miles – Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

Engineer of Design
Registered Civil Engineer No. 9857

Approved December 4 1967

State Highway Engineer
Registered Civil Engineer No. 5645

GENERAL NOTES

1. "H" is the difference in elevation between the outlet pipe flow line and the normal gutter grade line undepressed.
2. For "t" wall thickness, see table A.
3. Reinforcing steel in walls shall be #4 bars @ 18¾ centers placed 1½" clear to inside of box unless otherwise shown.
4. Steps – None required where "H" is 3'-6" or less. Install one step 16¾ 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 @ 12¾ intervals from 16¾ above floor to within 12¾ of the top of the box. Place steps in wall without pipe openings.
5. When shown on the project plans, Place a #6 protection bar horizontally across the length of the opening and bend back 4" into the inlet wall on each side.
6. Curb openings longer than 7' shall have one curb support for each additional 7' increment or fraction thereof.
7. Pipe(s) can be placed in any wall.
8. Curb section shall match adjacent curb.
9. Basin floors shall have wood trowel finish and a minimum slope of 12:3 from all directions toward outlet pipe.
10. Galvanizing: See Standard Specifications or Special Provisions.
11. W= 2'-11⅜" for one grate. Add 3'-5⅜" for additional grates in tandem.
12. See "Standard Grate Details" D77- for Grate and Frame details and Weights of Miscellaneous Iron and Steel.
13. See Standard Plan D78- or D79- for Depression Details.
14. Full penetration butt welds may be substituted for the fillet welds on all anchors.
15. Standard square, hexagon, round or equivalent headed anchors may be substituted for the right angle hooks on the anchors shown on this plan.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

STORM DRAIN INLETS D74-7

D74-7

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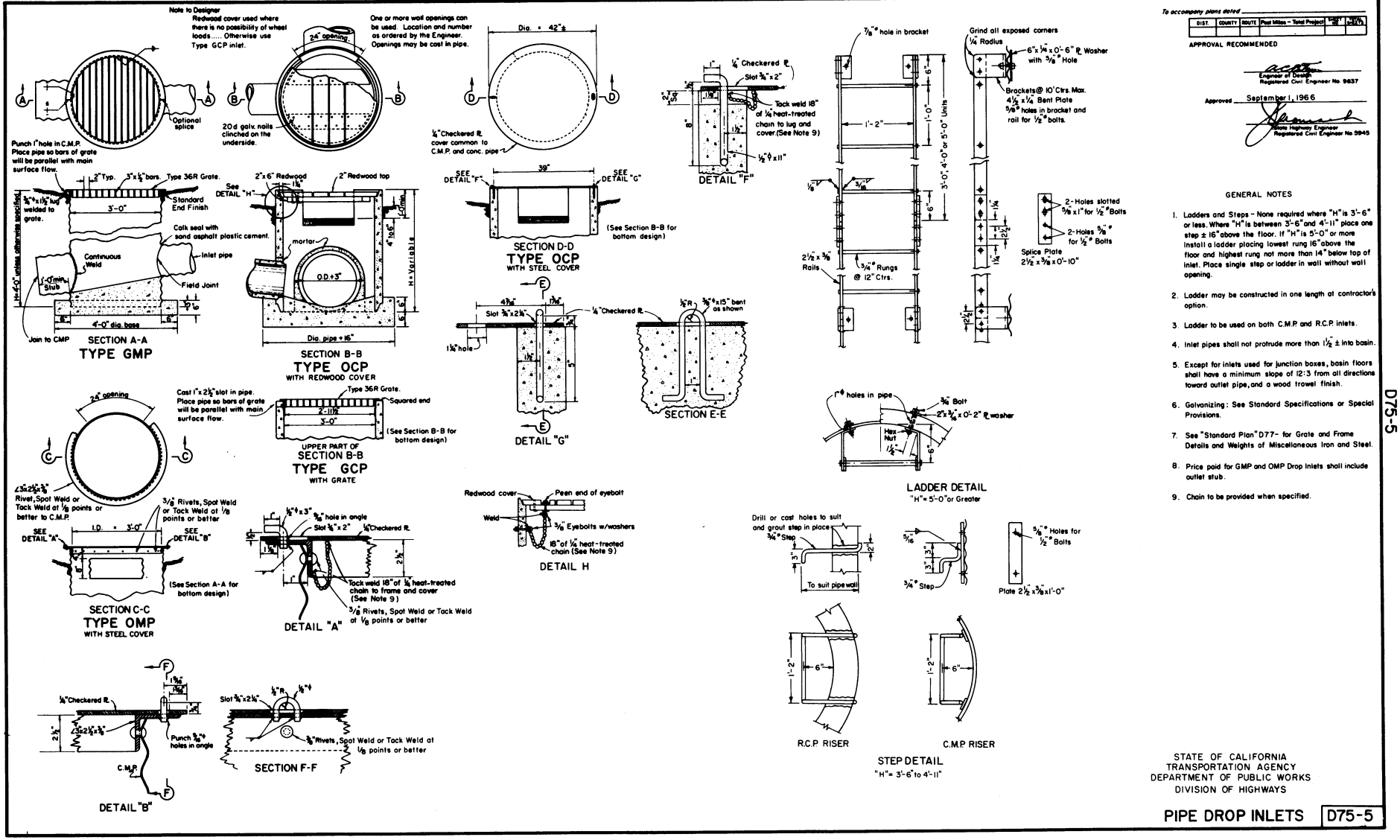

To accompany plans dated _____

DIST.	COUNTY	ROUTE	Post Miles – Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

Engineer of Design
Registered Civil Engineer No. 9637

Approved September 1, 1966

State Highway Engineer
Registered Civil Engineer No. 5945

GENERAL NOTES

1. Ladders and Steps - None required where "H" is 3'-6" or less. Where "H" is between 3'-6" and 4'-11" place one step ± 16" above the floor. If "H" is 5'-0" or more install a ladder placing lowest rung 16" above the floor and highest rung not more than 14" below top of inlet. Place single step or ladder in wall without wall opening.
2. Ladder may be constructed in one length at contractor's option.
3. Ladder to be used on both C.M.P. and R.C.P. inlets.
4. Inlet pipes shall not protrude more than 1 1/2" ± into basin.
5. Except for inlets used for junction boxes, basin floors shall have a minimum slope of 12:3 from all directions toward outlet pipe, and a wood trowel finish.
6. Galvanizing: See Standard Specifications or Special Provisions.
7. See "Standard Plan" D77- for Grate and Frame Details and Weights of Miscellaneous Iron and Steel.
8. Price paid for GMP and OMP Drop Inlets shall include outlet stub.
9. Chain to be provided when specified.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PIPE DROP INLETS D75-5

D75-5

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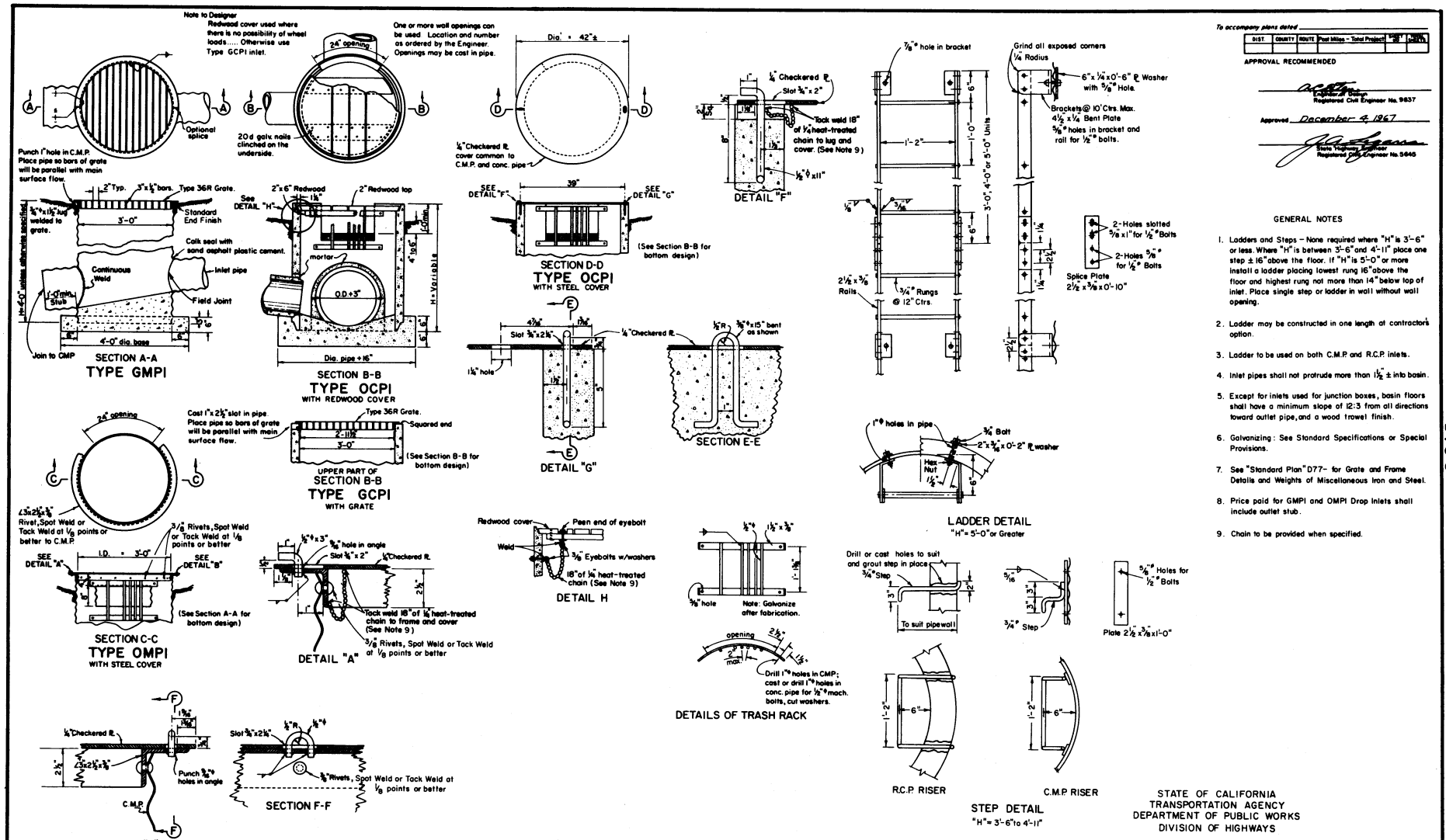

To accompany plans dated _____

DIST.	COUNTY	ROUTE	Post Miles - Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

Engineer of Design
Registered Civil Engineer No. 9837

Approved December 4, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

GENERAL NOTES

1. Ladders and Steps – None required where "H" is 3'-6" or less. Where "H" is between 3'-6" and 4'-11" place one step ± 16" above the floor. If "H" is 5'-0" or more install a ladder placing lowest rung 16" above the floor and highest rung not more than 14" below top of inlet. Place single step or ladder in wall without wall opening.
2. Ladder may be constructed in one length at contractor's option.
3. Ladder to be used on both C.M.P. and R.C.P. inlets.
4. Inlet pipes shall not protrude more than 1½" ± into basin.
5. Except for inlets used for junction boxes, basin floors shall have a minimum slope of 12:3 from all directions toward outlet pipe, and a wood trowel finish.
6. Galvanizing: See Standard Specifications or Special Provisions.
7. See "Standard Plan" D77- for Grate and Frame Details and Weights of Miscellaneous Iron and Steel.
8. Price paid for GMPI and OMPI Drop Inlets shall include outlet stub.
9. Chain to be provided when specified.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PIPE DROP INLETS
FOR USE WITH PUMPING INSTALLATIONS

D76-6

D76-6

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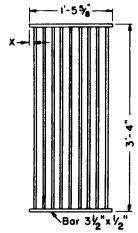
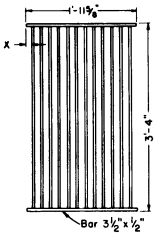


TYPE 18-9

1 3/8" Clear Spacing

Use within the roadbed on highways where bicycles and pedestrians are excluded - or for rural conditions



TYPE 24-18

3/4" Clear Spacing

Use within the roadbed under urban conditions where bicycles and pedestrians are permitted

TYPE 24-12

1 3/8" Clear Spacing

Use within the roadbed on highways where bicycles and pedestrians are excluded - or for rural conditions

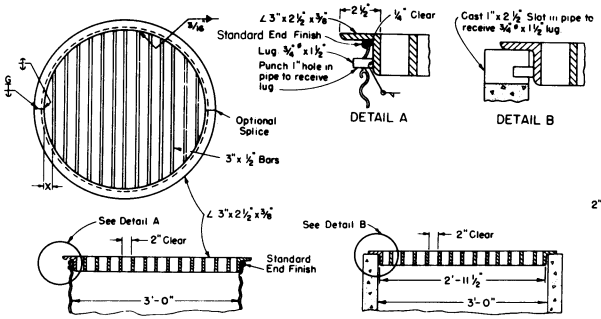
TYPE 24-9

2" Clear Spacing

Use in locations off the roadbed on all types of highways

RECTANGULAR GRATE DETAILS

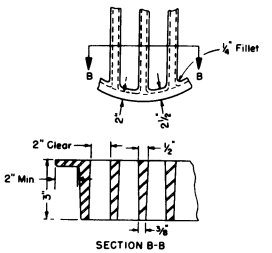
(SEE TABLE BELOW)



DETAIL A

DETAIL B

TYPE 36R GRATE DETAILS



SECTION B-B

ALTERNATIVE CAST NODULAR IRON GRATE OR CAST STEEL GRATE TYPE 36R

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

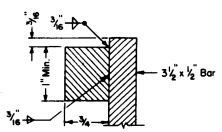
Engineer of Design
Registered Civil Engineer No. 9837

Approved December 4, 1967

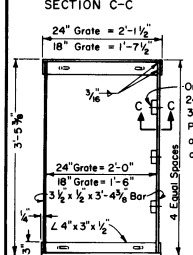
State Highway Engineer
Registered Civil Engineer No. 5646

GENERAL NOTES

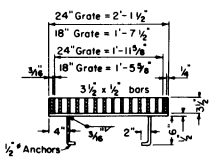
1. Grate type numbers refer to width of grate in inches and number of bars, respectively.
2. Contractor has the option of using cast nodular iron, cast steel, welded, bolted or cast end block grate
3. Grates and frames may be galvanized or asphalt dipped See Standard Specifications or Special Provisions.
4. Rounded top of bars optional on all grates.
5. Pipe drop inlets with a grate shall be placed so that bars parallel direction of principle surface flow.
6. Full penetration butt welds may be substituted for the fillet welds on all anchors.
7. Standard square, hexagon, round or equivalent headed anchors may be substituted for the right angle hooks on the anchors shown on this plan.
8. Grate and Frame weights are based on welded grates.



SECTION C-C

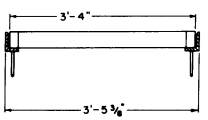


TYPICAL FRAME



CROSS SECTION

(Thru Frame and Grate)

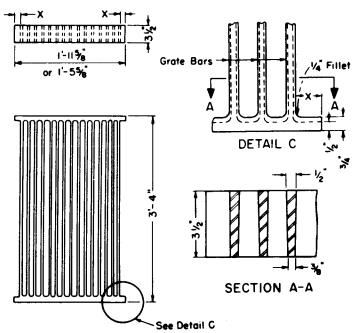


LONGITUDINAL SECTION

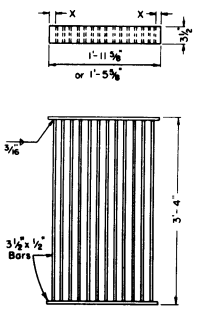
(Thru Frame and Grate)

RECTANGULAR FRAME DETAILS

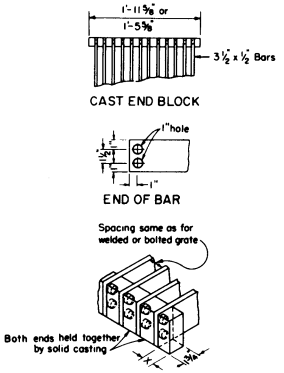
(For all Rectangular Grates)



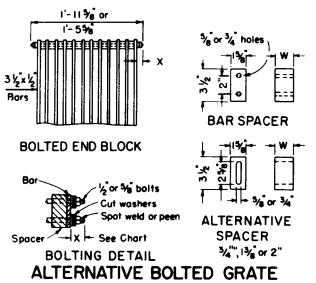
ALTERNATIVE CAST NODULAR IRON GRATE OR CAST STEEL GRATE



ALTERNATIVE WELDED GRATE



ALTERNATIVE CAST NODULAR IRON OR CAST STEEL END BLOCK GRATE



ALTERNATIVE BOLTED GRATE

TYPE	NO. BARS	CLEAR BAR SPACING	X
18-9	9	1 3/8"	1 1/16"
24-9	9	2"	1 9/16"
24-12	12	1 3/8"	1 1/4"
24-18	18	3/4"	15/16"
36R	13	2"	2 1/8"

GRATE BAR SPACING TABLE

INLET TYPE	COVER TYPE	WEIGHT
05	PLATE	184
OL-7	PLATE	210
OL-10	PLATE	236
OL-14	PLATE	265
OL-21	PLATE	321
OCP	PLATE	109
OCP1	PLATE	122
OCP1	REDWOOD	13
OMP	PLATE	180
OMP1	PLATE	193

INLET TYPE	GRATE TYPE	WEIGHT
GDO	24-12	748
	24-18	948
GOL-7	24-12	433
	24-18	557
GOL-10	24-12	459
	24-18	583
G0,G1,G2,G3,G4(24")	24-9	310
	24-12	374
	24-18	498
G4(18") G5,G6	18-9	291
GT-1	18-9	635
GT-2	18-9	658
GT-3	24-12	799
	24-18	1003
GT-4	24-12	818
	24-18	1021
GMP,GCP	36R	224
GMP1,GCP1	36R	224

BASIS FOR MISC. IRON & STEEL FINAL PAY WEIGHTS FOR STORM DRAIN INLETS (See General Notes No. 8)

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

GRATE DETAILS

D77-8

D77-8

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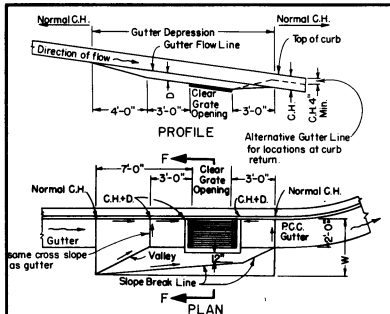
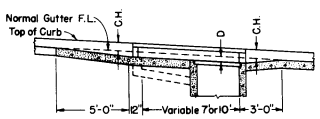
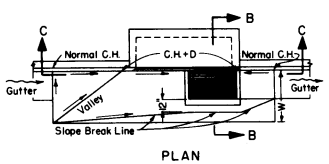


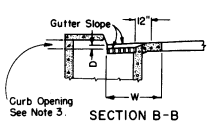
TYPE G_1 THRU G_6 INLETS ON GRADE



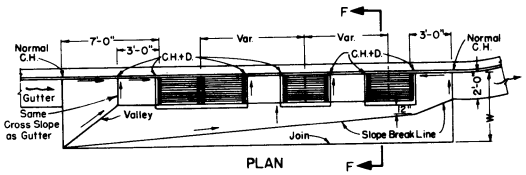
SECTION C-C



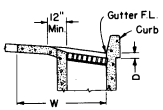
TYPE GOL INLET ON GRADE



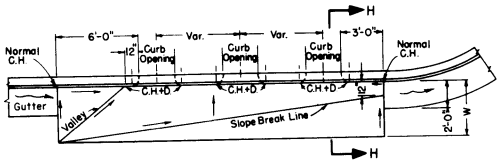
SECTION B-B



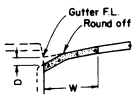
GRATE INLET IN SERIES



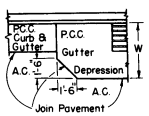
SECTION F-F



TYPE OS & OL INLETS IN SERIES ON GRADE

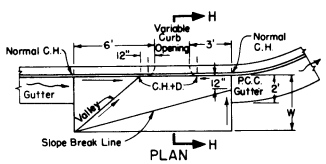


SECTION H-H

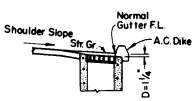


DETAIL OF ASPHALT CONCRETE PAVEMENT

(See Note 4)

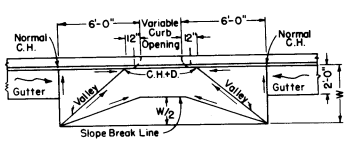


TYPE OS & OL INLETS ON GRADE

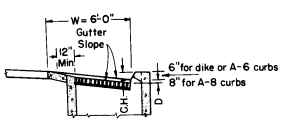


DETAIL OF INLET WITH DIKE

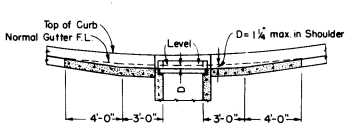
(SINGLE GRATE SHOWN)



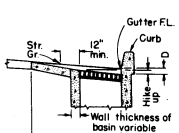
TYPE OS & OL INLETS IN GRADE SAG



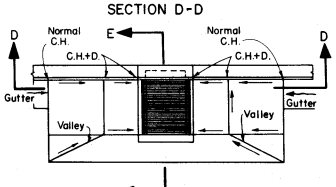
SECTION E-E



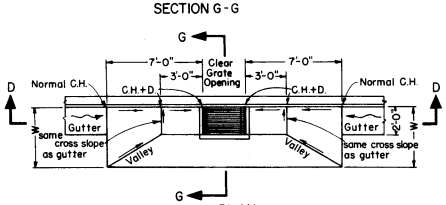
SECTION D-D



SECTION G-G



TYPE GDO INLET IN GRADE SAG



TYPE G_1 THRU G_6, GT3 & GT4 INLETS IN GRADE SAG

To accompany plans dated

DISTRICT	COUNTY	ROUTE	Post Miles = Total Project	Sheets Min.	Total Sheets

APPROVAL RECOMMENDED

Engineer of Design
Registered Civil Engineer No. 9837

Approved September 1, 1966

State Highway Engineer
Registered Civil Engineer No. 5945

GENERAL NOTES

1. W = Width of depressed apron and shall be 4' on shoulders and 4' to 6' in city street gutters unless otherwise shown.
   D = Gutter Depression. It shall be 1¼" for shoulders and 1¼" to 3" in city street gutters or locations outside of shoulders unless otherwise shown.
   C.H. = Curb Height.
   → = Straight Grade, Downward Slope.
   ⌒ = Gutter or Shoulder direction of flow.
2. Gutter depressions shall be Class "B" P.C.C. 8" thick.
3. Establish curb opening height at midpoint of grate.
4. Details shown for P.C.C. pavement. When A.C. pavement is used corners to be cut off as shown on Detail of Asphalt Concrete Pavement.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

GUTTER DEPRESSIONS

D78

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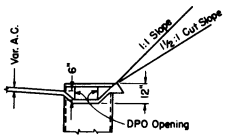
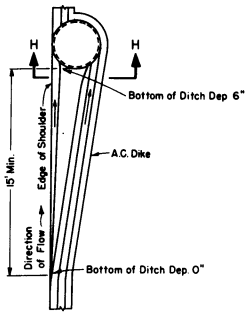
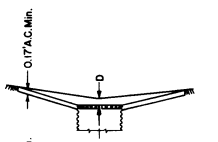


SECTION H-H

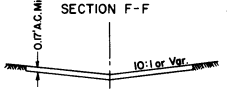


PLAN

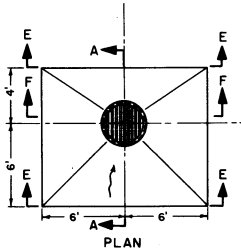
TYPE OCP & OMP INLETS ON A GRADE IN CUT



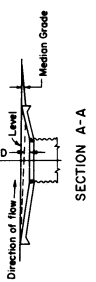
SECTION F-F



SECTION E-E



PLAN



SECTION A-A

TYPE GCP & GMP INLETS
(In Wide Median)

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

Engineer of Design
Registered Civil Engineer No. 9837

Approved September 1, 1966

State Highway Engineer
Registered Civil Engineer No. 5945

GENERAL NOTES

1. D = Median Depression is 0.35' for grades flatter than 2% and 0.50' for grades 2% and steeper.
   → = Straight Grade, Downward Slope.
   ⇝ = Gutter or Shoulder direction of flow.
2. Depression aprons shall be constructed of a minimum of 0.17' asphalt concrete unless otherwise noted.
3. No depression shall encroach on shoulder area.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PIPE INLET DEPRESSIONS D79-1

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DIST.	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED SEPTEMBER 1, 1966

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945

SPAN	2'		3'			4'						5'											
HEIGHT	1'-6"	2'	2'	3'		2'	3'		4'			2'		3'		4'				5'			
STRENGTH CLASSIFICATION	A	A	A	A	B	A	A	B	A	B	C	A	B	A	B	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP	66		38	38	66	28	28	37	28	37	50	12	27	12	27	11	26	35	46	11	25	35	46
Conc. Top Slab T_1	6	6	6¼	6¼	8	7	7	8	7	8	9	7½	8	7½	8	7½	8	9½	10½	7¼	8	9½	10½
Conc. Bottom Slab T_2	6	6	6¼	6¼	8	7	7	8	7	8	9	6	8	6	8	6	8	10	10¾	6	8	10	10¾
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
Reinforcing Steel "a" Size: Bar #	4	4	4	4	5	5	5	5	5	5	6	5	5	5	5	5	5	6	6	5	5	6	6
"a" Spacing	3½	3½	3½	3½	4	5	5	4½	5	4½	5	4	4	4	4	4	4	5	4½	4	4	5	4½
"a" Length	3-2	3-2	4-2	4-2	4-3	5-3	5-3	5-3	5-3	5-3	5-2	6-3	6-3	6-3	6-3	6-3	6-3	6-2	6-2	6-3	6-3	6-2	6-2
"d" Dist. Bars Top Slab-No. of	2	2	3	3	2	5	5	3	5	3	3	7	3	7	3	7	3		3	7	3		3
"d" Dist. Bars Bottom Slab-No. of	2	2	2	2	2	3	3		3		3	3		3		3			3	3	3		3
"e" Bars Spacing	18	18	18	18	12½	18	18	18	17	13	9½	18	18	18	18	18	17	13	11	18	12	8½	6½
Spacers Number	12	12	12	12		12	12		14			14		14		14				16			
Quan. Concrete: C.Y. per lin. ft.	.17	.18	.23	.27	.31	.29	.33	.36	.36	.40	.43	.32	.37	.36	.41	.40	.44	.51	.54	.43	.48	.55	.57
Quan. Reinf. lbs. per lin. ft.	27	29	34	36	46	44	45	47	48	52	64	57	56	59	57	61	60	68	75	63	65	77	87
Hydraulics Area A	3	4	6	9		8	12		16			10		15		20				25			
Hydraulic Radius R	.43	.50	.60	.75		.67	.86		1.00			.71		.94		1.11				1.25			
Neutral Slope %	.83	.91	.73	.82		.64	.70		.77			.59		.62		.67				.73			
Head Factor k	1.30	1.07	.85	.65		.75	.55		.45			.69		.49		.39				.34			
Entrance Capacity Q_{10}	11	17	26	48		35	64		99			43		80		123				172			
Design Discharge Q_{100}	18	28	43	79		58	107		163			71		132		203				284			

SPAN	6'																				
HEIGHT	2'		3'		4'			5'				6'					7'				
STRENGTH CLASSIFICATION	A	B	A	B	A	B	C	A	B	C	D	A	B	C	D	E	A	B	C	D	E
MAX. FILL OVER TOP	10	18	10	18	10	18	25	9	18	25	36	9	17	25	36	45	9	17	25	36	45
Conc. Top Slab T_1	8¼	8¼	8¼	8¼	8¼	8¼	9¼	8¼	8¼	9¼	11	8¼	8¼	9¼	11	12	8¼	8¼	9¼	11	12
Conc. Bottom Slab T_2	6¾	8	6¾	8	6¾	8	9¾	7¼	8¼	10	11¼	7¼	8¼	10½	11¼	12¼	7¼	8¼	10½	11¼	12¼
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6¼	7	6	6	6¼	7	7¾
Reinforcing Steel "a" Size: Bar #	5	5	5	5	5	5	6	5	5	6	6	5	5	6	7	7	5	5	6	7	7
"a" Spacing	4	4	4	4	4	4	5	4	4	5	4½	4	4	5	5½	5	4	4	5	5½	5
"a" Length	7-3	7-3	7-3	7-3	7-3	7-3	7-2	7-3	7-3	7-2	7-2	7-3	7-3	7-2	7-3	7-5	7-3	7-3	7-2	7-5	7-6
"d" Dist. Bars Top Slab-No. of	7	4	7	4	7	4		7	4		4	7	4		4	4	7	4		4	4
"d" Dist. Bars Bottom Slab-No. of	4		4		4			4			4	4			4	4	4			4	4
"e" Bars Spacing	18	18	18	18	18	18	17	18	15½	11½	8½	17	10½	7½	6	5	12	7½	7	5	4½
Spacers Number	12		12		14			16				16					18				
Quan. Concrete: C.Y. per lin. ft.	.40	.42	.43	.46	.47	.50	.58	.52	.54	.60	.66	.56	.58	.65	.71	.78	.59	.61	.70	.78	.88
Quan. Reinf. lbs. per lin. ft.	64	63	66	65	69	67	74	70	70	80	91	73	78	92	112	127	81	90	99	126	139
Hydraulics Area A	12		18		24			30				36					42				
Hydraulic Radius R	.75		1.00		1.20			1.36				1.50					1.62				
Neutral Slope %	.53		.56		.59			.62				.66					.71				
Head Factor k	.645		.45		.358			.305				.271					.247				
Entrance Capacity Q_{10}	52		96		148			207				272					343				
Design Discharge Q_{100}	86		159		244			341				448					565				

Note:

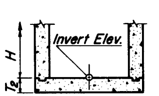
For boxes of height less than that shown in table, use next greater table height slabs, wall dimensions and reinforcing steel, and make necessary changes in bar lengths, number of spacers and quantities.

SPAN	7'												
HEIGHT	3'		4'		5'			6'			7'		
STRENGTH CLASSIFICATION	A	B	A	B	A	B	C	A	B	C	A	B	C
MAX. FILL OVER TOP	16	26	16	26	16	26	35	16	26	35	16	26	35
Conc. Top Slab T_1	7¼	8¼	7¼	8¼	7¼	8¼	9¾	7¼	8¼	9¾	7¼	8¼	9¾
Conc. Bottom Slab T_2	7½	8¾	7½	8¾	7½	8¾	10½	7½	8¾	10½	7½	8¾	10½
Conc. Sidewalls T_3	6	7	6	7	6	7	8½	6	7	8½	6	7	8½
Reinforcing Steel "a" Size: Bar #	5	5	5	5	5	5	6	5	5	6	5	5	6
"a" Spacing	9	7	9	7	9	7	9	9	7	9	9	7	9
"a" Length	6-8	6-9	6-8	6-9	6-8	6-9	6-10	6-8	6-9	6-10	6-8	6-9	6-10
"b" Size: Bar #	5	5	5	5	5	5	6	5	5	6	5	5	6
"b" Spacing	9	7	9	7	9	7	9	9	7	9	9	7	9
"b" Dimension "X"	1-3	1-4	1-3	1-4	1-3	1-4	1-8	1-3	1-4	1-8	1-3	1-4	1-8
"b" Length	3-1	3-2	3-1	3-2	3-1	3-2	3-10	3-1	3-2	3-10	3-1	3-2	3-10
"c" Size: Bar #	5	5	5	5	5	5	6	5	5	6	5	5	6
"c" Spacing	9	7	9	7	9	7	9	9	7	9	9	7	9
"c" Dimension "Y"	1-10	1-11	1-10	1-11	1-10	1-11	2-3	1-10	1-11	2-3	1-10	1-11	2-3
"c" Length	5-2	5-4	6-2	6-4	7-2	7-4	7-10	8-2	8-4	8-10	9-2	9-4	9-10
"c1" Size: Bar #	5	5	5	5	5	5	6	5	5	6	5	5	6
"c1" Spacing	9	7	9	7	9	7	9	9	7	9	9	7	9
"c1" Dimension "Y"	1-10	1-11	1-10	1-11	1-10	1-11	2-3	1-10	1-11	2-3	1-10	1-11	2-3
"c1" Length	3-8	3-10	3-8	3-10	3-8	3-10	4-6	3-8	3-10	4-6	3-8	3-10	4-6
"d" Bars Top Slab-No. of	7	4	7	4	7	4	4	7	4	4	7	4	4
"d" Bars Bottom Slab-No. of	4	4	4	4	4	4	4	4	4	4	4	4	4
"e" Bars Spacing	18	18	18	18	18	18	18	18	18	18	18	18	18
Spacers Total Number	24		28		28			32			36		
Quan. Concrete: C.Y. per lin. ft.	.47	.56	.51	.60	.55	.64	.78	.58	.68	.84	.62	.73	.89
Quan. Reinf: lbs. per lin. ft.	107	130	114	138	118	143	168	125	150	176	132	158	184
Hydraulics Area A	21		28		35			42			49		
Hydraulic Radius R	1.05		1.27		1.46			1.62			1.75		
Neutral Slope %	0.52		0.54		0.57			0.61			0.64		
Head Factor k	0.423		0.332		0.281			0.247			0.224		
Entrance Capacity Q_{10}	112		173		241			317			400		
Design Discharge Q_{100}	185		285		398			523			659		

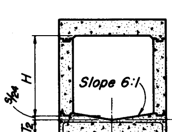
SPAN	8'														
HEIGHT	3'		4'		5'		6'			7'			8'		
STRENGTH CLASSIFICATION	A	B	A	B	A	B	A	B	C	A	B	C	A	B	C
MAX. FILL OVER TOP	13	21	13	21	13	21	13	21	31	13	21	31	13	21	31
Conc. Top Slab T_1	7¼	8½	7¼	8½	7¼	8½	7¼	8½	10¼	7¼	8½	10¼	7¼	8½	10¼
Conc. Bottom Slab T_2	7¼	9½	7¼	9½	7¼	9½	7½	9½	11½	7½	9½	11½	7½	9½	11½
Conc. Sidewalls T_3	6½	7½	6½	7½	6½	7½	6½	7½	9¾	6½	7½	9¾	6½	7½	9¾
Reinforcing Steel "a" Size: Bar #	5	5	5	5	5	5	5	5	6	5	5	6	5	5	6
"a" Spacing	9	7	9	7	9	7	9	7	8	9	7	8	9	7	8
"a" Length	7-7	7-8	7-7	7-8	7-7	7-8	7-7	7-8	7-10	7-7	7-8	7-10	7-7	7-8	7-10
"b" Size: Bar #	5	5	5	5	5	5	5	5	6	5	5	6	5	5	6
"b" Spacing	9	7	9	7	9	7	9	7	8	9	7	8	9	7	8
"b" Dimension "X"	1-6	1-7	1-6	1-7	1-6	1-7	1-6	1-7	1-8	1-6	1-7	1-8	1-6	1-7	1-8
"b" Length	3-4	3-5	3-4	3-5	3-4	3-5	3-4	3-5	3-10	3-4	3-5	3-10	3-4	3-5	3-10
"c" Size: Bar #	5	5	5	5	5	5	5	5	6	5	5	6	5	5	6
"c" Spacing	9	7	9	7	9	7	9	7	8	9	7	8	9	7	8
"c" Dimension "Y"	2-0	2-5	2-0	2-5	2-0	2-5	2-0	2-5	2-8	2-0	2-5	2-8	2-0	2-5	2-8
"c" Length	5-4	5-10	6-4	6-10	7-4	7-10	8-4	8-10	9-3	9-4	9-10	10-3	10-4	10-10	11-3
"c1" Size: Bar #	5	5	5	5	5	5	5	5	6	5	5	6	5	5	6
"c1" Spacing	9	7	9	7	9	7	9	7	8	9	7	8	9	7	8
"c1" Dimension "Y"	2-0	2-5	2-0	2-5	2-0	2-5	2-0	2-5	2-8	2-0	2-5	2-8	2-0	2-5	2-8
"c1" Length	3-9	4-5	3-9	4-5	3-9	4-5	3-9	4-5	5-0	3-9	4-5	5-0	3-9	4-5	5-0
"d" Bars Top Slab-No. of	7	5	7	5	7	5	7	5	5	7	5	5	7	5	5
"d" Bars Bottom Slab-No. of	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
"e" Bars Spacing	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Spacers Total Number	28		32		32		36			40			40		
Quan. Concrete: C.Y. per lin. ft.	.52	.65	.56	.70	.60	.74	.65	.79	1.00	.69	.83	1.06	.73	.88	1.12
Quan. Reinf: lbs. per lin. ft.	118	146	125	154	129	159	136	167	211	143	174	220	147	179	225
Hydraulics Area A	24		32		40		48			56			64		
Hydraulic Radius R	1.09		1.33		1.54		1.71			1.87			2.00		
Neutral Slope %	0.50		0.52		0.54		0.56			0.59			0.62		
Head Factor k	0.404		0.314		0.262		0.229			0.206			0.189		
Entrance Capacity Q_{10}	128		197		276		362			457			558		
Design Discharge Q_{100}	212		326		455		597			753			921		

SPAN	10'																
HEIGHT	4'		5'		6'		7'		8'			9'			10'		
STRENGTH CLASSIFICATION	A	B	A	B	A	B	A	B	A	B	C	A	B	C	A	B	C
MAX. FILL OVER TOP	9	18	9	18	9	18	9	18	8	18	28	8	18	28	8	18	28
Conc. Top Slab T_1	8	9½	8¼	9¾	8¼	9¾	8½	9¾	8½	9¾	12¼	8½	9¾	12¼	8½	9¾	12¼
Conc. Bottom Slab T_2	8¾	10½	9	10¾	9	10¾	9¼	11	9¼	11	13¼	9¼	11	13¼	9¼	11	13½
Conc. Sidewalls T_3	7¼	9½	7¼	9½	7¼	9½	7¼	9½	7¼	9½	11½	8	9½	11½	9	9½	11½
Reinforcing Steel "a" Size: Bar #	6	6	6	6	6	6	6	6	6	6	7	6	6	7	6	6	7
"a" Spacing	11	8	11	8	11	8	11	8	11	8	9	11	8	9	11	8	9
"a" Length	9-5	9-8	9-5	9-8	9-5	9-8	9-5	9-8	9-5	9-8	9-9	9-6	9-8	9-9	9-7	9-8	9-9
"b" Size: Bar #	5	6	5	6	5	6	5	6	5	6	6	5	6	6	5	6	6
"b" Spacing	11	8	11	8	11	8	11	8	11	8	9	11	8	9	11	8	9
"b" Dimension "X"	2-0	2-0	2-0	2-0	2-0	2-0	2-0	2-0	2-0	2-0	2-6	2-0	2-0	2-6	2-0	2-0	2-6
"b" Length	3-10	4-2	3-10	4-2	3-10	4-2	3-10	4-2	3-10	4-2	4-8	3-10	4-2	4-8	3-10	4-2	4-8
"c" Size: Bar #	5	6	5	6	5	6	5	6	5	6	6	5	6	6	5	6	6
"c" Spacing	11	8	11	8	11	8	11	8	11	8	9	11	8	9	11	8	9
"c" Dimension "Y"	2-8	3-4	2-8	3-4	2-8	3-4	2-8	3-4	2-8	3-4	3-6	2-8	3-4	3-6	2-8	3-4	3-6
"c" Length	6-11	7-10	8-1	8-10	9-1	9-10	10-1	10-10	11-1	11-10	12-3	12-1	12-10	13-3	13-1	13-10	14-3
"c1" Size: Bar #	5	6	5	6	5	6	5	6	5	6	6	5	6	6	5	6	6
"c1" Spacing	11	8	11	8	11	8	11	8	11	8	9	11	8	9	11	8	9
"c1" Dimension "Y"	2-8	3-4	2-8	3-4	2-8	3-4	2-8	3-4	2-8	3-4	3-6	2-8	3-4	3-6	2-8	3-4	3-6
"c1" Length	4-7	5-8	4-7	5-8	4-7	5-8	4-7	5-8	4-7	5-8	6-0	4-7	5-8	6-0	4-7	5-8	6-2
"d" Bars Top Slab-No. of	9	5	9	5	9	5	9	5	9	5	5	9	5	5	9	5	5
"d" Bars Bottom Slab-No. of	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
"e" Bars Spacing	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Spacers Total Number	32		34		36		40		40			44			48		
Quan. Concrete: C.Y. per lin. ft.	.75	.94	.82	1.02	.86	1.08	.92	1.15	.97	1.21	1.50	1.06	1.26	1.57	1.18	1.32	1.65
Quan. Reinf: lbs. per lin. ft.	143	221	148	228	154	235	160	244	164	250	265	170	259	273	178	267	281
Hydraulics Area A	40		50		60		70		80			90			100		
Hydraulic Radius R	1.43		1.67		1.88		2.06		2.22			2.37			2.50		
Neutral Slope %	0.47		0.49		0.51		0.52		0.54			0.56			0.58		
Head Factor k	0.288		0.238		0.205		0.183		0.165			0.153			0.143		
Entrance Capacity Q_{10}	247		345		453		571		698			834			976		
Design Discharge Q_{100}	407		568		747		941		1150			1380			1610		

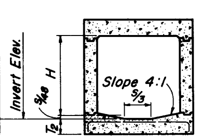
SPAN	12'														
HEIGHT	6'		7'		8'		9'			10'			12'		
STRENGTH CLASSIFICATION	A	B	A	B	A	B	A	B	C	A	B	C	A	B	C
MAX. FILL OVER TOP	5	16	5	16	5	16	5	16	24	5	16	24	5	16	24
Conc. Top Slab T_1	8¾	11¼	8¾	11¼	8¾	11¼	9	11¼	13¼	9	11¼	13¼	9	11¼	13¼
Conc. Bottom Slab T_2	8¾	12¼	8¾	12¼	8¾	12½	9	12½	14¾	9	12½	14¾	9	12½	14¾
Conc. Sidewalls T_3	7½	10½	7½	10½	7½	10½	8	10½	12½	9	10½	12½	9	10½	12½
Reinforcing Steel "a" Size: Bar #	6	7	6	7	6	7	6	7	7	6	7	7	6	7	7
"a" Spacing	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8
"a" Length	11-3	11-6	11-3	11-6	11-3	11-6	11-4	11-6	11-8	11-5	11-6	11-8	11-5	11-6	11-8
"b" Size: Bar #	6	7	6	7	6	7	6	7	7	6	7	7	6	7	7
"b" Spacing	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8
"b" Dimension "X"	2-8	3-0	2-8	3-0	2-8	3-0	2-8	3-0	3-0	2-8	3-0	3-0	2-8	3-0	3-0
"b" Length	4-10	5-7	4-10	5-7	4-10	5-7	4-10	5-7	5-7	4-10	5-7	5-7	4-10	5-7	5-7
"c" Size: Bar #	6	7	6	7	6	7	6	7	7	6	7	7	6	7	7
"c" Spacing	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8
"c" Dimension "Y"	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	10-2	10-4	11-2	11-4	12-2	12-4	13-2	13-4	13-6	14-2	14-4	14-6	16-2	16-4	16-6
"c1" Size: Bar #	6	7	6	7	6	7	6	7	7	6	7	7	6	7	7
"c1" Spacing	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8
"c1" Dimension "Y"	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	5-11	6-5	5-11	6-5	5-11	6-6	5-11	6-6	6-8	5-11	6-6	6-8	5-11	6-6	6-8
"d" Bars Top Slab-No. of	10	6	10	6	10	6	10	6	6	10	6	6	10	6	6
"d" Bars Bottom Slab-No. of	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
Spacers Total Number	36		44		44		44			48			52		
Quan. Concrete: C.Y. per lin. ft.	.99	1.38	1.03	1.44	1.08	1.52	1.18	1.58	1.90	1.30	1.65	1.98	1.41	1.78	2.13
Quan. Reinf: lbs. per lin. ft.	203	293	213	304	218	311	223	317	387	231	326	397	243	341	415
Hydraulics Area A	72		84		96		108			120			144		
Hydraulic Radius R	2.00		2.21		2.40		2.57			2.73			3.00		
Neutral Slope %	0.46		0.48		0.49		0.51			0.52			0.56		
Head Factor k	0.189		0.167		0.151		0.138			0.128			0.114		
Entrance Capacity Q_{10}	543		686		838		1000			1170			1540		
Design Discharge Q_{100}	896		1130		1380		1650			1930			2540		



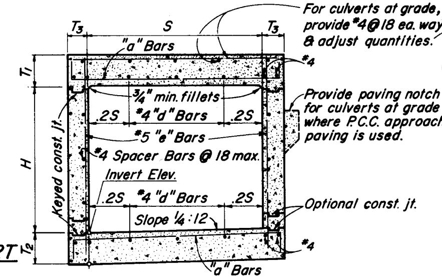
ALTERNATIVE FLAT INVERT



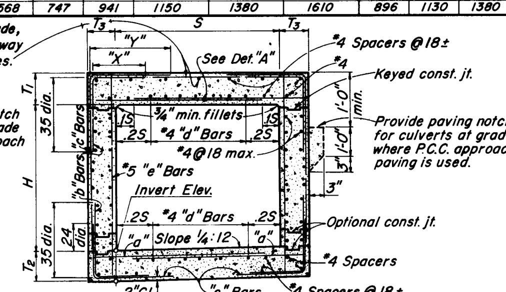
ALTERNATIVE V INVERT



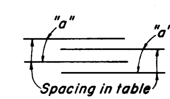
ALTERNATIVE TRAPEZOIDAL INVERT



TYPICAL SECTIONS 2' THRU 6' SPANS



TYPICAL SECTION 7' THRU 12' SPANS



DETAIL "A"

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

SINGLE BOX CULVERTS

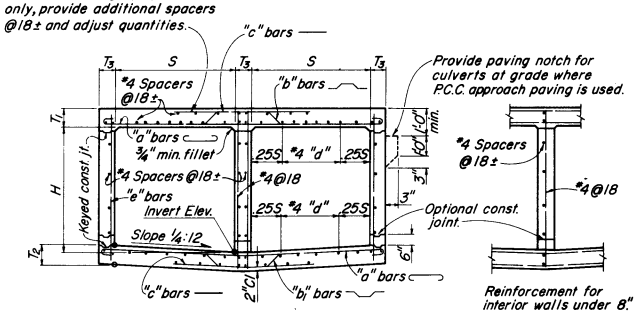
D80

Return to Table of Contents

SPAN	4'												5'												6'												8'											
HEIGHT	2'			3'				4'					2'			3'				4'					3'			4'				5'					4'			5'				6'					7'				8'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	D	A	B	C	D		A	B	C	A	B	C		A	B	C	D		A	B	C	A	B	C	D	A	B	C	D		A	B	C	A	B	C	D	A	B	C	D		A	B	C	D	A	B	C	D
MAX. FILL OVER TOP	11	21	32	11	23	34	46	11	23	34	46		6	24	36	6	24	36		6	23	34	46		6	23	34	46				6	23	34	46		4	20	34	4	20	34		4	19	33	43		4	19	33	43	3	14	25	3	14	25	37	3	14	25	37
Conc. Top Slab T_1	6½	6½	7¼	6½	6½	7¼	8½	6½	6½	7½	8½		6¾	7¾	9¼	6¾	7¾	9¼		6¾	7¾	9	10¼		6¾	7¾	9¼	10¼		7¼	8¼	10½	7¼	8¼	10½		7¼	8¼	10½	12		7¼	8¼	10½	12		8½	9½	12		8½	9½	12	8½	9½	12¼	14¼	8½	9½	12¼	14¼
Conc. Bottom Slab T_2	6	7¼	8½	6	7½	8½	9½	6	7½	8½	9½		6½	8¾	10¼	6½	8¾	10¼		6½	8¾	10	11¼		6½	8¾	10¼	11¼		7¼	9½	11½	7¼	9½	11½		7¼	9½	11½	12¾		7¼	9½	11½	12¾		7½	10½	12¾		7½	10½	12¾	7½	10½	12¾	13	7½	10½	13	15¼
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	6	6	6	6	6	6	6		6	6	6	6	7	7	7	8	7	7	8	8½
Steel a Size: Bar #	5	4	4	5	4	4	4	5	4	4	4		5	4	4	5	4	4		5	4	4	4		5	4	4	5	4	4	4	5	4	4	4		5	4	4	5	4	4	4	5	4	4	4		6	4	4	6	4	4	4	6	4	4	4	4
Steel a Spacing	11	11	9	11	10½	8½	7½	11	10½	8½	7½		10	8½	10	10	8½	10		10	8½	10	9		10	8½	10½	9		9½	11	8½	9½	11	8½	10½		9½	11	8½	10½		9½	11	8½	10½		9½	11	8½	10½	12	9½	10½	12	9½	10	8½	10	8½
Steel a Length	10-3	10-2	10-2	10-3	10-2	10-2	10-2	10-3	10-2	10-2	10-2		12-3	12-2	12-2	12-3	12-2	12-2		12-3	12-2	12-2	12-2		12-3	12-2	12-2	12-2		14-3	14-2	14-2	14-3	14-2	14-2		14-3	14-2	14-2	14-2		14-3	14-2	14-2	14-2		14-3	14-2	14-2	14-2	14-8	18-4	18-2	18-2	18-4	18-2	18-2	18-2	18-7	18-5	18-5	18-5	18-8	18-10
Steel b or b_1 Size: Bar #	5	5	5	5	5	5	5	5	5	5	5		5	5	6	5	5	6		5	5	6	6		5	5	6	6		5	6	6	5	6	6	7		5	6	6	7		5	6	6	7		5	6	6	7	6	6	7	6	6	7	7	6	6	7	7
Steel b or b_1 Spacing	11	11	9	11	10½	8½	7½	11	10½	8½	7½		10	8½	10	10	8½	10		10	8½	10	9		10	8½	10½	9		9½	11	8½	9½	11	8½	10½		9½	11	8½	10½		9½	11	8½	10½		9½	11	8½	10½	12	9½	10½	12	9½	10	8½	10	8½
Steel b or b_1 Length "b"	9-4	9-4	9-6	9-4	9-4	9-6	9-7	9-4	9-4	9-6	9-7		11-5	11-6	11-7	11-5	11-6	11-7		11-5	11-6	11-7	11-8		11-5	11-6	11-7	11-8		13-6	13-6	13-8	13-6	13-6	13-8		13-6	13-6	13-8	14-2		17-7	17-8	17-9	17-7	17-8	17-9		17-7	17-8	17-9	17-10	17-10	18-0	18-5	17-10	18-3	18-6		
Steel b or b_1 Length "b_1"	9-4	9-5	9-6	9-4	9-5	9-6	9-7	9-4	9-5	9-6	9-7		11-4	11-6	11-7	11-4	11-6	11-7		11-4	11-6	11-7	11-8		11-4	11-6	11-7	11-8		13-5	13-7	13-8	13-5	13-7	13-8		13-5	13-6	13-8	13-9		13-5	13-6	13-8	13-9		13-5	13-6	13-8	14-2		17-5	17-8	17-9	17-5	17-8	17-9		17-5	17-8	17-9	17-8	17-11	18-0	18-5	17-8	17-11	18-0	18-7	
Steel c Size: Bar #	4	5	5	4	5	5	5	4	5	5	5		4	5	6	4	5	6		4	5	6	6		4	5	6	6		4	6	6	4	6	6	6		4	6	6	6		4	6	6	6		4	6	6	7	4	6	7	4	6	7	7	4	6	7	7
Steel c Spacing	11	11	9	11	10½	8½	7½	11	10½	8½	7½		10	8½	10	10	8½	10		10	8½	10	9		10	8½	10½	9		9½	11	8½	9½	11	8½	10½		9½	11	8½	10½		9½	11	8½	10½		9½	11	8½	10½	12	9½	10½	12	9½	10	8½	10	8½
Steel c Length	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6		5-6	5-6	5-6	5-6	5-6	5-6		5-6	5-6	5-6	5-6		5-6	5-6	5-6	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	6-6	6-6		6-6	6-6	6-6	6-8	8-6	8-6	8-7	8-6	8-6	8-7	8-8	8-7	8-8	8-9	
"d" Dist. Bars Top Slab-Tot. No.	10	6	6	10	6	6	6	10	6	6	6		12	6	6	12	6	6		12	6	6	6		12	6	6	6		12	6	6	12	6	6	6		12	6	6	6		12	6	6	6		12	6	6	6	16	8	8	16	8	8	8	16	8	8	8
"d" Dist. Bars Bottom Slab-Tot. No.	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	8	8	8	8	8	8	8	8	8	8	8
"e" Bars Size: Bar #	4	4	4	4	4	4	4	4	4	4	5		4	4	4	4	4	4		4	4	5	4		4	5	5	4		4	4	4	4	4	4	5		4	5	6	6		4	5	6	6		4	5	6	7	4	4	4	4	5	5	7	4	5	7	7
"e" Bars Spacing	18	18	18	18	18	16	12	18	12	9	10		18	18	18	18	18	16		18	12	10	10½		18	12	10	10½		18	18	16	18	18	16	12		18	18	16	12		18	10	9½	7		18	11	9	6	18	18	10½	18	12	10	18	11½	10	14	9½	7½	8½	11½	8½	7½	8
Spacers Number	23			26				29					23			26				29					30			33				36					36							41					44				47			50			50			60	
Quan. Concrete: C.Y. per lin. ft.	0.47	0.51	0.57	0.53	0.57	0.63	0.69	0.59	0.63	0.69	0.75		0.58	0.69	0.80	0.63	0.75	0.86		0.69	0.80	0.89	0.98		0.74	0.86	0.97	1.04		0.77	0.90	1.08	0.82	0.96	1.13		0.88	1.01	1.19	1.30		0.93	1.07	1.25	1.47		1.08	1.30	1.55	1.14	1.37	1.61	1.19	1.42	1.66	1.32	1.56	1.83	2.14	1.39	1.62	1.99	2.27
Quan. Reinf. : Lbs. per lin. ft.	81	74	84	84	79	91	101	87	85	99	111		99	100	109	103	104	112		106	109	119	133		109	116	126	148		121	119	147	125	124	155		128	131	164	175		129	137	177	201		169	175	200	172	181	218	173	188	229	185	199	248	299	191	207	264	314
Hydraulics Area A	16			24				32					20			30				40					50					36			48					60					72					64				80			96			112			128	
Hydraulics Hydraulic Radius R	0.67			0.86				1.00					0.71			0.94				1.11					1.25					1.00			1.20					1.33					1.50					1.33				1.54			1.71			1.87			2.00	
Hydraulics Neutral Slope %	0.64			0.70				0.77					0.59			0.62				0.67					0.73					0.56			0.59					0.62					0.66					0.52				0.54			0.56			0.59			0.62	
Hydraulics Head Factor k	0.75			0.55				0.45					0.69			0.49				0.39					0.34					0.450			0.358					0.305					0.271					0.314				0.262			0.229			0.206			0.189	
Hydraulics Entrance Capacity Q_{10}	70			128				198					86			160				246					344					192			296					414					544					394				552			724			914			1116	
Hydraulics Design Discharge Q_{100}	116			214				326					142			264				406					568					318			488					682					896									910			1194			1506			1842	

SPAN	10'																		12'																													
HEIGHT	5'			6'				7'				8'				10'				6'				7'				8'				9'				10'				12'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP	2	17	30	2	17	30	2	17	30	2	16	29	36	2	16	29	36	2	14	26	2	14	26	2	14	26	2	14	26	36	2	14	26	36	2	14	26	36	2	14	26	36
Conc. Top Slab T_1	8¾	12¾	16	8¾	12¾	16	8¾	12¾	16	8¾	12¾	16	17¼	8¾	12¾	16	17½	10	14	17½	10	14¼	17½	10¼	14¼	17¾	10¼	14¼	17¾	20¾	10¼	14½	17¾	20¾	10¼	14½	18¼	21¼	10¼	15¼	18¾	21½	10¼	15¼	19¼	22
Conc. Bottom Slab T_2	8¼	13½	16½	8¼	13½	16½	8¼	13½	16½	8¾	13½	16½	18½	9¼	14¾	18	9¼	15	18¼	9¾	15	18½	10	15¼	18¾	21¼	10¼	15¼	18¾	21½	10¼	15¼	18¾	21½	10¼	15¼	19¼	22								
Conc. Sidewalls T_3	6	6	6	6	6	6	6½	7	7	7	7½	8½	8	8	9	10	6	6	6½	7	7	7	8	8	8½	9	9	9	9	9	9	9½	11	9	9	10	11	12								
Steel a Size: Bar #	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4	6	4	4	4	6	4	4	4	6	4	4	4	6	4
Steel a Spacing	11	10	10	11	9½	10	11	9½	10	11	10	10	9	11	10	10	9	9	11½	9	9	11	8½	9	9	11	8½	9	9	11	8½	9	9	11	8½	9	9	11	8½	9	9	11	8½	9	9	11	8½	9
Steel a Length	22-4	22-2	22-2	22-4	22-2	22-2	22-4	22-2	22-2	22-5	22-7	22-5	22-7	22-10	22-10	22-8	22-11	23-2	26-4	26-2	26-2	26-4	26-7	26-5	26-5	26-10	26-8	26-10	27-1	26-11	26-11	27-1	27-1	26-11	27-3	27-5	27-1	27-3	27-5	27-8								
Steel b or b_1 Size: Bar #	6	7	8	6	7	8	6	7	8	6	7	8	8	8	6	7	8	8	6	8	8	6	8	8	6	8	8	6	8	9	6	8	8	9	6	8	8	9	6	8	8	9						
Steel b or b_1 Spacing	11	10	10	11	9½	10	11	9½	10	11	10	10	9	11	10	10	9	9	11½	9	9	11½	9	9	11	8½	9	9	11	8½	9	9	11	8½	9	9	11	8½	9	9	11	8½	9	9	11	8½	9
Steel b or b_1 Length "b"	21-7	21-0	22-0	21-7	21-0	22-0	21-7	21-1	22-3	21-10	21-1	22-4	22-9	22-1	22-9	22-3	22-4	23-1	25-8	25-10	26-3	25-11	26-1	26-4	26-2	26-4	26-6	26-9	26-5	26-8	27-4	26-5	26-8	27-2	27-6	26-5	26-11	27-3	27-5	27-10								
Steel b or b_1 Length "b_1"	21-5	21-0	22-0	21-5	21-0	22-0	21-5	21-1	22-3	21-9	22-0	22-4	22-9	22-0	22-9	22-3	22-8	23-2	25-6	25-10	26-3	25-9	26-2	26-4	26-1	26-5	26-9	26-4	26-8	26-11	27-4	26-4	26-8	27-2	27-7	26-4	26-11	27-3	27-5	27-11								
Steel c Size: Bar #	6	7	8	6	7	8	6	7	8	6	7	8	8	8	6	7	8	8	5	8	8	5	8	8	5	8	8	5	8	8	5	8	8	9	5	8	8	9	5	8	8	9						
Steel c Spacing	11	10	10	11	9½	10	11	9½	10	11	10	10	9	11	10	10	9	9	11½	9	9	11½	9	9	11	8½	9	9	11	8½	9	9	11	8½	9	9	11	8½	9	9	11	8½	9	9	11	8½	9
Steel c Length	10-6	10-6	10-6	10-6	10-6	10-6	10-6	10-7	10-7	10-7	10-7	10-8	10-9	10-8	10-8	10-9	10-10	10-10	12-6	12-6	12-7	12-7	12-7	12-7	12-8	12-8	12-8	12-9	12-9	12-9	12-9	12-9	12-10	12-10	12-11	12-9	12-10	12-11	12-11	13-0								
"d" Dist. Bars Top Slab-Tot. No.	18	10	10	18	10	10	18	10	10	18	10	10	10	18	10	10	10	10	24	10	10	24	10	10	24	10	10	24	10	10	24	10	10	10	24	10	10	10	24	10	10	10						
"d" Dist. Bars Bottom Slab-Tot. No.	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						
"e" Bars Size: Bar #	4	4	5	4	4	5	4	4	6	4	5	6	7	4	6	6	7	4	4	5	4	4	5	4	4	5	4	5	4	5	7	8	4	7	8	8	6	7	8	9								
"e" Bars Spacing	18	10	10	18	6	6½	14	6	8	11	8½	6	6	7½	7	5½	5	18	8	8	15	6	6½	12	5½	6	9	7½	8½	8	8½	11	8½	9	12	8	7	7								
Spacers Number	48			48				51				54				64			52					55				68				68				72				76							
Quan. Concrete: C.Y. per lin. ft.	1.40	2.05	2.46	1.45	2.07	2.48	1.51	2.18	2.64	1.68	2.27	2.74	3.04	1.92	2.51	3.05	3.41	1.84	2.59	3.16	1.97	2.77	3.28	2.19	2.93	3.59	2.38	3.15	3.69	4.25	2.48	3.23	3.86	4.49	2.67	3.53	4.30	4.92								
Quan. Reinf. : Lbs per lin. ft.	236	254	310	238	274	324	243	280	339	252	278	355	430	279	327	400	476	309	317	401	316	330	415	336	363	460	345	374	485	578	351	394	519	582	371	427	567	673								
Hydraulics Area A	100			120				140				160				200			144			168			192					216					240					288							
Hydraulics Hydraulic Radius R	1.67			1.88				2.06				2.22				2.50			2.00			2.21			2.40					2.57					2.73					3.00							
Hydraulics Neutral Slope %	0.49			0.51				0.52				0.54				0.58			0.46			0.48			0.49					0.51					0.52					0.56							
Hydraulics Head Factor k	0.238			0.205				0.183				0.165				0.143			0.189			0.167			0.151					0.138					0.128					0.114							
Hydraulics Entrance Capacity Q_{10}	690			906				1142				1396				1952			1086			1372			1676					2000					2340					3080							
Hydraulics Design Discharge Q_{100}	1136			1494				1882				2300				3220			1792			2260			2760					3300					3860					5080							

For culverts at grade, extend "c" bars full length, top slab only, provide additional spacers @18± and adjust quantities.



Reinforcement for interior walls under 8".

TYPICAL SECTION

(Showing reinforcement for interior walls 8" and over.)

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO.5585

APPROVED SEPTEMBER 1, 1966

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO.5945

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.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

DOUBLE BOX CULVERTS

D 81

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SPAN	4'								
HEIGHT	2'			3'			4'		
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C
MAX. FILL OVER TOP	10	24	38	10	24	38	10	24	38
Conc. Top Slab T_1	6¼	6¼	7¼	6¼	6¼	7¼	6¼	6¼	7¼
Conc. Bottom Slab T_2	6	7	8¼	6	7	8¼	6	7	8¼
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6
Reinforcing Steel "a" Size: Bar #	5	4	5	5	4	5	5	4	5
"a" Spacing	11	11½	13	11	11½	13	11	11½	13
"a" Length	14-9	14-8	14-9	14-9	14-8	14-9	14-9	14-8	14-9
"b" or "b_1" Size: Bar #	5	5	6	5	5	6	5	5	6
Spacing	11	11½	13	11	11½	13	11	11½	13
Length "b"	14-2	14-2	14-3	14-2	14-2	14-3	14-2	14-2	14-3
Length "b_1"	14-0	14-2	14-3	14-0	14-2	14-3	14-0	14-2	14-3
"c" Size: Bar #	4	5	6	4	5	6	4	5	6
"c" Spacing	11	11½	13	11	11½	13	11	11½	13
"c" Length	9-0	9-0	9-0	9-0	9-0	9-0	9-0	9-0	9-0
"d" Dist. Bars Top Slab-Tot. No.	15	9	9	15	9	9	15	9	9
"d" Dist. Bars Bottom Slab-Tot. No.	9	9	9	9	9	9	9	9	9
"e" Bars Size: Bar #	4	4	4	4	4	4	4	4	5
"e" Bars Spacing	18	18	18	18	18	13	18	11½	13
Spacers Number	34			38			42		
Quan. Concrete: C.Y. per lin. ft.	0.67	0.71	0.81	0.75	0.79	0.89	0.82	0.86	0.96
Quan. Reinf. : Lbs. per lin. ft.	122	110	133	127	115	138	131	122	147
Hydraulics Area A	24			36			48		
Hydraulic Radius R	.67			.86			1.00		
Neutral Slope %	.64			.70			.77		
Head Factor k	.75			.55			.45		
Entrance Capacity Q_{10}	105			192			297		
Design Discharge Q_{100}	174			321			489		

SPAN	5'													
HEIGHT	2'			3'			4'				5'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP	8	17	26	8	17	26	8	17	26	35	8	17	26	35
Conc. Top Slab T_1	6¾	6¾	7½	6¾	6¾	7½	6¾	6¾	7½	8½	6¾	6¾	7½	8½
Conc. Bottom Slab T_2	6¼	7¼	8½	6¼	7¼	8½	6¼	7¼	8½	9½	6¼	7½	8½	9½
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Reinforcing Steel "a" Size: Bar #	5	4	5	5	4	5	5	4	5	5	5	4	5	5
"a" Spacing	10	11½	13	10	11½	13	10	11	13	11½	10	11	13	11½
"a" Length	17-9	17-8	17-9	17-9	17-8	17-9	17-9	17-8	17-9	17-9	17-9	17-8	17-9	17-9
"b" or "b_1" Size: Bar #	5	5	6	5	5	6	5	5	6	6	5	5	6	6
Spacing	10	11½	13	10	11½	13	10	11	13	11½	10	11	13	11½
Length "b"	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-5	17-3	17-3	17-3	17-5
Length "b_1"	17-0	17-2	17-4	17-0	17-2	17-4	17-0	17-2	17-4	17-5	17-0	17-2	17-4	17-5
"c" Size: Bar #	4	5	6	4	5	6	4	5	6	6	4	5	6	6
"c" Spacing	10	11½	13	10	11½	13	10	11	13	11½	10	11	13	11½
"c" Length	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0
"d" Dist. Bars Top Slab-Tot. No.	18	9	9	18	9	9	18	9	9	9	18	9	9	9
"d" Dist. Bars Bottom Slab-Tot. No.	9	9	9	9	9	9	9	9	9	9	9	9	9	9
"e" Bars Size: Bar #	4	4	4	4	4	4	4	4	4	5	4	4	4	6
"e" Bars Spacing	18	18	18	18	18	18	18	17	11½	11½	18	11	7	11½
Spacers Number	34			38			38				42			
Quan. Concrete: C.Y. per lin. ft.	0.82	0.87	0.98	0.90	0.95	1.05	0.97	1.02	1.13	1.23	1.04	1.11	1.20	1.31
Quan. Reinf. : Lbs. per lin. ft.	150	126	153	155	130	157	157	136	161	181	161	143	171	192
Hydraulics Area A	30			45			60				75			
Hydraulic Radius R	.71			.94			1.11				1.25			
Neutral Slope %	.59			.62			.67				.73			
Head Factor k	.69			.49			.39				.34			
Entrance Capacity Q_{10}	129			240			369				516			
Design Discharge Q_{100}	213			396			609				852			

SPAN	6'													
HEIGHT	3'			4'			5'				6'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP	3	13	23	3	13	23	3	13	23	30	3	13	23	30
Conc. Top Slab T_1	7½	7½	8¼	7½	7½	8¼	7½	7½	8¼	9¼	7½	7½	8¼	9¼
Conc. Bottom Slab T_2	6	7¾	9¼	6	7¾	9¼	6	8	9¼	10	6	8	9¼	10¼
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Reinforcing Steel "a" Size: Bar #	6	5	5	6	5	5	6	5	5	5	6	5	5	5
"a" Spacing	13	14	11½	13	14	11½	13	14	11½	10	13	14	11½	10
"a" Length	20-10	20-9	20-9	20-10	20-9	20-9	20-10	20-9	20-9	20-9	20-10	20-9	20-9	20-9
"b" or "b_1" Size: Bar #	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Spacing	13	14	11½	13	14	11½	13	14	11½	10	13	14	11½	10
Length "b"	20-3	20-3	20-5	20-3	20-3	20-5	20-3	20-3	20-5	20-6	20-3	20-3	20-5	20-6
Length "b_1"	20-0	20-2	20-5	20-0	20-2	20-5	20-0	20-3	20-5	20-6	20-0	20-0	20-5	20-7
"c" Size: Bar #	4	6	6	4	6	6	4	6	6	6	4	6	6	6
"c" Spacing	13	14	11½	13	14	11½	13	14	11½	10	13	14	11½	10
"c" Length	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
"d" Dist. Bars Top Slab-Tot. No.	18	9	9	18	9	9	18	9	9	9	18	9	9	9
"d" Dist. Bars Bottom Slab-Tot. No.	9	9	9	9	9	9	9	9	9	9	9	9	9	9
"e" Bars Size: Bar #	4	4	4	4	4	4	4	4	5	5	4	4	6	6
"e" Bars Spacing	18	18	18	18	18	11½	18	11½	12	10	18	8	12	10
Spacers Number	40			40			44				48			
Quan. Concrete: C.Y. per lin. ft.	1.05	1.15	1.29	1.12	1.23	1.37	1.19	1.32	1.44	1.55	1.27	1.39	1.52	1.64
Quan. Reinf. : Lbs. per lin. ft.	181	168	196	183	170	200	187	177	209	235	192	187	221	249
Hydraulics Area A	54			72			90				108			
Hydraulic Radius R	1.00			1.20			1.36				1.50			
Neutral Slope %	.56			.59			.62				.66			
Head Factor k	.450			.358			.305				.271			
Entrance Capacity Q_{10}	288			444			621				816			
Design Discharge Q_{100}	477			732			1023				1344			

SPAN	8'																
HEIGHT	4'			5'			6'			7'				8'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP	2	11	20	2	11	20	2	11	20	2	11	20	28	2	11	20	28
Conc. Top Slab T_1	8¼	8¼	10¼	8¼	8¼	10¼	8¼	8¼	10¼	8¼	8¼	10¼	11½	8¼	8¼	10¼	11½
Conc. Bottom Slab T_2	6½	9	11	6½	9¼	11	6½	9¼	11	6¾	9¼	11	12¼	6¾	9¼	11	12¼
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6	6½	6½	7	7	7½	8½
Reinforcing Steel "a" Size: Bar #	6	5	5	6	5	5	6	5	5	6	5	5	6	6	5	5	6
"a" Spacing	11½	12	12	11½	12	12	11½	12	12	11½	12	12	10½	11½	11½	12	10½
"a" Length	26-10	26-9	26-9	26-10	26-9	26-9	26-10	26-9	26-9	26-10	26-9	26-11	27-4	27-2	27-1	27-3	27-8
"b" or "b_1" Size: Bar #	6	6	7	6	6	7	6	6	7	6	6	7	7	6	6	7	7
Spacing	11½	12	12	11½	12	12	11½	12	12	11½	12	12	10½	11½	11½	12	10½
Length "b"	26-5	26-5	26-7	26-5	26-5	26-7	26-5	26-5	26-7	26-5	26-5	26-9	27-3	26-9	26-9	27-1	27-7
Length "b_1"	26-0	26-4	26-7	26-0	26-5	26-7	26-0	26-5	26-7	26-1	26-5	26-9	27-3	26-5	26-9	27-1	27-7
"c" Size: Bar #	4	6	7	4	6	7	4	6	7	4	6	7	7	4	6	7	7
"c" Spacing	11½	12	12	11½	12	12	11½	12	12	11½	12	12	10½	11½	11½	12	10½
"c" Length	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-0	17-1	17-3	17-2	17-2	17-3	17-5
"d" Dist. Bars Top Slab-Tot. No.	24	12	12	24	12	12	24	12	12	24	12	12	12	24	12	12	12
"d" Dist. Bars Bottom Slab-Tot. No.	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
"e" Bars Size: Bar #	4	4	4	4	4	5	4	5	6	4	6	7	7	4	6	7	7
"e" Bars Spacing	18	18	12	18	12	12	18	12	12	11½	12	12	10½	11½	11½	12	10½
Spacers Number	58			62			62			66				70			88
Quan. Concrete: C.Y. per lin. ft.	1.47	1.67	1.99	1.54	1.76	2.06	1.62	1.84	2.14	1.71	1.91	2.26	2.57	1.90	2.10	2.46	2.79
Quan. Reinf. : Lbs. per lin. ft.	261	250	301	266	257	310	267	264	320	276	277	336	409	283	295	347	441
Hydraulics Area A	96			120			144			168				192			
Hydraulic Radius R	1.33			1.54			1.71			1.87				2.00			
Neutral Slope %	.52			.54			.56			.59				.62			
Head Factor k	.314			.262			.229			.206				.189			
Entrance Capacity Q_{10}	591			828			1086			1371				1674			
Design Discharge Q_{100}	978			1365			1791			2259				2763			

DIST. | COUNTY | ROUTE | Post Miles - Total Project | SHEET NO. | TOTAL SHEETS

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

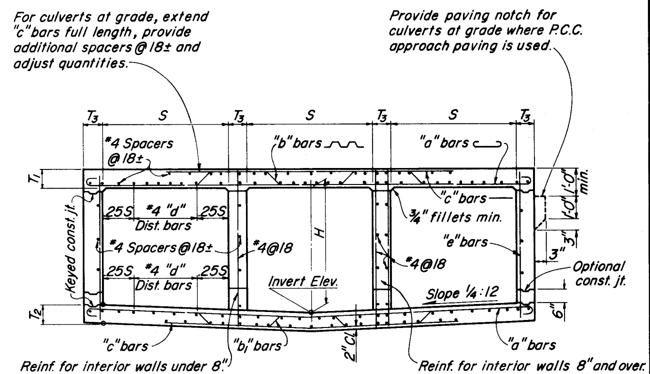
APPROVED SEPTEMBER 1, 1966

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945

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.

SPAN	10'																
HEIGHT	5'			6'			7'			8'				10'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP	2	11	20	2	11	20	2	11	20	2	11	20	28	2	11	20	28
Conc. Top Slab T_1	9	10	12	9	10	12	9	10	12	9	10	12	14¼	9	10¼	12½	14¼
Conc. Bottom Slab T_2	7½	10¾	13	7½	10¾	13	7½	10¾	13	7¾	11	13	15	8	11	13½	15
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6½	7	7	7½	8½	8	8½	9	10
Reinforcing Steel "a" Size: Bar #	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
"a" Spacing	10½	13	10	10½	13	10	10½	13	10	10½	13	10	11	10½	13	10	11
"a" Length	32-10	32-10	32-10	32-10	32-10	32-10	32-10	32-10	33-0	33-2	33-2	33-4	33-8	33-6	33-8	33-10	34-2
"b" or "b_1" Size: Bar #	6	7	7	6	7	7	6	7	7	6	7	7	8	6	7	7	8
Spacing	10½	13	10	10½	13	10	10½	13	10	10½	13	10	11	10½	13	10	11
Length "b"	32-6	32-7	32-10	32-6	32-7	32-10	32-6	32-7	33-0	32-10	32-11	33-4	33-11	33-2	33-5	33-11	34-5
Length "b_1"	32-2	32-7	32-11	32-2	32-7	32-11	32-2	32-7	33-1	32-6	32-11	33-5	33-11	32-11	33-5	33-11	34-5
"c" Size: Bar #	5	7	7	5	7	7	5	7	7	5	7	7	8	5	7	7	8
"c" Spacing	10½	13	10	10½	13	10	10½	13	10	10½	13	10	11	10½	13	10	11
"c" Length	21-0	21-0	21-0	21-0	21-0	21-0	21-0	21-0	21-1	21-2	21-2	21-3	21-5	21-4	21-5	21-6	21-8
"d" Dist. Bars Top Slab-Tot. No.	27	15	15	27	15	15	27	15	15	27	15	15	15	27	15	15	15
"d" Dist. Bars Bottom Slab-Tot. No.	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
"e" Bars Size: Bar #	4	4	5	4	5	6	4	6	7	4	6	7	8	5	6	8	8
"e" Bars Spacing	18	13	10	18	13	10	13	13	10	10½	12	10	11	10½	9	10	9
Spacers Number	68			68			72			76			94	102			
Quan. Concrete: C.Y. per lin. ft.	1.98	2.40	2.82	2.06	2.48	2.90	2.13	2.55	3.03	2.34	2.77	3.23	3.78	2.68	3.18	3.73	4.22
Quan. Reinf. : Lbs. per lin. ft.	358	372	470	359	379	482	367	391	502	377	402	514	590	421	453	577	632
Hydraulics Area A	150			180			210			240				300			
Hydraulic Radius R	1.67			1.88			2.06			2.22				2.50			
Neutral Slope %	.49			.51			.52			.54				.58			
Head Factor k	.238			.205			.183			.165				.143			
Entrance Capacity Q_{10}	1035			1359			1713			2094				2928			
Design Discharge Q_{100}	1704			2241			2823			3450				4830			

SPAN	12'																			
HEIGHT	6'			7'			8'			9'				10'				12'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D	A	B	C	D
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	10¼	11½	14	10¼	11½	14	10¼	11½	14	10¼	12	14¾	17¾	10¼	12	14¾	17¾	10¼	12	14¾	17¾
Conc. Bottom Slab T_2	8¼	12	14½	8½	12	14¾	8½	12	14¾	8¾	12½	15½	18¼	8¾	12½	15½	18¼	9	12¾	15¾	18¼
Conc. Sidewalls T_3	6	6	6½	6	6	7	7	7	7½	8	8	9	10	8	8	9	10½	9	9	10½	12
Reinforcing Steel "a" Size: Bar #	7	6	7	7	6	7	7	6	7	7	6	7	8	7	6	7	8	7	6	7	8
"a" Spacing	12	11	11½	12	11	11½	12	11	11½	12	10½	11	11½	12	10½	11	11½	12	10½	11	11½
"a" Length	39-1	38-10	39-3	39-1	38-10	39-5	39-5	39-2	39-7	39-9	39-6	40-1	40-10	39-9	39-6	40-1	41-0	40-1	39-10	40-7	41-6
"b" or "b_1" Size: Bar #	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	38-11	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
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 #	6	7	8	6	7	8	6	7	8	6	7	8	9	6	7	8	9	6	7	8	9
"c" Spacing	12	11	11½	12	11	11½	12	11	11½	12	10½	11	11½	12	10½	11	11½	12	10½	11	11½
"c" 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
"d" Dist. Bars Bottom 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" Bars Size: Bar #	4	4	6	4	4	6	4	4	6	4	6	7	8	5	7	8	8	6	7	9	9
"e" Bars Spacing	18	7	11½	12	5¾	11½	12	5½	9	10	10½	11	11½	12	10½	11	6½	12	9	11	9
Spacers Number	76			80			84			104				110				116			
Quan. Concrete: C.Y. per lin. ft.	2.60	3.18	3.82	2.70	3.26	3.98	2.88	3.45	4.13	3.13	3.79	4.61	5.45	3.23	3.89	4.72	5.65	3.62	4.28	5.24	6.18
Quan. Reinf. : Lbs. per lin. ft.	489	505	628	497	516	637	505	527	654	536	582	719	872	548	606	745	939	575	636	793	963
Hydraulics Area A	216			252			288			324				360				432			
Hydraulic Radius R	2.00			2.21			2.40			2.57				2.73				3.00			
Neutral Slope %	.46			.48			.49			.51				.52				.56			
Head Factor k	.189			.167			.151			.138				.128				.114			
Entrance Capacity Q_{10}	1629			2058			2514			3000				3510				4620			
Design Discharge Q_{100}	2688			3390			4140			4950				5790				7620			



TYPICAL SECTION

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STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TRIPLE BOX CULVERTS | D 82

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DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED SEPTEMBER 1, 1966

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5946

DESIGN NOTES

SPECIFICATIONS:

DESIGN: A.A.S.H.O. DATED 1957 WITH REVISIONS AND AS SUPPLEMENTED BY BRIDGE PLANNING AND DESIGN MANUAL.

SECTIONS DESIGNED FOR CULVERT IN A TRENCH ON HARD FOUNDATION, OR CULVERT UNTRENCHED ON YIELDING FOUNDATION. FOR CULVERTS ON PILES OR ROCK FOUNDATIONS SPECIAL DESIGN WILL BE REQUIRED.

LOADING:

LIVE LOAD = H20-S16-44 OR ALTERNATIVE WITH 30% IMPACT FOR ALL COVER DEPTHS. NEGLECT LIVE LOAD WHEN ON SINGLE SPANS, COVER IS MORE THAN 8' AND EXCEEDS SPAN, AND ON MULTIPLE SPANS WHEN COVER EXCEEDS DISTANCE BETWEEN EXTERIOR WALLS.

CULVERTS AT GRADE TREATED AS A BRIDGE, WITH THE WHEEL LOAD ON THE INVERT SLAB DISTRIBUTED OVER 7.5' TRANSVERSLY AND THE BREADTH OF THE CULVERT LONGITUDINALLY.

WHEEL LOADS DISTRIBUTED UNIFORMLY OVER A SQUARE, THE SIDES OF WHICH ARE 1.75 TIMES THE DEPTH OF FILL, BUT NOT LESS TRANSVERSLY THAN THE DIMENSION FOR GRADE TOP ON THE TOP SLAB, AND NOT LESS THAN 7.5' ON THE INVERT SLAB. WHEN SUCH AREAS FROM SEVERAL CONCENTRATIONS OVERLAP, THE TOTAL LOAD SHALL BE CONSIDERED AS UNIFORMLY DISTRIBUTED OVER THE AREA DEFINED BY THE OUTSIDE LIMITS OF THE INDIVIDUAL AREAS, BUT THE TOTAL WIDTH SHALL NOT EXCEED THE TOTAL WIDTH OF THE SUPPORTING SLAB.

DEAD LOAD: EARTH LOAD OF 120 LBS. PER CU. FT. AND AN EQUIVALENT FLUID PRESSURE OF 36 LBS. PER SQ. FT. (BOTH REDUCED 30% FOR BALANCED DESIGN).
DISTRIBUTION OF WHEEL AT GRADE; $E = .175S + 3.2$

UNIT STRESSES: F_s = 20,000 P.S.I., N = 10
F_c = 1,200 P.S.I.

REINFORCEMENT EMBEDMENT IS 1 1/2 DIA. CLEAR, MIN. 1", EXCEPT AS NOTED.

DISTRIBUTION "d" BARS EXPRESSED AS A % OF MAIN REINFORCEMENT:

CLASSIFICATION "A" TOP SLAB = $\frac{100}{\sqrt{SPAN}}$, MAX. 50%

CLASSIFICATION "A" BOTTOM SLAB = MIN. #4 @ 18

CLASSIFICATION "B", OR ABOVE, TOP AND BOTTOM SLABS MIN. #4 @ 18

CONSTRUCTION NOTES

SPECIFICATIONS: STANDARD SPECIFICATIONS, DIVISION OF HIGHWAYS, CURRENT EDITION AND SPECIAL PROVISIONS ACCOMPANYING PLANS.

EXPANSION JOINTS: NONE IN INVERT SLAB. UNDER COVER LESS THAN SPAN LENGTH, PLACE 1/2" EXPANSION JOINT FILLER IN TOP SLAB AND SIDE WALLS IN DIVIDING STRIP OR OUTSIDE SHOULDER. UNDER COVER MORE THAN SPAN LENGTH, PLACE EXPANSION JOINTS IN TOP SLAB AND SIDE WALLS ONLY AT 30' ± CENTERS, AND ADDITIONAL JOINTS AS DIRECTED BY THE ENGINEER AT LOCATIONS OF CHANGE OF FOUNDATION CHARACTER.

CONSTRUCTION LOADS: CONSTRUCTION LOADS HEAVIER THAN LEGAL LOADS NOT PERMITTED UNTIL CONCRETE HAS REACHED A STRENGTH OF 3,000 P.S.I. AND STRUCTURE STRUTTED AND CUSHIONED AS DIRECTED BY THE ENGINEER.

LOCATION NOTES

HYDRAULICS: IF SLOPE OF NATURAL CHANNEL EXCEEDS "NEUTRAL SLOPE" OF CULVERT ENTRANCE, CAPACITY FOR 10 YEAR FLOOD (Q10) WILL USUALLY DETEMINE SIZE, OTHERWISE COMPUTE TOTAL HEAD = $\left(\frac{Q100}{8A}\right)^2\left(1.05+\frac{KL}{100}\right)$ WHERE "k" IS HEAD FACTOR "A" IS AREA, "L" IS LENGTH OF CULVERT AND Q100 THE 100 YEAR FLOOD, AND COMPARE WITH ALLOWABLE HEAD. TABULATED ELEMENTS ARE FOR FULL NOMINAL SECTION.

DESIGNATION: SHOW ON PLANS AS SPAN X HEIGHT STRENGTH CLASSIFICATION X LENGTH: THUS 4 x 4 -A x 60', FOLLOWED BY ALTERNATIVES.

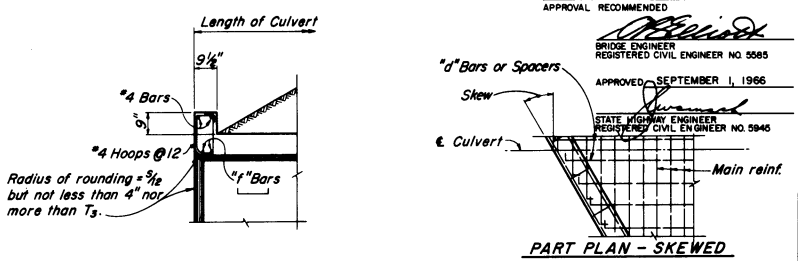
ALTERNATIVES: INVERT WILL BE SLOPED UNLESS "TRAPEZOIDAL INVERT", "FLAT INVERT" OR "V INVERT" IS INCLUDED IN DESIGNATION. ENDS OF CULVERT WILL BE ROUNDED UNLESS "SQUARE ENDS" ARE DESIGNATED. PARAPET ON CULVERTS WITH OVER 2' COVER WILL BE 0'-9" UNLESS "___FT. PARAPET" IS DESIGNATED. SUCH DESIGNATIONS MAY BE DIFFERENT FOR INLET AND OUTLET ENDS.

QUANTITIES: QUANTITIES ARE FOR ESTIMATING ONLY. THEY ARE FOR THE SLOPED INVERT SLAB AND DO NOT INCLUDE SPLICES IN LONGITUDINAL BARS NOR CONCRETE AND REINFORCEMENT FOR SPECIAL COVERAGE, NOR TEMPERATURE REINFORCEMENT FOR GRADE TOP CULVERT.

SPECIAL COVERAGE: WHERE CULVERTS ARE EXPOSED TO ACTION OF SALT WATER THICKNESS OF CONCRETE SHALL BE INCREASED TO PROVIDE 4" COVERAGE BETWEEN STEEL AND EXPOSED SURFACES. WHERE SCOUR IS ANTICIPATED, THICKNESS OF BOTTOM SLAB SHALL BE INCREASED TO PROVIDE 2" MINIMUM COVERAGE BETWEEN STEEL AND EXPOSED SURFACE.

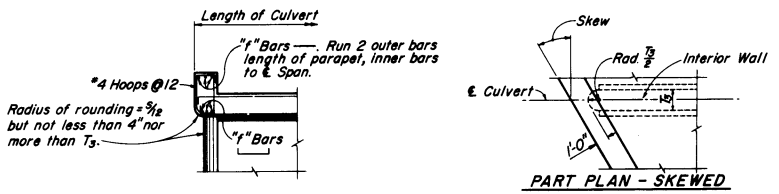
USE OF STANDARD PLAN

"STRENGTH CLASSIFICATION", SYMBOLIZED BY THE LETTERS "A", "B", "C" ETC., AT THE TOP OF THE DATA TABLE IS MERELY A CONVENIENT DESIGNATION FOR A PARTICULAR STRUCTURAL SECTION FOR A CULVERT OF ANY GIVEN OPENING. IT IS DICTATED BY THE COVER OR DEPTH OF FILL OVER THE TOP SLAB.



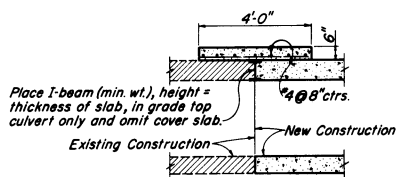
PART PLAN - SKEWED

PARAPET DETAILS FOR SINGLE SPAN CULVERTS



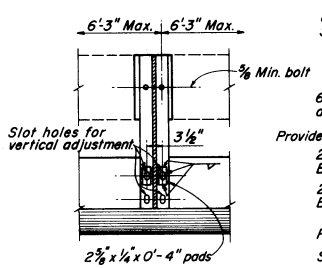
PART PLAN - SKEWED

PARAPET DETAILS FOR MULTIPLE SPAN CULVERTS

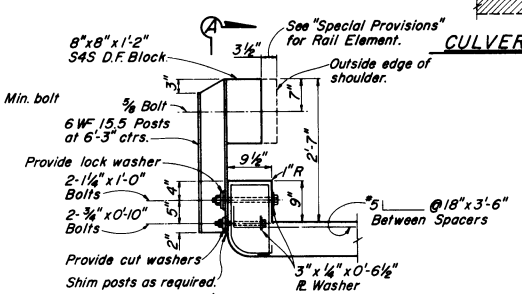


CULVERT EXTENSION

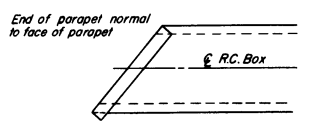
SKEWED PARAPETS								
Skew Angle	Span	3	4	5	6	8	10	12
0°-15°	"f" Bars: Bar No.	4	4	5	6	6	7	8
	No. of bars	2	2	2	2	3	3	3
16°-30°	Bar No.	4	4	5	6	7	8	8
	No. of bars	2	3	3	3	3	3	3
31°-45°	Bar No.	4	4	6	6	7	8	8
	No. of bars	3	3	3	3	3	3	3
0°-45°	#4 Hoops	12" ctrs.						



SECTION A-A
Scale: 1" = 1'-0"



RAILING DETAILS
Scale: 1" = 1'-0"



PARAPET DETAIL FOR SKEWED CULVERTS

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX CULVERT
MISCELLANEOUS DETAILS

D 83-2

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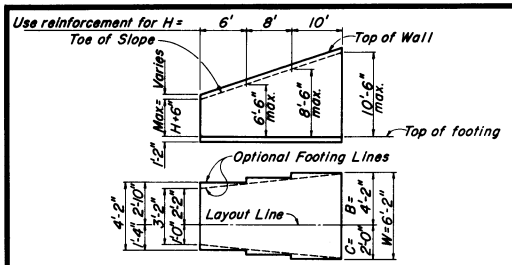
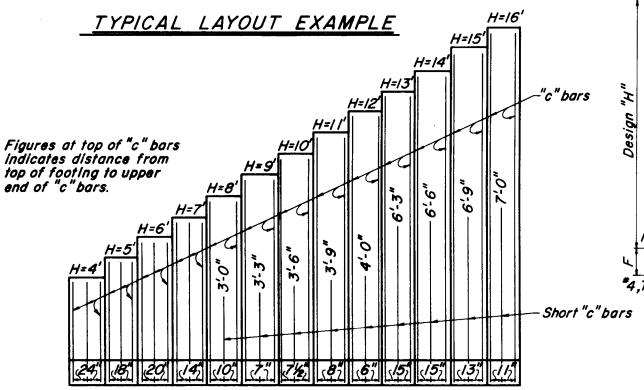
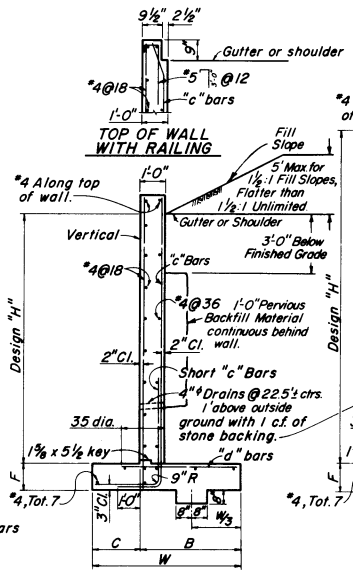
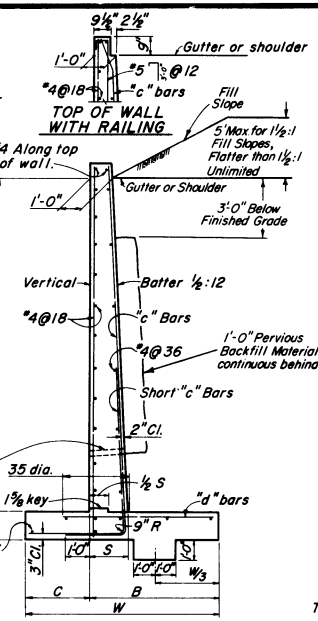


TYPICAL LAYOUT EXAMPLE



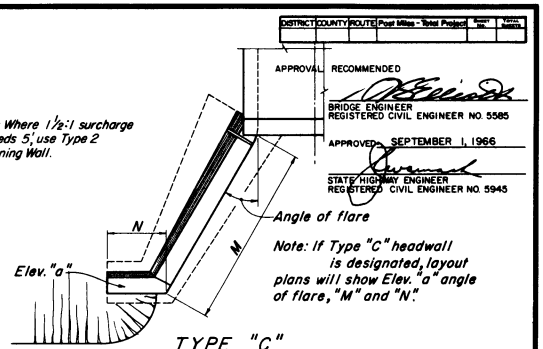


TYPICAL SECTION
H=4' THRU 12'

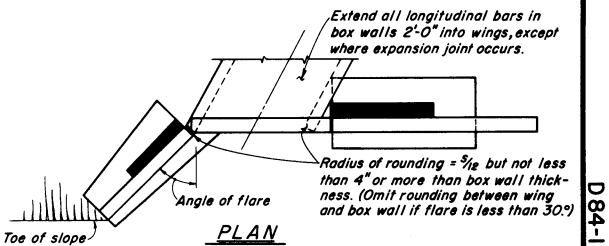


TYPICAL SECTION
H=13' THRU 16'

Note: Where 1½:1 surcharge exceeds 5', use Type 2 Retaining Wall.



TYPE "C"



PLAN

REINFORCED CONCRETE WING HEADWALLS

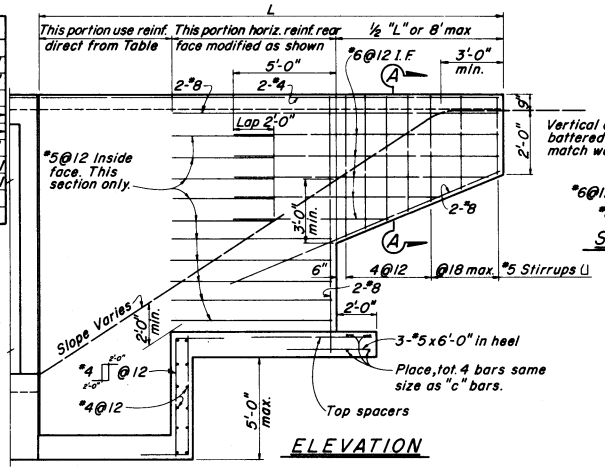
H	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'
W	3'-2"	3'-8"	4'-2"	4'-8"	5'-2"	5'-8"	6'-2"	6'-8"	7'-2"	7'-8"	8'-2"	8'-8"	9'-2"
C	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-10"	2'-0"	2'-2"	2'-4"	2'-6"	2'-8"	2'-10"	3'-0"
B	2'-2"	2'-6"	2'-10"	3'-2"	3'-6"	3'-10"	4'-2"	4'-6"	4'-10"	5'-2"	5'-6"	5'-10"	6'-2"
F	1'-2"												
Batter	None									½:12			
S	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-6½"	1'-7"	1'-7½"	1'-8"
"c" Bars	#4@24	#4@18	#5@20	#5@14	#5@10	#5@7	#6@7½	#7@8	#7@6	#9@15	#10@15	#10@13	#10@11
"d" Bars	#4@24	#4@18	#5@20	#5@14	#5@10	#6@14	#7@15	#8@16	#7@12	#8@15	#9@15	#9@13	#9@11
Conc. CY/L.F.	0.32	0.38	0.44	0.49	0.55	0.61	0.67	0.73	0.79	1.02	1.10	1.18	1.26
Reinf. lbs/L.F.	13	16	19	25	30	37	49	62	76	70	89	104	125

Deign Notes:

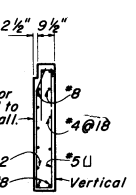
Unit Stresses: $f_s = 20{,}000$ p.s.i, $f_c = 1200$ p.s.i, $n = 10$

Maximum Toe Pressure = 1½ Tons/sq. ft.

Elevations, length and angle of flare of wings may be varied by the Engineer to suit conditions encountered in the field. Walls designed for 2' liveload surcharge, 1½:1 sloping surcharge not to exceed 5' in elevation plus 2' liveload surcharge, or unlimited 2:1 surcharge.

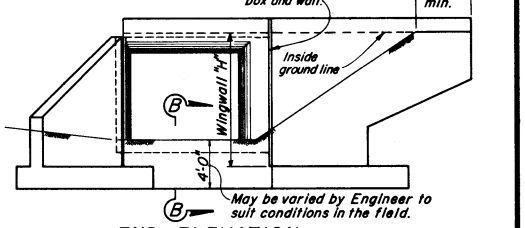


ELEVATION



SEC A-A

SEC B-B



END ELEVATION

TYPE "A" TYPE "B"

STRAIGHT WING HEADWALLS

STATE OF CALIFORNIA
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CULVERT HEADWALLS
TYPES "A", "B" & "C"

D 84-1

D84-1

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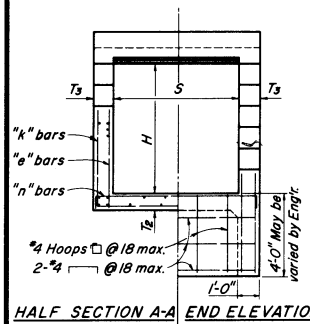
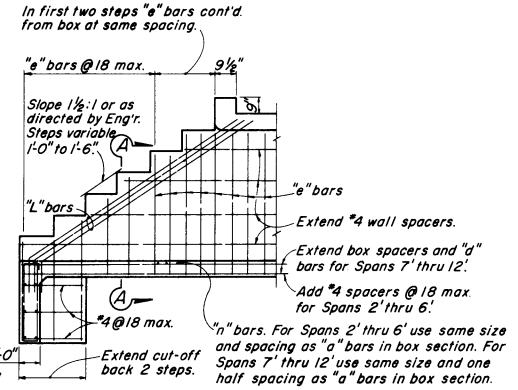
Note: Dimensions S, H, T_2 and T_3 to be same as adjacent box.

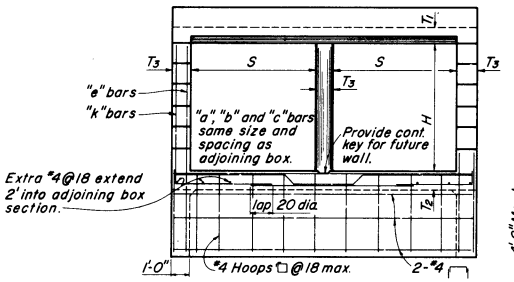


HALF SECTION A-A | END ELEVATION

SINGLE BOX

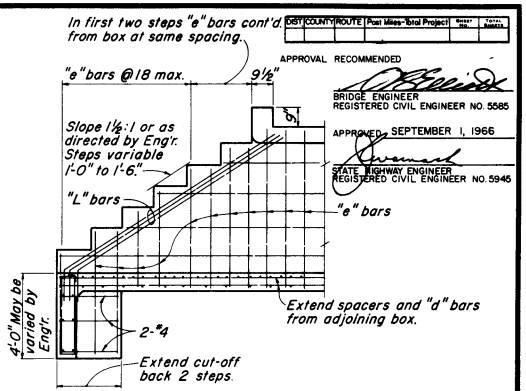


LONGITUDINAL SECTION
(Showing reinforcement in inside face)



END ELEVATION

MULTIPLE BOXES



LONGITUDINAL SECTION
(Showing reinforcement in inside face)

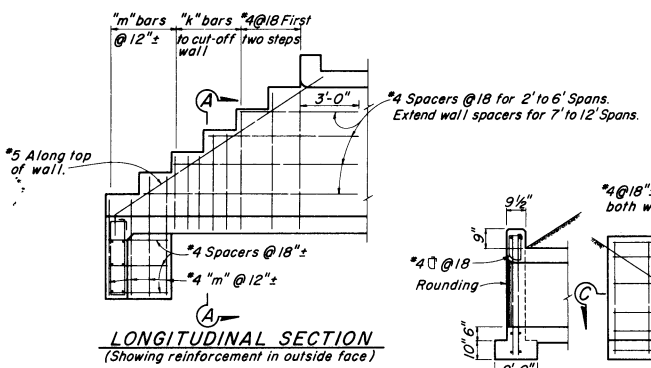
DIST	COUNTY	ROUTE	Post Miles-Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED SEPTEMBER 1, 1966

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945

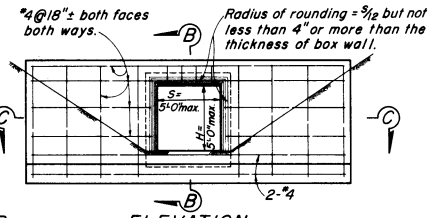


LONGITUDINAL SECTION
(Showing reinforcement in outside face)

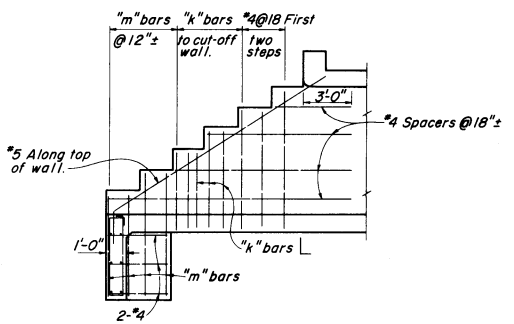
TYPE "E" STEPPED HEADWALL

Table of Reinforcement for Type "E" Walls									
	H	3'	4'	5'	6'	7'	8'	10'	12'
"k" Bars	Bar No.	4	4	5	5	5	5	5	5
	Spacing	12	12	12	10	9	8	7	6
"m" Bars	Bar No.	5	5	6	6	7	7	7	7
	Number ea. wall	2	2	3	3	3	3	3	3

SECTION B-B

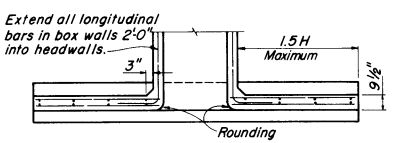


ELEVATION



LONGITUDINAL SECTION
(Showing reinforcement in outside face)

TYPE "E" STEPPED HEADWALL



SECTION C-C
TYPE "D"

STRAIGHT HEADWALL

Details similar for multiple span boxes.

STATE OF CALIFORNIA
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DEPARTMENT OF PUBLIC WORKS
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CULVERT HEADWALLS
TYPES "D" AND "E"

D 85-1

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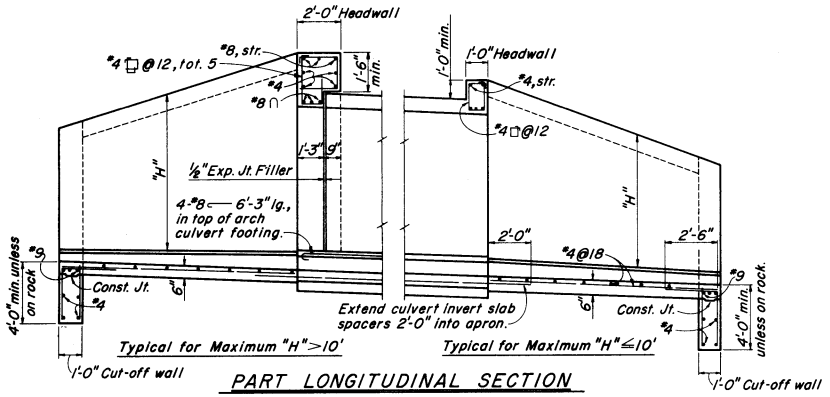
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

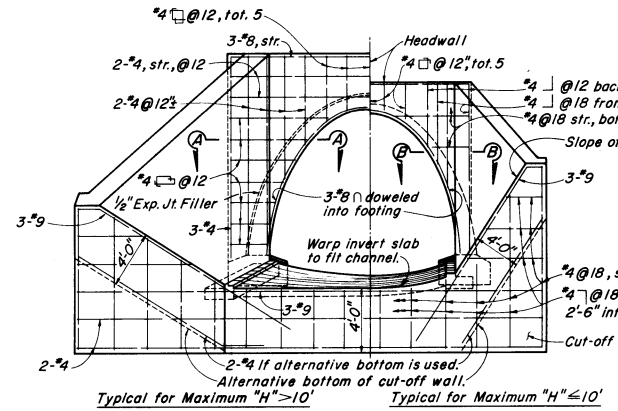
BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED SEPTEMBER 1, 1966

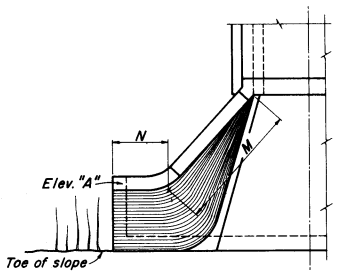
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945



PART LONGITUDINAL SECTION

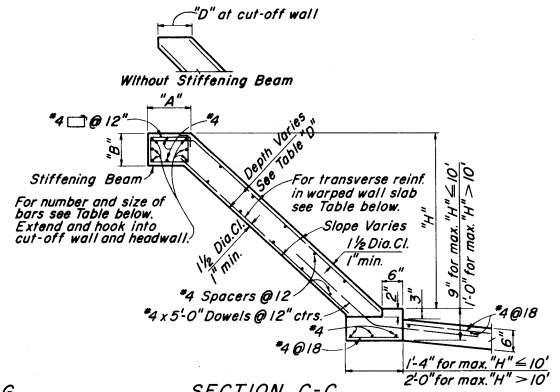


END ELEVATION

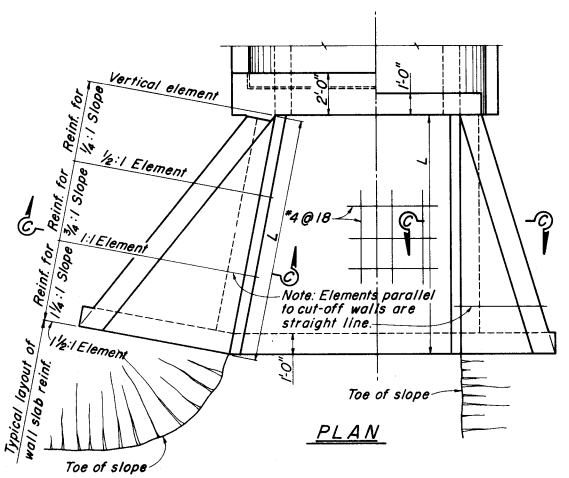


ALTERNATIVE WARPED WING

(Use where additional protection to toe of embankment is required.)

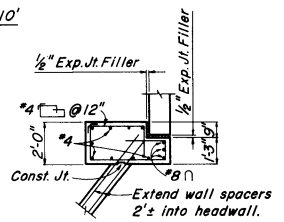


SECTION C-C

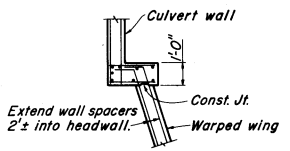


PLAN

Note: Details similar for box culverts.



SECTION A-A



SECTION B-B

WARPED WINGWALLS

WALL SLAB DIMENSIONS AND REINFORCING									STIFFENING BEAM DIMENSIONS & REINFORCING									
Element Slope	H	8' or less	10'	12'	14'	16'	18'	20'	H / L max.	12'	14'	16'	18'	20'	25'	30'	35'	40' or more
1/4:1	Front face reinf.	#4 @ 12	#4 @ 7	#5 @ 7	#5 @ 5	#6 @ 6	#7 @ 7	#7 @ 6	6'	No beam. Place 2-#6 in each face along top of wall								
	Rear face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	8'									
3/4:1	Front face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 10	#4 @ 8	#4 @ 6	10'		A=1'-0" B=9"							
	Rear face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 10	#4 @ 7	#4 @ 6	#5 @ 8	12'						A=1'-6" B=1'-0"			
1 1/4:1	Front face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	14'		Tot. 6-#6						A=1'-10"	
	Rear face reinf.	#4 @ 8	#4 @ 8	#4 @ 5	#5 @ 6	#6 @ 7	#6 @ 6	#7 @ 6	16'				Tot. 6-#7			B=1'-0"		A=2'-0"
Slab at Cut-off Wall "D"		6"	6"	6"	7 1/2"	8"	9 1/2"	11"	18'						Tot. 6-#8			B=1'-6"
Slab at Headwall "D"		6"	6"	6"	8"	9 1/2"	11"	1'-1"	20'							Tot. 8-#9		

Note: Walls designed for 2' surcharge; earth load = 120 #/cu. ft.; equivalent fluid pressure = 36 #/cu. ft.
Vary depth of warped slab uniformly from depth at cut-off wall to that at headwall.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

REINFORCED CONCRETE WARPED WING HEADWALLS & ENDWALLS

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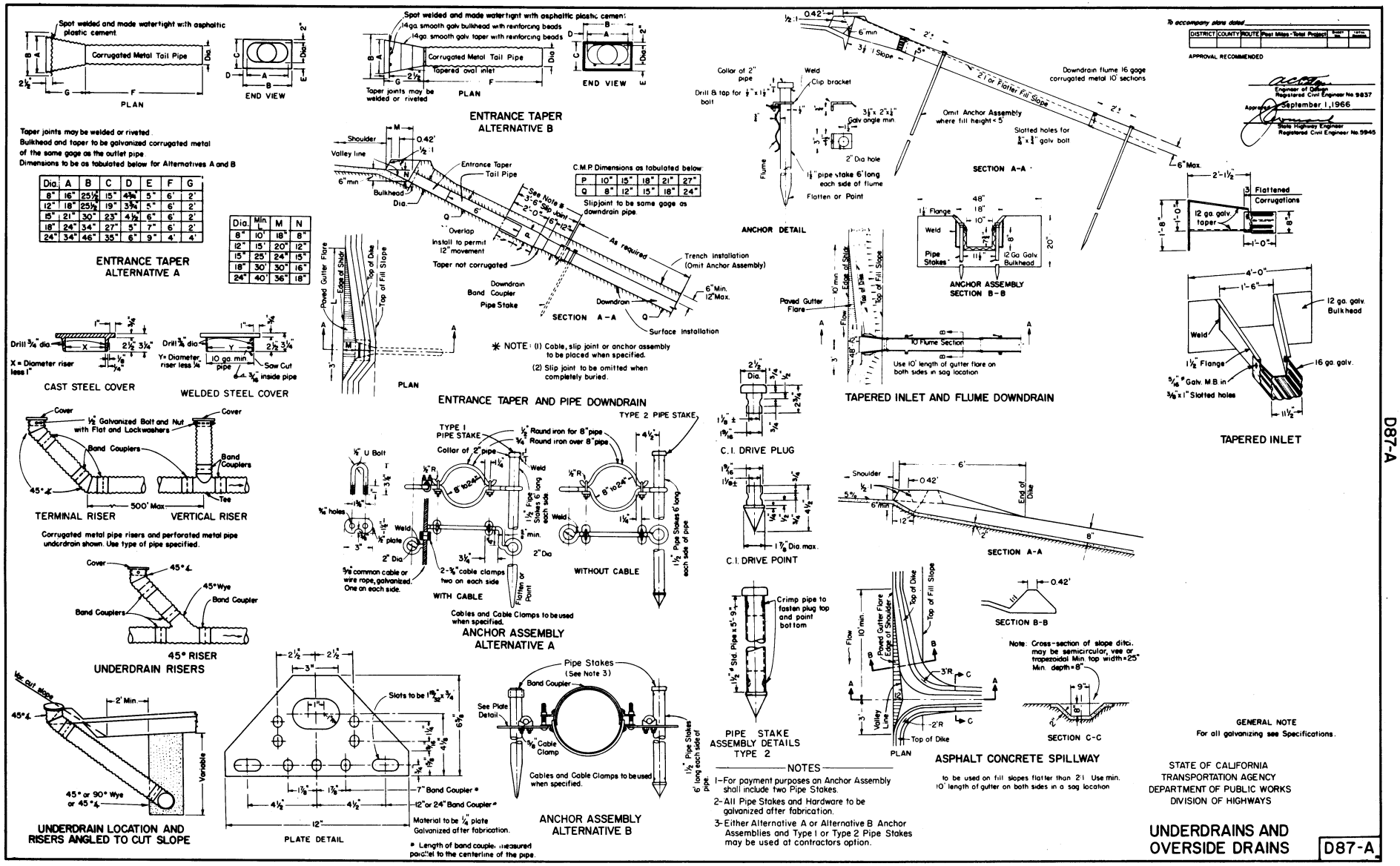

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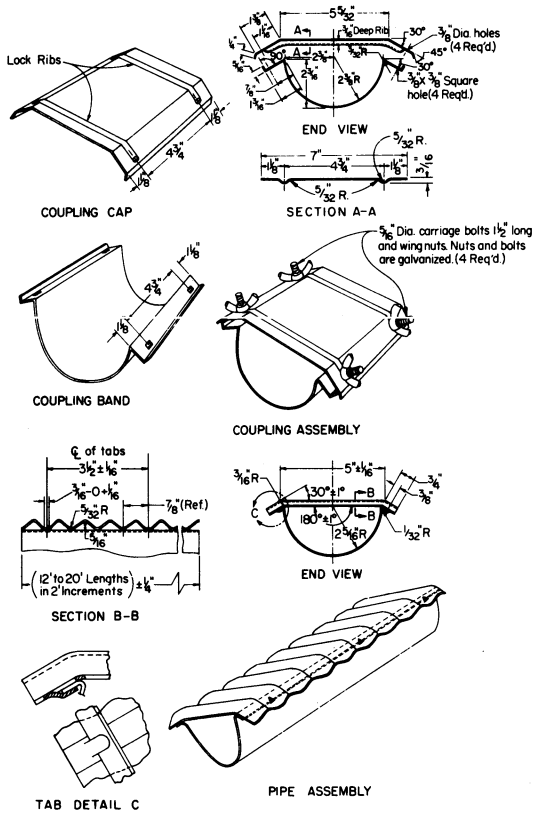


SEMICIRCULAR PIPE UNDERDRAIN

Notes:
1. Tolerance on all dimensions is ± 1/32" except as shown.
2. Corrugated lips at ends of underdrain may fall up, down or at any intermediate position.
3. Corrugated top section shall be attached to bottom section by tabbing as shown.

To accompany plans dated

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Engineer of Design
Registered Civil Engineer No. 9837

Approved: September 1, 1966

State Highway Engineer
Registered Civil Engineer No. 5945

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

UNDERDRAINS D87-B

D87-B

Return to Table of Contents

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles — Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

Assistant State Highway Engineer
Registered Civil Engineer No 5390

Approved November 28, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

	CLASSIFICATION	18 – 50k AXLE					50 – 75k AXLE					75 – 110k AXLE					110 – 150k AXLE				
		SPAN	TYPE	MIN. COVER	STRUTS REQ'D	STRUT SIZE & SPACING	SPAN	TYPE	MIN. COVER	STRUTS REQ'D	STRUT SIZE & SPACING	SPAN	TYPE	MIN. COVER	STRUTS REQ'D	STRUT SIZE & SPACING	SPAN	TYPE	MIN. COVER	STRUTS REQ'D	STRUT SIZE & SPACING
BOX CULVERTS	A	2' to 5'	Single	4'	—	—	2' to 5'	Single	5'	—	—	2' to 4'	Single	3'	—	—	2' to 4'	Single	4'	—	—
	A	6'	Single	5'	—	—	6'	Single	5'	1/2 Pt.	Posts 4 x 6 @ 3' Sills 4 x 6, Cont.	5' to 6'	Single	5'	1/3 Pts.	Posts 4 x 6 @ 3' Sills 4 x 6, Cont.	5' to 6'	Single	5'	1/3 Pts.	Posts 4 x 6 @ 3' Sills 4 x 6, Cont.
	A	7' to 8'	Single	5'	—	—	7' to 8'	Single	5'	—	—	7' to 8'	Single	5'	—	—	7' to 8'	Single	5'	1/4 Pts	Posts 4 x 6 @ 3' Sills 4 x 6, Cont.
	A	10' to 12'	Single	5'	—	—	10' to 12'	Single	5'	—	—	10' to 12'	Single	5'	1/5 Pts.	Posts 6 x 6 @ 3'-6" Sills 6 x 6, Cont.	10' to 12'	Single	5'	1/5 Pts.	Posts 6 x 6 @ 3' Sills 6 x 6, Cont.
	A	14'	Single	3'	—	—	14'	Single	3'	1/5 Pts.	Posts 6 x 6 @ 3'-6" Sills 6 x 8, Cont.	14'	Single	3'	1/5 Pts.	Posts 6 x 8 @ 3'-6" Sills 6 x 8, Cont.	14'	Single	4'	1/5 Pts.	Posts 6 x 8 @ 3'-6" Sills 6 x 8, Cont.
	A	4' to 12'	Multiple	5'	—	—	4' to 12'	Multiple	5'	—	—	4' to 12'	Multiple	5'	—	—	4' to 12'	Multiple	5'	—	—
	B, C, D, E	All	All	Span / 1.75 or 5' Min.	—	—	All	All	Span / 1.75 or 5' Min.	—	—	All	All	Span / 1.75 or 5' Min.	—	—	All	All	Span / 1.75 or 5' Min.	—	—
R.C. PIPES	12" to 39"	Min. Cover = 2'					Min. Cover = 3'					Min. Cover = 3'					Min. Cover = 3'				
	42" to 108"	Dia. / 1.75 or 3' Min.					Dia. / 1.75 or 3' Min.					Dia. / 1.75 or 4' Min.					Dia. / 1.75 or 4' Min.				
METAL CULVERTS	PIPES	To 120"	Dia. / 1.75 or 4' Min.				Dia. / 1.75 or 4' Min.					Dia. / 1.75 or 4' Min.					Dia. / 1.75 or 4' Min.				
		Over 120"	Dia. / 3 or 4' Min.				Dia. / 3 or 4' Min.					Dia. / 3 or 4' Min.					Dia. / 3 or 4' Min.				
	Pipe-Arches	All Spans	Span / 3 or 4' Min.				Span / 3 or 4' Min.					Span / 3 or 4' Min.					Span / 3 or 4' Min.				
	Arches, Vehicular U'Passes	All Spans	Span / 3 or 5' Min.				Span / 3 or 5' Min.					Span / 3 or 5' Min.					Span / 3 or 5' Min.				
R.C. ARCH CULVERTS	Spans to 14'	Span / 2.5 or 4' Min.					Span / 2.5 or 4' Min.					Span / 2.5 or 4' Min.					Span / 2.5 or 4' Min.				
	Spans 15' to 22'	Span / 3.5 or 5' Min.					Span / 3.5 or 5' Min.					Span / 3.5 or 5' Min.					Span / 3.5 or 5' Min.				

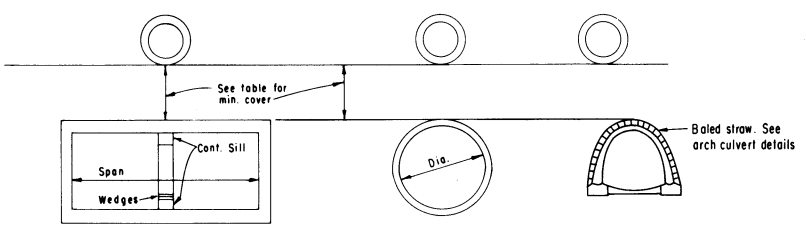
Notes: Limits of strutting to be determined by Engineer, but shall not be less than as shown in sketch below.
Reference-Std Box Culverts
Assumed tire patterns _____:

50k Axle	2.0' x 1.5'
75k Axle	3.0' x 2.0'
110k Axle	3.0' x 2.5'
150k Axle	3.0' x 3.0'

Impact = 50%
Timber sills & posts to be D.F., 1450f. Sills to be glued-laminated or solid timbers.

All box culvert strutting and removal to be at expense of the contractor.

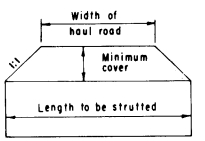
For strutting of Steel "Structural Plate Vehicular Underpasses" see Bridge Dept. plan of that title.



BOX CULVERTS

R.C. PIPES & METAL CULVERTS

R.C. ARCH CULVERTS



MINIMUM LENGTH OF STRUTTING

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

CONSTRUCTION LOADS ON CULVERTS D88-1

D88-1

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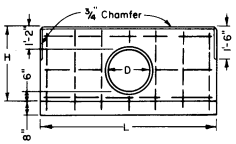
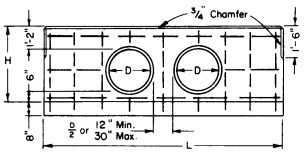
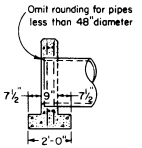


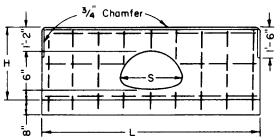
FRONT ELEV. SINGLE HEADWALL



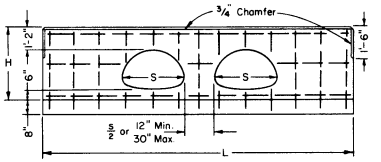
FRONT ELEV. DOUBLE HEADWALL



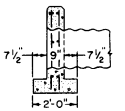
SECTION, SINGLE & DOUBLE HEADWALLS



FRONT ELEV. SINGLE HEADWALL



FRONT ELEV. DOUBLE HEADWALL



SECTION, SINGLE & DOUBLE HEADWALLS

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

H. H. Dieckhoff
Assistant Engineer of Design
Registered Civil Engineer No. 5600

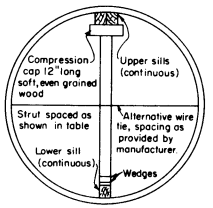
Approved September 1, 1966

State Highway Engineer
Registered Civil Engineer No. 5945

D in.	H ft-in.	SINGLE L ft-in.	SINGLE Steel Lbs.	SINGLE Conc. Cu.Yds.	DOUBLE L ft-in.	DOUBLE Steel Lbs.	DOUBLE Conc. Cu.Yds.
12	2-8	5-0	35	0.60	7-0	45	0.82
15	2-11	6-0	40	0.75	8-6	55	1.04
18	3-2	7-0	50	0.91	9-6	65	1.21
21	3-5	7-6	60	1.02	10-6	80	1.38
24	3-8	8-6	75	1.20	11-6	90	1.57
27	3-11	9-6	85	1.39	13-0	105	1.84
30	4-2	10-0	85	1.52	14-0	115	2.04
33	4-5	11-0	100	1.73	15-0	120	2.25
36	4-8	12-0	105	1.95	16-6	140	2.56
39	4-11	12-6	130	2.09	17-6	165	2.79
42	5-2	13-6	140	2.34	18-6	180	3.03
45	5-5	14-6	150	2.60	20-0	195	3.38
48	5-8	15-0	160	2.75	21-0	200	3.64
51	5-11	16-0	180	3.03	22-6	225	4.02
54	6-2	17-0	190	3.31	23-6	240	4.30

STRAIGHT HEADWALLS

NOTE: Compression caps and sills to be same dimension timber as struts. Timber for struts and sills shall be Douglas Fir, "Construction Grade"



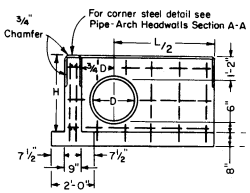
STRUT DETAILS

C.M.P. ARCH SIZE	SINGLE H	SINGLE L	SINGLE Steel Lbs.	SINGLE Conc. Cu.Yds.	DOUBLE L	DOUBLE Steel Lbs.	DOUBLE Conc. Cu.Yds.
18"x11"	2'-7"	5'-6"	37	.64	8'-0"	52	.91
22"x13"	2'-9"	6'-6"	45	.77	9'-0"	56	1.04
25"x16"	3'-0"	7'-6"	50	.93	10'-6"	66	1.27
29"x18"	3'-2"	8'-6"	58	1.08	12'-6"	82	1.56
36"x22"	3'-6"	10'-6"	84	1.42	15'-0"	113	1.96
43"x27"	3'-11"	12'-6"	107	1.70	18'-0"	140	2.49
50"x31"	4'-3"	14'-6"	125	2.19	21'-0"	166	3.03
58"x36"	4'-8"	17'-0"	153	2.73	24'-6"	203	3.75
65"x40"	5'-0"	19'-0"	171	3.18	27'-0"	222	4.29
72"x44"	5'-4"	21'-0"	188	3.66	30'-0"	246	4.95

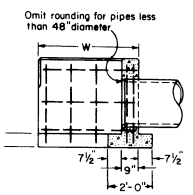
STRAIGHT HEADWALLS

NOTES:

1. No deduction made in quantities for thickness of pipe walls
2. All reinforcing steel #4 bars. All vertical and horizontal tie bars 18" maximum spacing.
3. Length of wall "W" may be varied to suit conditions encountered in the field, and straight line interpolation may be used to calculate quantities.



FRONT ELEV. "L" HEADWALL



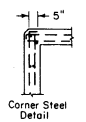
SECTION "L" HEADWALL

D in.	H ft-in	L/2 ft-in.	LENGTH OF W 3'-4" Steel Lbs.	3'-4" Conc. Cu. Yds.	4'-10" Steel Lbs.	4'-10" Conc. Cu. Yds.	6'-4" Steel Lbs.	6'-4" Conc. Cu. Yds.	7'-10" Steel Lbs.	7'-10" Conc. Cu. Yds.	9'-4" Steel Lbs.	9'-4" Conc. Cu. Yds.
12	2-8	2-6	50	.79	60	.98						
15	2-11	3-0	55	.91	65	1.11						
18	3-2	3-6	65	1.04	75	1.25						
21	3-5	3-9	75	1.15	90	1.36						
24	3-8	4-3	85	1.29	100	1.51	110	1.74				
27	3-11	4-9	90	1.44	105	1.67	115	1.91				
30	4-2	5-0	95	1.55	110	1.80	120	2.05	135	2.29		
33	4-5	5-6	105	1.71	120	1.97	135	2.23	150	2.48		
36	4-8	6-0	110	1.88	125	2.15	140	2.41	155	2.68	170	2.95
39	4-11	6-3			150	2.28	170	2.56	185	2.84	200	3.12
42	5-2	6-9			155	2.42	175	2.76	190	3.05	210	3.34
45	5-5	7-3					180	2.97	200	3.27	215	3.57
48	5-8	7-6					190	3.13	216	3.44	230	3.75
51	5-11	8-0							220	3.67	235	3.99
54	6-2	8-6							235	3.91	250	4.24

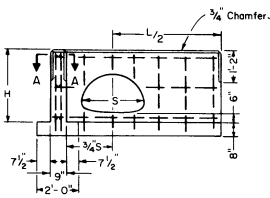
"L" HEADWALLS

FULL CIRCLE PIPE CULVERT HEADWALLS

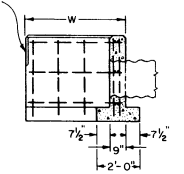
SPACING IN FEET OF TIMBER STRUTS FOR CORRUGATED METAL AND STRUCTURAL PLATE PIPE									
PIPE DIA.	STRUT SIZE	HEIGHT OF FILL IN FEET 0-20	30	40	50	60	70	80	100+
48"	4"x4"		5.0	3.5					
	4 x 6		6.0	5.0	4.0	3.5	3.0		
	6 x 6				6.0	5.0	4.5		
	6 x 8								
60	4 x 4	6.0	4.0	3.0					
	4 x 6		6.0	4.5	3.5	3.0			
	6 x 6				5.5	4.5	4.0	3.5	3.0
	6 x 8					5.0	4.5	4.0	
72	4 x 4	5.0	3.0						
	4 x 6	6.0	5.0	3.5	3.0				
	6 x 6			6.0	4.5	4.0	3.5	3.0	3.0
	6 x 8					5.0	4.5	4.0	3.5
84	6 x 6	6.0	6.0	5.0	4.0	3.5	3.0		
	6 x 8				5.0	4.5	4.0	3.5	3.0
	8 x 8							4.5	3.5
96	6 x 6	6.0	5.5	4.5	3.5	3.0			
	6 x 8			5.5	4.5	4.0	3.5	3.0	
	8 x 8						4.5	4.0	3.0
108	6 x 6	6.0	5.0	3.5	3.0				
	6 x 8		6.0	5.0	4.0	3.5	3.0		
	8 x 8					4.5	4.0	3.5	3.0
120	6 x 6	6.0	4.0	3.0					
	6 x 8	6.0	5.5	4.0	3.5	3.0			
	8 x 8				5.0	4.0	3.5	3.0	3.0
132	6 x 6	5.0	3.5						
	6 x 8	6.0	4.5	3.5	3.0				
	8 x 8			5.5	4.5	4.0	3.5	3.0	
144	6 x 6	4.5	3.0						
	6 x 8	5.5	4.0	3.0					
	8 x 8			5.0	4.0	3.5	3.0	3.0	
156	6 x 8	4.5	3.0						
	8 x 8		6.0	4.5	3.5	3.0	3.0	3.0	
168	6 x 8	3.5							
	8 x 8	6.0	5.0	4.0	3.0	3.0	3.0		
180	6 x 8	3.0							
	8 x 8	6.0	4.5	3.5	3.0	3.0	3.0		
Thru 252	8 x 8	5.0	3.0	3.0	3.0	3.0			
	10 x 10	8.0	4.5	4.5	4.5	4.5			



SECTION A-A



FRONT ELEV. "L" HEADWALL



SECTION "L" HEADWALL

C.M.P. ARCH SIZE	H	L/2	LENGTH OF W 3'-4" Steel Lbs.	3'-4" Conc. Cu.Yds.	4'-10" Steel Lbs.	4'-10" Conc. Cu.Yds.	6'-4" Steel Lbs.	6'-4" Conc. Cu.Yds.	7'-10" Steel Lbs.	7'-10" Conc. Cu.Yds.	9'-4" Steel Lbs.	9'-4" Conc. Cu.Yds.
18"x11"	2'-7"	2'-9"	50	0.84	60	1.03	70	1.21	80	1.39	90	1.57
22"x13"	2'-9"	3'-3"	60	.96	65	1.14	75	1.33	85	1.52	95	1.71
25"x16"	3'-0"	3'-9"	60	1.03	70	1.28	80	1.48	95	1.68	105	1.88
29"x18"	3'-2"	4'-3"	70	1.21	80	1.42	90	1.62	100	1.83	110	2.04
36"x22"	3'-6"	5'-3"	95	1.46	110	1.69	120	1.91	135	2.13	150	2.35
43"x27"	3'-11"	6'-3"	110	1.76	125	2.00	135	2.24	150	2.47	165	2.75
50"x31"	4'-3"	7'-3"	125	2.05	140	2.30	150	2.56	165	2.81	180	3.06
58"x36"	4'-8"	8'-6"	140	2.45	155	2.72	170	2.99	185	3.26	200	3.52
65"x40"	5'-0"	9'-6"	180	2.78	195	3.07	210	3.35	230	3.63	245	3.91
72"x44"	5'-4"	10'-6"	195	3.13	210	3.43	230	3.72	245	4.02	265	4.32

"L" HEADWALLS

CORRUGATED METAL PIPE-ARCH CULVERT HEADWALLS

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PIPE HEADWALLS AND STRUT DETAILS

D89-1

D89-1

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To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles – Total Project	SHEET NO.	TOTAL SHEETS

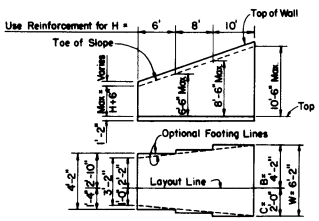
APPROVAL RECOMMENDED

Bridge Engineer Civil Engineer – License 5582

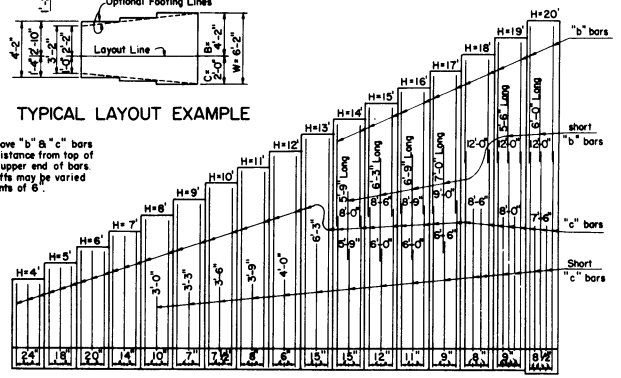
Approved September 1, 1966

State Highway Engineer
Registered Civil Engineer License No. 5945

Design Notes:
Unit Stresses: f_s = 20,000 psi, f_c = 1200 psi, n = 10
Maximum Toe Pressure = 1 ½ Tons/sq.ft.
Elevations, length and angle of flare of wings may be varied by the Engineer to suit conditions encountered in the field.
Walls designed for 2' live load surcharge, 1 ½:1 sloping surcharge not to exceed 5' in elevation plus 2' live load surcharge, or unlimited 2:1 surcharge.

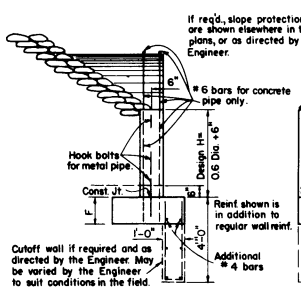


TYPICAL LAYOUT EXAMPLE

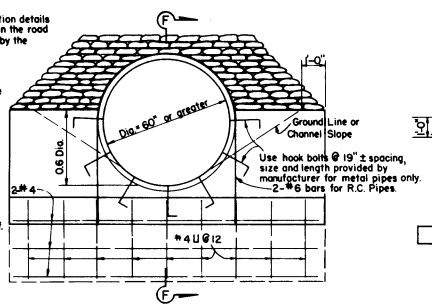


REINFORCED CONCRETE WING HEADWALLS AND ENDWALLS

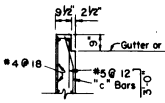
H	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'	17'	18'	19'	20'
W	3'-2"	3'-8"	4'-2"	4'-8"	5'-2"	5'-8"	6'-2"	6'-8"	7'-2"	7'-8"	8'-0"	8'-8"	9'-4"	10'-0"	10'-8"	11'-4"	12'-0"
C	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-10"	2'-0"	2'-2"	2'-4"	2'-6"	2'-8"	3'-0"	3'-4"	3'-8"	4'-0"	4'-4"	4'-8"
B	2'-2"	2'-6"	2'-10"	3'-2"	3'-6"	3'-10"	4'-2"	4'-6"	4'-10"	5'-2"	5'-4"	5'-8"	6'-0"	6'-4"	6'-8"	7'-0"	7'-4"
F	1'-2"																1'-4"
Batter	None									1/2:12							
S	1'-0"									1'-6½"	1'-7"	1'-7½"	1'-8"	1'-8½"	1'-9"	1'-9½"	1'-10"
"b" bars	None										#5@15	#5@12	#5@11	#5@9	#6@24	#6@18	#7@17
"c" bars	#4@24	#4@18	#5@20	#5@14	#5@10	#5@7	#6@7½	#7@8	#7@6	#8@15	#10@15	#10@12	#10@11	#10@9	#10@8	#11@9	#11@8½
"d" bars	#4@24	#4@18	#5@20	#5@14	#5@10	#6@14	#7@15	#8@16	#7@12	#8@15	#9@15	#9@12	#9@11	#9@9	#9@8	#10@9	#10@8½
Conc. C.Y./L.F.	0.32	0.38	0.44	0.49	0.55	0.61	0.67	0.73	0.79	1.02	1.10	1.18	1.26	1.36	1.45	1.55	1.72
Reinf. LBS./L.F.	13	16	19	25	30	37	49	62	76	73	90	104	123	141	170	189	206



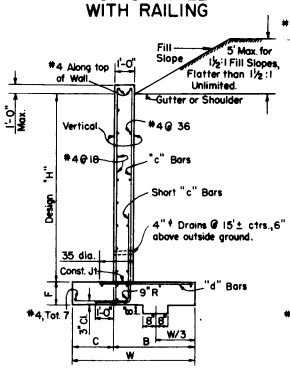
SECTION F-F



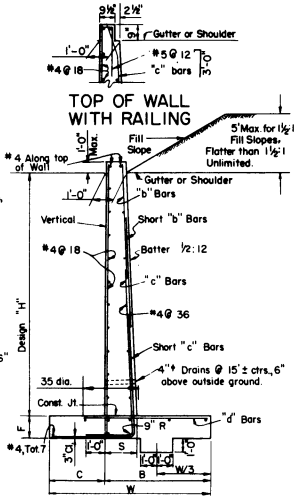
TYPE C HEADWALL



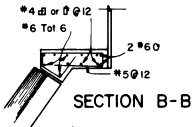
TOP OF WALL WITH RAILING



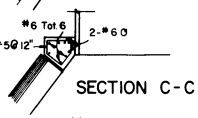
TYPICAL SECTION H=4' THRU 12'



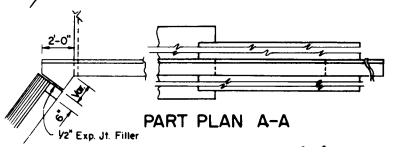
TYPICAL SECTION H=13' THRU 20'



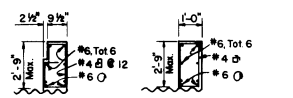
SECTION B-B



SECTION C-C

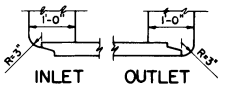


PART PLAN A-A

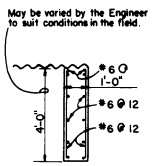


WITH RAILING WITHOUT RAILING

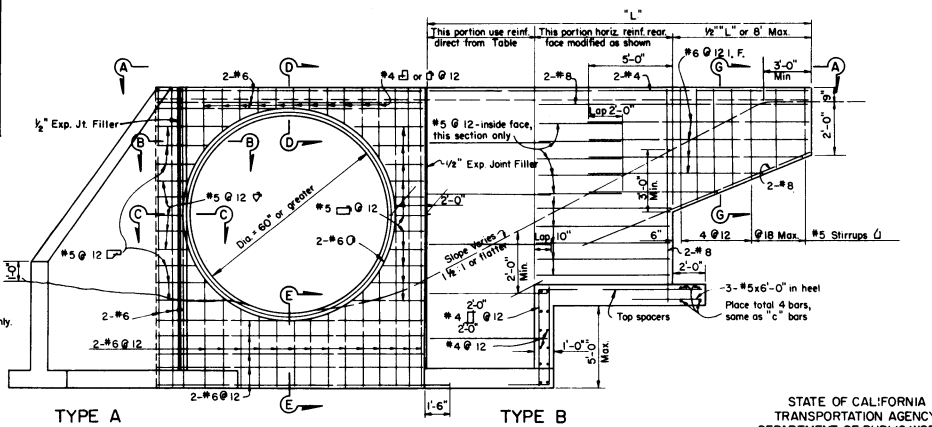
SECTION D-D



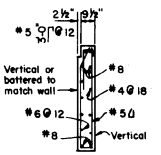
INLET OUTLET
R.C. PIPE DETAILS



SECTION E-E



STRAIGHT WING HEADWALLS



SECTION G-G

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PIPE CULVERT HEADWALLS TYPES "A" "B" & "C"

D90-1

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DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	Sheet No.	Total Sheets

SPAN	5'											
HEIGHT	6'				7'				8'			
Strength Classification	A	B	C	D	A	B	C	D	A	B	C	D
Max. Fill Over Top	9	22	33	45	9	24	34	45	9	26	35	45
Conc. Top Slab T_1	7	7	8	9	7	7	8	9	7	7	8	9
Conc. Bottom Slab T_2	6	7¼	8¼	9¼	6	7¼	8¼	9¼	6	7½	8½	9¼
Conc. Sidewalls T_3	6	6	6¾	7½	6	6½	7¼	8	6	6¾	7¾	8½
Reinforcing Steel "a" Size: Bar #	5	5	5	6	5	5	5	6	5	5	5	6
"a" Spacing	5	7	5½	6	5	7	5½	6	5	7	5½	5½
"a" Length	5-8	5-8	5-10	5-11	5-8	5-9	5-11	6-0	5-8	5-10	6-0	6-1
"a_1" Size: Bar #	5	5	5	6	5	5	5	6	5	5	5	6
"a_1" Spacing	8	7	5½	6	8	7	5½	6	8	6½	5½	5½
"a_1" Length	5-8	5-8	5-10	5-11	5-8	5-9	5-11	6-0	5-8	5-10	6-0	6-1
"b" Size: Bar #	5	5	5	5	5	5	5	6	5	5	6	6
"b" Spacing	16	14	11	11	16	11	11	12	16	10	12	11
"b" Dimension "X"	1-3	1-4	1-5	1-5	1-3	1-4	1-6	1-7	1-3	1-4	1-6	1-8
"b" Length	3-1	3-2	3-3	3-3	3-1	3-2	3-4	3-9	3-1	3-2	3-9	3-10
"c" Size: Bar #	5	5	5	5	5	5	5	6	5	5	6	6
"c" Spacing	16	14	11	11	16	11	11	12	16	10	12	11
"c" Dimension "Y"	1-9	1-9	1-10	1-10	1-9	1-10	1-11	2-0	1-9	1-10	2-0	2-2
"c" Length	8-1	8-1	8-4	8-4	9-1	9-2	9-4	9-6	10-1	10-2	10-5	10-8
"c_1" Size: Bar #	5	5	5	5	5	5	5	6	5	5	6	6
"c_1" Spacing	16	14	11	11	16	11	11	12	16	10	12	11
"c_1" Dimension "Y"	1-8	1-9	1-9	1-9	1-8	1-9	1-11	2-0	1-8	1-9	2-0	2-2
"c_1" Length	3-3	3-5	3-6	3-7	3-3	3-5	3-9	4-1	3-3	3-6	4-1	4-3
"d" bars Tot. No. Top Slab	7	3	3	3	7	3	3	3	7	3	3	3
"d" bars Tot. No. Bot. Slab	3	3	3	3	3	3	3	3	3	3	3	3
"e" bars Spacing	18	18	18	18	18	18	18	18	18	18	18	18
Spacers Total No.	32	32	32	32	36	36	36	36	40	40	40	40
Quan. Concrete: C.Y. per lin. ft.	.46	.49	.57	.63	.50	.55	.63	.70	.54	.61	.70	.78
Quan. Reinf: Lbs. per lin. ft.	88	87	103	113	93	102	111	139	99	114	136	157

SPAN	6'									
HEIGHT	8'					9				
Strength Classification	A	B	C	D	E	A	B	C	D	E
Max. Fill Over Top	5	25	32	39	45	4	25	32	39	45
Conc. Top Slab T_1	7½	7½	8	8½	9¼	7½	7½	8	8¾	9¼
Conc. Bottom Slab T_2	6½	8	8½	9½	10¼	6	8½	9	9¾	10½
Conc. Sidewalls T_3	6	6¾	7½	8½	9¼	6½	7½	8	8¾	9½
Reinforcing Steel "a" Size: Bar #	6	6	6	6	6	6	6	6	6	7
"a" Spacing	6½	6½	6	5½	5	6½	7	6	5½	6½
"a" Length	6-8	6-10	6-11	7-1	7-3	6-9	6-11	7-0	7-2	7-3
"a_1" Size: Bar #	5	6	6	7	6	5	6	6	6	7
"a_1" Spacing	8	6	5½	7	5	6½	7	5½	5½	6½
"a_1" Length	6-8	6-10	6-11	7-1	7-3	6-9	6-11	7-0	7-2	7-3
"b" Size: Bar #	5	6	6	6	6	5	6	6	6	7
"b" Spacing	16	13	13	11	10	15	14	12	10	12
"b" Dimension "X"	1-5	1-6	1-7	1-8	1-9	1-5	1-5	1-7	1-9	1-10
"b" Length	3-3	3-9	3-9	3-10	3-11	3-3	3-7	3-9	3-11	4-5
"c" Size: Bar #	5	6	6	6	6	5	6	6	6	7
"c" Spacing	16	13	13	11	10	15	14	12	10	12
"c" Dimension "Y"	1-9	2-0	2-2	2-3	2-4	1-9	2-0	2-2	2-4	2-5
"c" Length	10-2	10-4	10-7	10-9	10-10	11-2	11-5	11-7	11-10	11-11
"c_1" Size: Bar #	5	6	6	6	6	5	6	6	6	7
"c_1" Spacing	16	13	13	11	10	15	14	12	10	12
"c_1" Dimension "Y"	1-10	2-0	2-1	2-2	2-3	1-11	2-0	2-2	2-4	2-5
"c_1" Length	3-6	4-0	4-2	4-4	4-5	3-6	4-1	4-3	4-6	4-11
"d" bars Tot. No. Top Slab	8	4	4	4	4	8	4	4	4	4
"d" bars Tot. No. Bot. Slab	4	4	4	4	4	4	4	4	4	4
"e" bars Spacing	18	18	18	18	18	18	18	18	18	18
Spacers Total No.	44	44	44	44	44	44	44	44	44	44
Quan. Concrete: C.Y. per lin. ft.	.61	.67	.74	.83	.91	.66	.78	.83	.91	.99
Quan. Reinf: Lbs. per lin. ft.	110	146	152	170	183	118	142	163	182	208

SPAN	7'											
HEIGHT	8				9				10'			
Strength Classification	A	B	C	D	A	B	C	D	A	B	C	D
Max. Fill Over Top	3	22	29	35	3	22	29	35	3	23	29	35
Conc. Top Slab T_1	7½	7½	8½	9¾	7½	7½	8½	10	7½	7½	8½	10
Conc. Bottom Slab T_2	6¼	8¼	9¼	10¾	6½	8¼	9	11	6½	8¾	9¾	11
Conc. Sidewalls T_3	6½	7½	8	9½	6¾	7¾	8½	10	7	8	8¾	10¼
Reinforcing Steel "a" Size: Bar #	6	6	6	7	6	6	6	6	6	5	6	7
"a" Spacing	6	6	5	6	6	6	5½	5	6½	5	6	6½
"a" Length	7-9	7-11	8-0	8-3	7-10	8-0	8-1	8-4	7-10	8-0	8-2	8-5
"a_1" Size: Bar #	6	6	6	7	5	6	6	5	5	6	7	7
"a_1" Spacing	8	5½	5	6	6	6	5½	5	6½	6	7½	6½
"a_1" Length	7-9	7-11	8-0	8-3	7-10	8-0	8-1	8-4	7-10	8-0	8-2	8-5
"b" Size: Bar #	5	6	6	7	5	6	6	7	6	6	6	7
"b" Spacing	12	12	12	12	13	12	10½	13	16	11	10½	13
"b" Dimension "X"	1-4	1-5	1-8	1-11	1-5	1-7	1-9	2-0	1-5	1-8	1-10	2-0
"b" Length	3-2	3-7	3-10	4-6	3-3	3-9	3-11	4-7	3-7	3-10	4-0	4-7
"c" Size: Bar #	5	6	6	7	5	6	6	7	6	6	6	7
"c" Spacing	12	12	12	12	13	12	10½	13	16	11	10½	13
"c" Dimension "Y"	1-6	1-11	2-2	2-5	1-7	2-2	2-5	2-7	1-8	2-5	2-7	2-8
"c" Length	9-1	10-4	10-8	11-0	11-0	11-7	11-11	12-2	12-1	12-10	13-1	13-3
"c_1" Size: Bar #	5	6	6	7	5	6	6	7	6	6	6	7
"c_1" Spacing	12	12	12	12	13	12	10½	13	16	11	10½	13
"c_1" Dimension "Y"	1-9	1-11	2-3	2-7	1-11	2-2	2-4	2-7	2-1	2-3	2-5	2-7
"c_1" Length	3-4	3-11	4-4	5-1	3-7	4-2	4-5	5-1	4-0	4-4	4-7	5-1
"d" bars Tot. No. Top Slab	9	4	4	4	9	4	4	4	9	4	4	4
"d" bars Tot. No. Bot. Slab	4	4	4	4	4	4	4	4	4	4	4	4
"e" bars Spacing	18	18	18	18	18	16	18	18	18	15	18	18
Spacers Total No.	44	44	44	44	44	44	44	44	48	48	48	48
Quan. Concrete: C.Y. per lin. ft.	.66	.77	.85	1.01	.73	.83	.93	1.12	.79	.91	1.02	1.20
Quan. Reinf: Lbs. per lin. ft.	132	161	173	217	132	168	184	208	145	181	192	220

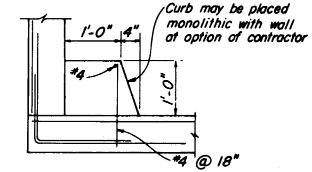
SPAN	8'															
HEIGHT	9'				10'				11'				12'			
Strength Classification	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Max. Fill Over Top	3	20	25	30	2	19	24	30	2	18	24	30	2	15	23	30
Conc. Top Slab T_1	7¾	7¾	8½	10½	7¾	7¾	9	10¼	7¾	7¾	9¼	10	7¾	7¾	9½	10½
Conc. Bottom Slab T_2	6½	8¾	9½	11¼	6¾	9	9¾	11	6¾	9	10	10¾	7	9¼	10½	11½
Conc. Sidewalls T_3	7	8¼	8¾	9¾	7½	8½	9¼	10¼	8	8½	9½	10½	8½	8¾	10	11
Reinforcing Steel "a" Size: Bar #	6	6	6	7	6	6	6	7	6	6	6	7	6	5	6	6
"a" Spacing	6	5½	5½	6	5½	6	5	6½	6	6½	5	6½	6½	6	7	5
"a" Length	8-10	9-1	9-2	9-4	8-11	9-1	9-3	9-5	9-0	9-1	9-3	9-5	9-1	9-2	9-4	9-6
"a_1" Size: Bar #	6	6	6	7	5	6	6	7	5	6	6	7	5	6	7	7
"a_1" Spacing	8	5½	5	6	5½	5½	5	6	5½	6	5	6	6	6	7	6
"a_1" Length	8-10	9-1	9-2	9-4	8-11	9-1	9-3	9-5	9-0	9-1	9-3	9-5	9-1	9-2	9-4	9-6
"b" Size: Bar #	6	6	6	6	6	6	6	7	5	6	6	7	6	6	7	7
"b" Spacing	18	11	11	12	18	11	10½	13	12	11	10	12	16	12	13	12
"b" Dimension "X"	1-8	1-8	1-9	1-10	1-9	1-9	1-10	2-0	1-9	1-9	1-10	2-1	1-11	1-10	2-0	2-3
"b" Length	3-10	3-10	3-11	4-0	3-11	3-11	4-0	4-7	3-7	3-11	4-0	4-8	4-1	4-0	4-7	4-10
"c" Size: Bar #	6	6	6	6	6	6	6	7	5	6	6	7	6	6	7	7
"c" Spacing	18	11	11	12	18	11	10½	13	12	11	10	12	16	12	13	12
"c" Dimension "Y"	1-10	2-4	2-5	2-5	1-10	2-5	2-6	2-7	1-10	2-6	2-6	2-8	2-4	2-9	2-11	2-11
"c" Length	11-3	11-9	11-10	12-1	12-3	12-10	13-0	13-2	13-3	13-11	14-0	14-3	14-9	15-2	15-5	15-6
"c_1" Size: Bar #	6	6	6	6	6	6	6	7	5	6	6	7	6	6	7	7
"c_1" Spacing	18	11	11	12	18	11	10½	13	12	11	10	12	16	12	13	12
"c_1" Dimension "Y"	2-3	2-3	2-3	2-3	2-4	2-4	2-4	2-7	2-4	2-4	2-5	2-10	2-11	2-6	2-9	2-11
"c_1" Length	4-2	4-4	4-5	4-6	4-3	4-5	4-6	5-1	4-0	4-5	4-7	5-4	4-10	4-7	5-3	5-6
"d" bars Tot. No. Top Slab	9	5	5	5	9	5	5	5	9	5	5	5	9	5	5	5
"d" bars Tot. No. Bot. Slab	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
"e" bars Spacing	18	18	18	18	18	18	18	18	18	18	18	18	18	13	15	14
Spacers Total No.	44	44	44	44	48	48	48	48	48	48	48	48	52	52	52	52
Quan. Concrete: C.Y. per lin. ft.	.79	.94	1.01	1.19	.88	1.01	1.12	1.27	.96	1.06	1.21	1.34	1.06	1.15	1.34	1.48
Quan. Reinf: Lbs. per lin. ft.	145	187	192	200	155	193	208	231	156	193	218	247	168	196	232	263

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED SEPTEMBER 1, 1966

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945

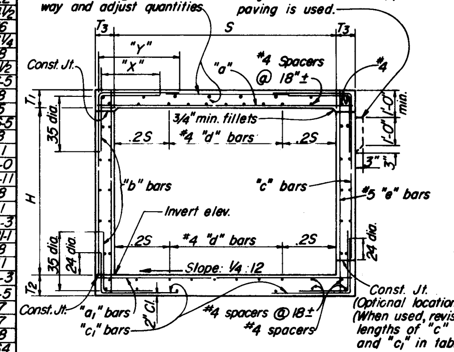


EQUIPMENT PASS CURB DETAILS

SPAN	10																			
HEIGHT	11				12				13				14				15			
Strength Classification	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Max. Fill Over Top	2	12	20	28	2	12	20	28	2	12	20	28	2	11	19	28	3	11	19	28
Conc. Top Slab T_1	8½	8½	10½	12¼	8½	8½	10½	12¼	8½	8½	10½	12¼	8¼	8¾	10¾	12½	8	8¾	10¾	12¾
Conc. Bottom Slab T_2	7½	9	11½	13¼	8½	9¼	11¾	13½	8	9½	11¾	13½	8¼	10	12¼	13¾	9	10½	12½	13¾
Conc. Sidewalls T_3	8	8½	10½	12½	8½	8¾	11	13¼	9	9	11½	13¾	11	10½	12	14	12	12	12½	14
Reinforcing Steel "a" Size: Bar #	6	6	7	7	6	6	7	7	6	6	7	7	6	6	7	7	6	5	7	7
"a" Spacing	5½	5½	6	5	5½	5½	5½	5	6	7	6	5½	6	8½	6	6	6	6½	8	6½
"a" Length	11-0	11-1	11-5	11-9	11-1	11-2	11-6	11-11	11-2	11-2	11-7	12-0	11-6	11-5	11-8	12-0	11-8	11-8	11-9	12-0
"a_1" Size: Bar #	6	7	7	8	6	7	7	8	5	7	7	8	6	7	7	8	6	7	7	8
"a_1" Spacing	6½	7	6	6	6½	7	5½	5½	5	7	5½	6½	7	8½	5½	7	9	6½	7	6
"a_1" Length	11-0	11-1	11-5	11-9	11-1	11-2	11-6	11-11	11-2	11-2	11-7	12-0	11-6	11-5	11-8	12-0	11-8	11-8	11-9	12-0
"b" Size: Bar #	5	6	7	7	5	6	7	7	5	7	7	8	6	7	7	8	6	6	7	7
"b" Spacing	10	11	13	12	10	11	12	10	10	14	11	12	12	13	10	12	12	13	10	12
"b" Dimension "X"	1-9	1-9	2-1	2-3	1-10	1-11	2-2	2-5	1-11	2-1	2-3	2-6	2-0	2-5	2-4	2-6	2-1	2-8	2-5	2-6
"b" Length	3-7	3-11	4-8	4-10	3-8	4-1	4-9	5-0	3-9	4-8	4-10	5-5	4-2	5-0	4-11	5-5	4-3	5-3	5-0	5-5
"c" Size: Bar #	5	6	7	7	5	6	7	7	5	7	7	8	6	7	7	8	6	7	7	8
"c" Spacing	10	11	13	12	10	11	12	10	10	14	11	12	12	13	10	12	12	13	10	12
"c" Dimension "Y"	2-1	2-5	2-11	3-0	2-4	2-9	3-0	3-4	2-7	3-1	3-1	3-7	2-11	3-4	3-3	2-6	3-3	3-8	3-5	3-7
"c" Length	13-6	13-10	14-6	14-9	14-9	15-2	15-7	16-1	16-0	16-6	16-8	17-4	17-4	17-9	17-10	17-3	18-8	19-1	18-11	19-4
"c_1" Size: Bar #	5	6	7	7	5	6	7	7	5	7	7	8	6	7	7	8	6	7	7	8
"c_1" Spacing	10	11	13	12	10	11	12	10	10	14	11	12	12	13	10	12	12	13	10	12
"c_1" Dimension "Y"	2-5	2-5	2-11	3-0	2-8	2-9	3-0	3-4	2-10	3-0	3-1	3-7	3-4	3-4	3-4	2-6	3-9	3-8	3-6	3-7
"c_1" Length	4-2	4-6	5-6	5-9	4-6	4-10	5-7	6-1	4-7	5-5	5-8	6-7	5-4	5-9	5-11	5-6	5-10	6-2	6-2	6-7
"d" bars Tot. No. Top Slab	10	5	5	5	10	5	5	5	9	5	5	5	9	5	5	5	9	5	5	5
"d" bars Tot. No. Bot. Slab	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
"e" bars Spacing	18	18	18	18	18	18	18	18	18	18	18	18	18	18	16	15	18	18	14	12
Spacers Total No.	48	48	48	48	52	52	52	52	56	56	56	56	60	60	60	60	60	60	60	60
Quan. Concrete: C.Y. per lin. ft.	1.10	1.19	1.51	1.80	1.23	1.28	1.63	1.95	1.31	1.36	1.74	2.08	1.55	1.59	1.89	2.21	1.74	1.82	2.03	2.31
Quan. Reinf: Lbs. per lin. ft.	187	216	259	299	196	227	287	345	198	240	305	362	227	251	335	356	229	258	325	372

SPAN	12															
HEIGHT	13				14				15				16			
Strength Classification	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Max. Fill Over Top	2	9	16	24	2	8	15	23	2	8	15	22	2	7	14	22
Conc. Top Slab T_1	8¾	9½	11	12¾	8¾	9½	11	12¾	8¾	9¼	11	12¾	8¾	9½	11¼	13
Conc. Bottom Slab T_2	8½	10¼	12	14	9	10½	12¼	14	9½	10¾	12¼	14	10	11	13	14½
Conc. Sidewalls T_3	9	9	11¾	14	11	11	12¼	14¼	12	12	12½	14½	13	13	13	14¾
Reinforcing Steel "a" Size: Bar #	6	7	7	8	6	6	7	7	6	6	7	7	6	6	6	8
"a" Spacing	5	6½	5½	6	5½	6	6	5	6	6	6	5	6	6	5½	7
"a" Length	13-2	13-2	13-8	14-0	13-6	13-6	13-9	14-1	13-8	13-8	13-9	14-1	13-11	13-11	13-11	14-2
"a_1" Size: Bar #	6	7	8	8	6	7	8	8	6	7	7	8	6	7	7	8
"a_1" Spacing	6	6	6½	5½	6½	6½	7	6	6½	7	5	6	6½	6½	6½	6
"a_1" Length	13-2	13-2	13-8	14-0	13-6	13-6	13-9	14-1	13-8	13-8	13-9	14-1	13-11	13-11	13-11	14-2
"b" Size: Bar #	6	7	7	8	6	7	7	8	7	7	7	8	6	7	7	8
"b" Spacing	12	14	11	12	11½	13	11	12	15	12	11	12	10	12	11	12
"b" Dimension "X"	1-11	2-3	2-4	2-9	2-1	2-3	2-5	2-10	2-3	2-3	2-6	2-10	2-6	2-8	2-9	2-11
"b" Length	4-1	4-10	4-11	5-8	4-3	4-10	5-0	5-9	4-10	4-10	5-1	5-9	4-8	5-3	5-4	5-10
"c" Size: Bar #	6	7	7	8	6	7	7	8	7	7	7	8	6	7	7	8
"c" Spacing	12	14	11	12	11½	13	11	12	15	12	11	12	10	12	11	12
"c" Dimension "Y"	2-10	2-9	3-2	3-0	3-1	3-1	3-5	3-6	3-4	3-5	3-8	4-0	3-7	3-9	3-10	4-0
"c" Length	16-3	16-3	16-9	16-9	17-6	17-7	18-0	18-3	18-9	18-11	19-3	19-9	20-0	20-3	20-6	20-9
"c_1" Size: Bar #	6	7	7	8	6	7	7	8	7	7	7	8	6	7	7	8
"c_1" Spacing	12	14	11	12	11½	13	11	12	15	12	11	12	10	12	11	12
"c_1" Dimension "Y"	3-0	3-2	3-2	3-9	3-4	3-4	3-4	3-11	3-8	3-6	3-6	4-0	3-10	3-10	3-11	4-0
"c_1" Length	5-1	5-7	5-9	6-9	5-5	5-10	5-11	6-11	6-1	6-0	6-1	7-0	6-0	6-4	6-7	7-1
"d" bars Tot. No. Top Slab	12	6	6	6	11	6	6	6	11	6	6	6	11	6	6	6
"d" bars Tot. No. Bot. Slab	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
Spacers Total No.	56	56	56	56	60	60	60	60	60	60	60	60	64	64	64	64
Quan. Concrete: C.Y. per lin. ft.	1.44	1.55	1.93	2.31	1.71	1.81	2.07	2.42	1.90	1.97	2.17	2.52	2.10	2.18	2.34	2.68
Quan. Reinf: Lbs. per lin. ft.	225	278	337	408	252	285	339	409	265	300	352	419	285	320	341	426

SPAN	14											
HEIGHT	14				15				16			
Strength Classification	A	B	C	D	A	B	C	D	A	B	C	D
Max. Fill Over Top	2	8	15	22	2	8	15	22	2	8	15	22
Conc. Top Slab T_1	9	10¼	11¾	14½	9	10½	12	14½	9	10¾	12¼	14½
Conc. Bottom Slab T_2	9½	11½	13½	15½	10	11¾	13¾	15¾	10¼	12	13¾	16
Conc. Sidewalls T_3	11	11¼	13	15½	11½	11¾	13½	16	12	12	13¾	16¼
Reinforcing Steel "a" Size: Bar #	6	7	7	8	6	7	7	8	6	7	8	8
"a" Spacing	5	6	5	5½	5	6	5	5½	5½	6	7	5½
"a" Length	15-6	15-5	15-10	16-3	15-7	15-8	15-11	16-4	15-8	15-8	16-0	16-5
"a_1" Size: Bar #	6	7	8	8	6	7	8	8	6	7	8	8
"a_1" Spacing	5½	5	6	5	5½	5½	6	5	5½	5½	6	5
"a_1" Length	15-6	15-5	15-10	16-3	15-7	15-8	15-11	16-4	15-8	15-8	16-0	16-5
"b" Size: Bar #	6	7	7	8	6	7	7	8	6	7	8	8
"b" Spacing	11	11	10	11	10	11	10	11	10	12	12	11
"b" Dimension "X"	2-4	2-6	2-8	3-0	2-5	2-8	2-9	3-0	2-5	2-9	2-10	3-0
"b" Length	4-6	5-1	5-3	5-11	4-7	5-3	5-4	5-11	4-7	5-4	5-9	5-11
"c" Size: Bar #	6	7	7	8	6	7	7	8	6	7	8	8
"c" Spacing	11	11	10	11	10	11	10	11	10	12	12	11
"c" Dimension "Y"	3-3	3-9	3-10	4-4	3-5	3-9	4-0	4-4	3-6	3-8	4-1	4-3
"c" Length	17-8	18-3	18-6	19-2	18-10	19-3	19-8	20-2	19-11	20-3	20-9	21-1
"c_1" Size: Bar #	6	7	7	8	6	7	7	8	6	7	8	8
"c_1" Spacing	11	11	10	11	10	11	10	11	10	12	12	11
"c_1" Dimension "Y"	3-6	3-8	3-9	4-3	3-9	3-10	3-11	4-3	3-11	3-11	4-1	4-3
"c_1" Length	5-8	6-3	6-6	7-5	5-11	6-5	6-8	7-5	6-1	6-6	7-1	7-5
"d" bars Tot. No. Top Slab	13	7	7	7	13	7	7	7	12	7	7	7
"d" bars Tot. No. Bot. Slab	7	7	7	7	7	7	7	7	7	7	7	7
"e" bars Spacing	18	18	18	18	18	18	18	18	18	18	18	18
Spacers Total No.	60	60	60	60	60	60	60	60	64	64	64	64
Quan. Concrete: C.Y. per lin. ft.	1.85	2.04	2.38	2.87	2.00	2.18	2.54	3.03	2.13	2.31	2.67	3.17
Quan. Reinf: Lbs. per lin. ft.	287	364	406	494	305	367	417	502	309	363	444	512



TYPICAL SECTION

NOTE:

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

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

SPECIAL SINGLE BOX CULVERTS & EQUIP. PASSES | D91

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DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET No.	TOTAL SHEETS

SPAN 5'

HEIGHT	6'				7'				8'			
Strength Classification	A	B	C	D	A	B	C	D	A	B	C	D
Max. Fill Over Top	4	16	30	45	3	16	30	45	3	16	30	45
Conc. Top Slab T_1	7	7	8½	10¼	7	7	8½	10¼	7	7	8½	10¼
Conc. Bottom Slab T_2	6	8	9¾	11½	6	8	9¾	11½	6	8	9¾	11½
Conc. Sidewalls T_3	6	6	6½	7	6	6	7¼	8¼	6	6	7¾	9½
"a" or "a_1" Size: Bar # "a"	5	4	4	4	6	4	4	4	6	4	4	4
Spacing "a"	12	14	12	10½	11½	11½	12	10	11½	11½	13	11
Size: Bar # "a_1"	4	5	5	4	4	5	4	5	4	4	4	4
Spacing "a_1"	12	14	12	10½	11	11½	12	10	11	11½	12	10½
Length "a" or "a_1"	11-2	11-2	11-3	11-5	11-2	11-2	11-6	11-9	11-2	11-2	11-7	12-1
"b" Size: Bar #	6	5	6	6	5	5	6	6	5	5	6	6
"b" Spacing	12	14	12	10½	11½	11½	12	10	11½	11½	13	11
"b" Length	11-5	11-6	11-8	11-11	11-6	11-6	11-10	12-3	11-6	11-6	12-0	12-7
"b_1" Size: Bar #	6	5	6	6	5	5	6	6	5	5	6	6
"b_1" Spacing	12	14	12	10½	11	11½	12	10	11	11½	12	10½
"b_1" Length	11-4	11-6	11-9	11-11	11-4	11-6	11-11	12-3	11-4	11-6	12-0	12-7
"c" or "c_1" Size: Bar "c"	4	6	6	6	4	6	6	6	4	5	6	6
Spacing "c"	12	14	12	10½	11½	11½	12	10	11½	11½	13	11
Size: Bar # "c_1"	4	6	6	6	5	6	6	6	5	5	6	6
Spacing "c_1"	12	14	12	10½	11	11½	12	10	11	11½	12	10½
Length "c" or "c_1"	4-6	4-6	5-0	5-6	5-0	4-6	5-0	5-6	5-0	5-0	5-0	5-0
"d" Dist. Bars Top Slab-Tot. No.	12	6	6	6	12	6	6	6	12	6	6	6
"d" Dist. Bars Bot. Slab-Tot. No.	6	6	6	6	6	6	6	6	6	6	6	6
"e" Bars Spacing	18	18	18	18	18	16	15	14	18	15	12	11½
"f" Size: Bar #	5	5	4	5	5	5	5	6	4	5	5	6
"f" Spacing	16	18	12	11	16	16	12	13	12	13	11	12
"f" Length	3-1	3-1	2-5	3-3	3-1	3-2	3-0	3-8	2-8	3-3	3-2	3-9
"f" Dimension "X"	1-3	1-3	1-0	1-5	1-3	1-4	1-2	1-6	1-3	1-5	1-4	1-7
"g" or "g_1" Size: Bar #	5	5	5	5	5	5	5	6	4	5	5	6
Spacing	16	18	12	11	16	16	12	13	12	13	11	12
Length "g"	8-3	8-0	8-1	8-6	9-6	9-6	9-4	9-9	10-8	10-6	10-7	10-11
Length "g_1"	3-5	3-3	3-5	3-9	3-7	3-9	3-8	4-3	3-6	3-9	3-11	4-6
Dimension "Y"	1-10	1-6	1-6	1-9	2-0	2-0	1-9	2-0	2-2	2-0	2-0	2-2
Spacers Total No.	56	56	56	56	61	61	61	70	66	66	66	76
Quan. Concrete: C.Y. per lin. ft.	.80	.87	1.02	1.18	.85	.92	1.14	1.35	.91	.98	1.26	1.54
Quan. Reinf. Lbs. per lin. ft.	149	131	159	180	157	154	172	225	158	162	187	234

SPAN 6'

HEIGHT	7'				8'				9'			
Strength Classification	A	B	C	D	A	B	C	D	A	B	C	D
Max. Fill Over Top	3	16	30	45	3	16	30	45	3	16	30	45
Conc. Top Slab T_1	7½	7½	9¼	11¼	7½	7½	9¼	11¼	7½	7½	9	11
Conc. Bottom Slab T_2	6	8	10½	12½	6¼	8¼	10½	12½	6½	8½	10½	12¼
Conc. Sidewalls T_3	6	6	7¼	8½	6¼	6½	8	9¼	6½	7	8½	10
"a" or "a_1" Size: Bar # "a"	6	4	4	4	6	4	4	5	6	4	4	4
Spacing "a"	13	11½	10	11	13	11½	12	11	11½	11	10	11½
Size: Bar # "a_1"	4	4	4	4	4	4	4	4	4	4	4	4
Spacing "a_1"	11½	11	11½	10½	13	12	13	10	13	12	10	12
Length "a" or "a_1"	13-2	13-2	13-6	13-10	13-3	13-3	13-8	14-0	13-3	13-5	13-10	14-2
"b" Size: Bar #	6	5	6	7	6	5	6	6	5	5	6	7
"b" Spacing	13	11½	10	11	13	11½	12	11	11½	11	10	11½
"b" Length	13-6	13-6	13-11	14-4	13-6	13-8	14-1	14-7	13-8	13-9	14-3	14-8
"b_1" Size: Bar #	4	5	6	7	5	6	7	6	5	5	6	7
"b_1" Spacing	11½	11	11½	10½	13	12	13	10	13	12	10	12
"b_1" Length	13-4	13-6	13-11	14-4	13-5	13-7	14-1	14-7	13-6	13-9	14-3	14-9
"c" or "c_1" Size: Bar "c"	5	6	6	7	5	6	7	7	5	5	6	7
Spacing "c"	13	11½	10	11	13	11½	12	11	11½	11	10	11½
Size: Bar # "c_1"	6	6	7	7	5	6	7	7	5	6	6	8
Spacing "c_1"	11½	11	11½	10½	13	12	13	10	13	12	10	12
Length "c" or "c_1"	4-6	5-0	5-6	5-6	4-6	5-0	5-6	5-6	4-6	5-0	5-0	5-6
"d" Dist. Bars Top Slab-Tot. No.	12	6	6	6	12	6	6	6	10	6	6	6
"d" Dist. Bars Bot. Slab-Tot. No.	6	6	6	6	6	6	6	6	6	6	6	6
"e" Bars Spacing	18	18	18	18	18	16	15	14	18	14	11	10
"f" Size: Bar #	4	5	6	6	4	4	6	6	4	5	6	6
"f" Spacing	11½	15	15	13	12	10½	13	11	10	11½	12	12
"f" Length	2-6	3-1	3-8	3-11	2-7	2-10	3-9	4-0	2-8	3-4	3-9	4-0
"f" Dimension "X"	1-1	1-3	1-6	1-9	1-2	1-5	1-7	1-10	1-3	1-6	1-7	1-10
"g" or "g_1" Size: Bar #	4	5	6	6	4	5	6	6	4	5	6	6
Spacing	11½	15	15	13	12	10½	13	11	10	11½	12	12
Length "g"	9-0	9-2	9-8	10-1	10-2	10-5	10-10	11-4	11-3	11-8	11-10	12-5
Length "g_1"	2-10	3-5	4-3	4-8	3-0	3-8	4-5	4-11	3-2	4-0	4-6	5-0
Dimension "Y"	1-6	1-8	2-0	2-3	1-8	1-11	2-2	2-6	1-9	2-2	2-3	2-8
Spacers Total No.	61	61	61	70	66	66	76	76	66	66	76	76
Quan. Concrete: C.Y. per lin. ft.	.95	1.04	1.32	1.58	1.04	1.15	1.45	1.74	1.13	1.26	1.56	1.88
Quan. Reinf. Lbs. per lin. ft.	157	160	204	248	164	181	233	268	171	185	255	279

SPAN 8'

HEIGHT	9'				10'				11'				12'			
Strength Classification	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Max. Fill Over Top	2	7	18	30	2	7	18	30	2	8	19	30	2	9	20	30
Conc. Top Slab T_1	7¾	7¾	10¼	12¾	7¾	7¾	10½	12½	7¾	7¾	10½	12¼	7¾	7¾	10½	12¼
Conc. Bottom Slab T_2	7¼	8¾	11	13½	7½	9	11¼	13½	7½	9¼	11½	13½	7½	9	11½	13½
Conc. Sidewalls T_3	7	7	7½	9	7¾	7¾	8¼	9¾	8½	8½	8¾	10½	9	9	10	12
"a" or "a_1" Size: Bar # "a"	6	4	5	5	6	4	4	5	5	4	4	4	5	4	6	4
Spacing "a"	12	12	13	11½	12	14	13	11½	11	13	11	12	10	12	12	9
Size: Bar # "a_1"	5	4	4	4	4	4	4	5	4	4	4	4	4	4	4	4
Spacing "a_1"	11	12	11	11	11	11	12	11½	11	13	12	11½	11	11½	12	10
Length "a" or "a_1"	17-5	17-5	17-7	17-11	17-7	17-7	17-9	18-1	17-10	17-10	17-10	18-3	17-11	17-11	18-2	18-8
"b" Size: Bar #	6	6	7	7	6	6	7	7	6	6	6	7	6	6	6	6
"b" Spacing	12	12	13	11½	12	14	13	11½	11	13	11	12	10	12	12	9
"b" Length	17-9	17-9	18-0	18-7	17-11	17-11	18-2	18-9	18-2	18-2	18-5	18-11	18-3	18-3	18-8	19-4
"b_1" Size: Bar #	5	6	7	8	5	5	7	7	5	6	7	7	6	6	7	7
"b_1" Spacing	11	12	11	11	11	11	12	11½	11	13	12	11½	11	11½	12	10
"b_1" Length	17-8	17-9	18-0	18-6	17-10	18-0	18-3	18-9	18-1	18-2	18-4	18-11	18-2	18-3	18-8	19-4
"c" or "c_1" Size: Bar "c"	5	6	7	8	5	7	7	8	4	6	7	8	4	6	7	7
Spacing "c"	12	12	13	11½	12	14	13	11½	11	13	11	12	10	12	12	9
Size: Bar # "c_1"	5	6	6	7	5	6	7	8	5	7	7	8	4	6	7	7
Spacing "c_1"	11	12	11	11	11	11	12	11½	11	13	12	11½	11	11	12	10
Length "c" or "c_1"	5-6	6-0	6-6	7-0	5-6	6-6	6-6	7-0	5-6	6-6	7-0	7-0	5-6	6-6	7-0	7-6
"d" Dist. Bars Top Slab-Tot. No.	14	8	8	8	14	8	8	8	14	8	8	8	16	8	8	8
"d" Dist. Bars Bot. Slab-Tot. No.	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
"e" Bars Spacing	18	18	18	16	18	18	15	14	18	18	12	11	18	18	11½	11
"f" Size: Bar #	5	5	6	6	5	5	6	7	5	5	6	7	6	5	6	7
"f" Spacing	13	15	15	11½	13	14	13	14	11½	13	13	13	14	10½	12	14
"f" Length	3-6	3-6	3-10	4-0	3-6	3-5	3-11	4-7	3-6	3-4	3-11	4-10	4-3	3-10	4-4	4-9
"f" Dimension "X"	1-8	1-8	1-8	1-10	1-8	1-7	1-9	2-0	1-8	1-6	1-9	2-3	2-1	2-0	2-2	2-2
"g" or "g_1" Size: Bar #	5	5	6	6	5	5	6	7	5	6	6	7	5	5	6	7
Spacing	13	15	15	11½	13	14	13	14	11½	13	13	13	14	10½	12	14
Length "g"	11-9	11-9	11-9	12-3	13-0	13-1	13-0	13-9	14-0	14-4	14-3	14-10	15-3	15-7	15-9	16-1
Length "g_1"	3-11	4-1	4-3	4-9	4-2	4-5	4-6	5-6	4-3	4-11	4-9	5-9	4-6	4-10	5-3	6-0
Dimension "Y"	2-3	2-3	2-0	2-4	2-5	2-7	2-3	2-10	2-6	2-10	2-6	3-0	2-9	3-0	3-0	3-3
Spacers Total No.	66	66	66	76	71	71	82	82	88	88	88	88	88	88	88	88
Quan. Concrete: C.Y. per lin. ft.	1.41	1.49	1.80	2.23	1.58	1.67	1.98	2.39	1.72	1.82	2.13	2.56	1.86	1.95	2.37	2.85
Quan. Reinf. Lbs. per lin. ft.	226	206	258	328	227	211	285	355	250	257	304	366	268	267	335	380

SPAN 10'

HEIGHT	11'				12'				13'				14'				15'			
Strength Classification	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Max. Fill Over Top	2	6	14	22	2	6	14	22	2	6	14	22	2	6	14	22	2	6	14	22
Conc. Top Slab T_1	9¼	9¼	11½	13½	9¼	9¼	11½	13½	9¼	9¼	11½	13½	9¼	9¼	11½	13½	9¼	9¼	11½	13½
Conc. Bottom Slab T_2	8½	10½	12½	14½	8½	10½	12¾	14½	8½	10½	12¾	14½	8¾	10¾	12¾	14½	9	11	12¾	14½
Conc. Sidewalls T_3	8½	8½	8½	9½	9¼	9¼	9½	10¾	10	10	10¼	12	11	11	11¼	13	12	12	12¼	14
"a" or "a_1" Size: Bar # "a"	6	5	5	5	5	5	4	4	5	5	4	4	6	5	4	4	6	5	4	4
Spacing "a"	12	12	11	12	13	14	15	12	13	14	15	12	13	14	15	12	15	15	15	12
Size: Bar # "a_1"	4	4	5	5	4	4	4	4	4	4	4	4	5	4	4	4	4	4	4	4
Spacing "a_1"	12	12	10½	11½	12	14	14	11	12	13	14	11	12	13	14	11	12	14	14	12
Length "a" or "a_1"	21-10	21-10	21-10	22-1	22-0	22-0	22-1	22-4	22-2	22-2	22-3	22-8	22-5	22-5	22-6	22-11	22-8	22-8	22-9	23-2
"b" Size: Bar #	7	6	6	7	7	6	7	7	7	6	7	7	7	6	7	7	7	7	7	7
"b" Spacing	12	12	11	12	13	14	15	12	13	14	15	12	13	14	15	12	15	15	15	12
"b" Length	22-2	22-3	22-5	22-9	22-5	22-5	22-7	23-1	22-7	22-7	22-9	23-4	22-10	22-10	23-0	23-7	23-1	23-1	23-3	23-10
"b_1" Size: Bar #	6	7	6	7	6	7	7	7	6	7	7	7	6	7	7	7	6	7	7	8
"b_1" Spacing	12	12	10½	11½	12	14	14	11	12	13	14	11	12	13	14	11	12	14	14	12
"b_1" Length	22-1	22-3	22-5	22-9	22-4	22-5	22-8	23-1	22-5	22-7	22-10	23-5	22-9	22-10	23-1	23-8	23-0	23-2	23-4	23-10
"c" or "c_1" Size: Bar # "c"	5	7	7	8	6	7	8	8	6	7	8	8	7	7	8	8	7	7	8	8
Spacing "c"	12	12	11	12	13	14	15	12	13	14	15	12	13	14	15	12	15	15	15	12
Size: Bar # "c_1"	6	6	7	8	6	7	8	8	6	7	8	8	6	7	8	8	6	7	8	8
Spacing "c_1"	12	12	10½	11½	12	14	14	11	12	13	14	11	12	13	14	11	12	14	14	12
Length "c" or "c_1"	7-0	7-6	8-0	8-0	7-0	7-6	7-6	8-0	7-0	7-6	8-0	8-0	7-6	8-0	8-0	8-0	7-6	8-0	8-0	8-6
"d" Dist Bars Top Slab-Tot. No.	22	10	10	10	22	10	10	10	22	10	10	10	22	10	10	10	22	10	10	10
"d" Dist Bars Bot. Slab-Tot. No.	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
"e" bars Spacing	18	18	18	15	18	18	16	14	18	18	15	14	18	16	12	12	18	15	9½	11
"f" Size: Bar #	5	5	6	6	5	5	6	7	6	6	6	7	6	6	6	7	6	6	6	7
"f" Spacing	12	12	14	12	12	12	13	14	14	15	12	14	14	12	12	13	13	12	11	12
"f" Length	3-8	3-7	3-10	3-11	3-10	3-9	4-0	4-6	4-2	4-2	4-2	4-7	4-4	4-6	4-6	4-11	4-6	4-10	4-10	5-3
"f" Dimension "X"	1-10	1-9	1-8	1-9	2-0	1-11	1-10	1-11	2-0	2-0	2-0	2-0	2-2	2-4	2-4	2-4	2-4	2-8	2-8	2-8
"g" or "g_1" Size: Bar #	5	5	6	6	5	5	6	7	6	6	6	7	6	6	6	7	6	6	6	7
Spacing	12	12	14	12	12	12	13	14	14	15	12	14	14	12	12	13	13	12	11	12
Length "g"	14-4	14-1	14-4	14-6	15-8	15-5	15-6	16-0	17-1	16-8	16-10	17-6	18-2	18-1	18-3	18-7	19-4	19-5	19-8	19-8
Length "g_1"	4-6	4-5	4-11	5-0	4-9	4-9	5-1	5-9	5-6	5-3	5-5	6-3	5-7	5-7	5-10	6-4	5-9	6-0	6-3	6-6
Dimension "Y"	2-8	2-5	2-6	2-6	3-0	2-9	2-8	3-0	3-5	3-0	3-0	3-6	3-6	3-5	3-5	3-7	3-8	3-9	3-10	3-8
Spacers Total No.	88	88	88	88	94	94	94	94	94	94	94	94	100	100	100	100	106	106	106	106
Quan. Concrete: C.Y. per lin. ft.	2.08	2.22	2.51	2.90	2.26	2.39	2.74	3.16	2.44	2.58	2.93	3.44	2.70	2.84	3.17	3.70	2.97	3.11	3.43	3.98
Quan. Reinf. Lbs. per lin. ft.	307	297	333	374	305	291	324	396	331	317	346	411	366	354	368	440	364	372	402	480

SPAN 12'

HEIGHT	13'				14'				15'				16'			
Strength Classification	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Max. Fill Over Top	2	9	16	22	2	9	16	22	2	9	16	22	2	9	16	22
Conc. Top Slab T_1	11	11¼	14	15½	11	11½	14	15½	10¾	11½	14	15½	10¾	11½	14	15½
Conc. Bottom Slab T_2	9½	12¾	15	16¾	10	13	15	16¾	10¼	13	15	16¾	9½	13	15	16½
Conc. Sidewalls T_3	10	10	10½	11	11	11	11¼	12	12	12	12	13	12	12	12	13
"a" or "a_1" Size: Bar # "a"	5	5	5	5	6	5	5	5	6	5	5	5	5	5	5	5
Spacing "a"	11½	15	11½	10½	16	15	12	10	17	15	12	11	12	15	13	9½
Size: Bar # "a_1"	6	5	5	5	4	5	5	5	4	5	5	5	4	5	5	5
Spacing "a_1"	16	14	11	10	15	13	11	10	14	13	11	10	11	14	11½	9
Length "a" or "a_1"	26-2	26-2	26-4	26-5	26-5	26-5	26-6	26-8	26-8	26-8	26-8	26-11	26-8	26-8	26-8	26-11
"b" Size: Bar #	7	8	8	8	8	8	8	8	8	8	8	8	7	8	8	7
"b" Spacing	11½	15	11½	10½	16	15	12	10	17	15	12	11	12	15	13	9½
"b" Length	26-8	26-8	27-0	27-3	26-11	26-11	27-2	27-5	27-2	27-2	27-4	27-9	27-2	27-2	27-4	27-9
"b_1" Size: Bar #	7	8	8	8	7	8	8	8	7	8	8	8	6	8	8	7
"b_1" Spacing	16	14	11	10	15	13	11	10	14	13	11	10	11	14	11½	9
"b_1" Length	26-6	26-9	27-0	27-3	26-10	27-0	27-2	27-6	27-1	27-3	27-5	27-9	27-1	27-3	27-5	27-9
"c" or "c_1" Size: Bar # "c"	7	8	8	8	8	8	8	8	8	8	8	8	7	8	8	8
Spacing "c"	11½	15	11½	10½	16	15	12	10	17	15	12	11	12	15	13	9½
Size: Bar # "c_1"	7	8	8	8	7	8	8	8	7	8	8	8	7	8	8	8
Spacing "c_1"	16	14	11	10	15	13	11	10	14	13	11	10	11	14	11½	9
Length "c" or "c_1"	8-6	9-6	9-6	9-6	8-6	9-6	9-6	9-6	8-6	9-0	9-6	9-6	9-6	9-6	9-6	9-6
"d" Dist Bars Top Slab-Tot. No.	26	12	12	12	26	12	12	12	26	12	12	12	28	12	12	12
"d" Dist Bars Bot. Slab-Tot. No.	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
"e" bars Spacing	18	18	18	13	18	18	14	11½	18	18	10½	9½	18	15	10½	9½
"f" Size: Bar #	6	6	7	7	6	7	7	8	7	7	7	8	6	7	7	8
"f" Spacing	13	13	14	12	12	15	12	15	15	13	11½	14	12	12	11	13
"f" Length	4-2	3-11	4-9	4-10	4-5	4-10	5-1	5-4	4-10	4-10	5-3	5-5	5-4	5-4	5-4	5-11
"f" Dimension "X"	2-0	1-9	2-2	2-3	2-3	2-3	2-6	2-5	2-3	2-3	2-8	2-6	3-2	2-9	2-10	3-0
"g" or "g_1" Size: Bar #	6	6	7	7	6	7	7	8	7	7	7	8	6	7	7	8
Spacing	13	13	14	12	12	15	12	15	15	13	11½	14	12	12	11	13
Length "g"	17-0	16-11	17-0	17-6	18-5	18-4	18-6	18-4	19-3	19-4	20-0	20-1	20-11	21-0	21-2	21-3
Length "g_1"	5-4	5-6	5-10	6-4	5-10	6-2	6-4	6-6	5-11	6-2	6-10	7-3	6-4	6-11	7-0	75
Dimension "Y"	3-3	3-1	3-0	3-4	3-8	3-6	3-6	3-3	3-6	3-6	4-0	4-0	4-2	4-2	4-2	4-2
Spacers Total No.	94	94	94	94	100	100	100	100	106	106	106	106	106	106	106	106
Quan. Concrete: C.Y. per lin. ft.	2.89	3.17	3.66	4.00	3.17	3.46	3.87	4.25	3.43	3.72	4.10	4.53	3.47	3.83	4.21	4.63
Quan. Reinf. Lbs. per lin. ft.	396	404	496	556	402	447	534	592	422	475	570	620	441	501	572	642

NOTE:

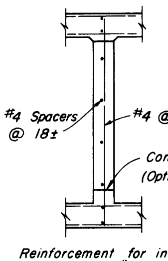
For boxes of height less than that shown in table, use next greater table height slabs, wall dimensions and reinforcing steel, and make necessary changes in bar lengths, number of spacers and quantities. Reinforcement embedment is 1½ dia., min. 1", except as noted.

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED SEPTEMBER 1, 1966

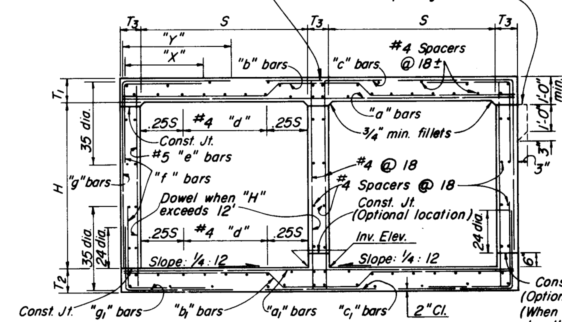
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945



Reinforcement for interior walls under 8".

For culverts at grade, extend "c" bars full length, top slab only, provide additional spacers @ 18± and adjust quantities.

Provide paving notch for culverts at grade where P.C.C. approach paving is used.



TYPICAL SECTION

(Showing reinforcement for interior walls 8" and over)

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

SPECIAL DOUBLE BOX CULVERTS

D 92

D92

Return to Table of Contents

To accompany plans dated

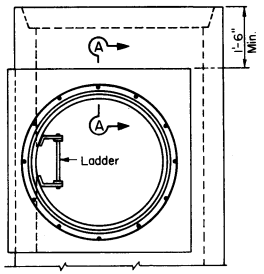
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

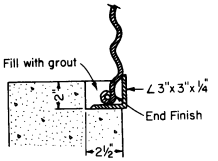
Engineer of Design
Registered Civil Engineer No. 9837

Approved September 1, 1966

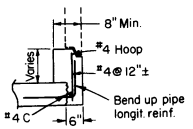
State Highway Engineer
Registered Civil Engineer No. 5945



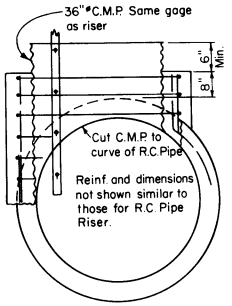
PLAN



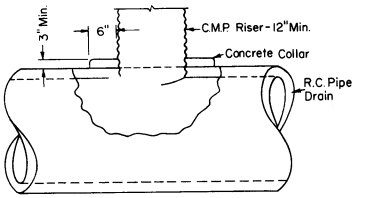
DETAIL A



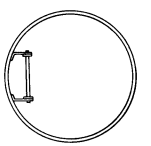
SECTION A-A

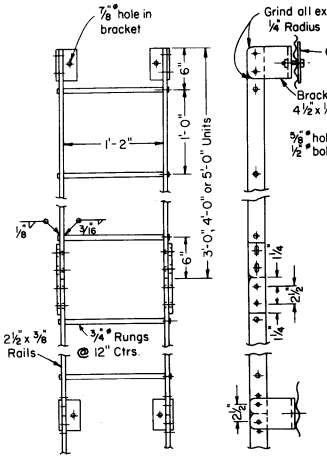


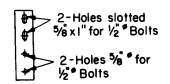
WITH 36" C.M.P. RISER
ALTERNATIVE COLLAR DETAIL



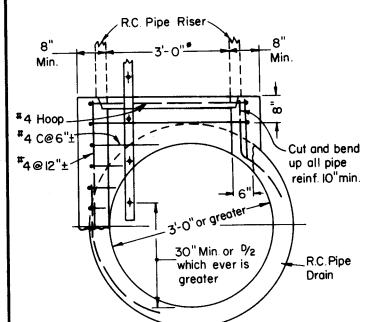
WITH C.M.P. RISER
WHERE NO ACCESS IS REQUIRED



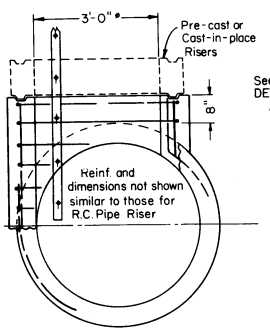




SPLICE PLATE
2 1/2" x 3/8" x 0'-10"

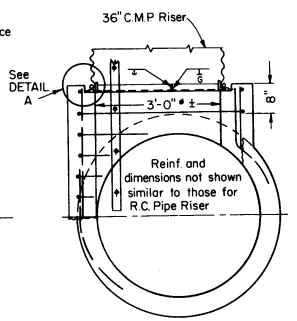


WITH 36" R.C. PIPE RISER

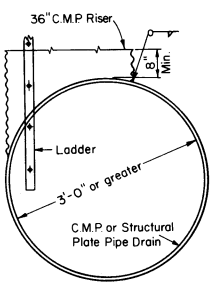


WITH 36" PRE-CAST RISERS

R.C. PIPE DRAIN

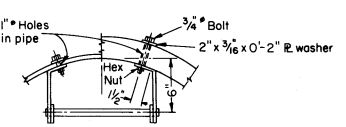


WITH 36" C.M.P. RISER



WITH 36" C.M.P. RISER

C.M.P. OR STRUCTURAL
PLATE PIPE DRAIN



LADDER DETAIL

GENERAL NOTES

1. Structure at top of riser may be any standard storm drain inlet, round grate or manhole.
2. Galvanizing: See Standard Specifications or Special Provisions.
3. Ladder may be constructed in one length at contractor's option.
4. Ladder to be used on both C.M.P. and R.C.P. inlets.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

STORM DRAIN
RISER CONNECTIONS

D93-3

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To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

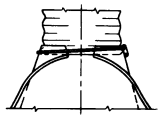
Engineer of Design
Registered Civil Engineer No. 9837

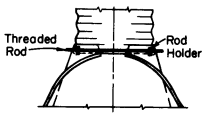
Approved September 1, 1966

State Highway Engineer
Registered Civil Engineer No. 5946

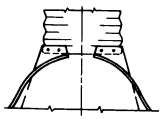
NOTES

1. All 3 pc. bodies to have 12 Ga. sides and 10 Ga. center panels. Width of center panels to be greater than 20% of the pipe periphery. Multiple panel bodies to have lap seams which are to be tightly joined by 3/8" galvanized rivets or bolts.
2. Reinforced edges to be supplemented with galvanized stiffener angles for the 60" thru 84" round, 79" x 49" and 85" x 54" pipe-arch sizes. The angles will be 2" x 2" x 1/4 for the 60" thru 72" round, 79" x 49" and 85" x 54" 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.
3. Angle reinforcement will be placed under the center panel seams on the 79" x 49" and 85" x 54" pipe-arch sizes.
4. Galvanized toe plate to be available as an accessory when specified.
5. End of pipe to be finished with annular corrugations to conform to flared end section so that no leakage results from the connection. Other designs may be used with approval of the Engineer.

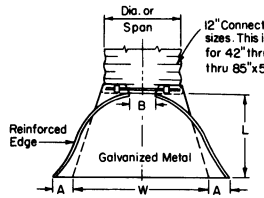




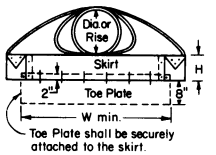
CONNECTIONS WITH ANNULAR CORRUGATIONS



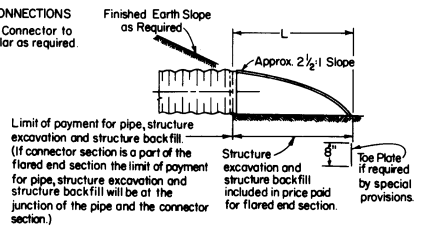
ALTERNATIVE CONNECTIONS
Minimum 1' stub - Connector to be helical or annular as required.



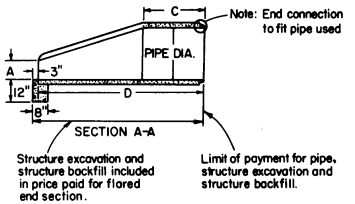
PLAN

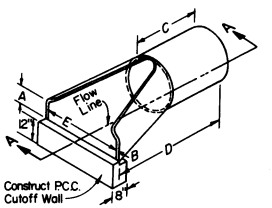


ELEVATION



TYPICAL CROSS - SECTION





CIRCULAR PIPES						
PIPE DIA.	Ga.	DIMENSIONS - INCHES				
		A	B	H	L	W
		1"	Max.	1"	1 1/2"	2"
12"	16	6	6	6	21	24
15	16	7	8	6	26	30
18	16	8	10	6	31	36
21	16	9	12	6	36	42
24	16	10	13	6	41	48
30	14	12	16	8	51	60
36	14	14	19	9	60	72
42	12	16	22	11	69	84
48	12	18	27	12	78	90
54	12	18	30	12	84	102
60	12	18	33	12	87	114
66	12	18	36	12	87	120
72	12	18	39	12	87	126
78	12	18	42	12	87	132
84	12	18	45	12	87	138

PIPE-ARCHES								
INCHES		Ga.	DIMENSIONS - INCHES					
			A	B	H	L	W	
Span	Rise		1"	Max.	1"	1 1/2"	2"	
18	11	16	7	9	6	19	30	
22	13	16	7	10	6	23	36	
25	16	16	8	12	6	28	42	
29	18	16	9	14	6	32	48	
36	22	14	10	16	6	39	60	
43	27	14	12	18	8	46	75	
50	31	12	13	21	9	53	85	
58	36	12	18	26	12	63	90	
65	40	12	18	30	12	70	102	
72	44	12	18	33	12	77	114	
79	49	12	18	36	12	77	126	
85	54	12	18	39	12	77	138	

FLARED END SECTIONS FOR C.M.P. CULVERTS

MINIMUM DIMENSIONS					
PIPE DIA.	A	B	C	D	E
12"	4"	1 3/4"	2'-0"	3'-10"	2'-0"
18"	9"	2"	2'-1"	4'-2"	3'-0"
24"	9 1/2"	2 1/2"	2'-6"	6'-0"	4'-0"
30"	1'-0"	3"	1'-8"	6'-1"	5'-0"
36"	1'-3"	3 3/8"	2'-11"	8'-1"	6'-0"
42"	1'-9"	3 3/4"	2'-11"	8'-2"	6'-6"
48"	2'-0"	4 1/4"	2'-2"	8'-2"	7'-0"
54"	2'-3"	4 5/8"	2'-9"	8'-3"	6'-10"

PRECAST CONCRETE FLARED END SECTION

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

FLARED END SECTIONS

D94

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SPAN	Waterway Area Sq. Ft.	Rated Waterway Area-Sq. Ft.	HEIGHT	Crown	W_1	W_2	W_3	R_1	R_2	R_3	R_4	A	B	C	D	E	F	G	H	I	J	ⓐ Bars	ⓒ Bars	ⓓ Bars	Concrete Cu. Yds. Per Lin. Ft.	Reinforcing Steel Lbs./Lin. Ft.
6	27	25	6'-10 13/16"	6"	2'-0"	1'-3 1/2"	11"	6'-0"	6'-2 3/8"	1'-11"	2'-7 1/4"	2 1/4"	2'-7 1/16"	2'-6"	6"	6"	5 1/2"	1 1/2"	2 1/2"	5"	4'-5 1/2"	#6	#6	#5	0.59	164
7	37	33	7-10 7/8	6	2-3	1-5 1/2	11 5/8	7-0	7-1 3/4	2-2 3/4	2-11 1/2	2 3/4	3-0 1/4	2-11	7	6	6 1/2	2	3	5 3/8	5-1 1/4	6	6	5	0.74	181
8	48	42	8-10 3/8	6	2-6	1-7	1'-0 3/8"	8-0	8-1 1/4	2-6 5/8	3-3 5/8	3	3-5 3/8	3-4	8	6	7 1/2	2	3 1/2	6 3/8	5-9 1/8	6	6	5	0.89	204
9	61	54	9-9 11/16	6	2-9	1-8	1-1 1/4	9-0	9-0 5/8	2-10 1/2	3-7 7/8	3 3/8	3-10 9/16	3-9	9	6	8	2	4	7 1/4	6-5 1/8	6	6	5	1.05	220
10	74	65	10-9 3/4	6	3-0	1-10	1-2	10-0	10-0	3-2 1/4	4-0	3 3/4	4-3 3/4	4-2	10	6	10	2	4	8	7-1	6	6	5	1.23	255
11	92	73	11-10 9/16	6 5/8	3-4	2-0	1-3 3/8	11-0	11-0	3-6	4-4 7/8	4 1/4	4-8 5/16	4-7	11	6	10	3	5	8 3/4	7-9 11/16	6	6	5	1.46	275
12	110	85	12-10 3/8	7 1/4	3-8	2-1	1-5	12-0	12-0	3-10	4-9 5/8	4 3/8	5-2 1/8	5-0	1'-0"	6	11	3	5	9 5/8	8-6 1/2	6	6	5	1.70	292
13	127	98	13-11 1/8	7 7/8	4-0	2-3	1-6 1/4	13-0	13-0	4-1 3/4	5-2 1/2	4 7/8	5-7 1/4	5-5	1-1	7	1'-0"	3	5	10 3/8	9-3 1/8	7	7	6	2.02	415
14	148	112	14-10 15/16	8 3/8	4-3	2-4	1-7 5/8	14-0	14-0	4-5 1/2	5-7 1/4	5 3/8	6-0 7/16	5-10	1-2	7	1-0	3	6	11 1/4	9-11 3/16	7	7	6	2.26	443
15	169	127	15-11 3/8	9	4-6	2-6	1-9	15-0	15-0	4-9 3/8	6-0	5 5/8	6-5 5/8	6-3	1-3	7	1-2	3	6	1'-0"	10-7 1/2	7	7	6	2.59	470
16	192	143	17-0 7/16	9 5/8	4-10	2-8	1-10 3/8	16-0	16-0	5-1 1/4	6-4 7/8	6	6-10 3/16	6-8	1-4	7	1-3	3	7	1-0 3/4	11-4 3/16	7	7	6	2.92	496
17	217	160	18-2 3/8	10 1/4	5-2	2-11	2-0	17-0	17-0	5-5	6-9 3/4	6 1/2	7-4	7-1	1-5	8	1-4	4	7	1-1 5/8	12-1	8	8	6	3.38	658
18	244	177	19-3	11	5-5	3-1	2-1 1/4	18-0	18-0	5-8 7/8	7-2 1/2	6 5/8	7-9 1/8	7-6	1-6	8	1-5	4	8	1-2 3/8	12-9 1/8	8	8	6	3.76	695
19	272	196	20-3 13/16	11 3/8	5-8 1/2	3-3	2-2 5/8	19-0	19-0	6-0 3/4	7-7 1/4	7 1/8	8-2 5/16	7-11	1-7	9	1-6	4	8	1-3 1/4	13-5 9/16	8	8	6	4.19	730
20	301	216	21-3 1/2	1'-0"	6-0	3-4	2-4	20-0	20-0	6-4 1/2	8-0	7 1/2	8-7 1/2	8-4	1-8	9	1-6	4	9	1-4	14-2	8	8	6	4.56	759
21	334	236	22-5 9/16	1-0 5/8	6-3 5/8	3-7	2-5 3/8	21-0	21-0	6-8 3/8	8-4 7/8	7 7/8	9-0 11/16	8-9	1-9	9	1-9	4	9	1-4 3/4	14-10 1/2	8	8	6	5.09	796
22	363	257	23-4 1/4	1-1 1/4	6-7	3-7	2-7	22-0	22-0	7-0 1/4	8-9 3/4	8 1/4	9-5 7/8	9-2	1-10	9	1-9	4	9	1-5 5/8	15-7	8	8	6	5.47	825

To accompany plans dated

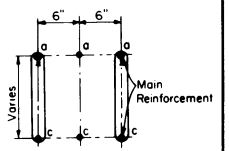
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

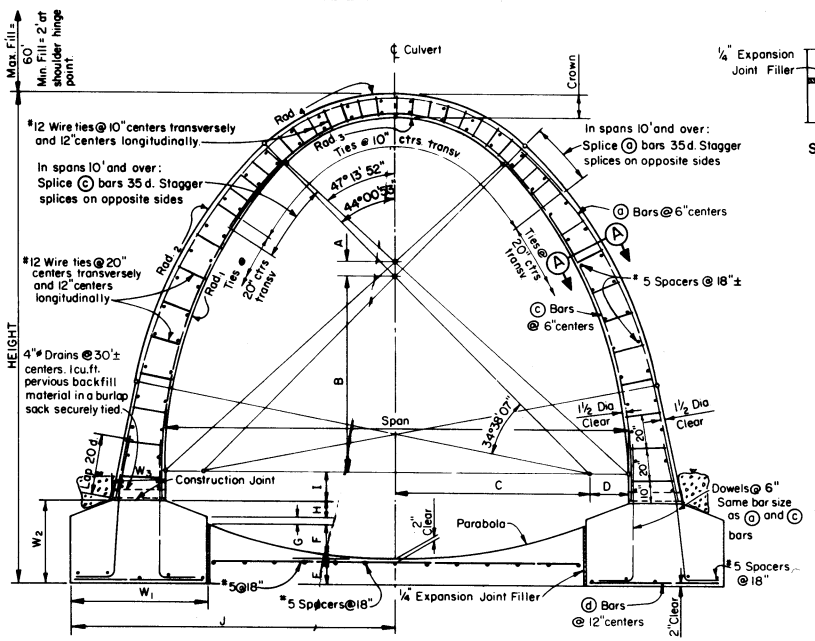
ASSISTANT STATE HIGHWAY ENGINEER – BRIDGE

APPROVED June 15, 1967

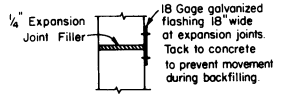
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO 5845



WIRE TIE DETAIL



TYPICAL SECTION



SECTION A-A

REINFORCING BAR SCHEDULE

SPAN	6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'	17'	18'	19'	20'	21'	22'
ⓐ Bars ⌒ or ⌒	14-6	16-7	18-10	21-0	8-7 / 16-8	9-5 / 18-1	10-3 / 19-9	11-2 / 21-7	12-0 / 23-1	13-0 / 24-6	13-10 / 26-3	14-8 / 27-9	15-7 / 29-4	16-5 / 30-10	17-4 / 32-4	18-2 / 33-9	19-0 / 35-2
ⓒ Bars ⌒ or ⌒	13-5	15-6	17-8	19-10	8-3 / 15-11	9-1 / 17-3	9-11 / 18-8	10-8 / 20-4	11-6 / 21-9	12-4 / 23-1	13-2 / 24-5	14-0 / 26-1	14-9 / 27-5	15-7 / 28-9	16-5 / 30-1	17-3 / 31-5	18-0 / 32-10
ⓓ Bars —	1-8	1-11	2-2	2-5	2-8	3-0	3-4	3-8	3-11	4-2	4-6	4-10	5-1	5-5	5-8	6-0	6-3
Invert Slab —	4-8	5-6	6-3	7-1	7-11	8-9	9-6	10-3	11-1	12-0	12-9	13-7	14-5	15-3	16-1	16-11	17-9
Footing Dowels	3-3	3-4	3-6	3-7	3-9	3-11	4-0	4-6	4-8	4-10	5-0	5-6	5-8	5-10	5-11	6-2	6-2
Number of Spacers	32	33	39	40	44	49	49	56	60	65	66	70	75	81	82	87	91
Footing (Fill 20')	2.4	2.4	2.5	2.5	2.6	2.7	2.8	2.8	3.0	3.0	3.0	3.1	3.2	3.2	3.3	3.4	3.5
Pressure (40')	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.8	5.0	5.0	5.0	5.1	5.2	5.2	5.3	5.4	5.5
Tons psf. (60')	6.0	6.2	6.3	6.5	6.6	6.7	6.8	6.8	7.0	7.0	7.0	7.1	7.2	7.2	7.3	7.4	7.5

GENERAL NOTES

DESIGN: A.A.S.H.O. dated 1965 with revisions and as supplemented by Bridge Planning and Design Manual.

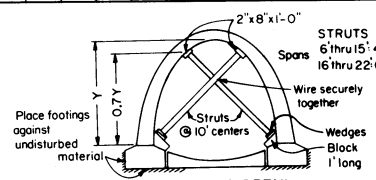
EARTH LOADING: Earth pressure = 120 lbs. per cu. ft.
Equivalent fluid pressure 36 lbs. per cu. ft.

REINFORCED CONCRETE: FS = 20,000 PSI, N = 10
FC = 1,200 PSI

REINFORCEMENT COVERAGE: Where culverts are constructed adjacent to salt water, thickness of concrete shall be increased to provide minimum 2" coverage between reinforcement and exposed surfaces. Where scour is anticipated, thickness of invert slab to be increased or reinforced as condition requires.

EXPANSION JOINTS: Place expansion joints with 1/4" expansion joint filler in arch rib only at 30' ± centers. None in footings and invert slab.

EXCAVATION AND BACKFILL: See Standard Plan A62-C



BRACING DETAIL

Inner forms, with bracing, or bracing as shown, shall remain in place until fill has been placed to a depth over the crown equal to the span.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

CONCRETE ARCH CULVERTS

D95-1

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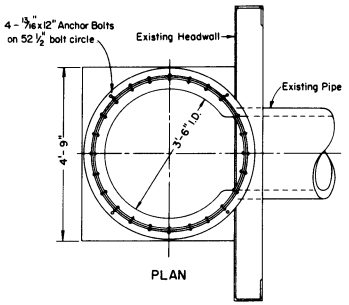
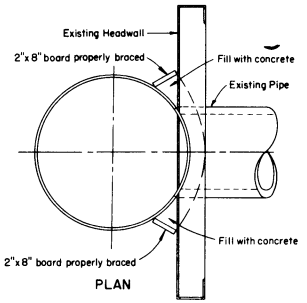
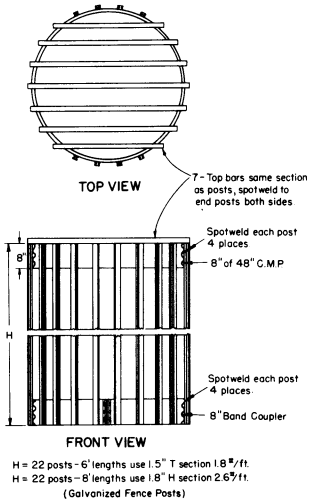


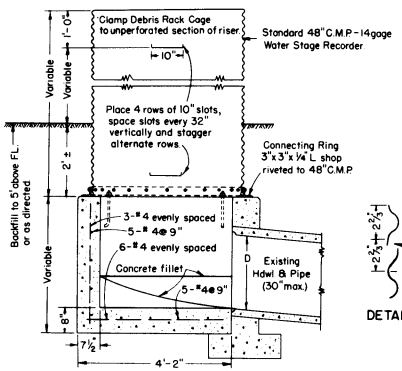
PLAN



PLAN



DEBRIS RACK CAGE

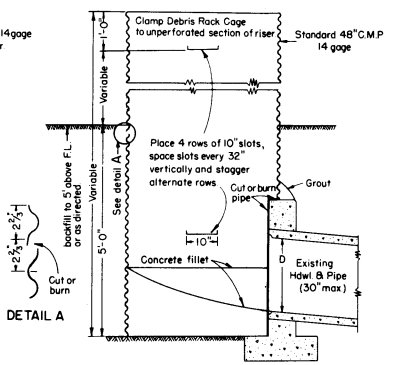


SECTION

C.M.P. RISER

AND JUNCTION BOX

TYPE A



DETAIL A

SECTION

C.M.P. RISER

TYPE B

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles — Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

Engineer of Design
Registered Civil Engineer No. 9837

Approved September 1, 1966

State Highway Engineer
Registered Civil Engineer No. 5945

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PIPE RISER WITH DEBRIS RACK CAGE

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To accompany plans dated _____

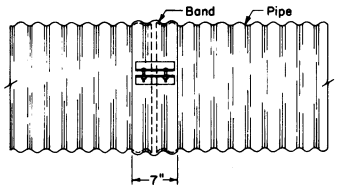
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

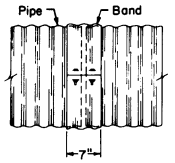
APPROVAL RECOMMENDED

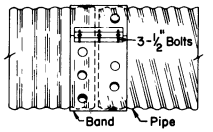
Engineer of Design
Registered Civil Engineer No. 9837

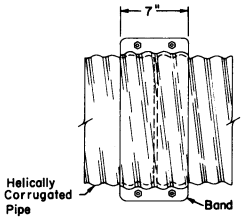
Approved November 28, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

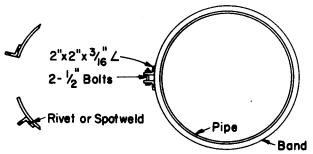






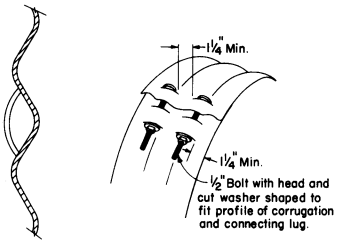


TOP VIEW



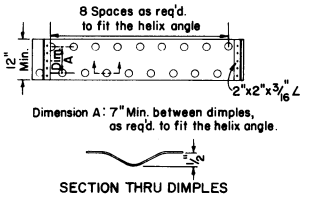
DETAIL - BAND CONNECTION

7" WIDE STANDARD AASHO COUPLING BAND FOR USE ON C.M.P. THRU 30" INCLUSIVE



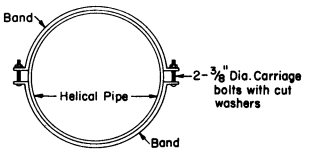
LUG DETAIL

7" WIDE COUPLING BAND WITH INTEGRAL FORMED CONNECTING LUGS FOR USE ON C.M.P. THRU 30" INCLUSIVE



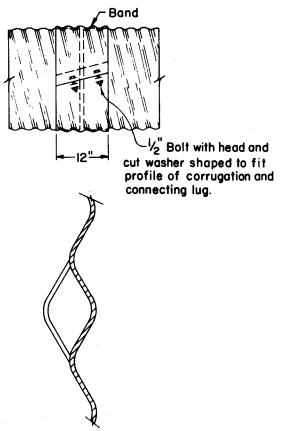
SECTION THRU DIMPLES

UNIVERSAL COUPLING BAND FOR USE ON C.M.P. THRU 30" INCLUSIVE



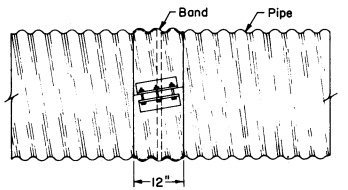
END VIEW

TWO PIECE INTEGRAL FLANGE DIE FORMED FOR USE ON 6", 8" & 10" H.C.M.P.

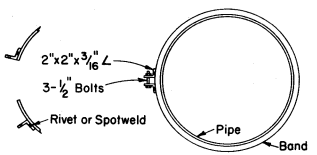


LUG DETAIL

12" HELICALLY CORRUGATED BAND WITH INTEGRAL FORMED CONNECTING LUG FOR USE ON 12"-24" H.C.M.P.

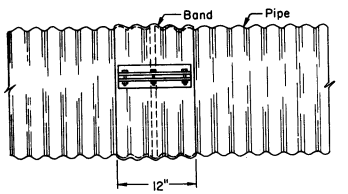


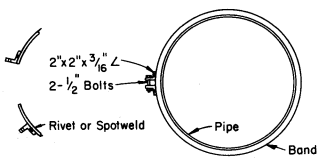
NOTE: Angles may be oriented parallel to axis of pipe provided connecting holes are slotted lengthwise sufficiently to allow adjustment for the helix angle.



DETAIL - ANGLE CONNECTION

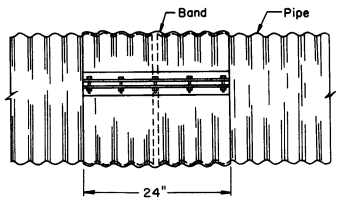
12" HELICALLY CORRUGATED BAND WITH ANGLE CONNECTIONS FOR USE ON 12"-48" H.C.M.P.

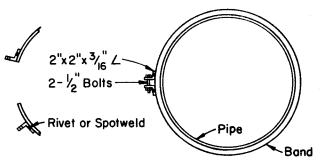




DETAIL - BAND CONNECTION

12" WIDE STANDARD AASHO COUPLING BAND FOR USE ON C.M.P. THRU 60" INCLUSIVE





DETAIL - BAND CONNECTION

24" WIDE STANDARD AASHO COUPLING BAND FOR USE ON C.M.P. THRU 96" INCLUSIVE

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

C.M.P. COUPLING BAND DETAILS

D97

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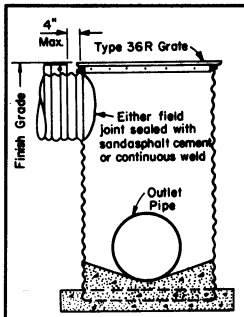
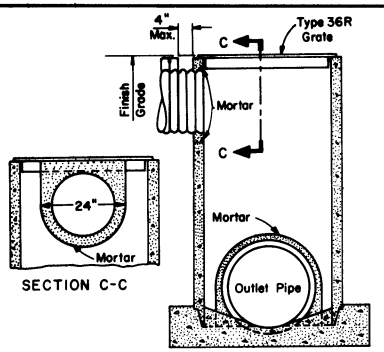
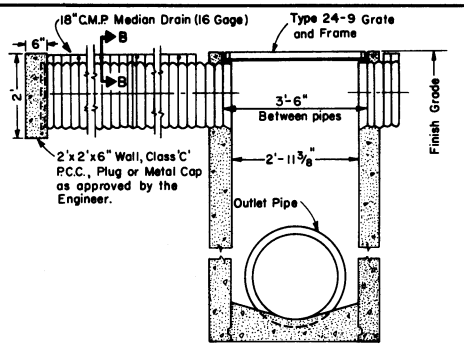


SAME AS TYPE GMP WITH TYPE 36R GRATE
See Standard Plans D75 and D77

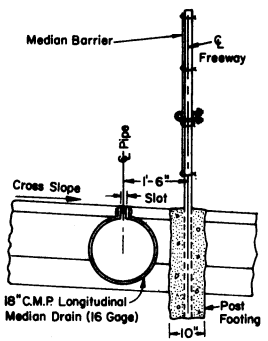


SAME AS TYPE GCP WITH TYPE 36R GRATE
See Standard Plans D75, D76 and D77

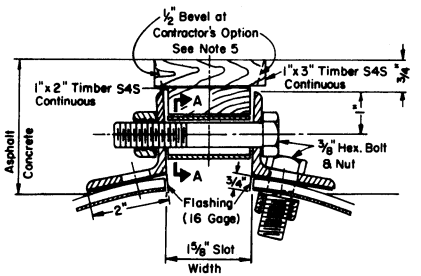


TYPE G1 or G2
See Standard Plan D73

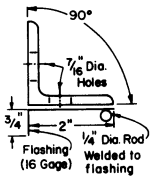
DETAILS OF MEDIAN DRAIN CONNECTIONS TO STANDARD INLET STRUCTURES



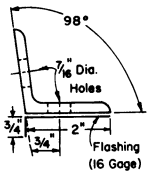
TYPICAL CROSS SECTION



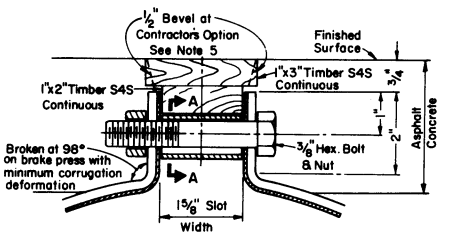
SECTION B-B
ANGLE SLOT DETAIL



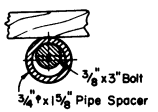
ALTERNATIVE SLOT ANGLE



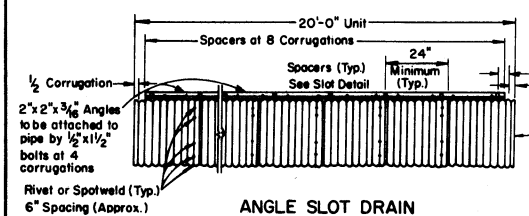
SLOT ANGLE
2"x2"x3/16" ANGLE DETAILS



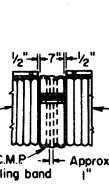
SECTION B-B
FLANGED SLOT DETAIL



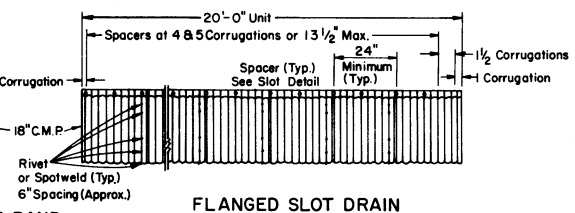
SECTION A-A



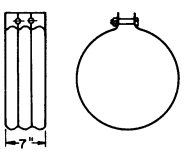
ANGLE SLOT DRAIN



ANGLE SLOT COUPLING BAND



FLANGED SLOT DRAIN



FLANGE SLOT COUPLING BAND
See Note 4

To accompany plans dated _____

DIST.	COUNTY	ROUTE	POST MILES	TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Engineer of Design
Registered Civil Engineer No. 9837

Approved September 21, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

GENERAL NOTES

1. Drains to be 18" in diameter and fabricated by joining the C.M.P. cans using rivets or resistance spotwelds at equal spaced centers.
2. All bolts, nuts, angles and pipe spacers to be galvanized.
3. 1"x2" and 1"x3" S4S timber to remain in place until final clean-up operations are complete.
4. Each drain section shall be assembled with coupling band.
5. If the contractor elects to use bevel, a 1"x4" S4S timber shall be used in lieu of 1"x3" S4S timber.
6. 20' units of 18" slotted C.M.P. median drain shall be fabricated and all nuts and bolts tightened prior to beginning field installation.
7. The contractor shall take precaution to prevent adhesion between timber placed in the slotted median drain as shown on section B-B and the asphalt concrete paving.
8. The contractor may elect to use either alternative method of fabrication.
9. The slotted C.M.P. shall not be installed until after the P.C.C. pavement adjacent to the median has been completed.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

18" SLOTTED C.M.P. MEDIAN DRAIN DETAILS | D98

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ALTERNATIVE PIPE ARCH CULVERTS

Nominal Size	Type	R.C.P.A. Dimensions	R.C.P.A. Class	C.M.P.A. Gage	C.M.P.A. Bit. Coated	C.A.P.A. Gage	C.A.P.A. Bit. Coated
18" x 11"	I	18" x 11"	A-II	16	No	16	No
18" x 11"	2	18" x 11"	A-II	16	Yes	16	Yes
18" x 11"	3	18" x 11"	A-II	16	No	16	Yes
18" x 11"	4	18" x 11"	A-II	16	Yes	16	No
22" x 13"	I	22" x 13½"	A-II	16	No	16	No
22" x 13"	2	22" x 13½"	A-II	16	Yes	16	Yes
22" x 13"	3	22" x 13½"	A-II	16	No	16	Yes
22" x 13"	4	22" x 13½"	A-II	16	Yes	16	No
25" x 16"	I	26" x 15½"	A-II	16	No	16	No
25" x 16"	2	26" x 15½"	A-II	16	Yes	16	Yes
25" x 16"	3	26" x 15½"	A-II	16	No	16	Yes
25" x 16"	4	26" x 15½"	A-II	16	Yes	16	No
25" x 16"	5	26" x 15½"	A-II	16	No	14	No
25" x 16"	6	26" x 15½"	A-II	16	Yes	14	Yes
25" x 16"	7	26" x 15½"	A-II	16	No	14	Yes
25" x 16"	8	26" x 15½"	A-II	16	Yes	14	No
29" x 18"	I	28½" x 18"	A-II	16	No	14	No
29" x 18"	2	28½" x 18"	A-II	16	Yes	14	Yes
29" x 18"	3	28½" x 18"	A-II	16	No	14	Yes
29" x 18"	4	28½" x 18"	A-II	16	Yes	14	No

Nominal Size	Type	R.C.P.A. Dimensions	R.C.P.A. Class	C.M.P.A. Gage	C.M.P.A. Bit. Coated	C.A.P.A. Gage	C.A.P.A. Bit. Coated
29" x 18"	5	28½" x 18"	A-II	14	No	14	No
29" x 18"	6	28½" x 18"	A-II	14	Yes	14	Yes
29" x 18"	7	28½" x 18"	A-II	14	No	14	Yes
29" x 18"	8	28½" x 18"	A-II	14	Yes	14	No
36" x 22"	I	36¼" x 22½"	A-II	16	No	14	No
36" x 22"	2	36¼" x 22½"	A-II	16	Yes	14	Yes
36" x 22"	3	36¼" x 22½"	A-II	16	No	14	Yes
36" x 22"	4	36¼" x 22½"	A-II	16	Yes	14	No
36" x 22"	5	36¼" x 22½"	A-II	14	No	14	No
36" x 22"	6	36¼" x 22½"	A-II	14	Yes	14	Yes
36" x 22"	7	36¼" x 22½"	A-II	14	No	14	Yes
36" x 22"	8	36¼" x 22½"	A-II	14	Yes	14	No
43" x 27"	I	43¾" x 26⅝"	A-II	16	No	12	No
43" x 27"	2	43¾" x 26⅝"	A-II	16	Yes	12	Yes
43" x 27"	3	43¾" x 26⅝"	A-II	16	No	12	Yes
43" x 27"	4	43¾" x 26⅝"	A-II	16	Yes	12	No
43" x 27"	5	43¾" x 26⅝"	A-II	12	No	12	No
43" x 27"	6	43¾" x 26⅝"	A-II	12	Yes	12	Yes
43" x 27"	7	43¾" x 26⅝"	A-II	12	No	12	Yes
43" x 27"	8	43¾" x 26⅝"	A-II	12	Yes	12	No

Nominal Size	Type	R.C.P.A. Dimensions	R.C.P.A. Class	C.M.P.A. Gage	C.M.P.A. Bit. Coated	C.A.P.A. Gage	C.A.P.A. Bit. Coated
50" x 31"	I	51⅛" x 31 5/16"	A-II	16	No	12	No
50" x 31"	2	51⅛" x 31 5/16"	A-II	16	Yes	12	Yes
50" x 31"	3	51⅛" x 31 5/16"	A-II	16	No	12	Yes
50" x 31"	4	51⅛" x 31 5/16"	A-II	16	Yes	12	No
50" x 31"	5	51⅛" x 31 5/16"	A-II	12	No	10	No
50" x 31"	6	51⅛" x 31 5/16"	A-II	12	Yes	10	Yes
50" x 31"	7	51⅛" x 31 5/16"	A-II	12	No	10	Yes
50" x 31"	8	51⅛" x 31 5/16"	A-II	12	Yes	10	No
58" x 36"	I	58½" x 36"	A-II	16	No	12	No
58" x 36"	2	58½" x 36"	A-II	16	Yes	12	Yes
58" x 36"	3	58½" x 36"	A-II	16	No	12	Yes
58" x 36"	4	58½" x 36"	A-II	16	Yes	12	No
58" x 36"	5	58½" x 36"	A-II	10	No	10	No
58" x 36"	6	58½" x 36"	A-II	10	Yes	10	Yes
58" x 36"	7	58½" x 36"	A-II	10	No	10	Yes
58" x 36"	8	58½" x 36"	A-II	10	Yes	10	No

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Approved December 20, 1967

RCP - Reinforced Concrete Pipe

CMP - Corrugated Metal Pipe

CAP - Corrugated Aluminum Pipe

RCPA - Reinforced Concrete Pipe Arch

CAPA - Corrugated Aluminum Pipe Arch

ACP - Asbestos Cement Pipe

ALTERNATIVE PIPE CULVERTS

Size	Type	R.C.P Class	C.M.P Gage	C.M.P Bit. Coated	C.A.P Gage	C.A.P Bit. Coated	A.C.P Class
12"	I	II	16	No	16	No	II
12"	2	II	16	Yes	16	Yes	II
12"	3	II	16	No	16	Yes	II
12"	4	II	16	Yes	16	No	II
12"	9	II					II
12"	10	III					III
15"	I	II	16	No	16	No	
15"	2	II	16	Yes	16	Yes	
15"	3	II	16	No	16	Yes	
15"	4	II	16	Yes	16	No	
15"	9	II					II
15"	10	III					III
15"	11	II	16	No			II
15"	12	III	16	No			III
15"	13	II	16	Yes			II
15"	14	III	16	Yes			III
18"	I	II	16	No	16	No	
18"	2	II	16	Yes	16	Yes	
18"	3	II	16	No	16	Yes	
18"	4	II	16	Yes	16	No	
18"	9	II					II
18"	10	III					III
18"	11	II	16	No			II
18"	12	III	16	No			III
18"	13	II	16	Yes			II
18"	14	III	16	Yes			III
21"	I	II	16	No	16	No	
21"	2	II	16	Yes	16	Yes	
21"	3	II	16	No	16	Yes	
21"	4	II	16	Yes	16	No	

PIPE CULVERTS

Size	Type	R.C.P Class	C.M.P Gage	C.M.P Bit Coated	C.A.P Gage	C.A.P Bit Coated	A.C.P Class
21"	5	II	16	No	14	No	
21"	6	II	16	Yes	14	Yes	
21"	7	II	16	No	14	Yes	
21"	8	II	16	Yes	14	No	
21"	9	II					II
21"	10	III					III
21"	11	II	16	No			II
21"	12	III	16	No			III
21"	13	II	16	Yes			II
21"	14	III	16	Yes			III
24"	1	II	16	No	16	No	
24"	2	II	16	Yes	16	Yes	
24"	3	II	16	No	16	Yes	
24"	4	II	16	Yes	16	No	
24"	5	II	16	No	14	No	
24"	6	II	16	Yes	14	Yes	
24"	7	II	16	No	14	Yes	
24"	8	II	16	Yes	14	No	
24"	9	II					II
24"	10	III					III
24"	11	II	16	No			II
24"	12	III	16	No			III
24"	13	II	16	Yes			II
24"	14	III	16	Yes			III
27"	1	II	16	No	16	No	
27"	2	II	16	Yes	16	Yes	
27"	3	II	16	No	16	Yes	
27"	4	II	16	Yes	16	No	
27"	5	II	14	No	14	No	
27"	6	II	14	Yes	14	Yes	

CULVERTS

Size	Type	R.C.P Class	C.M.P Gage	C.M.P Bit. Coated	C.A.P Gage	C.A.P Bit. Coated	A.C.P Class
27"	7	II	14	No	14	Yes	
27"	8	II	14	Yes	14	No	
27"	9	II					II
27"	10	III					III
27"	11	II	16	No			II
27"	12	III	16	No			III
27"	13	II	16	Yes			II
27"	14	III	16	Yes			III
30"	1	II	16	No	16	No	
30"	2	II	16	Yes	16	Yes	
30"	3	II	16	No	16	Yes	
30"	4	II	16	Yes	16	No	
30"	5	II	14	No	14	No	
30"	6	II	14	Yes	14	Yes	
30"	7	II	14	No	14	Yes	
30"	8	II	14	Yes	14	No	
30"	9	II					II
30"	10	III					III
30"	11	II	16	No			II
30"	12	III	16	No			III
30"	13	II	16	Yes			II
30"	14	III	16	Yes			III
36"	1	II	16	No	14	No	
36"	2	II	16	Yes	14	Yes	
36"	3	II	16	No	14	Yes	
36"	4	II	16	Yes	14	No	
36"	5	II	14	No	12	No	
36"	6	II	14	Yes	12	Yes	
36"	7	II	14	No	12	Yes	
36"	8	II	14	Yes	12	No	

Size	Type	R.C.P Class	C.M.P Gage	C.M.P Bit. Coated	C.A.P Gage	C.A.P Bit. Coated	A.C.P Class
36"	9	II					II
36"	10	III					III
36"	11	II	16	No			II
36"	12	III	16	No			III
36"	13	II	16	Yes			II
36"	14	III	16	Yes			III
42"	1	II	16	Yes	12	No	
42"	2	II	16	Yes	12	Yes	
42"	3	II	16	No	12	Yes	
42"	4	II	16	Yes	12	No	
42"	5	II	12	No	10	No	
42"	6	II	12	Yes	10	Yes	
42"	7	II	12	No	10	Yes	
42"	8	II	12	Yes	10	No	
48"	1	II	16	No	12	No	
48"	2	II	16	Yes	12	Yes	
48"	3	II	16	No	12	Yes	
48"	4	II	16	Yes	12	No	
48"	5	II	12	No	10	No	
48"	6	II	12	Yes	10	Yes	
48"	7	II	12	No	10	Yes	
48"	8	II	12	Yes	10	No	

TABLE OF EQUIVALENTS FOR ALTERNATIVE PIPE CULVERTS AND ALTERNATIVE PIPE ARCH CULVERTS D99

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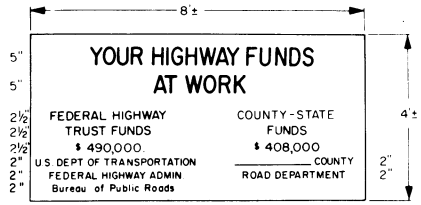
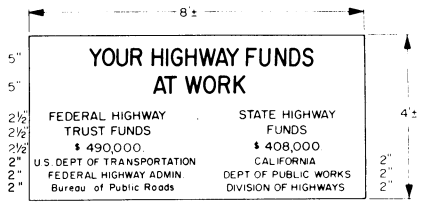
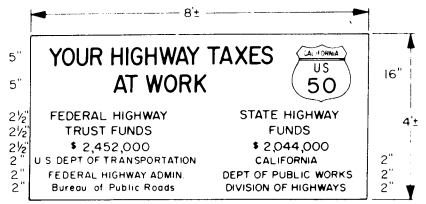


TYPE 9



TYPE 6 - FEDERAL HIGHWAY TRUST FUNDS

TYPE 6A - FEDERAL EMERGENCY RELIEF FUNDS



TYPE 3 - FEDERAL HIGHWAY TRUST FUNDS

TYPE 3A - FEDERAL FUNDS

To accompany plans dated _____

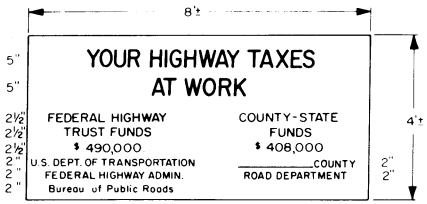
DISTRICT	COUNTY	ROUTE	Post Miles	Total Project	Sheet No.	Total Sheets

APPROVAL RECOMMENDED

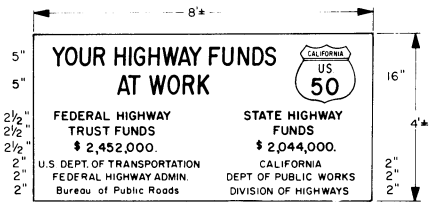
Traffic Engineer Registered Civil Engineer No 5618

APPROVED December 20, 1967

State Highway Engineer
Registered Civil Engineer No 5645

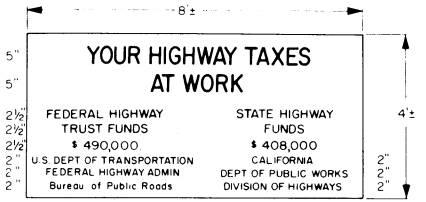


TYPE 8



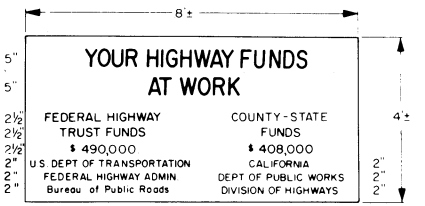
TYPE 5 - FEDERAL HIGHWAY TRUST FUNDS

TYPE 5A - FEDERAL EMERGENCY RELIEF FUNDS



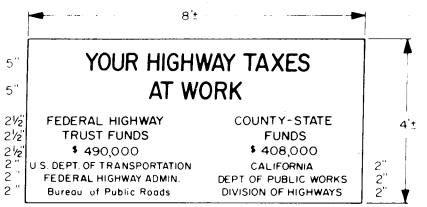
TYPE 2 - FEDERAL HIGHWAY TRUST FUNDS

TYPE 2A - FEDERAL FUNDS

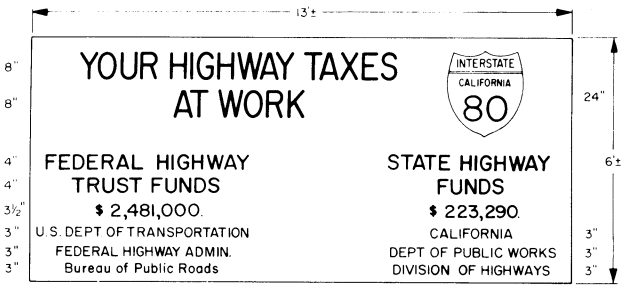


TYPE 7 - FEDERAL HIGHWAY TRUST FUNDS

TYPE 7A - FEDERAL EMERGENCY RELIEF FUNDS



TYPE 4



TYPE 1

GENERAL NOTES.

1. U.S. Standard capital and lower case "C" letters
2. Stroke width 0.16" per inch of letter height
3. The following information will be furnished by the Engineer for the Contractor's use in making the sign:
   (a) Sources and amounts of Federal and State funds
   (b) Route numbers
4. Where Type of sign has letter suffix given in Special Provisions, "Federal Highway Trust Funds" is to be replaced by appropriate wording shown

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

FEDERAL CONSTRUCTION IDENTIFICATION SIGNS FSI-2

Mcoff

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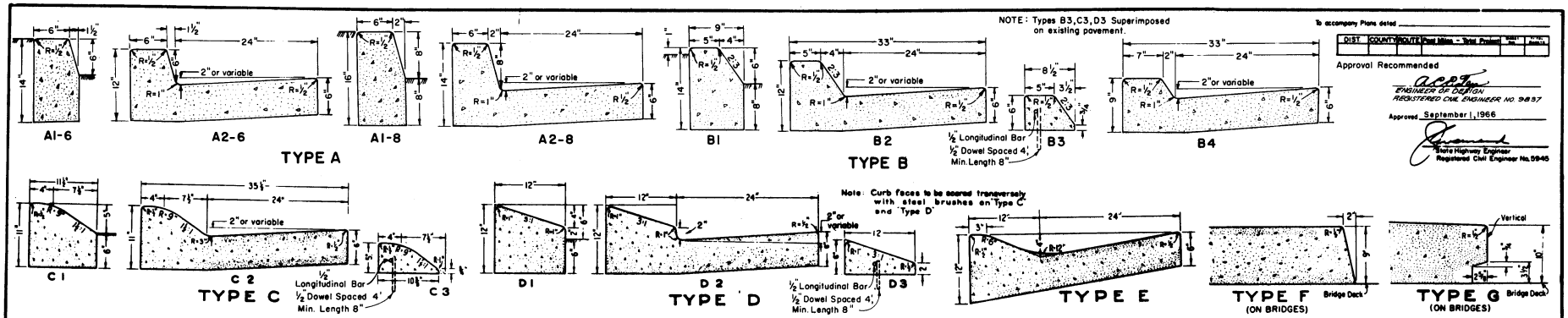


To accompany Plans dated _____

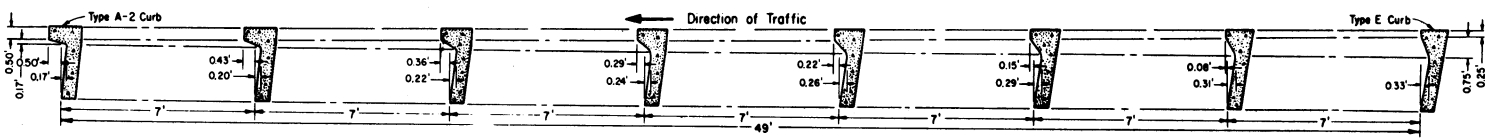
DIST.	COUNTY	ROUTE	Post Miles - Total Project	Sheet No.	Total Sheets

Approval Recommended

ENGINEER OF DESIGN
REGISTERED CIVIL ENGINEER NO. 9837

Approved September 1, 1966

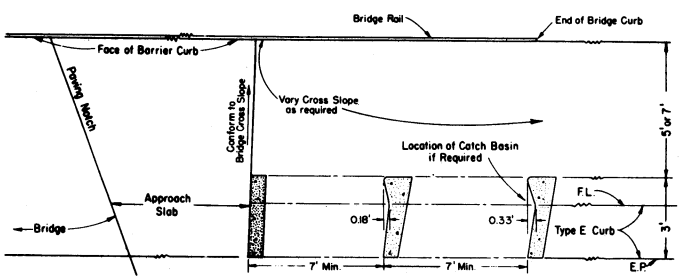
State Highway Engineer
Registered Civil Engineer No. 5945



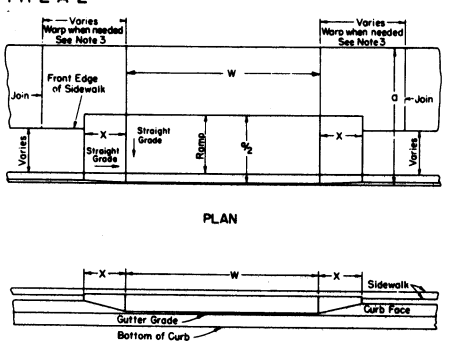
STANDARD CURB TRANSITION - TYPE E TO TYPE A-2

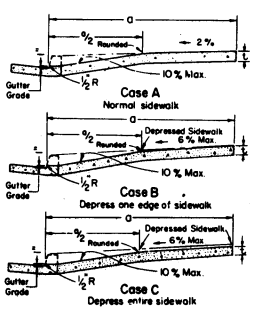
Note: Straight Line Transition in Flow Line and Top of Curb unless otherwise ordered by Engineer.

CURB QUANTITIES			
Type	C.Y. Per Lin. Ft.	Type	C.Y. Per Lin. Ft.
A1-6	0.02585	C1	0.02752
A2-6	0.05903	C2	0.06457
A1-8	0.03084	C3	0.00965
A2-8	0.06379	D1	0.03073
B1	0.02930	D2	0.06782
B2	0.06171	D3	0.01223
B3	0.01074	E	0.06661
B4	0.05709		



FLOW LINE TRANSITION - TYPE E AT STRUCTURE

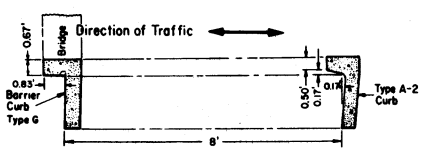




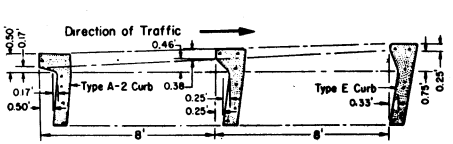
NOTES:

1. - Case A normally applies
2. - Use Case B when ramp slopes would exceed 10% in Case A.
3. - Use Case C when sidewalk slope would exceed 6% in Case B. Longitudinal slope of warped area adjacent to driveway shall not vary more than 6% from the longitudinal grade line of the sidewalk.
4. - X = 3'-0" except for curb heights over 10" where 4:1 slopes shall be used on curb slope.
5. - Sidewalk and ramp thickness "t" at driveway shall be 4" for residential and 6" for commercial.
6. - Difference in slope of the driveway ramp and the slope of a line between the gutter and a point on the roadway 5 feet from the gutter line shall not exceed 15%. Reduce driveway ramp slope, not gutter slope, where required.

DRIVEWAYS



CURB TRANSITION - TYPE A-2 TO TYPE G



CURB TRANSITION - TYPE A-2 TO TYPE E
(See Note)

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

CURBS AND DRIVEWAYS N8-3

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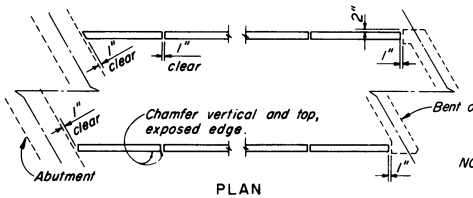
BRIDGE



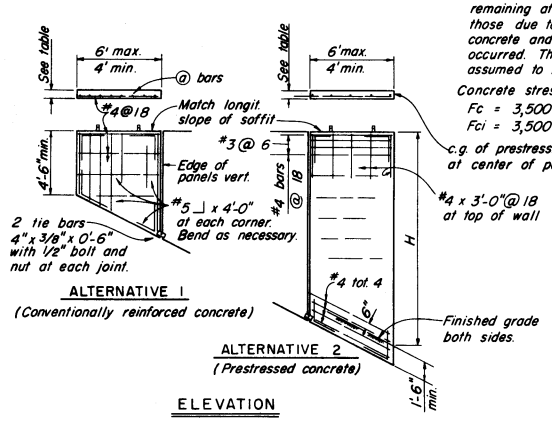
PLAN

Skew not to scale

NOTE:
Post-tensioned prestressing will not be permitted.

Pf = the force, per foot of panel width, remaining after all losses, including those due to creep and shrinkage of concrete and creep of steel have occurred. These losses shall be assumed to be 35,000 psi.

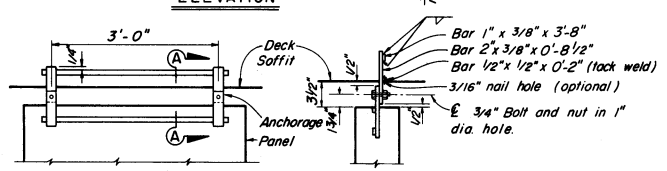
Concrete stress:
Fc = 3,500 psi @ 28 days.
Fci = 3,500 psi @ time of stressing.



ALTERNATIVE 1
(Conventionally reinforced concrete)

ALTERNATIVE 2
(Prestressed concrete)

ELEVATION



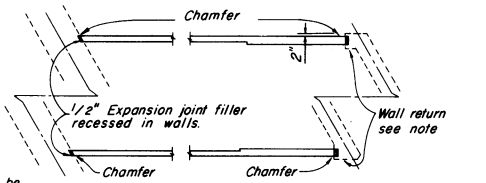
ANCHORAGE DETAIL
Use with Alternative 1 or 2

SECTION A-A

PRECAST PANELS, ALTERNATIVE 1 OR 2

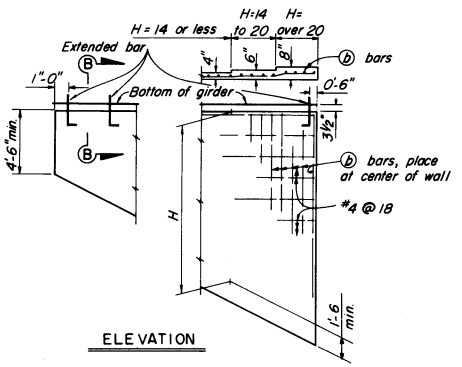
VERTICAL REINFORCEMENT OR PRESTRESSING FORCE AND WALL THICKNESS				
H	Alt. 1	Alt. 2	Wall Thickness	
	ⓐ bars	Pf	Alt. 1	Alt. 2
10 & less	#4 @ 18	7,200 lbs.	6"	4"
12	#4 @ 18	10,600 lbs.	6"	4"
14	#4 @ 12	14,400 lbs.	6"	4"
16	#4 @ 10	18,200 lbs.	6"	4"
18	#4 @ 8	23,500 lbs.	6"	4"
20	#4 @ 6	28,800 lbs.	6"	4"
22	#4 @ 7	22,300 lbs.	8"	5"
24	#4 @ 6	26,600 lbs.	8"	5"
26	#4 @ 5	31,200 lbs.	8"	5"

NOTES:
1. Contractor to determine size of panels and location of anchorages. Panels shall be approximately equal in width within limits shown. Maximum weight of any panel not to exceed 11,000 lbs.
2. Panels to be backfilled uniformly on each side.
3. Panels shall conform to horizontal and vertical alignment.
4. Panels to be erected vertically.
5. All parts of anchorages and tie bar assembly to be galvanized.
6. ⓐ bars or Pf may be selected for average H of any one panel.

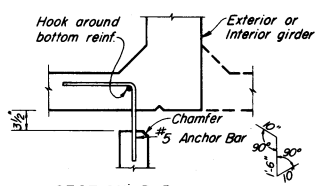


PLAN

Skew not to scale



ELEVATION



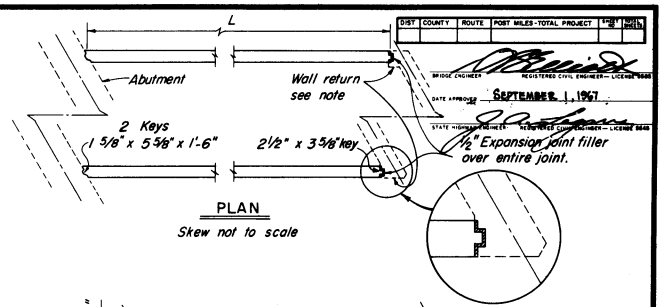
SECTION B-B

AIR BLOWN MORTAR, ALTERNATIVE 3

NOTES:
1. Welded wire fabric of equivalent area, and minimum spacing of 3 inches, may be substituted for reinforcement shown.
2. Wall return may be omitted for skews 20° or less.
3. Walls to be backfilled uniformly on each side.
4. Expansion joint filler to be cast into pier and abutment walls.
5. #5 anchor bar to be galvanized. Bar may be bent after removal of deck soffit forms.
6. Where anchor rods are located within the center half of a bay, measured face to face of girders, the maximum spacing is 12 inches.
7. For walls over 40 feet in length, provide vertical construction joints, equally spaced, at 24 feet maximum spacing.

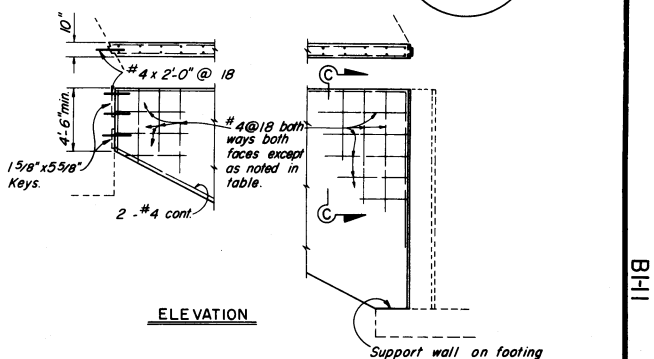
VERTICAL REINFORCEMENT AND WALL THICKNESS			
H	ⓑ bars	Wall Thickness	Max. Spacing of Anchor Rods
10 & less	#4 @ 16	4"	*36"
12	#4 @ 12	4"	*36"
14	#4 @ 9	4"	*36"
16	#4 @ 10	6"	*24"
18	#4 @ 8	6"	*24"
20	#4 @ 6	6"	*24"
22	#4 @ 7	8"	12"
24	#4 @ 6	8"	12"
26	#4 @ 5	8"	12"

*See note 6.

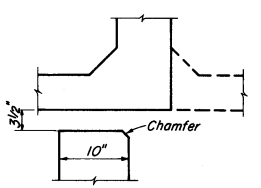


PLAN

Skew not to scale



ELEVATION



SECTION C-C

HORIZONTAL REINFORCEMENT INSIDE FACE TOP 8 FEET OF WALL	
L	
to 20	#4 @ 18
20 to 25	#4 @ 12
25 to 30	#4 @ 9
30 to 35	#4 @ 6
35 to 40	#4 @ 5
40 to 45	#5 @ 6
45 to 50	#5 @ 5

CAST-IN-PLACE, ALTERNATIVE 4

1. Wall return may be omitted for skews 20° or less.
2. Wall to be placed after piers and abutments.

DIST	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.
DATE APPROVED SEPTEMBER 1, 1967
STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

9/67

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-22-6

CLOSURE WALL DETAILS - BOX GIRDER

BRIDGE NO	POST MILE	DRAWING NO	SHEET	OF

BI-11

BI-11

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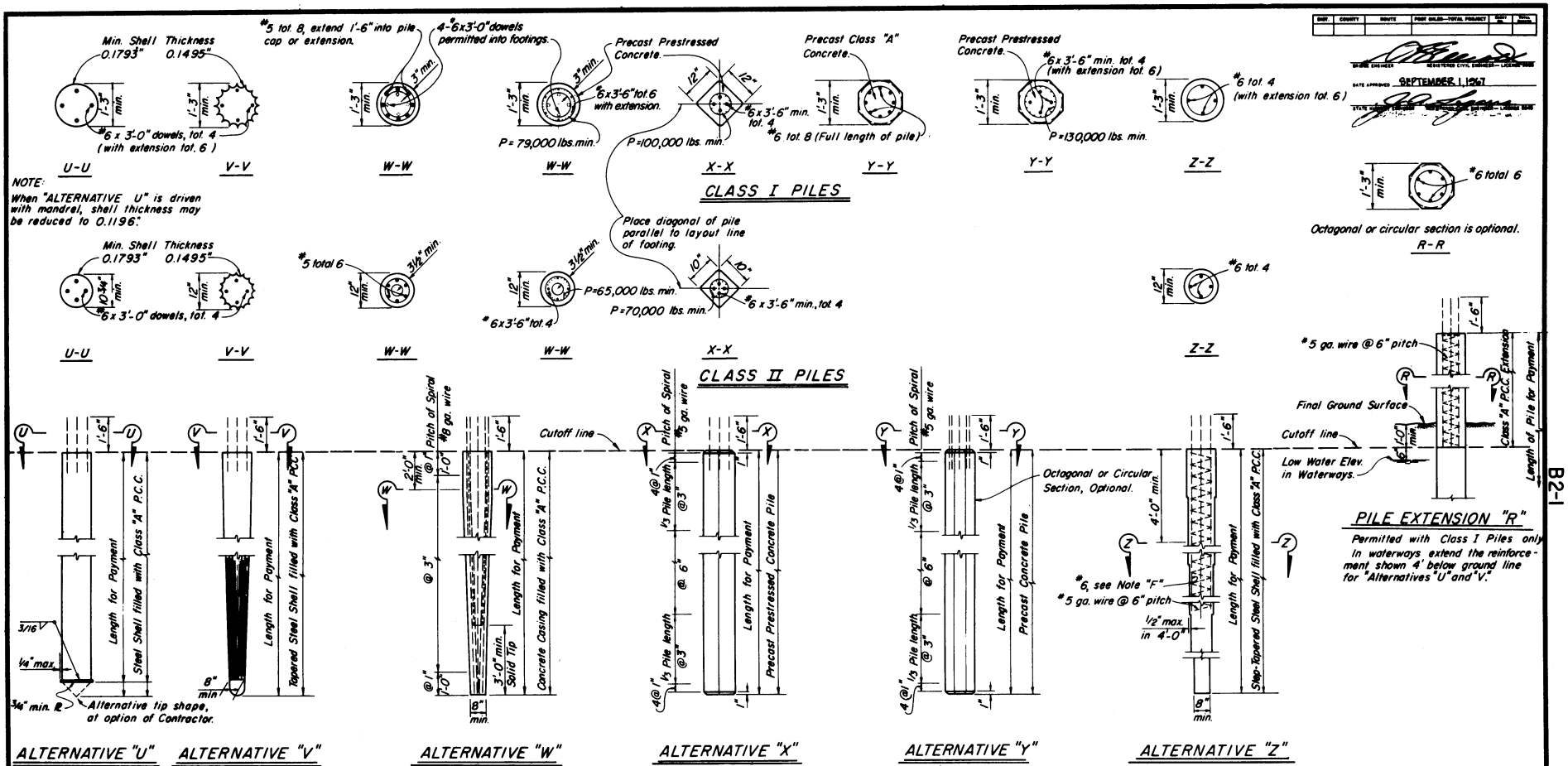

PILE NOTES :

Alternatives "W" and "Y" may be driven full length or may be extended.

All exposed piles or pile extensions shall be consistent in cross-section throughout the project.

PRECAST PRESTRESSED PILES:

P = Prestressing Force (After losses) If section used is larger than the min. section shown, then "P" shall provide 700 psi min.

Concrete Stress: f'c @ 28 days = 6,000 p.s.i. (Alternative "X")
4,500 p.s.i. (Alternative "Y")
5,000 p.s.i. (Alternative "W")

Alternative "X" may not extend above ground line nor be used with pile extension "R".

NOTE F: In Alternative "Z" 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 through fills.

Unless indicated to the contrary all piles shall be Class I piles. Class I piles may be substituted for Class II piles.

A 10" minimum diameter pipe extension (thickness = 0.1793" min.) may be used at the tip of Alternatives "V" or "Z" when taper is 30' or more in length.

All dowels or bars extending into slab or footing having a depth less than 2'-0" shall be hooked.

DESIGN LOADING = 45 TONS

9/67 STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS XS-10-17

CONCRETE PILE DETAILS-45 TON

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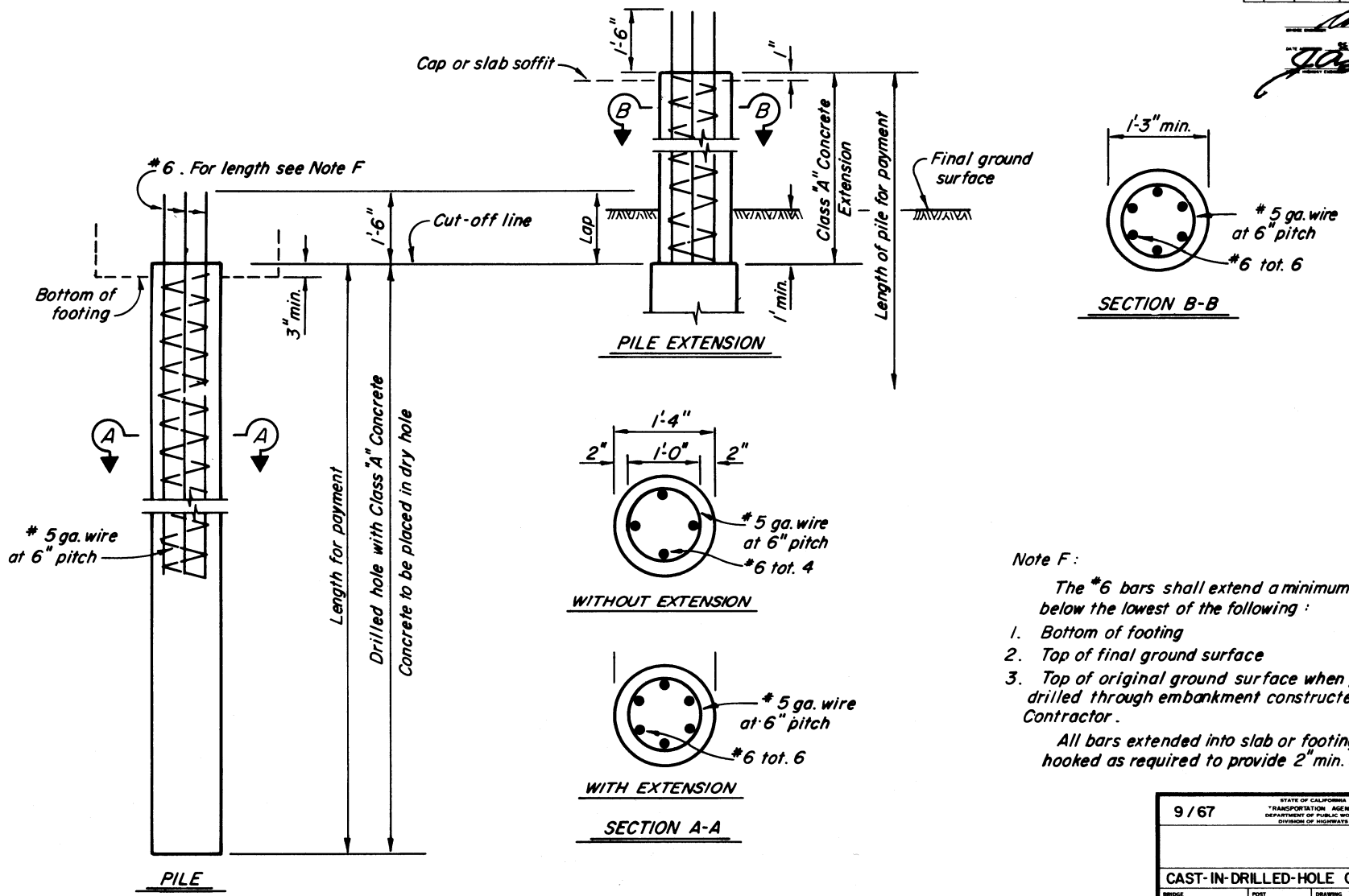

Note F:

The #6 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 embankment constructed by Contractor.

All bars extended into slab or footing shall be hooked as required to provide 2" min. clearance.

9/67	STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS	XS-10-25
CAST-IN-DRILLED-HOLE CONCRETE PILE		
BRIDGE NO. / POST MILE / DRAWING NO. / SHEET / OF		

B2-3

B2-3

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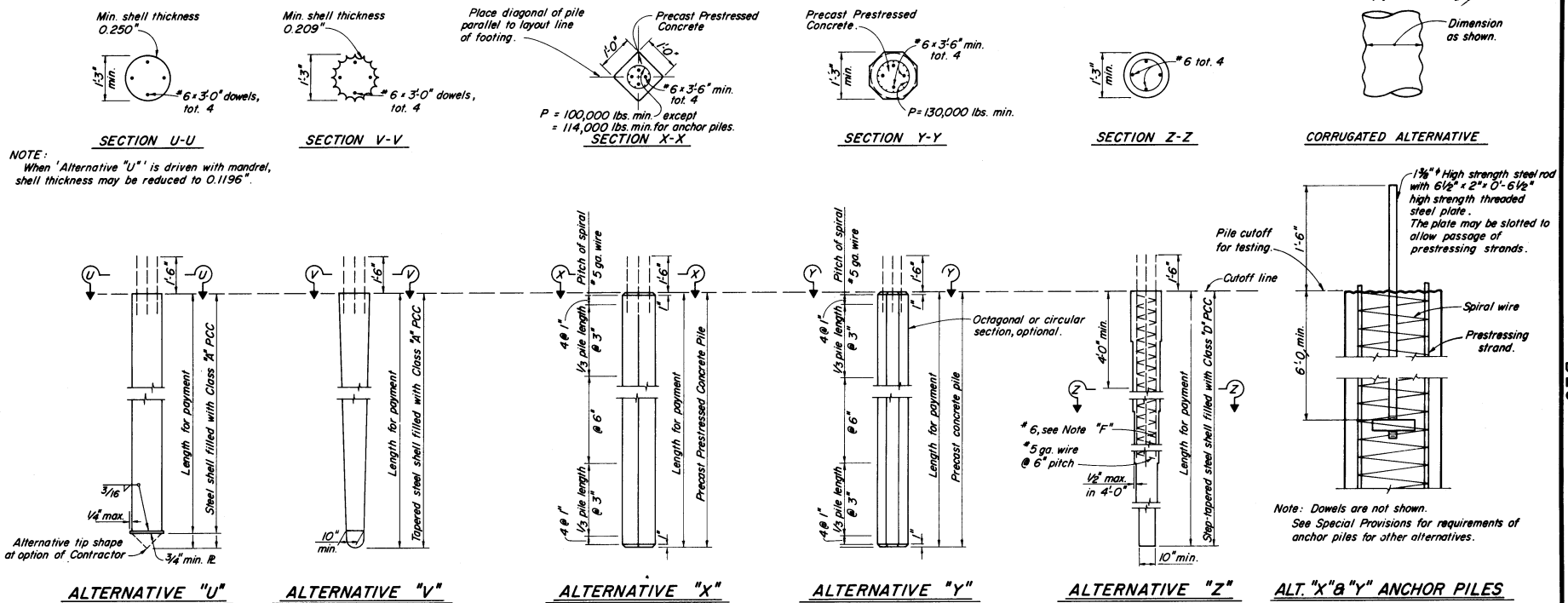
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET No.	TOTAL SHEETS

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

DATE APPROVED SEPTEMBER 1, 1967

STATE BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.



A 10" minimum diameter pipe extension (thickness = 0.250" min.) may be used at the tip of Alternatives "V" or "Z" when taper is 30' or more in length.

PRECAST PRESTRESSED PILES:

P = Prestressing Force (After losses)

Concrete Stress: f'_c @ 28 days = 6,000 psi (Alternative "X")
5,000 psi (Alternative "Y")

All dowels or bars extending into slab or footing having a depth less than 2'-0" shall be hooked

NOTE: "F"

In ALTERNATIVE "Z" 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 through fills.

DESIGN LOADING = 70 TONS

9/67	STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS	XS-10-26

CONCRETE PILE DETAILS - 70 TON

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF

B2-5

70

B25

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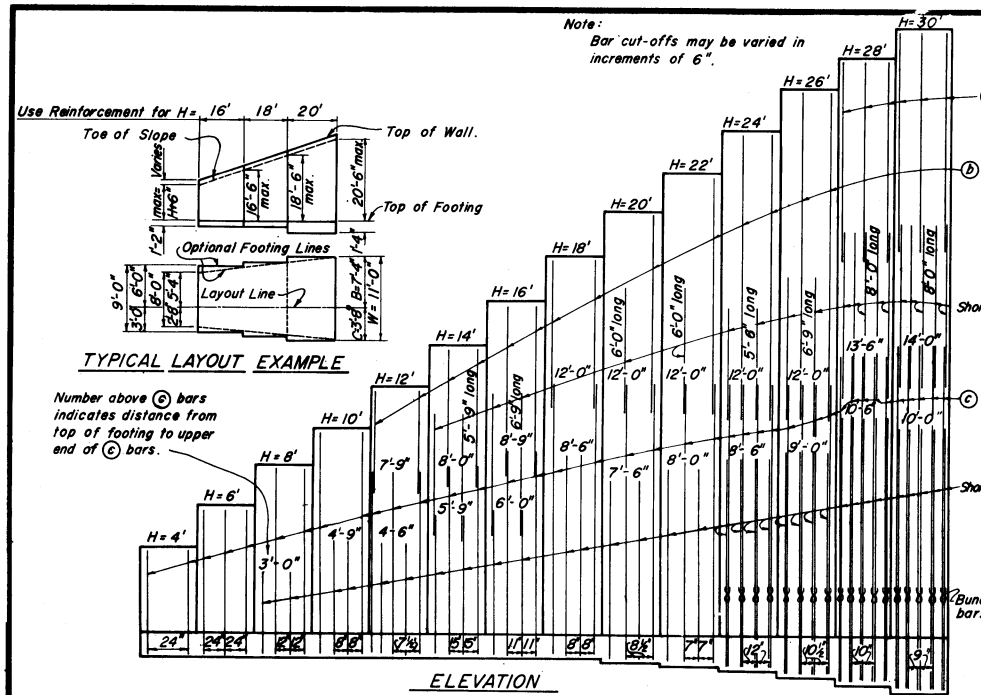

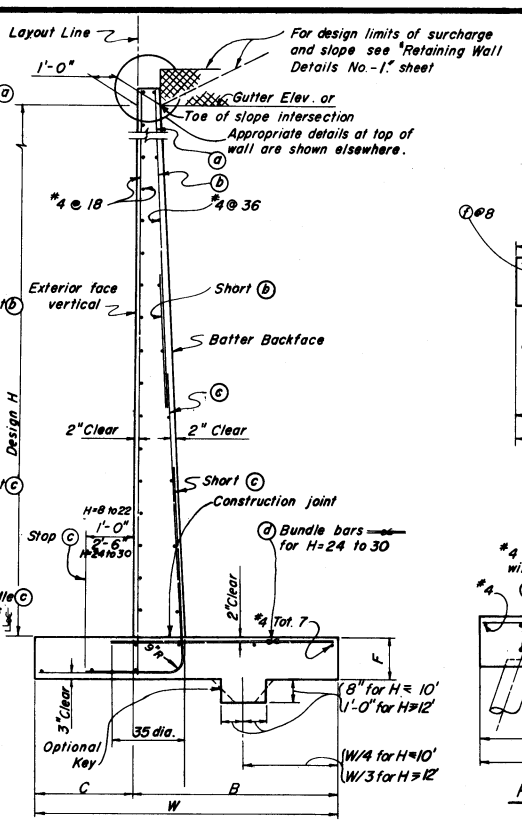

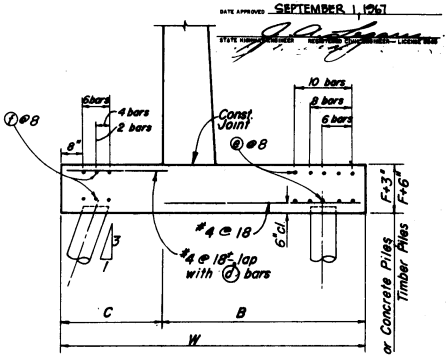

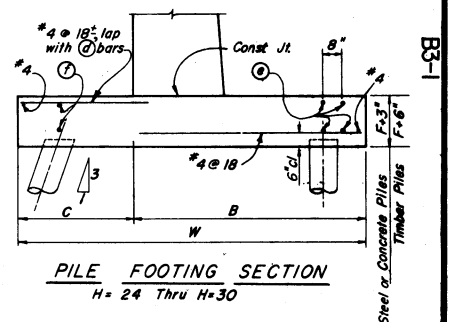

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA														
Design H		◉4'	6'	8'	10'	12'	14'	16'	18'	20'	22'	24'	26'	28'	30'
W		3'-2"	4'-2"	5'-2"	6'-2"	7'-2"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	13'-3"	14'-3"	15'-3"	16'-3"
C		1'-0"	1'-4"	1'-8"	2'-0"	2'-4"	2'-8"	3'-0"	3'-4"	3'-8"	4'-0"	4'-5"	4'-9"	5'-1"	5'-5"
B		2'-2"	2'-10"	3'-6"	4'-2"	4'-10"	5'-4"	6'-0"	6'-8"	7'-4"	8'-0"	8'-10"	9'-6"	10'-2"	10'-10"
F Spread Ftg.		1'-2"	1'-2"	1'-2"	1'-2"	1'-2"	1'-2"	1'-2"	1'-2"	1'-4"	1'-6"	1'-8"	1'-11"	2'-2"	2'-4"
Batter		1/2:12	1/2:12	1/2:12	1/2:12	1/2:12	1/2:12	1/2:12	1/2:12	1/2:12	1/2:12	5/8:12	5/8:12	3/4:12	7/8:12
ⓐ	bars														#7@20
ⓑ	bars					#5@30	#5@15	#5@11	#6@24	#7@17	#7@14	#8@12	#8@10½	#9@10	#9@9
ⓒ	bars	#5@24	#5@24	#5@12	#5@8	#6@7½	#10@15	#10@11	#10@8	#10@8½	#11@7	#11@12	#11@10½	#11@10	#11@9
ⓓ	bars	#5@24	#5@24	#4@12	#4@8	#5@7½	#9@15	#9@11	#9@8	#10@8½	#10@7	#10@12	#10@10½	#9@10	#9@9
Total ⓐ	bars	6-#6	6-#6	6-#6	10-#7	10-#7	10-#7	10-#7	8-#7	8-#7	8-#7	4-#7	4-#7	4-#7	4-#7
Total ⓕ	bars				6-#7	6-#7	6-#7	6-#7	4-#7	4-#7	4-#7	2-#7	2-#7	2-#7	2-#7
2" level surcharge	H Comp k	0.85	1.4	2.2	3.1	4.1	5.2	6.5	8.0	9.7	11.6	13.7	16.0	18.6	21.1
	V Comp k	2.3	3.8	5.6	7.7	10.2	12.6	15.6	19.0	24.9	27.3	32.8	38.1	43.9	50.0
	Toe Pr. k/sf	1.4	1.8	2.2	2.5	2.8	3.1	3.5	3.8	4.1	4.6	4.7	5.3	5.7	6.2
2:1 unlimited slope	H Comp k	0.7	1.4	2.3	3.4	4.8	6.3	8.1	10.2	12.6	15.3	18.4	21.7	25.4	29.1
	V Comp k	2.3	3.9	5.8	8.2	11.0	13.9	17.5	21.5	28.3	31.5	38.0	44.4	51.5	58.9
	Toe Pr. k/sf	1.1	1.5	2.0	2.5	2.9	3.4	3.8	4.3	4.8	5.5	5.9	6.5	7.1	7.8
1½:1 limited slope	H Comp k	1.1	2.0	3.1	4.1	5.4	6.9	8.4	10.0	11.8	13.9	16.2	18.6	21.1	23.4
	V Comp k	2.7	4.5	6.5	8.9	11.7	14.2	17.5	21.0	27.1	29.6	35.2	40.7	46.3	52.3
	Toe Pr. k/sf	1.3	1.9	2.4	2.8	3.5	3.8	4.2	4.6	4.9	5.5	5.8	6.4	6.9	7.5
Spread Footing	Steel lbs/ft	14	20	28	39	56	84	108	169	206	259	328	393	429	484
	Conc. cf/ft	8.9	12.6	16.3	20.2	24.3	29.5	33.8	38.5	45.0	52.1	63.1	73.0	87.6	102.7
Concrete pile ftg.	Steel lbs/ft	27	31	39	74	92	120	144	198	236	289	348	413	449	504
	Conc. cf/ft	10.6	12.8	16.7	20.8	25.2	29.5	34.1	39.0	45.8	53.1	64.4	74.6	89.4	104.8

⅊ Denotes a bundle of 2 bars

Note:

For details not shown and drainage notes see "Retaining Wall Details No. 1."

Quantities apply to Design H portion and exclude the added portion above "Gutter Elevation."

PILE EMBEDMENT IN FOOTING

Pile Type	Embedment
Concrete	3"
Steel	5"
Timber	6"

Note:

Reinforcement detailed is to be placed in addition to that shown for spread footing. All piles not shown, see Pile Layout on other sheets.

◉ For pile footing Design H=4' use same footing dimensions as Design H=6'

DIST	COUNTY	ROUTE	POST MILES	TOTAL PROJECT	Sheet No.	Total Sheets

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

DATE APPROVED SEPTEMBER 1, 1967

STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

9/67

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-3-46

RETAINING WALL TYPE I H=4'-30'

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF

B3-1

B3-1

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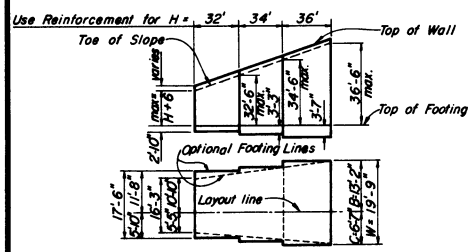
DIST	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

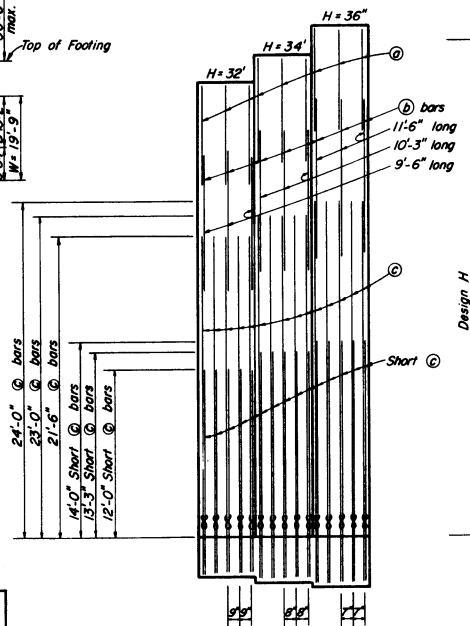
DATE APPROVED SEPTEMBER 1, 1967

STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

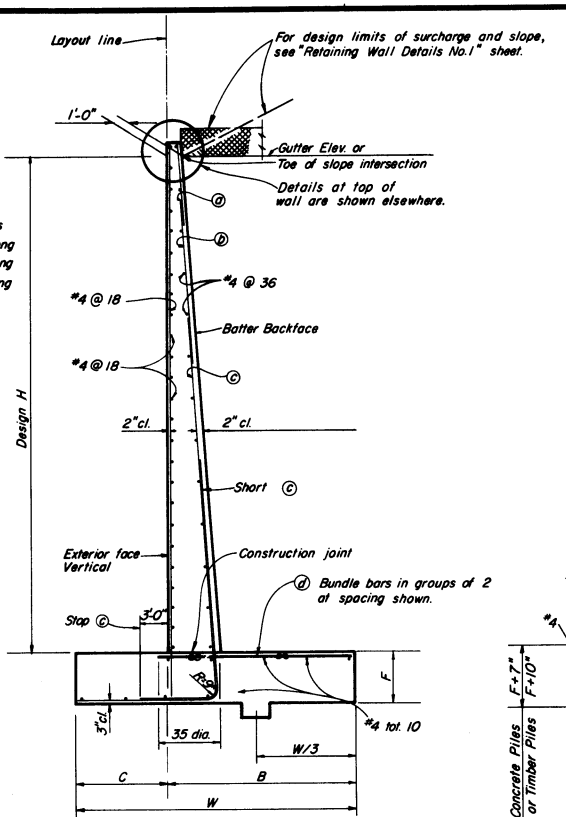


TYPICAL LAYOUT EXAMPLE

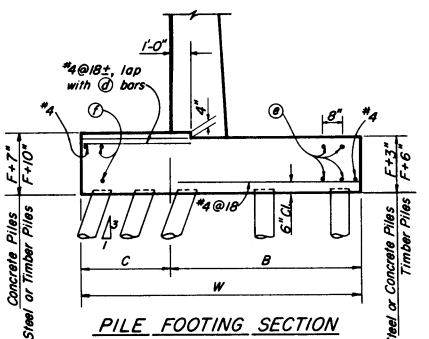
Note:
Bar cut-offs may be varied in increments of 6".



ELEVATION



TYPICAL SECTION



PILE FOOTING SECTION

H = 32' Thru H = 36'

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA				
Design H		32'	34'	36'
W		17'-6"	18'-8"	19'-9"
C		5'-10"	6'-3"	6'-7"
B		11'-8"	12'-5"	13'-2"
F Spread Ftg.		2'-10"	3'-3"	3'-7"
Batter		1:12	1:12	1:12
ⓐ	bars	#4 @ 18	#4 @ 16	#4 @ 14
ⓑ	bars	#9 @ 18	#9 @ 16	#9 @ 14
ⓒ	bars	#11 @ 9 ‖	#11 @ 8 ‖	#11 @ 7 ‖
ⓓ	bars	#10 @ 9 ‖	#10 @ 8 ‖	#9 @ 7 ‖
Total ⓐ	bars	4-#7	4-#7	4-#7
Total ⓕ	bars	2 #7	2-#7	2-#7
2' level surcharge	H Comp. k	24.3	27.7	31.0
	V Comp. k	58.3	66.3	74.3
	Toe Pr. k/sf	6.6	7.1	7.5
2:1 unlimited slope	H Comp. k	33.9	38.8	43.8
	V Comp. k	68.8	78.5	88.4
	Toe Pr. k/sf	8.5	9.2	9.8
1½:1 limited slope	H Comp. k	26.2	29.4	32.5
	V Comp. k	60.2	68.7	77.4
	Toe Pr. k/sf	7.9	8.2	8.5
Spread Footing	Steel lbs./ft.	588	694	778
	Conc. c.f./ft.	127.4	145.4	163.7
Concrete pile ftg.	Steel lbs./ft.	606	716	800
	Conc. c.f./ft.	131.7	150.5	168.6

‖ Denotes a bundle of 2 bars.

Note:
For details not shown and drainage notes see "Retaining Wall Details No. 1".

Quantities apply to Design H portion and exclude the added portion above "Gutter Elevation."

PILE EMBEDMENT IN FOOTING

Pile Type	Embedment
Concrete	3"
Steel	5"
Timber	6"

Note:
Reinforcement detailed is to be placed in addition to that shown for spread footing. See Pile Layout on other sheets.

9/67

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

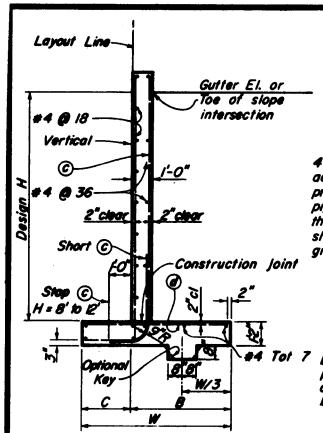
XS-3-47

RETAINING WALL TYPE I H= 32'-36'

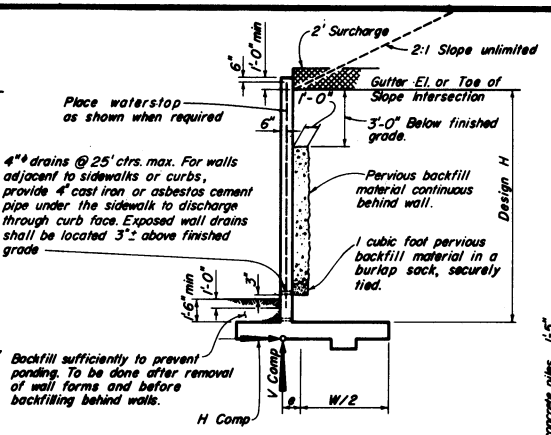
BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF

B3-2

Return to Table of Contents

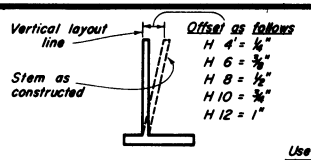


SPREAD FOOTING SECTION

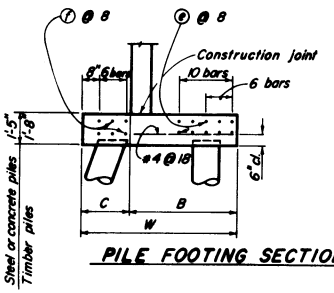


DESIGN AND DRAINAGE

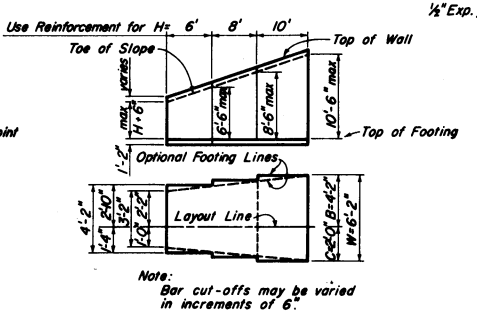
Place concrete in toe against undisturbed material, except as permitted by the Engineer.



WALL OFFSET

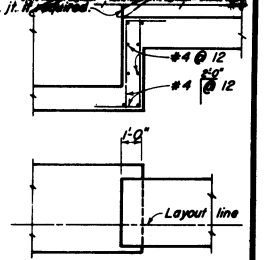


PILE FOOTING SECTION

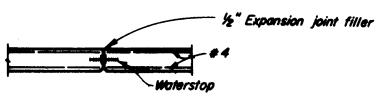


Note:
Bar cut-offs may be varied in increments of 6".

TYPICAL LAYOUT EXAMPLE



FOOTING STEP



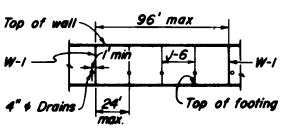
PLAN

WALL WITH DETAIL W-1

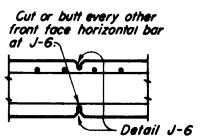
Note:
Quantities apply to Design H portion and exclude the added portion above "Gutter Elevation."

PILE EMBEDMENT IN FOOTING

Pile Type	Embedment
Concrete	3"
Steel	5"
Timber	6"

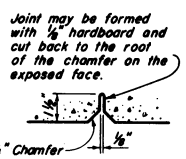


ELEVATION



SECTION

DETAIL J-6



PLAN

Note:
Reinforcement detailed is to be placed in addition to that shown for spread footing. All piles not shown, see Pile Layout on other sheet.

Ⓔ For pile footing Design H=4' use same footing dimensions as Design H=6'

NOTES

Design Conditions

Design H may be exceeded by 6" before going to the next size. Footing key is required except when found unnecessary by the Engineer. Special footing design is required where foundation material is incapable of supporting toe pressure loads listed in table.

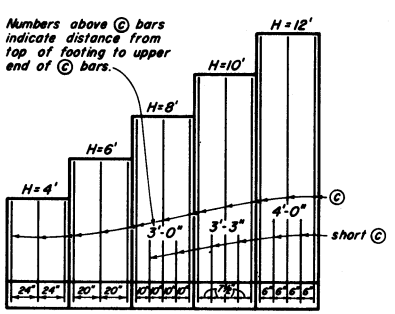
Design Data

fc = 1200 psi f'c = 3000 psi fs = 20,000 psi
n = 10 earth = 120 pcf

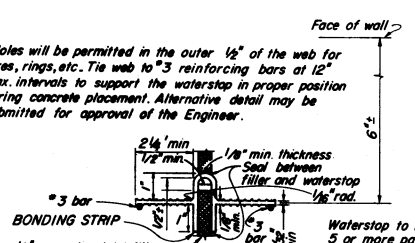
Equivalent fluid pressure =
36 psf max for determination of toe pressure.
27 psf min for determination of heel pressure.

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA

Design H		Ⓔ 4'	6'	8'	10'	12'
W		3'-2"	4'-2"	5'-2"	6'-2"	7'-2"
C		1'-0"	1'-4"	1'-8"	2'-0"	2'-4"
B		2'-2"	2'-10"	3'-6"	4'-2"	4'-10"
Ⓒ bars		#5 @ 24	#5 @ 20	#5 @ 10	#6 @ 7½	#7 @ 6
Ⓓ bars		#5 @ 24	#5 @ 20	#5 @ 10	#7 @ 15	#7 @ 12
Total Ⓔ bars		6 - #6	6 - #6	6 - #6	10 - #7	10 - #7
Total Ⓕ bars					6 - #7	6 - #7
H Comp pounds		850	1440	2170	3050	4070
V Comp pounds		2020	3460	5230	7340	9760
e feet		.50	.60	.79	.94	1.07
Toe Pressure PSF		1240	1570	1930	2270	2640
Spread Footing	Steel lbs/ft	13	19	30	49	77
	Conc CF/ft	8.6	11.8	15.0	18.1	21.4
Conc Pile Ftg	Steel lbs/ft	24	30	41	82	112
	Conc CF/ft	9.9	11.9	15.4	18.8	22.2



ELEVATION



Holes will be permitted in the outer ½" of the web for wires, rings, etc. Tie web to #3 reinforcing bars at 12" max. intervals to support the waterstop in proper position during concrete placement. Alternative detail may be submitted for approval of the Engineer.

Waterstop to have 5 or more pairs of raised ribs to provide 0.1 sq.in. min. rib cross-section area on each half of the waterstop. Height of ribs to be 3/32" min.

DETAIL W-1

DIST	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

DATE APPROVED SEPTEMBER 1, 1967

9/67 — STATE OF CALIFORNIA, TRANSPORTATION AGENCY, DEPARTMENT OF PUBLIC WORKS, DIVISION OF HIGHWAYS — XS-3-49

RETAINING WALL TYPE I-A

DIVISION NO. | POST MILE | DRAWING NO. | SHEET | OF

B3-3

B3-3

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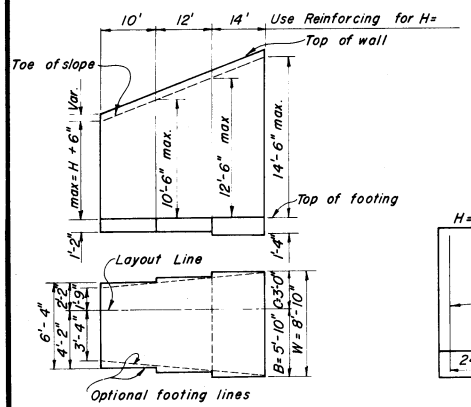
DIST	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE 5848

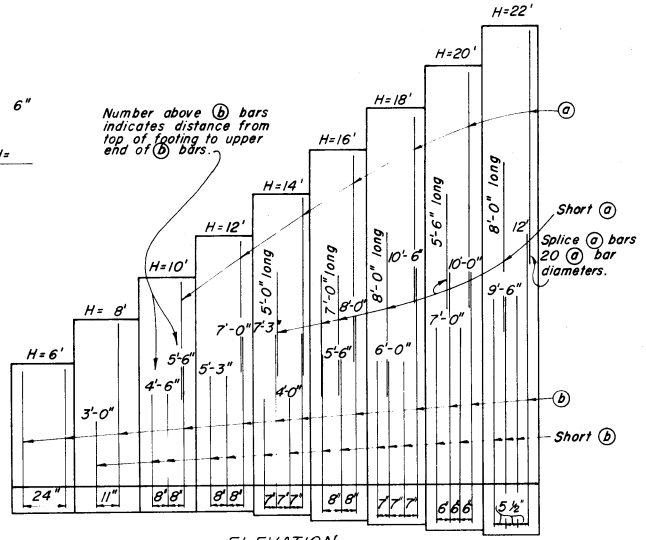
DATE APPROVED SEPTEMBER 1, 1967

STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE 5845

Note: Bar cut-offs may be varied in increments of 6"



TYPICAL LAYOUT EXAMPLE



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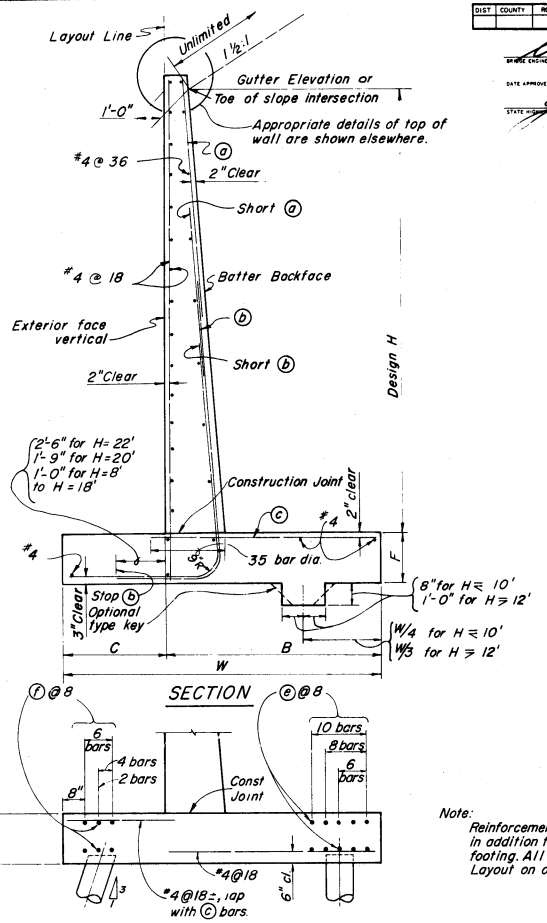


PILE FOOTING SECTION

Note:
Reinforcement detailed is to be placed in addition to that shown for spread footing. All piles not shown, see Pile Layout on other sheets.

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA

	Design H	6'	8'	10'	12'	14'	16'	18'	20'	22'
	W	3'-10"	5'-1"	6'-4"	7'-7"	8'-10"	10'-1"	11'-4"	13'-0"	14'-10"
	C	1'-4"	1'-9"	2'-2"	2'-7"	3'-0"	3'-5"	3'-10"	4'-8"	5'-8"
	B	2'-6"	3'-4"	4'-2"	5'-0"	5'-10"	6'-8	7'-6"	8'-4"	9'-2"
	F	1'-2"	1'-2"	1'-2"	1'-2"	1'-4"	1'-7"	1'-10"	2'-1"	2'-4"
	Batter	½ : 12	½ : 12	½ : 12	½ : 12	½ : 12	½ : 12	⅝ : 12	¾ : 12	⅞ : 12
	(a) bars			#5@24	#5@24	#6@14	#6@8	#8@14	#8@12	#8@11
	(b) bars	#5@24	#5@11	#6@8	#8@8	#9@7	#11@8	#11@7	#11@6	#11@5½
	(c) bars	#5@24	#5@11	#6@8	#8@8	#9@7	#11@8	#11@7	#11@6	#11@5½
	Tot. (e) bars	6-#6	6-#6	10-#7	10-#7	10-#7	10-#7	8-#7	8-#7	8-#7
	Tot. (f) bars			6-#7	6-#7	6-#7	6-#7	4-#7	4-#7	4-#7
	Toe Press	2350	2960	3570	4150	4970	5660	6590	6970	6980
	H Comp. lbs.	2780	4800	7360	10470	14450	18900	24250	30600	37400
	V Comp. lbs.	4670	7870	11900	16790	23030	29910	38390	48450	58780
	e	.59'	.77'	.94'	1.10'	1.33'	1.55'	1.79'	1.87'	1.84'
Spread footing	Conc. c.f./ft.	12.2	16.2	20.4	24.8	31.9	39.3	49.2	61.6	76.3
	Steel lbs./ft.	21	32	54	94	139	211	273	349	454
Conc. pile footing	Conc. c.f./ft.	12.2	16.2	20.4	25.5	32.1	39.8	50.0	62.8	77.8
	Steel lbs./ft.	32	43	89	129	175	247	302	379	485

Note:
For Design and Drainage notes and other details see "Retaining Wall Details No. 1."
Quantities apply to Design H portion and exclude the added portion above "Gutter Elevation."

PILE EMBEDMENT IN FOOTING

Pile Type	Embedment
Concrete	3"
Steel	5"
Timber	6"

9/67

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-3-42

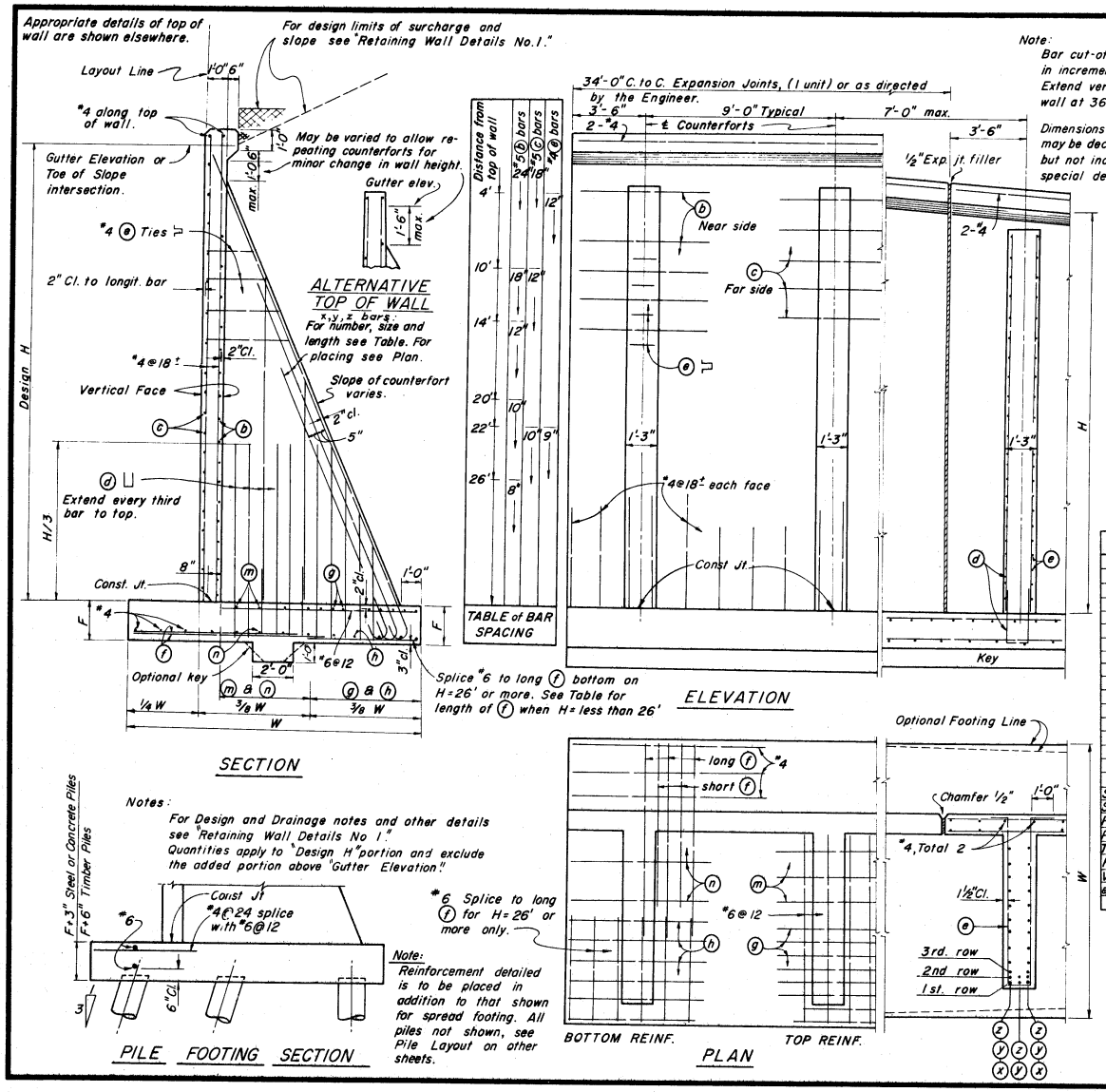
RETAINING WALL TYPE 2

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET

B3-4

B3-4

Return to Table of Contents



Notes:

For Design and Drainage notes and other details see "Retaining Wall Details No 1."
Quantities apply to "Design H" portion and exclude the added portion above "Gutter Elevation."

#6 Splice to long (f) for H=26' or more only.

Note:
Reinforcement detailed is to be placed in addition to that shown for spread footing. All piles not shown, see Pile Layout on other sheets.

Note:
Bar cut-offs may be varied in increments of 6".
Extend vertical bars to top of wall at 36" ctrs. max.

Dimensions 9'-0" and 3'-6" may be decreased proportionally but not increased without a special design.

DIST	COUNTY	ROUTE	POST MILES	TOTAL PROJECT	SHEET NO	TOTAL SHEETS

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE 5588

DATE APPROVED SEPTEMBER 1, 1967

STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE 5640

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA

Design H	18	20	22	24	26	28	30	32	34	36
W	11'-6"	12'-6"	13'-6"	14'-6"	15'-6"	16'-6"	17'-6"	18'-6"	19'-6"	20'-6"
F	1'-3"	1'-3"	1'-4"	1'-4"	1'-6"	1'-6"	1'-9"	1'-9"	2'-0"	2'-0"
(a) bars, cntrfort heel	#5 @ 8					#6@8				
(f) bars, bottom toe	#6@7	#7@7	#8@8	#9@8	#9@7 1/2	#10@7 1/2	#10@7 1/2	#11@8	#11@8	#11@7
(f) bars, length Alt.	7'-4"	7'-8"	8'-0"	8'-3"	8'-6"	8'-10"	9'-2"	9'-6"	9'-9"	10'-0"
(f) bars, length Alt.	11'-0"	12'-0"	13'-0"	14'-0"	10'-0"	10'-4"	10'-8"	11'-0"	11'-3"	11'-6"
(g) bars, top of heel	#6@7 All heights									
(h) bars, bottom heel	#6@12 All heights									
(m) bars, top of heel	#6@14 All heights									
(n) bars, bottom of heel	#6@24 All heights									
(x) bar,	2-#9	2-#9	2-#9	2-#9	2-#10	2-#10	2-#10	2-#10	2-#11	2-#11
(x) bar, length	20'-6"	22'-6"	24'-10"	27'-0"	29'-6"	31'-9"	34'-0"	36'-2"	39'-0"	41'-0"
(y) bar,	2-#9	2-#9	3-#9	2-#9	2-#10	2-#10	2-#10	2-#10	2-#11	3-#11
(y) bar, length	11'-6"	13'-9"	16'-0"	18'-2"	18'-3"	20'-5"	22'-9"	24'-10"	26'-0"	28'-0"
(z) bar,				2-#9	2-#9	2-#10	2-#11	3-#11	3-#11	3-#11
(z) bar, length				10'-10"	11'-0"	13'-5"	16'-0"	18'-0"	18'-9"	17'-2"
Spd. Ftg. Conc. cu. ft./lin. ft.	43.0	48.3	54.8	60.6	69.2	75.6	86.6	93.7	105.9	113.4
Spd. Ftg. Steel lbs./lin. ft.	162	193	229	268	310	375	418	480	533	601
Pile Ftg. Conc. cu. ft./lin. ft.										
Pile Ftg. Steel lbs./lin. ft.										
Toe pressure lbs./□'	3550	3910	4310	4650	5070	5410	5850	6250	6680	7040
Horiz. comp. lbs.	8060	9650	11,490	13,400	15,600	17,960	20,440	22,900	25,930	28,750
Vertical comp. lbs.	24,470	28,890	33,880	39,050	45,170	50,990	57,940	64,640	72,520	80,040
e (eccentricity of resultant)	1.30	1.44	1.61	1.75	1.91	2.06	2.24	2.43	2.60	2.74

PILE EMBEDMENT IN FOOTING

Pile Type	Embedment
Concrete	3"
Steel	5"
Timber	6"

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STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-3-43

COUNTERFORT RETAINING WALL TYPE 3

BRIDGE NO	POST MILE	DRAWING NO	SHEET	OF

B3-5

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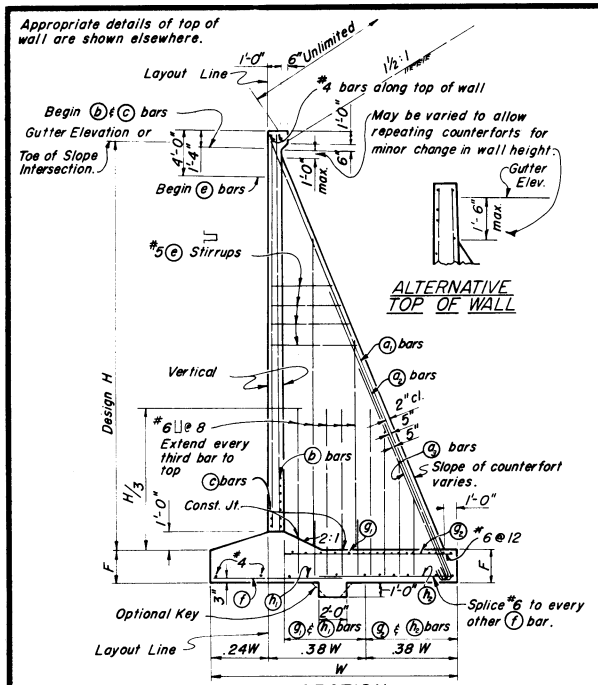
DIST	COUNTY	ROUTE	POST MILES: TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE 35886

DATE APPROVED SEPTEMBER 1, 1967

STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE 36448

Appropriate details of top of wall are shown elsewhere.



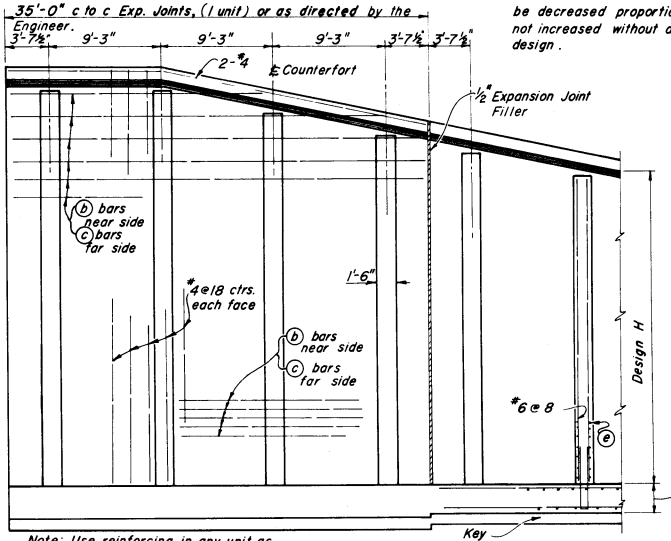
SECTION

Top of wall	ⓑ	ⓒ	ⓔ
2'	24	24	
4'	24	24	
6'	24	24	24
8'	18	24	24
10'	18	24	24
12'	15	18	18
14'	15	18	18
16'	12	18	18
18'	12	15	15
20'	12	15	15
22'	9	15	12
24'	9	12	12
26'	7	12	9
28'	7	12	9
30'	7	12	9

TABLE OF SPACING FOR ⓑ ⓒ & ⓔ BARS

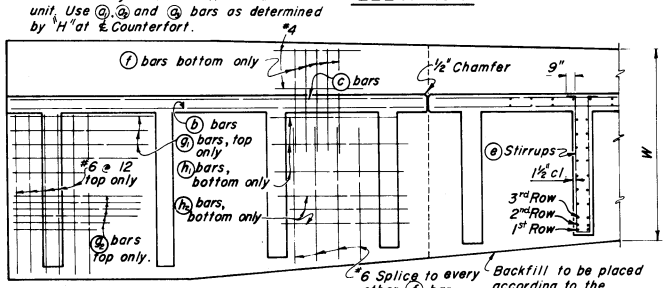
Distance below top of wall

Note: Dimensions 9'-3" and 3'-7½" may be decreased proportionally but not increased without a special design.

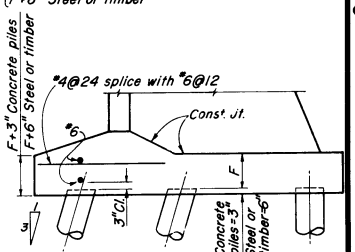


Note: Use reinforcing in any unit as determined by maximum "H" in that unit. Use ⓐ, ⓐ₁ and ⓐ₂ bars as determined by "H" at ℄ Counterfort.

ELEVATION



PLAN



PILE FOOTING SECTION

Note: Reinforcement detailed is to be placed in addition to that shown for spread footing. All piles not shown, see Pile Layout on other sheets.

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA

	Design H	18'	20'	22'	24'	26'	28'	30'
	W	12'-10"	14'-1"	15'-6"	16'-10"	18'-3"	19'-6"	21'-0"
	F	1'-9"	2'-0"	2'-0"	2'-0"	2'-3"	2'-3"	2'-6"
	ⓐ bars, edge counterfort	2-#11	3-#11	3-#11	3-#11	3-#11	3-#11	3-#11
	ⓐ bars, length	22'-2"	24'-3"	26'-10"	29'-0"	31'-9"	33'-10"	36'-4"
	ⓐ₁ bars, edge counterfort	2-#11	2-#11	3-#11	3-#11	2-#11	3-#11	3-#11
	ⓐ₁ bars, length	12'-0"	14'-0"	16'-0"	18'-0"	23'-0"	24'-0"	24'-6"
	ⓐ₂ bars, edge counterfort					2-#11	2-#11	3-#11
	ⓐ₂ bars, length					16'-6"	17'-6"	18'-3"
	ⓑ bars, back face wall	#6	See Table for spacing					
	ⓒ bars, front face wall	#6						
	ⓔ Stirrups counterfort	#5						
	ⓕ bars, toe	#11 @ 9½	#11 @ 9½	#11 @ 8½	#11 @ 8½	#11 @ 8½	#11 @ 8	#11 @ 8
	ⓕ bars, length	6'-2"	6'-9"	7'-8"	8'-0"	8'-9"	9'-0"	9'-5"
	ⓖ bars, top of heel	#5 @ 12	#5 @ 12	#6 @ 12	#6 @ 12	#6 @ 12	#6 @ 12	#6 @ 12
	ⓖ₁ bars, top of heel	#5 @ 6	#5 @ 6	#6 @ 6	#6 @ 6	#6 @ 6	#6 @ 6	#6 @ 6
	ⓗ bars, bottom of heel	#5 @ 24	#5 @ 24	#6 @ 24	#6 @ 24	#6 @ 24	#6 @ 24	#6 @ 24
	ⓗ₁ bars, bottom of heel	#5 @ 12	#5 @ 12	#6 @ 12	#6 @ 12	#6 @ 12	#6 @ 12	#6 @ 12
Spread Footing	Concrete, cu. ft. per lin. ft.	56.1	66.8	75.1	83.6	97.3	106.4	122.2
	Steel lbs. per lin. ft.	216	263	331	369	433	493	552
Conc Pile ftg.								
	Toe Pressure, lbs. per sq. ft.	6500	7200	8000	8700	9500	10100	11200
	Horizontal Comp. lbs.	27700	33700	41100	48300	57200	65200	77000
	Vertical Comp. lbs.	45000	56000	68000	81000	95000	110000	128000
	e (eccentricity of resultant)	1.70	1.85	2.00	2.20	2.40	2.60	3.00

Quantities based on 35'-0" wall unit including 4 Counterforts.

Notes: For Design and Drainage notes and other details see Retaining Wall Details No. 1. Quantities apply to Design H portion and exclude the added portion above Gutter Elev.

9/67

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-3-44

COUNTERFORT RETAINING WALL TYPE 4

SCALE	BRIDGE	FILE	DRAWING
None			

B3-6

B3-6

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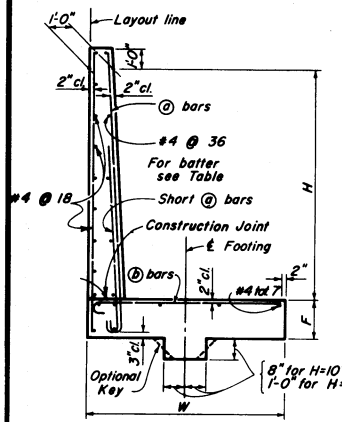
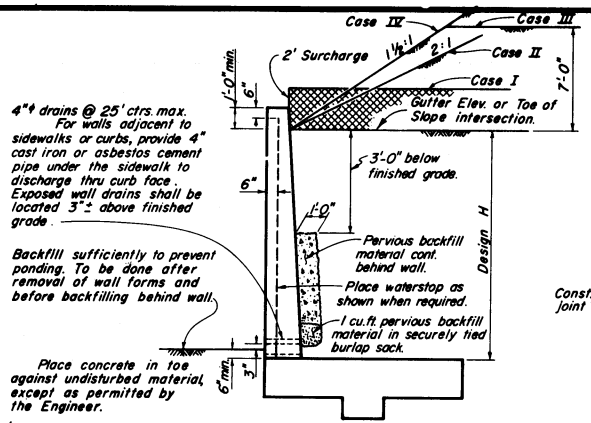


SPREAD FOOTING SECTION



4"ϕ drains @ 25' ctrs. max. For walls adjacent to sidewalks or curbs, provide 4" cast iron or asbestos cement pipe under the sidewalk to discharge thru curb face. Exposed wall drains shall be located 3"± above finished grade.

Backfill sufficiently to prevent ponding. To be done after removal of wall forms and before backfilling behind wall.

Place concrete in toe against undisturbed material, except as permitted by the Engineer.

Loading Conditions:

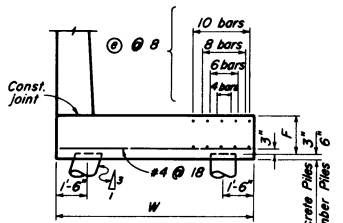
Case I	2' level surcharge
Case II	2:1 unlimited surcharge
Case III	1½:1 7' limited surcharge
Case IV	1½:1 unlimited surcharge

DESIGN AND DRAINAGE

MAX. PILE SPACING FOR 45 TON PILES

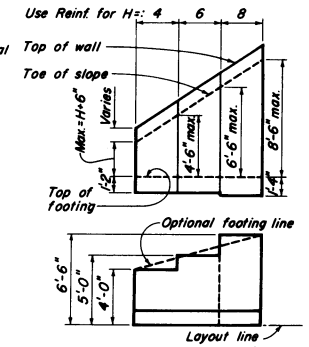
Design H	Front Row 1:3 Batter	Back Row Vertical
4	18'-0"	18'-0"
6	12'-0"	18'-0"
8	9'-0"	18'-0"
10	6'-0"	12'-0"
12	4'-0"	8'-0"

Note: For actual spacing see Wall Layout.

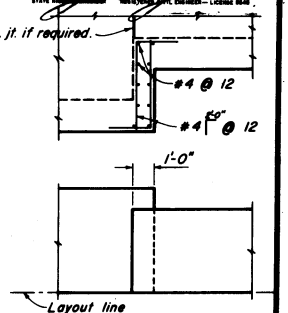


Note: Reinforcement detailed is to be placed in addition to that shown for spread footings.
For Design H=4 use W=5'-0".
All others from table.

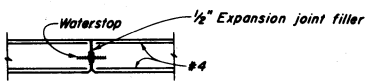
PILE FOOTING SECTION



TYPICAL LAYOUT EXAMPLE

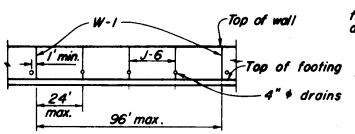


FOOTING STEP

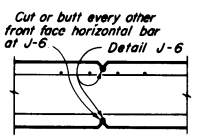


PLAN

WALL WITH DETAIL W-1

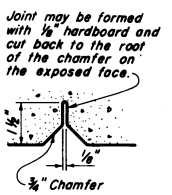


ELEVATION

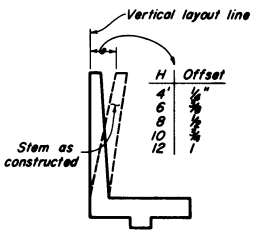


SECTION

DETAIL J-6



PLAN

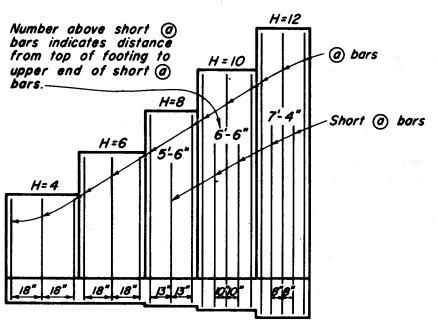


H	Offset
4'	¼"
6	3/16"
8	⅛"
10	3/16"
12	¼"

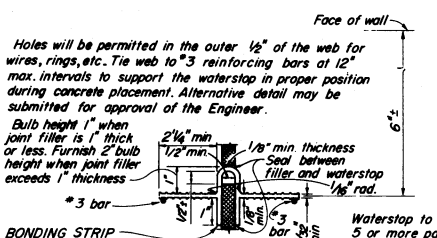
WALL OFFSET

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA

Design H ft.		4	6	8	10	12
W		4'-0"	5'-0"	6'-6"	8'-0"	9'-6"
F Spread Ftg.		1'-2"	1'-2"	1'-4"	1'-6"	1'-10"
Batter		None	None	None	3/16 : 12	3/16 : 12
	ⓐ bars	#4 @ 18	#5 @ 18	#6 @ 26	#6 @ 20	#6 @ 16
Short	ⓐ bars	None	None	#6 @ 26	#6 @ 20	#6 @ 16
	ⓑ bars	#4 @ 12	#6 @ 8	#7 @ 6	#10 @ 7	#10 @ 6
Total	ⓐ bars	8 - #8	4 - #8	10 - #9	10 - #8	6 - #8
Toe Pressure	Case I k/sf	1.6	2.2	2.6	3.0	3.6
	Case II k/sf	1.5	2.2	2.8	3.4	4.3
	Case III k/sf	1.8	2.6	3.2	3.8	4.6
	Case IV k/sf	1.8	2.7	3.6	4.6	5.5
Spread Ftg.	Steel lbs/l.f.	16	28	64	104	138
	Conc. c.y./l.f.	10.6	13.7	18.5	25.6	37.3
Conc. Pile Ftg.	Steel lbs/l.f.	40	41	110	134	158
	Conc. c.y./l.f.	11.9	15.0	20.1	27.6	39.7
Steel or Timber Pile Ftg.	Steel lbs/l.f.	40	41	110	134	158
	Conc. c.y./l.f.	13.1	16.2	21.8	29.6	42.1



ELEVATION



Holes will be permitted in the outer ½" of the web for wires, rings, etc. Tie web to #3 reinforcing bars at 12" max. intervals to support the waterstop in proper position during concrete placement. Alternative detail may be submitted for approval of the Engineer.

Bulb height 1" when joint filler is 1" thick or less. Furnish 2" bulb height when joint filler exceeds 1" thickness

Waterstop to have 5 or more pairs of raised ribs to provide 0.1 sq. in. min. rib cross-section area on each half of the waterstop. Height of ribs to be 3/32" min.

DETAIL W-1

NOTES

Design Conditions:
Design H may be exceeded by 6" before going to the next size. Footing key is required except when found unnecessary by the Engineer. Special footing design is required where foundation material is incapable of supporting toe pressure loads listed in table.

Design Data:
f_c = 1200 psi f'_c = 3000 psi f_s = 20,000 psi n = 10
earth = 120 pcf Case I - Wall design for equivalent fluid pressure = 27 and 36 pcf Case II, III, IV - Wall design for earth pressures from A.R.E.A. Manual, Chapter 8, Part 5, Appendix C, Soil Type I.

Quantities:
Quantities apply to Design H portion and exclude the added portion above "Gutter Elevation."

DIST	COUNTY	ROUTE	POST MILES	TOTAL PROJECT	SHEET	TOTAL

SEPTEMBER 1, 1967

9/67 — STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS — XS-3-49

RETAINING WALL TYPE 5

BRIDGE NO. | POST MILE | DRAWING NO.

B3-7

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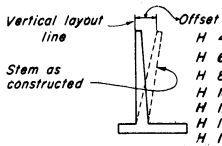
DIST	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE 5608

DATE APPROVED SEPTEMBER 1, 1967

STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE 5608



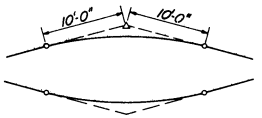
APPROX. WALL OFFSET VALUES

Not required for wall types 3 and 4

Values for offsetting forms to be determined by the Engineer.

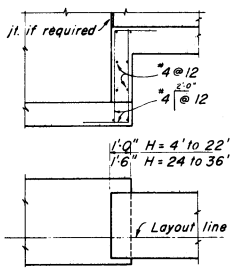
PLAN OF WALL WITH DETAIL W-1

PLAN OF WALL WITH EXPANSION JOINT ONLY

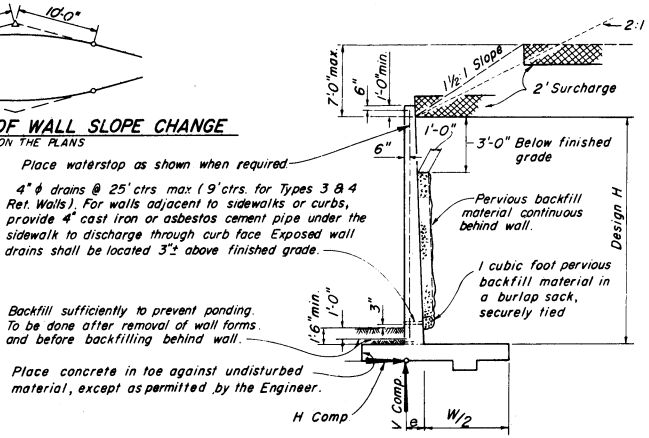


20' VC AT TOP OF WALL SLOPE CHANGE

WHERE SHOWN ON THE PLANS



FOOTING STEP



Place waterstop as shown when required.

4" ϕ drains @ 25' ctrs max. (9' ctrs. for Types 3 & 4 Ret. Walls). For walls adjacent to sidewalks or curbs, provide 4" cast iron or asbestos cement pipe under the sidewalk to discharge through curb face. Exposed wall drains shall be located 3"± above finished grade.

Pervious backfill material continuous behind wall.

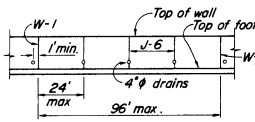
1 cubic foot pervious backfill material in a burlap sack, securely tied

Backfill sufficiently to prevent ponding. To be done after removal of wall forms and before backfilling behind wall.

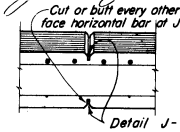
Place concrete in toe against undisturbed material, except as permitted by the Engineer.

DESIGN AND DRAINAGE

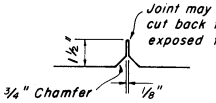
Surcharge limits shown apply to Retaining walls Type 1 and 3.



ELEVATION

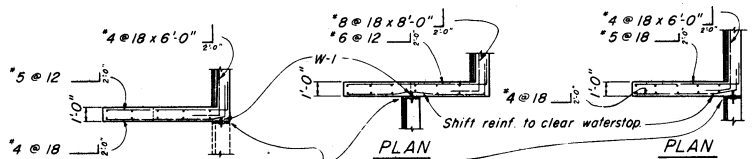


SECTION



PLAN

DETAIL J-6

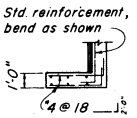


1/2" Exp. joint filler and waterstop as shown when required.

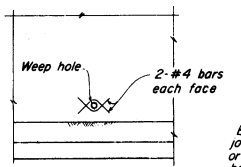
PLAN

PLAN

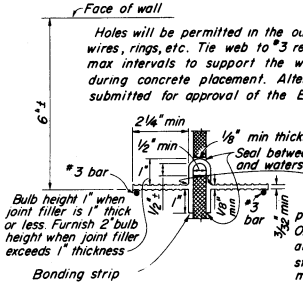
PLAN



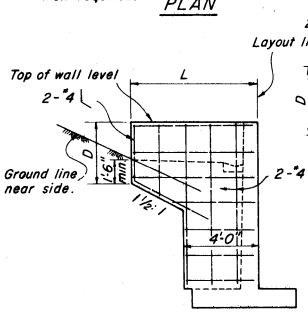
PLAN



DRAIN REINF. DETAIL



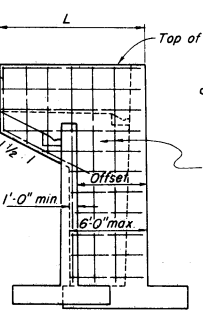
DETAIL W-1



ELEVATION

RETURN WALL TYPE 'A'

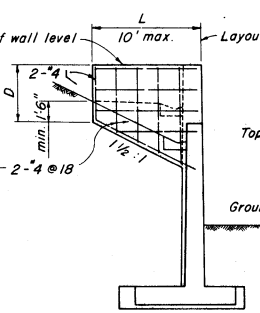
Use where H = 8' or less



ELEVATION

RETURN WALL TYPE 'B'

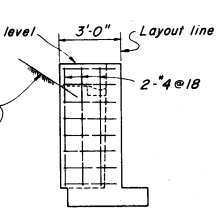
Use where H = 10' or more on offset walls



ELEVATION

RETURN WALL TYPE 'C'

Use where H = 10' or more on straight walls



ELEVATION

RETURN WALL TYPE 'D'

Use where H = 6' or less

NOTES:

Design Conditions:

Design H may be exceeded by 6" before going to the next size.

Footing key is required except when found unnecessary by the Engineer.

Special footing design is required where foundation material is incapable of supporting toe pressure loads listed in table.

Return wall not required unless shown elsewhere.

Design Data:

fc = 1200 psi fc' = 3000 psi fs = 20,000 psi n = 10 earth = 120 pcf

Equivalent fluid pressure = 36 pcf max. for determination of toe pressure.
27 pcf min. for determination of heel pressure.

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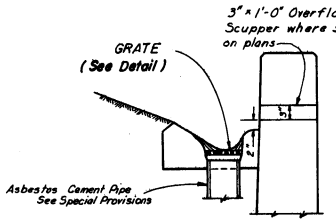
STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-3-45

RETAINING WALL DETAILS NO. 1

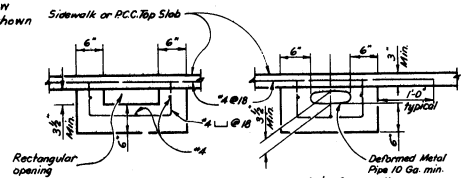
BRIDGE NO	POST MILE	DRAWING NO.	SHEET	OF

Return to Table of Contents



__" WALL DRAIN DETAIL

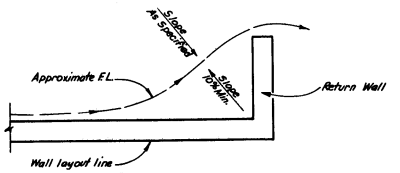
Scale: 1" = 1'-0"



Note: Area of opening to be not less than that of pipe from wall gutter. Make opening transition in wall. Edge opening in curb face to ⅜" Min. Radius.

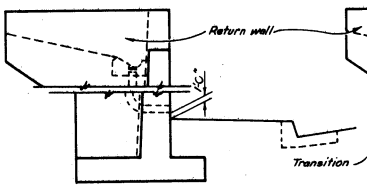
OUTLET DETAIL - SECTION B-B

Scale: 1" = 1'-0"



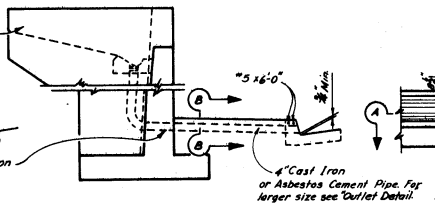
WALL DRAINAGE WHERE GUTTER NOT REQUIRED

Scale: ⅜" = 1'-0"



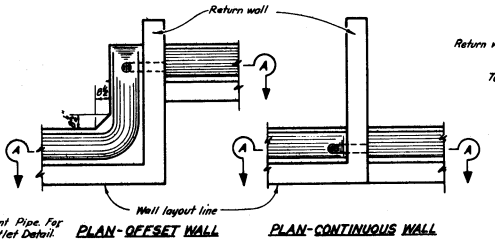
RETAINING WALL, FACE OF WALL OUTLET

Scale: ⅜" = 1'-0"



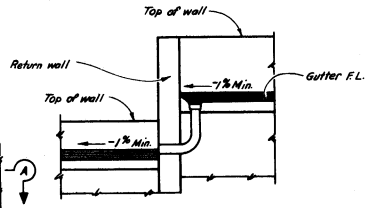
RETAINING WALL, GUTTER OUTLET

Scale: ⅜" = 1'-0"



PLAN - OFFSET WALL

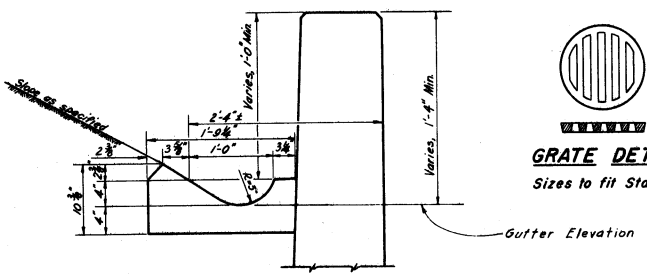
PLAN - CONTINUOUS WALL



SECTION A-A

DRAIN THROUGH RETURN WALL

Scale: ⅜" = 1'-0"

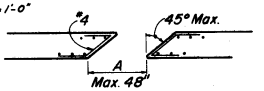


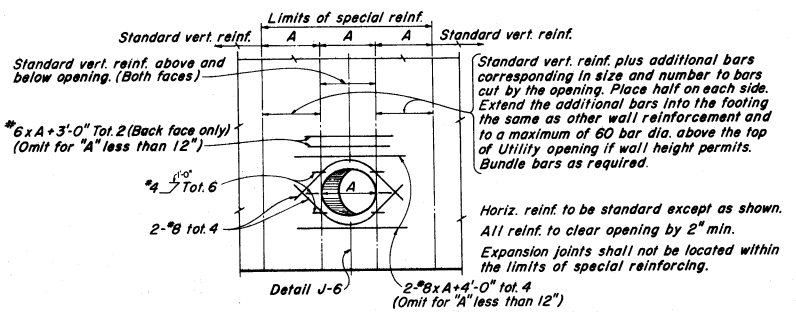
TYPICAL GUTTER DETAIL

Scale: 1½" = 1'-0"

GRATE DETAIL

Sizes to fit Standard Hubs





RETAINING WALL UTILITY OPENING

To be used in conjunction with the "Type I Cantilever Retaining Wall" sheet.
Max. size of Opening (A) = 48"

D-4	COUNTY	ROUTE	POST MILES	TOTAL PROJECT	SHEET No.	TOTAL SHEETS

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NUMBER

DATE APPROVED SEPTEMBER 1, 1967

STATE BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NUMBER

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STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-3-29

RETAINING WALL DETAILS NO. 2

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF

B3-9

B3-9

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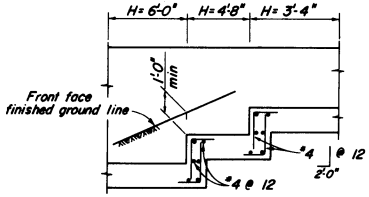
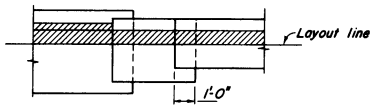
DIST	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

DATE APPROVED SEPTEMBER 1, 1967

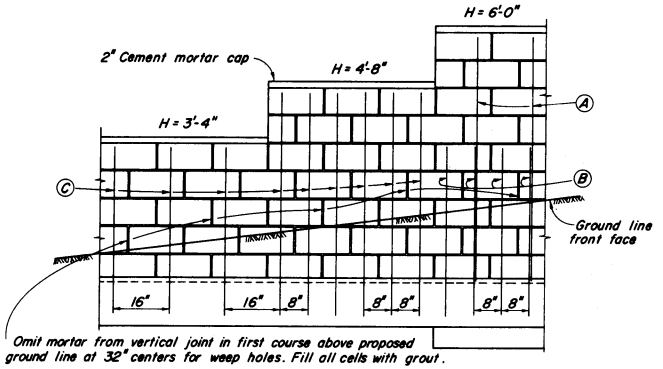


ELEVATION



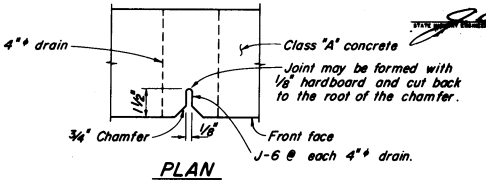
PLAN

FOOTING STEP DETAILS



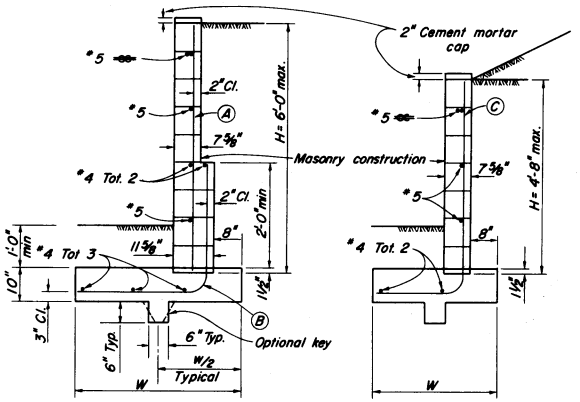
Omit mortar from vertical joint in first course above proposed ground line at 32" centers for weep holes. Fill all cells with grout.

ELEVATION—MASONRY CONSTRUCTION

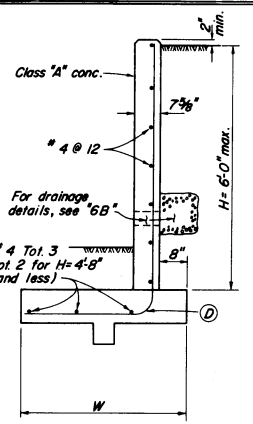


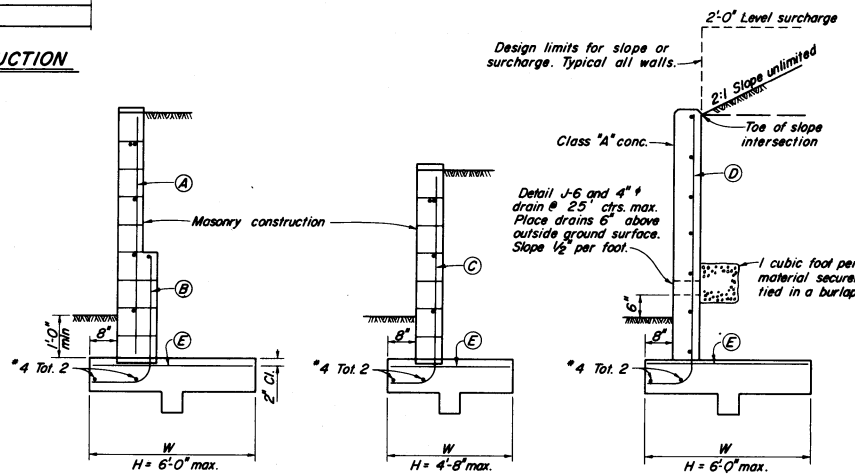
PLAN

DETAIL J-6



TYPE 6A WALL





TYPE 6B WALL

Type	Design H	3'-4"	4'-0"	4'-8"	5'-4"	6'-0"
6A	W	3'-2"	3'-6"	3'-10"	4-2"	4'-6"
6A	A				#4@16	#5@16
6A	B				#4@8	#4@8
6A	C	#4@16	#5@16	#4@8		
6A	D	#4@16	#4@12	#4@8	#5@10	#5@8
Footing conc. Cu. ft. / L.F.		2.9	3.2	3.4	3.7	4.0
Reinf. Lbs./L.F. Masonry		7.5	10.9	13.4	16.0	18.3
Reinf. Lbs./L.F. Class "A" PCC		7.1	9.4	12.9	17.6	22.6

NOTES

1. For details not shown at "6B", see "6A"
2. Area of wall for payment is based upon horizontal length and height from top of footing to top of wall.
3. Type 6 Retaining Wall shall be limited to use for walls of Design H of 6 feet or less.
4. Where traffic is adjacent to the top of wall, guard rails should be set back from the top front face of wall at least 3' for masonry walls or 2' for Class "A" PCC walls.
5. Unless otherwise stipulated, the contractor will have the option of constructing the Type 6 Walls of either Masonry or Class "A" PCC.

Type	Design	3'-4"	4'-0"	4'-8"	5'-4"	6'-0"
6B	W	2-8"	3'-0"	3'-4"	3'-8"	4'-0"
6B	A				#4@16	#5@16
6B	B				#4@8	#4@8
6B	C	#4@16	#5@16	#4@8		
6B	D	#4@16	#4@12	#4@8	#5@10	#5@8
6B	E	#4@16	#4@16	#4@8	#4@10	#4@8
Footing conc. Cu. Ft. / L.F.		2.5	2.8	3.0	3.3	3.6
Reinf. Lbs./L.F. Masonry		8.1	11.3	14.8	16.2	19.1
Reinf. Lbs./L.F. Class "A" PCC		7.7	9.7	14.8	16.9	21.3

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DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-3-50

RETAINING WALL TYPE 6 - 6'-0" max.

BRIDGE NO	POST MILE	DRAWING NO	SHEET	OF

B3-11

B3-11

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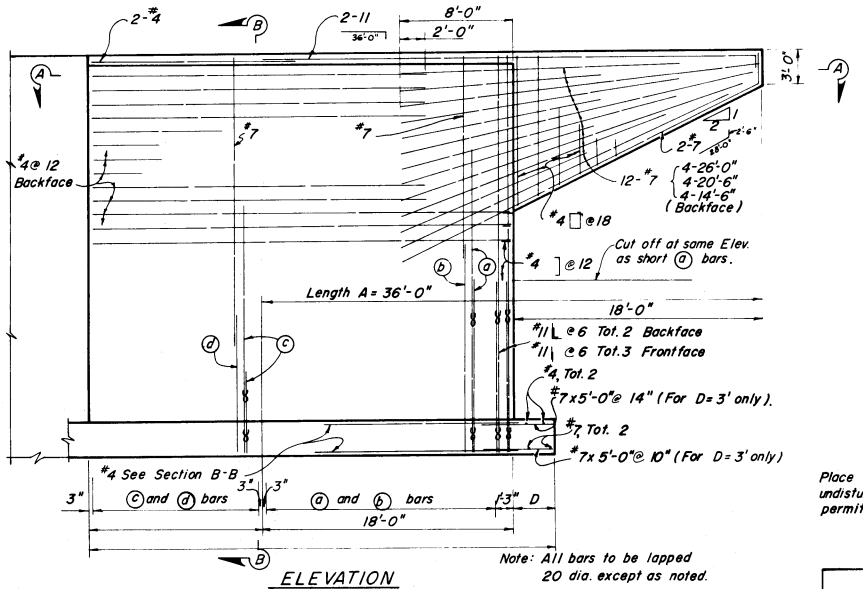
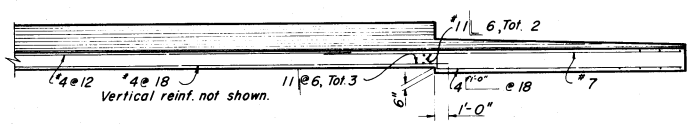
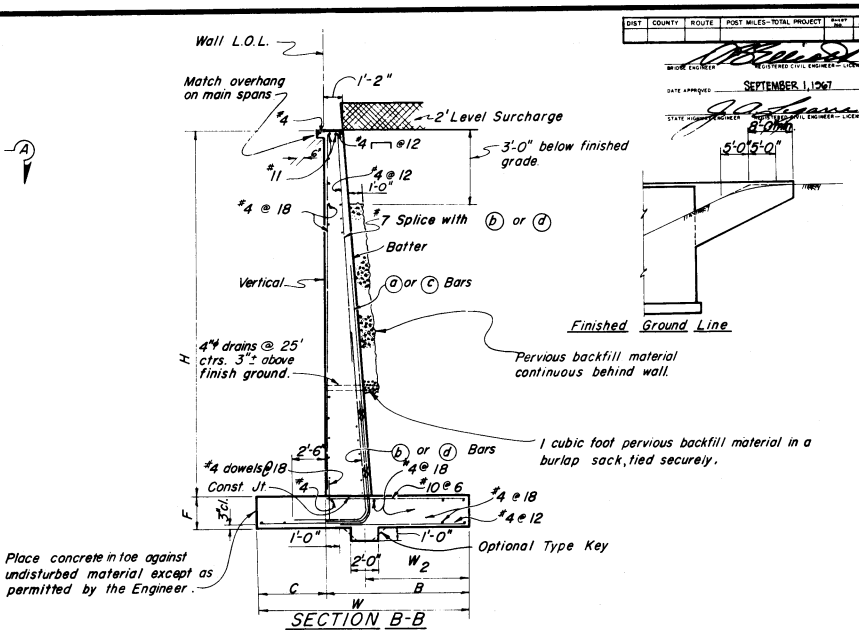


ELEVATION



SECTION A-A



SECTION B-B

H	22			24			26		28		30		32	
Footing Pressure	2½ Tons	3 Tons	4 Tons	2½ Tons	3 Tons	4 Tons	3 Tons	4 Tons	3 Tons	4 Tons	3 Tons	4 Tons	3 Tons	4 Tons
B	9'-0"	8'-0"	8'-0"	10'-0"	8'-10"	8'-10"	10'-0"	9'-6"	10'-6"	10'-2"	11'-3"	10'-10"	12'-0"	11'-6"
C	5'-0"	4'-6"	4'-0"	6'-0"	5'-2"	4'-5"	5'-9"	4'-9"	6'-6"	5'-1"	7'-0"	5'-5"	7'-6"	5'-9"
D	3'-0"	3'-0"	1'-0"	3'-0"	3'-0"	1'-0"	3'-0"	1'-0"	3'-0"	1'-0"	3'-0"	1'-0"	3'-0"	1'-0"
F	2'-0"	2'-0"	2'-0"	2'-1"	2'-1"	2'-1"	2'-3"	2'-3"	2'-5"	2'-5"	2'-7"	2'-7"	2'-9"	2'-9"
W	14'-0"	12'-6"	12'-0"	16'-0"	14'-0"	13'-3"	15'-9"	14'-3"	17'-0"	15'-3"	18'-3"	16'-3"	19'-6"	17'-3"
Conc. cu. ft. Length A	1610	1540	1470	1830	1750	1660	1980	1840	2230	2070	2480	2280	2820	2590
Conc. cu. ft 1' Additional	70	67	66	82	78	76	89	86	103	99	115	110	133	127
Reinf. Steel lbs. Length A	9410	9080	8710	10400	9970	9510	11130	10500	12110	11390	13110	12310	14150	13300
Reinf. Steel lbs 1' Add.	336	325	325	375	364	363	405	400	502	497	554	547	607	602
a bars 2-#11 @ 12 bundle	1-24'-0" lg. 1-10'-0" lg.	1-23'-6" lg. 1-9'-6" lg.	1-23'-0" lg. 1-9'-0" lg.	1-27'-0" lg. 1-12'-0" lg.	1-26'-2" lg. 1-11'-2" lg.	1-25'-5" lg. 1-10'-5" lg.	1-30'-0" lg. 1-14'-0" lg.	1-29'-0" lg. 1-13'-0" lg.	1-33'-0" lg. 1-16'-6" lg.	1-31'-7" lg. 1-15'-1" lg.	1-36'-0" lg. 1-19'-0" lg.	1-34'-5" lg. 1-17'-5" lg.	1-39'-0" lg. 1-22'-0" lg.	1-37'-3" lg. 1-20'-3" lg.
b bars	#11 @ 12 x 15'-0" lg.			#11 @ 12 x 17'-0" lg.			#11 @ 12 x 19'-0" lg.		#11 @ 12 x 21'-6" lg.		#11 @ 12 x 24'-0" lg.		#11 @ 12 x 26'-6" lg.	
c bars	#11 @ 12 x 20'-0" lg.			#11 @ 12 x 23'-0" lg.			#11 @ 12 x 26'-0" lg.		#11 @ 12 x 29'-0" bundle #11 @ 12 x 12'-0"		#11 @ 12 x 32'-0" bundle #11 @ 12 x 14'-6"		#11 @ 12 x 35'-0" bundle #11 @ 12 x 17'-0"	
d bars	#11 @ 12 x 12'-0" lg.			#11 @ 12 x 14'-0" lg			#11 @ 12 x 16'-0" lg.		#11 @ 12 x 16'-6" lg.		#11 @ 12 x 19'-0" lg.		#11 @ 12 x 21'-6" lg.	
Batter	7/16 : 12			¾ : 12			¾ : 12		13/16 : 12		15/16 : 12		15/16 : 12	

DIST	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	PROJECT NO.	TOTAL BRIDGES

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE 5686

DATE APPROVED SEPTEMBER 1, 1967

STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE 5646

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STATE OF CALIFORNIA
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DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-4-24

WINGWALLS- SPREAD FOOTING

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF

B3-15

B3-15

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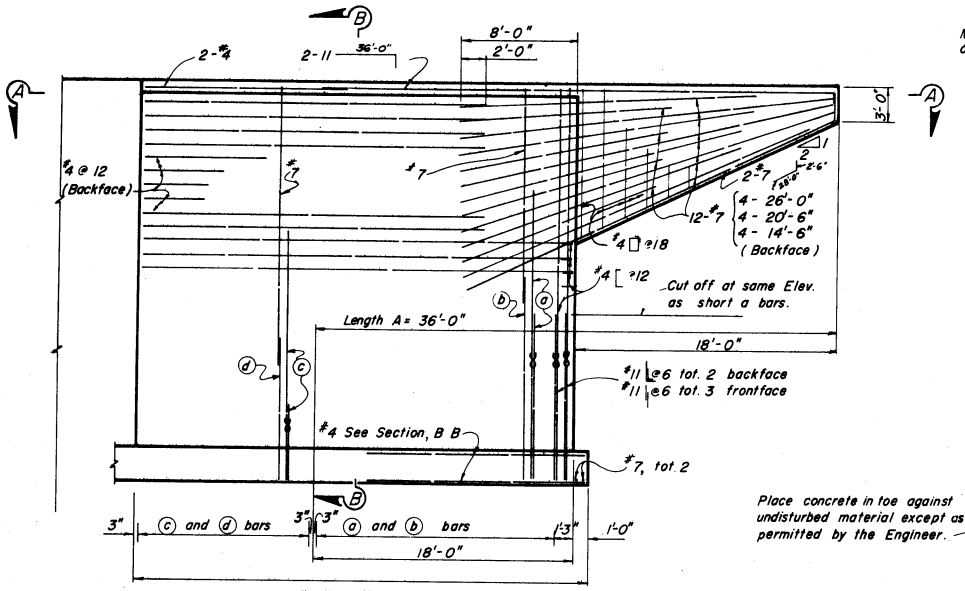
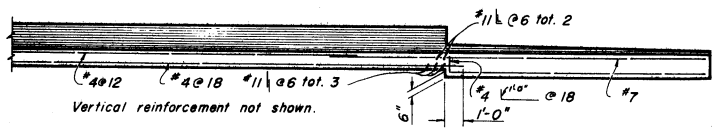
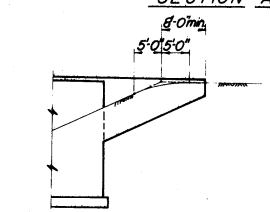


ELEVATION

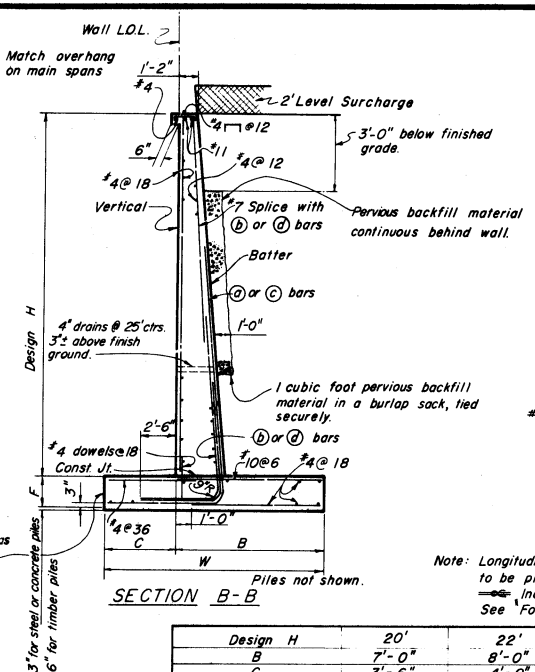


Vertical reinforcement not shown.

SECTION A-A

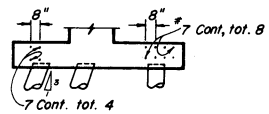


Finished Ground Line

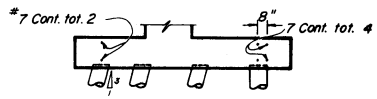


Place concrete in toe against undisturbed material except as permitted by the Engineer.

SECTION B-B



TYPICAL SECTION TYPE I



TYPICAL SECTION TYPE II

Note: Longitudinal bars shown on "TYPICAL SECTIONS I and II" to be placed in addition to standard reinforcement.
⟷ indicates a bundle of 2 bars.
See "Foundation Plan" for pile spacing.

	Design H	20'	22'	24'	26'	28'
	B	7'-0"	8'-0"	8'-10"	9'-6"	10'-2"
	C	3'-6"	4'-0"	4'-5"	4'-9"	5'-1"
	F	1'-10"	2'-0"	2'-1"	2'-3"	2'-5"
	W	10'-6"	12'-0"	13'-3"	14'-3"	15'-3"
	Type	I	I	II	II	II
	Wall Batter	11/16 : 12	11/16 : 12	3/4 : 12	3/4 : 12	13/16 : 12
	a bars	#11@12 × 20'-0"	#11@12 × 23'-0" #11@12 × 9'-0"	#11@12 × 25'-5" #11@12 × 10'-5"	#11@12 × 29'-0" #11@12 × 13'-0"	#11@12 × 31'-7" #11@12 × 15'-1"
	b bars	#11@12 × 12'-0"	#11@12 × 15'-0"	#11@12 × 17'-0"	#11@12 × 19'-0"	#11@12 × 21'-6"
	c bars	#11@12 × 16'-0"	#11@12 × 20'-0"	#11@12 × 23'-0"	#11@12 × 26'-0"	#11@12 × 29'-0" #11@12 × 12'-0"
	d bars	#11@12 × 10'-0"	#11@12 × 12'-0"	#11@12 × 14'-0"	#11@12 × 16'-0"	#11@12 × 16'-6"
Steel or Concrete Piles	Conc. cu.ft. Length A	1310	1490	1680	1870	2100
	" " " Additional 1'	57	67	77	87	100
	Reinf. Steel lbs. Length A	7710	9330	9900	10890	11800
	" " " Additional 1'	307	352	381	417	514
Timber Piles	Conc. cu.ft. Length A	1360	1550	1740	1940	2170
	" " " Additional 1'	60	70	81	91	104
	Reinf. Steel lbs. Length A	7710	9330	9900	10890	11800
	" " " Additional 1'	307	352	381	417	514

PILE EMBEDMENT IN FOOTING

Pile Type	Embedment
Concrete	3"
Steel	5"
Timber	6"

DIST	COUNTY	ROUTE	POST MILES TOT. PROJECT	Sheet No.	Total Sheets

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE 5688
DATE APPROVED SEPTEMBER 1, 1967
STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE 5688

9/67

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-4-23

WINGWALLS- PILE FOOTING

BRIDGE NO	POST MILE	DRAWING NO	SHEET	OF

B3-16

B3-16

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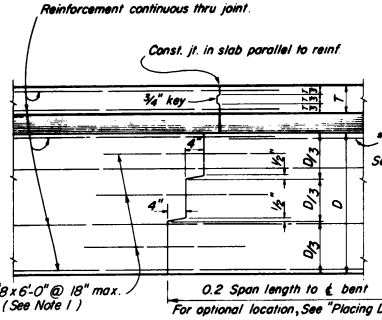
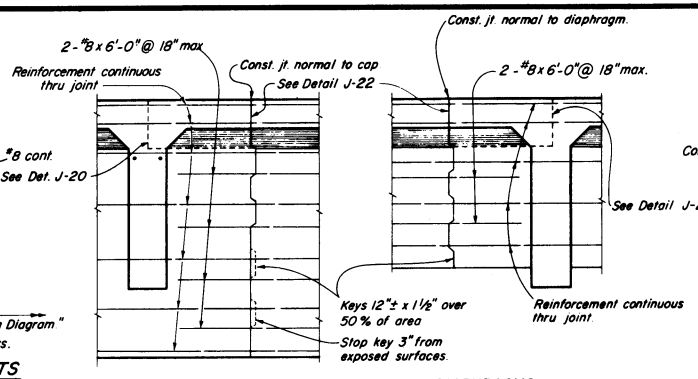
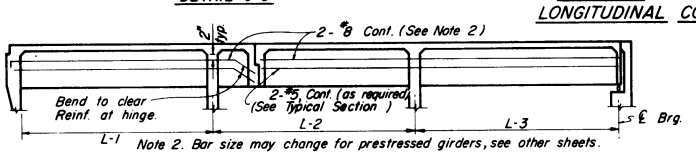


Note 1. These bars may be omitted for prestressed girders.

TRANSVERSE GIRDER CONSTRUCTION JOINTS
DETAIL J-3

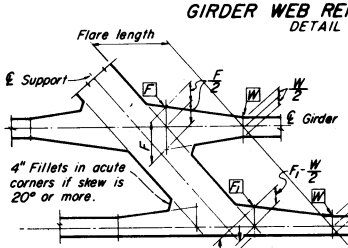


BENT CAP
LONGITUDINAL CONSTRUCTION JOINTS
DETAIL J-4



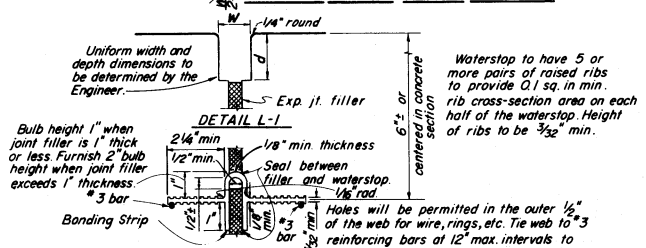
Note 2. Bar size may change for prestressed girders, see other sheets.

GIRDER WEB REINFORCEMENT
DETAIL J-1

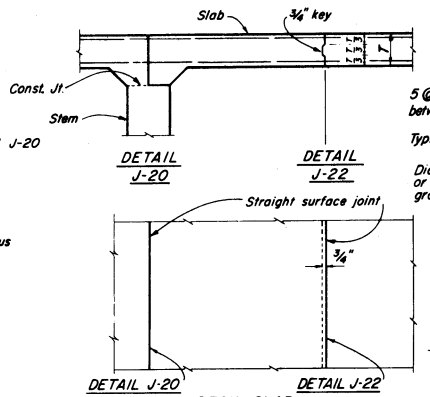


W & F denote girder width in inches.
Where the increase in stem width due to flare at the support is not more than 2 1/2" on a side, the stirrups may all be a constant width. In this case the stirrup width shall be determined by the minimum stem width, and the clearance from face of concrete to stirrup will vary throughout the flare.

TYPICAL GIRDER FLARE DIAGRAM

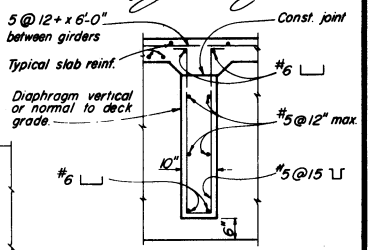


SEALED DECK JOINT

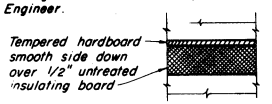


LONGITUDINAL CONSTRUCTION JOINTS

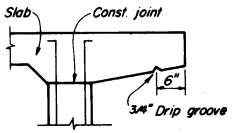
Note: Longitudinal construction joints in slab, if required, are to be located at edge of traffic lanes except as approved by the Engineer.



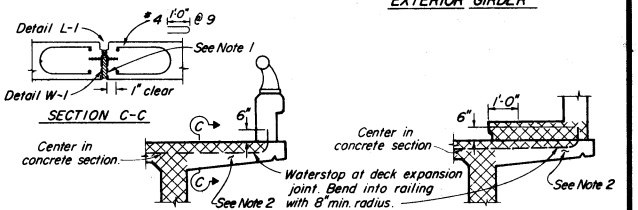
INTERMEDIATE DIAPHRAGM SECTION
DETAIL D-1



DETAIL M-1



PART SECTION
EXTERIOR GIRDER



DECK AND SIDEWALK JOINTS
DETAIL C-1

NOTES:
1. Each side may be tapered 1/4" if open joint option is used.
2. Open joint in deck overhang same width as joint in deck. Or expansion joint material 1/2" thicker than material in main portion of joint.

DIST	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	SHEET NO	TOTAL SHEETS

DATE APPROVED SEPTEMBER 1, 1967

9/67 STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS XS-16-21

T-BEAM DETAILS NO. 1

BRIDGE NO	POST MILE	DRAWING NO	SHEET	OF

B6-1

B6-1

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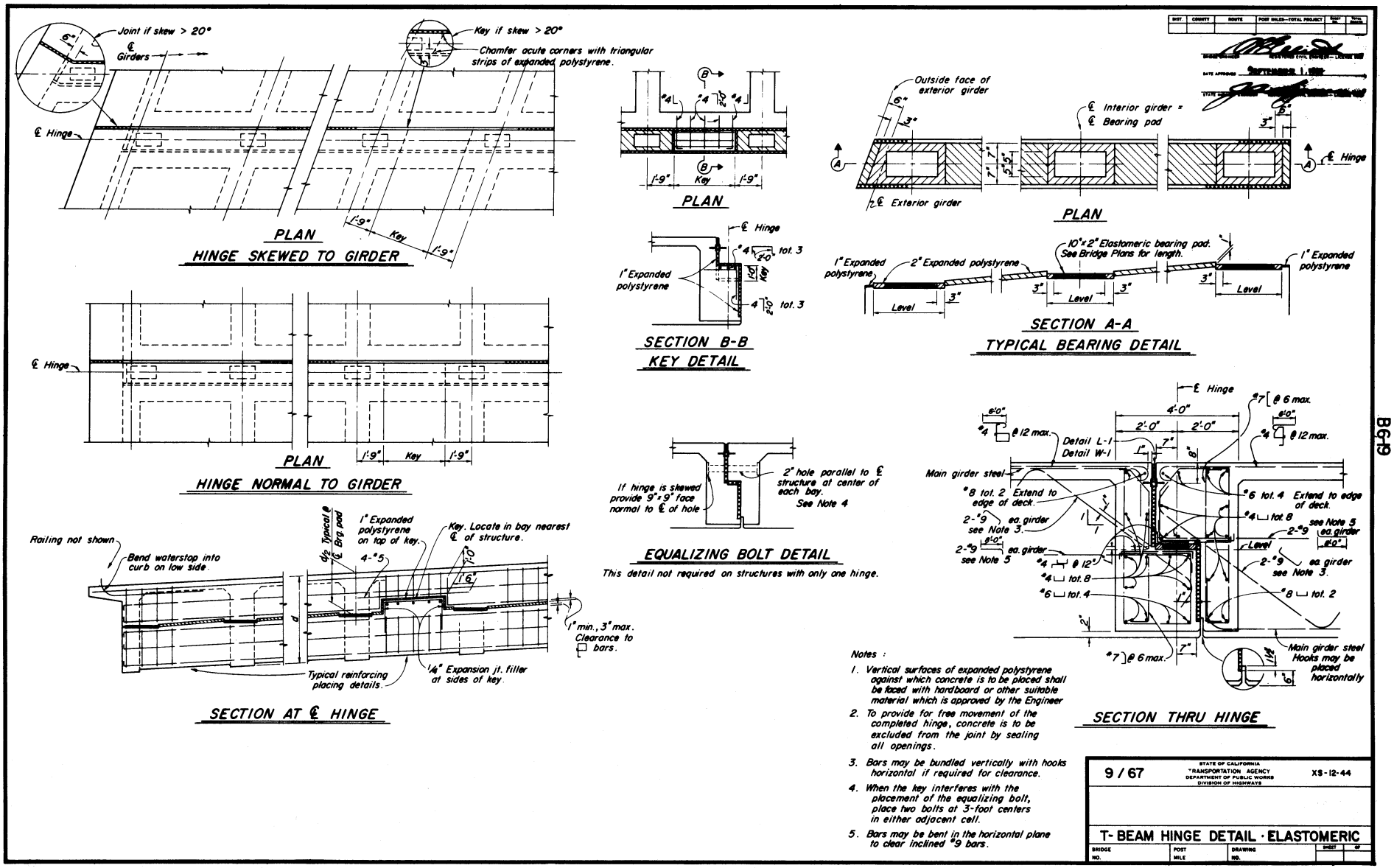

Notes :

1. Vertical surfaces of expanded polystyrene against which concrete is to be placed shall be faced with hardboard or other suitable material which is approved by the Engineer
2. To provide for free movement of the completed hinge, concrete is to be excluded from the joint by sealing all openings.
3. Bars may be bundled vertically with hooks horizontal if required for clearance.
4. When the key interferes with the placement of the equalizing bolt, place two bolts at 3-foot centers in either adjacent cell.
5. Bars may be bent in the horizontal plane to clear inclined #9 bars.

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

DATE APPROVED SEPTEMBER 1, 1967

STATE BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

9 / 67

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-12-44

T-BEAM HINGE DETAIL · ELASTOMERIC

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF

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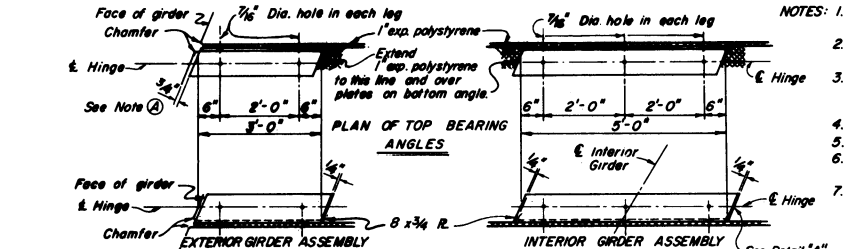
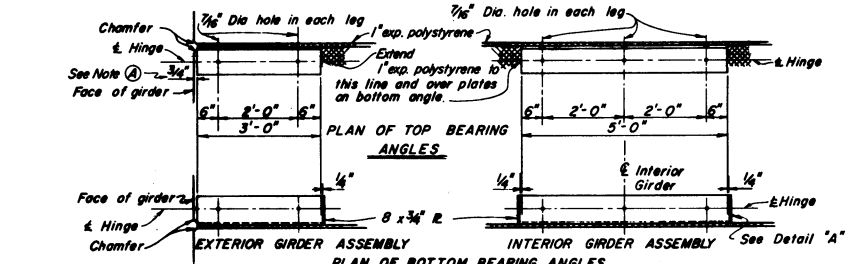


PLAN OF BOTTOM BEARING ANGLES

* HINGE SKEWED TO GIRDER

Scale: 3/4" = 1'-0"

NOTES:
1. To provide for free movement of the completed hinge, abutting surfaces shall be separated with expanded polystyrene.
2. Caulk and tape the joints between steel angles and all remaining openings to prevent grout or concrete seepage between abutting surfaces of hinge.
3. Vertical surfaces of expanded polystyrene against which concrete is to be placed shall be faced with hardboard or other suitable material which is approved by the Engineer.
4. Remove sharp corners and burrs from ends of angles and end plates.
5. Galvanize hinge assembly after fabrication.
6. Bars may be bundled vertically with hooks horizontal if required for clearance.
7. Bars may be bent in the horizontal plane to clear inclined #9 bars.



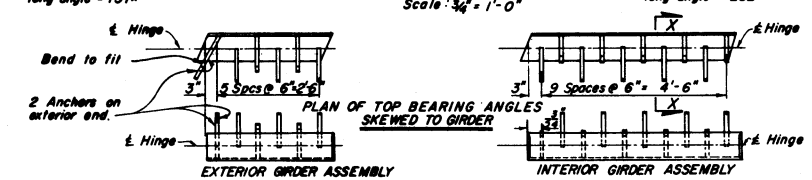
PLAN OF BOTTOM BEARING ANGLES

HINGE NORMAL TO GIRDER

Scale: 3/4" = 1'-0"

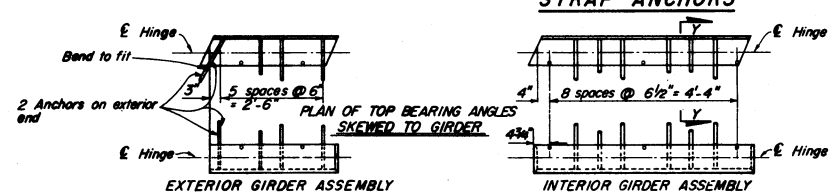
Exterior Assembly Max. shear for 3'-0" long angle = 151k

Interior Assembly Max. shear for 5'-0" long angle = 252k



PLAN OF BOTTOM BEARING ANGLES NORMAL TO GIRDER

STRAP ANCHORS

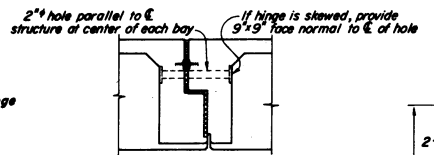


PLAN OF BOTTOM BEARING ANGLES NORMAL TO GIRDERS

STUD ANCHORS

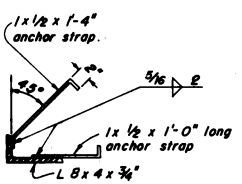
ANCHOR ALTERNATIVES

Scale: 3/4" = 1'-0"



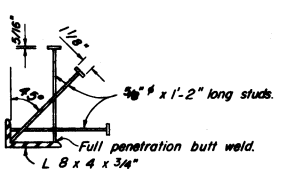
This detail not required on structures with only one hinge.

EQUALIZING BOLT HOLE DETAIL



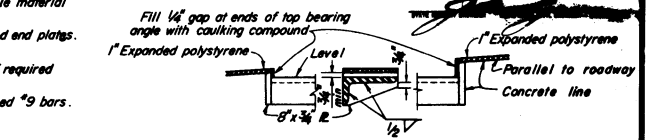
SECTION X-X

Scale: 1 1/2" = 1'-0"



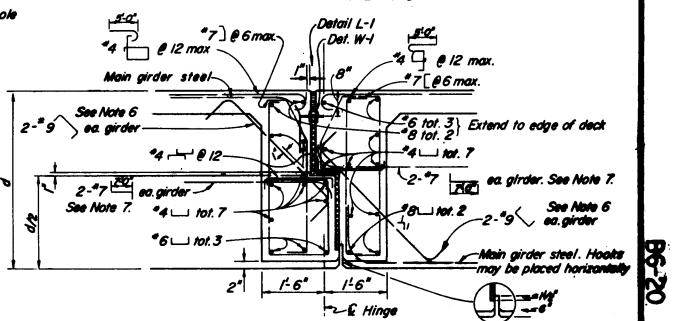
SECTION Y-Y

Scale: 1 1/2" = 1'-0"



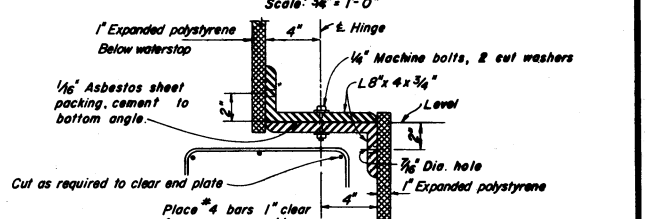
DETAIL "A"

SCALE: 1 1/2" = 1'-0"



TYPICAL EXPANSION HINGE

Scale: 3/4" = 1'-0"



SECTION THRU EXPANSION ASSEMBLY

Scale: 3" = 1'-0"

* See details on other sheets if skew exceeds 20°

DIST	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	SHEET	TOTAL SHEETS

[redacted]

DATE APPROVED SEPTEMBER 1, 1967

[redacted]

9/67	STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS	XS-12-11

T-BEAM HINGE DETAIL — STEEL

BRIDGE NO	POST MILE	DRAWING NO	SHEET	OF

B6-20

B6-20

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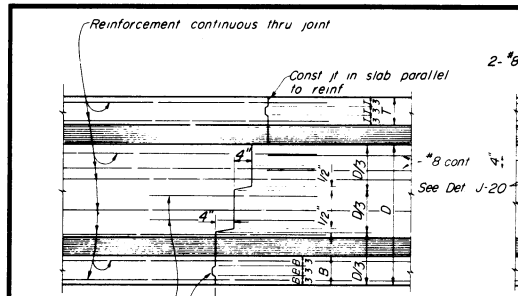
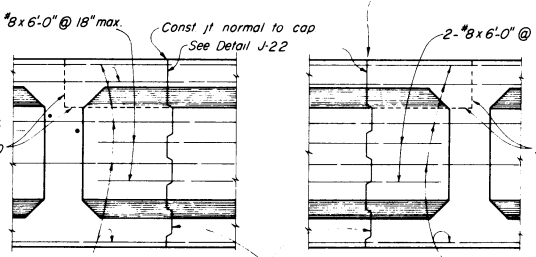
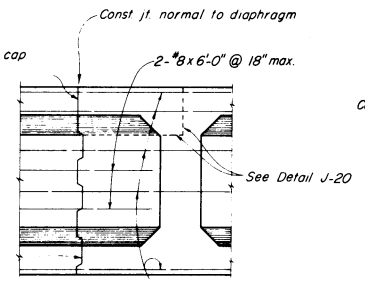


Note 1. These bars may be omitted for prestressed girders.

TRANSVERSE GIRDER CONSTRUCTION JOINTS
DETAIL J-3

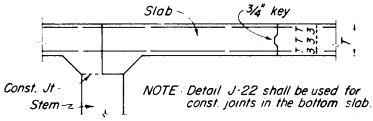


BENT CAP

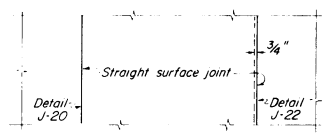


DIAPHRAGMS

LONGITUDINAL CONSTRUCTION JOINTS
DETAIL J-4

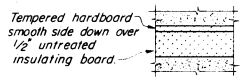


DETAIL J-20 DETAIL J-22

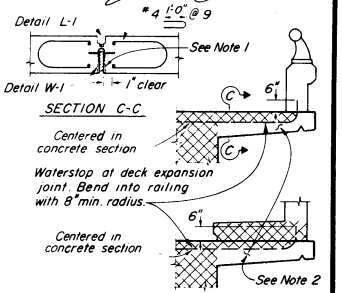


DECK SLAB

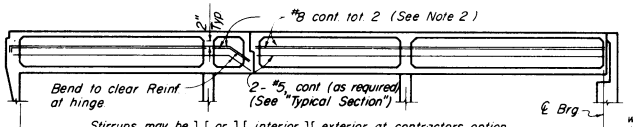
LONGITUDINAL CONSTRUCTION JOINTS
Longitudinal const. joints in slab, if required, are to be located at edge of traffic lanes except as approved by the Engineer.



DETAIL M-1



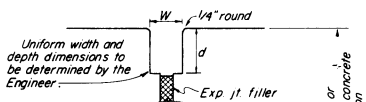
DECK AND SIDEWALK JOINTS
DETAIL C-1



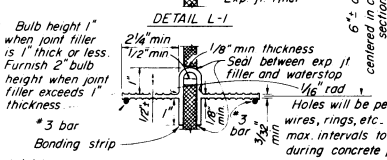
A main girder reinforcing bar must be placed on the inside of each stirrup hook.

GIRDER WEB REINFORCEMENT
DETAIL J-1

Note 2: Bar size may change for prestressed girders, see other sheets.



DETAIL L-1



Holes will be permitted in the outer 1/2" of the web for wires, rings, etc. Tie web to #3 reinforcing bars at 12" max. intervals to support the waterstop in proper position during concrete placement. Alternative detail may be submitted for approval of the Engineer.

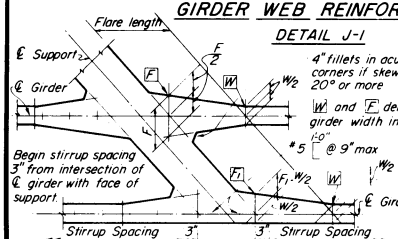
DETAIL W-1

Waterstop to have 5 or more pairs of raised ribs to provide 0.1 sq in. min rib cross-section area on each half of the waterstop. Height of ribs to be 3/32" min.

SEALED DECK JOINT

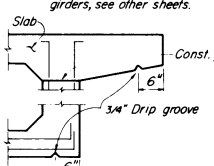
NOTES:

1. Each side may be tapered 1/4" if open joint option is used.
2. Open joint in deck overhang same width as joint in deck. Or expansion joint material 1/2" thicker than material in main portion of joint.

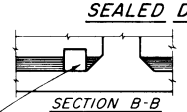


TYPICAL GIRDER FLARE AND STIRRUP SPACING DIAGRAM

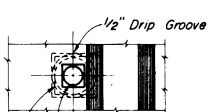
Where the increase in stem width due to flare at the support is not more than 2 1/2" on a side, the stirrups may all be a constant width. In this case the stirrup width shall be determined by the minimum stem width, and the clearance from face of concrete to stirrup will vary throughout the flare.

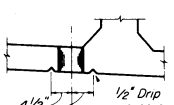


PART SECTION
EXTERIOR GIRDER



SECTION B-B

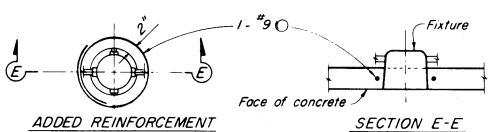




VENT
DETAIL V-1

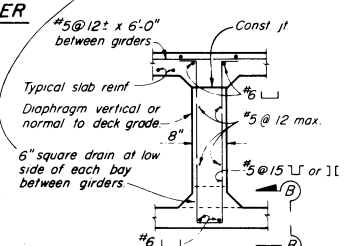
Note 5" ϕ vent in lower slab.

Min of two vents per span in each bay between girders. One vent to be located at low point of span and other vent to be located at opposite end of span @ 1'-6" from face of Abutment or Bent.



ADDED REINFORCEMENT SECTION E-E

RECESSED SOFFIT LIGHT
DETAIL F-1



INTERMEDIATE DIAPHRAGM SECTION
DETAIL D-1

DIST	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	SHEET NO	TOTAL SHEETS

DATE APPROVED SEPTEMBER 1, 1967

9/67 — STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS — File XS-16-22

BOX GIRDER DETAILS NO. 1

BRIDGE NO	POST MILE	DRAWING NO	SHEET	OF

B7-1

B7-1

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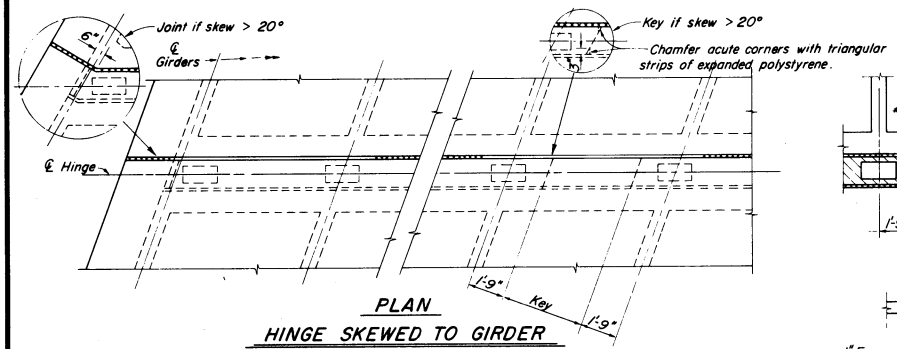
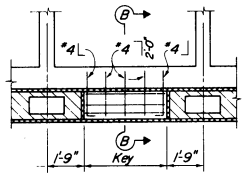
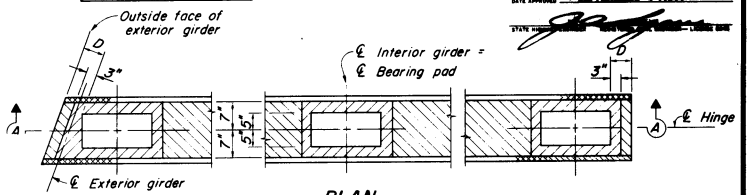


PLAN
HINGE SKEWED TO GIRDER

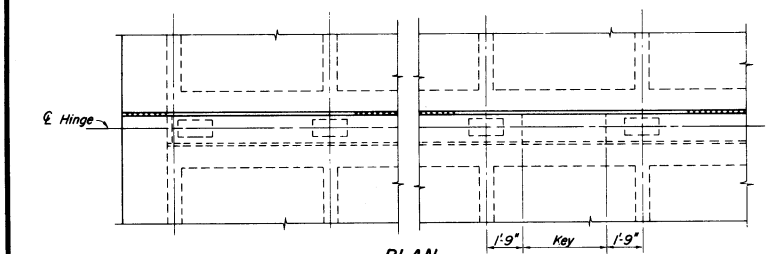


PLAN

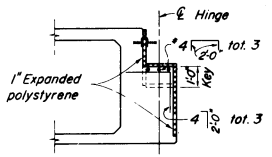
EXTERIOR FACE	D
Vertical	6"
Sloping	1'-0"



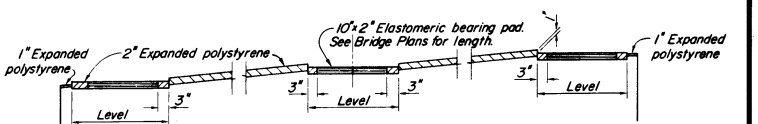
PLAN



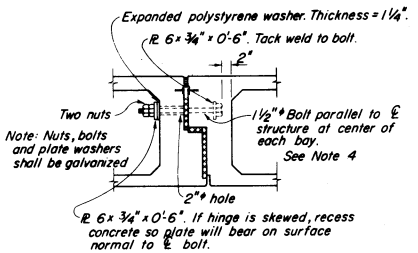
PLAN
HINGE NORMAL TO GIRDER



SECTION B-B
KEY DETAIL

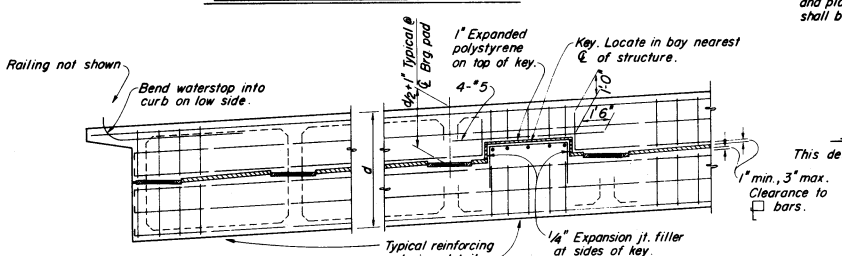


SECTION A-A
TYPICAL BEARING DETAIL



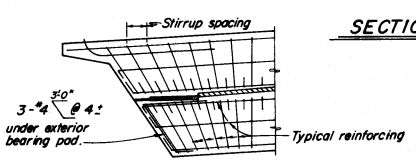
EQUALIZING BOLT DETAIL

This detail not required on structures with only one hinge.

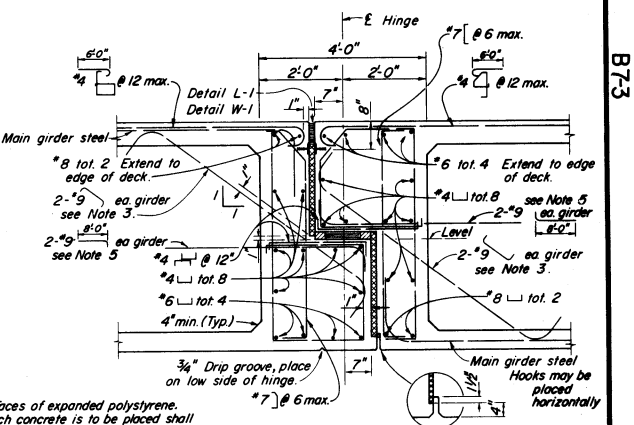


VERTICAL EXTERIOR FACE

SECTION AT ℄ HINGE



SLOPING EXTERIOR FACE



SECTION THRU HINGE

Notes :

1. Vertical surfaces of expanded polystyrene, against which concrete is to be placed shall be faced with hardboard or other suitable material which is approved by the Engineer.
2. To provide for free movement of the completed hinge, concrete is to be excluded from the joint by sealing all openings.
3. Bars may be bundled vertically with hooks horizontal if required for clearance.
4. When the key interferes with the placement of the equalizing bolt, place two bolts at 3-foot centers in either adjacent cell.
5. Bars may be bent in the horizontal plane to clear inclined #9 bars.

DIST	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.
DATE APPROVED SEPTEMBER 1, 1967
STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

9 / 67

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-12-43

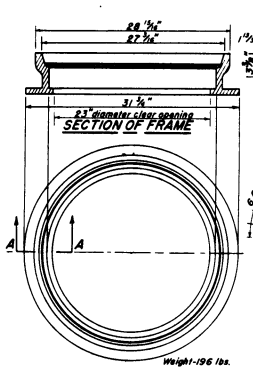
BOX GIRDER HINGE DETAIL · ELASTOMERIC

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF

B7-3

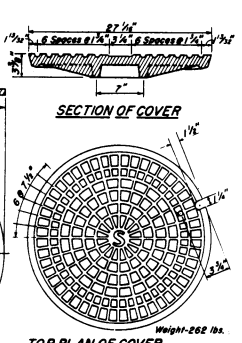
B7-3

Return to Table of Contents



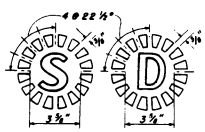
SECTION OF FRAME

PLAN OF FRAME



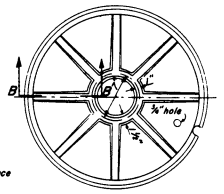
SECTION OF COVER

TOP PLAN OF COVER

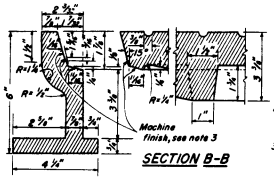


DETAILS OF LETTERS

Surface of letter shall be flush with finished surface



BOTTOM PLAN OF COVER



SECTION B-B

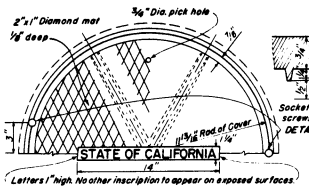
SECTION A-A

NOTES-

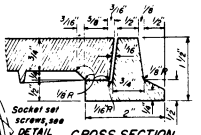
1. The manhole frame and cover shall be made of gray cast iron conforming to the latest specifications.
2. All parts of the manhole frame and cover except machined surfaces shall be coated with asphaltum paint.
3. The manhole frame and cover shall be tested for accuracy of fit and shall be marked in sets before delivery. The cover shall fit the frame snugly but not tightly.
4. Covers for use on sewer structures shall bear the letter "S"; on storm drain structures the letter "D"; on openings for utilities the letter "U".
5. The weights of the frame and cover shall not vary more than two per cent from those given hereon.

NON-ROCKING MANHOLE FRAME AND COVER FOR DECKS

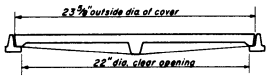
DETAIL U45



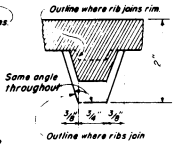
TOP OF MANHOLE FRAME & COVER



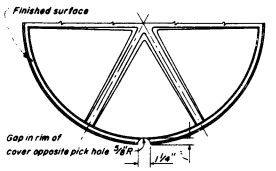
CROSS SECTION THROUGH RIM



CROSS SECTION THROUGH FRAME & COVER

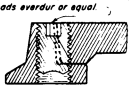


CROSS SECTION THROUGH RIB AT MID RADIUS



BOTTOM OF MANHOLE COVER

Drill and tap hole and install 3/4" x 1 1/4" socket set screw, hexagonal hole, U.S.S. threads everdur or equal.

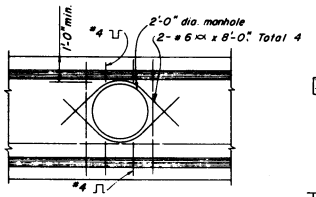


MANHOLE COVER LOCKING DEVICE DETAIL

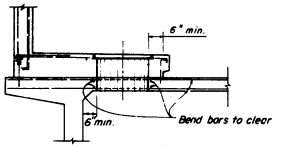
NOTE: Frame and cover shall be CAST IRON. Weight - 130 lbs.
Material and workmanship shall be in accordance with the latest specifications.
Galvanize complete assembly after fabrication.

MANHOLE FRAME AND COVER FOR SIDEWALKS

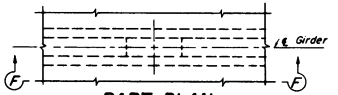
DETAIL U46



ELEVATION F-F



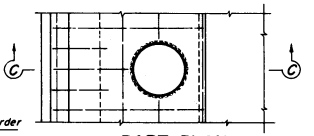
SECTION C-C



PART PLAN

GIRDER STEM ACCESS OPENING

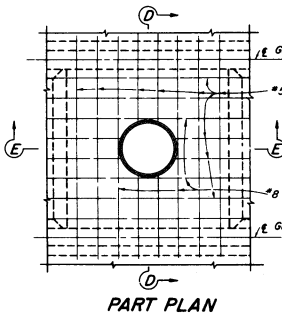
DETAIL U41



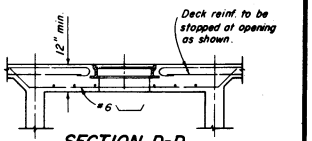
PART PLAN

SIDEWALK ACCESS OPENING

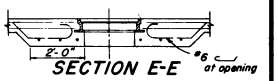
DETAIL U42



PART PLAN

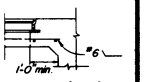


SECTION D-D



SECTION E-E

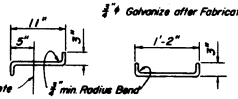
Note:
Where manhole is located adjacent to a diaphragm or abut., substitute Half Section E'-E' on one side of Section E-E.



HALF SECTION E'-E'

DECK ACCESS OPENING

DETAIL U43



LADDER RUNG DETAIL

DETAIL U44

___ Required

NOTES

1. For exact location of openings see other sheets.
2. Location and size of manholes may be modified as directed by the Engineer, provided minimum dimensions are maintained.
3. All reinforcement detailed to be placed in addition to reinforcement shown on other sheets.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — License 5606

DATE APPROVED SEPTEMBER 1, 1967

STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE 5646

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UTILITIES DETAIL NO. 2

BRIDGE NO	POST MILE	DRAWING NO	SHEET	OF

B7-11

B7-11

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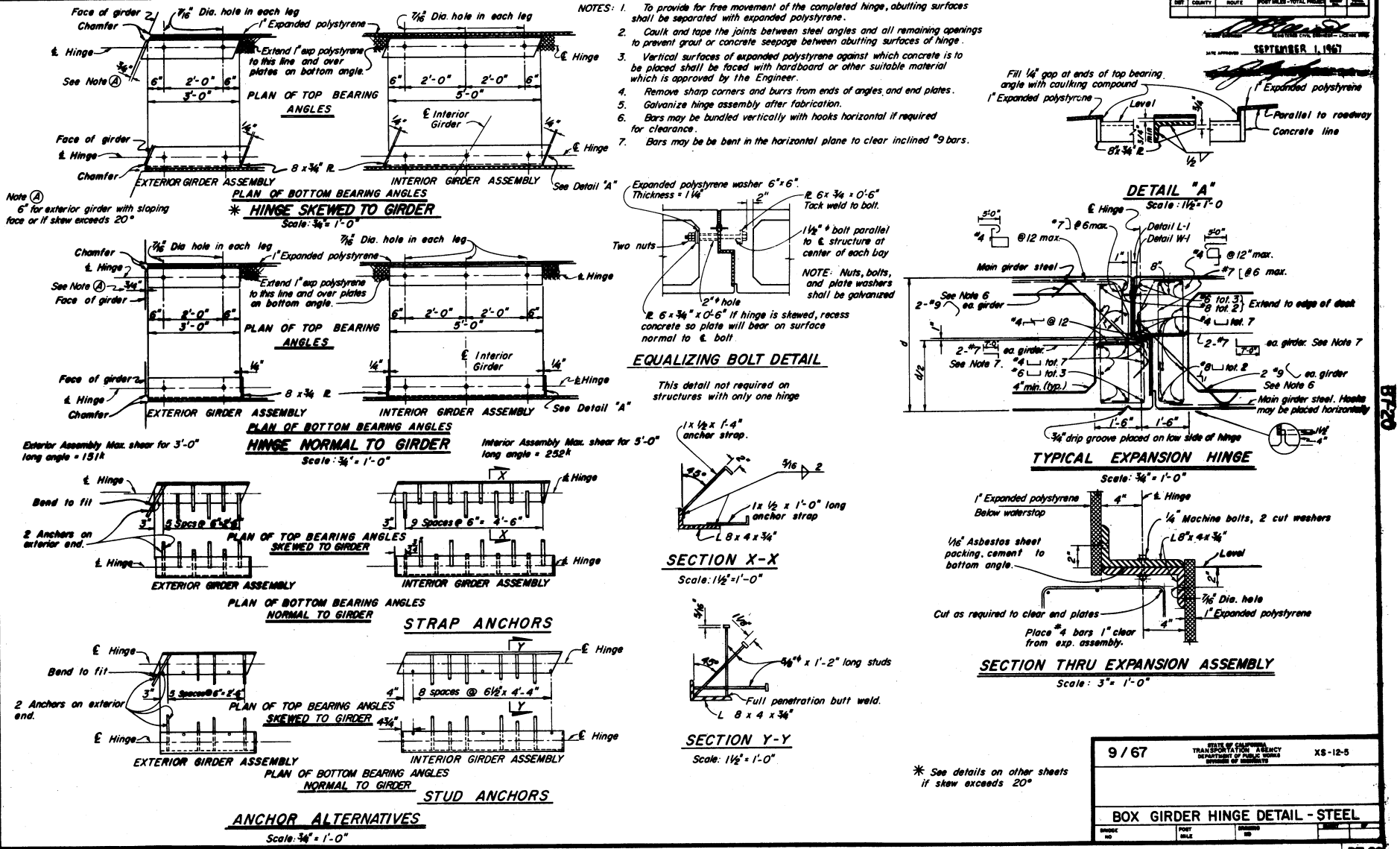

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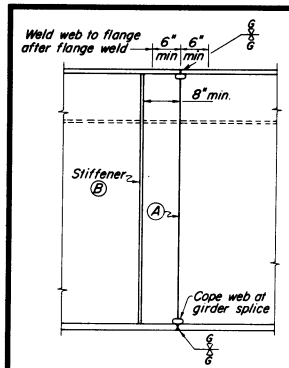
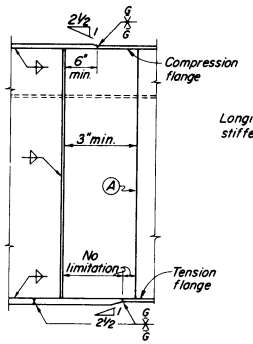
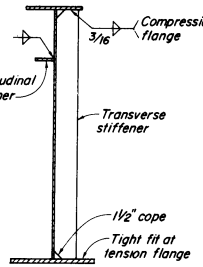
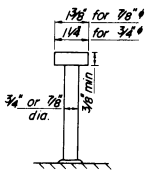


GIRDER SPLICE FIELD OR SHOP

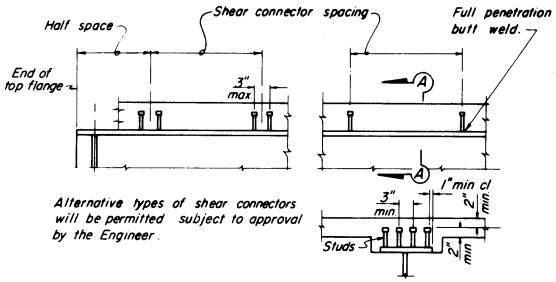




ASSEMBLY AND FABRICATION DETAILS



STUD CONNECTOR

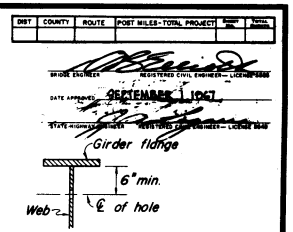


Alternative types of shear connectors will be permitted subject to approval by the Engineer.

SECTION A-A

SHEAR CONNECTOR DETAILS

Scale 1" = 1'-0"

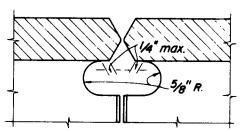


1" max. diameter hole at 4'± min. spacing to be used for falsework support when specified by the contractor. Contractor to determine location, size and spacing.

2" max. diameter hole to be drilled where lighting conduit passes through girder web. For location and size of hole see "Lighting Plan".

℄ of holes to be 6" min. from horizontal or vertical weld.

HOLES FOR CONDUIT AND FALSEWORK



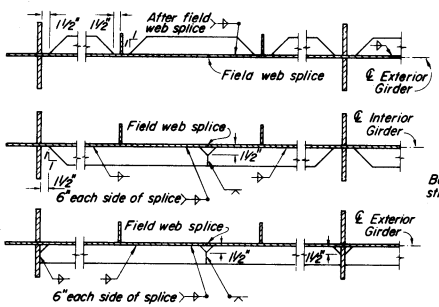
WEB COPE AT GIRDER SPLICE

NOTE: Alternative girder splices will be permitted subject to the approval by the Engineer.

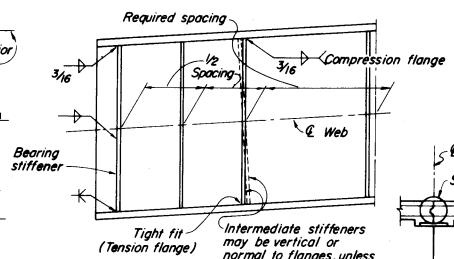
(A) Web splices shall be full penetration butt welds. All weld areas on the exterior face of exterior girders shall be ground flush. Where welds on a girder interfere with longitudinal stiffeners, the weld areas shall be ground flush. Additional areas shall be ground for radiography.

Under full dead load and deck shrinkage, as shown on the camber diagram, girder ends and bearing stiffeners shall be vertical except they may be normal to grade for grades less than 2 percent.

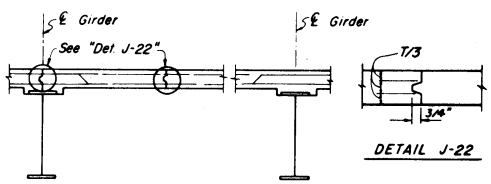
(B) Stiffeners near a field splice may be field welded.



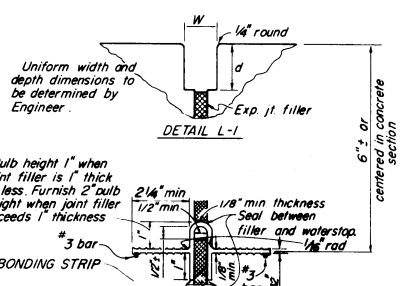
LONGITUDINAL STIFFENER DETAILS



TRANSVERSE STIFFENERS



DETAIL J-22



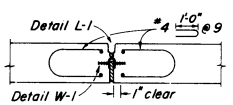
DETAIL L-1

DETAIL W-1

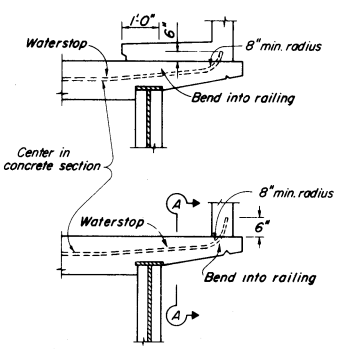
Waterstop to have 5 or more pairs of raised ribs to provide 0.1 sq. in. min. rib cross-section area on each half of the waterstop. Height of ribs to be 3/32" min.

Holes will be permitted in the outer 1/2" of the web for wires, rings, etc. Tie web to #3 reinforcing bars at 12" max. intervals to support the waterstop in proper position during concrete placement. Alternative detail may be submitted for approval of the Engineer.

SEALED DECK JOINT



SECTION A-A



DECK JOINTS

1. Longitudinal construction joints in slab, if required, are to be located at edge of traffic lanes, except as otherwise approved by the Engineer.
2. Reinforcing shall be continuous through all construction joints.

DECK CONSTRUCTION

DIST	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheets	Total

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

DATE APPROVED: SEPTEMBER 1967

STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

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STEEL GIRDER DETAILS

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF

B9-1

90

B9-1

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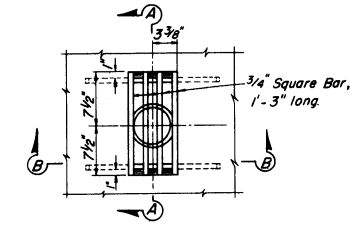
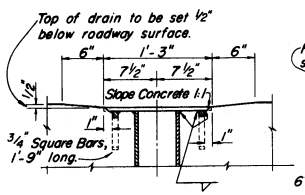
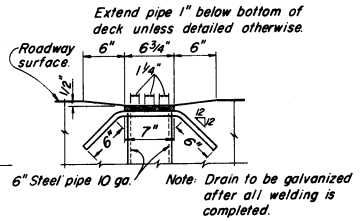


PLAN



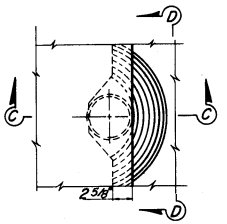
SECTION A-A



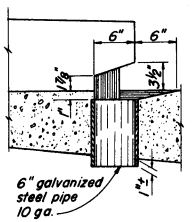
SECTION B-B

DRAIN DETAIL - TYPE "A"

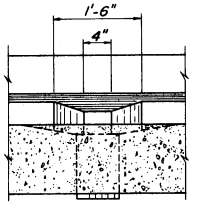
Scale: 1 1/2" = 1'-0"



PLAN



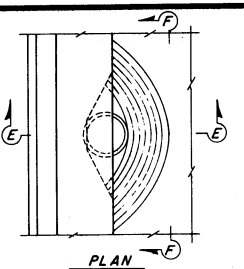
SECTION C-C



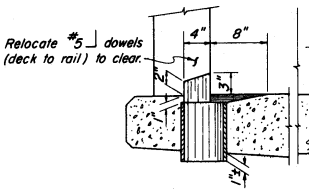
SECTION D-D

DRAIN DETAIL - TYPE "B"

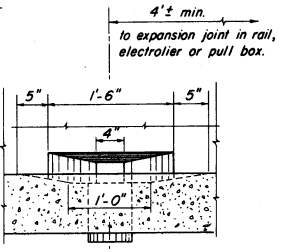
FOR TYPES 10 AND 11 BARRIER RAILINGS



PLAN



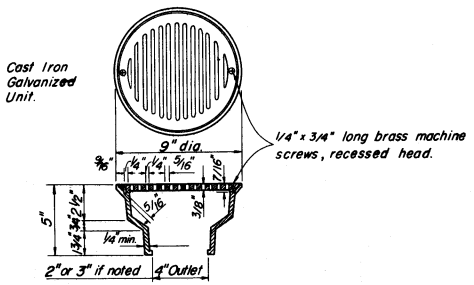
SECTION E-E



SECTION F-F

DRAIN DETAIL - TYPE "B"

FOR TYPE 9 BARRIER RAILING



AREA DRAIN

DIST	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

DESIGN ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

DATE APPROVED SEPTEMBER 1, 1967

STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

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STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-16-60

DRAIN DETAILS

BRIDGE NO	DRAWING NO	SHEET	OF

B9-2

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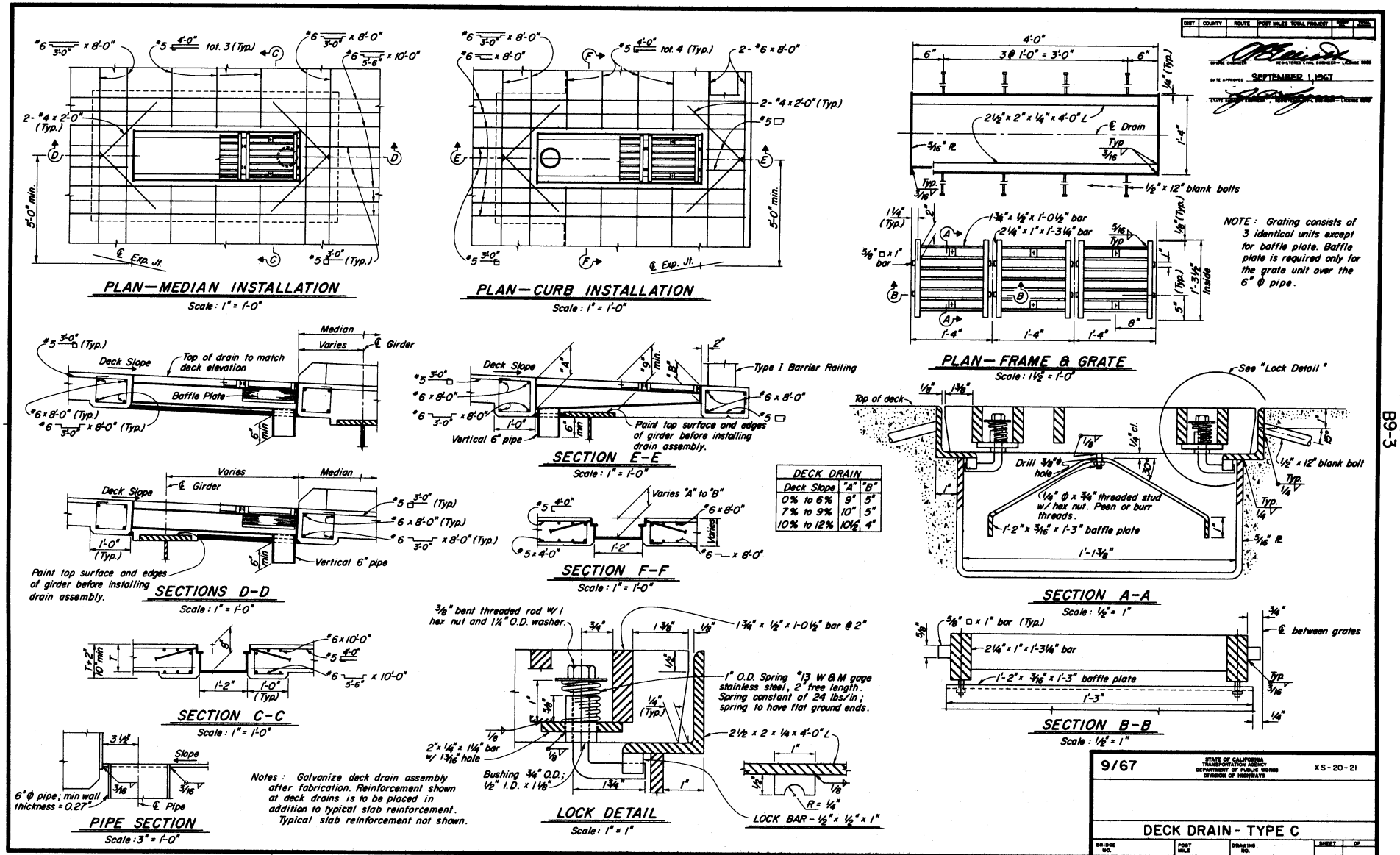

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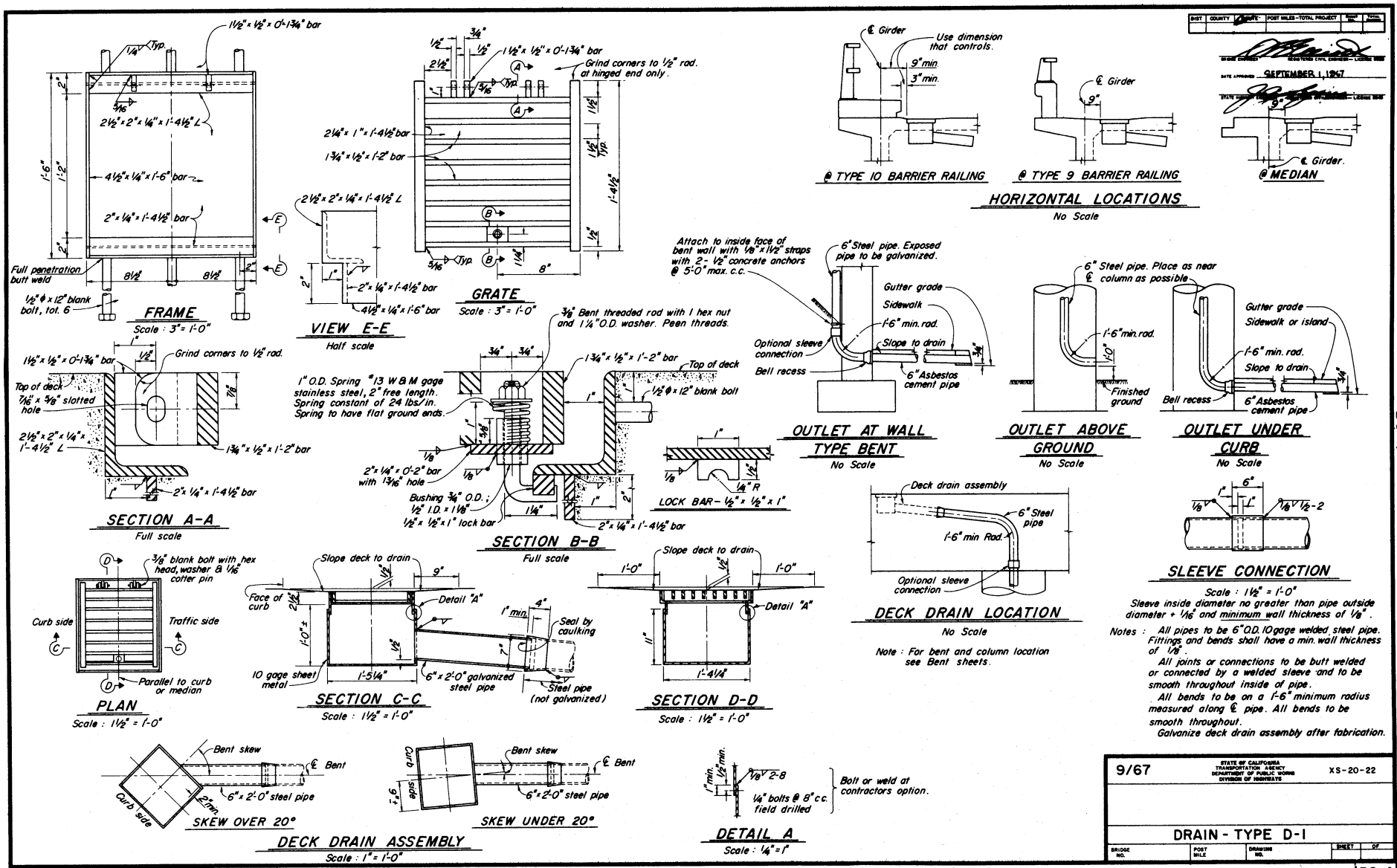

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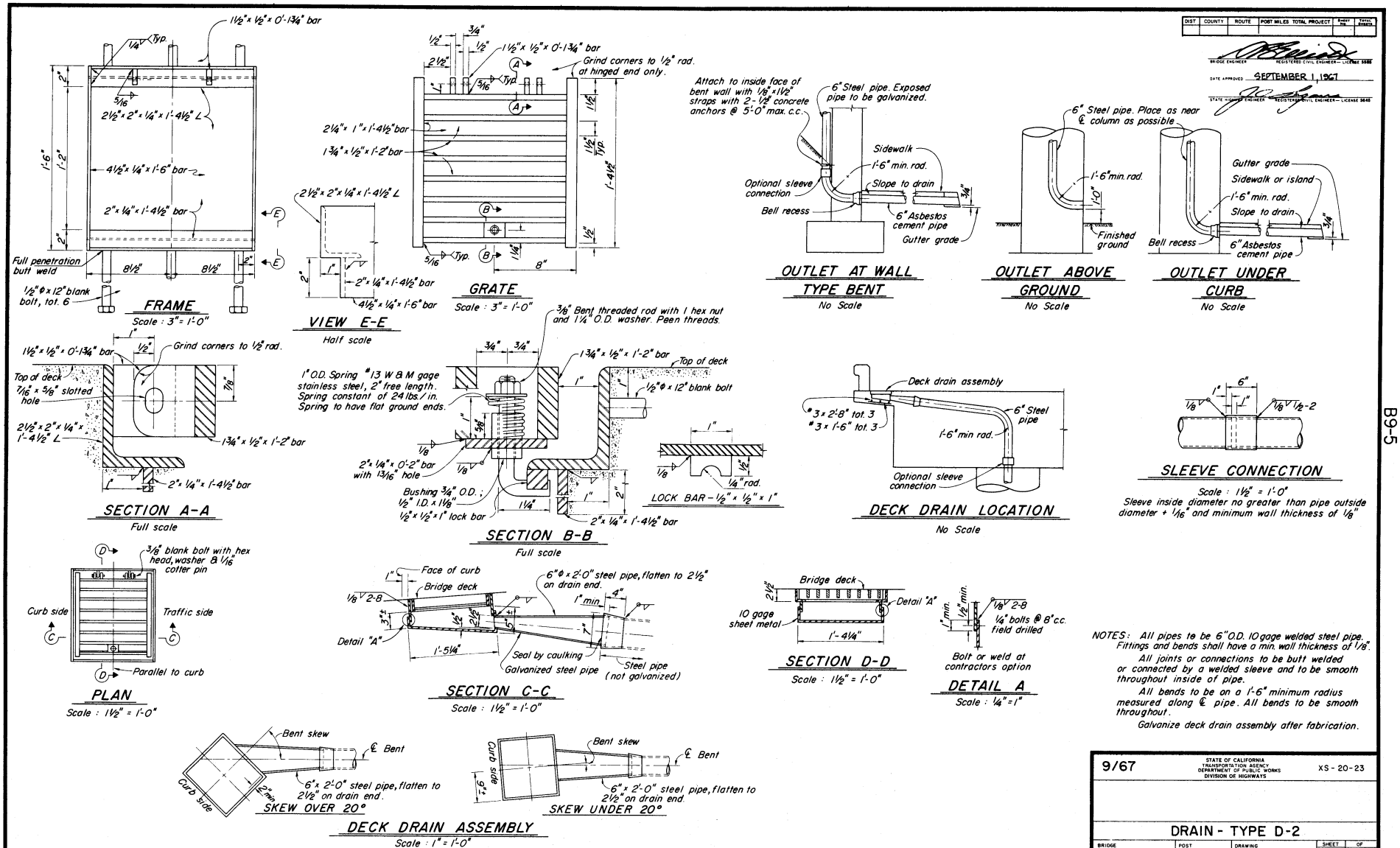

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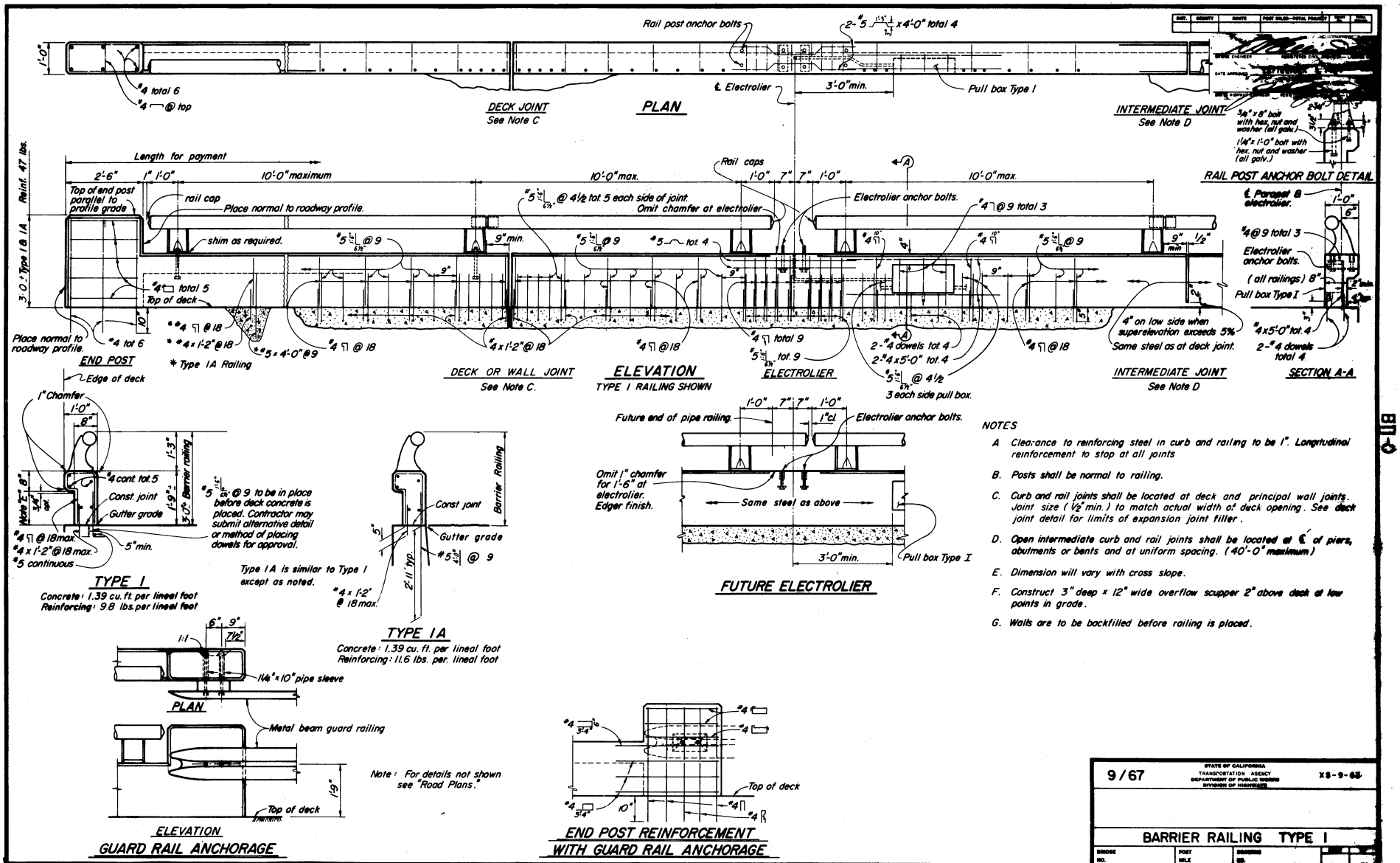

NOTES

A. Clearance to reinforcing steel in curb and railing to be 1". Longitudinal reinforcement to stop at all joints

B. Posts shall be normal to railing.

C. Curb and rail joints shall be located at deck and principal wall joints. Joint size (½" min.) to match actual width of deck opening. See deck joint detail for limits of expansion joint filler.

D. Open intermediate curb and rail joints shall be located at ℄ of piers, abutments or bents and at uniform spacing. (40'-0" maximum)

E. Dimension will vary with cross slope.

F. Construct 3" deep x 12" wide overflow scupper 2" above deck at low points in grade.

G. Walls are to be backfilled before railing is placed.

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STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-9-65

BARRIER RAILING TYPE I

BRIDGE NO. | POST MILE | DRAWING NO.

B11-C

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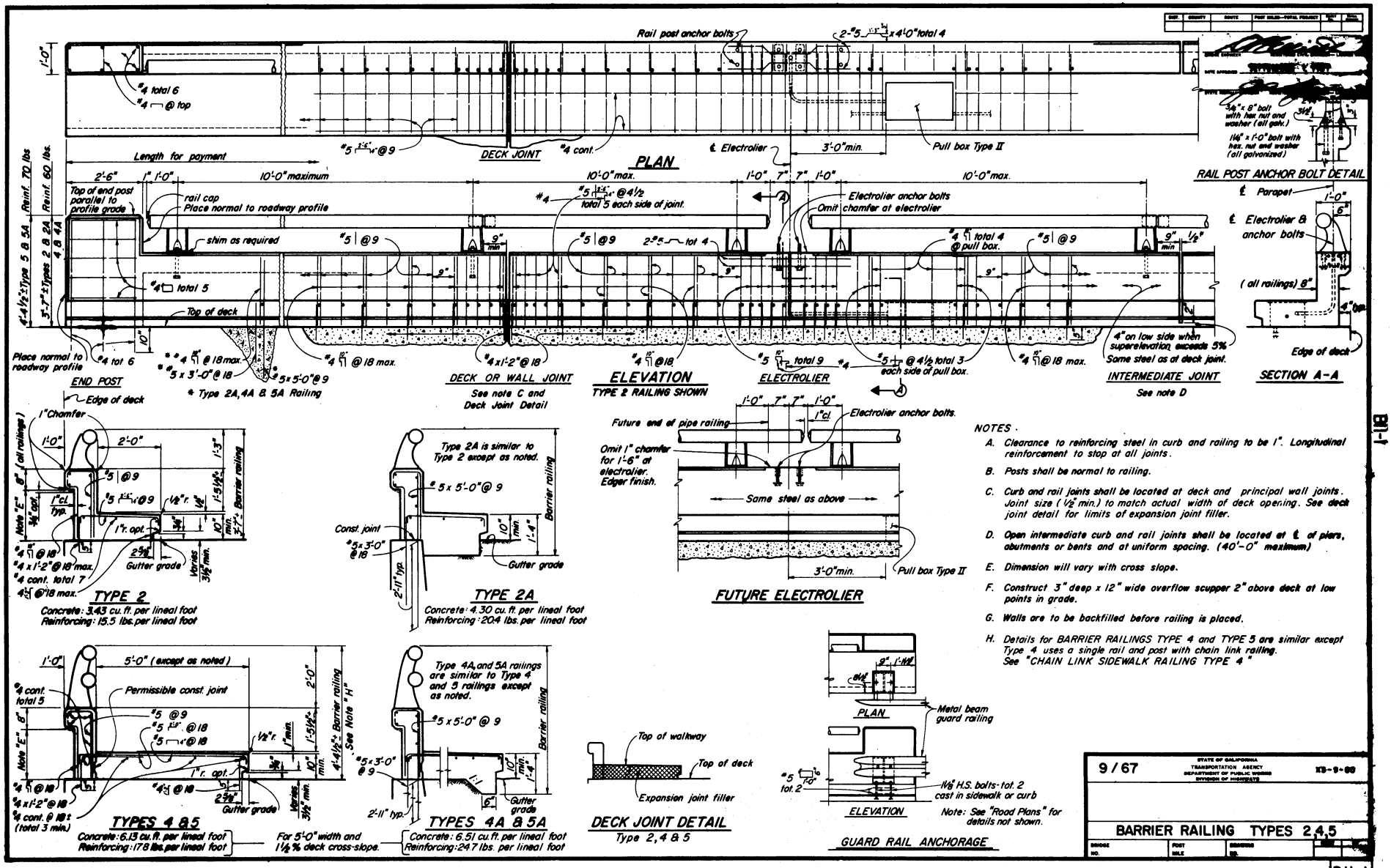

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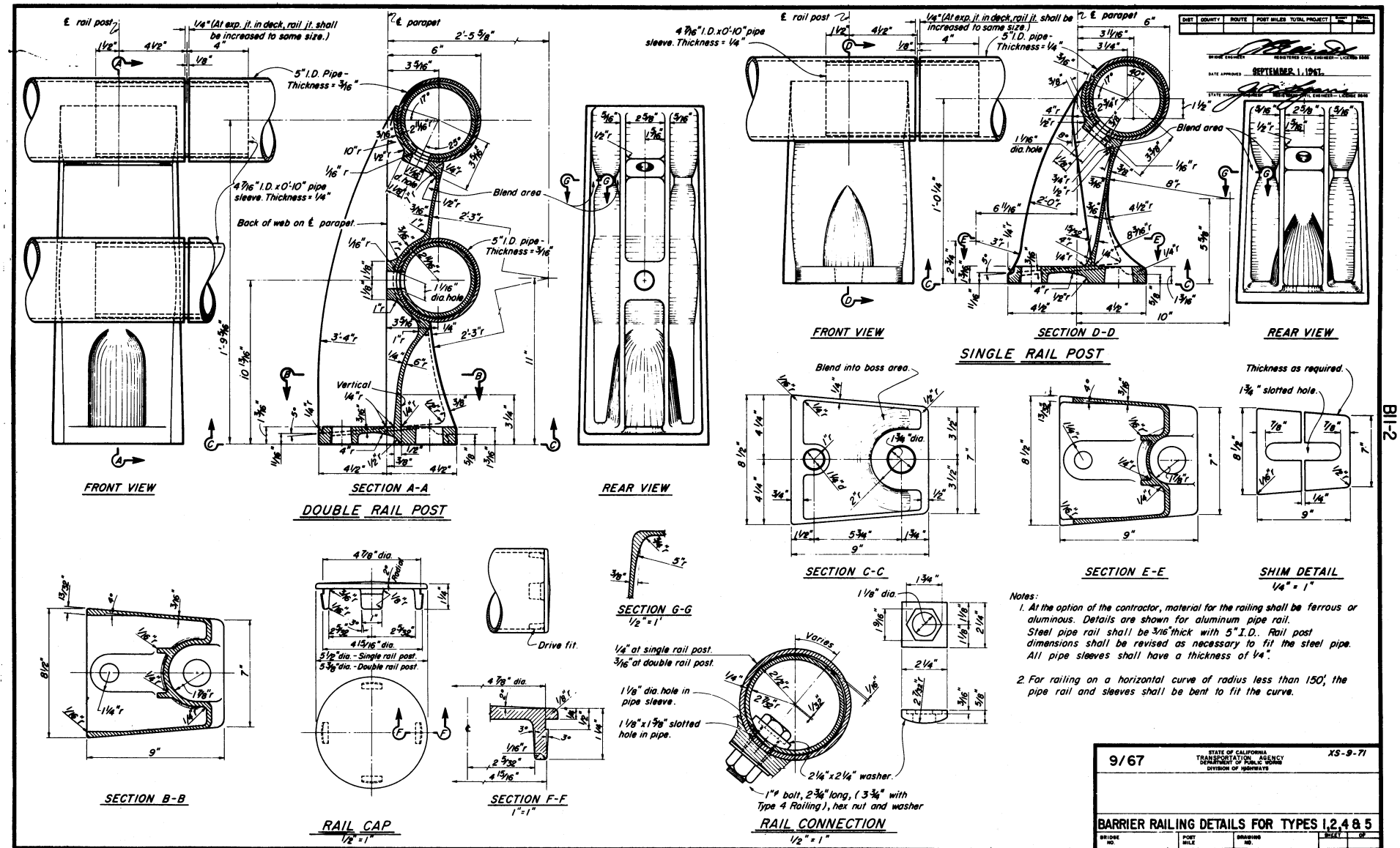

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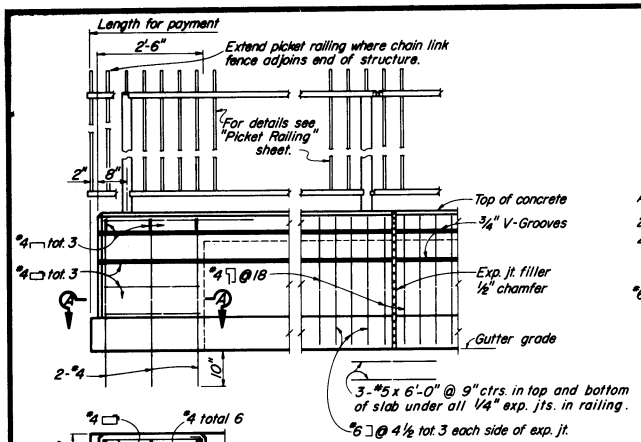
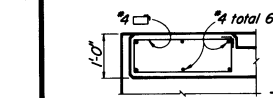
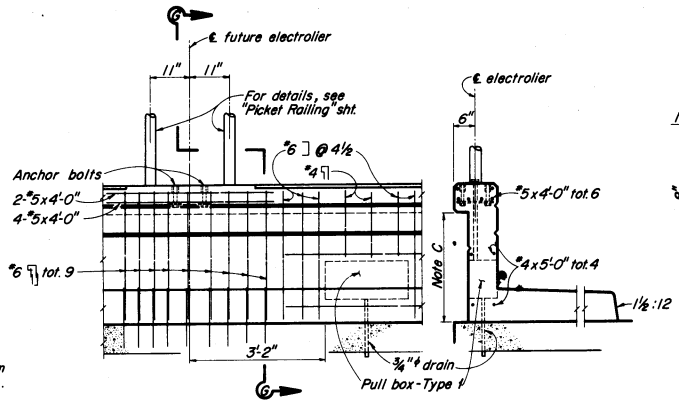




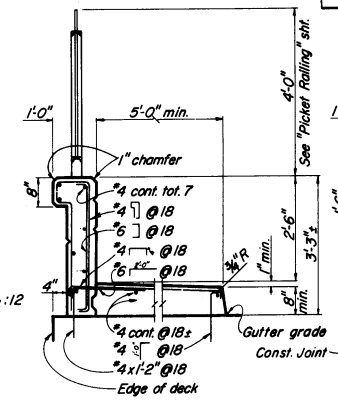
SECTION A-A

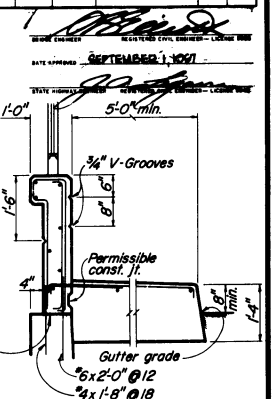
RAILING AT END POST



SECTION G-G

RAILING CLOSURE AT ELECTROLIER





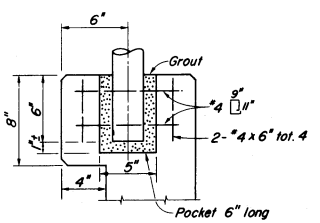
TYPE 6

Conc. 6.00 cu. ft. / lin. ft.
Reinf. 21.2 lbs. / lin. ft.
For 5'-0" width
Conc. 0.67 cu. ft. / lin. ft.
Reinf. 1.1 lbs. / lin. ft.
Per additional ft. (width)

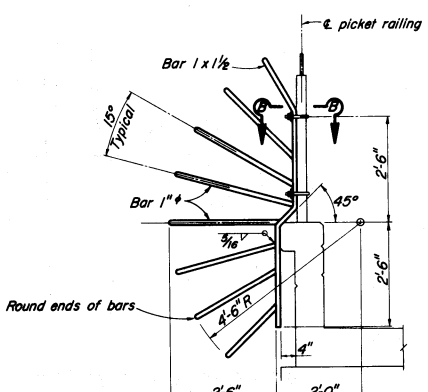
TYPE 6A

Conc. 9.35 cu. ft. / lin. ft.
Reinf. 23.7 lbs. / lin. ft.
Conc. 1.34 cu. ft. / lin. ft.
Reinf. 1.1 lbs. / lin. ft.

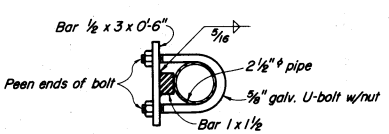
Notes:
A. Railing shall conform to horizontal and vertical alignment.
B. Construct 3" deep x 12" wide overflow scuppers 2" above deck at low points in grade.
C. Dimension will vary with cross-slope of deck.
D. Walls are to be backfilled before railing is placed.
E. Curb and wall exp. jts. to be located at all deck joints, at ℄ piers or bents and at uniform spacing (40' max.) between those specified. Joint size to be 1/4" min. and increased to match deck joints.



ANCHORAGE DETAIL



ELEVATION



SECTION B-B
Scale: 3" = 1'-0"

Note: Access preventer to be galvanized after fabrication. Location to be determined by the Engineer.

ACCESS PREVENTER DETAIL
____ Required

DIST	COUNTY	ROUTE	POST MILES	TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.
DATE APPROVED SEPTEMBER 1, 1967
STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

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STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-9-72

BARRIER RAILING - TYPE 6

BRIDGE NO	POST MILE	DRAWING NO.	SHEET	OF

B11-3

B11-3

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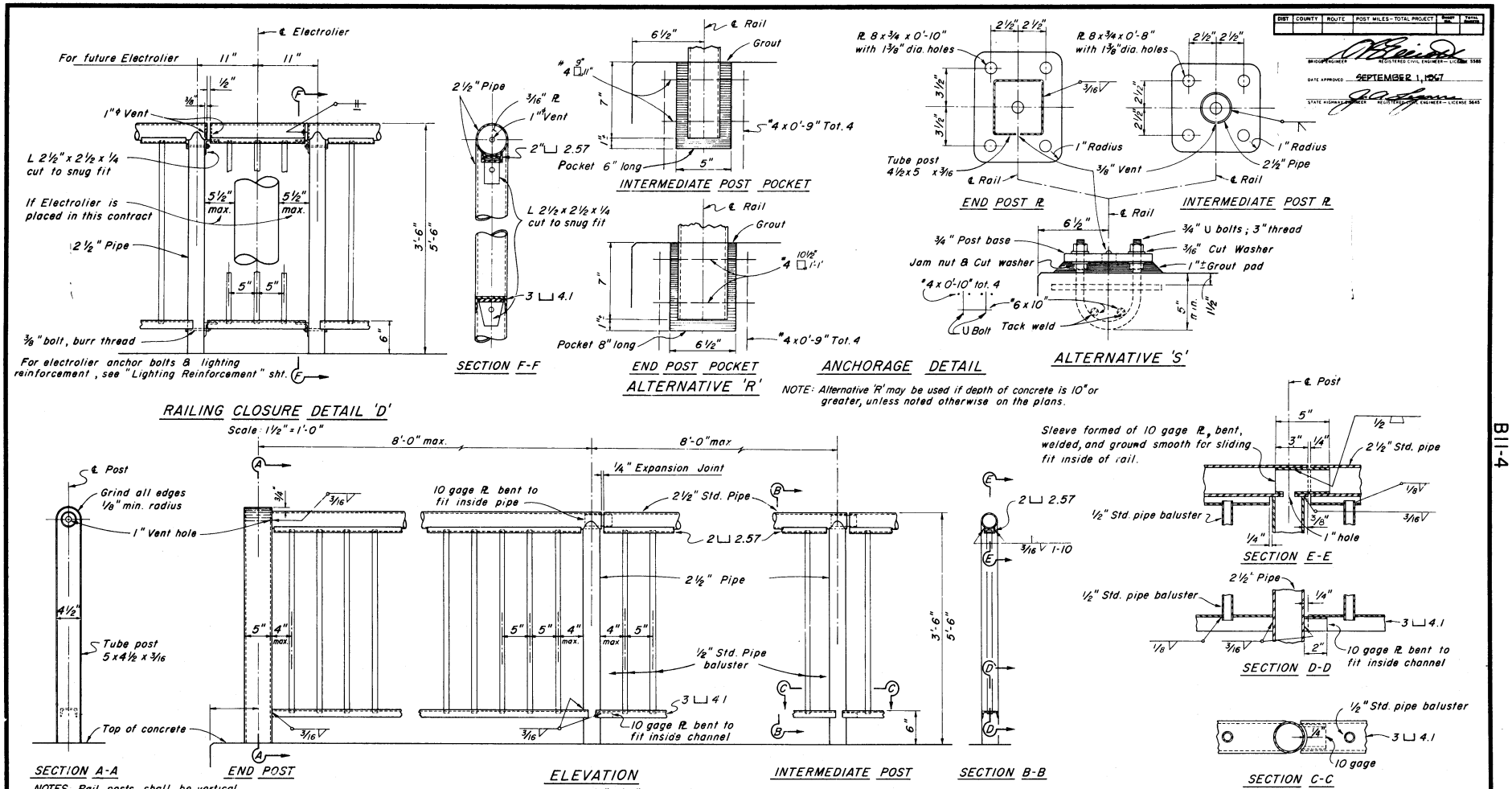

NOTES: Rail posts shall be vertical.
Space posts to clear expansion joints by 9" min. to ℄ of post.
Rail joints at expansion joints in the deck shall provide same allowance for movement with corresponding increase in length of sleeve.
Railing on bridge wingwalls to be placed after walls are backfilled.

CURVED ALIGNMENT

50' Radius or greater = 8' max. post spacing with straight panels.
30'–50' Radius = 8' max. post spacing with curved panels.
30'–50' Radius = 6' max. post spacing with straight panels.
Less than 30' = 6' max. post spacing with curved panels.

3'-6" RAILING - Intermediate posts to be 2 1/2" Std pipe

5'-6" RAILING - Intermediate posts to be 2 1/2" extra strong pipe.

3'-6" Railing = approx. 21 lbs. per lineal foot.
5'-6" Railing = approx. 28 lbs. per lineal foot

DIST	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE 5586

DATE APPROVED SEPTEMBER 1, 1967

STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE 5645

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STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-9-65

PEDESTRIAN PIPE RAILING

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF

B11-4

B11-4

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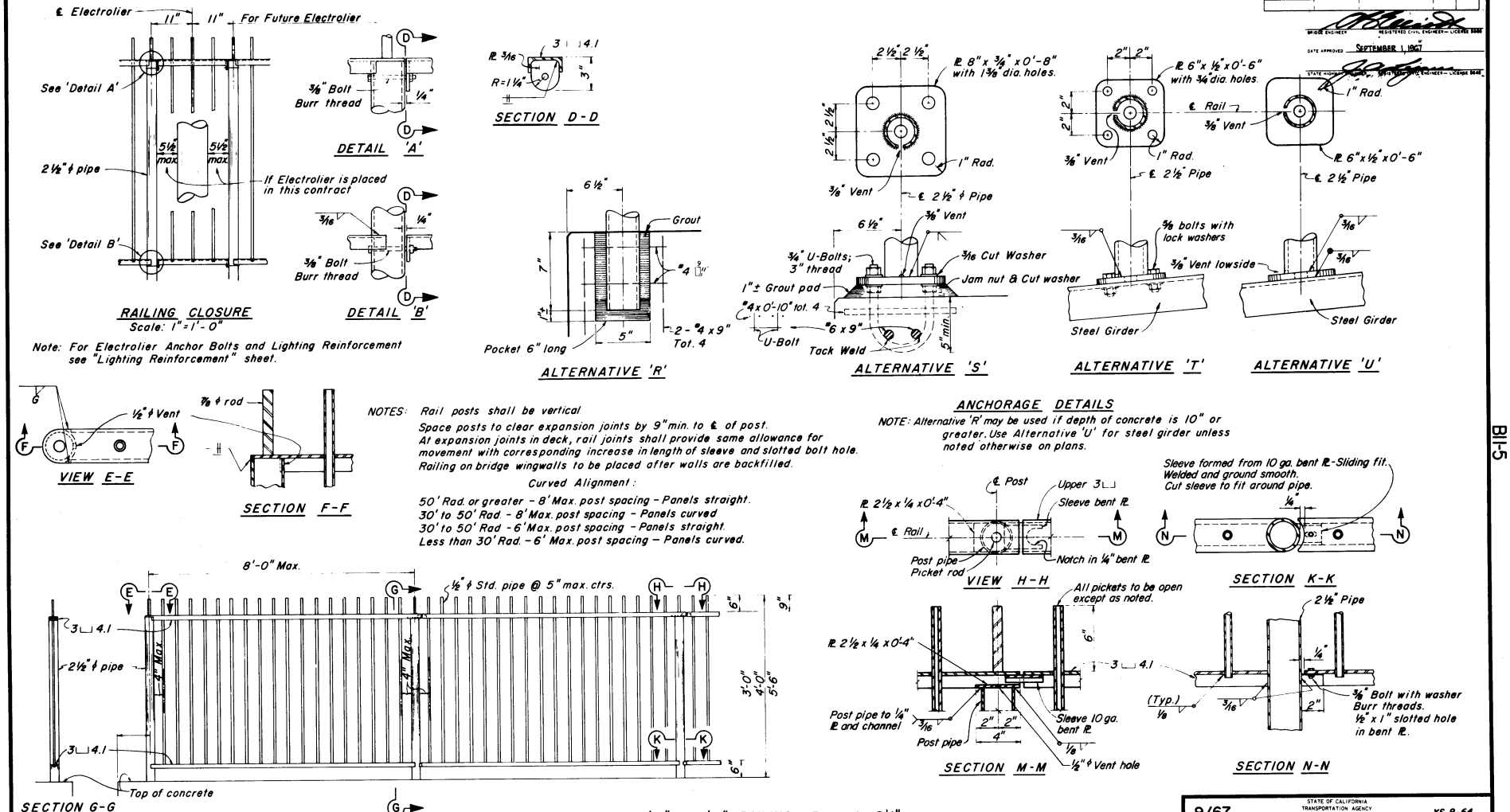

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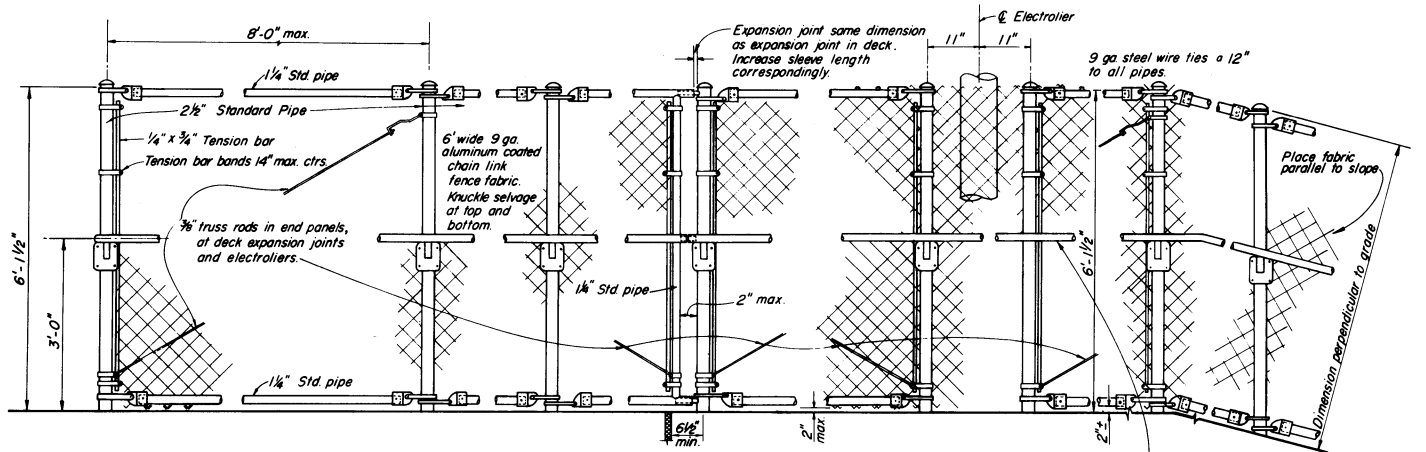
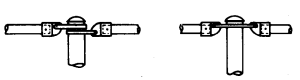
DIST	COUNTY	ROUTE	POST MILES – TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

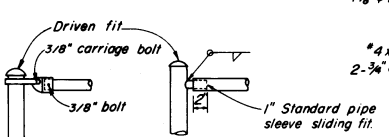
DATE APPROVED SEPTEMBER 1, 1967

STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

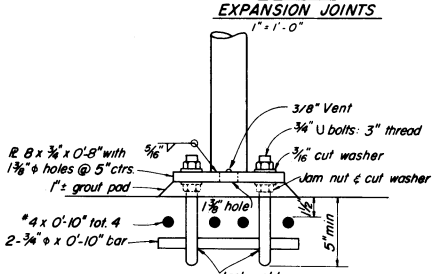




ALTERNATIVE DETAILS

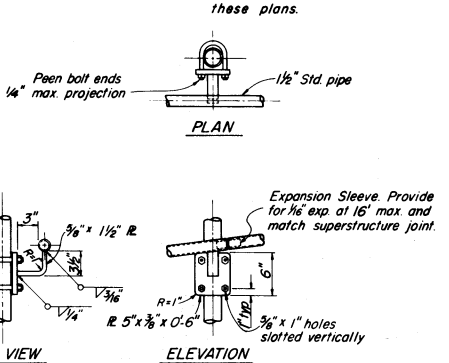


TYPICAL CONNECTION DETAILS

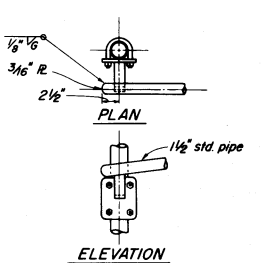


ANCHORAGE DETAIL

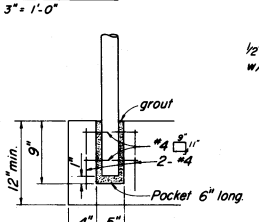
3" = 1'-0"



HAND RAIL BRACKET



HAND RAIL AT END



ALTERNATIVE ANCHORAGE DETAIL

May be used when thickness of concrete is 12" or more.

NOTES :

1. Railing assembly except chain link fabric to be galvanized after fabrication.
2. Peen all ⅜" bolts.
3. Railing shall conform to horizontal and vertical alignment. Posts shall be vertical. Top and bottom pipes shall be bent if radius is 150' or less -- may be on 8' chords if radius is over 150'.
4. When railing is on slope, 6' chain link fabric shall be placed parallel to slope.
5. All exposed corners to be smooth.
6. Alternative details may be submitted by Contractor for Engineer's approval.

9/67	STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS	XS-9-73

CHAIN LINK SIDEWALK RAILING

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF

B11-7

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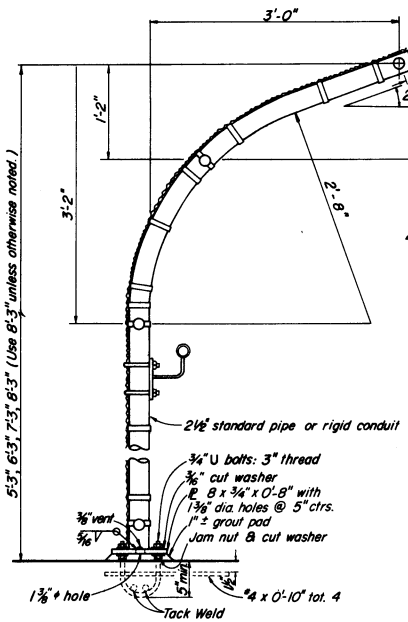
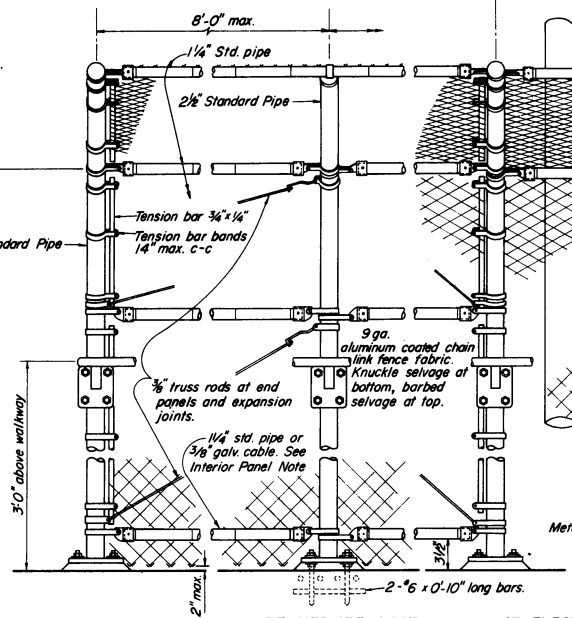
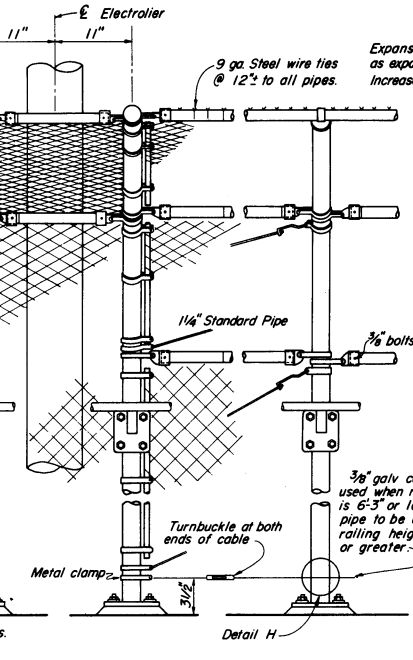


TYPICAL POST DETAIL

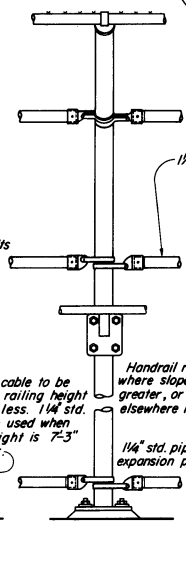


END POST

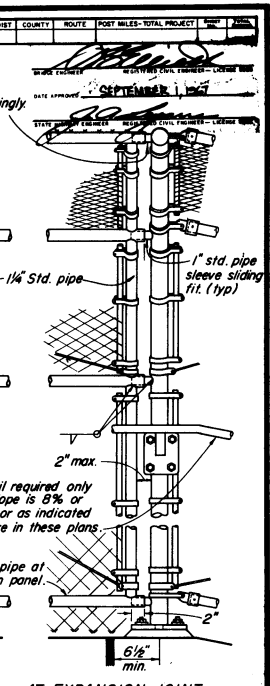
INTERMEDIATE POST



AT ELECTROLIER

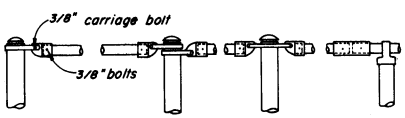


TYPICAL INTERIOR PANEL



AT EXPANSION JOINT

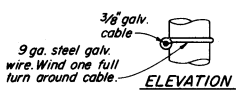
ELEVATION



ALTERNATIVE DETAILS

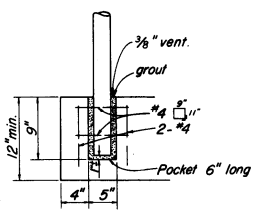
TYPICAL DETAILS

PLAN



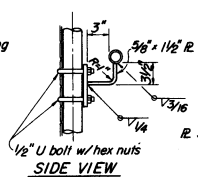
ELEVATION

DETAIL "H"

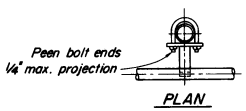


ALTERNATIVE ANCHORAGE DETAIL

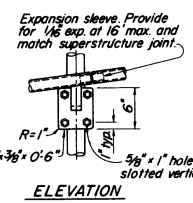
May be used when thickness of concrete is 12" or more



SIDE VIEW

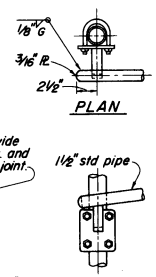


PLAN



ELEVATION

HAND RAIL BRACKET



PLAN

ELEVATION

HAND RAIL AT END

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. Horizontal pipes shall be bent if radius is 150' or less -- may be on 8' chords if radius is over 150'.
3. All exposed corners to be smooth.
4. Peen all 3/8" bolts.
5. When railing is on slope, fabric shall be placed parallel to slope.
6. Alternative details may be submitted by Contractor for Engineer's approval.

DIST	COUNTY	ROUTE	POST MILES- TOTAL PROJECT	SHEET	TOTAL SHEETS

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

DATE APPROVED SEPTEMBER 1, 1967

STATE BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

9/67

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-9-74

CHAIN LINK SIDEWALK RAILING TYPE 3

BRIDGE NO	POST MILE	DRAWING NO.	SHEET	OF

B11-8

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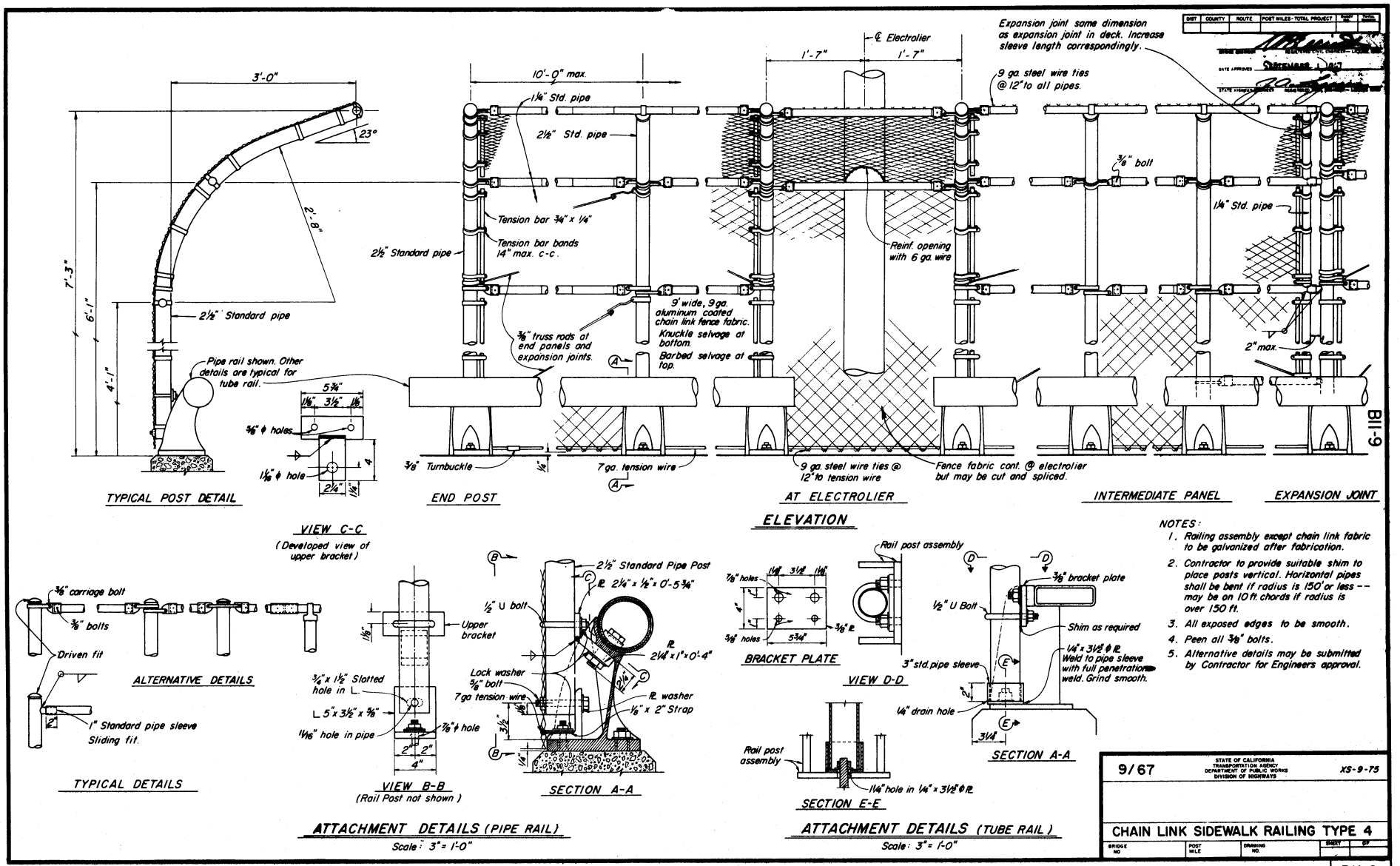

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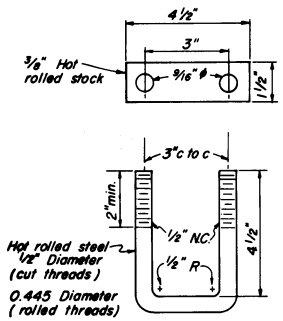
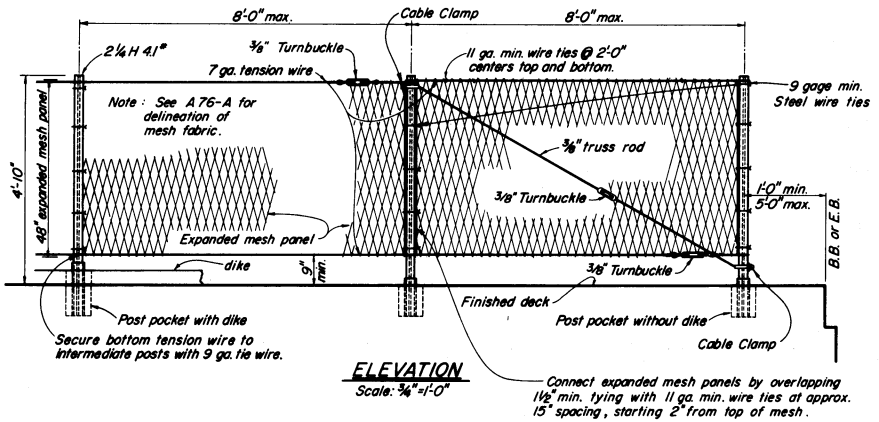
DIST	COUNTY	ROUTE	POST MILES- TOTAL PROJECT	SHEET NO.	TOTAL SHEETS



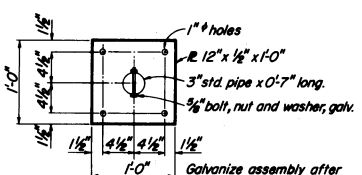
CABLE CLAMP DETAIL

SCALE: 1/2"=1"

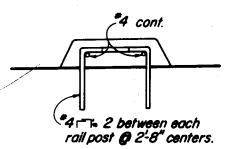


ELEVATION

Scale: 3/8"=1'-0"



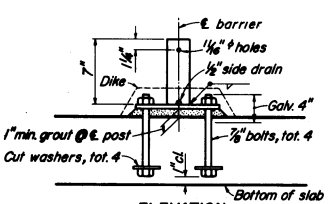
PLAN



DIKE SECTION

Scale: 1 1/2"=1'-0"

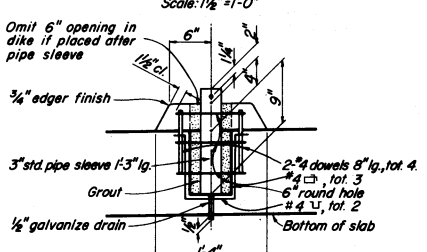
NOTE: All hardware except panels to be galvanized.



ELEVATION
BOLTED POST ANCHORAGE

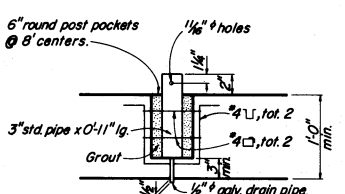
Scale: 1 1/2"=1'-0"

Use this detail when use of post pocket is precluded by type of structure or special details.



POST POCKET WITH DIKE

Scale: 1 1/2"=1'-0"



POST POCKET WITHOUT DIKE

Scale: 1 1/2"=1'-0"

9/67	STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS	X 9-9-70
MESH MEDIAN BARRIER		
BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF

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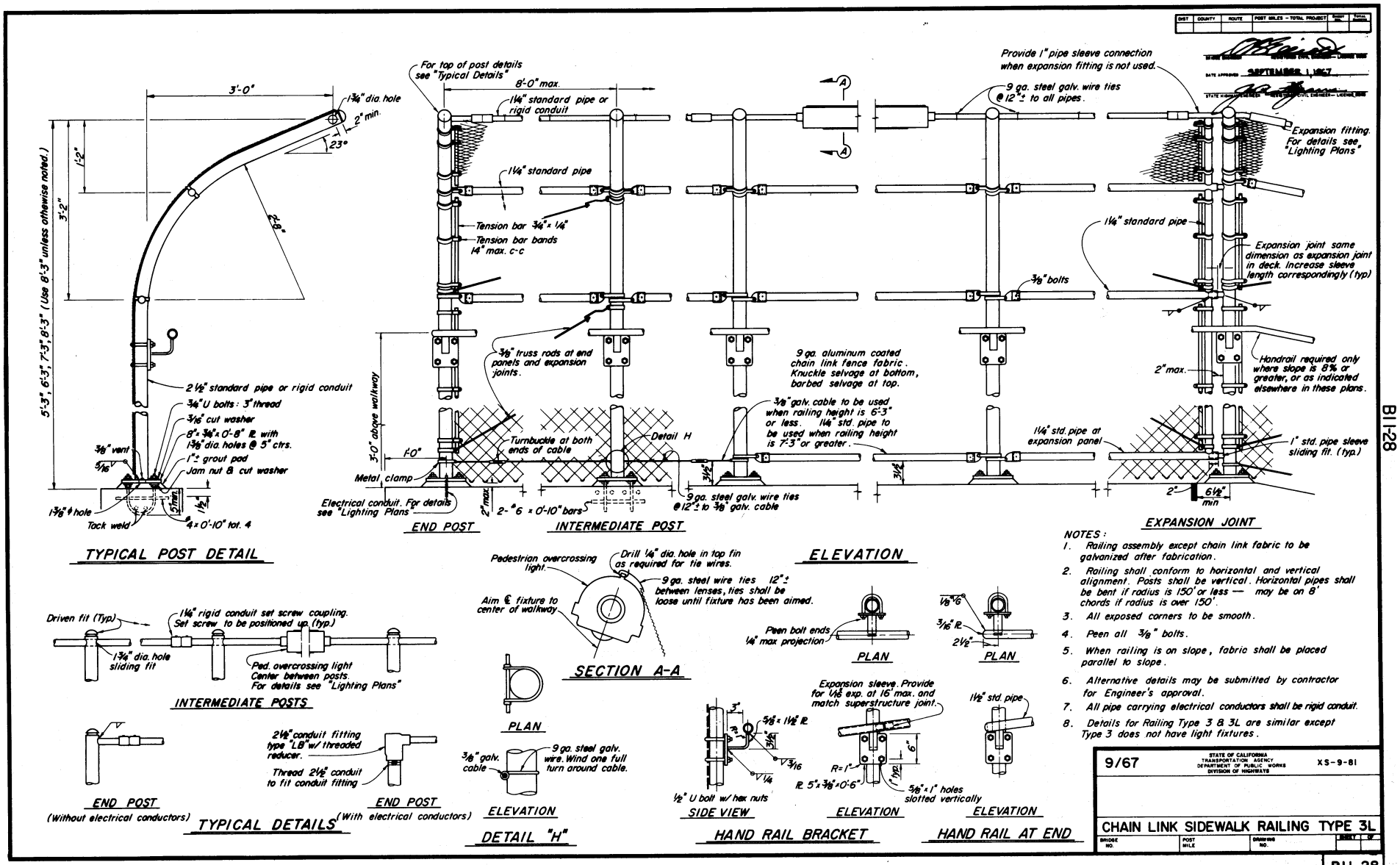

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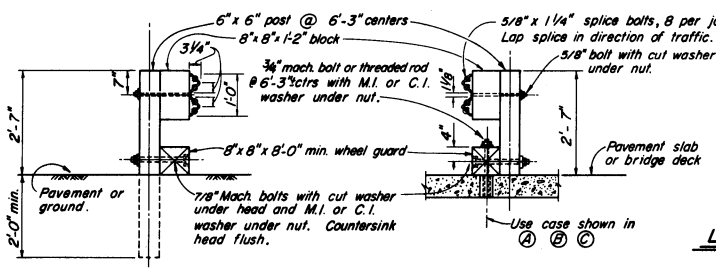
DIST	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

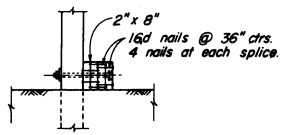
BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

DATE APPROVED SEPTEMBER 1, 1967

STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

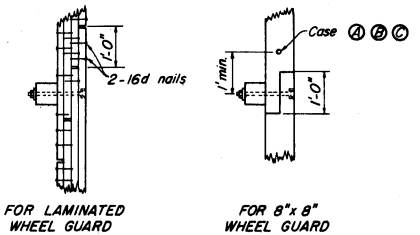


USE ON APPROACHES

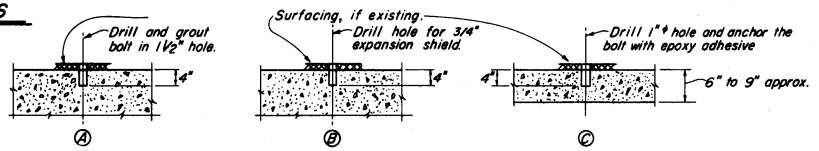


LAMINATED WHEEL GUARD

(OPTIONAL)



SPLICE DETAIL

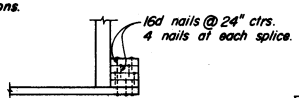


ALTERNATIVE ANCHORS

TEMPORARY RAILING - TYPE J

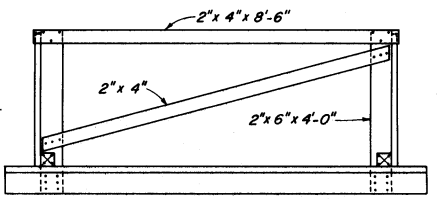
Notes:

1. All nails are 16d except as noted
2. All bolts to have cut washers unless otherwise noted.
3. Paint entire unit white. See Special Provisions.
4. All timber to be S4S.
5. Remove bolts and fill holes with grout when railing is no longer needed.
6. For Rail Element see Special Provisions.

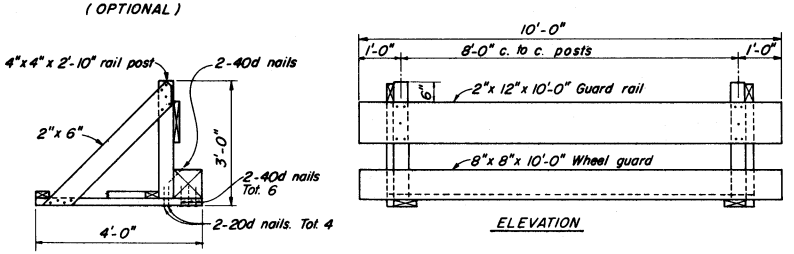


LAMINATED WHEEL GUARD

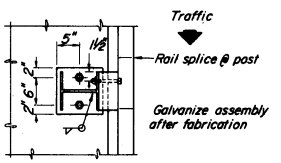
(OPTIONAL)



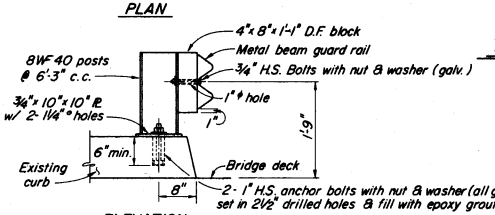
PLAN



TEMPORARY TIMBER RAILING (PORTABLE)

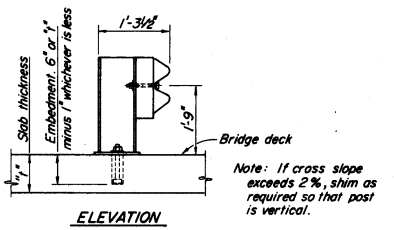


PLAN



ELEVATION

TEMPORARY RAILING - TYPE G



TEMPORARY RAILING - TYPE H

Details similar to Type G except as noted

9/67	STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS	File XS-9-67
	TEMPORARY RAILINGS	
BRIDGE NO.	POST MILE / DRAWING NO.	SHEET OF

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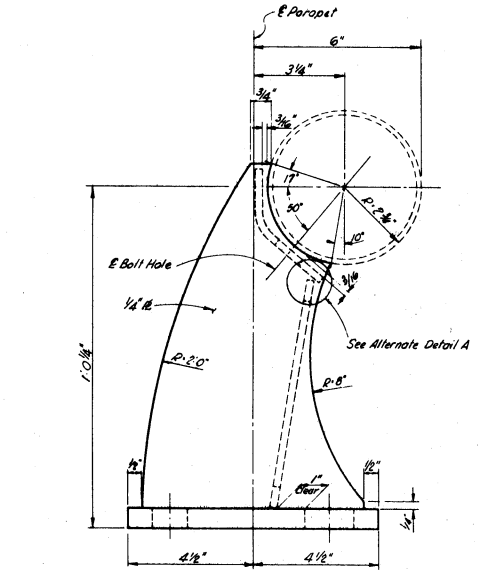
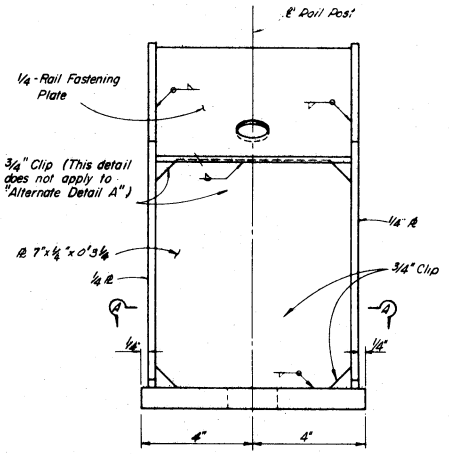


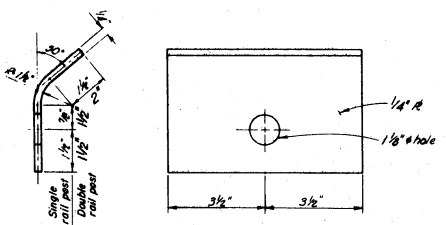
SIDE VIEW



FRONT VIEW

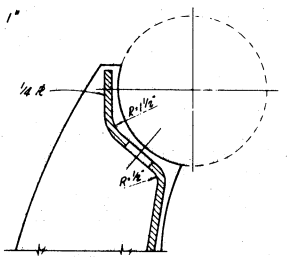
STEEL ALTERNATIVE FOR SINGLE RAIL POST

Scale: ½" = 1"



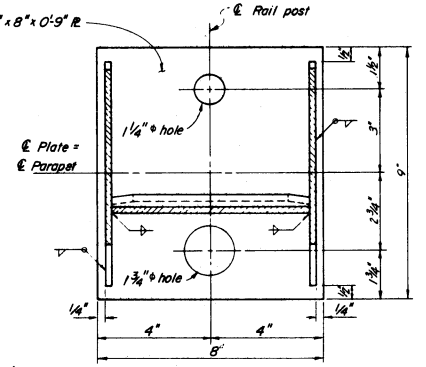
RAIL FASTENING PLATE

Note: Length of PL before bending for single rail post = 5", for double rail post 6"



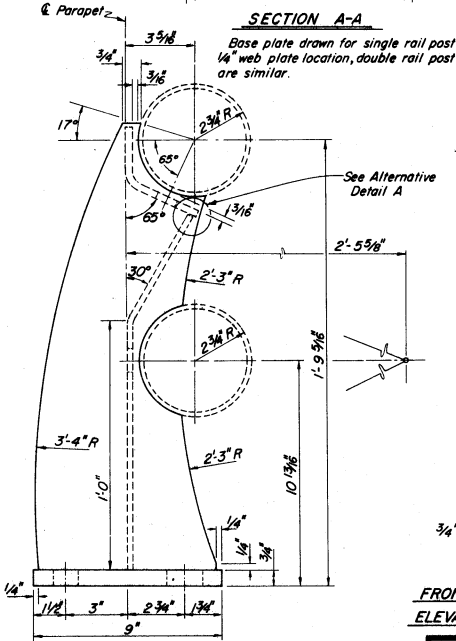
ALTERNATE DETAIL A

Notes:
1. All welds 3/16"
2. Alternative steel post detail shown. For details and notes not shown see "Barrier Railing Details" sheet.
3. Single rail post approximate weight 31 lbs, double rail post approximate weight 46 lbs.

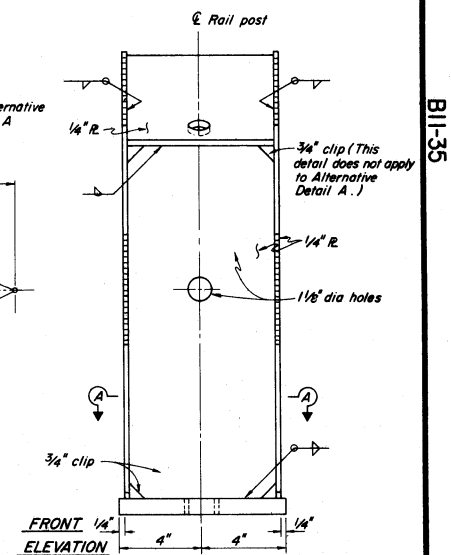


SECTION A-A

Base plate drawn for single rail post. Except for ¼" web plate location, double rail post base plate are similar.



SIDE VIEW



FRONT ELEVATION

STEEL ALTERNATIVE FOR DOUBLE RAIL POST

Scale: ⅜" = 1"

9/67	STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS	XS-9-82
BARRIER RAILING DETAILS-STEEL POST		
BRIDGE NO.	POST MILE	DRAWING NO.

SEPTEMBER 1, 1967

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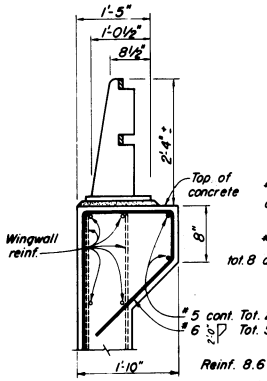
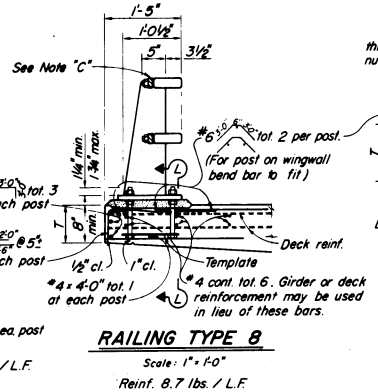


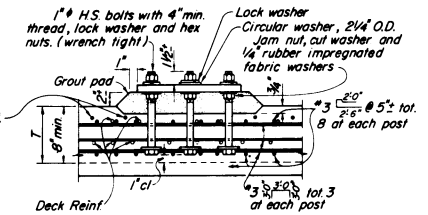
TOP OF WINGWALL SECTION

Scale: 1" = 1'-0"



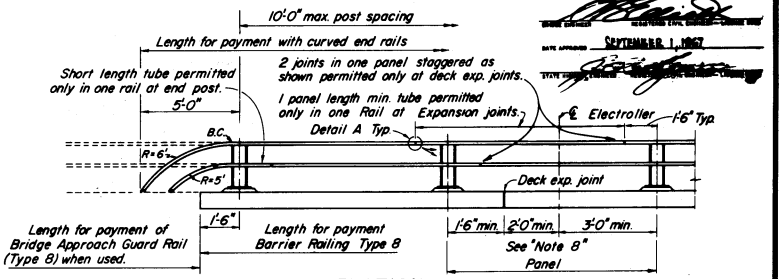
RAILING TYPE 8

Scale: 1" = 1'-0"

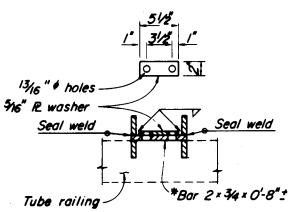


SECTION L-L

Scale: 1½" = 1'-0"

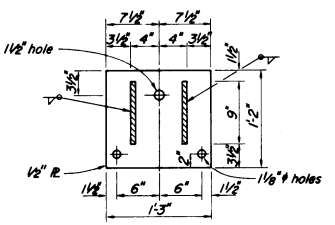


RAIL ELEVATION

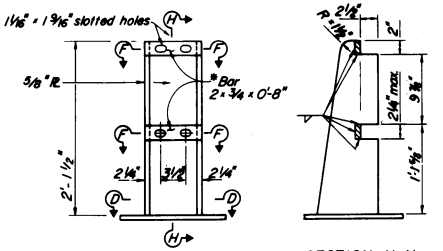


SECTION F-F

* Rolled bar required



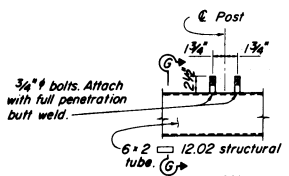
SECTION D-D



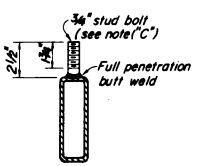
ELEVATION

SECTION H-H

RAIL POST DETAILS



PLAN



SECTION G-G

Scale: 3" = 1'-0"

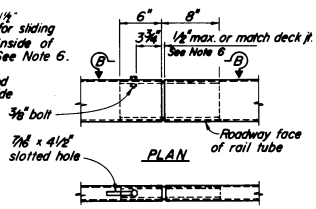
STUD BOLT DETAILS

Sleeve formed of 3/16 R. bent thus: 1½" for sliding fit inside of rail tube. Tack weld ⅜" nut inside of sleeve for ⅜" hex hd. bolt with washer. See Note 6.

½" ϕ holes near side and far side

2" 4" 8"

SLEEVE



DETAIL A TUBE SPLICE

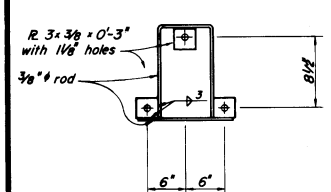
NOTES:

Materials:

A. Structural steel shall conform to ASTM Designation A 36.
B. Anchor bolts shall be high strength conforming to ASTM Designation A 325 (Galv.)
C. Stud bolt steel shall be ASTM A 108; Torque rail to post nuts to 175 ft. lbs.

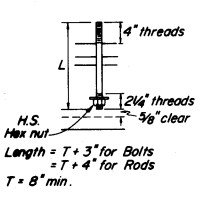
Fabrication:

1. Posts shall be normal to railing.
2. Tubing shall be bent or fabricated to fit horiz. curve when curve radius is less than 950'.
3. All exposed corners shall be ground smooth.
4. Tubing shall be continuous over not less than 2 intermediate posts, with a min. length of 2 panels except as noted.
5. Galvanize rail assembly after fabrication.
6. Rail joints in top and bottom tubes at deck expansion joints shall provide allowance for movement equal to width of deck joint with corresponding increase in length of sleeve.
7. Railing on bridge wingwalls to be placed after walls are backfilled.
8. Locate pull box at midpoint between posts. No deck joints or electroliers allowed in same panel as pull box.

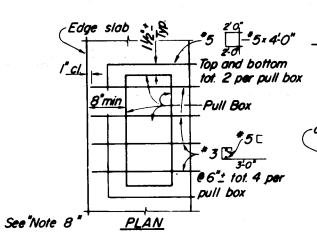


PLAN

ANCHOR BOLT TEMPLATE

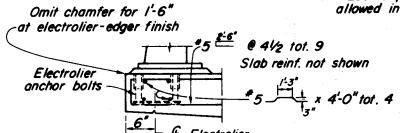


H.S. ROD (Galv) ALTERNATIVE ANCHOR BOLT



PULL BOX DETAIL

Scale: 1" = 1'-0"



ELECTROLIER ANCHOR DETAIL

SHT.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

DATE APPROVED SEPTEMBER 1, 1967

9 / 67	STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS	XS-9-79

BARRIER RAILING TYPE 8

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF

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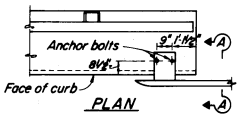
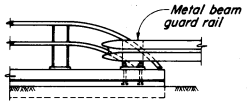
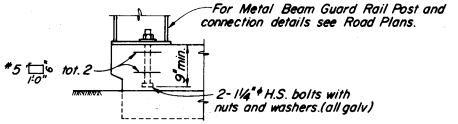


PLAN

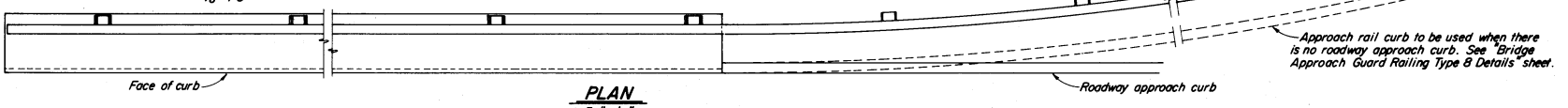


ELEVATION

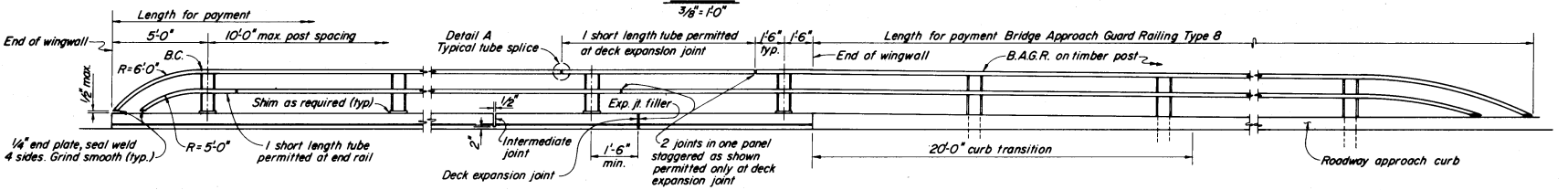
METAL BEAM GUARD RAIL ANCHORAGE
3/8" = 1'-0"



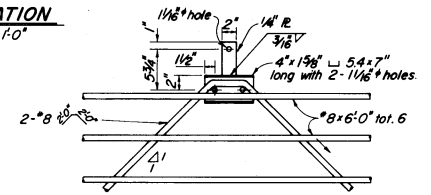
SECTION A-A
1" = 1'-0"



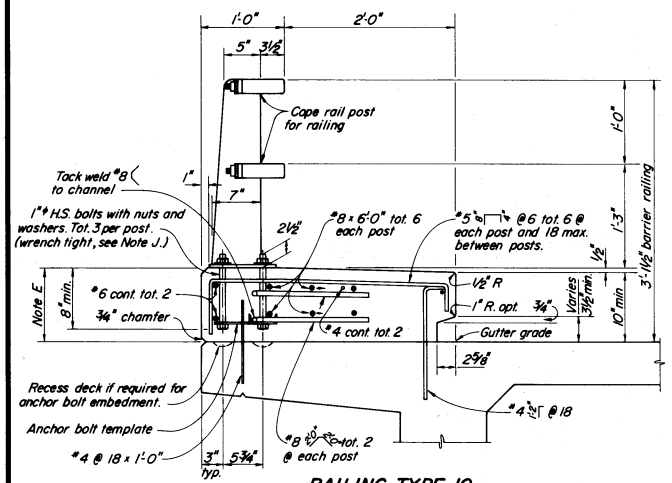
PLAN
3/8" = 1'-0"



ELEVATION
3/8" = 1'-0"

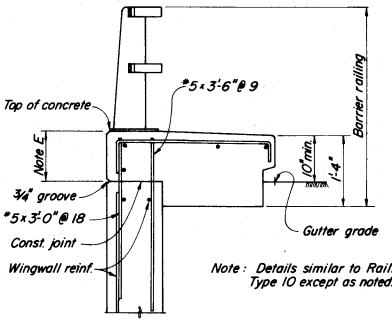


PLAN-ANCHOR BOLT TEMPLATE & REINF.
1½" = 1'-0"



RAILING TYPE 10
1½" = 1'-0"

Concrete : 2.5 cu.ft. per lineal foot
Reinforcing : 22.0 lbs. per lineal foot



Note : Details similar to Railing Type 10 except as noted.

RAILING TYPE 10A
1" = 1'-0"

Concrete : 3.4 cu.ft. per lineal foot
Reinforcing : 28.2 lbs. per lineal foot

Notes :

A. Tubing shall be shop bent or fabricated to fit horizontal curve when radius is less than 950'.
B. Posts shall be normal to railing.
C. Curb and rail joints shall be located at all deck joints. Joint size to match actual width of deck opening. Sleeve in railing joint to be lengthened as required.
D. Open intermediate curb joints shall be located at ℄ pier, abutments or bents and at uniform spacing. (40'-0" max.)
E. Dimension will vary with cross slope.
F. Construct 3" deep x 12" wide overflow scupper 2" above deck at low points in grade.
G. Walls are to be backfilled before railing is placed.
H. Clearance to reinforcing steel in curb and railing to be 1". Longitudinal reinforcement to stop at all joints.
J. High strength rods threaded both ends with 2 hex nuts and washers (all galv) may be substituted for high strength anchor bolts.
K. Torque rail to post nuts to 175 ft. lbs.
L. Tubing shall be continuous over not less than 2 intermediate posts, with a minimum length of 2 panels except as noted.
M. All exposed corners shall be ground smooth.
N. Galvanize rail assembly after fabrication.
O. Locate pull box near mid-point between posts, but not in same panel as deck joints or electroliers.

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.
DATE APPROVED SEPTEMBER 1, 1967
STATE HIGHWAY ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

9/67 — STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS — XS-9-85

BARRIER RAILING TYPE 10

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF

B11-40

B11-40

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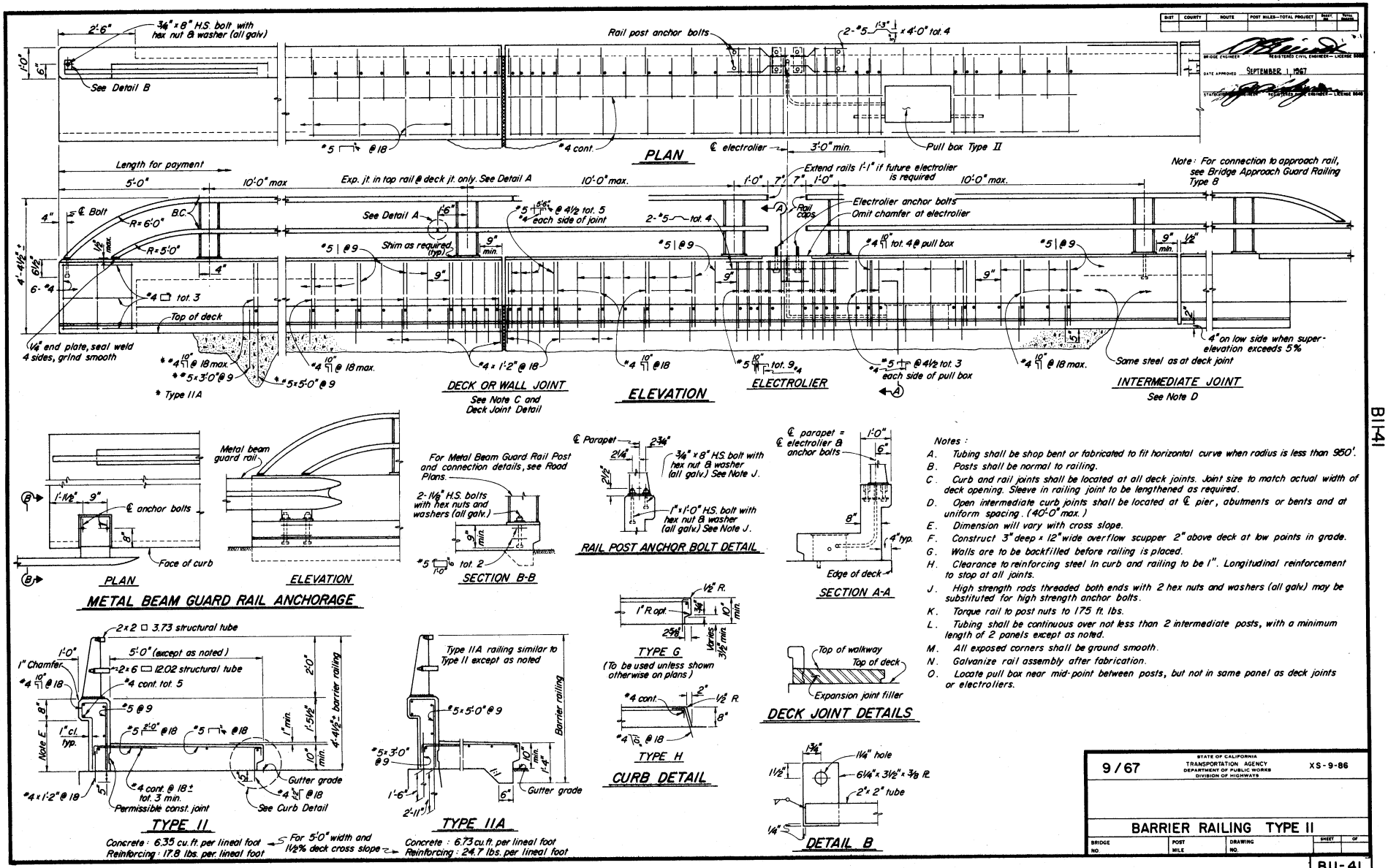

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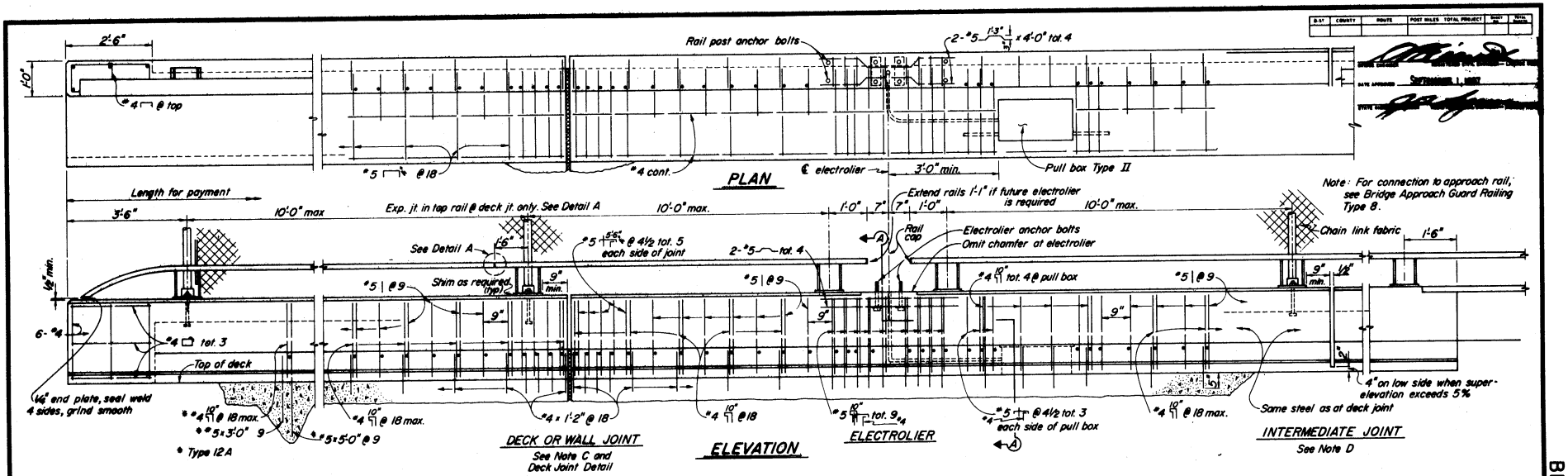
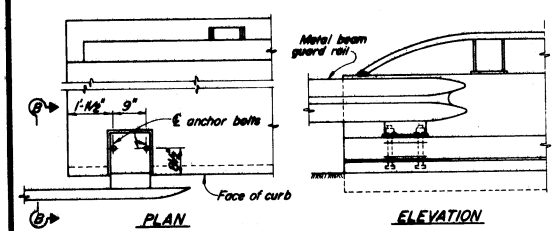
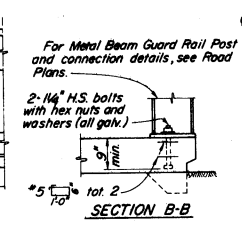
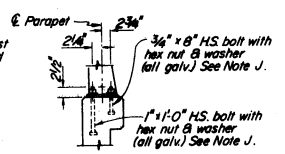
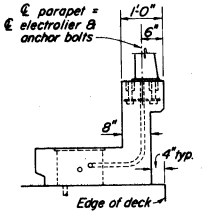




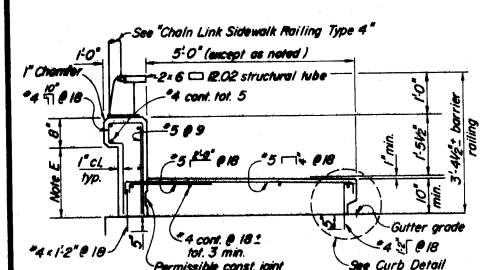


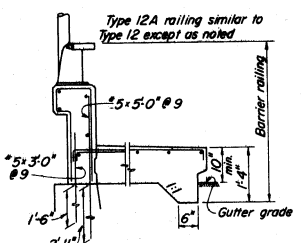


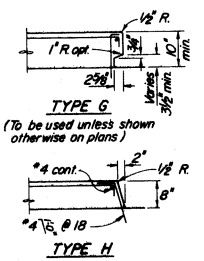


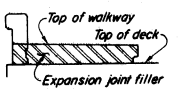
Notes:

A. Tubing shall be shop bent or fabricated to fit horizontal curve when radius is less than 950'.
B. Posts shall be normal to railing.
C. Curb and rail joints shall be located at all deck joints. Joint size to match actual width of deck opening. Sleeve in railing joint to be lengthened as required.
D. Open intermediate curb joints shall be located at ℄ pier, abutments or bents and at uniform spacing. (40'-0" max.)
E. Dimension will vary with cross slope.
F. Construct 3" deep x 12" wide overflow scupper 2" above deck at low points in grade.
G. Walls are to be backfilled before railing is placed.
H. Clearance to reinforcing steel in curb and railing to be 1". Longitudinal reinforcement to stop at all joints.
J. High strength rods threaded both ends with 2 hex nuts and washers (all galv.) may be substituted for high strength anchor bolts.
K. Torque rail to post nuts to 175 ft. lbs.
L. Tubing shall be continuous over not less than 2 intermediate posts, with a minimum length of 2 panels except as noted.
M. All exposed corners shall be ground smooth.
N. Galvanize rail assembly after fabrication.
O. Locate pull box near mid-point between posts, but not in same panel as deck joints or electroliers.
P. See attachment details on "Chain Link Sidewalk Railing Type 4" sheet.









9/67	STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS			XS-9-88
BARRIER RAILING TYPE 12				
BRIDGE NO	POST MILE	DRAWING NO	SHEET	OF

B11-42

B11-42

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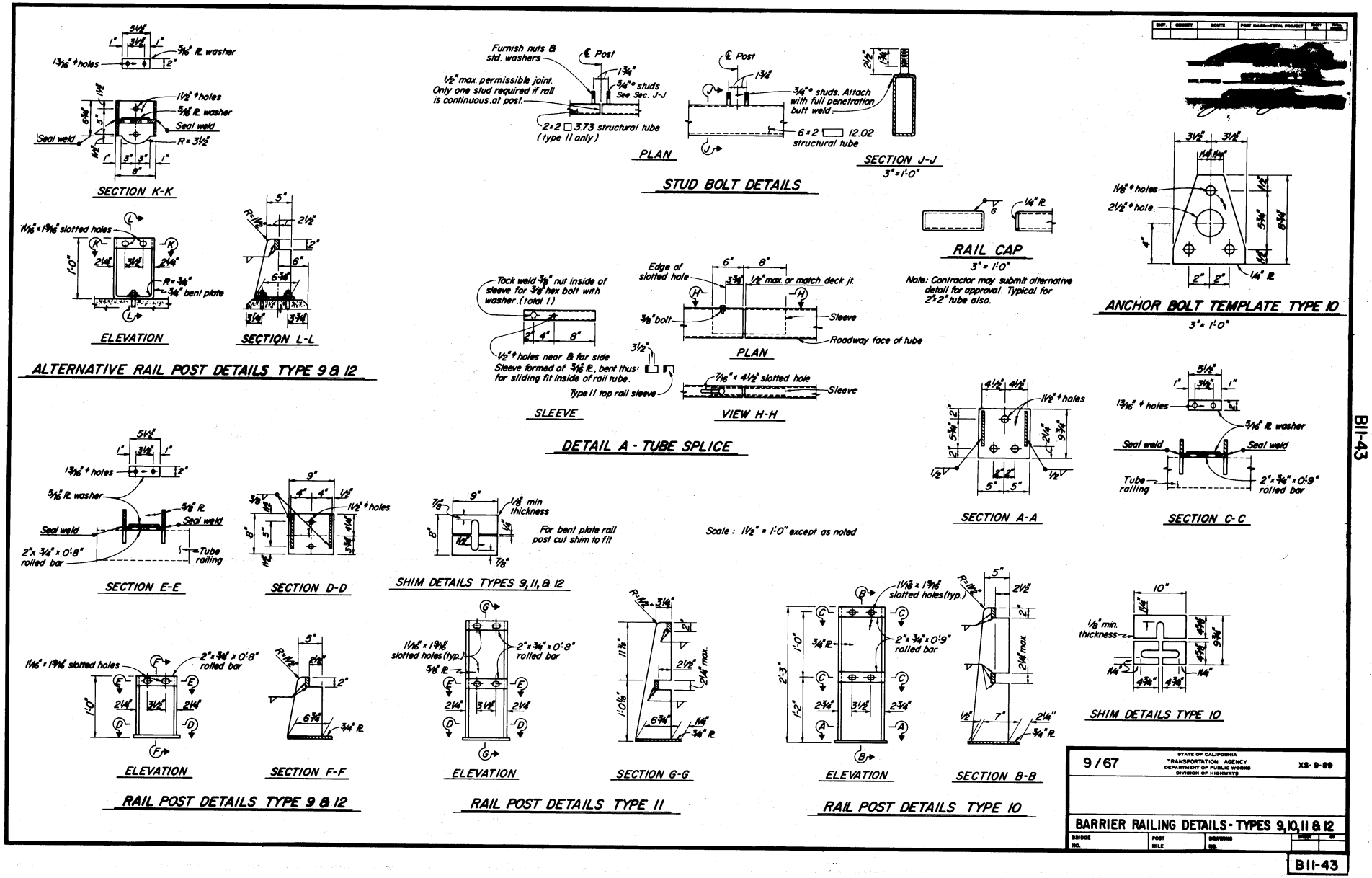

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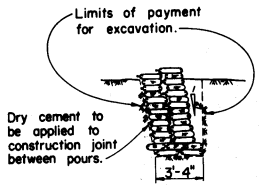
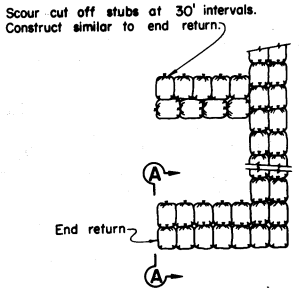
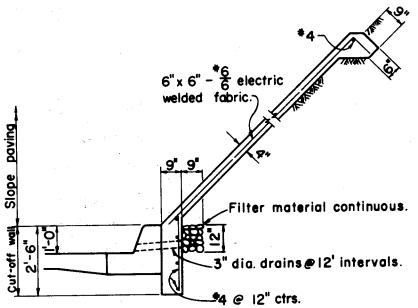


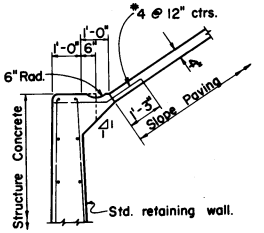
SECTION A-A



PLAN OF FIRST COURSE IN TRENCH



TYPICAL SECTION



RETAINING WALL SECTION

P.C. CONCRETE ON ROADWAY SLOPE

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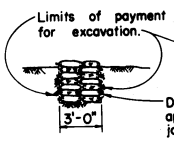
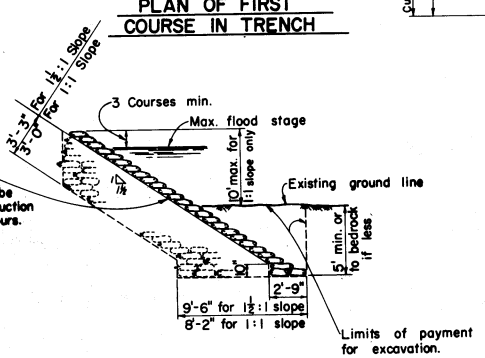


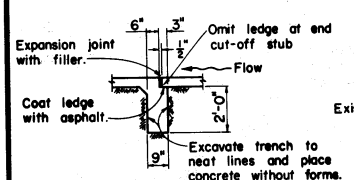
SECTION OF SCOUR CUT-OFF STUBS



TYPICAL SECTION

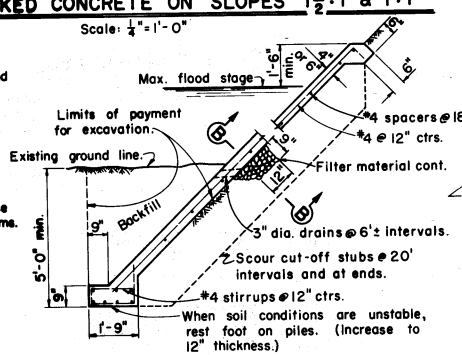
SACKED CONCRETE ON SLOPES 1 1/2:1 & 1:1

Scale: 1/4" = 1'-0"

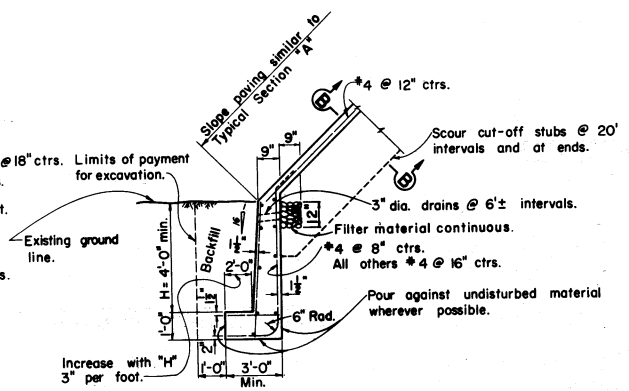


SECTION B-B

Scale: 1/2" = 1'-0"



TYPICAL SECTION "A"



TYPICAL SECTION "B"

PORTLAND CEMENT CONCRETE

Scale: 1/2" = 1'-0"

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	Sheet No.	Total Sheets

DATE APPROVED SEPTEMBER 1, 1967

9/67

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-19-1

EMBANKMENT PROTECTION DETAIL No.1

BRIDGE NO	DIST	DIVISION	DRAWING NO.	SHEET	OF

B13-1

B13H

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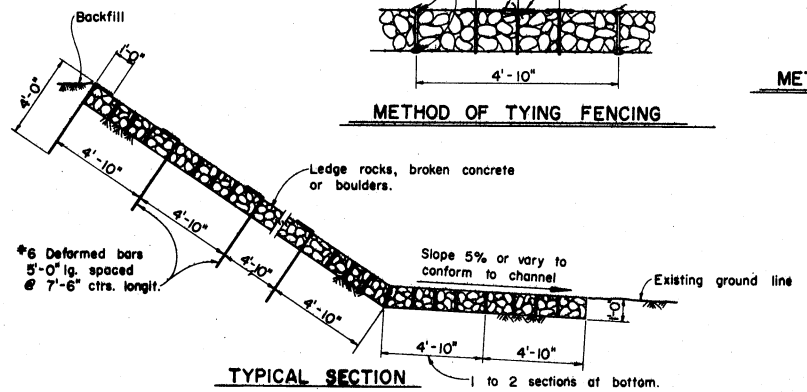
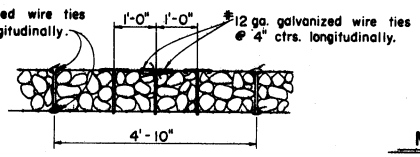
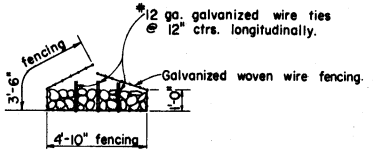


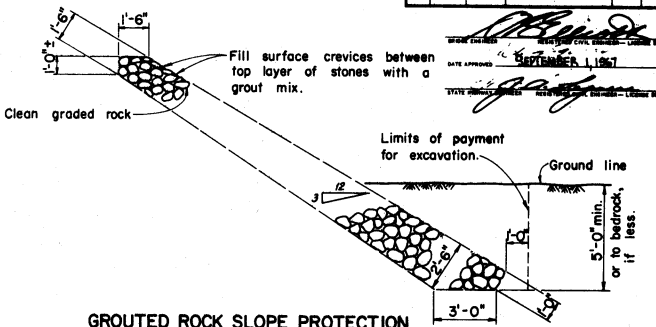
TYPICAL SECTION
WIRE AND ROCK MATTRESS



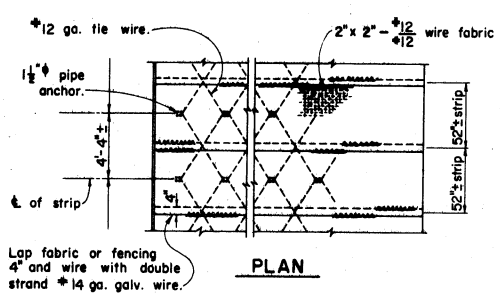
METHOD OF TYING FENCING



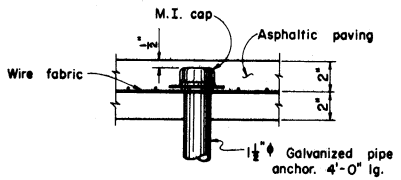
METHOD OF FORMING BASKETS



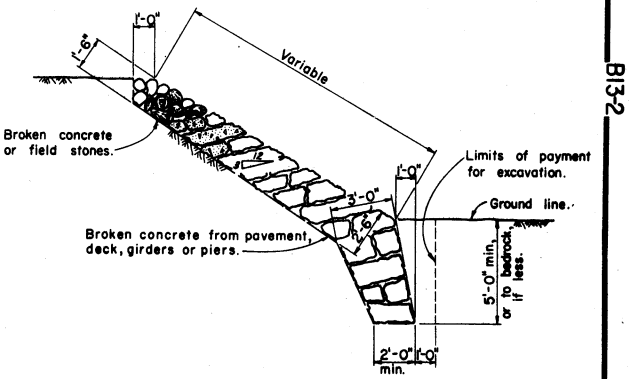
GROUTED ROCK SLOPE PROTECTION



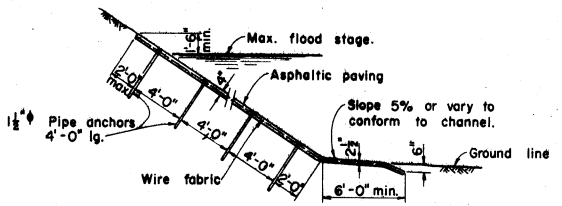
PLAN



SECTIONAL ELEVATION

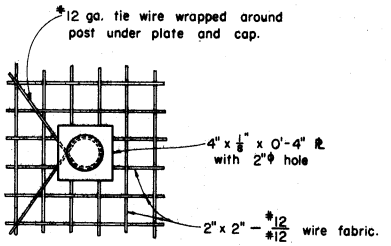


BROKEN CONCRETE SLOPE PROTECTION



TYPICAL SECTION

ASPHALTIC MIXTURE SLOPE PAVING



PLAN OF PIPE ANCHOR

DIST	COUNTY	ROUTE	POST MILES	TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.
DATE APPROVED SEPTEMBER 1, 1967
STATE BRIDGE ENGINEER — REGISTERED CIVIL ENGINEER — LICENSE NO.

9/67

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-19-2

EMBANKMENT PROTECTION DETAIL No.2

BRIDGE NO	POST MILE	DRAWING NO	SHEET	TOTAL SHEETS

B13-2

B13-2

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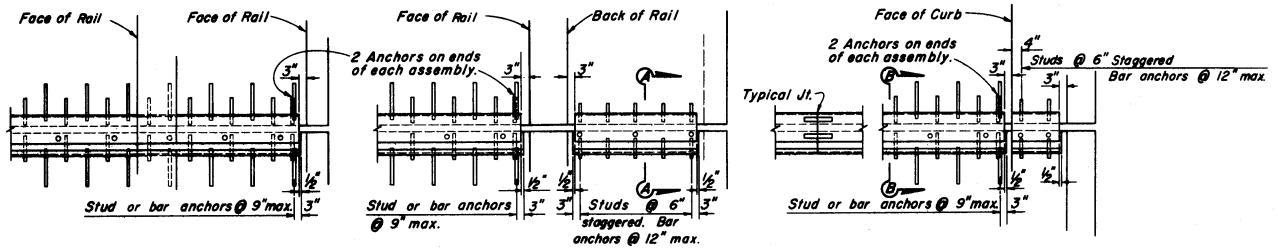

PART PLAN EXPANSION ARMOR NORMAL TO GIRDER

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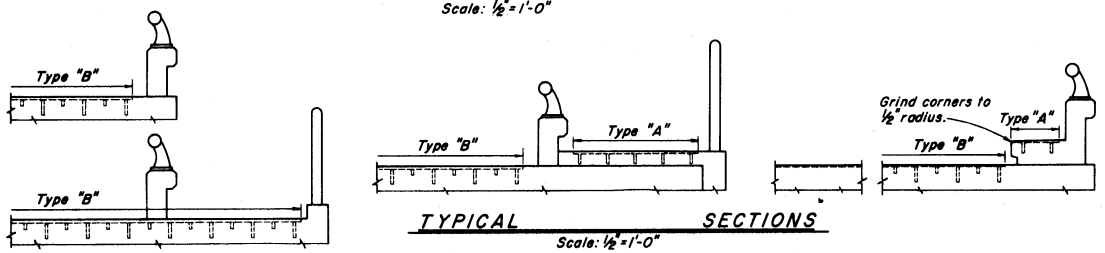

TYPICAL SECTIONS

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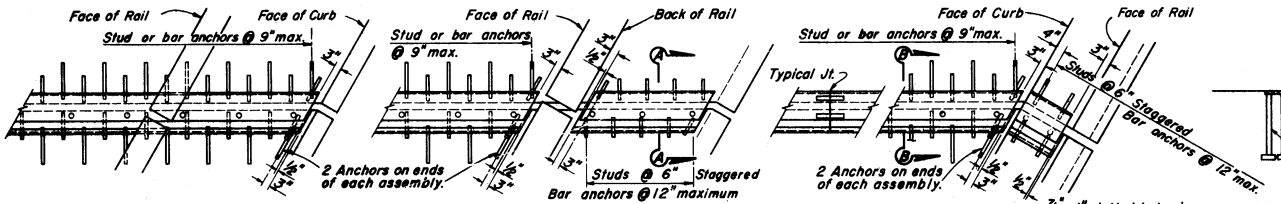

PART PLAN EXPANSION ARMOR SKEWED TO GIRDER

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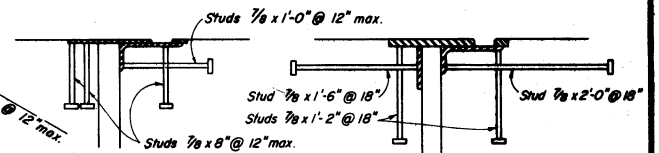

TYPE A TYPE B

DETAIL OF STUD ANCHORS

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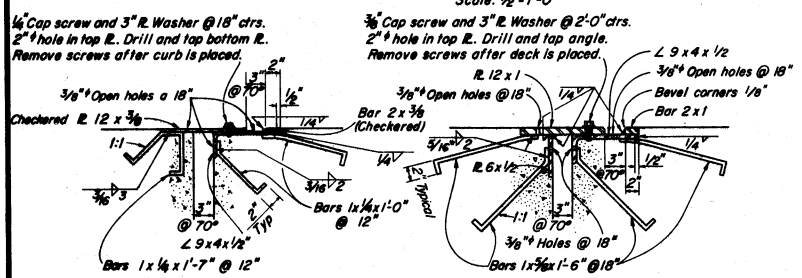
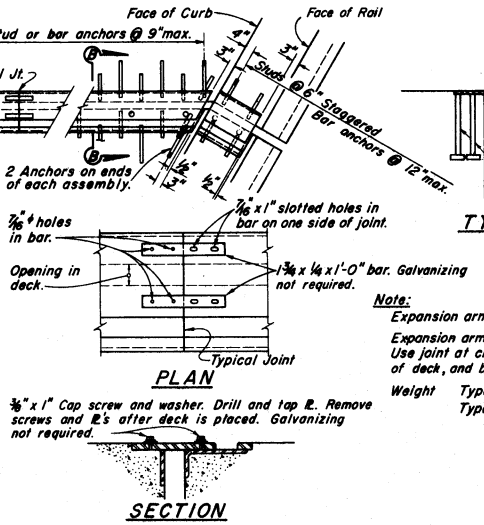


SECTION A-A

Scale: 1 1/2" = 1'-0"

SECTION B-B

Scale: 1 1/2" = 1'-0"



PLAN

SECTION

TYPICAL JOINT DETAILS

Scale: 1 1/2" = 1'-0"

Note:

Expansion armor assembly to be galvanized after fabrication except as noted.

Expansion armor assembly to be fabricated in 12' max. lengths. Use joint at crown of roadway at any change in transverse slope of deck, and between 12' lengths.

Weight Type A 32 #/Lin. Ft.
Type B 88 #/Lin. Ft.

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EXPANSION JOINT ARMOR DETAIL

BRIDGE NO | POST MILE | DRAWING NO | SHEET | TOTAL SHEETS

B13-3

B13-3

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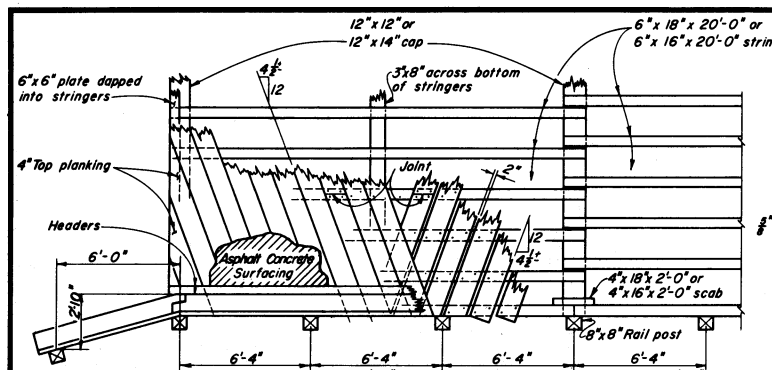
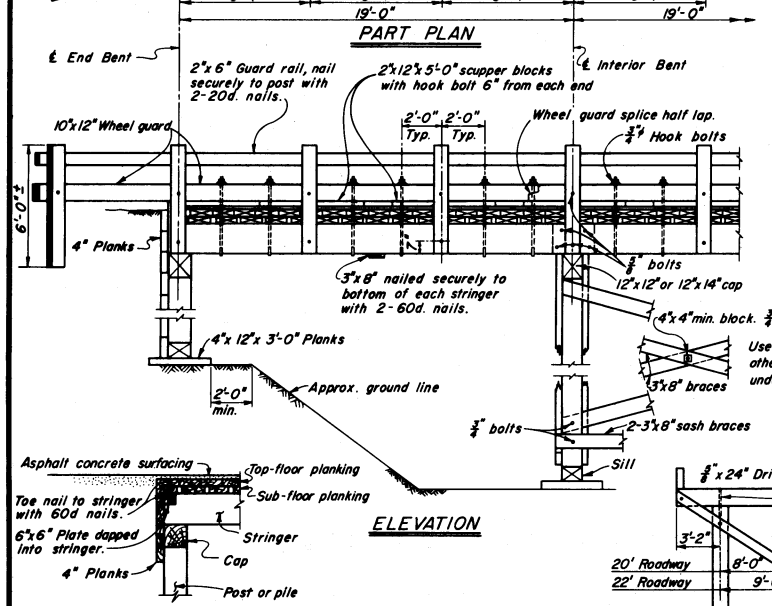


PART PLAN



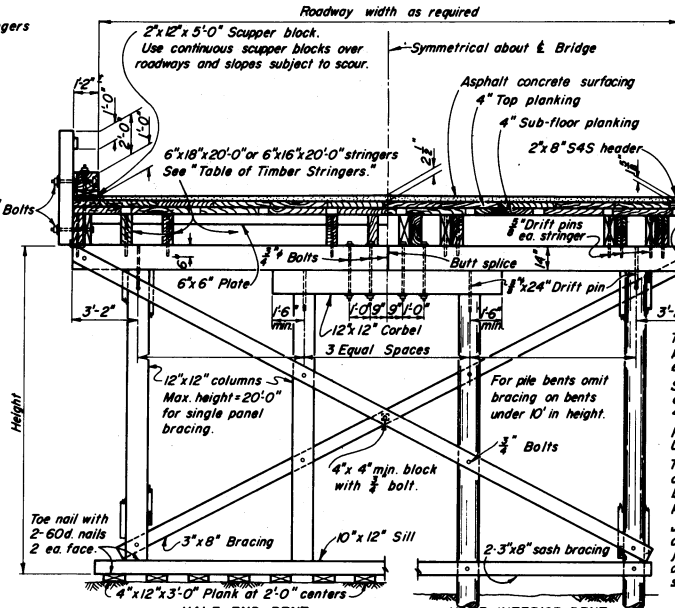
ELEVATION

Use longitudinal bracing every other span. Omit for pile bents under 10' in height.

END BENT DETAIL

TABLE OF TIMBER STRINGERS FOR 19'-0" SPANS					
ROADWAY WIDTH	26'-0"	26'-0"	24'-0"	22'-0"	20'-0"
NO. OF LINES 6"x18" STRINGERS	15	14	13	12	11
NO. OF LINES 6"x16" STRINGERS	19	18	17	16	15

NOTE: STRINGERS EQUALLY SPACED.

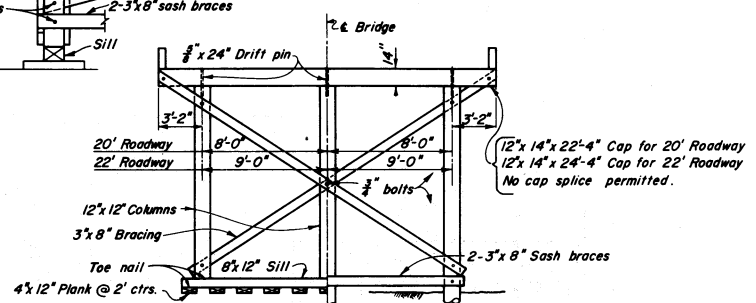


HALF END BENT SHOWING FRAME BENT

HALF INTERIOR BENT SHOWING PILE BENT

TYPICAL SECTION

Use framed or pile bents as directed by the Engineer.



HALF END BENT SHOWING FRAME BENT

HALF INTERIOR BENT SHOWING PILE BENT

OPTIONAL SECTION – 20' & 22' ROADWAY WIDTH

FLOORING NOTES

Top planks to be 4" thick, random widths 8" to 12". Fasten each plank to each stringer with 2-7" double grip spikes and 2-6"x6" end plates with 3-7" spikes. Use 4-7" spikes at joint, see plan.

Sub-floor planks to be 4" thick, random widths 8" to 12". Fasten each plank to each stringer with 2-7" round wire spikes. Use 4-7" spikes at joint see plan.

Prebore flooring for spikes if less than 12" from end of plank. Use 3/16" diameter bit.

Top and sub-floor planks may be random lengths with a maximum of 2 joints per run. Minimum length of plank to be 6'. Planks may be S4S or rough, or mixed S4S and rough. Except that sub-floor planks shall be of one thickness, S4S or rough.

Joint to be spaced so that there are at least 2 planks between joints on same stringer, and at least one stringer between joints, on adjacent planks. Joints in top planks to be placed so that they do not occur directly over joint in sub-floor planks. Joint to occur at ℄ of stringer and to be parallel with stringer. See Plan.

GENERAL NOTES

Specifications:

Design: A.A.S.H.O. Dated 1965 with subsequent revisions.

Construction: Standard Specifications, Division of Highways, dated July 1964 and the special provisions.

Live Loading: H-15-44

Unit Stresses:

Lumber and Timber: Douglas fir or equal, graded according to use and conforming to applicable paragraphs in Standard Grading and Dressing Rules, current edition of The West Coast Lumber Inspection Bureau.

Railing & Stringers: Construction-Par. 124-b.

Wheel Guards, Caps and Posts: Construction Par.-125-b.

Flooring, Sills & Bracing: And any other pieces not listed above. Standard-Par. 123-c. Wheel guards, railing and railing post to be dressed (S4S). All other lumber and timber may be dressed (S4S) or rough, except as noted.

Hardware: All bolts fitted with suitable washers.

Pile Load: 20 Tons Type: Timber

Soil Pressure: 1,200 lbs. per sq. ft.

DIST	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Project No.	Sheet No.

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STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

XS-7-6

TIMBER DETOUR BRIDGE

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF

B13-4

B13-4

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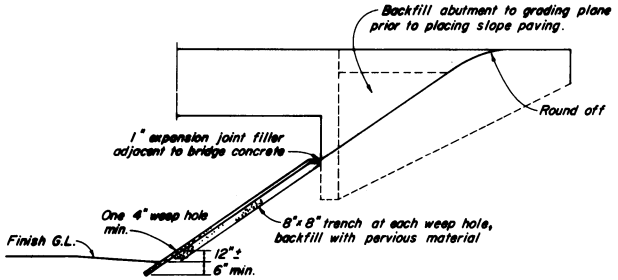
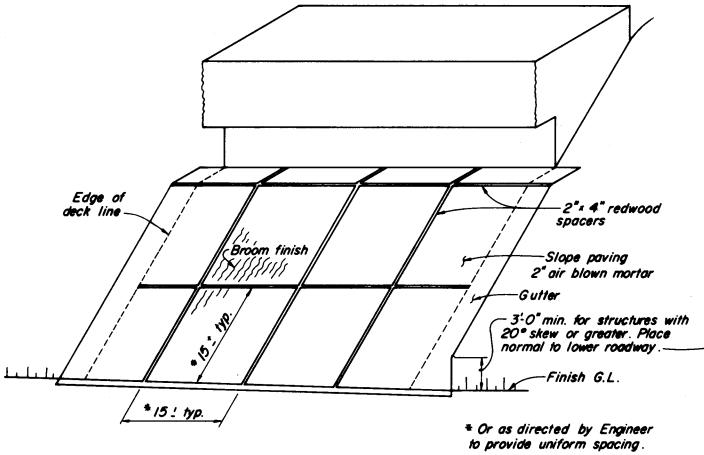
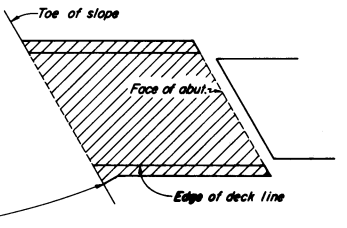


TYPICAL - NO CURB



* Or as directed by Engineer to provide uniform spacing.

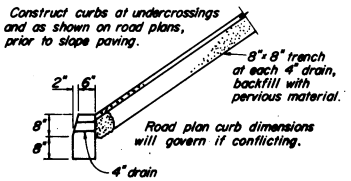
ELEVATION VIEW



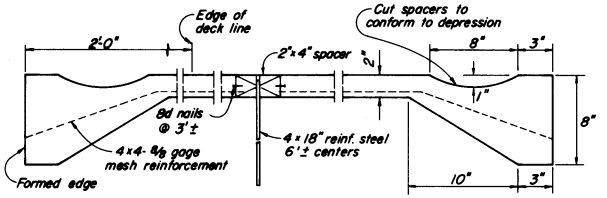
LIMITS OF SLOPE PAVING

PLAN VIEW

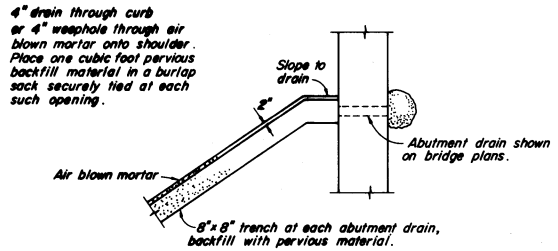
TYPICAL - WITH SIDEWALK



TYPICAL - WITH CURB



CROSS SECTION



TYPICAL - DRAIN

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

[redacted]

9/67	STATE OF CALIFORNIA TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS	XS-22-8

SLOPE PAVING DETAILS TYPE I

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF

B13-7

B13-7

Return to Table of Contents

SIGNS SIGNALS AND LIGHTING

To accompany plans dated _____

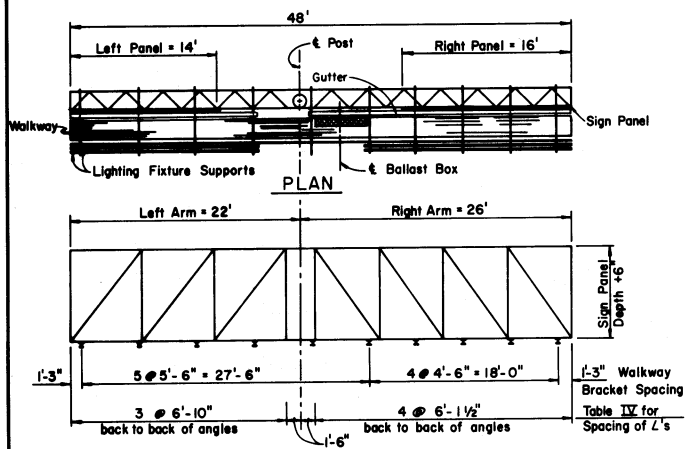
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5586

APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645



UNBALANCED SINGLE POST TYPE

EXAMPLE NO. 1

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, and number of ballast boxes.

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

S1. Instructions and examples.
S2. Post type II thru VIII.
S3. Post type I-s thru VII-s.
S4. Structural frame members (single post type).
S5. Structural frame members (two post type).
S6. Structural frame details.
S7. Frame juncture details.
S8. Removable sign panel frames.
S9 & S10. Walkway details no. 1 & no. 2.
S11. Walkway safety railing details.
S12. Walkway mounted ballast box.
S13. Alternate pile foundations.

WALKWAY BRACKETS: The walkway bracket spacing where ballast boxes are located shall be 5'-6". Space all others to suit, maintaining uniform spacing where possible. Maximum spacing shall not exceed 5'-6".

BALLAST BOXES: Locate ballast boxes near the center of the area being served.

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: A.A.S.H.O. Specifications for the design and construction of structural supports for highway signs, dated November 1960.

CONSTRUCTION: Standard Specifications, Division of Highways, dated July 1964 and the special provisions.

LOADING:

WIND LOADING: Normal to face of sign: 30 P.S.F. Transverse to face of sign: 0.2 of normal force.

WALKWAY LOADING: Dead load + 500 lbs. concentrated live load.

UNIT STRESSES:

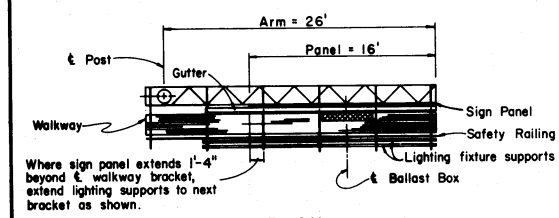
STRUCTURAL STEEL:	Fs = 20,000 P.S.I.
REINFORCED CONCRETE:	Fs = 20,000 P.S.I.; Fc = 1,200 P.S.I.
FOOTING SOIL PRESSURE:	1¼ tons/sq. ft.

Allowable unit stresses due to wind load, or wind load in combination with other forces, are increased 45%.

MINIMUM CLEARANCE: Vertical roadway clearance 18'-0".

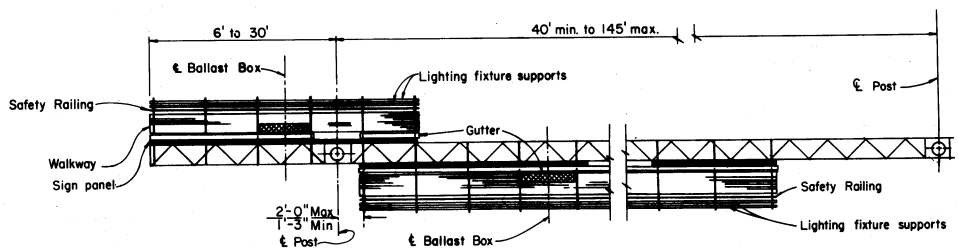
WELDING: All welding continuous unless otherwise noted on the plans. All welding to be done in accordance with the A.W.S. Specifications for Welded Highway and Railway Bridges, dated 1963.

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 CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

OVERHEAD SIGNS INSTRUCTION AND EXAMPLES

S1-8

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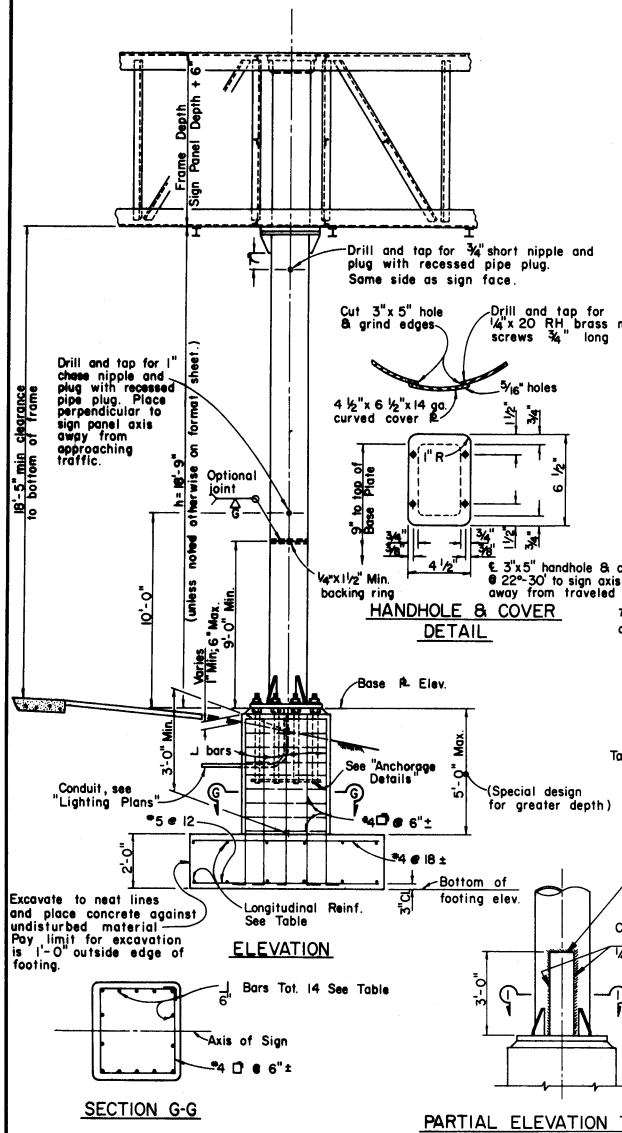
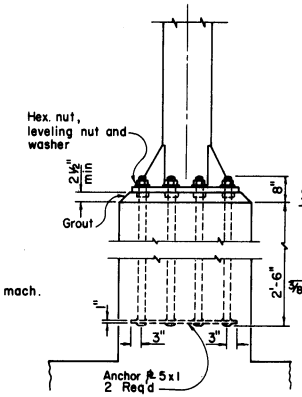
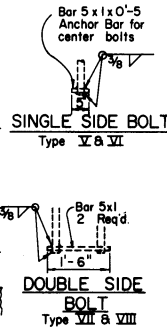
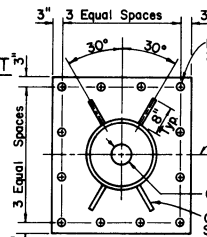
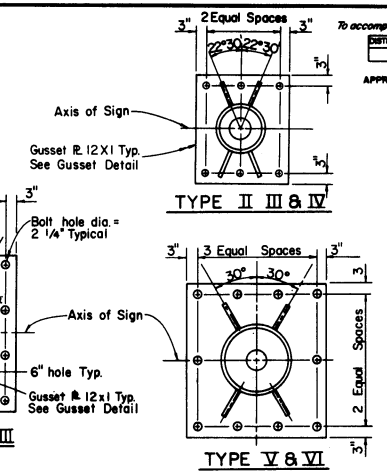










To accompany plans dated _____

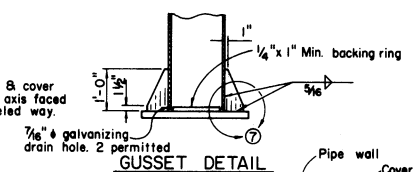
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

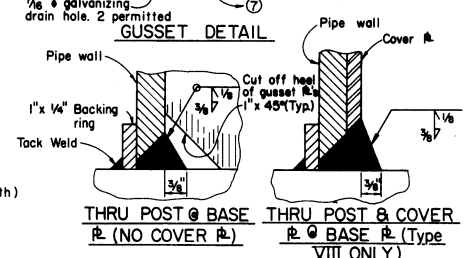
APPROVAL RECOMMENDED

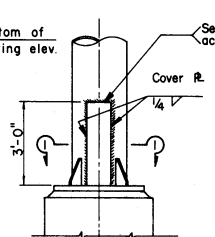
BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

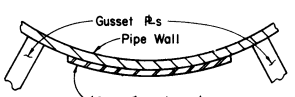
APPROVED December 6, 1967

STATE BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645









Post Type	Pipe Size	Cap Plate Size	Base Plate Size (Note #2)	2" ϕ Anchor Bolts	Pedestal Size (Note #2)	Footing Size (Note #2)	Longitudinal Footing Reinforcement Top	Longitudinal Footing Reinforcement Bottom	⌋ 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'-8"	7'-0"x 10'-0"	6-#4 bars	9-#5 bars	#5
III	14" O.D. @ 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" O.D. @ 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-#5 bars	9-#8 bars	#6
V	18" O.D. @ 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" O.D. @ 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" O.D. @ 125.49 with cover PL	2'-6"x 2'-6"x 1"	3'-9"x 3'-3"x 2"	12	4'-5"x 3'-11"	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 8" of anchor bolts and galvanize upper 1'-0".
5. Spread footing shown, use Alternate Pile Foundation when shown on the Format sheet.
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.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

OVERHEAD SIGNS
SINGLE POST TYPE
POST TYPES II THRU VIII

S2-7

Return to Table of Contents

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645

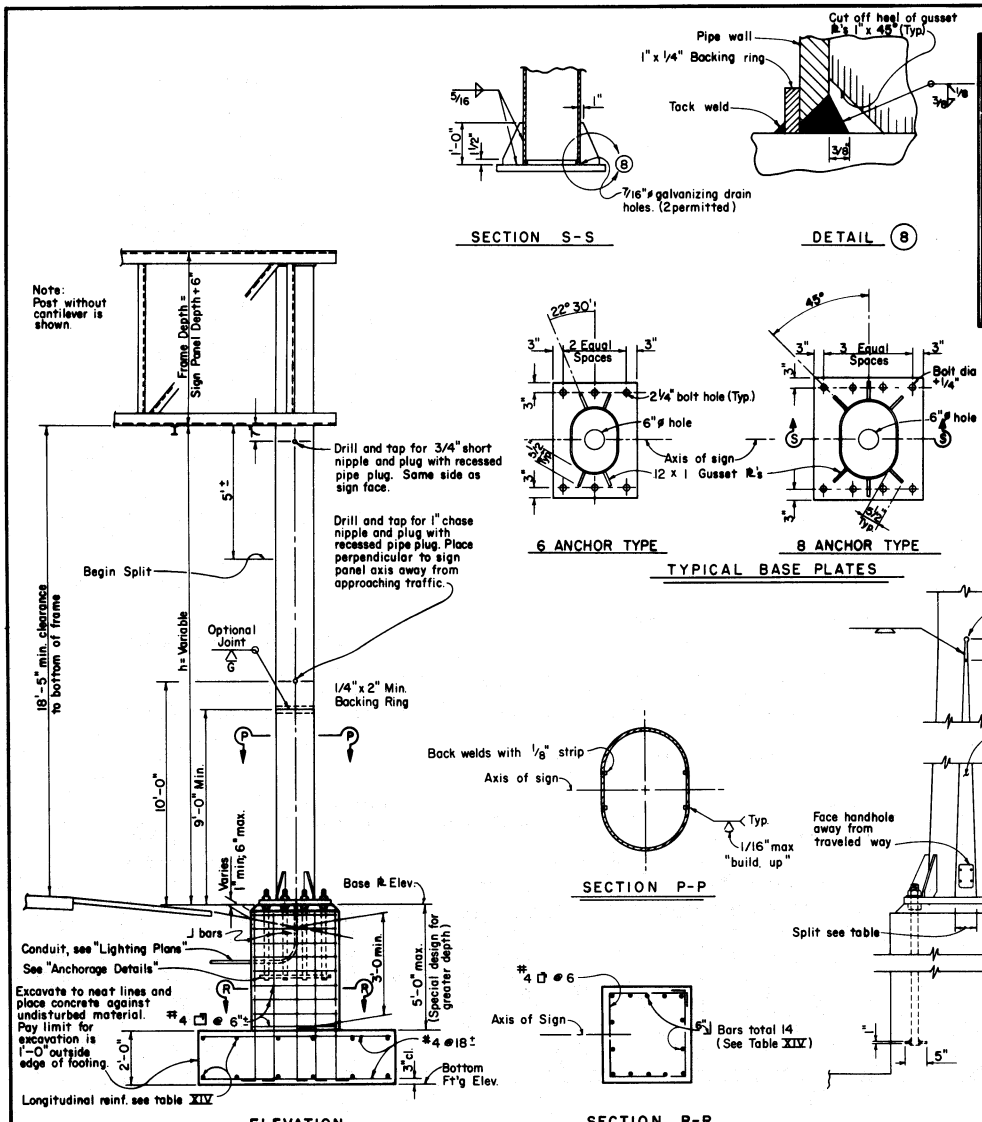


TABLE XIV									
Post Type	Pipe Size	Split	Base Plate Size (Note #3)	Anchor Bolts	Pedestal Size (Note #3)	Footing Size (Note #3)	Longitudinal Footing Reinforcement Top	Longitudinal Footing Reinforcement Bottom	J Bars
I - S	10" std. @ 40.48	4"	2'-3" x 1'-9" x 2"	6-2" ø	2'-9" x 2'-3"	5'-0" x 10'-0"	5-#4 bars	5-#6 bars	#6
II - S	12" std. @ 49.56	5"	2'-6" x 1'-11" x 2"	6-2" ø	3'-0" x 2'-6"	6'-0" x 11'-0"	6-#4 bars	6-#7 bars	#6
III - S	14" O.D. @ 72.09	5"	2'-9" x 2'-0" x 2"	6-2" ø	3'-4" x 2'-7"	7'-0" x 13'-0"	7-#4 bars	7-#8 bars	#8
IV - S	16" O.D. @ 82.77	6"	2'-11" x 2'-7" x 2"	8-2" ø	3'-6" x 3'-2"	8'-0" x 14'-0"	8-#5 bars	8-#9 bars	#8
V - S	18" O.D. @ 93.45	7"	3'-1" x 2'-9" x 2"	8-2" ø	3'-8" x 3'-4"	8'-0" x 16'-0"	8-#5 bars	8-#9 bars	#9
VI - S	20" O.D. @ 104.13	8"	3'-5" x 2'-9" x 2"	8-2" ø	4'-0" x 3'-4"	9'-0" x 17'-0"	9-#5 bars	9-#10 bars	#10
VII - S	24" O.D. @ 125.49	8"	3'-9" x 3'-3" x 2"	8-2 1/4" ø	4'-5" x 3'-11"	10'-0" x 18'-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, use Alternate Pile Foundation when shown on the Format sheet.
7. Anchor ℞'s may be retained with hex nut or formed head.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

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

S3-7

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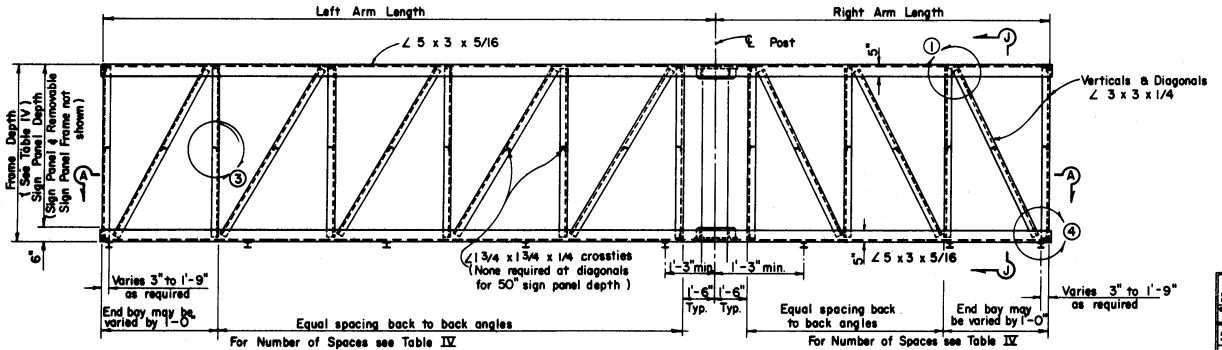
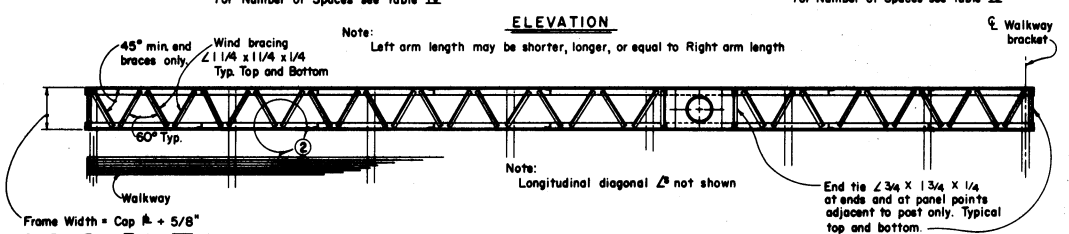


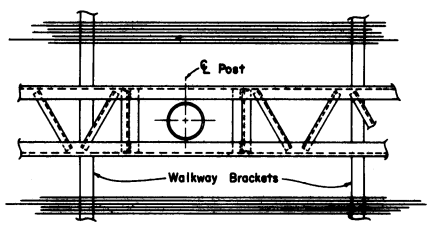
ELEVATION

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

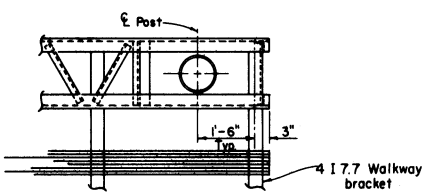


Note:
Longitudinal diagonal ∠s not shown

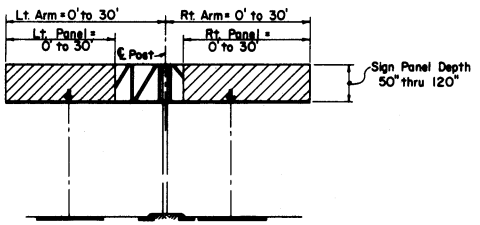
SECTION A-A



PART PLAN OF DOUBLE FACED TYPE AT POST



PART PLAN OF CANTILEVER TYPE AT POST



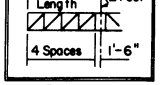
▨ = Sign Panel

LIMITING DIMENSIONS OF FRAME & SIGN PANEL

Sign Panel Depth	Frame Depth	Arm Length Left or Right (Feet) 2-4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
50"	4'-8"																										7 Spaces	
60"	5'-6"																								6 Spaces			
70"	6'-4"																			5 Spaces								
80"	7'-2"																											
90"	8'-0"	1 Space					2 Spaces						3 Spaces								4 Spaces							
100"	8'-10"																											
110"	9'-8"																											
120"	10'-6"																											

Diagonals No

TABLE IV - NUMBER OF BRACING SPACES



Example

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 location of ballast, boxes, typical walkway arrangement, special instructions and examples, see "Instructions and Examples" sheet.
6. Minimum length of frame = 12'-0".
7. 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.
8. At final position of post all top and bottom nuts shall be tightened against base plate.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

OVERHEAD SIGNS SINGLE POST TYPE STRUCTURAL FRAME MEMBERS

S4-3

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED September 1, 1964

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945

S4-3

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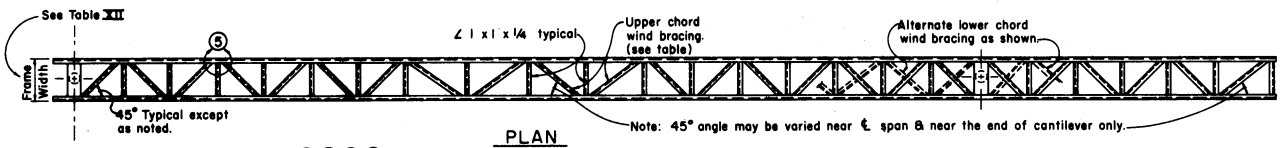
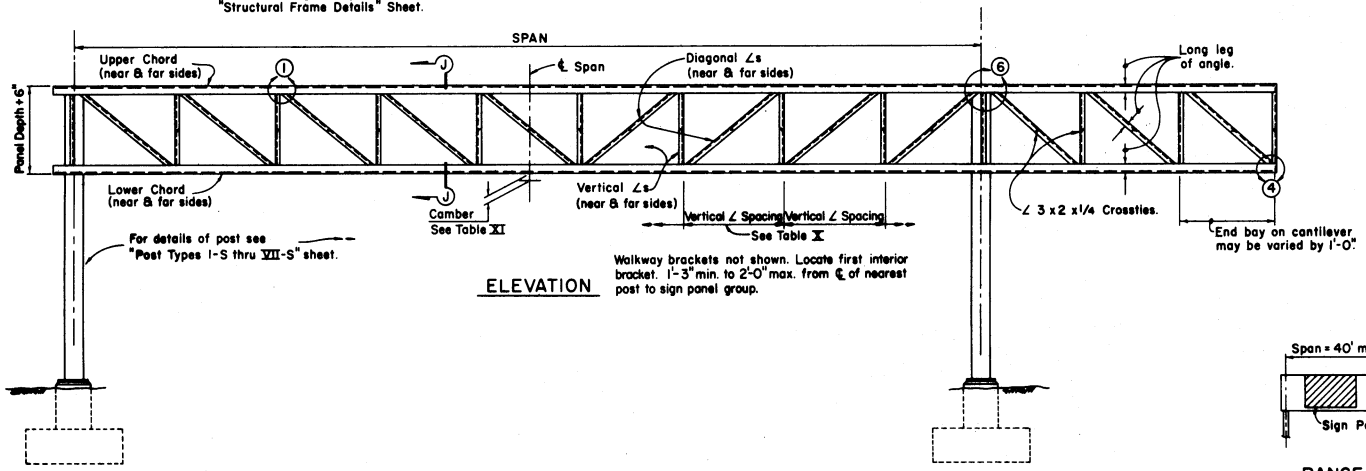
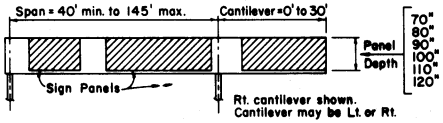


PLAN

Note: For Details ①④⑤⑥ & Sec. J-J see "Structural Frame Details" Sheet.



ELEVATION



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			1¼x1¼x1/4
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
90'-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

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			1¼x1¼x1/4	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"	6x4x3/8			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

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

Camber For Fabrication At ℄ Span	
Span	Camber
40' - 50'	1/2"
51' - 100'	1"
101' - 145'	1½"

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

TABLE XI

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 V-S & VI-S; Add 1'-0" for Post Type VII-S.

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

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL SHEETS

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5565

APPROVED September 1, 1966

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

OVERHEAD SIGNS
TWO POST TYPE
STRUCTURAL FRAME MEMBERS

S5-3

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To accompany plans dated _____

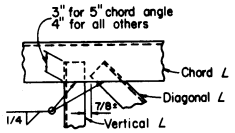
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

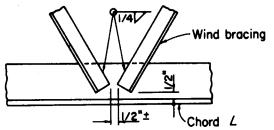
BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED September 1, 1966

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO 5945



DETAIL 1



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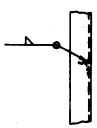

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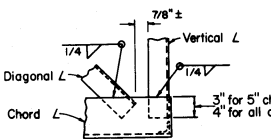
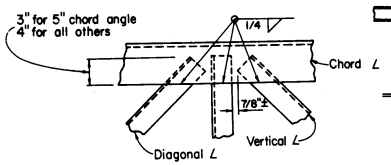


DETAIL 4

DETAIL 5



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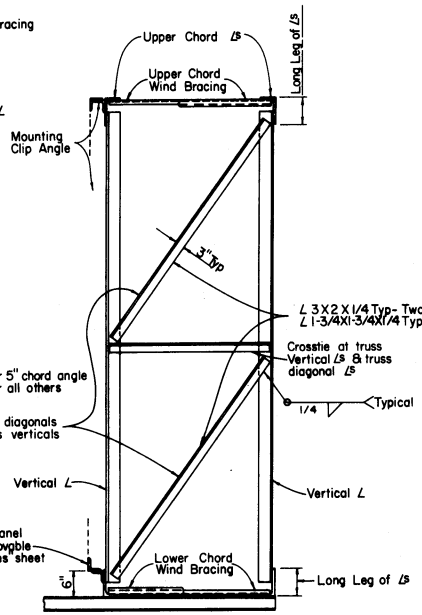
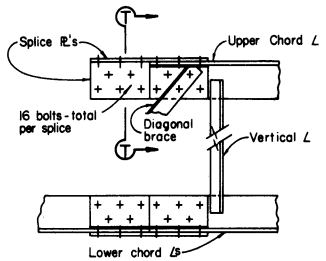
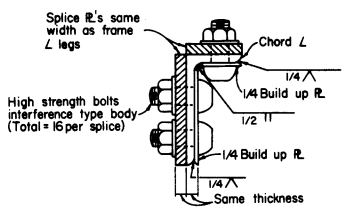


TYPICAL SECTION J-J

Note:
Diagonal L5 in plane of truss, not shown. Bracing shown is at all vertical L5 of truss



OPTIONAL
BOLTED CHORD SPLICE



SECTION T-T

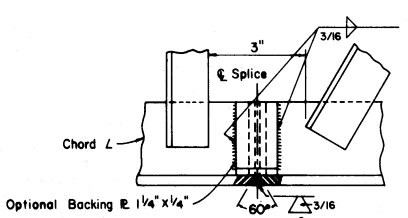
SPLICE NOTES

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.

Build Up Plate:
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 L	Nominal Bolt Diam.
5X3 1/2X5/16	3/4"
6X4 X 3/8	7/8"
7X4 X 7/16	1"
8X4 X 1/2	1 1/8"
8X4 X 5/8	1 1/4"
SINGLE POST SIGNS	
Chord L	Nominal Bolt Diam.
5X3X5/16	3/4"

STATE OF CALIFORNIA
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STRUCTURAL FRAME DETAILS

S6-5

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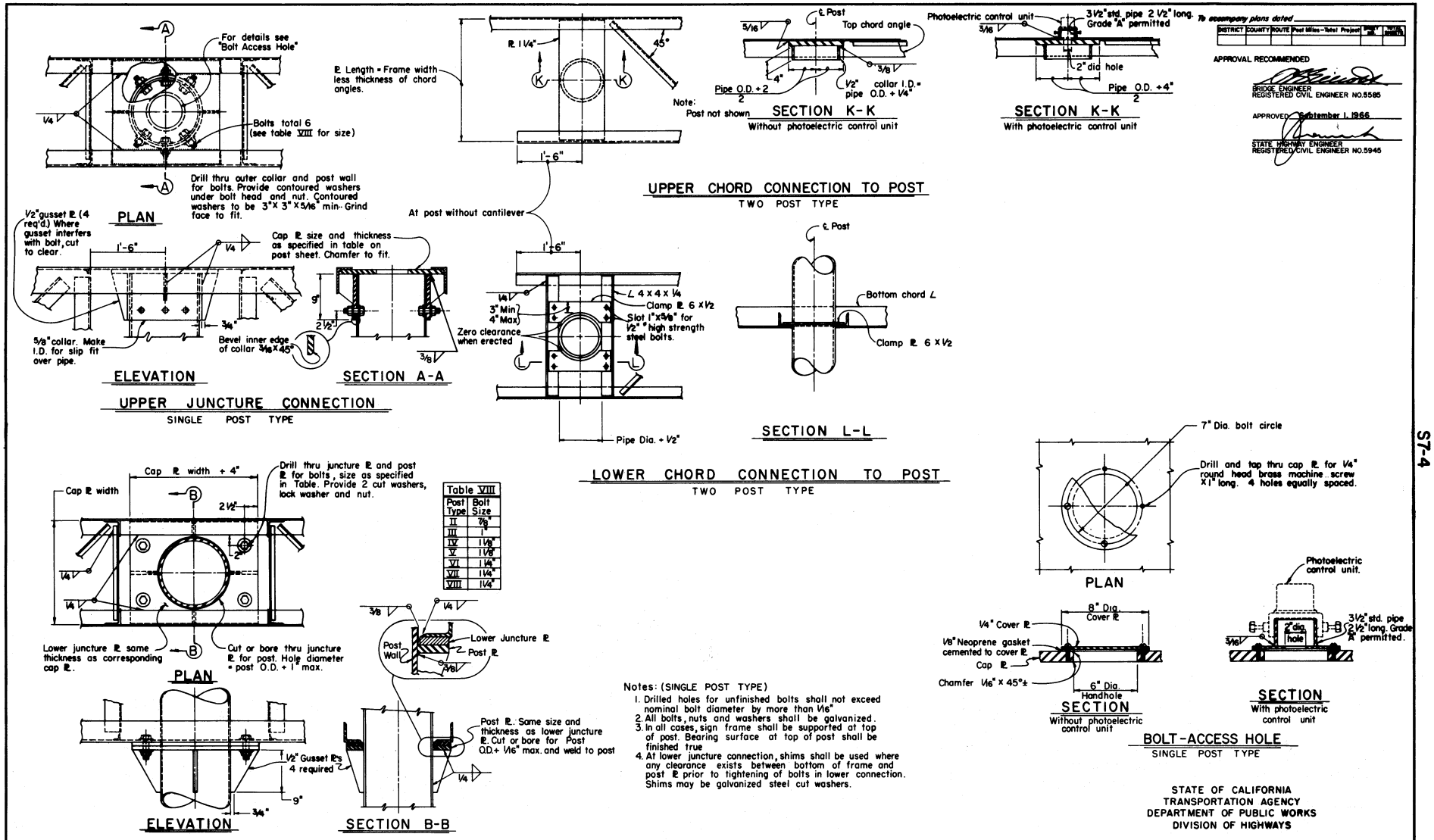

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To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

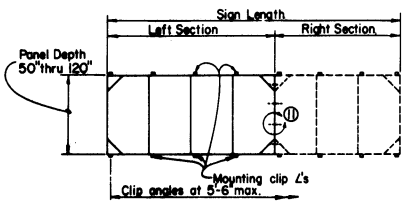
APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO.5585

APPROVED September 1, 1966

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO.5945

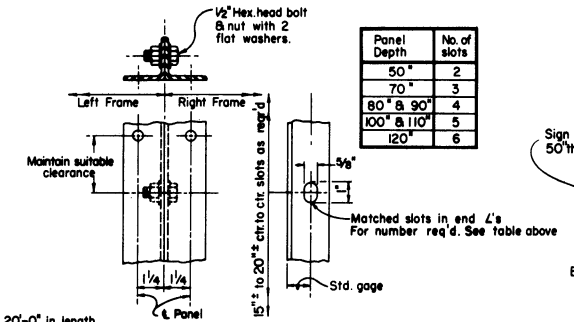
Note:
Panel mounting holes not shown.
Panel lengths available in 2'-0" increments.



REMOVABLE FRAME
GREATER THAN 20'-0"

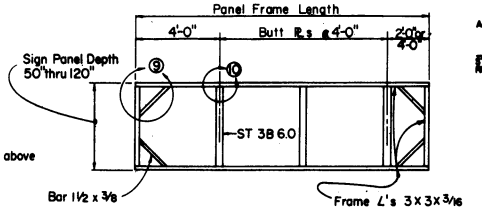
Sign Length	Left Section	Right Section
22'-0"	12'	10'
24'-0"	12'	12'
26'-0"	12'	14'
28'-0"	16'	12'
30'-0"	16'	14'
32'-0"	16'	16'
34'-0"	16'	18'
36'-0"	20'	16'
38'-0"	20'	18'
40'-0"	20'	20'

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.



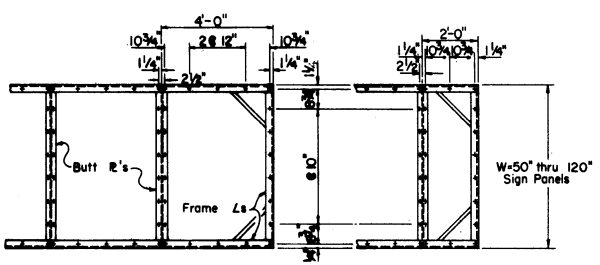
Panel Depth	No. of slots
50"	2
70"	3
80" & 90"	4
100" & 110"	5
120"	6

DETAIL ⑪
No Scale



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

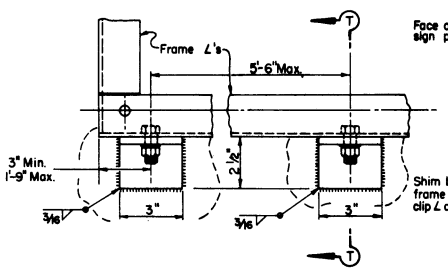
NOTES:
1. Frames shall be all-welded construction.
2. ½" Panel mounting holes shall be drilled by template. Sign panel may be considered a template.
3. Drilled and tapped holes (1/4"-20 N.C.) may be used where interference due to welds or structural members is encountered.
4. Butt plate faces shall be 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. Butt plates may be crimped at ends to join frame angles. Fillet weld all around.



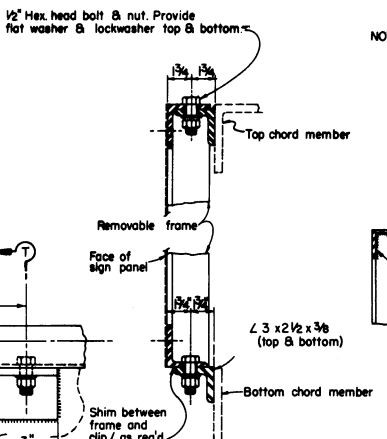
TYPICAL 4'-0" PANEL
TYPICAL 2'-0" PANEL

Note: All holes ½" diameter

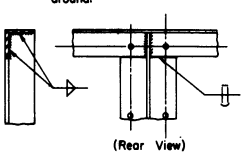
MOUNTING HOLE SPACING FOR SIGN PANEL & FRAME
Scale: ½" = 1'-0"



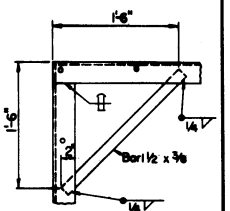
FRAME MOUNTING DETAILS
No Scale



SECTION T-T



DETAIL ⑩



DETAIL ⑨

TYPICAL JOINT DETAILS

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TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

OVERHEAD SIGNS
REMOVABLE SIGN PANEL FRAMES S8-6

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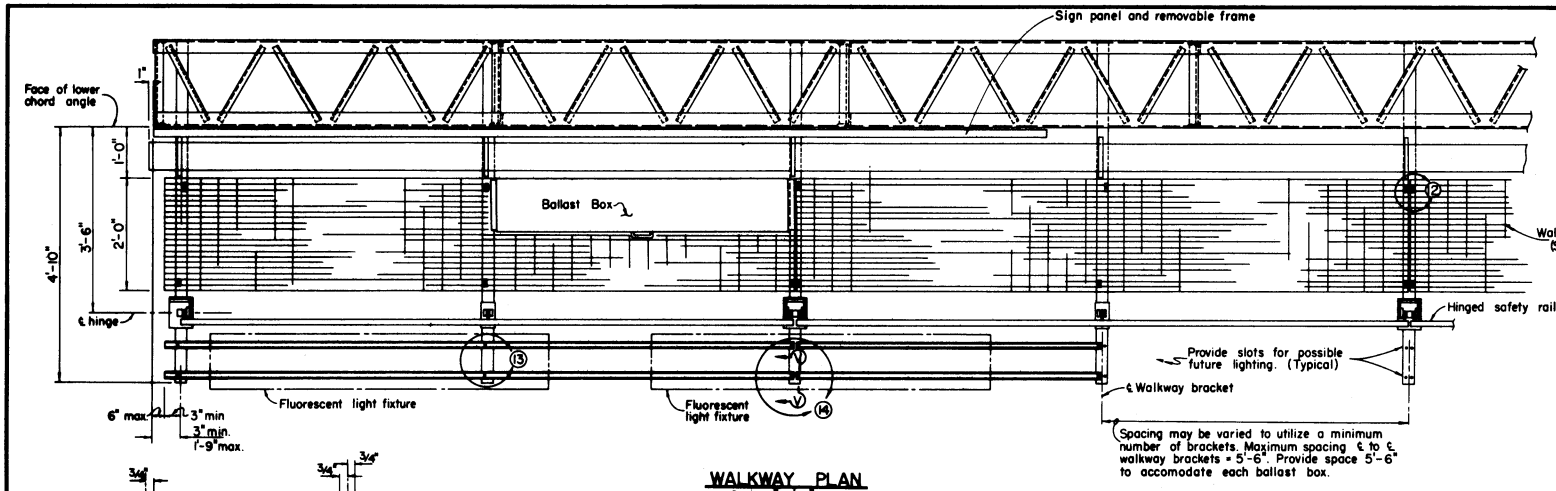
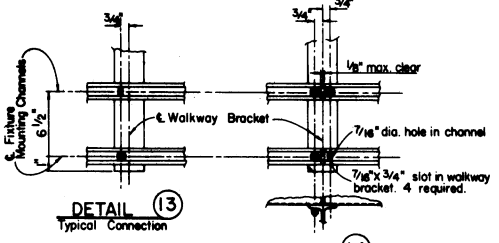


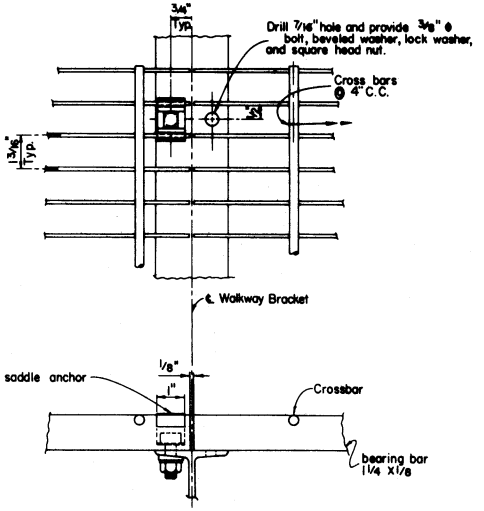
WALKWAY PLAN
Scale 1" = 1'-0"



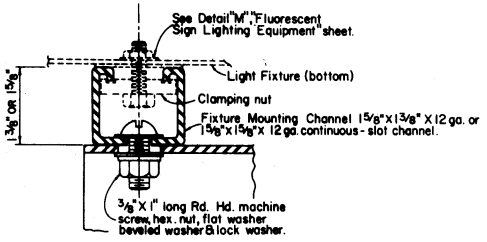
DETAIL (13)
Typical Connection

DETAIL (14)
Connection at Splice

1. Welded-type grating shall have 1 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

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET	TOTAL

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5566

APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

OVERHEAD SIGNS
WALKWAY DETAILS NO 1 S9-8

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To accompany plans dated _____

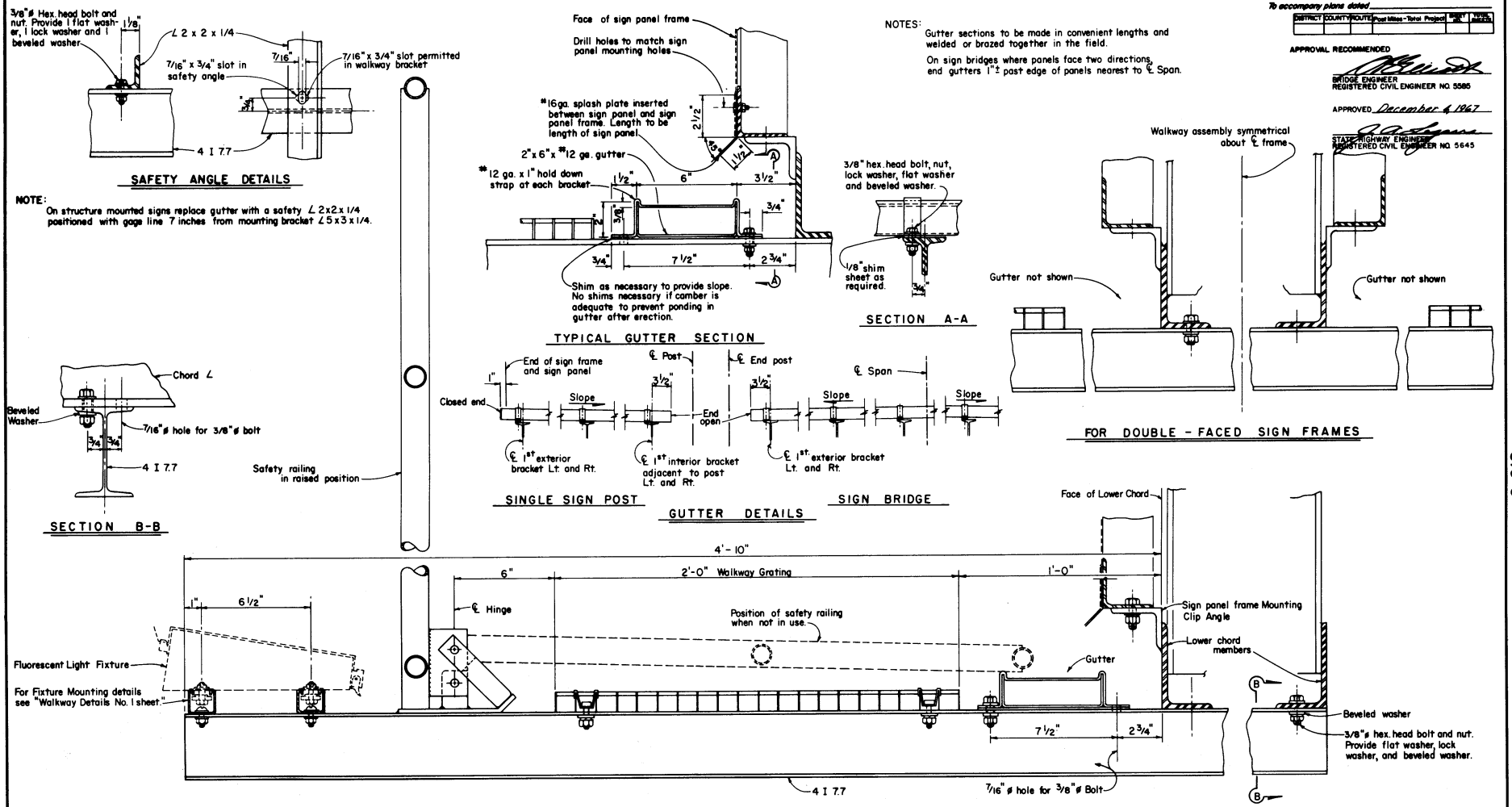
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645



STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

OVERHEAD SIGNS
WALKWAY DETAILS NO. 2

SIO-6

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To accompany plans dated _____

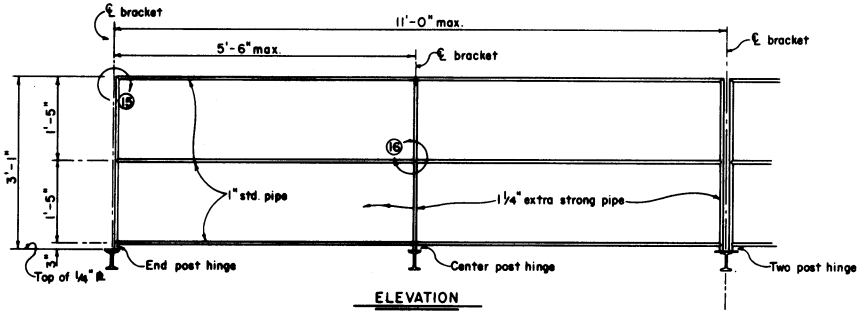
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645



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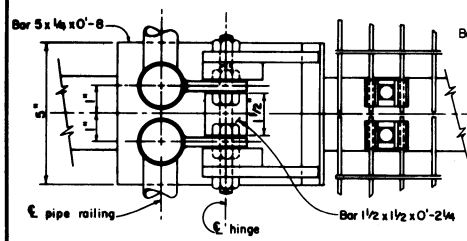
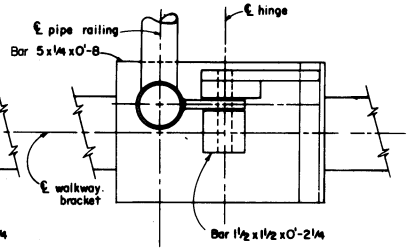
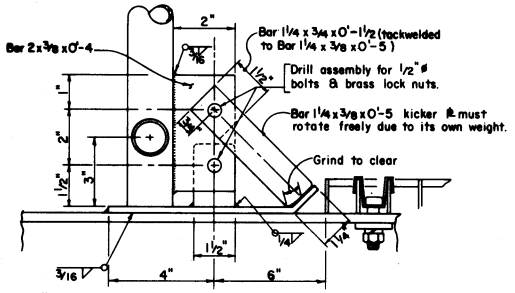


PLAN VIEW — TWO POST HINGE



PLAN VIEW — END POST HINGE



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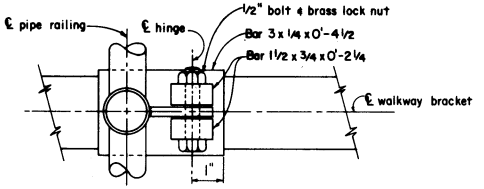
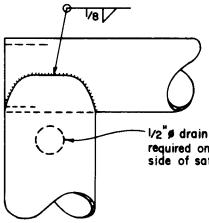


PLAN VIEW — CENTER POST HINGE

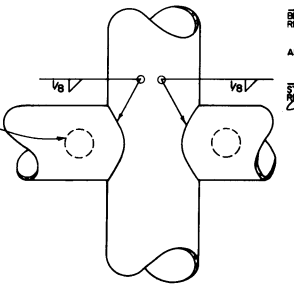
Note:

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

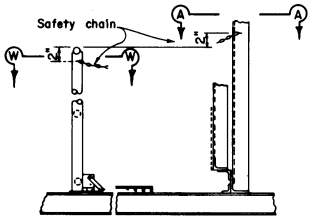


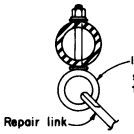
DETAIL 15

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

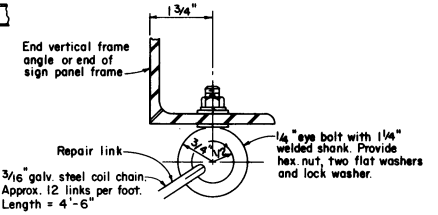


DETAIL 16





SECTION W-W



SECTION A-A

CHAIN ASSEMBLY

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

OVERHEAD SIGNS
WALKWAY SAFETY RAILING DETAILS SII-7

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To accompany plans dated _____

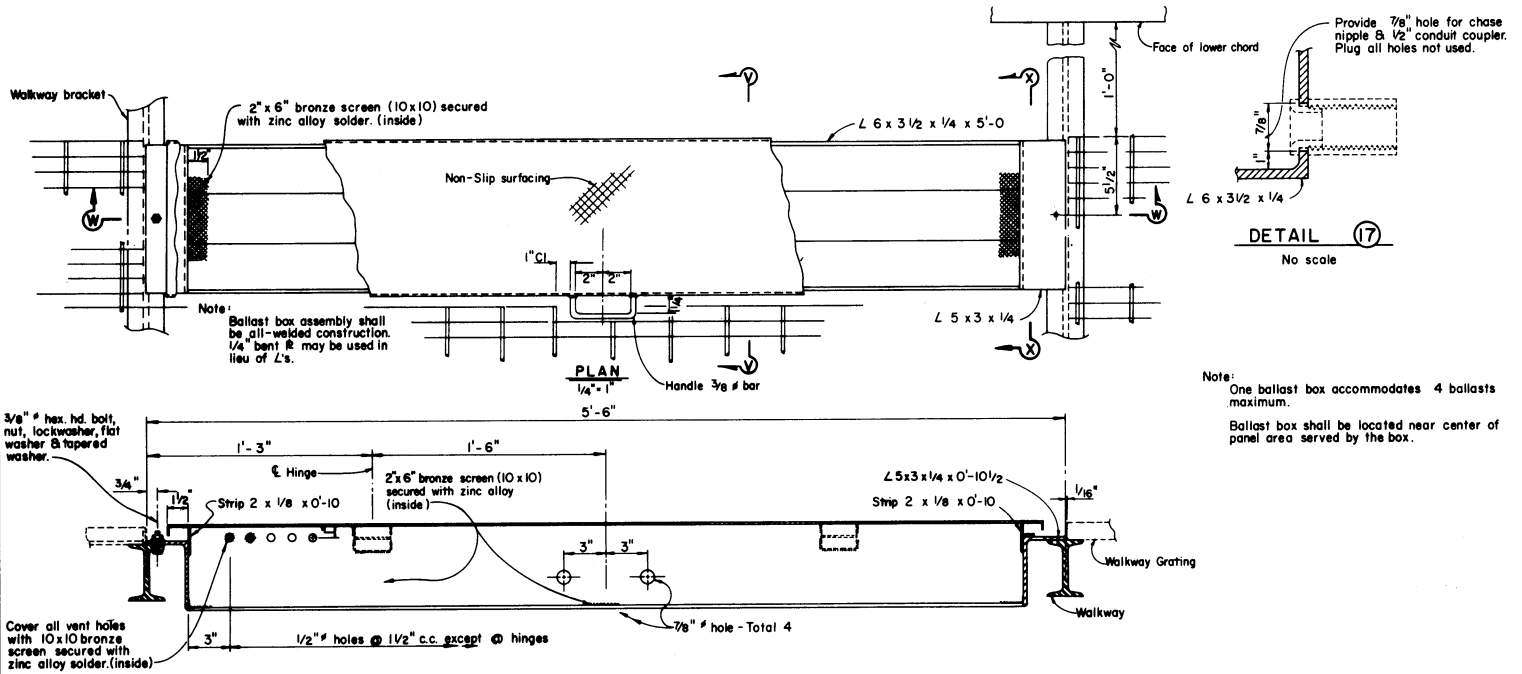
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	Sheet No.	Total Sheets

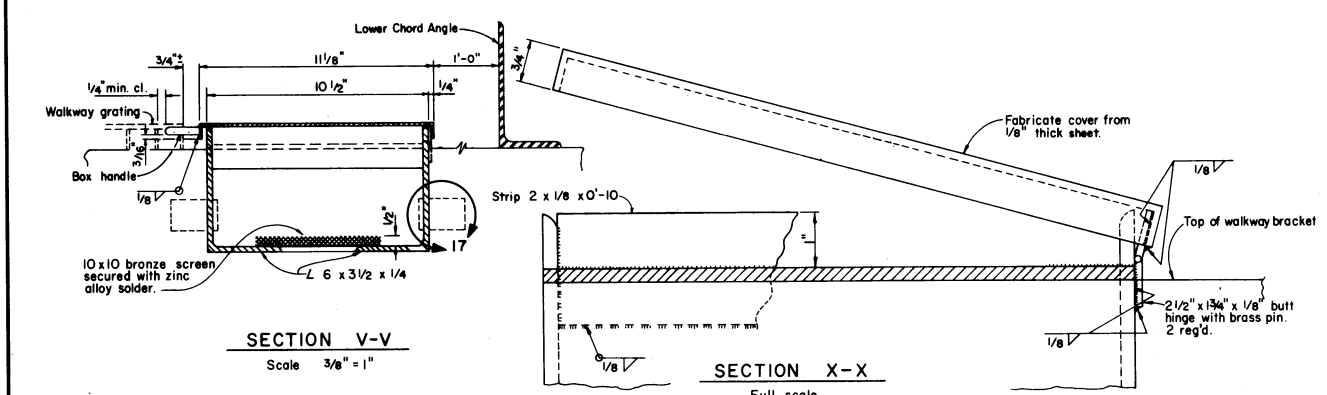
APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645





STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

OVERHEAD SIGNS

WALKWAY-MOUNTED BALLAST BOX

S12-6

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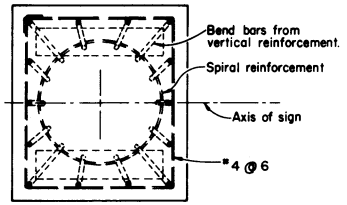
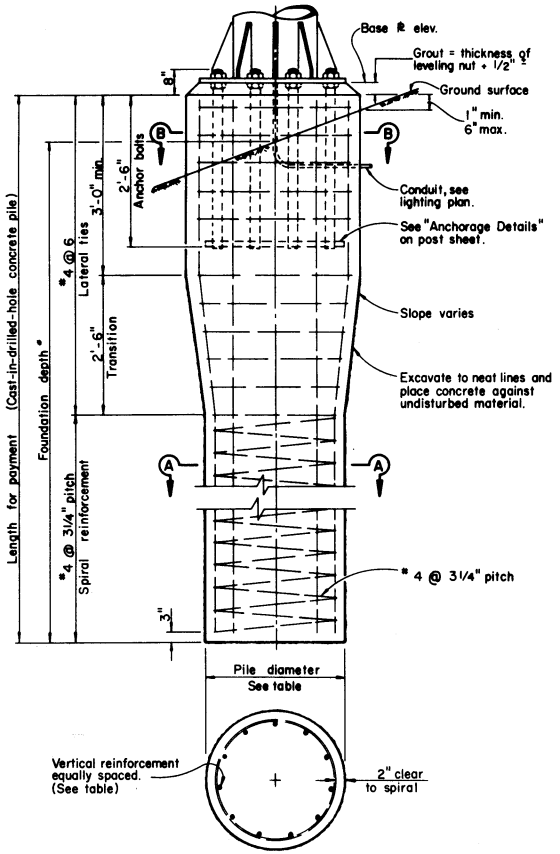


SECTION B-B



SECTION A-A

Post Type	Anchor Bolts	Pedestal Size	Reinforcing Steel Vertical	Pile Diameter	Foundation Depth*
II	6 - 2" #	2'-11" x 2'- 8"	14 - # 7	30"	12'
III	6 - 2" #	3'- 2" x 2'-10"	14 - # 8	30"	12'
IV	6 - 2" #	3'- 8" x 3'- 4"	16 - # 8	36"	12'
V	10 - 2" #	3'-10" x 3'- 7"	16 - # 9	36"	15'
VI	10 - 2" #	3'-10" x 3'- 7"	16 - #10	36"	16'
VII	12 - 2" #	4'- 3" x 3'-11"	16 - #11	36"	19'
VIII	12 - 2" #	4'- 5" x 3'-11"	16 - #14	36"	20'
I-S	6 - 2" #	2'- 7" x 2'- 3"	14 - # 7	30"	12'
II-S	6 - 2" #	3'- 0" x 2'- 6"	14 - # 8	30"	14'
III-S	6 - 2" #	3'- 4" x 2'- 7"	14 - #10	30"	16'
IV-S	8 - 2" #	3'- 6" x 3'- 2"	16 - #10	36"	17'
V-S	8 - 2" #	3'- 8" x 3'- 4"	16 - #11	36"	20'
VI-S	8 - 2" #	4'- 0" x 3'- 4"	16 - #11	36"	21'
VII-S	8 - 2¼"#	4'- 5" x 3'-11"	16 - #14	36"	23'

* Use Foundation Depth shown in table unless otherwise shown on the Format Sheet.

NOTES:

1. For anchor bolt layout see Post Sheet.
2. For "Base ℞ Elev." see Format Sheet.
3. Pedestal and pipe shall be Class "A" P.C.C.
4. Pedestals & Base Plates; longer sides shall be normal to axis of sign.
5. The excavation around the formed pedestal shall be backfilled & compacted with material equivalent to the surrounding material.
6. Pedestal shall be formed 6" min. below ground suface.

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO.6585

APPROVED December 4, 1967

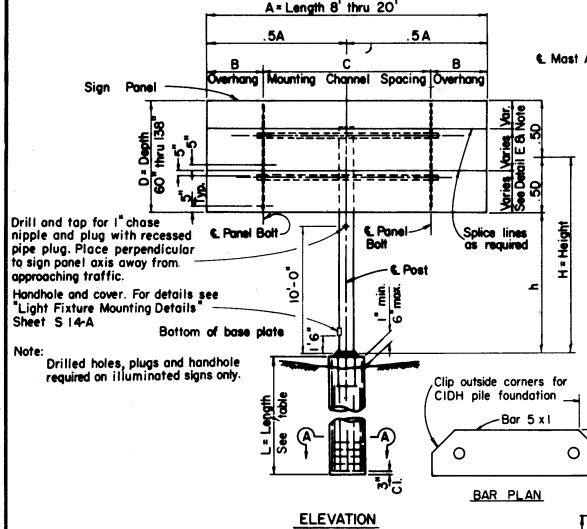
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO.5645

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

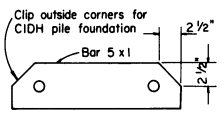
OVERHEAD SIGNS
ALTERNATE PILE FOUNDATION

S 13-4

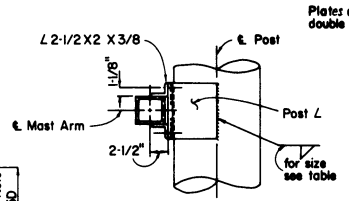
Return to Table of Contents



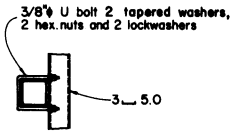
ELEVATION



BAR PLAN

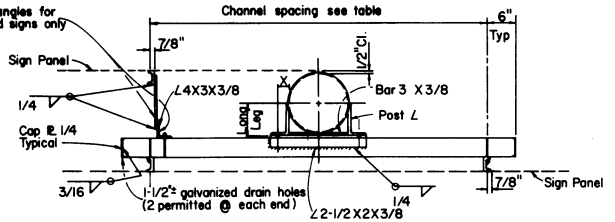


SECTION B-B

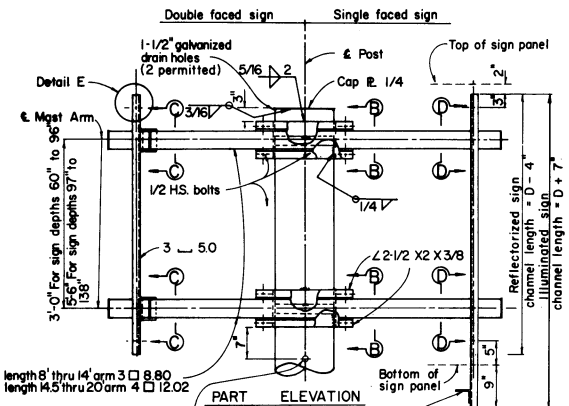


SECTION D-D

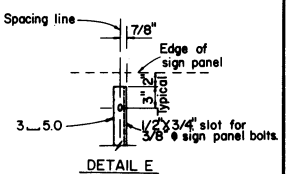
Typical connection for single faced signs



PLAN



PART ELEVATION

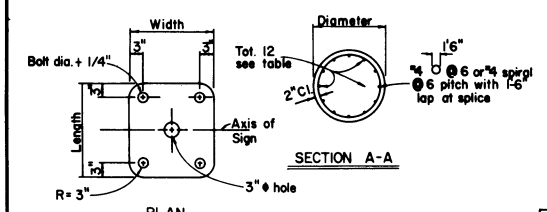


DETAIL E

Sign panel depths more than 60" require additional mounting holes located 5" each side of sign panel splice lines. Exact location is dependent on sign panel manufacturer and must be determined at time of sign erection.

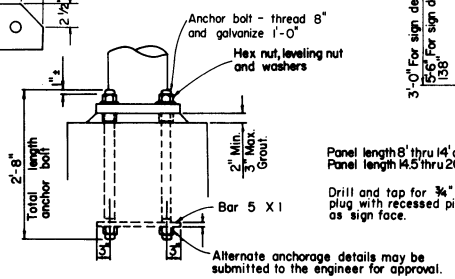
SIGN PANEL LENGTH	SIGN PANEL OVERHANG	MOUNTING CHANNEL SPACING
A	B	C
8'-0"	18"	5'-0"
8'-6"	20"	5'-2"
9'-0"	22"	5'-4"
9'-6"	23"	5'-8"
10'-0"	24"	6'-0"
10'-6"	24"	6'-6"
11'-0", 11'-6" & 12'-0"	24", 27" & 30"	7'-0"
12'-6"	30"	7'-6"
13'-0"	30"	8'-0"
13'-6" & 14'-6"	30" & 36"	8'-6"
14'-0" & 15'-0"	30" & 36"	9'-0"
15'-6" & 16'-0"	36" & 39"	9'-6"
16'-6"	39"	10'-0"
17'-0" & 17'-6"	39" & 42"	10'-6"
18'-0" & 18'-6"	42" & 45"	11'-0"
19'-0"	45"	11'-6"
19'-6" & 20'-0"	45" & 48"	12'-0"

MOUNTING CHANNEL SPACING
LAMINATED PANEL SIGNS

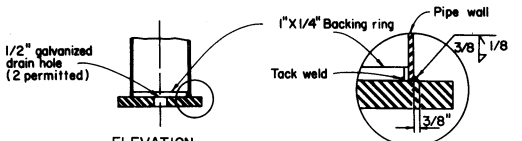


PLAN

SECTION A-A

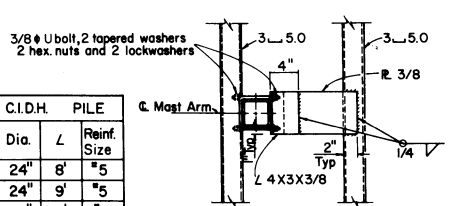


ANCHORAGE DETAILS



ELEVATION

BASE PLATE DETAILS



SECTION C-C

Typical for double faced signs

POST SIZE (Pipe)	POST ANGLES			BASE PLATE	ANCHOR BOLT DIA.	C.I.D.H. PILE		
	ANGLE	X	WELD			Dia.	∠	Reinf. Size
6 @ 18.97	∠4X3X1/2	1-3/4"	1/4	1'-2"X1'-2"XH/2"	H/4"	24"	8'	#5
6 @ 28.57	∠4X3X1/2	1-3/4"	1/4	1'-2"X1'-2"XH/2"	H/2"	24"	9'	#5
8 @ 28.55	∠5X3X1/2	1-3/4"	1/4	1'-6"X1'-4"XH/2"	1-1/2"	30"	9'	#6
8 @ 43.39	∠5X3X1/2	1-3/4"	1/4	1'-6"X1'-4"X2"	1-3/4"	30"	11'	#7
10 @ 54.74	∠6X4X5/8	2 1/2"	1/4	1'-8"X1'-6"X2"	2"	30"	13'	#8
12 @ 65.42	∠7X4X5/8	2 1/2"	5/16	1'-8"X1'-6"X2"	2-1/2"	30"	15'	#10
14 @ 72.09	∠8X4X3/4	2 1/2"	5/16	1'-10"X1'-6"X2-1/4"	2-1/2"	36"	15'	#10

To accompany plans dated

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5565

APPROVED December 4 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BALANCED LIGHTWEIGHT SIGNS
(SINGLE STEEL POST)
POST FOUNDATION AND MOUNTING DETAILS

S14-A

Return to Table of Contents

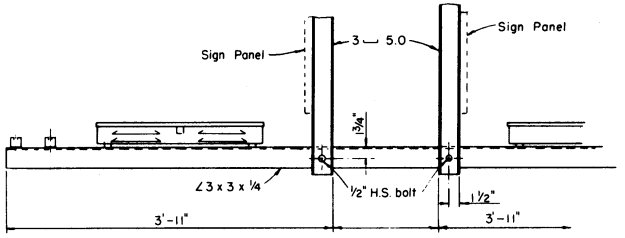
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED December 6, 1967

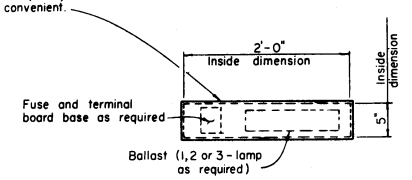
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645



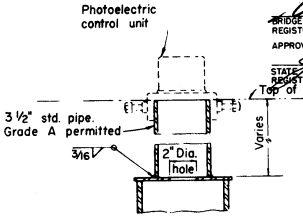
SIDE VIEW - DOUBLE FACED SIGN
1½" = 1'-0"

Note:
For details not shown see "Side View - Single Faced Sign" details

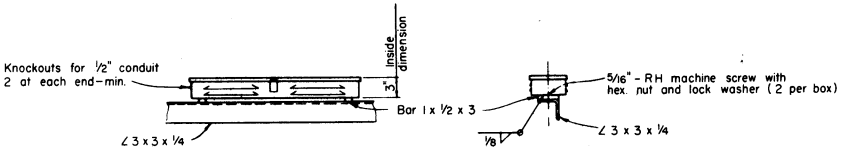
Side-hinged, rain tight 16 gage galvanized steel ballast box with screened side louvers as shown.
Furnish one box for each ballast. Mount on fixture bracket as shown.
If more than two boxes are required, mount remainder on arm or beam or post as convenient.



PLAN



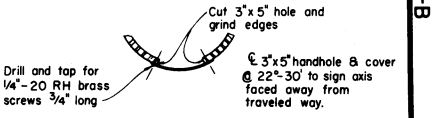
PHOTOELECTRIC CONTROL UNIT

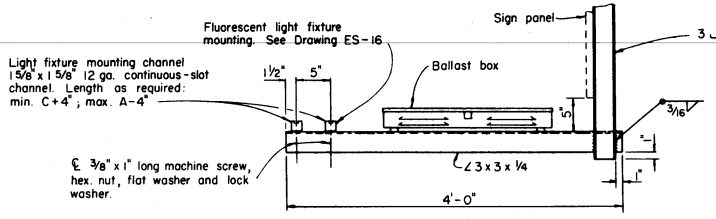


ELEVATION

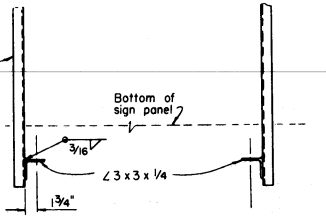
END VIEW

BALLAST BOX DETAILS
1½" = 1'-0"

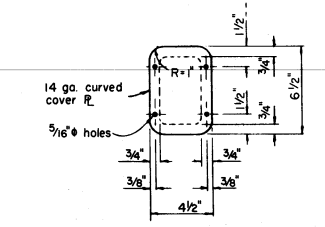




SIDE VIEW - SINGLE FACED SIGN
1½" = 1'-0"



FRONT VIEW
1½" = 1'-0"



HANDHOLE DETAILS
3" = 1'-0"

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BALANCED LIGHTWEIGHT SIGNS
LIGHT FIXTURE MOUNTING DETAILS S14-B

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To accompany plans dated _____

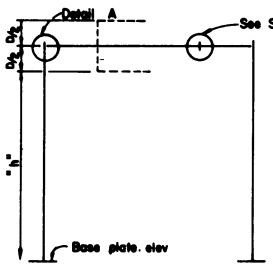
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	PLANS DATE

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO.5585

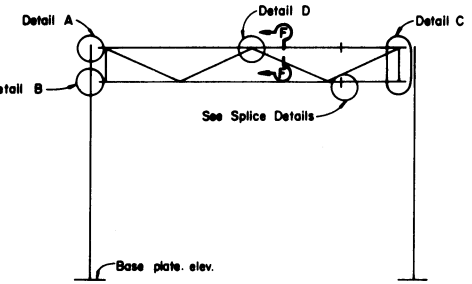
APPROVED December 4 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO.5645



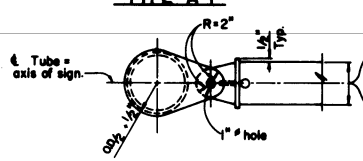
SINGLE CROSS BEAM SERIES

TYPE A-1

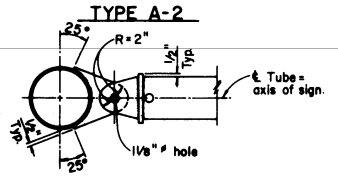


TRUSSED CROSS BEAM SERIES

TYPE A-2



PLAN



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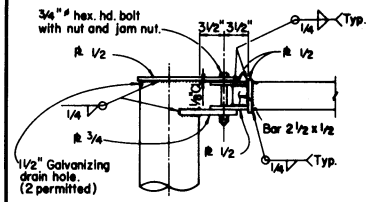
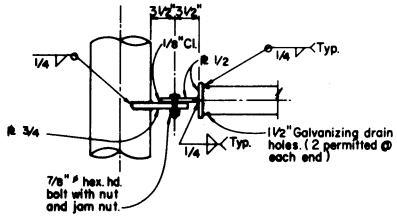
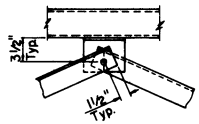


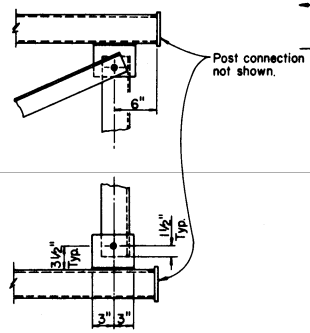
DETAIL A



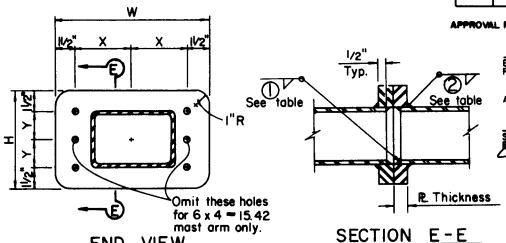
DETAIL B



DETAIL D



DETAIL C



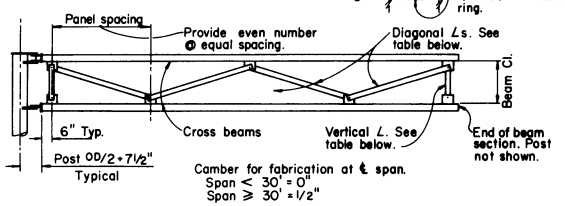
END VIEW

SECTION E-E

SPLICE DETAILS*

TUBULAR CROSS BEAM SIZE	HIGH STRENGTH BOLTS				A-36 PLATES			WELDING	
	NO.	SIZE	X	Y	W	H	THICKNESS	①	②
6 x 4 = 15.42	4	5/8"	4 1/4"	2"	11 1/2"	7"	1"	3/16	5/16
8 x 4 = 18.82	6	5/8"	5 1/4"	2"	1'-1 1/2"	7"	1"	3/16	5/16
8 x 6 = 22.04	6	5/8"	5 1/4"	2 1/2"	1'-1 1/2"	8"	1 1/8"	3/16	3/8
8 x 6 = 31.73	6	5/8"	4 1/4"	3 1/2"	11 1/2"	10"	1 1/8"	1/4	5/16
10 x 6 = 25.44	6	5/8"	6 1/2"	2 1/2"	1'-4"	8"	1 3/8"	3/16	3/8
10 x 6 = 36.83	6	3/4"	6 1/2"	3"	1'-4"	9"	1 5/8"	5/16	1/2

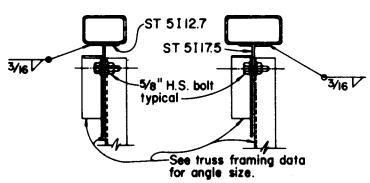
*Optional welded splice.



SIGN DEPTH	BEAM CLEARANCE	MAX. PANEL SPACING	VERTICAL ANGLE	DIAGONAL ANGLE
40"- 72"	2'-0"	5'-6"	L3 1/2 x 2 1/2 x 1/4*	L3 1/2 x 2 1/2 x 1/4*
73"-100"	4'-6"	6'-6"	L3 1/2 x 2 1/2 x 1/4*	L3 1/2 x 2 1/2 x 1/4*

* Short leg outstanding.

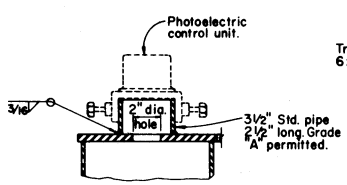
TRUSS FRAMING DATA



Truss cross beam 6 x 4 = 15.42 only.

Truss cross beam except 6 x 4 = 15.42.

SECTION F-F



PHOTOELECTRIC CONTROL UNIT

Note:
For post connection to base R see "Standard Lightweight Signs - Foundation" sheet.
For cross beam to sign panel connections see "Standard Lightweight - Sign Panel Mounting Details" sheet.

See format sheet for:
1. Sign type and location.
2. Panel type and location on structure.
3. Post size and dimension "h".
4. Cross beam size.
5. Foundation type.
6. Illumination if required.

For General Notes see "Standard Lightweight Signs - Foundation" sheet.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

LIGHTWEIGHT SIGNS TYPE A CONNECTION DETAILS

S 15-4

Return to Table of Contents

To accompany plans dated _____

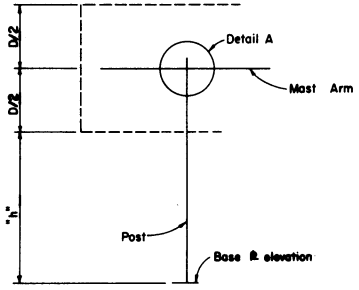
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

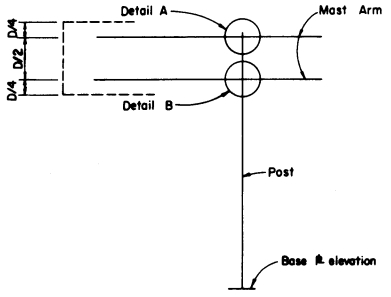
BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO.5585

APPROVED September 1, 1966

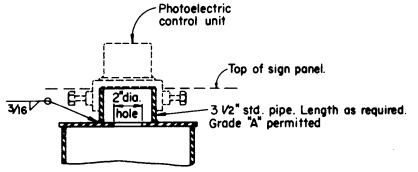
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO.5945



SINGLE ARM SERIES
TYPE B-1



DOUBLE ARM SERIES
TYPE B-2

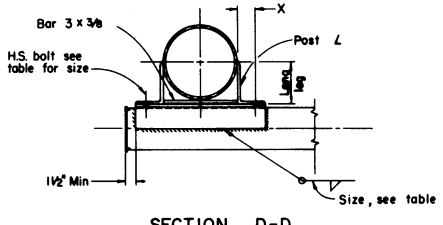


PHOTOELECTRIC CONTROL UNIT

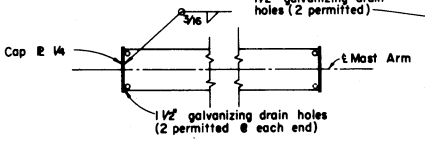
POST ANGLES			
POST SIZE	ANGLE	X	WELD
6	∠ 4 x 3 x 1/2	1 3/4"	1/4
8	∠ 5 x 3 x 1/2	1 3/4"	1/4
10	∠ 6 x 4 x 5/8	2 1/2"	1/4
12	∠ 7 x 4 x 5/8	2 1/2"	5/16
14	∠ 8 x 4 x 3/4	2 1/2"	5/16

MAST ARM ANGLES				
ARM SIZE	ANGLE	H.S. BOLT	Y	WELD
3 □ 8.80	∠ 2 x 2 x 3/8	1/2	1 1/8"	1/4
4 □ 12.02	∠ 2 1/2 x 2 x 3/8	1/2	1 1/8"	1/4
5 □ 15.42	∠ 3 x 2 1/2 x 3/8	5/8	1 3/8"	1/4
6 □ 18.82	∠ 3 1/2 x 2 1/2 x 3/8	5/8	1 3/8"	1/4
7 □ 22.04	∠ 4 x 3 x 1/2	3/4	1 3/4"	5/16
8 □ 25.44	∠ 5 x 3 x 1/2	7/8	1 3/4"	5/16
10 □ 32.23	∠ 6 x 4 x 5/8	7/8	2 1/2"	5/16

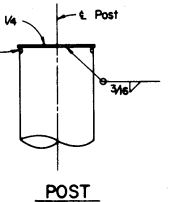
POST TO ARM FRAMING DATA



SECTION D-D



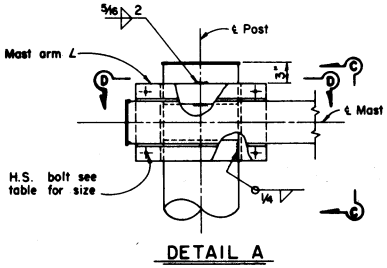
MAST ARM



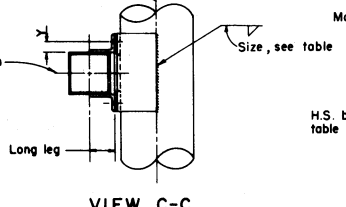
POST

END DETAIL

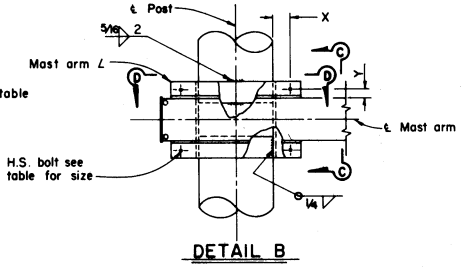
SEE FORMAT SHEET FOR:
1. Sign type and location.
2. Panel type and location on structure.
3. Post size and dimension "h".
4. Mast arm size.
5. Foundation type.
6. Illumination if reqired.



DETAIL A



VIEW C-C



DETAIL B

NOTE:
For post connection to base plate see "Standard Lightweight Signs – Foundation" sheet.
For mast arm to sign panel connections see "Standard Lightweight Signs – Sign Panel Mounting Details" sheet.
For mast arm length see "Standard Lightweight Signs – Sign Panel Mounting Details" sheet.

For General Notes See "Standard Lightweight Signs – Foundation" sheet

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

LIGHTWEIGHT SIGNS
TYPE B
CONNECTION DETAILS

S 16-3

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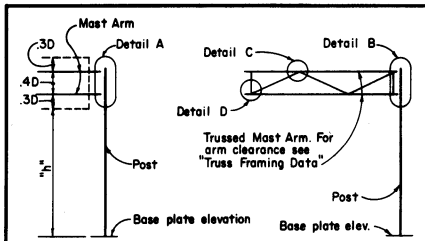
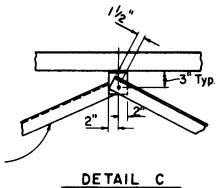


DOUBLE MAST ARM SERIES
TYPE C-1

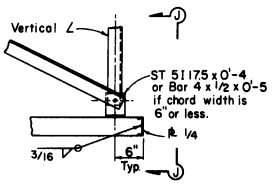
TRUSSED MAST ARM SERIES
TYPE C-2



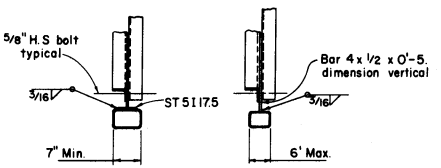
DETAIL C

SECTION F-F

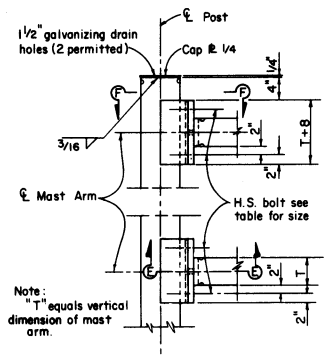
SECTION G-G



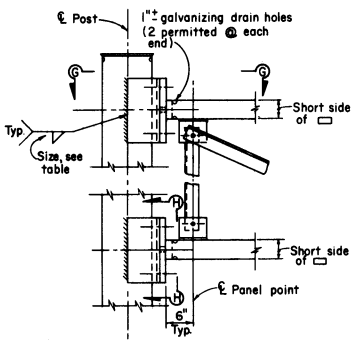
DETAIL D



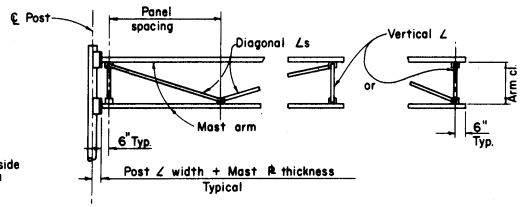
VIEW J-J



DETAIL A



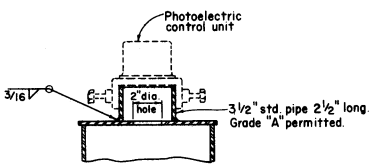
DETAIL B



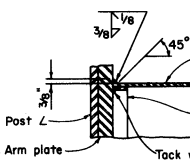
SIGN DEPTH INCHES	ARM CLEARANCE	MAX. PANEL SPACING	VERTICAL ANGLE	DIAGONAL ANGLE
D = 40"-72	2'-0"	4'-4"	∠2 x 2 x ¼	∠2 x 2 x ¼
D = 73"-100"	3'-0"	6'-6"	∠3½ x 2½ x ¼*	∠3½ x 2½ x ¼*

* Short leg outstanding

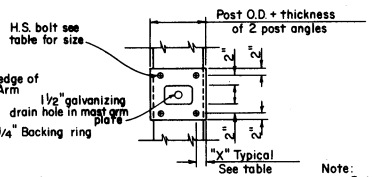
TRUSS FRAMING DATA



PHOTOELECTRIC CONTROL UNIT



SECTION E-E



SECTION H-H

Note:
Bottom connection shown.
Top similar

To accompany plans dated _____

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED September 1, 1966

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945

POST ANGLES			
POST SIZE	ANGLE	X	WELD
6	∠5 x 3 x ½	1¾"	¼
8	∠6 x 4 x ⅝	2¼"	¼
10	∠7 x 4 x ⅝	2¼"	¼
12	∠8 x 4 x ¾	2¼"	5/16
14	∠8 x 4 x ¾	2¼"	5/16

MAST ARM PLATE			
TWO ARMS	TRUSSED ARMS	PLATE	H.S. BOLT
3 □ 8.80		3/4"	1/2"
4 □ 12.02		1"	5/8"
5 □ 15.42		1"	3/4"
6 □ 18.82		1"	3/4"
7 □ 22.04	5 x 3 ▭ 16.84	1¼"	3/4"
	6 x 4 ▭ 21.94	1¼"	7/8"
	7 x 5 ▭ 27.04	1¼"	7/8"
	8 x 6 ▭ 31.73	1¼"	7/8"
	10 x 6 ▭ 36.83	1¼"	1"

POST TO ARM FRAMING DATA

Note:
For post connection to base ℞ see "Standard Lightweight Signs - Foundation" sheet.

For mast arm to sign panel connections see "Standard Lightweight Sign Panel Mounting Details" sheet.

For mast arm length see "Standard Lightweight Signs - Sign Panel Mounting Details" sheet.

See format sheet for:
1. Sign type and location.
2. Panel type and location on structure.
3. Post size and dimension "h".
4. Mast Arm size.
5. Foundation type.
6. Illumination if required.

For General Notes see "Standard Lightweight Signs - Foundation" sheet.

STATE OF CALIFORNIA
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DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

LIGHTWEIGHT SIGNS
TYPE C
CONNECTION DETAILS S 17-3

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To accompany plans dated _____

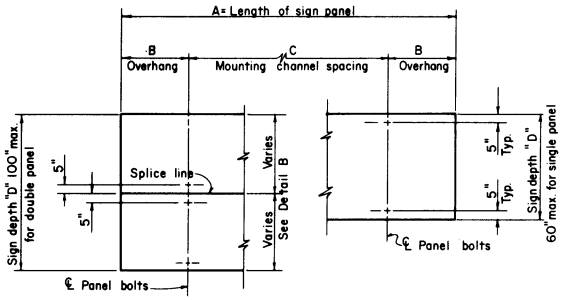
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

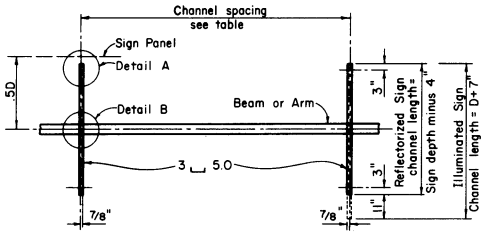
BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED September 1, 1966

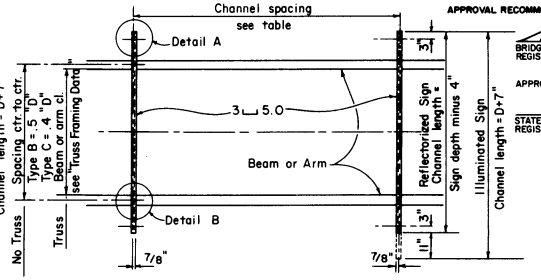
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945



LAMINATED PANEL SIGN - ELEVATION



SINGLE BEAM OR ARM SERIES

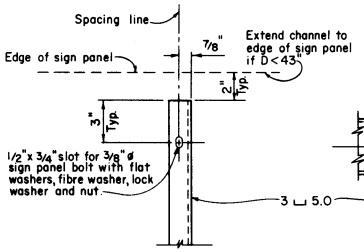


DOUBLE BEAM OR ARM SERIES

SIGN PANEL LENGTH *	SIGN PANEL OVERHANG	MOUNTING CHANNEL SPACING
A	B	C
4'-6", 5'-0" & 5'-6"	6", 9" & 12"	3'-6"
6'-0" & 6'-6"	12" & 15"	4'-0"
7'-0" & 7'-6"	15" & 18"	4'-6"
8'-0"	18"	5'-0"
8'-6"	20"	5'-2"
9'-0"	22"	5'-4"
9'-6"	23"	5'-8"
10'-0"	24"	6'-0"
10'-6"	24"	6'-6"
11'-0", 11'-6" & 12'-0"	24", 27" & 30"	7'-0"
12'-6"	30"	7'-6"
13'-0"	30"	8'-0"
13'-6" & 14'-6"	30" & 36"	8'-6"
14'-0" & 15'-0"	30" & 36"	9'-0"
15'-6" & 16'-0"	36" & 39"	9'-6"
16'-6"	39"	10'-0"
17'-0" & 17'-6"	39" & 42"	10'-6"
18'-0" & 18'-6"	42" & 45"	11'-0"
19'-0"	45"	11'-6"
19'-6" & 20'-0"	45" & 48"	12'-0"
20'-6" & 21'-0"	48" & 51"	12'-6"
21'-6"	51"	13'-0"
22'-0" & 22'-6"	51" & 54"	13'-6"
23'-0"	54"	14'-0"
23'-6" & 24'-0"	54" & 57"	14'-6"

*Signs longer than 24' are fabricated and mounted as adjoining single panels.

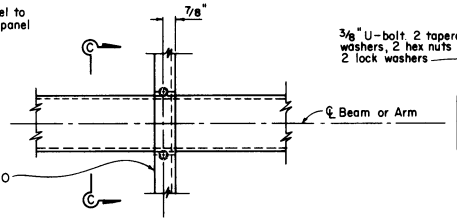
MOUNTING CHANNEL SPACING
LAMINATED PANEL SIGNS



DETAIL A

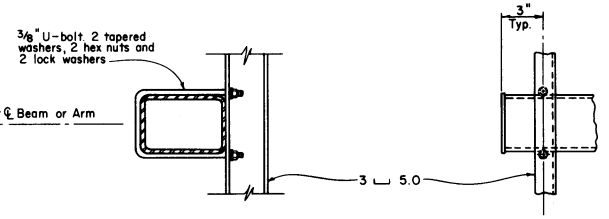
SINGLE AND DOUBLE SERIES

Sign panel depths more than 60" require additional mounting holes located 5" each side of sign panel splice line. Exact location is dependent on sign panel manufacturer and must be determined at time of sign erection.



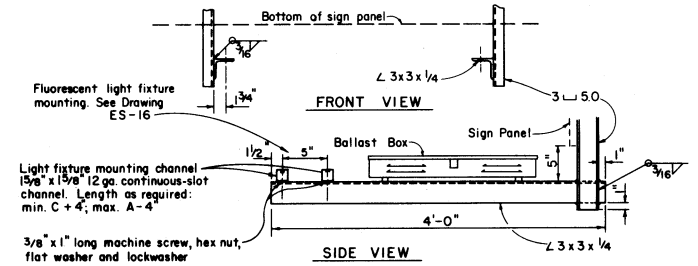
DETAIL B

Note:
Position sign panel so that mounting channels will clear truss connections and arm to post joints. Where interference cannot be avoided, 1/2" ø holes to pass the 3/8" ø U-bolt may be drilled through mast arm angles or truss connection members as necessary.

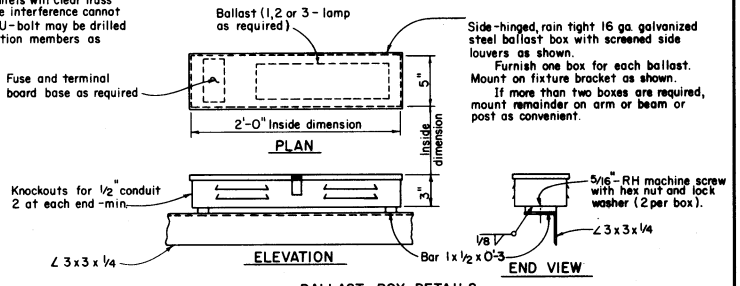


SECTION C-C

END ARM DETAIL
SINGLE POST SIGNS



LIGHT FIXTURE MOUNTING DETAIL



BALLAST BOX DETAILS

For General Notes see "Standard Lightweight Signs - Foundation" sheet.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

LIGHTWEIGHT SIGNS
(LAMINATED PANEL)
SIGN PANEL MOUNTING DETAIL

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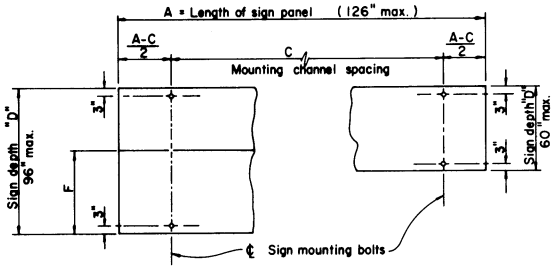
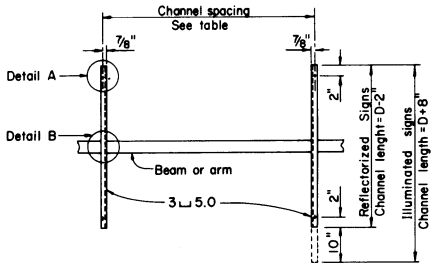


FRAMED SHEET METAL SIGNS

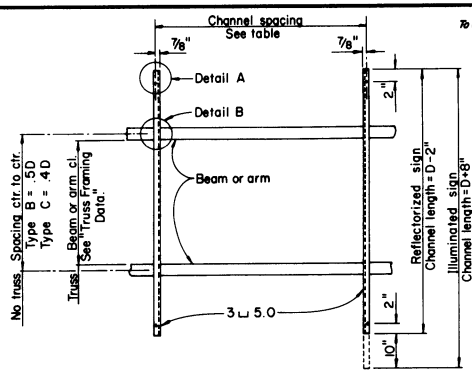
LENGTH OF SIGN *	DEPTH OF SIGN	MOUNTING CHANNEL SPACING		BOTTOM TO INTERIOR FRAME ℄
A	D	C		F
42" Special (R-59 & R-60)	50"	36"		—
54" 60" or 66"	36"–48"	42"		—
	49"–60"	42"		36"
	61"–96"	42"		48"
72" or 78"	36"–48"	48"		—
	49"–60"	48"		36"
	61"–72"	48"		48"
	73"–96"	48"		48"
84" or 90"	36"–48"	54"		—
	49"–60"	54"		36"
	61"–72"	54"		48"
	73"–96"	54"		48"
96"	36"–48"	60"		—
	49"–60"	60"		36"
	61"–96"	60"		48"
102"	36"–48"	62"		—
	49"–60"	62"		36"
	61"–96"	62"		48"
108"	36"–48"	64"		—
	49"–60"	64"		36"
	61"–96"	64"		48"
114"	36"–48"	68"		—
	49"–60"	68"		36"
	61"–96"	68"		48"
120"	36"–48"	72"		—
	49"–60"	72"		36"
	61"–96"	72"		48"
126"	36"–48"	78"		—
	49"–60"	78"		36"
	61"–96"	78"		48"

MOUNTING CHANNEL LAYOUT FRAMED SHEET METAL SIGNS

* Signs longer than 126" are fabricated and mounted as adjoining single panels.

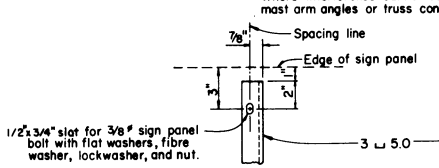


SINGLE BEAM OR ARM SERIES

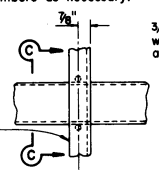


DOUBLE BEAM OR ARM SERIES

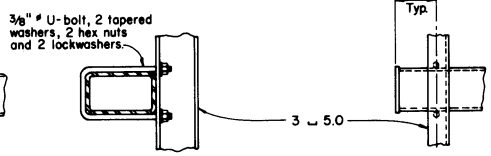
Note: Position sign panel so that mounting channels will clear truss connections and arm to post joints. Where interference cannot be avoided, 1/2" ø holes to pass the 3/8" ø U-bolts may be drilled through mast arm angles or truss connection members as necessary.



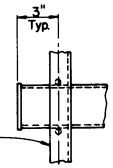
DETAIL A



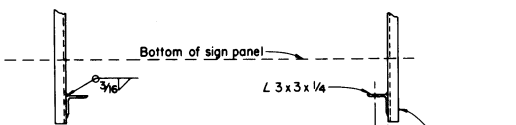
DETAIL B



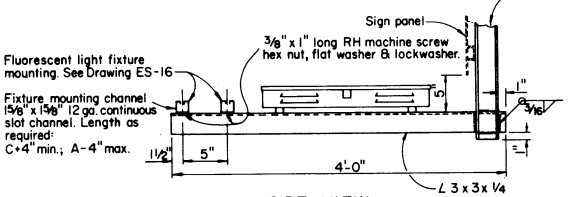
SECTION C-C



END ARM DETAIL SINGLE POST SIGNS



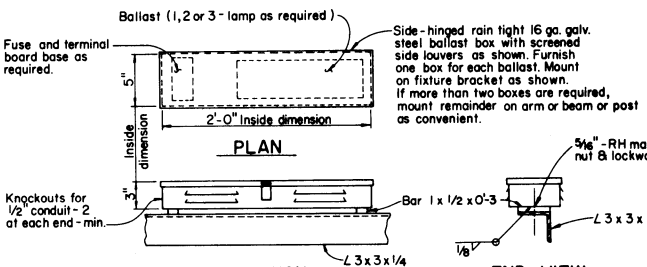
FRONT VIEW



SIDE VIEW

LIGHT FIXTURE MOUNTING DETAIL

For General Notes see "Standard Lightweight Signs - Foundation" sheet.



PLAN

ELEVATION

END VIEW

BALLAST BOX DETAILS

Scale - None

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

LIGHTWEIGHT SIGNS (FRAMED SHEET METAL) SIGN PANEL MOUNTING DETAIL

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To accompany plans dated

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED September 1, 1966

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945

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To accompany plans dated _____

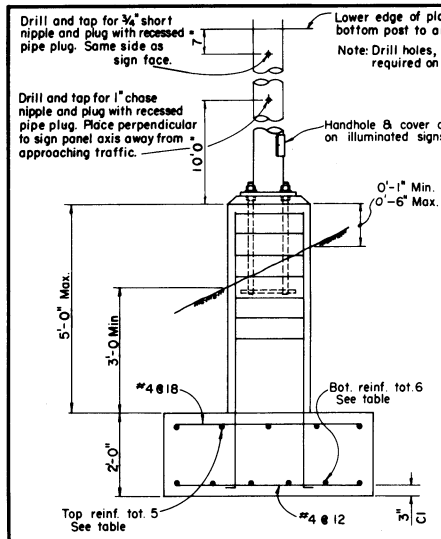
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

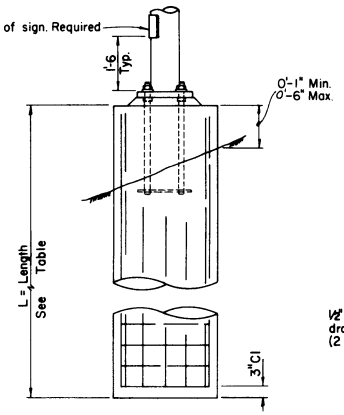
BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO.5585

APPROVED December 4, 1967

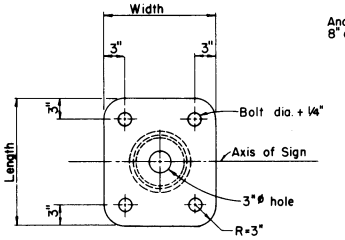
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO.5645



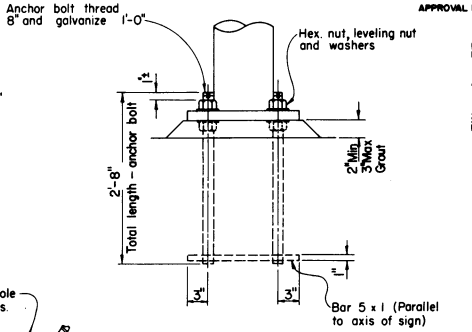
ELEVATION



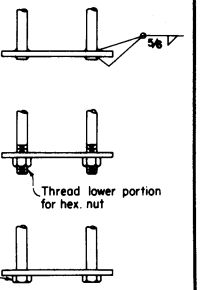
ELEVATION



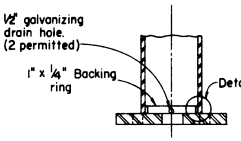
PLAN



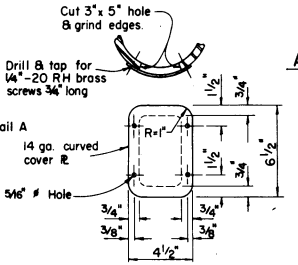
ANCHOR BOLT



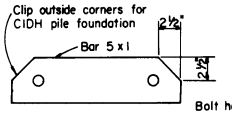
ALTERNATE BAR CONNECTIONS



ELEVATION

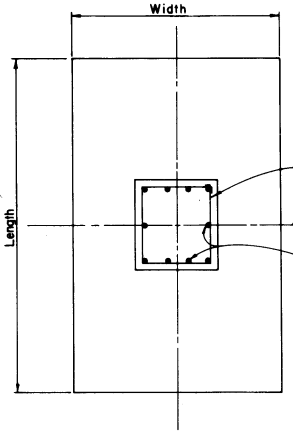


HANDHOLE DETAILS

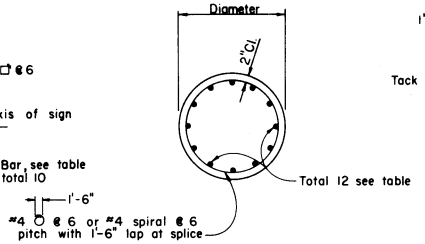


BAR PLAN

ANCHORAGE DETAILS

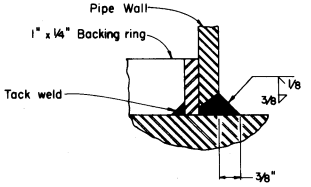


PLAN



PLAN

CAST-IN-DRILLED-HOLE PILE



DETAIL A

BASE PLATE DETAILS

POST SIZE	BASE PLATE	ANCHOR BOLT DIA.	C.I.D.H. PILE			SPREAD FOOTING				
			Dia.	L	Reinf. Size	Pedestal	Footing	Reinf. Top	Reinf. Bot.	Reinf. L Bar
6 @ 18.97	1'-2" x 1'-2" x 1 1/2"	1 1/4"	24"	8'	#5	1'-10" x 1'-10"	4'-0" x 6'-0"	#4	#4	#5
6 @ 28.57	1'-2" x 1' 2" x 1 1/2"	1 1/2"	24"	9'	#5	1'-10" x 1'-10"	4'-0" x 7'-0"	#4	#4	#5
8 @ 28.55	1'-6" x 1'-4" x 1 1/2"	1 1/2"	30"	9'	#6	2'-2" x 2'-0"	5'-0" x 8'-0"	#4	#4	#5
8 @ 43.39	1'-6" x 1'-4" x 2"	1 3/4"	30"	11'	#7	2'-2" x 2'-0"	6'-0" x 9'-0"	#4	#5	#5
10 @ 54.74	1'-8" x 1'-6" x 2"	2"	30"	13'	#8	2'-4" x 2'-2"	7'-0" x 10'-0"	#5	#7	#7
12 @ 65.42	1'-8" x 1'-6" x 2"	2 1/2"	30"	15'	#10	2'-4" x 2'-2"	7'-0" x 12'-0"	#6	#8	#8
14 @ 72.09	1'-10" x 1'-6" x 2 1/4"	2 1/2"	36"	15'	#10	2'-6" x 2'-2"	7'-0" x 13'-0"	#7	#9	#8

NOTE:
Base plates, pedestals and footings shall be placed with long dimensions normal to axis of sign.
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.
Backfill shall be in place prior to erection of post.

SPREAD FOOTING

GENERAL NOTES

DESIGN: A.A.S.H.O. Specifications for the Design and Construction of Structural Supports for Highway Signs, dated November 1960.
CONSTRUCTION: Standard Specifications, Division of Highways, dated July 1964 and the special provisions.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

LIGHTWEIGHT SIGNS FOUNDATION

S 20-3

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DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Bridge Engineer
Registered Civil Engineer No. 5585

APPROVED December 4, 1964

State Highway Engineer
Registered Civil Engineer No. 5645

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, and number of ballast boxes.

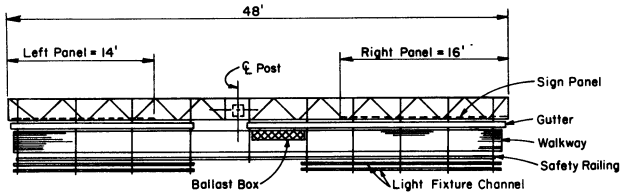
REFER TO THE FOLLOWING SHEETS FOR DETAILS NOT SHOWN ON FORMAT SHEET:

S21. Instructions and examples.
S22. Two post type - frame members
S23. Two post type - frame details.
S24. Two post type - cantilever - frame details.
S25. Two post type - frame juncture details.
S26. Two post type - post and anchorage details.
S27. Single post type - frame members.
S28. Single post cantilever - frame details.
S29. Single post cantilever - frame juncture details.
S30. Single post cantilever - post details.
S31. Single post butterfly - frame details.
S32. Single post butterfly - frame juncture details.
S33. Single post butterfly - post details.
S34. Single and two post types - sign panel mounting detail.
S35. Walkway details No. 1
S36. Walkway details No. 2
S37. Walkway safety railing details.
S38. Walkway mounted ballast box.
S39. Foundations.
Fluorescent sign lighting equipment - special details.

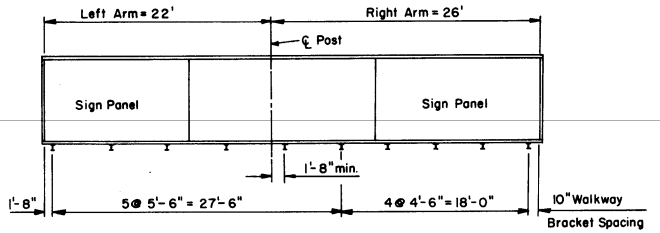
WALKWAY BRACKETS: The walkway bracket spacing where ballast boxes are located shall be 5'-6". Space all others to suit, maintaining uniform spacing where possible. Maximum spacing shall not exceed 5'-6".

BALLAST BOXES: Locate ballast boxes near the center of the area being served.

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.

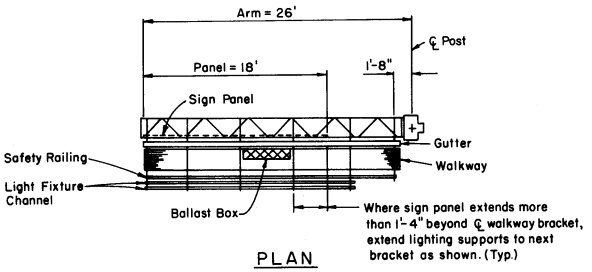


PLAN



SINGLE POST BUTTERFLY

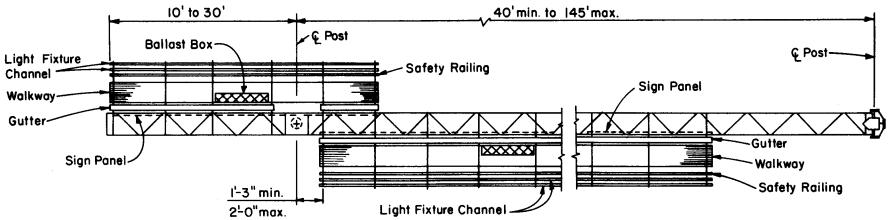
EXAMPLE NO. 1



PLAN

SINGLE POST CANTILEVER

EXAMPLE NO. 2



PLAN

TWO POST TYPE WITH CANTILEVER
(PART DOUBLE-FACED)

EXAMPLE NO. 3

GENERAL NOTES

SPECIFICATIONS:

DESIGN: A.A.S.H.O. Specifications for the design and construction of structural supports for highway signs, dated November 1960.

CONSTRUCTION: Standard Specifications, Division of Highways, dated July 1964 and the Special Provisions.

LOADING:
WIND LOADING: Normal to face of sign: 30 P.S.F.
Transverse to face of sign: 0.2 of normal force.

WALKWAY LOADING: Dead load + 500 lbs. concentrated live load.

UNIT STRESSES:

STRUCTURAL STEEL:	Fs = 20,000 P.S.I.
REINFORCED CONCRETE:	Fs = 20,000 P.S.I., Fc = 1,200 P.S.I.
FOOTING SOIL PRESSURE:	1¼ tons/sq. ft.

Allowable unit stresses due to wind load, or wind load in combination with other forces, are increased 45%.

MINIMUM CLEARANCE: Vertical roadway clearance 18'-0"

WELDING: All welding continuous unless otherwise noted on the plans. All welding to be done in accordance with the A.W.S. Specifications for Welded Highway and Railway Bridges, dated 1963.

NOTE:
Signs are shown and dimensioned looking in the direction of traffic. Double-faced signs are shown and dimensioned looking ahead along stationing.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS
INSTRUCTIONS AND EXAMPLES

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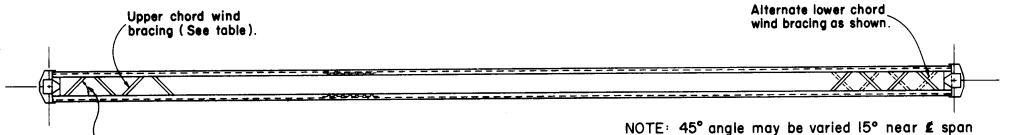
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Bridge Engineer
Registered Civil Engineer No. 5585

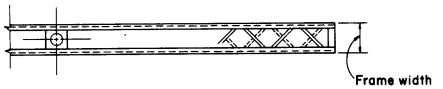
APPROVED December 4, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

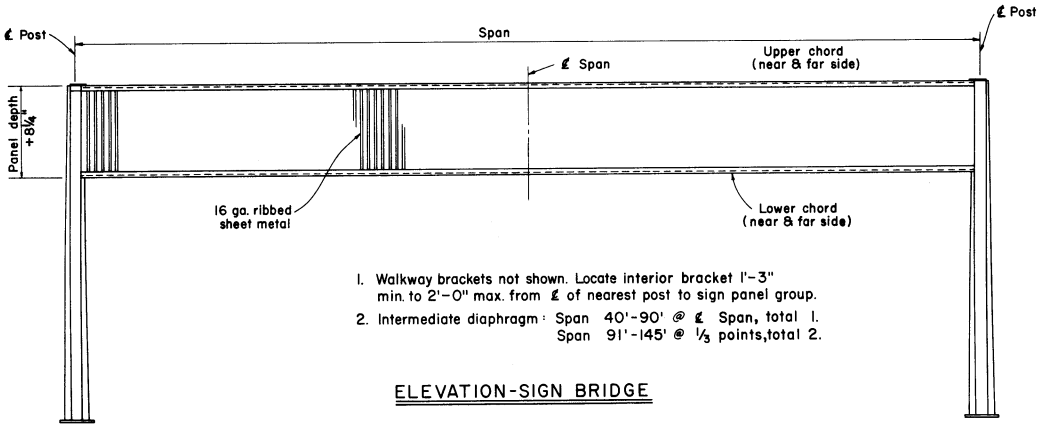


PLAN

NOTE: 45° angle may be varied 15° near ℄ span and near the end of cantilever only.

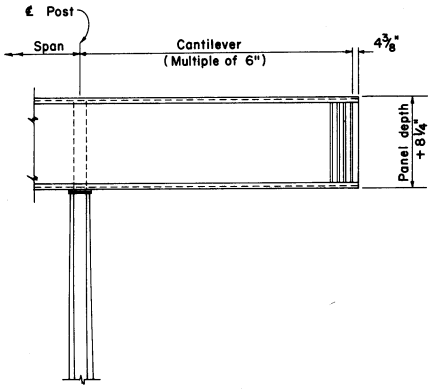


PLAN



1. Walkway brackets not shown. Locate interior bracket 1'-3" min. to 2'-0" max. from ℄ of nearest post to sign panel group.
2. Intermediate diaphragm: Span 40'-90' @ ℄ Span, total 1.
   Span 91'-145' @ 1/3 points, total 2.

ELEVATION-SIGN BRIDGE



ELEVATION - SIGN BRIDGE CANTILEVER

70" Panel Depth				80" Panel Depth				90" Panel Depth			
Span	Frame Width	Chord L's	Wind Bracing	Span	Frame Width	Chord L's	Wind Bracing	Span	Frame Width	Chord L's	Wind Bracing
40'-50'	2'-0"	4 x 4 x ⅜	1½ x 1½ x ¼	40'-50'	2'-0"	4 x 4 x ⅜	1½ x 1½ x ¼	40'-50'	2'-0"	4 x 4 x ⅜	1½ x 1½ x ¼
51'-60'	↑	4 x 4 x ⅜	↑	51'-60'	↑	4 x 4 x ⅜	↑	51'-60'	↑	4 x 4 x ⅜	↑
61'-70'		4 x 4 x ⅜		61'-70'		4 x 4 x ⅜		61'-70'		4 x 4 x ⅜	
71'-80'		4 x 4 x ⅜		71'-80'		4 x 4 x ⅜		71'-80'		4 x 4 x ½	
81'-90'		4 x 4 x ½		81'-90'		4 x 4 x ½		81'-90'		4 x 4 x ½	
91'-100'		4 x 4 x ⅝		91'-100'		4 x 4 x ⅝		91'-100'		4 x 4 x ¾	
101'-110'		4 x 4 x ¾		101'-110'	↓	4 x 4 x ¾	↓	101'-110'	↓	6 x 4 x ¾	↓
111'-120'	↓	6 x 4 x ¾	↓	111'-120'	2'-0"	6 x 4 x ¾	1½ x 1½ x ¼	111'-120'	2'-0"	6 x 4 x ⅞	1½ x 1½ x ¼
121'-132'	2'-0"	6 x 4 x ⅞	1½ x 1½ x ¼	121'-132'	2'-6"	6 x 4 x ¾	2 x 2 x ¼	121'-132'	2'-6"	6 x 4 x ⅞	2 x 2 x ¼
133'-145'	2'-6"	6 x 4 x ⅞	2 x 2 x ¼	133'-145'	2'-6"	8 x 4 x ⅞	2 x 2 x ¼	133'-145'	2'-6"	8 x 4 x ⅞	2 x 2 x ¼

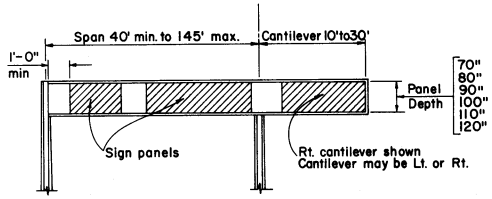
100" Panel Depth				110" Panel Depth				120" Panel Depth			
Span	Frame Width	Chord L's	Wind Bracing	Span	Frame Width	Chord L's	Wind Bracing	Span	Frame Width	Chord L's	Wind Bracing
40'-50'	2'-0"	4 x 4 x ⅜	1½ x 1½ x ¼	40'-50'	2'-0"	4 x 4 x ⅜	1½ x 1½ x ¼	40'-50'	2'-0"	4 x 4 x ⅜	1½ x 1½ x ¼
51'-60'	↑	4 x 4 x ⅜	↑	51'-60'	↑	4 x 4 x ⅜	↑	51'-60'	↑	4 x 4 x ⅜	↑
61'-70'		4 x 4 x ⅜		61'-70'		4 x 4 x ⅜		61'-70'		4 x 4 x ⅜	
71'-80'		4 x 4 x ½		71'-80'		4 x 4 x ½		71'-80'		4 x 4 x ½	
81'-90'		4 x 4 x ⅝		81'-90'		4 x 4 x ⅝		81'-90'		4 x 4 x ⅝	
91'-100'		4 x 4 x ¾		91'-100'		4 x 4 x ¾		91'-100'	↓	6 x 4 x ¾	1½ x 1½ x ¼
101'-110'	↓	6 x 4 x ¾	↓	101'-110'	2'-0"	6 x 4 x ¾	1½ x 1½ x ¼	101'-110'	2'-0"	6 x 4 x ⅞	2 x 2 x ¼
111'-120'	2'-0"	6 x 4 x ⅞	1½ x 1½ x ¼	111'-120'	2'-6"	6 x 4 x ¾	2 x 2 x ¼	111'-120'	2'-6"	8 x 4 x ¾	2 x 2 x ¼
121'-132'	2'-6"	6 x 4 x ⅞	2 x 2 x ¼	121'-132'	2'-6"	8 x 4 x ⅞	2 x 2 x ¼	121'-132'	2'-6"	8 x 4 x ⅞	2 x 2 x ¼
133'-145'	2'-6"	8 x 4 x 1	2 x 2 x ¼	133'-145'	2'-6"	8 x 4 x 1	2 x 2 x ¼	133'-145'	2'-6"	8 x 4 x 1	2 x 2 x ¼

TABLE I

Camber For Fabrication at ℄ Span	
Span	Camber
40'-70'	1"
71'-100'	1¾"
101'-120'	2¼"
121'-145'	2¾"

TABLE II

Fabricate camber to approximate parabola. Camber of cantilever arm = + ½ for arms greater than 10'.



RANGE OF STRUCTURE SIZES

NOTE: Frame widths shown are nominal. These widths may be varied by ¼" to standardize fabrication methods.
When upper limit of each span range is exceeded, use data for next longer span range.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS TWO POST TYPE FRAME MEMBERS

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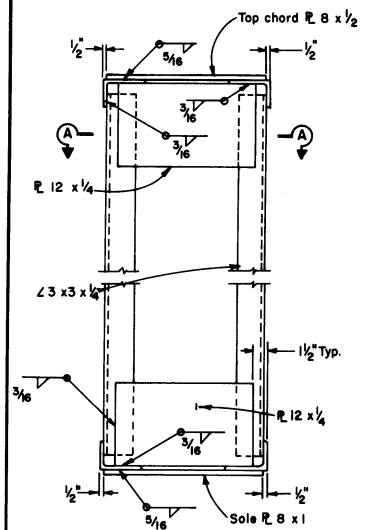
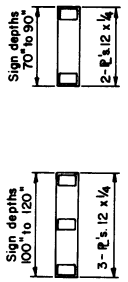
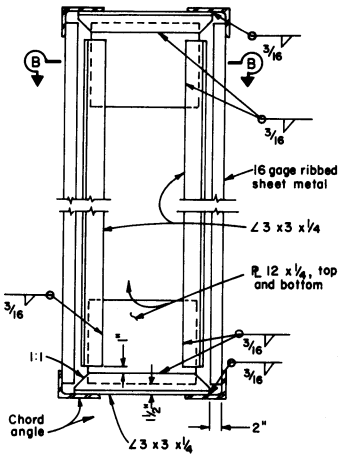


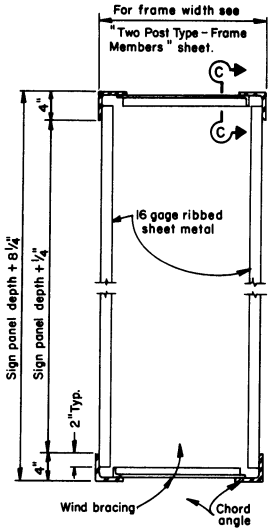
END VIEW



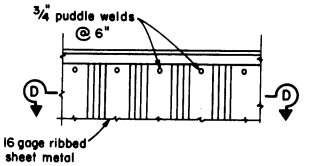
DIAPHRAGM PL LAYOUT



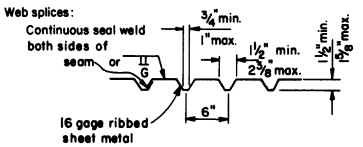
SECTION AT DIAPHRAGM



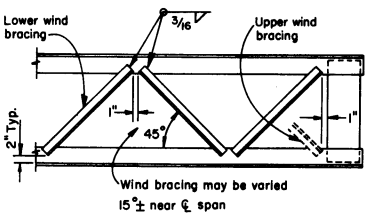
TYPICAL SECTION



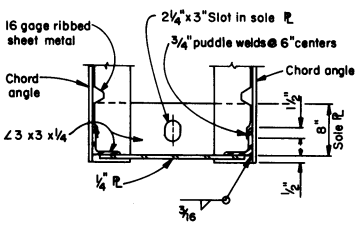
SECTION C-C



SECTION D-D

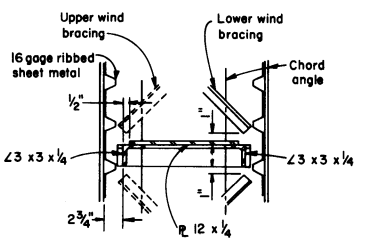


WIND BRACING DETAILS



SECTION A-A

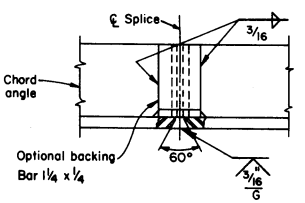
END DIAPHRAGM DETAILS



SECTION B-B

Note:
Details for top and bottom connections are similar.

INTERMEDIATE DIAPHRAGM DETAILS



WELDED CHORD SPLICE

Splice Notes:

1. The splices shall be located so as not to interfere with mounting the walkway brackets.
2. Alternative splice details may be used if approved by the Engineer.

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Bridge Engineer
Registered Civil Engineer No. 5585

APPROVED December 4, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS
TWO POST TYPE
FRAME DETAILS

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Return to Table of Contents

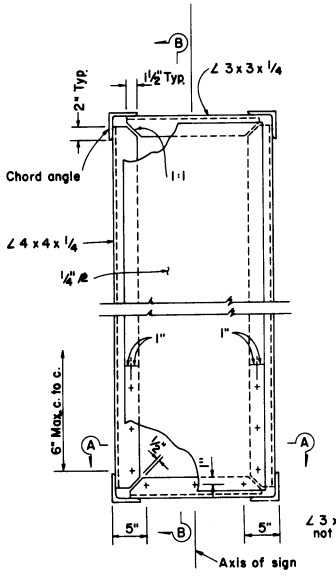
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

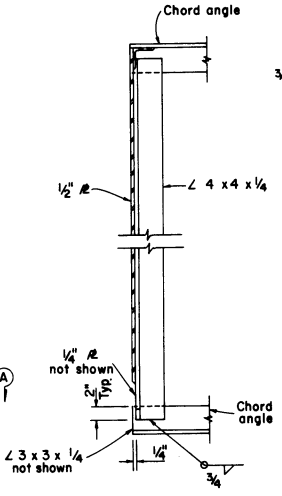
Bridge Engineer
Registered Civil Engineer No. 5585

APPROVED December 4, 1967

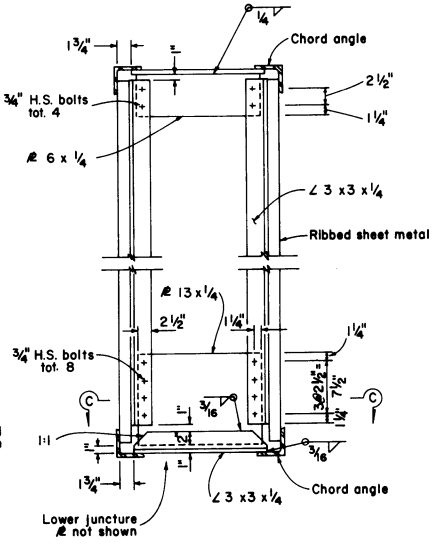
State Highway Engineer
Registered Civil Engineer No. 5645

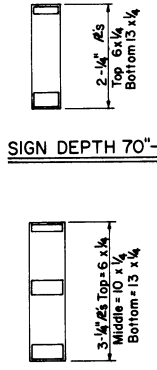


END VIEW



SECTION B-B

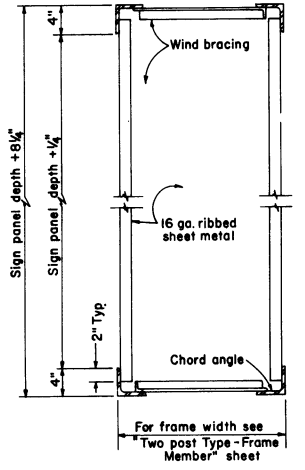




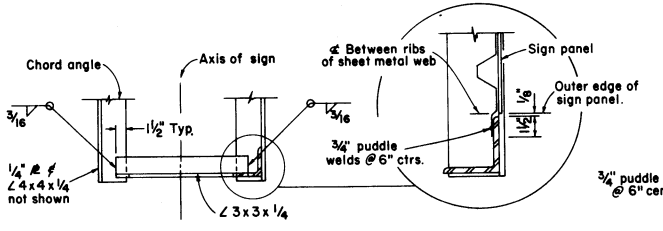
SIGN DEPTH 70"-90"

SIGN DEPTH 100"-120"

If middle ℞ is required, space 4 H.S. bolts similar to bottom ℞

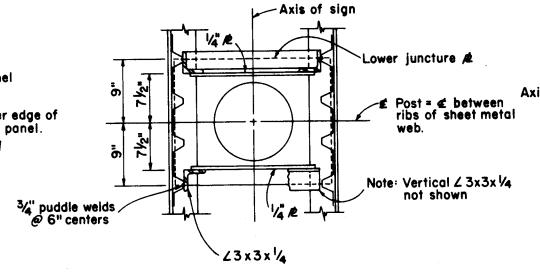


TYPICAL SECTION



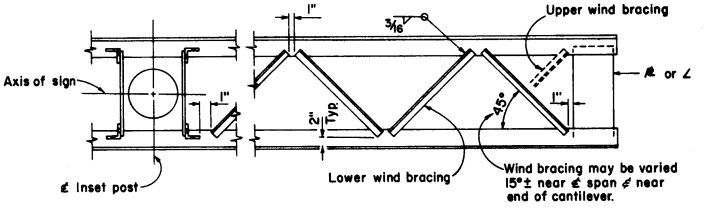
SECTION A-A

END DIAPHRAGM DETAILS



SECTION C-C

INSET POST DIAPHRAGM DETAILS



WIND BRACING DETAILS

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS TWO POST TYPE CANTILEVER FRAME DETAILS

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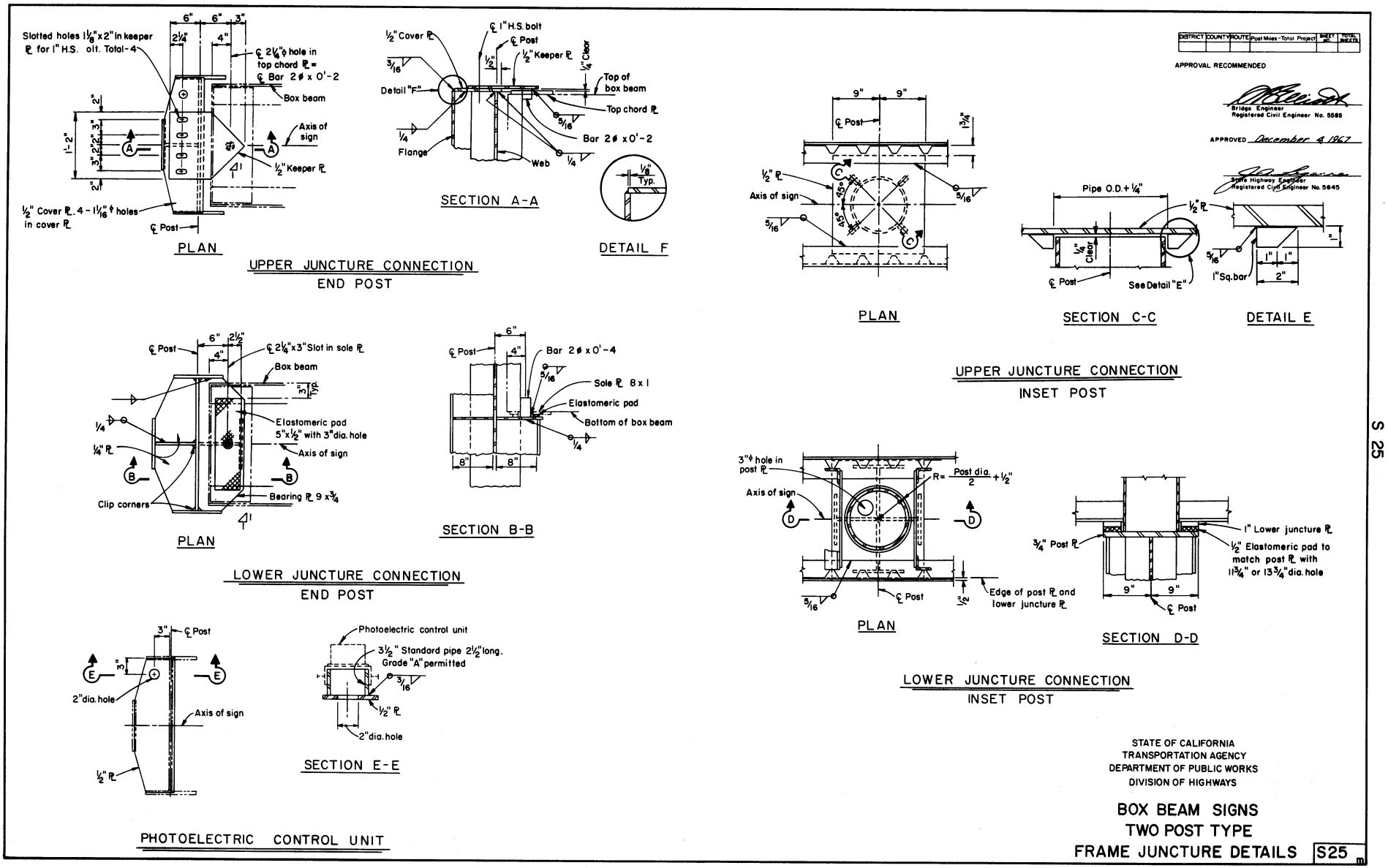

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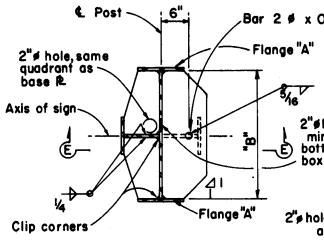
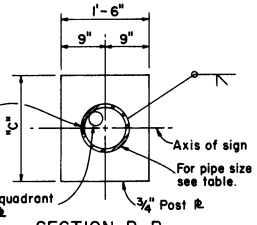
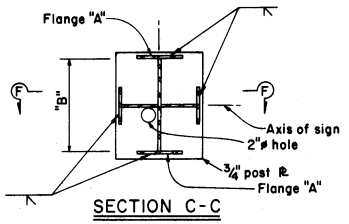


SECTION A-A



SECTION B-B



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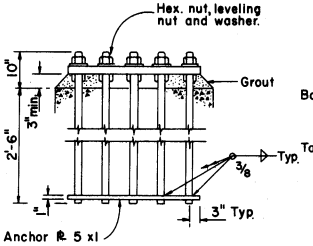
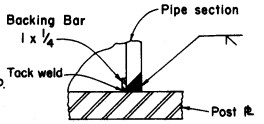


ANCHORAGE DETAILS



PIPE SECTION TO POST ℞

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

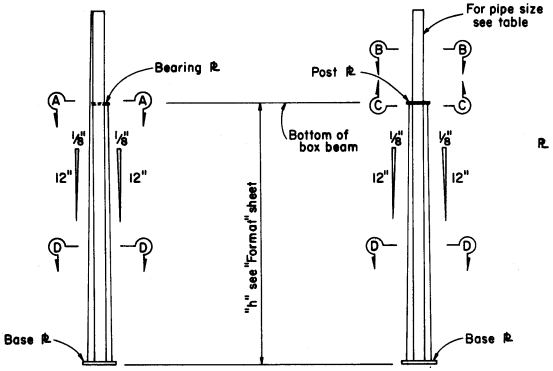
APPROVAL RECOMMENDED

Bridge Engineer
Registered Civil Engineer No. 5585

APPROVED December 4, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

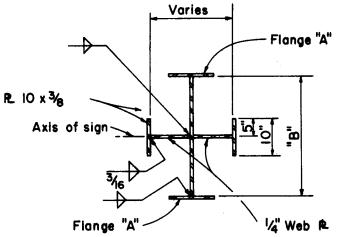
NOTE: For dimensions not shown see table



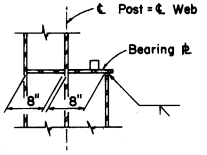
END POST
"A" & "B"

INSET POST
"C" & "D"

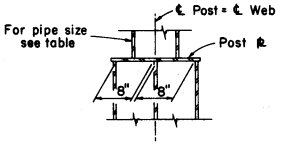
ELEVATION



SECTION D-D



SECTION E-E

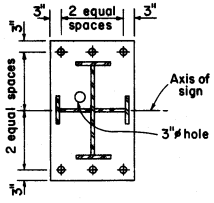


SECTION F-F

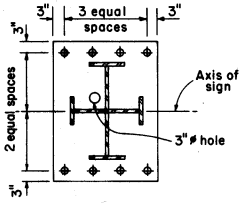
NOTE: Locate 3"ø hole for conduit in quadrant away from approaching traffic-center 2" from web plates.

Post Type	Base Plate	Anchor Bolts		Flange	Post Plate		Inset Post
		Dia.	Nº	"A"	"B"	"C"	Pipe Size
A-1	24" x 2" x 3'-4"	2 1/4"	6	10" x 3/8"	2'-2"		
A-2	24" x 2 1/2" x 3'-4"	2 1/4"	8	10" x 1/2"			
A-3	24" x 2 1/2" x 3'-4"	2 1/2"	8	10" x 3/4"			
A-4	24" x 2 1/2" x 3'-4"	2 1/2"	8	10" x 1"			
A-5	24" x 2 1/2" x 3'-4"	2 1/2"	8	10" x 1 1/4"	2'-2"		
B-1	30" x 2" x 3'-9"	2 1/4"	8	10" x 1/2"	2'-8"		
B-2	30" x 2" x 3'-9"	2 1/2"	8	10" x 3/4"			
B-3	30" x 2 1/2" x 3'-11"	2 1/2"	8	10" x 1"			
B-4	30" x 2 1/2" x 3'-11"	2 1/2"	8	10" x 1 1/4"			
B-5	30" x 2 1/2" x 3-11"	2 1/2"	10	10" x 1 1/2"	2'-8"		
C-1	24" x 2" x 2'-9"	2 1/4"	6	10" x 1/2"	1'-8"	2'-0"	10 @ 43.7
C-2	30" x 2 1/2" x 3'-0"	2 1/4"	8	10" x 3/4"			10 @ 58.0
C-3	30" x 2 1/2" x 3'-0"	2 1/2"	8	10" x 1"			10 @ 76.9
C-4	30" x 2 3/4" x 3'-0"	2 1/2"	8	10" x 1 1/4"			10 @ 104.1
C-5	30" x 2 3/4" x 3'-0"	2 1/2"	10	10" x 1 1/2"		2'-0"	10 @ 109.9
C-6	38" x 2 3/4" x 3'-2"	2 1/2"	10	10" x 1 3/4"		2'-1 1/2"	
C-7	38" x 2 3/4" x 3'-2"	2 1/2"	10	10" x 2"		2'-1 1/2"	
C-8	38" x 2 3/4" x 3'-2"	2 1/2"	10	10" x 2 1/4"	1'-8"	2'-1 1/2"	10 @ 109.9
D-1	24" x 2 1/2" x 3'-4"	2 1/2"	8	10" x 3/4"	2'-2"	2'-6"	12 @ 65.4
D-2	30" x 2 3/4" x 3'-6"	2 1/2"	8	10" x 1"			12 @ 80.9
D-3	30" x 2 3/4" x 3'-6"	2 1/2"	10	10" x 1 1/4"			12 @ 107.2
D-4	38" x 2 1/2" x 3'-6"	2 1/2"	10	10" x 1 1/2"		2'-6"	
D-5	38" x 2 1/2" x 3'-6"	2 1/2"	10	10" x 1 3/4"		2'-7 1/2"	
D-6	42" x 3" x 3'-11"	2 1/2"	10	10" x 2"		2'-7 1/2"	
D-7	42" x 3" x 3'-11"	2 1/2"	10	10" x 2 1/4"	2'-2"	2'-7 1/2"	12 @ 107.2

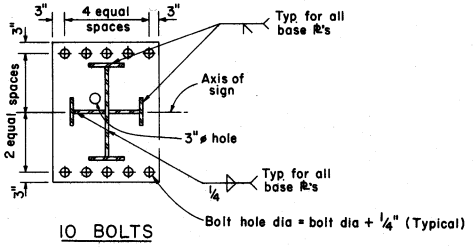
1. Thread upper 10" of anchor bolts and paint upper 1'-0".
2. Anchor ℞'s may be retained with hex nut or formed head.



6 BOLTS



8 BOLTS



10 BOLTS

TYPICAL BASE PLATES

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS
TWO POST TYPE
POST AND ANCHORAGE DETAILS

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DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

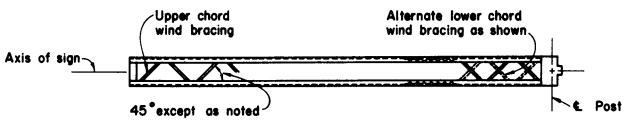
APPROVAL RECOMMENDED

Bridge Engineer
Registered Civil Engineer No. 5585

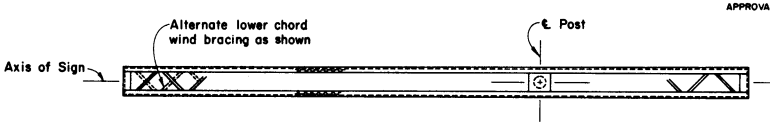
APPROVED December 4, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

Note: 45° angle may be varied 15° near the end of cantilever only.



PLAN



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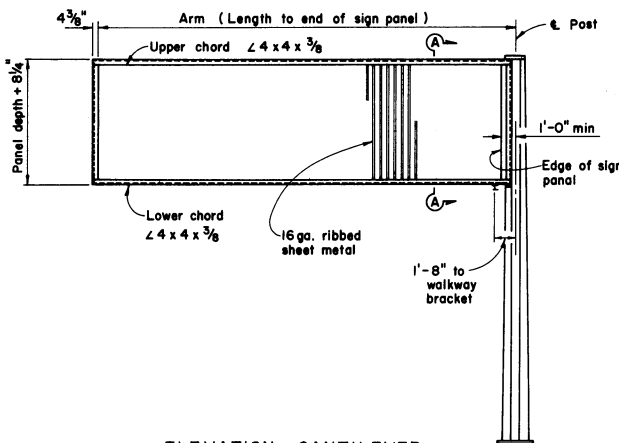
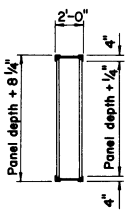
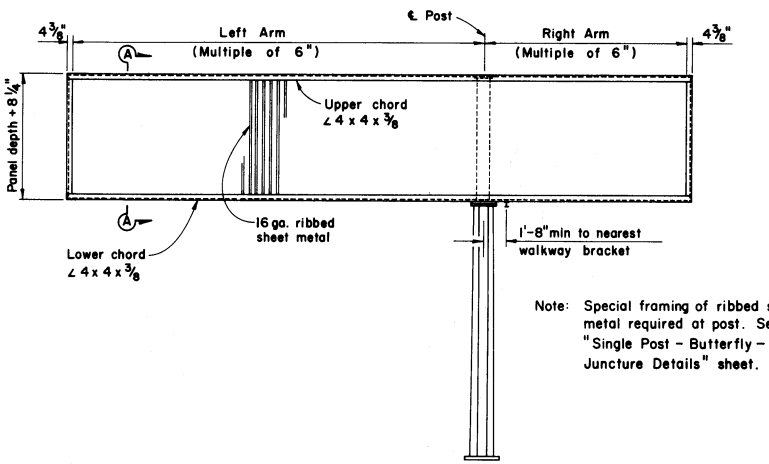


ELEVATION - CANTILEVER

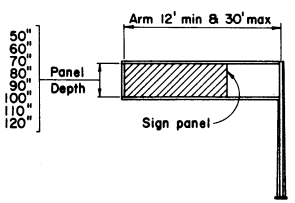


SECTION A-A

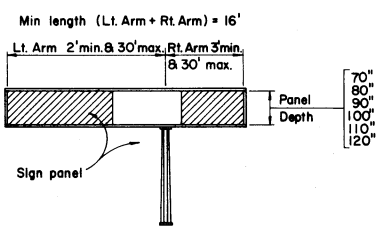


Note: Special framing of ribbed sheet metal required at post. See "Single Post - Butterfly - Frame Juncture Details" sheet.

ELEVATION - BUTTERFLY

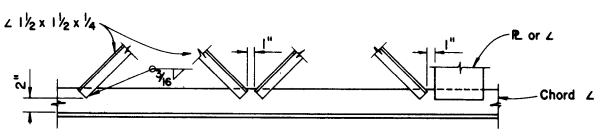


CANTILEVER



BUTTERFLY

RANGE OF STRUCTURE SIZES



WIND BRACING

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS SINGLE POST TYPE FRAME MEMBERS

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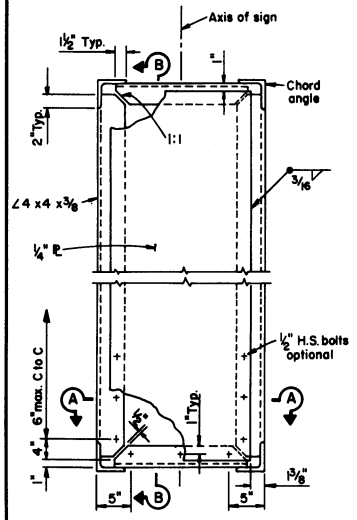
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

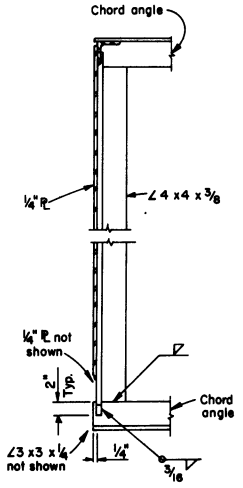
Bridge Engineer
Registered Civil Engineer No. 5585

APPROVED December 4, 1967

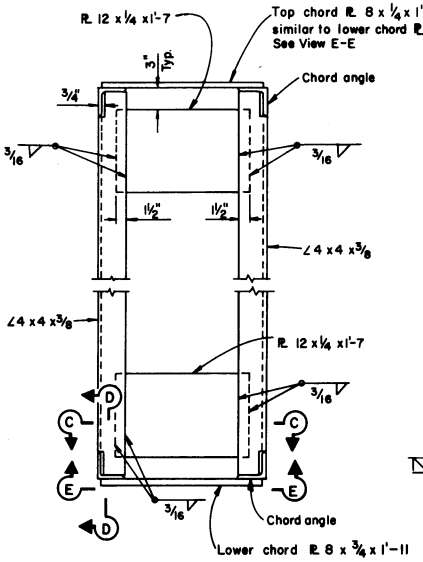
State Highway Engineer
Registered Civil Engineer No. 5645



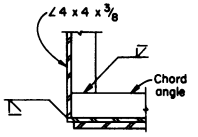
END VIEW



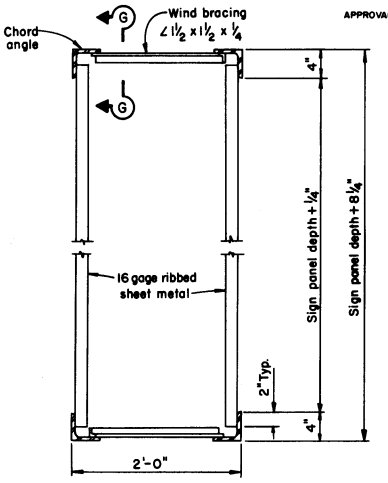
SECTION B-B



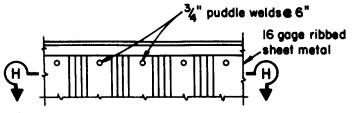
END VIEW



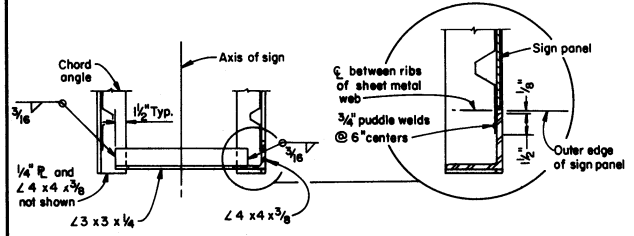
SECTION D-D



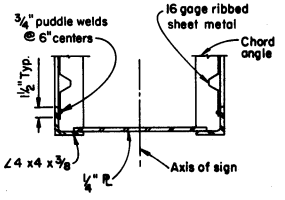
TYPICAL SECTION



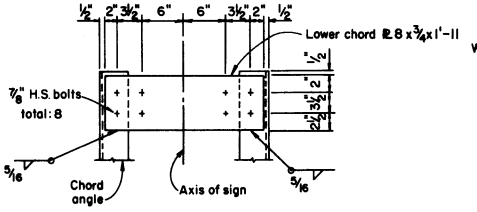
SECTION G-G



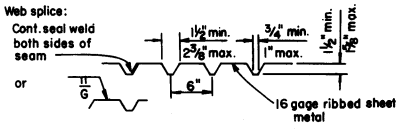
SECTION A-A



SECTION C-C



VIEW E-E



SECTION H-H

END DIAPHRAGM DETAILS

CANTILEVER END

END DIAPHRAGM DETAILS

POST END

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS SINGLE POST CANTILEVER FRAME DETAILS

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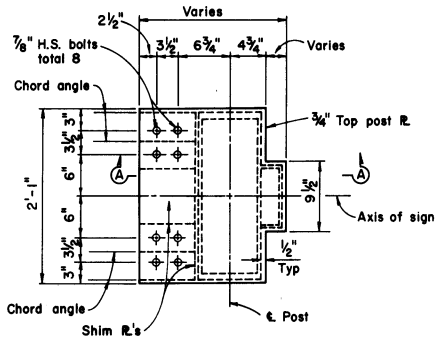
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

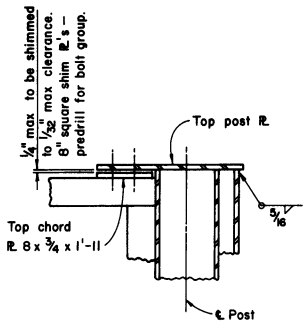
Bridge Engineer
Registered Civil Engineer No. 5585

APPROVED December 4, 1967

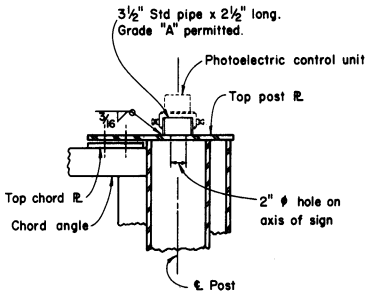
State Highway Engineer
Registered Civil Engineer No. 5645



PLAN



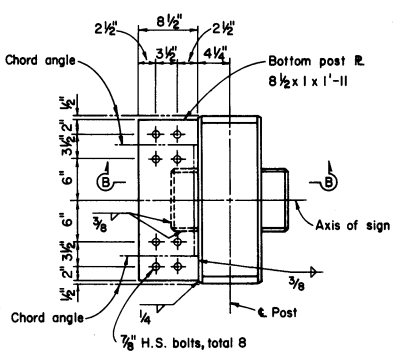
SECTION A-A



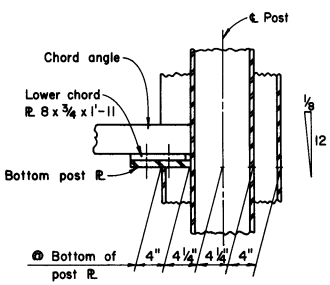
SECTION A-A

With photoelectric control unit

UPPER JUNCTURE CONNECTION

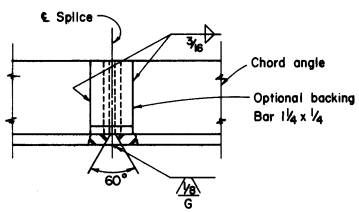


PLAN



SECTION B-B

LOWER JUNCTURE CONNECTION



WELDED CHORD SPLICE

Splice Notes:

1. The splice shall be located so as not to interfere with mounting the walkway brackets.
2. Alternative splice details may be used if approved by the Engineer.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS
SINGLE POST CANTILEVER
FRAME JUNCTURE DETAIL

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Return to Table of Contents

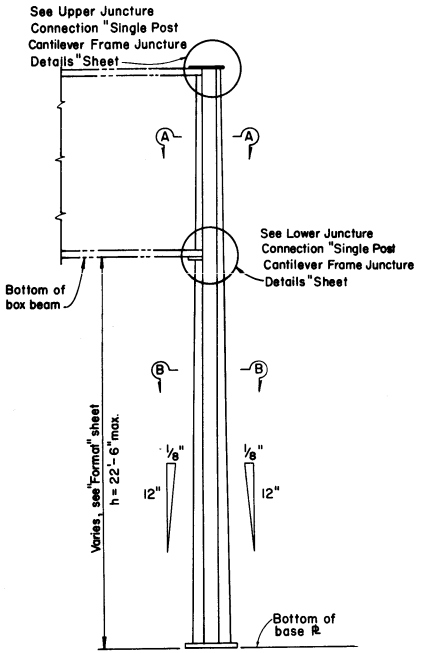
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

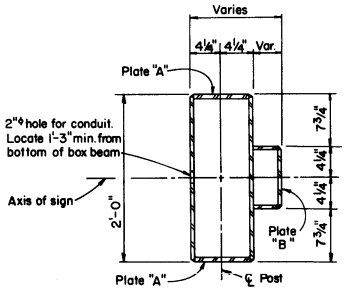
Bridge Engineer
Registered Civil Engineer No. 5585

APPROVED December 4 1967

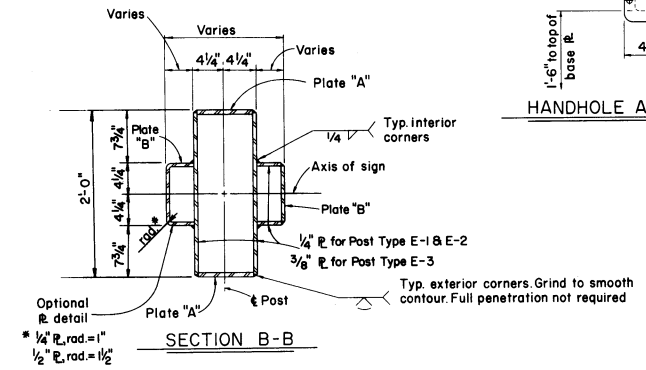
State Highway Engineer
Registered Civil Engineer No. 5645



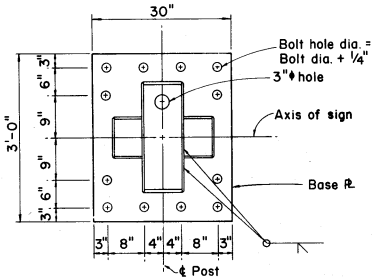
ELEVATION



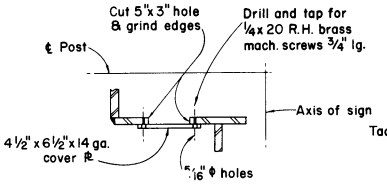
SECTION A-A



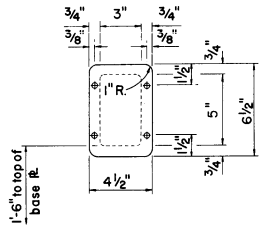
SECTION B-B



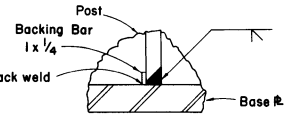
Post Type	Base Plate	Plate "A"	Plate "B"	Anchor Bolts
E-1	30" x 2" x 3'-0"	½"	¼"	12-1¾"
E-2	30" x 2½" x 3'-0"	1"	½"	12-2"
E-3	30" x 2½" x 3'-0"	1"	½"	12-2"



Note: Face handhole and cover ℞ away from traveled way

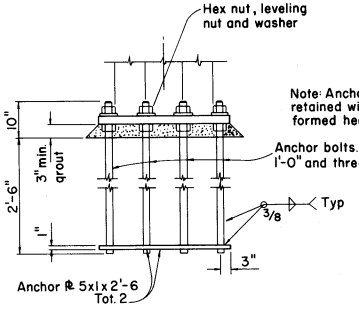


HANDHOLE AND COVER DETAIL



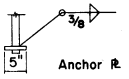
POST TO BASE PLATE

WELDING DETAILS



Note: Anchor ℞'s may be retained with hex. nut or formed head.

ANCHORAGE DETAILS



Anchor ℞ 5x1x0'-5

SINGLE SIDE BOLT

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS
SINGLE POST CANTILEVER
POST DETAILS

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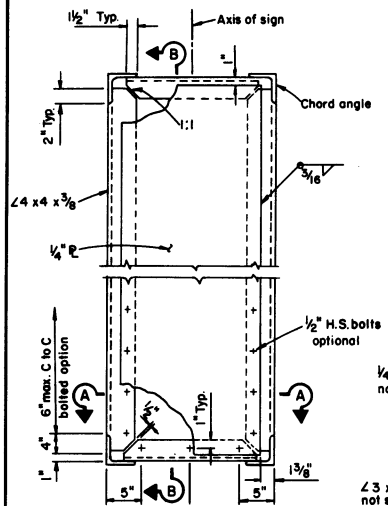
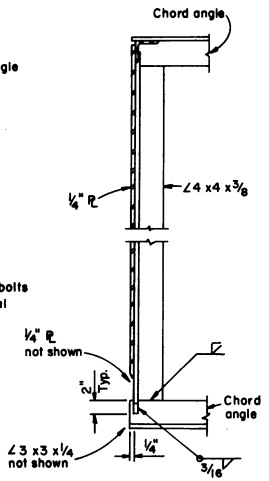
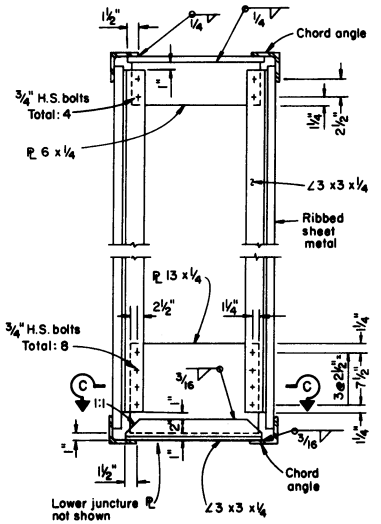


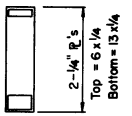
END VIEW



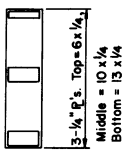
SECTION B-B



SECTION AT DIAPHRAGM

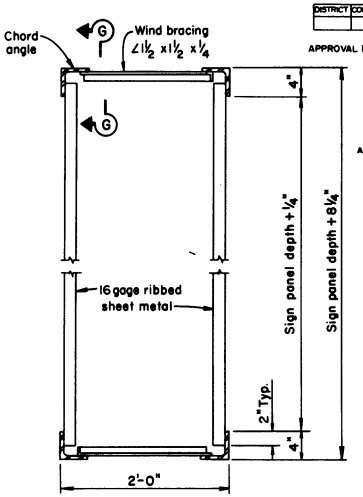


SIGN DEPTH 70"-90"



SIGN DEPTH 100"-120"

If middle PL is required, space H.S. bolts similar to bottom PL Total: 8



TYPICAL SECTION

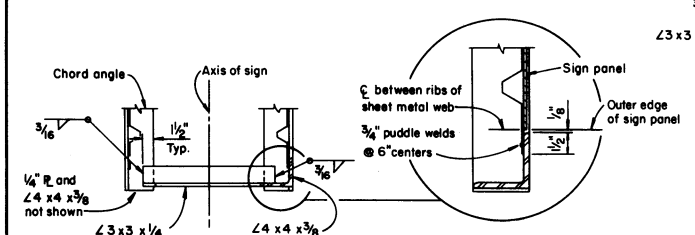
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Bridge Engineer
Registered Civil Engineer No. 5685

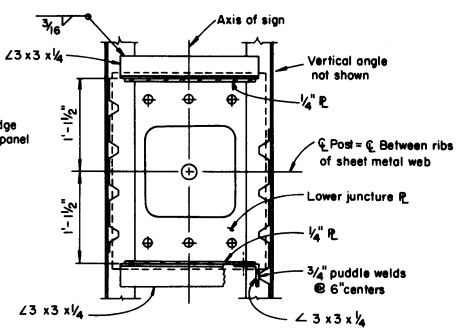
APPROVED December 4, 1967

State Highway Engineer
Registered Civil Engineer No. 5645



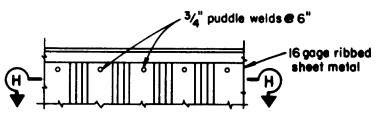
SECTION A-A

END DIAPHRAGM DETAILS

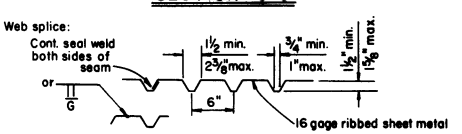


SECTION C-C

POST DIAPHRAGM DETAILS



SECTION G-G



SECTION H-H

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS
SINGLE POST BUTTERFLY
FRAME DETAILS

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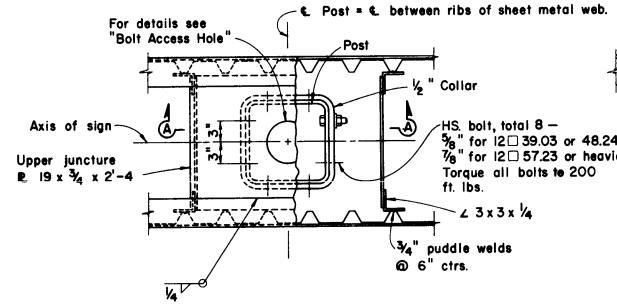
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

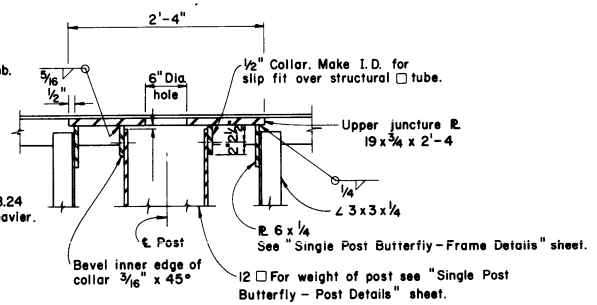
Bridge Engineer
Registered Civil Engineer No. 5585

APPROVED December 4, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

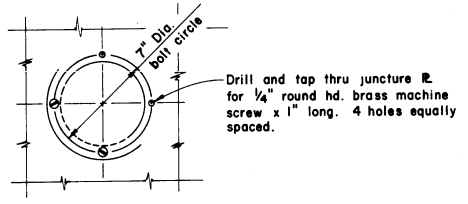


PLAN

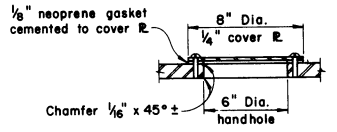


SECTION A-A

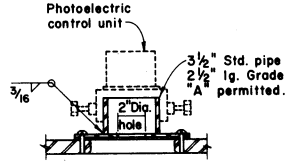
UPPER JUNCTURE CONNECTION



PLAN

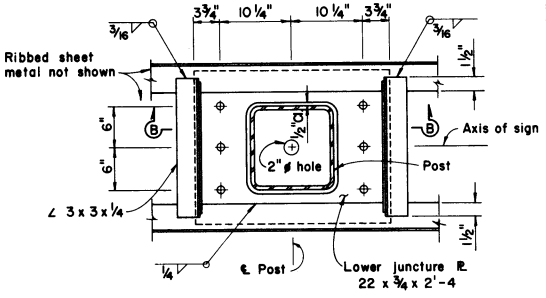


SECTION

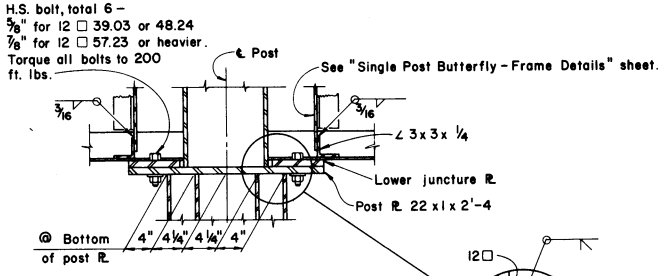


SECTION
With photoelectric control unit

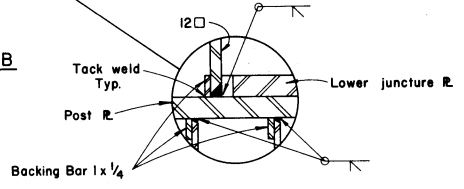
BOLT ACCESS HOLE



PLAN



SECTION B-B



LOWER JUNCTURE CONNECTION

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS SINGLE POST BUTTERFLY FRAME JUNCTURE DETAILS

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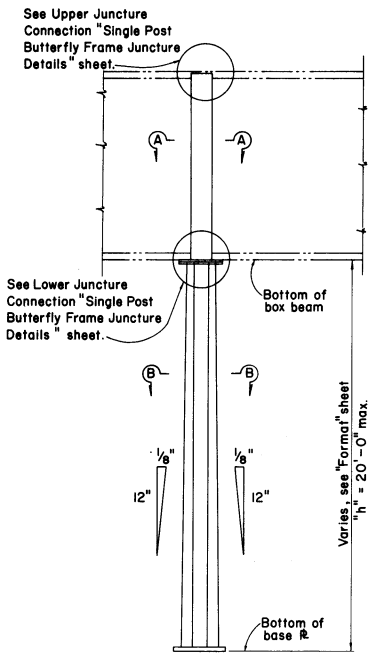
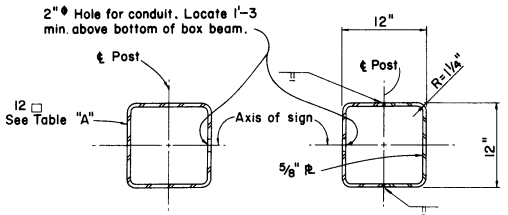
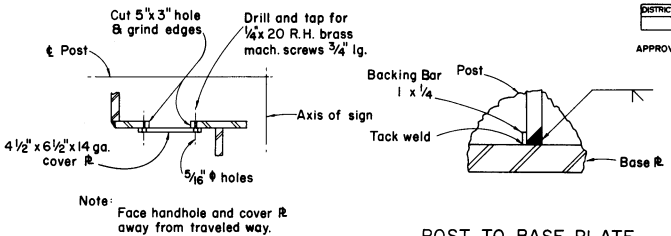


ELEVATION



TYPE F-1 THRU F-5 TYPE F-6 & F-7

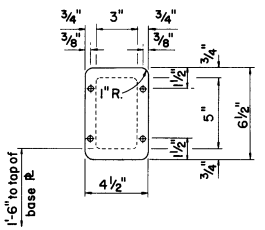
SECTION A-A



Note: Face handhole and cover ℞ away from traveled way.

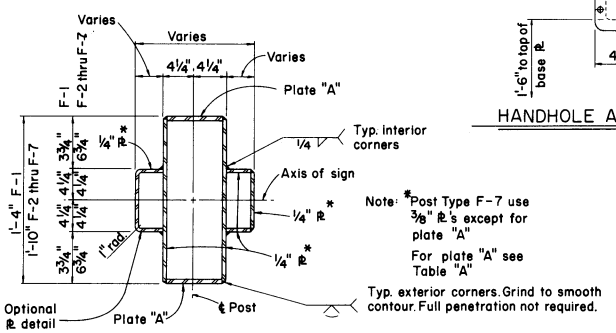
POST TO BASE PLATE

WELDING DETAILS



HANDHOLE AND COVER DETAIL

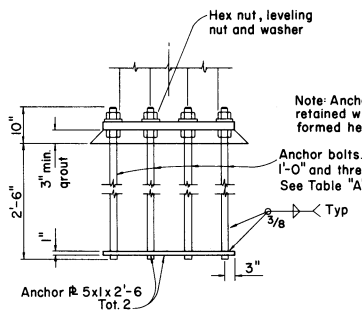
TABLE "A"				
Post Type	Plate "A"	Base Plate	Anchor Bolts	Structural Tube
F-1	8"x 1/4"	30"x 2"x 2'-6"	8 - 1 3/4"	12@39.03
F-2	8"x 1/4"	30"x2"x3'-0"	8- 2"	12@48.24
F-3	8"x 1/2"	30"x2"x3'-0"	12- 1 3/4"	12@57.23
F-4	8"x3/4"	30"x2"x3'-0"	12- 2"	12@74.54
F-5	8"x 1"	30"x2 1/4"x3'-0"	12- 2"	12@74.54
F-6	8"x 1 1/2"	30"x2 1/2"x3-0"	12- 2 1/4"	See Section A-A
F-7	8"x 1 1/2"	30"x2 3/4"x3'-0"	12- 2 1/4"	



Note: *Post Type F-7 use 3/8" ℞'s except for plate "A"

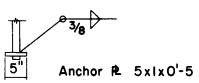
For plate "A" see Table "A"

SECTION B-B

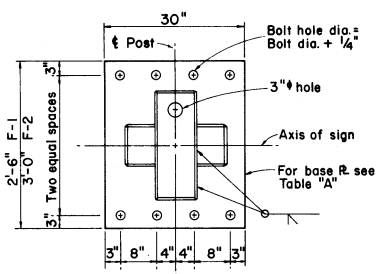


Note: Anchor ℞'s may be retained with hex. nut or formed head.

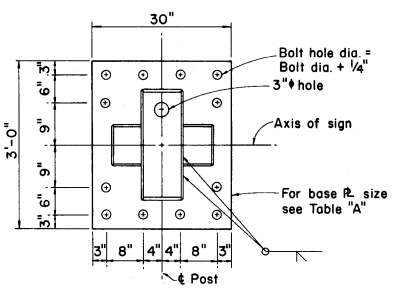
ANCHORAGE DETAILS



SINGLE SIDE BOLT



TYPE F-1 & F-2



TYPE F-3 THRU F-7

BASE PLATE DETAILS

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Bridge Engineer
Registered Civil Engineer No. 5585

APPROVED December 4 1967

State Highway Engineer
Registered Civil Engineer No. 5645

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS SINGLE POST BUTTERFLY POST DETAILS

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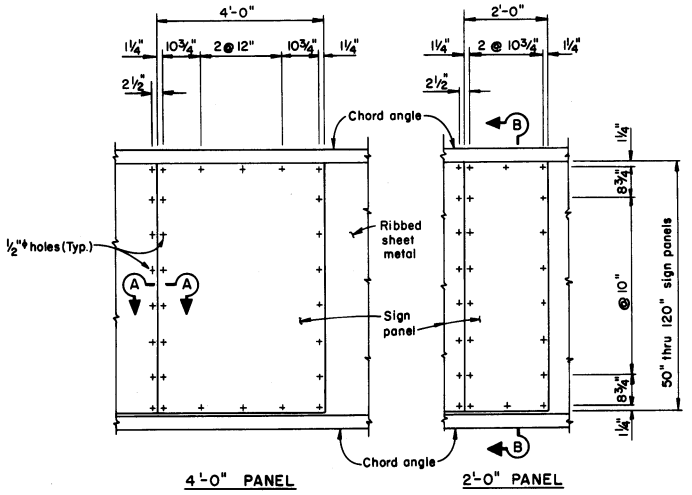
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Bridge Engineer
Registered Civil Engineer No. 5685

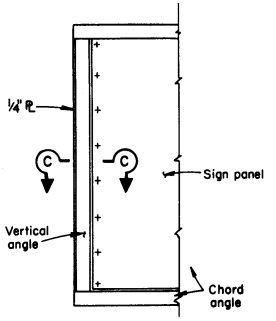
APPROVED December 4, 1967

State Highway Engineer
Registered Civil Engineer No. 5646

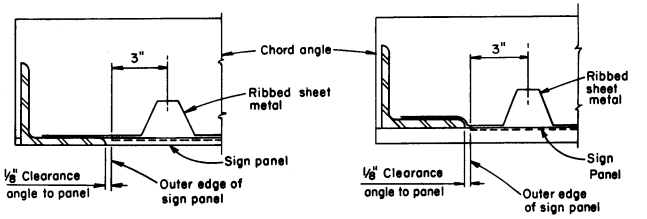


INTERIOR SPAN

ELEVATION



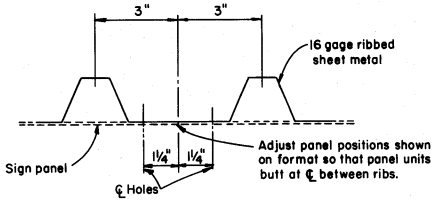
CANTILEVER ARM



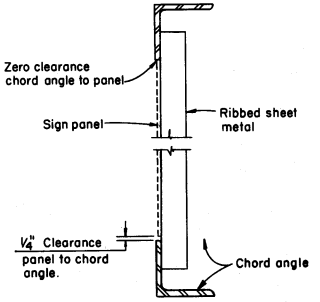
SINGLE POST CANTILEVER

TWO POST CANTILEVER

SECTION C-C



SECTION A-A



SECTION B-B

Notes:

1. Sign panel mounting holes are ½" diameter.
2. Holes shall be drilled by template. Sign panel may be considered a template.
3. ¼" clearance at bottom of sign panel is necessary for installation of 16 gage splash plate. See "Walkway Details No.2" sheet.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS
SINGLE AND TWO POST TYPES
SIGN PANEL MOUNTING DETAIL

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Return to Table of Contents

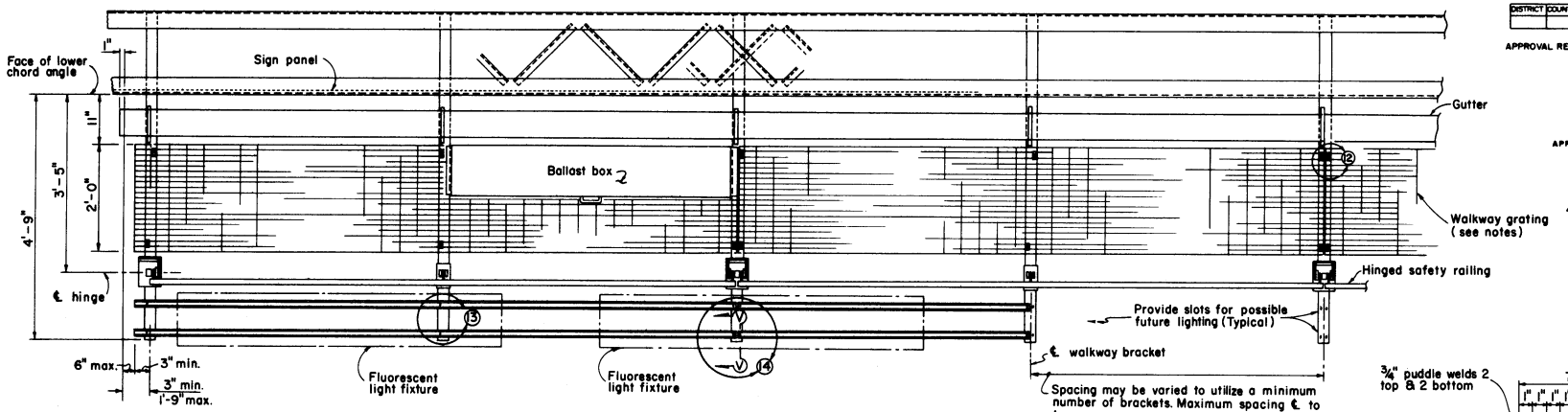
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

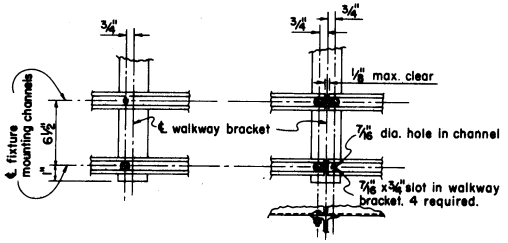
Bridge Engineer
Registered Civil Engineer No. 5585

APPROVED December 4 1967

State Highway Engineer
Registered Civil Engineer No. 5645

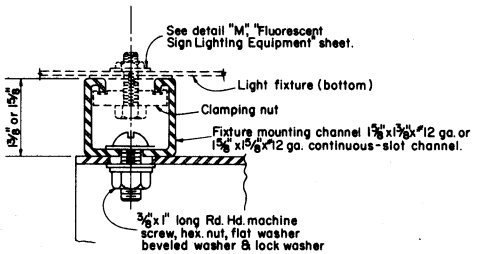


WALKWAY PLAN
Scale 1" = 1'-0"

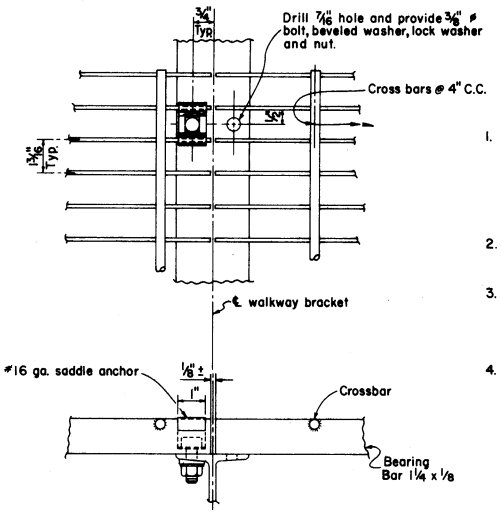


DETAIL 13
Typical Connection

DETAIL 14
Connection at Splice



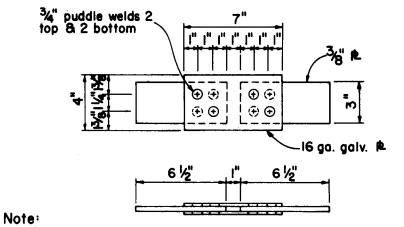
SECTION V-V
Full Scale



DETAIL 12
Scale 1/2" = 1"

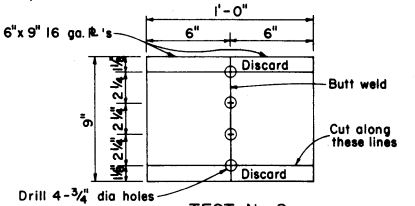
NOTES

1. Welded-type grating shall have 1 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.



Note:
Two specimens req'd for each position to be welded.

TEST No. 1



TEST No. 2

WELD QUALIFICATION TESTS

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS
WALKWAY DETAILS No. 1

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DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

Notes:

Gutter sections to be made in convenient lengths and welded or brazed together in the field.

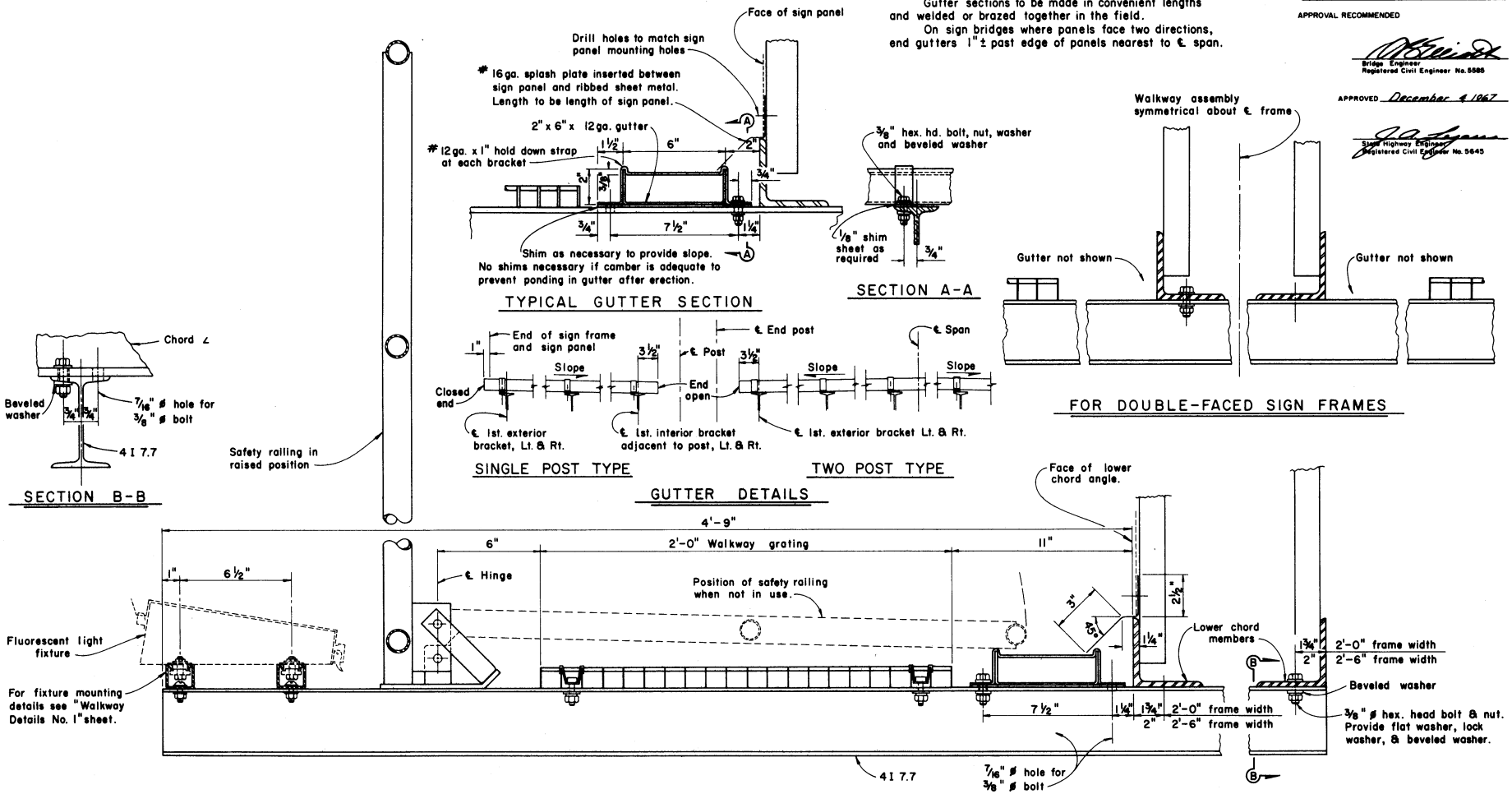
On sign bridges where panels face two directions, end gutters 1" ± past edge of panels nearest to ℄ span.

APPROVAL RECOMMENDED

Bridge Engineer
Registered Civil Engineer No. 5585

APPROVED December 4 1967

State Highway Engineer
Registered Civil Engineer No. 5645



STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS
WALKWAY DETAILS NO. 2

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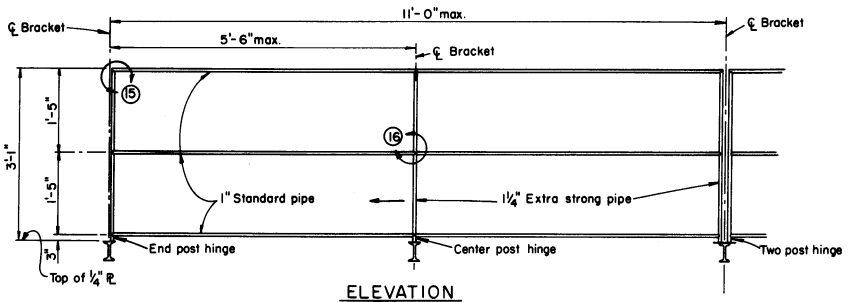
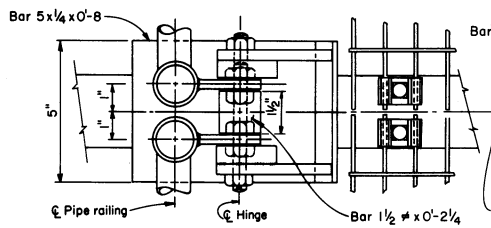
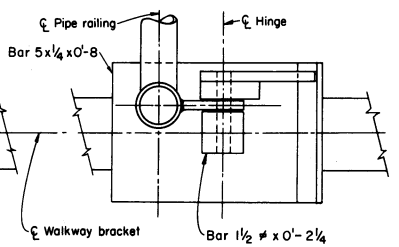


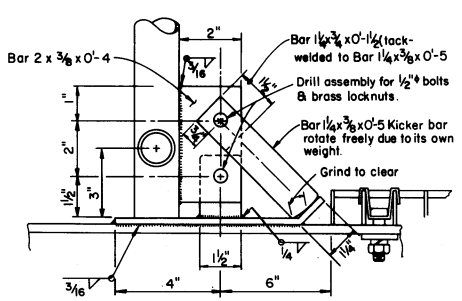
ELEVATION



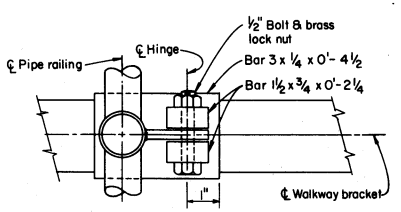
PLAN VIEW - TWO POST HINGE



PLAN VIEW - END POST HINGE



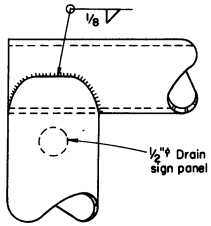
ELEVATION



PLAN VIEW - CENTER POST HINGE

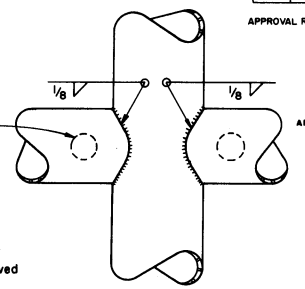
NOTES:

1. Special care shall be taken to insure that the completed hinge and latch assembly will hold the safety railing in a steady manner, free of wobble while in the raised position. Maximum allowable displacement from vertical at top of railing when latched shall be 1".
2. Details for bolting hinge base PL to walkway bracket may be submitted for approval.



DETAIL 15

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



DETAIL 16

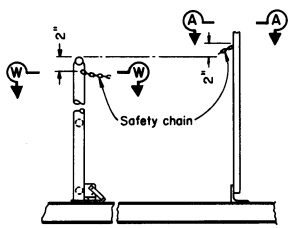
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

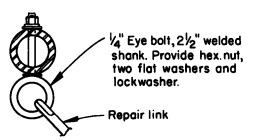
APPROVAL RECOMMENDED

Bridge Engineer
Registered Civil Engineer No. 5585

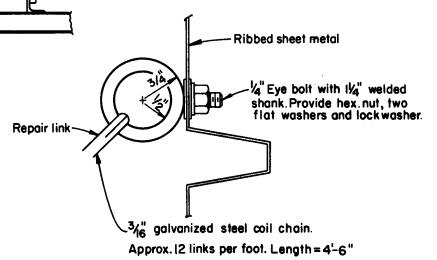
APPROVED December 4, 1967

State Highway Engineer
Registered Civil Engineer No. 5645





SECTION W-W



SECTION A-A

CHAIN ASSEMBLY

Note: Alternative details approved by the Engineer may be substituted for the safety chain connections shown.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS
WALKWAY SAFETY
RAILING DETAILS

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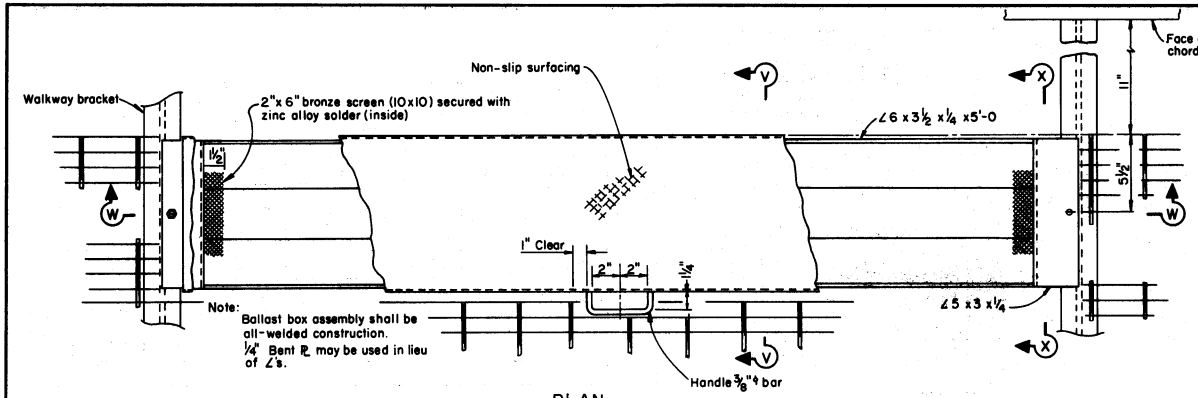
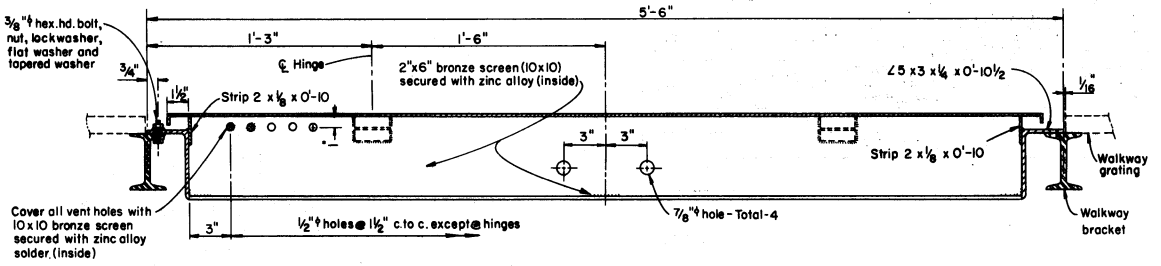
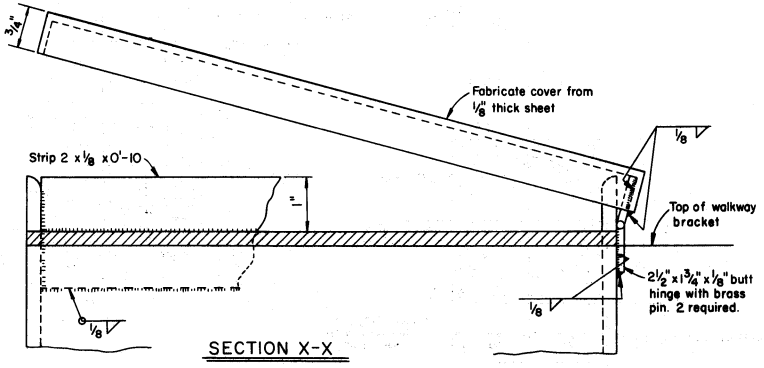


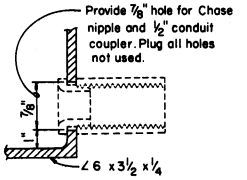
PLAN



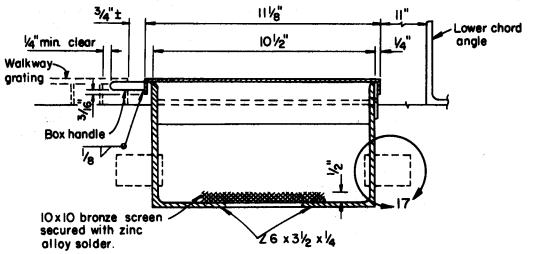
SECTION W-W



SECTION X-X



DETAIL 17



SECTION V-V

Note: One ballast box accommodates 4 ballasts maximum.
Ballast box shall be located near center of panel area served by the box.

DISTRICT	COUNTY	ROUTE	Post Mites - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

Bridge Engineer
Registered Civil Engineer No. 5595

APPROVED December 4, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS WALKWAY-MOUNTED BALLAST BOX

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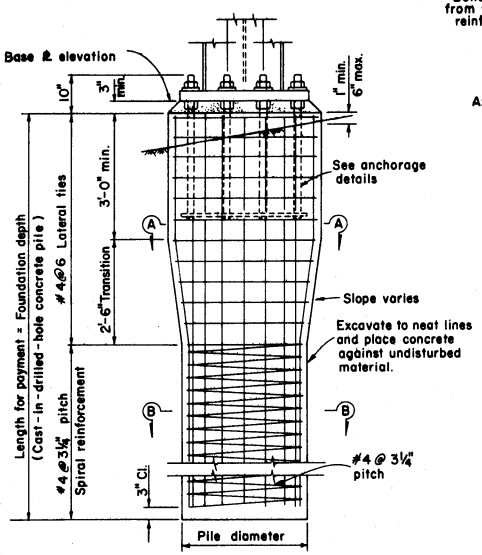
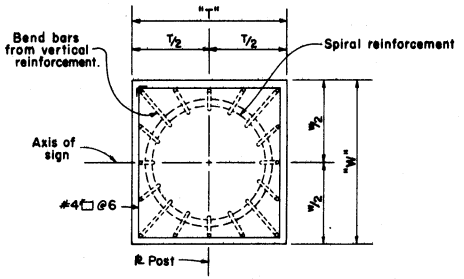
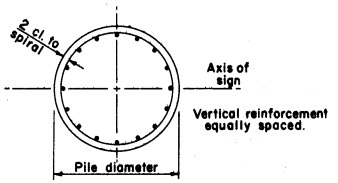


ELEVATION

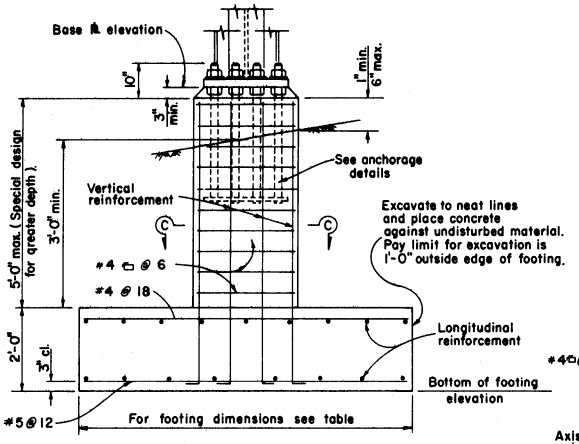
PILE FOOTING



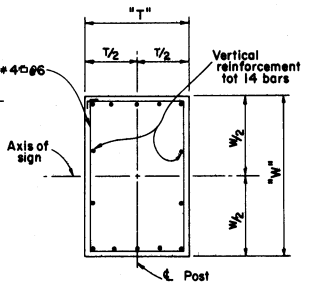
SECTION A-A



SECTION B-B



ELEVATION



SPREAD FOOTING

SECTION C-C

DISTRICT	COUNTY	ROUTE	Post Mileo - Total Project	SHEET	TOTAL SHEETS

APPROVAL RECOMMENDED

Bridge Engineer
Registered Civil Engineer No. 5585

APPROVED December 4, 1967

State Highway Engineer
Registered Civil Engineer No. 5646

SINGLE POST TYPE										
Post Type	Pedestal Size "T"x"W"	C. I. D. H. Pile			Spread Footing					
		Vertical Reinf.	Dia.	Foundation Depth	Pedestal Vert. Reinf.	Footing Dimension	Top Reinf. Longit.	Top Reinf. Transv.	Bottom Reinf. Longit.	Bottom Reinf. Transv.
E-1	3'-2"x 3'-8"	16-#8	36"	13'	14-#8	8'-0"x14'-0"	6-#5	4@18	9-#7	5@12
E-2	↑	16-#9	↑	15'	14-#9	9'-0"x15'-0"	6-#6	↑	9-#9	↑
E-3		16-#9		15'	14-#9	9'-0"x15'-0"	6-#6		9-#9	
F-1		16-#8		11'	14-#6	8'-0"x12'-0"	7-#4		9-#6	
F-2		16-#8		13'	14-#7	8'-0"x13'-0"	8-#4		10-#7	
F-3		16-#9		15'	14-#7	8'-0"x15'-0"	8-#5		11-#8	
F-4		16-#9		16'	14-#8	8'-0"x16'-0"	9-#5		10-#9	
F-5		16-#10		17'	14-#8	8'-0"x 17'-0"	10-#5		12-#9	
F-6	↓	16-#11	↓	19'	14-#9	8'-0"x 19'-0"	9-#6	↓	10-#11	↓
F-7	3'-2"x 3'-8"	16-#11	36"	22'	14-#10	8'-0"x 20'-0"	10-#6	4@18	12-#11	5@12

TWO POST TYPE												
Post Type	Pedestal Size "T"x"W"	C. I. D. H. Pile			Spread Footing							
		Vertical Reinf.	Dia.	Foundation Depth	Pedestal Vertical Reinf.	Footing Dimension	Top Reinf. Longit.	Top Reinf. Transv.	Bottom Reinf. Longit.	Bottom Reinf. Transv.
A-1	3'-0"x 4'-0"	16-#8	36"	14'	14-#7	7'-0"x16'-0"	7-#5	#4@18	6-#9	#5@12
A-2	3'-0"x 4'-0"	16-#9	36"	16'	14-#8	8'-0"x17'-0"	10-#5	↑	10-#9	↑
A-3	3'-0"x 4'-0"	16-#11	36"	20'	14-#9	8'-0"x18'-0"	8-#6		9-#11	
A-4	3'-0"x 4'-0"	16-#14	36"	21'	14-#9	8'-0"x 20'-0"	8-#8		11-#11	
A-5	3'-0"x 4'-0"	16-#14	36"	21'	14-#10	8'-0"x20'-0"	8-#8		11-#11	
B-1	3'-2"x 4'-5"	16-#11	36"	20'	14-#8	8'-0"x 18'-0"	8-#6		9-#11	
B-2	3'-2"x 4'-5"	16-#14	36"	22'	14-#9	8'-0"x20'-0"	10-#6		11-#11	
B-3	3'-2"x 4'-7"	20-#14	36"	24'	14-#10	8'-0"x 21'-0"	7-#8		13-#11	
B-4	3'-2"x 4'-7"	16-#14	42"	22'	14-#10	8'-0"x22'-0"	7-#8		14-#11	
B-5	3'-2"x 4'-7"	16-#14	42"	23'	14-#10	8'-0"x 23'-0"	8-#8		15-#11	
C-1	3'-0"x 3'-5"	16-#9	36"	16'	14-#7	7'-0"x 16'-0"	6-#6		7-#11	
C-2	3'-2"x 3'-8"	16-#11	36"	19'	14-#9	8'-0"x 17'-0"	8-#6		9-#11	
C-3	3'-2"x 3'-8"	16-#14	36"	21'	14-#10	8'-0"x 19'-0"	9-#6		11-#11	
C-4	3'-2"x 3'-8"	20-#14	36"	24'	14-#10	8'-0"x 21'-0"	7-#8		13-#11	
C-5	3'-2"x 3'-8"	16-#14	42"	22'	14-#11	8'-0"x 22'-0"	8-#8		15-#11	
C-6	3'-10"x 3'-10"	16-#14	42"	23'	14-#11	8'-0"x23'-0"	8-#8		16-#11	
C-7	3'-10"x3'-10"	20-#14	42"	24'	14-#11	8'-0"x23'-0"	8-#8		12-#14	
C-8	3'-10"x 3'-10"	24-#14	42"	25'	14-#14	8'-0"x24'-0"	9-#8		13-#14	
D-1	3'-0"x 4'-0"	16-#14	36"	21'	14-#9	8'-0"x 19'-0"	9-#6		10-#11	
D-2	3'-2"x 4'-2"	20-#14	36"	24'	14-#10	8'-0"x21'-0"	7-#8		13-#11	
D-3	3'-2"x 4'-2"	16-#14	42"	24'	14-#11	8'-0"x23'-0"	8-#8		16-#11	
D-4	3'-10"x 4'-2"	24-#14	42"	27'	14-#11	8'-0"x23'-0"	8-#8		18-#11	
D-5	3'-10"x 4'-2"	24-#14	42"	30'	14-#14	8'-0"x25'-0"	9-#8		14-#14	
D-6	4'-2"x 4'-7"	24-#14	42"	30'	14-#11	8'-0"x26'-0"	10-#8		14-#14	
D-7	4'-2"x 4'-7"	24-#14	42"	30'	14-#11	8'-0"x26'-0"	10-#8	#4@18	15-#14	#5@12

NOTES:

1. Base plates, pedestals and footings; longer sides shall be normal to axis of sign.
2. For anchor bolt layout see "Post" sheet.
3. For base plate elevation see "Format" sheet
4. Prior to erection of the post, backfill which is equivalent to the surrounding material shall be in place.
5. Pile pedestal shall be formed 6" min. below qround surface.
6. Pile footing - use foundation depth shown in table unless otherwise shown on format sheet.
7. On single post sign structure the post shall be raked out of plumb with the use of the leveling nuts to make the bottom of the sign frame level.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BOX BEAM SIGNS FOUNDATION

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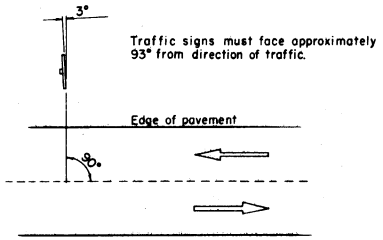
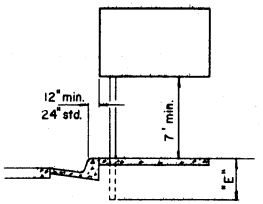
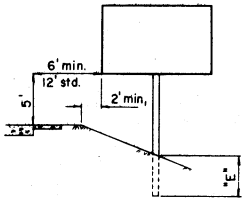
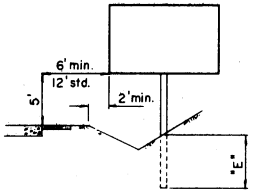


PLAN VIEW



URBAN LOCATIONS

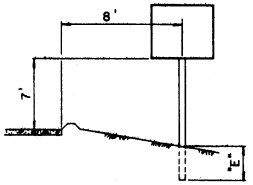




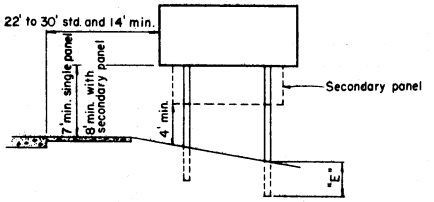
RURAL LOCATIONS

Note: Lateral distance to sign edge should be 4' minimum beyond the improved shoulder. The distance from the pavement must allow sufficient clearance for trucks or wide vehicles to park clear of pavement.

CONVENTIONAL HIGHWAYS AND INTERCHANGE AREAS



REGULATORY AND WARNING SIGNS AND ROUTE SHIELDS



GUIDE SIGNS

FREEWAY AND EXPRESSWAY LOCATION

TYPICAL SIGN POSITIONS

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

ROADSIDE SIGNS

TYPICAL INSTALLATION DETAILS NO 1 S41-1

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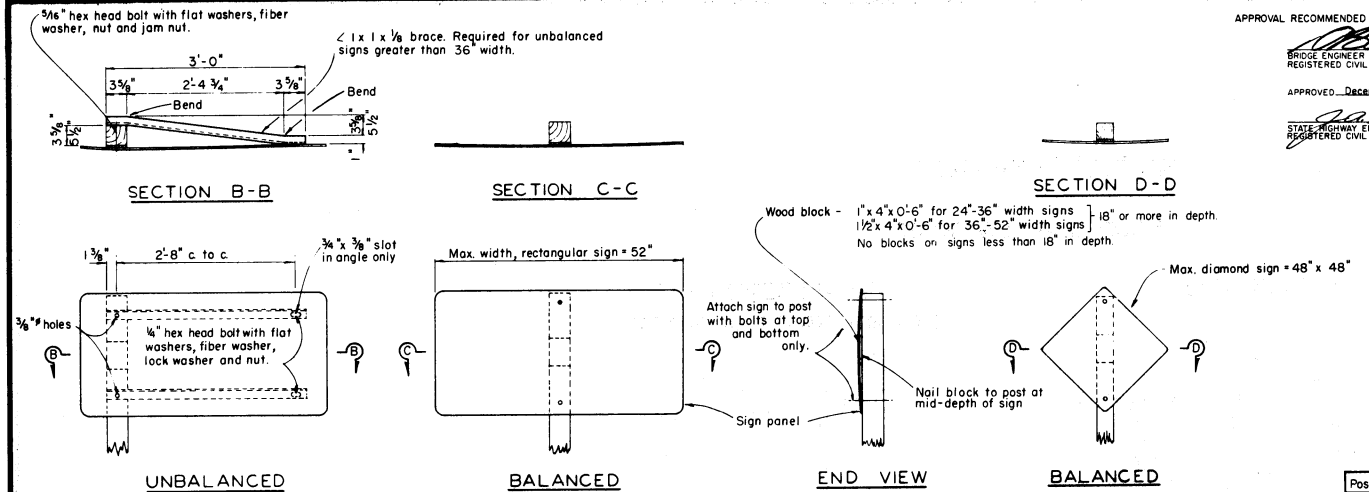

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

POST SPACING TABLE		
SIGN PANEL LENGTH	SIGN PANEL OVERHANG	POST SPACING
"A"	"B"	"C"
4'-6", 5'-0" & 5'-6"	6", 9" & 12"	3'-6"
6'-0" & 6'-6"	12" & 15"	4'-0"
7'-0" & 7'-6"	15" & 18"	4'-6"
8'-0"	18"	5'-0"
8'-6"	20"	5'-2"
9'-0"	22"	5'-4"
9'-6"	23"	5'-8"
10'-0"	24"	6'-0"
10'-6"	24"	6'-6"
11'-0", 11'-6" & 12'-0"	24", 27" & 30"	7'-0"
12'-6"	30"	7'-6"
13'-0"	30"	8'-0"
13'-6" & 14'-6"	30" & 36"	8'-6"
14'-0" & 15'-0"	30" & 36"	9'-0"
15'-6" & 16'-0"	36" & 39"	9'-6"
16'-6"	39"	10'-0"
17'-0" & 17'-6"	39" & 42"	10'-6"
18'-0" & 18'-6"	42" & 45"	11'-0"
19'-0"	45"	11'-6"
19'-6" & 20'-0"	45" & 48"	12'-0"
20'-6" & 21'-0"	48" & 51"	12'-6"
21'-6"	51"	13'-0"
22'-0" & 22'-6"	51" & 54"	13'-6"
23'-0"	54"	14'-0"
23'-6" & 24'-0"	54" & 57"	14'-6"

Post Embedment	
Post Size	"E"
4" x 4"	3.5'
4" x 6"	4.5'
6" x 6"	5.0'
6" x 8"	6.0'

Note:

1. All sign panels to be furnished by the State.
2. Exact location of sign posts to be determined by the Engineer.
3. All lumber shall be S4S.
4. Place long dimension of post cross section normal to sign axis.
5. Balanced single post installations of unframed sheet metal signs require back braces only when less than 18" in depth and 34" or more in width.
6. For post size see sign layout, format or quantity sheets.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

ROADSIDE SIGNS

TYPICAL INSTALLATION DETAILS NO 2 | S42-8

S42-8

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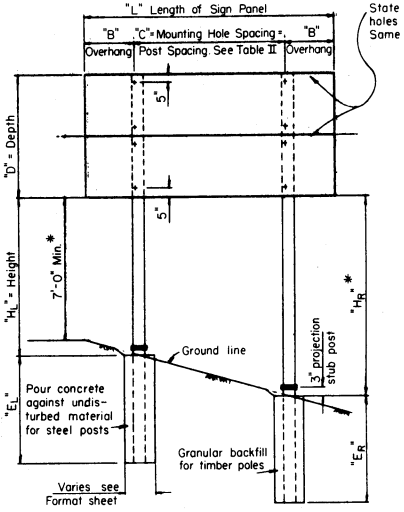
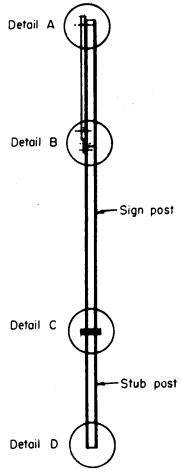
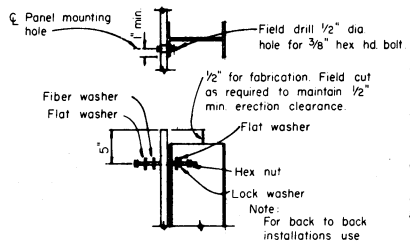


ELEVATION

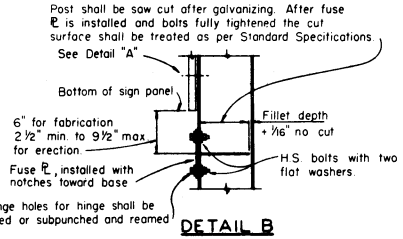


END VIEW

* Dimensions given on format sheet are for fabrication. At time of installation adjust these dimensions to provide a level sign approximately 7' above roadway shoulder.



DETAIL A



DETAIL B

Note: Detail shown is typical for signs located right of traffic. For median installations orient Detail "B" so that the fuse plate will face traffic nearest to post.

SIGN PANEL LENGTH	SIGN PANEL OVERHANG	MOUNTING HOLE SPACING
"A"	"B"	"C"
4'-6", 5'-0" & 5'-6"	6", 9" & 12"	3'-6"
6'-0" & 6'-6"	12" & 15"	4'-0"
7'-0" & 7'-6"	15" & 18"	4'-6"
8'-0"	18"	5'-0"
8'-6"	20"	5'-2"
9'-0"	22"	5'-4"
9'-6"	23"	5'-8"
10'-0"	24"	6'-0"
10'-6"	24"	6'-6"
11'-0", 11'-6" & 12'-0"	24", 27" & 30"	7'-0"
12'-6"	30"	7'-6"
13'-0"	30"	8'-0"
13'-6" & 14'-6"	30" & 36"	8'-6"
14'-0" & 15'-0"	30" & 36"	9'-0"
15'-6" & 16'-0"	36" & 39"	9'-6"
16'-6"	39"	10'-0"
17'-0" & 17'-6"	39" & 42"	10'-6"
18'-0" & 18'-6"	42" & 45"	11'-0"
19'-0"	45"	11'-6"
19'-6" & 20'-0"	45" & 48"	12'-0"
20'-6" & 21'-0"	48" & 51"	12'-6"
21'-6"	51"	13'-0"
22'-0" & 22'-6"	51" & 54"	13'-6"
23'-0"	54"	14'-0"
23'-6" & 24'-0"	54" & 57"	14'-6"

LAMINATED PANELS

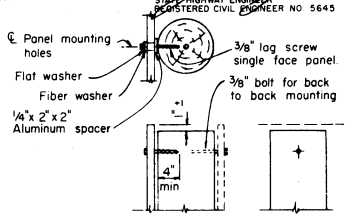
TABLE II

APPROVAL RECOMMENDED

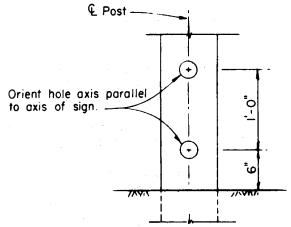
BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645

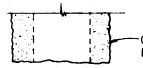


DETAIL A



DETAIL C

Pole Diameter @ Ground Line	Hole Dia.
Less than 7"	No hole
7" to less than 8"	2" ⌀
8" to less than 9"	2 1/2" ⌀
9" to less than 10 1/2	3" ⌀
10 1/2" to less than 12"	3 1/2" ⌀
Over 12"	4" ⌀



DETAIL D

TIMBER POLES

(Elevation and end view similar to those shown for steel posts)

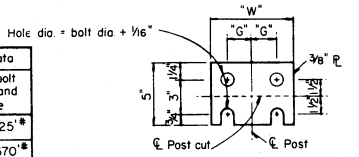
Notes: See Sign Format sheet and / or Sign Location and / or Quantities sheet for:

1. Station of each sign.
2. Distance from edge of pavement or other layout line.
3. Length of Sign "L".
4. Depth of Sign "D".
5. Height "H" of each post or pole above foundation.
6. Depth of embedment "E" for each post or pole.
7. Diameter of bankfill.
8. Size of post or class of timber pole.

Post Size	Base Connection Data					Fuse Plate Data		
	H.S. bolt size and torque	Base ℄				Fuse ℄		H.S. bolt size and torque
		"W"	"T"	"R"		"W"	"G"	
6 B 12	5/8" x 38"*	5"	1"	1 1/32"		4"	1 1/4"	1/2" x 125"*
6 WF 15.5								3/4" x 370"*
8 WF 20		7"				5"	1 1/2"	3/4" x 400"*
8 WF 24								3/4" x 415"*
8 WF 28	1" x 85"*	8"						3/4" x 400"*
8 WF 31			1 1/2"	1 7/32"				3/4" x 400"*
8 WF 35		9"				7"	2 1/2"	
10 WF 39	1" x 106"*							3/4" x 310"*
10 WF 45								

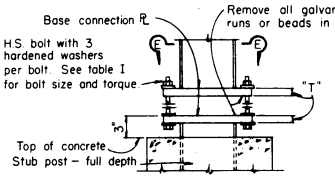
BASE PLATE & FUSE PLATE DATA

TABLE I

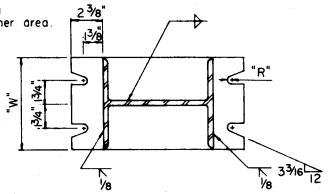


FUSE PLATE DETAIL

(See Table I for dimensions not shown)

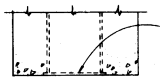


DETAIL C

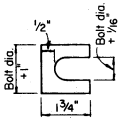


SECTION E-E

(Top plate shown – bottom plate similar)



DETAIL D



SHIM DETAIL

Furnish shims .012" ± thick & .034" ± thick. Shim shall be fabricated from brass shim stock or strip conforming to ASTM - B36.

Assembly Procedure

1. Assemble sign post to foundation post verifying that there is one flat washer on each bolt between plates.
2. Shim as required to plumb post.
3. Tighten all bolts to a snug-tight postion to bed washers and shims and to clean out threads. Then loosen each bolt in turn and retighten in a systematic order to the prescribed torque.
4. Burr threads at junction with nut using a center punch to prevent nut loosening.

BREAK-AWAY STEEL POSTS

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

ROADSIDE SIGNS
STEEL POSTS AND TIMBER POLES
INSTALLATION DETAILS

S 43-7

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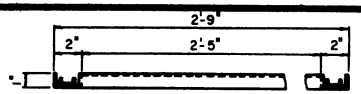
APPROVAL RECOMMENDED

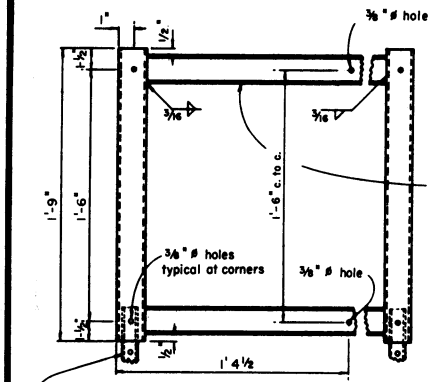
BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED December 4, 1967

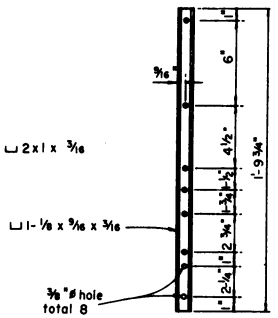
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645



PLAN



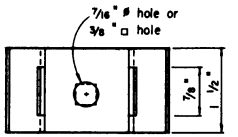
ELEVATION

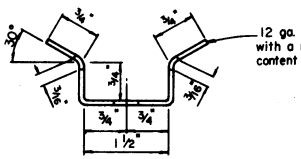


ADAPTER CHANNEL

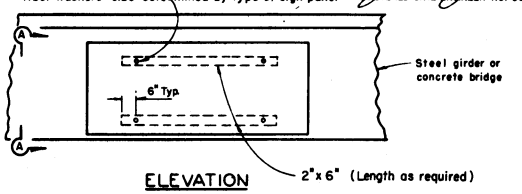
GALVANIZED STEEL FRAME

Note: Adapter channel nests inside frame channel when used.

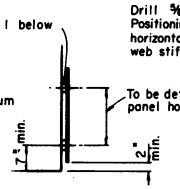




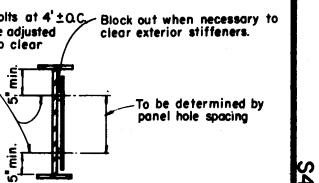
SADDLE BRACKET



ELEVATION



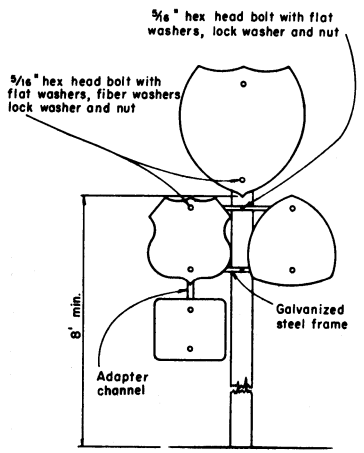
SECTION A-A
CONCRETE BRIDGE



SECTION A-A
STEEL BRIDGE

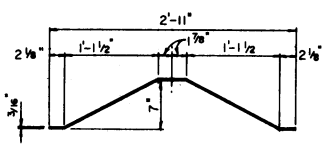
SIGN INSTALLATION ON BRIDGES

Note:
1. Attach 2"x 6" to concrete by means of 1/2" bolts at 4' ± centers cast into the concrete or fastened by approved expansion anchorage devices. Embedment of anchorage devices shall be 3 1/2" minimum. Holes shall be drilled by non-percussion methods.
2. Recess bolt head or nut in 2"x 6" for flush attachment of sign panel.
3. Contractor shall furnish anchorages, hardware and lumber necessary to attach panel to bridge.

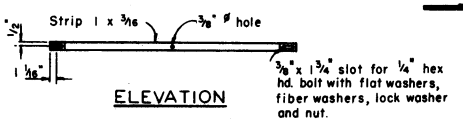


ELEVATION

MULTIPLE SIGN INSTALLATION

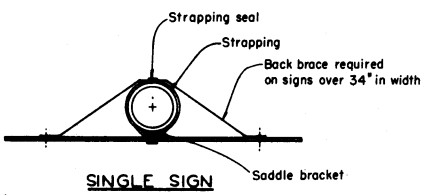


PLAN

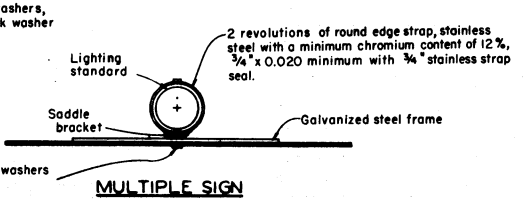


ELEVATION

BACK BRACE DETAILS



SINGLE SIGN



MULTIPLE SIGN

INSTALLATION ON LIGHTING OR SIGNAL STANDARD

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

ROADSIDE SIGNS
TYPICAL INSTALLATION DETAILS NO 3 S44-3

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STATE	FEDERAL PROJECT NO	SHEET NO	TOTAL SHEETS
CALIF			

DIST	COUNTY	ROUTE			

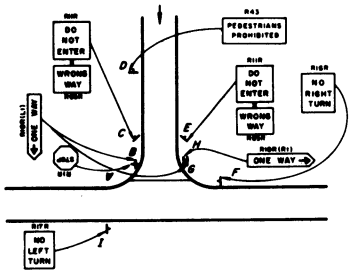
APPROVAL RECOMMENDED

Traffic Engineer
Registered Civil Engineer No. 8586

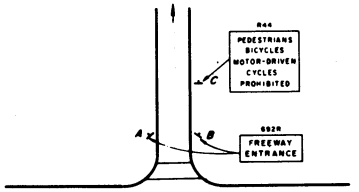
Approved SEPTEMBER 1, 1966

State Highway Engineer
Registered Civil Engineer No. 5845

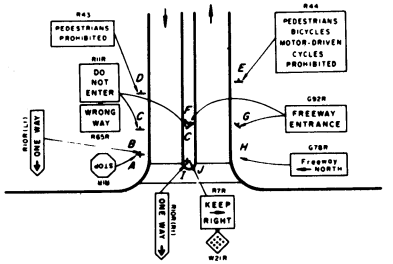
OFF-RAMP DETAIL "A"



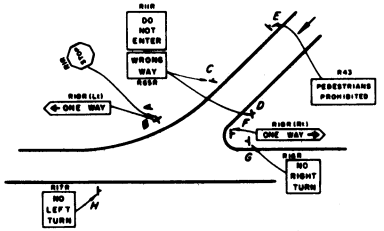
ON - RAMP DETAIL "B"



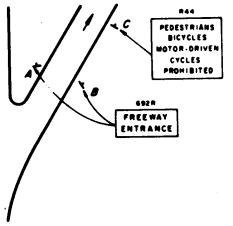
ON AND OFF-RAMP DETAIL "C"



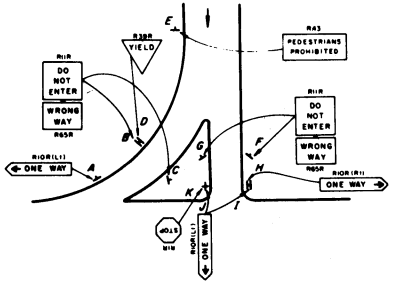
OFF-RAMP DETAIL "D"



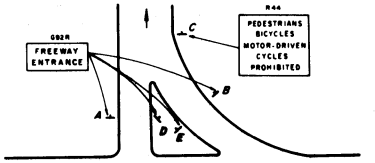
ON-RAMP DETAIL "E"



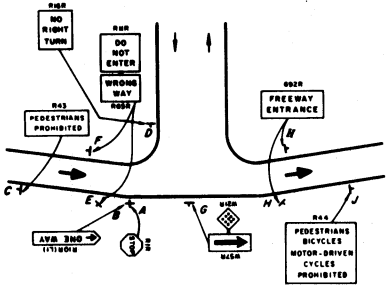
OFF-RAMP DETAIL "F"



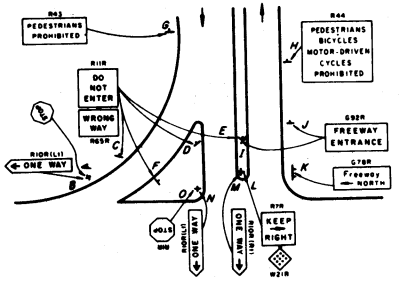
ON - RAMP DETAIL "G"



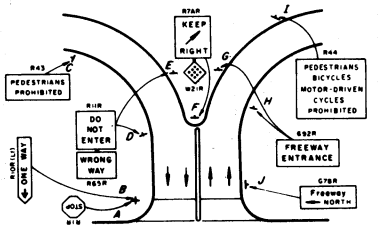
ON AND OFF-RAMP DETAIL "H"



ON AND OFF-RAMP DETAIL "I"



ON AND OFF-RAMP DETAIL "J"



NOTES:

1. R43 or R44 shall be installed far enough up the ramps to avoid conflict with the signs nearer the entrance (75'-100' from other signs)
2. The G92R "FREEWAY ENTRANCE" signs shall be installed as near the actual entrance as is practicable
3. Standard mounting height of primary signs 5', except R11R to be 6' to provide for R65R below.
4. Omit R1R at signalized intersections
5. Where an off-ramp has a free right turn lane as in Details F & I, a single set of R11R, R65R signs may be used further up the ramp where it becomes a single roadway. Optimum location to be determined by engineer.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

MINOR ROADSIDE SIGNS TYPICAL LOCATION DETAILS

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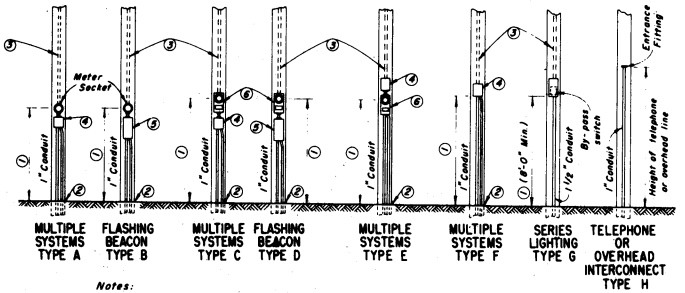
DIST.	COUNTY	ROUTE	POST MILE	SHEET NO.	TOTAL SHEETS

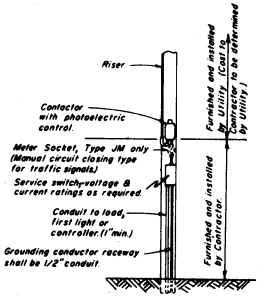
APPROVAL RECOMMENDED

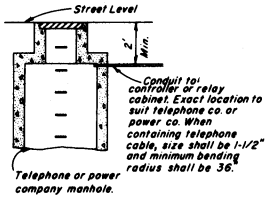
TRAFFIC ENGINEER
REGISTERED CIVIL ENGINEER NO. 8586

APPROVED SEPTEMBER 1, 1966

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945





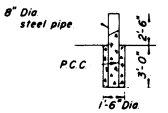


Notes:

1. Position of service equipment to be determined by serving utility.
2. See "Service Grounding" detail.
3. If service pole is utility owned, service riser shall be furnished by contractor and installed by serving utility. On state owned poles, the service riser shall be furnished and installed by contractor. Service riser conduit shall be terminated with a service head and shall be sealed to prevent the entrance of water, as approved by serving utility.
4. Service switch.
5. Flashing beacon control with service switch.
6. Meter socket box with either manual circuit closing device or space for test block as specified.

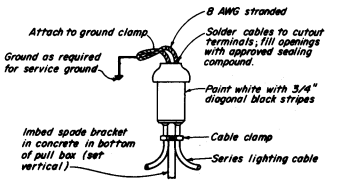
ELECTRICAL AND TELEPHONE SERVICE DETAILS

NO SCALE

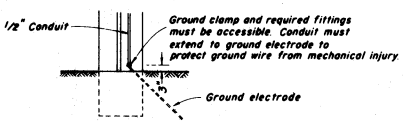


GUARD POST

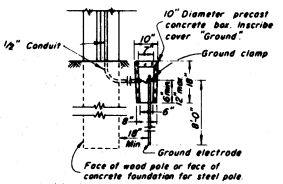
NO SCALE



GROUNDING CUTOUT



TYPE A



TYPE B

(Use where serving utility requires 18" between electrode and pole.)

Installation shown is for sidewalk or paved areas. Omit concrete box and locate ground clamp and fittings above ground in unpaved areas.

Notes:

When water pipe is used for ground, wire shall be enclosed in galvanized rigid conduit, or equivalent mechanical protection.

Rod or pipe electrodes shall be driven to a depth of at least 8 ft. below surrounding grade.

SERVICE GROUNDING

NO SCALE

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TRAFFIC SIGNAL AND HIGHWAY LIGHTING INSTALLATIONS DETAILS NO. 1

ES-1-3

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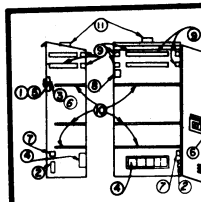
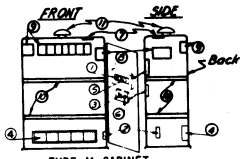
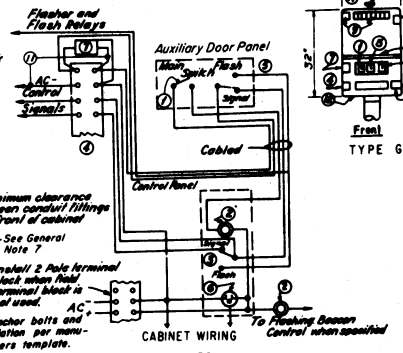
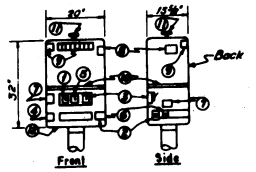




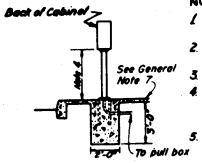
TYPE M CABINET



CABINET WIRING



TYPE G CABINET



PEDESTAL AND FOUNDATION
TYPE G AND PRE-TIMED CONTROLLER CABINETS

NOTES:

1. Pedestal, base, and foundation details similar to Type I Standard. (Unless otherwise specified.)
2. Cabinets shall be provided with slip fitter to permit mounting on 4 1/2" O.D. pedestal.
3. Upper end of pedestal shall be 4 1/2" O.D.
4. The distance between the bottom of the controller cabinet and top of the foundation shall be:
   5'-7" for pre-timed controllers.
   3'-0" for traffic actuated controllers.
5. Conduit between foundation and adjacent pull box shall be 2" size minimum.

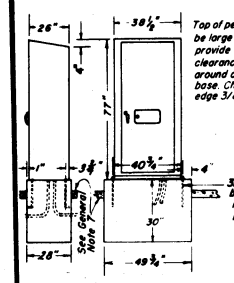
APPROVAL RECOMMENDED

TRAFFIC ENGINEER
REGISTERED CIVIL ENGINEER NO. 9618

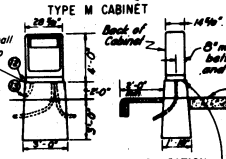
APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645

ROUTE	POST MILE	SHEET NO.	TOTAL SHEETS



TYPE R CABINET



P.C.C. PEDESTAL FOUNDATION
TYPE M CABINET

SYMBOLS FOR EQUIPMENT IN CABINETS

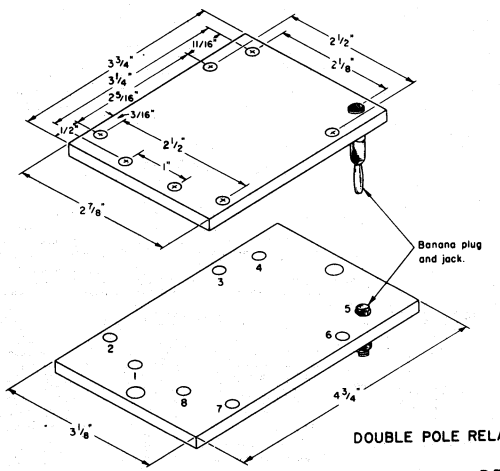
1. Main switch
2. Fuse receptacle. Cartridge fuses in Type R cabinet. Plug fuses in other cabinets.
3. Controller - Flash - Signal switch
4. Field wire terminal blocks. Mount on metal shelf when specified.
5. Auxiliary door flash switch
6. N.E.M.A. Standard plug receptacle with grounding contact
7. Radio interference suppressor
8. Flasher
9. External light and control relays
10. Shelf (adjustable every 2" in Type R cabinet) Controller unit located on top shelf.
11. Raintight vent (and cabinet fan when specified)
12. Screened vent, 8-1/2" holes or louvers
13. 1" Drain pipe with screen

GENERAL INSTALLATION NOTES - ALL CABINETS

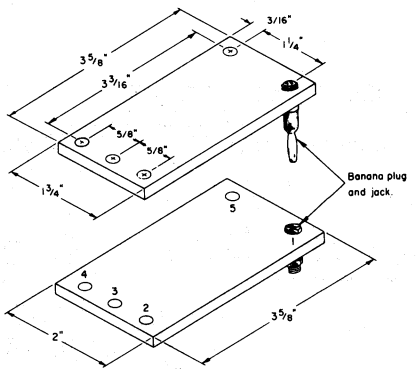
1. All cabinet dimensions are nominal.
2. Foundations shall be located to provide 2'-0" minimum clearance between face of curb and back of cabinet.
3. One anchor bolt shall be bonded to conduit or ground wire.
4. If telephone interconnect is specified a minimum of 5 inches clear vertical space shall be left beneath all other equipment inside cabinet.
5. Not more than two conductors from a detector or push-button circuit shall be connected to a terminal on the terminal board in the controller cabinet.
6. For telephone interconnect a 3/4" conduit shall be installed inside the steel or P.C.C. pedestal to a point 1 inch above the cabinet or finished surface of the P.C.C. pedestal. Conduit shall terminate in a No. 3-1/2 pull box adjacent to the foundation.
7. In unpaved areas, a raised P.C.C. pad of 2'-6" x 3'-0" x 0'-4" for Type G, M and Pre-timed controller cabinets and of 4'-1" x 3'-0" x 0'-4" for Type R cabinets shall be placed in front of each controller cabinet.
8. In all unpaved areas top of foundation for G, R and Pre-timed controller cabinets shall be 6" above surrounding grade. In paved areas top of foundation for G and Pre-timed controller cabinets shall be level with surrounding grade.
9. Anchor bolts, nuts and washers shall be galvanized.
10. Locations shown for equipment is typical only.
11. Controllers and relays shall be located to permit easy and safe removal from plug-in mounting.

DETAILS OF CONTROLLER CABINETS

NO SCALE



DOUBLE POLE RELAY



SINGLE POLE RELAY

DETAILS OF SIGNAL LIGHT AND CONTROL RELAY

BASES AND RECEPTACLES

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TRAFFIC SIGNAL AND HIGHWAY LIGHTING INSTALLATIONS
DETAILS NO. 2A

ES-2A-3

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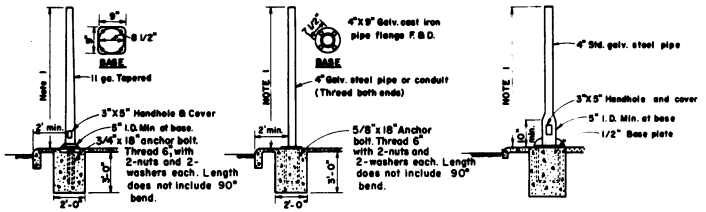


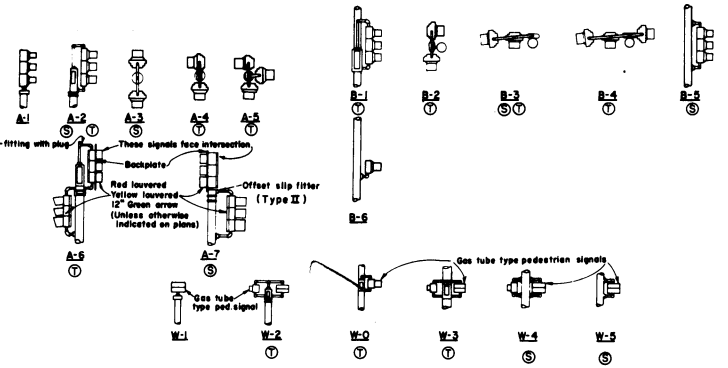
TYPE I-A STANDARD — TYPE I-B STANDARD — TYPE I-C STANDARD

(Details not shown same as in Type I-A.)

NOTES: 1. Standards shall be 10'-0" for vehicular signals; 7'-0" for pedestrian signals and left-turn vehicular signals, unless otherwise noted on plans.
2. Top of standard shall be 4-1/2" O.D.
3. Conduits shall extend 2" max. above finished surface of foundation and for Types I-A and I-C Standards, shall be sloped toward handhole.
4. One anchor bolt shall be bonded to conduit.
5. Conduit between standard and adjacent pull box shall be 2" size minimum.

SIGNAL STANDARDS

NO SCALE



POST-TOP MOUNTINGS — BRACKET MOUNTINGS

(T) Mounting includes terminal compartment
(S) Special mountings (Use only when noted on plans.)

SIGNALS AND MOUNTINGS

NO SCALE

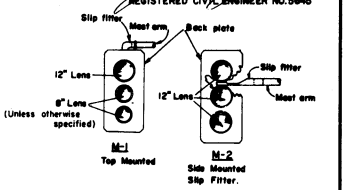
DISTRICT	COUNTY	ROUTE	POST	MILE	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

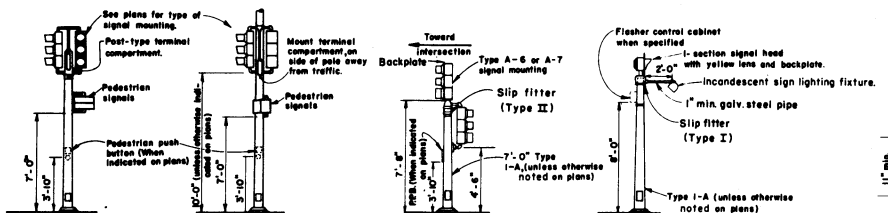
TRAFFIC ENGINEER
REGISTERED CIVIL ENGINEER NO. 9618

APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645



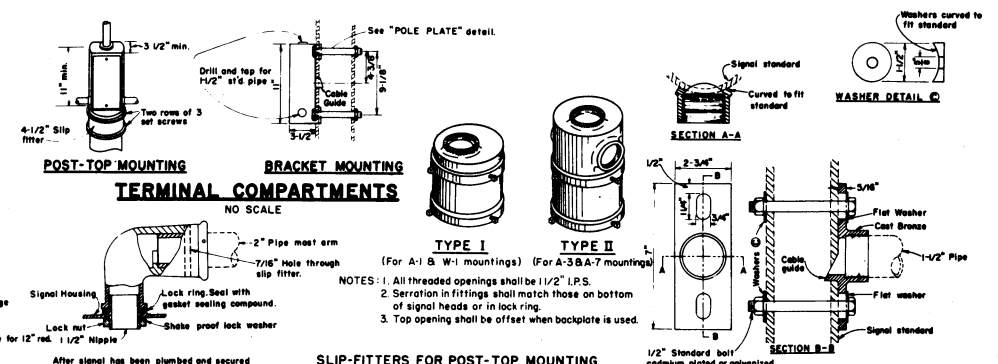
MAST ARM MOUNTING



ON TYPE I-A, I-B OR I-C STANDARDS — ON TYPE II, III, X, XV XVI OR XVII STANDARDS — LEFT TURN LANE SIGNALS — ADVANCE FLASHING BEACON INSTALLATIONS

NOTES: 1. Mountings shall be oriented to provide maximum horizontal clearance to adjacent roadway. 2. Pedestrian signals shall be positioned on the side of standard nearest crosswalk controlled. 3. Bracket arms shall be long enough to permit proper alignment of signals.

TYPICAL EQUIPMENT MOUNTING



POST-TOP MOUNTING — BRACKET MOUNTING

TERMINAL COMPARTMENTS

NO SCALE

TYPE I (For A-1 & W-1 mountings) — TYPE II (For A-3 & A-7 mountings)

NOTES: 1. All threaded openings shall be 1 1/2" I.P.S.
2. Serration in fittings shall match those on bottom of signal heads or in lock ring.
3. Top opening shall be offset when backplate is used.

SLIP-FITTERS FOR POST-TOP MOUNTING

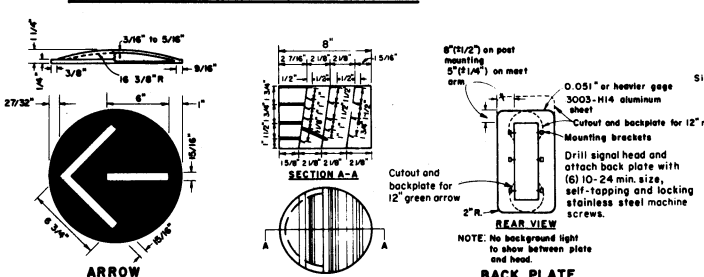
2" SLIP FITTER FOR MAST ARM MOUNTING — LOCK RING — SPECIAL 90° ELBOW

One for each face, except those with special slip fitter mounting.

NOTE: On upper clamp omit cable guide on center hole in standard.

POLE PLATE

NO SCALE


3/16" to 5/16"
3/8"
16 3/8" R
9/16"
27/32"
6"
1"
15/16"
8 3/4"
15/16"
ARROW
(12" GLASS LENS)
8"
2 7/16"
2 1/8"
2 1/8"
1 5/16"
1/2"
1 1/2"
1 1/2"
1"
1 1/2"
1 1/2"
1 1/2

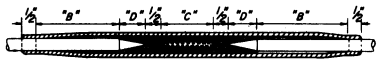
DIST	COUNTY	ROUTE	POST MILE	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

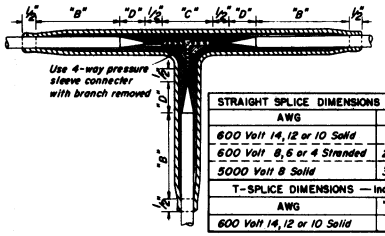
TRAFFIC ENGINEER
REGISTERED CIVIL ENGINEER NO. 9618

APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5646



STRAIGHT SPLICE (600 V or 5000 V)



STRAIGHT SPLICE DIMENSIONS — Inches		
AWG	"B"	"D"
600 Volt 14, 12 or 10 Solid	2"	½"
600 Volt 8, 6 or 4 Stranded	2½"	½"
5000 Volt 8 Solid	3¼"	1"
T-SPLICE DIMENSIONS — Inches		
AWG	"B"	"D"
600 Volt 14, 12 or 10 Solid	2"	½"

"C" = Connector length

600 VOLT "T" SPLICE

PROCEDURE

A. Remove insulation from each conductor to distance ½ C + ½" and pencil to dimension D. Roughen penciling.

B. Train conductors and place connector, centering over butted cable ends

C. Crimp connector. If crimping tool is not ratchet type, solder crimp connection.

D. Insulate. Use method "A" on high voltage circuits unless otherwise specified.

INSULATING METHODS

Low Voltage Circuits (0-600 volts) Method "A"

1. Apply one coat of rubber cement and allow to dry.
2. Apply low voltage tape to a thickness equal to original insulation.

High Voltage Circuits (601-5000 volts) Method "A"

1. Apply one coat of rubber cement and allow to dry.
2. Apply high voltage tape to a thickness equal to original insulation.
3. Apply two layers of low voltage tape, half lapped.

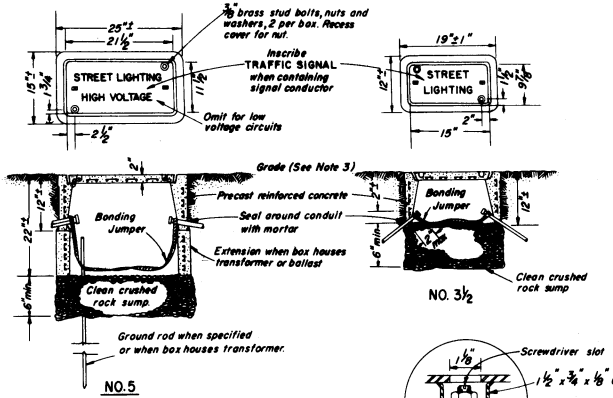
High Voltage or Low Voltage Circuits — Method "B"

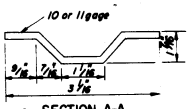
1. Apply two layers, half lapped, of synthetic, oil resistant, self fusing rubber tape.
2. Apply .007" thick P.V.C. tape to a thickness equal to original insulation.
3. Apply two layers of asphalt impregnated, open meshed fabric tape and fuse in.

GENERAL NOTES

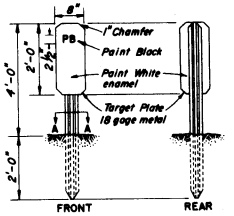
1. All dimensions are nominal.
2. Rubber tapes shall be rolled after application.
3. If P.V.C. low voltage tape is used as a final layer, paint finished splice with electrical insulating coating.

SPLICING



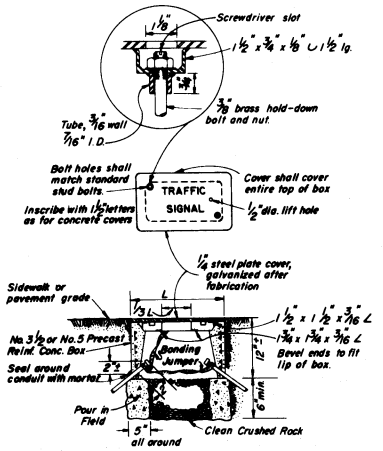


SECTION A-A

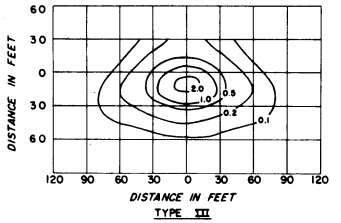


(Type A Guide Marker-No Reflectors)

PULL BOX MARKER



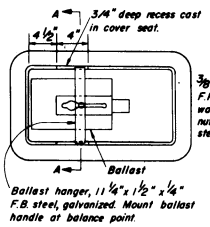
PULL BOX WITH TRAFFIC COVER

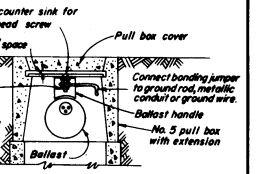


TYPE III

Shielded Highway Lighting Luminaire, 30' Mounting Height, 20,000 Lumen Mercury Vapor Lamp

ISOLUX LINES OF MINIMUM HORIZONTAL FOOT CANDLES





SECTION A-A

BALLAST INSTALLATION IN PULL BOX

No Scale

(Type A Guide Marker-No Reflectors)

NOTES

1. Use steel cover and special concrete footing, as shown, when box is to be installed where subject to traffic loads. Steel cover shall have embossed non-skid pattern when box is placed in paved or sidewalk areas.
2. Steel reinforcing shall be as regularly used in the standard products of the respective manufacturer.
3. Top of pull boxes shall be flush with surrounding grade or top of adjacent curb, except that in unpaved areas where pull box is not immediately adjacent to and protected by a concrete foundation, pole or other protective construction, the box shall be buried 12 inches below grade and shall be marked by a pull box marker placed adjacent to the pull box. Where practicable, pull boxes shown in the vicinity of curbs shall be placed adjacent to the back of curb, and pull boxes shown adjacent to standards shall be placed on side of foundation facing traffic, unless otherwise noted.

PULL BOXES

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TRAFFIC SIGNAL AND HIGHWAY LIGHTING INSTALLATIONS DETAILS NO. 3A

ES-3A-2

ES-3A-2

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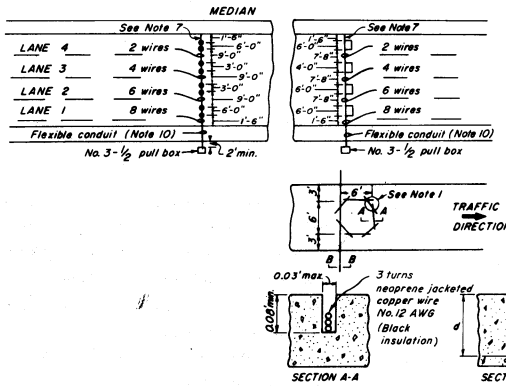
DIST	COUNTY	ROUTE	POST MILE	SHEET NO.	TOTAL SHEETS

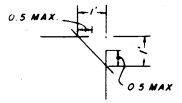
APPROVAL RECOMMENDED

TRAFFIC ENGINEER
REGISTERED CIVIL ENGINEER NO. 9618

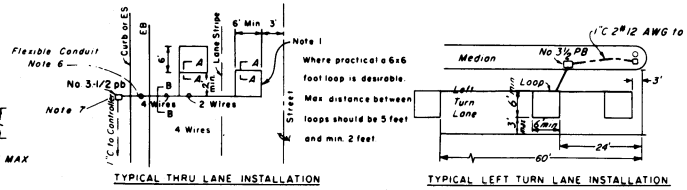
APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645





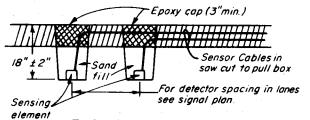
DETAIL "C"-DIAGONAL CORNER CUTS



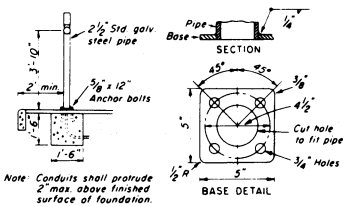
TYPICAL THRU LANE INSTALLATION

TYPICAL LEFT TURN LANE INSTALLATION

TYPICAL LOOP DETECTOR INSTALLATIONS



TYPICAL MAGNETOMETER DETECTOR INSTALLATION



PEDESTRIAN PUSH BUTTON POST

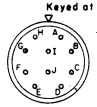
Notes: For Loop Installations

1. *Saw groove in pavement for loops. Corners may be diagonal as shown in detail "C".*
2. *Overlap cuts at all corners so slots are full depth at corners.*
3. *Push wire in with wood. Do not use screwdriver or other metallic instrument.*
4. *Pour clean dry white silica sand in slot to cover conductors. Fill slot with flexible epoxy resin conforming to specifications. Repeat pouring clean dry white silica sand to cover slot.*
6. *Maximum slot depth shall be 0.23'.*
7. *Make cut all the way across pavement.*
9. *Provide a minimum of 5' of slack in each conductor at pull box.*
10. *Flexible conduit (size as required) to be placed in sawed channel slot or rigid conduit may be placed under curb or shoulder to pull box.*
11. *Lead-in conductors from each loop to pull box shall be twisted together a minimum of two turns per foot from point of leaving pavement to inductive loop detector. Identify loop circuit pairs by lane.*
12. *TESTS:*
    (a.) Test each loop for continuity.
    (b.) A megger test shall be made between loops. Insulation resistance shall be not less than ten megohms.

lanes	d
2	0.12' min.
3	0.14' min.
4	0.18' min.
5	0.21' min.

DETECTOR INSTALLATIONS
TRAFFIC COUNTING

Keyed at this position



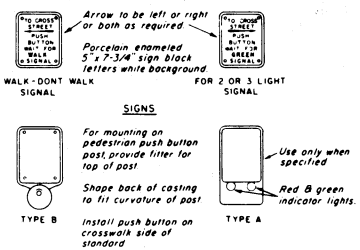
Type MS 3102A-18-1P plug
A-AC. (Line)
B-Relay common
C-AC (Neutral)
D, E-Loop
F-Normally closed
G-Normally open
H-Chassis ground
I-Spare
J-Spare

PLUG CONNECTOR FOR SENSOR UNIT WITH INTEGRAL POWER SUPPLY

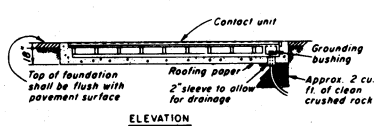
Notes: For Loop Installations

1. *Saw groove in pavement for loops. Corners may be diagonal as shown in Detail "C".*
2. *Overlap cuts at all corners so slots are full depth at corners.*
3. *Push wire in with wood. Do not use screwdriver or other metallic instrument.*
4. *Pour clean dry white silica sand in slot to cover conductors. Fill slot with flexible epoxy resin conforming to specifications. Repeat pouring clean dry white silica sand to fill slot.*
5. *Provide a minimum of 5' of slack in each conductor at pull box.*
6. *Flexible conduit (size as required) to be placed in sawed channel slot or rigid conduit may be placed under curb or shoulder to pull box.*
7. *Lead-in conductors from each loop to pull box shall be twisted together a minimum of two turns per foot.*
8. *In pull box, splice conductors from loop to a cable of 2 No.12 AWG conductors to sensor unit in controller cabinet.*
9. *Sections A-A and B-B shall be as shown for traffic counting detectors.*
10. *Pressure type terminals applied to inductive loop detector terminals shall be soldered.*
11. *Tests:*
    (a) Test each loop for continuity.
    (b) A megger test shall be made between loops. Insulation resistance shall be not less than ten megohms.

DETECTOR INSTALLATIONS
TRAFFIC SIGNAL



PEDESTRIAN PUSH BUTTON & SIGN

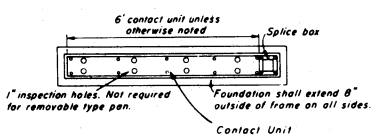


ELEVATION

Installation Notes:

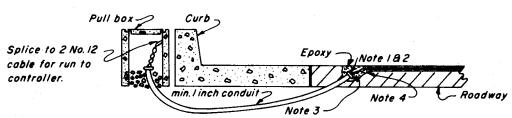
1. *Detector position dimensions refer to contact unit.*
2. *Concrete under removable contact unit mounting pan shall be finished flush with top of pan supporting angles.*
3. *Detector contact unit surface shall be flush with rim of housing or no more than 1/8" higher, if low, unit shall be raised using one-piece, galvanized, sheet metal shims with dimensions the same as the bottom surface of the contact unit.*
4. *Screw threads shall be coated with anti-seize compound. All screws shall be tightened securely.*

PRESSURE SENSITIVE DETECTOR



PLAN

VEHICLE DETECTORS



1. *Non-metallic bushing shall be used at roadway end of conduit.*
2. *Tape wire 3 inches each side of roadway bushing.*
3. *Install flexible compound on low side of roadway conduit before installing wire.*
4. *Round all sharp edges where wire has to pass.*
5. *End of roadway conduit shall be 2 inches below roadway.*

TYPICAL DETAIL OF RIGID CONDUIT BETWEEN ROADWAY AND PULL BOX

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TRAFFIC SIGNAL AND HIGHWAY LIGHTING INSTALLATIONS DETAILS NO. 3B

ES-3B-9

ES-3B-9

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DIST	COUNTY	ROUTE	POST MILE	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

TRAFFIC ENGINEER
REGISTERED CIVIL ENGINEER NO. 9618

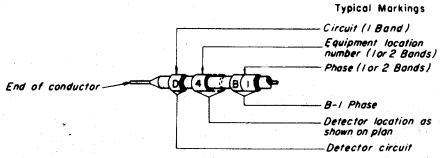
APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645

SYMBOLS

PROPOSED	EXISTING	
		Ultra-sonic detector (Side fire type Existing)
		Magnetometer Detector
		Inductive loop detector
		Non-directional pressure detector
		Non-directional magnetic detector
		Directional pressure detector
		Traffic signal with all colors louvered
		Traffic signal each arrow one-way three color (On Type 1-A standard unless otherwise specified)
		Traffic signal one way three color with backplate (On Type 1-A standard unless otherwise specified)
		Traffic signal one way three-color with green arrow (On Type 1 standard unless otherwise specified. Red and yellow louvered.)
		Walk-Don't Walk pedestrian signal (7' Type 1 standard unless otherwise indicated.)
		Pedestrian signal, 2 color head. (Existing)
		Electrolier, Type XXX Standard with aluminum base unless otherwise specified.
		Mast arm traffic signal with backplate, Type XXI, Standard unless otherwise specified.
		Electrolier, mast arm type with mast arm traffic signal with backplate Type XXII Standard unless otherwise specified.
		Electrolier, Type XX Standard with aluminum base unless otherwise specified.
		Electrolier, Type XV Standard without aluminum base unless otherwise specified.
		Electrolier, upright type
		Telephone pole
		Power pole
		Flashing beacon, one-way
		Fire hydrant
		Overhead conductor
		Signal conduit
		Lighting conduit
		Pull box
		Controller
		Flush soffit luminaire, Detail "F," (arrow indicates "street" side)
		Pendant soffit luminaire, Detail "P," (arrow - "street" side)
		Wall-mounted luminaire, Detail "W"
PPB	ppb	Pedestrian push button
PPB	ppb	Pedestrian push button on special push button post.

Typical Markings



TYPICAL BANDING OF CONDUCTOR ENDS

CONDUIT

1. Unless otherwise indicated, conduit in service and detector runs shall be 1 inch and all other conduit shall be 1-1/2 inch.
2. Conduit shall be installed 18" minimum below curb grade in sidewalk areas and 30" minimum below grade or finished surface in all other areas except that conduit installed within curbed dividing strips constructed on existing pavement may be laid on and secured to the pavement.
3. Conduit runs parallel to curbs shall be placed adjacent to back of curb, except where in conflict with existing facilities. Minimum depth shall be 12 inches.
4. Existing underground conduit to be incorporated into new systems shall be cleaned with a mandrel and blown out with compressed air.
5. Conduit terminating in standards and pedestals shall extend 2" max above finished top of foundation and shall slope toward the handhole.
6. Conduit entering controller cabinets shall be sealed with paraffin or other approved sealing compound.
7. Service risers shall be terminated with a service head and shall be sealed to prevent the entrance of water, as approved by the serving utility.
8. Conduit shall not be run through foundations for standards.

PULL BOXES

1. Pull boxes shall be No 5 except as noted.

CONDUCTORS AND WIRING

1. Signal neutral shall be #10 AWG conductor.
2. Conductors between ballasts or transformers and luminaires shall be #10 AWG, 600 volt.
3. Conductors between series-to-multiple transformers and sign fixture ballasts shall be #12 AWG, 600 volt or larger.
4. Number of conductors indicated in signal system conduit includes three #14 AWG spares.
5. Conductors shall be identified with bands.
6. Underground conductors to signals shall be run without splices, except that where existing signals are being modified, signal conductors may be spliced where indicated.
7. Neutral conductors may be spliced in pull box.
8. Two feet of slack shall be provided in each conductor in each pull box.
9. A separate conductor, other than neutral, shall be run from each pressure detector to controller cabinet.
10. Connection to each terminal of a pedestrian push button shall be by a single conductor. Splices shall be made in nearest pull box.
11. Color coding for wiring to pedestrian signals shall be as specified for corresponding vehicular green and red indications.
12. One side of secondary circuit of series-to-multiple and step-down transformers shall be grounded. On structures the grounding electrode shall be the conduit system. Off structures, it shall be 1/2" x 8' ground rod installed through bottom of pull box.

SIGNAL EQUIPMENT

1. Vehicular and pedestrian signal mountings shall be oriented so as to provide maximum horizontal clearance to adjacent roadway.

ELECTROLIERS

1. A mercury-vapor lamp ballast shall be installed in a pull box adjacent to each electrolier, unless integral ballast type luminaires are used.
2. Type XXV standards shall be installed with 700 watt mercury vapor luminaires and glare shields unless otherwise specified.
3. Types XV and XVII standards shall be installed with 400 watt mercury vapor luminaires and glare shields unless otherwise specified.

FOUNDATIONS

1. Top of foundations for standards shall be level with top of curb in curbed areas or surrounding grade in other areas.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TRAFFIC SIGNAL AND HIGHWAY LIGHTING INSTALLATIONS DETAILS NO. 4

ES-4-4

ES-4-4

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DIST	COUNTY	ROUTE	POST MILE	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

TRAFFIC ENGINEER
REGISTERED CIVIL ENGINEER NO. 8586

APPROVED SEPTEMBER 1, 1966

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945

POLE TYPE	POLE HEIGHT & GAUGE	POLE BASE DIAMETER "c"	BASE PLATE DIMENSIONS "a"	BASE PLATE DIMENSIONS "b1"	BASE PLATE DIMENSIONS "b2"	BASE PLATE SLOT SIZE "l"	ANCHOR BOLTS DIMENSIONS (2)	ANCHOR BOLTS BOLT CIRCLE DIAMETER
II	20' x 10ga. (1)	6 3/8"	11 1/2"	9 1/2"	11 1/2"	1 1/4"	1" x 36"	9 1/2
II-a	25' x 10ga. (1)	7 5/16"	11 1/2"	9 1/2"	11 1/2"	1 1/4"	1" x 36"	10"
III	30' x 7ga.	8"	11 1/2"	9 1/2"	11 1/2"	1 3/8"	1 1/8" x 40"	11"
III-a	35' x 7ga.	8 11/16"	13 1/2"	11"	12 1/2"	1 1/2"	1 1/8" x 44"	11 1/2"
X	30' x 10ga. (1)	8"	11 1/2"	9 1/2"	11 1/2"	1 1/4"	1" x 36"	11"
X-a	35' x 10ga. (1)	8 11/16"	13 1/2"	11"	12 1/2"	1 1/2"	1" x 36"	11 1/2"
XIV	20' x .188" thick.	7"	11"	9 1/2"	11 1/2"	1 1/4"	(3)	10"

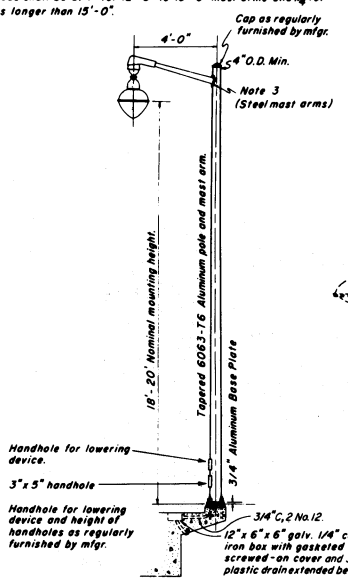
BASE AND ANCHOR BOLT SCHEDULE

NOTE

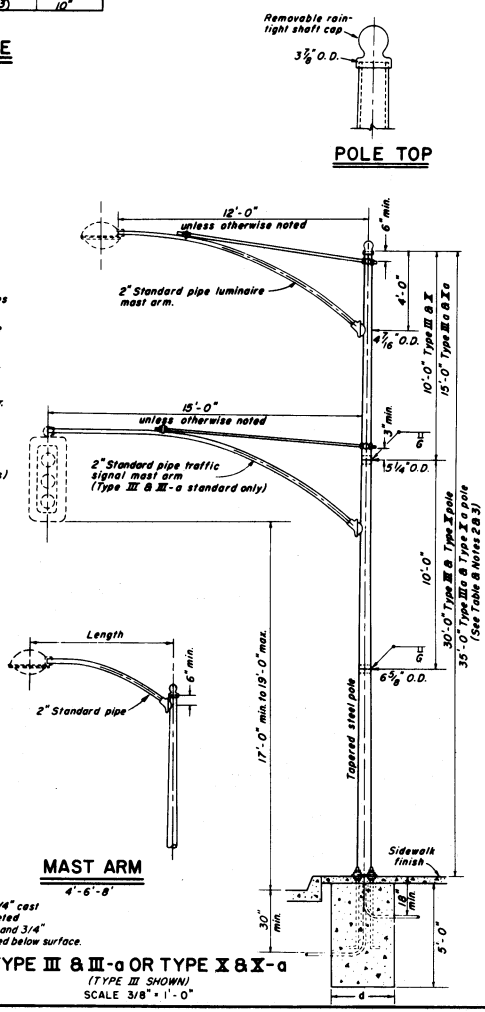
1. 11 gage acceptable if fabricated from sheet steel of 40,000 psi minimum yield.
2. Length indicated does not include required 4"-90° bend.
3. See Standard Electrical Details-Bridge (ES-7) for structure mounted standard.

TIE RODS

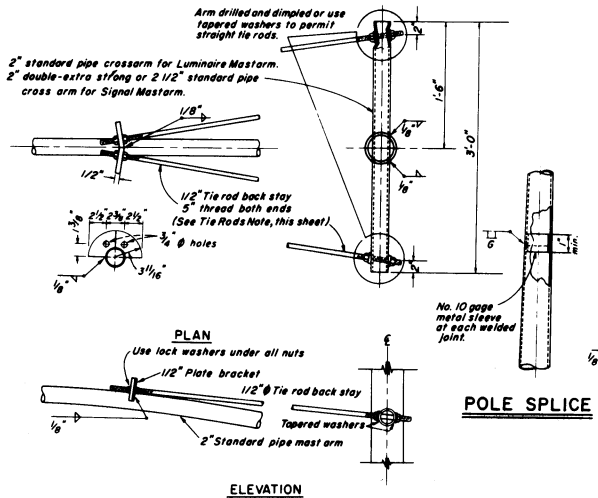
1. All traffic signal mast arms and mast arms 12' and longer for luminaires with integral ballasts shall be equipped with standard pipe tie rods with welded 5/8" round bolt tips on each end, threaded 5". Weld shall be coated with zinc-oxide paint or galvanized.
2. Pipe tie rods shall be 3/4" for 12'-0" to 15'-0" mast arms and 1 1/8" for mast arms longer than 15'-0".



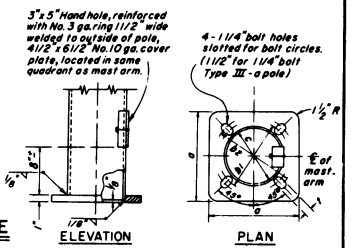
TYPE XIV
(P.O.C. Electrolier)
SCALE 3/8" = 1'-0"



TYPE III & III-a OR TYPE X & X-a
(TYPE III SHOWN)
SCALE 3/8" = 1'-0"



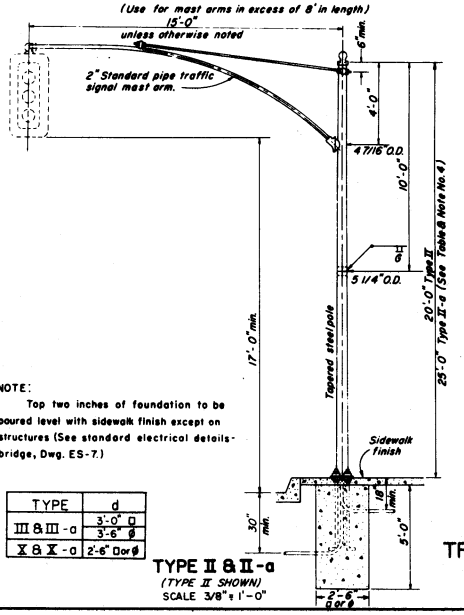
POLE SPLICE



POLE BASE

MAST ARM TIE RODS AND CROSS ARM

(Use for mast arms in excess of 8' in length)



NOTE:
Top two inches of foundation to be poured level with sidewalk finish except on structures (See standard electrical details-bridge, Dwg. ES-7.)

TYPE	d
III & III-a	3'-0" □ / 3'-6" ϕ
X & X-a	2'-6" □ or ϕ

TYPE II & II-a
(TYPE II SHOWN)
SCALE 3/8" = 1'-0"

CALIF-TYPE STANDARDS

GENERAL AND INSTALLATION NOTES

1. All steel shafts and mast arms shall be galvanized. Bolts, screws, nuts, washers and tie rods shall be galvanized.
2. The lower 5' length of a 35' Type III-a pole shall consist of a 5'-#7 gage tapered section (8" O.D. to 8 11/16" O.D.) butt welded to the lower end of a 30' Type III pole.
3. The lower 5' length of a 35' Type X-a pole shall consist of a 5'-#10 gage tapered section (8" O.D. to 8 11/16" O.D.) butt welded to the lower end of a 30' Type X pole.
4. The lower 5' length of a 25' Type II-a pole shall consist of a 5'-#10 gage tapered section (6-5/8" to 7-5/16" O.D.) butt welded to the lower end of a 20' Type II pole.
5. For standards to be installed on structures, see Drwg. ES-7.

STEEL MAST ARMS

1. Luminaire mast arms shall be so curved that when mast arm is fastened to pole the luminaire end shall not be below top of pole or more than 1-6" above.
2. The last 3" of the mast arm shall be straight and shall be horizontal with luminaire or traffic signal attached.
3. Connection between mast arm and pole shall be made by means of a raintight socket of a design permitting simple removal of the mast arm and providing a chased outlet for electrical conductors.

ANCHOR BOLTS

1. Each standard shall be supplied with 4 anchor bolts.
2. Each anchor bolt shall be provided with 6" of thread and an 4"-90° bend and shall be furnished with two nuts and two washers. Washers shall be 11/64" x 2-1/2" min.
3. Threads may be cut or rolled. Bolts shall be galvanized or plated after threads are formed.
4. One anchor bolt shall be bonded to conduit.

STATE OF CALIFORNIA
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TRAFFIC SIGNAL AND LIGHTING STANDARDS TYPES II, II-a, III, III-a, X, X-a & XIV DETAILS NO. 6

ES-6-5

ES-6-5

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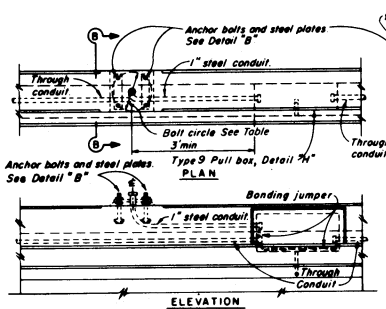
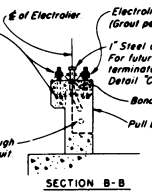


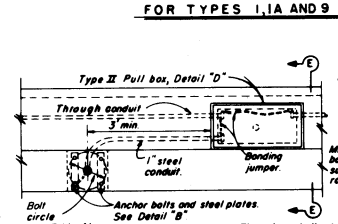


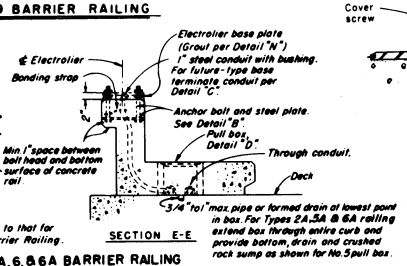
STRUCTURE MOUNTED ELECTROLIER

Type	Bolt Circle	Anchor Bolt Diameter	Steel Plate Holes	Steel Plate Spacing
XV *	11"	1"	1 1/16"	7 3/4"
XXI * XXV *	11 1/2"	1 1/8"	1 5/16"	8 1/8"

* Without aluminum base

FOR TYPES 1, 1A AND 9 BARRIER RAILING





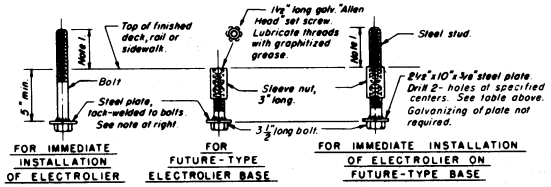
Elevation similar to that for Types 1 & 1A Barrier Railing.

FOR TYPES 2, 2A, 5, 5A, 6, & 6A BARRIER RAILING

See sheet titled "Barrier Railing" for structural details at electrolier.

DETAIL "A" ELECTROLIER BASE AND PULL BOX INSTALLATION

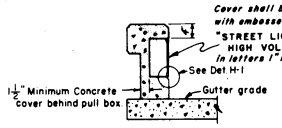
Scale: 3/4" = 1'-0"



Notes:
1. Anchor bolt or stud length shall be such that thread extends 1/8" maximum above nut on level base plate after grouting. See Detail "N".
2. Electrolier anchor bolts shall be held in position for pouring by means of suitable templates. Deviation from the true position, vertical and height, shall not exceed 1/16".
3. Nuts, threaded ends of anchor bolts, and studs shall be galvanized. The threads shall accept nuts without requiring use of tools or removal of protective galvanizing. Threads shall be N.C.

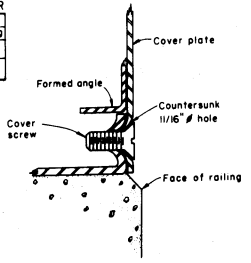
DETAIL "B" ELECTROLIER ANCHOR BOLTS

Scale: 3/16" = 1"



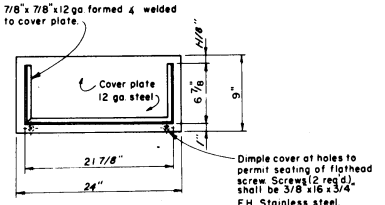
INSTALLATION FOR TYPES 1 AND 1A RAILING

No Scale



DETAIL H-1

No Scale



COVER DETAIL

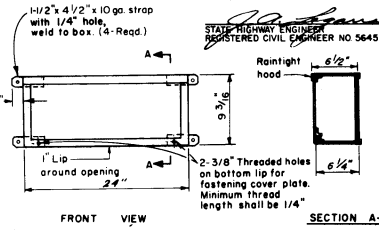
No Scale

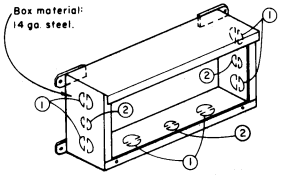
INSTALLATION NOTES

1. Box axis shall be parallel to top of railing.
2. Close box during pouring with 1/4" plywood of sufficient size to provide 1:1 chamfer on 3 sides of cover. Upper edge of of plywood shall fit against lower edge of raintight hood.

FABRICATION NOTES

1. Box and cover shall be hot-dip galvanized after fabrication. Slot in raintight hood shall be cleaned out to permit cover to fit under.
2. Install ballast hangers only when specified.





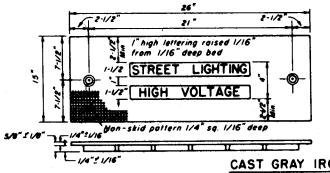
Knockout Schedule

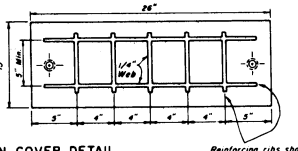
1. 1 1/2" conduit, 2-each end, 2 on bottom.
2. 1" conduit, 1-each end, 1 on bottom. Pound knockouts flat after punching.

GENERAL DETAILS

No Scale

DETAIL "H" STRUCTURE PULL BOX (TYPE 9)

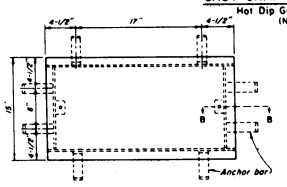


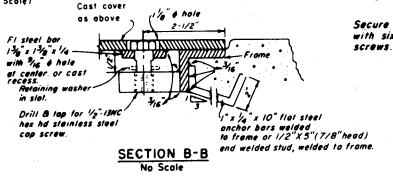


CAST GRAY IRON COVER DETAIL

Hot Dip Galv. After Fabrication

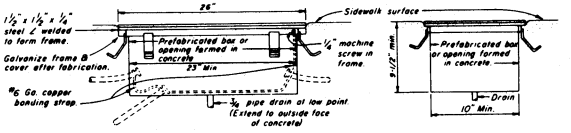
(No Scale)





SECTION B-B

No Scale

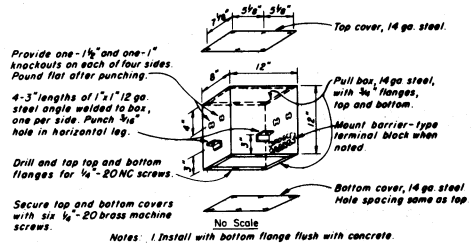


DETAIL "D" STRUCTURE PULL BOX (TYPE II)

No Scale

Note: Prefabricated Boxes

1. Boxes may be concrete or galvanized steel.
2. Alternate methods of attaching covers may be used on prefabricated boxes.
3. Metal covers shall be grounded by means of a 3 foot flexible braid between conduit and cover.



No Scale

Notes: 1. Install with bottom flange flush with concrete.
2. Galvanize after fabrication.
3. Both covers shall be on box during pouring.

DETAIL "K" CEILING PULL BOX

APPROVAL RECOMMENDED

TRAFFIC ENGINEER
REGISTERED CIVIL ENGINEER NO. 9615

APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

ELECTRICAL DETAILS
BRIDGE SHEET 1

ES-7A-4

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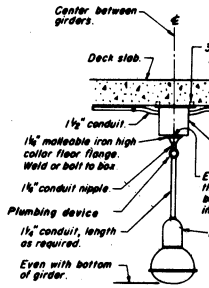
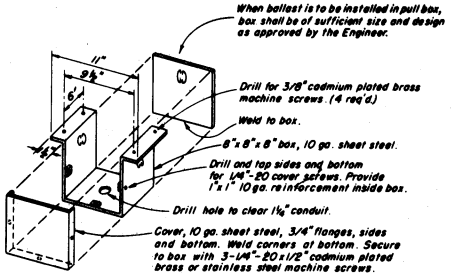
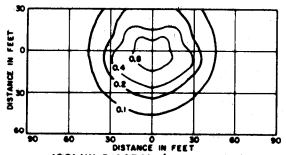


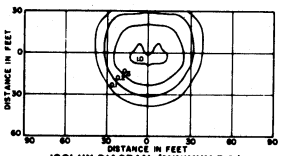


Notes.
1. Cast-in-place malleable iron wedge inserts or self-drilling expansion steel anchor.
2. Galvanize box and cover after fabrication.
3. Provide one 1½" knock-out 6" up on each side and back. Pound flat after punching.
4. For future installation, omit suspension conduit and luminaire, closed flange with galv. plug.

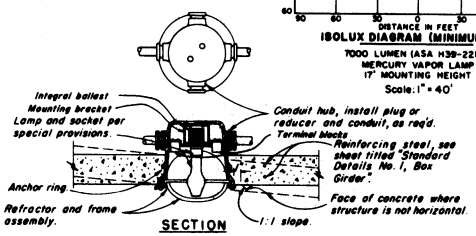


ISOLUX DIAGRAM (MINIMUM F.C.)
7000 LUMEN (ASA H39-22KB)
MERCURY VAPOR LAMP
17' MOUNTING HEIGHT
Scale: 1" = 40'

DETAIL "P"
PENDANT SOFFIT LUMINAIRE
Scale: 1" = 1'-0"



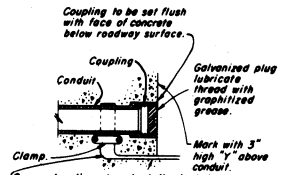
ISOLUX DIAGRAM (MINIMUM F.C.)
7000 LUMEN (ASA H39-22KB)
MERCURY VAPOR LAMP
17' MOUNTING HEIGHT
Scale: 1" = 40'



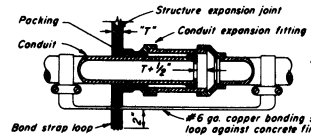
SECTION

Notes:
1. Place 1/4" plywood disk in body opening during pouring.
2. Install luminaire with axis vertical and "street side" of refractor oriented as indicated on lighting layout.
3. Luminaire shall be located so as to provide minimum clearance of 2 ft. from inside surface of girders and 1 ft. from near face of diaphragm.

DETAIL "F"
FLUSH SOFFIT LUMINAIRE
Scale: 3/32" = 1"

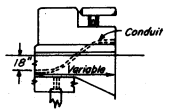


DETAIL "C"
CONDUIT TERMINATION
No Scale

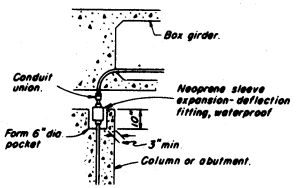


Notes
1. Except for sidewalk joints, a conduit expansion fitting shall be installed at each 1/2-inch or greater structure joint, hinge or abutment.
2. Expansion fitting shall be installed parallel to superstructure girders.
3. When conduit is installed thru rail joints of bridges having skews greater than 30° or where lateral movement greater than 1/4" may occur, install neoprene sleeve expansion-deflection fitting straddling joint.

DETAIL "X"
CONDUIT EXPANSION JOINT
No Scale

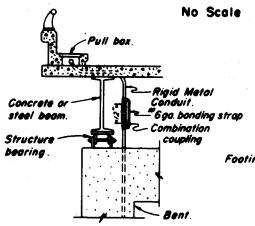


DETAIL I
CONDUIT TERMINATION AT END OF STRUCTURE

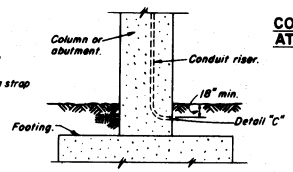


Notes
1. Fitting and pocket required only where movement can occur between girder and column or abutment.
2. Fill pocket around fitting with resilient waterproof compound.

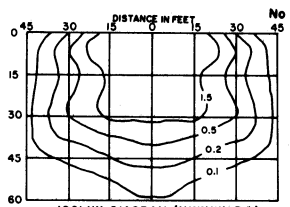
CONDUIT RISER CONNECTION AT COLUMN OR ABUTMENT
No Scale



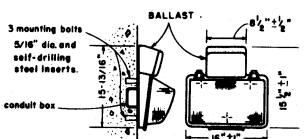
CONDUIT RISER CONNECTION
No Scale



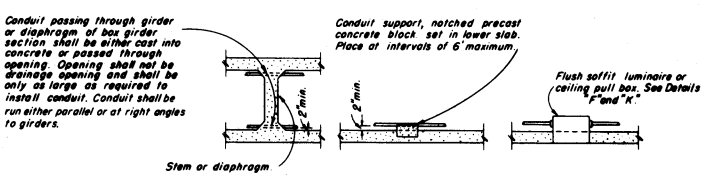
LOWER END OF CONDUIT RISER AT COLUMN OR ABUTMENT
No Scale



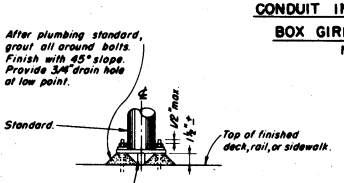
ISOLUX DIAGRAM (MINIMUM F.C.)
12000 LUMEN (ASA H37-5KB)
MERCURY VAPOR LAMP
15' MOUNTING HEIGHT
Scale: 1" = 20'



DETAIL "W"
WALL LUMINAIRE
Not to Scale



CONDUIT INSTALLATION IN BOX GIRDER SECTIONS
No Scale



DETAIL "N"
GROUTING AT ELECTROLIER
No Scale

DIST.	COUNTY	ROUTE	POST MILE	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

TRAFFIC ENGINEER
REGISTERED CIVIL ENGINEER NO. 8586

APPROVED SEPTEMBER 1, 1966

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

ELECTRICAL DETAILS
BRIDGE SHEET 2

ES-7B-1

ES-7B-1

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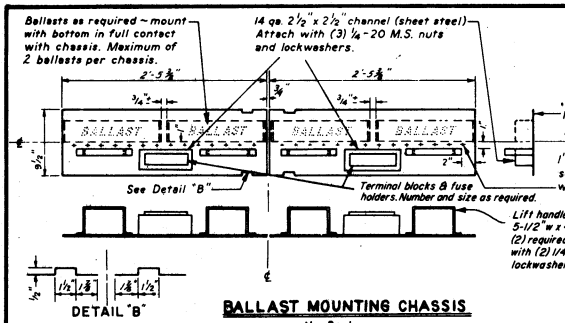
DIST	COUNTY	ROUTE	POST MILE	SHEET	TOTAL SHEETS

APPROVAL RECOMMENDED
TRAFFIC ENGINEER
REGISTERED CIVIL ENGINEER NO. 9618

APPROVED December 4, 1967
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645



BALLAST MOUNTING CHASSIS

No Scale

BALLAST NOTES

Each ballast shall be fused with a 1 1/4" x 1/4" slow-blow glass tube fuse - 2½ amp for 2-lamp ballast and 1 amp for 1-lamp ballast.

Ballasts shall be rated at 300 ma.

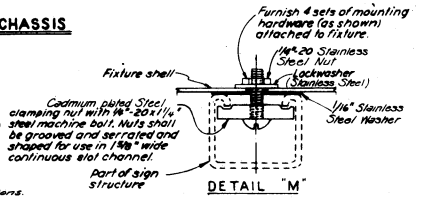
Ballasts shall be secured by 8-32 machine screw studs soldered to chassis with nuts and lockwashers.

Fuseholders shall be a panel mounted type. See Specifications.

For number of ballast boxes see "Overhead Sign Format and Quantities" sheet.

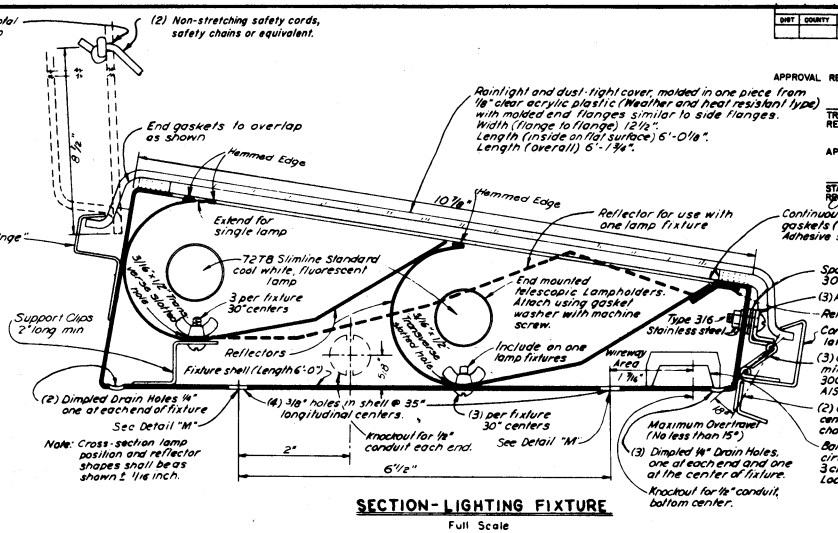
Chassis not requiring ballasts shall be furnished with lift handles, terminal channel and screened vents.

Two chassis shall be installed in each ballast box.



FIXTURE MOUNTING ON CONTINUOUS SLOT CHANNEL

Full Scale



SECTION - LIGHTING FIXTURE

Full Scale

FIXTURE NOTES

Two lamp fixtures shall be used for signs over 70" in vertical dimension. One lamp fixtures for 70" signs and smaller.

Lighting fixtures shall be fabricated of 0.064" clad 3003 H-14 aluminum, unless otherwise indicated. Machine screw parts and lockwashers for fixture shall be stainless steel, unless otherwise indicated.

Reflectors shall be made of 0.020" (min.) thickness aluminum with specular finish, and shall be 59" long. The finish shall be as described in the special provisions. Remove protective coverings before installation.

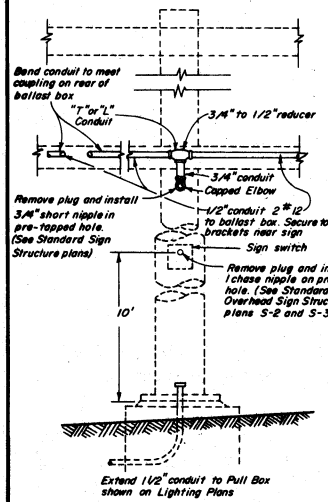
Alternate fixture fabrication methods and design details may be acceptable provided the light distribution, lamp size, and the mounting details are equivalent to the fixture shown. All variations must be approved by the Engineer.

Machine screws shall be 8-32 with nuts and lockwashers (except as noted).

Manufacturer shall submit five copies of shop drawings to the Engineer for approval prior to fabrication if fixtures have not previously been approved.

For method of mounting fluorescent fixtures see Walkways plan titled "Walkway Details No. 2".

After fabrication metal parts shall be thoroughly cleaned and degreased and shall have a well finished appearance. Painting will not be required.



TYPICAL WIRING AND SIGN SWITCH INSTALLATION DETAILS

No Scale

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	475,97
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
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

TRANSFORMER AND LOAD DATA

TOTAL NUMBER OF LAMPS	SM TRANSFORMER SIZE (VA)	SIGN * LOAD (WATTS)
1	75	70
2	150	134
3	225	201
4	300	262
5	375	332
6	450	393
7	525	463
8	600	524
9	750	594
10	750	655
11	900	726
12	900	786
13	1050	856
14	1050	917
15	1200	987
16	1200	1048
17	1350	1118
18	1350	1179
19	1500	1249
20	1500	1310

Notes

For sign structure with 21 or more lamps the load shall be split into two ballast box groups with separate switching supplied independently from two SM transformers in separate pull boxes.

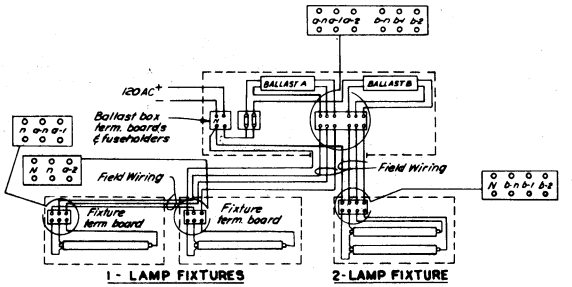
See Sign Format Sheet for size of panels.

Use one SM transformer for each sign structure unless otherwise indicated or required.

Use 2-lamp ballasts wherever possible.

Input to ballasts (90% pf) average 75 VA per lamp.

* Does not include SM transformer losses which are approximately 10% of load.



TYPICAL FIXTURE WIRING DIAGRAM

WIRING NOTES

Wiring between ballast box and nearest fixture and between fixtures shall be run in 1/2" liquid tight flexible conduit.

Flexible conduit shall be secured to the nearest walkway bracket using one-hole galvanized malleable iron or steel strap and brass machine screws tapped into the bracket.

Ballasts and terminal boards shall be marked with legible symbols, conductors shall be tagged and their identification marked on the corresponding terminal on the terminal board as shown on the Typical Fixture Wiring Diagram.

See Special Provisions for additional specifications.

GENERAL NOTE - METALS

Where steel is indicated, part shall be hot-dip 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 A151 Type 316 stainless steel unless otherwise noted.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

FLUORESCENT SIGN LIGHTING EQUIPMENT STANDARD OVERHEAD SIGNS

ES-8-10

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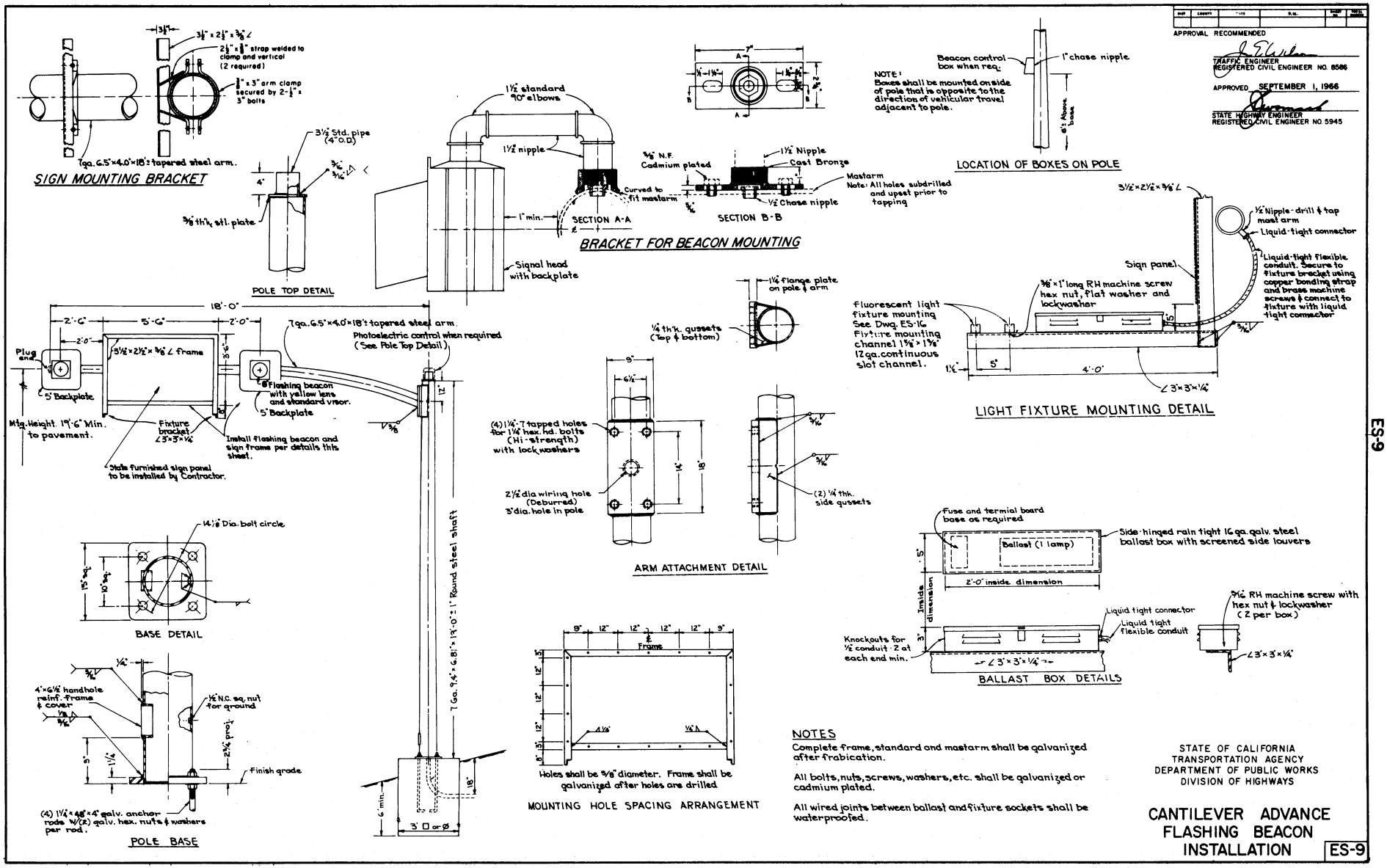

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DIST.	COUNTY	ROUTE	POST MILE-TOT.	PROJ. SHEET	TOTAL

TRAFFIC ENGINEER
REGISTERED CIVIL ENGINEER NO. 9618

APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5646

NOTES

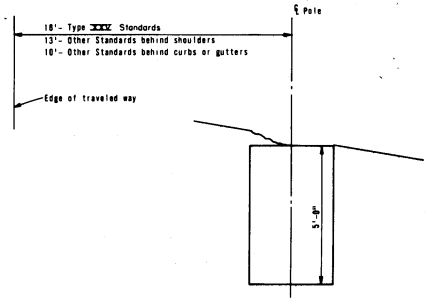
1. Pull boxes for electrolier ballasts shall be located at the same station (±5 feet) as the adjacent electrolier.

   Pull boxes, including those without ballasts, shall be placed adjacent to back of curb or edge of shoulder except where this is impracticable, a box may be placed in another suitably protected and accessible location.

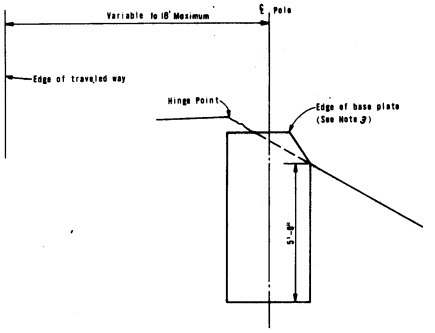
   Pull boxes shall be flush with surrounding grade and shall not be buried.

2. Conduit in foundation and to pull box shall be 1" size (2" size if signals are mounted on electrolier) and shall extend 2" above top of foundation.

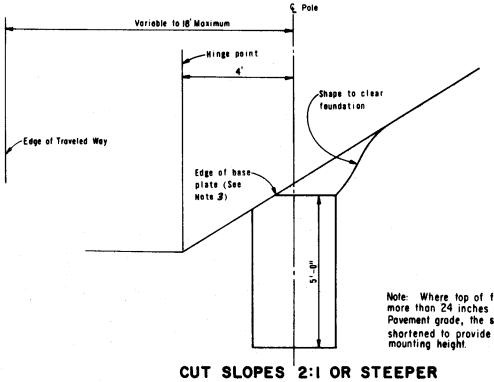
3. Where a portion of the foundation is above grade, the top edges shall have a 1" chamfer and the exposed faces of foundation shall be finished with mortar to provide a uniform appearance.



FILL SLOPES FLATTER THAN 4:1

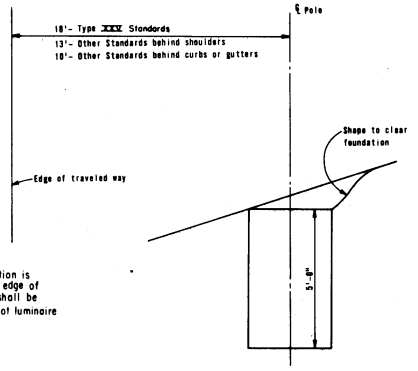


FILL SLOPES 4:1 OR STEEPER



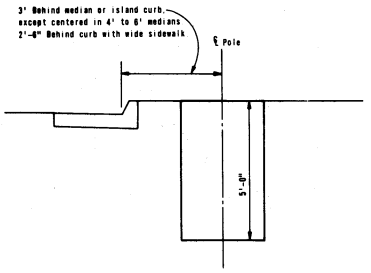
Note: Where top of foundation is more than 24 inches above edge of Pavement grade, the shaft shall be shortened to provide 40 foot luminaire mounting height.

CUT SLOPES 2:1 OR STEEPER

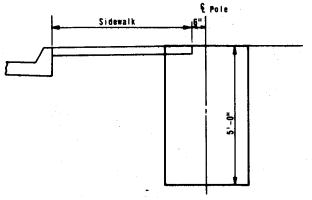


CUT SLOPES FLATTER THAN 2:1

FOUNDATIONS ADJACENT TO ALL ROADWAYS EXCEPT IN SIDEWALK, MEDIAN AND ISLAND AREAS



WIDE SIDEWALK
(7' WIDE AND WIDER)



NARROW SIDEWALK
(LESS THAN 7' WIDE)

FOUNDATIONS IN SIDEWALK, MEDIAN AND ISLAND AREAS

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TYPICAL ELECTROLIER FOUNDATION
DETAILS NO. 11

ES-11-1

ES-11-1

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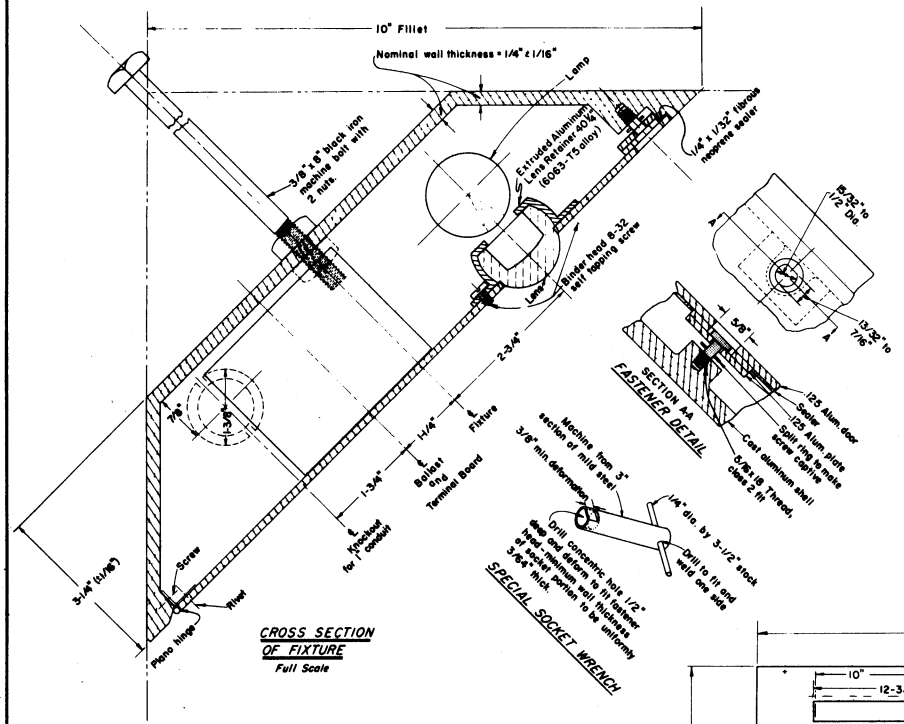
DIST	COUNTY	ROUTE	POST MILE		SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

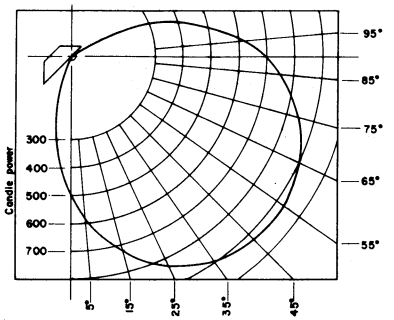
TRAFFIC ENGINEER
REGISTERED CIVIL ENGINEER NO. 8586

APPROVED SEPTEMBER 1, 1966

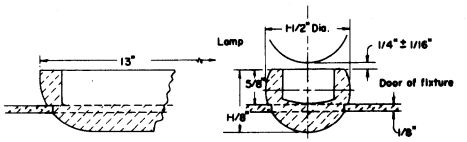
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945



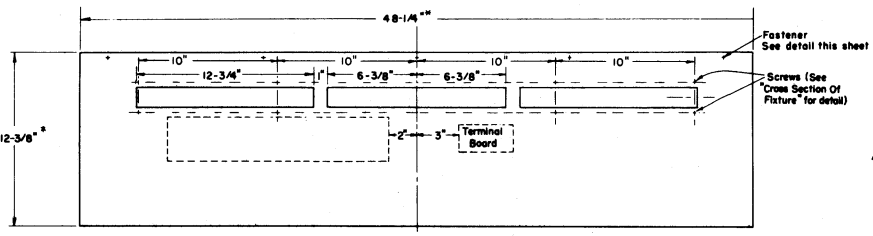
CROSS SECTION OF FIXTURE
Full Scale



TYPICAL CANDLEPOWER DISTRIBUTION



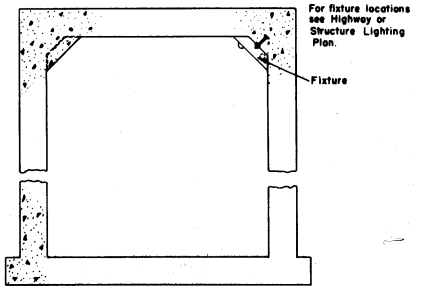
FIXTURE LENS
Full Scale



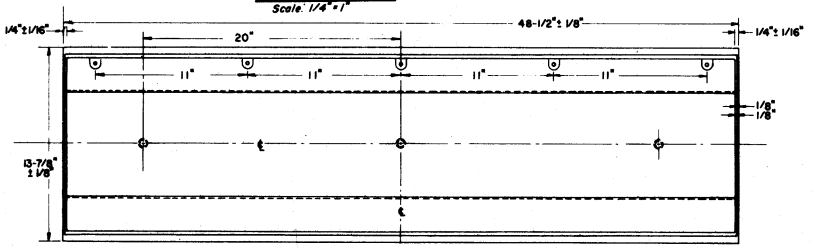
DOOR OF FIXTURE
Scale: 1/4" = 1"

* Dimensions of door shell vary to fit fixture shell within 1/16" of actual door recess dimensions.

Note: The max. tolerance between door and lens is 1/64 in.



CROSS SECTION OF PEDESTRIAN U.C.



SHELL OF FIXTURE
Scale: 1/4" = 1"

Casting dimensions of shell are nominal and are subject to such tolerances as are consistent with sound foundry practice.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PEDESTRIAN U.C. FLUORESCENT LIGHTING FIXTURE

ES-12

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ROUND TAPERED STEEL POLE					LUMINAIRE ARM LGT.	SIGNAL ARM LGT.	BASE PLATE				ANCHOR BOLTS	
TYPE	HGT	GAGE	MIN. O.D. Base	MIN. O.D. Top			a	b	c	t	Size ③	BC
XV	28'-6"	10ga ②	7 3/4"	3 7/8	6'—15'	None	11 1/2	7/8"	1 1/4"	1"	1"x 36"	11"
XVI	18'-0"	10ga ②	7 3/4"	5 1/4"	None	15'—20	11 1/2	5/8"	1 1/4"	1"	1"x 36"	11"
XVII	28'-6"	7ga.	7 3/4"	3 7/8	6'—15'	15	11 1/2	3/4	1 1/2"	1"	1 1/4 x 44	11"
					6'—12'	18						
					6'—10'	20						
		3ga.	7 3/4	3 7/8	15'	18	11 1/2"	3/4"	1 1/2"	1 1/4"	1 1/4 x 44	11"
					12'—15'	20						

POLE AND ANCHORAGE SCHEDULE

LUMINAIRE ARM DATA ①			
PROJECTED LENGTH	GAGE	MINIMUM O.D. @ POLE	MOUNTING HEIGHT
6'-0"	10ga ②	3.2"	30.0±'
8'-0"		3.5"	30.5±'
10'-0"		3.8"	31.3±'
12'-0"		3.8"	32.3±'
15'-0"		4.2"	32.8±'

③ 4 anchor bolts each base plate. Length indicated does not include required 4"-90° bend. Top threaded 6" and furnished with 2 nuts and 2 washers. One anchor bolt bonded to Conduit.

SIGNAL ARM DATA ①			
PROJECTED LENGTH	GAGE	MINIMUM O.D. @ POLE	MOUNTING HEIGHT
15'-0"	10ga ②	4.6"	22.3±'
18'-0		5.2"	23.3±'
20'-0	7ga	5.0"	

NOTES

① Round tapered steel tube with maximum taper of .15 inches per foot. End section O.D. of 2 3/8 for mounting hardware. Standard 2" pipe extensions of 1'-0" max. on 6'-10' sizes and 3'-0 max. on 12'-20' sizes may be used at the option of manufacturer.

② No. 11 gage sheet steel or weld 36 grade acceptable if the steel after fabrication has a minimum yield strength of 40,000 psi.

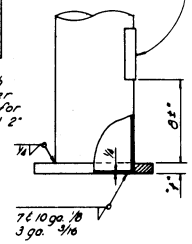
4x6 1/2 handhole reinforced with No. 3 gage ring 1 1/2" wide welded to outside of pole. Cover of 10 ② gage plate. Locate in same quadrant as mast arm.

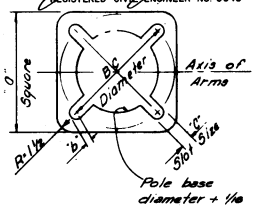
APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

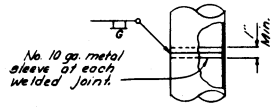
APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645

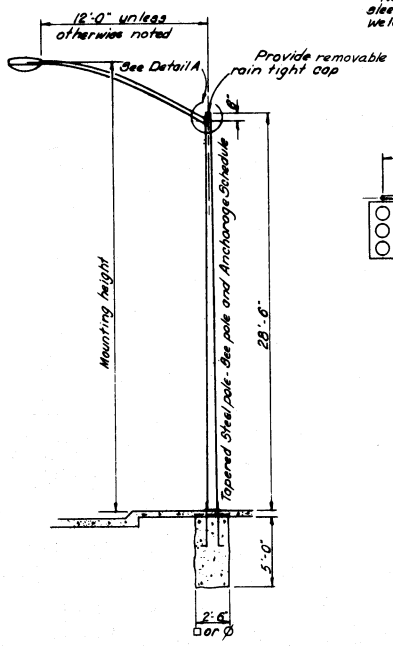




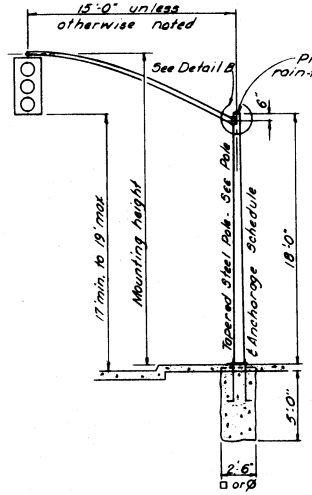
POLE BASE PLATE



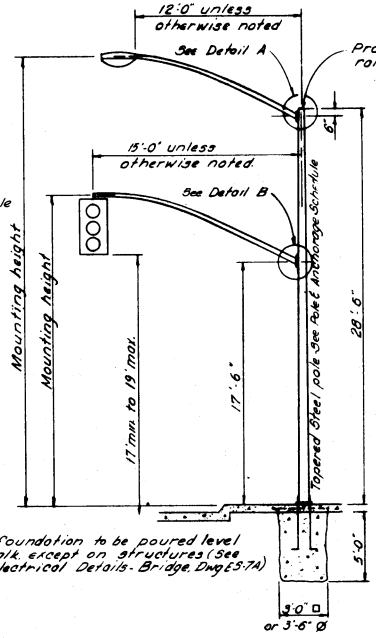
POLE SPLICE



TYPE XV

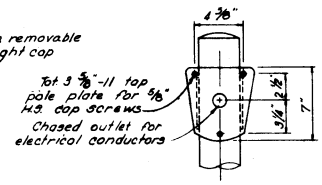


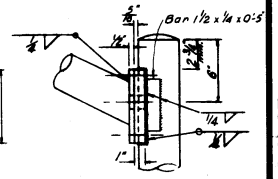
TYPE XVI



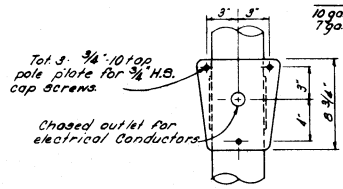
TYPE XVII

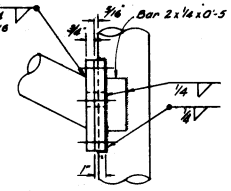
Note:
Top 2' of foundation to be poured level with sidewalk, except on structures (See Standard Electrical Details - Bridge, Dwg ES-7A)





DETAIL A
Luminaire arm connection





DETAIL B
Signal arm connection.

Note:
Alternative details approved by the Engineer may be substituted for the arm connections and configurations shown.
Fabricators electing to use larger than minimum arm diameters must adjust the details as required to permit solid seating of cap screws. In lieu of the torque requirements for H.S. bolts, cap screws shall be tightened by the turn-of-nut method 1/6 turn from snug tight condition. No washer will be required.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TRAFFIC SIGNAL AND LIGHTING STANDARDS
TYPES - XV, XVI AND XVII

ES-13-2

ES-13-2

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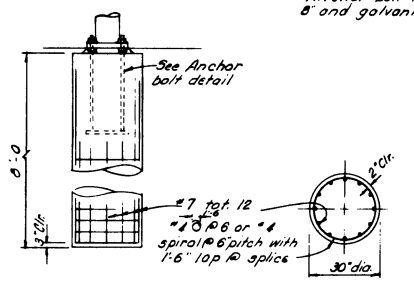
LUMINAIRE ARM DATA ①			
PROJECTED LENGTH	GAGE	MINIMUM O.D. @ POLE	MOUNTING HEIGHT
6'-0"	10ga. ②	3.2"	32.1 ±
8'-0"		3.5"	32.7 ±
10'-0"		3.8"	33.2 ±
12'-0		3.8"	33.7 ±
15'-0"		4.2"	34.2 ±

SIGNAL ARM DATA ①			
PROJECTED LENGTH	GAGE	MINIMUM O.D. @ POLE	MOUNTING HEIGHT
25'-0"	7ga.	7 5/16"	22.6±
30'-0"		8"	23.0±

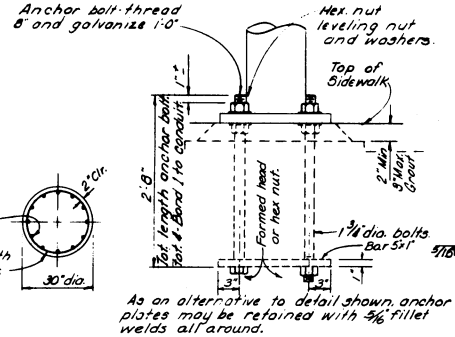
NOTES

① Round tapered steel tube with maximum taper of 0.15 inches per foot.

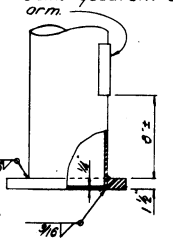
② No. 11 gage sheet steel of weldable grade acceptable if the steel after fabrication has a minimum yield strength of 40,000 psi.

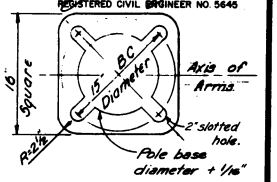


CAST-IN-DRILLED-HOLE PILE

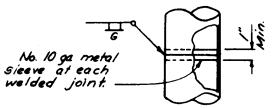


ANCHOR BOLT

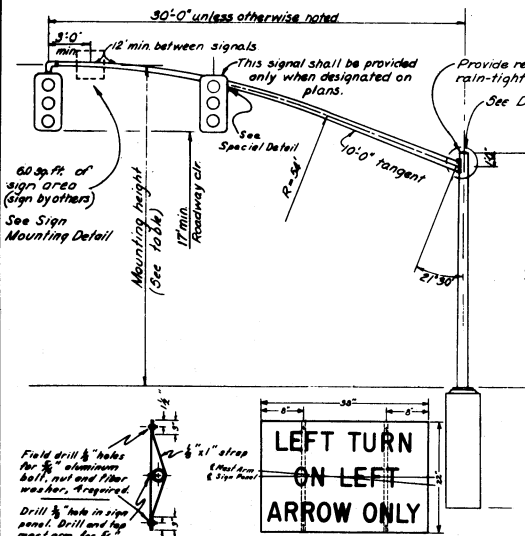


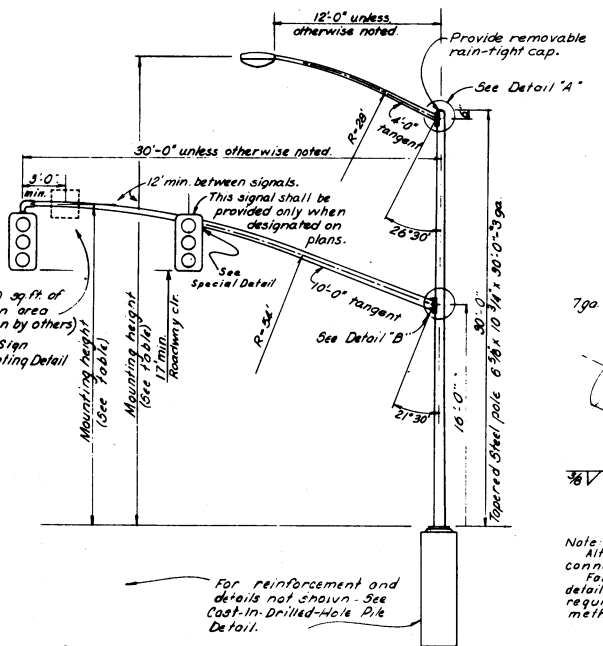


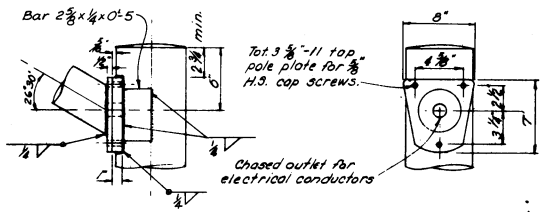
POLE BASE PLATE



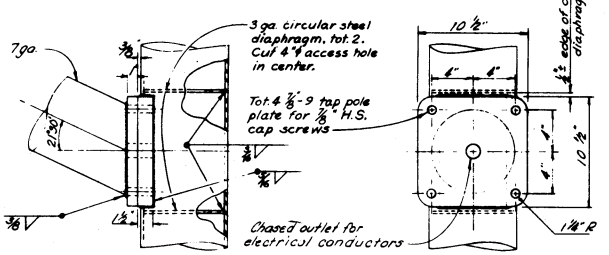
POLE SPLICE





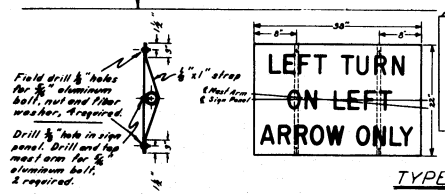


DETAIL A



DETAIL B

Note:
Alternative details approved by the Engineer may be substituted for the arm connections and configurations shown.
Fabricators electing to use larger than minimum arm diameters must adjust the details as required to permit solid sealing of cap screws. In lieu of the torque requirements for H.S. bolts, cap screws shall be tightened by the turn-of-nut method 1/6 turn from snug tight condition. No washer will be required.



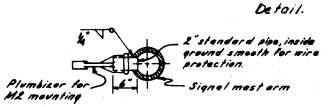
TYPE XVIII

SIGN MOUNTING DETAIL

Sign panel will be state furnished. Contractor shall furnish mounting hardware and shall install sign.

For reinforcement and details not shown - See Cast-In-Drilled-Hole Pile Detail.

TYPE XIX



SPECIAL DETAIL
FOR MOUNTING SIGNAL HEAD

DIST.	COUNTY	ROUTE	POST MILE	SHT.	TOTAL SHTS.

APPROVAL RECOMMENDED
BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO. 5585

APPROVED December 4, 1967
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TRAFFIC SIGNAL AND LIGHTING STANDARDS
TYPES XVIII AND XIX

ES-14-3

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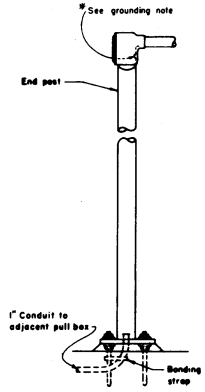
DIST	COUNTY	ROUTE	POST MILE	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

TRAFFIC ENGINEER
REGISTERED CIVIL ENGINEER NO. 9618

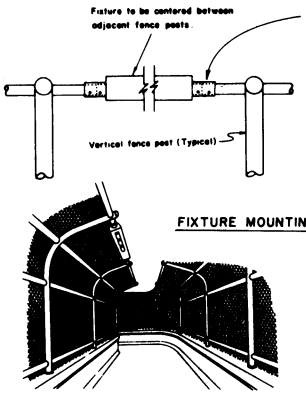
APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645



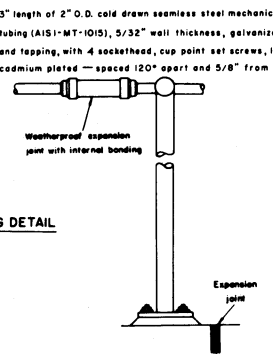
END POST DETAIL

Not to Scale



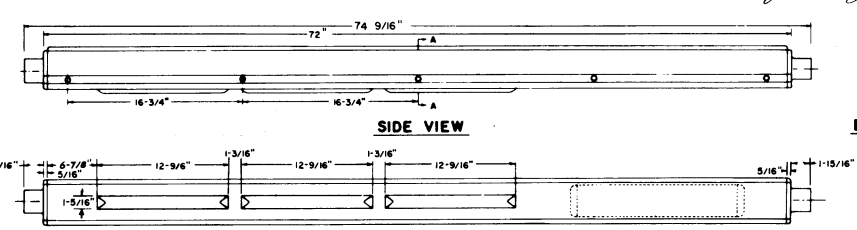
FIXTURE MOUNTING DETAIL

TYPICAL ARRANGEMENT

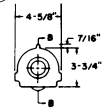


EXPANSION FITTING DETAIL

Not to Scale



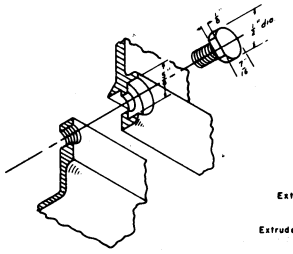
SIDE VIEW



END VIEW

BOTTOM VIEW

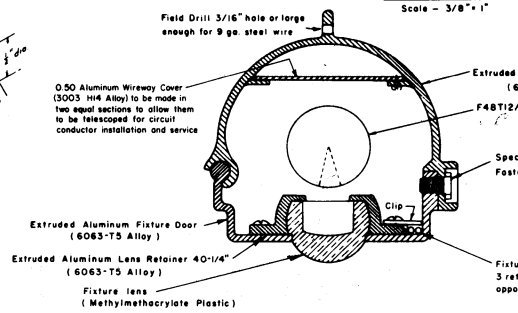
Scale: 3/16" = 1"



FASTENER DETAIL

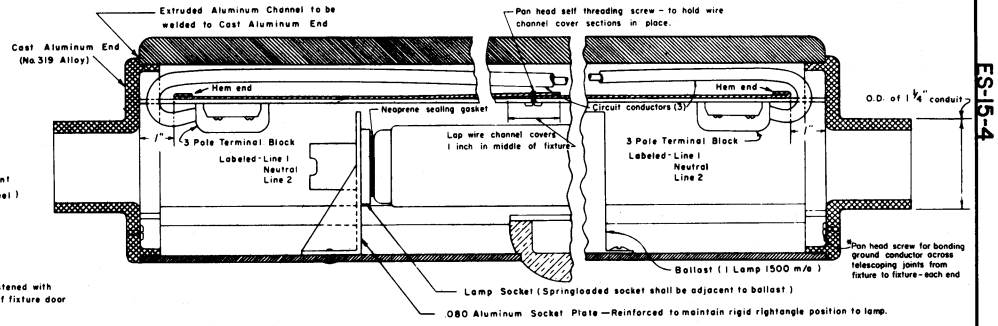
BOTTOM VIEW

Scale – 3/8" = 1"

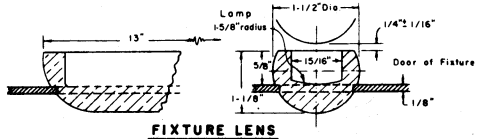


SECTION "AA"

Scale: Full

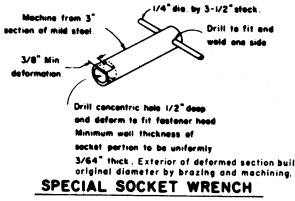


SECTION "BB"

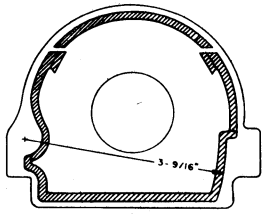


FIXTURE LENS

Scale: Full



SPECIAL SOCKET WRENCH



INSIDE VIEW OF END CASTING

NOTE: 1- The max. tolerance between door & lens is 1/64" Casting dimensions of shell are nominal & are subject to such tolerances as are consistent with sound foundry practice.

2- See sheet for "Chain Link Sidewalls Railing Type 3L" for positioning of light fixture.

3- *Continuous grounding between fixtures and from fixture to end post carrying conductors shall be provided.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

P.O.C. FLUORESCENT LIGHT FIXTURE

ES-15-4

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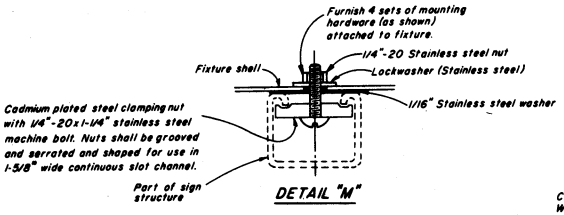
DIST	COUNTY	ROUTE	POST MILE	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

TRAFFIC ENGINEER
REGISTERED CIVIL ENGINEER NO. 8586

APPROVED SEPTEMBER 1, 1966

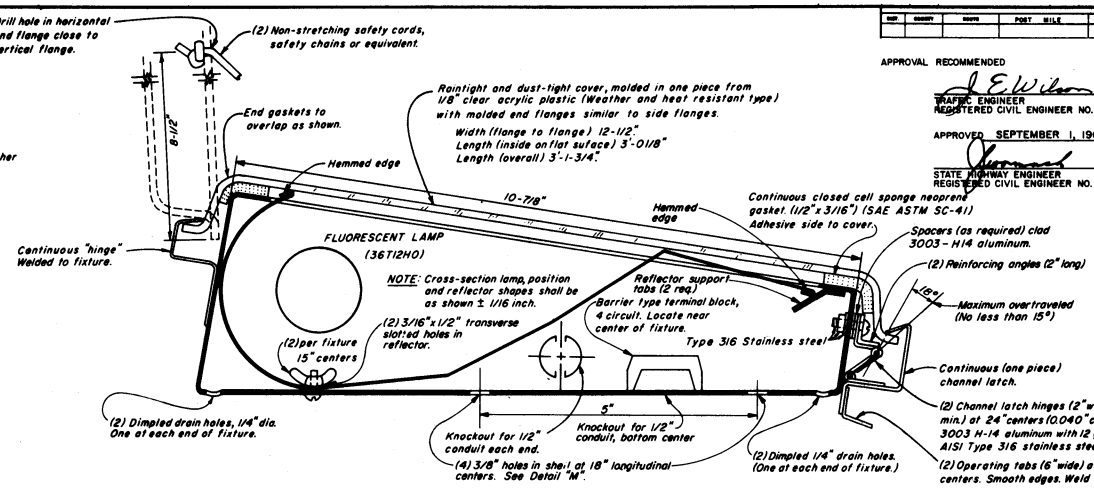
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5945



DETAIL "M"

FIXTURE MOUNTING ON CONTINUOUS SLOT CHANNEL

FULL SCALE



SECTION-LIGHTING FIXTURE

FULL SCALE

LIGHTING FIXTURE DATA

LENGTH OF PANEL (inches)	NUMBER OF FIXTURES	CONSECUTIVE SPACING FROM LEFT EDGE OF PANEL TO CENTER OF FIXTURES (inches)
42	1	21
48	1	24
54	1	27
60	1	30
66	1	33
72	2	15.5, 54.5
78	2	19.5, 58.5
84	2	20.5, 63.5
90	2	23.5, 66.5
96	2	24.5, 71.5
102	2	27.5, 74.5
108	3	18, 56, 94
114	3	18.5, 57, 95
120	3	19, 57, 95
126	3	21, 63, 105
132	3	20, 63, 106
138	3	25, 69, 113
144	3	28.5, 72, 115.5
150	3	29.5, 75, 119.5
156	4	18.5, 57.5, 96.5, 135.5
162	4	21, 61, 101, 141
168	4	21, 63, 105, 147
174	4	22.5, 65.5, 108.5, 151.5
180	4	22.5, 67.5, 112.5, 157.5
186	4	22.5, 69.5, 116.5, 163.5
192	4	23.5, 71.5, 119.5, 167.5
198	4	25.5, 74.5, 123.5, 172.5
204	5	20, 61, 102, 143, 184
210	5	21, 63, 105, 147, 189
216	5	20, 64, 108, 152, 196
222	5	19, 65, 111, 157, 203
228	5	22, 68, 114, 160, 206
234	5	23, 70, 117, 164, 211
240	6	20, 60, 100, 140, 180, 220
246	6	20.5, 61.5, 102.5, 143.5, 184.5, 225.5
252	6	21, 63, 105, 147, 189, 231
258	6	21.5, 64.5, 107.5, 150.5, 193.5, 236.5
264	6	22, 66, 110, 154, 198, 242
270	6	22.5, 67.5, 112.5 157.5, 202.5
276	6	23, 69, 115, 161, 207, 253
282	7	21, 61, 101, 141, 181, 221, 261
288	7	21, 62, 103, 144, 185, 226, 267

SIGN LOAD (WATTS)

1 Lamp and ballast — 75
2 Lamps and ballast — 150
3 Lamps and ballast — 215

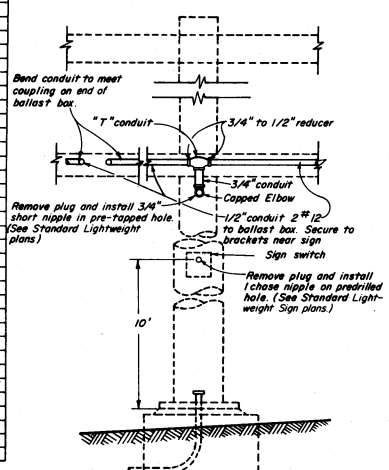
BALLAST NOTES

Ballasts shall be one, two or three lamp types as required, rated at 800 ma.

Each ballast shall be fused with a 1-1/4"x 1/4" slow-blow glass tube fuse, 3 amp. for 3 lamp ballast, 2-1/2 amp. for 2 lamp ballast and 1 amp. for 1 lamp ballast.

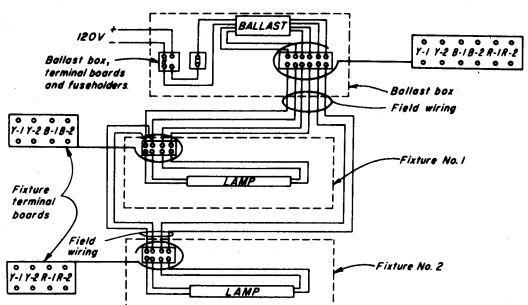
Fuseholder shall be a panel mounted type, with screw type finger knob.

For ballast box locations and fabrication details see plan titled "Sign Panel Mounting Details."



TYPICAL WIRING AND SIGN SWITCH INSTALLATION DETAILS

No Scale



TYPICAL FIXTURE WIRING DIAGRAM (TWO LAMP)

WIRING NOTES

Wiring between ballast box and nearest fixture and between fixtures shall be run in 1/2" liquid-tight flexible conduit.

Conduit shall be secured to nearest sign member using one-hole galvanized malleable iron or steel straps at, 5 foot maximum centers and brass machine screws tapped into the member.

Ballasts and terminal boards shall be marked with legible symbols. Conductors shall be tagged and their identification marked on the corresponding terminal on the terminal board as shown on the Typical Fixture Wiring Diagram.

See Special Provisions for additional specifications.

FIXTURE NOTES

Lighting fixtures shall be fabricated of 0.064" clad 3003-H14 aluminum unless otherwise indicated. Machine screw parts and lockwashers for fixture shall be stainless steel, unless otherwise indicated.

Reflectors shall be made of 0.020" (min.) thickness aluminum with specular finish, and shall be 33" long. The finish shall be as described in the special provisions. Remove protective coverings before installation.
Alternate fixture fabrication methods and design details may be acceptable provided the light distribution, lamp size, mounting details and other design features are equivalent to the fixture shown. All variations must be approved by the Engineer.

Machine screws shall be 8-32 with nuts and lockwashers (except as noted).

Manufacturer shall submit five copies of shop drawings to the Engineer for approval prior to fabrication if fixtures have not been previously approved.

For method of mounting fluorescent fixtures see plan titled "Sign Panel Mounting Details."

After fabrication, metal parts shall be thoroughly cleaned and degreased and shall have a well finished appearance. Painting will not be required.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

FLUORESCENT SIGN LIGHTING EQUIPMENT (36 INCH)

ES-16-1

ES-16-1

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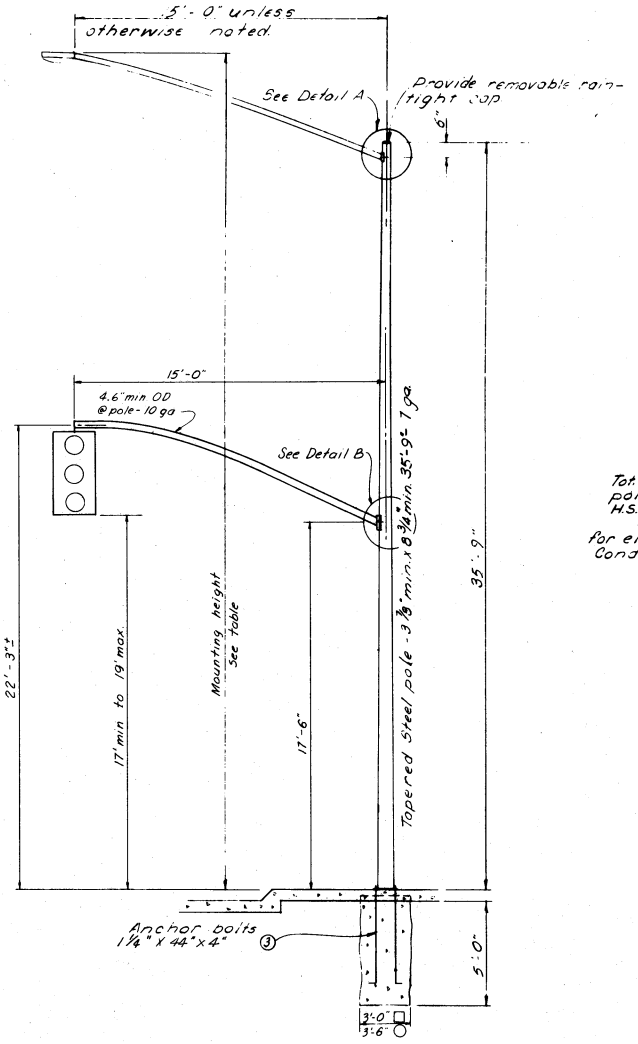
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

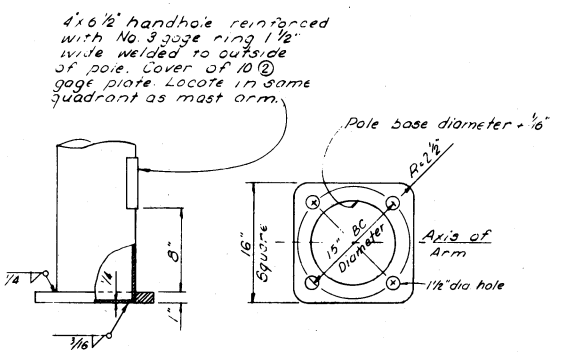
APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645

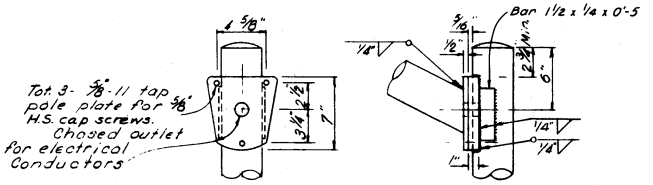
REGISTERED CIVIL ENGINEER NO. 5645

DATE APPROVED



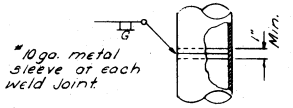


POLE BASE PLATE

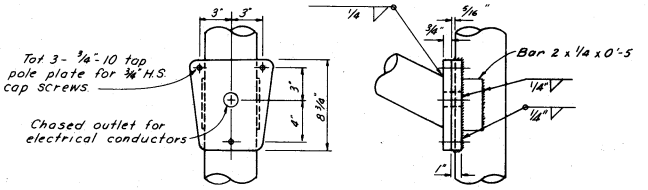


DETAIL A

Luminaire Arm Connection



POLE SPLICE



DETAIL B

Signal arm connection

LUMINAIRE ARM DATA ①			
PROJECTED LENGTH	GAGE	MINIMUM O.D. @ POLE	MOUNTING HEIGHT
6'-0"	10 ga. ②	3.2"	37.2±'
8'-0"		3.5"	37.7±'
10'-0"		3.8"	38.5±'
12'-0"		3.8"	39.5±'
15'-0"		4.2"	40.0±'

NOTES

① Round tapered steel tube with maximum taper of .15 inches per foot. End section O.D. of 2 3/8" for mounting hardware. Standard 2" pipe extensions of 1'-0" max. on 6'-10' sizes and 3'-0" max. on 12'-15' sizes may be used at the option of the manufacturer.

② No. 11 gage sheet steel of weldable grade acceptable if the steel after fabrication has a minimum yield strength of 40,000 psi.

③ 4 anchor bolts each base plate. Top threaded 6" and furnished with 2 nuts and 2 washers.

Top 2" of foundation to be poured level with sidewalk, except on structures (See Standard Electrical Details - Bridge, Dwg ES-7A)

Alternative details approved by the Engineer may be substituted for the arm connection shown.

Note:
Fabricators electing to use larger than minimum arm diameters must adjust the details as required to permit solid seating of cap screws. In lieu of the torque requirements for H.S. bolts, cap screws shall be tightened by the turn-of-nut method 1/6 turn from snug tight condition. No washer will be required.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TRAFFIC SIGNAL AND LIGHTING STANDARD TYPE XXII

ES-18

ES-18

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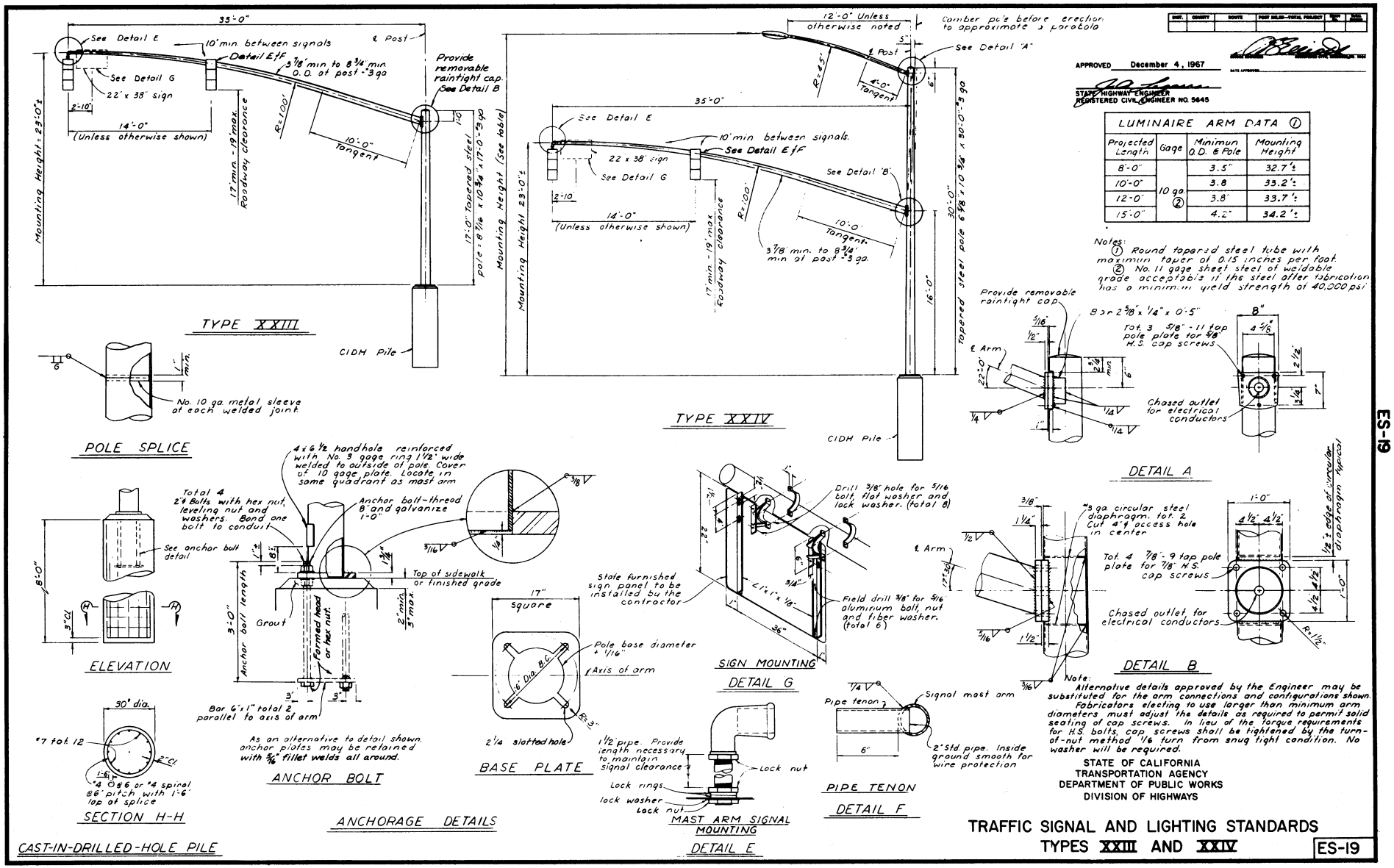

LUMINAIRE ARM DATA ①			
Projected Length	Gage	Minimum O.D. @ Pole	Mounting Height
8'-0"	10 ga. ②	3.5"	32.7'±
10'-0"		3.8	33.2'±
12'-0"		3.8	33.7'±
15'-0"		4.2"	34.2'±

Notes:
① Round tapered steel tube with maximum taper of 0.15 inches per foot.
② No. 11 gage sheet steel of weldable grade acceptable if the steel after fabrication has a minimum yield strength of 40,000 psi.

Note:
Alternative details approved by the Engineer may be substituted for the arm connections and configurations shown. Fabricators electing to use larger than minimum arm diameters must adjust the details as required to permit solid seating of cap screws. In lieu of the torque requirements for H.S. bolts, cap screws shall be tightened by the turn-of-nut method 1/6 turn from snug tight condition. No washer will be required.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TRAFFIC SIGNAL AND LIGHTING STANDARDS TYPES XXIII AND XXIV

ES-19

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Sheet	Quantity	Revision	Sheet No.	Total Sheets
		80.7	2	2

DATE APPROVED May 31, 1967

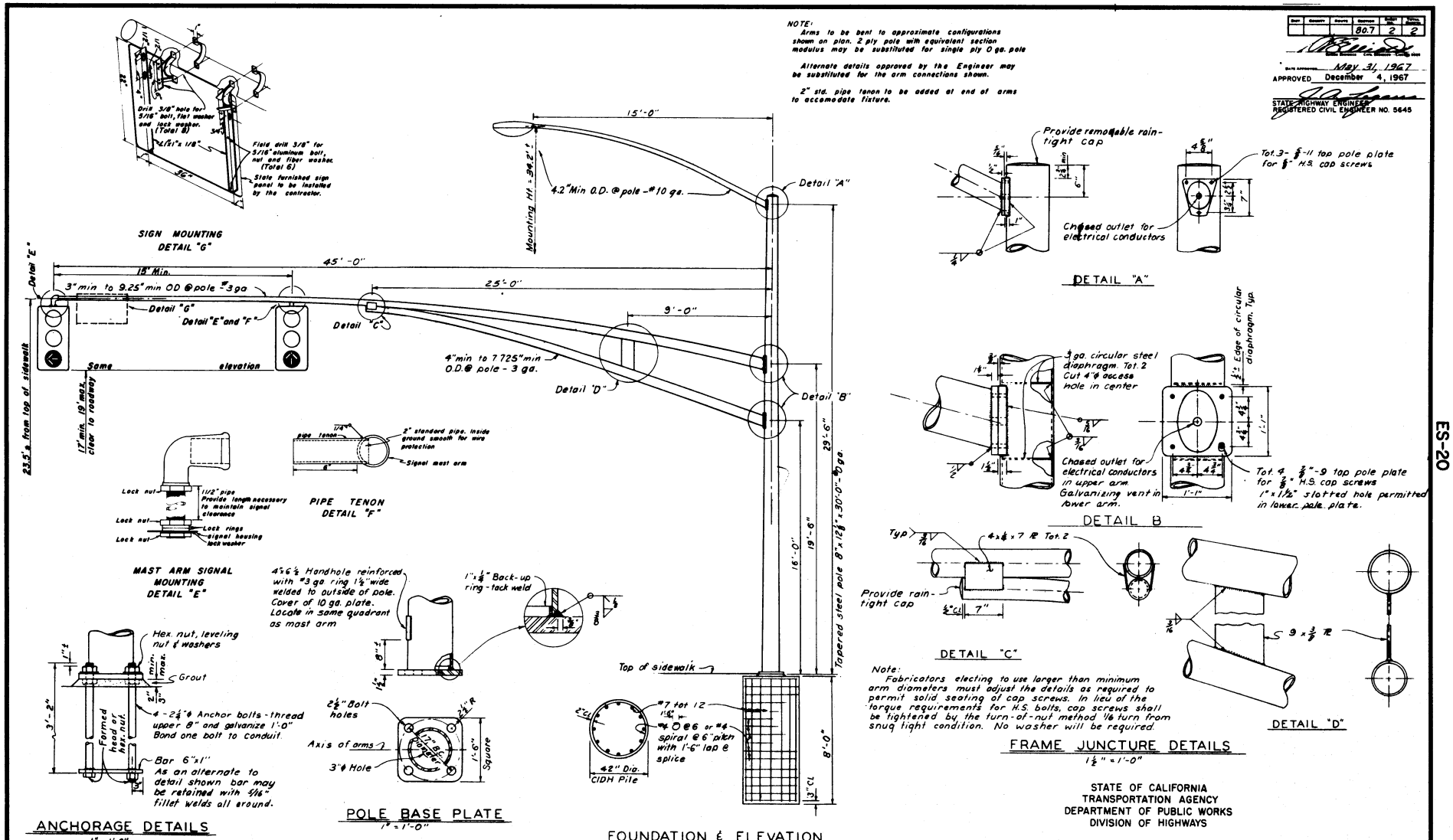
APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645

NOTE:
Arms to be bent to approximate configurations shown on plan. 2 ply pole with equivalent section modulus may be substituted for single ply 0 ga. pole

Alternate details approved by the Engineer may be substituted for the arm connections shown.

2" std. pipe tenon to be added at end of arms to accomodate fixture.



Note:
Fabricators electing to use larger than minimum arm diameters must adjust the details as required to permit solid seating of cap screws. In lieu of the torque requirements for H.S. bolts, cap screws shall be tightened by the turn-of-nut method 1/6 turn from snug tight condition. No washer will be required.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

TRAFFIC SIGNAL AND LIGHT STANDARD 45 FOOT SIGNAL ARM

ES-20

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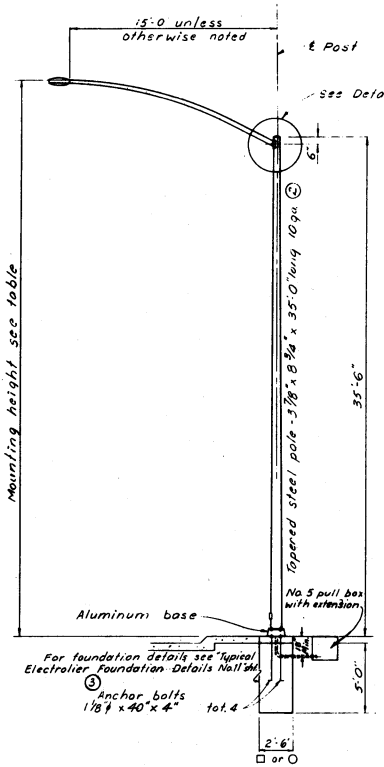
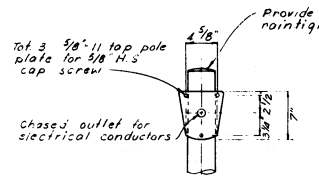
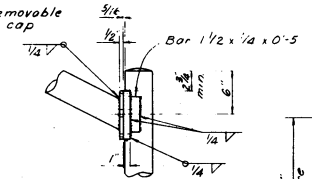


ELEVATION

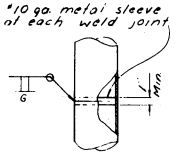




DETAIL A

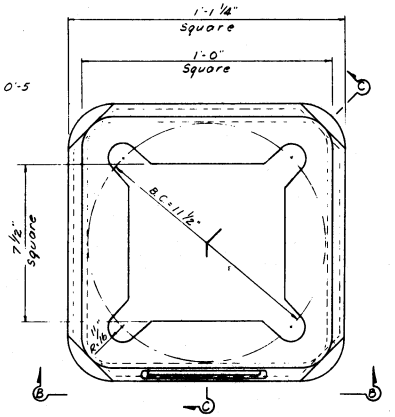
Note:
Fabricators electing to use larger than minimum arm diameters must adjust the details as required to permit solid seating of cap screws. In lieu of the torque requirements for H.S. bolts, cap screws shall be tightened by the turn-of-nut method 1/6 turn from snug tight condition. No washer will be required.

LUMINAIRE ARM DATA (1)			
Projected Length	Gage	Minimum O.D. @ Pole	Mounting Height
6'-0"	10 ga (2)	3.2"	37.2±
8'-0"		3.5"	37.7±
10'-0"		3.8"	38.5±
12'-0"		3.8"	39.5±
15'-0"		4.2"	40.0±

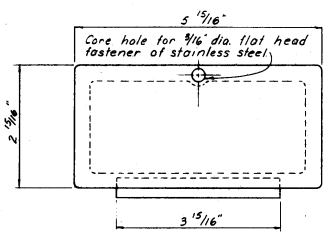


POLE SPLICE

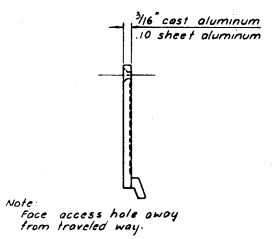
(4) 1/8" Hex. hd. bolt

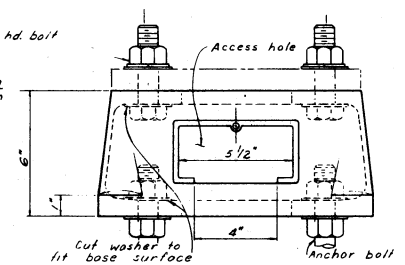


PLAN



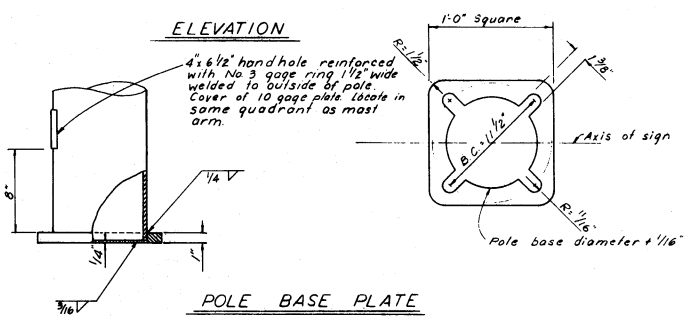
ACCESS COVER PLATE



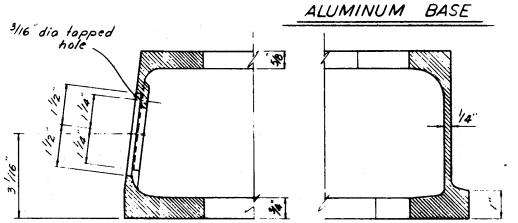


VIEW B-B

ALUMINUM BASE



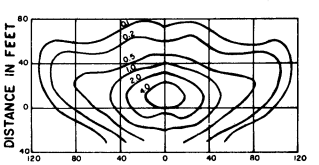
POLE BASE PLATE



SECTION C-C

NOTES

1. Round tapered steel tube with maximum taper of 0.15 inches per foot. End section O.D. of 2 3/8" for mounting hardware. Standard 2" pipe extensions of 1'-0" max. on 6'-10' sizes and 3'-0" max. on 12'-15' sizes may be used at the option of the manufacturer.
2. No. 11 gage sheet steel of weldable grade acceptable if the steel after fabrication has a minimum yield strength of 40,000 psi.
3. 4 anchor bolts at bottom of aluminum base, top threaded 6" and each furnished with hexagon nut, leveling nut and cut washers.
4. 4 hexagon head bolts at top of aluminum base, each furnished with hexagon nut, lock washer and cut washers.
5. All steel shafts, mast arms, bolts, screws, nuts and washers shall be galvanized.
6. The base shall be aluminum cast in a permanent mold complying with ASTM Designation: B-108, Alloy SG-70A heat treated to T-6 temper.
7. The access cover plate may be cast with Alloy SG70A as above or formed from sheet aluminum Alloy 6061-T6. Fastener shall be a stainless steel screw.
8. Certification shall be furnished stating that the pole, aluminum base and miscellaneous hardware meets the requirements of the specifications and plans.
9. Top 2" of foundation to be poured level with sidewalk, except on structures.
10. Alternative details approved by the Engineer may be substituted for the arm connection and aluminum base shown.
11. Casting details for the aluminum base to be submitted for approval prior to use.
12. Aluminum base not required when mounted on bridge barrier railing.



TYPE III
Shielded Highway Lighting Luminaire
40' Mounting Height
700 Watt, ASA Type H35-18 NA
Mercury Vapor Lamp

ISOLUX LINES OF MINIMUM HORIZONTAL FOOT CANDLES

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	SHEET	TOTAL SHEETS

APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

LIGHTING STANDARD
TYPE XXV

ES-21

ES-21

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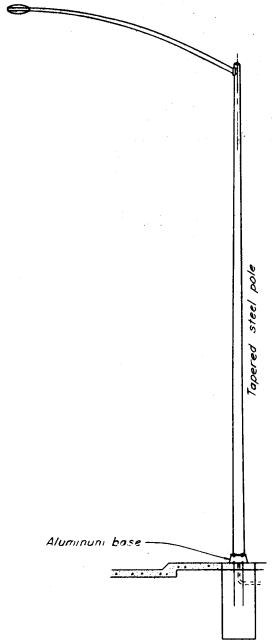
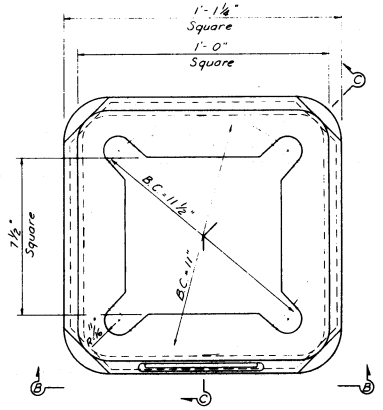
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

APPROVED December 4, 1967

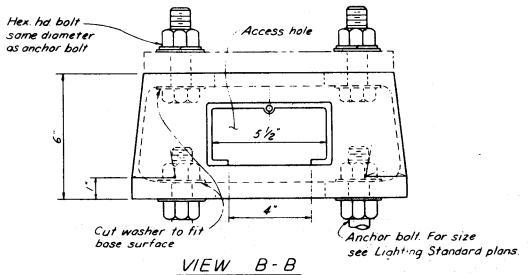
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645



LIGHTING STANDARD

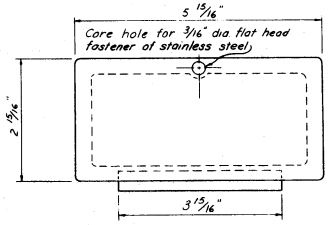


PLAN

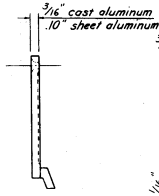


VIEW B-B

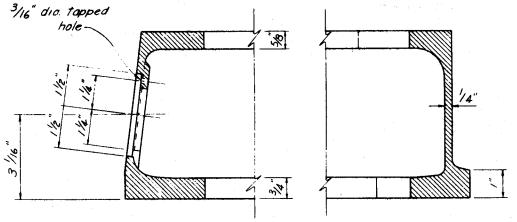
ALUMINUM BASE



ACCESS COVER PLATE



Note:
Face access hole away from traveled way.



SECTION C-C

NOTES

1. 4 anchor bolts at bottom of aluminum base, top threaded 6" and each furnished with hexagon nut, leveling nut and cut washers.
2. 4 hexagon head bolts at top of aluminum base, each furnished with hexagon nut, lock washer and cut washers.
3. The base shall be aluminum cast in a permanent mold complying with ASTM Designation: B-108, Alloy SG-70A heat treated to T-6 temper.
4. The access cover plate may be cast with Alloy SG-70A as above or formed from sheet aluminum Alloy 6061-T6. Fastener shall be a stainless steel screw.
5. Certification shall be furnished stating that the aluminum base and miscellaneous hardware meet the requirements of the specifications and plans.
6. Alternative details approved by the Engineer may be substituted for the aluminum base shown.
7. Casting details for the aluminum base to be submitted for approval prior to use.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

LIGHTING STANDARD TYPE XV
ALUMINUM BASE DETAIL

ES-22

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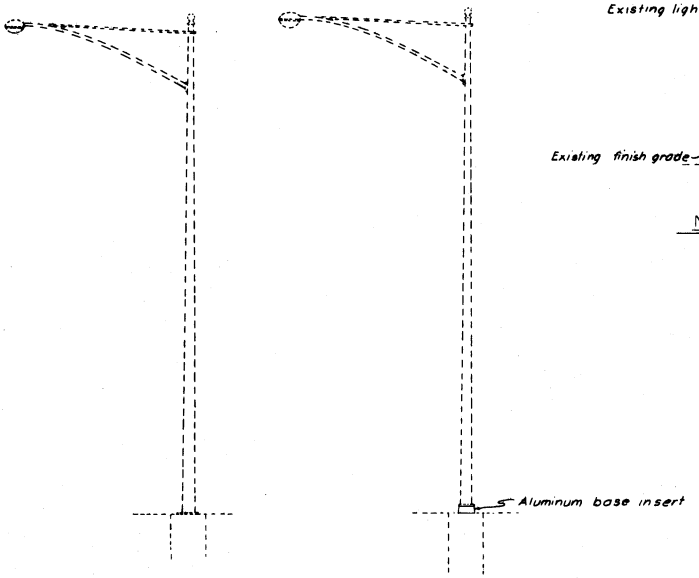
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

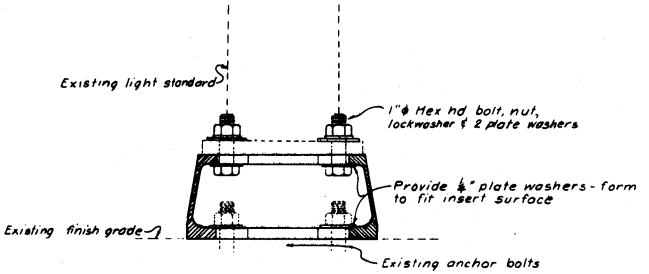
DATE APPROVED December 4, 1967

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645



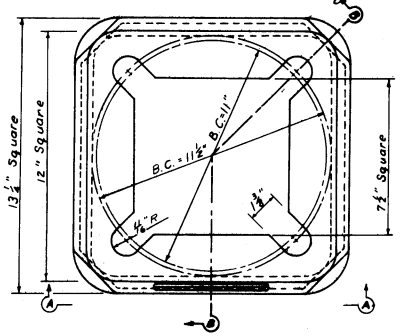
EXISTING STANDARD MODIFIED STANDARD

No Scale

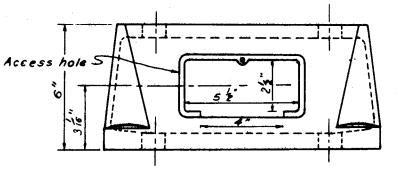


MOUNTING DETAIL

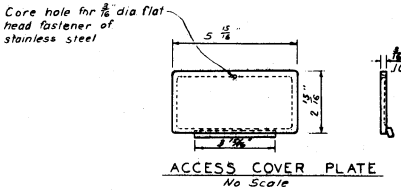
3" = 1'-0"



PLAN

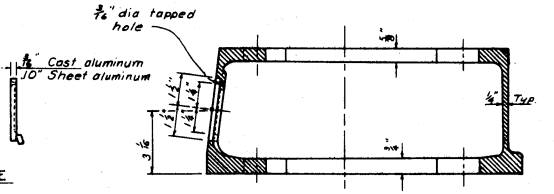


VIEW A-A



ACCESS COVER PLATE

No Scale



SECTION B-B

INSERT DETAIL

⅜" = 1"

Note:

1. Remove existing light standard.
2. Install aluminum base insert on existing foundation using existing anchor bolts.
3. Reinstall existing light standard on aluminum base insert using 4-1"ϕ hex hd bolts, ¼" plate washers and lockwashers as shown.
4. Existing wiring may be cut and spliced as required.
5. The base shall be aluminum cast in a permanent mold complying with ASTM Designation: B-108, Alloy SG 70A heat treated to T-6 temper.
6. The access cover plate may be cast with Alloy SG70A as above, or formed from sheet aluminum Alloy 6061-T6. Fastener shall be a stainless steel screw.
7. Certification shall be furnished stating that the aluminum base and miscellaneous hardware meet the requirements of the specifications and plans.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

LIGHT STANDARD MODIFICATION ALUMINUM BASE INSERT

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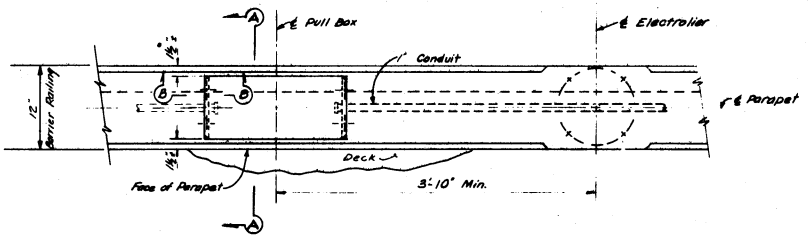
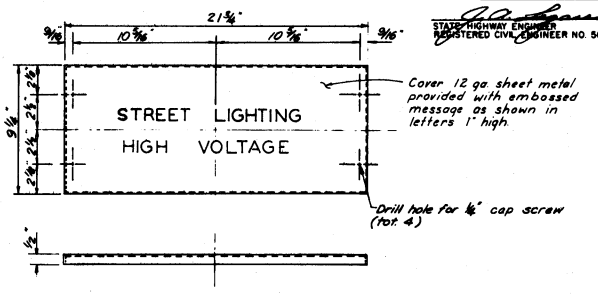
APPROVED December 4, 1967

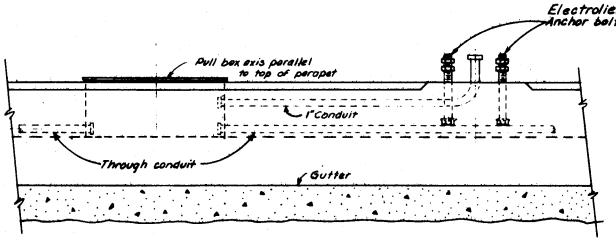
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645



PLAN
1½" = 1'-0"

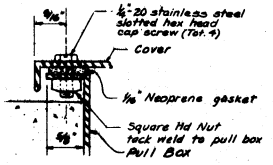


COVER DETAIL
3" = 1'-0"

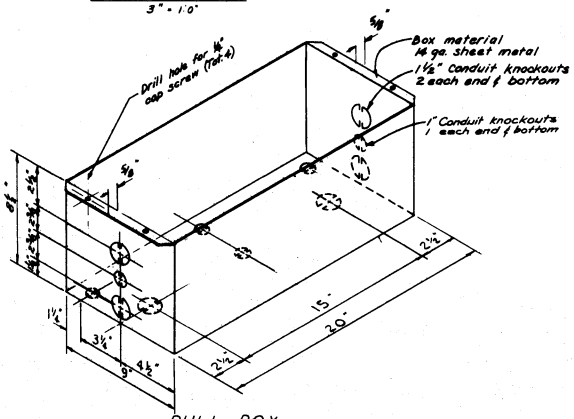


ELEVATION
1½" = 1'-0"

Note
For reinforcing in area of electrolier and electrolier anchor bolts see sheets "Barrier Railing (Type 9)" and "Electrical Details Bridge Sheet 1", (ES-7A).

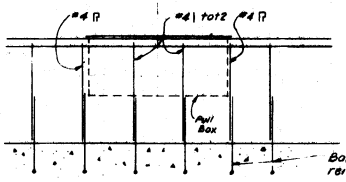


SECTION B-B
Full Scale

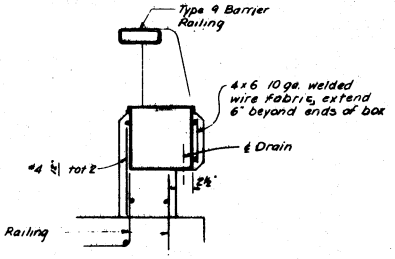


PULL BOX
3" = 1'-0"

Notes:
1. Box and Cover to be hot-dip galvanized after fabrication.
2. Round knockouts flat after punching.
3. 3 - ½" drain knockouts in bottom, located as shown above. Use one in center if box is horizontal, at low end if box is inclined.



FRONT ELEVATION
1½" = 1'-0"



SECTION A-A
1½" = 1'-0"

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PULL BOX TYPE 9-A

ES-24-I

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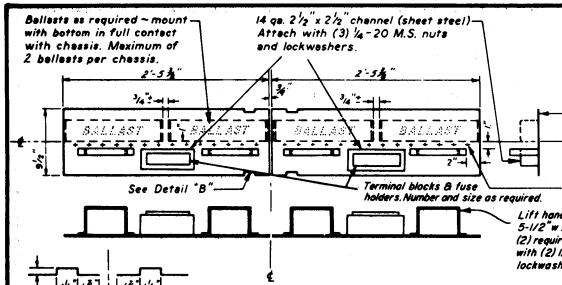
DIST.	COUNTY	ROUTE	POST MILE	SHEET	TOTAL SHEETS

APPROVAL RECOMMENDED
TRAFFIC ENGINEER
REGISTERED CIVIL ENGINEER NO. 9618

APPROVED December 4, 1967
STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO. 5645



DETAIL "B"

BALLAST MOUNTING CHASSIS

No Scale

BALLAST NOTES

Each ballast shall be fused with a 1¼" x ¼" slow-blow glass tube fuse - 2½ amp for 2-lamp ballast and 1 amp for 1-lamp ballast.

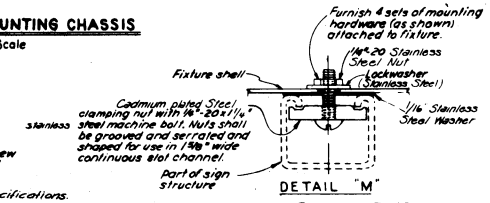
Ballasts shall be rated at 300 ma.

Ballasts shall be secured by 8-32 machine screw studs soldered to chassis with nuts and lockwashers.

Fuseholders shall be a panel mounted type. See Specifications.

For number of ballast boxes see "Overhead Sign Format and Quantities" sheet.

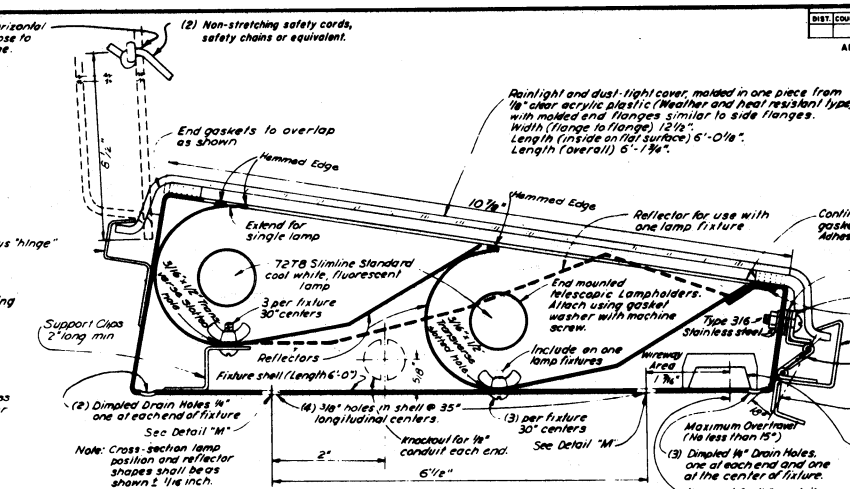
Chassis not requiring ballasts shall be furnished with lift handles, terminal channel and screened vents. Two chassis shall be installed in each ballast box.



DETAIL "M"

FIXTURE MOUNTING ON CONTINUOUS SLOT CHANNEL

Full Scale



SECTION - LIGHTING FIXTURE

Full Scale

FIXTURE NOTES

Two lamp fixtures shall be used for signs over 70" in vertical dimension. One lamp fixtures for 70" signs and smaller.

Lighting fixtures shall be fabricated of 0.064" clad 3003 H-14 aluminum, unless otherwise indicated. Machine screw parts and lockwashers for fixture shall be stainless steel, unless otherwise indicated.

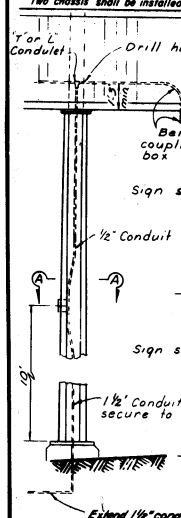
Reflectors shall be made of 0.020" (min.) thickness aluminum with specular finish, and shall be 69" long. The finish shall be as described in the special provisions. Remove protective coverings before installation.

Alternate fixture fabrication methods and design details may be acceptable provided the light distribution, lamp size, and the mounting details are equivalent to the fixture shown. All variations must be approved by the Engineer.

Machine screws shall be 8-32 with nuts and lockwashers (except as noted). Manufacturer shall submit five copies of shop drawings to the Engineer for approval prior to fabrication if fixtures have not previously been approved.

For method of mounting fluorescent fixtures see walkways plan titled "Walkway Details No. 2."

After fabrication metal parts shall be thoroughly cleaned and degreased and shall have a well finished appearance. See special provisions for painting requirements.



TYPICAL WIRING AND SIGN SWITCH INSTALLATION DETAILS

No Scale

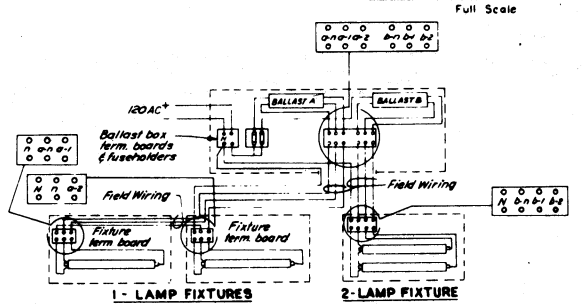
LIGHTING FIXTURE DATA

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, 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	34.5, 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
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

TRANSFORMER AND LOAD DATA

TOTAL NUMBER OF LAMPS	SM TRANSFORMER SIZE (VA)	SIGN * LOAD (WATTS)
1	75	70
2	150	131
3	225	201
4	300	262
5	375	332
6	450	393
7	525	463
8	600	524
9	750	594
10	750	655
11	900	725
12	900	786
13	1050	856
14	1050	917
15	1200	987
16	1200	1048
17	1350	1118
18	1350	1179
19	1500	1249
20	1500	1310

Notes
For sign structure with 21 or more lamps the load shall be split into two ballast box groups with separate switching supplied independently from two SM transformers in separate pull boxes.
See Sign Format Sheet for size of panels.
Use one SM transformer for each sign structure unless otherwise indicated or required.
Use 2-lamp ballasts wherever possible.
Input to ballasts (90% pf) average 75 VA per lamp.
* Does not include SM transformer losses which are approximately 10% of load.



TYPICAL FIXTURE WIRING DIAGRAM

WIRING NOTES

Wiring between ballast box and nearest fixture and between fixtures shall be run in 1/2" liquid-tight flexible conduit. Flexible conduit shall be secured to the nearest wallway bracket using one-hole galvanized malleable iron or steel straps and brass machine screws tapped into the bracket.

Ballasts and terminal boards shall be marked with legible symbols, conductors shall be tagged and their identification marked on the corresponding terminal on the terminal board as shown on the Typical Fixture Wiring Diagram.
See Special Provisions for additional specifications.

GENERAL NOTE - METALS

Where steel is indicated, part shall be hot-dip 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.

STATE OF CALIFORNIA
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DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

FLUORESCENT SIGN LIGHTING EQUIPMENT BOX BEAM SIGNS

ES-25

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SAFETY ROADSIDE REST

To accompany plans dated _____

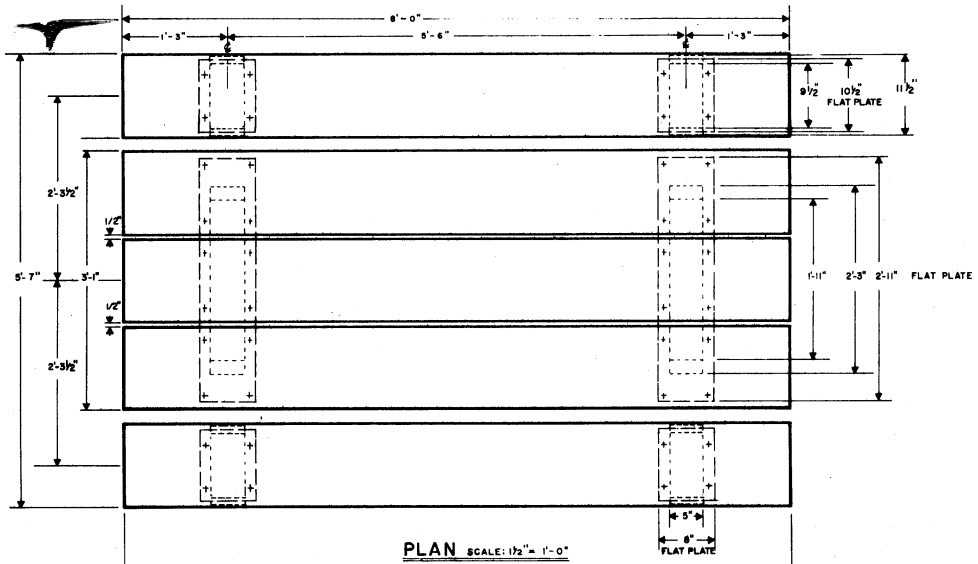
DIST.	CO.	RTE.	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

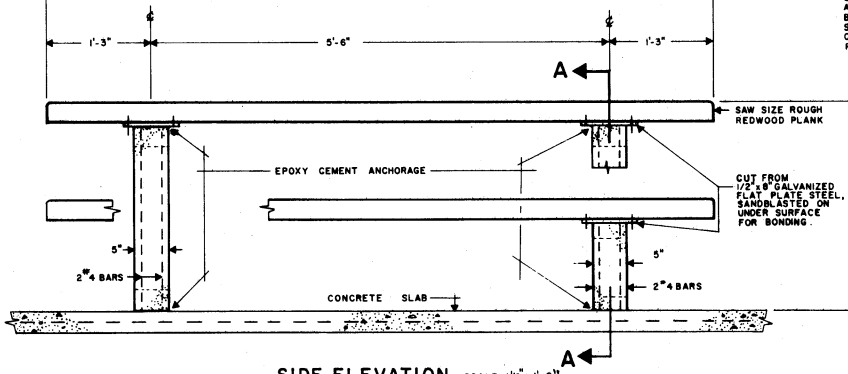
Registered Landscape Architect No. 76

Approved December 4, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

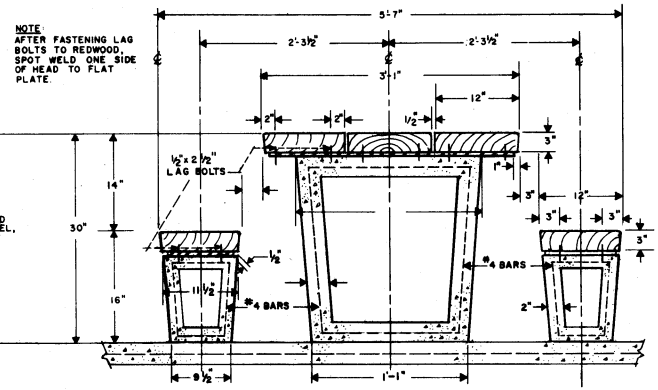


PLAN SCALE: 1½" = 1'-0"



SIDE ELEVATION SCALE: 1½" = 1'-0"

NOTE:
AFTER FASTENING LAG BOLTS TO REDWOOD, SPOT WELD ONE SIDE OF HEAD TO FLAT PLATE.



SECTION A-A SCALE: 1½" = 1'-0"

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PICNIC TABLE TYPE I
SAFETY ROADSIDE REST

PT-1

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To accompany plans dated _____

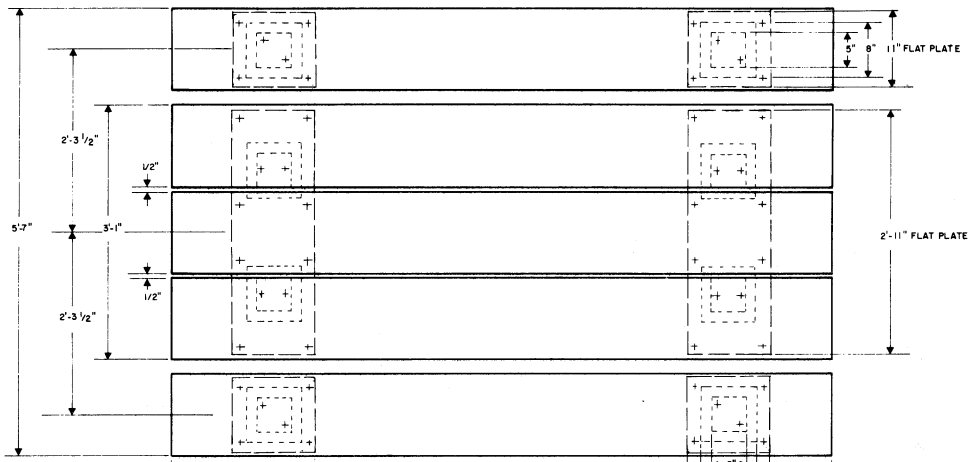
DISTRICT COUNTY ROUTE Post Miles - Total Project SHEET NO. TOTAL SHEETS

APPROVAL RECOMMENDED

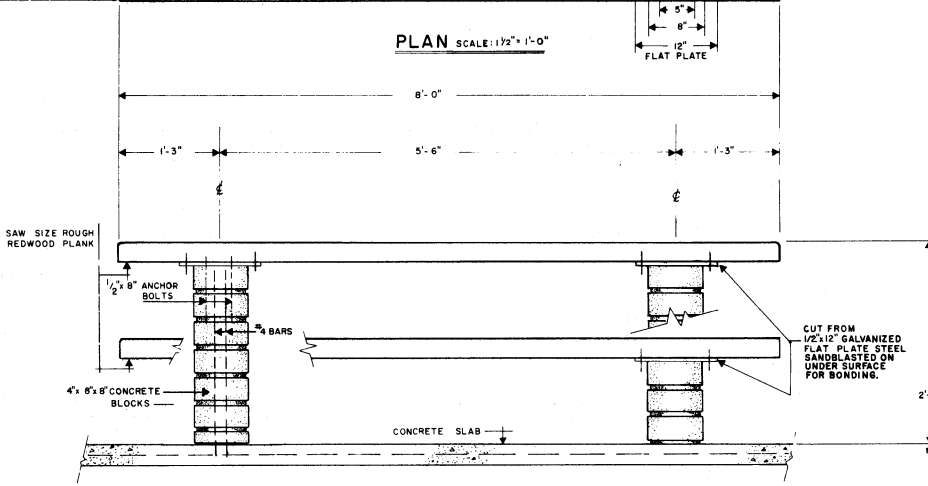
Registered Landscape Architect No. 76

Approved December 4, 1967

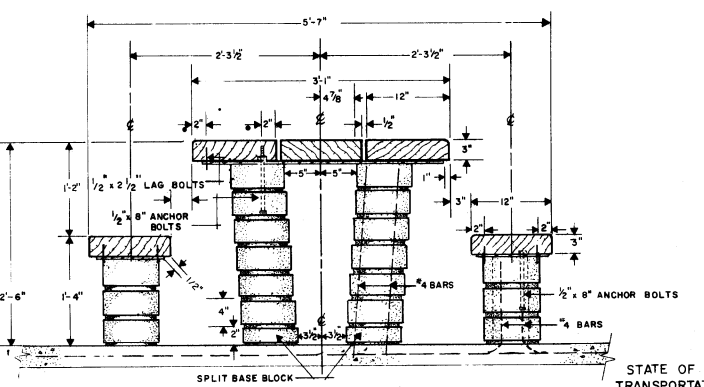
State Highway Engineer
Registered Civil Engineer No 5645



PLAN SCALE: 1 1/2" = 1'-0"



SIDE ELEVATION SCALE: 1 1/2" = 1'-0"



END ELEVATION SCALE: 1 1/2" = 1'-0"

NOTES: AFTER FASTENING LAG BOLTS TO REDWOOD, SPOT WELD ONE SIDE OF HEAD TO FLAT PLATE
USE DARK BROWN MORTAR
RAKE ALL JOINTS 1/4".

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PICNIC TABLE TYPE 2
SAFETY ROADSIDE REST

PT-2

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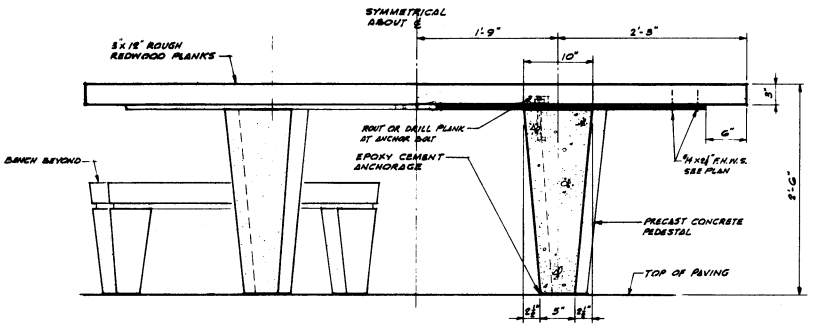

ELEVATION-SECTION "A-A"

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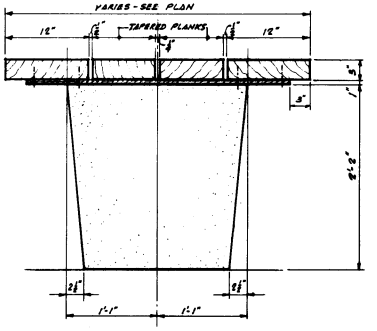
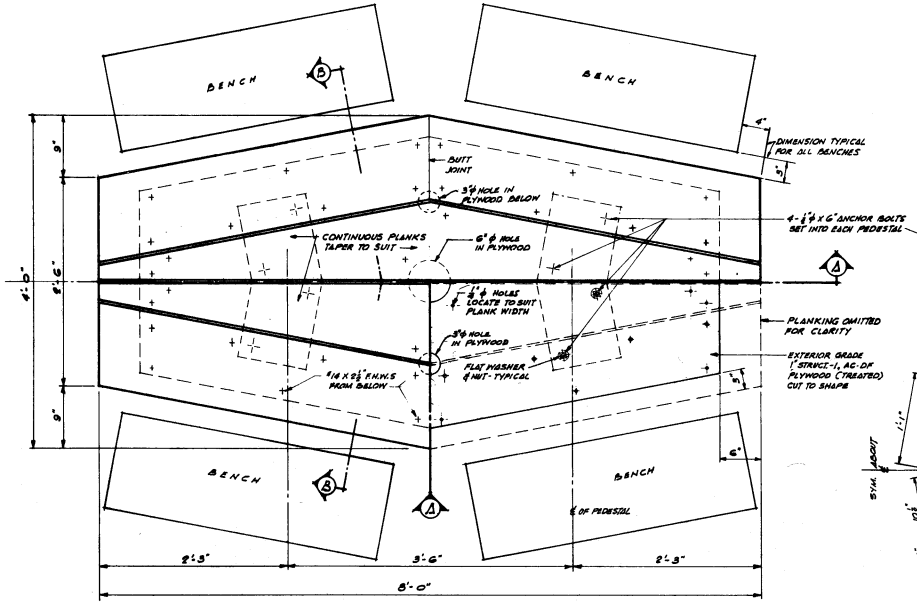


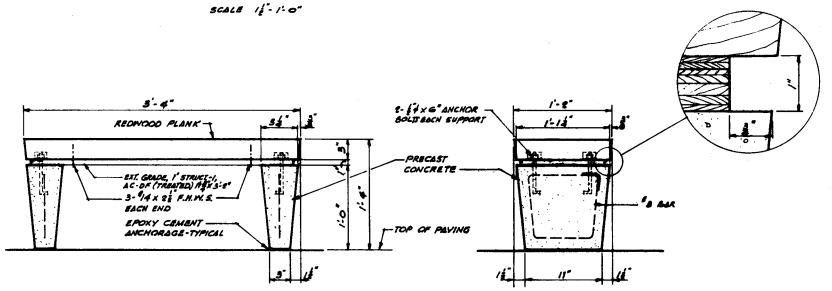
DEVELOPED CROSS SECTION "B-B"

SCALE 1½"=1'-0"



PLAN

SCALE 1½"=1'-0"

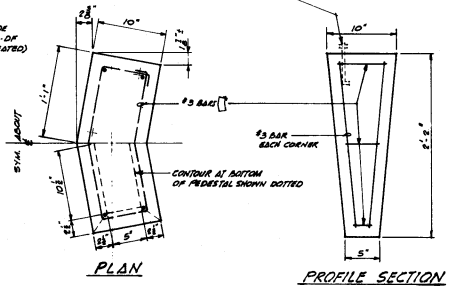


SIDE ELEVATION

END ELEVATION

BENCH DETAIL

SCALE 1½"=1'-0"



PLAN

PROFILE SECTION

PRECAST CONCRETE PEDESTAL REINFORCING

SCALE 1½"=1'-0"

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
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PICNIC TABLE
TYPE 3
SAFETY ROADSIDE REST | PT-3

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To accompany plans dated _____

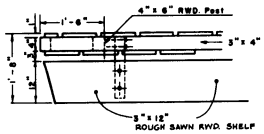
DIST.	CO.	RTE.	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

APPROVAL RECOMMENDED

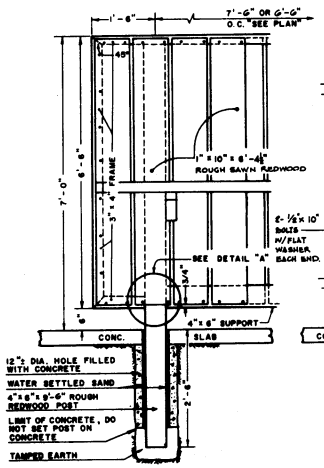
Registered Landscape Architect No 76

Approved December 4, 1967

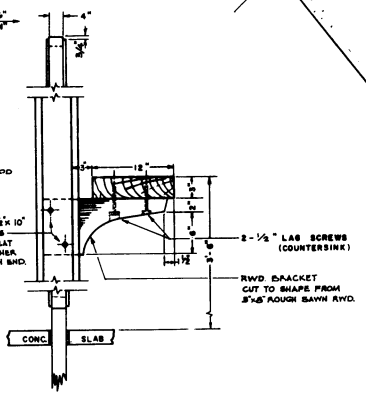
State Highway Engineer
Registered Civil Engineer No. 5645



TOP VIEW

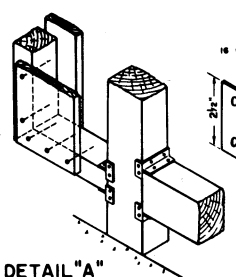


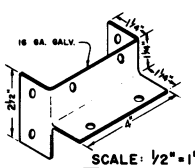
FRONT VIEW
SCALE: 3/4" = 1'-0"



SIDE VIEW
SCALE: 1 ½" = 1'-0"

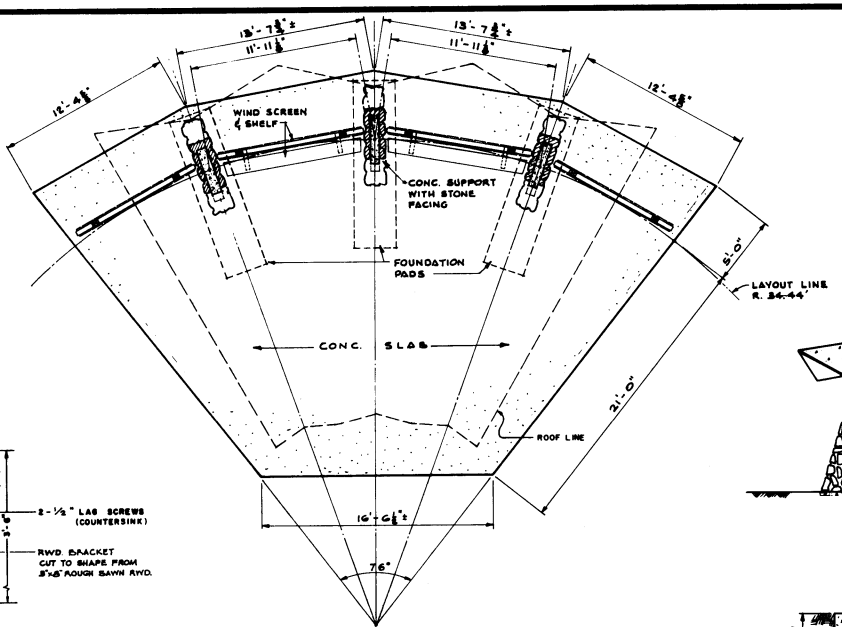
REDWOOD WIND SCREEN & SHELF DETAILS



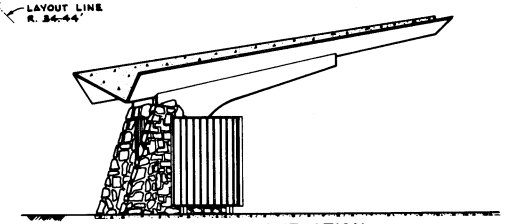


SCALE: ½" = 1"

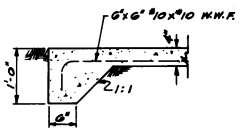
DETAIL "A"
SCALE: 1 ½" = 1'-0"



FLOOR PLAN
SCALE: 1/4" = 1'-0"



SIDE ELEVATION
SCALE: 1/4" = 1'-0"



TYPICAL CONC. SLAB REINFORCING
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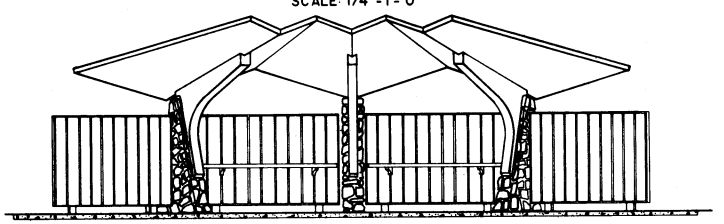
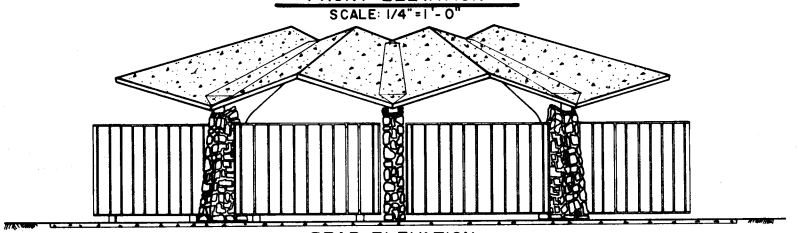


FRONT ELEVATION
SCALE: 1/4" = 1'-0"



REAR ELEVATION
SCALE: 1/4" = 1'-0"

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PICNIC TABLE SHELTER TYPE 1
SAFETY ROADSIDE REST
ARCHITECTURAL DETAIL

PTS-I-I

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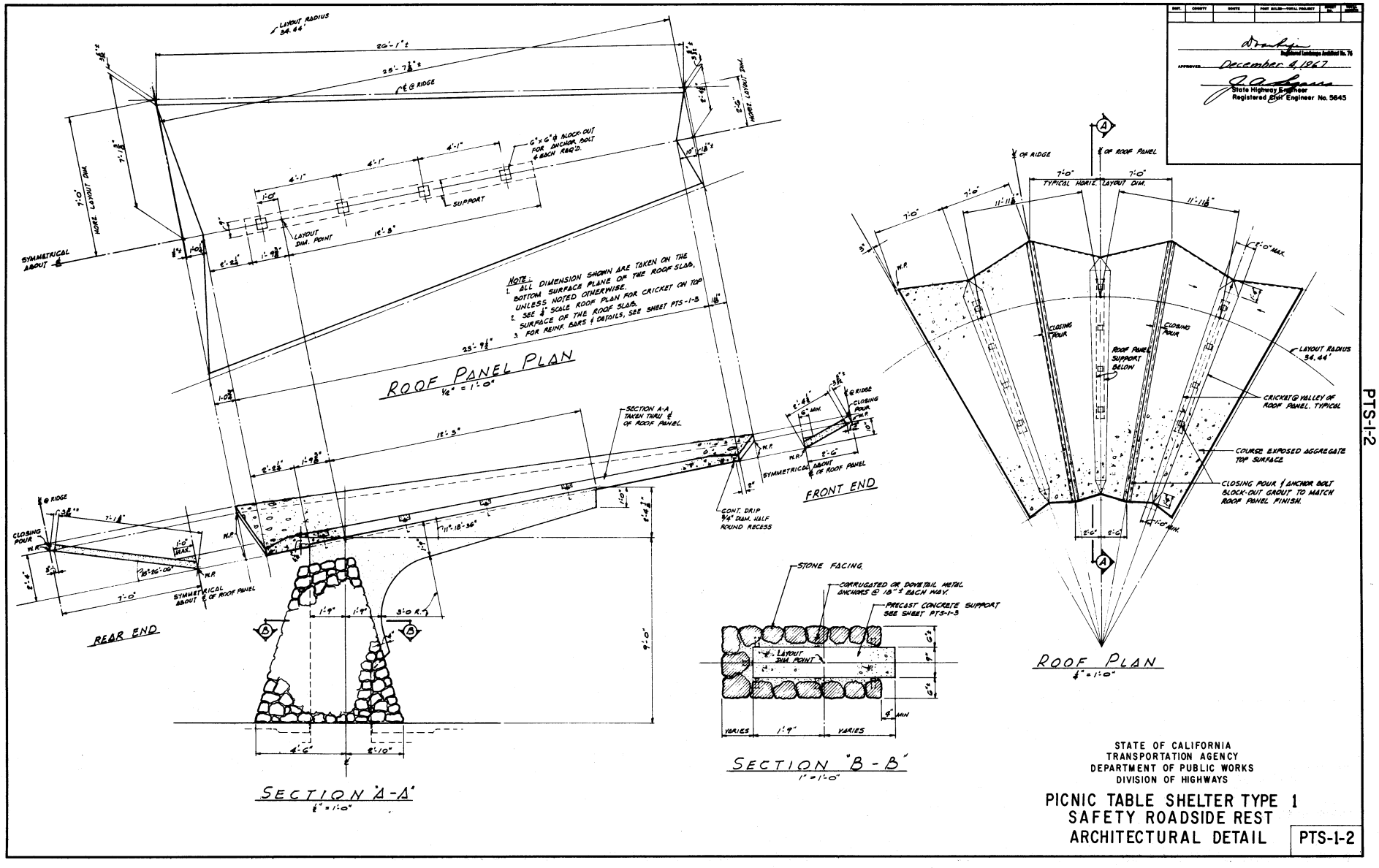

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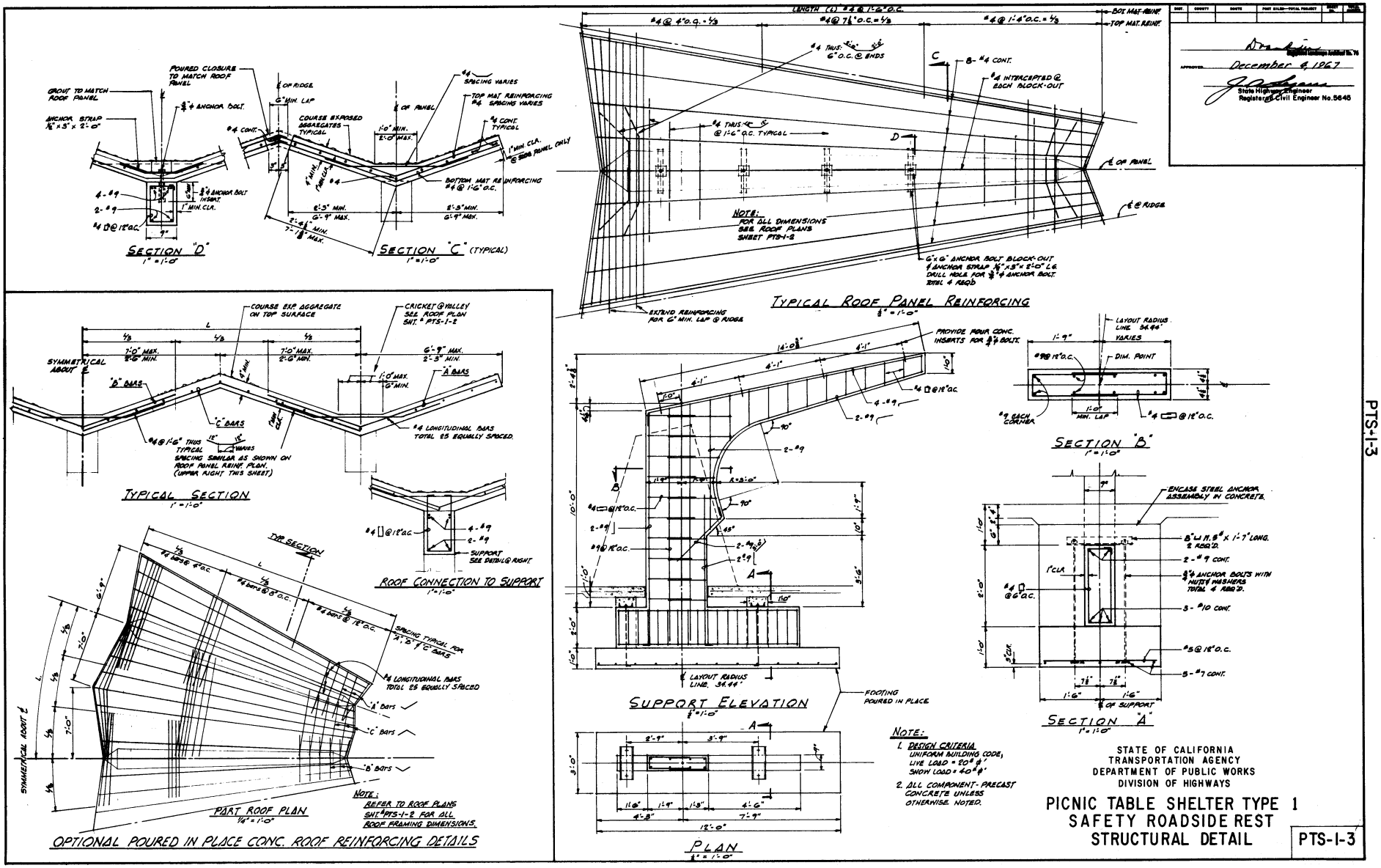

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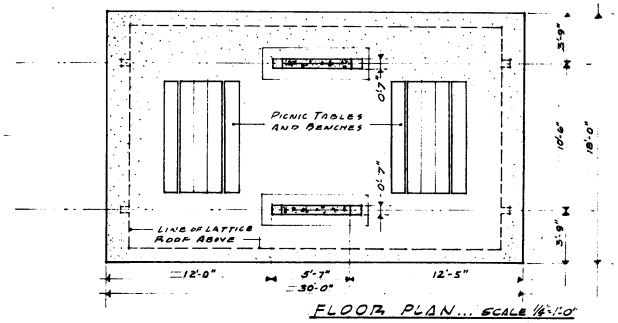
DIST.	COUNTY	ROUTE	POST MILE—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

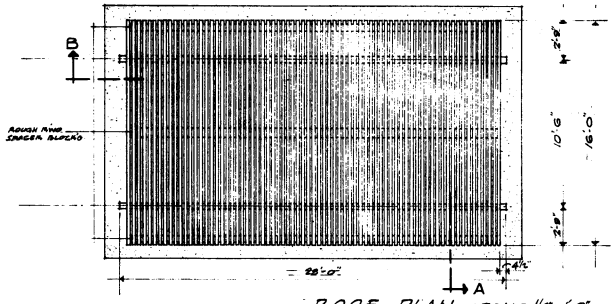
Registered Landscape Architect No. 76

APPROVED December 4, 1967

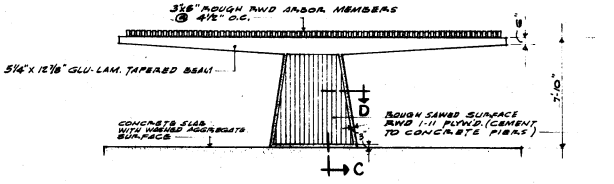
State Highway Engineer
Registered Civil Engineer No. 5645



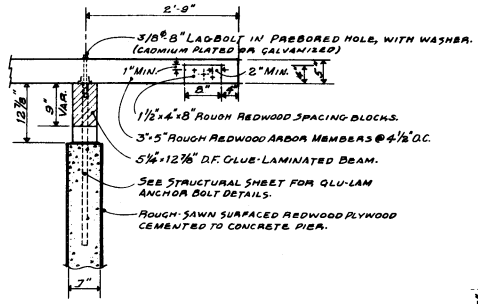
FLOOR PLAN... SCALE 1/4"=1'-0"



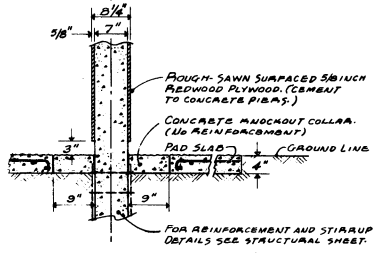
ROOF PLAN... SCALE 1/4"=1'-0"



SIDE ELEVATION... SCALE 1/4"=1'-0"



SECTION A... SCALE 1"=1'-0"



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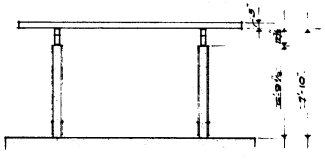
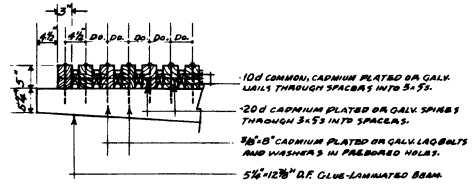
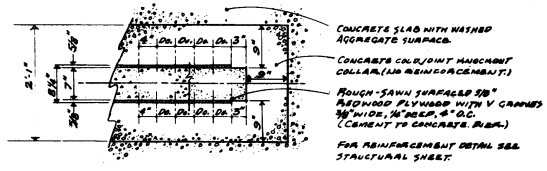


END ELEVATION... SCALE 1/4"=1'-0"



SECTION B... SCALE 1"=1'-0"



SECTION D... SCALE 1"=1'-0"

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PICNIC TABLE SHELTER TYPE 2
SAFETY ROADSIDE REST
ARCHITECTURAL DETAILS

PTS-2-1

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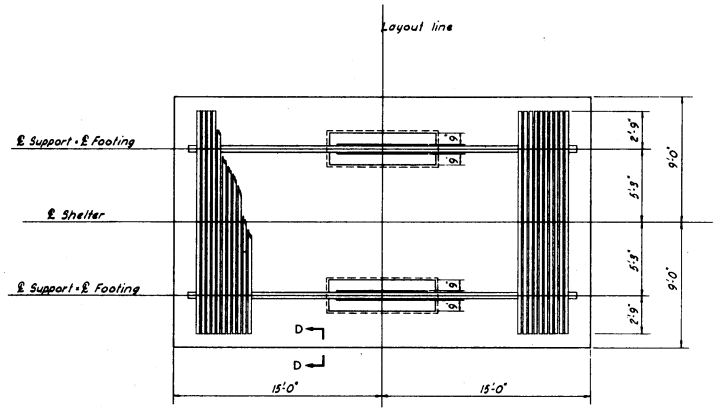
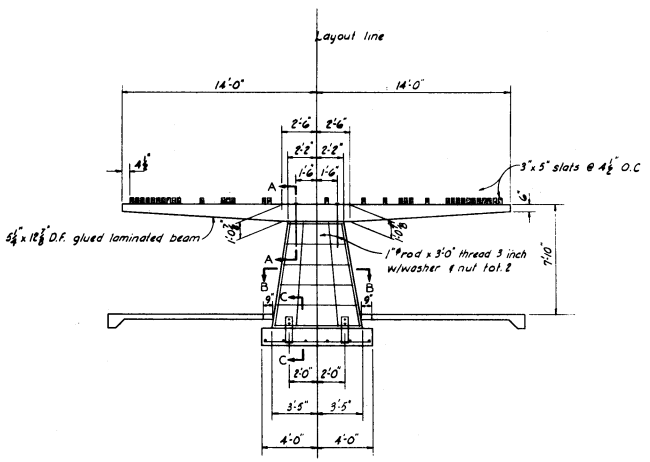
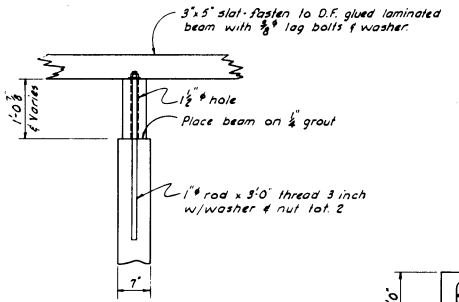


PLAN
1/4"=1'-0"



SUPPORT ELEVATION
1/4"=1'-0"



SECTION A-A
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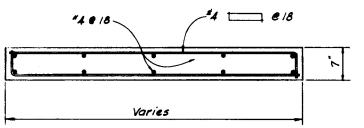

SECTION B-B
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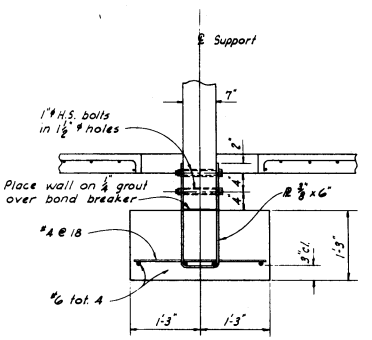

SECTION C-C
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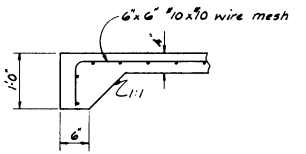

SECTION D-D
1"=1'-0"

DIST.	COUNTY	ROUTE		POST MILE	TOTAL SHEETS

Registered Landscape Architect No. 76
APPROVED December 4, 1967
State Highway Engineer
Registered Civil Engineer No. 5645

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PICNIC TABLE SHELTER TYPE 2
SAFETY ROADSIDE REST
STRUCTURAL DETAILS

PTS-2-2

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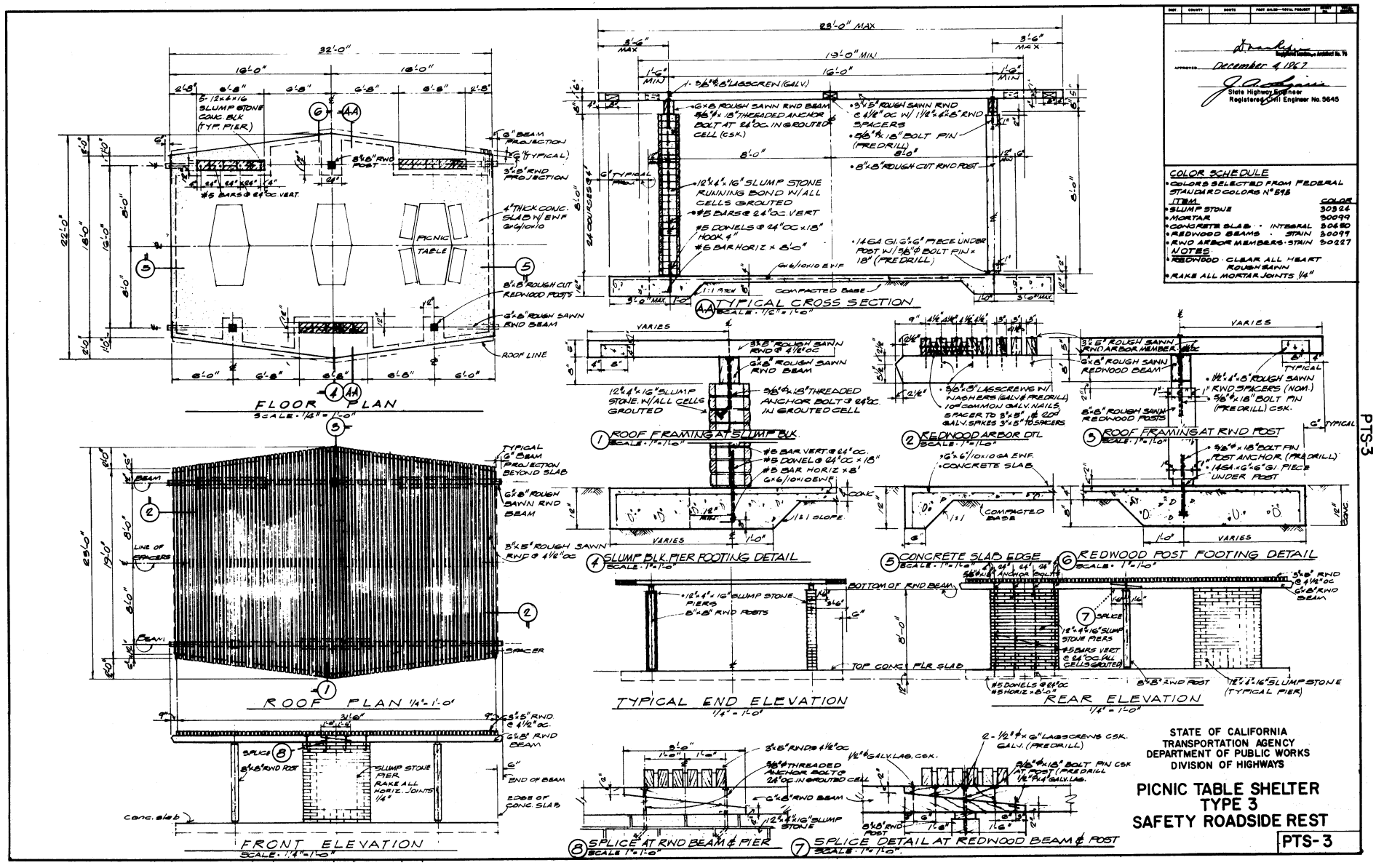

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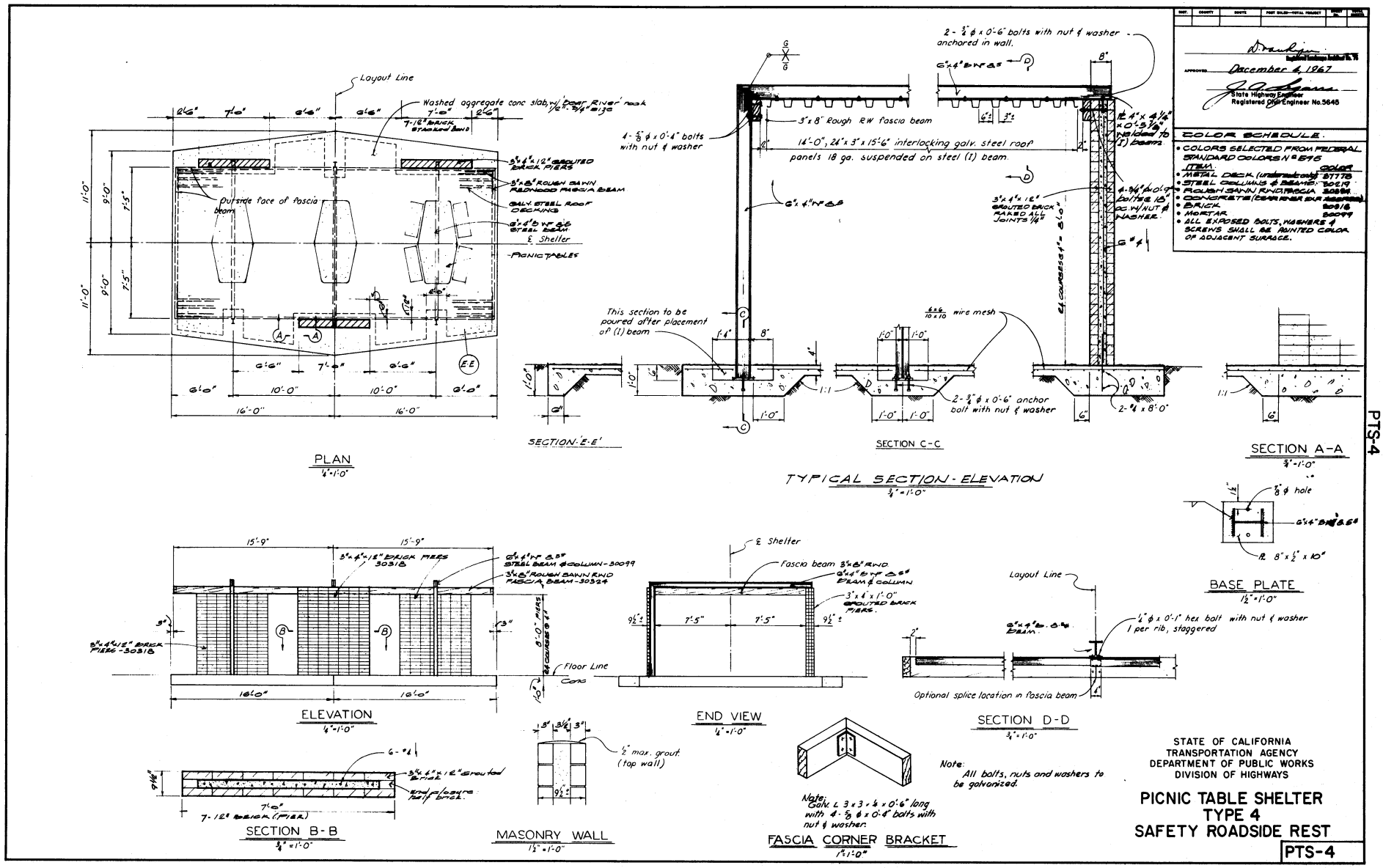

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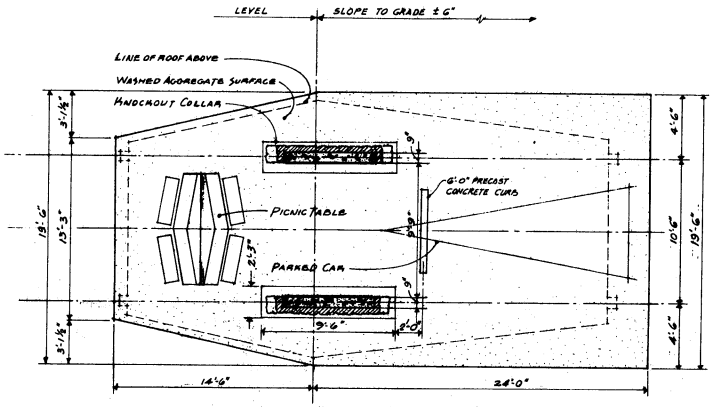
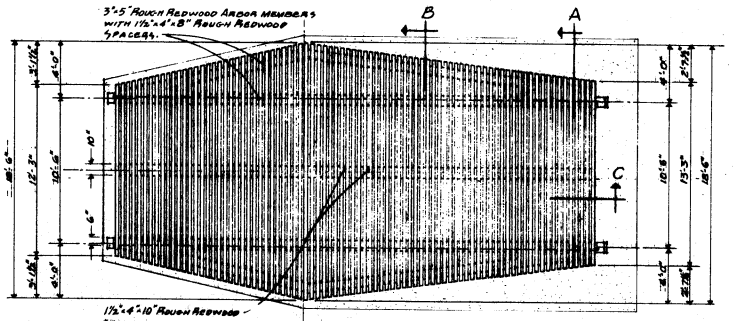
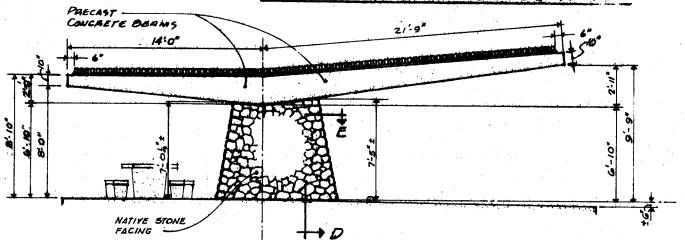


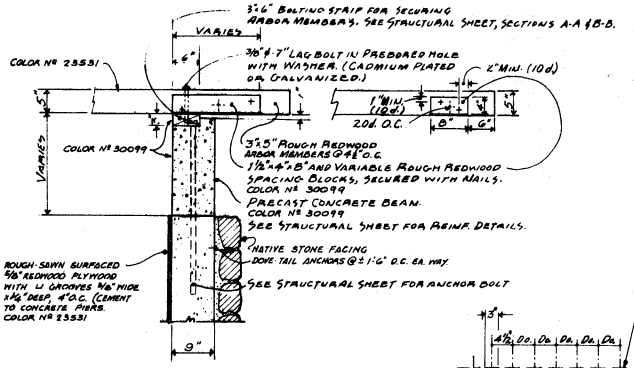
FLOOR PLAN... SCALE 1/4" = 1'-0"



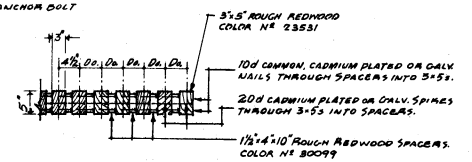
ROOF PLAN... SCALE 1/4" = 1'-0"



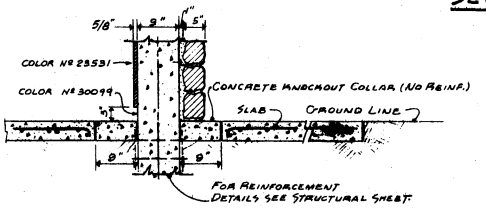
SIDE ELEVATION... SCALE 1/4" = 1'-0"



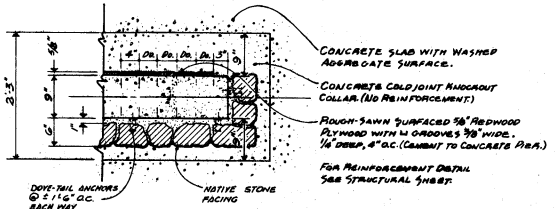
SECTIONS A & B... SCALE 1" = 1'-0"



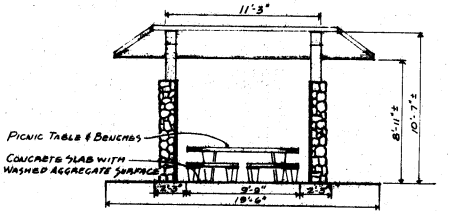
SECTION C... SCALE 1" = 1'-0"



SECTION D... SCALE 1" = 1'-0"



SECTION B... SCALE 1" = 1'-0"



END ELEVATION... SCALE 1/4" = 1'-0"

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Registered Civil Engineer No. 79

APPROVED December 4, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

NOTE:
ALL COLOR NUMBERS INDICATED ARE SELECTED FROM FEDERAL STANDARD COLORS Nº 595.

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PICNIC TABLE AND VEHICLE SHELTER TYPE I ARCHITECTURAL DETAILS SAFETY ROADSIDE REST

PTVS-1-1

PTVS-H

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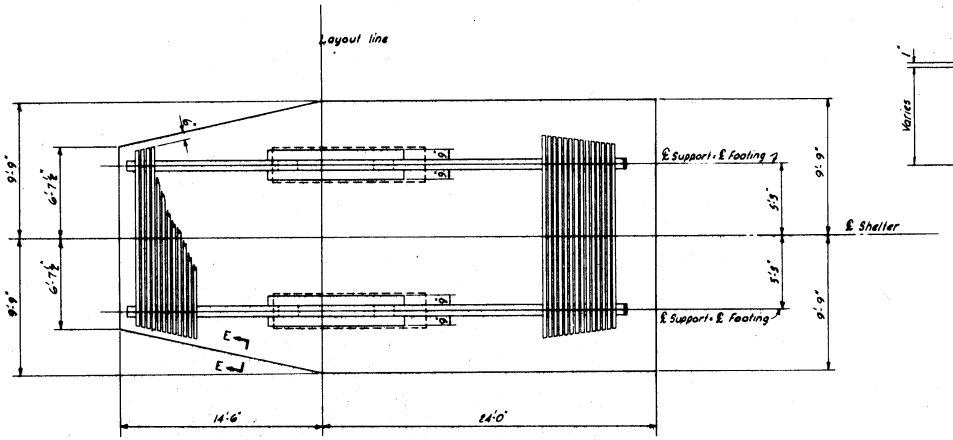
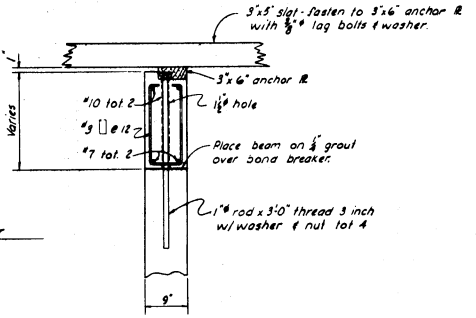
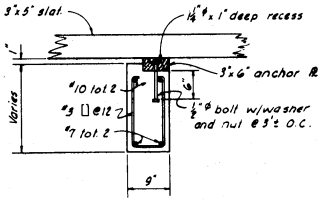


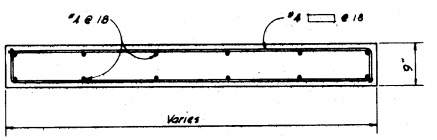
PLAN
1/4"=1'-0"



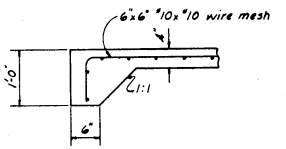
SECTION A-A
1"=1'-0"



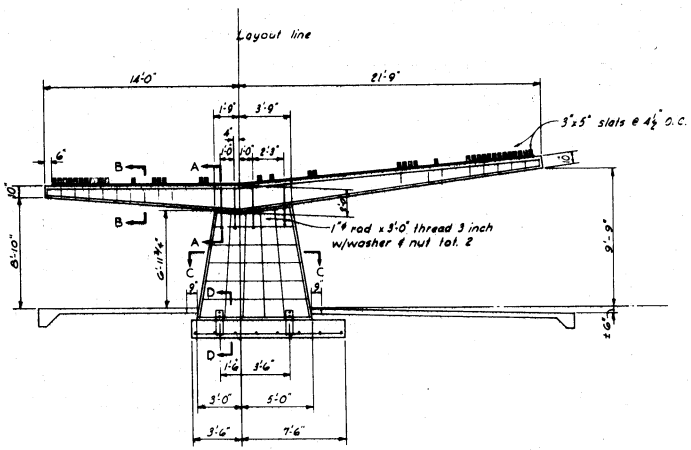
SECTION B-B
1"=1'-0"



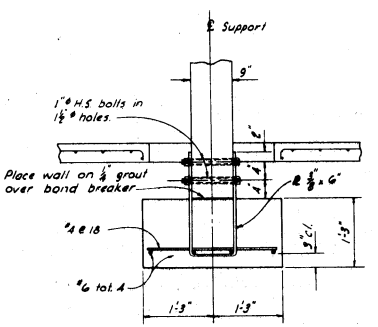
SECTION C-C
1"=1'-0"



SECTION E-E
1"=1'-0"



SUPPORT ELEVATION
1/4"=1'-0"



SECTION D-D
1"=1'-0"

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PICNIC TABLE AND VEHICLE SHELTER TYPE I STRUCTURAL DETAILS SAFETY ROADSIDE REST

PTVS-I-2

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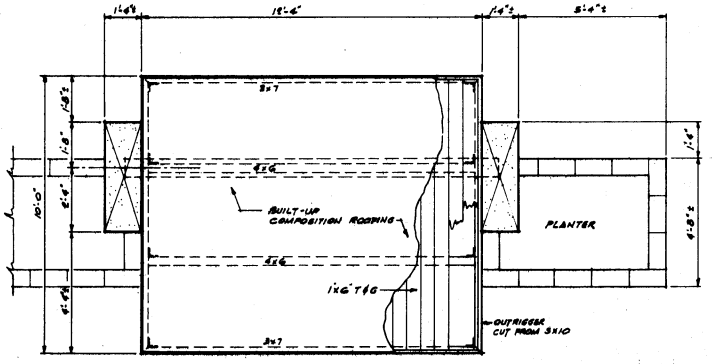
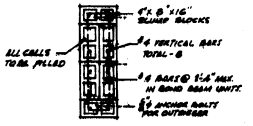
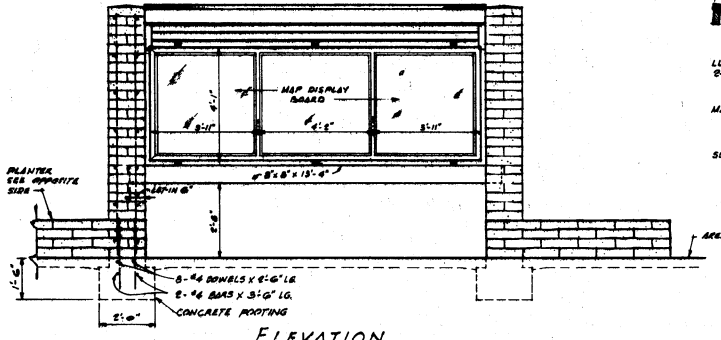


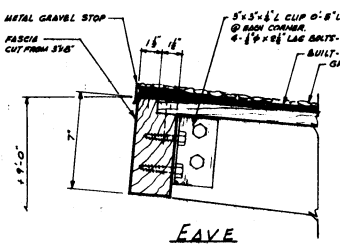
PLAN
SCALE 1/4"=1'-0"



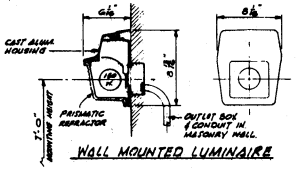
REINFORCING DIAGRAM (TYPICAL)



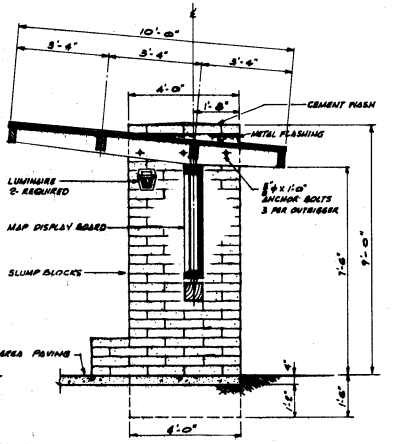
ELEVATION
SCALE 1/4"=1'-0"



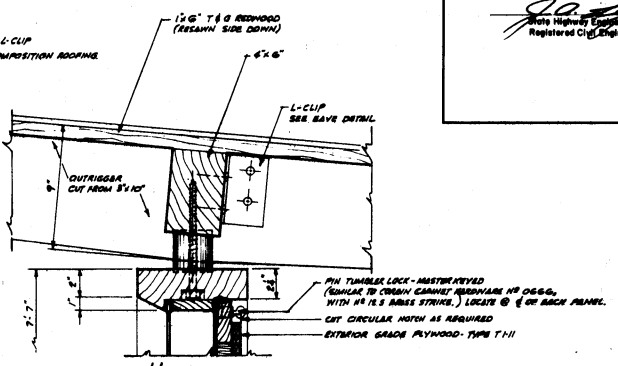
EAVE
LOWER EAVE SIMILAR



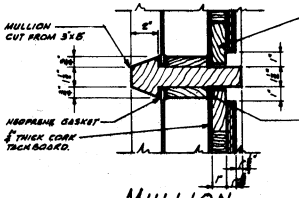
WALL MOUNTED LUMINAIRE



SECTION
SCALE 1/4"=1'-0"

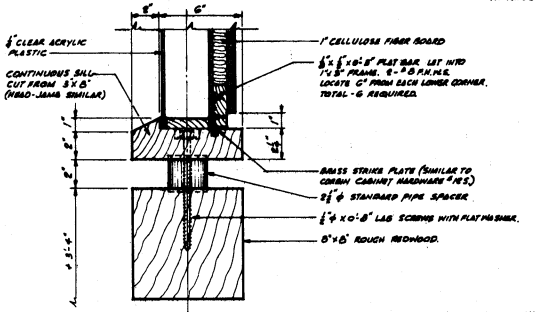


HEAD



MULLION

NOTE:
USE ROUGH SAWN REDWOOD CLEAR ALL HEART CERT. KILN DRIED UNLESS OTHERWISE NOTED. ALL CUSTOM MILLING SHALL BE LEFT IN ROUGH SAWN TEXTURE.



SILL DETAILS
SCALE 3"=1'-0"

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

INFORMATION DISPLAY PANEL
TYPE I
SAFETY ROADSIDE REST

IDP-1

Drafter
December 6, 1967
State Highway Engineer
Registered Civil Engineer No. 5646

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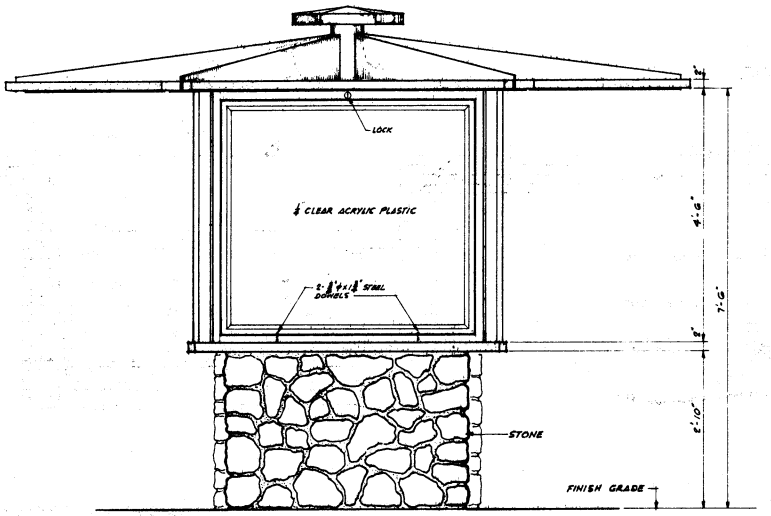
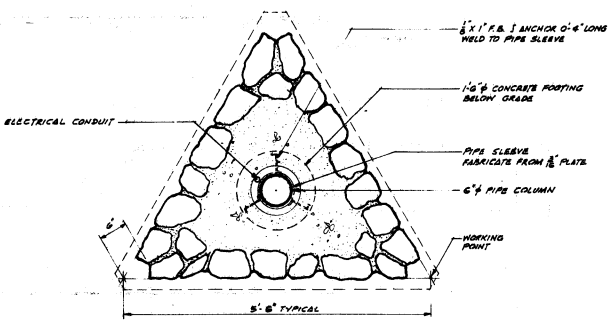
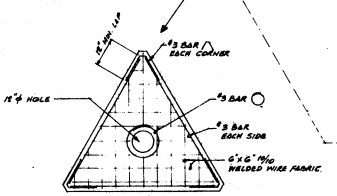


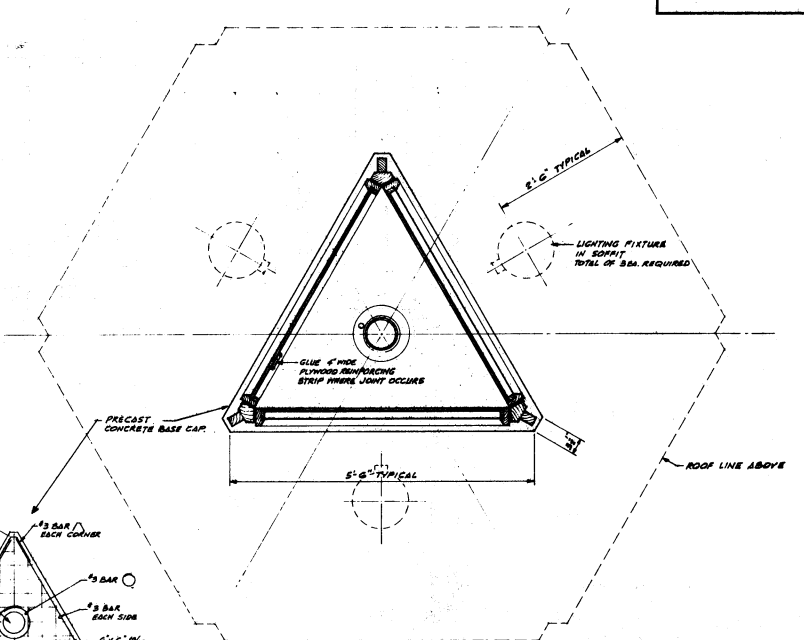
TYPICAL ELEVATION
SCALE 1" = 1'-0"



PLAN OF BASE
SCALE 1½" = 1'-0"



REINFORCING DIAGRAM NO SCALE



PLAN
SCALE 1" = 1'-0"

December 4, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

INFORMATION DISPLAY KIOSK
TYPE I
SAFETY ROADSIDE REST

IDK-I-I

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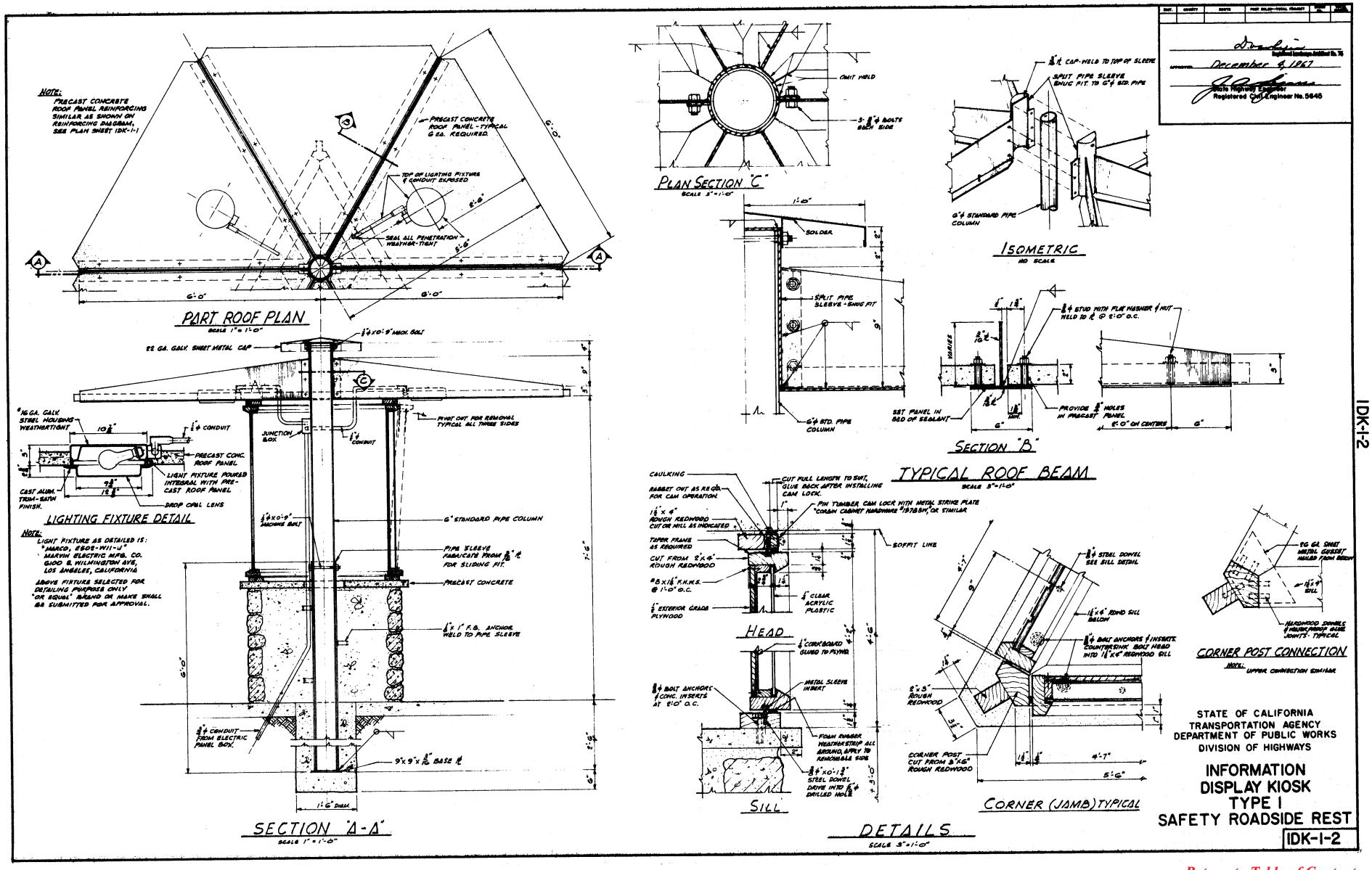

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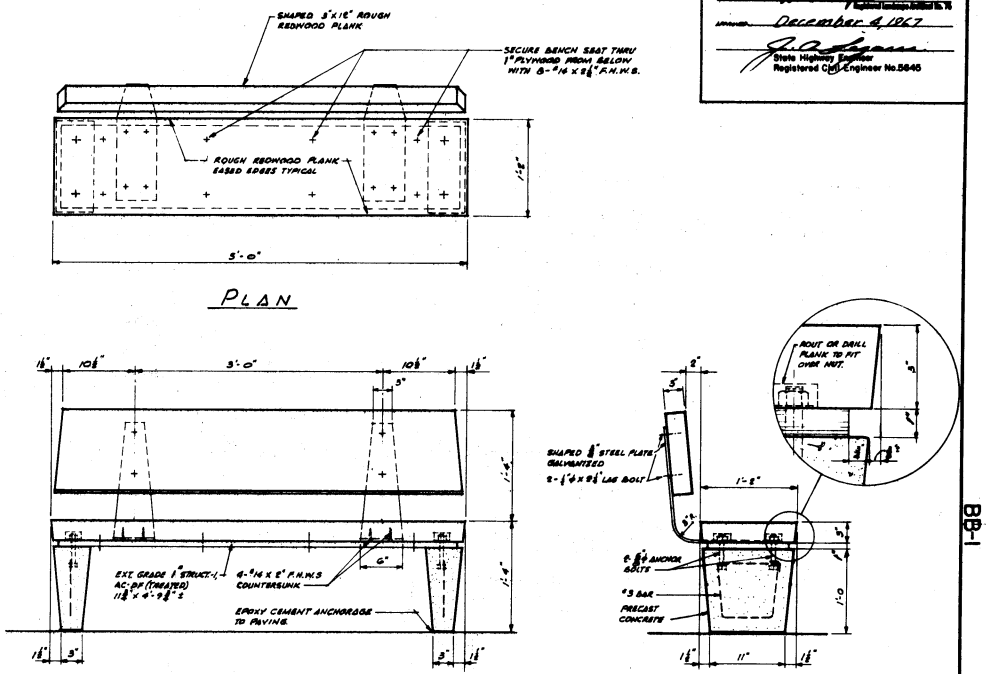

DETAIL OF BENCH WITH BACK

SCALE 1½"=1'-0"

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BENCH WITH BACK
TYPE I
SAFETY ROADSIDE REST | BB-1

BB-1

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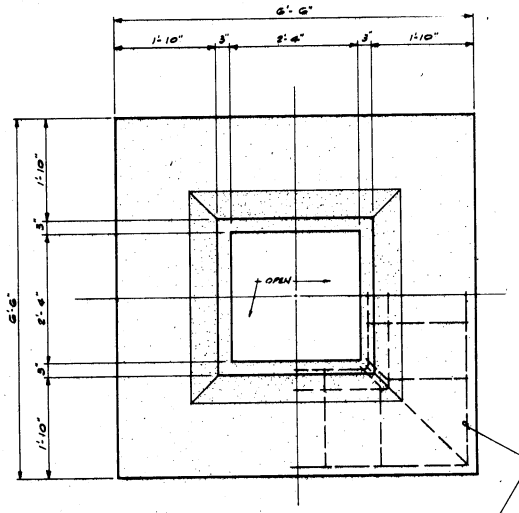
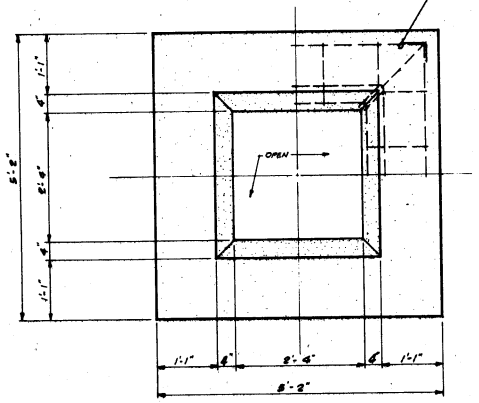
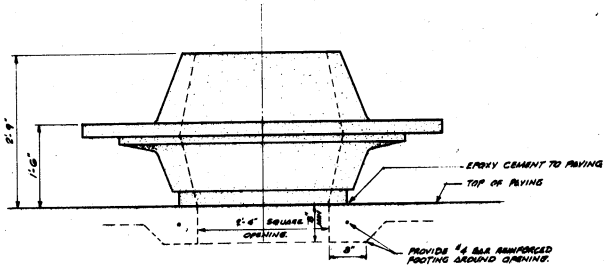


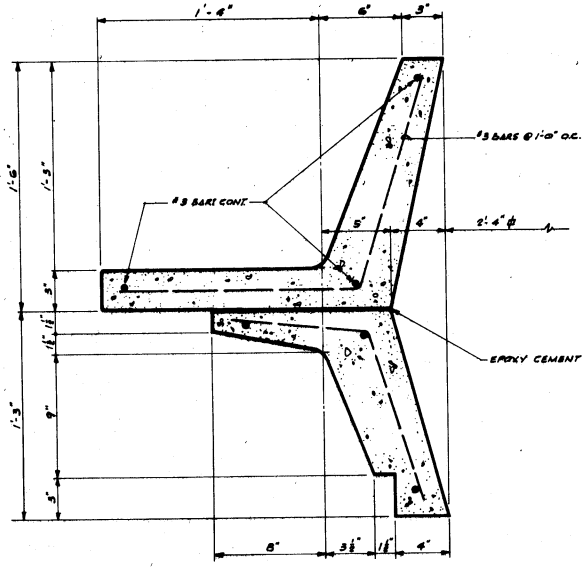
PLAN - UPPER SEGMENT
SCALE 1"=1'-0"



PLAN - LOWER SEGMENT
SCALE 1"=1'-0"



ELEVATION
SCALE 1"=1'-0"



SECTION
SCALE 3"=1'-0"

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PRECAST CONCRETE
PLANTER BENCH
TYPE I
SAFETY ROADSIDE REST | BP-I

December 4, 1967

State Highway Engineer
Registered Civil Engineer No. 5645

BP-I

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