STANDARD PLANS

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

JULY, 1984

ISSUED BY

DEPARTMENT OF TRANSPORTATION

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TOPOGRAPHIC SYMBOLS

Existing Features

- Horizontal Control Monument (2nd Order or better)
- Horizontal Control Monument & Bench Mark (2nd Order or better)
- Horizontal Control Monument (Third Order)
- Horizontal Control Monument & Bench Mark (Third Order)
- Bench Mark
- Building
- Foundation or Ruin
- Surfaced street, highway or road
- Curb
- Gravel or Dirt Road
- Drive or Walk
- Trail
- Railroad
- Bridge
- Culvert and Headwalls
- Fence and Gate
- Chain Link Fence
- Guard Rail
- Power Poles
- Other Poles
- Roadside Signs
- Well Overhead Transmission Line (Tower Base to Scale)
- Manhole, Well or Tank
- 123.4 — Spot Elevations (Taken at Decimal Point)
- Channel
- Stream or River
- Body of Water
- Flow
- Depression
- Marsh or Tidal Area
- Flood Channel or Wash
- Spring
- Timber or Brush Area
- Tree
- Orchard
- Vineyard
- Hedge

UNDERGROUND UTILITIES

- W — Water
- G — Gas
- S — Sewer
- D — Drain
- E — Electric
- T — Telephone
- O — Oil
- GS — Gasoline
- TV — Television

CONSTRUCTION & CADASTRAL SYMBOLS

- Layout Line (Future) — 9, 260
- Layout Line (Ramps, Frontage Roads, Crossroads) — 155, 6
- Separate Roadway Centerline
- R/W — Controlled Access — Right of Way
- Pavement Edges and Shoulders
- Cut — Fill — Top of Cut — Toe of Fill — Slope Lines
- State or County
- City Limits
- National or State Forest or Park
- Township, Range, Grant
- Section or Fraction - Subdivision — Boundary Lines
- On tangent — BC or EC
- R/W Access Monuments
- R/W Monuments — Monuments
- FES — G-2 D1 — HW — 24" x 80' CMP — 36" x 120' RCP — Culvert, Flared End Section, Drainage Inlet, Headwall or Endwall
- AC Dike — AC Spwy — DD — Dike and Down Drain
- Curb or Dike
- Curb & Gutter
- Guard Rail
- Chain Link Fence
- Other Fence
- Br. No. 33-33 — Structure
- Δ — Point of Intersection
- 3, 2, 10, 11 — Section Corner
- Wall
- Concrete Barrier
- Concrete Channel
- Ditch Flow Line
- OG — Original Ground

ABBREVIATIONS

AB	aggregate base
ABBC	asbestos bonded bituminous coated
ABM	air-blown mortar
Abn	abandon
Abut	abutment
AC	asphalt concrete
ACP	asbestos cement pipe
Ahd	ahead
Adj	adjust
Alt	alternate
APC	alternative pipe culvert
AS	aggregate subbase
Assy	assembly
Att	attenuator
Ave	avenue
BAGR	bridge approach guardrail
BC	begin horizontal curve
BCR	begin curb return
Beg	begin
Bit Ctd	bituminous coated
Bit Sl	bituminous seal
Bit Surf	bituminous surfacing
Bk	back
Bkf	backfill
Bldg	building
Blvd	boulevard
BM	bench mark
Br	bridge
BVC	begin vertical curve
BW	barbed wire
BB	beginning of bridge
CAA	cable anchor assembly
CAP	corrugated aluminum pipe
C - C	center to center
CF	cubic feet
C & G	curb and gutter
Chnl	channel
CIDH	cast in drilled hole
CIP	cast iron pipe
CIPP	cast-in-place pipe
℄	center line
CL	chain link
Cl	class
Clr	clear, clearance
Co	county
Col	column
Conc	concrete
Cond	conduit
Conn	connector
Const	construct(ion)
Coord	coordinate
Cr	creek
CSP	corrugated steel pipe
CSPA	corrugated steel pipe arch
CTB	cement-treated base
Culv	culvert
CY	cubic yards
Dbl	double
DD	down drain
Dei	delineators
Det	detour
DI	drop inlet
Dia	diameter
Dist	distance
DMBB	double metal beam barrier
Dr	driveway
Ea	each
Ease	easement
EC	end horizontal curve
ECR	end curb return
Elev	elevation
Emb	embankment
EP	edge of pavement
Eq	equation
ES	edge of shoulder
ETW	edge of traveled way
EVC	end vertical curve
EW	endwall
Exc	excavation
Exist	existing
Exp Jt	expansion joint
Fc	fence
F & C	frame and cover
Fdn	foundation
FES	flared end section
F & G	frame and grate
FG	finish grade
FH	fire hydrant
FL	flow line
Flr	flare
Fr Rd	frontage road
Ft	foot (feet)
Ftg	footing
Fwy	freeway
G	gutter
Ga	gauge
Gal	gallon
GM	guide marker
GR	guardrailing
GSP	galvanized steel pipe
H	height
Horiz	horizontal
HP	hinge point or horse power
HW	headwall
Hwy	highway
IB	imported borrow
ID	inside diameter
Inv	invert
Irr	irrigation
JP	joint pole
JS	junction structure
Jt	joint
L	length
Lb	pound
LCB	lean concrete base
LF	linear feet
Loc	location
LOL	layout line
Ln	line
LS	lump sum
Lt	left
Max	maximum
MB	metal beam
MBB	metal beam barrier
MBGR	metal beam guardrailing
Med	median
MES	metal end section
MH	manhole
Mi	mile (s)
Mkr	marker
MFBM	thousand foot board measure
Min	minimum
Ml & S	miscellaneous iron and steel
Misc	miscellaneous
Mod	modified or modify
Mon	monument
MP	metal plate
MS	minor structure
MSYD	thousand station yard
Mtl	material
No	number
Obtr	obliterate
OC	overcrossing
OD	outside diameter
OG	original ground
OG AC	open-graded asphalt concrete
OH	overhead
P & A	plug and abandon
PAP	perforated aluminum pipe
PB	pull box
PCC	point of compound curve or Portland cement concrete
PCVC	point of compound vertical curve
Ped	pedestrian
Ped UC	pedestrian undercrossing
Perm Mtl	permeable material
PI	point of intersection
℘	property line
Pl	plate
PM	post mile
PN	paving notch
POC	point on horizontal curve
POT	point on tangent
POVC	point on vertical curve
PP	power pole
PRC	point of reverse curve
PRVC	point of reverse vertical curve
PSP	perforated steel pipe
Pvmt	pavement
PVPP	polyvinyl plastic pipe
R	radius
RCB	reinforced concrete box
RCP	reinforced concrete pipe
RCPA	reinforced concrete pipe arch
R & D	remove and dispose
Rd	road
Reinf	reinforced (ing)
Rel	relocate
Ret	retaining
RM	road-mixed
RP	reference point
RR	railroad
R & S	remove and salvage
RSP	rock slope protection
Rt	right
Rte	route
RW	retaining wall
R/W	right of way
Salv	salvage
SC	sand cushion
℄	station line
SCSP	slotted corrugated steel pipe or sacked concrete slope protection
SD	storm drain
Sec	section
Sep	separation
SG	subgrade
Shld	shoulder
Sht	sheet
Sl Ct	seal coat
Sltl	selected material
Spec	special
Spwy	spillway
SQFT	square foot
SQYD	square yard
SS	slope stake
SSPP	structural steel plate pipe
St	street
Sta	station
Std	standard
Str	structure
STYD	station yard
Surf	surfacing
SW	sidewalk
Swr	sewer
T	semi-tangent
TBB	thrie beam barrier
Tbr	timber
TCB	traffic control box
Temp	temporary
TG	top of grade
TMi	ten mile
Trans	transition
TS	traffic signal
Typ	typical
Typ Sec	typical section
UC	undercrossing
UD	underdrain
UP	underpass
V	design speed, valve
Var	variable
VC	vertical curve
VCP	vitrified clay pipe
Vert	vertical
WH	weep hole
WM	wire mesh
WSP	welded steel pipe
WW	wing wall
Xing	crossing
X Sec	cross section

DATE	ADDENDA	REVISIONS	SECTION	DRAWING NO.	TOTAL SHEETS

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

APPROVED July 1, 1984

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SYMBOLS & ABBREVIATIONS

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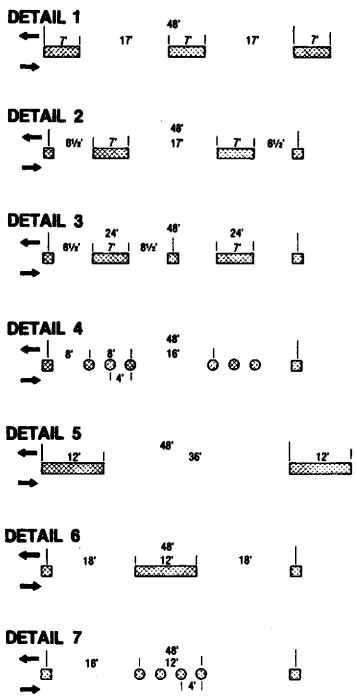
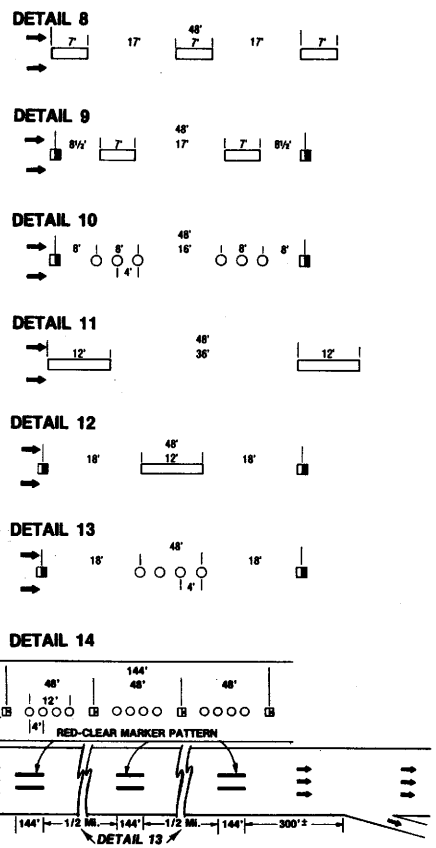
Dist.	County	Route	Post Mile / Total Project	Sheet No.	Total Sheets

CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995
July 1, 1984

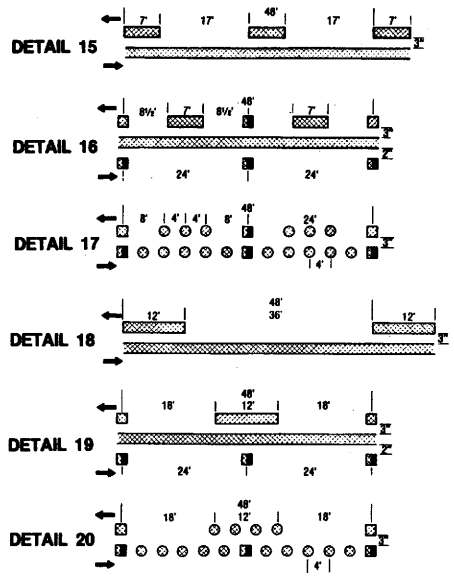
CENTERLINES (2 LANE HIGHWAYS)



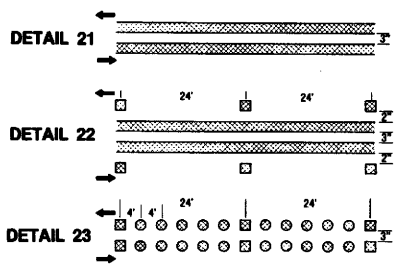
LANELINES (MULTILANE HIGHWAYS)



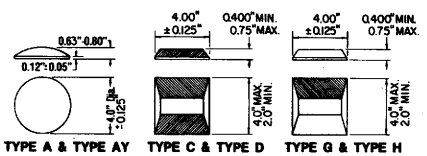
NO PASSING ZONES - ONE DIRECTION



NO PASSING ZONES - TWO DIRECTION



MARKER DETAILS



NOTE: Minimum Projected Area Of Reflective Face = 1.00 Square Inch

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PAVEMENT MARKERS AND TRAFFIC LINES TYPICAL DETAILS

A 20-A

A 20-A

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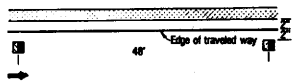
Dist.	County	Route	Post Miles Total Project	Sheet No.	Total Sheets

C D Bartell
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO.10995
July 1, 1984
APPROVED

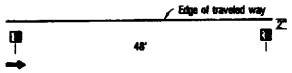
LEFT EDGELINES
(Divided Highways)

DETAIL 24

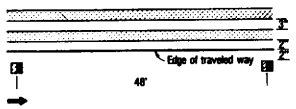
DETAIL 25



DETAIL 26



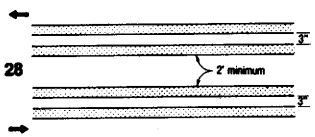
DETAIL 27



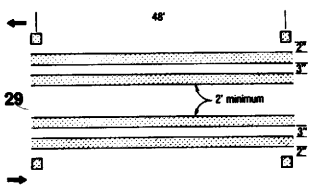
Note: Pavement markers shall be spaced 24' apart on freeway ramps and connectors.

MEDIAN ISLANDS

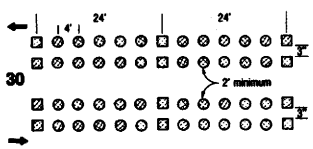
DETAIL 28



DETAIL 29

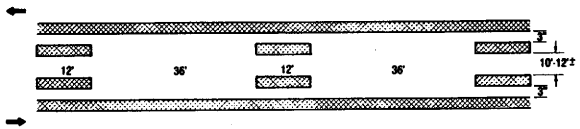


DETAIL 30

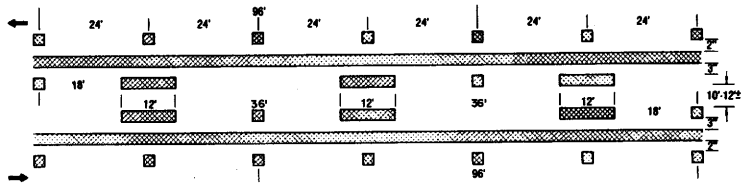


TWO-WAY LEFT TURN LANES

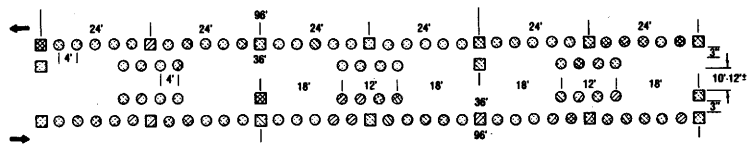
DETAIL 31



DETAIL 32

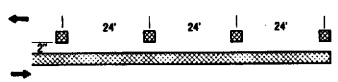


DETAIL 33

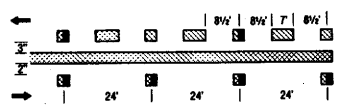


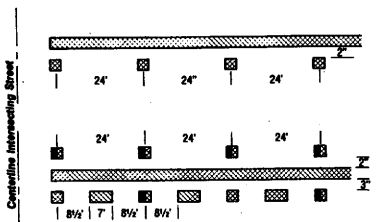
INTERSECTION TREATMENTS

DETAIL 34



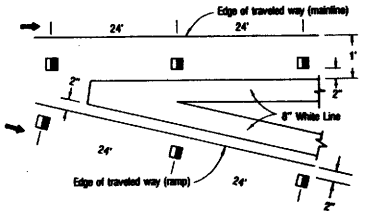
DETAIL 35



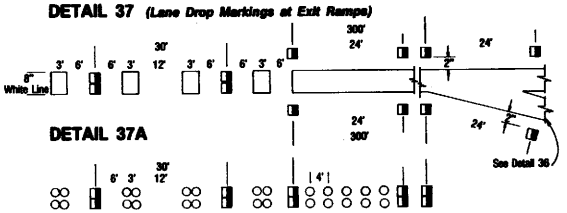


MISCELLANEOUS MARKINGS

DETAIL 36 *(Exit Ramp Treatment)*

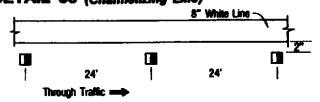


DETAIL 37 *(Lane Drop Markings at Exit Ramps)*



DETAIL 37A

DETAIL 38 *(Channelizing Line)*



LEGEND

MARKERS

- TYPE A White Non-reflective
- TYPE AY Yellow Non-reflective
- TYPE C Red-clear Reflective
- TYPE D Two-way Yellow Reflective
- TYPE G One-way Clear Reflective
- TYPE H One-way Yellow Reflective

LINES

- 4" White
- 4" Yellow
- Direction of Travel
- No Scale

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PAVEMENT MARKERS AND TRAFFIC LINES TYPICAL DETAILS

A 20-B

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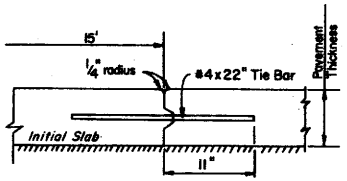
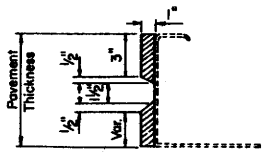


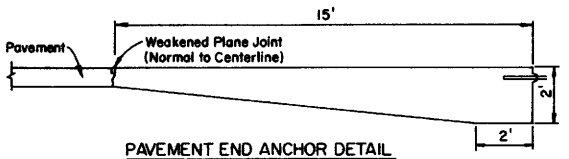
SECTION A-A

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.

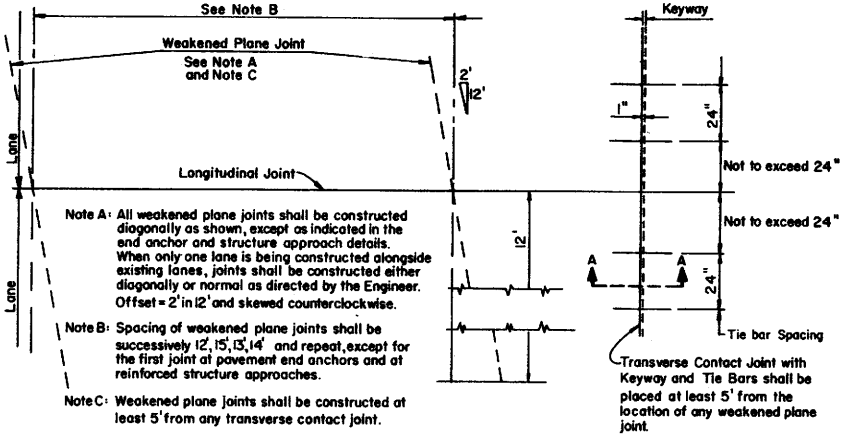


DETAIL OF METAL OR WOODEN INSERTS TO BE PLACED ON FORM



PAVEMENT END ANCHOR DETAIL

NOTE- Pavement end anchors shall be constructed as the terminal panels of all pavement not abutting existing pavements or structures, at Pavement Pressure Relief Joint, or elsewhere if ordered by the Engineer.

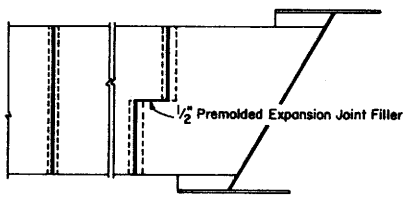


Note A: All weakened plane joints shall be constructed diagonally as shown, except as indicated in the end anchor and structure approach details. When only one lane is being constructed alongside existing lanes, joints shall be constructed either diagonally or normal as directed by the Engineer. Offset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

Note B: Spacing of weakened plane joints shall be successively 12', 15', 13', 14' 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.

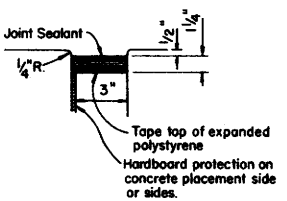
PLAN - PAVEMENT



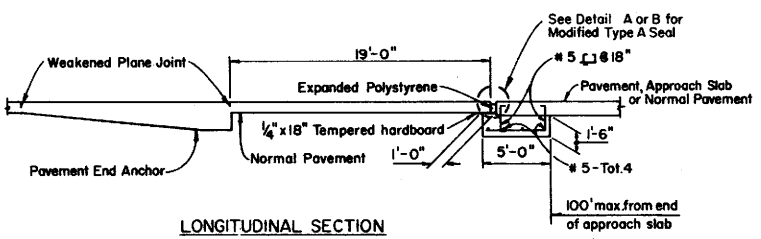
NORMAL JOINT STAGGERED JOINT

PLAN

(Pavement Pressure Relief Joints when Placed at Ends of Approach Slabs).



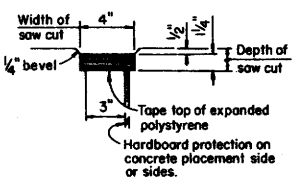
FORMED JOINT DETAIL A



LONGITUDINAL SECTION

NOTE- Pavement Pressure Relief Joint to be used only when specified in the Special Provisions.

PAVEMENT PRESSURE RELIEF JOINT



OPTIONAL SAW CUT DETAIL B

DISTRICT	COUNTY	ROUTE	POST MILES	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

DATE July 1, 1984

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

P.C.C. PAVING DETAILS

A35-A

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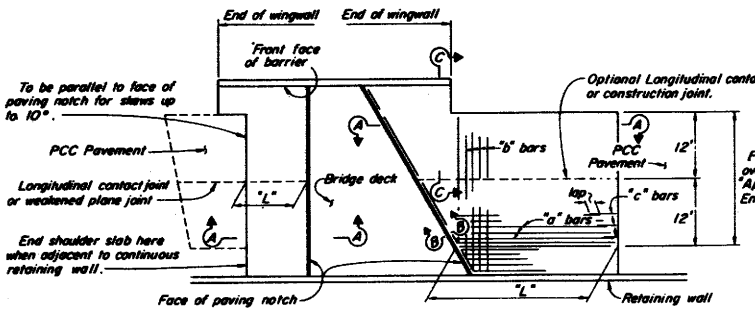
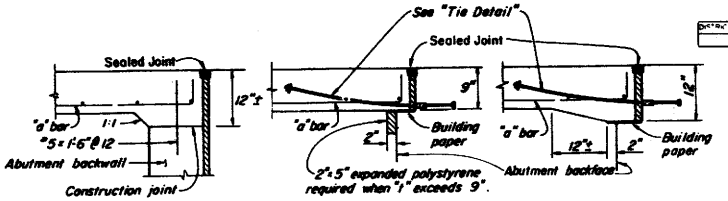


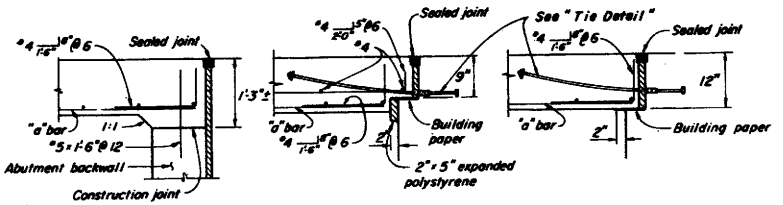
NORMAL SKEW

PLAN



ABUTMENT WITH BACKWALL 9" PAVING NOTCH 12" PAVING NOTCH

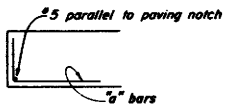
TYPE 1 APPROACH SLAB



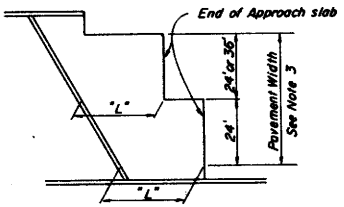
ABUTMENT WITH BACKWALL 9" PAVING NOTCH 12" PAVING NOTCH

TYPE 2 APPROACH SLAB

DETAIL "G"

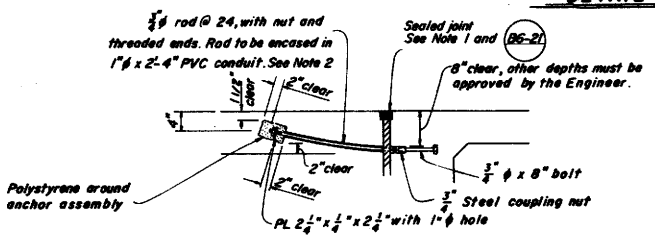


SECTION B-B



APPROACH SLAB - END STAGGER DETAIL

Approach Slab Type	"L"	"f"	Bar Reinforcement Table			
			"a" bars	"b" bars	"c" bars	Lap
Type 1	10'-6"	0.75'	#6 x 10'-2" @ 6	#4 @ 12	#4 @ 12	1'-11"
Type 2	30'-0"	1.00'	#8 x 29'-8" @ 6	#5 @ 12	#5 @ 12	2'-4"

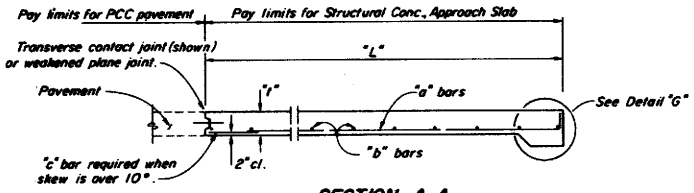


TIE DETAIL

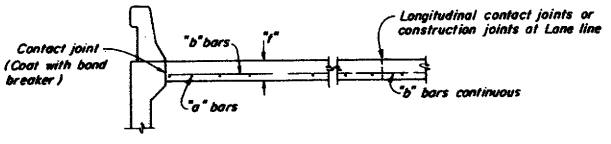
Place Parallel to ℄ Roadway

NOTES:

1. Sealed joint M.R. (Movement Rating) as shown on other detail sheets. Adjust bar reinforcement to clear a sawcut for sealed joint, when required.
2. All metal parts to be galvanized. Full length tie rod, projecting 9" min. into abutment and 2'-6" min. into approach slab, may be substituted for rod and bolt shown. Full length rod shall have a plate at the approach slab end and may have a head at one end and nut at the other end or nuts at both ends. #5 Grade 60 reinforcing bar may be substituted for 3/4" rod.
3. Approach slabs to skewed structures shall be staggered at lane lines. Staggered lines may be 24' or 36' apart for skews of 45° or less and at any lane line for skews greater than 45°.



SECTION A-A



SECTION C-C

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

APPROACH SLAB

A 35-B

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED July 1, 1984

A 35-B

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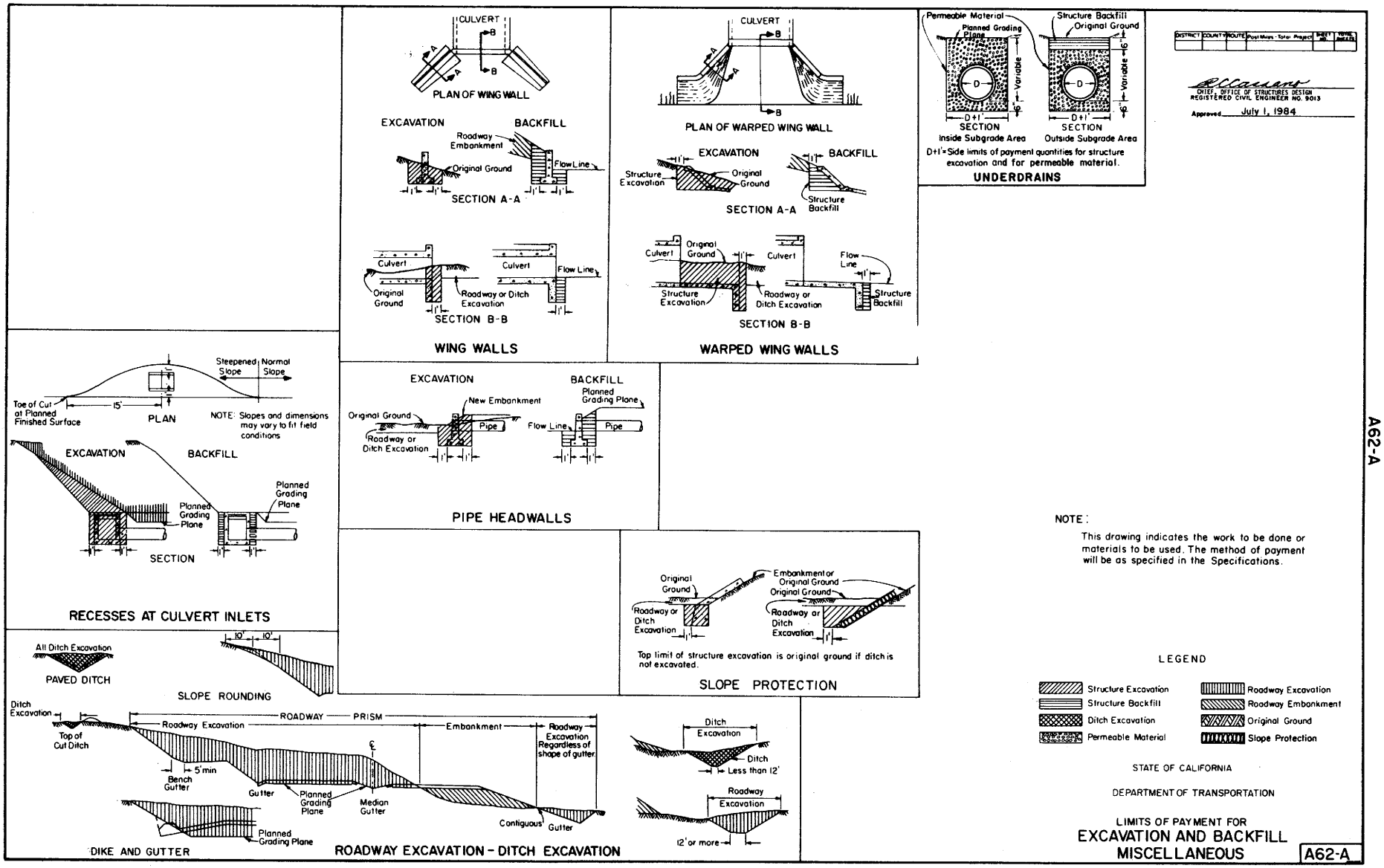

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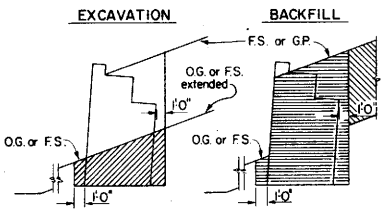
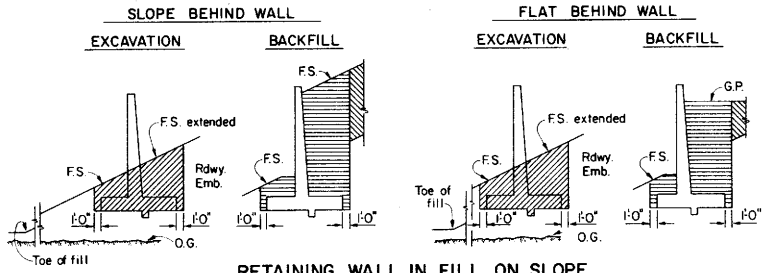
DIST	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

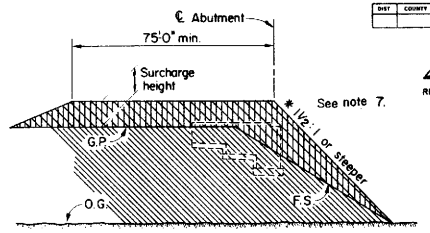
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013
APPROVED July 1, 1984



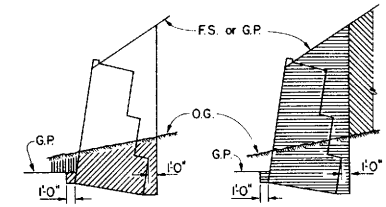
CRIB WALL, ON SLOPE



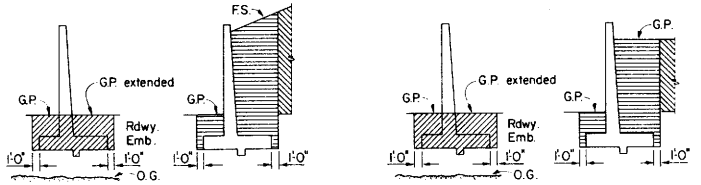
RETAINING WALL IN FILL, ON SLOPE



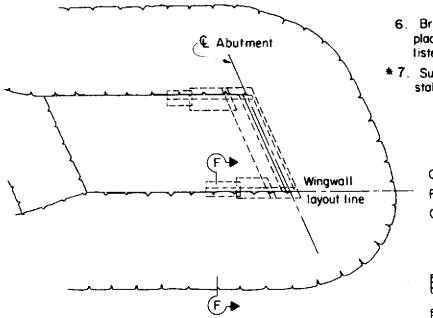
ELEVATION



REINFORCED CONCRETE or TIMBER CRIB WALL



RETAINING WALL IN FILL



PLAN

SURCHARGE NOTES

6. Bridge embankment surcharges to be placed at locations and to the heights listed in the special provisions.

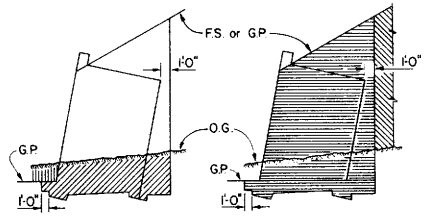
* 7. Surcharge slopes to be as steep as stability of material permits.

ABBREVIATIONS

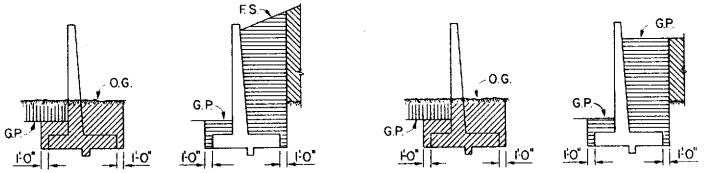
O.G. Original Ground
F.S. Planned Finished Surface
G.P. Planned Grading Plane

LEGEND

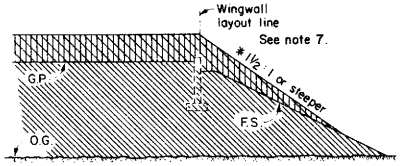
Structure Excavation
Structure Backfill
Roadway Excavation
Roadway Embankment
Bridge Embankment Surcharge



METAL CRIB WALL



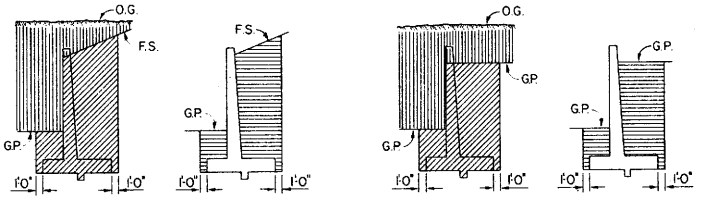
RETAINING WALL IN FILL & CUT



SECTION F-F
BRIDGE EMBANKMENT SURCHARGE

GENERAL NOTES:

1. Roadway embankment is not delineated on excavation drawings for clarity.
2. Embankment, if any, must be in place before structure excavation is made.
3. If no roadway or ditch excavation or embankment is involved at the wall, structure excavation will be measured from the original ground.
4. No deduction for cribwall member volumes is made from structure backfill quantities.
5. When an embankment settlement period is required, the upper limits of structure excavation are raised to conform to the elevation of the embankment after the settlement period or, when an embankment surcharge is used to the finished surface and grading plane elevations.



RETAINING WALL IN CUT

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

LIMITS OF PAYMENT FOR
EXCAVATION AND BACKFILL
BRIDGE SURCHARGE AND WALL

A62-B

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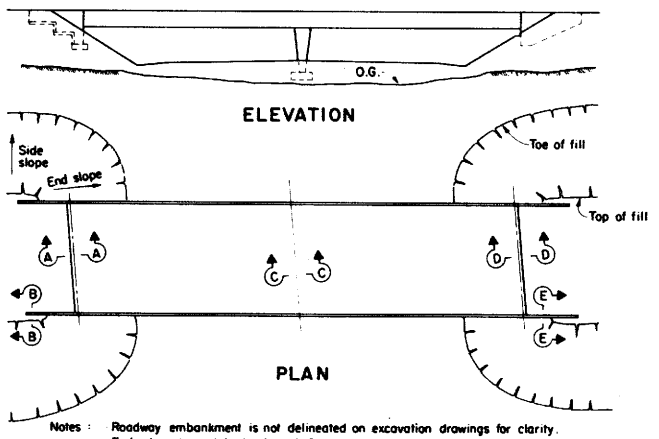
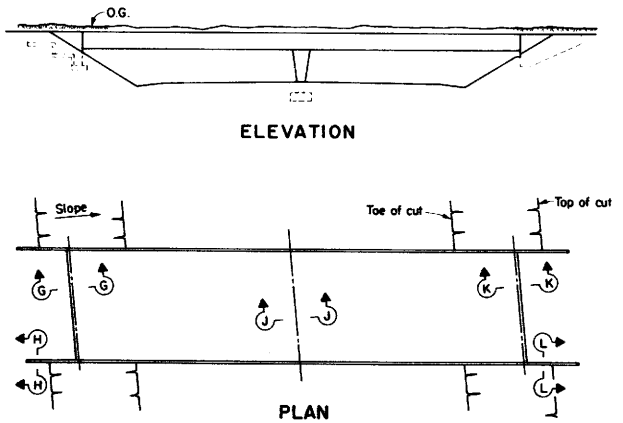
IN FILL



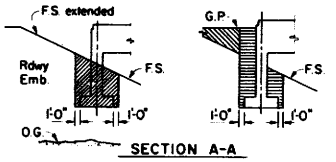
Notes : Roadway embankment is not delineated on excavation drawings for clarity. Embankment must be in place before structure excavation is made.

IN CUT

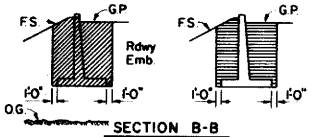


Note : If no roadway excavation is involved at bridge, structure excavation is measured from original ground.

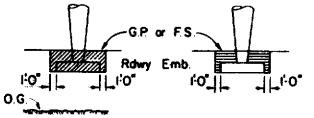
EXCAVATION — BACKFILL



SECTION A-A

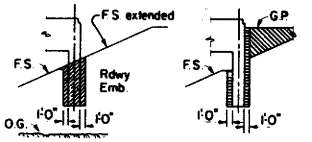


SECTION B-B

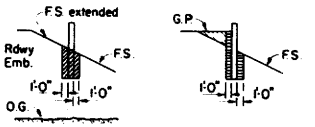


SECTION C-C

EXCAVATION — BACKFILL

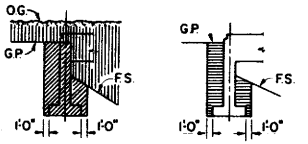


SECTION D-D

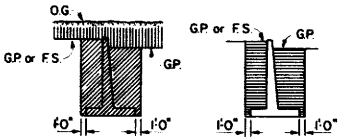


SECTION E-E

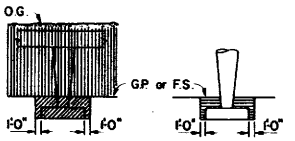
EXCAVATION — BACKFILL



SECTION G-G

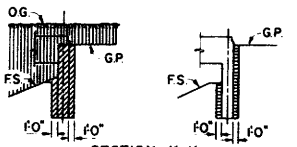


SECTION H-H

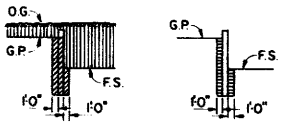


SECTION J-J

EXCAVATION — BACKFILL



SECTION K-K



SECTION L-L

ABBREVIATIONS

O.G. Original Ground
F.S. Planned Finished Surface
G.P. Planned Grading Plane

LEGEND

- Structure Excavation
- Structure Backfill
- Roadway Excavation
- Roadway Embankment

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 8013
APPROVED July 1, 1984

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

LIMITS OF PAYMENT FOR
EXCAVATION AND BACKFILL
BRIDGE

A62-C

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Dist.	County	Route	Post Mile Abbr. Order	Sheet No.	Total Sheets

CHIEF, OFFICE OF STRUCTURES DESIGN
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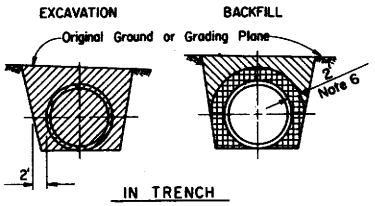
DATE APPROVED July 1, 1984



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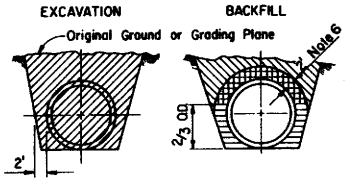

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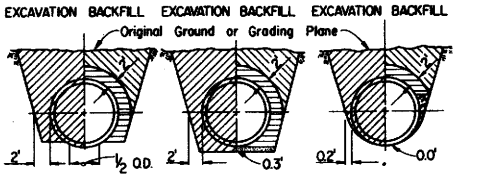
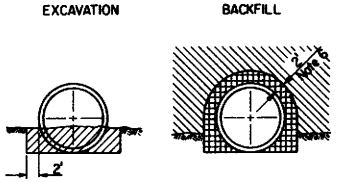
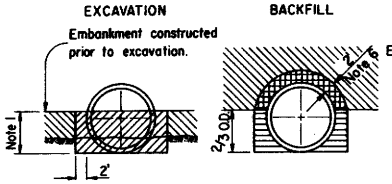


SHAPED BEDDING SAND BEDDING SOIL CEMENT BEDDING

IN TRENCH



IN EMBANKMENT



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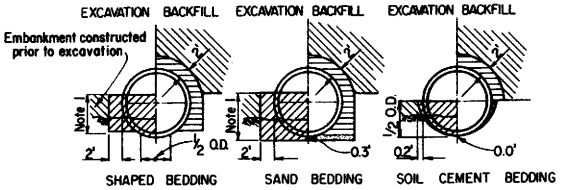


SHAPED BEDDING SAND BEDDING SOIL CEMENT BEDDING

IN EMBANKMENT

MINIMUM ALLOWABLE CLASSES OF RCP FOR METHOD 1

Cover (in feet)	Minimum Class & D-Load
Less than 6.0	Class II 1000D
6.0-7.9	Class III 1350D
8.0-9.9	Class III Special 1700D
10.0-11.9	Class IV 2000D
12.0-13.9	Class IV Special 2500D
14.0-16.9	Class V 3000D
17.0-20.0	Class V Special 3600D

Notes 8 and 9

CIRCULAR REINFORCED CONCRETE PIPE

METHOD 1

Pipes with inside diameter of 78" and smaller.

MINIMUM ALLOWABLE CLASSES OF RCP FOR METHOD 2

Cover (in feet)	Minimum Class & D-Load
Less than 16.0	Class II 1000D
16.0-19.9	Class III 1350D
20.0-24.9	Class III Special 1700D
25.0-27.9	Class IV 2000D
28.0-34.9	Class IV Special 2500D
35.0-41.9	Class V 3000D
42.0-50.0	Class V Special 3600D

Notes 8 and 9

REINFORCED CONCRETE PIPE AND ASBESTOS - CEMENT PIPE

Note 5

METHOD 2

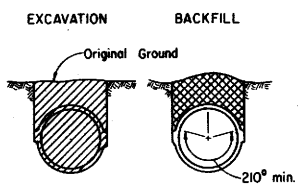
MINIMUM ALLOWABLE CLASSES OF RCP FOR METHOD 3

Cover (in feet)	Minimum Class & D-Load
Less than 26.0	Class II 1000D
26.0-31.9	Class III 1350D
32.0-37.9	Class III Special 1700D
38.0-44.9	Class IV 2000D
45.0-55.9	Class IV Special 2500D
56.0-67.9	Class V 3000D
68.0-80.0	Class V Special 3600D

Notes 7, 8 and 9

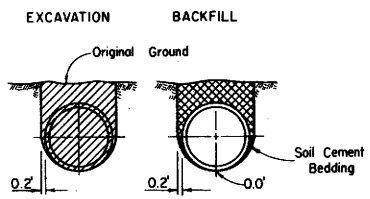
CIRCULAR REINFORCED CONCRETE PIPE

METHOD 3



IN TRENCH ONLY

CAST-IN-PLACE CONCRETE PIPE



IN TRENCH ONLY

NON-REINFORCED PRECAST CONCRETE PIPE

LEGEND

- Structure Excavation (Culvert)
- Structure Backfill (Culvert) 95% relative compaction
- Structure Backfill (Culvert) 90% relative compaction
- Sand Bedding
- Loose Backfill
- Soil Cement Bedding
- Roadway Embankment
- Original Ground

O.D. = Outside diameter for circular pipes, and maximum vertical outside dimension for other shapes.

R.C.P. = Reinforced concrete pipe.

NOTES

1. 30" minimum up to 45" O.D., then 2/3 O.D., but no more than 60" required.
2. Slope or shore excavation sides as necessary.
3. Backfill shall be placed full width of excavation, except where dimension is shown for backfill width or thickness.
4. Dimensions shown are minimum.
5. Reinforced concrete pipe refers to circular reinforced concrete pipe, oval shaped reinforced concrete pipe and reinforced concrete pipe arch. Oval shaped and arch shaped reinforced concrete pipe and asbestos-cement pipe to be placed by Method 2 only.
6. When top of pipe is within 4 1/2' of finished grade, embankment compaction required will govern over culvert backfill 90% relative compaction.
7. The type of bedding shall be at the Contractor's option, but the bedding selected shall be the same throughout the length of any given culvert.
8. "Cover" is defined as the maximum vertical distance from top of pipe to finished grade within the length of any given culvert.
9. Unless otherwise shown on the plans or specified in the special provisions, the class of pipe and the method (1, 2 or 3) for circular reinforced concrete pipe shall be at the Contractor's option, provided the cover, as listed elsewhere in the plans, falls within the limits given for the method selected and the class of pipe furnished.
   Examples:
   - 24" RCP culvert with a maximun cover of 19'
     Class V Special or stronger with Method 1.
     Class III or stronger with Method 2.
     Class II or stronger with Method 3.
   - 36" RCP culvert with a maximum cover of 27'
     Class IV or stronger with Method 2.
     Class III or stronger with Method 3.
     (Method 1 is not allowed with cover over 20')

   The class of pipe and method (1, 2 or 3) selected shall be the same throughout the length of any given culvert.
10. The "length of any given culvert" is defined as the culvert between:
    a. successive drainage structures (inlets, junction boxes, headwalls, etc.) or
    b. a drainage structure and the inlet or outlet end of the culvert, or
    c. the inlet and outlet end of the culvert when there are no intervening drainage structures.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

EXCAVATION AND BACKFILL DETAILS CONCRETE AND ASBESTOS-CEMENT PIPE CULVERTS

A62-D

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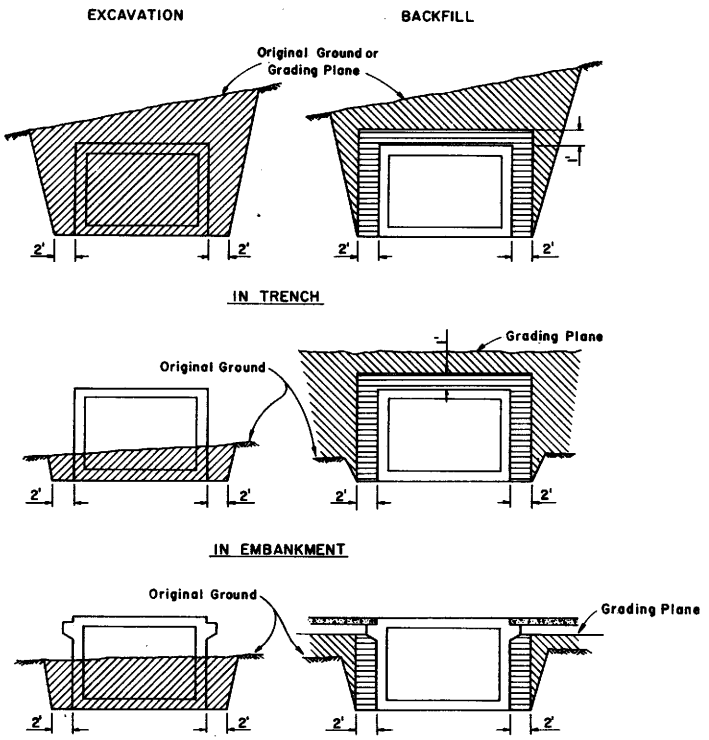
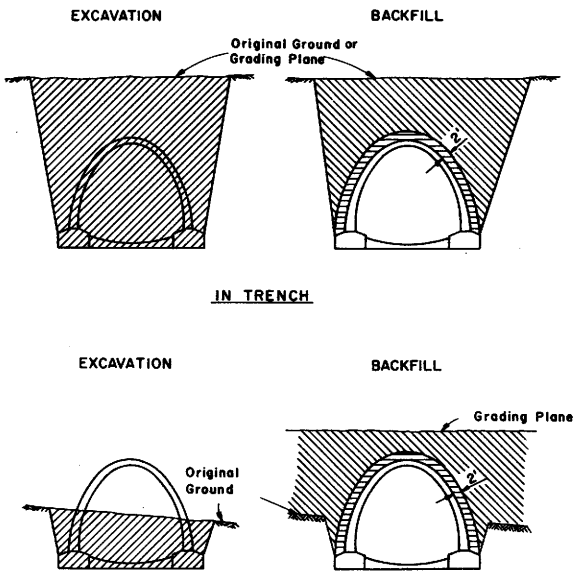
Dist.	County	Route	Post Mile Total Project	Sheet No.	Total Sheets

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1984



REINFORCED CONCRETE BOX CULVERT



REINFORCED CONCRETE ARCH CULVERT

NOTES

1. Slope or shore excavation sides as necessary.
2. Dimensions shown are minimum.

LEGEND

- Structure Excavation (Culvert)
- Structure Backfill (Culvert) 95% relative compaction
- Roadway Embankment
- Original Ground

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

EXCAVATION AND BACKFILL DETAILS REINFORCED CONCRETE BOX AND ARCH CULVERTS

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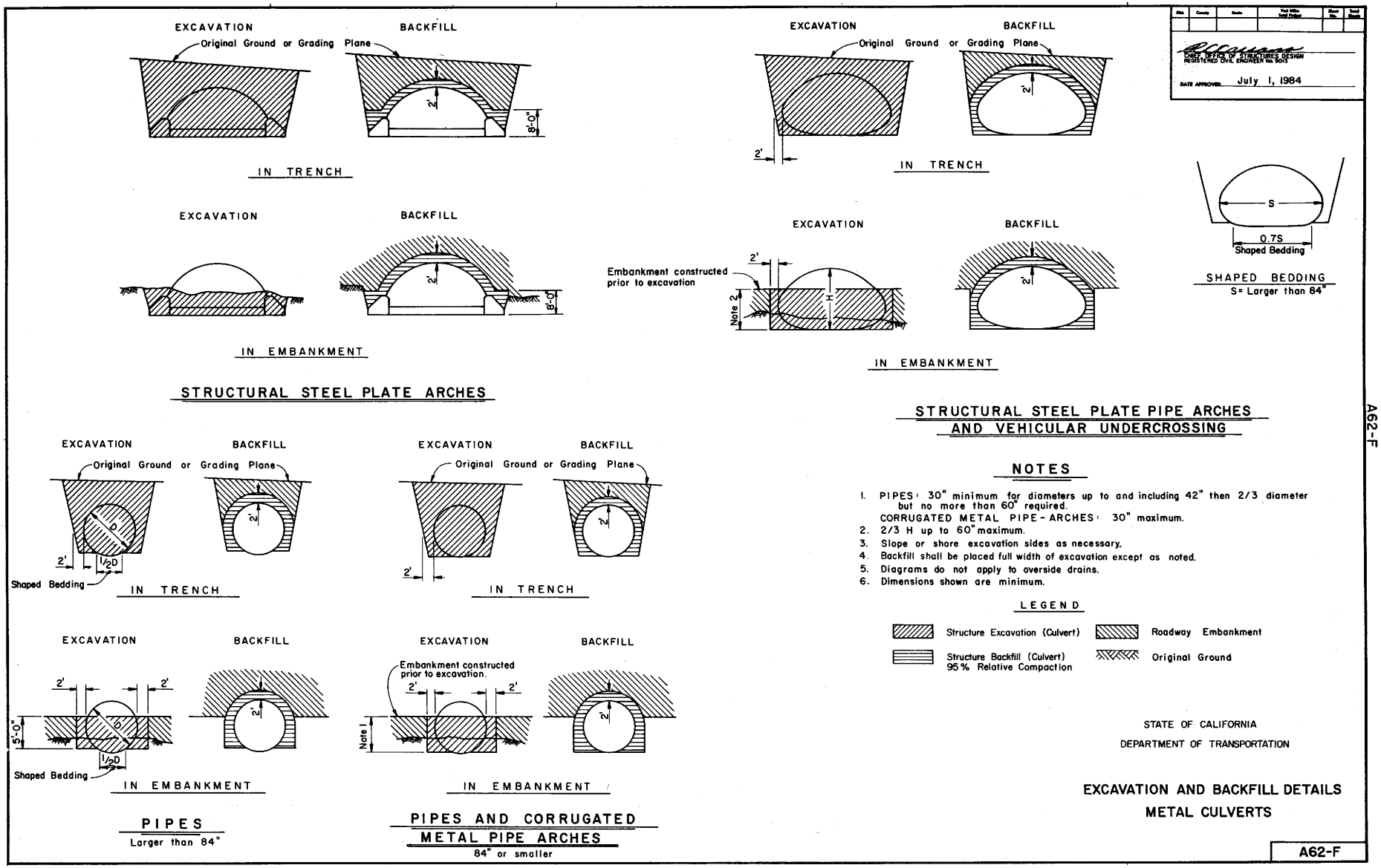

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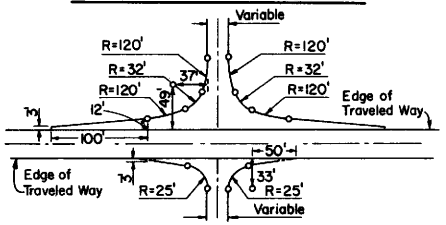
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

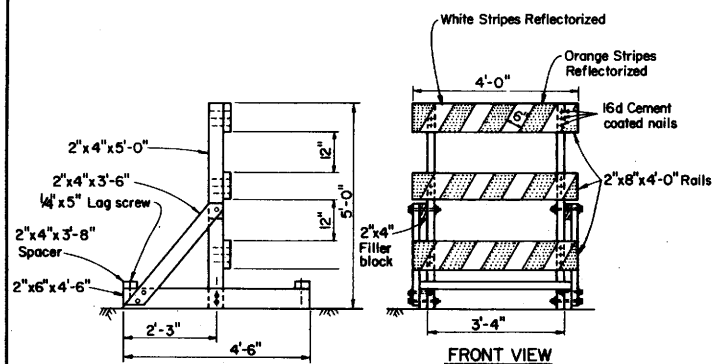
C O Bartell
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995
DATE July 1, 1984

PUBLIC ROAD INTERSECTION



PRIVATE ROAD INTERSECTION

NOTE: Plans for barricades made of wood are shown. Barricades may be made of any combination of wood, metal, or plastic as approved by the Engineer.

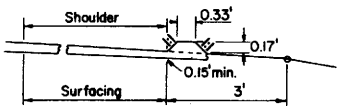


END VIEW

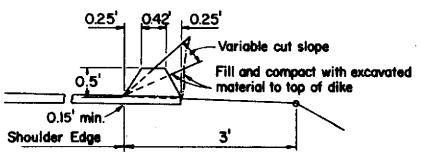
FRONT VIEW

TYPE III BARRICADE

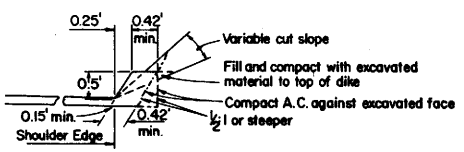
NOTE: Rails facing traffic to be reflectorized.
Where weight needed to resist overturning by wind use sand filled bags.
All timber to be S4S. All dimensions are nominal lumber dimensions.
Use 3/8" Machine bolts with nuts and cut washers.
Use 16d Cement coated nails for fastening 2"x8" horizontal board to 2"x4" vertical posts.
Use 1/4"x5" Lag screws for fastening 2"x4" spacer to 2"x6" bottom support.



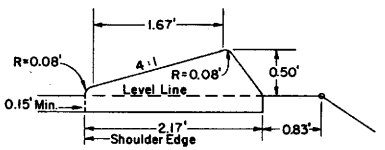
TYPE C (LOW DIKE)



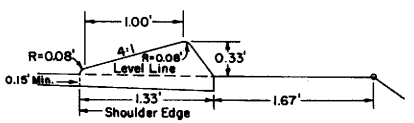
TYPE A (HIGH DIKE)



TYPE B (HIGH DIKE)



TYPE D (MOUNTABLE DIKE)



TYPE E (MOUNTABLE DIKE)

ASPHALT CONCRETE DIKES

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TYPE III BARRICADE
DIKES AND ROAD INTERSECTIONS

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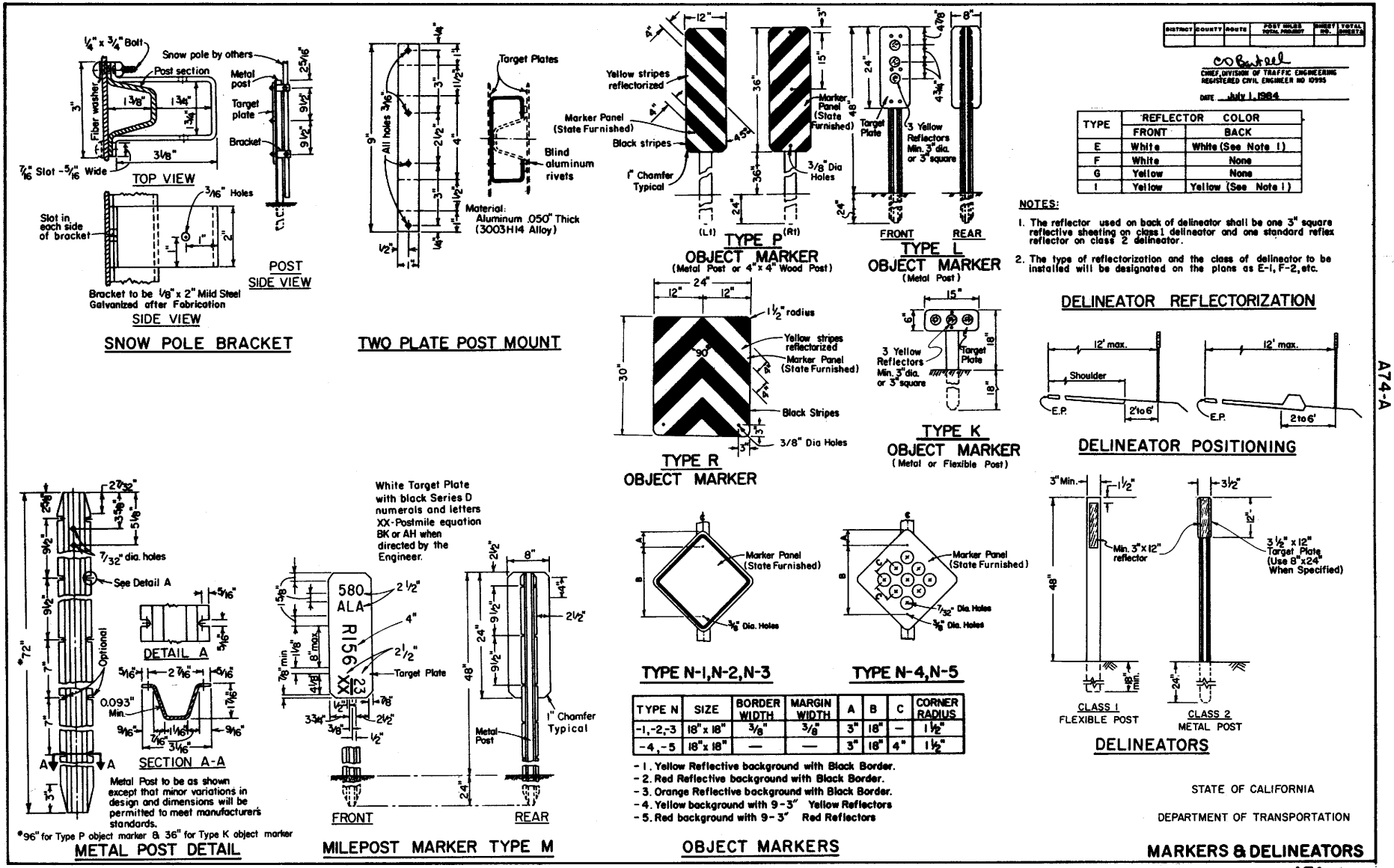

TYPE	REFLECTOR COLOR	
	FRONT	BACK
E	White	White (See Note 1)
F	White	None
G	Yellow	None
I	Yellow	Yellow (See Note 1)

NOTES:

1. The reflector used on back of delineator shall be one 3" square reflective sheeting on class 1 delineator and one standard reflex reflector on class 2 delineator.
2. The type of reflectorization and the class of delineator to be installed will be designated on the plans as E-1, F-2, etc.

TYPE N	SIZE	BORDER WIDTH	MARGIN WIDTH	A	B	C	CORNER RADIUS
-1,-2,-3	18" x 18"	3/8"	3/8"	3"	18"	—	1 1/2"
-4,-5	18" x 18"	—	—	3"	18"	4"	1 1/2"

- 1. Yellow Reflective background with Black Border.
- 2. Red Reflective background with Black Border.
- 3. Orange Reflective background with Black Border.
- 4. Yellow background with 9-3" Yellow Reflectors
- 5. Red background with 9-3" Red Reflectors

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

CHIEF, DIVISION OF TRAFFIC ENGINEERING
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STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

MARKERS & DELINEATORS

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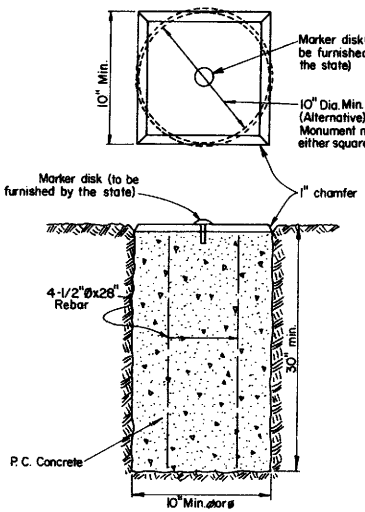
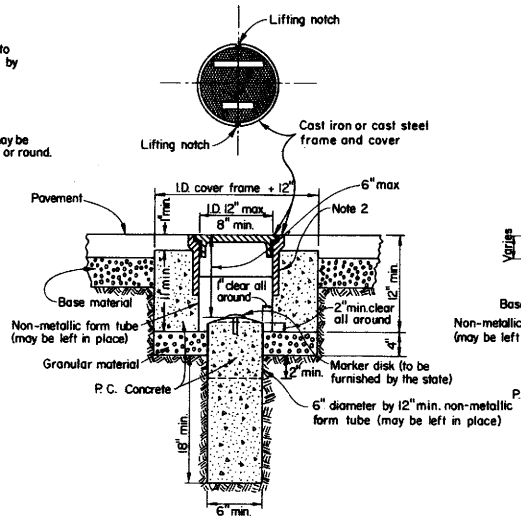
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, DIVISION OF ENGINEERING SERVICES
REGISTERED CIVIL ENGINEER NO. 9567

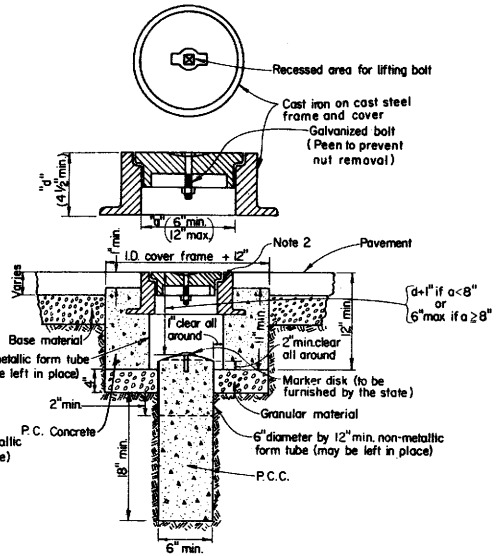
DATE July 1, 1984



TYPE A



TYPE D
(Alternative No. 1)



TYPE D
(Alternative No. 2)

NOTES:

1. The configuration of the cast iron or cast steel frame and cover may vary from that shown.
2. Frame shall be embedded in concrete a minimum of 3".
3. Type D monument shall be either alternative No. 1 or alternative No. 2 at the contractors option.
4. All Portland Cement Concrete shall be Class "B" or "Minor" with 1" maximum aggregate.

STATE OF CALIFORNIA
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SURVEY MONUMENTS

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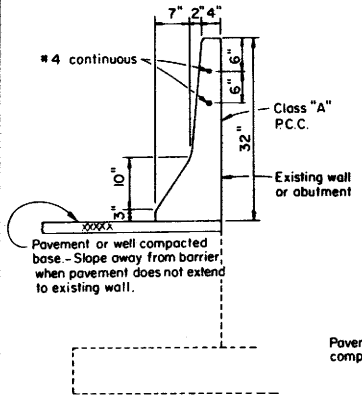
DISTRICT	COUNTY	ROUTE	Plot Miles - Total Project	SHEET NO.	TOTAL SHEETS

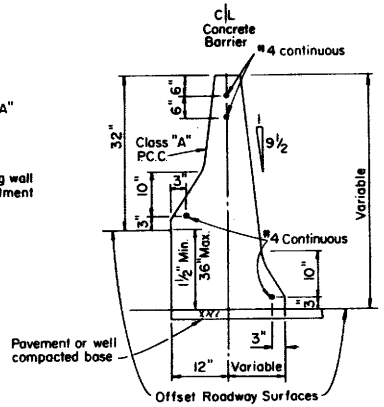
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

DATE July 1, 1984



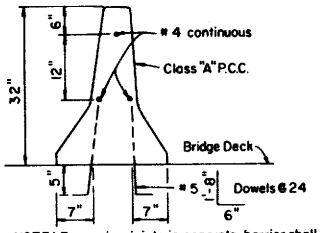
CONCRETE BARRIER
(TYPE 50D)

(Details similar to Type 50 except as noted)



CONCRETE BARRIER
(TYPE 50C)

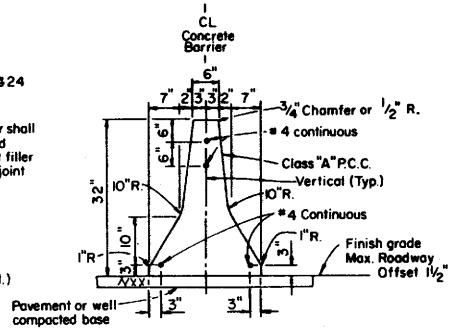
(Details similar to Type 50 except as noted. Barrier End Anchor when necessary.)



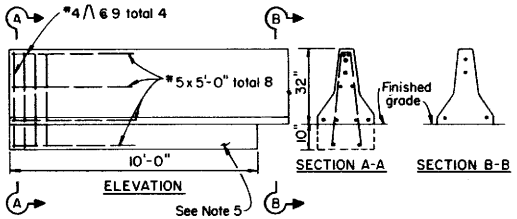
NOTE: Expansion joints in concrete barrier shall be located at all deck, pavement and principal wall joints. Expansion joint filler material shall be the same size as joint or ½" minimum.

CONCRETE BARRIER
(TYPE 50A)

(Details similar to Type 50 except as noted.)

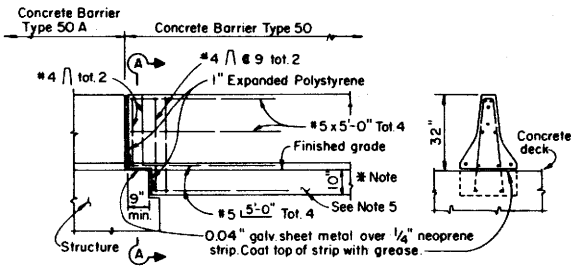


CONCRETE BARRIER
(TYPE 50)



BARRIER END ANCHOR

For Transition to other barriers
See Standard Plan A81



CONNECTION TO STRUCTURE

* Note- 10" Barrier footing extends 10' back from structure.

GENERAL NOTES

1. See Standard Plans A75-B for Transition at Bridge Column or Sign Pedestal, Type 50E Barrier, Glare Screen Attachment Details and A77-B for additional Headlight Glare Screen Details.
2. Openings into existing drainage inlets shall not extend above the 3-inch vertical face at bottom of the barrier.
3. Where the barrier is added to the face of an existing concrete structure match existing weep holes.
4. Contractor may submit alternative details for Engineer's approval.
5. Footing Monolithic or doweled with 2- #8x0'-8" @ 24. Required at barrier ends and at any interruptions in barrier.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CONCRETE BARRIER TYPE 50 | A75-A

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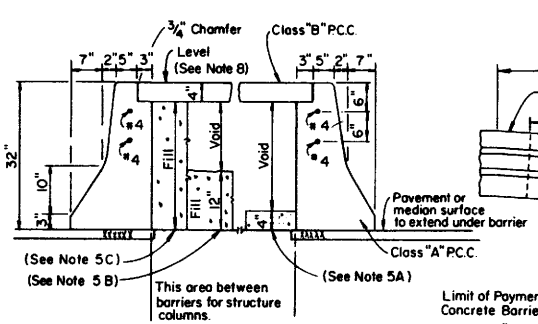
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

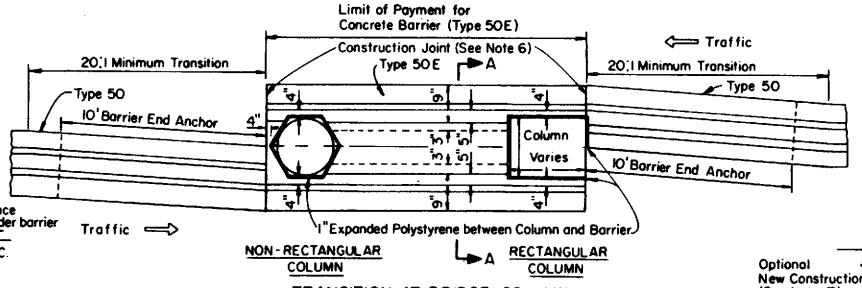
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995

DATE July 1, 1984

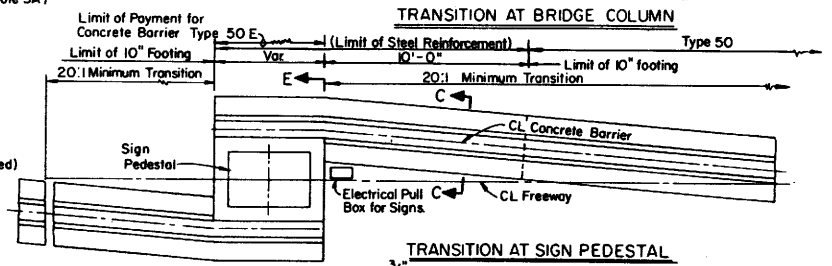


CONCRETE BARRIER
SECTION A-A
(TYPE 50E)

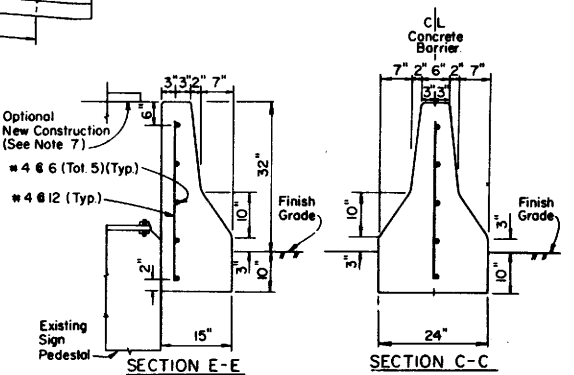
(Details similar to Type 50 except as noted)



TRANSITION AT BRIDGE COLUMN

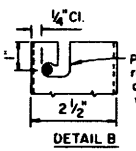


TRANSITION AT SIGN PEDESTAL

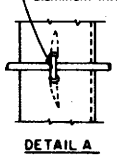


GENERAL NOTES

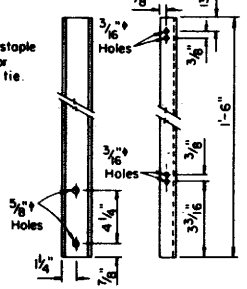
1. Omit expanded mesh panel at approximately 600' intervals. Vary spacing to provide an opening at each structure crossing over highway.
2. See Standard Plan A77-B for additional Headlight Glare Screen Details.
3. See Standard Plan A75-A for Concrete Barrier Type 50.
4. 5/16" Plate to conform to A.S.T.M. A36 Specifications.
5. Contractor Options for fill between barrier walls:
   A. Place 4" Class "B" P.C.C. at base between barrier walls.
   B. Place 12" of granular material at base between walls.
   C. Place granular material from base to bottom of 4" cap.
   Forming material for 4" cap may remain in place.
6. Reinforcing Steel shall extend continuous through construction joints.
7. See "Overhead Sign" Plans for Sign Pedestal Elevations on New Construction.
8. Adjust height of barrier on low side of Offset or Superelevated Roadways to provide level grade across top of Type 50E Barrier.



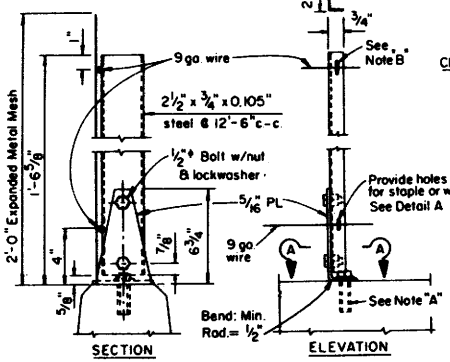
DETAIL B

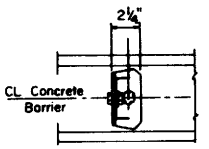


DETAIL A

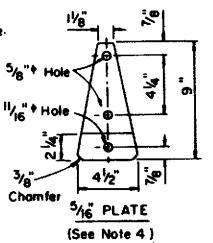


GLARE SCREEN POST DETAILS





SECTION A-A



5/16" PLATE
(See Note 4)

NOTE "A" 5/8" expansion anchorage device. Hole depth and diameter to be determined by manufacturer's specification

NOTE "B" Detail B may be used in place of Detail A.

GLARE SCREEN ATTACHMENT DETAILS - CONCRETE BARRIER TYPE 50

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DEPARTMENT OF TRANSPORTATION

CONCRETE BARRIER TYPE 50 | A75-B

A75-B

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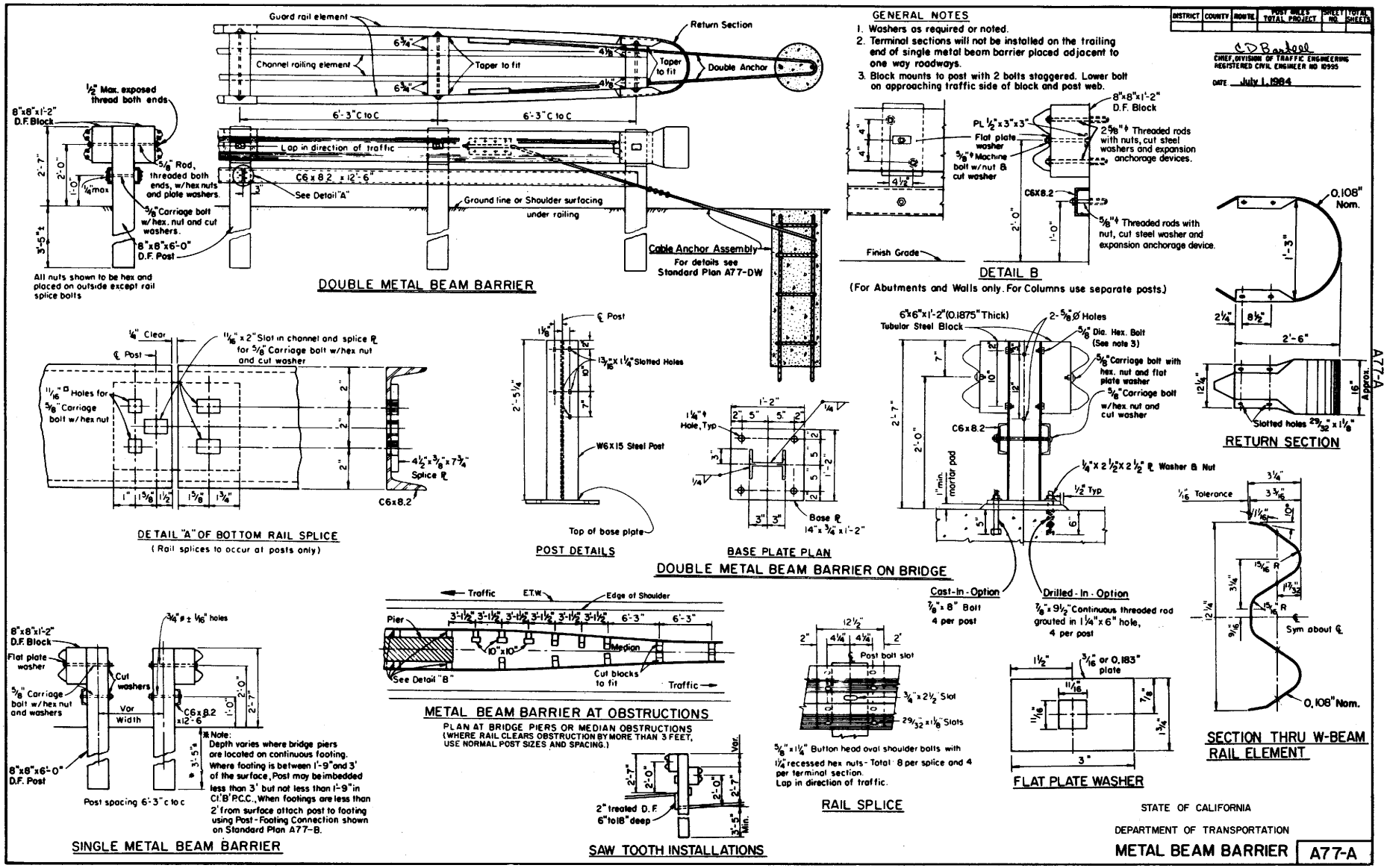
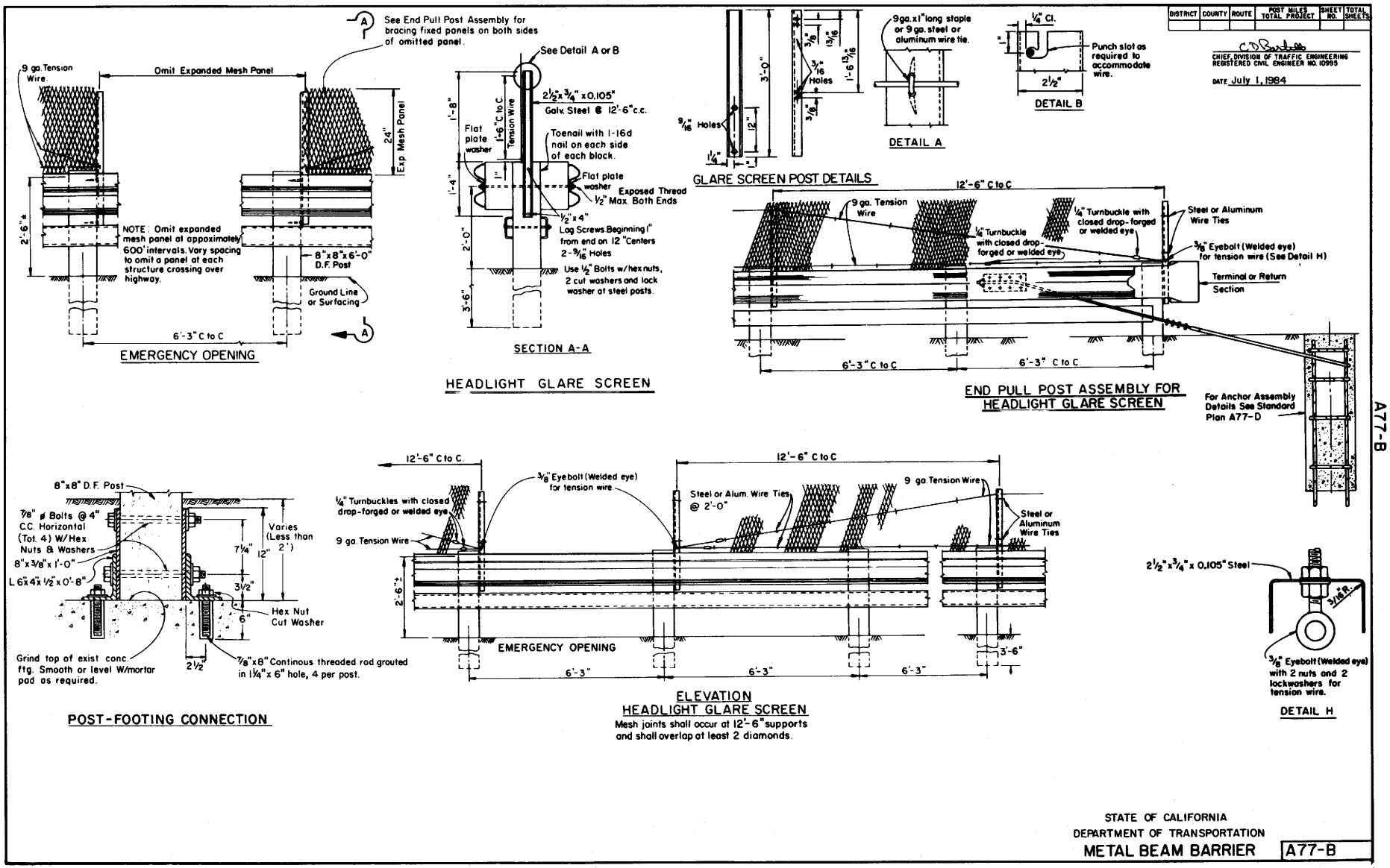


Return to Table of Contents



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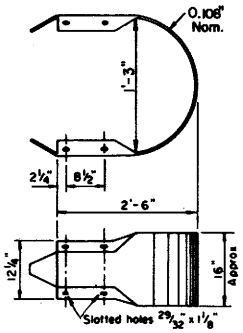

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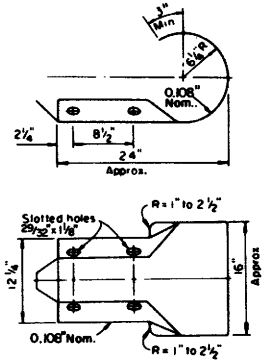
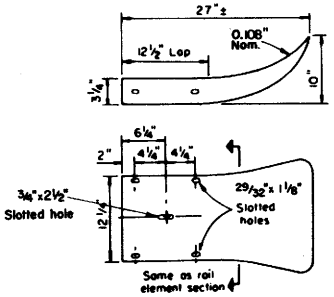


TERMINAL SECTION
TYPE "A"



TERMINAL SECTION
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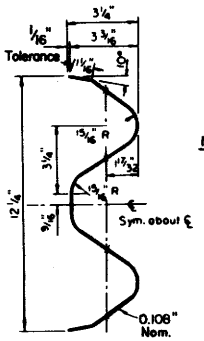


SECTION THRU
W-BEAM
RAIL ELEMENT

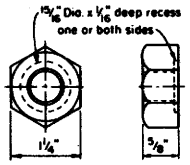
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

C.D. Beard
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10993

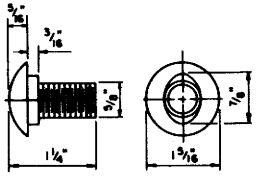
DATE July 1, 1984

NOTES:

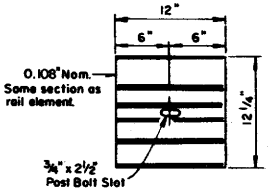
1. All holes in wood posts and blocks shall be 3/4" ø ± 1/16.
2. All holes in steel posts and blocks shall be 13/16" ø maximum.
3. Contractor may submit alternative steel post details for Engineer's approval.
4. Terminal sections will not be installed on the trailing end of guard rail placed adjacent to one-way roadways.



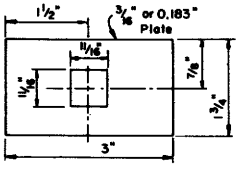
5/8" ø RECESS NUT



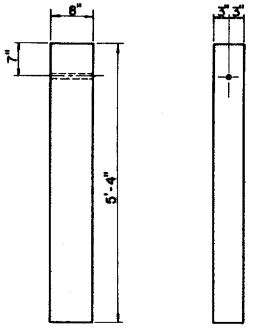
5/8" ø BUTTON HEAD BOLT



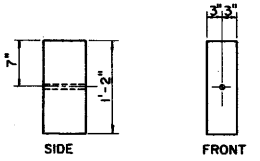
BACK-UP PLATE
(For use between guard rail and steel block of posts between rail splices.)



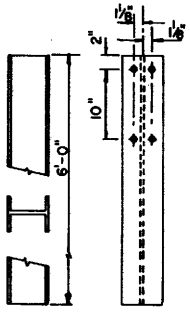
FLAT PLATE WASHER



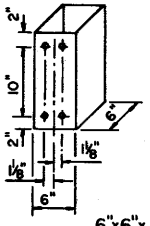
D.F. POST



D.F. BLOCK



W6X15 STEEL POST



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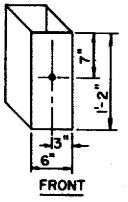
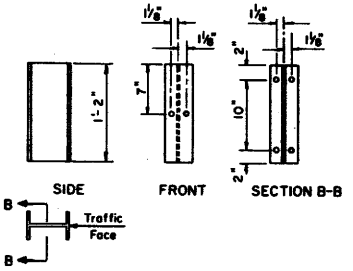
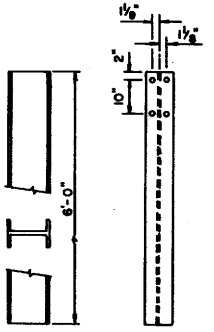


FRONT

6"x6"x1'-2"(0.1875" thick)
TUBULAR STEEL BLOCK



W6X8.5 OR W6X9 STEEL BLOCK



W6X8.5 OR W6X9
STEEL POST

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STANDARD HARDWARE
METAL BEAM GUARD RAILING | A77C-1

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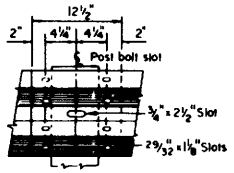
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

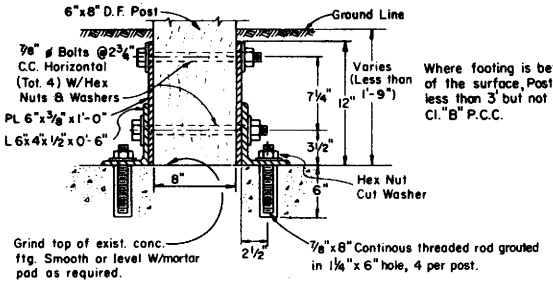
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

DATE July 1, 1984



⅝" x 1¼" Button head oval shoulder bolts with 1¼" recessed hex nuts - Total 8 per splice and 4 per terminal section
Lap in direction of traffic.

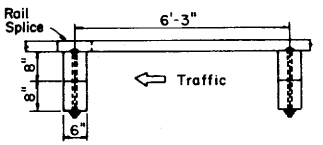
RAIL SPLICE



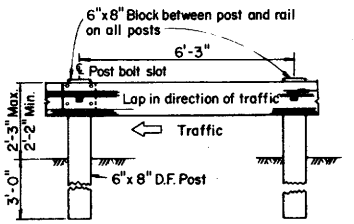
Where footing is between 1'-9" and 3' of the surface, Post may be imbedded less than 3' but not less than 1'-9" in Cl."B" P.C.C.

NOTE: Use 6"x8"x Var. D.F. Post with this detail in lieu of W6x8.5 or W6x9 Steel Post where spread footing is encountered. details.

POST-FOOTING CONNECTION

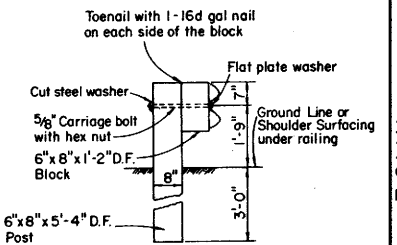


PLAN

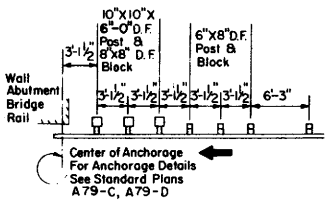


ELEVATION

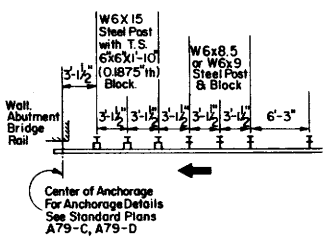
METAL BEAM GUARD RAIL WITH WOOD POSTS



Post spacing 6'-3" C to C.

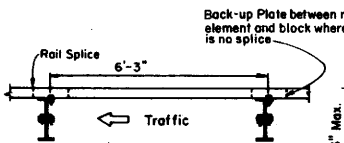


WOOD POSTS

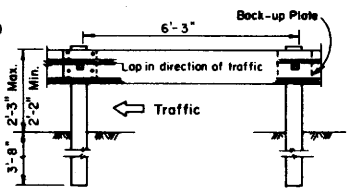


STEEL POSTS

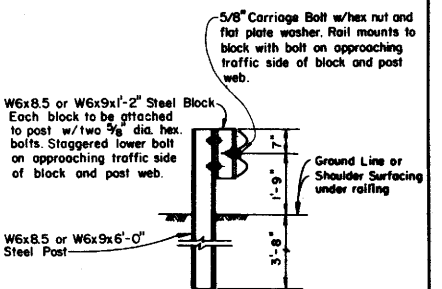
TRANSITIONS



PLAN



ELEVATION



Post spacing 6'-3" C to C

METAL BEAM GUARD RAIL WITH W6X8.5 OR W6X9 STEEL POSTS AND BLOCKS

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METAL BEAM GUARD RAILING | A77C-2

A77C-2

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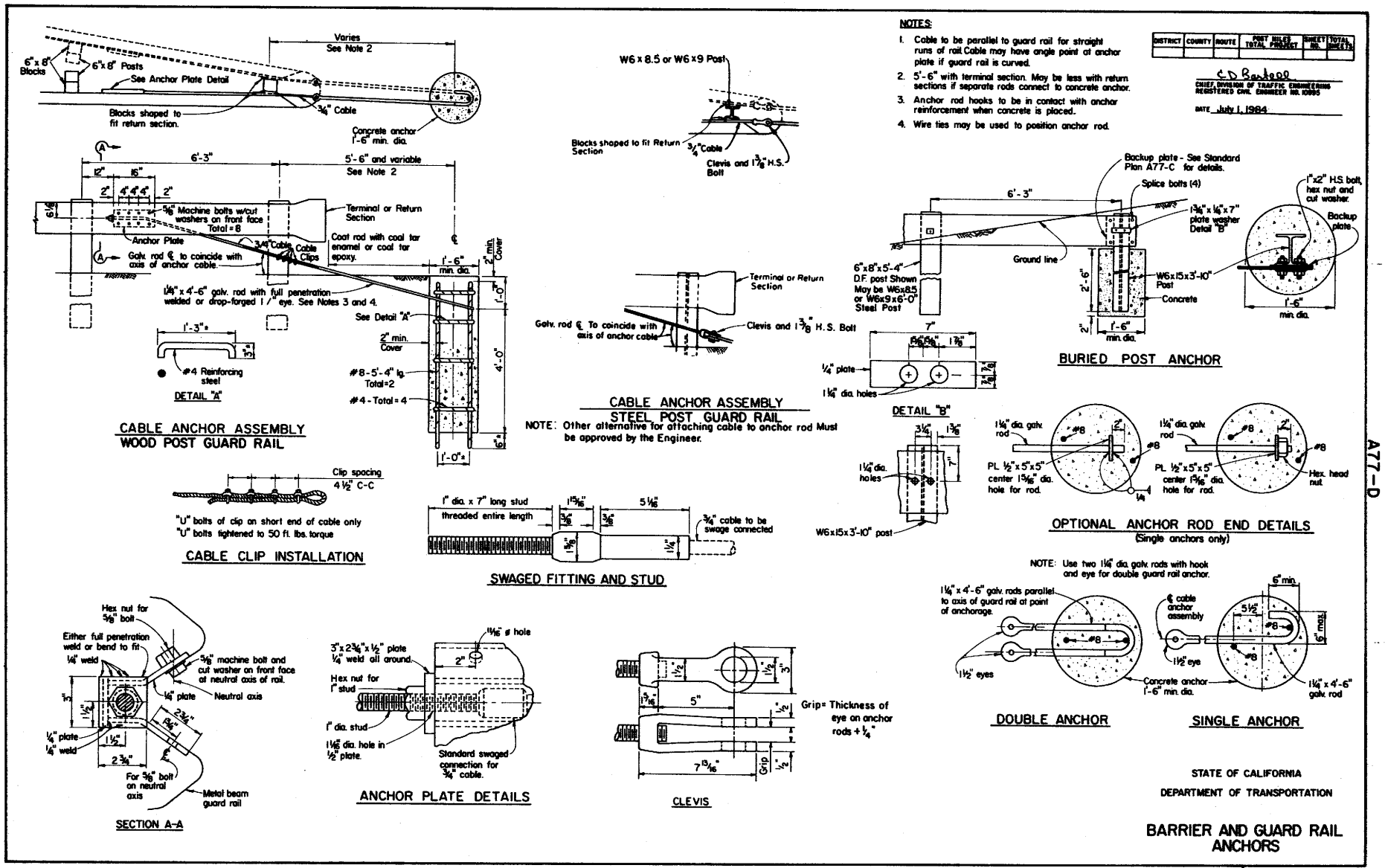

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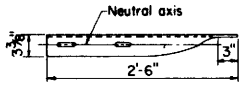
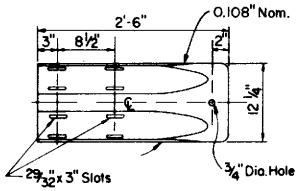
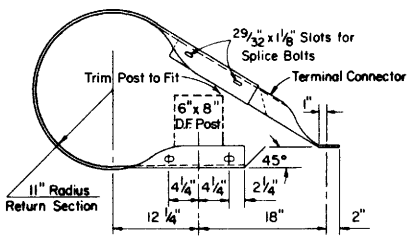
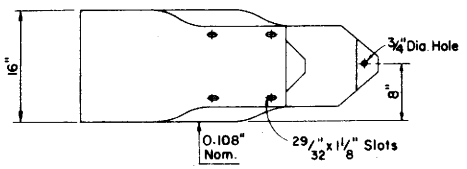




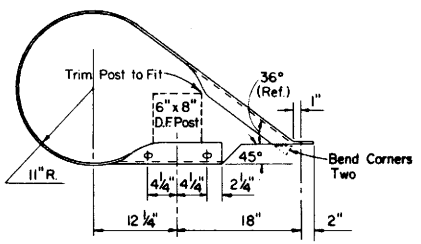
TERMINAL CONNECTOR



OPTIONAL DESIGN TERMINAL SECTION

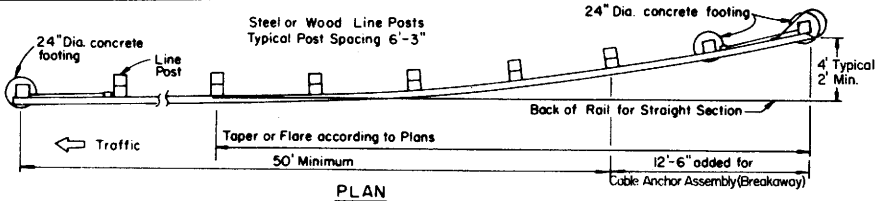


TERMINAL SECTION-ELEVATION

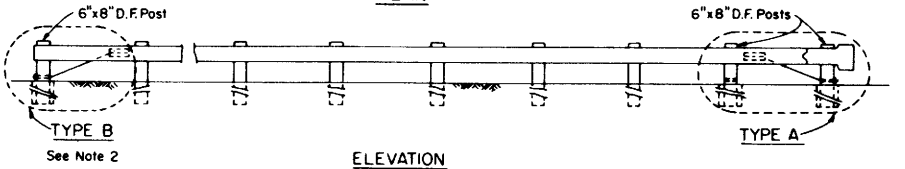


TERMINAL SECTION TYPE C

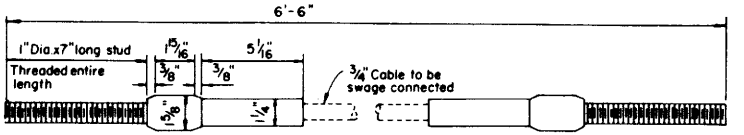
DETAIL A



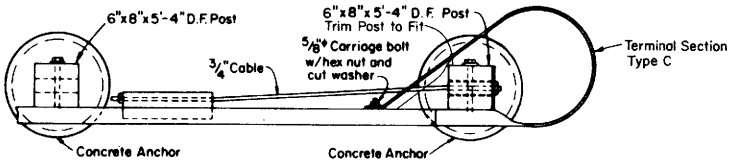
PLAN

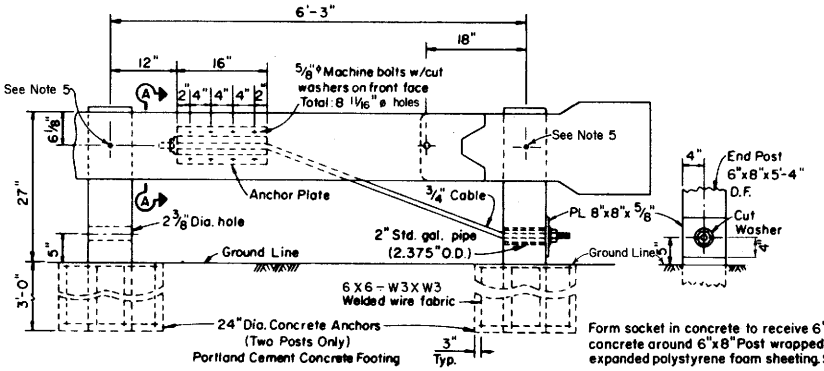


ELEVATION

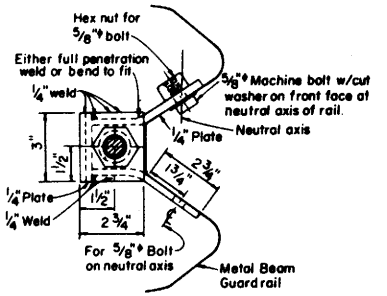


SWAGED FITTING AND STUD

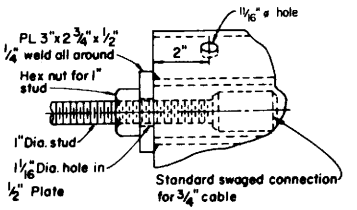




Form socket in concrete to receive 6"x8" Post or place concrete around 6"x8" Post wrapped with 1 layer of 1/2" thick expanded polystyrene foam sheeting. See Note 6



SECTION A-A



ANCHOR PLATE DETAILS

NOTES

1. Used with Steel or Wood Post Guardrail.
2. For Trailing end of guardrail adjacent to one-way roadway omit Terminal Section. Next to last post to be a Line Post.
3. For details not shown see Standard Plans.
4. Posts to be centered in concrete footing.
5. Omit washer under head of rail mounting bolt for Type A & Type B anchor posts only.
6. Do not nail polystyrene foam to post.

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

C.D. Sanborn
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

DATE July 1, 1984

STATE OF CALIFORNIA
DEPARTMENT OF CALIFORNIA

CABLE ANCHOR ASSEMBLY (BREAKAWAY)

A77-E

A77-E

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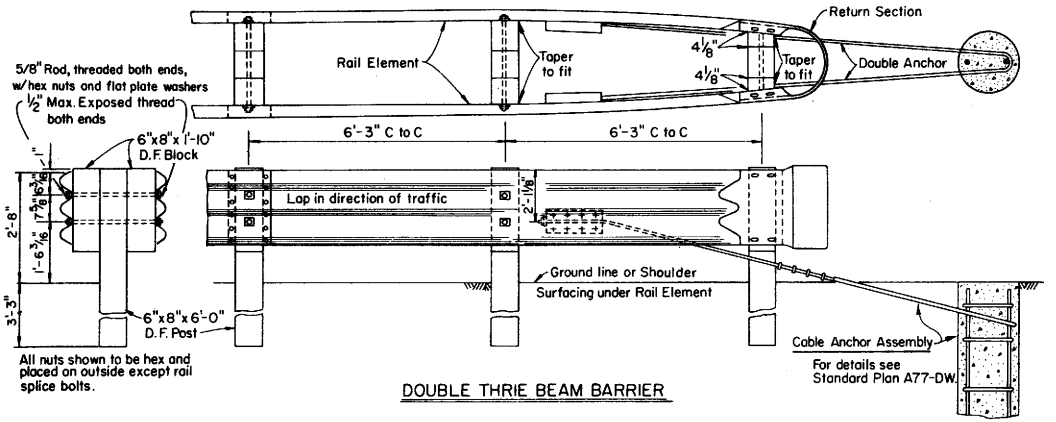
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

C.D. Bartoo
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10998
DATE July 1, 1984

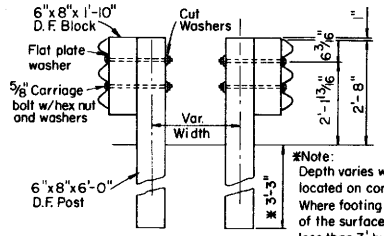
GENERAL NOTES

1. Washers as required or noted.
2. Terminal sections will not be installed on the trailing end of single THRIE BEAM barrier placed adjacent to one way roadways.
3. Rail mounting holes in steel posts and blocks to be 13/16"ϕ maximum. Holes in wood posts and blocks to be 3/4"ϕ ± 1/16".



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

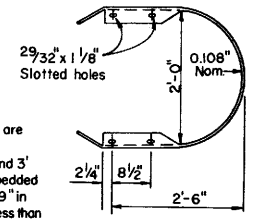
DOUBLE THRIE BEAM BARRIER



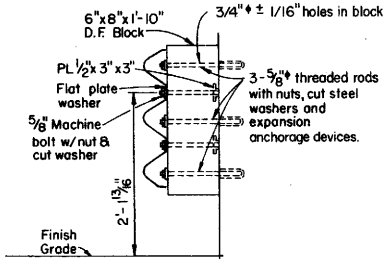
Post spacing 6'-3" c.to c.

*Note: Depth varies where bridge piers are located on continuous footing. Where footing is between 1'-9" and 3' of the surface, Post may be imbedded less than 3' but not less than 1'-9" in Cl. 'B' P.C.C. When footings are less than 2' from surface attach post to footing using Post-Footing Connection shown on Standard Plan A77-B.

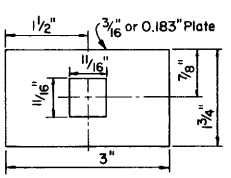
SINGLE THRIE BEAM BARRIER



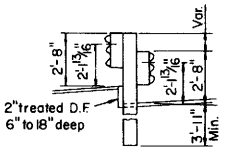
RETURN SECTION



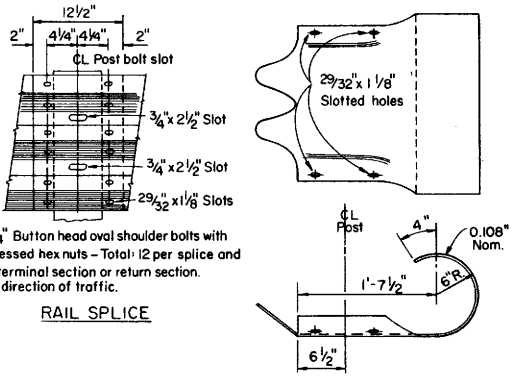
DETAIL B
For Abutments and Walls only
Not for Columns



FLAT PLATE WASHER



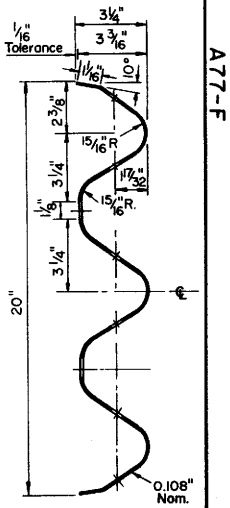
SAW TOOTH INSTALLATIONS
Steel Posts Only



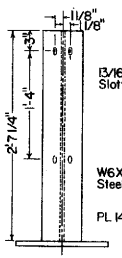
5/8"x 1 1/4" Button head oval shoulder bolts with 1 1/4" recessed hex nuts – Total: 12 per splice and 4 per terminal section or return section. Lap in direction of traffic.

RAIL SPLICE

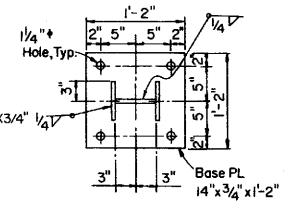
TERMINAL SECTION



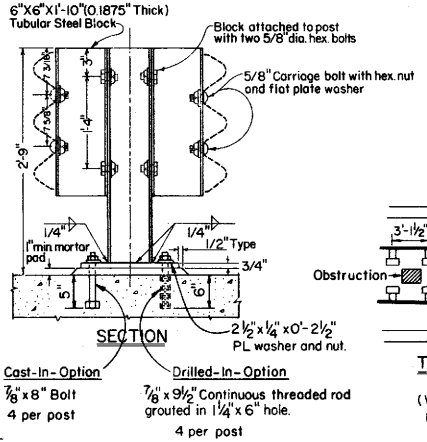
SECTION THRU RAIL ELEMENT



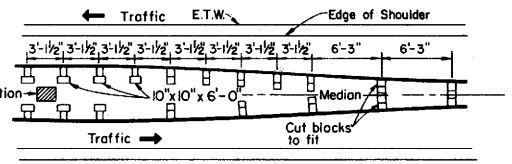
POST DETAILS



BASE PLATE PLAN



DOUBLE THRIE BEAM BARRIER ON BRIDGE



THRIE BEAM BARRIER AT OBSTRUCTIONS
PLAN AT MEDIAN OBSTRUCTIONS
(Where rail clears obstruction by more than 3 feet, use normal post size and spacing.)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

THRIE BEAM BARRIER

A77-F

A77-F

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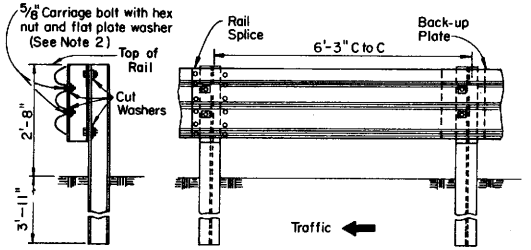
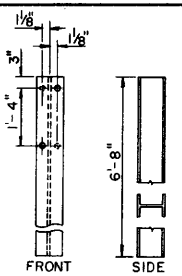
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CD Bart 2008
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995
DATE July 1, 1984

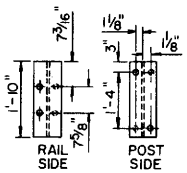


Block attached to post with two 5/8" dia. hex bolts (See Note 3)

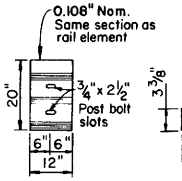
SINGLE THRIE BEAM BARRIER
(WITH W6x8.5 OR W6x9 STEEL POSTS and BLOCK)



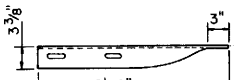
W6x8.5, W6x9 OR W6x15 STEEL POST

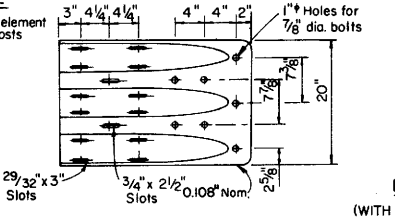


W6x8.5 OR W6x9 STEEL BLOCK

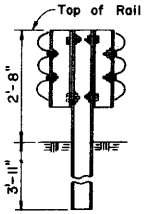


BACK-UP PLATE
For use between rail element and steel block at posts between splices.





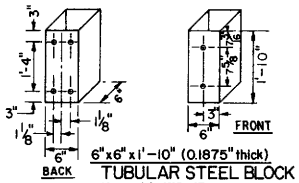
TERMINAL CONNECTOR



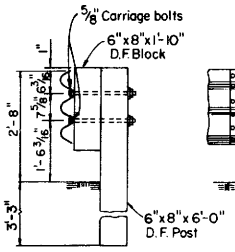
DOUBLE THRIE BEAM BARRIER
(WITH W6x8.5 OR W6x9 STEEL POSTS and BLOCKS)

NOTES:

1. All holes in steel posts and blocks shall be 13/16" ϕ
2. Rail mounts to block with bolt on approaching traffic side of block and post web.
3. Block mounts to post with 2 bolts staggered. Lower bolt on approaching traffic side of block and post web.
4. For End Anchorage see Standard Plans A77-D, A79-C, A79-D.
5. Terminal sections will not be installed on the trailing end of guard rail placed adjacent to one-way roadways.
6. Contractor may submit alternative POST details for Engineer's approval.

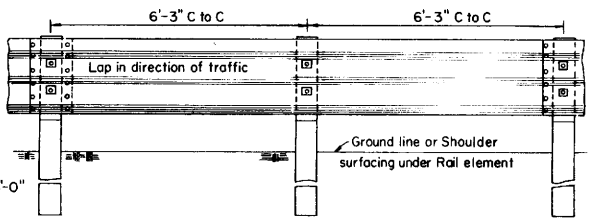


6"x6"x1'-10" (0.1875" thick)
TUBULAR STEEL BLOCK
Use with W6x15 post

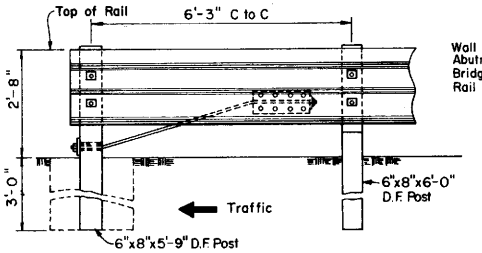


All nuts shown to be hex and placed on outside except rail splice bolts.

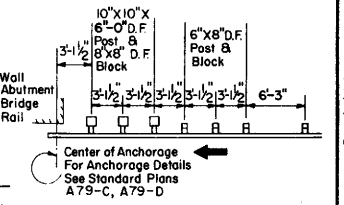
Hole placement same for 10"x10"x6'-0" D.F. Post



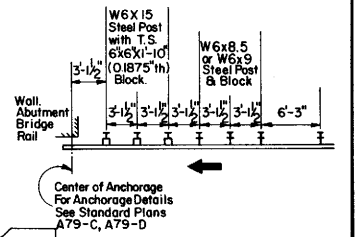
SINGLE THRIE BEAM BARRIER
(WITH 6"x8" D.F. POSTS and BLOCKS)



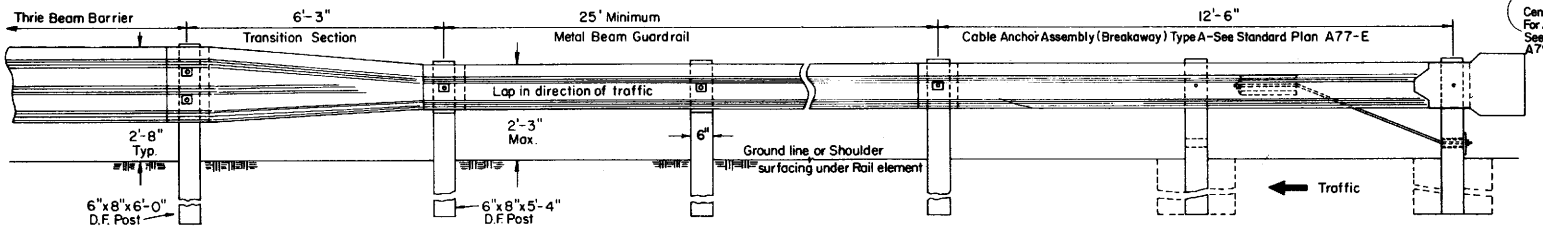
TRAILING END ANCHOR
(For Details See Standard Plan A77-E Cable Anchor Assembly-Breakaway-Type B)
(For One-Way Roadways)



WOOD POSTS



STEEL POSTS



APPROACH END ANCHOR

TRANSITIONS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

THRIE BEAM BARRIER

A77-G

A77-G

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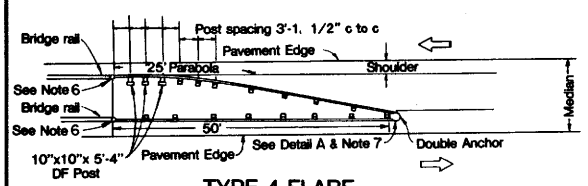
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS

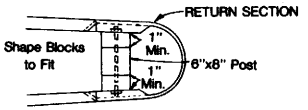
GENERAL NOTES

1. All post and blocks to be as shown on Standard Plan A77C-1.
2. All guard rail post spacing to be 6'-3" center to center except as noted.
3. Height of rail 27" typical above ground and parallel to grade of shoulder.
4. Where clearance shown cannot be obtained use Transition Detail Std. Plan A79-B.
5. Direction of traffic indicated by arrow.
6. For connection details see Standard Plan A79-C or A79-D.
7. For anchor details see Standard Plan A77-D.
8. 6"x8" D.F. posts and blocks shown. W6"x8.5" or W6"x9" steel posts and blocks may be specified where applicable. 10"x10" D.F. posts and 8"x8" D.F. block shown. W6x15 steel posts and T.S. 6"x6" x1'-2" (0.1875" thick) blocks may be specified where applicable. (See Standard Plan A77C-1.
9. Terminal Sections will not be installed on trailing end of guard rail placed adjacent to one way roadways.
10. Parabola portion of Type I Flare used at approach end of embankment guard rail.

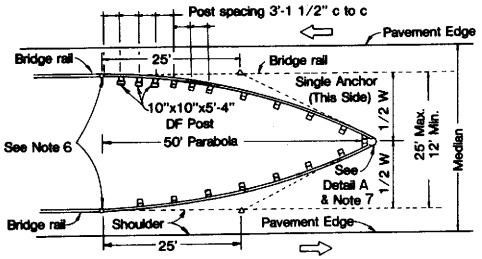
C D Bertroll
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10986
DATE July 1, 1984



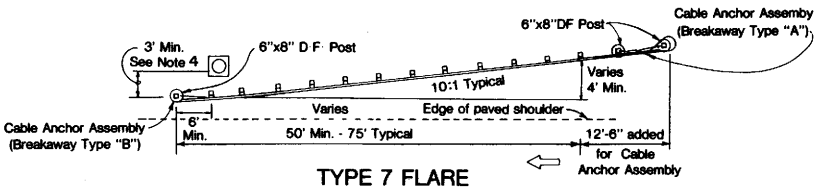
TYPE 4 FLARE



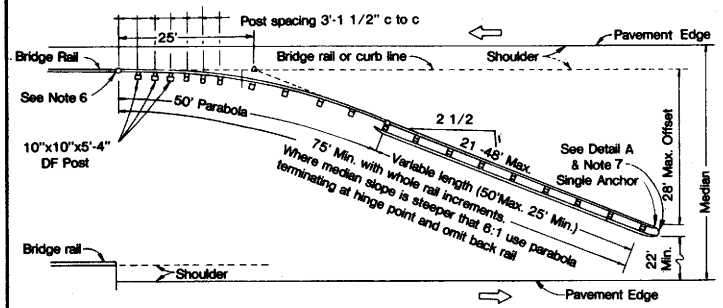
DETAIL A



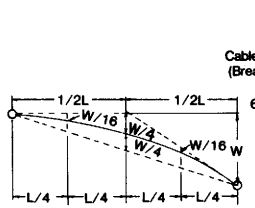
TYPE 3 FLARE



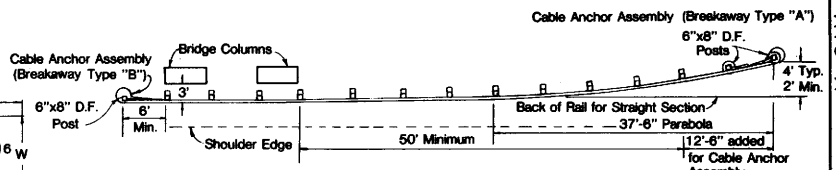
TYPE 7 FLARE



TYPE 2 FLARE

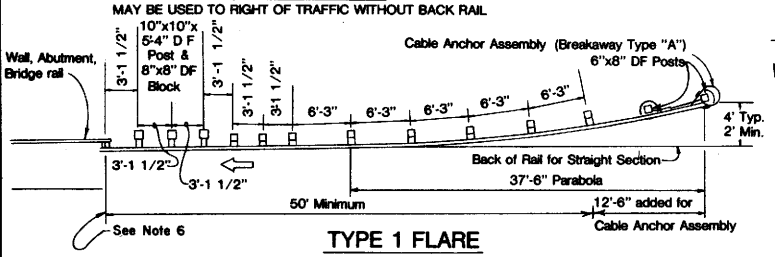


TYPICAL PARABOLIC LAYOUT

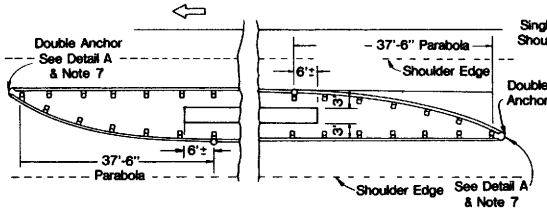


TYPE 8 FLARE

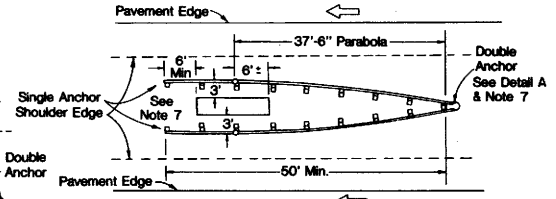
MAY BE USED TO RIGHT OF TRAFFIC WITHOUT BACK RAIL



TYPE 1 FLARE



TYPE 5 FLARE



TYPE 6 FLARE

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

GUARD RAIL FLARES

A79-A

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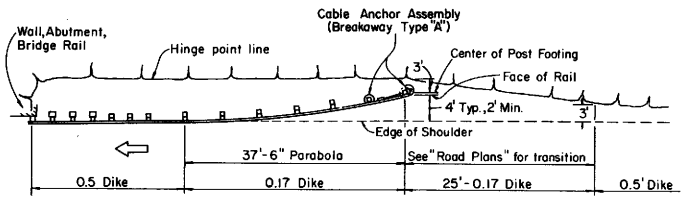
DISTRICT	COUNTY	ROUTE	Post Mileage	Total Project	SHEET NO.	TOTAL SHEETS

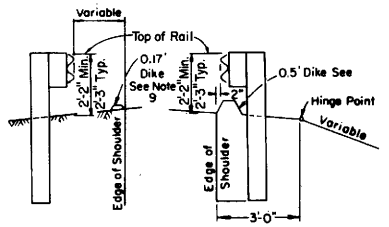
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEERING NO. 10995

DATE July 1, 1984



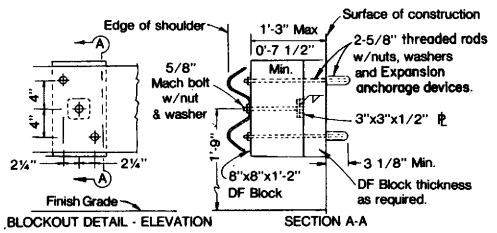
When necessary to place dike in front of guard rail, only the 0.17 high dike may be used.

EMBANKMENT WIDENING DIAGRAM



For dike details see Standard Plan A73

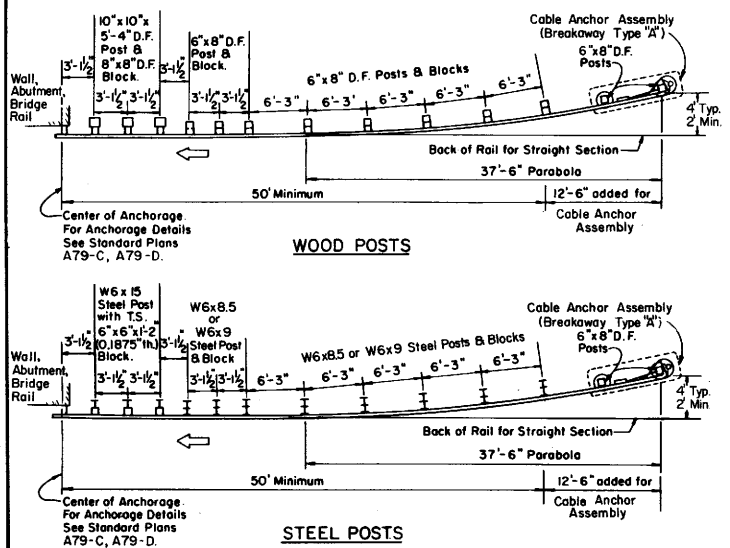
DIKE POSITIONING



Use timber shims without posts where rail to wall or abutment clearance is less than 15".

CONNECTION TO WALL OR ABUTMENT

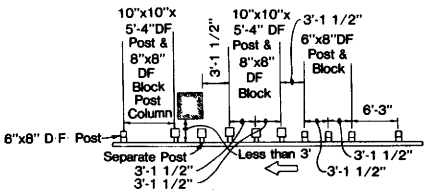
FOR COLUMNS USE SEPARATE POSTS



WOOD POSTS

STEEL POSTS

(Alternative Installations)



Use with Type 5,6,7 & 8 Flares when guard rail is less than 3' from Structure Support. For a series of columns additional 10"x10"x5'-4" D.F. Posts @ 3'-1 1/2" c.c. to be used between columns. 6"x8" D.F. Posts and Blocks shown, W6x8.5 or W6x9 Steel Posts and Blocks may be specified where applicable. 10"x10" D.F. Posts and 8"x8" D.F. Blocks shown. W6x15 Steel Posts and T.S. 6"x6"x1'-2" (0.1875" thick) Blocks may be specified where applicable. (See Std. Plan A77C-1).

TRANSITION

NOTES:

1. For guard rail details see Standard Plans A77C-1, A77C-2 and A77-D
2. Guard rail post spacing to be 6'-3" center to center unless otherwise noted.
3. Top of rail to be 27" typical above edge of road.
4. For connection details, see Standard Plan A79-C or A79-D.
5. For end anchors, see Standard Plan A77-D or A77-E.
6. Terminal sections will not be installed on the trailing end of guard rail adjacent to one way roadway.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

MISCELLANEOUS GUARD RAIL DETAILS | A79-B

A79-B

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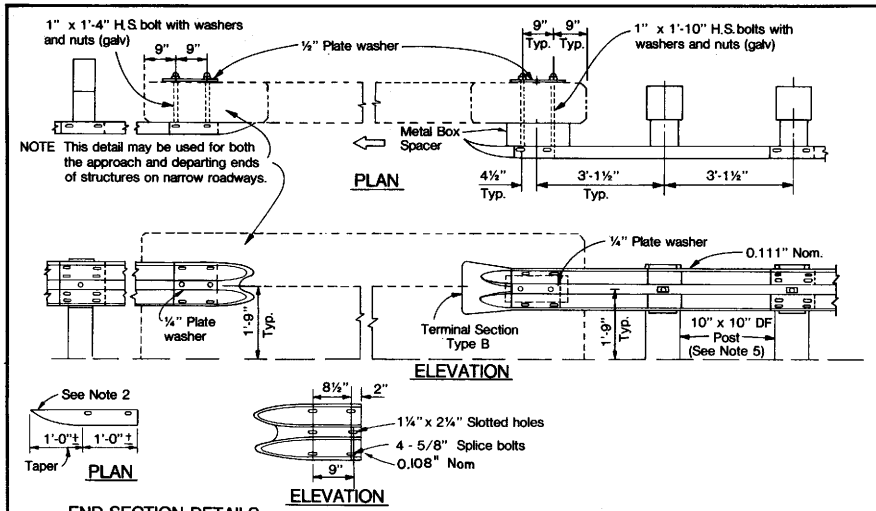
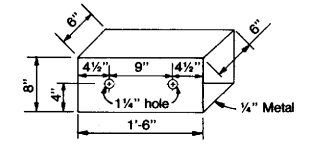
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

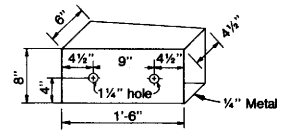
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995
DATE July 1, 1984



EXISTING STRUCTURE WITH NEW GUARD RAIL



STRAIGHT METAL BOX SPACER (See Note 6)
(Use when approach guardrail is not tapered)



TAPERED METAL BOX SPACER (See Note 6)
(Use when approach guardrail is tapered)

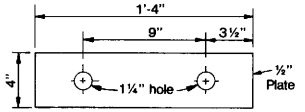


PLATE WASHER
FOR BACKSIDE OF PARAPET

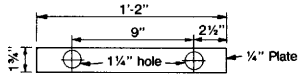
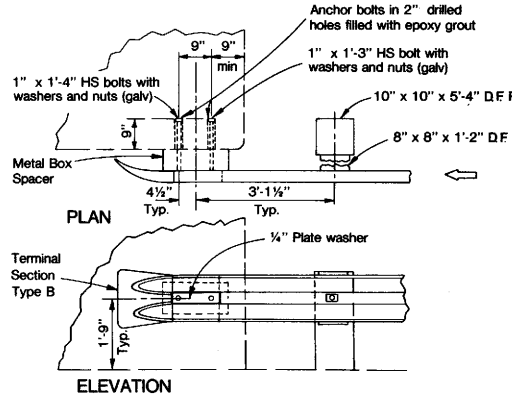
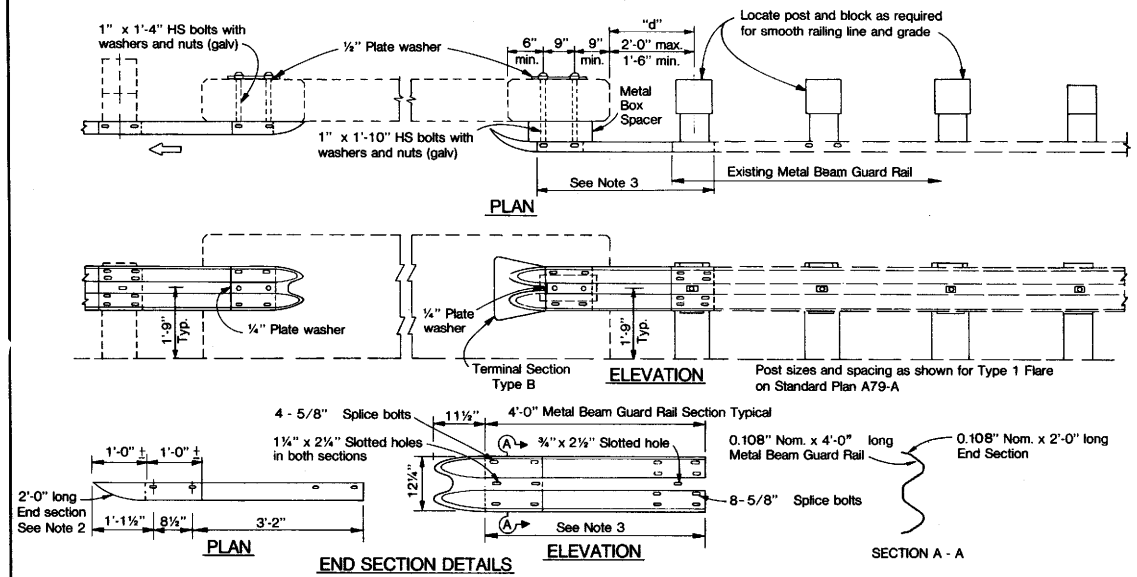


PLATE WASHER
FOR GUARD RAIL



GUARD RAIL ANCHORAGE TO WALL OR ABUTMENT FACE



EXISTING STRUCTURE AND EXISTING GUARD RAIL

GENERAL NOTES

1. These connection details apply to bridge rails, abutments and retaining walls. Do not connect guardrail to bridge columns.
2. End sections may be cut from Type B terminal section or fabricated.
3. The 4'-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 1 Flare on Standard Plan A 79-A.
6. When metal box spacer is installed, place 1¼" x 5" and 1¼" x 4" pipe spacers on 1" bolts passing through interior of tapered box and 1¼" x 5¼" pipe spacers on 1" bolts passing through interior of straight box.
7. 6" x 8" D.F. Posts and Blocks shown. W6x8.5 or W6x9 Steel Posts and Blocks may be specified where applicable. 10"x10" D.F. Posts and 8"x8" D.F. Blocks shown. W6x15 Steel Posts and T.S. 6"x6"x1'-2" (0.1875" thick) Blocks may be specified where applicable. (See Standard Plan A77C-1)
8. Terminal Sections will not be installed on trailing end of guard rail placed adjacent to one way roadways. When terminal section is not installed, use backup plate. (See Standard Plan A77C-1)

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

GUARD RAIL CONNECTIONS TO BRIDGE RAILS, RETAINING WALLS AND ABUTMENTS

A79-C

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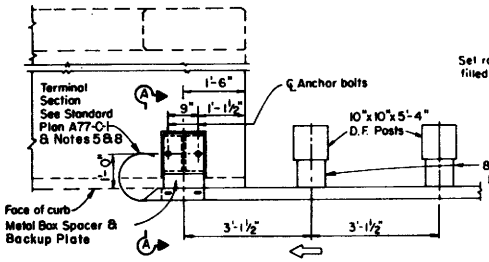
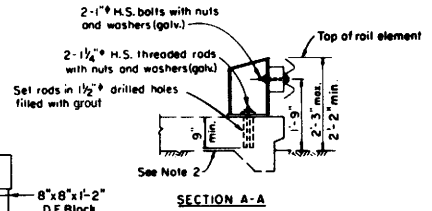
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

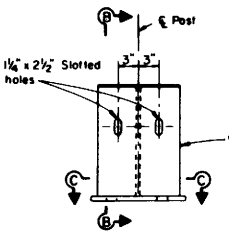
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995
DATE July 1, 1984



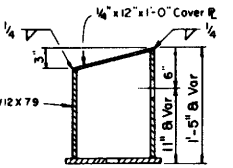
PLAN



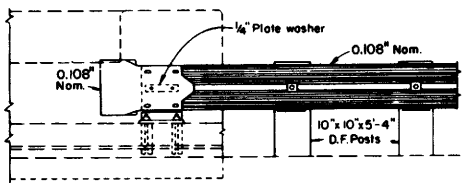
SECTION A-A



ASSEMBLY
(See Note 7)



SECTION B-B



ELEVATION

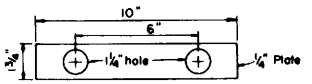
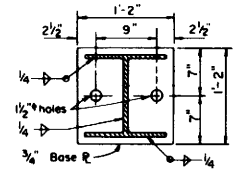


PLATE WASHER



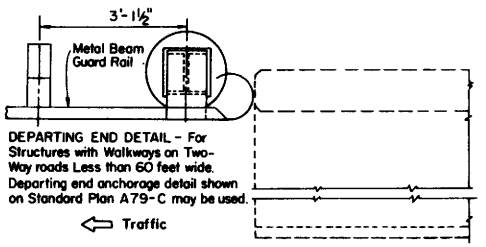
SECTION C-C

ANCHOR POST DETAILS

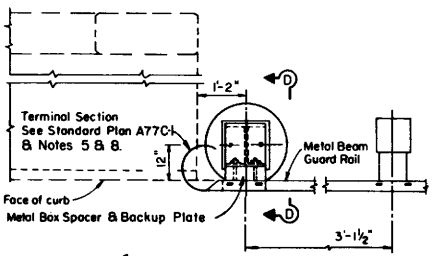
GENERAL NOTES

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 ⇨
4. For post size and spacing see Type I Flare on Standard Plan A79-A.
5. Terminal sections will not be installed on the trailing end of guard rail placed adjacent to one way roadways. When terminal section is not installed, use backup plate. (See Standard Plan A77C-1)
6. 10"x10" D.F. Posts and 8"x8" D.F. Blocks shown. W6x15 Steel Posts and T.S. 6"x6"x1'-2" (0.1875" thick) may be specified where applicable. See Standard Plan A77C-1
7. Rail post assembly to be galvanized after fabrication.
8. Terminal section Type A used where pedestrian traffic is present.

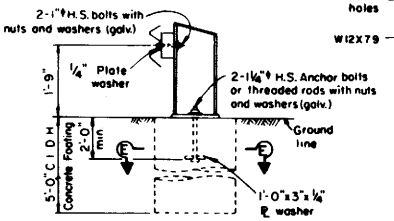
DETAIL A



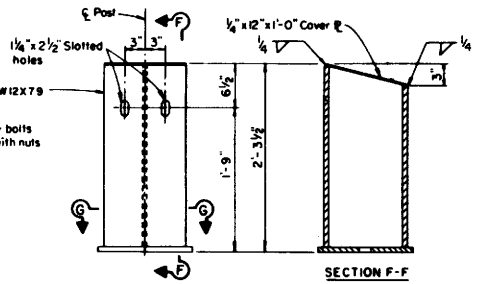
DEPARTING END DETAIL - For Structures with Walkways on Two-Way roads Less than 60 feet wide. Departing end anchorage detail shown on Standard Plan A79-C may be used.



PLAN

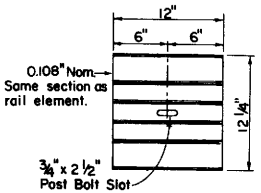


SECTION D-D

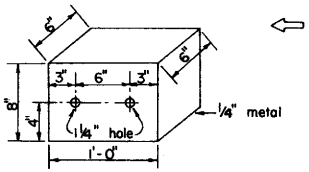


ASSEMBLY
(See Note 7)

SECTION F-F

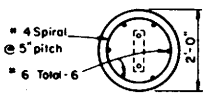


BACK-UP PLATE
(For use between guard rail and steel block at posts between rail splices).

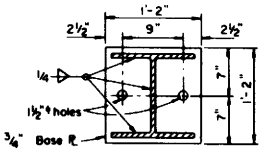


METAL BOX SPACER
Place 1¼" x 5¼" pipe spacers on 1" bolts passing through box interior.

DETAIL B



SECTION E-E



SECTION G-G

ANCHOR POST DETAILS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

GUARD RAIL CONNECTIONS TO BRIDGE SIDEWALKS AND CURBS

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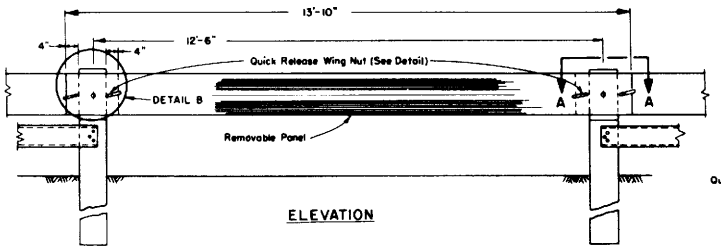
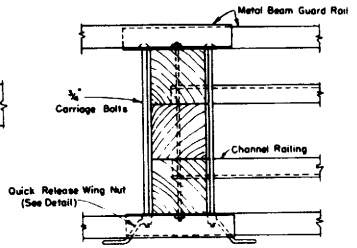
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS

C D Bardell
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995

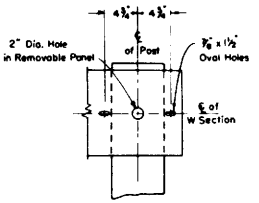
DATE July 1, 1984



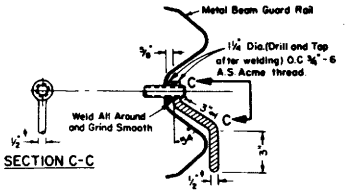
ELEVATION



SECTION A-A



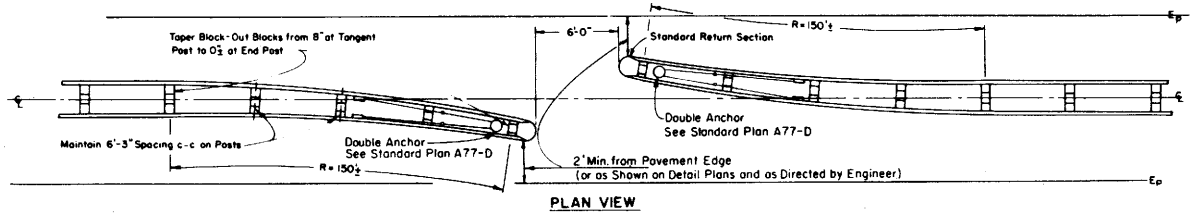
DETAIL B



SECTION C-C

QUICK RELEASE WING NUT

PASSAGEWAY IN METAL BEAM MEDIAN BARRIER



PLAN VIEW

MOTORCYCLE PASSAGEWAY IN METAL BEAM OR THRIE BEAM MEDIAN BARRIER

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
EMERGENCY PASSAGEWAYS A80

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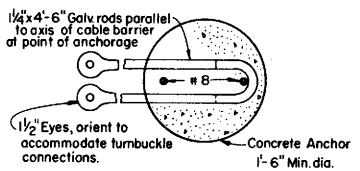
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS

CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995

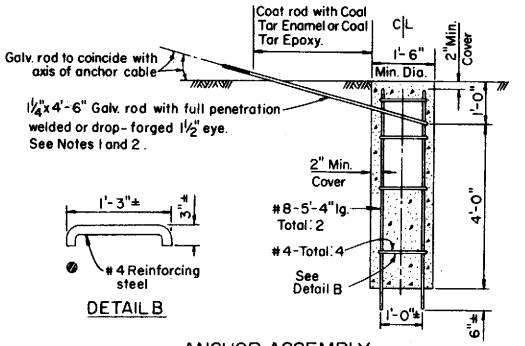
DATE July 1, 1984

GENERAL NOTES

1. Anchor rod hooks to be in contact with anchor reinforcement when concrete is placed.
2. Wire ties may be used to position anchor rod.
3. Shape blocks to fit.
4. Terminal sections will not be installed on the trailing end of guardrail placed adjacent to one way roadways.
5. Lap rail in direction of traffic.
6. Drop-forged steel sockets for 3/4" cable, closed pattern.
7. 1 1/4" drop-forged, galvanized steel Turnbuckles Jaw and Jaw or 2" Max. Pipe Type Turnbuckles both with 12" take-up leaving 3 1/2" of thread at each end for future tightening.

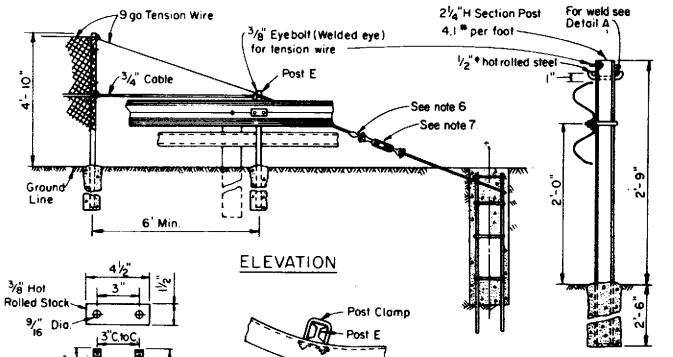


ANCHOR



ANCHOR ASSEMBLY

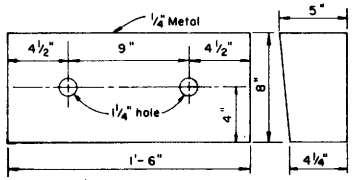
DETAIL B



ELEVATION

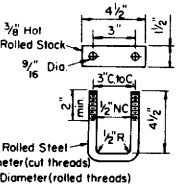
ANCHOR ASSEMBLY

DETAIL OF POST E

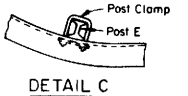


NOTE: Use 1 1/4" x 4" pipe spacers on 1" bolts passing through interior of box.

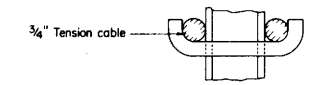
BEVEL METAL BOX SPACER



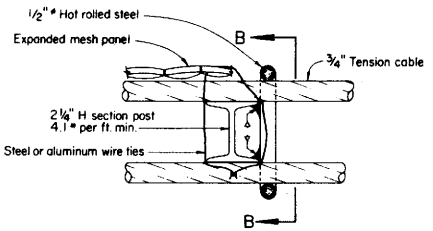
POST CLAMP



DETAIL C

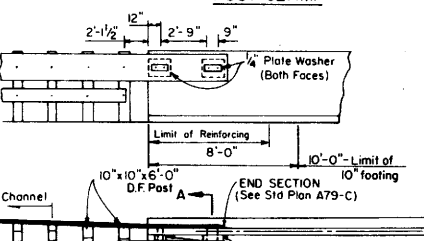


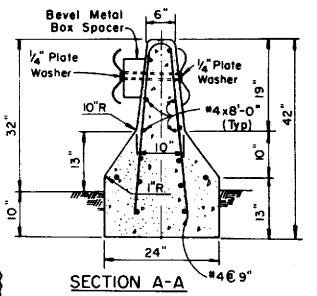
SECTION B-B



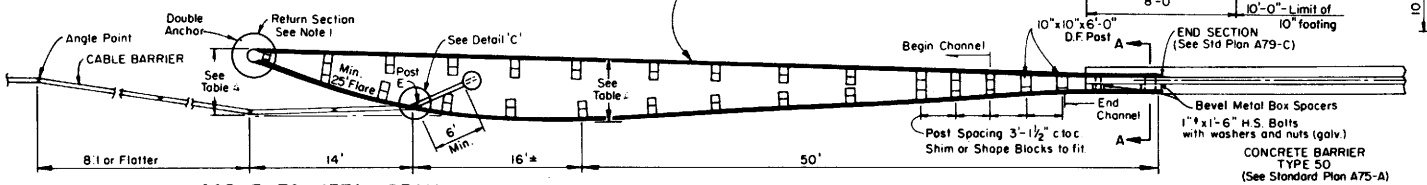
DETAIL A

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





SECTION A-A



CABLE TO METAL BEAM

METAL BEAM TO CONCRETE

TRANSITIONS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
BARRIER TRANSITIONS

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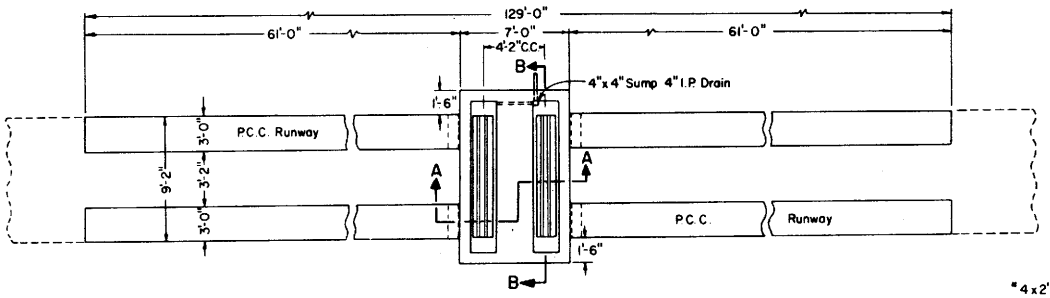
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

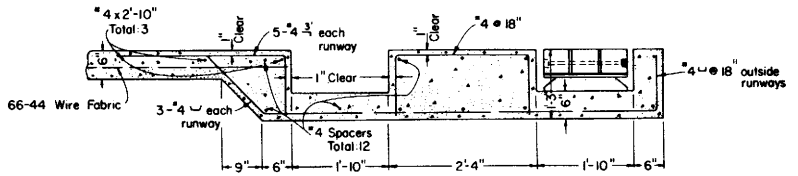
CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

DATE July 1, 1984

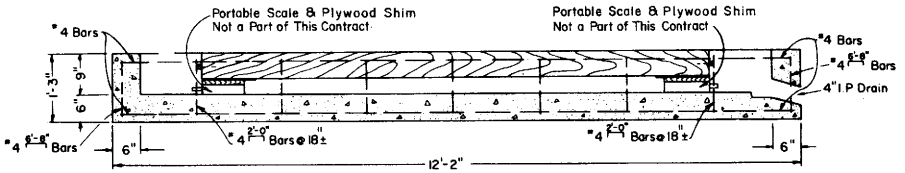


PLAN VIEW

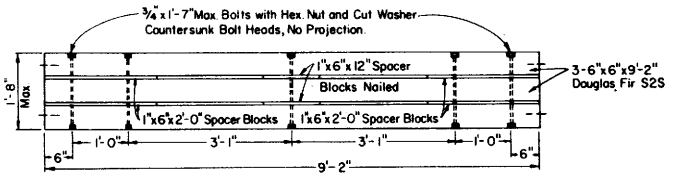
Note: Installation to be level in all directions for full length of runways.

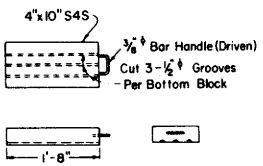


SECTION A-A

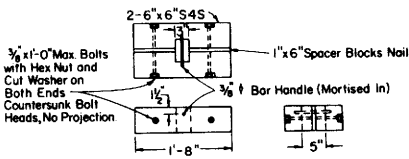


SECTION B-B



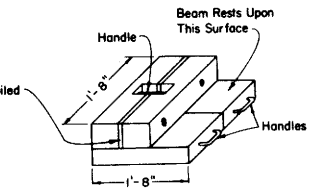


TIMBER FILLER BLOCK
(Make - 8 per installation)



TIMBER FILLER BLOCK
(Make - 4 per installation)

To fill space when Portable Scale is not in use.



FILLER BLOCK ASSEMBLY

DETAILS OF BEAM CONSTRUCTION

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

PORTABLE SCALE PIT

A83

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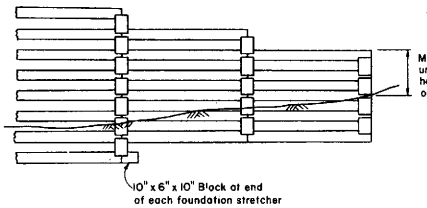
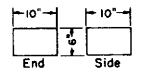
NUMBER OF UNITS REQUIRED FOR ONE INTERMEDIATE 6' PANEL OF HEIGHTS AS SHOWN

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	NOTE: Use 8"x6" stretchers with vertical walls.								4	1	13	NOTE: Use 8"x6" stretchers with vertical walls.		
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		
11-6	4	8	17	11		1						4	8	17	11		1
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	2		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	25	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



WALL LAYOUT DETAILS

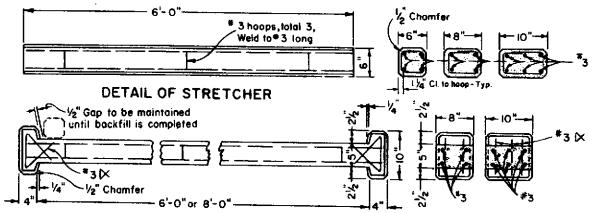


DETAIL OF FILLER BLOCK

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

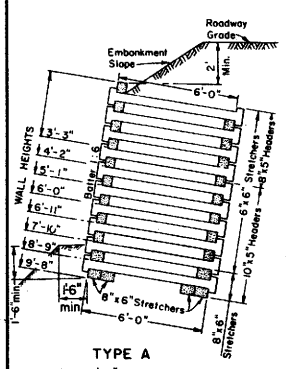
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED July 1, 1984

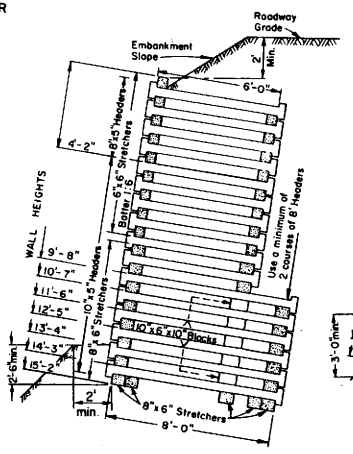


DETAIL OF STRETCHER

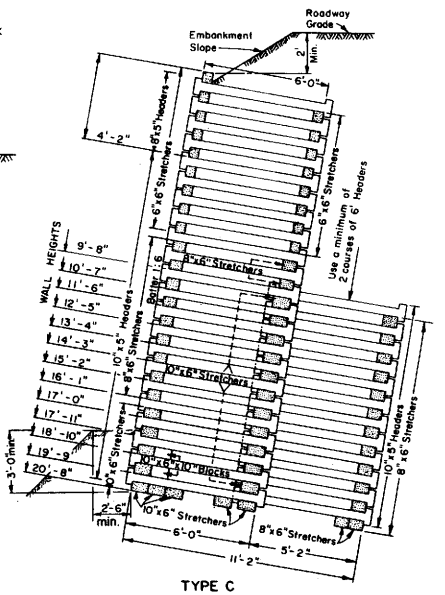
DETAIL OF HEADER



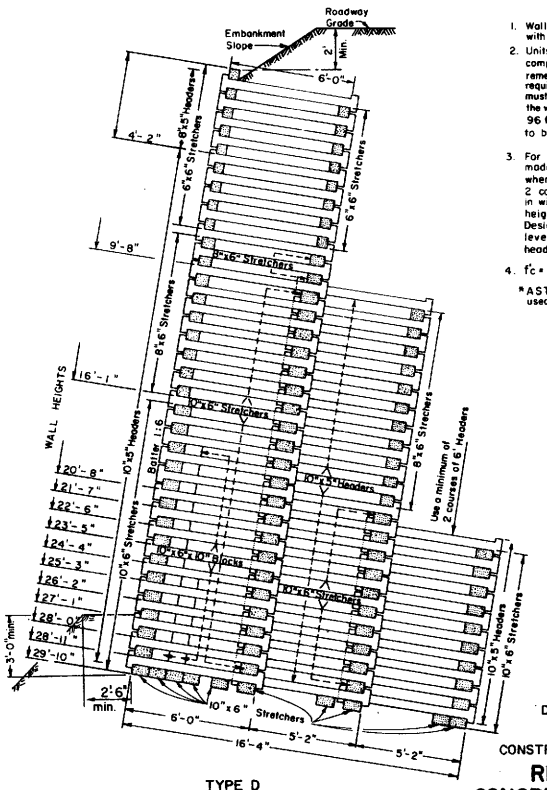
TYPE A
Walls 9'-8" or less in height



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

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. Table of number of units required apply to battered walls.
3. For battered walls, steps in width are to be made at the wall heights shown on this sheet when the next lower level consists of at least 2 courses of headers. For vertical walls, steps in width are to be made at the limiting total height for each wall shown on the graphs on the Design Data sheet providing the next lower level consists of at least 2 courses of headers.
4. f'c = 3250 psi, fy = 40,000 psi *

* ASTM Designation A-615 Grade 60 may be used in lieu of Grade 40

For Design Data see Standard Plan Sheet C7-B

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CONSTRUCTION DETAILS FOR
REINFORCED CONCRETE CRIB WALL TYPES A, B, C, & D

C7-A

C7-A

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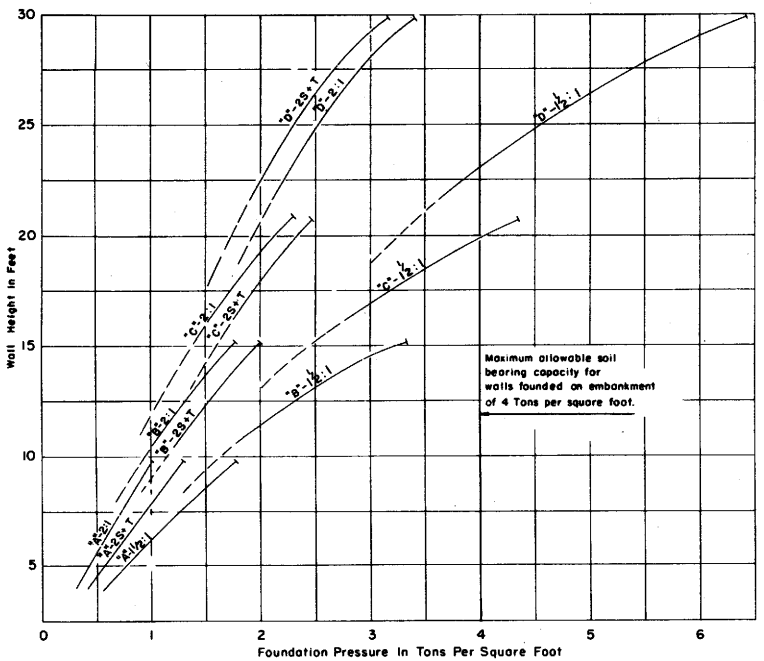
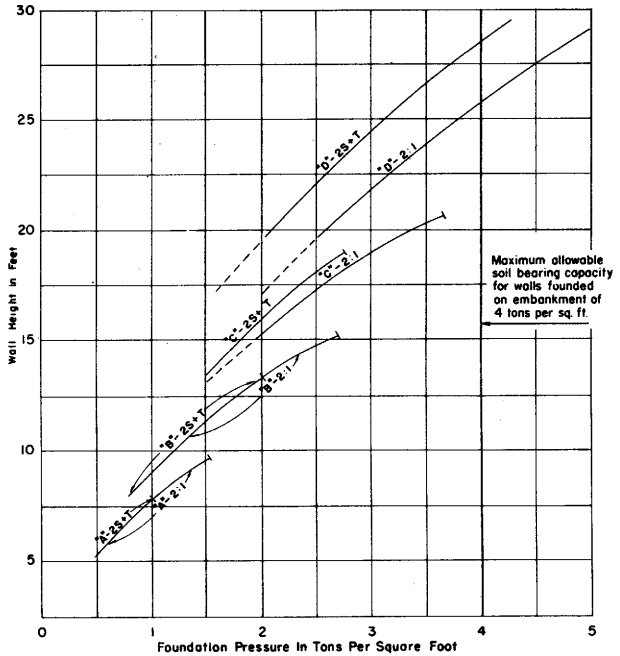
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF ENGINEER OF STRUCTURES DESIGN - REGISTERED CIVIL ENGINEER NO. 9013

APPROVED July 1, 1984



1:6 BATTERED WALL



VERTICAL WALL

DESIGN EXAMPLES

Example No. 1

Given: Wall Height 24'
2:1 embankment slope to be retained. Base founded in embankment.

Select: Either vertical or battered "D" wall. Both walls require a 5' depth embankment at 95% compaction below base. However, for the vertical wall with a foundation pressure of 3.0 TSF this embankment material must be "Structure Backfill" (See Design Note 1)

Example No. 2

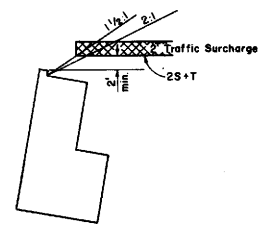
Given: Wall Height 20'
2:1 cut slope to be retained. Foundation site investigation indicates lateral pressure from material above will be equivalent to 2:1 embankment slope, and the allowable soil bearing capacity is 2.5 TSF.

Select: Battered "C" wall. Also a vertical "D" wall can be used. By increasing the allowable bearing capacity of the original ground (see Design Note 2), a vertical "C" wall can be used.

Example No. 3

Given: Wall Height 9'
2' level surcharge with traffic loading to be retained. Base founded in embankment.

Select: Battered "A" wall or vertical "B" wall. If vertical "B" wall is used, the actual height of the wall will be 9'-8". The first step in the wall will be 7'-10" which is the limiting height of the "A" wall for the 2S+T surcharge. A minimum of 2 courses of 8' headers is provided. (See Note 3, Construction Details sheet)



DESIGN NOTES

1. Wall base in embankment: A minimum depth of 5 feet of embankment at 95% relative soil compaction is required below the base of all walls in order to constitute an embankment condition. When the foundation pressure is between 2.5 & 4.0 Tons/S.F. embankment below the wall shall consist of "Structure Backfill" material as set forth in Section 19-3.06 of the Standard Specifications. The limits of relative compaction (95%) shall be as set forth in Section 19-5.03 of the Standard Specifications.

2. Wall base in original ground: Allowable soil pressure at toe of wall shall be determined by foundation site investigation. Walls that are to retain cut slopes shall be designed for lateral and toe pressures determined from site investigation data. Overall stability of slope with wall in place must be analyzed. If original ground slopes away from toe of wall, reduction in allowable bearing capacity due to slope must be considered. Walls shall not be founded in original ground having an allowable bearing capacity of less than 1.5 Tons/S.F. Consideration should be given to removal and replacement of unsuitable material with "Structure Backfill" material as set forth in Section 19-3.06 of the Standard Specifications. The limits of relative compaction (95%) shall be as set forth in Section 19-5.03 of the Standard Specifications.

3. Design data: Weight of soil = 120 pcf. For 2 foot level surcharge with traffic loading, an equivalent fluid pressure of 36 pcf was used. Earth pressures for 2:1 slope and 1½:1 unlimited slopes determined from Rankine's formula with $\phi = 33°-42'$.

LEGEND FOR GRAPHS

A, B, C, D = Wall type
2S+T = 2 foot level surcharge with traffic loading
2:1 = 2:1 Slope above wall
1½:1 = 1½:1 Slope above wall
} 115' Max. difference in elevation from toe of wall to top of slope

Solid lines indicate normal range of wall use.
Upper end of line indicates maximum wall height for a given wall type and loading.

DESIGN SURCHARGES

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

DESIGN DATA FOR REINFORCED CONCRETE CRIB WALL TYPES A, B, C, and D

C7-B

C-7B

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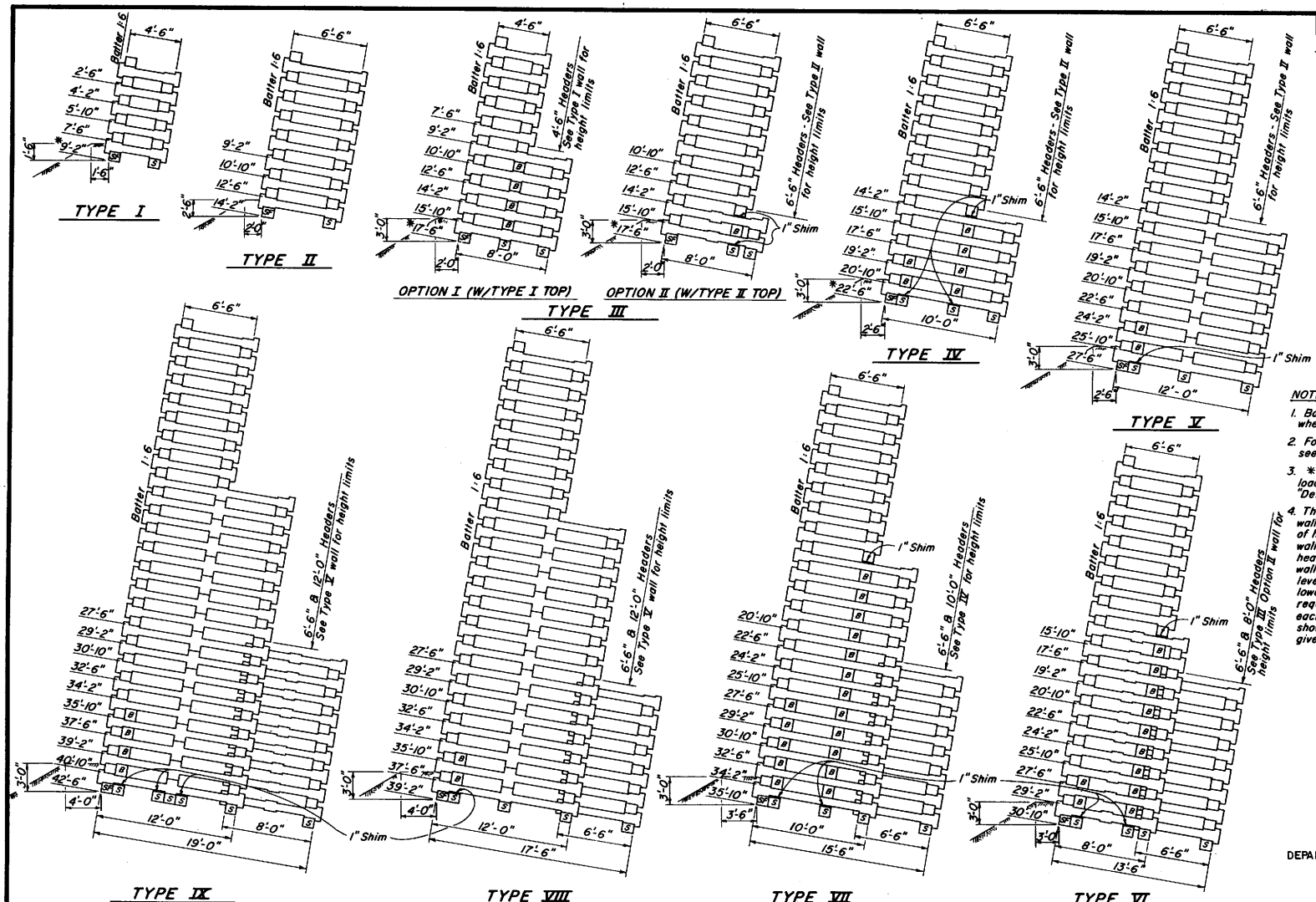

CHIEF, OFFICE OF STRUCTURES DESIGN

DATE APPROVED JULY 1, 1984

NOTES:

1. Battered walls shown. Designer to specify when vertical option is permissible.
2. For soil bearing pressure in Tons/sq.ft. see "Design Data" sheet.
3. * Indicates wall height where specific loading conditions are allowed. See "Design Data" sheet.
4. The thickness of the lowest step for each wall type must be at least 3'-4" (2 courses of headers) for Type I through Type IV walls and at least 5'-0" (3 courses of headers) for Type V through Type XII walls. Steps in width are made when upper levels reach maximum height, providing lower levels meet minimum thickness required. Limiting total wall height for each type and loading condition is as shown on "Design Data" sheet, i.e., last given figure for "Foundation Pressure".

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

C7-C

STANDARD DRAWING

FILE No. XS-3-60	DESIGN By W. Baker	Checked J.C. Moese	Approval Recommended By	
DRAWING DATE 10/78	DETAILS By K.C. Blechinger	Checked J.C. Moese		
	SUBMITTED BY	9737	REGISTERED CIVIL ENGINEER NUMBER 8198	

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN
PROJECT ENGINEER

BRIDGE NO.
POST MILE

REINFORCED CONCRETE CRIB WALL SHT 1 of 4
TYPES I, II, III, IV, V, VI, VII, VIII & IX

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET OF

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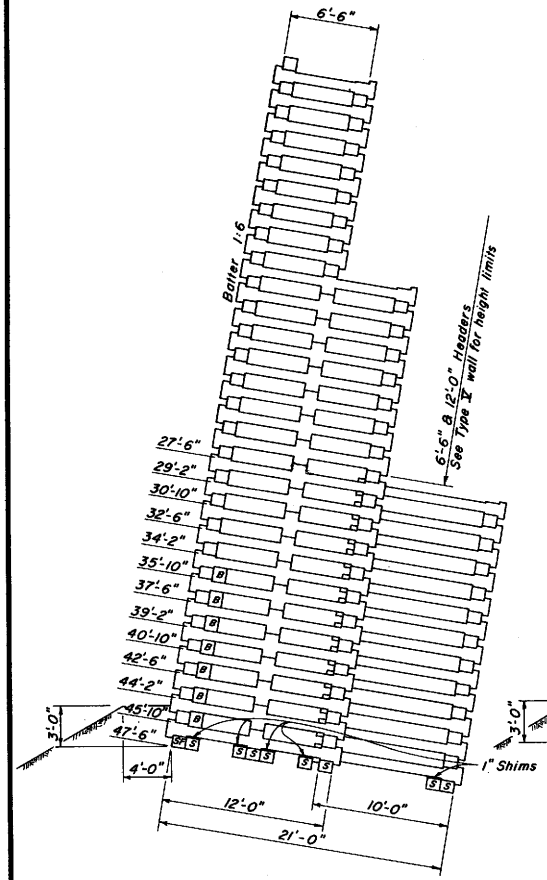
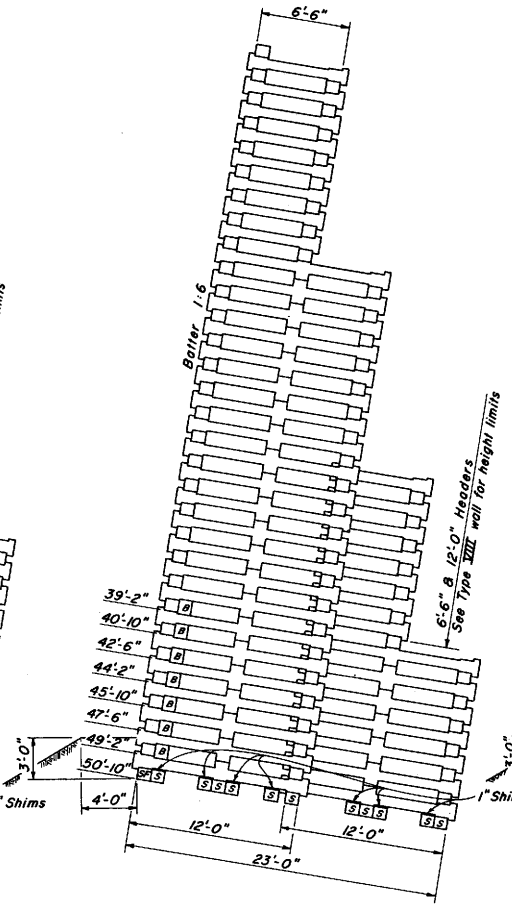
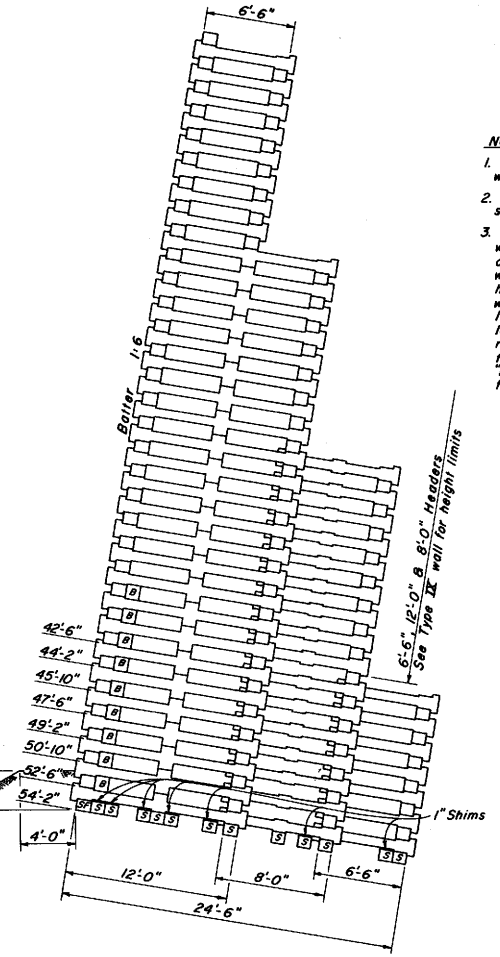


TYPE V



TYPE XI



TYPE XII

NOTES:

1. Battered walls shown. Designer to specify when vertical option is permissible.
2. For soil bearing pressure in Tons/sq ft see "Design Data" sheet.
3. The thickness of the lowest step for each wall type must be at least 3'-4" (2 courses of headers) for Type I through Type IV walls and at least 5'-0" (3 courses of headers) for Type V through Type XII walls. Steps in width are made when upper levels reach maximum height, providing lower levels meet minimum thickness required. Limiting total wall height for each type and loading condition is as shown on "Design Data" sheet, i.e., last given figure for "Foundation Pressure".

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

CHIEF OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER NUMBER 8018

DATE APPROVED July 1, 1984

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

C7-D

STANDARD DRAWING

FILE No. XS-3-61	DESIGN By W. BAKER	Checked J.C. MOESE	Approval Recommended By
DRAWING DATE 10/78	DETAILS By K.C. Blechinger	Checked J.C. MOESE	
	SUBMITTED BY		REGISTERED CIVIL ENGINEER NUMBER 8018

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER

BRIDGE No.

POST MILE

REINFORCED CONCRETE CRIB WALL SHT 2 of 4
TYPES X, XI & XII

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET OF

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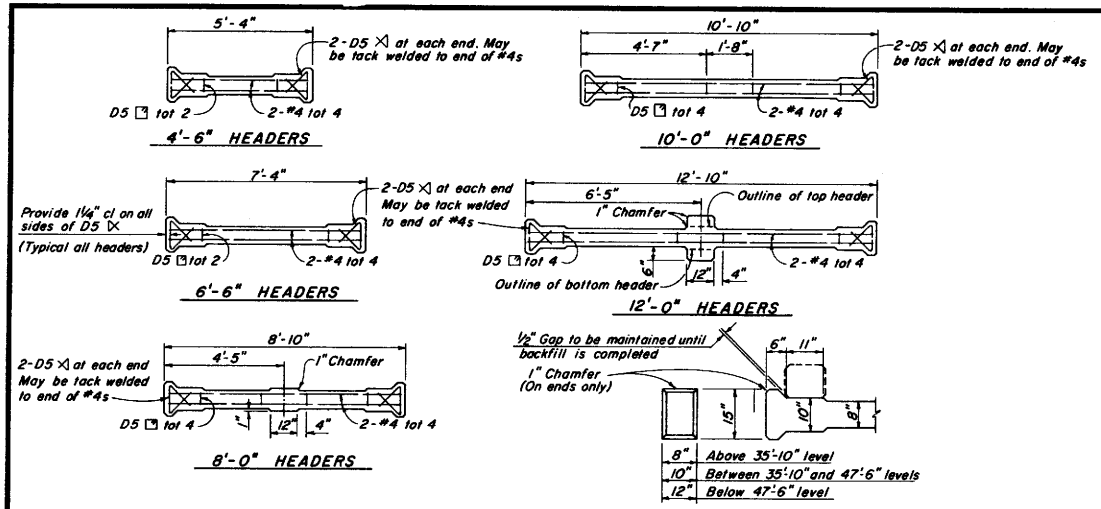
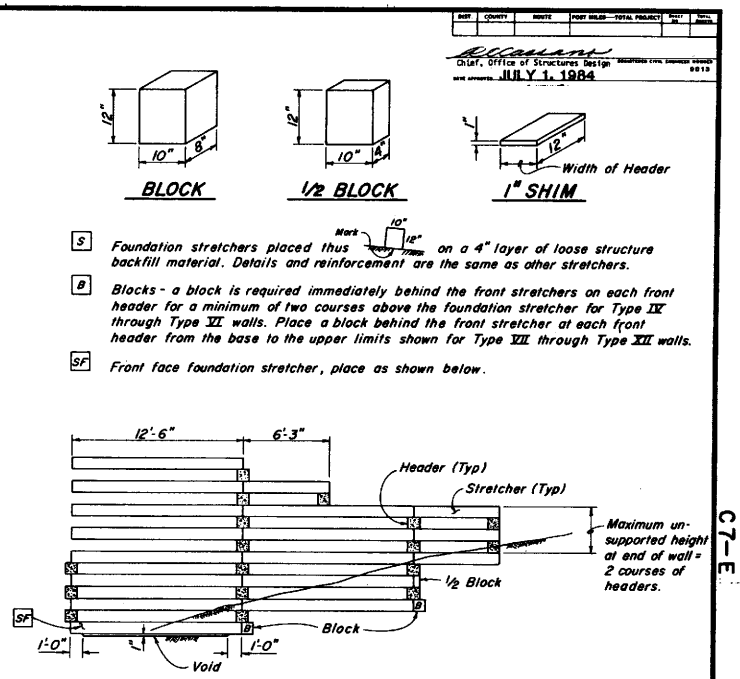


Wall Type	*Design f'_c psi	Open Face 6'-3" (a)	(b)	(c)	Open Face 12'-6" (a)	(b)	(c)	Close Face 6'-3" (a)	(b)	(c)	Close Face 12'-6" (a)	(b)	(c)	L 6'-3"	L 12'-6"
I - IV	3250	4	4	4	6		5	4	4	4	6		5	0'-10"	0'-10"
V	4000	4	4	4	6	6	6	4	4	4	6	6	5	1'-2"	2'-2"
VI - VIII	4500	4	4	4	7	6	6	4	4	4	7	6	5	1'-2"	2'-2"
IX - XII	5000	4	4	4	7	6	6	4	4	4	7	6	5	1'-6"	2'-6"

STRETCHER BAR SIZE DATA

*Required concrete compressive strength for stretchers increases with increased distance from the top of the crib wall as follows:
0' thru 22'-6", f'_c = 3250 psi
> 22'-6" thru 27'-6", f'_c = 4000 psi
> 27'-6" thru 39'-2", f'_c = 4500 psi
> 39'-2", f'_c = 5000 psi



GENERAL NOTES

1. fy = 60,000 psi except 50,000 psi in stirrups. f'_c = 3,250 psi in headers. See chart for stretchers. f'_c indicates the concrete compressive strength at 28 days.
2. Bearing Surfaces: Concrete to concrete bearing surfaces shall be finished to a smooth plane. Gap between bearing surfaces shall not exceed ⅛ inch. Where a gap of ⅛ inch to ⅛ inch exists, a ⅛ inch pad of asphalt felt* shall be placed between the bearing surfaces. For wall Types VIII through XII, a ⅛ inch asphalt felt * pad shall be placed between all bearing surfaces below the 32'-6" level. *Or may use sheet neoprene or neat cement paste.
3. Dimensional Tolerance: To allow for imperfect fit in the assembly of the units, members may be manufactured to dimensions ⅛ inch less than the nominal dimensions shown on this plan.
4. Supports For Reinforcements: If members are to be steam cured, supports for reinforcements shall be stainless steel containing at least 16% chromium.
5. Special Members at Utility Openings: Where an opening is specified in the face of wall for pipes or other utilities, special length stretchers and additional headers will be required.
6. Patent Rights: The right to use the shapes shown hereon, solely for projects administered by the State of California within the territory of the State, has been granted to the State of California by assignment dated August 28, 1969.
7. Closed face stretchers are required on front face of vertical wall.
8. W5 wire may be substituted for D5 wire.
9. Continuous wire @ 4 max. pitch providing equivalent area may be substituted for stirrups in stretchers.

Chief, Office of Structures Design
DATE APPROVED JULY 1, 1984

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
C7-E

STANDARD DRAWING
FILE No. XS-3-62
DRAWING DATE 8/78
DESIGN By W. BAKER Checked J.C. Moese
DETAILS By K.C. Blochinger Checked J.C. Moese
SUBMITTED BY
Approved Recommended by
8/3/78

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN
PROJECT ENGINEER
BRIDGE No.
POST MILE

REINFORCED CONCRETE CRIB WALL SHT 3 of 4
HEADER & STRETCHER DETAILS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3
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Disregard prints bearing earlier revision dates
REVISION DATES (PRELIMINARY STAGE ONLY)
SHEET OF

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

CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER NUMBER 8015

DATE APPROVED JULY 1, 1984

1:6 BATTER WALL

Foundation Pressure in Tons Per Sq Ft

TYPE	LOADING CONDITION	WALL HEIGHT 2'-6"	4'-2"	5'-10"	7'-6"	9'-2"	10'-10"	12'-6"	14'-2"	15'-10"	17'-6"	19'-2"	20'-10"	22'-6"	24'-2"	25'-10"	27'-6"
I	2S+T	0.3	0.5	0.9	1.3												
	1½:1	0.6	0.7	0.8	1.4	1.7											
	2:1	0.4	0.6	0.7	0.8	0.9											
II	2S+T	0.5	0.5	0.6	0.7	1.0	1.3	1.7	2.2								
	1½:1	0.7	0.9	0.9	1.2	1.4	1.6	2.6	3.0								
	2:1	0.5	0.7	0.8	1.0	1.1	1.2	1.2	1.5								
III-I	2S+T					1.0	1.2	1.5	1.8	2.2							
	1½:1					1.2	1.7	2.0	2.8	3.2	4.4						
	2:1					0.8	1.0	1.2	1.5	1.8	2.2						
III-II	2S+T							1.6	2.0	2.4							
	1½:1							2.6	3.0	3.3	4.6						
	2:1							1.4	1.7	2.0	2.4						
IV	2S+T									1.9	2.2	2.6	3.0				
	1½:1									3.0	3.3	4.3	4.8	6.2			
	2:1									1.8	2.1	2.4	2.8	3.2			

TYPE	LOADING CONDITION	15'-10"	17'-6"	19'-2"	20'-10"	22'-6"	24'-2"	25'-10"	27'-6"	29'-2"	30'-10"	32'-6"	34'-2"	35'-10"	37'-6"	39'-2"	40'-10"
V	2S+T	1.6	1.8	2.0	2.3	2.7	3.0	3.4	3.9								
	1½:1	2.8	3.1	3.3	4.2	4.6	5.6	6.1	7.5								
	2:1	1.5	1.8	2.0	2.3	2.6	3.0	3.4	3.9								
VI	2S+T		1.7	1.9	2.1	2.4	2.7	3.0	3.4	3.8	4.2						
	1½:1		3.0	3.2	3.5	4.3	4.6	5.6	6.0	7.2	7.7						
	2:1		1.7	1.9	2.2	2.4	2.7	3.1	3.4	3.8	4.3						
VII	2S+T					2.2	2.5	2.7	3.0	3.3	3.7	4.0	4.4	4.9			
	1½:1					4.1	4.4	4.8	5.6	6.0	7.0	7.5	8.7	9.4			
	2:1					2.4	2.6	2.9	3.2	3.6	3.9	4.3	4.8	5.2			
VIII	2S+T									3.2	3.4	3.7	4.1	4.4	4.8	5.2	
	1½:1									5.8	6.2	7.0	7.5	8.6	9.2	9.8	
	2:1									3.5	3.8	4.2	4.5	4.9	5.3	5.8	

TYPE	LOADING CONDITION	29'-2"	30'-10"	32'-6"	34'-2"	35'-10"	37'-6"	39'-2"	40'-10"	42'-6"	44'-2"	45'-10"	47'-6"	49'-2"	50'-10"	52'-6"	54'-2"
IX	2S+T	2.9	3.1	3.4	3.6	4.0	4.3	4.6	5.0	5.4							
	1½:1	5.4	5.8	6.2	6.9	7.4	8.3	8.8	9.9	10.5							
	2:1	3.2	3.5	3.8	4.1	4.5	4.8	5.2	5.7	6.1							
X	2S+T	2.6	2.8	3.0	3.3	3.5	3.8	4.1	4.4	4.7	5.1	5.5	5.9				
	1½:1	4.8	5.1	5.8	6.1	6.8	7.2	8.0	8.4	9.3	9.8	10.3	11.5				
	2:1	3.0	3.2	3.5	3.8	4.1	4.4	4.7	5.1	5.4	5.8	6.3	6.7				
XI	2S+T								4.4	4.7	5.0	5.3	5.7	6.1	6.5		
	1½:1								8.3	8.7	9.5	10.0	11.1	11.7	12.9		
	2:1								5.2	5.5	5.9	6.3	6.7	7.1	7.6		
XII	2S+T										4.8	5.1	5.4	5.7	6.1	6.5	6.9
	1½:1										9.1	9.6	10.4	10.9	11.9	12.6	13.8
	2:1										5.7	6.1	6.4	6.8	7.2	7.7	8.1

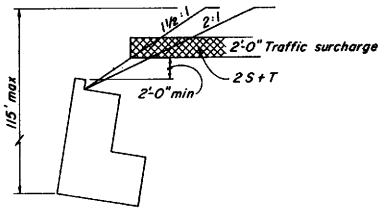
VERTICAL WALL

Foundation Pressure in Tons Per Sq Ft

WALL HEIGHT 2'-6"	4'-2"	5'-10"	7'-6"	9'-2"	10'-10"	12'-6"	14'-2"	15'-10"	17'-6"	19'-2"
0.4	0.7	1.2								
0.4	0.7									
0.3	0.4	0.8	1.2	1.9						
0.3	0.5	0.8	1.1	1.5	2.1					
0.5	0.5	1.0								
0.4	0.4	0.6	0.9	1.3	1.8	2.4				
				1.2	1.6	2.0	2.6			
				1.1	1.5	1.9	2.5	3.2	4.2	
						2.0	2.6			
						1.9	2.5	3.2	4.2	
								2.4	2.9	3.6
								2.5	3.0	3.7

15'-10"	17'-6"	19'-2"	20'-10"	22'-6"	24'-2"	25'-10"	27'-6"	29'-2"
2.0	2.3	2.7	3.2	3.8				
2.1	2.6	3.0	3.6	4.2	5.0	6.1	7.4	
	2.1	2.4	2.8	3.2	3.7	4.3	5.1	
	2.3	2.7	3.2	3.7	4.3	5.0	5.8	6.9
				2.8	3.2	3.6	4.0	4.6
				3.3	3.7	4.2	4.8	5.5
								4.0
								4.8

29'-2"
3.6
4.4
3.3
4.1



DESIGN SURCHARGE

DESIGN NOTES

1. Wall Base in Embankment: A minimum depth of 5 feet of embankment at 95% relative soil compaction is required below the base of all walls in order to constitute an embankment condition. When the foundation pressure is between 2.5 and 4.0 Tons/sq.ft., embankment below the wall shall consist of "Structure Backfill" material as set forth in Section 19-3.06 of the Standard Specifications. The limits of relative compaction (95%) shall be as set forth in Section 19-5.03 of the Standard Specifications.
2. Wall Base in Original Ground: Allowable soil pressure at toe of wall shall be determined by foundation site investigation. Walls that are to retain cut slopes shall be designed for lateral and toe pressures determined from site investigation data. Overall stability of slope with wall in place must be analyzed. If original ground slopes away from toe of wall, reduction in allowable bearing capacity due to slope must be considered.
   Walls shall not be founded in original ground having an allowable bearing capacity of less than 1.5 Tons/sq.ft. Consideration should be given to removal and replacement of unsuitable material with "Structure Backfill" material as set forth in Section 19-3.06 of the Standard Specifications. The limits of relative compaction (95%) shall be as set forth in Section 19-5.03 of the Standard Specifications.
3. Design Data: Weight of soil = 120 pcf for 2 foot level surcharge with traffic loading, an equivalent fluid pressure of 36 pcf was used. Earth pressures for 2:1 slope and 1½ slope were determined by trial wedge method with $\phi = 33°42'$.
4. The maximum allowable soil bearing capacity for walls founded in embankment is 4.0 Tons/sq.ft..

Legend for Chart

2S+T = 2 Foot level surcharge with traffic loading.

2:1 = 2:1 Slope above wall } 115' Max difference in elevation
1½:1 = 1½:1 Slope above wall } from toe of wall to top of slope

Heavy line indicates max allowable wall height for particular type and loading condition.

DESIGN EXAMPLES

Example No. 1
Given: Wall height 20'
2:1 Cut slope to be retained. Foundation site investigation indicates lateral pressure from material above will be equivalent to 2:1 design surcharge and the allowable soil bearing capacity is 2.5 tsf.
Select: Type V or VI battered wall. Actual H = 20'-10"

Type V or VI vertical walls can be used by increasing allowable bearing capacity of the original ground (See Design Note 2)

Example No. 2
Given: Wall height 9'
2' level surcharge with traffic loading to be retained. Base founded in embankment.
Select: Battered or vertical Type II or Type III-I. Actual H = 9'-2"

Example No. 3
Given: Wall height 10'
1½:1 Embankment slope to be retained. Base in original ground, sloping away from toe of wall at 2:1. Foundation investigation determines allowable soil bearing capacity is 3 tsf (Reduced for the effect of the slope).
Select: Battered Type II or III-I. Actual H = 10'-10". Vertical wall not allowed due to insufficient sliding safety factor.

Example No. 4
Given: Wall height 30'
2:1 Embankment slope to be retained. Base in embankment (5' depth min.)
Select: Battered Type VII, VIII, IX or X. Actual height = 30'-10". For all types foundation pressure is between 2.5 and 4.0 tsf and embankment material must be "Structure Backfill" (See Design Note 1).

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

C7-F

STANDARD DRAWING

FILE NO. XS-3-63	DESIGN By W. BAKER	Checked J. C. HOPE	Approval Recommended By
DRAWING DATE 5/77	DETAILS By K.C. Blechinger	Checked J. C. HOPE	
	SUBMITTED BY		REGISTERED CIVIL ENGINEER NUMBER 8198

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN
PROJECT ENGINEER

BRIDGE NO.
POST MILE

REINFORCED CONCRETE CRIB WALL SHT 4 of 4
DESIGN DATA - TYPES I THRU XII

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

C7-F

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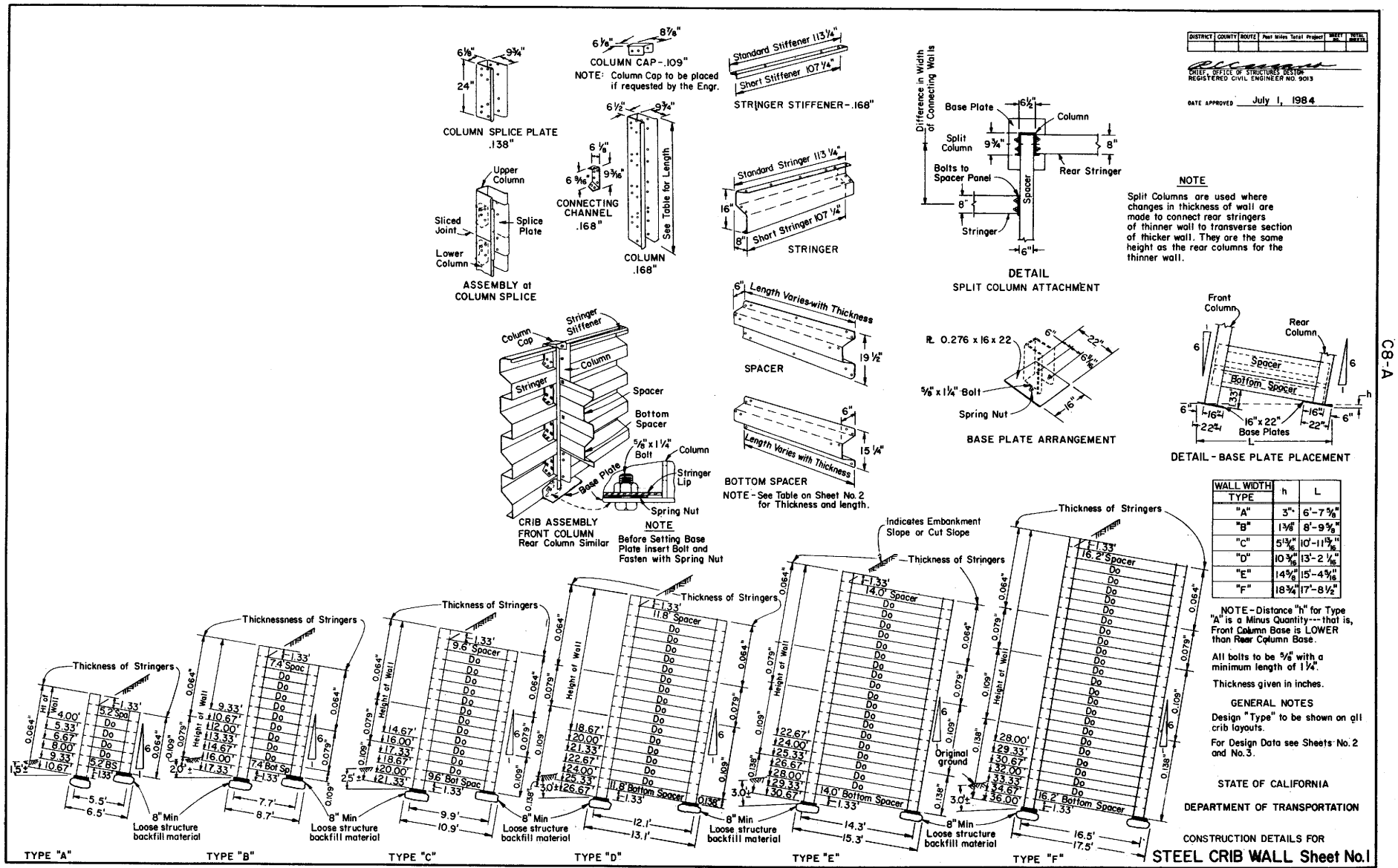

WALL WIDTH / TYPE	h	L
"A"	3"	6'-7 5/8"
"B"	1 3/8"	8'-9 5/8"
"C"	5 13/16"	10'-11 13/16"
"D"	10 3/16"	13'-2 1/16"
"E"	14 5/8"	15'-4 5/16"
"F"	18 3/4"	17'-8 1/2"

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".

Thickness given in inches.

GENERAL NOTES

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

For Design Data see Sheets No. 2 and No. 3.

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

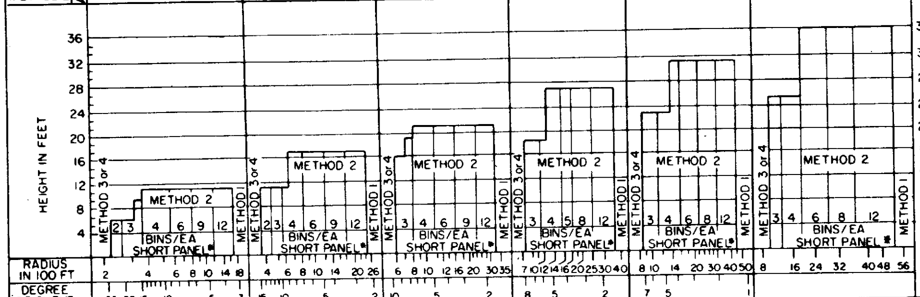
R.C. Cassano
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED July 1, 1984

CURVATURE CHART - 1 TO 6 BATTER

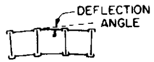
THIS DATA, OMITTING HEIGHT RESTRICTIONS, CAN BE USED FOR VERTICAL WALLS

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'



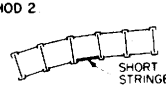
EXAMPLE - To build a Design "D" wall 20.00' high on a 1400' radius curve, use Method 2 with one set of short stringers in each group of five panel sections.

METHOD 1



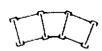
Use normal play in bolt holes of standard parts. Maximum deflection shown at top of table can be obtained at each column in vertical or battered walls. Chart shows smallest radius which can be used for each design of wall.

METHOD 2



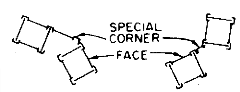
Use short panel sections (9'-6" face or rear) in addition to play in bolt holes. Curvature chart indicates number* of bins in each group, including a modified bin, necessary to build a curved wall at a required height and radius.

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 Graphs shown on Steel Crib Wall Sheet No.3 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								
	.064"		.079"		.109"		.138"		Sh't Str St'f	.064"		.079"		.109"		.138"		St'd Str St'f
	St'd	Short	St'd	Short	St'd	Short	St'd	Short		St'd	Short	St'd	Short	St'd	Short	St'd	Short	
FEET	9.5'	9.0'	9.5'	9.0'	9.5'	9.0'	9.5'	9.0'		9.5'	9.0'	9.5'	9.0'	9.5'	9.0'	9.5'	9.0'	
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

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

UNITS REQUIRED PER TRANSVERSE SECTION / UNITS REQUIRED PER PANEL 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 Thickness & Length						BOT SPACER Thickness & Length						STRINGERS				Str St'f	WALL HEIGHT
													.064	.064	.079	.109	.109	.109	.064	.064	.079	.109	.109	.109	.064	.079	.109	.138		
FEET	16" x 22"	1st Lift	2nd Lift	3rd Lift	Total Height	1st Lift	2nd Lift	3rd Lift	Total Height				5.2	7.4	9.6	11.8	14.0	16.2	5.2	7.4	9.6	11.8	14.0	16.2	9.5'	9.5'	9.5'	9.5'	9.5'	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	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	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	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 - For Construction Details See Sheet C8-A

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DESIGN DATA FOR
STEEL CRIB WALL Sheet No.2

C8-B

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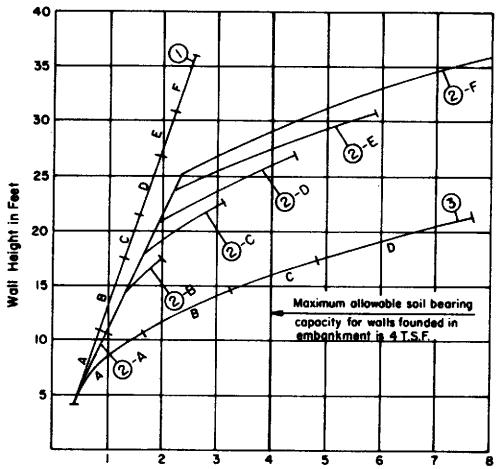
DISTRICT	COUNTY	ROUTE	Post Mile	Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1984



1:6 BATTERED WALL

DESIGN EXAMPLES

EXAMPLE NO. 1

Given: Wall Height 24'.
2:1 embankment slope to be retained.
115' maximum from toe of wall to top of slope.
Base in embankment (5' depth min.).

Select: 1:6 Battered Wall. Vertical wall not permitted. "D" Wall selected. Maximum height on graph is 26.00' at 4 T.S.F. Since the foundation pressure is 3.2 T.S.F. at 24.00', the wall must be founded on a 5 foot thickness of "Structure Backfill" (See Design Note 1). A drainage System behind this wall will be required.

EXAMPLE NO. 2

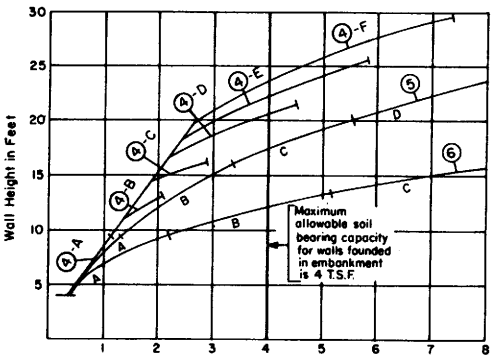
Given: Wall Height 29'.
2:1 cut slope to be retained. Foundation site investigation indicates lateral pressure from material above will be equivalent to 2:1 embankment slope. Base in excavation level at toe of wall. Foundation investigation determines the allowable soil bearing capacity at 3 T.S.F.

Select: Battered "F" Wall maximum height at 4 T.S.F. is 29', therefore the replacement of 5 foot of excavation with "Structure Backfill" to increase the allowable soil bearing capacity to 4 T.S.F. is required (See Design Note 1). A drainage System for this wall should be investigated.

EXAMPLE NO. 3

Given: Wall Height 15'.
1½:1 embankment slope 18' above top of wall to be retained. Base on original ground. Foundation investigation determines allowable soil bearing capacity at 2 T.S.F.

Select: Loading conditions interpolated as between 1½:1 and 2:1 embankment slope. Use a Type "B" Battered Wall or a Type "C" Vertical Wall. However, if the Type "C" Wall is used 5' of excavation must be replaced to increase the allowable soil bearing capacity to 4 T.S.F. (See Design Note 1).



VERTICAL WALL

Surcharge / Batter	Level 2' Min. Sur.	2:1 With Finite * Surcharge	1½:1 With Finite * Surcharge
Wall On 1:6 Batter	2S	2:1	1½:1
Wall Vertical	2S	2:1	1½:1

* 115 ft. maximum difference in elevation from toe of wall to top of slope.
A, B, C, D, E, F = Wall Type.
Indicates 2' Min. Surcharge above "Roadway Grade."

LEGEND FOR GRAPHS

Upper end of line indicates maximum wall height for a given wall type.

DESIGN NOTES

1. Wall base in embankment: A minimum depth of 5 feet of embankment at 95% relative soil compaction is required below the base of all walls in order to constitute an embankment condition. When the foundation pressure is between 2.5 and 4.0 Tons/S.F., embankment below the wall shall consist of "Structure Backfill" material as set forth in Section 19-3.06 of the Standard Specifications. The limits of relative compaction (95 percent) shall be as set forth in Section 19-5.03 of the Standard Specifications.

2. Wall base in original ground: Allowable soil pressure at toe of wall shall be determined by foundation site investigation. Walls that are to retain cut slopes shall be designed for lateral and toe pressures determined from site investigation data. Overall stability of slope with wall in place must be analyzed. If original ground slopes away from toe of wall, reduction in allowable bearing capacity due to slope must be considered. Walls shall not be founded in original ground having an allowable bearing capacity of less than 1.5 Tons/S.F. Consideration should be given to removal and replacement of unsuitable material with "Structure Backfill" material as set forth in Section 19-3.06 of the Standard Specifications. The limits of relative compaction (95 percent) shall be as set forth in Section 19-5.03 of the Standard Specifications.

3. Drainage:
   a. Internal: Section 19-3.06 of the Standard Specifications.
   b. External: If the combined height of wall and overfill (measured along face of wall and vertically from the toe of fill to top of fill) exceeds 25' a system to drain water away from the back face of wall shall be provided. The type and extent of this system will depend on the type of backfill material expected to be used, the combined height of wall and backfill, and the location of the water table in the area.

4. Sloping Surcharge Limitations: The maximum height of fill behind any wall, or family of walls, shall not exceed 115' (measured vertically from the toe of the bottom wall to the top of fill behind the uppermost wall.). For a family of walls the slope of a line drawn from the top of the front face of the bottom wall to the top of the front face of any intermediate or top wall, shall in no case exceed 1½:1.

5. MATERIAL SPECIFICATIONS:
   Steel sheets:
   AASHTO M218
   45,000 Ultimate
   33,000 Yield
   20% Elongation
   Bolts: ASTM A307 Grade A.

NOTE-For Construction Details See Sheet C8-A

STATE OF CALIFORNIA

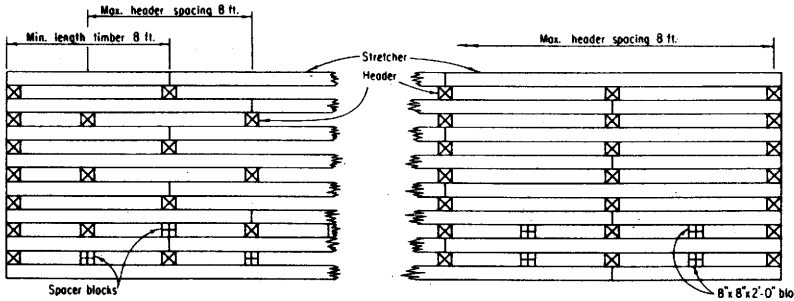
DEPARTMENT OF TRANSPORTATION

DESIGN DATA FOR

STEEL CRIB WALL Sheet No.3

C8-C

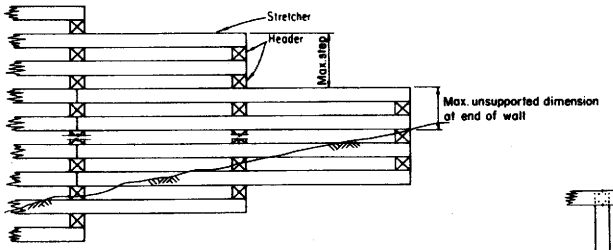
Return to Table of Contents



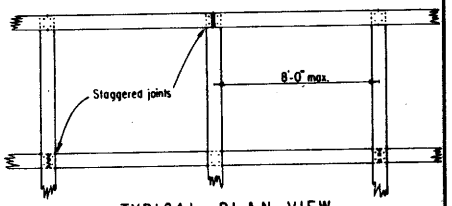
HEADERS STAGGERED (ALTERNATIVE)

HEADERS IN LINE (ALTERNATIVE)

OPEN FACE CRIB ELEVATION



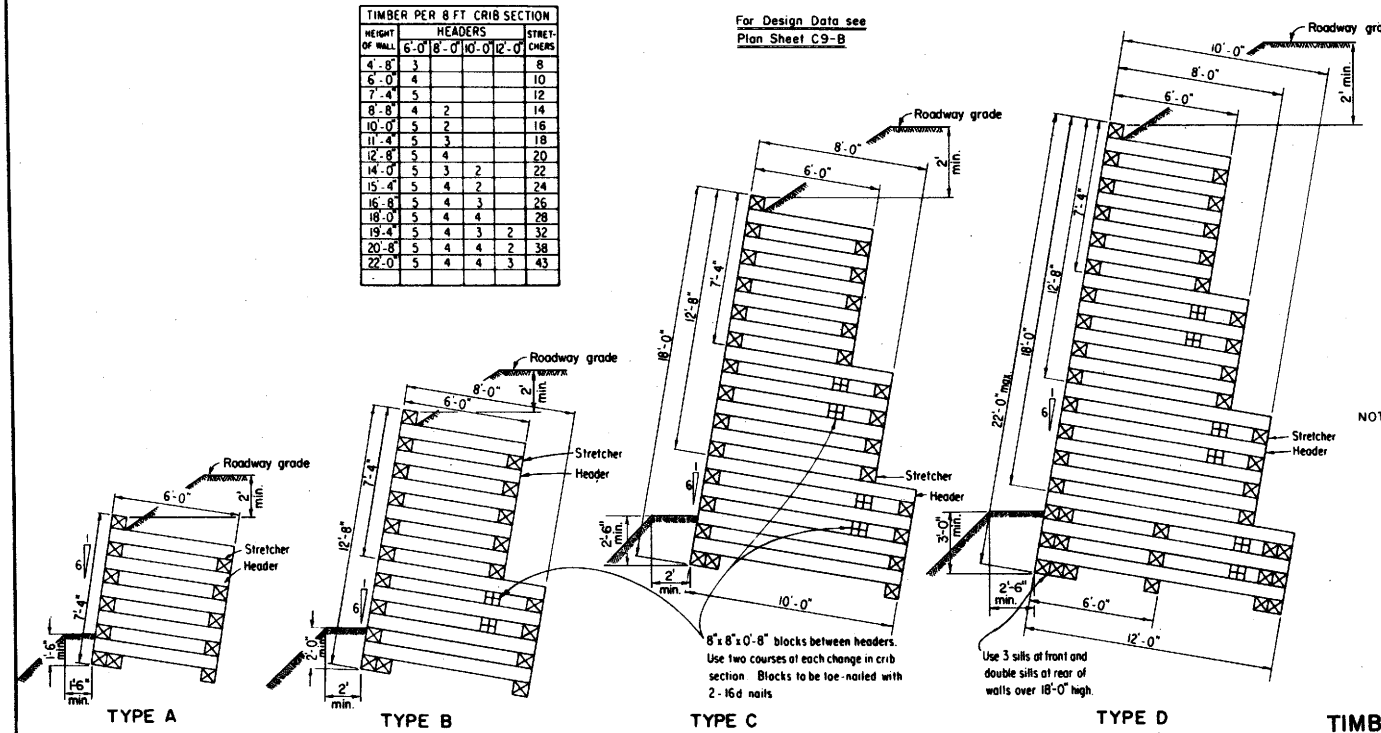
WALL LAYOUT DETAILS

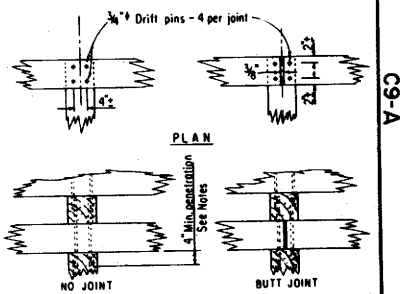


TYPICAL PLAN VIEW

TIMBER PER 8 FT CRIB SECTION					
HEIGHT OF WALL	HEADERS 6'-0"	8'-0"	10'-0"	12'-0"	STRETCHERS
4'-8"	3				8
6'-0"	4				10
7'-4"	5				12
8'-8"	4	2			14
10'-0"	5	2			16
11'-4"	5	3			18
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

For Design Data see Plan Sheet C9-B





TYPICAL END CONNECTIONS

NOTES:

1. All timber to be 8"x 8" rough, No. 1 Structural Douglas Fir-Larch, 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 3/4" 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. Vertical walls are not permitted.
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

DEPARTMENT OF TRANSPORTATION

CONSTRUCTION DETAILS FOR

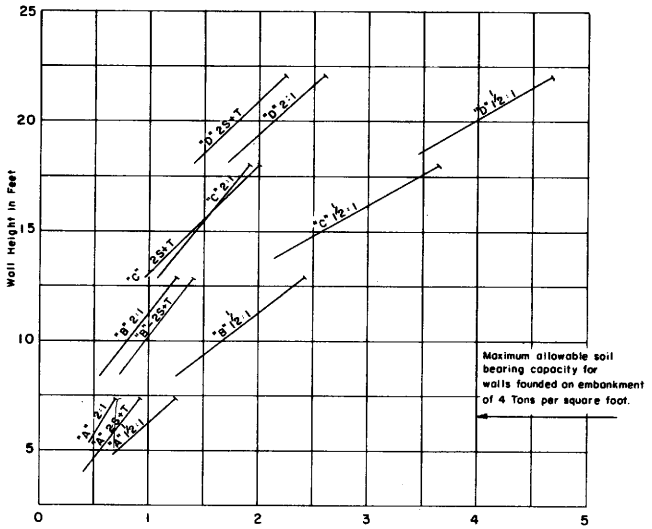
TIMBER CRIB WALL - TYPES A, B, C, & D

C9-A

Return to Table of Contents

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013
DATE APPROVED July 1, 1984



1:6 BATTERED WALL

DESIGN EXAMPLES

EXAMPLE NO. 1

Given: Wall Height 14'
2:1 embankment slope to be retained.
Base in embankment (5' depth min. See Note 1.)

Select: 1:6 Batter "C" Wall gives 1.25 T.S.F. foundation pressure. Vertical "C" Wall gives 2.1 T.S.F. foundation pressure. (See chart for required numbers and sizes of timber members.)

EXAMPLE NO. 2

Given: Wall Height 19'-4"
1½:1 embankment to be retained. Base is in original ground. Foundation sight investigation determines the allowable soil bearing capacity at 3 T.S.F.

Select: 1:6 batter "D" Wall, gives 3.75 T.S.F. foundation pressure. Vertical wall not permitted. Since foundation pressure is greater than allowable bearing capacity of native material, replace original material with "Structure Backfill" to increase base bearing capacity. (See Note 2.)

EXAMPLE NO. 3

Given: Wall Height 22'
2:1 embankment to be retained. Base is in embankment. (See Note 1.)

Select: 1:6 batter "D" Wall, gives 2.6 T.S.F. foundation pressure. Vertical wall not permitted. Foundation pressure is greater than 2.5 T.S.F. Base material below wall shall consist of "Structure Backfill" (See Note 1.)

DESIGN NOTES

1. Wall base in embankment: A minimum depth of 5 feet of embankment at 95% relative soil compaction is required below the base of all walls in order to constitute an embankment condition. When the foundation pressure is between 2.5 & 4.0 Tons/S.F. embankment below the wall shall consist of "Structure Backfill" material as set forth in Section 19-3.06 of the Standard Specifications. The limits of relative compaction (95%) shall be as set forth in Section 19-5.03 of the Standard Specifications.

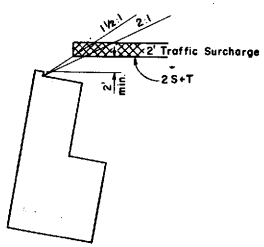
2. Wall base in original ground: Allowable soil pressure at toe of wall shall be determined by foundation site investigation. Walls that are to retain cut slopes shall be designed for lateral and toe pressures determined from site investigation data. Overall stability of slope with wall in place must be analyzed. If original ground slopes away from toe of wall, reduction in allowable bearing capacity due to slope must be considered. Walls shall not be founded in orig. gd. having an allowable bearing capacity of less than 1.5 Tons/S.F. Consideration should be given to removal and replacement of unsuitable material with "Structure Backfill" material as set forth in Section 19-3.06 of the Standard Specifications. The limits of relative compaction (95%) shall be as set forth in Section 19-5.03 of the Standard Specifications.

3. Weight of soil = 120 pcf. For 2 foot level surcharge with traffic loading, an equivalent fluid pressure of 36 pcf. was used. Earth pressures for 2:1 slope and 1½:1 slope determined from Rankine's formula with ϕ = 33° 42'.

LEGEND FOR GRAPHS

A, B, C, D = Wall type
2S+T = 2 foot level surcharge with traffic loading
2:1 = 2:1 Slope above wall
1½:1 = 1½:1 Slope above wall
} 15' Max. difference in elevation from toe of wall to top of slope

Solid lines indicate normal range of wall use.
Upper end of line indicates maximum wall height for a given wall type and loading.



DESIGN SURCHARGES

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

DESIGN DATA FOR

TIMBER CRIB WALL
TYPES A, B, C, D | C9-B

C9-B

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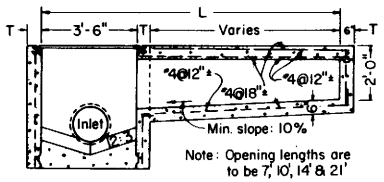
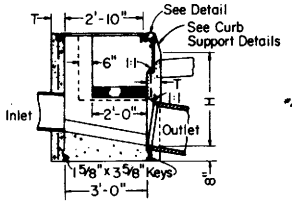


SECTION A-A



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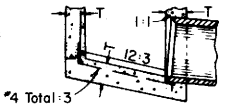
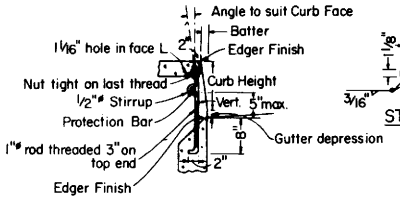
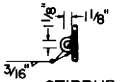


ALTERNATIVE REINFORCED BOTTOM



CURB SUPPORT DETAILS
(Shown for Type A Curbs)



STIRRUP

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

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

DATE July 1, 1984

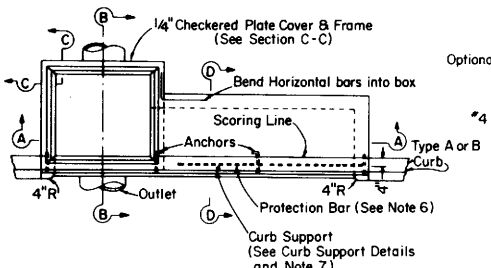
GENERAL NOTES

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. Wall reinforcing not required when H=8' or less and the unsupported width or length = 7' or less. Walls exceeding these limits shall be reinforced with #4 bars @ 18"± centers placed 1½" clear to inside of box unless otherwise shown.
5. Steps - None required where "H" is less than 30 inches. Where "H" is 30 inches or more, install steps with lowest rung 12 inches above the floor, and highest rung not more than 6 inches below top of inlet. The distance between steps shall not exceed 12 inches and shall be uniform throughout the length of the wall. Place steps in the wall without an opening.
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 supports shall be evenly spaced and minimal in number such that maximum span of unsupported curb is 7'.
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 floor 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 Specification or Special Provisions.
12. See "Standard Grate Details" D77-A & D77-B for Grate and Frame Details and Weights of Miscellaneous Iron and Steel.
13. See Standard Plan D78 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.
16. Cast-in-place or Precast alternative is optional with contractor. See Standard Specifications.

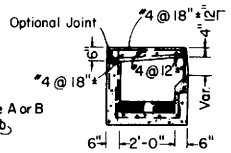
CONCRETE CUBIC YARDS

Type	H=3'-0" to 8'-0" (T=6")		H=8'-1" to 20'-0" (T=8")	
	H=3'-0"	Additional P.C.C. per ft. (C.Y.)	H=8'-1"	Additional P.C.C. per ft. (C.Y.)
OS	1.41	0.278	3.81	0.387
OL-7	1.92	0.278	4.29	0.387
OL-10	2.39	0.278	4.77	0.387
OL-14	3.06	0.278	5.45	0.387
OL-21	4.42*	0.278	6.78	0.387
GOL-7	2.33	0.313	4.96	0.434
GOL-10	2.84	0.313	5.47	0.434

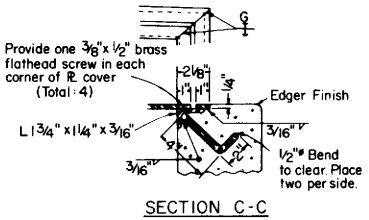
* Based on H=3.1'
Table based on 8" floor slab, no deduction for pipe openings, 7" curb openings, and curb type giving highest quantity of concrete. No deductions or adjustments are to be made to these quantities because of pipe openings, different floor alternatives different curb types or different height of curb openings.



PLAN



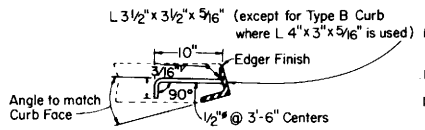
SECTION D-D



SECTION C-C

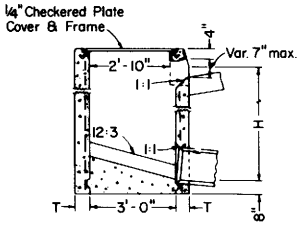
H	T
8'-0" or Less	6"
8'-1" to 20'-0"	8"

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

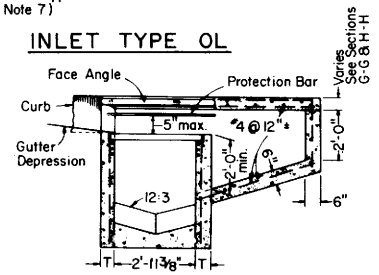


FACE ANGLE ANCHOR DETAIL

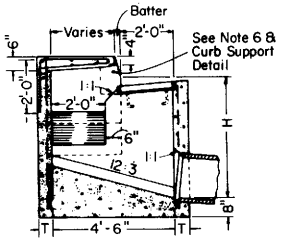
INLET TYPE OL



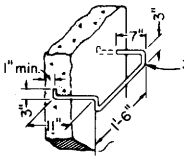
SECTION E-E



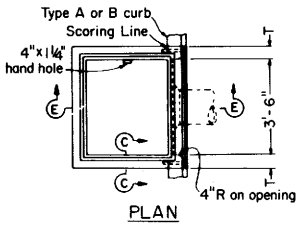
SECTION F-F



SECTION G-G

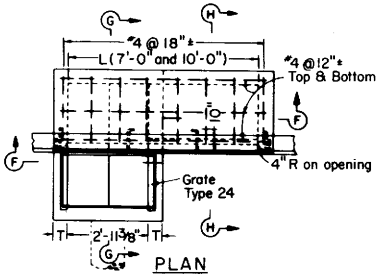


STEP DETAIL



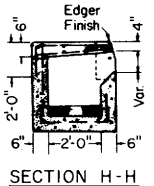
PLAN

INLET TYPE OS

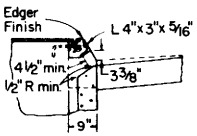


PLAN

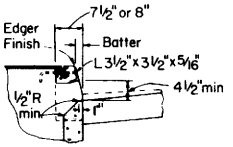
INLET TYPE GOL



SECTION H-H



TYPE B CURBS



TYPE A CURBS

CURB OPENING DETAILS

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

DRAINAGE INLETS | D72

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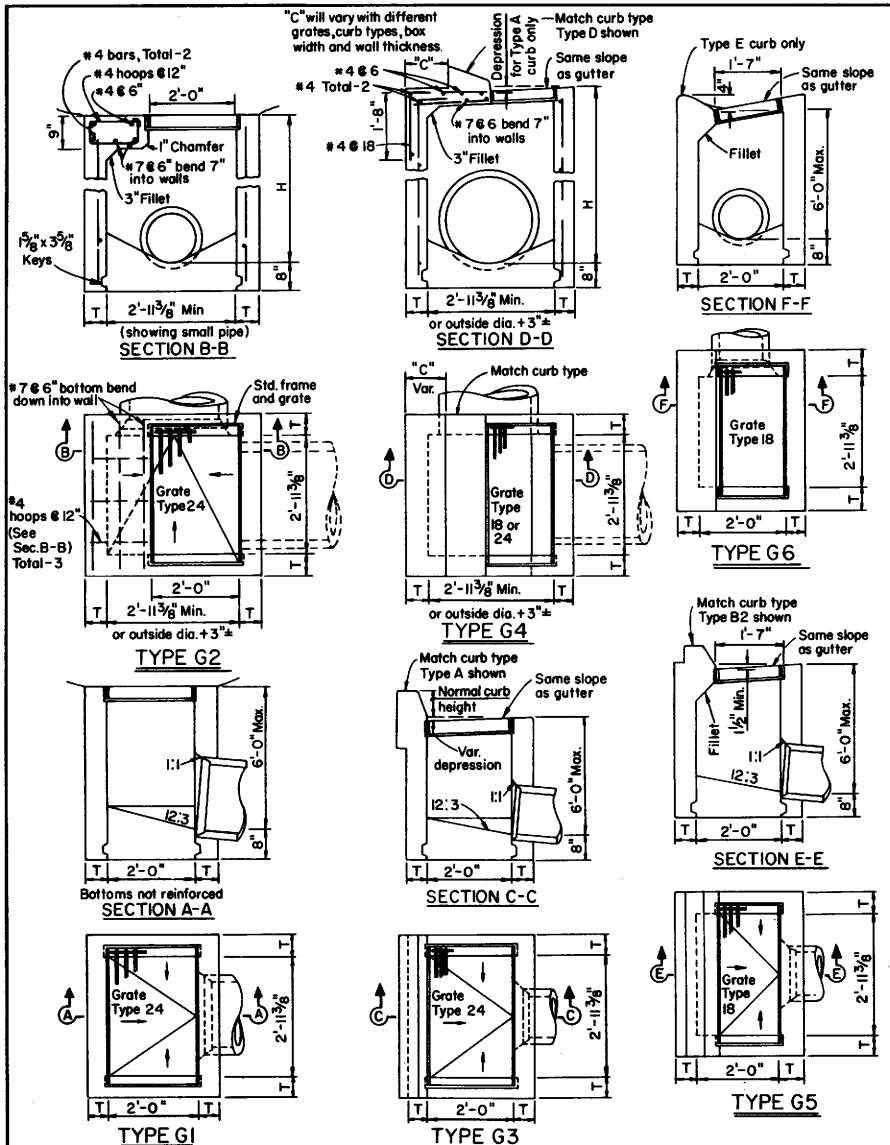
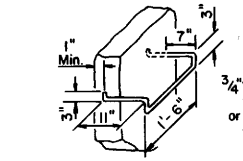
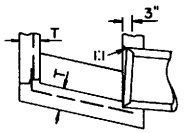
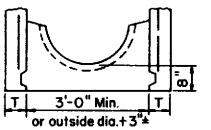




STEP DETAIL



ALTERNATIVE REINFORCED BOTTOM



ALTERNATIVE HALF ROUND BOTTOM

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

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

DATE July 1, 1984

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.
3. Wall reinforcing not required when H=8' or less and the unsupported width or length = 7' or less. Walls exceeding these limits shall be reinforced with #4 bars @ 18"± centers placed 1½" clear to inside of box unless otherwise shown.
4. Steps - None required where "H" is less than 30 inches. Where "H" is 30 inches or more, install steps with lowest rung 12 inches above the floor, and highest rung not more than 6 inches below top of inlet. The distance between steps shall not exceed 12 inches and shall be uniform throughout the length of the wall. Place steps in the wall without an opening.
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, See Standard Specifications.
11. Set inlet so that grate bars are parallel to direction of principal surface flow.
12. See "Standard Grate Details" D77-A & D77-B Grate and Frame Details and Weights of Miscellaneous Iron and Steel.

CONCRETE CUBIC YARDS				
Type	H= 3'-0" to 8'-0" (T=6")		H= 8'-1" to 20'-0" (T=8")	
	H= 3'-0"	Additional P.C.C. per ft. (C.Y.)	H= 8'-1"	Additional P.C.C. per ft. (C.Y.)
G-1	0.95	0.220	(1)	(1)
G-2	1.25	0.257	3.45	0.360
G-3	1.03	0.220	(1)	(1)
G-4 (24")	1.27	0.257	3.48	0.360
G-4 (18")	1.30	0.257	3.50	0.360
G-5	1.02	0.220	(1)	(1)
G-6	1.04	0.220	(1)	(1)

(1) Maximum allowable height 6'-0". Table based on 8" floor slab. No deductions are to be made to these quantities because of pipe openings, different floor alternatives or different curb types.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

DRAINAGE INLETS D73

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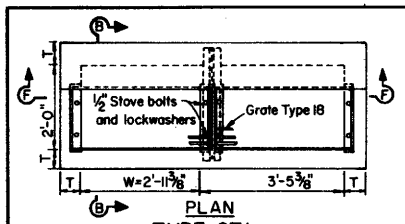
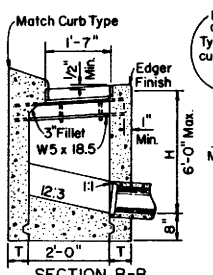
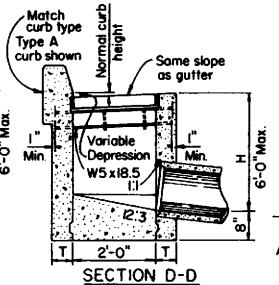
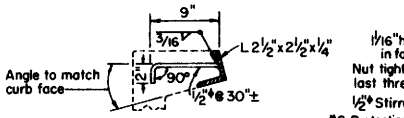
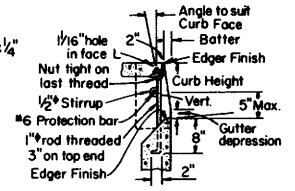
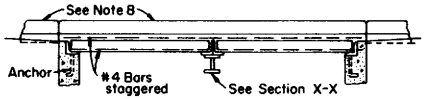


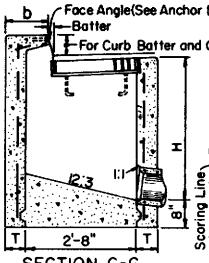


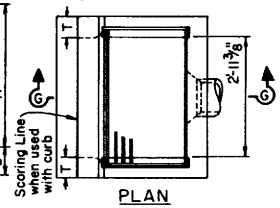


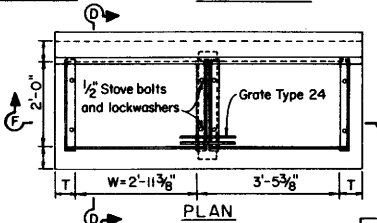


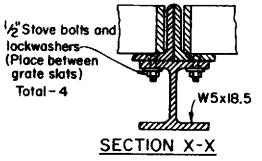












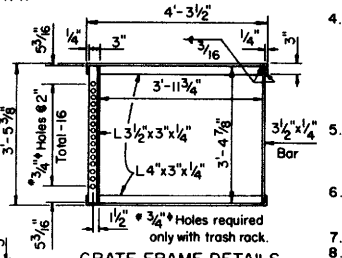
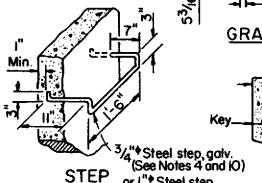
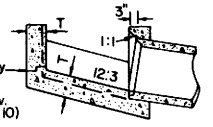
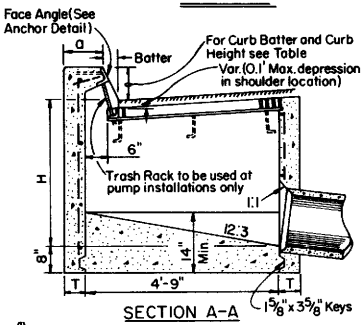


TABLE A

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







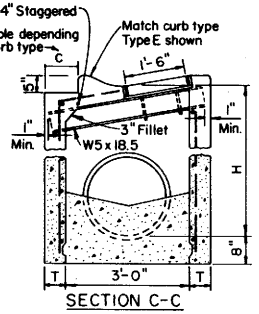
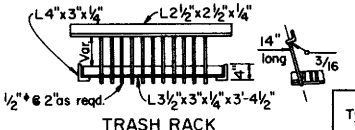
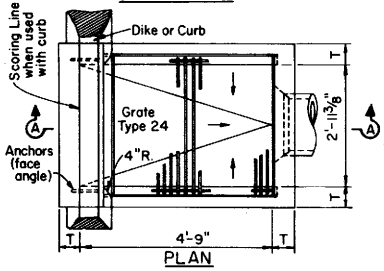
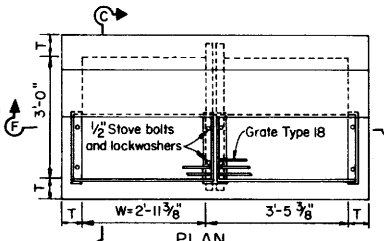


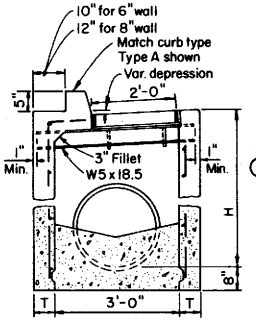
TABLE B

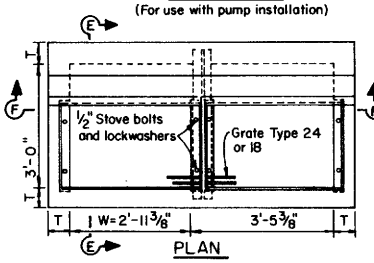
Curb Type	Normal Curb Height	Curb Batter	a	b
A-6	6"	1½"	T+7½"	12½"
A-8	8"	2"	T+7"	12
B	6"	4"	T+5"	10
Dike	6"	3"	T+6"	











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. Wall reinforcing not required when H = 8' or less and the unsupported width or length = 7' or less. Walls exceeding these limits shall be reinforced with #4 bars @ 18" ± centers placed 1½" clear to inside of box unless otherwise shown.
4. Steps - None required where "H" is less than 30 inches. Where "H" is 30 inches or more, install steps with lowest rung 12 inches above the floor and highest rung not more than 6 inches below top of inlet. The distance between steps shall not exceed 12 inches and shall be uniform throughout the length of the wall. Place steps in the wall without an opening.
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 supports shall be evenly spaced and minimal in number such that maximum span of unsupported curb is 7'.
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-A & D77-B for Grate and Frame Details and Weights of Miscellaneous Iron & Steel.
13. See Standard Plan D78-A 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.
16. Cast-in-place or Precast alternative is optional with contractor See Standard Specifications.

CONCRETE CUBIC YARDS

Type	H=3'-0" to 8'-0" (T=6")		H=8'-1" to 20'-0" (T=8")	
	H=3'-0"	Additional P.C.C. per ft. (C.Y.)	H=8'-1"	Additional P.C.C. per ft. (C.Y.)
GO	1.24	0.245	3.39	0.346
GDO	1.62	0.322	4.36	0.446
GT1	1.74	0.348	(1)	(1)
GT2	2.11	0.385	5.40	0.530
GT3	1.73	0.348	(1)	(1)
GT4	2.18	0.385	5.41	0.530

(1) Maximum allowable height = 6'-0"

Table based on 8" floor slab, no deduction for pipe openings, and curb type giving highest quantity of concrete. No deductions or adjustments are to be made to these quantities because of pipe openings, different floor alternatives or different curb type.

Rev.	County	Route	Post Mile Total Project	Sheet No.	Total Sheets

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

DATE July 1, 1984

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

DRAINAGE INLETS D74

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D74

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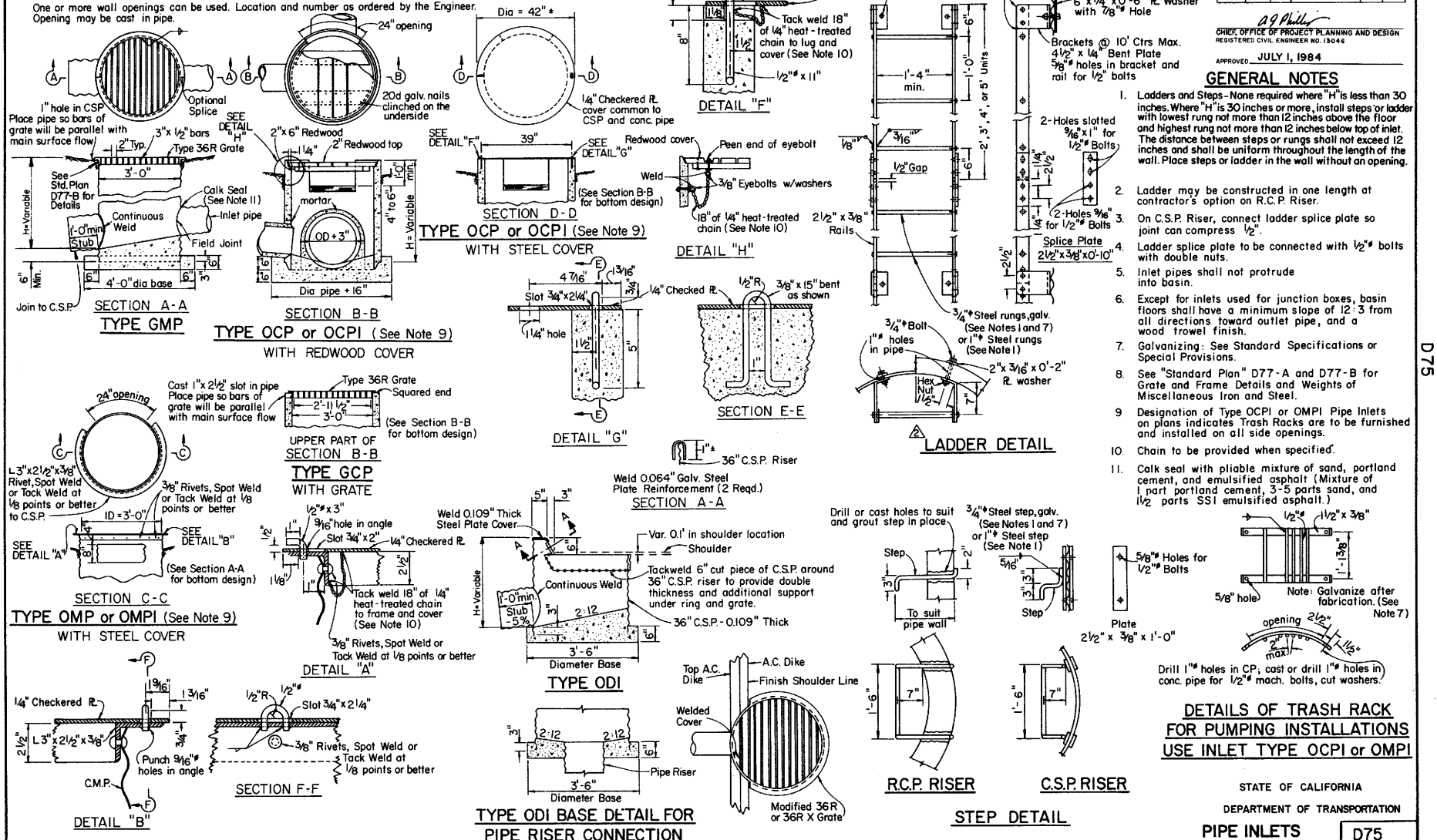
Note to Designer

Redwood cover used where there is no possibility of wheel loads. Otherwise use Type GCP inlet.

One or more wall openings can be used. Location and number as ordered by the Engineer. Opening may be cast in pipe.



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

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

APPROVED JULY 1, 1984

GENERAL NOTES

1. Ladders and Steps - None required where "H" is less than 30 inches. Where "H" is 30 inches or more, install steps or ladder with lowest rung not more than 12 inches above the floor and highest rung not more than 12 inches below top of inlet. The distance between steps or rungs shall not exceed 12 inches and shall be uniform throughout the length of the wall. Place steps or ladder in the wall without an opening.
2. Ladder may be constructed in one length at contractor's option on R.C.P. Riser.
3. On C.S.P. Riser, connect ladder splice plate so joint can compress 1/2".
4. Ladder splice plate to be connected with 1/2"ø bolts with double nuts.
5. Inlet pipes shall not protrude into basin.
6. 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.
7. Galvanizing: See Standard Specifications or Special Provisions.
8. See "Standard Plan" D77-A and D77-B for Grate and Frame Details and Weights of Miscellaneous Iron and Steel.
9. Designation of Type OCPI or OMPI Pipe Inlets on plans indicates Trash Racks are to be furnished and installed on all side openings.
10. Chain to be provided when specified.
11. Calk seal with pliable mixture of sand, portland cement, and emulsified asphalt (Mixture of 1 part portland cement, 3-5 parts sand, and 1 1/2 parts SS1 emulsified asphalt.)

DETAILS OF TRASH RACK FOR PUMPING INSTALLATIONS USE INLET TYPE OCPI or OMPI

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PIPE INLETS D75

D75

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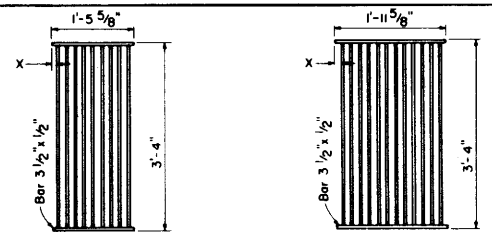
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

DATE July 1, 1984

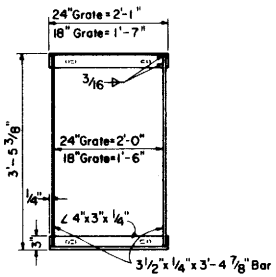


TYPE 18-9
1 3/8" Clear Spacing
Use within the roadbed on highways where bicycles and pedestrians are excluded.

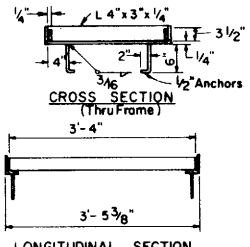
TYPE 24-9
2" Clear Spacing
Use in locations off the roadbed on all types of highways.

TYPE 24-12
1 3/8" Clear Spacing
Use within the roadbed on highways where bicycles and pedestrians are excluded.

RECTANGULAR GRATE DETAILS
(SEE TABLE BELOW)



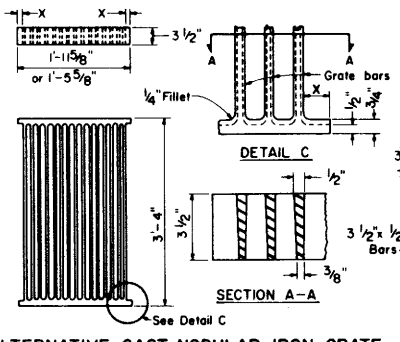
TYPICAL FRAME



CROSS SECTION
(Thru Frame)

LONGITUDINAL SECTION
(Thru Frame and Grate)

RECTANGULAR FRAME DETAILS
(FOR ALL RECTANGULAR GRATES)

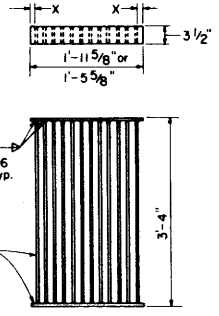


DETAIL C

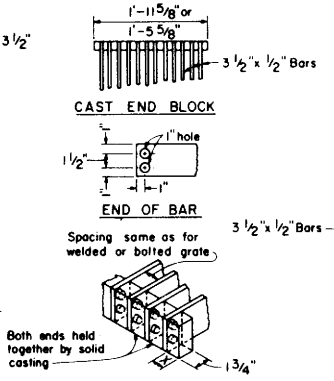
SECTION A-A

ALTERNATIVE CAST NODULAR IRON GRATE OR CAST STEEL GRATE

INLET TYPE	GRATE TYPE	NO. GRATES	WEIGHT LBS
GDO	24-12	2	634
GOL-7	24-12	1	326
GOL-10	24-12	1	326
GO,G1,G2,G3,G4 (24")	24-9	1	263
	24-12	1	326
G4(18"),G5,G6	18-9	1	249
GT-1	18-9	2	498
GT-2	18-9	2	498
GT-3	24-12	2	652
GT-4	24-12	2	652
TRASH RACK			22



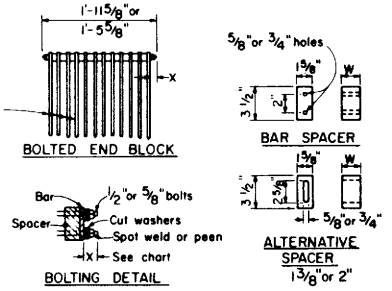
ALTERNATIVE WELDED GRATE



CAST END BLOCK

END OF BAR

ALTERNATIVE CAST NODULAR IRON OR CAST STEEL END BLOCK GRATE



BOLTED END BLOCK

BAR SPACER

BOLTING DETAIL

ALTERNATIVE SPACER
1 3/8" or 2"

ALTERNATIVE BOLTED GRATE

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. See Special Provisions for requirements pertaining to galvanizing or asphalt dipping of grates and frames.
4. Rounded top of bars optional on all grates.
5. Pipe 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. (weights of face angles, steps, protection bars, etc. are not included)

GRATE BAR SPACING TABLE

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"

INLET TYPE	COVER TYPE	WEIGHT LBS
OS	PLATE	174
OL-7	PLATE	170
OL-10	PLATE	170
OL-14	PLATE	170
OL-21	PLATE	170
OCP	PLATE	112
OCPI	PLATE	112
OCPI	REDWOOD	42
OMP	PLATE	177
OMPI	PLATE	177

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

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

GRATE DETAILS D77-A

D77-A

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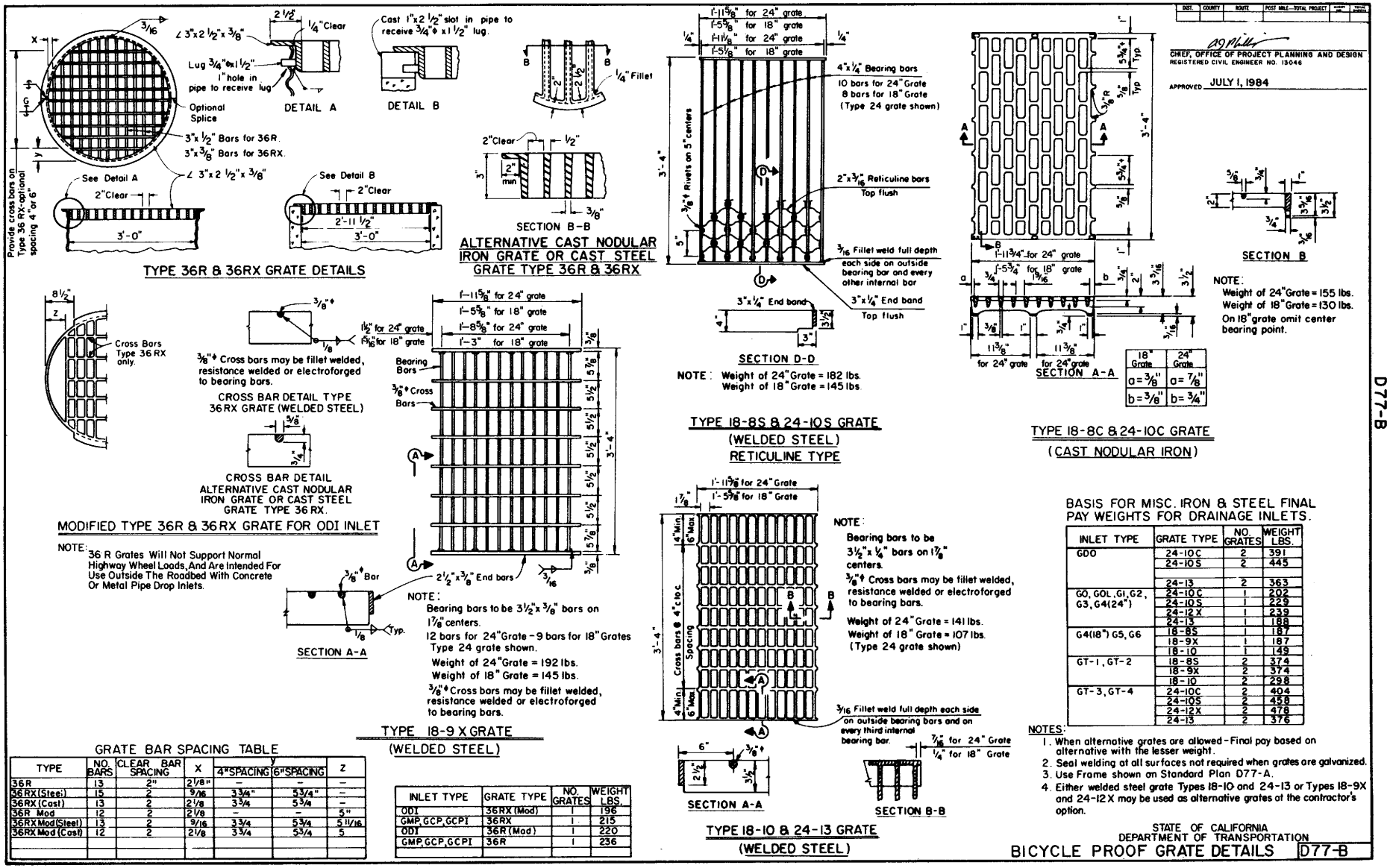

BASIS FOR MISC. IRON & STEEL FINAL PAY WEIGHTS FOR DRAINAGE INLETS.

INLET TYPE	GRATE TYPE	NO. GRATES	WEIGHT LBS.
GDO	24-10C	2	391
	24-10S	2	445
	24-13	2	363
GO, GOL, G1, G2, G3, G4(24")	24-10C	1	202
	24-10S	1	229
	24-12X	1	239
	24-13	1	188
G4(18") G5, G6	18-8S	1	187
	18-9X	1	187
	18-10	1	149
GT-1, GT-2	18-8S	2	374
	18-9X	2	374
	18-10	2	298
GT-3, GT-4	24-10C	2	404
	24-10S	2	458
	24-12X	2	478
	24-13	2	376

NOTES:
1. When alternative grates are allowed - Final pay based on alternative with the lesser weight.
2. Seal welding at all surfaces not required when grates are galvanized.
3. Use Frame shown on Standard Plan D77-A.
4. Either welded steel grate Types 18-10 and 24-13 or Types 18-9X and 24-12X may be used as alternative grates at the contractor's option.

GRATE BAR SPACING TABLE

TYPE	NO. BARS	CLEAR BAR SPACING	X	y 4" SPACING	y 6" SPACING	Z
36R	13	2"	2 1/8"	–	–	–
36RX (Steel)	15	2	9/16	3 3/4"	5 3/4"	–
36RX (Cast)	13	2	2 1/8	3 3/4	5 3/4	–
36R Mod	12	2	2 1/8	–	–	5"
36RX Mod (Steel)	13	2	9/16	3 3/4	5 3/4	5 11/16
36RX Mod (Cast)	12	2	2 1/8	3 3/4	5 3/4	5

INLET TYPE	GRATE TYPE	NO. GRATES	WEIGHT LBS.
ODI	36RX (Mod)	1	196
GMP, GCP, GCPI	36RX	1	215
ODI	36R (Mod)	1	220
GMP, GCP, GCPI	36R	1	236

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
BICYCLE PROOF GRATE DETAILS D77-B

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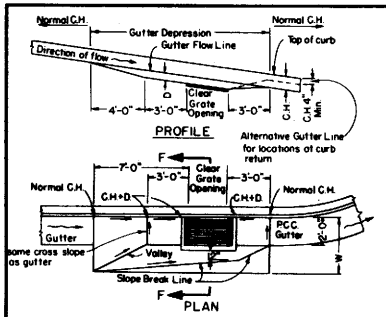
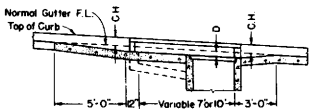
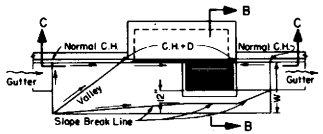


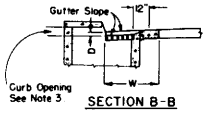
TYPE G_1 THRU G_6 INLETS ON GRADE

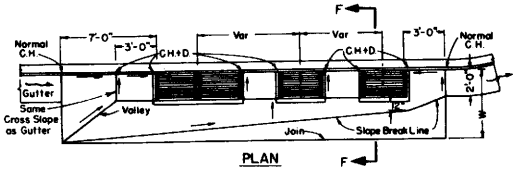


SECTION C-C

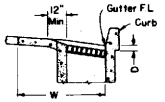


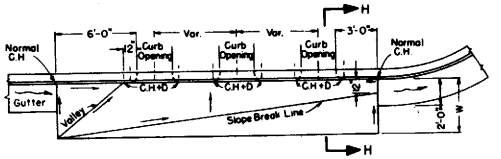
TYPE GOL INLET ON GRADE



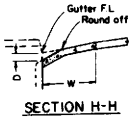


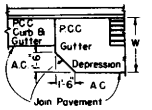
GRATE INLET IN SERIES



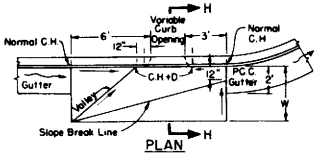


TYPE OS & OL INLETS IN SERIES ON GRADE

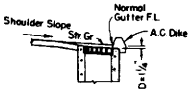




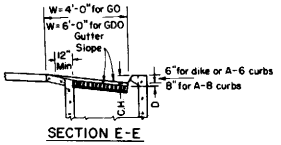
DETAIL OF ASPHALT CONCRETE PAVEMENT
(See Note 4)

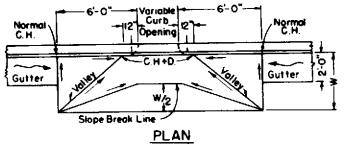


TYPE OS & OL INLETS ON GRADE

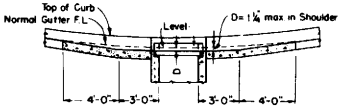


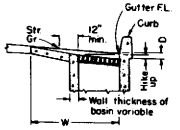
DETAIL OF INLET WITH DIKE
(SINGLE GRATE SHOWN)

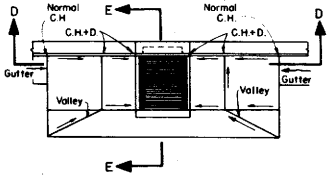




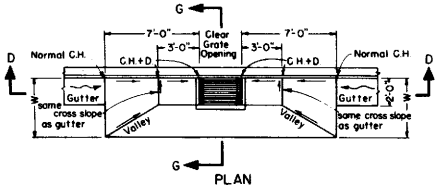
TYPE OS & OL INLETS IN GRADE SAG







TYPE GO & GDO INLET IN GRADE SAG
(GDO SHOWN)



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

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

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

DATE July 1, 1984

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 Shoulders 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
DEPARTMENT OF TRANSPORTATION

GUTTER DEPRESSIONS | D78

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SPAN		4					5					6					7					8				
HEIGHT	'	2	3		4		2	3		4	5	3	4	5		6	3	4	5		6	4	5		6	7	8
Maximum Earth Cover	'	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	10	20	10	20	10	10	20	10	20	10	20
Conc. Roof T1	"	7	7	7	7	7	7½	7½	7½	7½	7½	7½	7½	7½	7½	7½	8	8	8	8	8	8	8	8	8	8	8
Conc. Walls T2	"	6	6	6	6	6½	6	6	6	6	7	6½	7½	7	8½	8	6	6	6	7	6½	7½	7	8½	8	9½	9
Conc. Invert T3	"	6	6	6	6	6½	6½	7	6½	7	6½	7	6½	7	7	8	7	8	7	8	7	8	8	8	8	8	8
Reinf. Spacing	"	7	7	7	7	7	8½	6	8½	5½	8½	5½	8½	5½	7½	5	7½	5	7½	5	7½	4½	6½	5	6½	4½	6
Reinf. "a" Size Bar #		6	6	6	6	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7	6	7
Reinf. "e" Size Bar #		4	4	4	5	5	6	4	4	4	5	5	6	6	4	4	5	5	6	6	7	5	6	6	7	7	7
Quan. Concrete CF/LF		7.4	7.4	8.4	8.4	9.4	10.1	8.9	9.2	10.0	10.2	11.0	12.0	12.5	13.7	11.7	12.3	12.7	14.2	14.2	15.9	15.9	18.3	15.7	14.9	14.6	16.8
Quan. Reinforcement lbs/LF		48	48	50	55	58	67	58	60	58	68	67	81	82	105	70	81	82	96	97	120	124	148	94	94	105	118

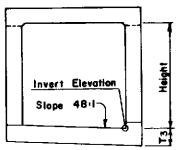
SPAN		10										12							14								
HEIGHT	'	5	6		7	8		9		10	6	7	8		9		10	11	12	7	8		9	10		11		12	13	14
Maximum Earth Cover	'	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
Conc. Roof T1	"	8	10½	8	10½	8	10½	8	10½	8	10½	8½	12	8½	12	8½	12	8½	12	8½	12	9½	12	9½	12	9½	12	9½	12	9½	12
Conc. Walls T2	"	8	8	8	9	8	9	8	10	8½	11½	9½	12½	8	10	8½	10½	8½	11½	9	12½	10½	13½	11½	15	9½	11	9½	11½	9½	11½
Conc. Invert T3	"	8	11	8	11	8	11	8	11	8	11	8½	12	8½	12½	9	12½	9	12½	9	12½	9	12½	9½	13	10	13	10	14½	10	14½
Reinf. Spacing	"	13	12	12	12	11	11	10	11	10	11	10	9	10	9	10	8	10	8	10	9	10	9	9	8	10	9	10	9	10	9
Reinf. "a"⑥ Size Bar #		6	7	6	7	6	7	6	7	6	6	6	7	6	7	6	7	6	7	6	6	6	6	7	7	7	7	7	7	7	7
Reinf. "b" Size Bar #		6	7	6	7	6	7	6	7	6	7	7	6	7	6	7	6	7	6	7	7	7	6	6	7	6	7	6	7	6	7
Reinf. "b" Dimension "B" ' "		2-11	2-11	2-11	3-0	2-11	3-9	2-11	3-9	2-11	3-9	3-1	3-2	3-9	3-9	3-9	3-9	3-7	3-9	3-7	4-4	3-7	4-4	4-4	4-4	2-9	4-2	3-4	4-4	3-4	4-6
Reinf. "b" Dimension "B" ' "		4-10	5-0	4-10	5-0	4-10	5-0	4-10	5-0	4-10	5-0	4-7	4-7	6-0	5-10	6-2	6-7	6-2	6-7	4-11	4-11	4-11	4-11	4-11	4-4	6-5	7-0	7-0	8-4	7-0	8-4
Reinf. "c" Size Bar #		6	7	6	7	6	7	6	7	7	7	7	7	6	7	6	7	6	7	6	7	7	7	7	7	7	7	7	7	7	7
Reinf. "c" Dimension "C" ' "		3-4	3-4	7-4	4-8	7-7	4-8	8-2	4-8	7-7	4-8	7-7	4-8	4-4	3-7	8-1	5-7	8-1	5-7	8-1	5-7	8-1	5-7	8-1	5-7	4-0	4-2	6-9	6-9	5-10	5-10
Reinf. "e"⑤ Size Bar #		4	4	4	4	4	4	4	4	4	4	5	5	4	4	4	4	4	4	4	4	5	5	5	5	4	4	4	4	4	4
Quan. Concrete CF/LF		21.6	26.8	23.0	29.5	24.3	31.0	25.6	34.1	27.8	37.7	32.1	42.3	26.8	37.7	29.3	40.1	30.3	41.9	32.2	45.4	34.5	49.8	40.7	54.2	45.4	59.9	36.2	51.0	37.8	53.1
Quan. Reinforcement lbs/LF		191	267	233	285	260	325	300	339	314	327	360	373	295	362	353	409	365	420	402	413	415	424	440	471	468	534	374	471	449	522

"d" bars, for earth covers of 2' and less							
Span	4'	5'	6'	7'	8'	10'	12'	14'
Number	5	6	7	8	9	10	12	16

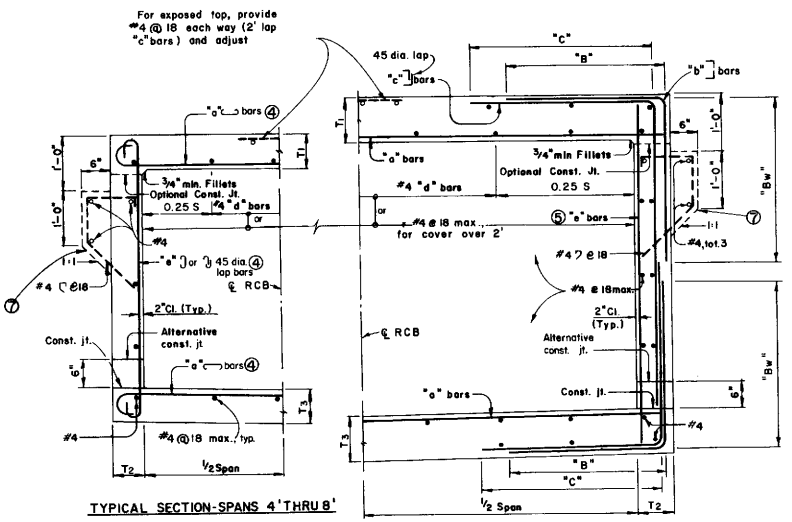
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE JULY 1, 1984

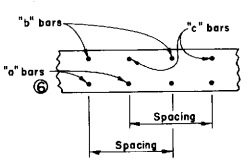


SLOPED INVERT

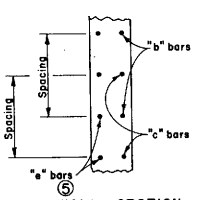


TYPICAL SECTION-SPANS 4' THRU 8'

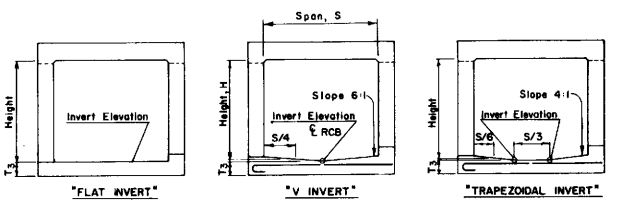
TYPICAL SECTION-SPANS 10' THRU 14'



ROOF SECTION
SPANS 10' THRU 14'
Invert similar



WALL SECTION
SPANS 10' THRU 14'



"FLAT INVERT"

"V INVERT"

"TRAPEZOIDAL INVERT"

ALTERNATIVE INVERTS

GENERAL NOTES

1. For boxes with Span or Height less than any of those shown in table, use next greater size box concrete dimensions and reinforcement. Make necessary changes in bar lengths and quantities.
2. Quantities are approximate and for design purposes only.
3. For boxes with Span or Height or cover greater than those shown in tables, a special design is required.
4. It is permissable to eliminate the 180° hooks on every other bar.
5. "e" bars are at half spacing. (spans 10'-14' only)
6. "a" bars are at half spacing. (spans 10'-14' only)
7. Provide paving notch when top is exposed and when pavement is P.C.C., and adjust quantities.
8. For design and details not shown, see Standard Plan "D83", Box Culvert Miscellaneous Details

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SINGLE BOX CULVERT

D80

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED JULY 1, 1984

SPAN	4					
HEIGHT	2		3		4	
Maximum Earth Cover	10	20	10	20	10	20
Conc. Roof T1 "	7	7	7	7	7	7
Conc. Exterior Walls T2 "	6	6	6	6	6	7
Conc. Invert T3 "	7	7	7	7	7	7
Reinf. Spacing "	16	15	16	15	16	15
Reinf. "g" Size Bar #	4	7	4	7	4	7
Reinf. "f" Size Bar #	5	5	5	5	5	5
Reinf. "a" Size Bar #	6	4	6	4	6	4
Reinf. "e" ⑤ Size Bar #	4	4	4	5	5	6
Quan. Concrete CF/LF	14.0	14.0	15.5	15.5	17.0	17.8
Quan. Reinforcement lbs/LF	78	89	84	95	93	112

SPAN	5							
HEIGHT	2		3		4		5	
Maximum Earth Cover	10	20	10	20	10	20	10	20
Conc. Roof T1 "	7	7½	7	7½	7	7½	7	7½
Conc. Exterior Walls T2 "	6	6	6	6	6	7	6½	7½
Conc. Invert T3 "	7	8	7	8	7	8	7	8
Reinf. Spacing "	11½	14	11½	14	11½	14	11½	15
Reinf. "g" Size Bar #	4	7	4	7	4	7	4	7
Reinf. "f" Size Bar #	5	5	5	5	5	5	5	5
Reinf. "a" Size Bar #	6	4	6	4	6	4	6	4
Reinf. "e" ⑤ Size Bar #	4	4	4	5	5	6	5	7
Quan. Concrete CF/LF	16.3	17.8	17.8	19.3	19.3	21.6	21.3	23.8
Quan. Reinforcement lbs/LF	119	112	122	121	134	137	145	162

SPAN	6							
HEIGHT	3		4		5		6	
Maximum Earth Cover	10	20	10	20	10	20	10	20
Conc. Roof T1 "	7	9	7	9	7	9	7	9
Conc. Exterior Walls T2 "	6	6	6	7	6½	8	7	8½
Conc. Invert T3 "	7	9	7	9	7	9	7	9
Reinf. Spacing "	11½	12	11½	12	11½	12	11½	12
Reinf. "g" Size Bar #	6	7	6	7	6	7	6	7
Reinf. "f" Size Bar #	5	5	5	5	5	5	5	5
Reinf. "a" Size Bar #	7	4	7	4	7	4	7	4
Reinf. "e" ⑤ Size Bar #	4	5	4	6	5	6	6	7
Quan. Concrete CF/LF	20.1	24.6	21.6	27.0	23.6	29.7	25.8	32.2
Quan. Reinforcement lbs/LF	186	162	192	179	206	190	227	212

SPAN	7									
HEIGHT	3		4		5		6		7	
Maximum Earth Cover	10	20	10	20	10	20	10	20	10	20
Conc. Roof T1 "	7½	10	7½	10	7½	10	7½	10	8	10
Conc. Exterior Walls T2 "	6	6	6	7	6½	7½	7	9	8	9½
Conc. Invert T3 "	7½	10½	7½	10½	7½	10½	7½	10½	7½	10½
Reinf. Spacing "	11	10½	11	10½	11	10½	11	10½	11	10½
Reinf. "g" Size Bar #	6	7	6	7	6	7	6	7	6	7
Reinf. "f" Size Bar #	6	5	6	5	6	5	6	5	6	5
Reinf. "a" Size Bar #	6	4	6	4	6	4	6	4	6	4
Reinf. "e" ⑤ Size Bar #	4	5	5	5	5	6	6	7	6	7
Quan. Concrete CF/LF	23.7	30.8	25.2	33.3	27.2	35.5	29.4	39.1	32.4	41.8
Quan. Reinforcement lbs/LF	207	197	220	208	227	228	252	262	260	276

SPAN	8									
HEIGHT	4		5		6		7		8	
Maximum Earth Cover	10	20	10	20	10	20	10	20	10	20
Conc. Roof T1 "	8	11	8	11	8	11	8	11	8	11
Conc. Exterior Walls T2 "	6	7½	6½	8	7	9	8	10	8½	11
Conc. Invert T3 "	8	11½	8	11½	8	11½	8	11½	8	11½
Reinf. Spacing "	9	10	9	10	9	10	9	10	9	10
Reinf. "g" Size Bar #	7	7	7	7	7	7	7	7	7	7
Reinf. "f" Size Bar #	5	5	5	5	5	5	5	5	5	5
Reinf. "a" Size Bar #	6	4	6	4	6	4	6	4	6	4
Reinf. "e" ⑤ Size Bar #	4	5	5	6	6	6	6	7	6	7
Quan. Concrete CF/LF	29.2	40.1	31.2	42.4	33.4	45.5	36.4	48.9	39.0	52.6
Quan. Reinforcement lbs/LF	283	237	302	266	340	279	350	312	360	326

SPAN	10											
HEIGHT	5		6		7		8		9		10	
Maximum Earth Cover	10	20	10	20	10	20	10	20	10	20	10	20
Conc. Roof T1 "	9	12½	9	12½	9	12½	9	12½	9½	12½	9½	12½
Conc. Exterior Walls T2 "	8	8	8	8½	8	9½	8	10½	8½	11½	9½	12½
Conc. Invert T3 "	9	12½	9	12½	9	12½	9	12½	9	12½	9	12½
Reinforcement Spacing "	11	7½	10½	7½	10	8	10	8	10½	8	10½	8½
"g" Size Bar #	7	7	7	7	7	7	7	7	7	7	7	7
"f" Size Bar #	7	5	6	5	6	5	6	5	6	5	6	5
"a" Size Bar #	4	4	4	4	4	4	4	4	4	4	4	4
"b" Size Bar #	5	5	4	5	5	5	6	5	6	6	6	6
"b" Dimension "B" ' "	1-9	2-7	2-0	2-9	2-3	2-9	2-7	3-1	2-7	3-1	2-7	3-1
"b" Dimension "Bw" ' "	4-0	4-11	4-0	4-11	4-0	4-11	4-0	4-11	4-0	4-11	4-0	4-11
"c" Size Bar #	5	5	6	6	6	6	6	6	7	6	7	6
"c" Dimension "C" ' "	3-1	2-9	3-9	3-3	4-6	4-3	5-6	4-6	6-0	4-9	6-0	4-9
"e" ⑤ Size Bar #	4	4	4	4	4	4	4	4	4	4	5	5
Quan. Concrete CF/LF	42.7	55.6	44.7	58.2	46.7	61.8	48.7	65.6	52.5	70.0	56.3	74.5
Quan. Reinforcement lbs/LF	370	454	381	494	418	494	460	510	486	550	518	568

SPAN	12													
HEIGHT	6		7		8		9		10		11		12	
Maximum Earth Cover	10	20	10	20	10	20	10	20	10	20	10	20	10	20
Conc. Roof T1 "	10	14½	10	14½	10	14½	10	14½	10	14½	10	14½	10	14½
Conc. Exterior Walls T2 "	8	8½	8	9	8½	10½	9	11½	9½	12½	10	14	11	15
Conc. Invert T3 "	10	15	10	15	10	15	10	15	10	15	10	15	10	15
Reinforcement Spacing "	9	8	9	8	8	7½	8	7½	8½	7½	8½	8	8½	8
"g" Size Bar #	7	7	7	7	7	7	7	7	7	7	7	7	7	7
"f" Size Bar #	7	7	7	7	6	6	6	6	6	6	6	6	6	6
"a" Size Bar #	4	4	4	4	4	4	4	4	4	4	4	4	4	4
"b" Size Bar #	5	5	5	6	5	6	5	6	6	6	5	6	6	6
"b" Dimension "B" ' "	2-7	3-1	3-0	3-2	3-6	3-2	3-6	3-4	3-9	3-4	3-9	3-4	3-9	3-4
"b" Dimension "Bw" ' "	4-1	3-2	4-1	3-4	4-1	3-4	4-1	3-7	3-9	3-7	3-9	3-7	3-7	3-7
"c" Size Bar #	6	6	6	6	6	6	6	6	6	6	7	7	7	7
"c" Dimension "C" ' "	3-10	3-7	4-6	4-4	5-7	5-0	6-6	5-2	7-2	5-4	7-5	5-7	7-5	5-7
"e" ⑤ Size Bar #	4	4	4	4	4	4	4	4	4	4	5	5	5	5
Quan. Concrete CF/LF	55.0	76.3	57.0	79.1	59.8	83.8	62.7	88.1	65.9	92.7	69.1	98.8	73.7	104
Quan. Reinforcement lbs/LF	543	604	563	646	600	663	614	688	627	691	701	749	733	764

SPAN	14															
HEIGHT	7		8		9		10		11		12		13		14	
Maximum Earth Cover	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
Conc. Roof T1 "	11½	16½	11½	16½	11½	16½	11½	16½	11½	16½	11½	16½	11½	16½	11½	16½
Conc. Exterior Walls T2 "	8½	9½	8½	10½	9	11½	9½	12½	10½	14	11½	15	12½	16½	13	17½
Conc. Invert T3 "	11½	17	11½	17	11½	17	11½	17	11½	17	11½	17	11½	17	11½	17
Reinforcement Spacing "	8½	8	8½	8	8½	8	8½	8	8½	8	8½	8	9	8	9	8
"g" Size Bar #	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
"f" Size Bar #	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
"a" Size Bar #	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
"b" Size Bar #	5	6	6	6	5	6	6	6	6	6	6	7	7	7	7	7
"b" Dimension "B" ' "	2-7	2-7	3-3	3-3	4-0	4-0	4-0	4-0	4-7	4-4	4-7	4-4	4-7	4-4	4-7	4-4
"b" Dimension "Bw" ' "	5-0	3-9	5-0	4-6	5-0	5-0	5-0	5-0	4-9	5-6	4-9	5-6	4-6	5-6	4-4	5-6
"c" Size Bar #	6	6	6	7	7	7	7	7	7	7	7	7	7	7	8	8
"c" Dimension "C" ' "	4-3	3-11	5-6	4-6	7-0	5-0	7-9	5-9	8-6	6-3	9-0	6-9	9-3	6-9	9-3	6-9
"e" ⑤ Size Bar #	4	4	4	4	4	4	4	4	4	4	5	5	5	5	6	6
Quan. Concrete CF/LF	71.8	99.7	73.9	104	76.9	108	80.0	113	84.2	119	88.8	124	94.1	131	98.1	137
Quan. Reinforcement lbs/LF	662	710	715	783	756	820	807	846	833	873	881	958	884	978	1002	1110

GENERAL NOTES:

① For boxes with Span or Height less than any of those shown in table, used next greater size box concrete dimensions and reinforcement. Make necessary changes in bar lengths and quantities.

② For boxes with Span or Height or cover greater than those shown in tables, a special design is required.

③ Quantities are approximate and for design purposes only.

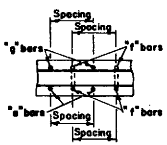
④ It is permissible to eliminate the 180° hooks on every other "e" bar.

⑤ "e" bars are at half spacing.

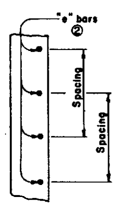
⑥ Provide paving notch when top is exposed and when pavement is P.C.C. and adjust quantities.

⑦ For design and details not shown, see Standard Plan "D83", Box Culvert Miscellaneous Details.

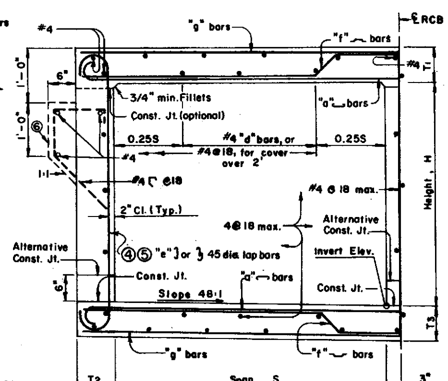
"d" bars, for earth covers of 2' and less								
Span	4'	5'	6'	7'	8'	10'	12'	14'
Number/Cell	4	5	6	8	10	11	13	15



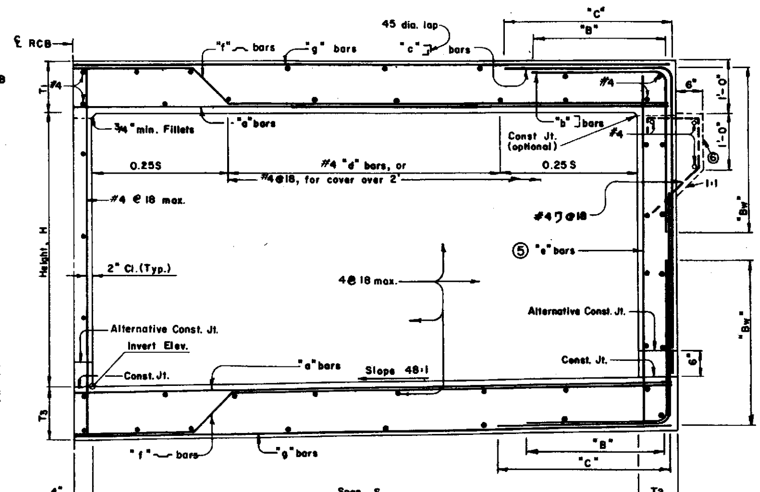
ROOF SECTION
SPANS 4' THRU 8'
INVERT SIMILAR



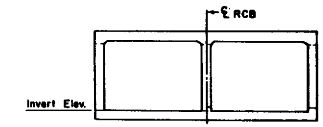
EXTERIOR WALL SECTION
SPANS 4' THRU 8'



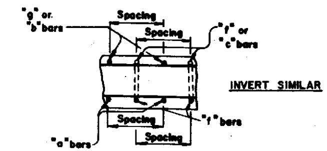
TYPICAL SECTION - 4' THRU 8' SPANS



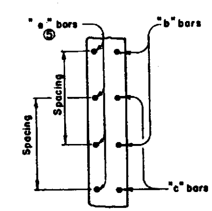
TYPICAL SECTION-10' THRU 14' SPANS



"FLAT INVERT" ALTERNATIVE



ROOF SECTION
SPANS 10' THRU 14'



EXTERIOR WALL SECTION
SPANS 10' THRU 14'

NOTE: This plan sheet may be used for Multiple Cell Culverts by making necessary adjustments.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

DOUBLE BOX CULVERT

D81

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DESIGN NOTES

Specifications:
AASHTO dated 1977 with revisions and as supplemented by Bridge Planning and Design Manual.

Sections are designed for culverts where foundations will support the soil pressures shown for fill heights, to 20' maximum.

Earth cover is assumed to be uniform.
For variable transverse cover heights, a special design is required.

Load Factors: $1.5D + 1.5E + 2.5(L+I)$ Where D=Dead Load
E=Earth Load
L=Live Load
I=Impact
Capacity reduction factor is included.

Loading:
Live load:
HS20-44 truck
Roof: 30% impact up to 3' cover, no impact above 3' cover.
Walls: No surcharge
Invert: No impact
Up to 2' cover
Wheel load distribution on the roof is $E = 4' + .06S$ longitudinally and is concentrated transversely. Wheel load distribution on the invert is 7' longitudinally and uniform over the width of the culvert. Traffic is analyzed parallel to the main (transverse) reinforcement.
Over 2' cover.
Wheel loads distribution on the roof is uniformly over a square, the sides of which are 1.75 times the depth of cover, but not less longitudinally than E. When such areas from several wheel 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 overall longitudinal dimension shall not exceed the total length of the supporting slab. Neglect live load when cover is greater than 8' and exceeds distance between exterior walls.

Wheel load distribution on the invert is the same as on the roof but not less than 7' longitudinally or the width of the invert transversely.
Earth load:
Earth pressures for two conditions:
140 lbs./cu. ft. vertical, 42 lbs./cu. ft. horizontal.
140 lbs./cu. ft. vertical, 140 lbs./cu. ft. horizontal.

Unit stresses:

$f'_c = 3.1/4$ KSI
$f_y = 60$ KSI
$n = 9$

Distribution "d" bars:
Up to 2' cover
Expressed as a percent of main positive reinforcement required: $\frac{100}{\sqrt{S}}$, max. 50% (unless traffic longitudinal).
Over 2' cover
#4 @ 18" maximum.

Shear: Maximum allowable shear, $v_c = 3.5\sqrt{f'_c}$, psi
Maximum shear is taken at a distance d from the supporting member.

Exclusions:
Compressive reinforcement and negative-moment reduction (for continuity) do not apply.
Axial loading on members has not been considered.

CONSTRUCTION NOTES

Construction loads:
Strutting required as shown on standard plan "Construction Loads on Culverts."
Strutting may be required on culvert extensions when existing parapet is removed.
Expansion joints:
Invert:
No expansion joints shall be permitted.
Roof and walls:
When cover is less than span length -
Place 1/2" expansion joint filler at 30'± centers outside the paved roadway lanes and place standard bridge detail 3-2 at 30' centers under paved roadway lanes.
When cover is more than span length -
Place 1/2" expansion joint filler at 30'± centers and additional 1/2" expansion joints at locations of change in foundation character, as directed by the engineer.

Construction joints:
Temporary joints may be permitted if normal (or radial) to ℄ of RCB. Otherwise, the contractor is to submit a proposal for consideration.

Cutoff walls:
4' cutoff walls are to be provided at inlet and/or outlet unless adjacent channel is lined and unless otherwise shown. These walls are to be extended if scour conditions warrant.

Earthwork:
See Standard Plan A62-E

Backfill:
See Standard Specifications, except that the difference in level of backfill (against outside walls) shall not exceed 2'.

(1) Adjacent to each side of the opening, place additional bars equivalent to half of the interrupted main reinforcement.

GENERAL NOTES

Designation:
Standard single or multiple box culverts are shown on plans as span times height with maximum cover over roof thus: 8 x 5 RCB with 10' or DBL 10 x 5 RCB with 20', followed by alternatives.

Alternatives:
Single cell: Invert will be sloped unless "trapezoidal invert", "flat invert" or "V invert" is included in designation.
Multiple cell: Invert will be vee unless "flat invert" is specified.
Ends of culvert will be rounded unless "square ends" are designated.
Parapets will be as shown unless designated in plans. Such designations may be different for inlet and outlet ends.

Quantities:
Quantities are for the sloped or vee invert and do not include "d" bars, nor splices in longitudinal bars, nor temperature reinforcement for exposed roof, nor concrete or reinforcement for parapets, cutoff walls or paving notches.

Reinforcement placement:
Main reinforcement is to be placed transverse or, for curved culverts, radial. When radial, reinforcing spacing is measured along the ℄. Stagger splices not shown. Hooks may be rotated or tilted, as necessary, for clearance.

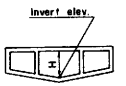
Special reinforcement coverage:
Box standard plans are not to be used for culverts in a corrosive environment or where there is a severe abrasive flow condition or in freeze-thaw locations.

Special design:
Required for culverts with conditions, loads or sizes greater than those given on this plan or the standard tables. Also required for multiple cell culverts with unequal spans. For culverts with railroad loading, see the current A.R.E.A. design specification.

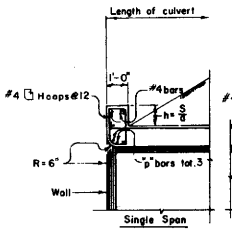
3 or more cells:
For culverts with more than two cells, use dimensions and reinforcement for the standard "double box culvert" and adjust quantities accordingly.

Height \ Cover	10'	20'
6'	1.0	1.6
8'	1.1	1.7
10'	1.2	1.8
12'	1.3	1.9
14'	1.4	2.0

DESIGN BEARING PRESSURE (TSF)



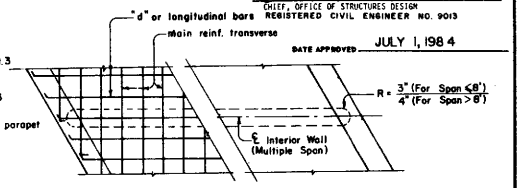
TYPICAL 3 CELL



PART SECTION
S = Clear Span
α = 12 cos. skew angle

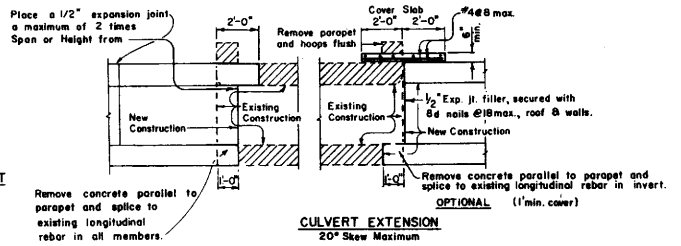
Parapet "P" Bars			
Skew Angle / Span	0° TO 15°	16° TO 30°	31° TO 45°
4'	#4	#4	#4
6'	#4	#4	#5
8'	#4	#5	#6
10'	#5	#6	#7
12'	#6	#7	#8
14'	#7	#8	#9

PARAPET REINFORCEMENT

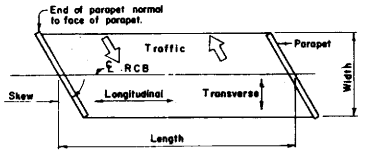


PART PLAN-SKEWED

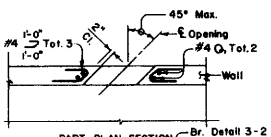
PARAPET DETAIL



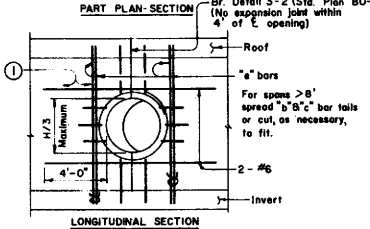
CULVERT EXTENSION
20° Skew Maximum



RCB TERMINOLOGY

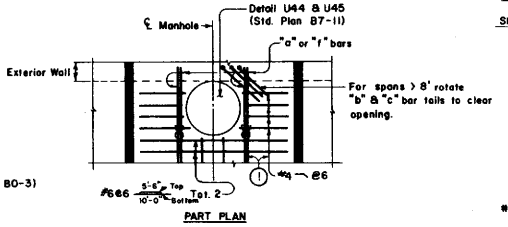


PART PLAN-SECTION

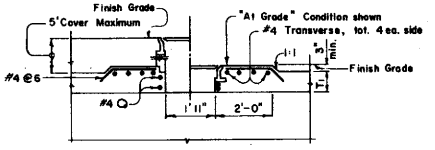


LONGITUDINAL SECTION

UTILITY OPENING-WALL
H = Height

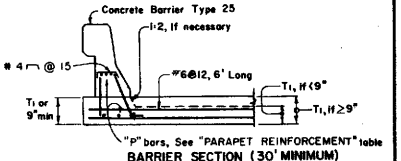


PART PLAN



PART LONGITUDINAL SECTION

MANHOLE



BARRIER SECTION (30' MINIMUM)

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013
DATE APPROVED JULY 1, 1984

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SPECIAL DETAILS
BOX CULVERT
MISCELLANEOUS DETAILS

D83

D83

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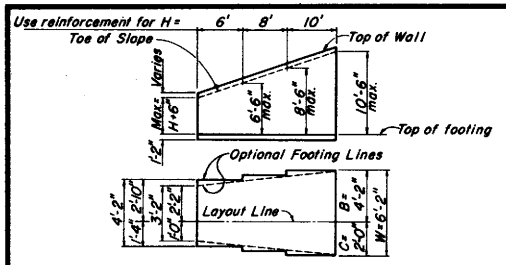
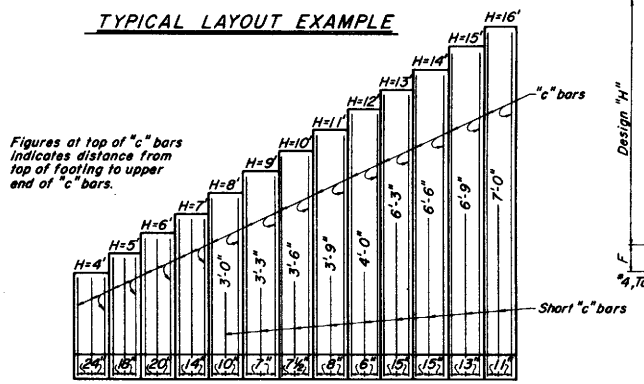
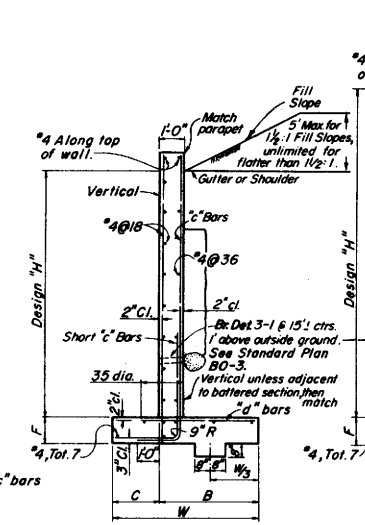
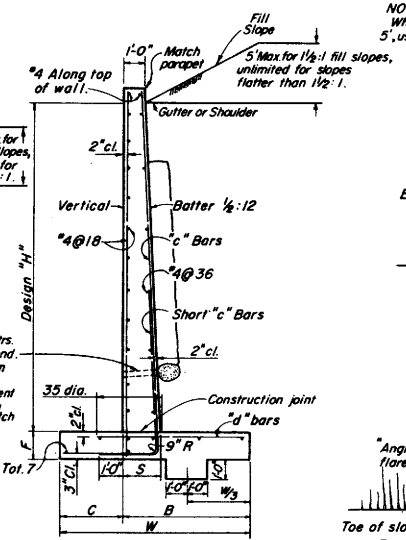


TYPICAL LAYOUT EXAMPLE

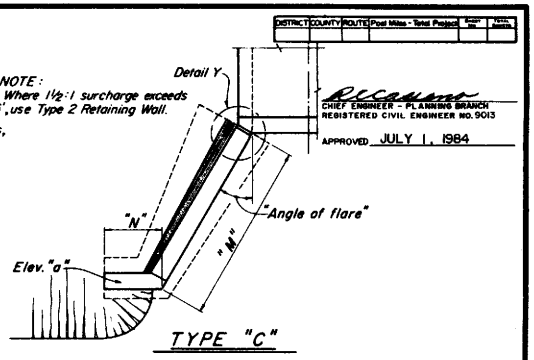




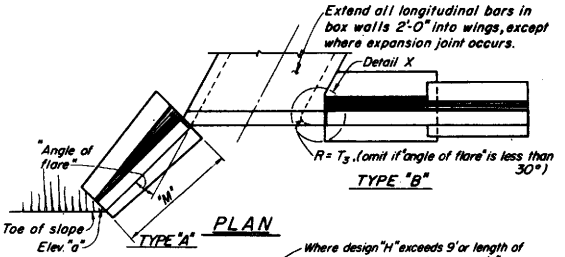
TYPICAL SECTION
H=4' THRU 12'



TYPICAL SECTION
H=13' THRU 16'

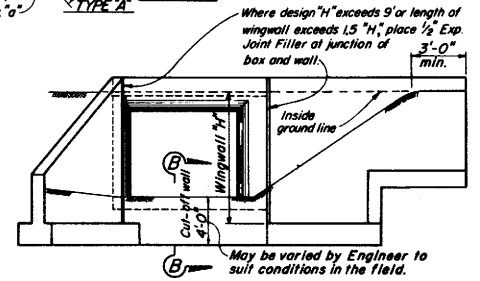


TYPE "C"



TYPE "B"

TYPE "A" PLAN



END ELEVATION

TYPE "A" TYPE "B"

STRAIGHT WINGWALLS

REINFORCED CONCRETE WINGWALLS													
"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. 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
Reinf. lbs./L.F.	13	16	19	25	30	37	49	62	76	73	90	104	125

Quantities do not include that portion above the design "H" limit.

Design Notes:

Unit Stresses: f_s = 24,000 p.s.i, f_c = 1,300 p.s.i, n=10

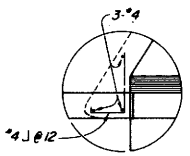
Maximum Toe Pressure = 1½ Tons/sq. ft.

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.

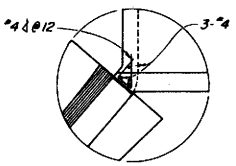
Dimensions "H", "L", "M", "N", Elev. "a" and "Angle of flare" (as apply) are shown on the plans.

Wall height may be exceeded by 6" before going to next greater "H"

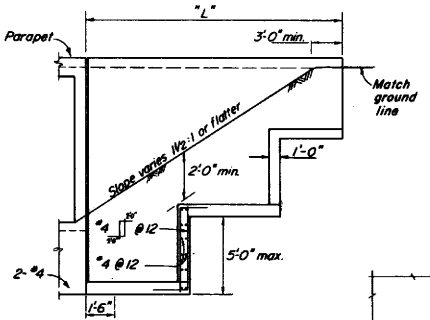
Eliminate cut-off wall if adjacent channel is paved and skew is 20° maximum.



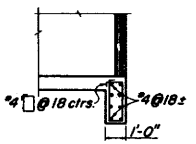
DETAIL X



DETAIL Y



ELEVATION



SEC B-B

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

BOX CULVERT WINGWALLS
TYPES "A", "B" & "C"

D84

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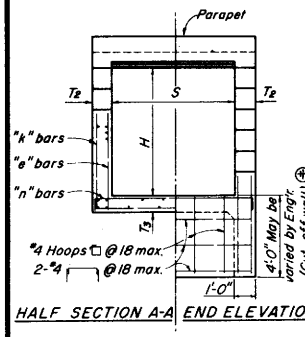
DIST	COUNTY	ROUTE	Post Miles	Total Project	Sheet No.	Total Sheets

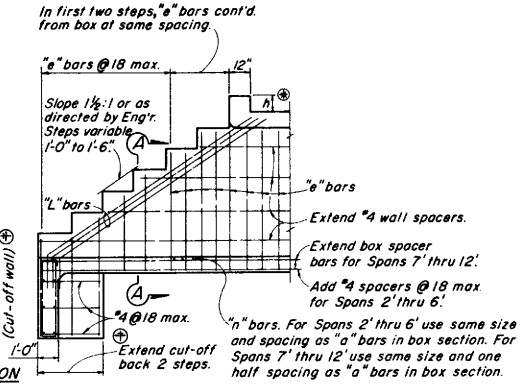
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED JULY 1, 1984

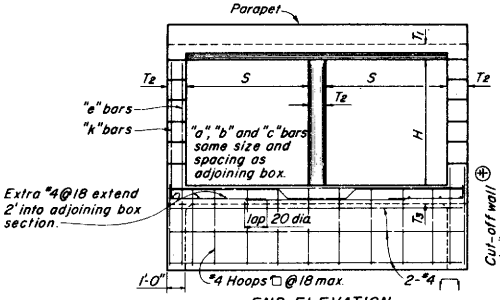
Note: Dimensions S, H, T_1, T_2 and T_3 to be same as adjacent box.



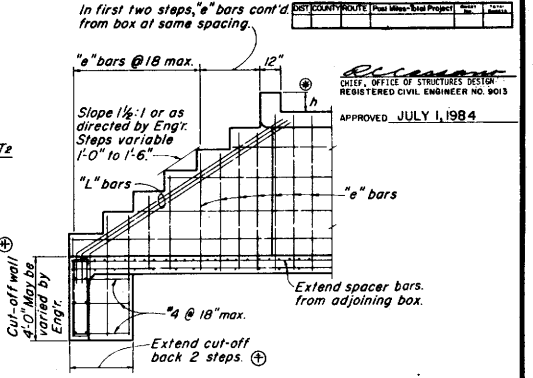
HALF SECTION A-A END ELEVATION



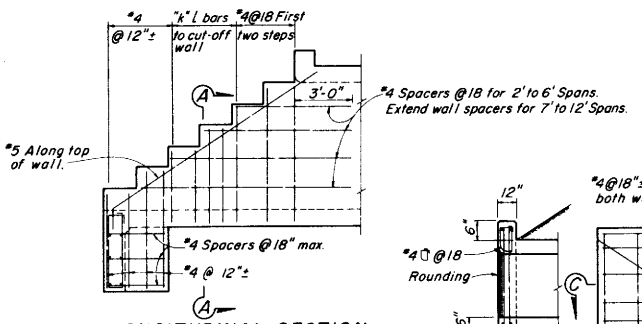
LONGITUDINAL SECTION
(Showing reinforcement in inside face)



END ELEVATION



LONGITUDINAL SECTION
(Showing reinforcement in inside face)

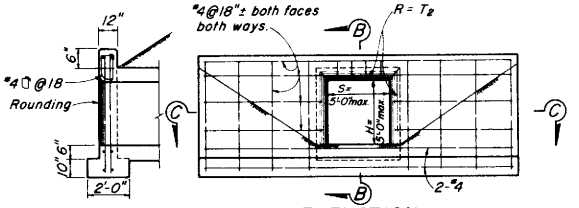


LONGITUDINAL SECTION
(Showing reinforcement in outside face)

TYPE "E" STEPPED WINGWALL

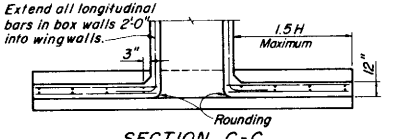
SINGLE BOX

Table of Reinforcement for Type "E" Wingwalls									
	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
"L" 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

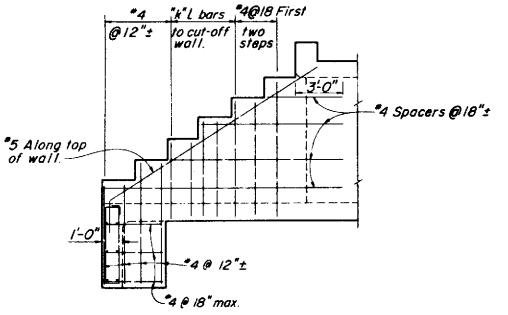
ELEVATION



SECTION C-C
TYPE "D"

STRAIGHT WINGWALL

Details similar for multiple span boxes.



LONGITUDINAL SECTION
(Showing reinforcement in outside face)

TYPE "E" STEPPED WINGWALL

MULTIPLE BOXES

⊕ Eliminate cut-off walls if adjacent channel is paved.

⊛ h" ≥ S', 6" minimum unless otherwise designated

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BOX CULVERT WINGWALLS TYPES "D" AND "E"

D85

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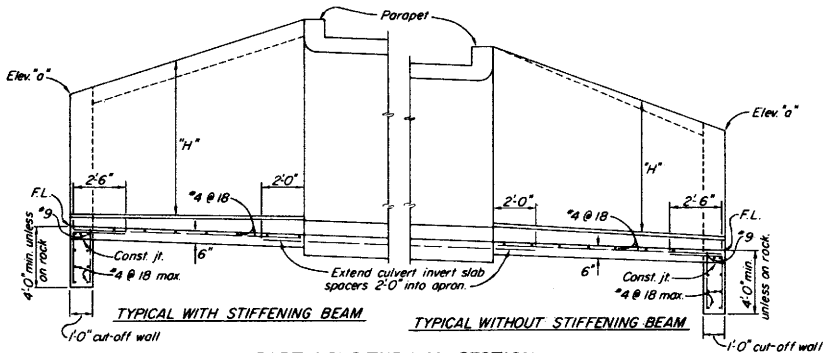
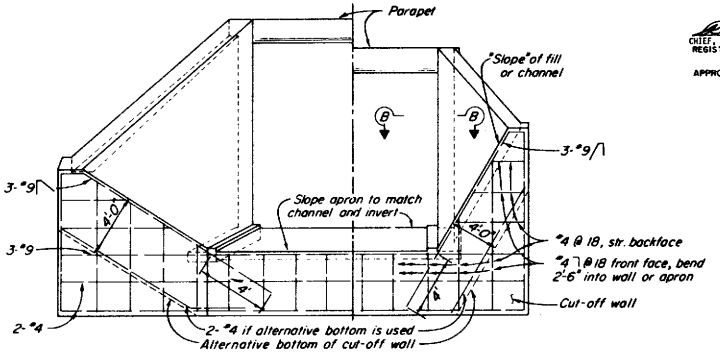
DIST	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	Sheet No.	Total Sheets

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED JULY 1, 1984



PART LONGITUDINAL SECTION



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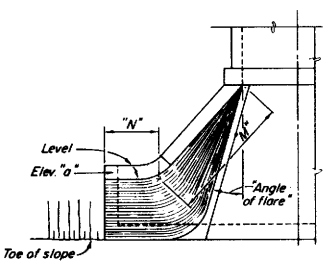
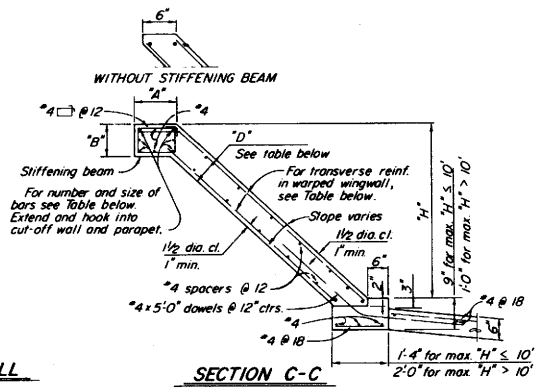
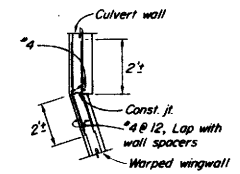


ALTERNATIVE WARPED WINGWALL

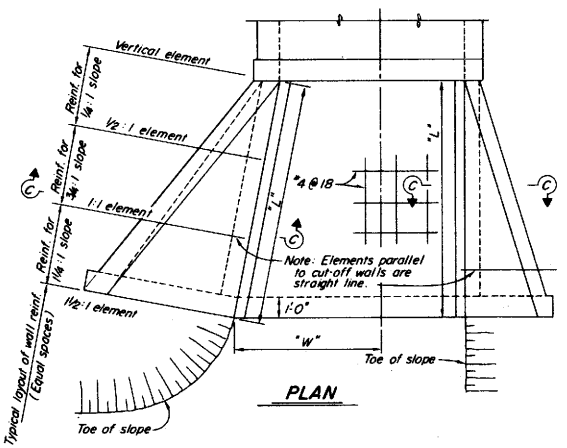
Use where additional protection to toe of embankment is required.



SECTION C-C



SECTION B-B



PLAN

WARPED WINGWALLS

Element Slope	"H"	8' or less	10'	12'	14'	16'	18'	20'
		WALL DIMENSIONS AND REINFORCING						
¼:1	Front face reinf.	#4 @ 12	#4 @ 7	#5 @ 7	#5 @ 5	#6 @ 6	#7 @ 7	#7 @ 6
	Rear face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12
¾:1	Front face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 10	#4 @ 8	#4 @ 6
	Rear face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 10	#4 @ 7	#4 @ 6	#5 @ 8
1¼:1	Front face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12
	Rear face reinf.	#4 @ 8	#4 @ 8	#4 @ 5	#5 @ 6	#6 @ 7	#6 @ 6	#7 @ 6
"D" at Cut-off Wall		6"	6"	6"	7½"	8"	9½"	11"
"D" at Culvert		6"	6"	6"	8"	9½"	11"	1'-1"

"H" max.	"L"	12'	14'	16'	18'	20'	25'	30'	35'	40' or more
	STIFFENING BEAM DIMENSIONS AND REINFORCING									
6'	No beam. Place 2-#6 in each face along top of wall									
8'										
10'		"A" = 1'-0"								
12'		"B" = 9"					"A" = 1'-6"			
14'		Tot. 6-#6					"B" = 1'-0"		"A" = 1'-10"	
16'					Tot. 6-#7			"B" = 1'-0"		"A" = 2'-0"
18'							Tot. 6-#8			"B" = 1'-6"
20'								Tot. 8-#9		

Notes: Walls designed for 2' surcharge; earth load = 120#/cu. ft.; equivalent fluid pressure = 36#/cu. ft.
Vary "D" of warped wall uniformly from that at cut-off wall to that at culvert, for max. "H" > 12'.
Where abrasion is anticipated increase apron thickness to 7" min. to provide 2" min. reinforcement coverage.
Dimensions "L", "W", "H", "M", "N", Elev. "a", "Angle of flare", and end "Slope" (as apply) are shown on the plans.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BOX CULVERT
WARPED WINGWALLS

D86-A

D86-A

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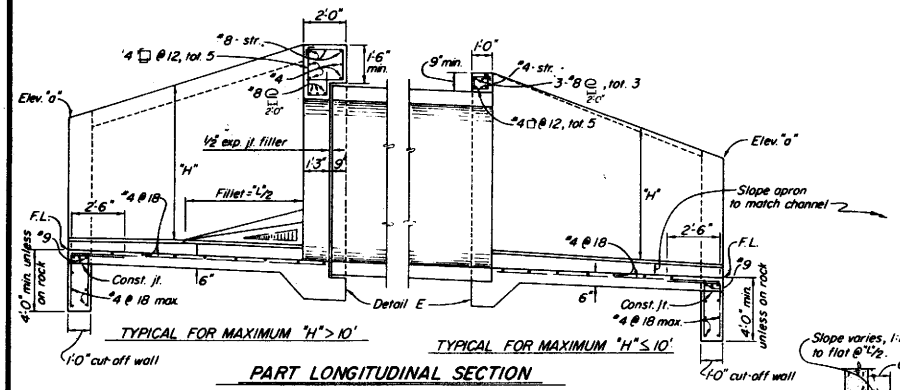
DIST	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

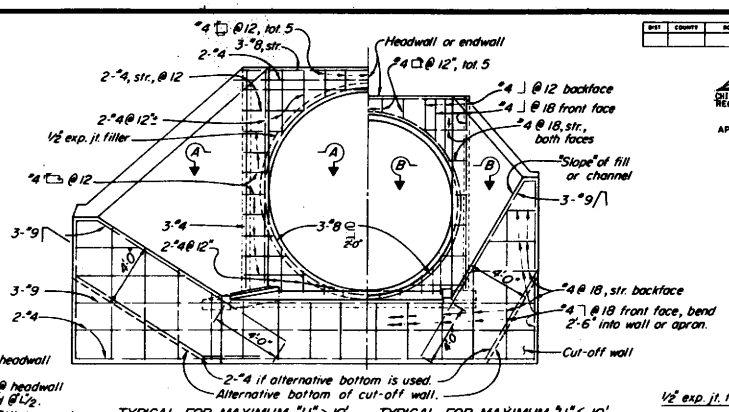
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED JULY 1, 1984



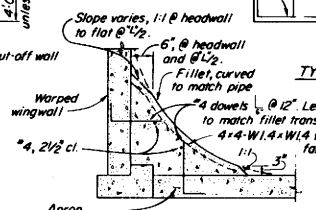
PART LONGITUDINAL SECTION

Note: RCP shown. Metal pipe similar except eliminate the expansion joint and use hook bolts @ 19"± spacing. Size and length provided by manufacturer.

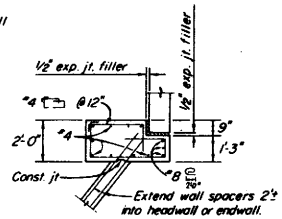


END ELEVATION

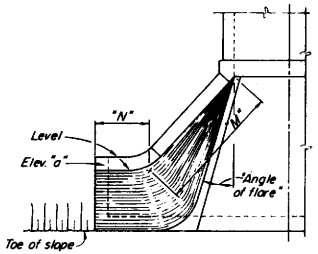
If at upstream end, fillet is not shown



SECTION F-F

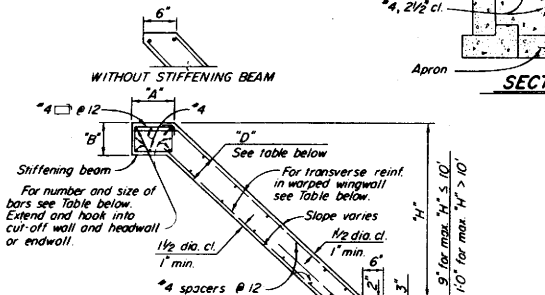


SECTION A-A



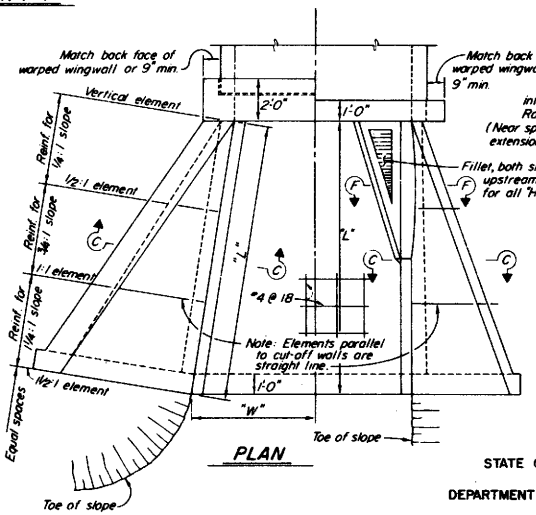
ALTERNATIVE WARPED WINGWALL

Use where additional protection to toe of embankment is required. If at upstream end, fillet is not shown.

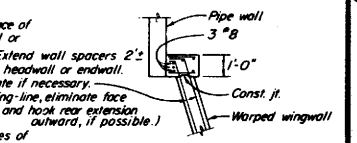


SECTION C-C

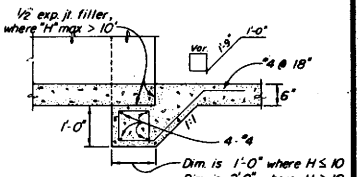
Where abrasion is anticipated, increase apron thickness to 7" min. to provide 2" min. reinforcement coverage.



PLAN



SECTION B-B



DETAIL E

WARPED WINGWALLS

WALL DIMENSIONS AND REINFORCING										STIFFENING BEAM DIMENSIONS AND REINFORCING									
Element Slope	"H"	8' or less	10'	12'	14'	16'	18'	20'	"H" 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" Tot. 6-#6								
	Rear face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 10	#4 @ 7	#4 @ 6	#5 @ 8	12'						"A" = 1'-6" "B" = 1'-0" Tot. 6-#7			
1 1/4:1	Front face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	14'							A = 1'-10" "B" = 1'-0" Tot. 6-#8		
	Rear face reinf.	#4 @ 8	#4 @ 8	#4 @ 5	#5 @ 6	#6 @ 7	#6 @ 6	#7 @ 6	16'								"A" = 2'-0" "B" = 1'-6" Tot. 8-#9	
"D" at Cut-off Wall		6"	6"	6"	7 1/2"	8"	9 1/2"	11"	18'									
"D" at Headwall / Endwall		6"	6"	6"	8"	9 1/2"	11"	1'-1"	20'									

Notes: Walls designed for 2' surcharge; earth load = 120#/cu. ft.; equivalent fluid pressure = 36#/cu. ft.
Vary "D" at warped wall uniformly from that at cut-off wall to that at headwall or endwall, for max. "H" > 12'.
Dimensions "L", "W", "H", "M", "N", Elev. "a", "Angle of flare", and end "Slope" (as apply) are shown on the plans.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PIPE CULVERT
HEADWALLS, ENDWALLS & WARPED WINGWALLS

D86-B

D86-B

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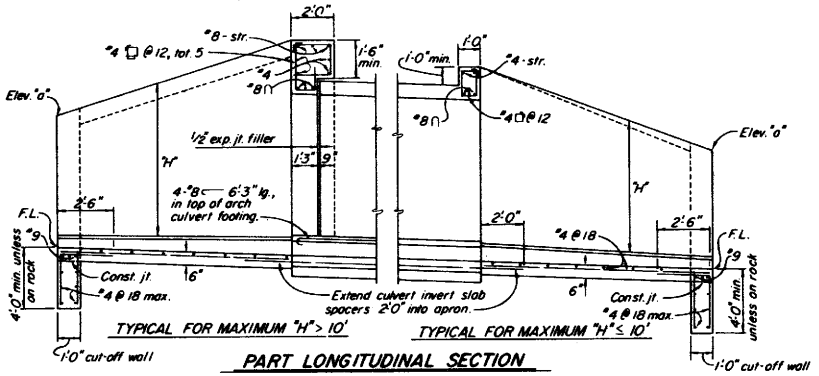
DIST	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

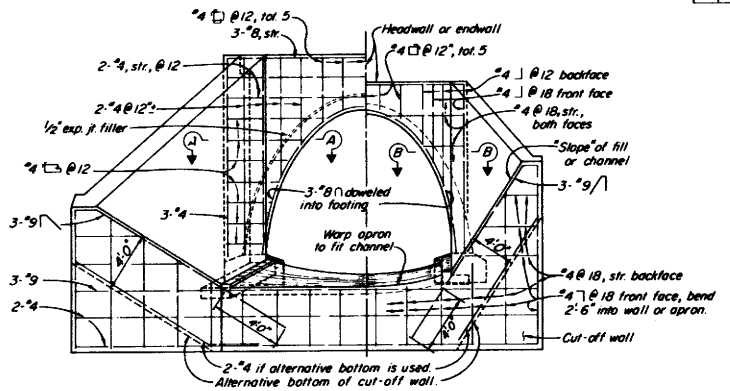
APPROVED JULY 1, 1984



TYPICAL FOR MAXIMUM "H" > 10'

TYPICAL FOR MAXIMUM "H" ≤ 10'

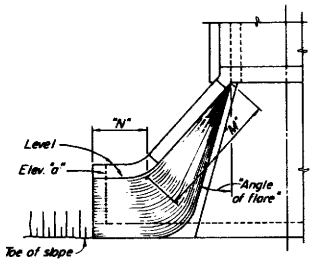
PART LONGITUDINAL SECTION



TYPICAL FOR MAXIMUM "H" > 10'

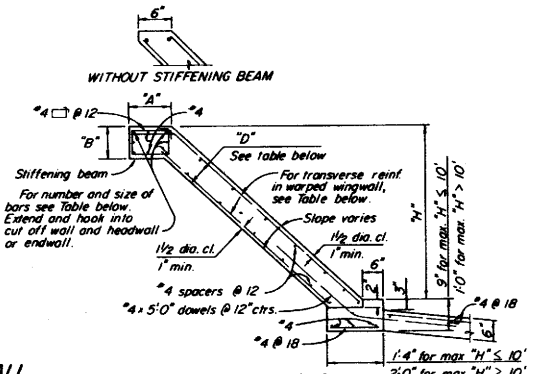
TYPICAL FOR MAXIMUM "H" ≤ 10'

END ELEVATION



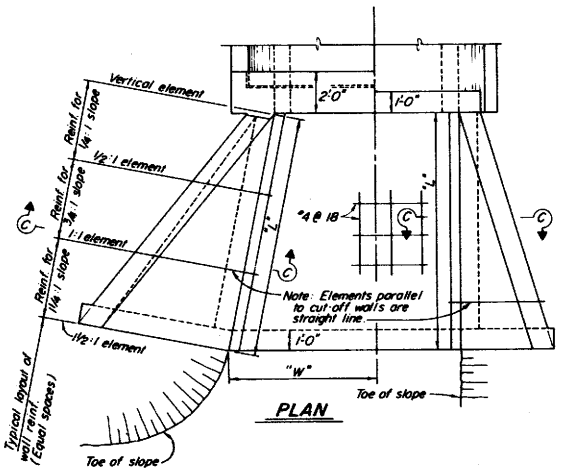
ALTERNATIVE WARPED WINGWALL

Use where additional protection to toe of embankment is required.

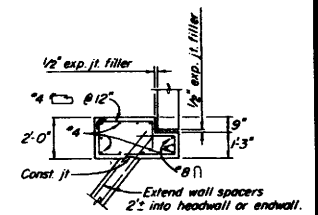


SECTION C-C

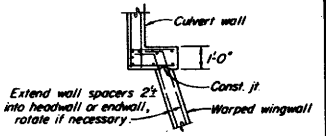
Where abrasion is anticipated, increase apron thickness to 7" min. to provide 2" min. reinforcement coverage.



PLAN



SECTION A-A



SECTION B-B

WARPED WINGWALLS

WALL DIMENSIONS AND REINFORCING									
Element Slope	"H"	8' or less	10'	12'	14'	16'	18'	20'
1/4 : 1	Front face reinf.	#4 @ 12	#4 @ 7	#5 @ 7	#5 @ 5	#6 @ 6	#7 @ 7	#7 @ 6
	Rear face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12
3/4 : 1	Front face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 10	#4 @ 8	#4 @ 6
	Rear face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 10	#4 @ 7	#4 @ 6	#5 @ 8
1 1/4 : 1	Front face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12
	Rear face reinf.	#4 @ 8	#4 @ 8	#4 @ 5	#5 @ 6	#6 @ 7	#6 @ 6	#7 @ 6
"D" at Cut-off Wall		6"	6"	6"	7 1/2"	8"	9 1/2"	11"
"D" at Headwall / Endwall		6"	6"	6"	8"	9 1/2"	11"	1'-1"

STIFFENING BEAM DIMENSIONS AND REINFORCING									
"L" max	12'	14'	16'	18'	20'	25'	30'	35'	40' or more
6'	No beam. Place 2-#6 in each								
8'	face along top of								
10'	wall	"A" = 1'-0"							
12'		"B" = 9"				"A" = 1'-6"			
14'		Tot. 6-#6				"B" = 1'-0"		"A" = 1'-10"	
16'				Tot. 6-#7		"B" = 1'-0"		"A" = 2'-0"	
18'						Tot. 6-#8		"B" = 1'-6"	
20'							Tot. 8-#9		

Notes: Walls designed for 2' surcharge; earth load = 120#/cu. ft.; equivalent fluid pressure = 36#/cu. ft.
Vary "D" of warped wall uniformly from that at cut-off wall to that at headwall or endwall, for max. "H" > 12'
Dimensions "L", "W", "H", "M", "N", Elev. "a", "Angle of flare", and end "Slope" (as apply) are shown on the plans.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

ARCH CULVERT
HEADWALLS, ENDWALLS & WARPED WINGWALLS

D86-C

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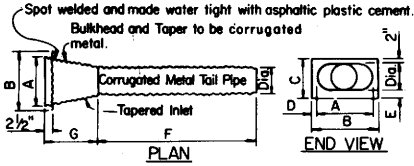
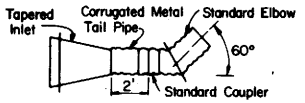


Bulkhead and Taper of same thickness as Tail Pipe with 0.079" Max.
Tail Pipe of same thickness as Downdrain Pipe.

ENTRANCE TAPER-TYPE I ALTERNATIVE A



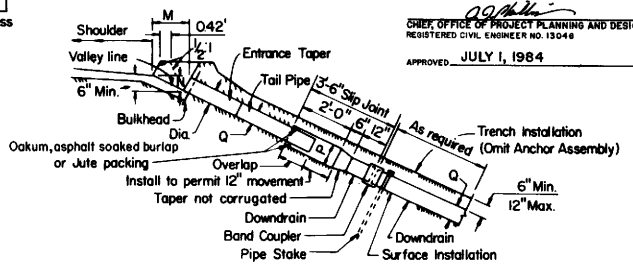
ENTRANCE TAPER-TYPE 2

NOTE: Tapered inlet of same construction and dimensions as Type I-Alternative A or B.

C.M.P. Dimensions as tabulated below

P	10"	15"	18"	21"	27"
Q	8"	12"	15"	18"	24"

Slip joint to be same thickness as downdrain pipe.



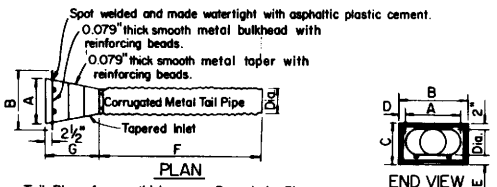
SECTION A-A (TYPE I)

NOTE: (1) Cable, slip joint or anchor assembly to be placed when specified.
(2) Slip joint to be omitted when completely buried.
(3) Slip joint for Type I entrance taper shown. Type 2 similar.

ENTRANCE TAPER AND PIPE DOWNDRAIN

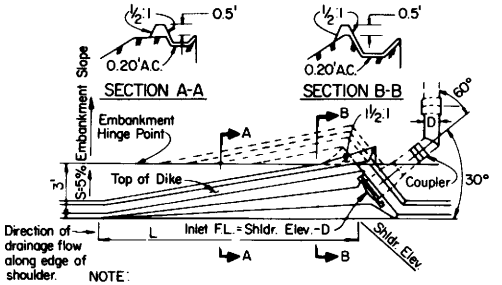
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046
APPROVED JULY 1, 1984



Tail Pipe of same thickness as Downdrain Pipe.

ENTRANCE TAPER-TYPE I ALTERNATIVE B



NOTE: Extend dike base to provide suitable support where dike extends beyond hinge point.

PLAN

TYPE 2

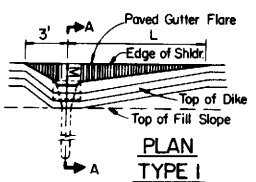
(Recommended for grades of 2% or greater)

DIA. D	MIN. L
8"	15'
12"	20'
15"	30'
18"	35'
24"	45'

NOTES:
Taper joints may be welded or riveted.
Dimensions to be as tabulated below for Type I Alternatives A and B

DIA.	A	B	C	D	E	F	G
8"	16"	25½"	15"	4¾"	5"	6'	2'
12"	18"	25½"	19"	3¾"	5"	6'	2'
15"	21"	30"	23"	4½"	6"	6'	2'
18"	24"	34"	27"	5"	7"	6'	2'
24"	34"	46"	35"	6"	9"	4'	4'

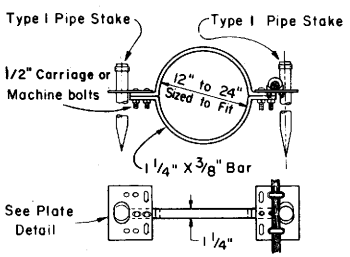
ENTRANCE TAPER-TYPE I ALTERNATIVE A&B



PLAN
TYPE I

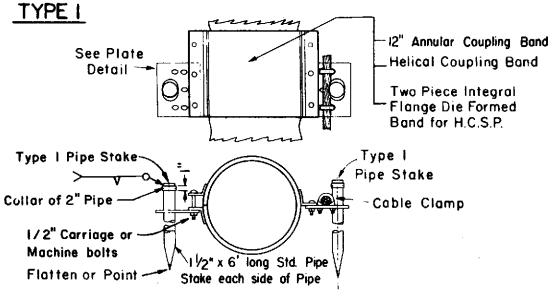
DIA.	MIN. L	M	N
8"	10'	18"	8"
12"	15'	20"	12"
15"	25'	24"	15"
18"	30'	30"	16"
24"	40'	36"	18"

1 - For payment purposes an Anchor Assembly shall include two Pipe Stakes.
2 - All Pipe Stakes and Hardware to be galvanized after fabrication.
3 - Either Alternative A or Alternative B Anchor Assemblies and Type I Pipe Stakes may be used at Contractor's option for C.S.P. or C.A.P., Alternative A anchor assembly only to be placed in annular corrugation. May be placed on annular or reformed end H.C.S.P. coupling band if securely fastened on downstream side of joint. Alternative B anchor assembly to be fastened to pipe sections and not to a band coupler used to join sections.

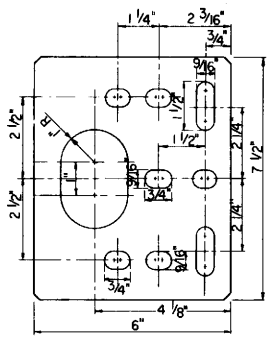


ANCHOR ASSEMBLY ALTERNATIVE A

Note: Cable and cable clamps to be used when required by the Special Provisions.



ANCHOR ASSEMBLY ALTERNATIVE B



Material to be ¼" plate galvanized after fabrication

PLATE DETAIL

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERSIDE DRAINS | D87-A

D87-A

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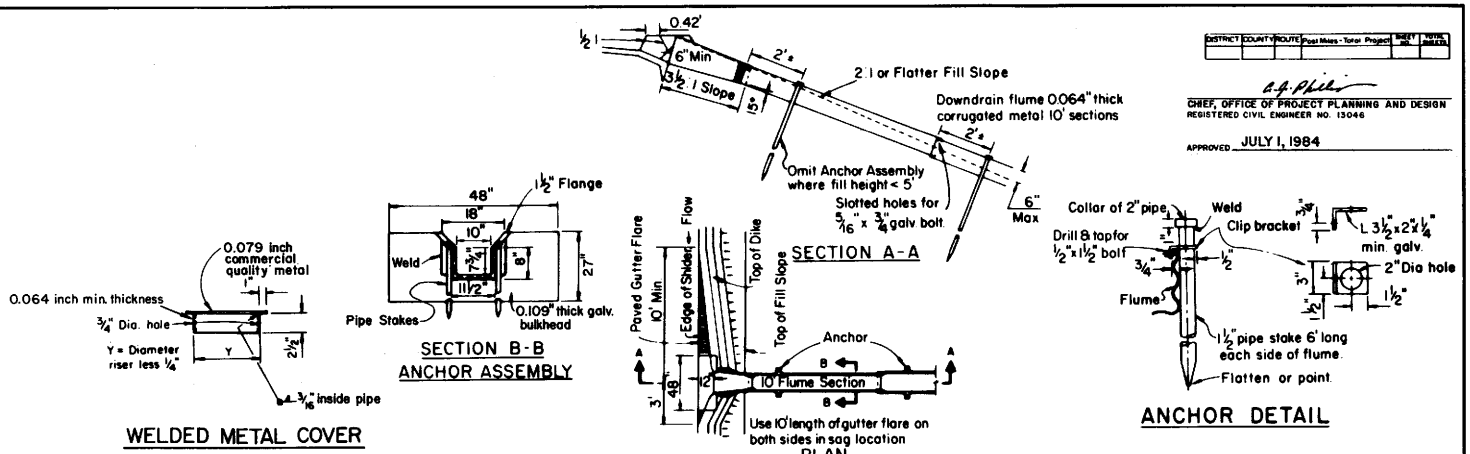
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

APPROVED JULY 1, 1984



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
OVERSIDE DRAINS AND UNDERDRAINS

D87-B

D87-B

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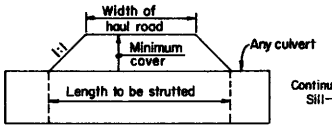
DISTRICT	COUNTY	ROUTE	Post Mile - Total Project	Sheet No.	Total Sheets

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

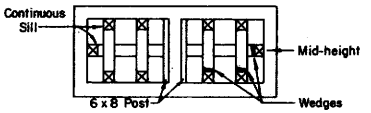
APPROVED JULY 1, 1984

TABLE OF MIN. FILL AND STRUTTING REQUIREMENTS

	TYPE				18-50k AXLE		50-75k AXLE		75-110k AXLE		110-150k AXLE	
	MAXIMUM DESIGN FILL	SPAN	CELLS	MIN. COVER	STRUTS REQ'D.	STRUT SIZE & SPACING	STRUTS REQ'D.	STRUT SIZE & SPACING	STRUTS REQ'D.	STRUT SIZE & SPACING	STRUTS REQ'D.	STRUT SIZE & SPACING
BOX CULVERTS	10' & 20'	4' to 8'	Single & Multiple	5'	—	—	—	—	—	—	—	—
	10'	10' to 14'	Single & Multiple	5'	—	—	1/3 PTS	Struts 6x6 @ 3'-6" Sills 6x8	1/3 PTS	Struts 6x8 @ 3'-6" Sills 6x8	1/3 PTS	Struts 6x8 @ 3'-6" Sills 6x8
	20'	10' to 14'	Single & Multiple	5'	—	—	—	—	—	—	—	—
R.C. PIPES	Dia. 12" to 39"				Min. Cover = 2'		Min. Cover = 3'		Min. Cover = 3'		Min. Cover = 3'	
	Dia. 42" to 108"				Dia./1.75 or 3'		Dia./1.75 or 3'		Dia./1.75 or 3'		Dia./1.75 or 3'	
METAL CULVERTS	Pipes	Dia. to 120"			Dia./1.75 or 4'		Dia./1.75 or 4'		Dia./1.75 or 4'		Dia./1.75 or 4'	
		Dia. Over 120"			Dia./3 or 6'		Dia./3 or 6'		Dia./3 or 6'		Dia./3 or 6'	
	Pipe-Arches	All Spans			Span/3 or 4'		Span/3 or 4'		Span/3 or 4'		Span/3 or 4'	
	Arches, Vehicular U/Crossings	All Spans			Span/3 or 5'		Span/3 or 5'		Span/3 or 5'		Span/3 or 5'	
R.C. ARCH CULVERTS	Spans to 14'				Span/2.5 or 4'		Span/2.5 or 4'		Span/2.5 or 4'		Span/2.5 or 4'	
	Spans 15' to 22'				Span/3.5 or 6'		Span/3.5 or 6'		Span/3.5 or 6'		Span/3.5 or 6'	



MINIMUM LENGTH OF STRUTTING



RCB STRUTTING DETAILS

GENERAL NOTES

Length of strutting to be determined by the Engineer, but shall not be less than as shown in sketch above.

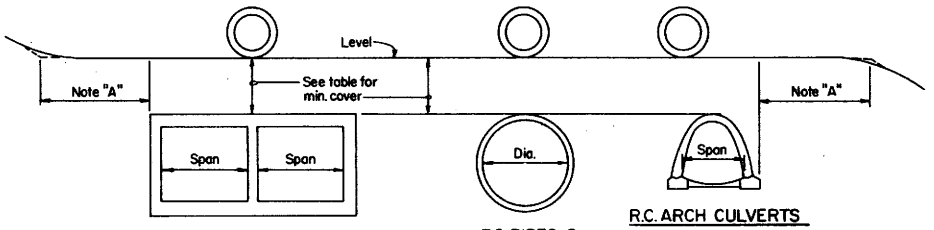
Assumed tire patterns _____:

50k Axle 2.0'x1.5'
75k Axle 3.0'x2.0'
110k Axle 3.0'x2.5'
150k Axle 3.0'x3.0'

Impact = 10%.

Sills to be glue-laminated or solid timber.

For strutting of "Structural Steel Plate Vehicular Undercrossing," "Structural Steel Plate Arches" and "Structural Steel Plate Pipes" see Standard Plans.



BOX CULVERTS

R.C. PIPES & METAL CULVERTS

R.C. ARCH CULVERTS

Note "A"
Minimum distance equals 3 times the span or 3 times the diameter.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

CONSTRUCTION LOADS ON CULVERTS D88

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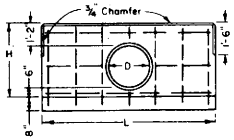
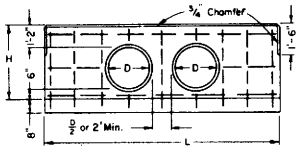
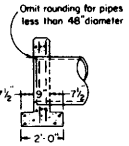


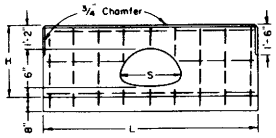
FRONT ELEV. SINGLE HEADWALL



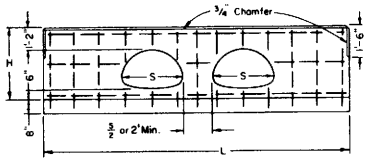
FRONT ELEV. DOUBLE HEADWALL



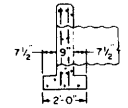
SECTION, SINGLE & DOUBLE HEADWALLS



FRONT ELEV. SINGLE HEADWALL



FRONT ELEV. DOUBLE HEADWALL



SECTION, SINGLE & DOUBLE HEADWALLS

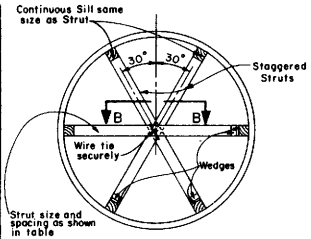
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

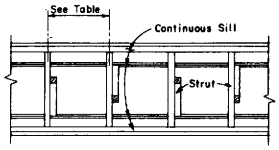
DATE July 1, 1984

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	8-0	50	0.94
15	2-11	6-0	40	0.75	9-6	60	1.17
18	3-2	7-0	50	0.91	10-6	75	1.35
21	3-5	7-6	60	1.02	11-6	90	1.52
24	3-8	8-6	75	1.20	12-6	100	1.72
27	3-11	9-6	85	1.39	14-0	115	2.00
30	4-2	10-0	85	1.52	15-0	126	2.21
33	4-5	11-0	100	1.73	16-0	130	2.42
36	4-8	12-0	105	1.95	17-0	145	2.65
39	4-11	12-6	130	2.09	18-0	170	2.88
42	5-2	13-6	140	2.34	19-0	185	3.13
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



TYPICAL SECTION



SECTION B-B

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
21"x15"	2'-11"	6'-6"	45	0.80	10'-0"	60	1.22
24"x18"	3'-2"	7'-6"	50	0.96	11'-6"	70	1.45
28"x20"	3'-4"	8'-6"	60	1.12	13'-6"	90	1.76
35"x24"	3'-8"	10'-6"	85	1.47	15'-6"	120	2.16
42"x29"	4'-1"	12'-6"	110	1.76	18'-0"	145	2.57
49"x33"	4'-5"	14'-6"	130	2.26	21'-0"	170	3.13
57"x38"	4'-10"	17'-0"	155	2.81	24'-6"	210	3.86
64"x43"	5'-3"	19'-0"	175	3.31	27'-0"	230	4.42
71"x47"	5'-7"	21'-0"	195	3.81	30'-0"	255	5.09

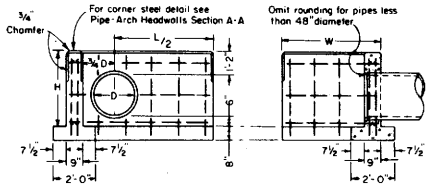
STRAIGHT HEADWALLS

GENERAL 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 encounted in the field, and straight line interpolation may be used to calculate quantities.
4. Quantities are for design purposes only.

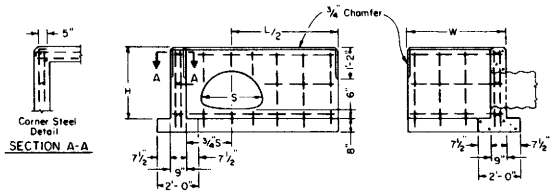
STRUT DETAILS

PIPE DIA	STRUT SIZE	SPACING IN FEET OF TIMBER STRUTS FOR STRUCTURAL STEEL PLATE PIPE — HEIGHT OF FILL IN FEET 0-20	30	40	50	60	70	80	100+
240 Thru 252	8x8	5.0	3.0	3.0	3.0	3.0			
	10x10	8.0	4.5	4.5	4.5	4.5			



FRONT ELEV "L" HEADWALL

SECTION "L" HEADWALL



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

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
21"x15"	2'-11"	3'-3"	60	1.00	65	1.18	75	1.38	90	1.58	100	1.77
24"x18"	3'-2"	3'-9"	60	1.07	70	1.32	80	1.53	95	1.74	110	1.94
28"x20"	3'-4"	4'-3"	70	1.26	80	1.47	90	1.68	100	1.90	115	2.11
35"x24"	3'-8"	5'-3"	100	1.51	110	1.74	120	1.97	140	2.20	155	2.42
42"x29"	4'-1"	6'-3"	115	1.82	130	2.06	140	2.31	155	2.55	170	2.83
49"x33"	4'-5"	7'-3"	130	2.12	145	2.37	155	2.64	170	2.90	185	3.15
57"x38"	4'-10"	8'-6"	145	2.52	160	2.79	175	3.07	190	3.35	205	3.61
64"x43"	5'-3"	9'-6"	185	2.89	200	3.11	215	3.48	235	3.77	250	4.06
71"x47"	5'-7"	10'-6"	200	3.25	215	3.56	235	3.86	250	4.17	270	4.48

"L" HEADWALLS

CORRUGATED METAL PIPE-ARCH CULVERT HEADWALLS

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

PIPE HEADWALLS AND STRUT DETAILS

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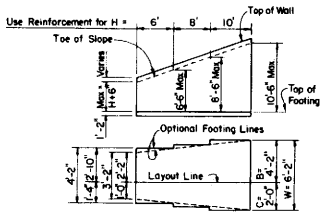
DISTRICT	COUNTY	ROUTE	Post Miles – Total Project	SHEET No.	TOTAL SHEETS

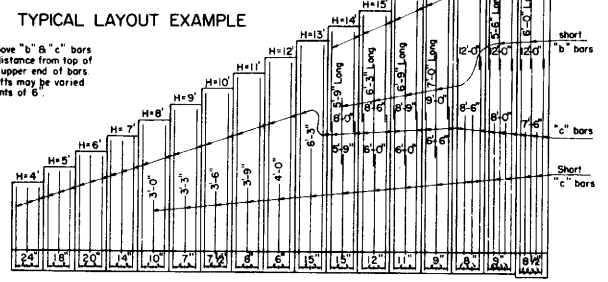
CHIEF ENGINEER – PLANNING BRANCH
REGISTERED CIVIL ENGINEER NO. 9013

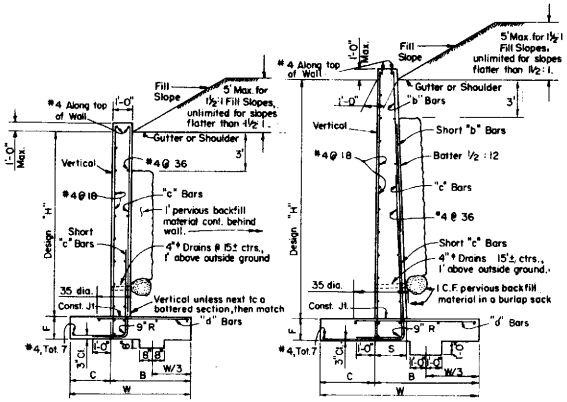
APPROVED JULY 1, 1984

Design Notes:
Unit Stresses: f_s = 24,000 psi, f_c = 1,300 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. If 1½:1 slope exceeds 5', use Type 2 Retaining Wall.
Wall height may be exceeded by 6" before going to the next greater "H".



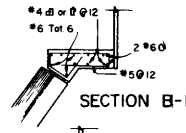
TYPICAL LAYOUT EXAMPLE



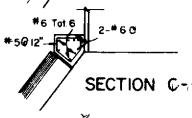


TYPICAL SECTION H=4' THRU 12'

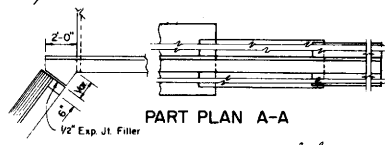
TYPICAL SECTION H=13' THRU 20'



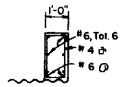
SECTION B-B



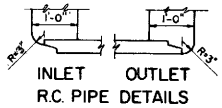
SECTION C-C



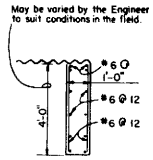
PART PLAN A-A



SECTION D-D



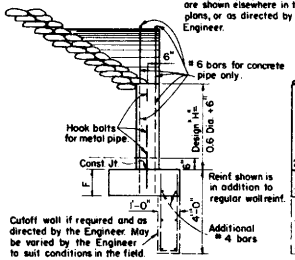
INLET OUTLET
R.C. PIPE DETAILS



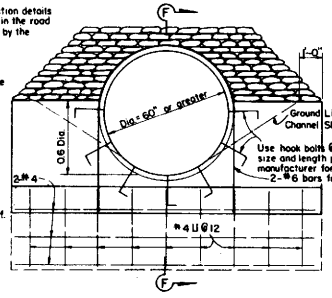
SECTION E-E

REINFORCED CONCRETE WINGWALLS

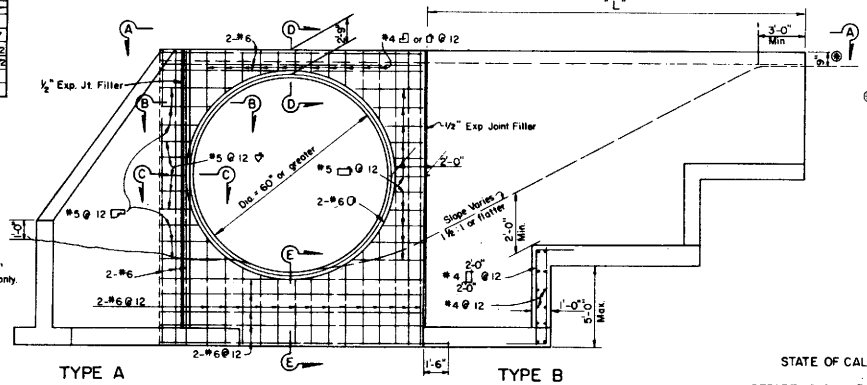
Design "H"	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'	17'	18'	19'	20'
W	3'-2"	3'-8"	4'-2"	4'-8"	5'-2"	5'-8"	6'-2"	6'-8"	7'-2"	7'-8"	8'-0"	8'-6"	9'-4"	10'-0"	10'-8"	11'-4"	12'-0"
C	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-10"	2'-0"	2'-2"	2'-4"	2'-6"	2'-8"	3'-0"	3'-4"	3'-8"	4'-0"	4'-4"	4'-8"
B	2'-2"	2'-6"	2'-10"	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	#9 @ 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 WALL



TYPE A

END ELEVATION

TYPE B

STRAIGHT WINGWALLS

Ⓐ Unless otherwise designated

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PIPE CULVERT
HEADWALLS, ENDWALLS & WINGWALL
TYPES "A", "B" & "C"

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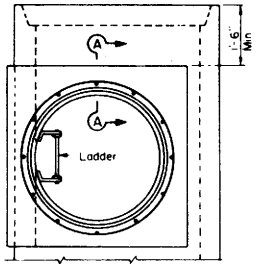
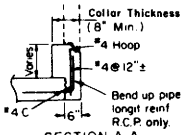
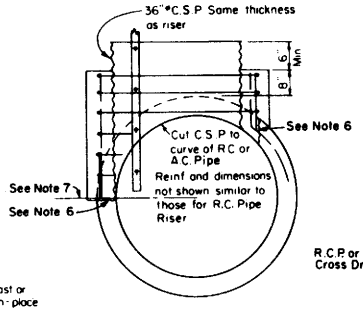


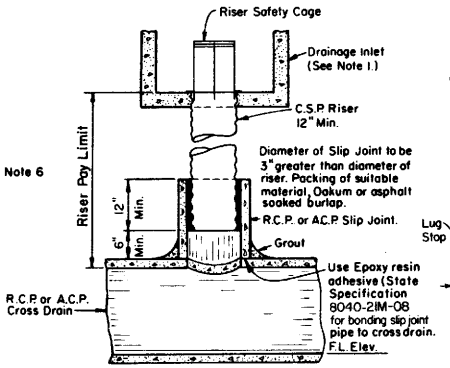
PLAN



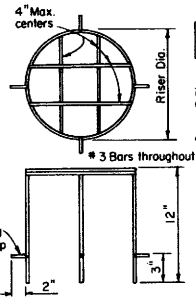
SECTION A-A



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



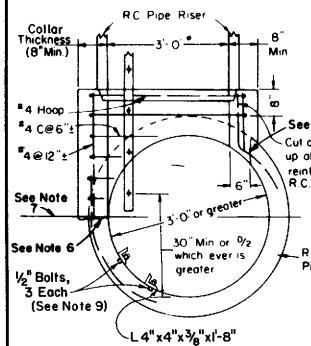
C.S.P. RISER FOR
DRAINAGE INLET



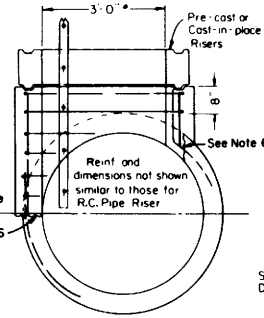
RISER SAFETY CAGE DETAIL

DISTRICT	COUNTY	ROUTE	POST MILE	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046
APPROVED JULY 1, 1984

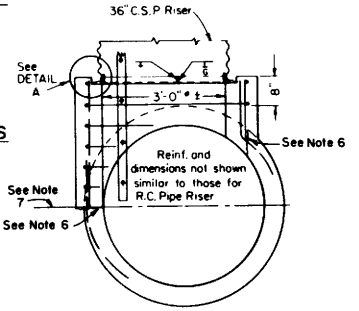


WITH 36" R.C. PIPE RISER

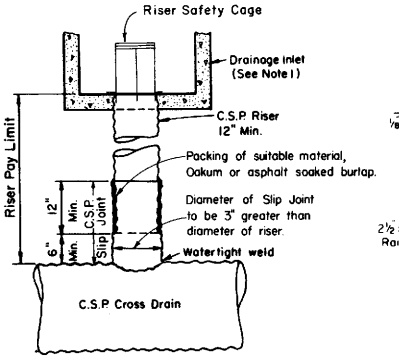


WITH 36" PRE-CAST RISERS

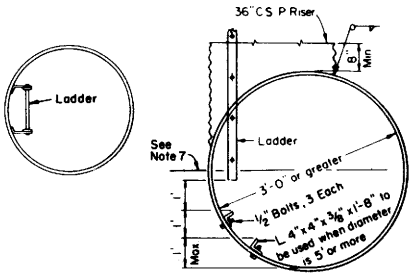
R.C. OR A.C. PIPE DRAIN



WITH 36" C.S.P. RISER

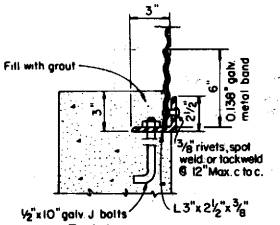


C.S.P. RISER FOR
DRAINAGE INLET

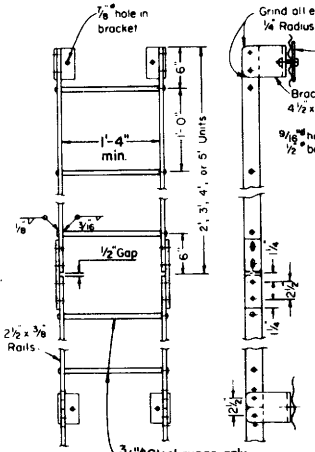


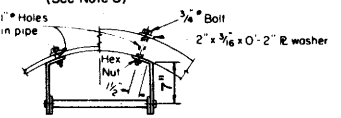
WITH 36" C.S.P. RISER

C.S.P. OR STRUCTURAL
PLATE PIPE DRAIN



DETAIL A





LADDER DETAIL

GENERAL NOTES

1. Structure at top of riser may be any standard drainage inlet, or pipe inlet.
2. Galvanizing: See Standard Specifications or Special Provisions.
3. Ladder may be constructed in one length at contractor's option on R.C.P. inlet.
4. On C.S.P. riser, connect ladder splice plate so joint can compress 1/2".
5. Ladder splice plate to be connected with 1/2" bolts with double nuts.
6. Use Epoxy resin adhesive (State Specification 8040-21M-08) for bonding concrete collars to A.C. Pipe.
7. Pay limit for 36" risers to C.L. of cross pipe.
8. Ladder- None required where "H" is less than 30 inches. Where "H" is 30 inches or more, install ladder with lowest rung not more than 12 inches above the floor and highest rung not more than 12 inches below top of inlet. The distance between rungs shall not exceed 12 inches and shall be uniform throughout the length of the wall. Place ladder in the wall without an opening.
9. For RC Pipe drains of sizes 30" diameter or greater, use power driven fasteners for fixing the angles to concrete wall.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DRAINAGE INLET RISER CONNECTIONS

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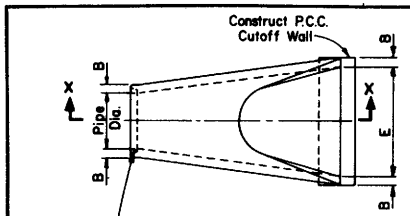
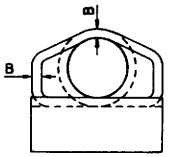


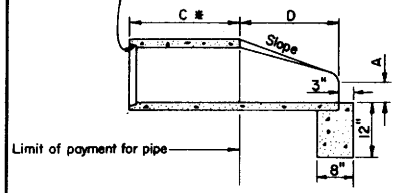
PLAN



END VIEW

Tongue end on inlet section.
Groove end on outlet section.

*C dimension shall be as desired by manufacturer and will be paid for at the price paid for concrete pipe.

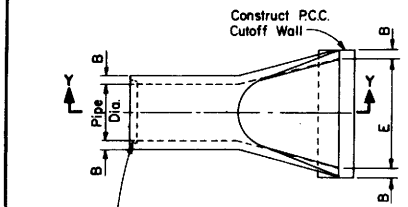


MINIMUM DIMENSIONS						
PIPE DIA.	A	B	C*	D	E	Slope
12"	4"	2"		2'-0"	2'-0"	2:1 or flatter
18"	9"	2½"		2'-3"	3'-0"	
24"	9½"	3"		3'-7½"	4'-0"	
30"	1'-0"	3½"		4'-6"	5'-0"	
36"	1'-3"	4"		5'-3"	6'-0"	
42"	1'-9"	4½"		5'-3"	6'-6"	
48"	2'-0"	5"		6'-0"	7'-0"	
54"	2'-3"	5½"		5'-5"	7'-6"	

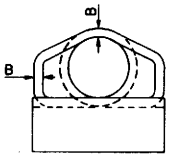
SECTION X-X

PRECAST CONCRETE FLARED END SECTION TYPE A

(See Note 6)



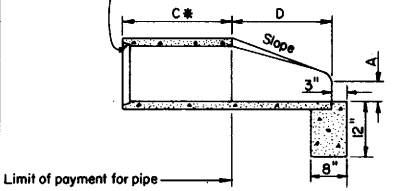
PLAN



END VIEW

Tongue end on inlet section.
Groove end on outlet section.

*C dimension shall be as desired by manufacturer and will be paid for at the price paid for concrete pipe

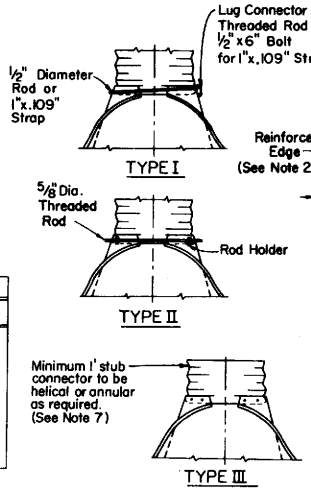


MINIMUM DIMENSIONS						
PIPE DIA.	A	B	C*	D	E	Slope
12"	4"	1¾"		1'-10"	2'-0"	2:1 or flatter
18"	9"	2"		2'-1"	3'-0"	
24"	9½"	2½"		3'-6"	4'-0"	
30"	1'-0"	3"		4'-5"	5'-0"	
36"	1'-3"	3⅜"		5'-2"	6'-0"	
42"	1'-9"	3¾"		5'-3"	6'-6"	
48"	2'-0"	4¼"		6'-0"	7'-0"	
54"	2'-3"	4⅝"		5'-6"	6'-10"	

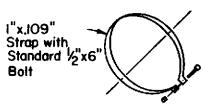
SECTION Y-Y

PRECAST CONCRETE FLARED END SECTION TYPE B

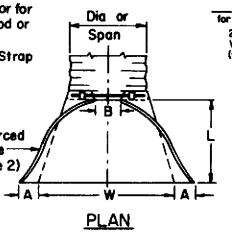
(See Note 6)



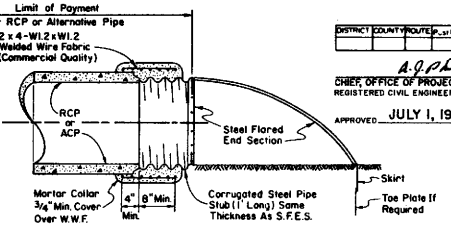
ALTERNATE CONNECTIONS PIPE TO FLARED END SECTIONS



ALTERNATE END SECTION CONNECTOR STRAP



PLAN

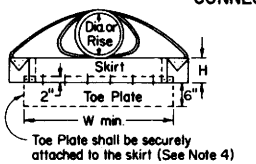


DISTRICT	COUNTY	ROUTE	P.M. Miles - Total Project	SHEET NO.	TOTAL SHEETS

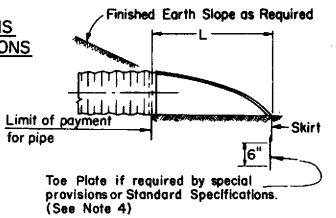
A. J. Philp
CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

APPROVED JULY 1, 1984

STEEL FLARED END SECTION CONNECTION TO RCP OR ACP



ELEVATION



TYPICAL CROSS-SECTION

NOTES

1. All 3pc bodies to have 0.109" thick sides and 0.138" thick 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 rivets or bolts.
2. Reinforced edges to be supplemented with stiffener angles for the 60" thru 84" round, 77"x52" and 83"x57" pipe-arch sizes. The angles will be 2"x2"x¼" for the 60" thru 72" round, 77"x52" and 83"x57" pipe-arch sizes and 2½"x2½"x¼" for 78" and 84" round. The angles to be attached by ⅜" nuts and bolts.
3. Angle reinforcement will be placed under the center panel seams on the 77"x52" and 83"x57" pipe-arch sizes.
4. 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 minimal leakage results from the connection. Other designs may be used with approval of the Engineer.
6. Contractor has the option of using either Type A or B "Precast Concrete Flared End Section".
7. For 12" thru 24" helical end section connection, a universal coupling band attached to the metal end section by rivets, bolts or one inch long shop tack welds spaced at same intervals as dimples may be used in place of the 12" stub. See Standard Plan D97-C.

CIRCULAR PIPES						
PIPE DIA.	End Section Thick.	DIMENSIONS-INCHES A 1"±	B Max	H 1"±	L 1½"±	W 2"±
12"	0.064"	6	6	6	21	24
15"	0.064"	7	8	6	26	30
18"	0.064"	8	10	6	31	36
21"	0.064"	9	12	6	36	42
24"	0.064"	10	13	6	41	48
30"	0.079"	12	16	8	51	60
36"	0.079"	14	19	9	60	72
42"	0.109"	16	22	11	69	84
48"	0.109"	18	27	12	78	90
54"	0.109"	18	30	12	84	102
60"	0.109"	18	33	12	87	114
66"	0.109"	18	36	12	87	120
72"	0.109"	18	39	12	87	126
78"	0.109"	18	42	12	87	132
84"	0.109"	18	45	12	87	138

PIPE-ARCHES							
INCHES Span	Rise	End Section Thick.	DIMENSIONS-INCHES A 1"±	B Max	H 1"±	L 1½"±	W 2"±
21	15	0.064"	7	10	6	23	36
24	18	0.064"	8	12	6	28	42
28	20	0.064"	9	14	6	32	48
35	24	0.079"	10	16	6	39	60
42	29	0.079"	12	18	8	46	75
49	33	0.109"	13	21	9	53	85
57	38	0.109"	18	26	12	63	90
64	43	0.109"	18	30	12	70	102
71	47	0.109"	18	33	12	77	114
77	52	0.109"	18	36	12	77	126
83	57	0.109"	18	39	12	77	138

ALTERNATE CONNECTIONS FOR PIPE TO FLARED END SECTIONS

Circular Pipes

12" thru 24" Type I or III
30" thru 84" Type II or III

Pipe-Arches

21"x15" thru 57"x38" Type II or III
64"x43" thru 83"x57" Type III

FLARED END SECTIONS FOR C.M.P. CULVERTS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

FLARED END SECTIONS

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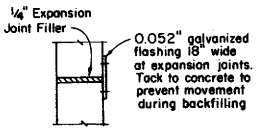
SPAN	Waterway Area Sq. Ft.	HEIGHT	Crown	W_1	W_2	W_3	R_1	R_2	R_3	R_4	A	B	C	D	E	F	G	H	I	J	ⓐ Bars	ⓒ Bars	ⓓ Bars	Footing Dowels	Reinf Steel Lbs/Lin Ft	Concrete Cu Yds Per Lin Ft
6	27	6'-10 15/16"	6"	2'-0"	1'-3 1/2"	11"	6'-0"	6'-2 3/8"	1'-11"	2'-7 1/4"	2 1/4"	2'-7 1/16"	2'-6"	6"	6"	5 1/2"	1 1/2"	2 1/2"	5"	4'-5 1/2"	#6	#6	#5	6	203	0.59
7	37	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 5/8	5-1 1/4	6	6	5	6	222	0.74
8	48	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	6	248	0.89
9	61	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	6	267	1.05
10	74	10-10 1/8	6 3/8	3-0	1-10	1-2	10-0	10-0 3/8	3-2 1/4	4-0 3/8	3 3/4	4-3 3/4	4-2	10	6	10	2	4	8	7-1	7	7	5	7	400	1.27
11	92	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 15/16	4-7	11	6	10	3	5	8 3/4	7-9 11/16	7	7	5	7	431	1.46
12	110	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	7	7	5	7	457	1.70
13	127	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	7	504	2.02
14	148	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 3/16	5-10	1-2	7	1-0	3	6	11 1/4	9-11 5/16	7	7	6	7	550	2.26
15	169	15-11 5/8	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	7	585	2.59
16	192	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 13/16	6-8	1-4	7	1-3	3	7	1-0 3/4	11-4 3/16	7	7	6	7	616	2.92
17	217	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	8	796	3.38
18	244	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	8	839	3.76
19	272	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 9/16	7-11	1-7	9	1-6	4	8	1-3 1/4	13-5 9/16	8	8	6	8	905	4.19
20	301	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	8	937	4.56
21	334	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	8	983	5.09
22	363	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	8	1020	5.47

DISTRICT	COUNTY	ROUTE	P.M. or Miles - Total Project	Sheet No.	Total Sheets

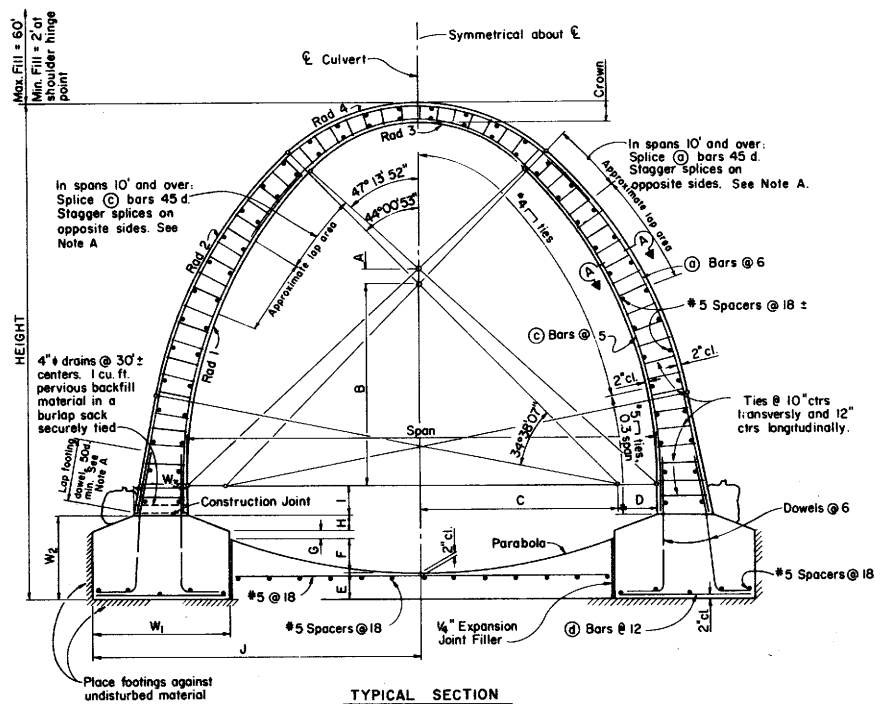
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED JULY 1, 1984



SECTION A-A

Note: Place expansion joints in arch rib only at 30'± centers. None in footings and invert slab.



TYPICAL SECTION

SPAN		FOOTING PRESSURE																
		6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'	17'	18'	19'	20'	21'	22'
Footing Pressure Tons psf	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
	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
	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: AASHTO dated 1977 with revisions and as supplemented by Bridge Planning and Design Manual.

EARTH LOADING:
Earth Pressures - 140 lbs./cu.ft. vert., 140 lbs./cu.ft. horiz.
- 140 lbs./cu.ft. vert., 42 lbs./cu.ft. horiz.

UNIT STRESSES: FY = 60,000 psi.
F'c = 3,250 psi

SPECIAL COVERAGE: This Standard Plan not to be used for culverts in a corrosive environment or where there is a severe abrasive flow condition.

LOAD FACTORS: 1.5 D + 1.5 E + 2.5 L, capacity modification factor = 1.00

MAXIMUM OVERFILL: 60'

EXCAVATION AND BACKFILL: See Standard Plan A62-E

NOTE A:

If lap splicing is used, main reinforcement shall be be placed so that in any 4 adjacent bars, no two bars are spliced at the same level. Splice levels shall be separated a minimum of one foot measured in the circumferential direction.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

CONCRETE ARCH CULVERTS

D95

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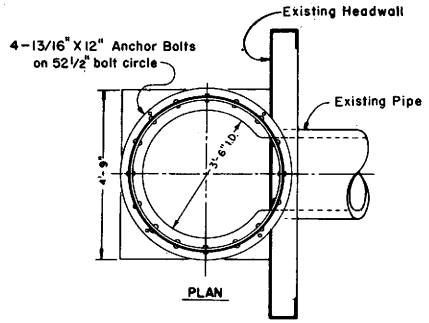
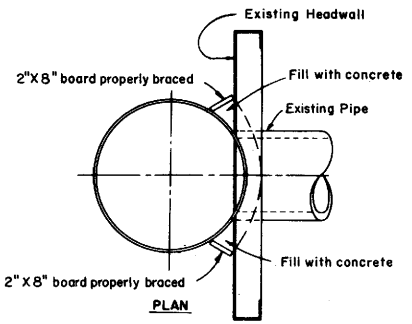
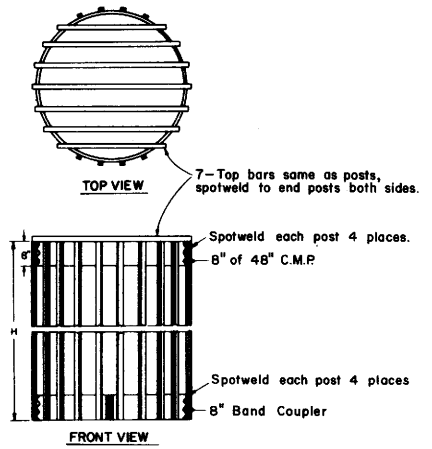
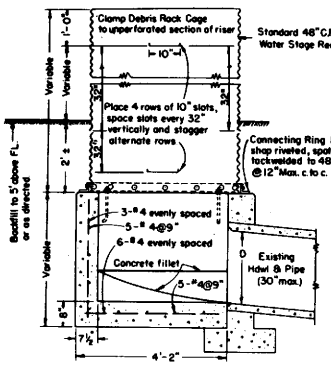


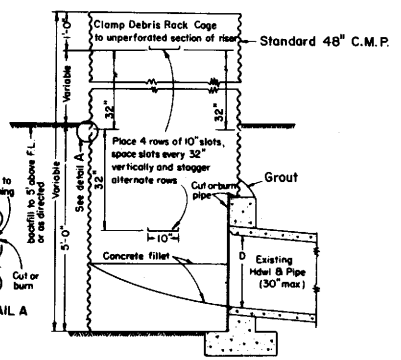




DEBRIS RACK CAGE



SECTION
C.M.P. RISER
AND JUNCTION BOX
TYPE A



SECTION
C.M.P. RISER
TYPE B

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

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

APPROVED JULY 1, 1984

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

PIPE RISER WITH DEBRIS RACK CAGE D96

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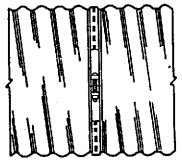
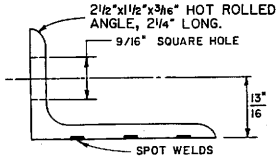
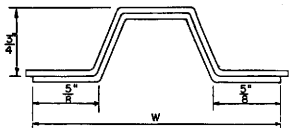


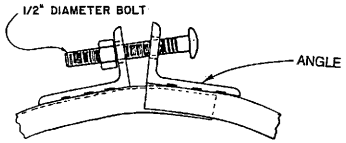
SIDE VIEW



ANGLE



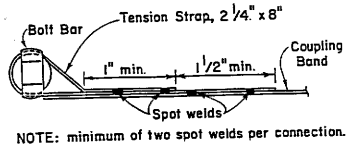
SECTIONAL VIEW



BOLT DETAIL

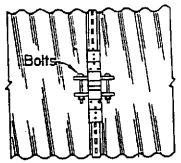
ANGLE CONNECTOR

(HAT BAND)

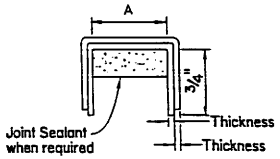


NOTE: minimum of two spot welds per connection.

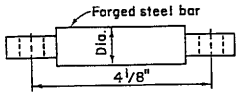
STRAP DETAIL

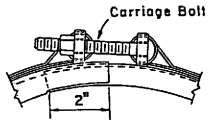


SIDE VIEW



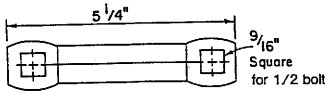
SECTIONAL VIEW





BOLT DETAIL

LEFT SIDE VIEW



FRONT VIEW

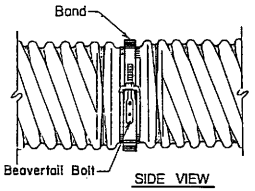
BAR DETAIL

BAR AND STRAP CONNECTOR

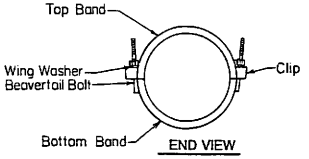
(CHANNEL BAND SHOWN)

GENERAL NOTES:

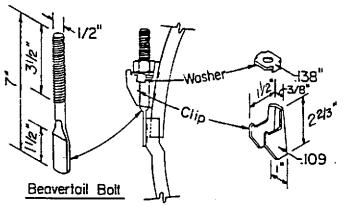
1. All ferrous metal coupling band connection hardware shall be galvanized or electro-plated in accordance with the Standard Specifications.
2. Dimensions and thicknesses shown are minimum.
3. Spot welds shall develop minimum required strength of strap.
4. Fillet welds of equivalent strength may be substituted for spot welds or rivets.

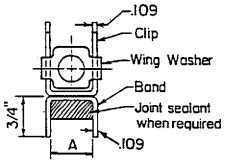


SIDE VIEW



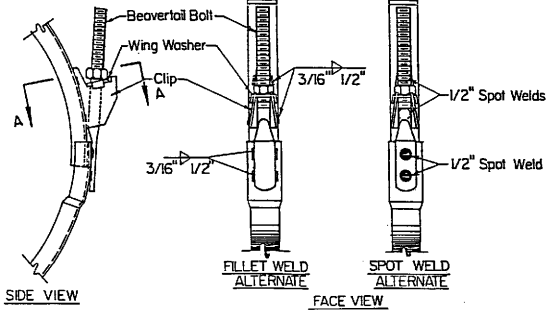
END VIEW





Section A-A

WASHERS AND BOLTS

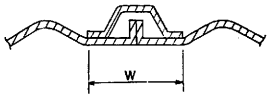


SIDE VIEW

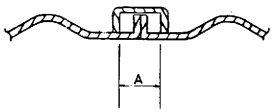
FACE VIEW

BEAVERTAIL CONNECTOR

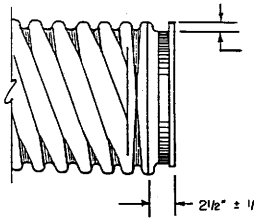
(CHANNEL BAND SHOWN)



HAT BAND



CHANNEL BAND



SIDE VIEW

FLANGE DETAILS

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

CHIEF, OFFICE OF PROJECT PLANNING and DESIGN
REGISTERED NO. 13046

APPROVED July 1, 1984

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

FLANGED END CSP CHANNEL
COUPLING BAND DETAILS
CMP COUPLING BAND DETAILS NO.1
DOWNDRAINS, STANDARD AND POSITIVE JOINTS

D97A

Return to Table of Contents

Dist.	County	Route	Post Miles Total Project	Sheet No.	Total Sheets

PROJECT ENGINEER

REGISTERED CIVIL ENGINEER

NO.

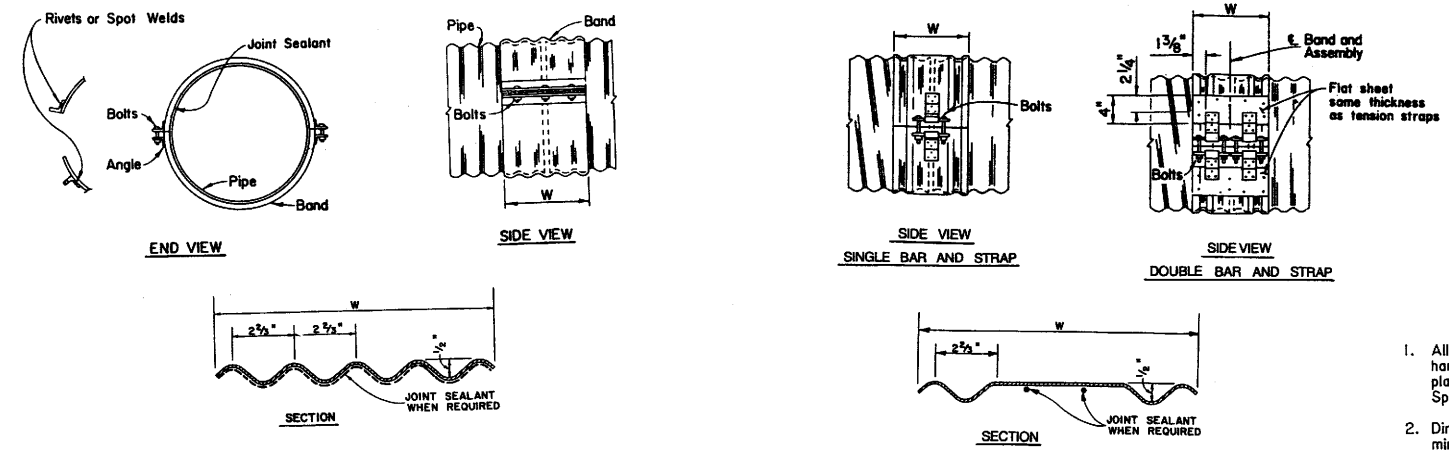
DATE APPROVED

Return to Table of Contents

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

CHIEF, OFFICE OF PROJECT PLANNING and DESIGN
REGISTERED NO. 13046

APPROVED July 1, 1984

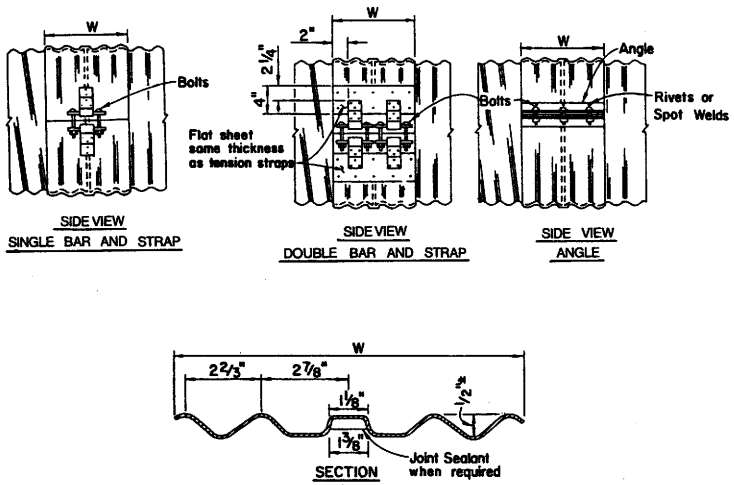


ANNULAR BAND

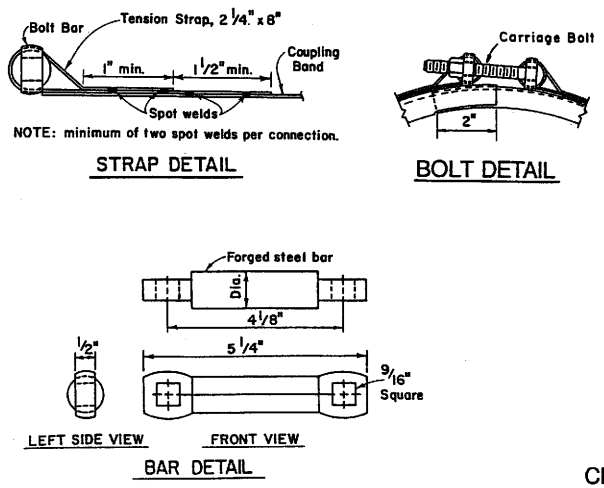
HUGGER BAND

GENERAL NOTES:

1. All ferrous metal coupling band connection hardware shall be galvanized or electroplated in accordance with the Standard Specifications.
2. Dimensions and thicknesses shown are minimum.
3. Spot welds shall develop minimum required strength of strap.
4. Fillet welds of equivalent strength may be substituted for spot welds or rivets.



WING CHANNEL BAND



BAR AND STRAP CONNECTOR

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ANNULAR, REFORMED END, AND HELICAL COUPLING BANDS
CMP COUPLING BAND DETAILS NO. 2
DOWNDRAINS, STANDARD AND POSITIVE JOINTS

D97B-1

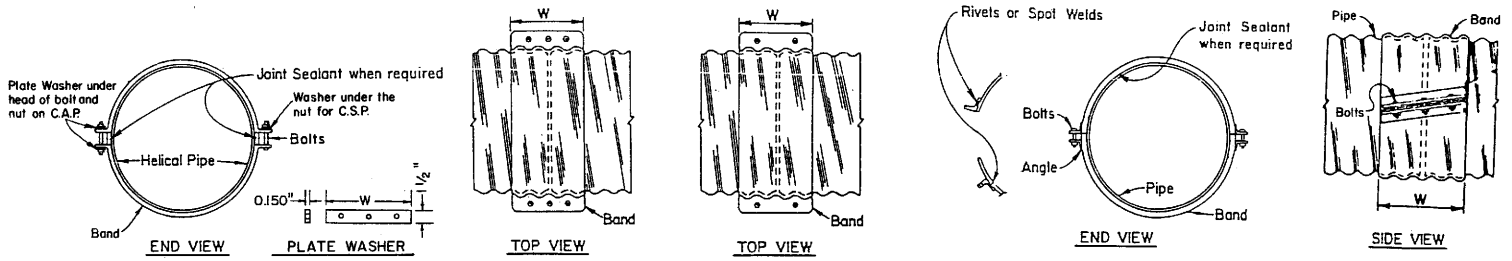
D97B-1

Return to Table of Contents

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

CHIEF, OFFICE OF PROJECT PLANNING and DESIGN
REGISTERED NO 13048

APPROVED July 1, 1984



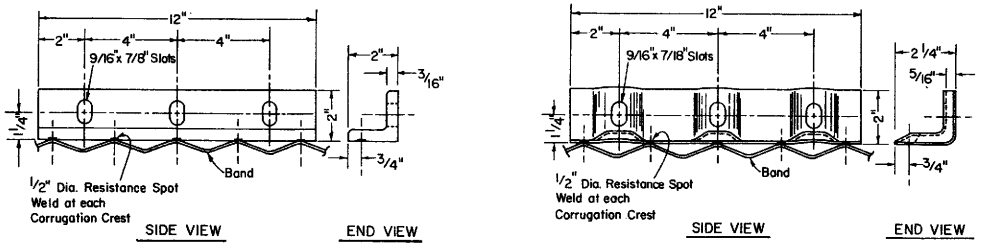
TWO PIECE INTEGRAL FLANGE DIE FORMED BAND

HELICAL BAND

HELICAL COUPLING BANDS

GENERAL NOTES:

1. All ferrous metal coupling band connection hardware shall be galvanized or electro-plated in accordance with the Standard Specifications.
2. Dimensions and thicknesses shown are minimum.
3. Spot welds shall develop minimum required strength of strap.
4. Fillet welds of equivalent strength may be substituted for spot welds or rivets.



2" x 2" x 3/16" ANGLE
(See table for width, W=12" shown)

DIE - FORMED ANGLE
(See table for width, W=12" shown)
Alternate only for Standard Joints and pipes through 72" diameter

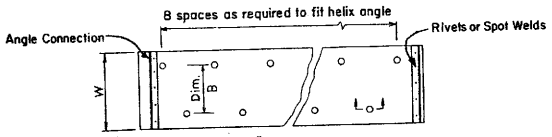
ANGLE CONNECTORS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

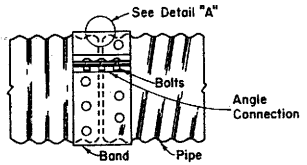
FLANGED END CSP CHANNEL
COUPLING BAND DETAILS
CMP COUPLING BAND DETAILS NO. 3
DOWNDRAINS, STANDARD AND POSITIVE JOINTS

D97 B-2

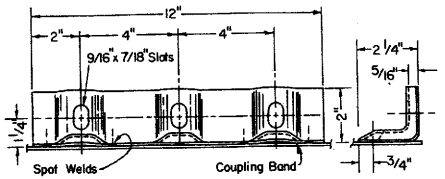
Return to Table of Contents



PLAN



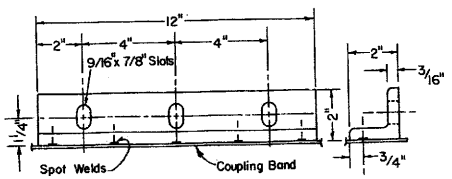
SIDE VIEW



SIDE VIEW END VIEW

DIE - FORMED ANGLE

(See table for width, W = 12" shown)
Alternate only for Standard Joints and pipes through 72" diameter

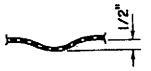


SIDE VIEW END VIEW

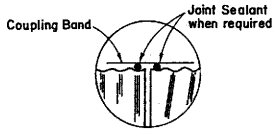
2" x 2" x 3/16" ANGLE

(See table for width, W = 12" shown)

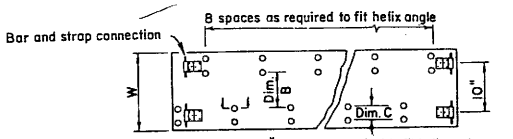
ANGLE CONNECTORS



SECTION THRU DIMPLES

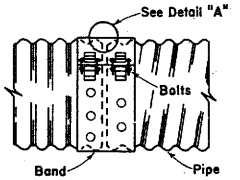


DETAIL "A"

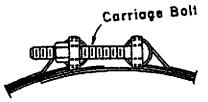


Dimension B: 7" min. or as required to fit helix angle.
Dimension C: 2 2/3" min. or as required to fit helix angle.
(Double dimple shown for use with 16 1/4" bands)

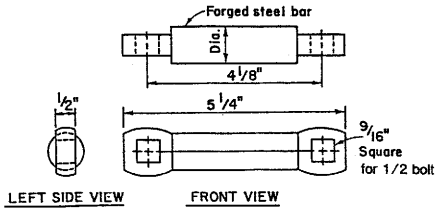
PLAN



SIDE VIEW

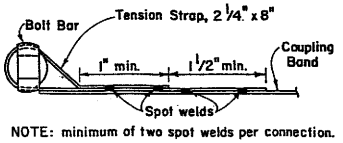


BOLT DETAIL



LEFT SIDE VIEW FRONT VIEW

BAR DETAIL



NOTE: minimum of two spot welds per connection.

STRAP DETAIL

BAR AND STRAP CONNECTOR

GENERAL NOTES:

1. All ferrous metal coupling band connection hardware shall be galvanized or electro-plated in accordance with the Standard Specifications.
2. Dimensions and thicknesses shown are minimum.
3. Spot welds shall develop minimum required strength of strap.
4. Fillet welds of equivalent strength may be substituted for spot welds or rivets.

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

CHIEF, OFFICE OF PROJECT PLANNING and DESIGN
REGISTERED NO. 13048

APPROVED July 1, 1984

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

UNIVERSAL COUPLING BANDS
CMP COUPLING BAND DETAILS NO. 4
STANDARD AND POSITIVE JOINTS

D97C-1

D97C-1

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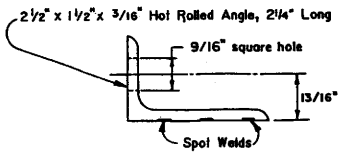
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF PROJECT PLANNING and DESIGN
REGISTERED NO. 13045

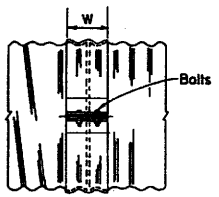
APPROVED July 1, 1984

GENERAL NOTES:

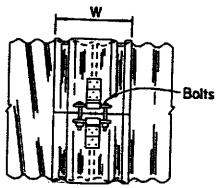
1. All ferrous metal coupling band connection hardware shall be galvanized or electro-plated in accordance with the Standard Specifications.
2. Dimensions and thicknesses shown are minimum.
3. Spot welds shall develop minimum required strength of strap.
4. Fillet welds of equivalent strength may be substituted for spot welds or rivets.



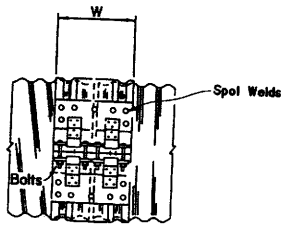
ANGLE



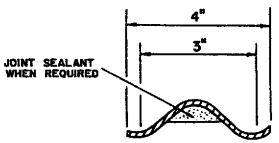
SIDE VIEW
ANGLE



SIDE VIEW
SINGLE BAR AND STRAP

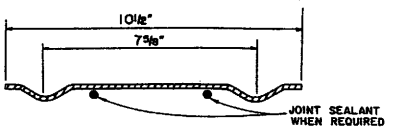


SIDE VIEW
DOUBLE BAR AND STRAP



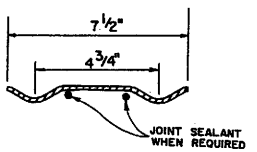
SECTION

H-4 HUGGER BAND



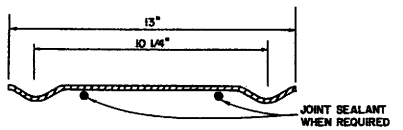
SECTION

H-10 HUGGER BAND



SECTION

H-6 HUGGER BAND



SECTION

H-13 HUGGER BAND

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ANNULAR AND REFORMED END COUPLING BANDS

UNIVERSAL COUPLING BANDS
CMP COUPLING BAND DETAILS NO.5
STANDARD AND POSITIVE JOINTS

COUPLING TYPE	PIPE CORRUGATION	PIPE SIZE	W OR A	THICKNESS PIPE WALL CSP	THICKNESS PIPE WALL CAP	THICKNESS BAND CSP	THICKNESS BAND CAP	BAR & STRAP (CSP ONLY) THICKNESS STRAP	BAR & STRAP (CSP ONLY) BOLTS (IN.)	BAR & STRAP (CSP ONLY) BAR DIAM. (IN.)	BAR & STRAP (CSP ONLY) BAR YIELD STRENGTH, PSI	BEAVERTAIL (CSP ONLY) BOLTS	ANGLE DIMENSIONS CSP	ANGLE DIMENSIONS CAP	ANGLE BOLTS CSP	ANGLE BOLTS CAP	ANGLE RIVETS ANGLE TO BAND CSP	ANGLE RIVETS ANGLE TO BAND CAP	ANGLE SPOT WELDS ANGLE TO BAND CSP
TWO PIECE INTEGRAL FLANGE	1 1/2"x1/4"	6" - 10"	7"	0.052-0.079	0.048-0.060	0.052	0.060								2-3/8"	2-3/8"			
		12" - 18"	7"	0.052-0.079		0.064									2-1/2"				
	2 2/3"x1/2"	12" - 24"	7"	0.052-0.079	0.060-0.105	0.064	0.060								2-1/2"	2-1/2"			
UNIVERSAL	2 2/3"x1/2"	THROUGH 36"	12"	0.052-0.138	0.060-0.135	0.052	0.060						2"x2"x3/16"	2"x2"x3/16"	3-1/2"	3-1/2"	3-3/8"	3-3/8"	3-1/2"
		42" - 60"	12"	0.052-0.168	0.075-0.164	0.052	0.060						2"x2"x3/16"	2"x2"x3/16"	3-1/2"	3-1/2"	3-3/8"	3-3/8"	5-1/2"
		THROUGH 72"	12"	0.052-0.168	0.164	0.052	0.105	0.079	1/2	7/8	32,000		2"x2"x3/16"	2"x2"x3/16"	3-1/2"	3-1/2"	3-3/8"	3-3/8"	5-1/2"
		78" - 84"	16 1/4"	0.168		0.079		DOUBLE 0.079	1/2	7/8	32,000								
ANNULAR	2 2/3"x1/2"	THROUGH 36"	7"	0.064-0.138	0.060-0.135	0.052	0.060	0.079	1/2	7/8	32,000		2"x2"x3/16"	2"x2"x3/16"	2-1/2"	2-1/2"	3-3/8"	3-3/8"	3-1/2"
		42" - 72"	12"	0.064-0.168	0.075-0.164	0.052	0.105	0.079	1/2	7/8	32,000		2"x2"x3/16"	2"x2"x3/16"	3-1/2"	3-1/2"	3-3/8"	3-3/8"	5-1/2"
		78" - 84"	12"	0.168		0.079		0.109	1/2	7/8	45,000		2"x2"x3/16"		3-1/2"		3-3/8"		5-1/2"
	3"x1"	48" - 90"	14"	0.064-0.109		0.052		0.079	1/2	7/8	32,000		2"x2"x3/16"		3-1/2"		3-3/8"		5-1/2"
		96" - 120"	14"	0.079-0.109		0.052		0.109	1/2	7/8	45,000		2"x2"x3/16"		3-1/2"		4-3/8"		
		42" - 108"	14"		0.060-0.135		0.060							2"x2"x3/16"		3-1/2"		3-3/8"	
HELICAL	2 2/3"x1/2"	THROUGH 36"	12"	0.052-0.138	0.060-0.135	0.052	0.060	0.079	1/2	7/8	32,000		2"x2"x3/16"	2"x2"x3/16"	3-1/2"	3-1/2"	3-3/8"	3-3/8"	3-1/2"
		42" - 72"	12"	0.052-0.168	0.075-0.164	0.052	0.060	0.079	1/2	7/8	32,000		2"x2"x3/16"	2"x2"x3/16"	3-1/2"	3-1/2"	3-3/8"	3-3/8"	5-1/2"
		78" - 84"	12"	0.168		0.079		0.109	1/2	7/8	45,000		2"x2"x3/16"		3-1/2"		3-3/8"		5-1/2"
	3"x1"	48" - 90"	14"	0.064-0.109		0.052		0.079	1/2	7/8	32,000		2"x2"x3/16"		3-1/2"		3-3/8"		5-1/2"
		96" - 120"	14"	0.079-0.109		0.052		0.109	1/2	7/8	45,000		2"x2"x3/16"		3-1/2"		4-3/8"		
		42" - 108"	14"		0.060-0.135		0.060							2"x2"x3/16"		3-1/2"		3-3/8"	
WING CHANNEL	2 2/3"x1/2"	THROUGH 72"	12"	0.052-0.168		0.052		0.079	1/2	7/8	32,000		2"x2"x3/16"		3-1/2"		3-3/8"		5-1/2"
		78" - 84"	12"	0.168		0.079		0.109	1/2	7/8	45,000		2"x2"x3/16"		3-1/2"		3-3/8"		5-1/2"
	3"x1" REROLLED END	48" - 90"	12"	0.064-0.109		0.052		0.079	1/2	7/8	32,000		2"x2"x3/16"		3-1/2"		3-3/8"		5-1/2"
		96" - 120"	12"	0.079-0.109		0.052		0.109	1/2	7/8	45,000		2"x2"x3/16"		3-1/2"		4-3/8"		
CHANNEL	2 2/3"x1/2"	THROUGH 42"	1"	0.138		0.079						1-1/2"	2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		THROUGH 54"	1"	0.052-0.109		0.079						1-1/2"	2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		60" - 66"	1"	0.109		0.079							2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		48" - 72"	1"	0.138-0.168		0.109		0.079	1/2	7/8	32,000								
	3"x1" REROLLED END	THROUGH 72"	1"	0.064-0.079		0.079						1-1/2"	2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		48" - 66"	1"	0.109									2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		78" - 90"	1"	0.064-0.079									2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
	3"x1"	72" - 108"	1"	0.109		0.109		0.109	1/2	7/8	32,000								
HUGGER	2 2/3"x1/2"	12" - 54"	4"	0.052-0.109		0.052							2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		60" - 66"	4"	0.109		0.064							2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		36" - 48"	4"	0.138		0.064							2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		THROUGH 72"	10 1/2"	0.052-0.168		0.052		0.079	1/2	7/8	32,000								
		78" - 84"	10 1/2"	0.168		0.079		0.109	1/2	7/8	45,000								
	3"x1"	48" - 90"	10 1/2"	0.064-0.109		0.052		0.079	1/2	7/8	32,000								
		96" - 120"	10 1/2"	0.079-0.109		0.052		0.109	1/2	7/8	45,000								
	5"x1"	48" - 66"	7 1/2"	0.064-0.109		0.064		0.079	1/2	7/8	32,000		2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		72 - 90"	7 1/2"	0.064-0.079		0.064		0.079	1/2	7/8	32,000		2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		48" - 90"	7 1/2"	0.064-0.138		0.064		0.079	1/2	7/8	32,000								
		48" - 120"	13"	0.064-0.109		0.064		0.079	1/2	7/8	32,000								
		48" - 84"	13"	0.138		0.064		0.079	1/2	7/8	32,000								
		90" - 120"	13"	0.138		0.064		DOUBLE 0.079	1/2	7/8	32,000								
HAT BAND	2 2/3"x1/2"	12" - 54"	2 3/4"	0.052-0.109		0.064						1-1/2"	2 1/2"x1 1/2"x3/16"		1-1/2"				
		60" - 66"	2 3/4"	0.109		0.064							2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		THROUGH 42"	2 3/4"	0.138		0.064						1-1/2"	2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		THROUGH 66"	2 3/4"	0.138		0.064		0.079	1/2	7/8	32,000								
		THROUGH 66"	2 3/4"	0.168		0.079		0.079	1/2	7/8	32,000								
	3"x1" REROLLED END	48" - 72"	2 3/4"	0.064-0.079		0.064						1-1/2"	2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		78" - 90"	2 3/4"	0.064-0.079		0.064							2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		48" - 66"	2 3/4"	0.109		0.064							2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		72" - 108"	2 3/4"	0.109		0.079		0.109	1/2	7/8	32,000								

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

C. J. Phillips
CHIEF, OFFICE OF PROJECT PLANNING and DESIGN
REGISTERED NO. 13046

APPROVED July 1, 1984

GENERAL NOTES

1. All ferrous metal coupling band connection hardware shall be galvanized or electroplated in accordance with the Standard Specifications.
2. For helically corrugated coupling bands, the connection angles may be oriented parallel to the pipe axis, provided connecting holes are slotted lengthwise sufficiently to allow adjustment for the helix angle.
3. Tension strap may be connected to band with either spot welds or fillet welds that develop minimum required strength of strap.
4. Use 1 1/4" gage line dimension on attached angle leg for rivets and spot welds.
5. Band thickness shall not be less than:
   (I) 3 standard thicknesses lighter than the thickness of the pipe for C.S.P.
   (II) 2 standard thicknesses lighter than the thickness of the pipe and in no case lighter than 0.060-inch for C.A.P.
6. Dimensions, thicknesses and strengths shown are minimum.
7. For pipe arches use same width band as for round pipe of equal periphery.
8. Fillet welds of equivalent strength may be substituted for spot welds or rivets.
9. Spot welds shall develop minimum required strength of strap.
10. Pipe with rerolled ends having at least two 2 2/3"x1/2" annular corrugations at each end with or without an upturned flange may be connected with any of the annular coupling bands shown for pipe of the same diameter and wall thickness and having 2 2/3"x1/2" corrugations.
11. In the case of H-13 huggerbands, two piece bands are required for diameters through 96" and three piece bands are required for diameters 102" through 120".
12. Two piece bands are required for pipes greater than 42" diameter.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

C.M.P. COUPLING DETAILS No. 6

STANDARD JOINT

D97D

D97D

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

CHIEF, OFFICE OF PROJECT PLANNING and DESIGN
REGISTERED NO. 13048
APPROVED July 1, 1984

COUPLING TYPE	PIPE CORRUGATION	PIPE SIZE	W OR A	THICKNESS PIPE WALL CSP	THICKNESS PIPE WALL CAP	THICKNESS BAND CSP	THICKNESS BAND CAP	BAR & STRAP (CSP ONLY) THICKNESS STRAP	BAR & STRAP (CSP ONLY) BOLTS (IN.)	BAR & STRAP (CSP ONLY) BAR DIAM. (IN.)	BAR & STRAP (CSP ONLY) BAR YIELD STRENGTH, PSI	BEAVERTAIL (CSP ONLY) BOLTS	ANGLE DIMENSIONS CSP	ANGLE DIMENSIONS CAP	ANGLE BOLTS CSP	ANGLE BOLTS CAP	ANGLE RIVETS ANGLE TO BAND CSP	ANGLE RIVETS ANGLE TO BAND CAP	ANGLE SPOT WELDS ANGLE TO BAND CSP
TWO PIECE INTEGRAL FLANGE	1 1/2"x1/4"	6" - 10"	7"	0.064-0.079	0.060	0.064	0.060								2-3/8"	2-3/8"			
	2 2/3"x1/2"	12" - 24"	12"		0.060-0.105		0.060									3-1/2"			
UNIVERSAL	2 2/3"x1/2"	THROUGH 36"	12"	0.064-0.138	0.060-0.135	0.064	0.060	0.079	1/2	7/8	32,000		2"x2"x3/16"	2"x2"x3/16"	3-1/2"	3-1/2"	3-3/8"	3-3/8"	5-1/2"
		42" - 60"	16 1/4"	0.064-0.168	0.060-0.164	0.064	0.060	DOUBLE 0.079	1/2	7/8	32,000		2"x2"x1/4"	2"x2"x1/4"	4-1/2"	4-1/2"	5-3/8"	5-3/8"	
ANNULAR	2 2/3"x1/2"	THROUGH 36"	12"	0.064-0.138	0.060-0.135	0.064	0.060						2"x2"x3/16"	2"x2"x3/16"	3-1/2"	3-1/2"	3-3/8"	3-3/8"	5-1/2"
		42" - 60"	12"	0.064-0.079		0.064							2"x2"x3/16"		3-1/2"		3-3/8"		5-1/2"
		42" - 60"	12"	0.109-0.168	0.135-0.164	0.064	0.075						2"x2"x1/4"	2"x2"x1/4"	3-1/2"	3-1/2"	5-3/8"	5-3/8"	
		66" - 72"	24"		0.164		0.105							2"x2"x1/4"		5-1/2"		5-1/2"	
		66" - 84"	24"	0.109-0.168		0.064							2"x2"x1/4"		5-1/2"		7-3/8"		
		42" - 54"	12"		0.060-0.105		0.060							2"x2"x3/16"		3-1/2"		3-3/8"	
	3"x1"	48" - 60"	14"	0.064-0.079		0.064							2"x2"x3/16"		3-1/2"		3-3/8"		5-1/2"
		48" - 60	14"	0.109		0.064							2"x2"x3/16"		3-1/2"		5-3/8"		
		66" - 120"	25"	0.064-0.109		0.064							2"x2"x3/16"		5-1/2"		9-3/8"		
		42" - 60"	14"		0.060-0.105		0.060							2"x2"x3/16"		3-1/2"		5-3/8"	
		42" - 60"	14"		0.135		0.075							2"x2"x1/4"		3-1/2"		5-3/8"	
		66" - 96"	25"		0.060-0.135		0.060							2"x2"x1/4"		5-1/2"		7-3/8"	
		96" - 108"	25"		0.135		0.075							2"x2"x1/4"		5-1/2"		7-3/8"	
HELICAL	2 2/3"x1/2"	THROUGH 36"	12"	0.064-0.138	0.060-0.135	0.064	0.060						2"x2"x3/16"	2"x2"x3/16"	3-1/2"	3-1/2"	3-3/8"	3-3/8"	5-1/2"
		42" - 54"	12"		0.060-0.105		0.060							2"x2"x3/16"		3-1/2"		3-3/8"	
		42" - 60"	12"	0.064-0.079		0.064							2"x2"x3/16"		3-1/2"	-	3-3/8"		5-1/2"
		42" - 60"	12"	0.109-0.168	0.135-0.164	0.064	0.075						2"x2"x1/4"	2"x2"x1/4"	3-1/2"	3-1/2"	5-3/8"	5-3/8"	
		66" - 84"	24"	0.109-0.168		0.064							2"x2"x1/4"		5-1/2"		7-3/8"		
		66" - 72"	24"		0.164		0.105							2"x2"x1/4"		5-1/2"		5-3/8"	
	3"x1"	48" - 60"	14"	0.064-0.079		0.064							2"x2"x3/16"		3-1/2"		3-3/8"		5-1/2"
		48" - 60"	14"	0.109		0.064							2"x2"x3/16"		3-1/2"		5-3/8"		
		66" - 120"	25"	0.064-0.109		0.064							2"x2"x3/16"		5-1/2"		9-3/8"		
		42" - 60"	14"		0.060-0.105		0.060							2"x2"x3/16"		3-1/2"		5-3/8"	
		42" - 60"	14"		0.135		0.075							2"x2"x1/4"		3-1/2"		5-3/8"	
		66" - 96"	25"		0.060-0.135		0.060							2"x2"x1/4"		5-1/2"		7-3/8"	
		96" - 108"	25"		0.135		0.075							2"x2"x1/4"		5-1/2"		7-3/8"	
WING CHANNEL	2 2/3"x1/2" REROLLED END	THROUGH 48"	12"	0.109		0.064		0.079	1/2	7/8	32,000		2"x2"x3/16"		3-1/2"		3-3/8"		5-1/2"
		THROUGH 54"	12"	0.064-0.079		0.064		0.079	1/2	7/8	32,000		2"x2"x3/16"		3-1/2"		3-3/8"		5-1/2"
		54" - 66"	12"	0.109		0.064		DOUBLE 0.079	1/2	7/8	32,000								
		THROUGH 72"	12"	0.138		0.079		DOUBLE 0.079	1/2	7/8	32,000								
		THROUGH 84"	12"	0.168		0.109		DOUBLE 0.079	1/2	7/8	45,000								
	3"x1" REROLLED END	48" - 102"	12"	0.064-0.079		0.064		DOUBLE 0.079	1/2	7/8	32,000								
		48" - 78"	12"	0.109		0.064		DOUBLE 0.079	1/2	7/8	32,000								
		84" - 96"	12"	0.109		0.079		DOUBLE 0.109	1/2	7/8	45,000								
		102" - 120"	12"	0.109		0.109		DOUBLE 0.109	1/2	7/8	45,000								

GENERAL NOTES

1. All ferrous metal coupling band connection hardware shall be galvanized or electroplated in accordance with the Standard Specifications.
2. For helically corrugated coupling bands, the connection angles may be oriented parallel to the pipe axis, provided connecting holes are slotted lengthwise sufficiently to allow adjustment for the helix angle.
3. Tension strap may be connected to band with either spot welds or fillet welds that develop minimum required strength of strap.
4. Use 1 1/4" gage line dimension on attached angle leg for rivets and spot welds.
5. Band thickness shall not be less than:
   (I) 3 standard thicknesses lighter than the thickness of the pipe for C.S.P.
   (II) 2 standard thicknesses lighter than the thickness of the pipe and in no case lighter than 0.060-inch for C.A.P.
6. Dimensions, thicknesses and strengths shown are minimum.
7. For pipe arches use same width band as for round pipe of equal periphery.
8. Fillet welds of equivalent strength may be substituted for spot welds or rivets.
9. Spot welds shall develop minimum required strength of strap.
10. Pipe with rerolled ends having at least two 2 2/3"x1/2" annular corrugations at each end with or without an upturned flange may be connected with any of the annular coupling bands shown for pipe of the same diameter and wall thickness and having 2 2/3"x1/2" corrugations.
11. In the case of H-13 huggerbands, two piece bands are required for diameters through 96" and three piece bands are required for diameters 102" through 120".
12. Two piece bands are required for pipes greater than 42" diameter.

C.M.P. COUPLING DETAILS No. 7

POSITIVE JOINT

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

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

CHIEF, OFFICE OF PROJECT PLANNING and DESIGN
REGISTERED NO. 13048
APPROVED July 1, 1984

POSITIVE JOINTS

COUPLING TYPE	PIPE CORRUGATION	PIPE SIZE	W OR A	THICKNESS PIPE WALL CSP	THICKNESS PIPE WALL CAP	THICKNESS BAND CSP	THICKNESS BAND CAP	BAR & STRAP (CSP ONLY) THICKNESS STRAP	BAR & STRAP (CSP ONLY) BOLTS (IN.)	BAR & STRAP (CSP ONLY) BAR DIAM. (IN.)	BAR & STRAP (CSP ONLY) BAR YIELD STRENGTH, PSI	BEAVERTAIL (CSP ONLY) BOLTS	ANGLE DIMENSIONS CSP	ANGLE DIMENSIONS CAP	ANGLE BOLTS CSP	ANGLE BOLTS CAP	ANGLE RIVETS ANGLE TO BAND CSP	ANGLE RIVETS ANGLE TO BAND CAP	ANGLE SPOT WELDS ANGLE TO BAND CSP
CHANNEL	2 2/3"x1/2"	THROUGH 30"	1"	0.064-0.079		0.079						1-1/2"	2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		36" - 48"	1"	0.064		0.079							2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		36" - 42"	1"	0.079		0.079		0.079	1/2	7/8	32,000								
		30" - 42"	1"	0.109		0.109		0.079	1/2	7/8	32,000								
		48" - 54"	1"	0.079		0.109		0.079	1/2	7/8	32,000								
HUGGER	2 2/3"X1/2" REROLLED END	THROUGH 48"	10 1/2"	0.109		0.064		0.079	1/2	7/8	32,000								
		54" - 66"	10 1/2"	0.109		0.064		DOUBLE 0.079	1/2	7/8	32,000								
		THROUGH 54"	10 1/2"	0.064-0.079		0.064		0.079	1/2	7/8	32,000								
		THROUGH 60"	10 1/2"	0.138		0.079		DOUBLE 0.079	1/2	7/8	32,000								
		66" - 72"	10 1/2"	0.138		0.109		DOUBLE 0.079	1/2	7/8	32,000								
		THROUGH 72"	10 1/2"	0.168		0.109		DOUBLE 0.109	1/2	7/8	45,000								
	3"X1" REROLLED END	48" - 84"	10 1/2"	0.109		0.079		DOUBLE 0.079	1/2	7/8	32,000								
		48" - 90"	10 1/2"	0.064-0.079		0.064		DOUBLE 0.079	1/2	7/8	32,000								
		96" - 102"	10 1/2"	0.079		0.079		DOUBLE 0.079	1/2	7/8	32,000								
		90" - 120"	10 1/2"	0.109		0.109		DOUBLE 0.109	1/2	7/8	45,000								
HAT BAND	2 2/3"X1/2"	12" - 30"	2 3/4"	0.064-0.079		0.064						1-1/2"	2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
		36" - 48"	2 3/4"	0.064		0.064							2 1/2"x1 1/2"x3/16"		1-1/2"		3-1/2"		3-1/2"
		36" - 48"	2 3/4"	0.079		0.079		0.079	1/2	7/8	32,000								
		THROUGH 42"	2 3/4"	0.109		0.079		0.079	1/2	7/8	32,000								

DOWNDRAINS

COUPLING TYPE	PIPE CORRUGATION	PIPE SIZE	W OR A	THICKNESS PIPE WALL CSP	THICKNESS PIPE WALL CAP	THICKNESS BAND CSP	THICKNESS BAND CAP	BAR & STRAP (CSP ONLY) THICKNESS STRAP	BAR & STRAP (CSP ONLY) BOLTS	BAR & STRAP (CSP ONLY) BAR DIAM.	BEAVERTAIL (CSP ONLY) BOLTS	BEAVERTAIL (CSP ONLY) WELDS	ANGLE DIMENSIONS CSP	ANGLE DIMENSIONS CAP	ANGLE BOLTS CSP	ANGLE BOLTS CAP	ANGLE RIVETS ANGLE TO BAND CSP	ANGLE RIVETS ANGLE TO BAND CAP	ANGLE SPOT WELDS ANGLE TO BAND CSP
Two Piece	1 1/2"x1/4"	6"	7"	0.064		0.052									3-3/8"				
Integral	1 1/2"x1/4"	8" - 10"	7"	0.064	0.060	0.064	0.060									3-3/8"			
Flange	2 2/3"x1/2"	12" - 24"	12"	0.064	0.060	0.064	0.060									3-1/2"			
Annular	2 2/3"x1/2"	Through 24"	12"	0.064	0.060	0.064	0.060						2"x2"x3/16"	2"x2"x3/16"	3-1/2"	3-1/2"	3-3/8"	3-3/8"	3-1/2"
Channel	2 2/3"x1/2"	Through 24"	3/4"	0.064		0.079		0.079"	1/2"	7/8"	1-1/2"	SEE DETAILS	2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
Hat Band	2 2/3"x1/2"	Through 24"	2 3/4"	0.064-0.079		0.064					1-1/2"		2 1/2"x1 1/2"x3/16"		1-1/2"				3-1/2"
Hugger	2 2/3"x1/2"	Through 24"	10 1/2"	0.064		0.064		0.079".	1/2"	7/8"									
Helical	2 2/3"x1/2"	Through 24"	12"	0.064	0.060	0.064	0.060						2"x2"x3/16"	2"x2"x3/16"	3-1/2"	3-1/2"	3-3/8"	3-3/8"	3-1/2"

GENERAL NOTES

1. All ferrous metal coupling band connection hardware shall be galvanized or electroplated in accordance with the Standard Specifications.
2. For helically corrugated coupling bands, the connection angles may be oriented parallel to the pipe axis, provided connecting holes are slotted lengthwise sufficiently to allow adjustment for the helix angle.
3. Tension strap may be connected to band with either spot welds or fillet welds that develop minimum required strength of strap.
4. Use 1 1/4" gage line dimension on attached angle leg for rivets and spot welds.
5. Band thickness shall not be less than:
   (i) 3 standard thicknesses lighter than the thickness of the pipe for C.S.P.
   (ii) 2 standard thicknesses lighter than the thickness of the pipe and in no case lighter than 0.060-inch for C.A.P.
6. Dimensions, thicknesses and strengths shown are minimum.
7. For pipe arches use same width band as for round pipe of equal periphery.
8. Fillet welds of equivalent strength may be substituted for spot welds or rivets.
9. Spot welds shall develop minimum required strength of strap.
10. Pipe with rerolled ends having at least two 2 2/3"x1/2" annular corrugations at each end with or without an upturned flange may be connected with any of the annular coupling bands shown for pipe of the same diameter and wall thickness and having 2 2/3"x1/2" corrugations.
11. In the case of H-13 huggerbands, two piece bands are required for diameters through 96" and three piece bands are required for diameters 102" through 120".
12. Two piece bands are required for pipes greater than 42" diameter.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

C.M.P. COUPLING DETAILS No. 8
POSITIVE JOINTS AND DOWNDRAINS

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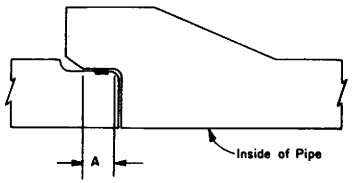
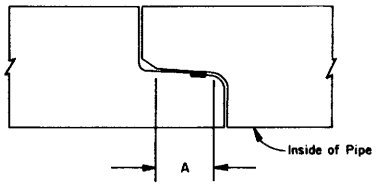
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

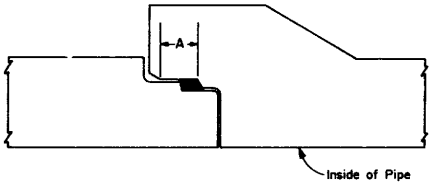
APPROVED July 1, 1984



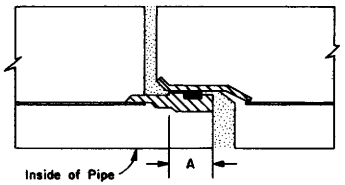
CONCRETE JOINT-FLARED BELL DESIGN



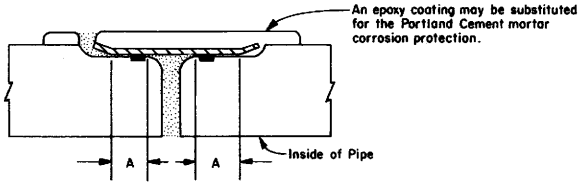
CONCRETE JOINT-FLUSH BELL DESIGN



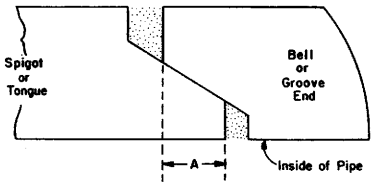
CONCRETE JOINT-FLARED BELL DESIGN
(TYPE R-3)



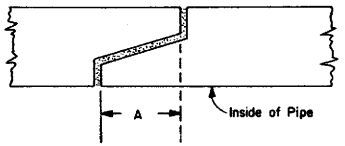
STEEL JOINT-FLUSH BELL DESIGN



CONCRETE JOINT-DOUBLE GASKET DESIGN



SELF-CENTERING TONGUE & GROOVE



T & G DESIGN

DIMENSION	DIAMETER LIMITS	STANDARD	POSITIVE
A	6" through 12" diameter	1/4" min.	1/2" min.
A	15" through 33" diameter	1/2" min.	3/4" min.
A	Greater than 33" diameter	3/4" min.	1" min.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

REINFORCED CONCRETE PIPE OR
NON-REINFORCED CONCRETE PIPE
STANDARD AND POSITIVE JOINTS

D97-F

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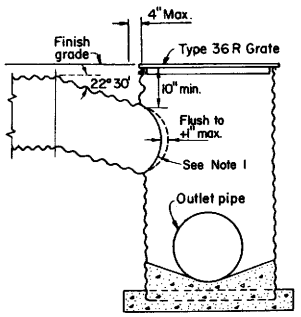
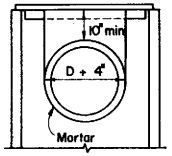
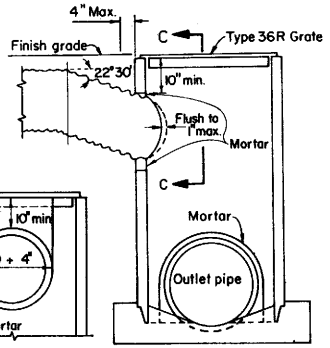


SAME AS TYPE GMP
WITH TYPE 36R GRATE

See Standard Plans D75-A & D77-A

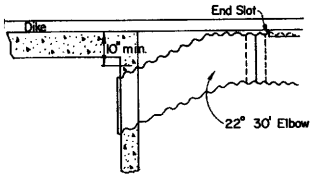


SECTION C-C

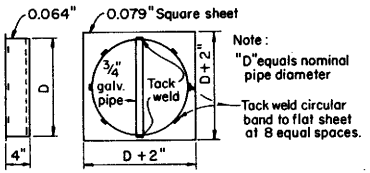


SAME AS TYPE GCP
WITH TYPE 36R GRATE

See Standard Plans D75-A & D77-A



DETAILS OF SLOTTED DRAIN CONNECTIONS TO STANDARD INLET STRUCTURES

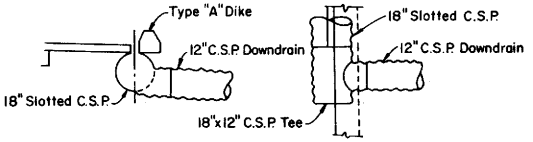


METAL CAP DETAIL

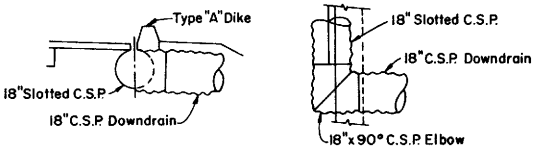
DISTRICT	COUNTY	ROUTE	Plan Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

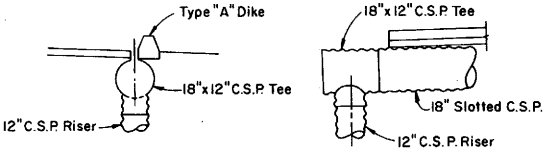
Approved July 1, 1984



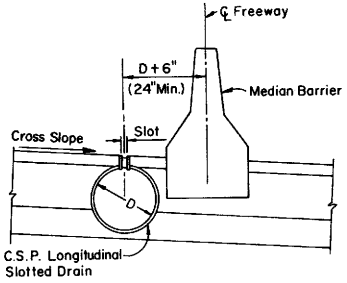
SHOULDER INSTALLATION 18" SLOTTED C.S.P. TO 12" C.S.P. DOWNDRAIN



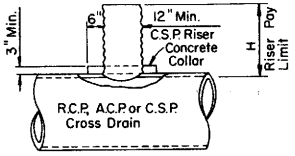
SHOULDER INSTALLATION 18" SLOTTED C.S.P. TO 18" C.S.P. DOWNDRAIN



SHOULDER INSTALLATION 18" SLOTTED C.S.P. TO 12" C.S.P. RISER



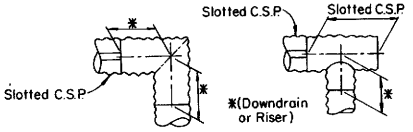
TYPICAL CROSS SECTION



RISER CONNECTION DETAIL

GENERAL NOTES

1. Either field joint sealed with a pliable mixture of sand, portland cement and emulsified asphalt (mixture of 1 part portland cement, 3-5 parts sand and 1½ parts SS1 emulsified asphalt), or continuous weld.



MEASUREMENT OF CORRUGATED PIPES, ELBOWS AND TEES

NOTE: Length is included in the linear feet of pipe involved as shown on the Drainage List. Watertight joints required on all Slotted C.S.P. connections.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

STANDARD INLET STRUCTURE
SHOULDER INSTALLATION DETAILS AND
DETAILS OF SLOTTED DRAIN CONNECTIONS

D98-A

D98-A

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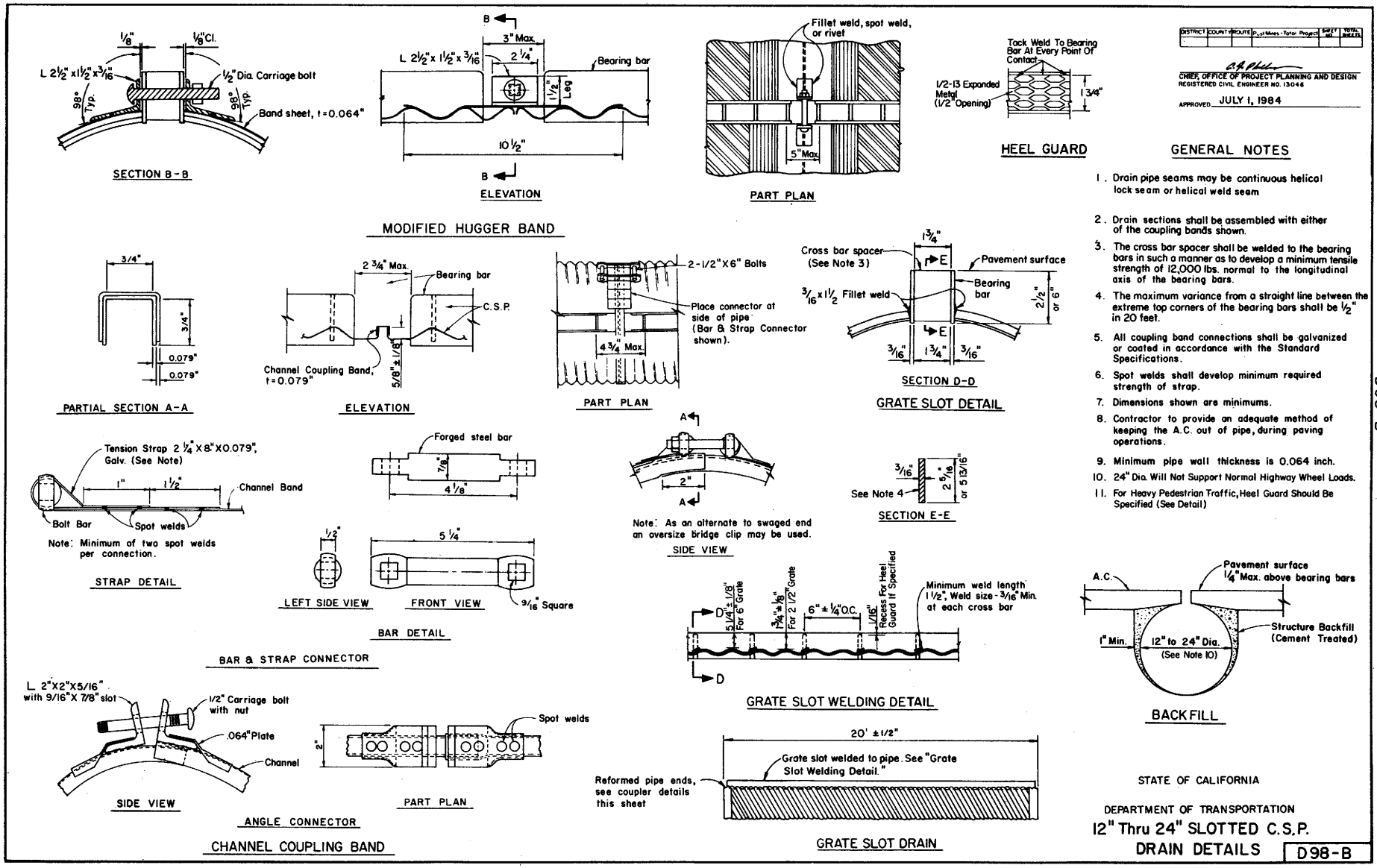

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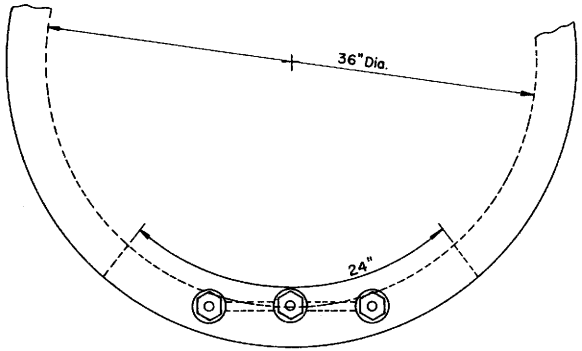
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

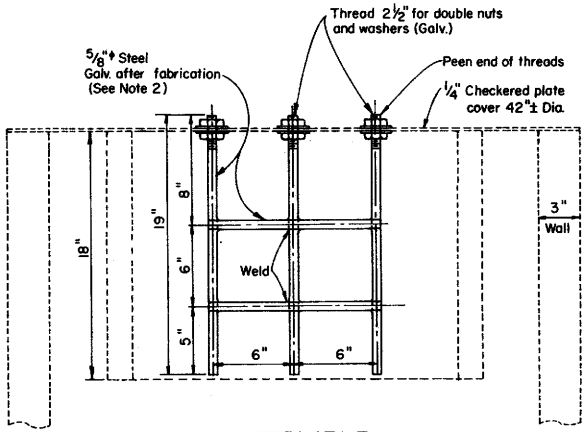
APPROVED JULY 1, 1984

GENERAL NOTES

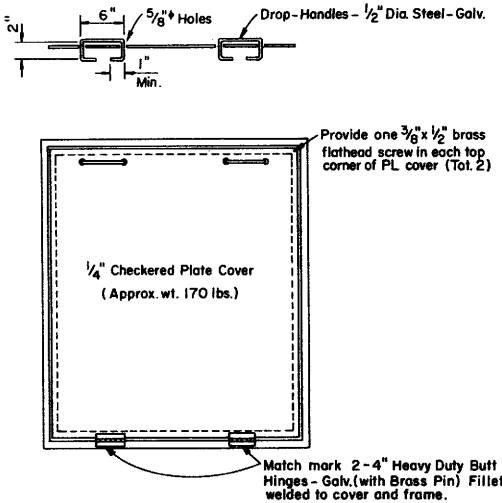
1. Alternative methods of securing drop-handles to cover will be acceptable.
2. Galvanizing: See Standard Specifications or Special Provisions.
3. This hinged cover is to be used only on embankment or steep slopes.



PLAN VIEW ⚠



ALTERNATIVE
TRASH RACK FOR TYPE OCP INLET
(SINGLE OR DOUBLE OPENING)
ELEVATION



HINGED COVER FOR
TYPE OL & OS INLETS

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION
ALTERNATIVE
HINGED COVER FOR TYPE OL & OS INLETS
& TRASH RACK FOR TYPE OCP INLET | D98-C

D98-C

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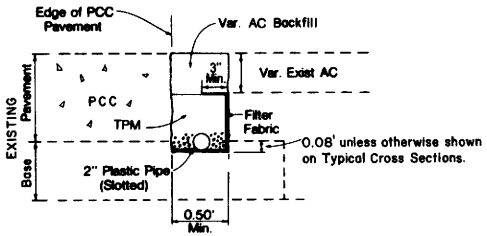
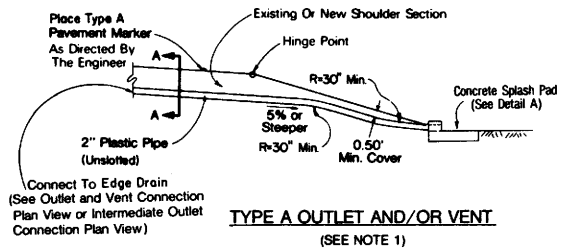
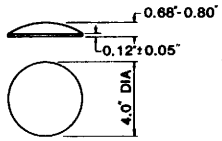


Note: See Typical Cross Section for limits and thickness of pavement and base.

TYPE I EDGE DRAIN
(FOR EXISTING HWY. FACILITY)



TYPE A OUTLET AND/OR VENT
(SEE NOTE 1)

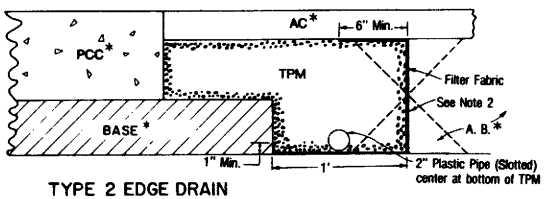


Type A Pavement Marker
DETAIL

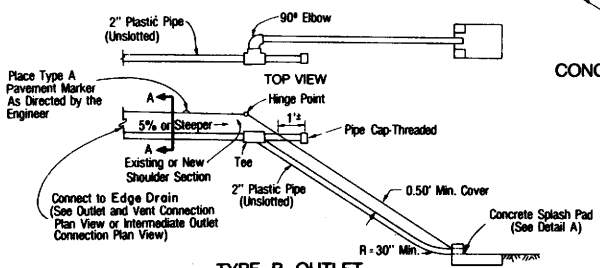
CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO 13046
DATE APPROVED July 1, 1984

ABBREVIATIONS

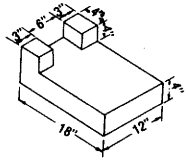
- AB — Aggregate Base
- AC — Asphalt Concrete
- PCC — Portland Cement Concrete
- TPM — Treated Permeable Material
- ETW — Edge of Traveled Way
- ES — Edge of Shoulder



TYPE 2 EDGE DRAIN
(NEW CONSTRUCTION)
*(See typical cross sections for thickness of pavement and base.)



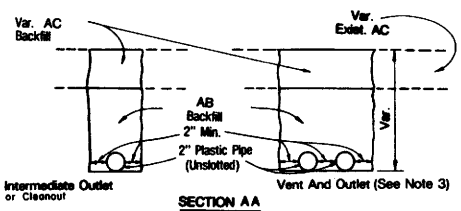
TYPE B OUTLET
(SEE NOTE 1)



CONCRETE SPLASH PAD
DETAIL A

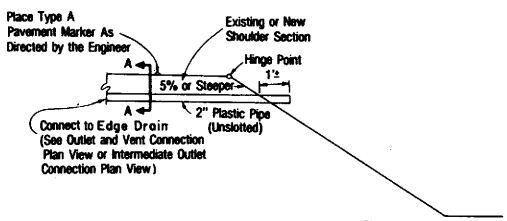
NOTES:

1. See Project Plans for typical cross-sections and location and type of outlet and vent installation.
2. At the Contractor's option on new construction (Type 2 Edge Drain), the vertical joint line (including filter fabric) between the TPM and AB may be rotated about its midpoint to a slope not flatter than 1:1 in either direction as shown by dashed lines.
3. Details shown also apply to dual outlet or dual vent installations.

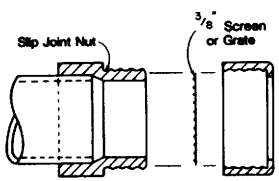


EXCAVATION AND BACKFILL IN EXISTING PAVED SHOULDERS

NOTE: Backfill With AB From Outside Edge Of Paved Shoulder To Hinge Point, And Backfill With Native Material In Slope Area.



TYPE C OUTLET AND/OR VENT
(SEE NOTE 1)



EDGE DRAIN OUTLET
& VENT COVER

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

EDGE DRAIN DETAILS

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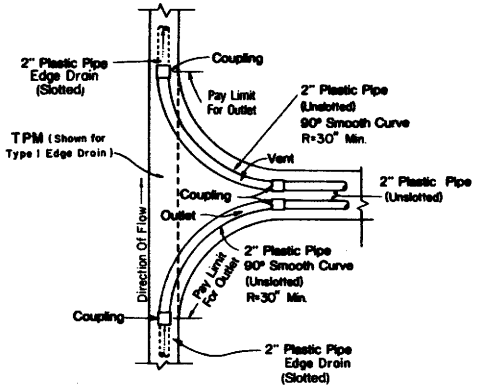
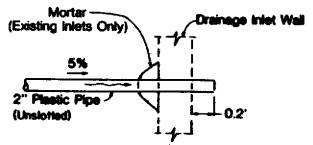
Dist.	County	Route	Post Mile Total Project	Sheet No.	Total Sheets

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 12676

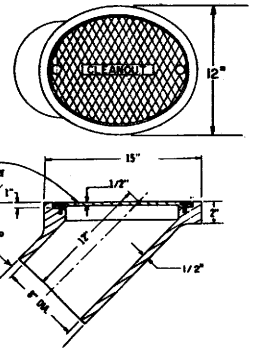
DATE APPROVED July 1, 1984



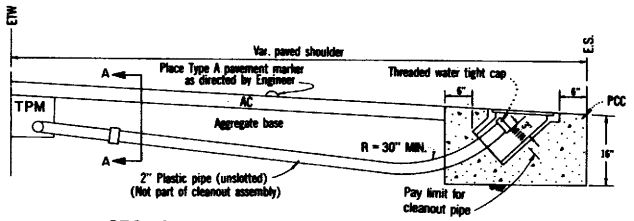
OUTLET AND VENT CONNECTION
PLAN VIEW (See Note 2)



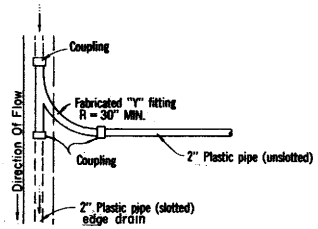
TYPE D OUTLET & VENT
CONNECTION TO D.I.



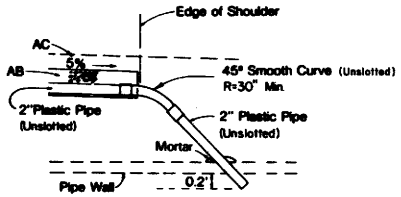
CLEANOUT ASSEMBLY DETAIL
(See Note 1)



SECTION—CLEANOUT ASSEMBLY DETAIL

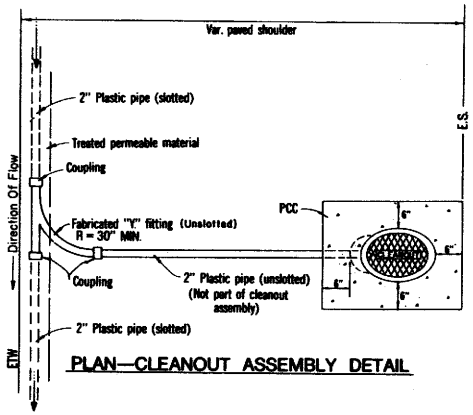


INTERMEDIATE OUTLET CONNECTION
PLAN VIEW



ELEVATION

TYPE E OUTLET CONNECTION
TO DRAINAGE PIPES



PLAN—CLEANOUT ASSEMBLY DETAIL

NOTES:

1. Minimum dimensions are shown for Cleanout Assembly. Traffic weight cover shall have two screws or one screw and a retaining lug.
2. Details shown also apply to dual outlet or dual venting installations.
3. See Standard Plan 98D-1 for abbreviations.

STATE OF CALIFORNIA
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EDGE DRAIN DETAILS

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D98D-2

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

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
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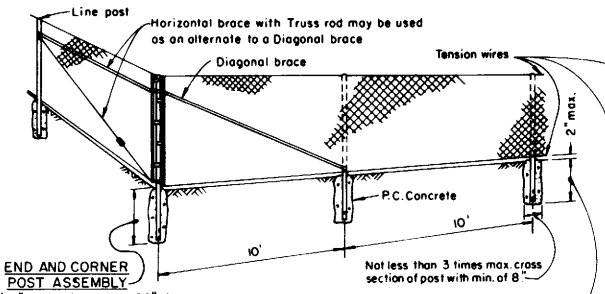
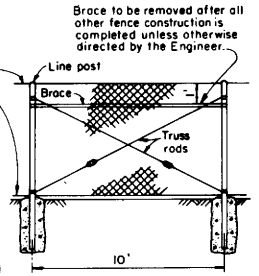
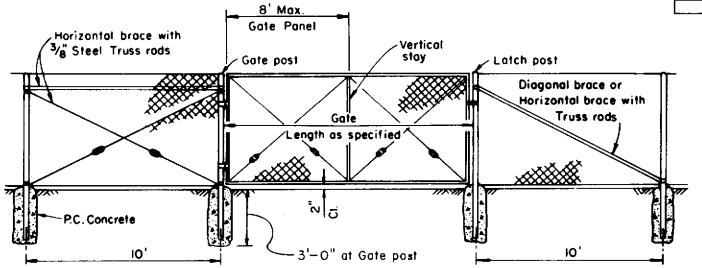
DATE July 1, 1984

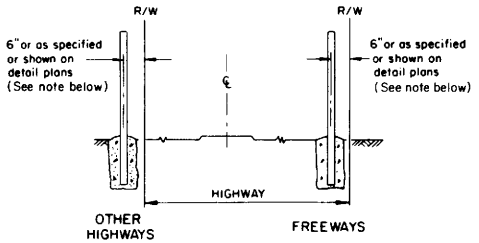




Line posts at 1000' max. intervals braced and trussed in both directions except that this bracing and trussing may be omitted when the fabric is stretched by equipment



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



NOTE: Offset to be 2'-0" at monument locations, measured at rt. angles to R/W lines. Taper to achieve offset to be at least 20' long.

FENCE LOCATION

TYPICAL MEMBER DIMENSIONS

FENCE HEIGHT	LINE POSTS			END, LATCH & CORNER POSTS			BRACES			
	ROUND (I.D.)	H	ROLL FORMED	ROUND (I.D.)	ROLL FORMED		ROUND (I.D.)	H	ROLL FORMED	
6' and Less	1 1/2"	1 7/8" x 1 5/8"	1 3/4" x 1 3/4"	2"	3 1/2" x 3 1/2"	2" x 1 3/4"	1 1/4"	1 1/2" x 1 5/16"	1 5/8" x 1 1/4"	1 3/4" x 1 1/4"
Over 6'	2"	2 1/4" x 2"	2" x 1 3/4"	2 1/2"	3 1/2" x 3 1/2"	2 1/2" x 2 1/2"	1 1/4"	1 1/2" x 1 5/16"	1 5/8" x 1 1/4"	1 3/4" x 1 1/4"

NOTES:

1. The above table shows examples of post and brace sections which may comply with the Specifications.
2. Sections shown in the tables must also comply with the strength requirements and other provisions of the Specifications.
3. Other sections which comply with the strength requirements and other provisions of the Specifications may be used on approval of the Engineer.
4. Options exercised shall be uniform on any one project.
5. Dimensions shown are nominal.

GATE POST

FENCE HEIGHT	GATE WIDTHS	NOMINAL I.D.	WEIGHT PER FOOT
6'-0" and Less	Up thru 6'	2 1/2"	4.95
	Over 6' thru 12'	4"	10.79
	Over 12' thru 18'	5"	14.62
	Over 18' to 24' Max.	6"	18.97
Over 6'	Up thru 6'	3"	7.58
	Over 6' thru 12'	5"	14.62
	Over 12' thru 18'	6"	18.97
	Over 18' to 24' Max.	8"	28.55

NOTE:
Above post dimensions and weights are minimums. Larger sizes may be used on approval of Engineer.

STATE OF CALIFORNIA
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CHAIN LINK FENCE | F10

F10

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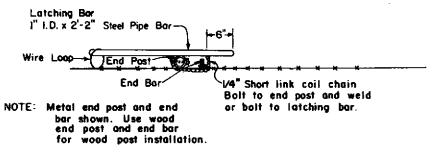
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

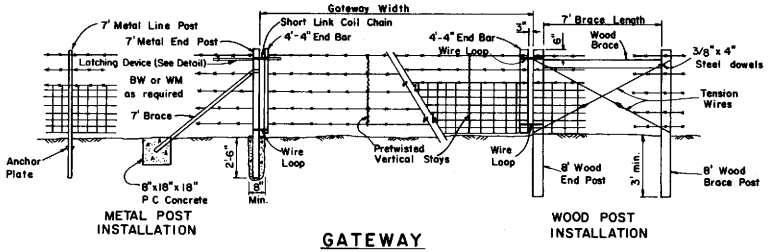
C. J. Phillips
CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEERING NO. 13046

Approved July 1, 1984



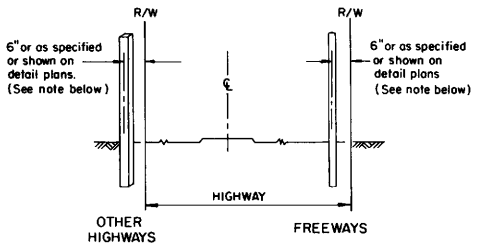
NOTE: Metal end post and end bar shown. Use wood end post and end bar for wood post installation.

LATCHING DEVICE FOR GATEWAYS



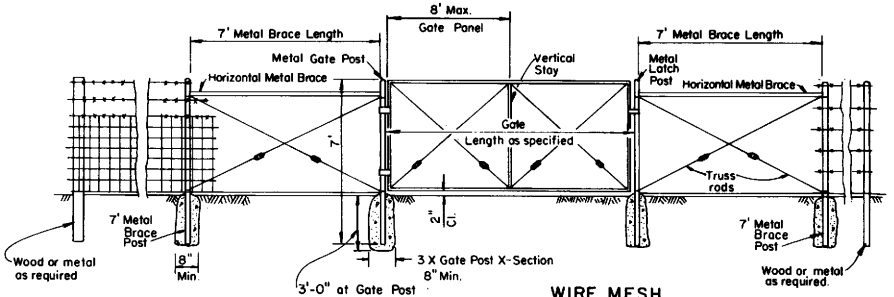
GATEWAY

NOTE: Gateway to be used when specified in the Special Provisions.



NOTE: Offset to be 2'-0" at monument locations, measured at rt. angles to R/W lines. Taper to achieve offset to be at least 20' long

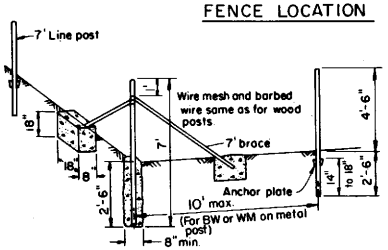
FENCE LOCATION



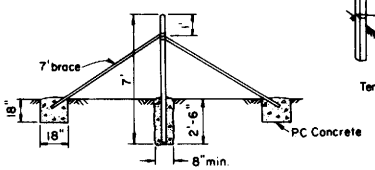
WIRE MESH GATE INSTALLATION FOR EITHER WOOD OR METAL POST FENCES

WIRE MESH GATE POST		
GATE WIDTHS	NOMINAL I.D.	WEIGHT PER FOOT
Up thru 6'	2½"	4.95
Over 6' thru 12'	3½"	9.11
Over 12' thru 18'	5"	14.62
Over 18' to 24' Max.	6"	18.97

NOTE:
Above post dimensions and weights are minimums. Larger sizes may be used on approval of Engineer.

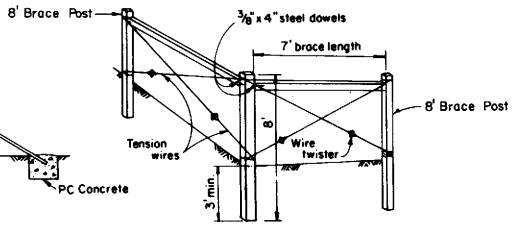


END AND CORNER POST ASSEMBLY

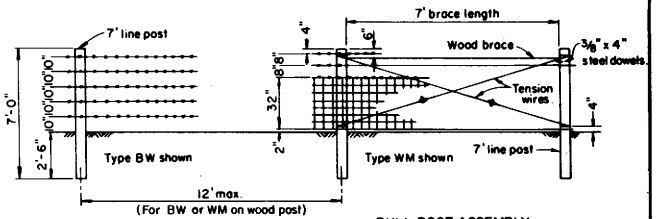


PULL POST ASSEMBLY
At 660' maximum intervals for WM fence
At 1320' maximum intervals for BW fence

METAL POST INSTALLATION



END AND CORNER POST ASSEMBLY
Type BW = 5 lines of barbed wire.
Type WM = Wire mesh and 3 lines of barbed wire.



PULL POST ASSEMBLY
At 660' maximum intervals for WM fence.
At 1320' maximum intervals for BW fence.

WOOD POST INSTALLATION

NOTE:
Line post spacing for wood post = 12' max.
Line post spacing for metal post = 10' max.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BARBED WIRE AND WIRE MESH FENCES | F20

F20

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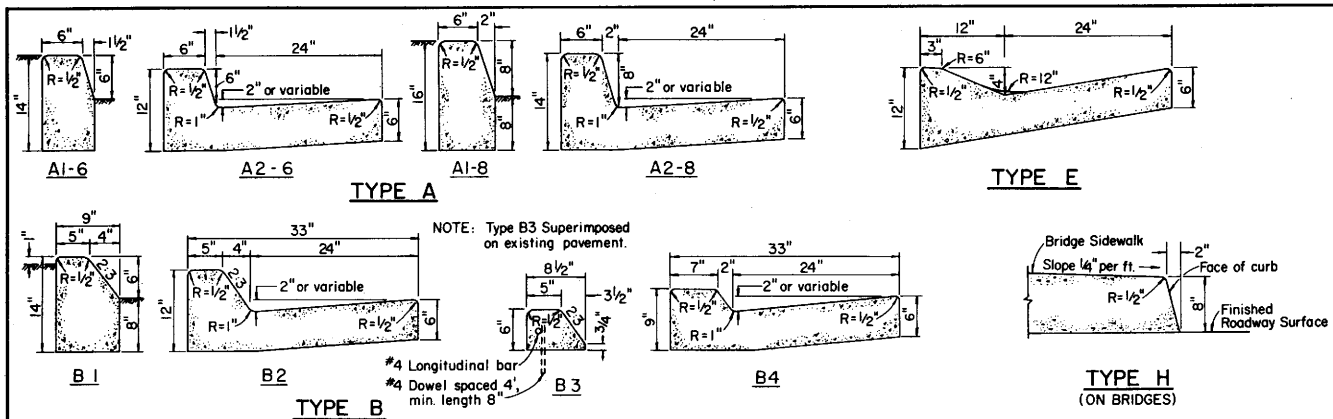


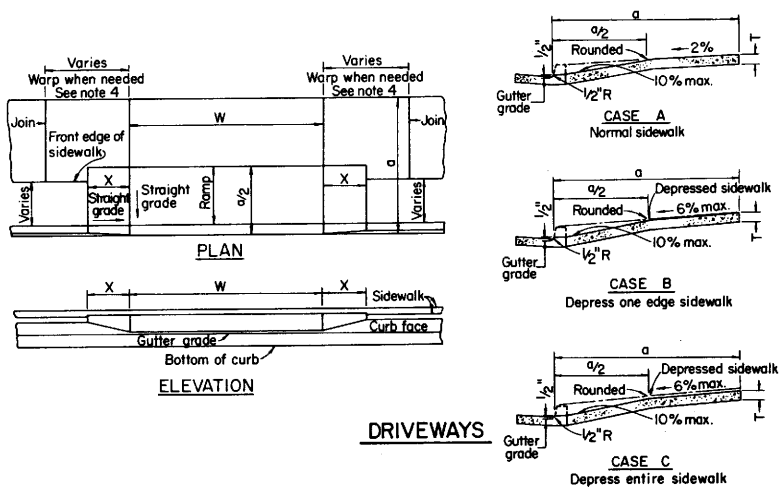
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

DATE July 1, 1984

CURB QUANTITIES

Type	C.Y. per lin. ft.	Type	C.Y. per lin. ft.
A1-6	0.02585	E	0.06661
A2-6	0.05903		
A1-8	0.03084		
A2-8	0.06379		
B1	0.02930		
B2	0.06171		
B3	0.01074		
B4	0.05709		



DRIVEWAYS

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. X is variable when sidewalk is located where wheelchairs may traverse the surface. Slopes shall be 12.5% maximum.
6. Sidewalk and ramp thickness "T" at driveway shall be 4" for residential and 6" for commercial.
7. 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 gutter line shall not exceed 15%. Reduce driveway ramp slope, not gutter slope, where required.

STATE OF CALIFORNIA
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CURBS AND DRIVEWAYS | **N8-A**

N8-A

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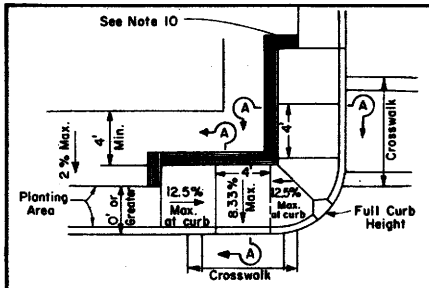
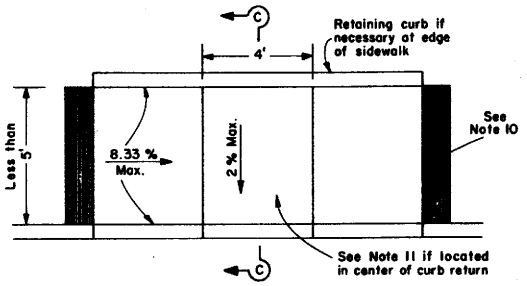
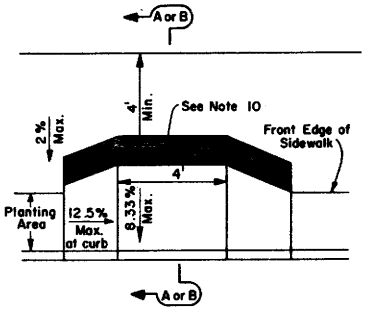


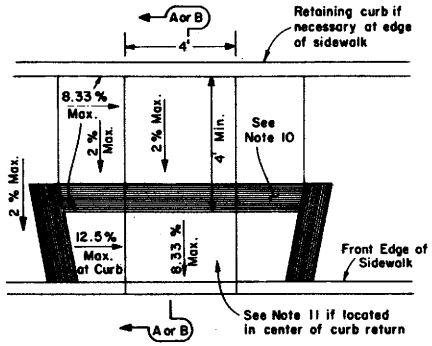
CASE A



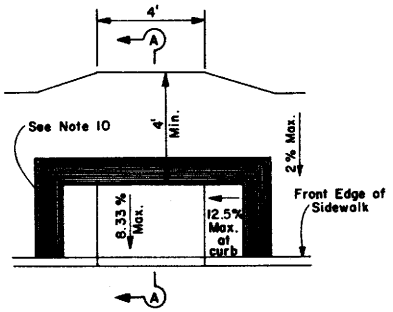
CASE C
(Sidewalk less than 5' wide)



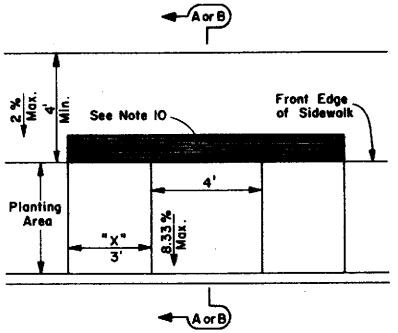
CASE F
See Note 6



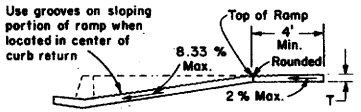
CASE B



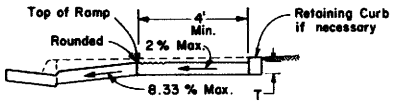
CASE D



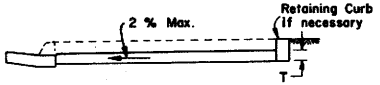
CASE G
See Note 6



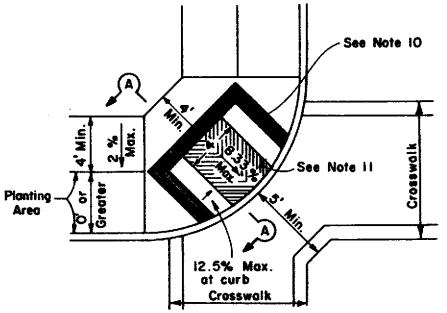
SECTION A-A



SECTION B-B
Depress entire sidewalk as required

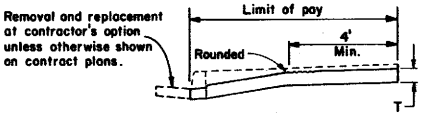


SECTION C-C

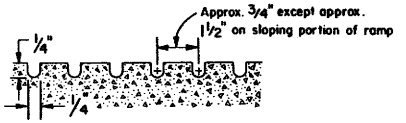


CASE E

LIP DETAIL
See Note 8



DETAIL H
Existing curb and sidewalk



GROOVING DETAIL

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

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13946
DATE November 18, 1983

NOTES

1. If distance from curb to back of sidewalk is too short to accommodate ramp and 4' platform as in Case A, the sidewalk may be depressed longitudinally as in Case B or C or may be widened as in Case D.
2. If sidewalk is less than 5' wide, the full width of the sidewalk shall be depressed as shown in Case C.
3. As an alternate to Case A, one ramp may be placed in the center of the curb return as in Case E.
4. When ramp is located in center of curb return, crosswalk configuration must be similar to that shown on the plan to accommodate wheelchairs.
5. If planting area width is equal to or greater than ramp length, ramp side slope "X" distance = 3' (See Case G)
6. For Cases F and G, the longitudinal portion of the sidewalk may need to be depressed as shown in Case B.
7. If located on a curve the sides of the ramp need not be parallel, but the minimum width of the ramp shall be 4'.
8. The bottom of the ramp shall have a 1/2" lip at 45°
9. Sidewalk and ramp thickness, "T", shall be 3 1/2".
10. The ramp shall have a 12" wide border with 1/4" grooves approximately 3/4" o.c. See grooving detail. The surface of ramp shall have a transverse broomed surface texture rougher than the surrounding sidewalk except when located in center of curb return.
11. When ramp is located in center of curb return, it shall be grooved in a herring-bone pattern with 1/4 grooves approximately 1 1/2" o.c. See grooving detail. Grooves should be aligned parallel to crosswalk stripes to direct blind pedestrians into appropriate crosswalk.
12. Ramp side slope varies uniformly from a maximum of up to 12.5 % at curb to conform with longitudinal sidewalk slope adjacent to top of the ramp, except in Cases C & G.
13. RETROFITS - When a wheelchair ramp is added to an existing facility, the following changes are permitted:
    (A) Ramp grade in Case C may be increased to 4 %.
    (B) Other ramp grades may be increased to a maximum of 11.1 %. (Nevertheless, they should be as flat as feasible.)
    (C) Where the 4' platform is not feasible, the width may be decreased to 3'.
    (D) The platform may be eliminated if the grade does not exceed 8.33 %.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

WHEELCHAIR RAMP DETAIL NO.1

N8-B

N8-B

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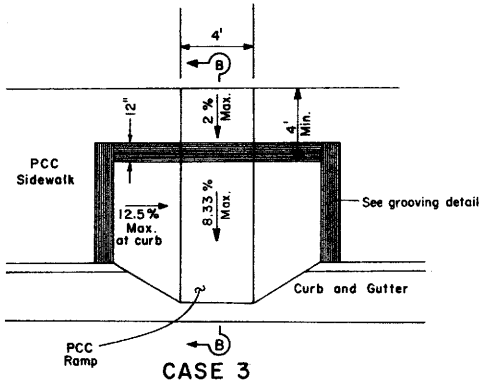
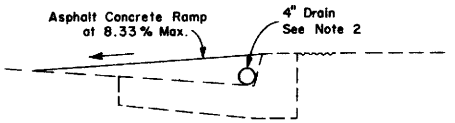
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF PROJECT PLANNING AND DESIGN
REGISTERED CIVIL ENGINEER NO. 13046

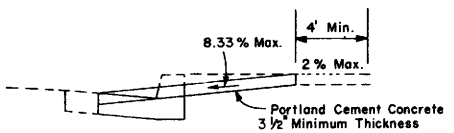
DATE July 1, 1984



CASE 3



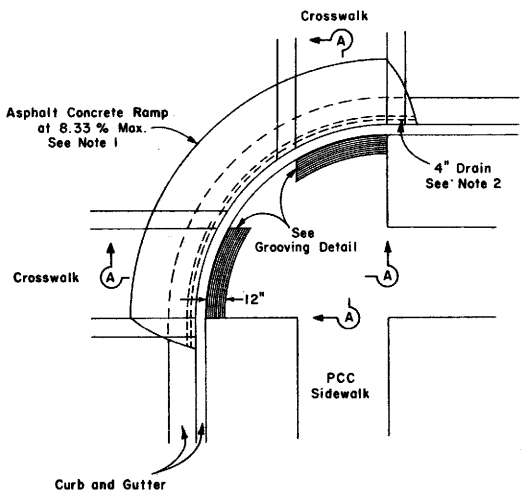
SECTION A-A



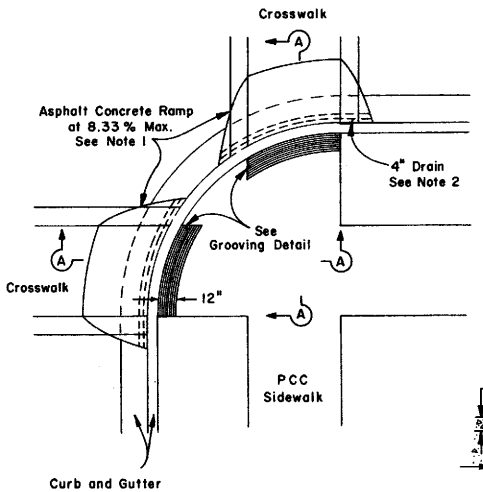
SECTION B-B

NOTES

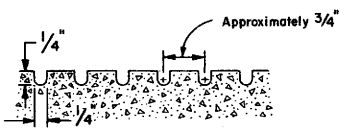
1. Asphalt Concrete Ramp side slopes shall be a maximum of 3:1.
2. 4" drain shall be 0.139" min. thickness steel pipe. Pipe shall conform to radius of curb and be beveled to conform to side slope.
3. Concrete finish for Case 3 shall have a transverse broomed surface texture rougher than the surrounding sidewalk.
4. RETROFITS – When a wheelchair ramp is added to an existing facility, the following changes are permitted:
   - (A) The ramp grade may be increased to a maximum of 11.1%. (nevertheless, it should be as flat as feasible.)
   - (B) Where the 4' platform is not feasible, the width may be decreased to 3'.
   - (C) The platform may be eliminated if the ramp grade does not exceed 8.33%.



CASE 1



CASE 2



GROOVING DETAIL

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

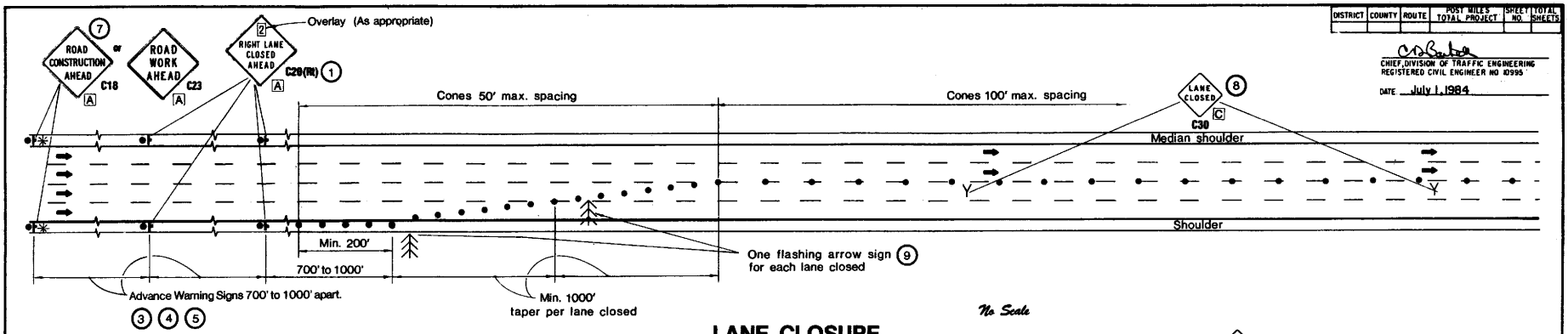
WHEELCHAIR RAMP DETAIL NO. 2

N8-C

Return to Table of Contents

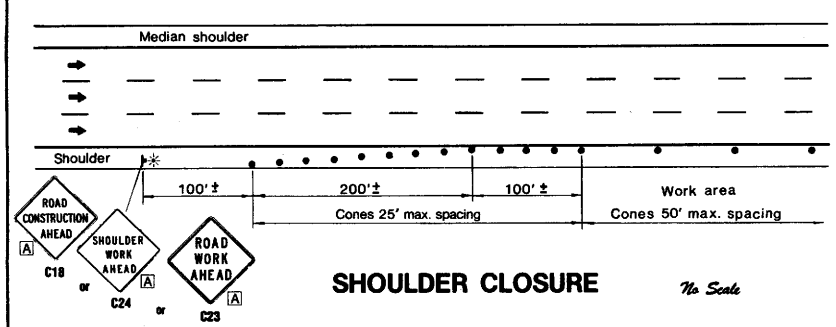
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995
DATE July 1, 1984



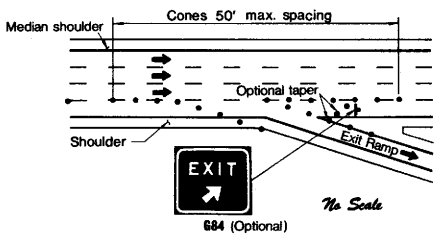
No Scale

LANE CLOSURE



SHOULDER CLOSURE

No Scale



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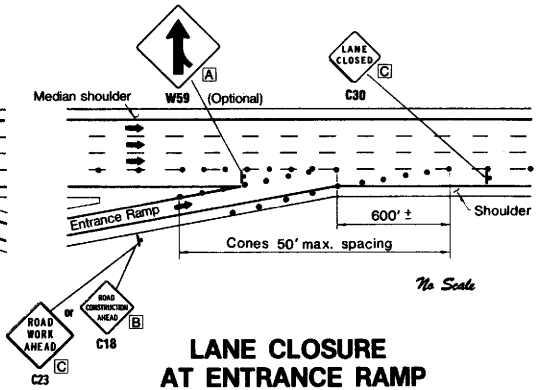
LANE CLOSURE AT EXIT RAMP



No Scale

LANE CLOSURE AT ENTRANCE RAMP

NOTES:

1. Median lane closures shall conform to the details for outside lane closures except that C20 (Lt) signs shall be used.
2. Not less than one person shall be assigned to full time maintenance of traffic control devices on all night lane closures, or daytime closures exceeding one mile in length, including taper.
3. Duplicate sign installations on opposite shoulders are not required for daytime operations if at least one-half of the available lanes remain open to traffic.
4. All advance warning signs for night lane closures shall be illuminated. Other signs shall be either illuminated or reflectorized.
5. All advance warning sign installations shall be equipped with flags for daytime closures. Flashing beacons shall be placed at the locations indicated during night lane closures.
6. A C13 "END CONSTRUCTION" or C14 "END ROAD WORK" sign, as appropriate, shall be placed at the end of the lane closure unless the end of work area is obvious, or ends within a larger project limits.
7. If the C18 (or C23) sign would follow within 2,000 feet of a stationary C18, C23, or C11 "STATE HIGHWAY CONSTRUCTION NEXT _____ MILES", use a C20 sign for the first advance warning sign.
8. Place a C30 sign on flag tree every 2,000 feet throughout length of lane closure.
9. The first flashing arrow sign shall be Type I. All others may be either Type I or Type II.
10. A minimum 1,500 feet of sight distance shall be provided, where possible, for vehicles approaching the first flashing arrow sign. Lane closures shall not begin at top of crest vertical curve or on a horizontal curve.
11. All cones used for night lane closures shall be illuminated traffic cones.
12. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used in lieu of cones for daytime closures only.
13. Warning (W) series signs used in work areas shall be black on orange.

SIGN PANEL SIZE (Min.)

A	48" x 48"
B	36" x 36"
C	30" x 30"

LEGEND

- Traffic Cone
- Portable Sign
- Flag Tree
- Flashing Arrow Sign
- Portable Flashing Beacon
- Direction of Travel

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE ON FREEWAYS AND EXPRESSWAYS

MISCELLANEOUS DETAILS

T-10

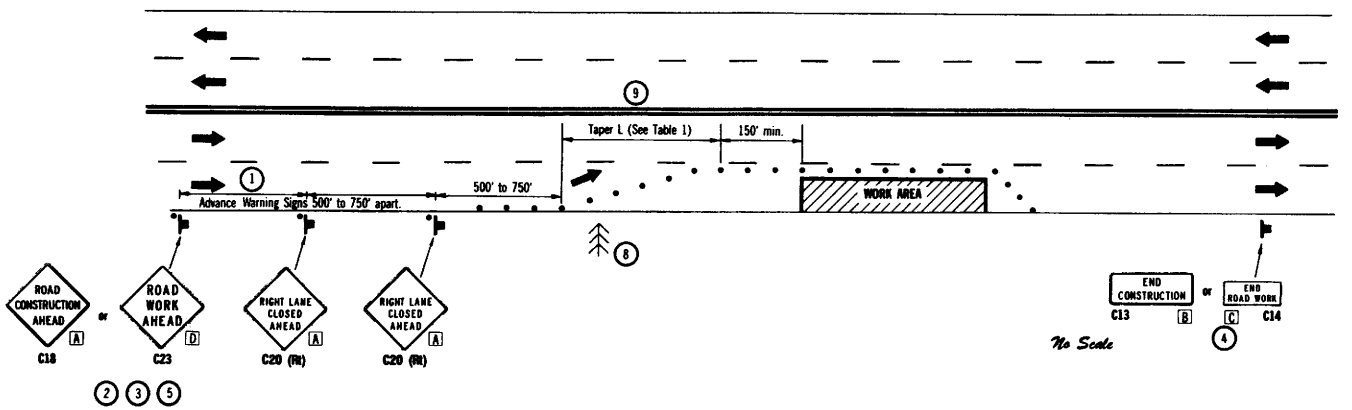
Return to Table of Contents

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

CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995

DATE July 1, 1984

TYPICAL LANE CLOSURE



SIGN PANEL SIZE (Min.)

A	36" x 36"
B	48" x 18"
C	36" x 18"
D	30" x 30"

LEGEND

- Traffic Cone
- Portable Sign
- Flashing Arrow Sign
- Direction of Travel

NOTES:

1. Where approach speeds are low, signs may be placed at 300 foot spacing, and in urban areas, closer.
2. All advance warning signs for night lane closures shall be illuminated. Other signs shall be either illuminated or reflectorized.
3. All advance warning sign installations shall be equipped with flags for daytime closures.
4. A C13 "END CONSTRUCTION" or C14 "END ROAD WORK" sign, as appropriate, shall be placed at the end of the lane closure unless the end of work area is obvious, or ends within a larger project limits.
5. If the C18 (or C23) sign would follow within 2,000 feet of a stationary C18, C23, or C11 "STATE HIGHWAY CONSTRUCTION NEXT _____ MILES", use a C20 sign for the first advance warning sign.
6. All cones used for night lane closures shall be illuminated traffic cones.
7. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used in lieu of cones for daytime closures only.
8. Flashing arrow sign shall be either Type I or Type II.
9. The maximum spacing between cones in a taper shall be approximately as shown in Table 1 and 50 foot maximum spacing on tangent.
10. For approach speeds over 50 mph, use the "Traffic Control System For Lane Closure On Freeways And Expressways" plan for lane closure details and requirements.

TABLE 1 (Taper)

Approach Speed (M.P.H.)	Taper Length (L)*	Number of Cones for Taper*	Spacing of Cones Along Taper (Feet) ±
0-25	125	6	25
25-40	320	9	40
40-50	600	13	50
Over 50 see note 10			

(*) Based on 12-Foot Wide Lane. This column is also appropriate for lane widths less than 12 feet.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE ON MULTILANE CONVENTIONAL HIGHWAYS

MISCELLANEOUS DETAILS

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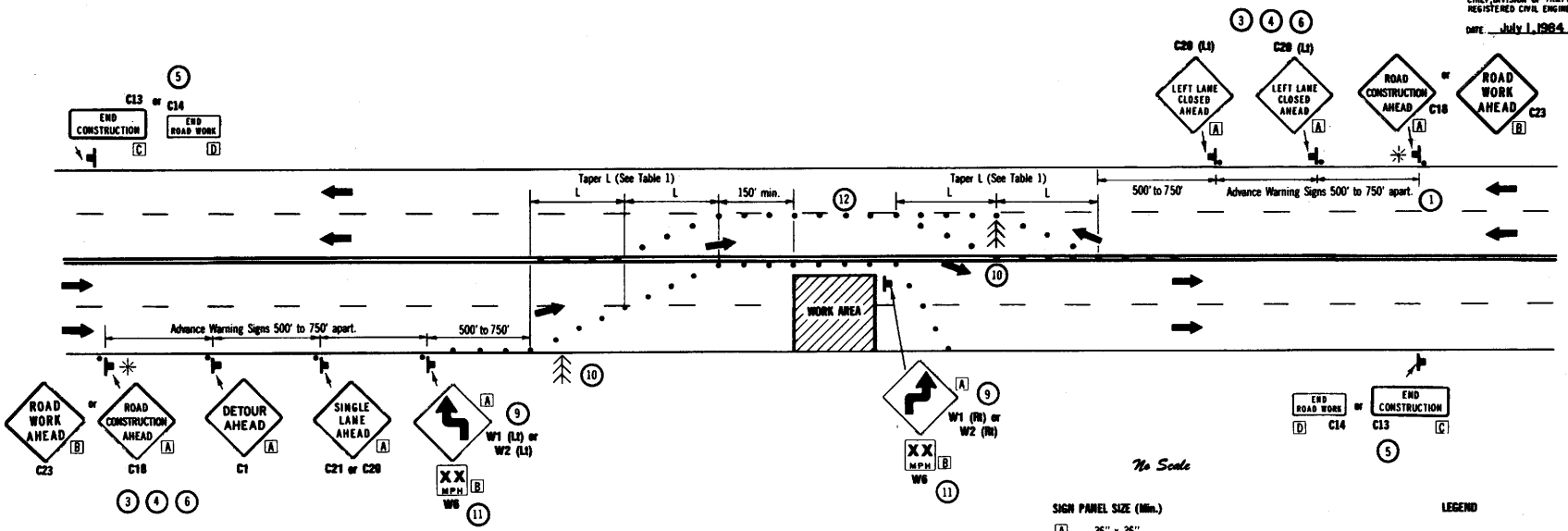
Return to Table of Contents

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

C.D. Bartell
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995
DATE July 1, 1984

TYPICAL CLOSING OF HALF ROADWAY



No Scale

SIGN PANEL SIZE (Min.)

- A 36" x 36"
- B 30" x 30"
- C 48" x 18"
- D 36" x 18"

LEGEND

- Traffic Cone
- Portable Sign
- Flashing Arrow Sign
- Direction of Travel
- Portable Flashing Beacon

NOTES:

1. Where approach speeds are low, signs may be placed at 300 foot spacing and, in urban areas, closer.
2. Not less than one person shall be assigned to full time maintenance of traffic control devices on all night lane closures.
3. All advance warning signs for night lane closures shall be illuminated. Other signs shall be either illuminated or reflectorized.
4. All advance warning sign installations shall be equipped with flags for daytime closures. Flashing beacons shall be placed at the locations indicated during night lane closures.
5. A C13 "END CONSTRUCTION" or C14 "END ROAD WORK" sign, as appropriate, shall be placed at the end of the lane closure unless the end of work area is obvious, or ends within a larger project limits.
6. If the C18 (or C23) sign would follow within 2,000 feet of a stationary C18, C23, or C11 "STATE HIGHWAY CONSTRUCTION NEXT _____ MILES", use a C20 sign for the first advance warning sign.
7. All cones used for night lane closures shall be illuminated traffic cones.
8. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used in lieu of cones for daytime closures only.
9. Warning (W) series signs used in work areas shall be black on orange.
10. Flashing arrow signs shall be either Type I or Type II.
11. Advisory speed will be determined by Engineer and will be posted only less than posted speed limit.
12. The maximum spacing between cones in a taper shall be approximately as shown in Table 1 and 50 foot maximum spacing on tangent.
13. For approach speeds over 50 mph, use the "Traffic Control System For Lane Closure On Freeways And Expressways" plan for lane closure details and requirements.

TABLE 1 (Taper)

Approach Speed (M.P.H.)	Taper Length (L)*	Number of Cones for Taper *	Spacing of Cones Along Taper (Feet) ±
0-25	125	6	25
25-40	320	9	40
40-50	600	13	50
Over 50 see note 13			

(*) Based on 12-Foot Wide Lane. This column is also appropriate for lane widths less than 12 feet.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE ON MULTILANE CONVENTIONAL HIGHWAYS

MISCELLANEOUS DETAILS

T-12

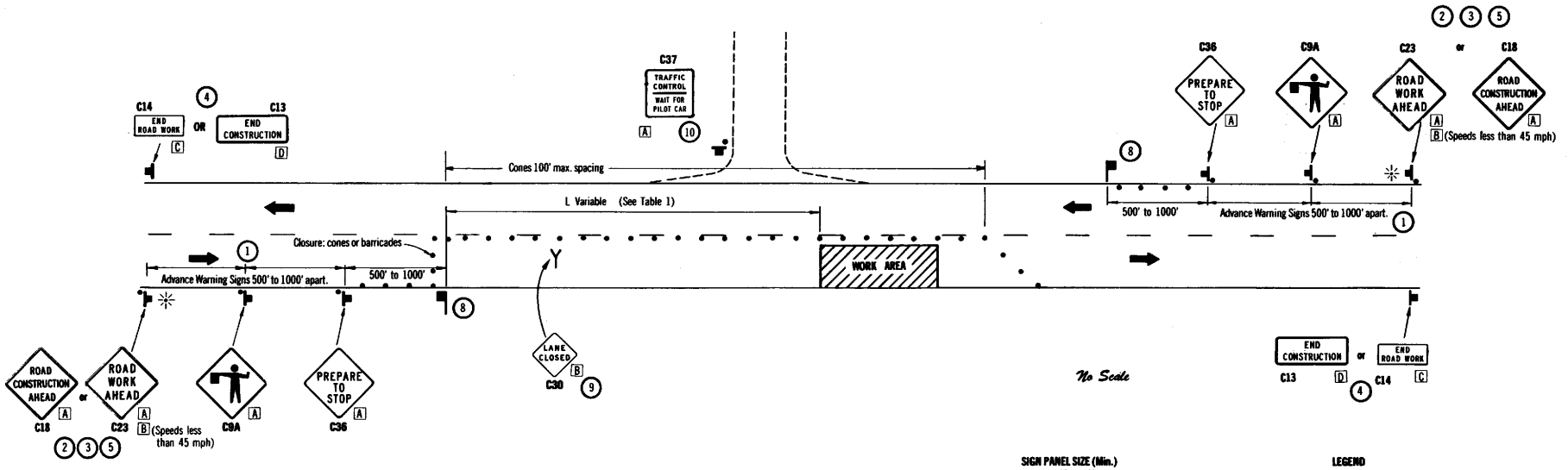
Return to Table of Contents

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

C.O. Bartell
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

DATE July 1, 1984

TYPICAL LANE CLOSURE WITH REVERSIBLE CONTROL



SIGN PANEL SIZE (Min.)

- A: 48" x 48" - Speeds of 45 mph or more; 36" x 36" - Speeds less then 45 mph (except C23)
- B: 30" x 30"
- C: 36" x 18"
- D: 48" x 18"

LEGEND

- Traffic Cone
- Flag Tree
- Portable Sign
- Flagger
- Direction of Travel
- Portable Flashing Beacon

NOTES:

1. Where approach speeds are low, signs may be placed at 300 foot spacing, and in urban areas, closer.
2. All advance warning signs for night closures shall be illuminated. Other signs shall be either illuminated or reflectorized.
3. All advance warning sign installations shall be equipped with flags for daytime closures. Flashing beacons shall be placed at the locations indicated during night lane closures.
4. At C13 "END CONSTRUCTION" or C14 "END ROAD WORK" sign, as appropriate, shall be placed at the end of the lane control unless the end of work area is obvious, or ends within a larger project limits.
5. If the C18 (or C23) sign would follow within 2,000 feet of a stationary C18, C23, or C11 "STATE HIGHWAY CONSTRUCTION NEXT _____ MILES", use a C9A sign for the first advance warning sign.
6. All cones used for night lane closure shall be illuminated traffic cones.
7. Portable delineators, placed at one half the spacing indicated for traffic cones, may be used in lieu of cones for daytime closures only.
8. An additional advance flagger shall be considered on high volume highways where traffic queues may develop. Flaggers stations for work at night shall be illuminated as noted in Section 5.06 of the "Manual of Traffic Controls."
9. Place C30 "LANE CLOSED" sign on flag tree at 500'-1000' intervals throughout extended work areas. They are optional if the work area is visible from the flagger station.
10. When a pilot car is used, place C37 "TRAFFIC CONTROL ——— WAIT FOR PILOT CAR" sign.

TABLE 1

Approach Speed Miles Per Hour	*L (Feet)±
0-30	200
30-45	310
over 45	500

(*) Increase by 20% on sustained downgrades steeper than 3% and longer than 1 mile.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE ON TWO LANE CONVENTIONAL HIGHWAYS

MISCELLANEOUS DETAILS

T-13

Return to Table of Contents

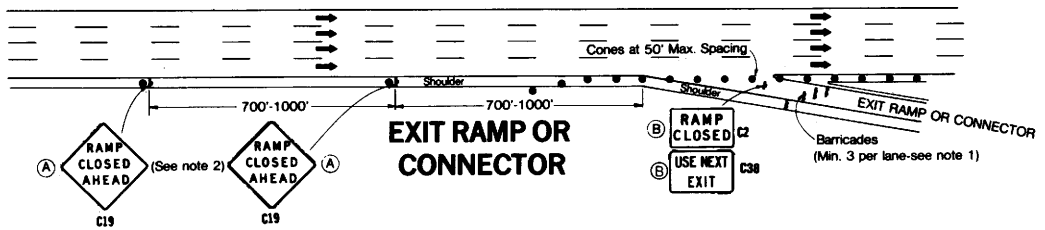
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

To accompany plans dated

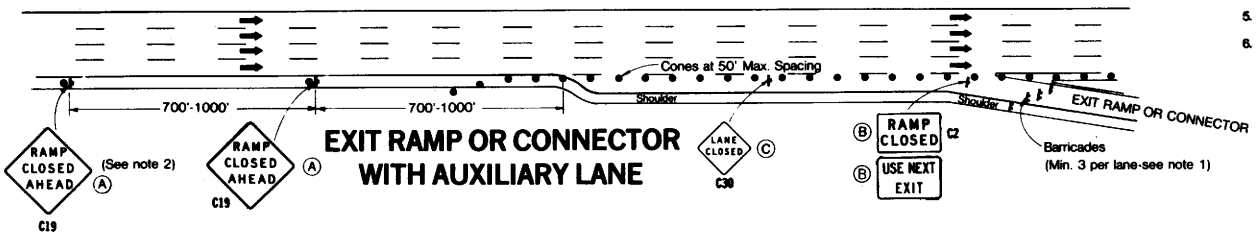
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

DATE July 1, 1984

TYPICAL RAMP CLOSURES



EXIT RAMP OR CONNECTOR



EXIT RAMP OR CONNECTOR WITH AUXILIARY LANE

NOTES:

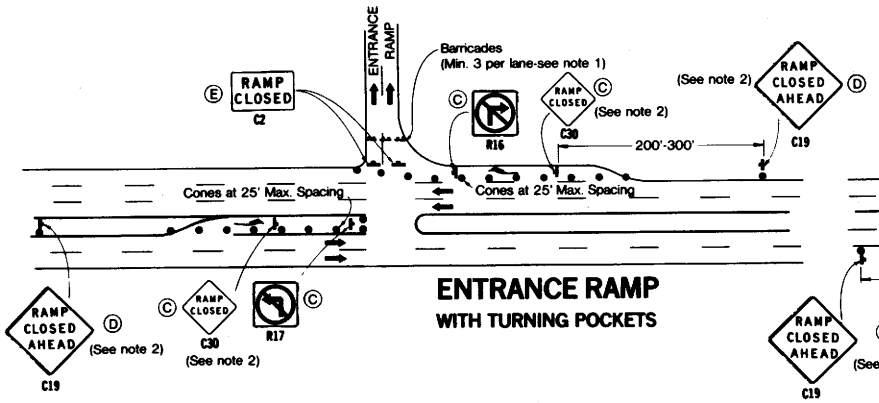
1. Barricades shall conform to the details shown in the "Manual of Traffic Controls" for Types I, II, or III for closures lasting one week or less, and for Type III for closures lasting longer than one week.
2. In lieu of placing the C19 "RAMP CLOSED AHEAD" and C30 "RAMP CLOSED" signs, black on orange overlay plates with the word "CLOSED" may be mounted, as directed by the Engineer, on all guide signs that refer to the closed ramp. The letter size on the overlay shall be the same as the guide sign.
3. All advance warning sign installations shall be equipped with flags for daytime closures, and shall be illuminated for nighttime closures.
4. All traffic cones used for nighttime ramp closures shall be illuminated traffic cones.
5. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used in lieu of cones for daytime ramp closures only.
6. During nighttime ramp closures, at least one person shall be assigned full time for maintenance of traffic control devices.

LEGEND

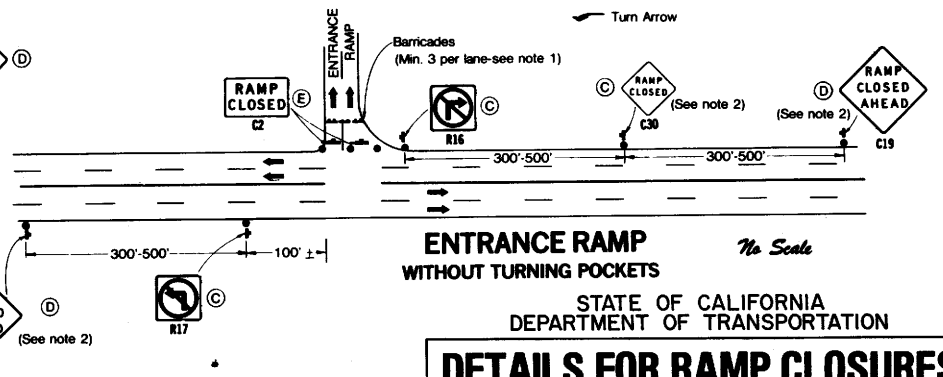
- Cone
- Sign
- Barricades
- Direction of Travel
- Turn Arrow

SIGNS

- (A) 48"x 48" min.
- (B) 48"x 30" min.
- (C) 30"x 30" min.
- (D) 36"x 36" min.
- (E) 36"x 24" min.



ENTRANCE RAMP
WITH TURNING POCKETS



ENTRANCE RAMP
WITHOUT TURNING POCKETS

No Scale

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DETAILS FOR RAMP CLOSURES

MISCELLANEOUS DETAILS

T-14

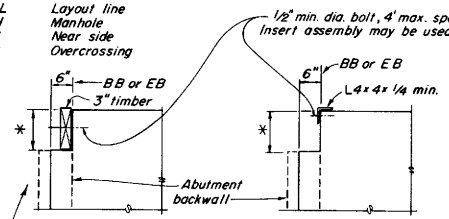
Return to Table of Contents

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

REGISTERED CIVIL ENGINEER STAMP — 9015 — REGISTERED CIVIL ENGINEER STAMP — DATE APPROVED July 1, 1984

BRIDGE PLAN ABBREVIATIONS

Abut	Abutment
AC Pav	Asphalt concrete pavement
ACP	Asbestos cement pipe
BB	Beginning of bridge
BM	Bench mark
Brg	Bearing
C-C	Center to center
CG	Center of gravity
CIDH	Cast-in-drilled-hole
CIP	Cast-in-place
Cl	Clear
Col	Column
CSP	Corrugated steel pipe
EB	End of bridge
EP	Edge of pavement
Exp Jt	Expansion joint
FS	Far side
Ftg	Footing
HW	High water
IF	Inside face
LOL	Layout line
MH	Manhole
NS	Near side
OC	Overcrossing
OF	Outside face
OG	Original ground
OH	Overhead
PSP	Perforated steel pipe
J	Outer, outer left bridge
K	Outer left bridge
S	Outer right bridge
T	Outer, outer right bridge
Ret	Retaining
R/W	Right of way
Sep	Separation
T & B	Top and bottom
UC	Undercrossing
UP	Underpass
VCP	Vitrified clay pipe
W	Drainage pumping plants
WW	Wingwall
BAGR	Bridge approach guard railing
HS	High strength
MBGR	Metal beam guard railing

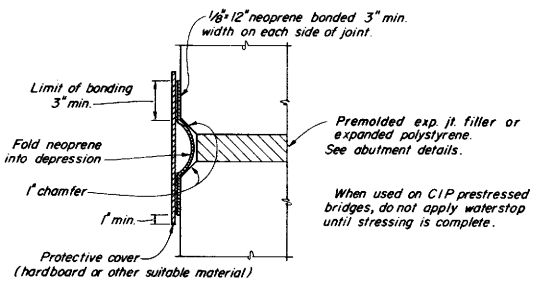


ALTERNATIVE 1 — ALTERNATIVE 2

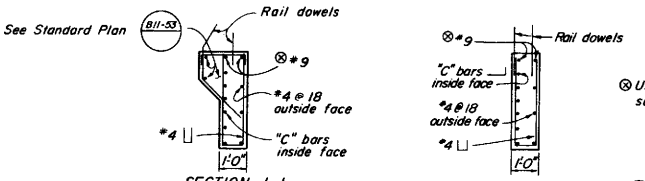
*Depth of paving notch or dimension to abutment backwall construction joint. Depth of paving notch = 12" and may be reduced to 9" min. to accommodate prestressing anchor plates. For dimension to abutment backwall construction joint, see Sheet No. A35-B.

Top of bumper to be at or above the top of deck concrete. Bumpers and bolts to be removed immediately prior to placing approach pavement.

TEMPORARY BUMPERS
BRIDGE DETAIL 1-2



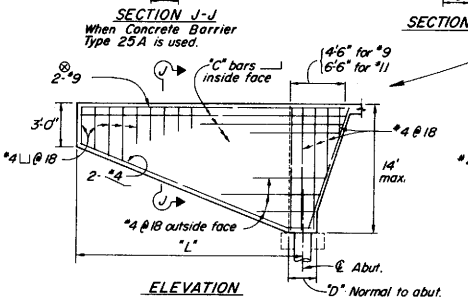
STRIP WATERSTOP DETAIL
BRIDGE DETAIL 1-3



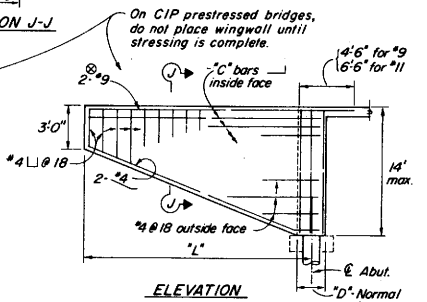
SECTION J-J
When Concrete Barrier Type 25A is used.

SECTION J-J

⊗ Use #11 bars if wingwall supports a sidewalk.

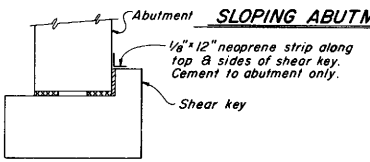


ELEVATION



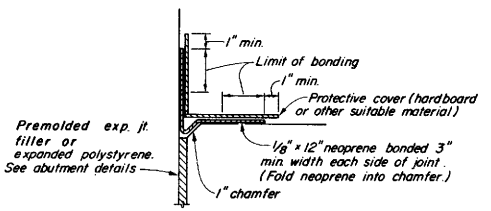
ELEVATION

SLOPING ABUTMENT
VERTICAL ABUTMENT



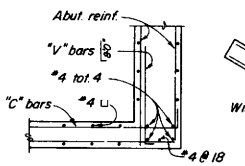
SHEAR KEY JOINT PROTECTION
BRIDGE DETAIL 1-6

"L"	"C" Bars	"V" Bars D = 2'-6"	"V" Bars D = 1'-6"
12'	#5 @ 9"	#4 @ 18"	#6 @ 18"
14'	#6 @ 9"	#5 @ 18"	#5 @ 9"
16'	#7 @ 9"	#4 @ 9"	#5 @ 9"
18'	#8 @ 9"	#5 @ 9"	#6 @ 9"
20'	#9 @ 9	#5 @ 9"	#5 @ 6"

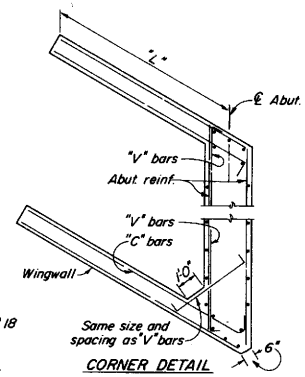


STRIP WATERSTOP CORNER DETAIL
BRIDGE DETAIL 1-4

When used on CIP prestressed bridges, do not apply waterstop until stressing is complete.



CORNER DETAIL FOR SKEW 20° AND LESS



CORNER DETAIL FOR SKEW OVER 20°

WINGWALLS FOR DIAPHRAGM ABUTMENT
BRIDGE DETAIL 1-5

STANDARD DRAWING				
FILE No. XS-22-10	DESIGN By W.G. Gill	Checked David Marsh	Approval Recommended By	
DRAWING 1/80	DETAILS By [illegible]	Checked David Marsh		
DATE	SUBMITTED BY [illegible]		8/98	

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER — REGISTERED CIVIL ENGINEER NO.

BRIDGE No. — POST MILE

BRIDGE DETAILS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates →

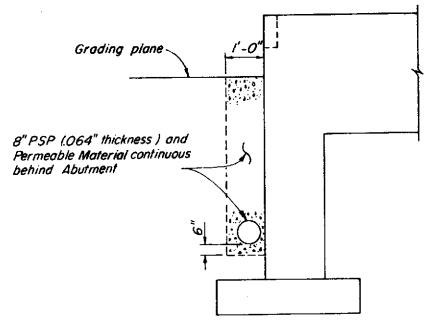
REVISION DATES (PRELIMINARY STAGE ONLY)

BO-1

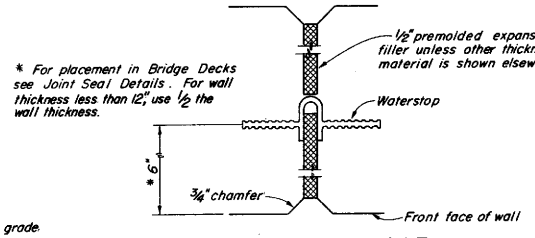
Return to Table of Contents

DIST. | COUNTY | ROUTE | POST MILES—TOTAL PROJECT

R. C. Cousins
CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER NO. 9013
DATE APPROVED JULY 1, 1984



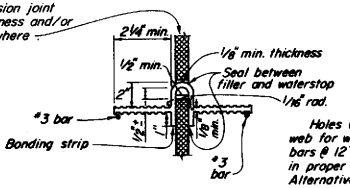
8" PSP AND PERMEABLE MATERIAL
BRIDGE DETAIL 3-5



* For placement in Bridge Decks see Joint Seal Details. For wall thickness less than 12", use 1/2 the wall thickness.

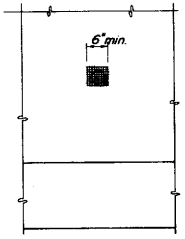
WALL EXPANSION JOINT
BRIDGE DETAIL 3-4

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.

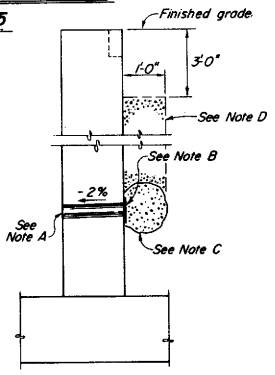


Holes will be permitted in the outer 1/2" of the web for wire, rings, etc.. Tie web to #3 reinforcing bars @ 12" max. intervals to support the waterstop in proper position during concrete placement. Alternative detail may be submitted for approval of the Engineer.

WATERSTOP
BRIDGE DETAIL 3-6

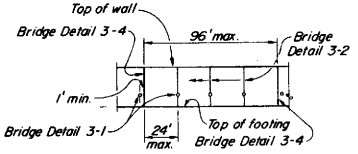


ELEVATION



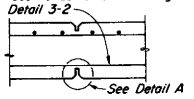
SECTION

WEEP HOLE AND PERVIOUS BACKFILL
BRIDGE DETAIL 3-1



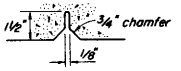
WALL EXPANSION JOINTS AND WEAKENED PLANES
BRIDGE DETAIL 3-3

Cut or butt every other front face horizontal bar at Bridge Detail 3-2



SECTION

Joint may be formed with 1/8" hardboard and cut back to the root of the chamfer on the exposed face.



DETAIL A

WEAKENED PLANES
BRIDGE DETAIL 3-2

Notes :

A. 4"ϕ drains @ 25' max. center to center (9' c-c for Type 3 and 9'-3" c c for Type 4 Retaining Walls) 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.

1 B. 6" square aluminum or galvanized steel wire 1/4" mesh hardware cloth. (Min wire diameter 0.025") Anchor firmly to backface.

C. One cubic foot pervious backfill material in a burlap sack, securely tied.

D. Pervious backfill material continuous behind retaining wall or abutment.

STANDARD DRAWING				
FILE NO. XS-3-53	DESIGN	By David Olerak	Checked W.E. Ellis	Approved Recommended By Guy A. Mancarti, Office Engineer
DRAWING 3/83	DETAILS	By G. Nunez	Checked David Olerak	
DATE	SUBMITTED BY	Roger P. Wong 4737		8/88

1 Notes changed

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER — REGISTERED CIVIL ENGINEER NO.

BRIDGE NO. | POST MILE

BRIDGE DETAILS

BO-3

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

DH-05-D 147

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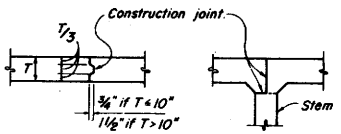
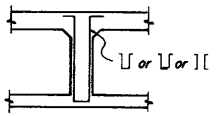


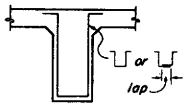
BRIDGE DETAIL 5-2
TOP OR BOTTOM SLAB

BRIDGE DETAIL 5-3

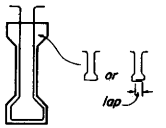
DECK CONSTRUCTION JOINTS



REINFORCED BOX GIRDER
Girder or diaphragm.



T-BEAM
Girder, bent cap or diaphragm.



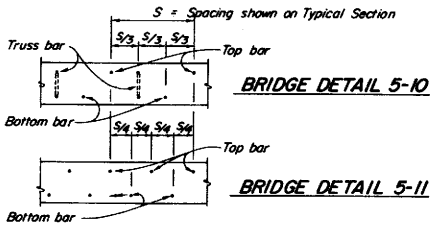
PRECAST GIRDER

STIRRUP SIZE	LAP
#4	5"
#5	6"
#6	7 1/2"
#7	9"
#8	10"

A reinforcing bar must be placed inside of each stirrup hook or 90° bend.

ALTERNATIVE STIRRUPS

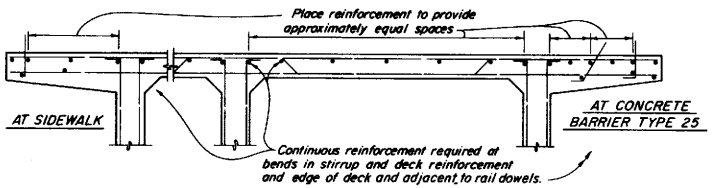
BRIDGE DETAIL 5-5



BRIDGE DETAIL 5-10

BRIDGE DETAIL 5-11

TRANSVERSE DECK REINFORCEMENT
SPACING DIAGRAMS



TOP GIRDER REINFORCEMENT

BRIDGE DETAIL 5-15

DECK PLACING NOTES

The Contractor shall submit a deck placing schedule which will be subject to the approval of the Engineer.

Unless shown otherwise on the plans, the following conditions shall be provided for:

1. Transverse joints will not be permitted in Simple Spans unless approved by the Engineer. For Continuous Spans, transverse joints may be located at about the 1/4 point of span. If the deck is placed over continuous steel or precast concrete girders, the portion over the supports shall be placed last.
2. Longitudinal joints shall be located at the edge of a traffic lane unless otherwise permitted by the Engineer
3. For decks supported on Precast Concrete Girders, the Intermediate and End Diaphragms shall be placed at least five days before the deck.
4. For deck supported on structural steel, the crossframes for the entire width of bridge shall be in place.
5. Reinforcing steel shall be continuous thru all construction joints.

JULY 1, 1984

STANDARD DRAWING
FILE No. XS-16-64
DRAWING DATE 1/80
DESIGN
DETAILS
SUBMITTED BY

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

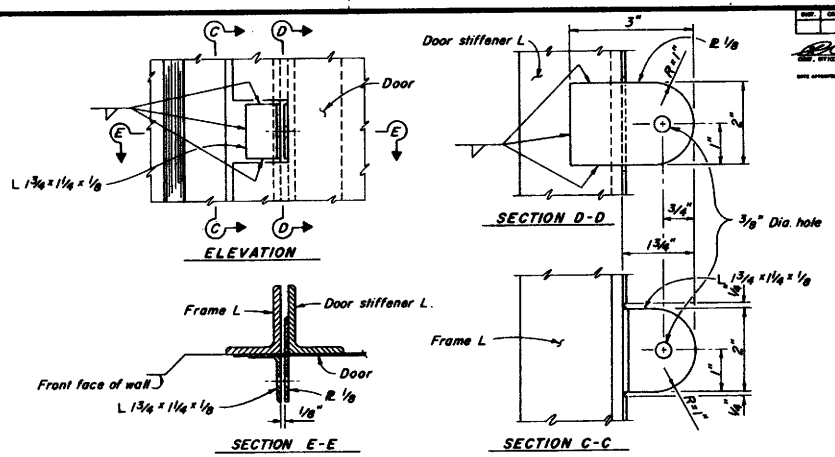
BRIDGE DETAILS

BO-5

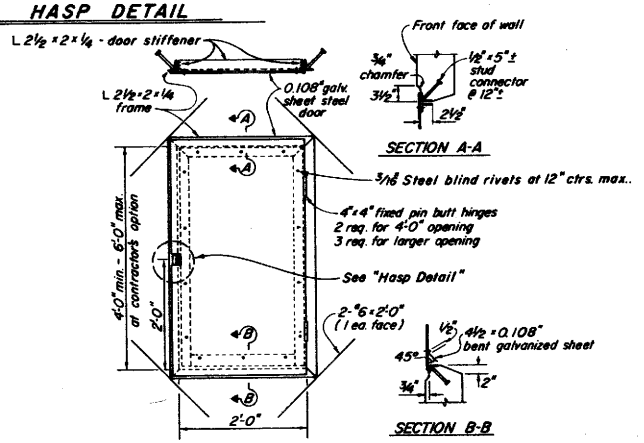
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

CU
WO

Return to Table of Contents



HASP DETAIL



ACCESS DOOR

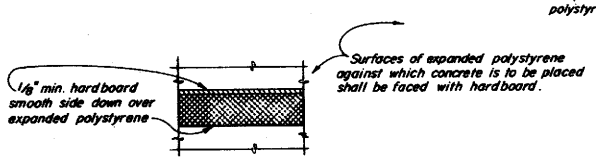
Note: Galvanize frame assemblies and door stiffener angles after welding and fabrication.

Attach door stiffener angles and bent sheet to steel door with blind rivets.

Pay quantity based upon 4'-0" min option.

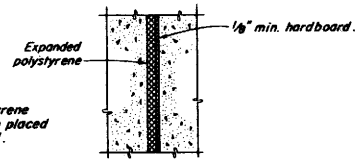
BRIDGE DETAIL 13-3

Scale : 1" = 1'-0"



PROTECTION OF HORIZONTAL POLYSTYRENE

BRIDGE DETAIL 13-1



PROTECTION OF VERTICAL POLYSTYRENE

BRIDGE DETAIL 13-2

STANDARD DRAWING

FILE No. XS-16-65	DESIGN		
DRAWING DATE 1/80	DETAILS		
	SUBMITTED BY		

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

BRIDGE DETAILS

BO-13

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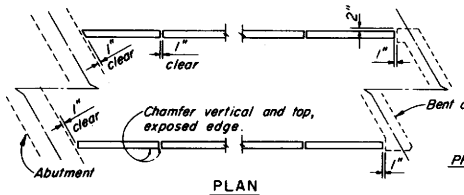


PLAN

Skew not to scale

PRESTRESSING NOTES:

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.

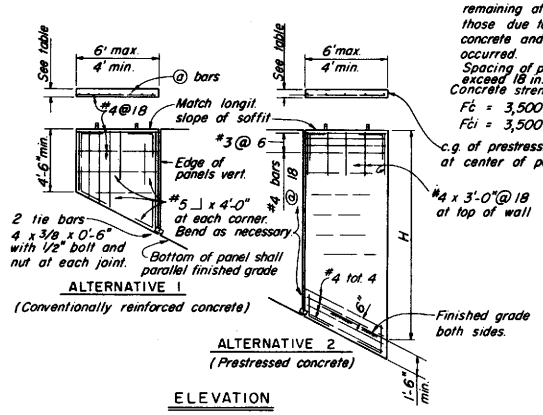
Spacing of prestressing tendons shall not exceed 18 in.

Concrete strength:

F'c = 3,500 psi @ 28 days.

F'ci = 3,500 psi @ time of stressing.

c.g. of prestressing forces at center of panel.



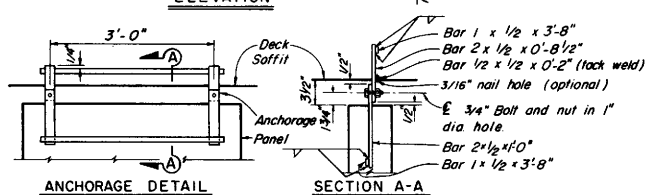
ALTERNATIVE 1

(Conventionally reinforced concrete)

ALTERNATIVE 2

(Prestressed concrete)

ELEVATION



ANCHORAGE DETAIL

Use with Alternative 1 or 2

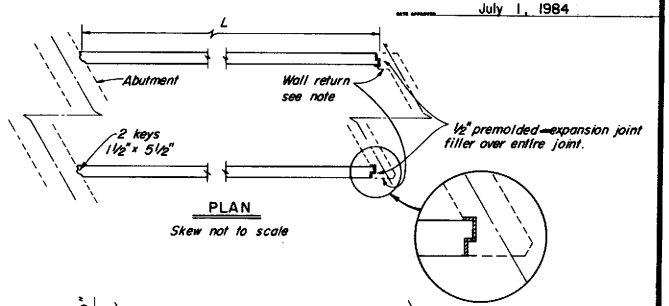
SECTION A-A

PRECAST PANELS, ALTERNATIVE 1 OR 2

VERTICAL REINFORCEMENT OR PRESTRESSING FORCE AND WALL THICKNESS				
H	Alt. 1 @ bars	Alt. 2 Pf	Wall Thickness Alt. 1	Wall Thickness 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"

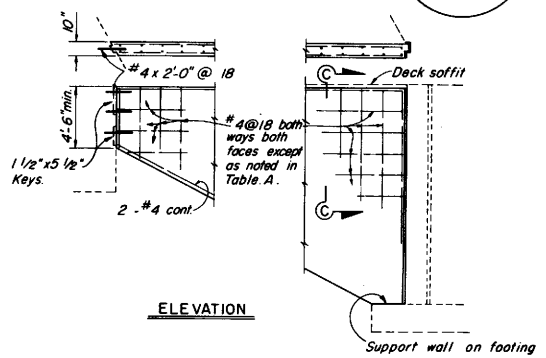
NOTES:

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 of panels.
3. Panels shall conform to horizontal and vertical alignment.
4. Panels to be erected vertically.
5. All parts of anchorages and tie bar assemblies, to be galvanized.
6. @ bars or Pf may be selected for average H of any one panel.

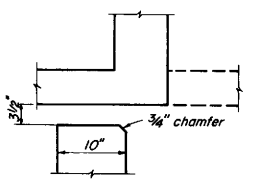


PLAN

Skew not to scale



ELEVATION



SECTION C-C

TABLE A

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 3

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

July 1, 1984

B 1-11

STANDARD DRAWING

FILE No. XS-22-6 | DRAWING DATE 1/80 | DESIGN By W. E. Ellis | DETAILS By | SUBMITTED BY | Checked | Approval Recommended By | State Bridge Engineer | Registered Civil Engineer Number 8178

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

BRIDGE No. | POST MILE | PROJECT ENGINEER | REGISTERED CIVIL ENGINEER NO.

CLOSURE WALL DETAILS - BOX GIRDER

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

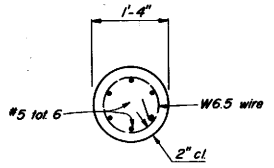
B 1-11

Return to Table of Contents

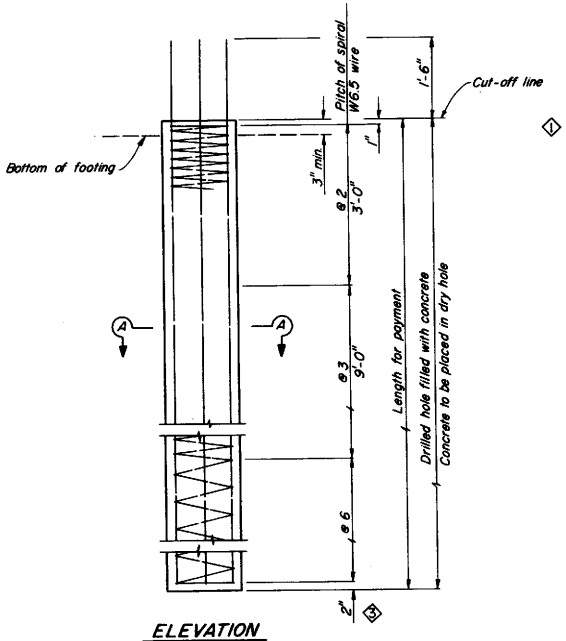
DIST. | COUNTY | ROUTE | POST MILES | TOTAL PROJECT | SHEET NO. | TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURE DESIGN — REGISTERED CIVIL ENGINEER NUMBER 9013

DATE APPROVED JULY 1, 1984



SECTION A-A ②



ELEVATION

① Notes:

Reinforcement extending into footing shall be hooked as required to provide clearance to top of footing.

Lapped splices in spiral pile reinforcement shall be lapped at least 80 wire diameters. Spiral pile reinforcement at splices and at ends shall be terminated with a 135° hook with a 6 inch tail hooked around a longitudinal bar.

Piles shall be extended only in accordance with details shown in the Project Plans.

STANDARD DRAWING

FILE NO. XS-10-25 | DESIGN By J.C. Moose Checked W.R. Baker | Approved Recommended By Dwight L. Manenti 8/1/83

DRAWING DATE 3/83 | DETAILS By Gaughan Checked W.R. Baker | REGISTERED CIVIL ENGINEER NUMBER

SUBMITTED BY Robert D. Fung 9/27/83

① Notes changed
② Rebars changed
③ Pitch of spiral revised

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER — REGISTERED CIVIL ENGINEER NO.

BRIDGE NO. | POST MILE

16" CAST-IN-DRILLED HOLE CONCRETE PILE

B2-3

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Dimmed prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

Do-05-D 147

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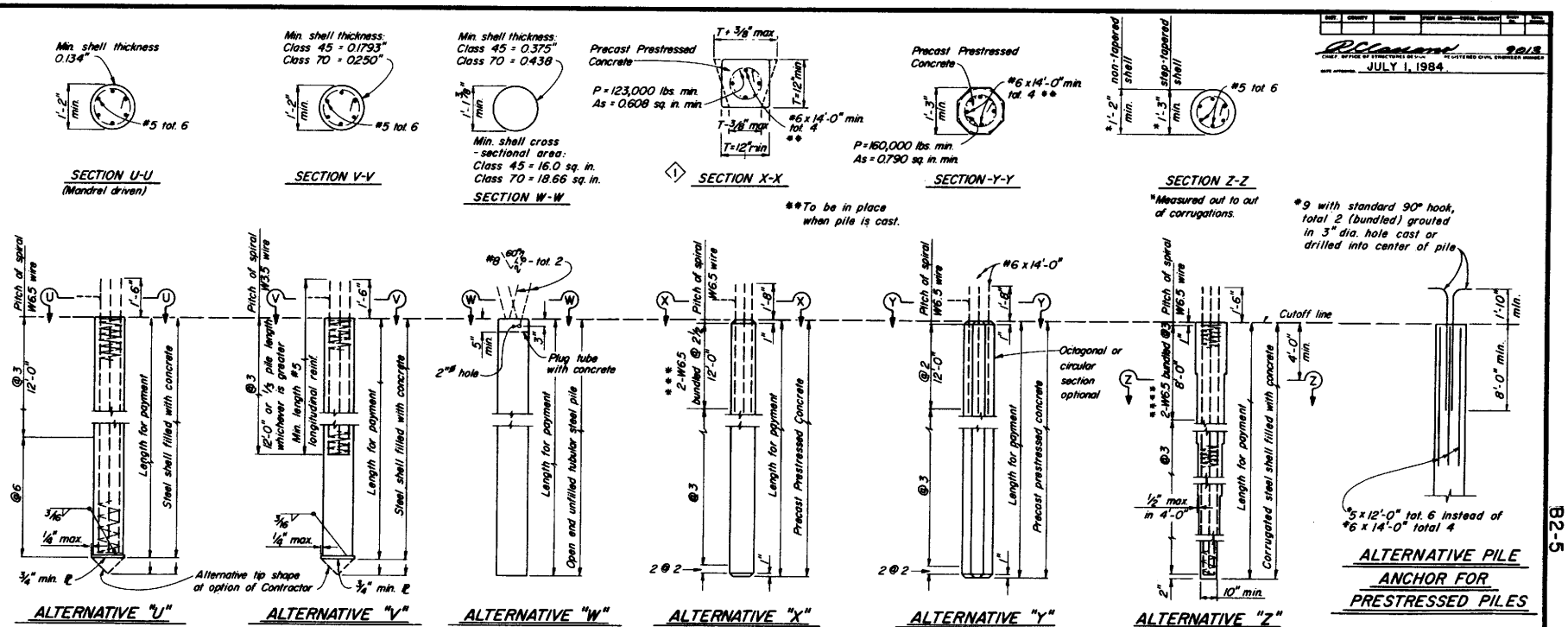


Notes:

Details are the same for both Class 45 and Class 70 piles unless noted otherwise.

A 10" minimum diameter pipe extension (thickness = 0.1798" min. for Class 45 and 0.250" min. for Class 70) may be used at the tip of Alternative "Z" when taper is 30' or more in length.

Pile reinforcement extending into a footing shall be hooked as required to provide clearance to top of footing. Piles shall be extended only in accordance with details shown elsewhere in these plans.

Lapped splices in spiral pile reinforcement shall be lapped 80 wire diameters minimum. Spiral pile reinforcement at splices and at ends shall be terminated by a 135° hook with 6" tail hooked around a longitudinal bar or strand.

(2) 2" clearance to spiral reinforcement shall be maintained if section used is larger than the minimum section shown.

PRECAST PRESTRESSED PILES:

P = Prestressing Force @ anchorage

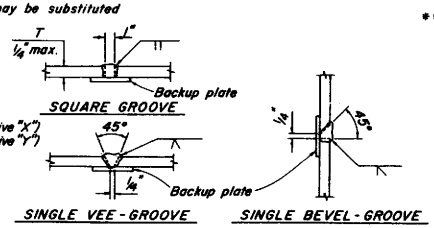
If section used is larger than the min. section shown, then "P" shall provide 860 psi min.

As = Minimum area of prestressing steel required.

Concrete Strength: f'c @ 28 days = 6,000 psi (Alternative "X")
5,000 psi (Alternative "Y")
f'ci @ transfer = 4,000 psi

DESIGN LOADING

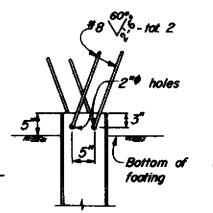
Class 45 = 45 tons
Class 70 = 70 tons



PILE WELDING DETAIL - BUTT JOINTS

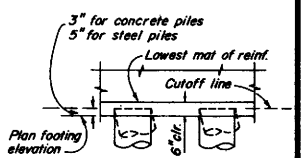
Notes:

1. Single Vee-Groove and Square Groove permitted for all positions.
2. Single Bevel-Groove permitted for horizontal joints only.



STEEL PILE ANCHOR

Steel piles, except for "Alternative W" to be used only when shown on plans or permitted by the Special Provisions.



Pile type to be as designated elsewhere

PILE EMBEDMENT

STANDARD DRAWING

FILE No. XS-10-26	DESIGN By J.C. Moose	Checked W.R. Baker	Approved & Recommended by Ingvald Moe Chief Structures Design
DRAWING DATE 1/84	DETAILS By C. Houghton	Checked W.R. Baker	8/1/84
	SUBMITTED BY	8/1/84	

(1) Rev. Section X-X
(2) Add Note

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

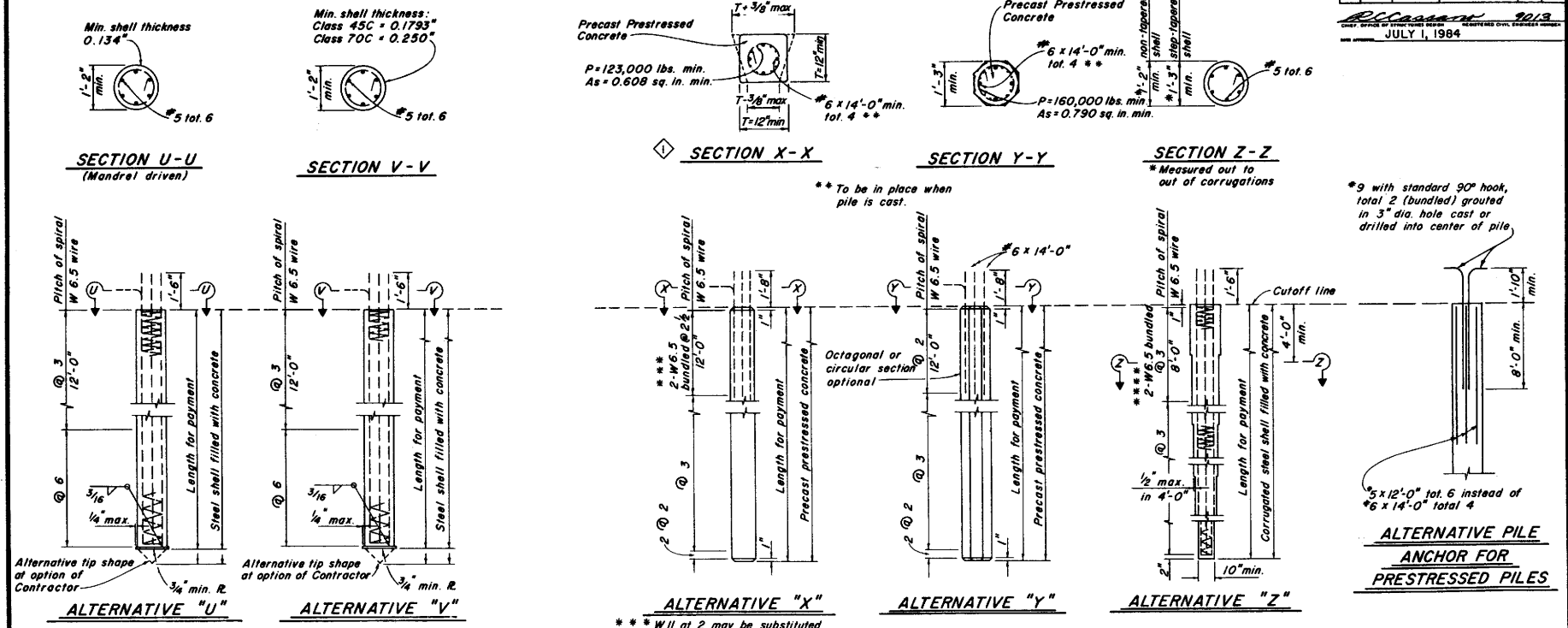
STRUCTURES-DESIGN

PILE DETAILS - CLASS 45 & CLASS 70

CU
WO

B2-5

Return to Table of Contents



*** W11 at 2 may be substituted

**** W11 at 2 1/2 may be substituted.

Notes:

Details are the same for both Class 45C and Class 70C piles unless noted otherwise.

A 10" minimum diameter pipe extension (thickness = 0.1793" min. for Class 45C and 0.250" min. for Class 70C) may be used at the tip of Alternative "Z" when taper is 30' or more in length.

Pile reinforcement extending into a footing shall be hooked as required to provide clearance to top of footing. Piles shall be extended only in accordance with details shown elsewhere in these plans.

Lapped splices in spiral pile reinforcement shall be lapped 80 wire diameters minimum. Spiral pile reinforcement at splices and at ends shall be terminated by a 135° hook with 6" tail hooked around a longitudinal bar or strand.

All concrete in piles and pile extensions shall contain not less than 8 sacks of cement per cubic yard.

(2) 2" clearance to spiral reinforcement shall be maintained if section used is larger than the minimum section shown.

PRECAST PRESTRESSED PILES:

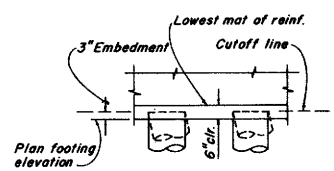
P = Prestressing Force @ anchorage — If section used is larger than the min. section shown, then "P" shall provide 860 psi min.

As = Minimum area of prestressing steel required.

Concrete Strength: f'_c @ 28 days = 6,000 psi (Aternative "X")
5,000 psi (Aternative "Y")
f'_{ci} @ transfer = 4,000 psi

DESIGN LOADING

Class 45C = 45 tons
Class 70C = 70 tons



PILE EMBEDMENT

JULY 1, 1984

STANDARD DRAWING

FILE No. XS-10-28	DESIGN: By J.C. Moose	Checked W.R. Baker	Approved Recommended By
DRAWING DATE 1/84	DETAILS By R. Lee	Checked W.R. Baker	
	SUBMITTED BY		

(1) Rev Section X-X
(2) Add Note

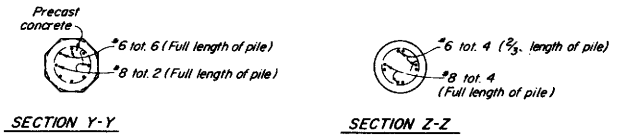
State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PILE DETAILS-CLASS 45C & CLASS 70C

B2-8

Return to Table of Contents



SECTION Y-Y

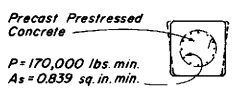
SECTION Z-Z

CLASS 45 & CLASS 45C PILES

SECTION U-U

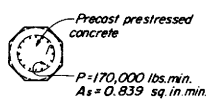
ALTERNATIVE "U"

(Mandrel driven)



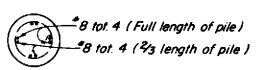
SECTION X-X

ALTERNATIVE "X"



SECTION Y-Y

ALTERNATIVE "Y"



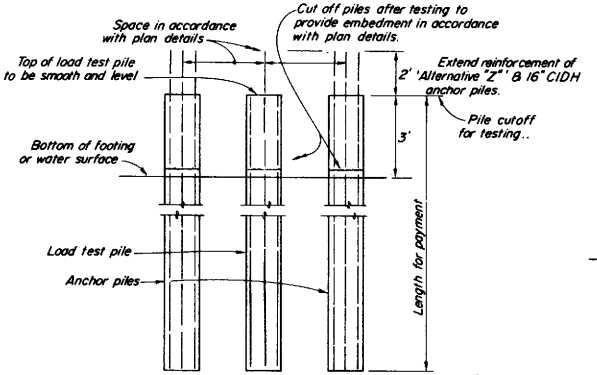
SECTION Z-Z

ALTERNATIVE "Z"

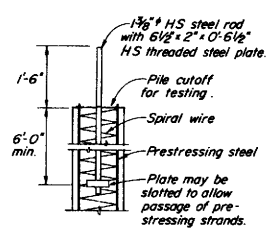
CLASS 70 & CLASS 70C PILES

Notes:

1. Only those load test anchor piles which differ from standard piles are shown.
2. For all details and location of Sections not shown, refer to Pile Details-Class 45, Class 45C, Class 70, Class 70C and 16" Cast-in-Drilled Hole Concrete pile, of the Standard Plans, as noted in the Project Plans.
3. Reinforcement for 16" Cast-in-drilled-hole anchor piles shall be the same as reinforcement for 'Alternative "Z"' anchor piles.
4. Extension of reinforcement above top of anchor piles for 'Alternatives "U", "V", "W" or Class 45 'Alternatives "X" & "Y"' not required.



LOAD TEST PILE GROUP



ALTERNATIVE "X" & "Y"

ANCHOR PILE CONNECTION

CLASS 70 & CLASS 70C PILES

STANDARD DRAWING			
FILE No. XS-10-31	DESIGN By J.C. Moese	Checked W.R. Baker	Approval Recommended By
DRAWING DATE 3/83	DETAILS By	Checked W.R. Baker	8/98
	SUBMITTED BY	9737	

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER REGISTERED CIVIL ENGINEER NO.

BRIDGE NO.

POST MILE

LOAD TEST ANCHOR PILE DETAILS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

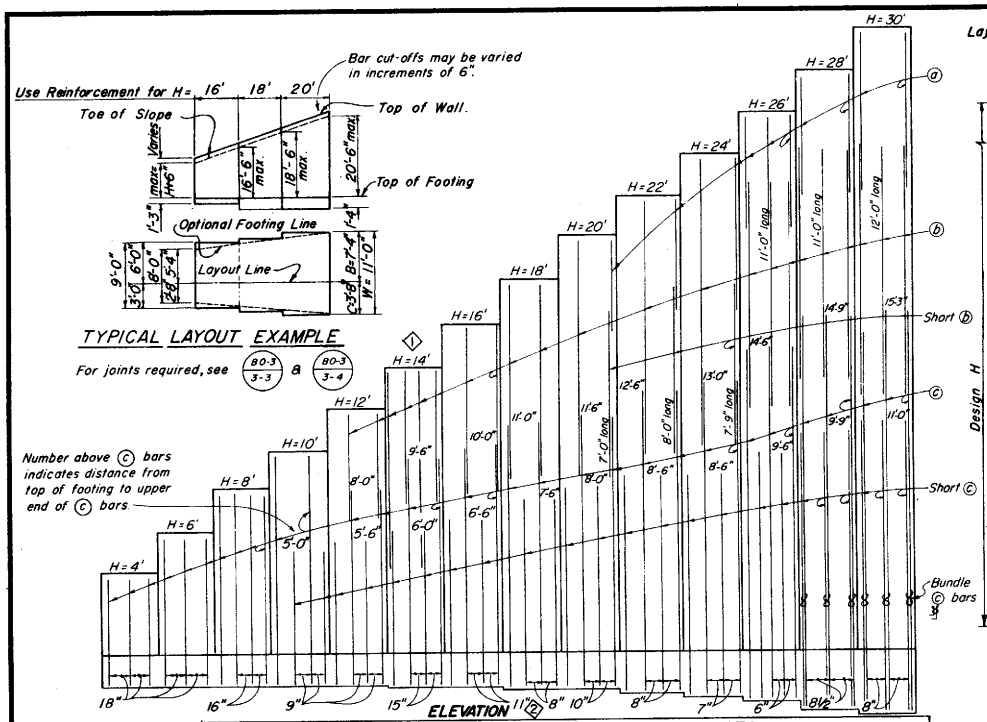
CU WO

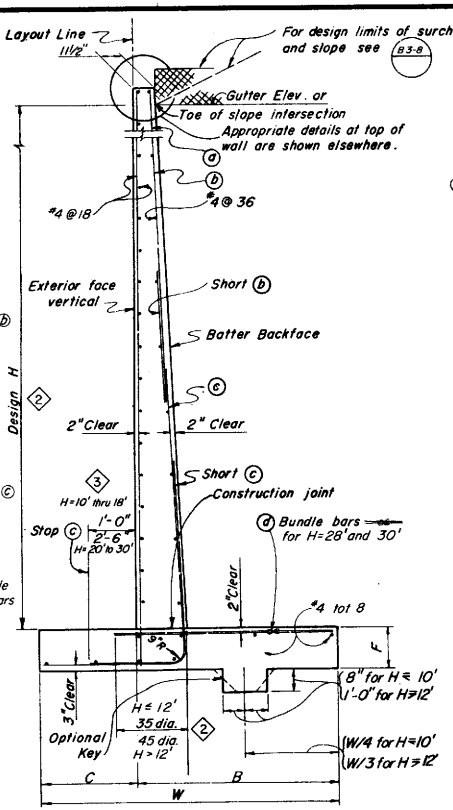
Disregard prints bearing earlier revision dates

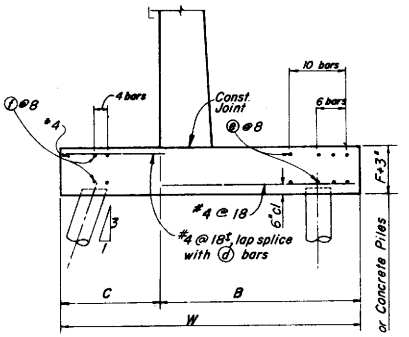
REVISION DATES (PRELIMINARY STAGE ONLY)

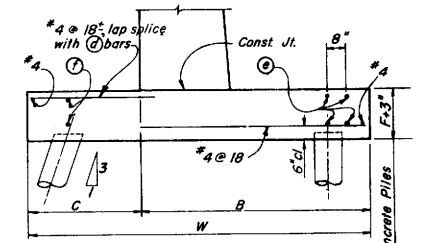
B2-9

Return to Table of Contents









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		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'-9"
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"	11'-4"
F Spread Ftg.		1'-2"	1'-2"	1'-2"	1'-2"	1'-2"	1'-3"	1'-3"	1'-4"	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	3/4:12	3/4:12	7/8:12
(a)	bars									#5@40	#5@32	#5@28	#5@12	#6@17	#6@16
(b)	bars					#4@18	#5@15	#6@22	#6@16	#8@20	#8@16	#8@14	#8@12	#8@8½	#8@8
(c)	bars	#5@18	#5@18	#5@16	#5@9	#6@9	#9@15	#9@11	#9@8	#10@10	#11@8	#11@7	#11@6	#10@8½	#10@8
(d)	bars	#5@18	#5@18	#4@16	#4@9	#5@9	#8@15	#8@11	#9@8	#10@10	#10@8	#10@7	#10@6	#9@8½	#9@8
Total (a)	bars	6-#6	6-#6	6-#6	10-#7	10-#7	10-#7	10-#7	6-#7	6-#7	6-#7	4-#7	4-#7	4-#7	4-#7
Total (b)	bars				4-#7	4-#7	4-#7	4-#7	4-#7	4-#7	4-#7	2-#7	2-#7	2-#7	2-#7
2' Level surcharge	Toe Pr. k/sf	1.6	1.9	2.2	2.5	2.8	3.3	3.5	4.0	4.3	4.6	4.9	5.3	5.7	6.2
2:1 unlimited slope	Toe Pr. k/sf	1.1	1.5	2.0	2.3	2.7	3.3	3.6	4.2	4.7	5.5	5.9	6.5	7.1	7.5
1½:1 limited slope	Toe Pr. k/sf	1.3	1.7	2.1	2.5	2.9	3.4	3.8	4.3	4.8	5.4	5.8	6.5	7.2	7.5
Spread Footing	Steel lbs/ft	18	22	28	37	51	83	105	155	192	249	307	409	449	507
	Conc cf/ft.	8.9	12.5	16.3	20.2	25.4	30.1	34.6	40.1	45.0	52.1	63.3	77.0	88.1	104.8
Pile ftg.	Steel lbs/ft	30	34	41	70	84	116	140	179	217	273	326	429	469	528
	Conc cf/ft.	10.2	12.7	16.7	20.8	25.2	30.1	34.8	40.6	45.7	53.1	64.7	78.6	89.9	107.0

NOTES:

For details not shown and drainage notes see B3-8.

Quantities do not include the wall portion above "Gutter Elevation" and are for design purposes only.

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

1. H=14' data revised
2. Design H added
3. Limit of H revised

STANDARD DRAWING

FILE No. XS-3-46 | DRAWING DATE 3/83 | DESIGN | DETAILS | SUBMITTED BY

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

BRIDGE No. | POST MILE

RETAINING WALL TYPE 1 H=4'-30'

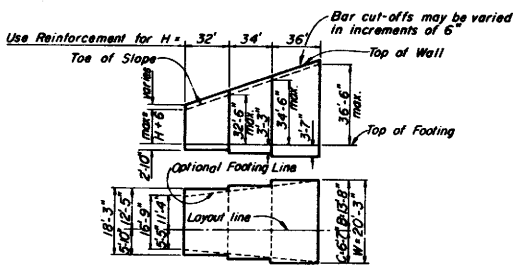
B 3-1

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

Disregard prints bearing earlier revision dates

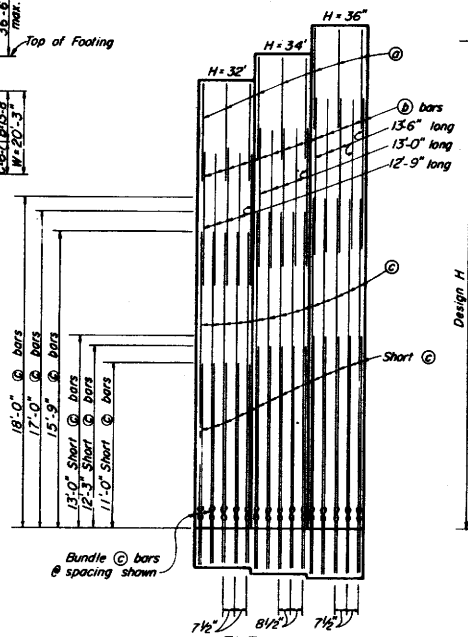
REVISION DATES (PRELIMINARY STAGE ONLY)

Return to Table of Contents

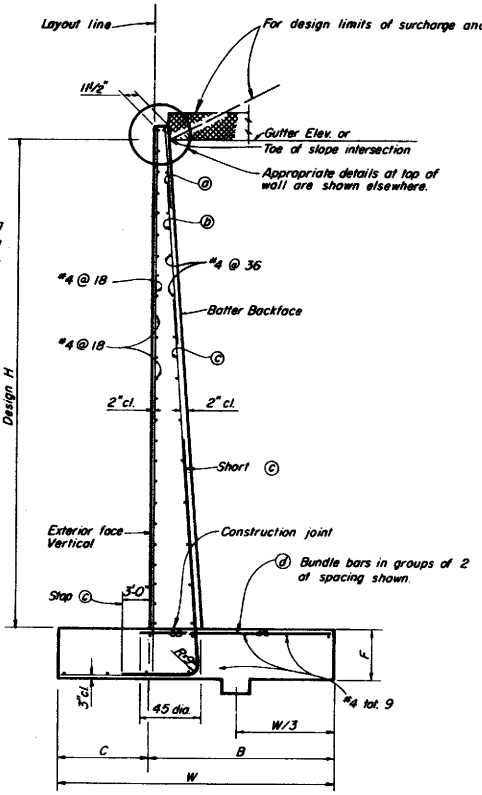


TYPICAL LAYOUT EXAMPLE

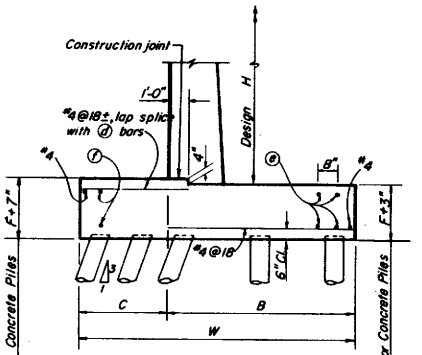
For joints required, see 80-3/3-3 & 80-3/3-4



ELEVATION



SPREAD FOOTING SECTION



45T PILE FOOTING SECTION

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

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA				
Design H		32'	34'	36'
W		18'-3"	19'-3"	20'-3"
C		5'-10"	6'-3"	6'-7"
B		12'-5"	13'-0"	13'-8"
F Spread Ftg.		2'-10"	3'-3"	3'-7"
Batter		1:12	1:12	1:12
ⓐ	bars	#6 @ 15	#7 @ 17	#7 @ 15
ⓑ	bars	#8 @ 7½	#9 @ 8½	#9 @ 7½
ⓒ	bars	#10 @ 7½ ‖	#11 @ 8½ ‖	#11 @ 7½ ‖
ⓓ	bars	#9 @ 7½ ‖	#10 @ 8½ ‖	#9 @ 7½ ‖
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	59.2	66.5	74.4
	Toe Pr. k/sf	6.3	6.8	7.3
2:1 unlimited slope	H Comp k	36.6	41.7	46.9
	V Comp k	81.5	91.7	102.6
	Toe Pr. k/sf	7.7	8.4	9.1
1½:1 limited slope	H Comp k	29.3	32.8	36.3
	V Comp k	66.6	74.5	82.9
	Toe Pr. k/sf	7.9	8.4	8.9
Spread Footing	Steel lbs./ft.	563.2	665.7	751.0
	Conc. c.f./ft.	129.4	147.8	165.7
Pile Footing	Steel lbs./ft.	590.3	694.3	779.0
	Conc. c.f./ft.	134.2	153.0	171.3

‖ Denotes a bundle of 2 bars.

NOTES:

For details not shown and drainage notes see 83-8.

Quantities do not include the wall portion above "Gutter Elevation" and are for design purposes only.

July 1, 1984

STANDARD DRAWING

FILE No. XS-3-47 | DRAWING DATE 1/80 | DESIGN By David Okasaki | DETAILS By B.J. Lang | SUBMITTED BY Robert J. Lang | Checked w/ C.B.Ellis | Checked David Okasaki | Approved Recommended By Joseph W. Wiemann 8/78

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

RETAINING WALL TYPE I H=32'-36'

B 3-2

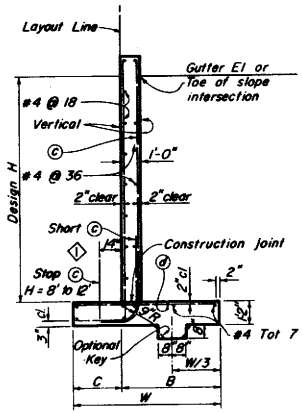
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

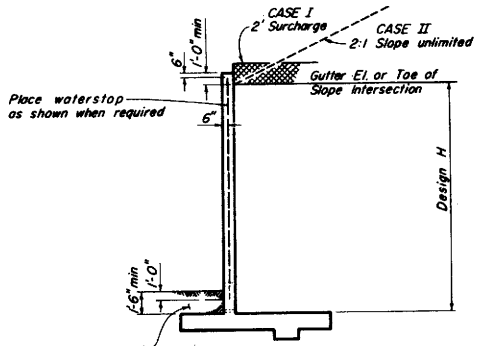
REVISION DATES (PRELIMINARY STAGE ONLY)

Return to Table of Contents



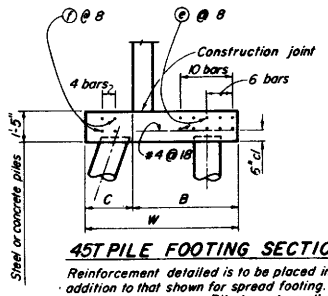
SPREAD FOOTING SECTION

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



DESIGN

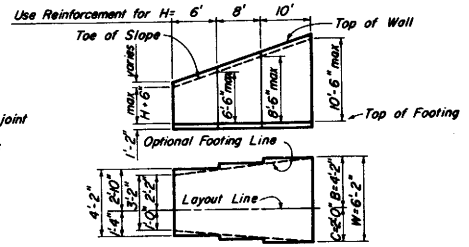
For drainage notes and other details, see (B3-8)



45T PILE FOOTING SECTION

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'.



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

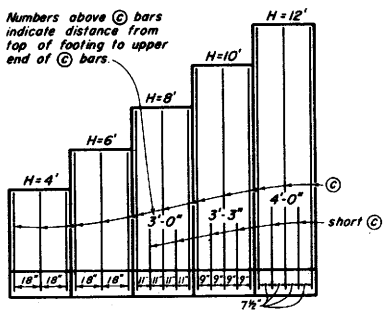
TYPICAL LAYOUT EXAMPLE

For joints required, see (B0-3 / 3-3) & (B0-3 / 3-4)

Quantities do not include the wall portion above "Gutter Elevation" and are for design purposes only.

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 @ 18	#5 @ 18	#5 @ 11	#6 @ 9	#7 @ 7½
ⓓ bars		#5 @ 18	#5 @ 18	#5 @ 22	#7 @ 18	#8 @ 15
Total ⓔ bars		6 - #6	6 - #6	6 - #6	10 - #7	10 - #7
Total ⓕ bars					4 - #7	4 - #7
CASE I - Toe Press. psf		1590	1930	2240	2550	2840
CASE II - Toe Press. psf		1060	1460	1860	2280	2700
Spread Footing	Steel lbs/ft	17	23	27	46	70
	Conc CF/ft	8.6	11.8	14.9	18.1	21.3
Pile Ftg	Steel lbs/ft	27	34	38	75	101
	Conc CF/ft	9.9	11.9	15.3	18.8	22.2



ELEVATION

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 = 1300 psi f'c = 3250 psi fs = 24,000 psi
n = 10 earth = 120 pcf

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

Case II - Earth pressure determined from Rankine's formula with ϕ = 33°-42'.

STANDARD DRAWING

FILE No. XS-3-48 | DRAWING DATE 3/83 | DESIGN By David Okazaki Checked W.E. Ellis | DETAILS By Checked David Okazaki | SUBMITTED BY 9/27/83 | Approval Recommended By Chief, Office of Structures Design | Approved Date 8/98

ⓒ Bars changed.

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER | REGISTERED CIVIL ENGINEER NO. | BRIDGE No. | POST MILE

RETAINING WALL TYPE IA

B 3-3

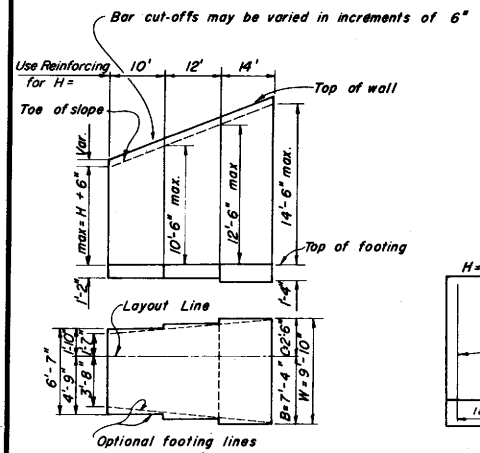
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

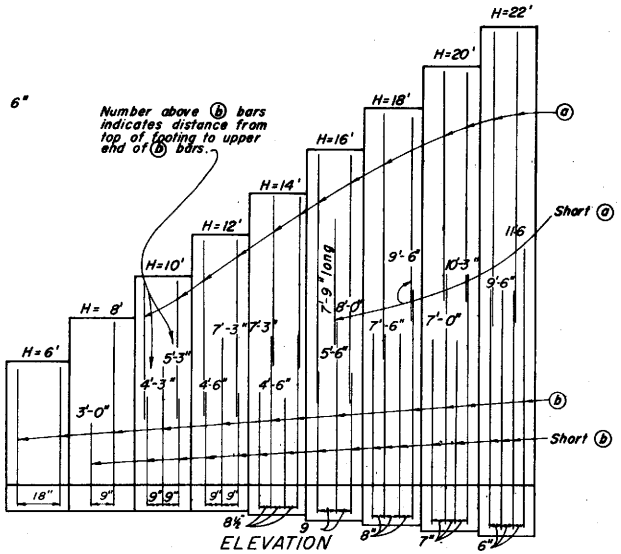
Damaged prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

Return to Table of Contents



TYPICAL LAYOUT EXAMPLE



ELEVATION

For joints required, see (B0-3/3-3) & (B0-3/3-4)

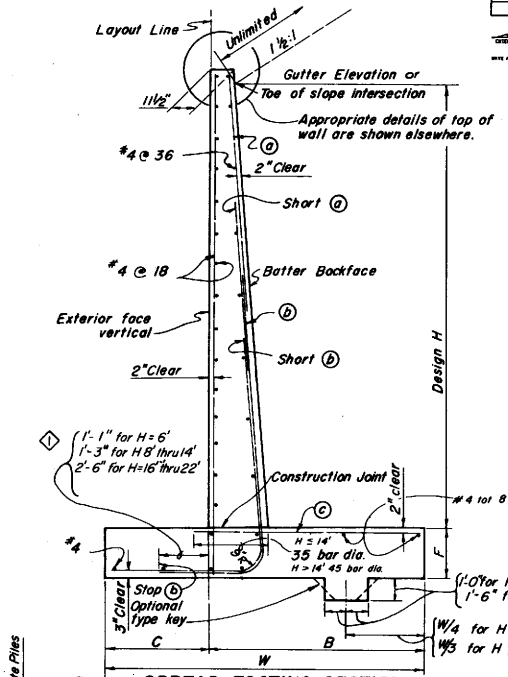
TABLE OF REINFORCING STEEL DIMENSIONS AND DATA

	Design H	6'	8'	10'	12'	14'	16'	18'	20'	22'
	W	3'-10"	5'-3"	6'-7"	8'-1"	9'-10"	11'-4"	13'-0"	14'-10"	17'-6"
	C	1'-4"	1'-7"	1'-10"	2'-1"	2'-6"	2'-10"	3'-1"	3'-8"	4'-4"
	B	2'-6"	3'-8"	4'-9"	6'-0"	7'-4"	8'-6"	9'-11"	11'-2"	13'-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@18	#5@18	#6@17	#6@9	#8@16	#8@14	#8@12
	(b) bars	#5@18"	#5@9	#6@9	#8@9	#9@8½	#11@9	#11@8	#11@7	#11@6
	(c) bars	#5@18"	#5@18	#6@18	#6@9	#6@8½	#8@9	#8@8	#8@7	#8@6
	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	2540	3170	3880	4470	4950	5720	6540	6970	6990
Spread footing	Conc. c.f./ft	13.2	17.5	21.8	29.0	35.7	43.7	54.9	68.2	85.7
	Steel lbs/ft	21	30	44	69	89	140	184	250	325
Pile Footing	Conc. c.f./ft.	12.2	16.8	21.4	26.5	33.6	42.1	53.7	67.5	85.5
	Steel lbs/ft.	32	42	80	106	126	177	214	280	357

NOTES:

For Design and Drainage notes and other details see (B3-8)

Quantities do not include the wall portion above "Gutter Elevation" and are for design purposes only.



45T PILE FOOTING SECTION

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

Rocusano
CHIEF, BRIDGE & STRUCTURE DESIGN — REGISTERED CIVIL ENGINEER NO. 8013
DATE APPROVED JULY 1, 1984

STANDARD DRAWING

FILE NO. XS-3-42	DESIGN	By: David Marsh	Checked: W.E. Ellis
DRAWING DATE 3/83	DETAILS	By: B.T. Lacy	Checked: David Marsh
	SUBMITTED BY	Roy R. Peters 4737	Approval Recommended By: Geoffrey Mancett, Chief, Bridge Design; Registered Civil Engineer Number 8198

(1) (b) Changed for H=6'

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER — REGISTERED CIVIL ENGINEER NO.

BRIDGE NO.

POST MILE

RETAINING WALL TYPE 2

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

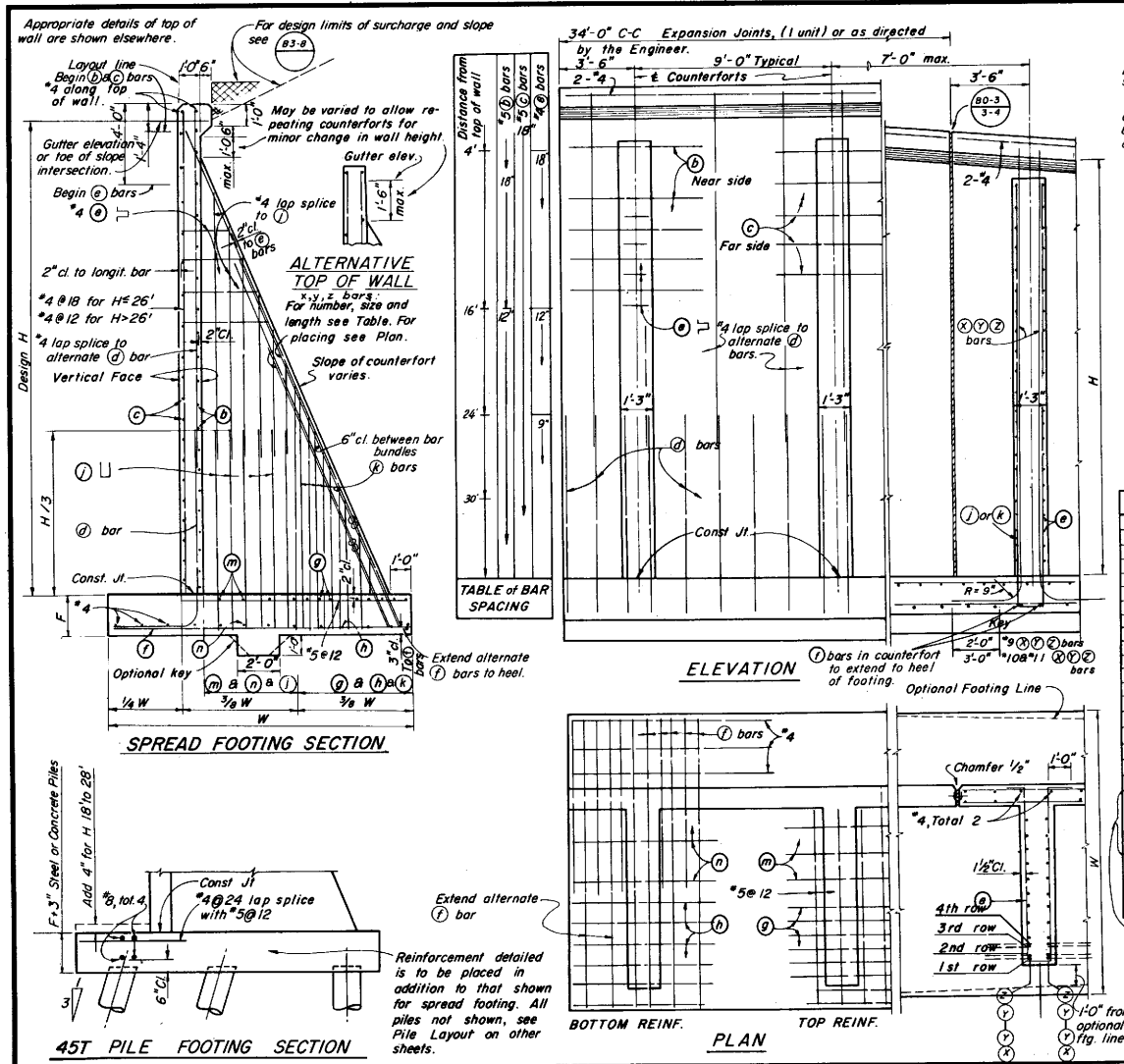
CU
WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B3-4

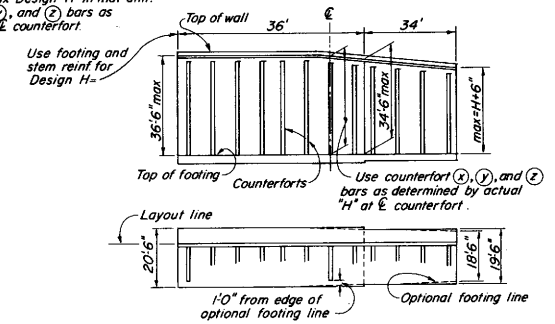
Return to Table of Contents



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

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

Use footing and stem reinforcing in any unit as determined by max Design "H" in that unit. Use counterfort (X), (Y), and (Z) bars as determined by "H" at ℄ counterfort.



TYPICAL LAYOUT EXAMPLE

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'-9"	2'-0"	2'-2"	2'-4"	2'-8"
(a) bars, cntrfort stem	#4@12	#5@12	#5@11	#6@12	#6@11	#6@10	#7@11	#7@10	#8@12	#8@11
(b) bars, bottom toe	#6@12	#7@12	#8@11	#9@12	#9@11	#9@10	#9@11	#9@10	#10@12	#10@11
(c) bars, length Alt.	5'-6"	6'-0"	6'-9"	7'-8"	8'-0"	8'-3"	8'-6"	9'-0"	9'-9"	10'-0"
(c) bars, length Alt.	11'-0"	12'-0"	13'-0"	14'-0"	15'-0"	16'-0"	17'-0"	18'-0"	19'-0"	20'-0"
(d) bars, top of heel	#6@7									→
(h) bars, bottom heel	#6@10									→
(j) bars, cntrfort heel	#5@24	#6@24	#6@24	#6@20	#6@18	#7@22	#7@22	#7@20	#7@18	#7@18
(k) bars, cntrfort heel	#5@12	#6@12	#6@12	#6@10	#6@9	#7@11	#7@11	#7@10	#7@9	#7@9
(m) bars, top of heel	#6@14									→
(n) bars, bottom of heel	#6@20									→
(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'-0"	22'-3"	24'-3"	26'-6"	28'-9"	30'-9"	33'-0"	35'-0"	37'-3"	39'-0"
(Y) bar,	2-#9	2-#9	4-#9	4-#9	4-#10	4-#10	4-#10	4-#10	4-#11	4-#11
(Y) bar, length	9'-3"	12'-0"	14'-3"	15'-9"	17'-9"	20'-8"	22'-6"	24'-10"	26'-3"	27'-9"
(Z) bar,							2-#10	2-#10	2-#11	2-#11
(Z) bar, length							11'-9"	12'-0"	14'-6"	17'-0"
Spd Ftg. Conc. cu ft/lin.ft.	43.0	48.5	55.0	61.2	69.8	80.5	91.3	101.5	113.2	128.5
Spd Ftg. Steel lbs/lin. ft.	156	176	217	256	298	358	399	450	517	583
Pile Ftg. Conc. cuft./lin.ft.	45.9	51.6	58.4	64.8	73.7	84.6	95.6	106.1	118.0	133.6
Pile Ftg. Steel lbs/lin.ft.	165	188	230	269	311	371	412	463	529	596
Toe Pressure, psf										
2-Level Surcharge	3470	3800	4180	4510	4940	5410	5930	6310	6740	7270
2:1 Unlimited	3920	4390	4930	5410	6000	6660	7330	7940	8550	9300
1 1/2:1 limited	4160	4690	5290	5850	6450	6900	7340	7740	8130	8640

Quantities based on 34'-0" wall unit including 4 counterforts

For H=18' to 28' 45T pile footing see '45T Pile Footing Section'.

NOTES:

For Design and Drainage notes and other details see B3-8

Quantities do not include the wall portion above "Gutter Elevation" and are for design purposes only.

Length of (X), (Y) & (Z) bars indicates distance from top of footing to upper end of bar.

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

R. C. Cameron — 5013
CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER NUMBER
DATE APPROVED JULY 1, 1984

STANDARD DRAWING

FILE No. XS-3-43	DESIGN By David Olerich Checked W. E. Ellis	Approval Recommended By Benjamin Mancarti
DRAWING DATE 1/80	DETAILS By B. Lucy Checked David Olerich	CHIEF OF DESIGN — REGISTERED CIVIL ENGINEER NUMBER 8178
	SUBMITTED BY George H. Maez	

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER — REGISTERED CIVIL ENGINEER NO.

BRIDGE NO. — POST MILE

COUNTERFORT RETAINING WALL TYPE 3

B 3-5

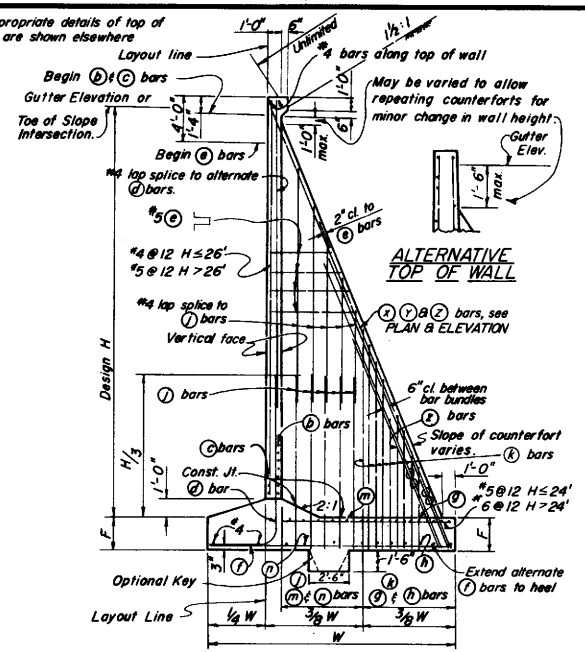
CU WO

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

Return to Table of Contents



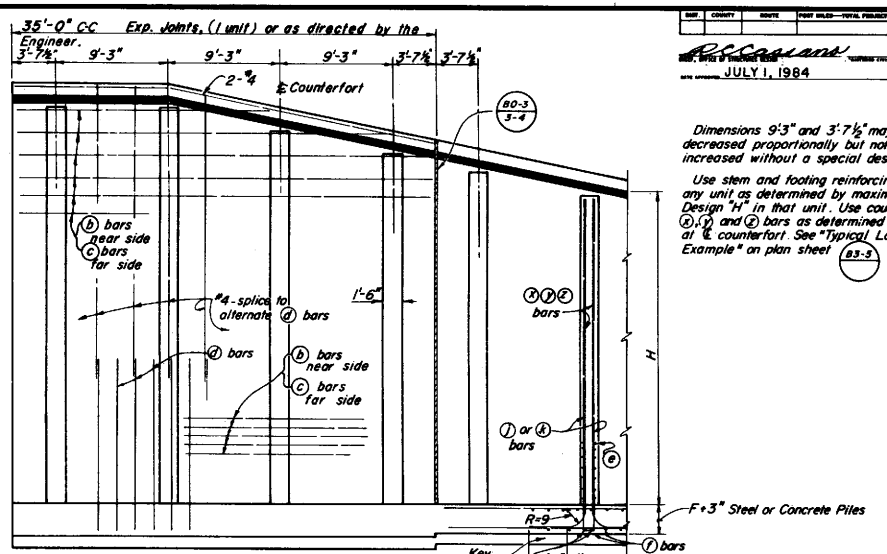
SPREAD FOOTING SECTION

ALTERNATIVE TOP OF WALL

TABLE OF SPACING FOR ⓑ ⓒ & ⓔ BARS

Distance below top of wall

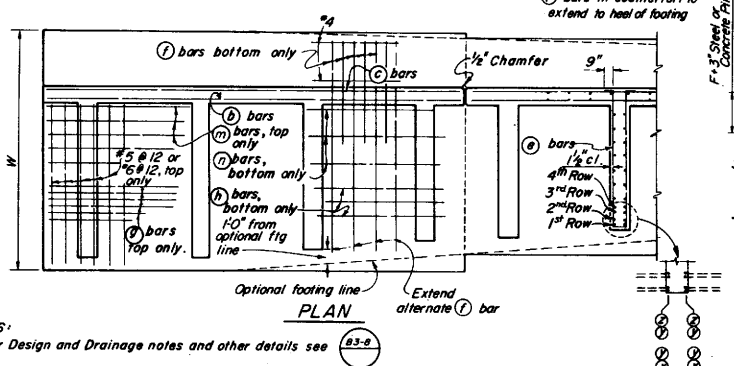
Top of wall	ⓑ	ⓒ	ⓔ
2'	24	18	
4'	24	18	
6'	24	18	24
8'	18	18	24
10'	18	18	24
12'	12	18	18
14'	12	18	18
16'	12	18	18
18'	12	18	12
20'	12	18	12
22'	12	18	12
24'	12	18	12
26'	12	18	9
28'	12	18	9
30'	12	18	9



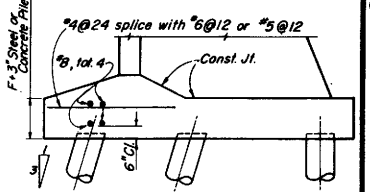
ELEVATION

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

Use stem and footing reinforcing in any unit as determined by maximum Design "H" in that unit. Use counterfort ⓧ, ⓨ and ⓩ bars as determined by "H" at ℄ counterfort. See "Typical Layout Example" on plan sheet B3-5



PLAN



45T PILE FOOTING SECTION

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-#9	2-#9	2-#9	2-#10	2-#10	2-#11	2-#11
	ⓐ bars, length	20'-8"	22'-6"	24'-9"	26'-10"	29'-0"	31'-3"	33'-6"
	ⓑ bars, edge counterfort	4-#9	4-#9	4-#9	4-#10	4-#10	4-#11	4-#11
	ⓑ bars, length	13'-0"	15'-6"	17'-9"	21'-0"	22'-0"	22'-6"	25'-9"
	ⓒ bars, edge counterfort			2-#9	2-#10	2-#10	2-#11	2-#11
	ⓒ bars, length			10'-6"	12'-0"	13'-3"	13'-5"	16'-4"
	ⓓ bars, back face wall	#5		See Table for spacing				
	ⓔ bars, front face wall	#5		See Table for spacing				
	ⓕ bars, wall face	#6 @ 12	#6 @ 10	#6 @ 9	#8 @ 12	#8 @ 11	#9 @ 12	#9 @ 11
	ⓖ Stirrups counterfort	#5		See Table for spacing				
	ⓗ bars, toe	#4 @ 12	#4 @ 10	#4 @ 9	#5 @ 12	#6 @ 11	#7 @ 12	#7 @ 11
	ⓗ bars, length	6'-0"	7'-0"	7'-9"	8'-5"	9'-2"	9'-9"	10'-6"
	ⓘ bars, counterfort heel	#5 @ 15	#5 @ 13	#5 @ 11	#6 @ 15	#6 @ 13	#6 @ 12	#6 @ 11
	ⓚ bars, counterfort heel	#5 @ 7½	#5 @ 6½	#5 @ 5½	#6 @ 7½	#6 @ 6½	#6 @ 6	#6 @ 5½
	ⓜ bars, top of heel	#6 @ 16	#6 @ 16	#6 @ 16	#6 @ 16	#6 @ 16	#6 @ 16	#6 @ 16
	ⓝ bars, top of heel	#6 @ 8	#6 @ 8	#6 @ 8	#6 @ 8	#6 @ 8	#6 @ 8	#6 @ 8
	ⓟ bars, bottom of heel	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 18	#5 @ 18
	ⓠ bars, bottom of heel	#5 @ 9	#5 @ 9	#5 @ 9	#5 @ 9	#5 @ 9	#5 @ 9	#5 @ 9
Spread Footing	Concrete cu.ft./lin.ft.	58.7	69.2	77.7	86.3	99.9	109.1	125.1
Spread Footing	Steel lbs/lin.ft.	185	218	271	342	401	477	560
Pile Footing	Concrete cu.ft./lin.ft.	61.9	72.7	81.6	90.5	104.5	114.0	130.3
Pile Footing	Steel lbs/lin.ft.	203	229	284	355	414	491	572
	Toe Pressure, lbs per sq.ft.	6510	7450	8010	8650	9450	10150	10890

NOTES:

For Design and Drainage notes and other details see B3-8

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

Quantities do not include the wall portion above "Gutter Elevation" and are for design purposes only.

Length of ⓧ, ⓨ and ⓩ bars indicates distance from top of footing to upper end of bar.

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	REG.	ACCT.

R. C. Cassano — CHIEF, OFFICE OF STRUCTURE DESIGN — REGISTERED CIVIL ENGINEER 9013

DATE APPROVED JULY 1, 1984

STANDARD DRAWING

FILE No. XS-3-44	DESIGN	By: David Marsh	Checked W.G. Ellis
DRAWING DATE 1/80	DETAILS	By: [illegible]	Checked David Marsh
	SUBMITTED BY	[illegible]	Approved Recommended by [illegible] — REGISTERED CIVIL ENGINEER NUMBER 8798

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER REGISTERED CIVIL ENGINEER NO.

BRIDGE No.

POST MILE

COUNTERFORT RETAINING WALL TYPE 4

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

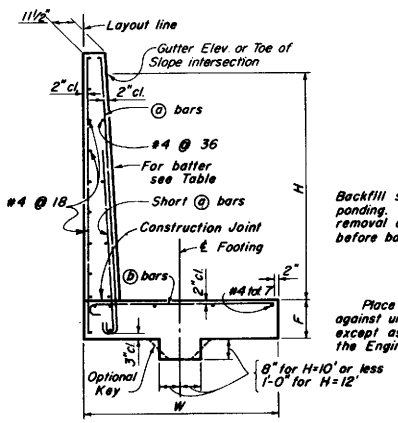
CU WD

Disregard prints bearing earlier revision dates

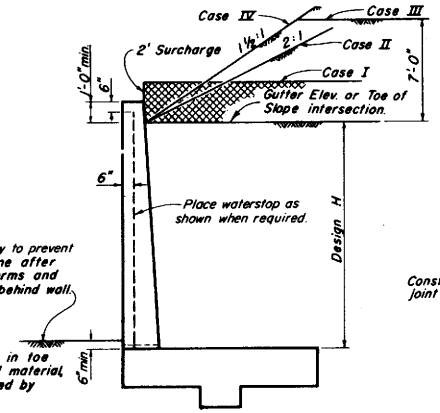
REVISION DATES (PRELIMINARY STAGE ONLY)

B 3-6

Return to Table of Contents



SPREAD FOOTING SECTION



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

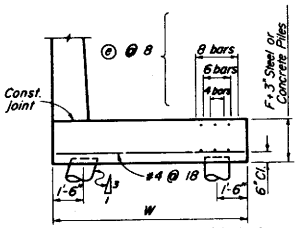
For drainage notes and other details, see (B3-8)

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"

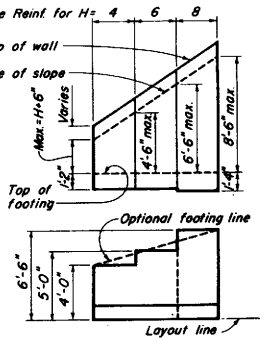
For actual spacing, see Wall Layout.

Pile layout does not apply to Case IV conditions.



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.

45T PILE FOOTING SECTION

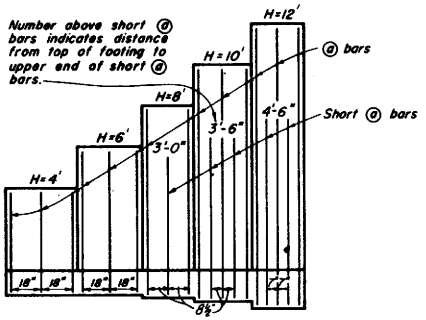


TYPICAL LAYOUT EXAMPLE

For joints required, see (B0-3 / 3-3) & (B0-3 / 3-4)

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	⅜:12	¾:12
	ⓐ bars	#4 @ 18	#5 @ 18	#5 @ 17	#6 @ 17	#6 @ 14
Short ⓐ bars		None	None	#5 @ 17	#6 @ 17	#6 @ 14
	ⓑ bars	#4 @ 18	#5 @ 18	#5 @ 8½	#6 @ 8½	#6 @ 7
Total ⓐ bars		6 - #7	6 - #7	8 - #7	6 - #7	4 - #7
Top Pressure	Case I k/sf	1.6	2.2	2.5	3.0	3.5
	Case II k/sf	1.5	2.1	2.7	3.4	4.1
	Case III k/sf	1.6	2.3	2.9	3.8	4.4
	Case IV k/sf	2.0	3.2	4.2	5.3	6.5
Spread Ftg.	Steel lbs/ft	16	22	35	55	73
	Conc. cu yd/ft	9.4	12.5	17.2	24.4	36.1
Pile Footing	Steel lbs/ft	31	36	54	70	85
	Conc. cu yd/ft	10.9	12.9	17.9	25.5	36.5



ELEVATION

NOTES

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

Design Data:
$f_c = 1300$ psi $f'_c = 3250$ psi $f_s = 24{,}000$ psi $n = 10$
earth = 120 pcf Case I - Wall design for equivalent fluid pressure = 27 and 36 pcf. Case II, III, IV - Wall design is based on Rankine's formula with $\phi = 33°-42'$.

Quantities:
Quantities do not include the wall portion above "Gutter Elevation" and are for design purposes only.

STANDARD DRAWING					
FILE No. XS-3-49	DESIGN By David Hersh	Checked W.E. Ellis	Approved Recommended By		
DRAWING DATE 1/80	DETAILS By E. Lacey	Checked David Hersh	Chief, Office of Structures Design		
	SUBMITTED BY Francis M. Zwiep		8/78		

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER REGISTERED CIVIL ENGINEER NO.

BRIDGE No.

POST MILE

RETAINING WALL TYPE 5

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

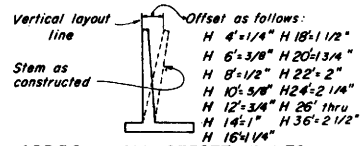
CU
WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B 3-7

Return to Table of Contents



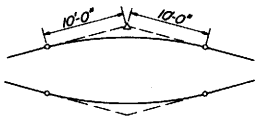
APPROX. WALL OFFSET VALUES

Not required for wall types 3 and 4

Values for offsetting forms to be determined by the Engineer.

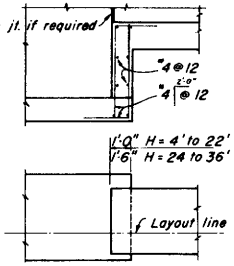
PLAN OF WALL WITH BR. DETAIL 3-4 (see BD-3 / 3-4)

PLAN OF WALL WITH EXPANSION JOINT ONLY

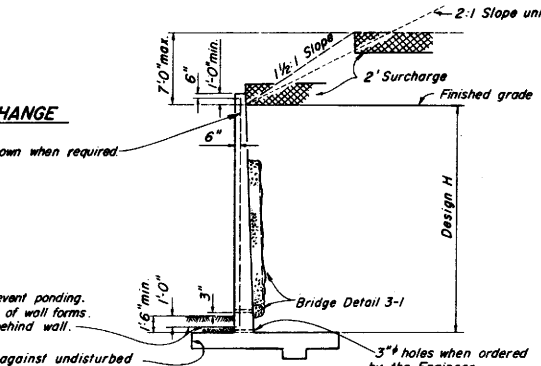


20' VC AT TOP OF WALL SLOPE CHANGE

WHERE SHOWN ON THE PLANS

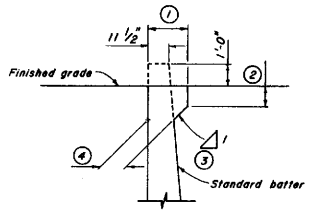


FOOTING STEP



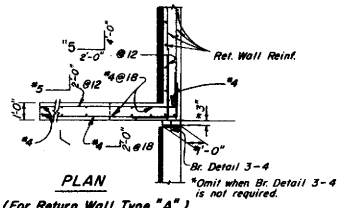
DESIGN AND DRAINAGE

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



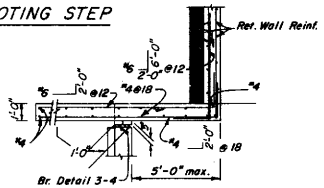
Dimensions 1, 2, & 3 to be as shown elsewhere in the Project Plans.
4 Stem width at base of haunch to be determined as shown.

STEM WIDTH AT BASE OF HAUNCH 1



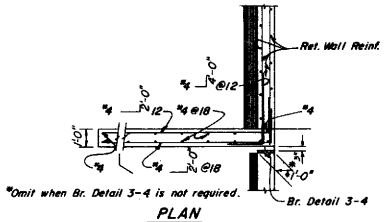
PLAN

(For Return Wall Type "A")



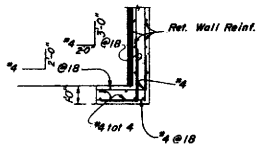
PLAN

(For Return Wall Type "B")



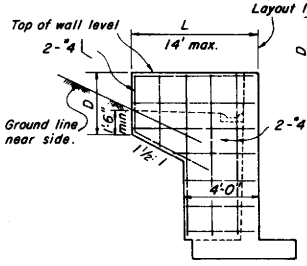
PLAN

(For Return Wall Type "C")



PLAN

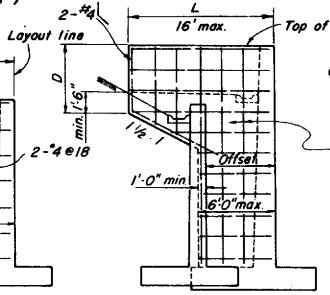
(For Return Wall Type "D")



ELEVATION

RETURN WALL TYPE "A"

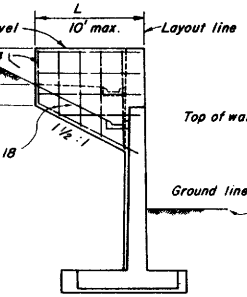
Use where H = 8' or less



ELEVATION

RETURN WALL TYPE "B"

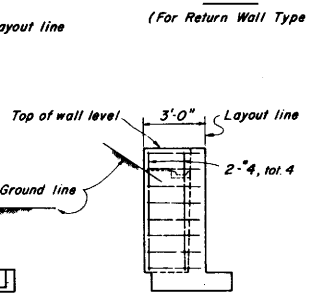
Use where H = 10' or more on offset walls



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.

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 = 1300 psi f'c = 3250 psi fs = 24,000 psi n = 10 earth = 120 pcf

2' Surcharge: Equivalent fluid pressure = 36 pcf max. for determination of toe pressure. 27 pcf min. for determination of heel pressure.

Earth pressures for 2:1 unlimited slope, 1 1/2:1 slope, and 1 1/2:1 unlimited slope, determined from Rankine's formula with ϕ = 33°-42'.

STANDARD DRAWING

FILE No. XS-3-45	DESIGN	By David Marsh	Checked N.E. Ellis
DRAWING 3/83	DETAILS	By [illegible]	Checked David Marsh
DATE	SUBMITTED BY	[illegible] 7/137	Approved Recommended By [illegible] 8/98

1 Added Detail

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

BRIDGE No. / POST MILE

RETAINING WALL DETAILS NO. 1

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

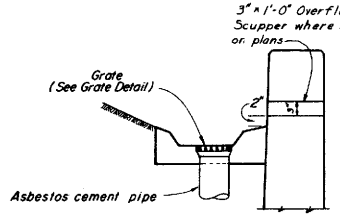
CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY BLANK ONLY)

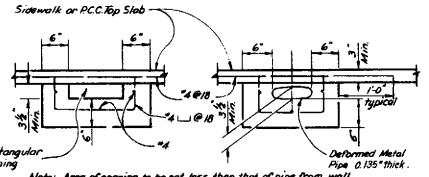
B3-8

Return to Table of Contents



WALL DRAIN DETAIL

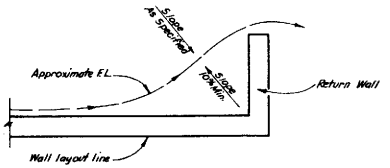
Scale: 1" = 1'-0"



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.

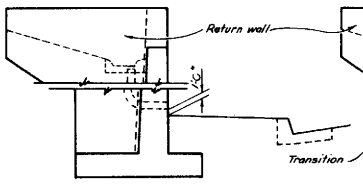
OUTLET DETAIL - SECTION B-B

Scale: 1" = 1'-0"



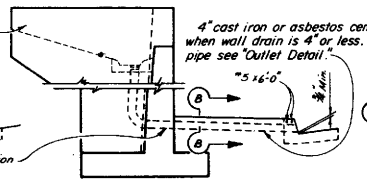
WALL DRAINAGE WHERE GUTTER NOT REQUIRED

Scale: ⅜" = 1'-0"



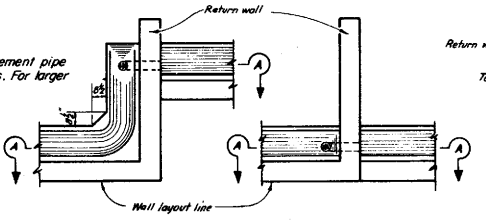
RETAINING WALL, FACE OF WALL OUTLET

Scale: ⅜" = 1'-0"



RETAINING WALL, GUTTER OUTLET

Scale: ⅜" = 1'-0"

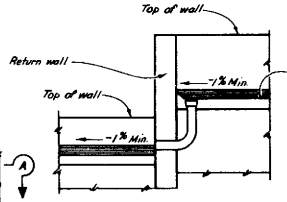


PLAN - OFFSET WALL

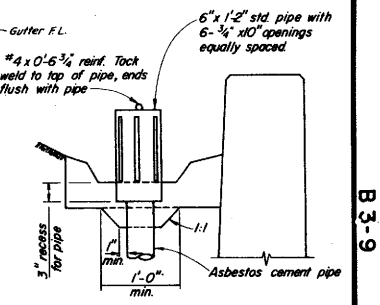
PLAN - CONTINUOUS WALL

DRAIN THROUGH RETURN WALL

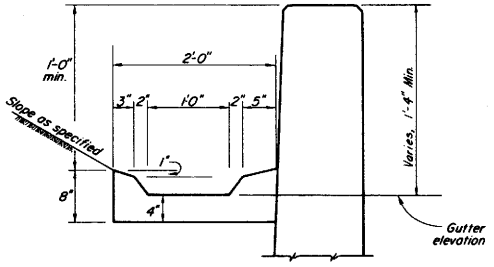
Scale: ⅜" = 1'-0"



SECTION A-A



WALL DRAIN WITH PIPE DOME

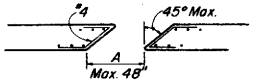


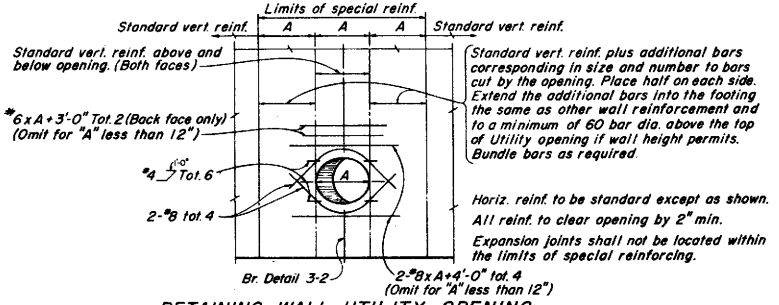
TYPICAL GUTTER DETAIL

Scale: 1½" = 1'-0"

GRATE DETAIL

Sizes to fit Standard Hubs





RETAINING WALL UTILITY OPENING

Max. size of Opening (A) = 48"

To be used in conjunction with sheet B3-8

STANDARD DRAWING				
FILE No. XS-3-29	DESIGN	By Richard Marsh	Checked W. E. Elliott	Approved for standard by W. E. Elliott
DRAWING 1/80	DETAILS	By	Checked Richard Marsh	REGISTERED CIVIL ENGINEER NUMBER 7189
DATE	SUBMITTED BY	Ronald W. Bittner		

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

BRIDGE NO. POST MILE

RETAINING WALL DETAILS NO. 2

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

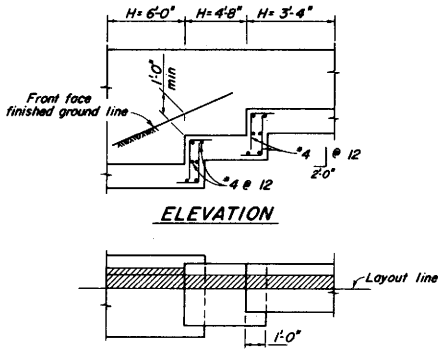
CU WO

Disregard prints bearing earlier revision dates

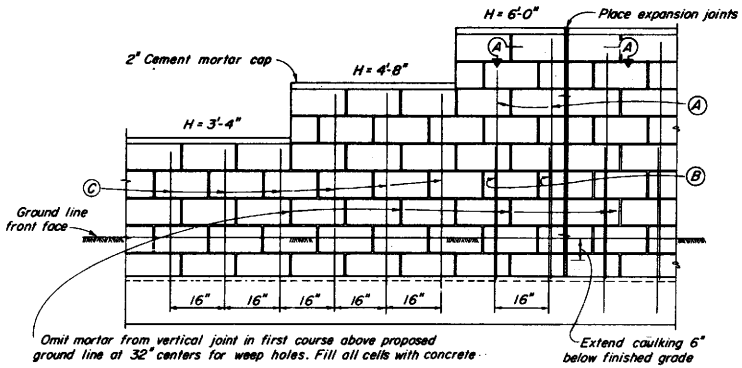
REVISION DATES (PRELIMINARY STAGE ONLY)

B3-9

Return to Table of Contents



FOOTING STEP DETAILS



ELEVATION—MASONRY CONSTRUCTION

DESIGN DATA:

Masonry: f_m = 500 psi f'_m = 1500 psi f_s = 24,000 psi n = 20

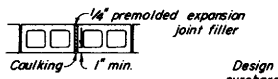
Reinf Conc: f_c = 1300 psi f'_c = 3250 psi f_s = 24,000 psi n = 10

Earth = 120 pcf

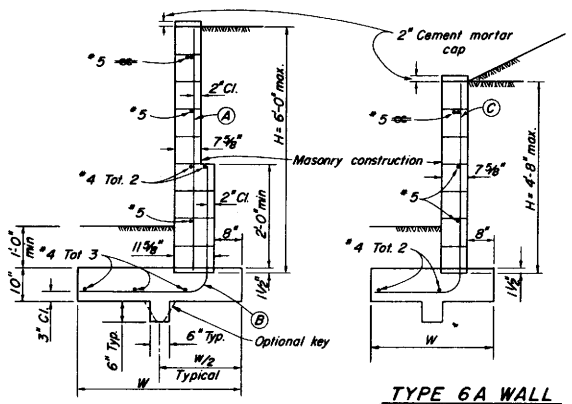
2' Level Surcharge:
Equivalent fluid pressure = 36 pcf for determination of toe pressure.
27 pcf for determination of heel pressure.

2:1 Unlimited Surcharge: Earth pressure determined from Rankine's formula ϕ = 33°-42'.

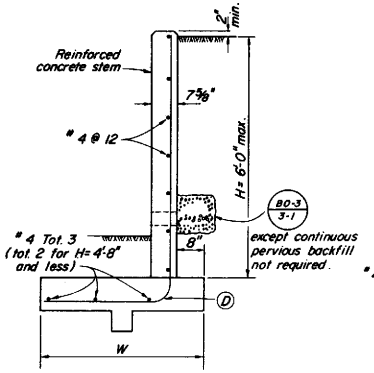
Minimum allowable soil bearing capacity of foundation material = 1 TSF.

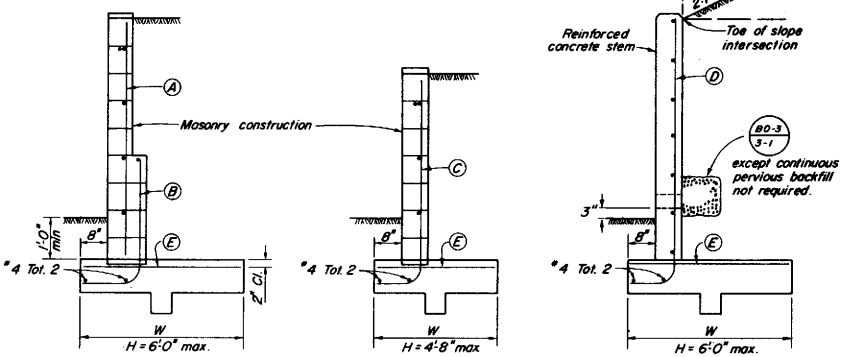


SECTION A-A



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	#4@16
6A	B				#4@16	#5@16
6A	C	#4@16	#4@16	#5@16		
6A	D	#4@18	#4@18	#4@14	#4@10	#5@12
Footing conc. Cu. ft. / L.F.		2.9	3.2	3.4	3.7	4.0
Reinf. Lbs./L.F. Masonry		8.5	8.9	11.6	12.8	15.0
Reinf. Conc. Stem		6.6	7.7	9.8	13.7	16.7

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 reinforced concrete walls.
5. Unless otherwise stipulated, the contractor will have the option of constructing the Type 6 Walls of either masonry or reinforced concrete.

Type	Design H	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	#4@16
6B	B				#4@16	#5@16
6B	C	#4@16	#4@16	#5@16		
6B	D	#4@16	#4@16	#5@16	#5@16	#4@8
6B	E	#4@16	#4@16	#4@16	#4@16	#5@16
Footing conc. Cu. Ft. / L.F.		2.5	2.8	3.0	3.3	3.6
Reinf. Lbs./L.F. Masonry		9.1	9.6	11.8	12.9	15.4
Reinf. Conc. Stem		6.6	7.7	9.8	13.7	16.7

For reinforced concrete stem joints required see B0-3 3-3 & B0-3 3-4

STANDARD DRAWING

FILE No. XS-3-50 DESIGN By David Mersch Checked W.E.Ellis
DRAWING DATE 1/80 DETAILS By Checked David Mersch
SUBMITTED BY Approval Recommended by

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

BRIDGE No.

POST MILE

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

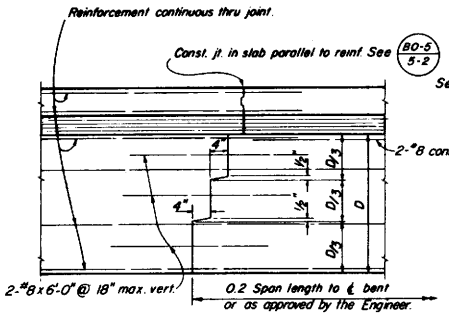
B3-11

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

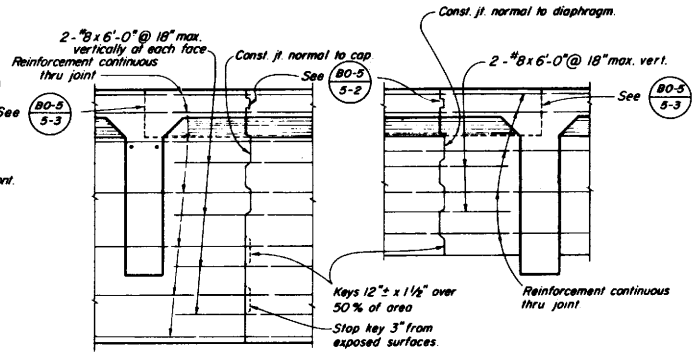
CU WO

Disregard prints bearing earlier revision dates

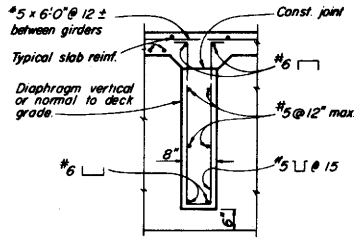
REVISION DATES (PSR,PR,NB,WRD,FF,REC ONLY)



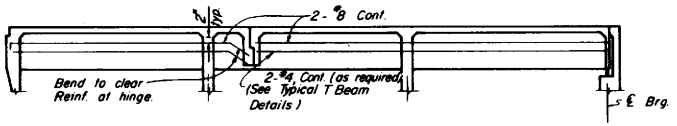
TRANSVERSE GIRDER CONSTRUCTION JOINTS
DETAIL J-3



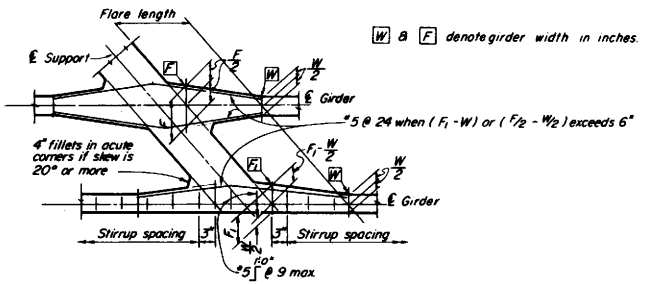
BENT CAP DIAPHRAGMS
LONGITUDINAL CONSTRUCTION JOINTS
DETAIL J-4



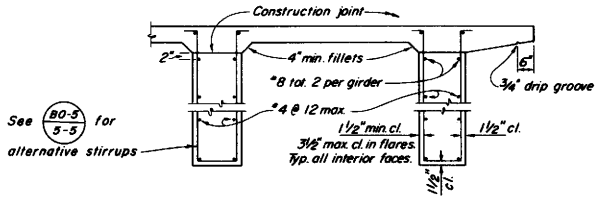
INTERMEDIATE DIAPHRAGM SECTION
DETAIL D-1



GIRDER WEB REINFORCEMENT
DETAIL J-1



TYPICAL GIRDER FLARE AND STIRRUP SPACING DIAGRAM
DETAIL S-3



TYPICAL T BEAM DETAILS
DETAIL T-1

JULY 1, 1984

STANDARD DRAWING
FILE No. XS-16-21
DRAWING DATE 1/80
DESIGN By
DETAILS By
SUBMITTED BY
Approved Recommended By George A. Hood Jr.

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

T-BEAM DETAILS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

CU
WO

Disregard prints bearing earlier revision dates

B 6-1

B 6-1

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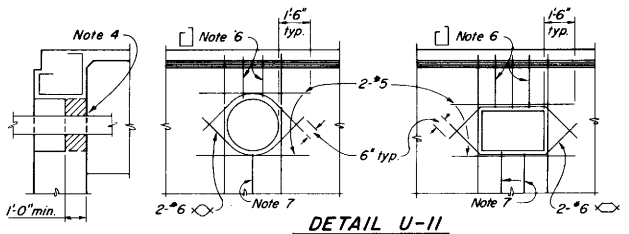
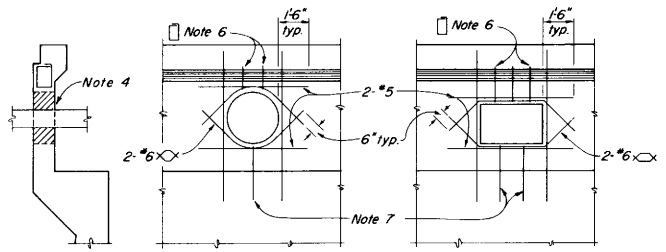
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

DIST. OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER — DATE APPROVED JULY 1, 1984

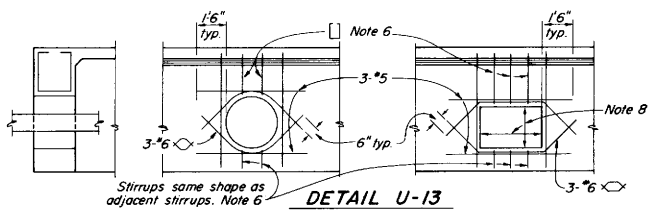
ABUTMENT DIAPHRAGMS



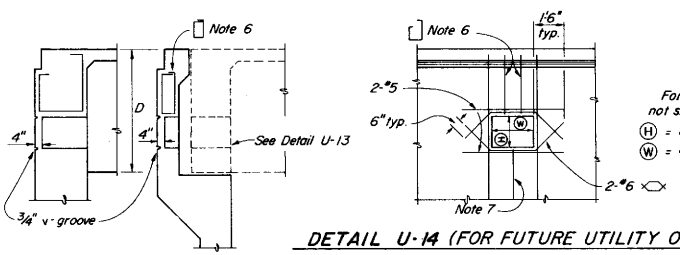
DETAIL U-11



DETAIL U-12



DETAIL U-13



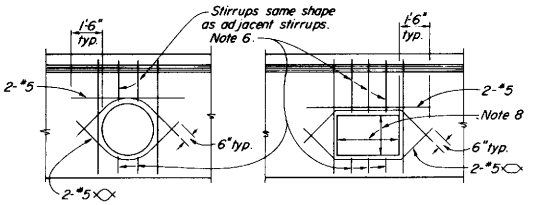
For future utility opening dimensions not shown on Project Plans use:

(H) = 1/3 D or 1'-3" min., whichever is greater.

(W) = 1/3 D or 1'-3" min., whichever is greater.

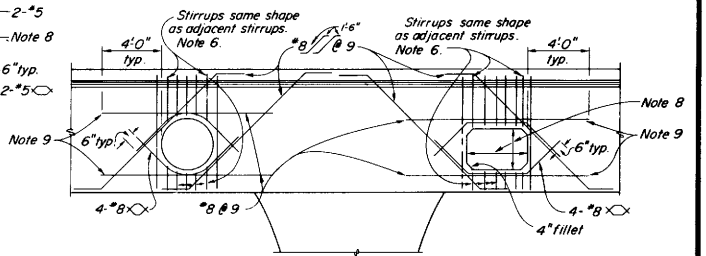
DETAIL U-14 (FOR FUTURE UTILITY OPENING)

INTERMEDIATE DIAPHRAGMS

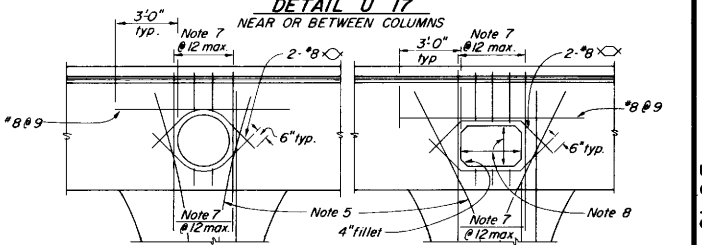


DETAIL U-15

BENT CAPS



DETAIL U 17
NEAR OR BETWEEN COLUMNS



DETAIL U-18
AT COLUMN

NOTES:

1. The exact location, elevation, size and direction of openings shall be in accordance with the Project Plans and as directed by the Engineer.
2. Girders not shown. See Project Plans.
3. All reinf. detailed to be placed in addition to reinf. shown on Project Plans.
4. Seal utilities at abutments with concrete or mortar, after tightly wrapping utility with 2 layers of 15# building paper.
5. Main reinf. to clear opening.
6. Reinf. to be same bar size, and 2/3 the spacing of adjacent reinf. shown on Project Plans.
7. Reinf. to be same bar size and shape as adjacent reinf. shown on Project Plans.
8. For future utility opening dimensions, see Project Plans and Detail U-14.
9. When there is insufficient space to place reinf. as shown, hook reinf. into exterior girder.

STANDARD DRAWING

FILE No. XS-16-51	DESIGN	By S.C. Maxwell	Checked	
DRAWING DATE 1/80	DETAILS	By K.C. Bleichinger	Checked	
	SUBMITTED BY			

Approval Recommended By — REGISTERED CIVIL ENGINEER NUMBER 7385

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

BRIDGE No. — POST MILE

UTILITY OPENINGS - T-BEAM

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

B6-10

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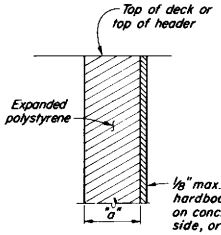
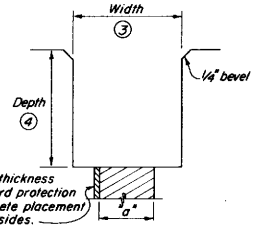
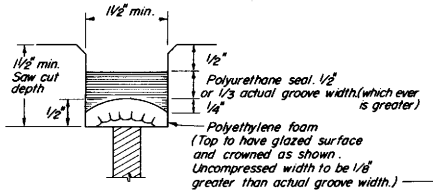


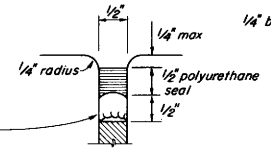
FORMING DETAIL



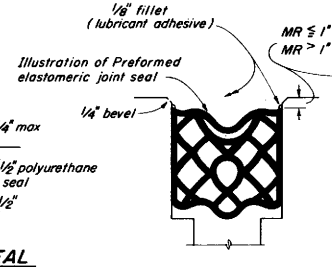
SAWCUT DETAIL



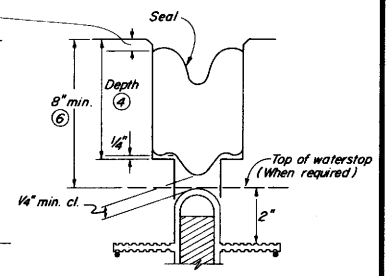
TYPE A SEAL
Movement Rating = 1/2" max.



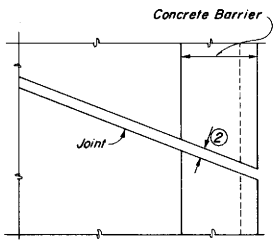
TYPE AL SEAL
Longitudinal Joints Only



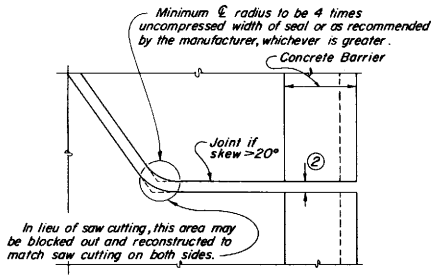
TYPE B SEAL
Movement Rating > 1/2"



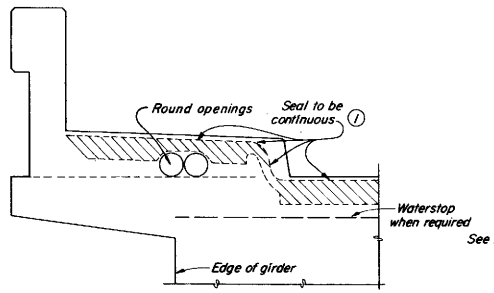
TYPE B JOINT SEAL
IN MINIMUM WIDTH POSITION (W_2)



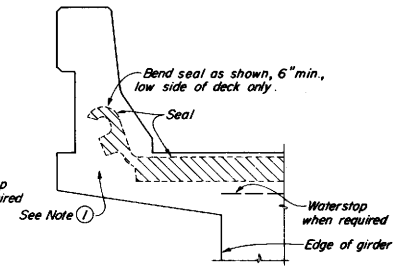
PLAN OF JOINT



PLAN OF ANGLED JOINT



CONCRETE BARRIER & SIDEWALK



CONCRETE BARRIER

Note: Type "B" Seal shown. Type "A" seals to conform to the general path of seal shown.

JOINT SEAL DETAILS

DIMENSIONS "a" OF JOINT REQUIRED

Movement Rating (M.R.) 5	Bridge Type	"a" Dimension Deck Concrete Placed Winter	Fall-Spring	Summer
2"	All except CIP/PS	1 1/2"	1 1/4"	3/4"
	CIP/PS	1 1/4"	1"	1/2"
1 1/2"	All except CIP/PS	1 1/4"	1"	1/2"
	CIP/PS	1"	3/4"	1/2"
1"	All except CIP/PS	1"	3/4"	1/2"
	CIP/PS	3/4"	1/2"	1/2"
1/2"	All except CIP/PS	3/4"	3/4"	1/2"
	CIP/PS	1/2"	1/2"	1/2"

NOTES :

1. Make smooth cuts from the bottom of seal to 1 1/2" clear of top leaving at least one complete cell between the top of the cut and top of the seal. When necessary cut back of seal to clear conduit and round openings.
2. Opening in barrier to match width of sawn deck joint.
3. Sawcut groove widths shall be as ordered by the Engineer.
4. Depth of sawcut : Type A - Depth to be shown above.
   Type B - Depth to be equal to or greater than the depth of seal measured along the contact surface, when compressed to minimum width position (W_2) plus dimensions shown above.
5. MR (movement rating) as shown on other detail plans.
6. Other depths must be approved by the Engineer.

STANDARD DRAWING
FILE No. XS-12-45
DRAWING DATE 1/80
DESIGN
DETAILS
SUBMITTED BY
Checked
Approval Recommended By
REGISTERED CIVIL ENGINEER NUMBER 7989

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

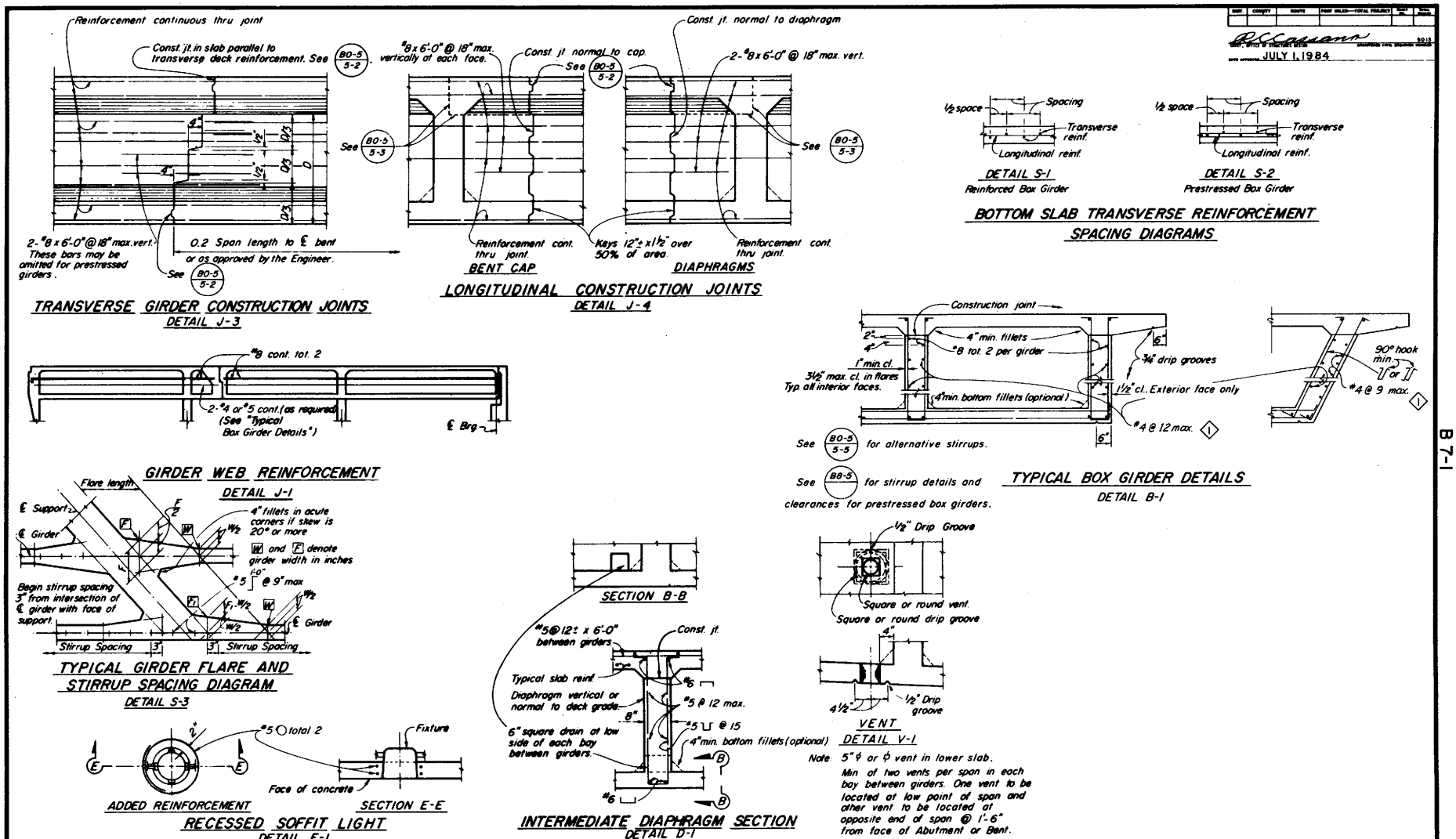
STRUCTURES-DESIGN
PROJECT ENGINEER
REGISTERED CIVIL ENGINEER NO.
BRIDGE NO.
POST MILE

JOINT SEALS
(MAXIMUM MOVEMENT RATING = 2")

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3
CU
WO
Disregard prints bearing earlier revision dates
REVISION DATES (PRELIMINARY STAGE ONLY)

B6-21

Return to Table of Contents



STANDARD DRAWING

FILE No. XS-16-22 | DRAWING DATE 1/84 | DESIGN | DETAILS | SUBMITTED BY George A. Hood | Checked | Approved Recommended By George A. Hood | 1984

1 Rev. Reinforcement

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

BOX GIRDER DETAILS

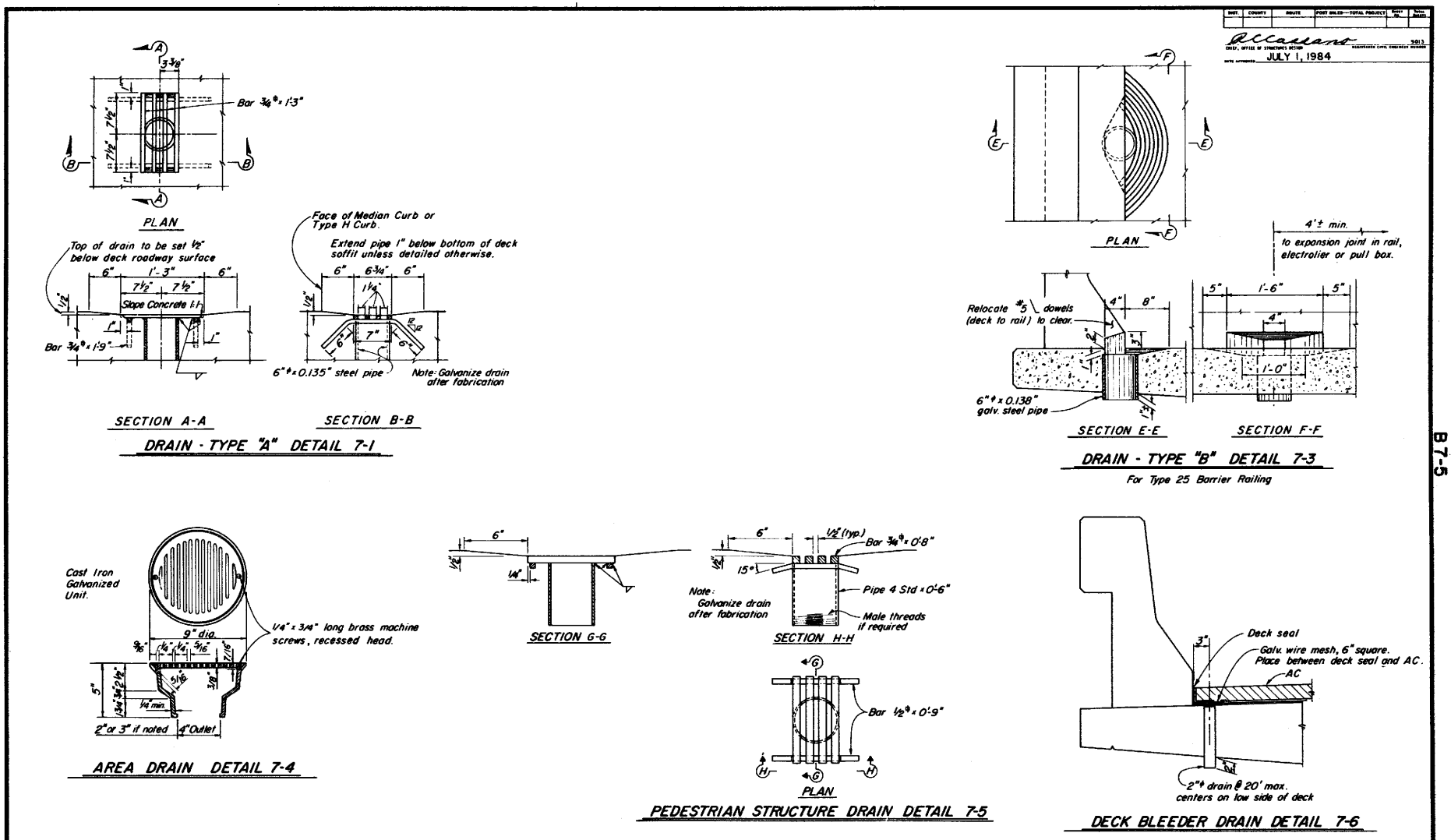
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

CU WO

Disregard prints bearing earlier revision dates

B7-1

Return to Table of Contents



STANDARD DRAWING

FILE NO. XS-16-60 | DRAWING DATE 1/80 | DESIGN | DETAILS | SUBMITTED BY

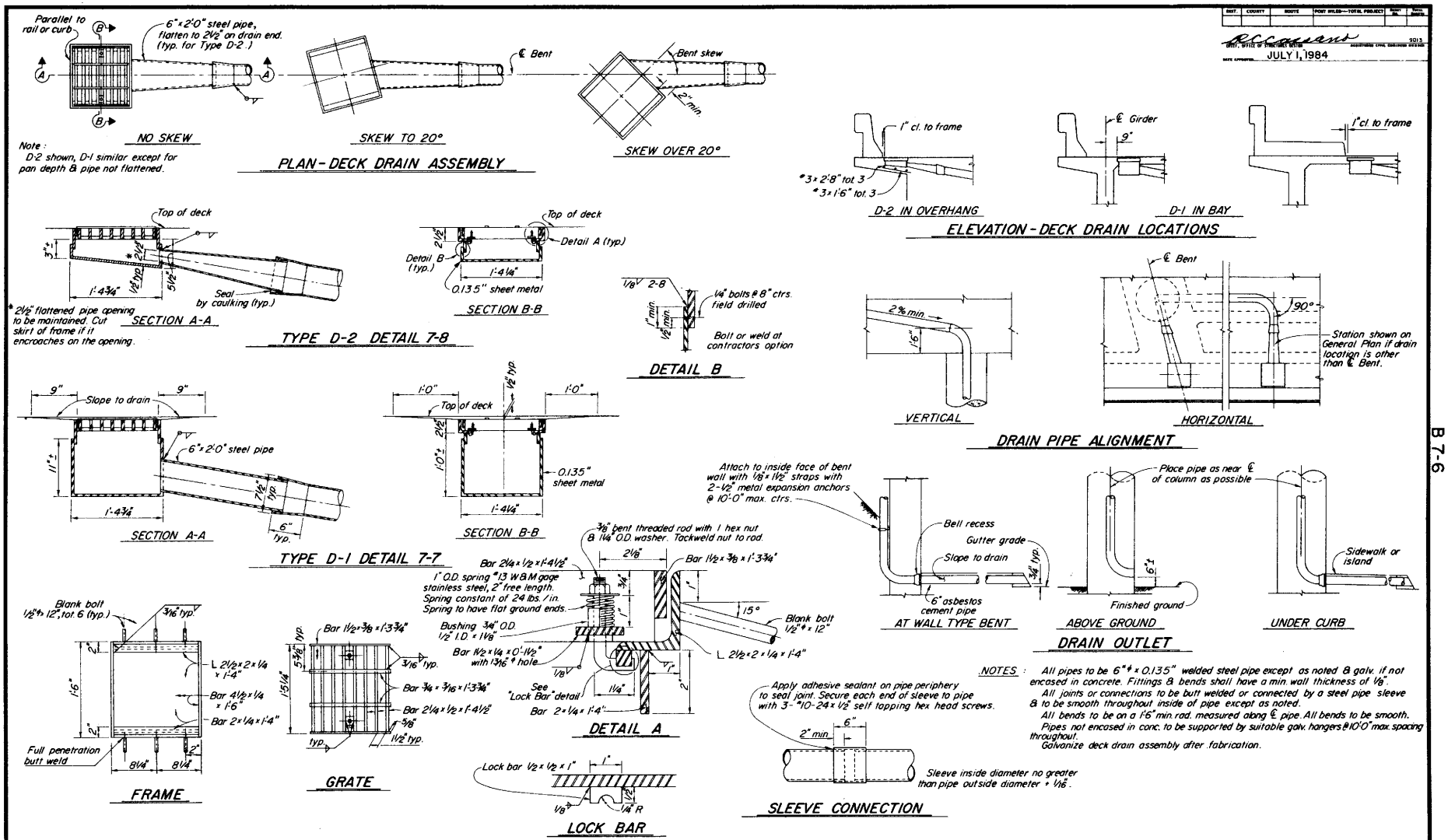
State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

DECK DRAINS

B7-5

Return to Table of Contents



NOTES:

All pipes to be 6"φ x 0.135" welded steel pipe except as noted & galv. if not encased in concrete. Fittings & bends shall have a min. wall thickness of ⅛".

All joints or connections to be butt welded or connected by a steel pipe sleeve & to be smooth throughout inside of pipe except as noted.

All bends to be on a 1'-6" min. rad. measured along ℄ pipe. All bends to be smooth.

Pipes not encased in conc. to be supported by suitable galv. hangers @ 10'-0" max. spacing throughout.

Galvanize deck drain assembly after fabrication.

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

R.C. Cousins — 9013 — ASSISTANT CIVIL ENGINEER UNDER OR ENGINEER
DATE APPROVED JULY 1, 1984

STANDARD DRAWING

FILE No. XS-20-22	DESIGN	By P.Y. Pomeroy	Checked E.W. Puskas	General Recommended By
DRAWING 1/80	DETAILS	By E.J. Lacey	Checked P.Y. Pomeroy	Lloyd A. Hand Jr.
DATE	SUBMITTED BY	E.W. Puskas		REGISTERED CIVIL ENGINEER NUMBER 7389

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER — REGISTERED CIVIL ENGINEER NO.

BRIDGE No.

POST MILE

DECK DRAINS - TYPES D-1 & D-2

DH-05 D147

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B7-6

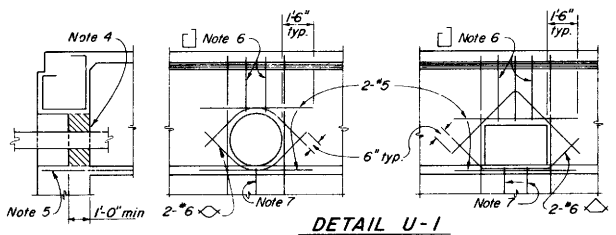
Return to Table of Contents

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

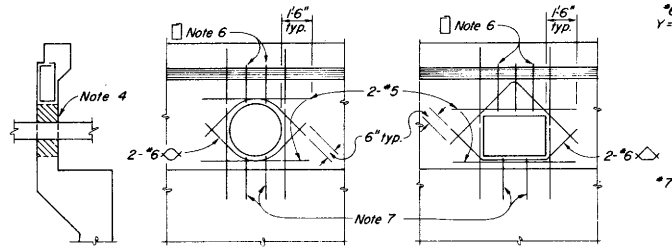
DIST. OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER DRAWING 9013

DATE APPROVED JULY 1, 1984

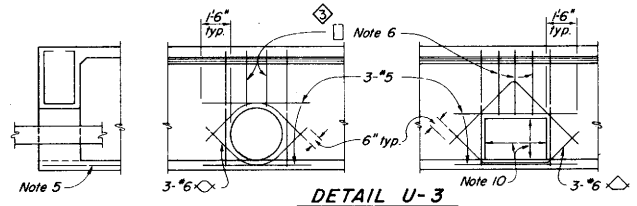
ABUTMENT DIAPHRAGMS



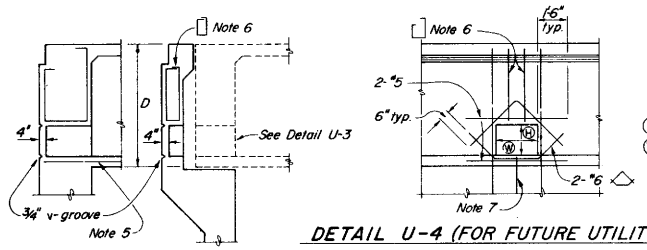
DETAIL U-1



DETAIL U-2



DETAIL U-3



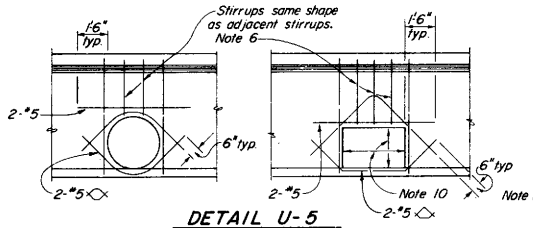
DETAIL U-4 (FOR FUTURE UTILITY OPENING)

For future utility opening dimensions not shown on Project Plans use:

(H) = 1/3 D or 1'-6" min., whichever is greater.

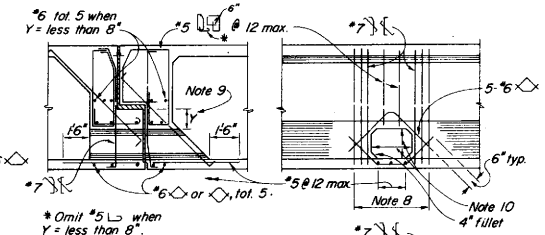
(W) = 1/3 D or 2'-0" min., whichever is greater.

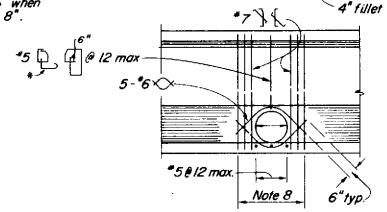
INTERMEDIATE DIAPHRAGMS AND HINGES



DETAIL U-5

AT INTERMEDIATE DIAPHRAGM

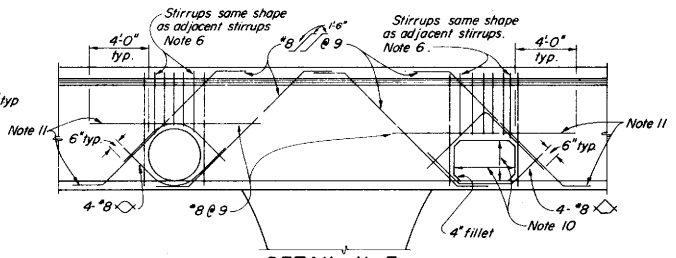




DETAIL U-6

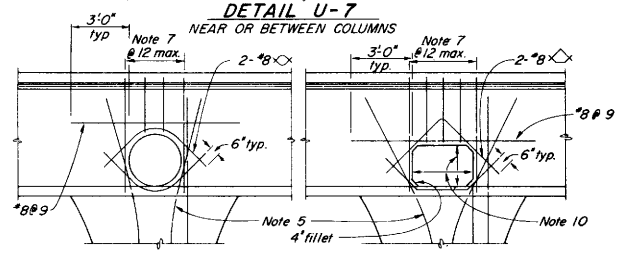
AT HINGE

BENT CAPS



DETAIL U-7

NEAR OR BETWEEN COLUMNS



DETAIL U-8

AT COLUMN

NOTES:

1. The exact location, elevation, size and direction of openings shall be in accordance with the Project Plans and as directed by the Engineer.
2. Girders not shown. See Project Plans.
3. All reinf. detailed to be placed in addition to reinf. shown on Project Plans.
4. Seal utilities at abutments with concrete or mortar, after tightly wrapping utility with 2 layers of 15# building paper. If structure is prestressed, seal to be placed after stressing is completed.
5. Main reinf. to clear opening.
6. Reinf. to be same bar size and 2/3 the spacing of adjacent reinf. shown on Project Plans.
7. Reinf. to be same bar size and shape as adjacent reinf. shown on Project Plans
8. Replace each set of 4-#7 bars cut off by opening. Place 1/2 on each side of opening.
9. When "Y" is less than 8", extend top of opening to bottom of bearing seat elevation.
10. For future utility opening dimensions, see Project Plans and Detail U-4.
11. When there is insufficient space to place reinf. as shown, hook reinf. into exterior girder.

STANDARD DRAWING

FILE No. XS-16-49	DESIGN	By S.D. Malvick	Checked Gar Clift
DRAWING 1/80	DETAILS	By K.C. Blechinger	Checked S.D. Malvick
DATE	SUBMITTED BY	S.A. Amaro	Approval Recommended By Gerald A. Hord Jr. — DESIGN ENGINEER OF STRUCTURES — REGISTERED CIVIL ENGINEER NUMBER 7889

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER — REGISTERED CIVIL ENGINEER NO.

BRIDGE No.

POST MILE

UTILITY OPENING - BOX GIRDER

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

B 7-10

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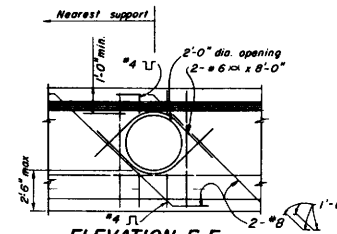
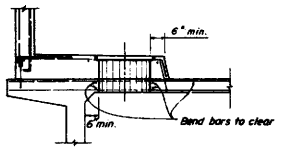
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

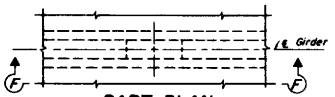
R. Cassano
CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER 8013
DATE APPROVED JULY 1, 1984



ELEVATION F-F



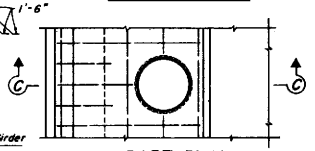
SECTION C-C



PART PLAN

GIRDER STEM ACCESS OPENING

DETAIL U41



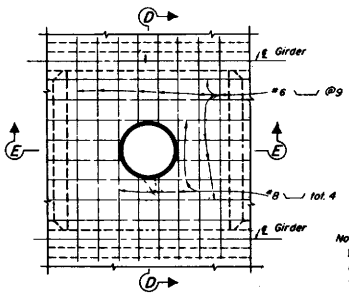
PART PLAN

SIDEWALK ACCESS OPENING

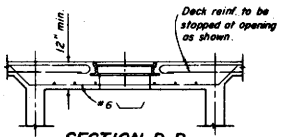
DETAIL U42

NOTES

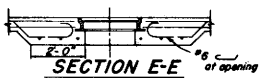
1. For exact location of openings see other sheets.
2. Location and size of manholes may be modified as directed by the Engineer, provided minimum dimensions are maintained.
3. All reinforcement detailed to be placed in addition to reinforcement shown on other sheets.



PART PLAN

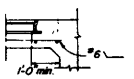


SECTION D-D



SECTION E-E

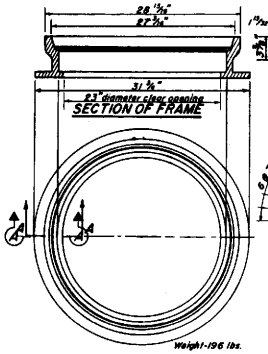
Note:
Where manhole is located adjacent to a diaphragm or abut., substitute Half Section E'-E' on one side of Section E-E.



HALF SECTION E'-E'

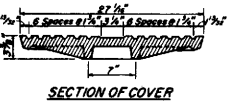
DECK ACCESS OPENING

DETAIL U43

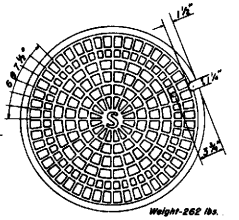


SECTION OF FRAME

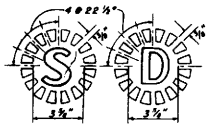
PLAN OF FRAME



SECTION OF COVER

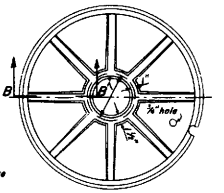


TOP PLAN OF COVER

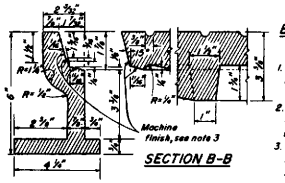


DETAILS OF LETTERS

Surface of letter shall be flush with finished surface



BOTTOM PLAN OF COVER



SECTION A-A

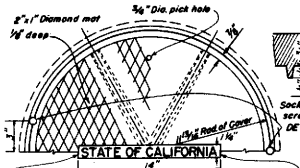
SECTION B-B

NOTES–

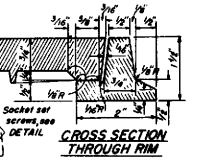
1. The manhole frame and cover shall be made of gray cast iron.
2. All parts of the manhole frame and cover except machined surfaces shall be coated with asphaltum paint.
3. The manhole frame and cover shall be tested for accuracy of fit and shall be marked in sets before delivery. The cover shall fit 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

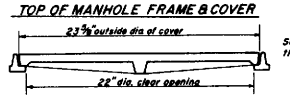
DETAIL U45



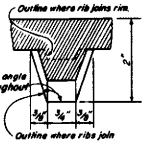
TOP OF MANHOLE FRAME & COVER



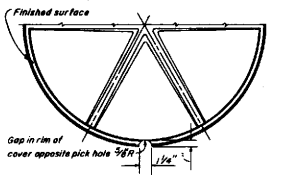
CROSS SECTION THROUGH RIM



CROSS SECTION THROUGH FRAME & COVER

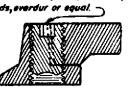


CROSS SECTION THROUGH RIB AT MID RADIUS



BOTTOM OF MANHOLE COVER

Drill and tap hole and install 3/4"x1 1/4" socket set screw, hexagonal hole, U.S.S threads, everdur or equal.

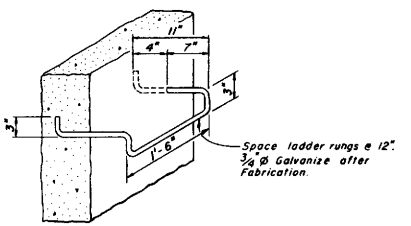


MANHOLE COVER LOCKING DEVICE DETAIL

NOTE: Frame and cover shall be CAST IRON. Weight - 130 lbs. Galvanize complete assembly after fabrication.

MANHOLE FRAME AND COVER FOR SIDEWALKS

DETAIL U46



LADDER RUNG DETAIL

DETAIL U44

STANDARD DRAWING				
FILE No. XS-16-50	DESIGN	Checked	Approved Recommended By	
DRAWING 1/80	DETAILS	Checked		
DATE	SUBMITTED BY		REGISTERED CIVIL ENGINEER NUMBER 7065	

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER — REGISTERED CIVIL ENGINEER NO.

BRIDGE NO.

POST MILE

UTILITIES DETAILS

DH-05 D347

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

B 7-11

B 7-11

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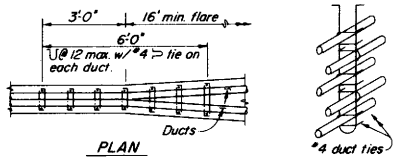
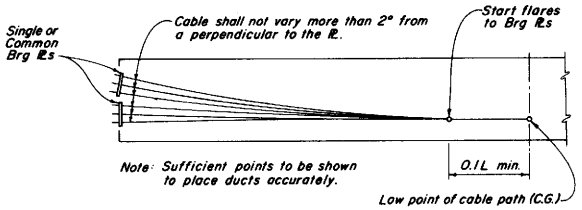


Note: Place closed end of duct ties in direction of flare

STIRRUP REINFORCEMENT AT FLARE OF GIRDER STEM



BEARING PLATE PRESTRESSING PATH

Distribution of prestressing force:

Unless otherwise noted the prestressing force, P jack or P_f, shall be distributed with an approximately equal amount in each girder and shall be placed symmetrically about the ℄ of the structure. In slabs, the prestressing force shall be uniformly distributed across the slab.

Stressing sequence:

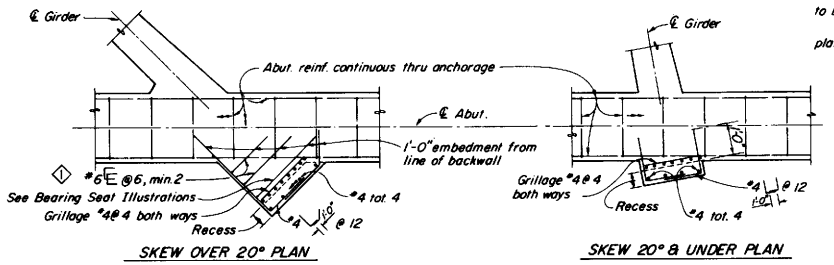
No more than 1/2 of the prestressing force in any girder may be stressed before an equal force is stressed in the adjacent girders. At no time during the stressing operations will more than 1/6 of the total prestressing force be applied eccentrically about the centerline of the structure.

Girder stem shall be flared near anchorage to provide a minimum of 1½" concrete covering the ducts, flare may be on one side of girder only.

Place duct ties, as shown for flare of girder stem, at each location where ducts change horizontal direction.

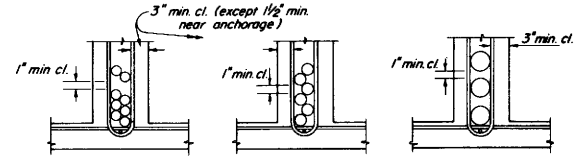
Bar reinforcement interfering with the prestressing tendon alignment shall be adjusted, as approved by the Engineer.

The working drawings shall include any additions or rearrangement of reinforcing steel from that shown on the plans.



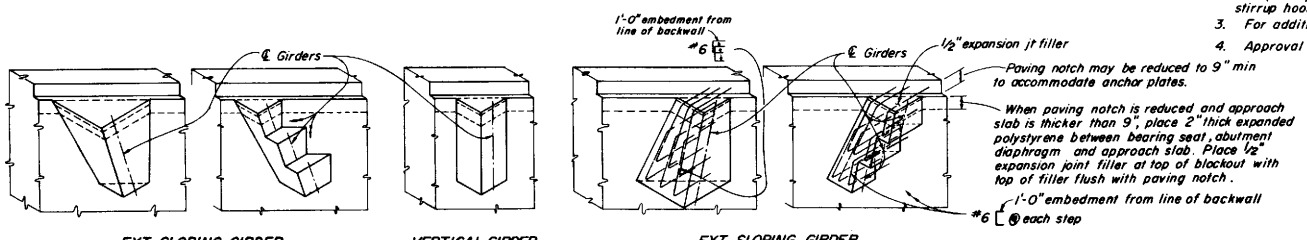
Notes:
Recess for anchorage to be filled with concrete.
Edge distance of bearing plates shall be 1½" min.

BEARING SEAT FOR PRESTRESSED ANCHORAGE AT DIAPHRAGM TYPE ABUTMENTS



CLEARANCE REQUIREMENTS FOR DUCTS

1. Duct patterns shown are for a 12" wide girder stem; for other widths the minimum clearances must be maintained.
2. Girder stirrups must be bent to fit the duct size used, or U or ⊔ stirrups may be used. A reinforcing bar must be placed inside of each stirrup hook or 90° bend.
3. For additional reinforcing details see B7-1
4. Approval of the Engineer is required for deviations.



BEARING SEAT ILLUSTRATIONS

Contractor to submit working drawings to the Engineer for approval.

STANDARD DRAWING			
FILE No. XS-12-46	DESIGN By E.H. Brunling	Checked RAD	Approval Recommended By Leonard Manassero
DRAWING DATE 4/83	DETAILS By K.C. Blechinger	Checked RAD	Date 8/90
	SUBMITTED BY Thomas Hsu		

◇ Revised notation

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER REGISTERED CIVIL ENGINEER NO.

BRIDGE No. POST MILE

CAST-IN-PLACE PRESTRESSED GIRDER DETAILS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

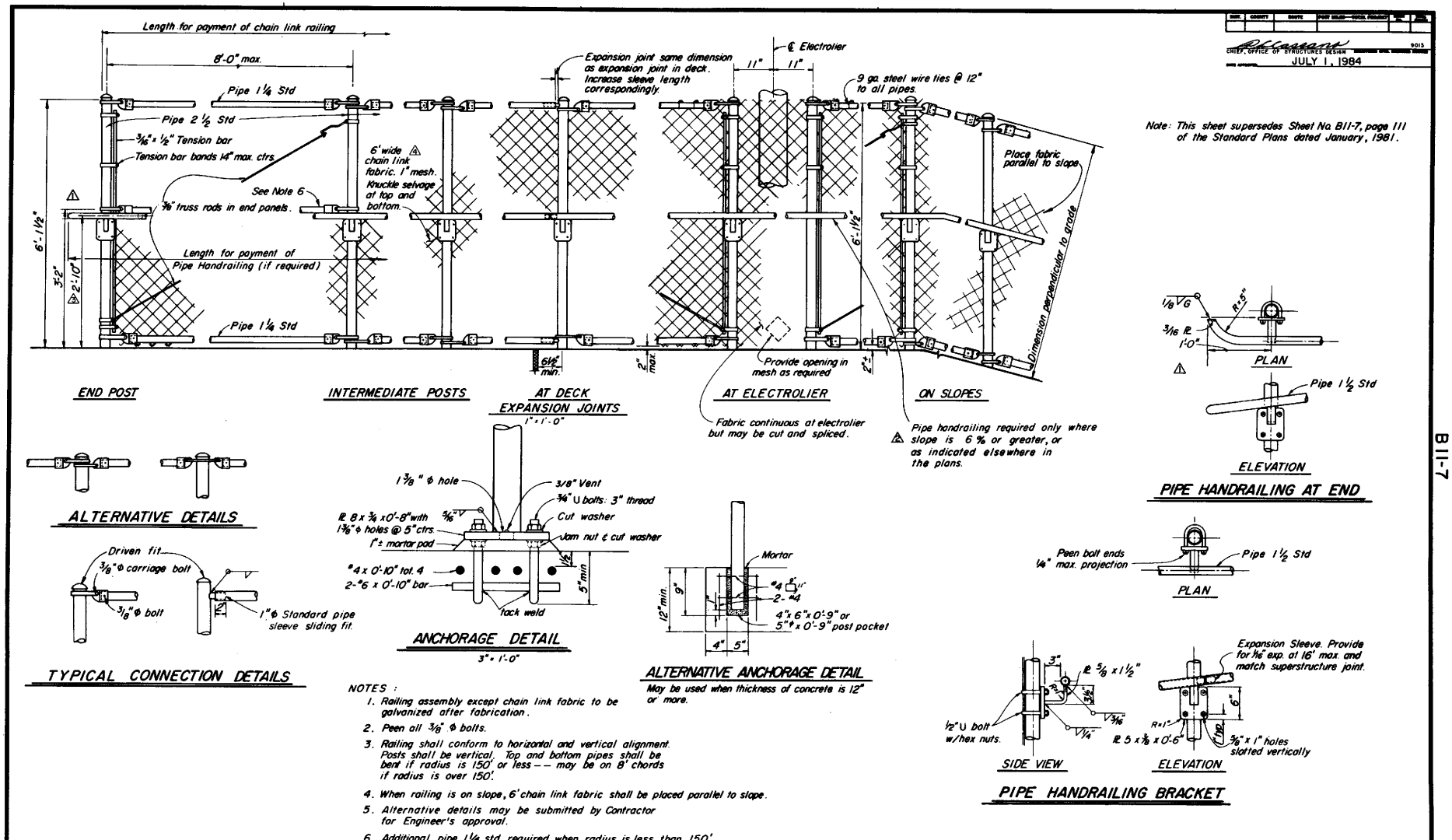
CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B8-5

Return to Table of Contents



NOTES :

1. Railing assembly except chain link fabric to be galvanized after fabrication.
2. Peen all ⅜" φ 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. Alternative details may be submitted by Contractor for Engineer's approval.
6. Additional pipe 1¼ std required when radius is less than 150'.

CHIEF, OFFICE OF STRUCTURES DESIGN — JULY 1, 1984

STANDARD DRAWING

FILE No. XS-9-73 — DRAWING DATE 1/84 — DESIGN By RPH — DETAILS By — SUBMITTED BY — Checked RWB SHOP — Checked RW BISHOP — Approval Recommended By — 8/98

1 Revised Handrail End
2 Revised Slope
3 Revised Handrail Height
4 Revised Note

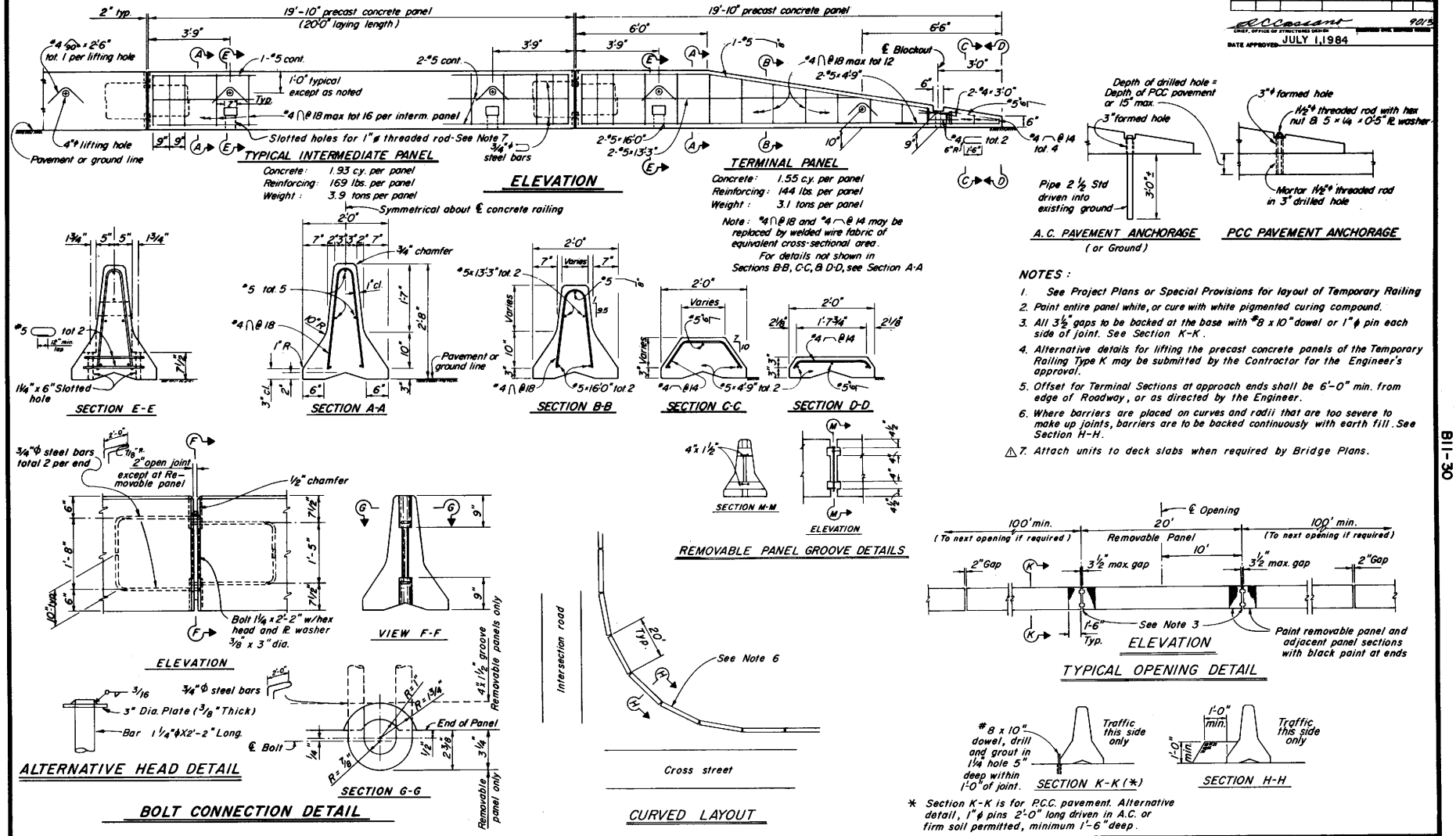
State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

CHAIN LINK RAILING

B11-7

Return to Table of Contents



NOTES:

1. See Project Plans or Special Provisions for layout of Temporary Railing
2. Paint entire panel white, or cure with white pigmented curing compound.
3. All 3 1/2" gaps to be backed at the base with #8 x 10" dowel or 1"ϕ pin each side of joint. See Section K-K.
4. Alternative details for lifting the precast concrete panels of the Temporary Railing Type K may be submitted by the Contractor for the Engineer's approval.
5. Offset for Terminal Sections at approach ends shall be 6'-0" min. from edge of Roadway, or as directed by the Engineer.
6. Where barriers are placed on curves and radii that are too severe to make up joints, barriers are to be backed continuously with earth fill. See Section H-H.
7. △ Attach units to deck slabs when required by Bridge Plans.

* Section K-K is for P.C.C. pavement. Alternative detail, 1"ϕ pins 2'-0" long driven in A.C. or firm soil permitted, minimum 1'-6" deep.

TRST.	COUNTY	ROUTE	POST MILE—TOTAL PROJECT

R.C. Crossant — CHIEF, OFFICE OF STRUCTURES DESIGN — 901/5
DATE APPROVED: JULY 1, 1984

STANDARD DRAWING
FILE No. XS-9-67 | DESIGN By RWB | Checked PH
DRAWING 1/84 | DETAILS By | Checked PH
DATE | SUBMITTED BY | Approved Structures Design by Donald Wiemann, Design Supervisor 8/84

△ Revised Note 7

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN
PROJECT ENGINEER | REGISTERED CIVIL ENGINEER NO.

BRIDGE No. | POST MILE

TEMPORARY RAILING (TYPE K)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

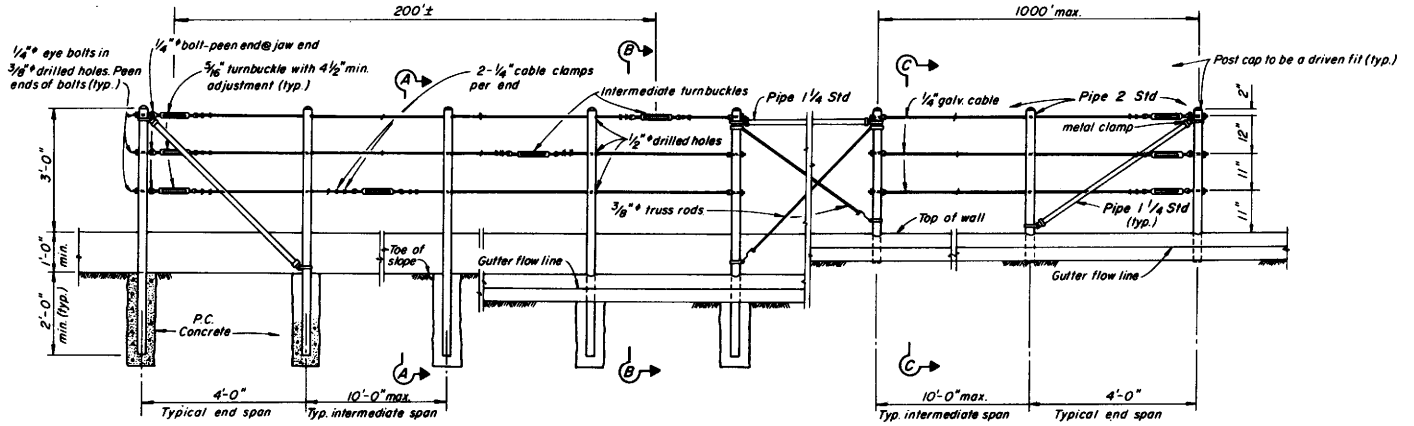
CU
WO

Changed prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

B11-30

Return to Table of Contents

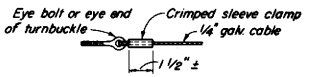


RETAINING WALL (Without Gutter)
EXISTING

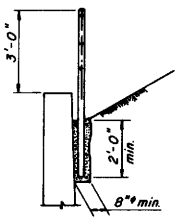
RETAINING WALL (With Gutter)
EXISTING

RETAINING WALL (With Gutter)
NEW CONSTRUCTION

ELEVATION

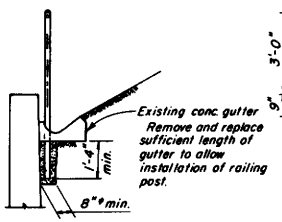


ALTERNATIVE CABLE CONNECTION



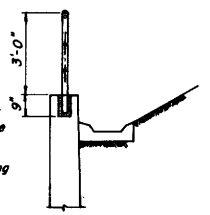
EXISTING

SECTION A-A



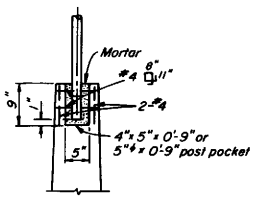
EXISTING

SECTION B-B

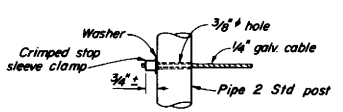


NEW CONSTRUCTION

SECTION C-C



POST POCKET



ALTERNATIVE DEAD END ANCHORAGE

NOTES:

1. Maximum distance between turnbuckles shall be 200'±.
2. Intermediate turnbuckles to be placed in adjacent spans.
3. Cable shall not be spliced between intermediate turnbuckles and end posts.
4. All posts, cable and hardware to be galvanized.
5. Posts to be vertical.
6. Alignment of holes in posts may vary to conform to slope of top of retaining wall.
7. The Contractor shall verify all dependent dimensions in the field before ordering or fabricating any material.
8. Alternative details may be submitted by the Contractor for approval by the Engineer.
9. Line posts shall be braced horizontally and trussed diagonally in both directions at intervals not to exceed 1000'.
10. Post pockets to be centered in top of wall.
11. Typical end spans, braced in both directions, shall be constructed at changes in line where the angle of deflection is 15° or more.
12. Provide thimbles at all cable loops.

JULY 1, 1984

STANDARD DRAWING

FILE No. XS-9-97 | DRAWING DATE 1/84 | DESIGN By RPH | DETAILS By | SUBMITTED BY | Checked RW Bishop | Checked RW Bishop | Approved Recommended By | 8/98

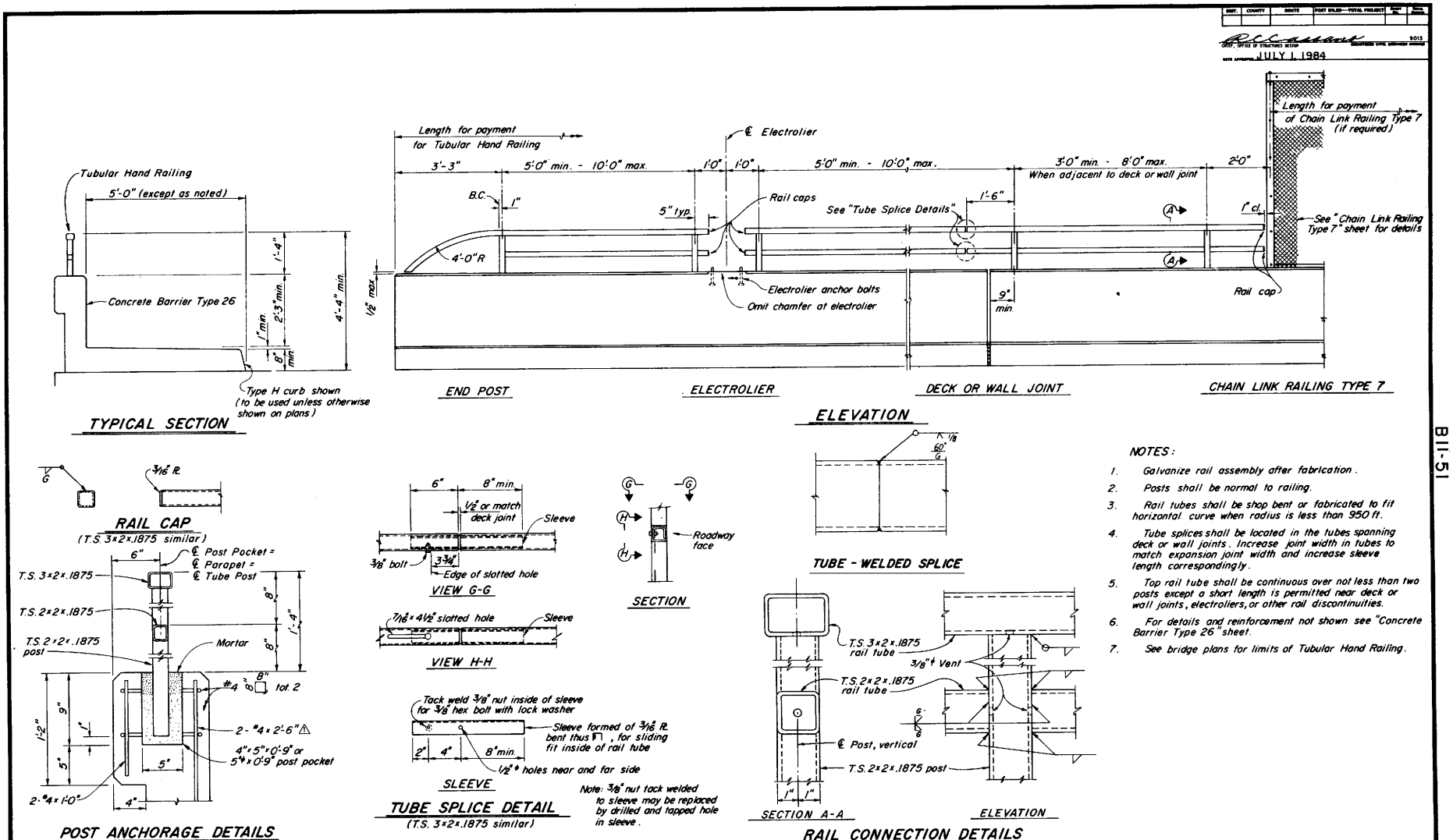
State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

CABLE RAILING

B11-47

Return to Table of Contents



NOTES:

1. Galvanize rail assembly after fabrication.
2. Posts shall be normal to railing.
3. Rail tubes shall be shop bent or fabricated to fit horizontal curve when radius is less than 950 ft.
4. Tube splices shall be located in the tubes spanning deck or wall joints. Increase joint width in tubes to match expansion joint width and increase sleeve length correspondingly.
5. Top rail tube shall be continuous over not less than two posts except a short length is permitted near deck or wall joints, electroliers, or other rail discontinuities.
6. For details and reinforcement not shown see "Concrete Barrier Type 26" sheet.
7. See bridge plans for limits of Tubular Hand Railing.

STANDARD DRAWING					
FILE No. XS-9-101	DESIGN	By RPH	Checked RWBishop	Approved Recommended By	
DRAWING DATE 1/84	DETAILS	By	Checked RW Bishop	DESIGN SUPERVISOR	
	SUBMITTED BY			REGISTERED CIVIL ENGINEER NUMBER	8/85

REV. REINF.

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER REGISTERED CIVIL ENGINEER NO.

BRIDGE NO.

POST MILE

TUBULAR HAND RAILING

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B11-51

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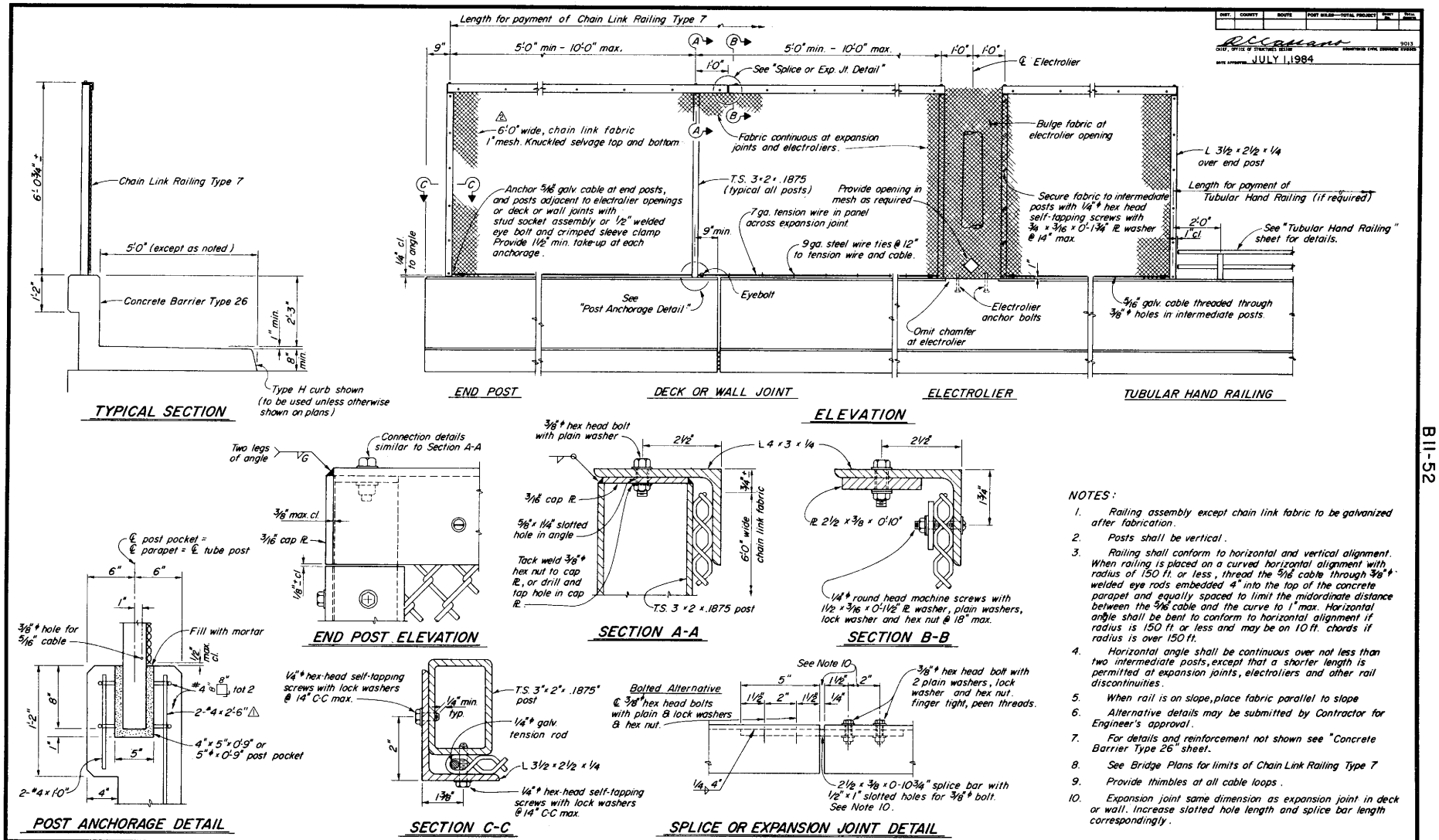


NOTES:

1. Railing assembly except chain link fabric to be galvanized after fabrication.
2. Posts shall be vertical.
3. Railing shall conform to horizontal and vertical alignment. When railing is placed on a curved horizontal alignment with radius of 150 ft. or less, thread the 5/16" cable through 3/8" ϕ welded eye rods embedded 4" into the top of the concrete parapet and equally spaced to limit the midordinate distance between the 5/16" cable and the curve to 1" max. Horizontal angle shall be bent to conform to horizontal alignment if radius is 150 ft or less and may be on 10 ft. chords if radius is over 150 ft.
4. Horizontal angle shall be continuous over not less than two intermediate posts, except that a shorter length is permitted at expansion joints, electroliers and other rail discontinuities.
5. When rail is on slope, place fabric parallel to slope
6. Alternative details may be submitted by Contractor for Engineer's approval.
7. For details and reinforcement not shown see "Concrete Barrier Type 26" sheet.
8. See Bridge Plans for limits of Chain Link Railing Type 7
9. Provide thimbles at all cable loops.
10. Expansion joint same dimension as expansion joint in deck or wall. Increase slotted hole length and splice bar length correspondingly.

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

R. C. Lamar — CHIEF, OFFICE OF STANDARDS DESIGN — 9013 REGISTERED CIVIL ENGINEER EXPIRES
DATE APPROVED JULY 1, 1984

STANDARD DRAWING

FILE NO. XS-9-102	DESIGN By R.O.W. Checked R.W. BISHOP	Approved & Recommended by Bryant Mancarti DESIGN SUPERVISOR
DRAWING 1/84	DETAILS By Checked R.W. BISHOP	REGISTERED CIVIL ENGINEER NUMBER 8198
DATE	SUBMITTED BY	

⚠ REV REINF.
⚠ REV NOTE

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER — REGISTERED CIVIL ENGINEER NO.

BRIDGE No.

POST MILE

CHAIN LINK RAILING TYPE 7

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

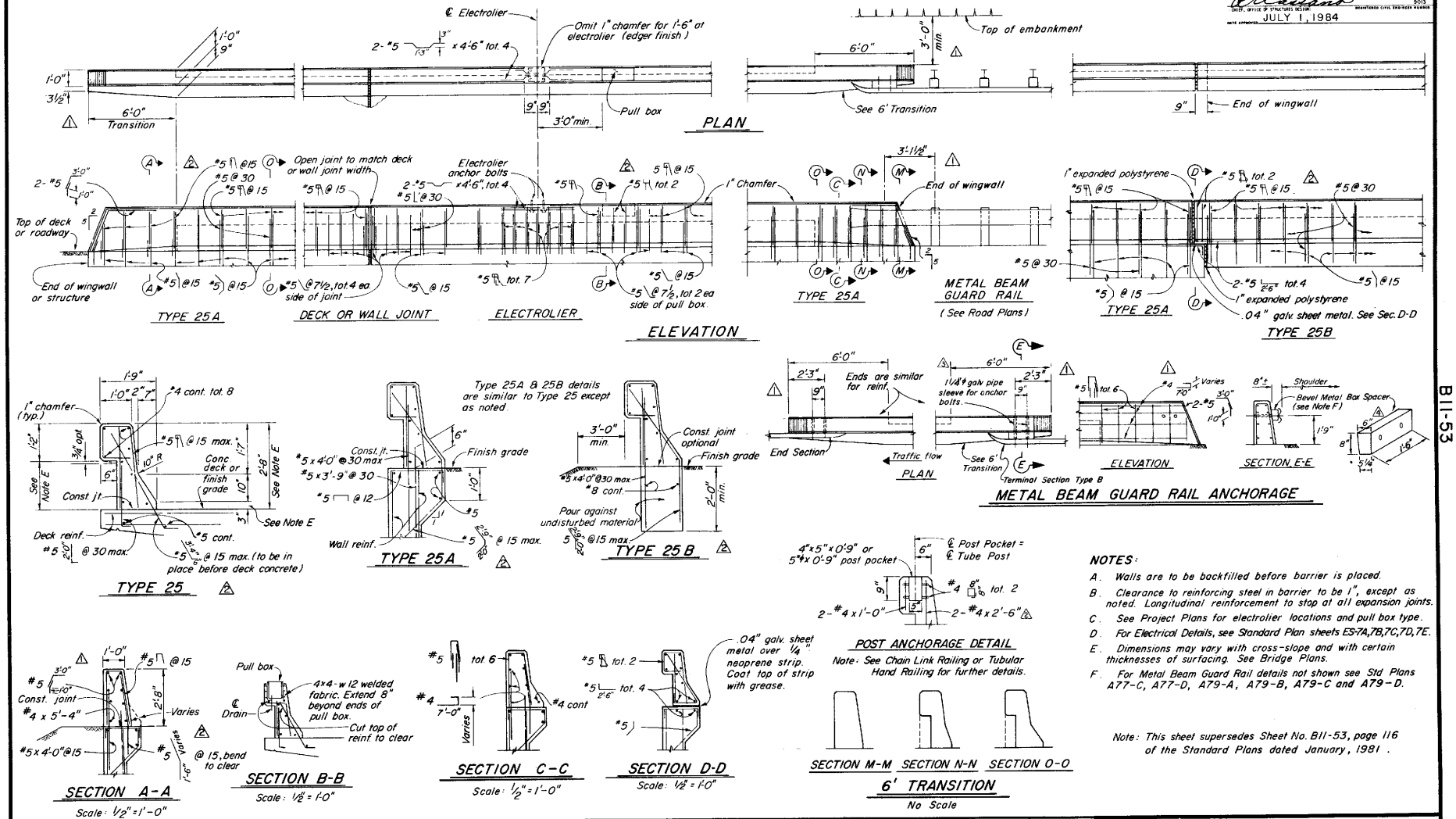
CU
WO

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

BII-52

Return to Table of Contents



NOTES:

A. Walls are to be backfilled before barrier is placed.

B. Clearance to reinforcing steel in barrier to be 1", except as noted. Longitudinal reinforcement to stop at all expansion joints.

C. See Project Plans for electrolier locations and pull box type.

D. For Electrical Details, see Standard Plan sheets ES-7A,7B,7C,7D,7E.

E. Dimensions may vary with cross-slope and with certain thicknesses of surfacing. See Bridge Plans.

F. For Metal Beam Guard Rail details not shown see Std Plans A77-C, A77-D, A79-A, A79-B, A79-C and A79-D.

Note: This sheet supersedes Sheet No. B11-53, page 116 of the Standard Plans dated January, 1981.

STANDARD DRAWING

FILE No. XS-9-103 | DESIGN By PH | Checked RW Bishop | Approval Recommended By

DRAWING DATE 1/84 | DETAILS By | Checked RW Bishop | SUBMITTED BY | REGISTERED CIVIL ENGINEER NUMBER 8198

1 Revised Barrier Ends
2 Revised Barrier Reinf.
3 Revised Pipe Sleeves
4 Revised Box Spacer

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER | REGISTERED CIVIL ENGINEER NO.

BRIDGE NO. | POST MILE

CONCRETE BARRIER TYPE 25

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

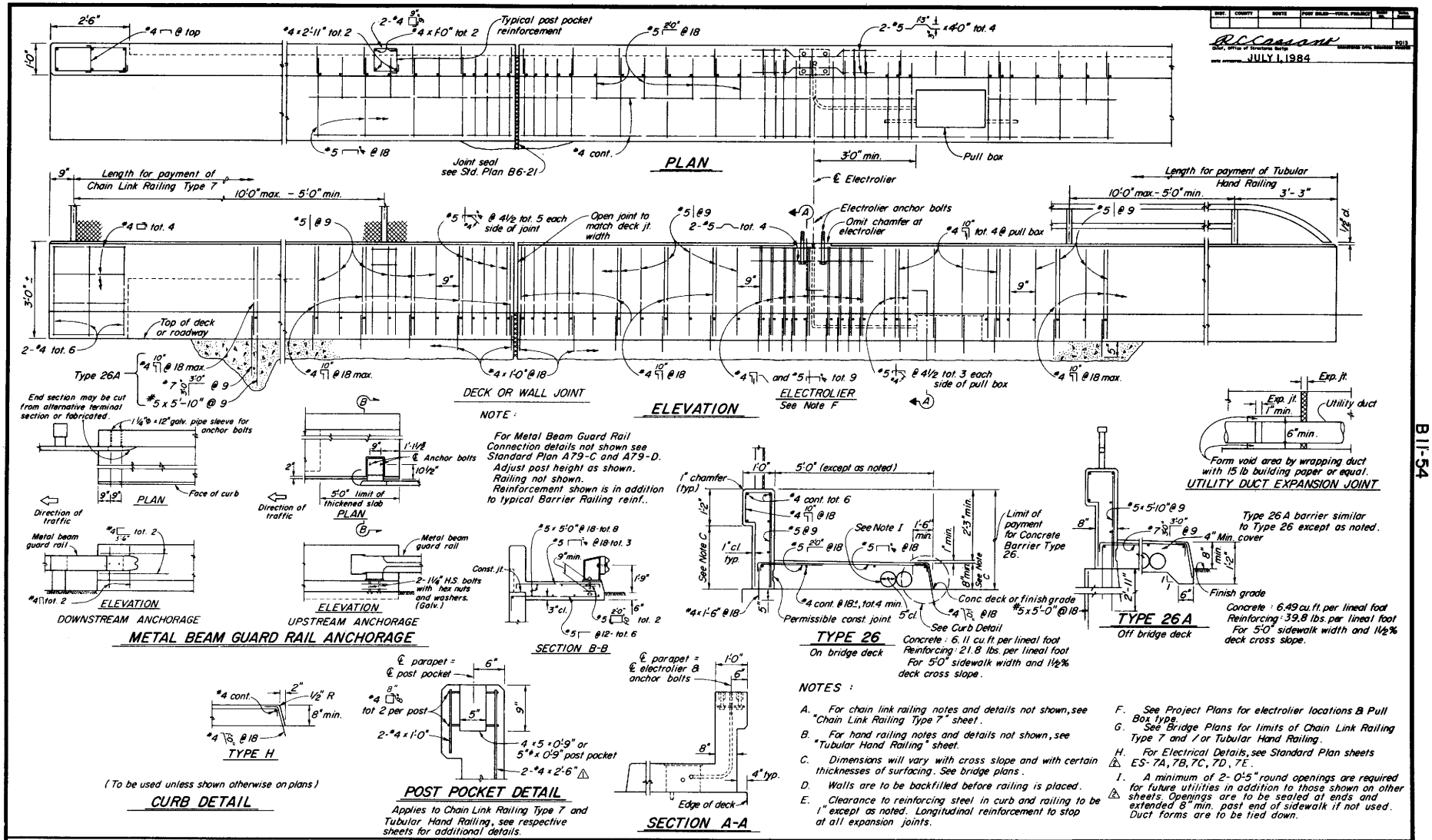
CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B11-53

Return to Table of Contents



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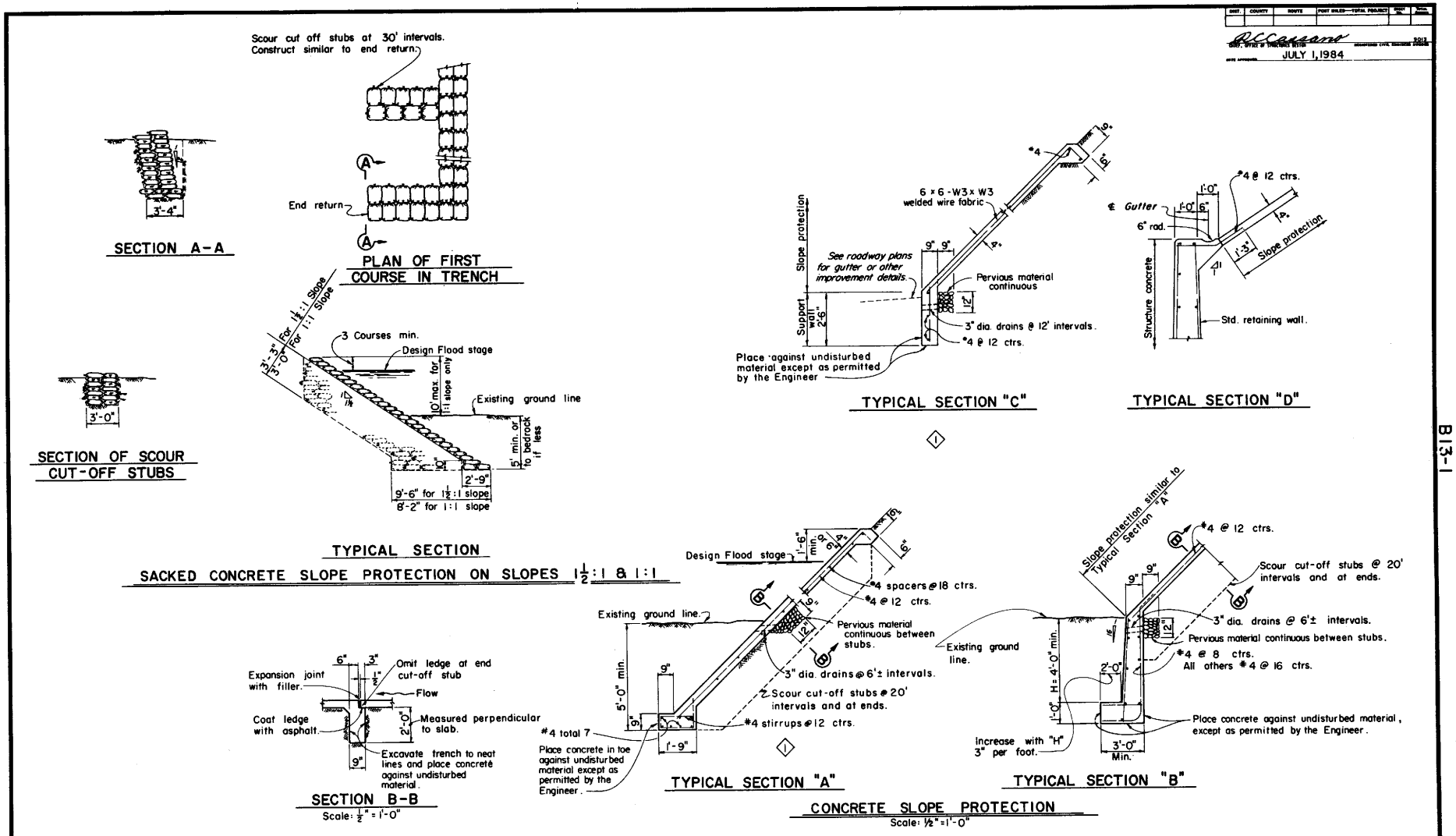


DIST.	COUNTY	ROUTE	POST MILES — TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

DIST. OFFICE ENGINEER — REGISTERED CIVIL ENGINEER
JULY 1, 1984
DATE APPROVED

B13-1

STANDARD DRAWING

FILE No. XS-19-1	DESIGN By W.T. Eckoff	Checked	Approval Recommended By Sergio Mancarti
DRAWING DATE 1/84	DETAILS By W.T. Eckoff	Checked W.T. Eckoff	DESIGN OFFICE ENGINEER REGISTERED CIVIL ENGINEER NUMBER 8198
	SUBMITTED BY W.T. Eckoff		

1 Deleted Notes

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER — REGISTERED CIVIL ENGINEER NO.

BRIDGE NO.

POST MILE

SLOPE PROTECTION DETAIL NO. 1

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

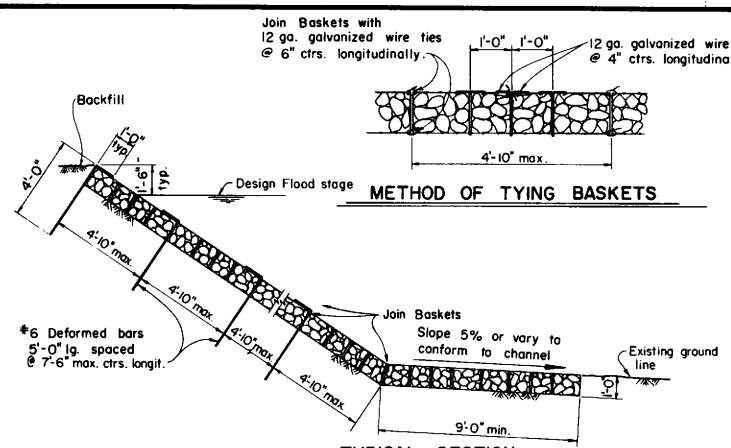
CU WO

Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B13-1

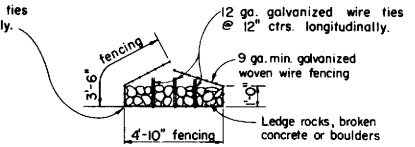
Return to Table of Contents



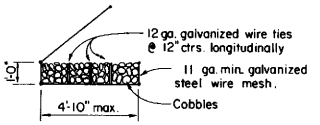
TYPICAL SECTION

WIRE AND ROCK MATTRESS SLOPE PROTECTION

METHOD OF TYING BASKETS

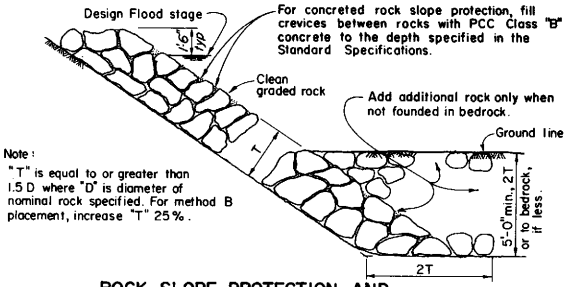


HEAVY TYPE A



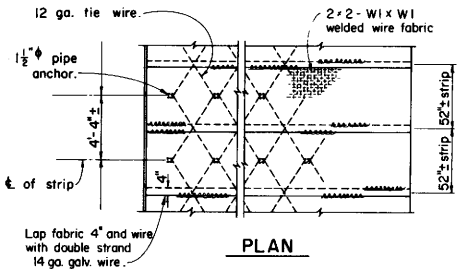
LIGHT TYPE B (Gabion)

METHOD OF FORMING BASKETS

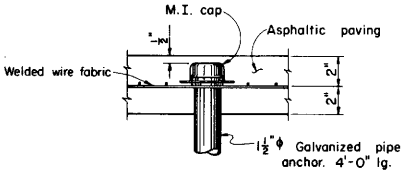


ROCK SLOPE PROTECTION AND

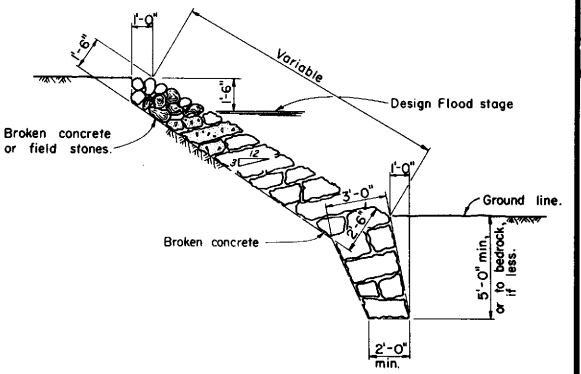
CONCRETED-ROCK SLOPE PROTECTION



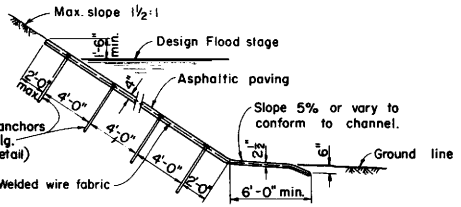
PLAN



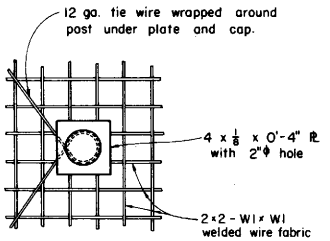
SECTIONAL ELEVATION of PIPE ANCHOR



BROKEN CONCRETE SLOPE PROTECTION



TYPICAL SECTION



PLAN OF PIPE ANCHOR

ASPHALTIC MIXTURE SLOPE PROTECTION

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

R. C. Sassaman — CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER 9013

DATE APPROVED JULY 1, 1984

STANDARD DRAWING

FILE No. XS-19-2	DESIGN By W. T. Cobb	Checked	Approval Recommended By Gary H. Maneuf, Chief Structures Design
DRAWING 1/80	DETAILS By W. T. Cobb	Checked W. T. Cobb	REGISTERED CIVIL ENGINEER NUMBER 8198
DATE	SUBMITTED BY W. T. Cobb		

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER REGISTERED CIVIL ENGINEER NO.

BRIDGE NO.

POST MILE

SLOPE PROTECTION DETAIL NO. 2

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

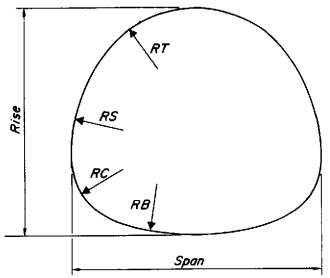
B13-2

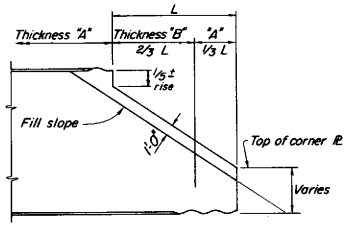
Return to Table of Contents

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

CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER NUMBER 9013

DATE APPROVED JULY 1, 1984

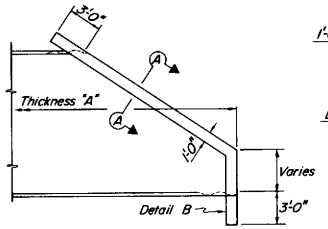




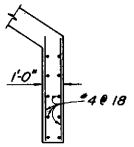
SIDE ELEVATION

Note: Thickness "B" two thicknesses greater than thickness "A", except for 0.249 & 0.280 thicknesses.
Skew-bevels not permitted with Alternative 1.
Cutoff dimensions are approximate only and may be varied by fabricator to suit plate layout.

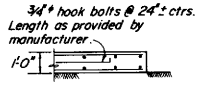
ALTERNATIVE 1



SIDE ELEVATION



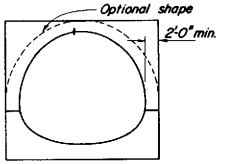
DETAIL B



SECTION A-A

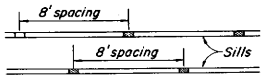
Note: Reinforce both faces of concrete collar with #4 @ 18 both ways.

ALTERNATIVE 2

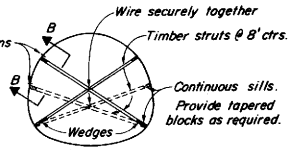


END ELEVATION

END BEVELS



SECTION B-B



TYPICAL SECTION

MAXIMUM HEIGHT OF FILL (Feet)																	
		Thickness (Inches)											LAYOUT DATA (inches)			
		0.109	0.138	0.168	0.188	0.109	0.138	0.168	0.188	0.218	0.249	0.280				
		Soil Pressure 1.5 Tons/s.f.				For soil pressures, see Table A below										
SPAN	RISE												RT	RS	RC	RB
12'-2"	11'-0"	16	16	16	16	17	26	33	38	46	54	59	68	93	38	134
12'-11"	11'-3"	15	15	15	15	16	24	31	36	43	51	56	73	95	38	144
13'-2"	11'-11"	14	14	14	14	16	24	31	35	42	50	55	73	103	38	159
13'-10"	12'-3"	13	13	13	13	15	22	29	33	41	48	52	77	108	38	164
14'-1"	12'-10"	13	13	13	13	15	22	29	33	40	47	51	77	115	38	182
14'-6"	13'-6"	13	13	13	13	14	21	28	32	39	46	50	78	131	38	174
14'-10"	14'-0"	13	13	13	13	14	21	27	31	38	45	49	79	136	38	192
15'-6"	14'-4"	12	12	12	12	13	20	26	30	36	43	47	84	138	38	201
15'-9"	15'-1"		12	12	12		20	26	29	35	42	46	83	150	38	212
16'-4"	15'-5"		12	12	12		19	25	28	34	40	44	86	157	38	215
16'-5"	16'-1"		11	11	11		19	25	28	34	40	44	88	158	38	271
16'-9"	16'-3"		11	11	11		19	24	28	33	39	43	89	167	38	247
17'-3"	17'-0"		14	14	14		18	23	27	32	38	42	90	174	47	215
18'-4"	16'-11"			13	13			22	25	30	36	39	99	157	47	249
19'-2"	17'-2"			13	13			21	24	29	35	38	105	156	47	264
19'-6"	17'-7"			12	12			21	24	29	34	37	107	158	47	297
20'-4"	17'-10"				12				23	28	33	36	113	156	47	314

Structures require strutting for fill heights below heavy lines.

NOTES:

A. Struts shown are minimum required and are for earth loads only.

B. Tabular data based on 6"x2" corrugations, (Structural steel plate)

C. Minimum cover from crown to shoulder hinge point = 5.0'.

D. Backfill shall be brought up uniformly on both sides of the structure.

E. Minimum cover for construction loading, see D-88 of Standard Plans.

STRUTTING DETAILS

SPAN	STRUT SIZE	SILL SIZE
13'-2"- 15'-6"	4 x 4	4 x 6
15'-9"–17'-3"	4 x 4	4 x 8
Over 17'-3"	6 x 6	6 x 8

TABLE A							
Spans	Soil Pressure Tons / S.F.						
	Thickness (Inches)						
	0.109	0.138	0.168	0.188	0.218	0.249	0.280
12'-2" to 16'-9"	1.7	2.5	3.3	3.7	4.5	5.3	5.8
17'-3" to 20'-4"	1.4	2.0	2.5	3.0	3.6	4.2	4.6

Reinforced concrete : F_s = 24,000 psi
N = 10
F_c = 1,300 psi

B14-1

STANDARD DRAWING

FILE No. XS-2-41	DESIGN By: G. S. Barber	Checked: Albert Banks	Approval Recommended By: W. J. Quinn
DRAWING 1/80	DETAILS By: G. Quinn	Checked: Albert Banks	REGISTERED CIVIL ENGINEER NUMBER 7 & 89
DATE	SUBMITTED BY G. S. Barber		

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

BRIDGE NO. / POST MILE / PROJECT ENGINEER / REGISTERED CIVIL ENGINEER NO.

STRUCTURAL STEEL PLATE VEHICULAR UNDERCOSSING

REVISION DATES (PRELIMINARY STAGE ONLY)

B14-1

DH-DS-D 147

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU
WO

Disregard prints bearing earlier revision dates

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TABLE OF FOOTING WIDTHS IN FEET

RISE / SPAN RATIO = 0.50

Span	Allowable Soil Pressure Tons/Sq.Ft.	Thickness (In.) H	5' / 0.109	10' / 0.109	0.109	0.138	0.168	0.188	0.218	0.249	0.280	Waterway Area (1) Sq.Ft.
10'	4		2.00	2.25	3.25							85
	6		2.00	2.00	2.75	3.25	◀	(2)	▶			85
	8		2.00	2.00								85
12'		H	5' / 0.109	10' / 0.109	18'	26'	34'					
	4		2.25	2.75	3.50	4.25						112
	6		2.25	2.25	3.00	3.50	4.00					112
	8		2.25									112
14'		H	5' / 0.138	10' / 0.138		22'	29'	34'				
	4		2.50	3.00		3.75	4.25	4.50				143
	6		2.50	2.50		3.50	4.00	4.25				143
	8		2.50	2.50		3.00	3.50	3.75				143
16'		H	5' / 0.168	10' / 0.168		20'	25'	29'				
	4		2.75	3.00		3.75	4.00	4.50				176
	6		2.50	2.50		3.50	3.75	4.25				176
	8		2.50	2.50		3.00	3.50	3.75				176
18'		H	5' / 0.168	10' / 0.168			23'	26'	31'			
	4		2.75	3.25			4.25	4.50				213
	6		2.50	2.75			4.00	4.25	4.50			213
	8		2.50	2.50			3.50	3.75	4.00			213
20'		H	5' / 0.188	10' / 0.188				24'	28'	33'		
	4		3.00	3.25				4.50				253
	6		2.50	3.00				4.25	4.50			253
	8		2.50	2.75				3.75	4.00	4.25		253
22'		H	5' / 0.218	10' / 0.218					25'	31'	33'	
	4		3.00	3.50					4.75			296
	6		2.50	3.25					4.50			296
	8		2.50	2.75					4.00	4.50	4.50	296
24'		H	5' / 0.249	10' / 0.249						27'	30'	
	4		3.00	3.50								342
	6		2.50	3.25								342
	8		2.50	3.00						4.25	4.25	342
26'		H	5' / 0.280	10' / 0.280							24'	
	4											
	6			3.50							4.00	391
	8			3.00							3.50	391

(1) Waterway area based on invert slab located at bottom of footing as shown on Typical Section.

(2) Structures to right of heavy line will require special design.

TABLE OF FOOTING WIDTHS IN FEET

RISE / SPAN RATIO = 0.30

Span	Allowable Soil Pressure Tons/Sq.Ft.	Thickness (In.) H	5' / 0.109	10' / 0.109	0.109	0.138	0.168	0.188	0.218	0.249	0.280	Waterway Area (1) Sq.Ft.
10'	4		4.25	4.00	5.25	6.25	7.25					65
	6		4.25	4.25	4.75	5.00	5.75		◀	(2)	▶	65
	8		4.25	4.25	4.75	4.50	5.00					65
12'		H	5' / 0.109	10' / 0.109	15'	22'	29'	34'				
	4		4.75	4.00	5.25	6.25	7.25					84
	6		4.75	4.50	4.75	5.00	5.75	6.25				84
	8		4.75	4.50	4.75	5.00	5.00	5.50				84
14'		H	5' / 0.138	10' / 0.138		19'	25'	29'	34'			
	4		4.75	4.00		7.25	8.50	9.25	10.25			105
	6		4.75	5.00		5.75	6.75	7.25	8.00			105
	8		4.75	5.00		5.50	6.25	6.50	7.00			105
16'		H	5' / 0.168	10' / 0.168			21'	25'	30'			
	4		5.00	5.00			7.00	7.50	8.25			128
	6		5.00	5.00			5.50	6.00	6.75			128
	8		5.00	5.00			5.00	5.75	5.75			128
18'		H	5' / 0.188	10' / 0.188				22'	27'	32'		
	4		5.00	5.25				7.25	7.75	9.00		152
	6		5.00	5.00				6.00	6.50	7.25		152
	8		5.00	5.00				5.00	5.50	5.75		152
20'		H	5' / 0.218	10' / 0.218					24'	29'	31'	
	4		5.00	5.25					8.00	8.00	8.75	177
	6		5.00	5.25					6.50	7.25	7.50	177
	8		5.00	5.25					5.50	6.00	6.75	177
22'		H	5' / 0.280	10' / 0.280							27'	
	4		5.25	5.75							8.75	205
	6		5.25	5.25							7.25	205
	8		5.25	5.25							6.25	205

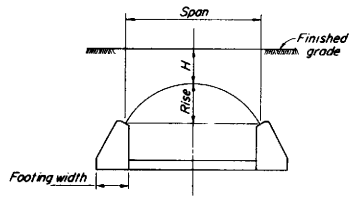
INVERT QUANTITIES PER LINEAL FOOT

Span	C.Y. Conc.	Lbs. Reinf.
10	0.34	8.7
12	0.41	10.9
14	0.49	12.4
16	0.56	14.0
18	0.64	16.2
20	0.71	17.8
22	0.78	19.3
24	0.86	21.6
26	0.93	23.1

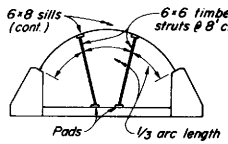
FOOTING QUANTITIES PER LINEAL FOOT (one footing)

Footing Width	C.Y. Conc.	Lbs. Reinf.
2.00	0.39	8.0
2.50	0.46	8.2
3.00	0.52	8.4
3.50	0.59	9.3
4.00	0.65	9.6
4.50	0.72	9.8
5.00	0.78	10.7
5.50	0.85	10.9
6.00	0.91	11.1
6.50	0.98	12.0
7.00	1.04	12.3
7.50	1.11	12.5
8.00	1.17	13.4
8.50	1.24	13.6
9.00	1.30	13.9
9.50	1.37	14.8
10.00	1.43	15.0
10.50	1.50	15.2

QUANTITIES SHOWN ARE FOR DESIGN PURPOSES ONLY



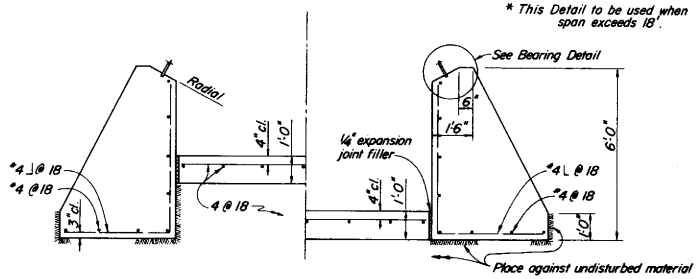
TYPICAL SECTION



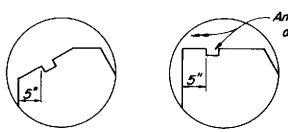
*STRUTTING DETAILS

Pad size as directed by Engineer

* This Detail to be used when span exceeds 18'.



FOOTING AND INVERT DETAILS



SLOPED SEAT
Rise / Span = 0.30

LEVEL SEAT
Rise / Span = 0.50

BEARING DETAIL

Reinforced Concrete: F_s = 24,000 P.S.I.
N = 10
F_c = 1,300 P.S.I.

NOTES:

A. Structural steel plate, 6" x 2" corrugations. Minimum depth of cover = 5'-0".

B. Footing widths not to be extrapolated or interpolated. Special designs required for loadings not covered.

C. Backfill shall be brought up uniformly on both sides of the structure.

D. Struts shown are minimum required and are for earth loads only.

E. Minimum cover for construction loading, see D-88 of Standard Plans.

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

R. C. Cassano
CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER

DATE APPROVED JULY 1, 1984

STANDARD DRAWING

FILE No. XS-2-42 | DESIGN By G. J. Barber | Checked Albert Barber | Approved for Publication By
DRAWING DATE 1/80 | DETAILS By B. J. Lacy | Checked Albert Barber
SUBMITTED BY G. J. Barber

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

PROJECT ENGINEER — REGISTERED CIVIL ENGINEER NO.

BRIDGE No.

POST MILE

STRUCTURAL STEEL PLATE ARCHES

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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Disregard prints bearing earlier revision dates

REVISION DATES (PRELIMINARY STAGE ONLY)

B14-2

130

B14-2

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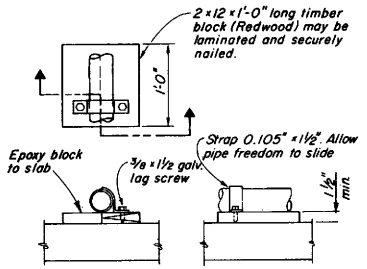
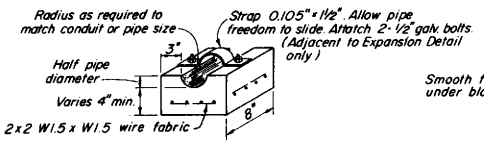
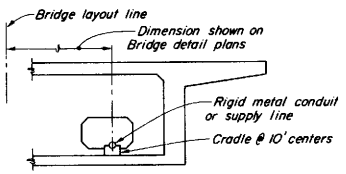


TIMBER ALTERNATIVE



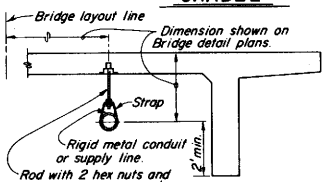
Note: Cradle to be precast concrete. Secure to bottom slab with epoxy adhesive.

CONCRETE ALTERNATIVE



BOX GIRDER

CRADLE



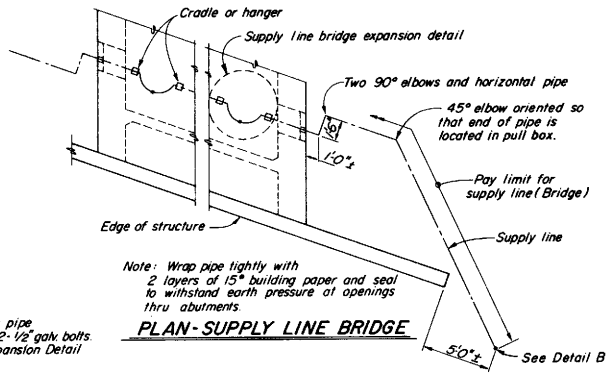
Note:
Cradle straps, hanger rods, and hanger straps to be galvanized after fabrication.

Conduit or pipe	2"	3"	4"
Rod	3/8"	1/2"	5/8"
Strap	0.090×1"	0.090×1"	0.105×1½"

OTHER THAN BOX GIRDER

HANGER

SUPPORT DETAILS

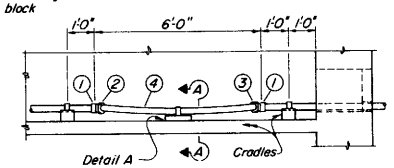


Note: Wrap pipe tightly with 2 layers of 15# building paper and seal to withstand earth pressure at openings thru abutments.

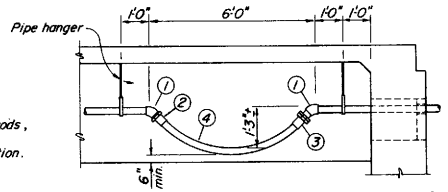
PLAN-SUPPLY LINE BRIDGE

DETAIL A

SECTION A-A



BOX GIRDER INSTALLATION

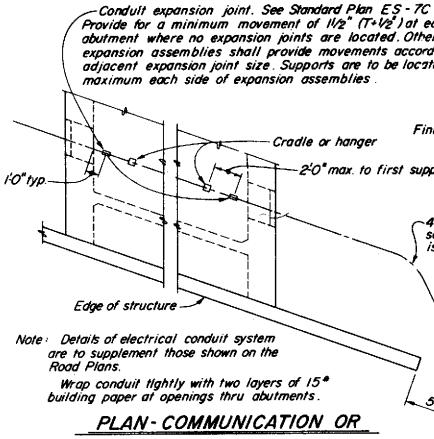


INSTALLATION FOR OTHER STRUCTURE TYPES

1. 45° pipe elbow
2. Hose fitting, male spud
3. Hose fitting, female spud with swivel nut.
4. Hose 6'3"± length (I.D. shall be nominal size of pipe).

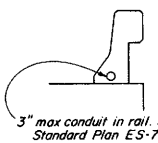
1. Use expansion assembly at one abutment or as shown elsewhere on the plans.
2. Openings through diaphragms and bent caps to be twice the diameter of the pipe unless otherwise detailed on the plans.

SUPPLY LINE BRIDGE EXPANSION DETAILS

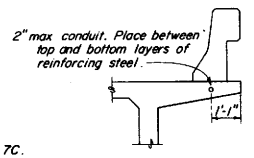


Note: Details of electrical conduit system are to supplement those shown on the Road Plans.
Wrap conduit tightly with two layers of 15# building paper at openings thru abutments.

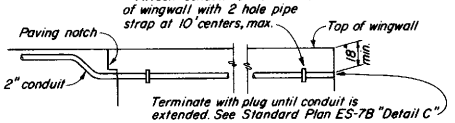
PLAN-COMMUNICATION OR SPRINKLER CONTROL CONDUITS



CONDUIT IN BRIDGE RAIL



CONDUIT IN OVERHANG

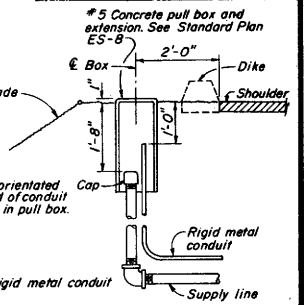


CONDUIT IN OVERHANG - WINGWALL DETAIL

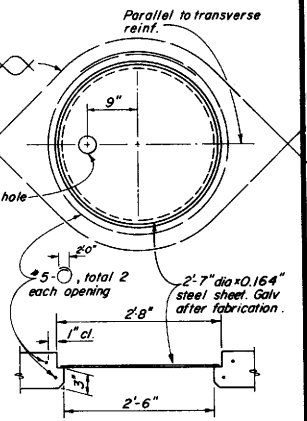
CONDUIT LOCATIONS

(For 2" conduit only except as noted)

For location see Bridge Detail plans.



DETAIL B



Locate where called for on plans. Adjust reinforcement to clear opening. Plate must be installed before top deck is placed.

ACCESS OPENING

STANDARD DRAWING				
FILE No. XS-20-45	DESIGN	By G.H. Imbsen	Checked C.W. PURKISS	Approved Recommended By
DRAWING DATE 1/80	DETAILS	By K.C. Blechinger	Checked C.W. PURKISS	
	SUBMITTED BY			

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

STRUCTURES-DESIGN

BRIDGE NO.

POST MILE

SUPPLY LINE AND COMMUNICATION & SPRINKLER CONTROL CONDUITS (MAXIMUM PIPE OR CONDUIT SIZE = 4")

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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Disregard prints bearing earlier revision dates

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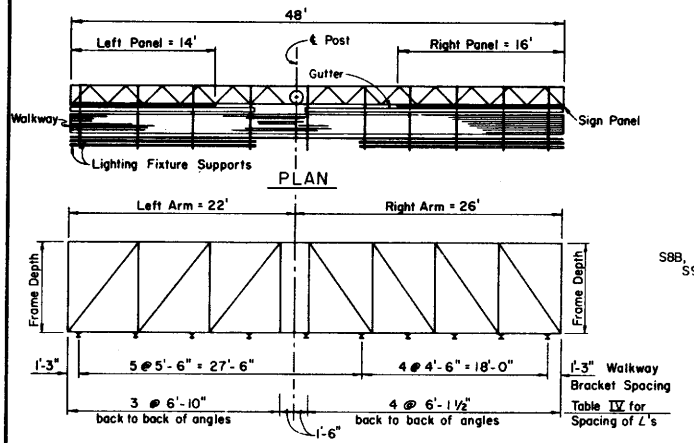
Return to Table of Contents

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



UNBALANCED SINGLE POST TYPE

EXAMPLE NO. 1

INSTRUCTIONS TO FABRICATOR

PROJECT PLANS SHOW:

1. Sign structure location.
2. Length of structure frame.
3. Panel size and locations on structure.
4. Walkway length for 2-post signs.
5. Post type and height to bottom of frame.
6. Base plate elevation.
7. Footing elevation or location of pile foundation.
8. Photoelectric cell location if required.

REFER TO THE FOLLOWING STANDARD PLANS FOR DETAILS NOT SHOWN ON PROJECT PLANS:

S1-12 Instructions and examples.
S2-11 Post types II thru VIII.
S3-11 Post types I-S thru VIII-S.
S4-6 Structural frame members.
S5-6 Structural frame members.
S6-8 Structural frame details.
S7-8 Frame juncture details.
S8B, S8C, S8D Sign panel mounting details.
S9-12 & S10-9 Walkway details no. 1 & no. 2.
S11-10 Walkway safety railing details.
S13-10 Pile foundation.
ES-29 Mercury Sign Lighting Equipment.
ES-31 72" Fluorescent Sign Lighting Equipment
ES-32 Sign Lighting Equipment

WALKWAY BRACKETS: Space all walkway brackets maintaining uniform spacing where possible. Maximum spacing shall not exceed 5'-6".

LIGHTING FIXTURE SUPPORTS: Where distance from walkway bracket to end of sign panel exceeds 1'-4", extend lighting fixture supports to next walkway bracket. See example 2.

WALKWAY AND SAFETY RAILING: Walkway to be continuous for entire length of frame for single post signs. For 2 post signs see Project Plans. 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.

R. L. Clausen
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1984

GENERAL NOTES

SPECIFICATIONS:

DESIGN: A.A.S.H.O. Specifications for the Design and Construction of Structural Supports for Highway Signs, dated 1968.

CONSTRUCTION: Standard Specifications 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.

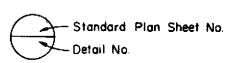
WALKWAY LOADING: Dead load + 500 lbs. concentrated live load.

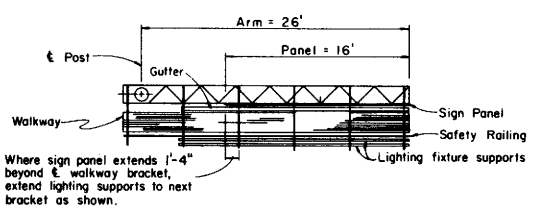
UNIT STRESSES:

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.

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

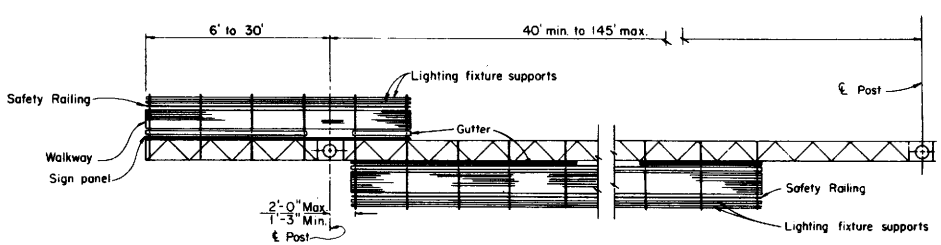
WELDING: All welding continuous unless otherwise noted on the plans. All welding to be done in accordance with the Standard Specifications.





PLAN
CANTILEVER SINGLE POST TYPE

EXAMPLE NO. 2



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

EXAMPLE NO. 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS TRUSS INSTRUCTIONS AND EXAMPLES

SI-12

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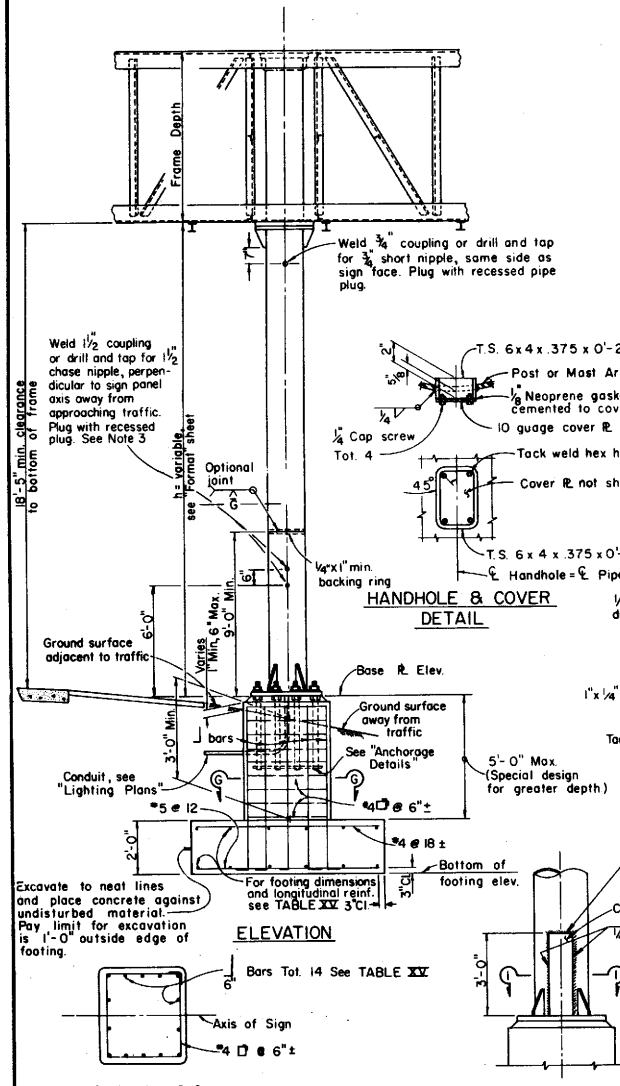

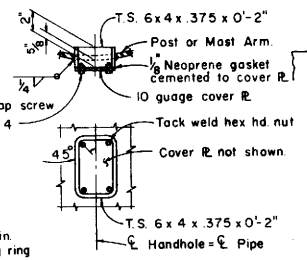

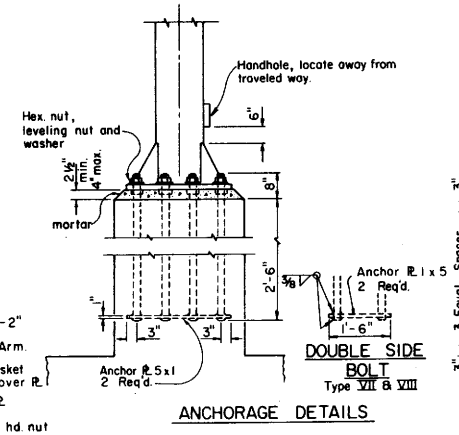

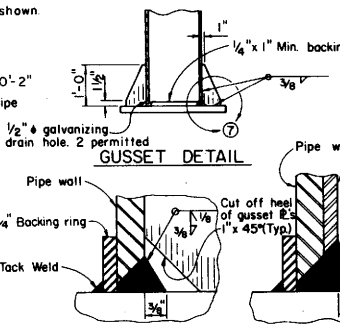

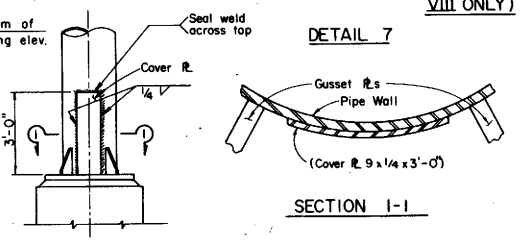

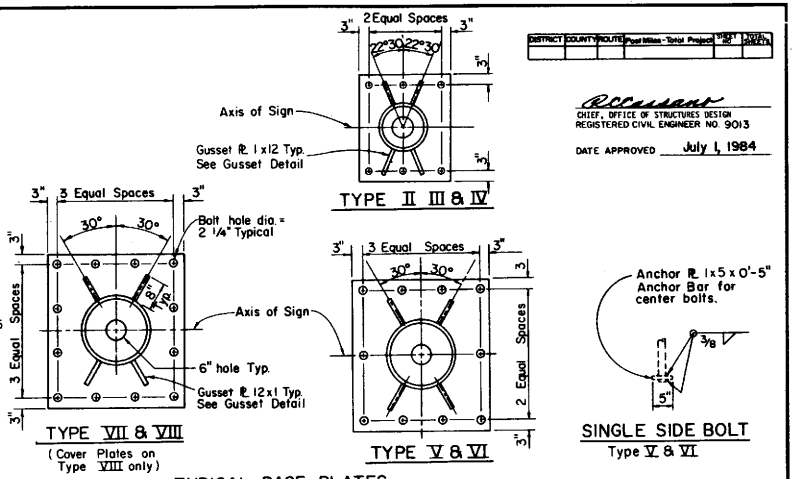

DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1984

TABLE XV

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"x1'-7"x 7/8"	2'-4"x2'-1"x2"	6	2'-11"x2'-8"	7'-0"x10'-0"	6-#4 bars	9-#5 bars	#5
III	14"O.D.@ 72.09	1'-8"x1'-8"x 7/8"	2'-7"x2'-3"x2"	6	3'-2"x2'-10"	8'-0"x12'-0"	6-#5 bars	8-#7 bars	#6
IV	16"O.D.@ 82.77	1'-10"x1'-10"x 7/8"	3'-1"x2'-9"x2"	6	3'-8"x3'-4"	8'-0"x14'-0"	6-#5 bars	9-#8 bars	#6
V	18"O.D.@ 93.45	2'-0"x2'-0"x 7/8"	3'-3"x3'-0"x2"	10	3'-10"x3'-7"	9'-0"x15'-0"	6-#5 bars	9-#9 bars	#7
VI	20"O.D.@ 104.13	2'-2"x2'-2"x1"	3'-3"x3'-0"x2"	10	3'-10"x3'-7"	9'-0"x16'-0"	6-#6 bars	8-#10 bars	#8
VII	24"O.D.@ 125.49	2'-6"x2'-6"x1"	3'-7"x3'-3"x2"	12	4'-3"x3'-11"	10'-0"x17'-0"	7-#6 bars	10-#10 bars	#10
VIII	24"O.D.@ 125.49 with cover PL	2'-6"x2'-6"x1"	3'-9"x3'-3"x2"	12	4'-5"x3'-11"	10'-0"x18'-0"	10-#6 bars	11-#10 bars	#10

NOTES:
1. For "General Notes" see "Instructions and Examples" sheet, S1-12.
2. Longer sides of Base Plates, Pedestals & Footing 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 Pile Foundation when shown on the Project Plans
6. Anchor PLs may be retained with hex. nut or formed head as alternatives to details shown.
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.
9. When foundation is located on a steep slope with exposed face of concrete adjacent to traffic, see detail on "Pile Foundation" sheet, S13-10.
10. Slope protection required when indicated on the Project Plans.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
TRUSS
SINGLE POST TYPE
POST TYPES II THRU VIII

S2-11

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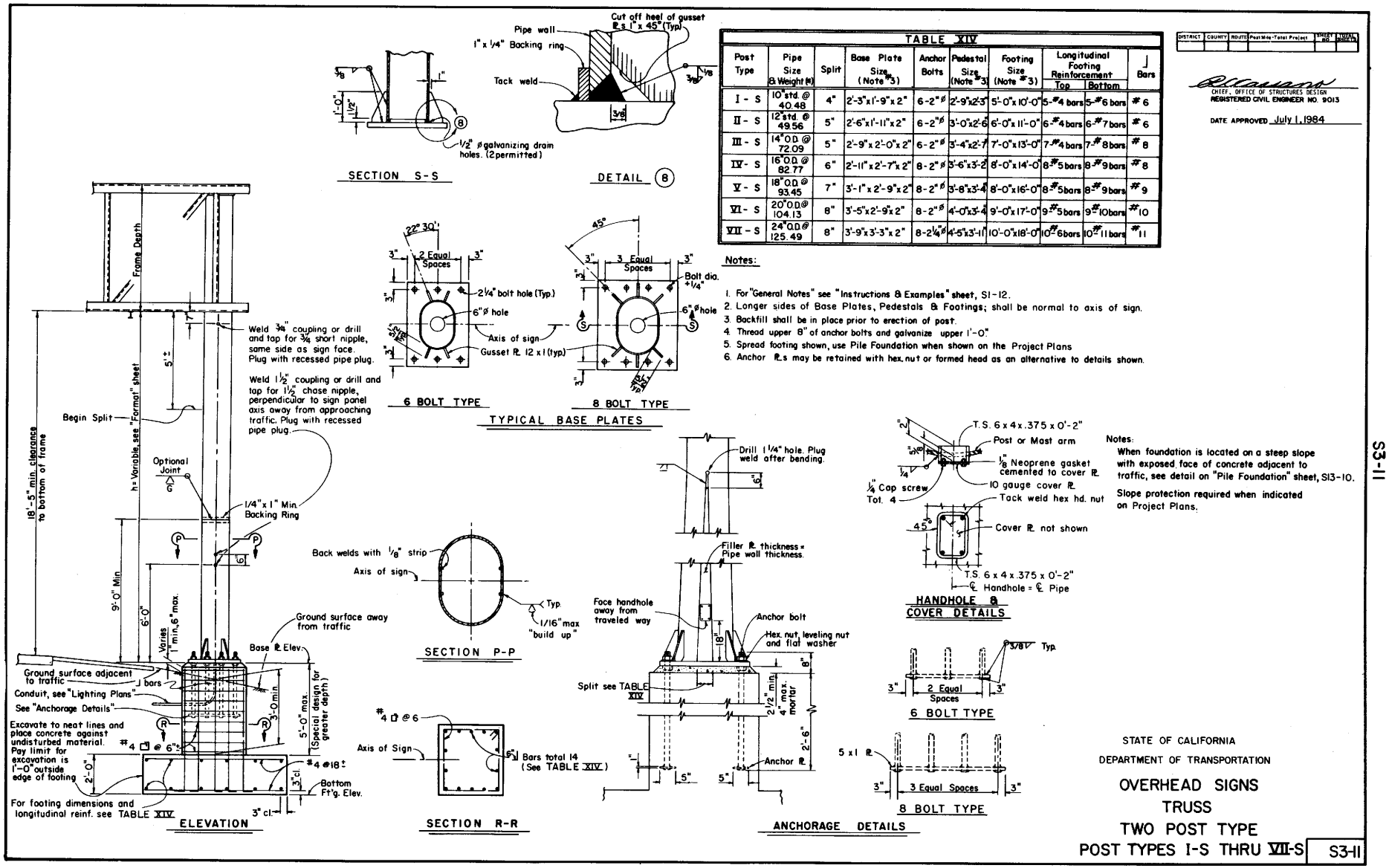

TABLE XIV									
Post Type	Pipe Size & Weight (#)	Split	Base Plate Size (Note #3)	Anchor Bolts	Pedestal Size (Note #3)	Footing Size (Note #3)	Longitudinal Footing Reinforcement Top	Longitudinal Footing Reinforcement Bottom	Bars
I - S	10" std. @ 40.48	4"	2'-3" x 1'-9" x 2"	6-2" ø	2'-9" x 2'-3"	5'-0" 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 "General Notes" see "Instructions & Examples" sheet, S1-12.
2. Longer sides of Base Plates, Pedestals & Footings; 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 Pile Foundation when shown on the Project Plans
6. Anchor PLs may be retained with hex. nut or formed head as an alternative to details shown.

Notes:

When foundation is located on a steep slope with exposed face of concrete adjacent to traffic, see detail on "Pile Foundation" sheet, S13-10.

Slope protection required when indicated on Project Plans.

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1984

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

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

S3-11

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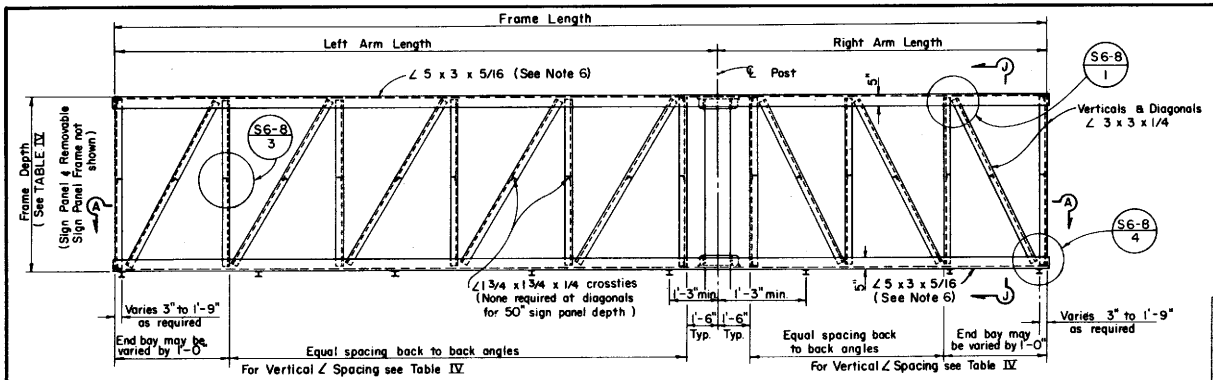
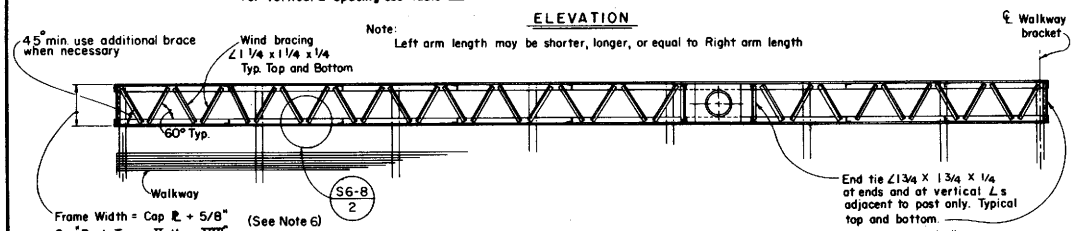


ELEVATION

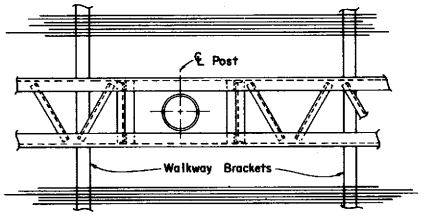
Note:
Left arm length may be shorter, longer, or equal to Right arm length



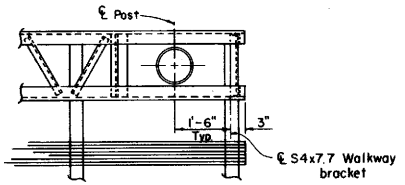
SECTION A-A

Sign Panel Depth	Frame Depth	Maximum Vertical Spacing	See Note 7
50"	4'-8"	4'-6"	4'
70"	6'-4"	5'-6"	4'
80"	7'-2"	6'-0"	5'
90"	8'-0"	7'-0"	5'
100"	8'-10"	7'-0"	6'
110"	↓	↓	6'
120"	↓	↓	6'

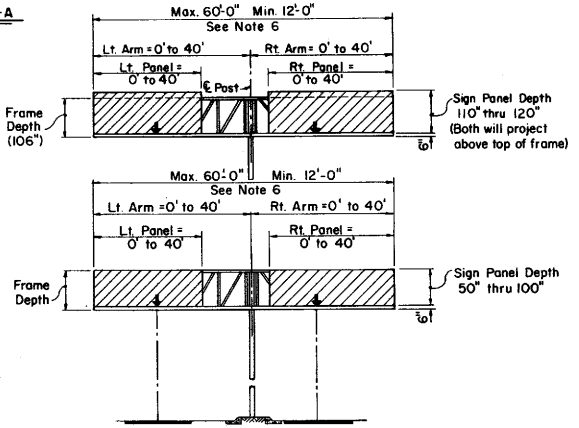
TABLE IV



PART PLAN OF DOUBLE FACED TYPE AT POST



PART PLAN OF CANTILEVER TYPE AT POST



▨ = Sign Panel

RANGE OF STRUCTURE SIZES

NOTES:

1. For connection of frame to post see S7-8
2. For walkway see S9-12 & S10-9
3. For walkway length see S1-12
4. Minimum length of frame = 12'-0"
5. Maximum length of frame = 60'-0"
6. For arm lengths 35' to 40' and sign depths 80" thru 120":
   a. Use 5x3x 7/16 chord ∠'s.
   b. Frame width = Cap ℞ + 7/8".
7. Diagonal not required if arm length is equal to or less than shown in this column.

Standard Plan Sheet No.
Detail No.

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1984

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS TRUSS SINGLE POST TYPE STRUCTURAL FRAME MEMBERS

S4-6

S4-6

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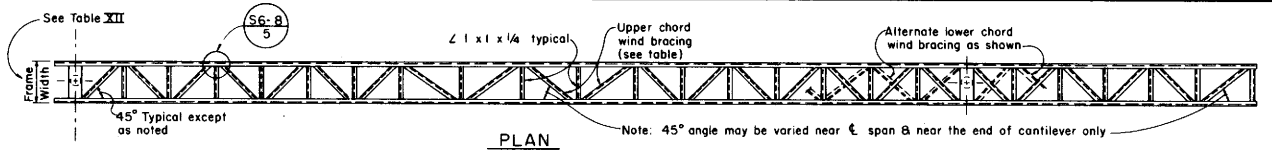
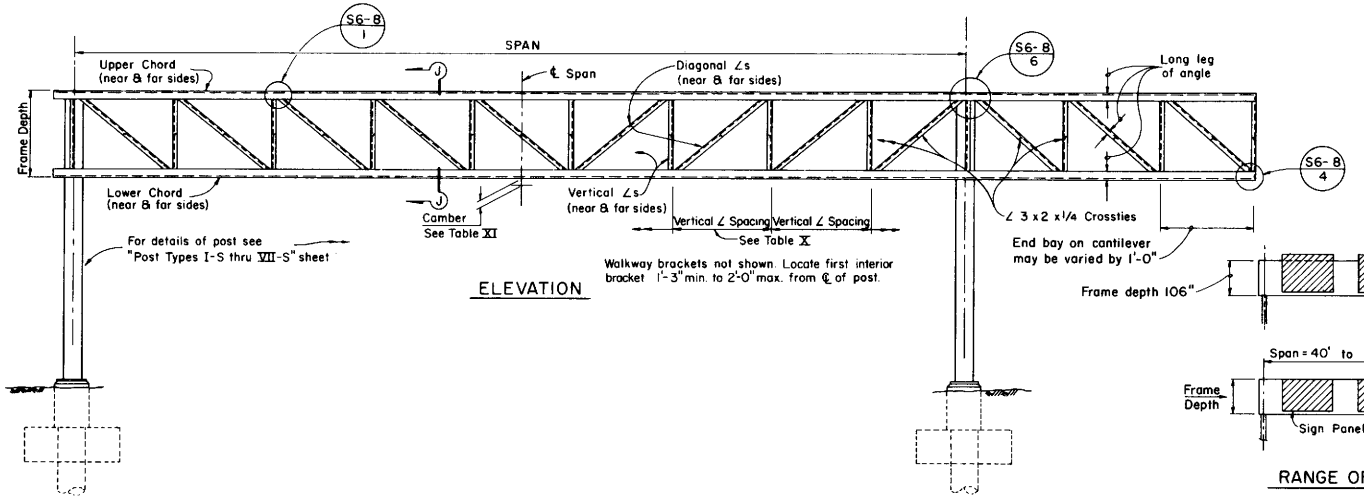
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

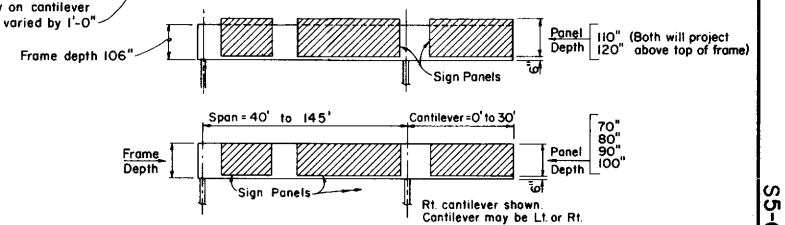
DATE APPROVED July 1, 1984



PLAN



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

Span	100" Panel Depth				
	Frame Width	Chord ∠'s	Vertical ∠'s	Diagonal ∠'s	Wind Bracing
40'-50'	2'-0"*	5x3½x5/16	3x3x5/16	3x3x5/16	1¼x1¼x1/4
51'-60'	2'-0"*	5x3½x5/16			1¼x1¼x1/4
61'-70'	2'-6"†	5x3½x5/16			1½x1½x1/4
71'-80'	3'-0"	6x4x3/8			1¾x1¾x1/4
81'-90'	3'-0"	6x4x3/8			1¾x1¾x1/4
91'-100'	3'-0"	6x4x3/8			1¾x1¾x1/4
101'-110'	3'-6"	7x4x7/16			2x2x1/4
111'-120'	3'-6"	7x4x7/16			2x2x1/4
121'-132'	3'-6"	8x4x1/2			2x2x1/4
133'-145'	3'-6"	8x4x5/8	↓	↓	2x2x1/4

TABLE XII

Span	110" & 120" Panel Depth				
	Frame Width	Chord ∠'s	Vertical ∠'s	Diagonal ∠'s	Wind Bracing
40'-50'	2'-0"*	5x3½x5/16	3x3x5/16	3x3x5/16	1¾x1¾x1/4
51'-60'	2'-0"*	5x3½x5/16			1¾x1¾x1/4
61'-70'	2'-6"†	↓			2x2x1/4
71'-80'	3'-0"	6x4x3/8			2x2x1/4
81'-90'	3'-0"	6x4x3/8			2½x2½x1/4
91'-100'	3'-6"	↓			2½x2½x1/4
101'-110'	3'-6"	7x4x7/16			2½x2½x1/4
111'-120'	3'-6"	8x4x1/2	↓		3x3x1/4
121'-132'	3'-6"	8x4x5/8	3½x3½x5/16		3x3x1/4
133'-145'	3'-6"	9x4x5/8	↓	↓	3x3x1/4

TABLE XI

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

TABLE X

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

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

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

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

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
TRUSS
TWO POST TYPE
STRUCTURAL FRAME MEMBERS

S5-6

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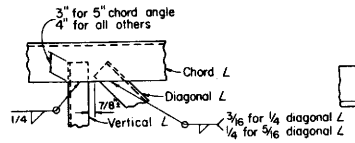
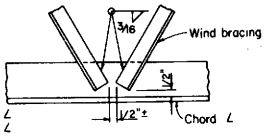
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE July 1, 1984



DETAIL 1



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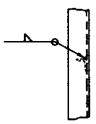

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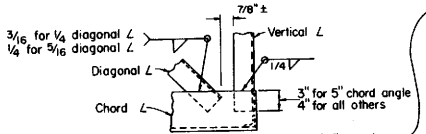

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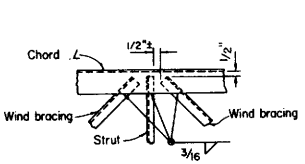

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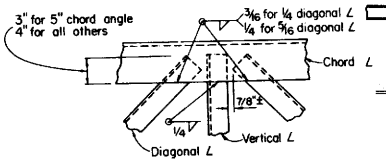
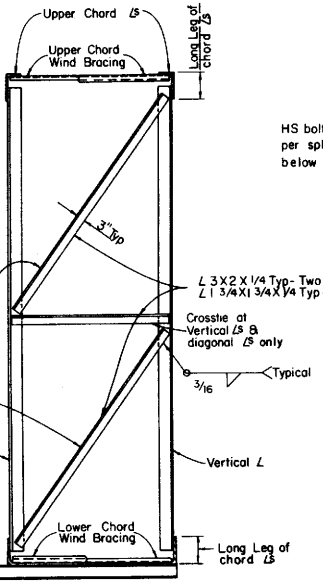
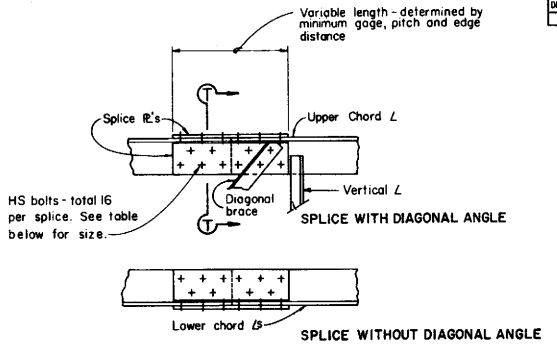


DETAIL 6

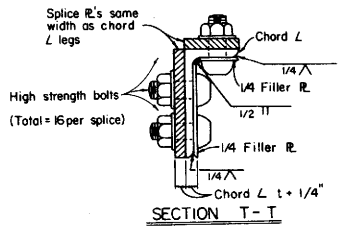


TYPICAL SECTION J-J

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



BOLTED CHORD SPLICE



SECTION T-T

SPLICE NOTES

Specifications:
The bolted splice shall conform to current "Specifications for Structural Joints Using ASTM A325 Bolts or A490 Bolts" approved by the Research Council on Structural Connections of the Engineering Foundation except all material shall be galvanized before assembly.

Location of Splices:
The splice shall be located so as not to interfere with mounting the walkway brackets or the clip angles for the removable sign panel frame. The wind bracing in the area of the bolted chord splice shall be bolted to the chord angles with a 3/8" bolt, nut, 2 cut washers and lock washer.

Filler PL:
The plates welded to the angle legs on the inside shall be welded before punching the bolt holes. They shall be the same length as the cover plates. The plates are not necessary on the single post signs if the splice is located over 1/3 of the cantilever length from the post. Alternative splice details may be used if approved by the Engineer.

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"
9X4 X 5/8	1-1/4"
SINGLE POST SIGNS	
Chord L	Nominal Bolt Diam.
5X3 X 5/16	3/4"
5X3 X 7/16	3/4"

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS

TRUSS

STRUCTURAL FRAME DETAILS

S6-8

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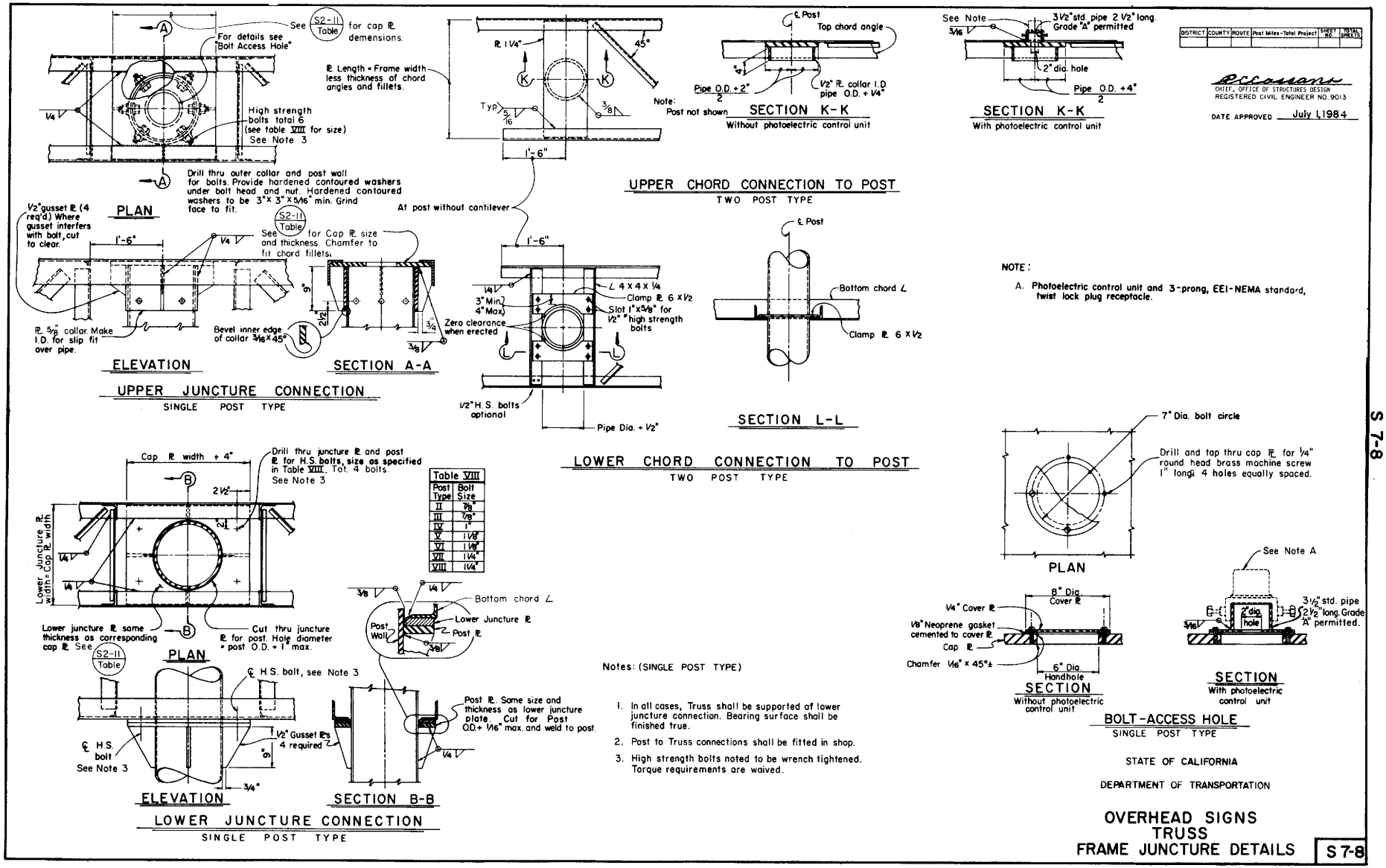

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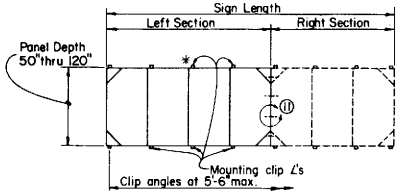
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1984

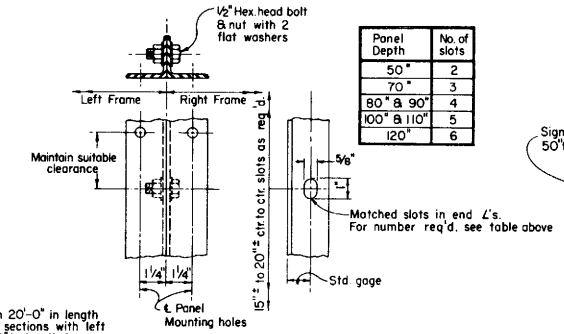


REMOVABLE FRAME
GREATER THAN 20'-0"

*110" & 120" sign panel frame will project above the top chord of the truss. In these cases the top clips shall be bolted to vertical frame members. See S 8D for details.

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'

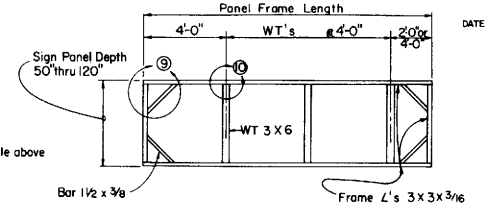
NOTES:
Frames for signs greater than 20'-0" in length shall be fabricated in two sections with left section a multiple of 4'-0" in length. See table above.
Sections shall be hoisted into place individually and bolted together as per detail ⑪ prior to tightening of mounting clip bolts.
Bolting two sections together and hoisting simultaneously will not be permitted.



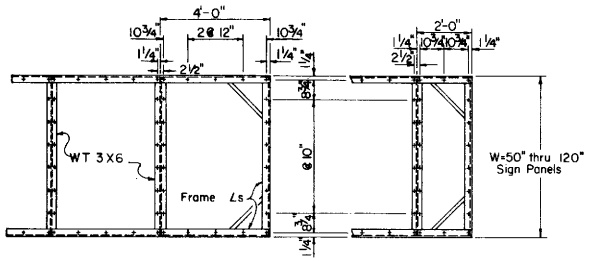
Panel Depth	No. of slots
50"	2
70"	3
80" & 90"	4
100" & 110"	5
120"	6

DETAIL ⑪
No Scale

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



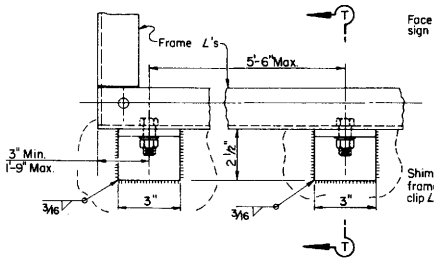
TYPICAL REMOVABLE FRAME
(4'-0" thru 20'-0")



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

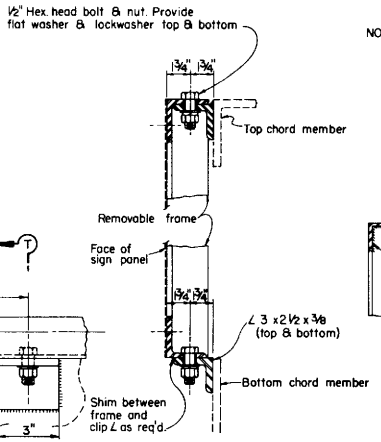
Note: All holes 1/2" diameter maximum.

MOUNTING HOLE SPACING FOR SIGN PANEL & FRAME
Scale: 1/2" = 1'-0"
Hole spacing is for single sheet sign panels.
For Overhead Formed Panels refer to "Overhead Formed Panel" Sheet.



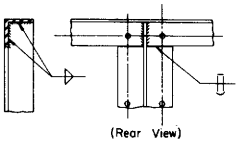
FRAME MOUNTING DETAILS
No Scale

Details shown apply for sign panel frames ≤ 100" deep. Mounting details for deeper panels shown on S 8D.

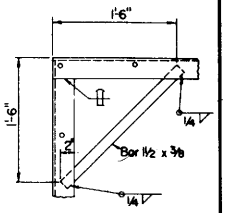


SECTION T-T

NOTES:
1. Frames shall be all-welded construction.
2. 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. WT 3 X 6 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. WT 3X6 may be crimped at ends to join frame angles. Fillet weld all around.



DETAIL ⑩



DETAIL ⑨

TYPICAL JOINT DETAILS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
STEEL FRAME
REMOVABLE SIGN PANEL FRAMES

S8B

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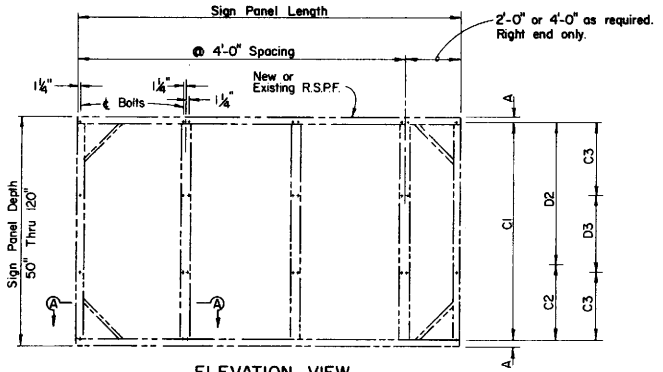
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

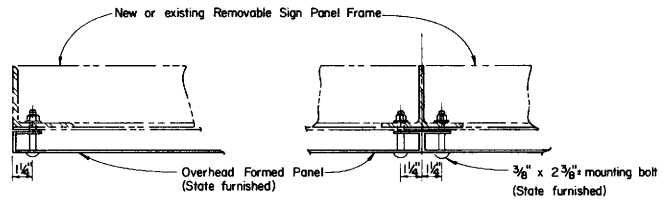
APPROVED July 1, 1984



ELEVATION VIEW
NEW OR EXISTING REMOVABLE SIGN PANEL FRAME
MOUNTING HOLE SPACING

PANEL DEPTH	MOUNTING BOLT SPACING						
	A	1 Space	2 Space		3 Space		
		C1	C2	D2	C3	D3	C3
50"	1¼"	47½"					
60"			28¾"	28¾"			
70"			48¾"	18¾"			
80"			38¾"	38¾"			
90"			38¾"	48¾"			
100"			48¾"	48¾"			
110"					38¾"	30"	38¾"
120"	1¼"				48¾"	20"	48¾"

TABLE I



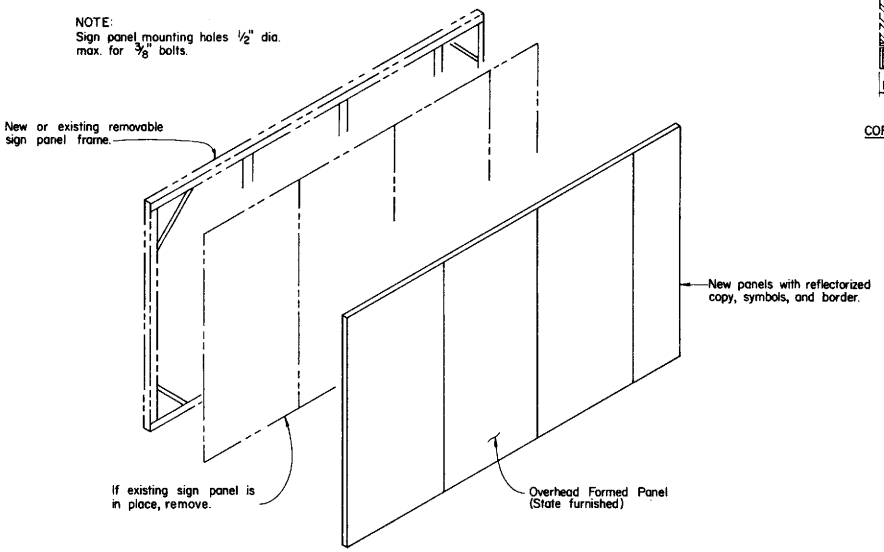
CORNER DETAIL

PANEL CONNECTION

SECTION A-A

NOTES:
When constructing a new frame:
(1) refer to standard plan sheet S8B for structural details,
(2) sign panels shall be considered as a template for drilling holes for mounting bolts.

NOTE:
Sign panel mounting holes ½" dia. max. for ⅜" bolts.



NOTE:
THE CONTRACTOR SHALL VERIFY ALL DEPENDENT DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD FORMED PANEL DETAILS FOR MOUNTING ON REMOVABLE SIGN PANEL FRAMES

S8-BA

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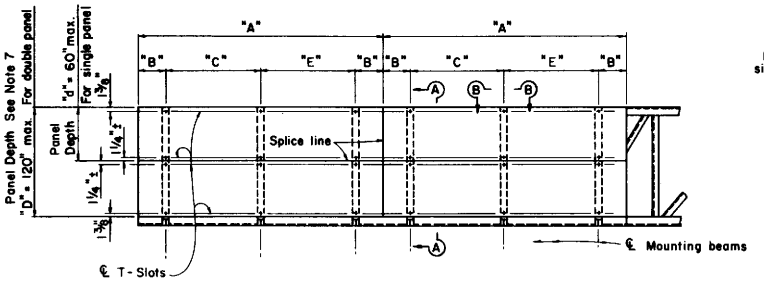
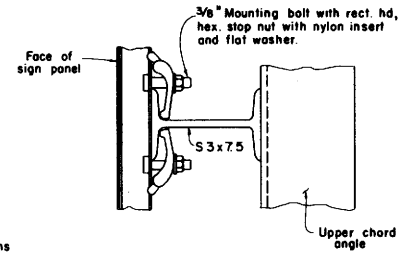
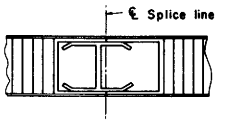


SIGN-ELEVATION



VIEW B-B



SECTION D-D

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

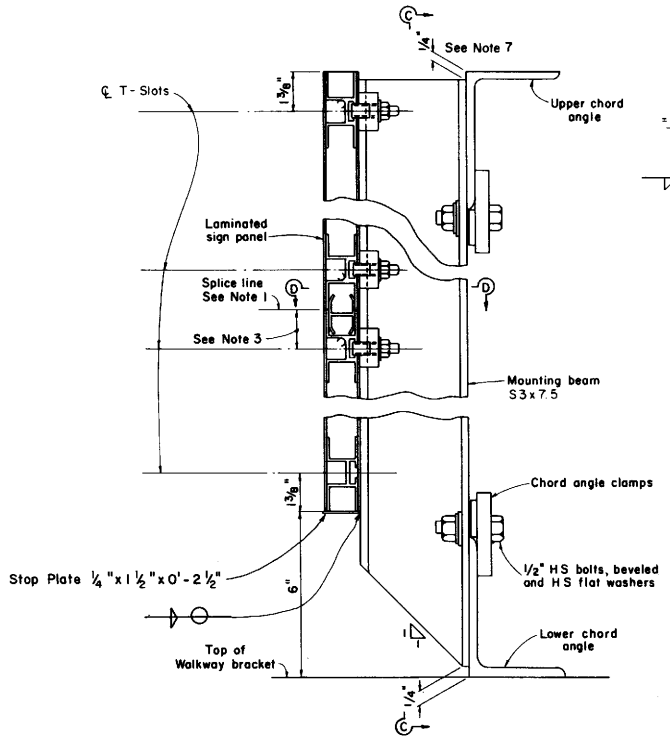
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED July 1, 1984

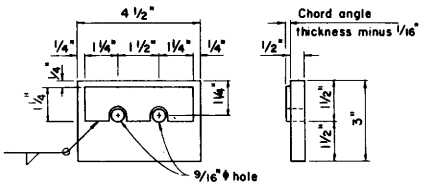
Sign Panel Length *	Number Mounting Beams	Sign Panel Overhang	Mounting Beam Spacing	
"A"		"B"	"C"	"E"
5' - 0"	2	9"	3'-6"	
6' - 0"	2	12"	4'-0"	
7' - 0"	2	15"	4'-6"	
8' - 0"	2	18"	5'-0"	
9' - 0"	2	22"	5'-4"	
10' - 0"	2	24"	6'-0"	
11' - 0"	2	24"	7'-0"	
12' - 0"	2	30"	7'-0"	
13' - 0"	2	30"	8'-0"	
14' - 0"	2	30"	9'-0"	
15' - 0"	2	36"	9'-0"	
16' - 0"	3	6"	7'-6"	7'-6"
17' - 0"	3	12"	7'-6"	7'-6"
18' - 0"	3	12"	8'-0"	8'-0"
19' - 0"	3	12"	8'-6"	8'-6"
20' - 0"	3	18"	8'-6"	8'-6"
21' - 0"	3	18"	9'-0"	9'-0"
22' - 0"	3	24"	9'-0"	9'-0"
23' - 0"	3	30"	9'-0"	9'-0"
24' - 0"	3	36"	9'-0"	9'-0"

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

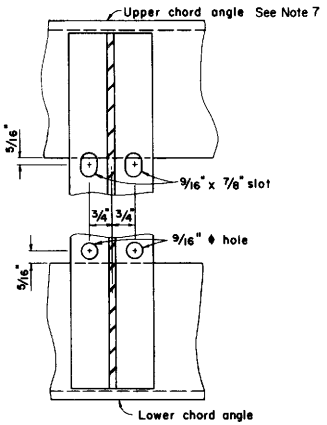
MOUNTING BEAM SPACING TABLE



SECTION A-A



CHORD ANGLE CLAMP



SECTION C-C

NOTES:

1. The size and number of individual sign panel plus the location of splice line is dependent on the sign panel manufacturer.
2. Mounting bolts are required on each side of the horizontal splice lines.
3. Dimension varies from panel to panel. Average value approximate 1 1/4".
4. Torque aluminum sign panel mounting bolts to 100 in-lbs.
5. Chord angle clamp to be galvanized after fabrication.
6. The Contractor shall verify all dependent dimensions in the field before ordering or fabricating any material.
7. 110" & 120" sign panels along with the mounting beams will project above the top chord truss member 10" & 20" respectively. Attachment details shall be the same.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
TRUSS
SIGN PANEL MOUNTING DETAILS
LAMINATED PANEL, TYPE A

S8C

141

S8C

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District	County	Route	Post Miles Total Project	Sheet No.	Total Sheets

CHIEF, OFFICE OF STRUCTURES DESIGN
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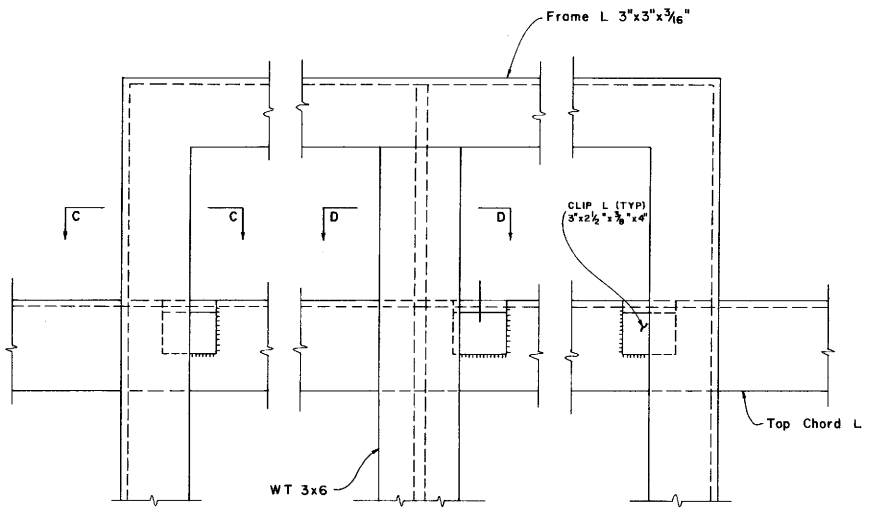
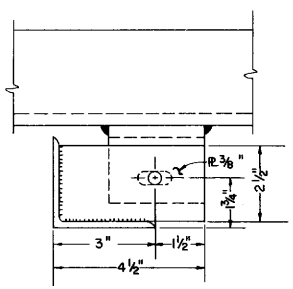
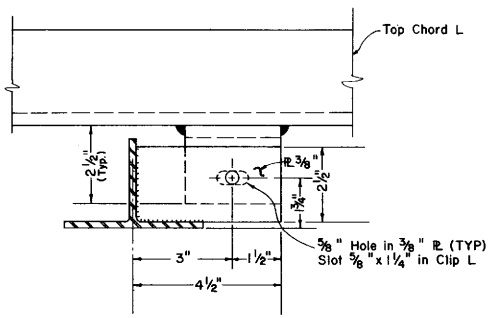


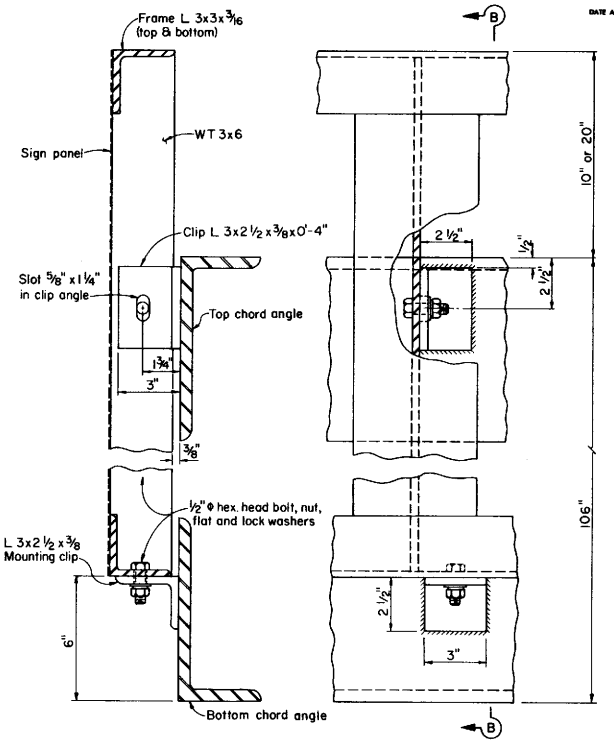


SECTION C-C



SECTION D-D

ALTERNATIVE CONNECTIONS AT TOP CHORD



SECTION B-B

ELEVATION VIEW

STEEL REMOVABLE SIGN PANEL FRAMES

NOTES:

1. For steel RSPF details see sheet S 8B.
2. Minimum fillet weld is ¼" for clip angles welded to chord member of truss.
3. Maximum spacing of bottom clip angle is 5'-6".
4. Top clips required for each vertical member of RSPF.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
TRUSS
REMOVABLE SIGN PANEL FRAMES
110" & 120" SIGN PANELS

S 8D

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

CHIEF, OFFICE OF STRUCTURES DESIGN
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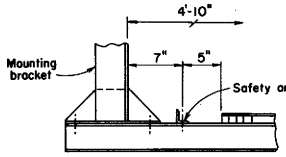
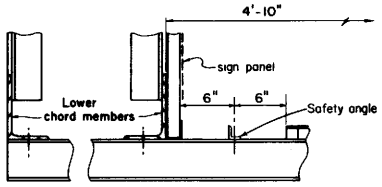
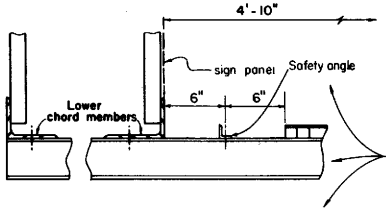


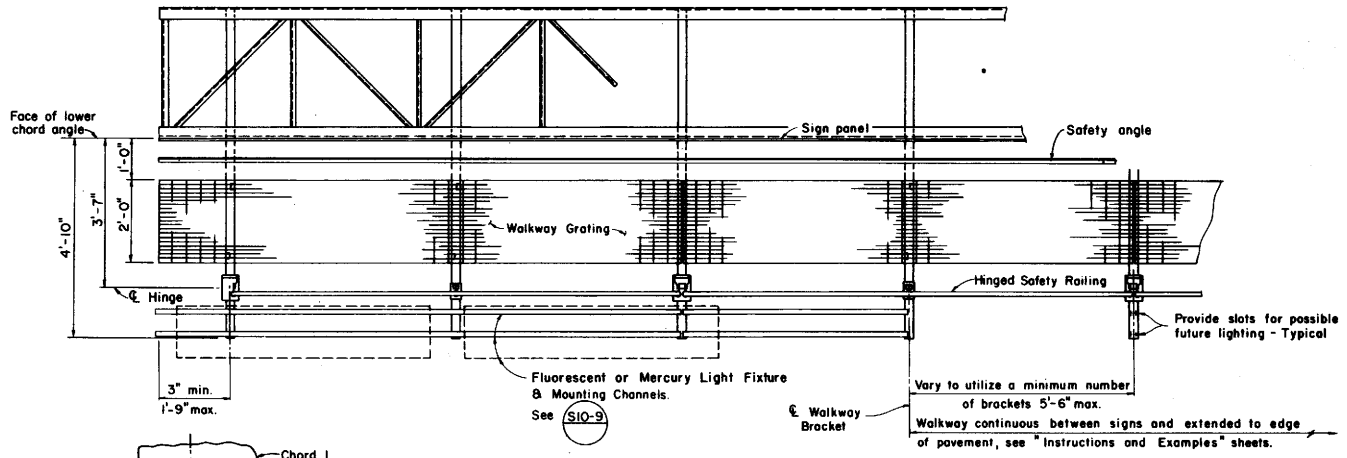
BRIDGE MOUNTED



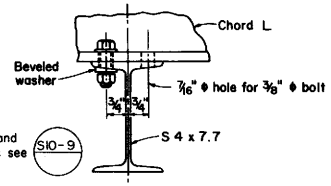
BOX BEAM
CLOSED TRUSS ALTERNATIVE

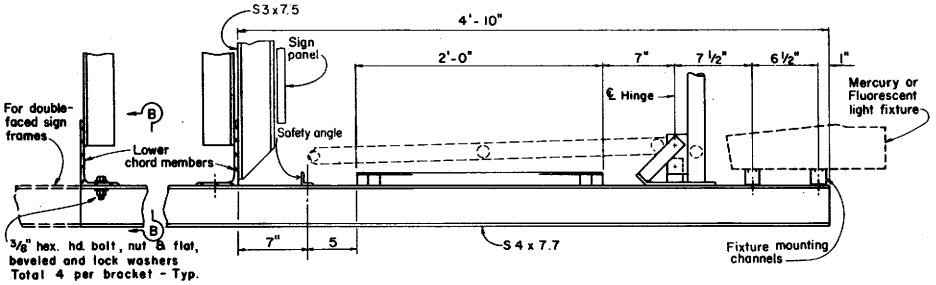


BOX BEAM



WALKWAY PLAN





TRUSS

TYPICAL WALKWAY SECTION

NOTE:
1. For spacing of lighting fixtures, see Standard Plans ES-29 and ES-31.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
WALKWAY DETAILS NO. 1

S 9-12

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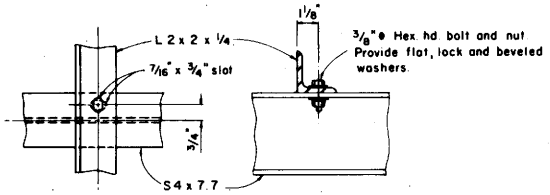
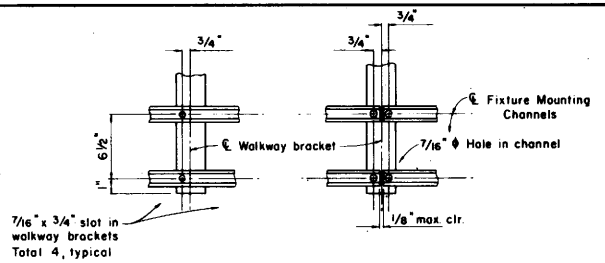
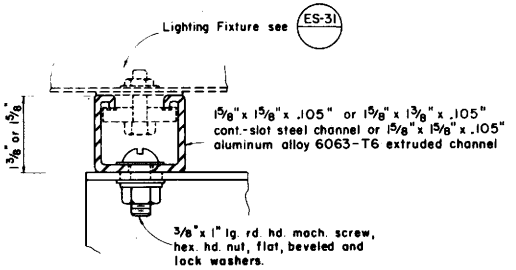


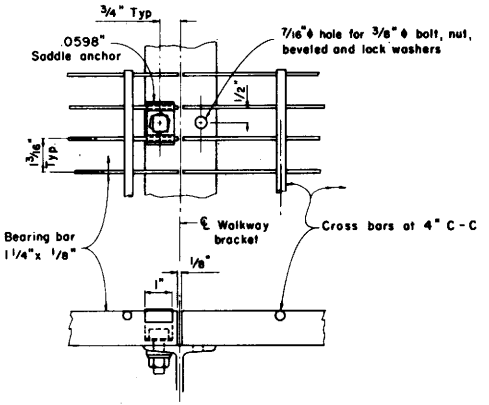
SAFETY ANGLE DETAILS
FOR BRIDGE MOUNTED SIGNS



TYPICAL CONNECTION CONNECTION AT SPLICE



LIGHT FIXTURE MOUNTING CHANNEL DETAILS



WALKWAY DETAILS

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

CHIEF, OFFICE OF STRUCTURES DESIGN
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NOTES:

1. Welded type grating shall have 1 1/4" x 1/8" bearing bars at 1 3/16" centers with 1/4" diameter (or equal) cross bars at 4" centers. 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. 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 assembly.
3. Gutter section to be made in convenient length and welded or brazed together in the field.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
WALKWAY DETAILS NO. 2

S10-9

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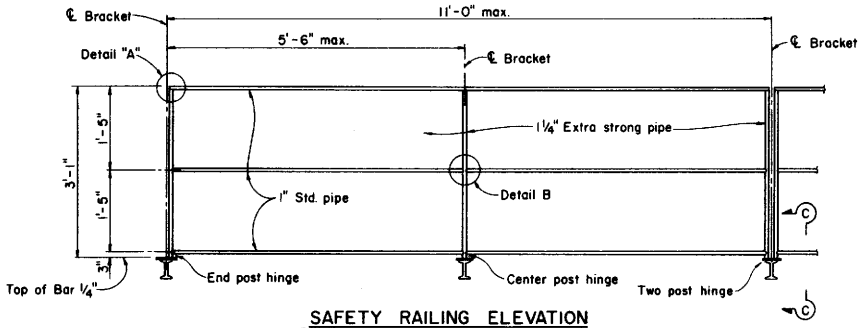
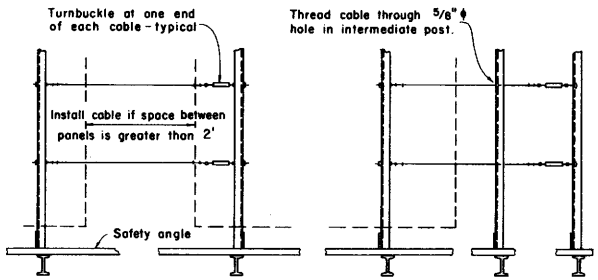


SAFETY RAILING ELEVATION



BETWEEN PANELS

BEYOND PANEL

SAFETY CABLE ELEVATION

FOR BRIDGE MOUNTED SIGNS

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

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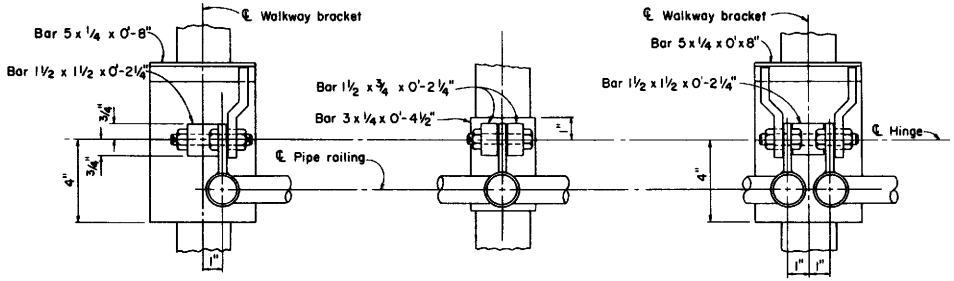
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED July 1, 1984

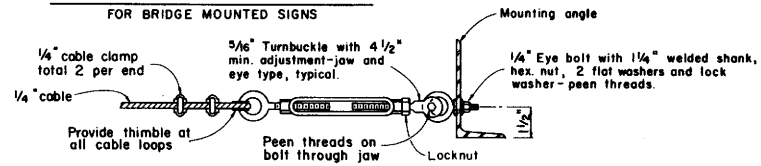


END POST

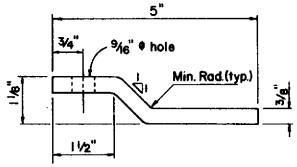
CENTER POST

TWO POST

HINGE - PLAN



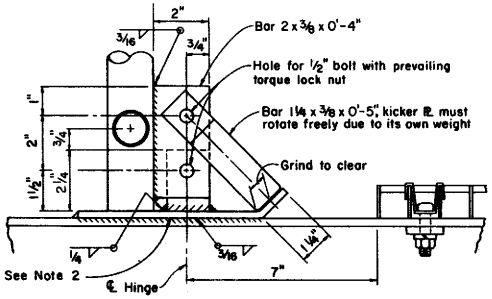
TURNBUCKLE DETAILS



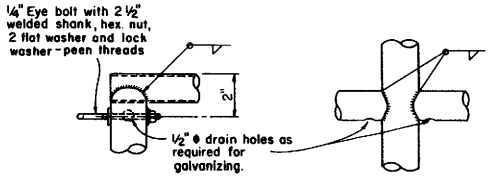
PLAN - KICKER BAR

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 plate to walkway bracket may be submitted for approval.
3. Safety chain shall be 3/16" galv. steel coil chain, approx. 12 links per foot. Length shall be minimum which allows lock-up of safety railing.



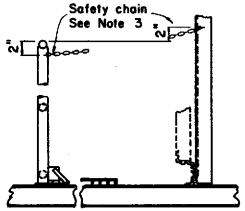
SECTION C-C



DETAIL A

DETAIL B

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



CHAIN ASSEMBLY

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATIONS

OVERHEAD SIGNS
WALKWAY SAFETY RAILING DETAILS

S 11-10

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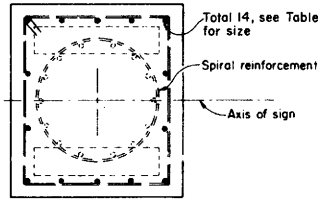
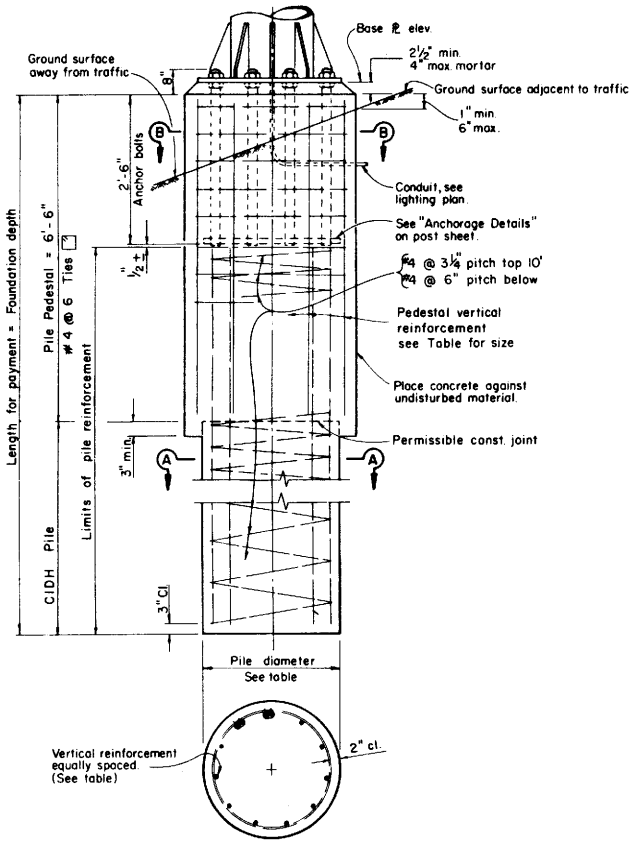


SECTION B-B



SECTION A-A

Post Type	Anchor Bolts	Pedestal Size	Reinforcing Steel Vertical	Pile Diameter	Foundation Depth**
II	6 - 2"	2'-11" x 2'-10"	14 - # 7	30"	14'
III	6 - 2"	3'-2" x 2'-10"	14 - # 8	30"	14'
IV	6 - 2"	3'-8" x 3'-4"	16 - # 8	36"	14'
V	10 - 2"	3'-10" x 3'-7"	16 - # 9	36"	17'
VI	10 - 2"	3'-10" x 3'-7"	16 - #10	36"	18'
VII	12 - 2"	4'-3" x 3'-11"	16 - #11	36"	21'
VIII	12 - 2"	4'-5" x 3'-11"	24* - #11	36"	22'
I-S	6 - 2"	2'-10" x 2'-10"	14 - # 7	30"	14'
II-S	6 - 2"	3'-1" x 2'-10"	14 - # 8	30"	16'
III-S	6 - 2"	3'-4" x 2'-10"	14 - #10	30"	18'
IV-S	8 - 2"	3'-6" x 3'-4"	16 - #10	36"	19'
V-S	8 - 2"	3'-9" x 3'-4"	16 - #11	36"	22'
VI-S	8 - 2"	4'-1" x 3'-4"	16 - #11	36"	23'
VII-S	8 - 2¼"	4'-5" x 3'-11"	24* - #11	36"	25'

** Use Foundation Depth shown in table unless otherwise shown on the Project Plans.

* Bundled bars

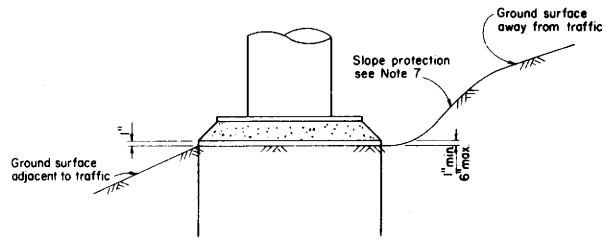
NOTES:

1. For anchor bolt layout see post sheet.
2. For "Base ℞ Elev." see Project Plans.
3. Pedestal and pile shall be Class "A" P.C.C.
4. Pedestals & Base Plates, longer sides shall be normal to axis of sign.
5. Prior to erection of the post, backfill which is equivalent to the surrounding material shall be in place.
6. Pedestal shall be formed 6" min. below ground surface. Remainder to be placed against undisturbed material.
7. Slope protection required when indicated on the Project Plans.

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1984



DETAIL C

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
TRUSS
PILE FOUNDATION

S 13-10

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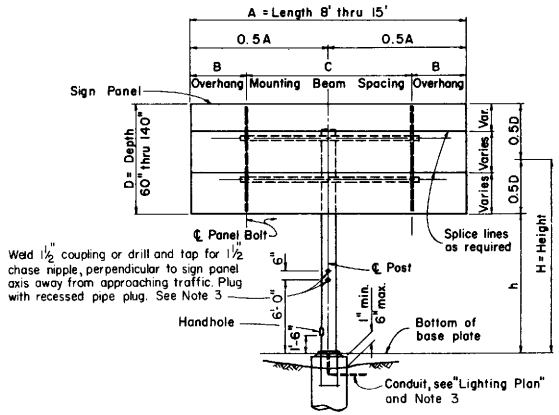
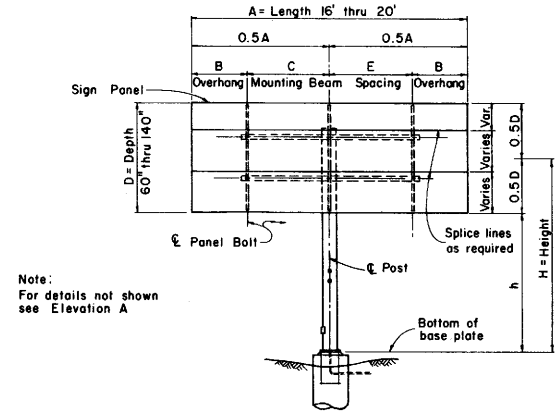
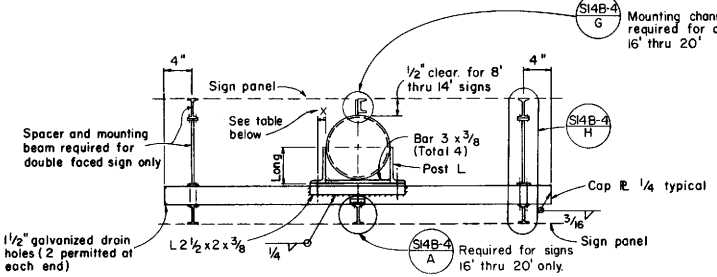


ELEVATION A

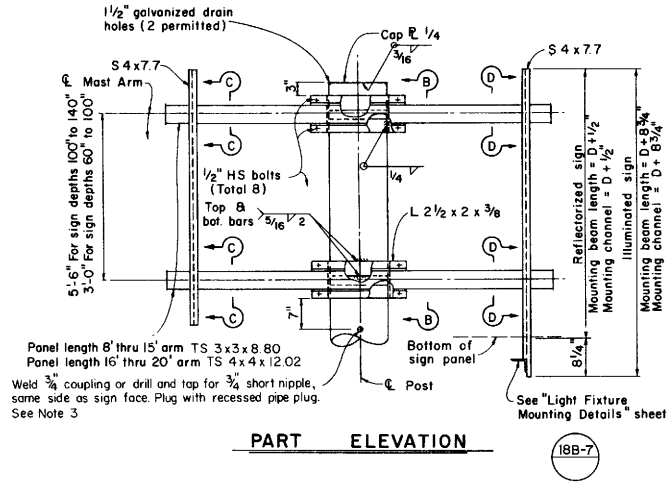


Note:
For details not shown see Elevation A

ELEVATION B



PLAN



PART ELEVATION

POST SIZE (Pipe)	POST ANGLES		
	ANGLE	X	WELD
6 @ 18.97	L 4 x 3 x ½	1¾"	¼
6 @ 28.57	L 4 x 3 x ½	1¾"	¼
8 @ 28.55	L 5 x 3 x ½	1¾"	¼
8 @ 43.39	L 5 x 3 x ½	1¾"	¼
10 @ 54.74	L 6 x 4 x ⅝	2½"	¼
12 @ 65.42	L 7 x 4 x ⅝	2½"	5/16
14 @ 72.09	L 8 x 4 x ¾	2½"	5/16
14 @ 89.30	L 8 x 4 x ¾	2½"	5/16

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

R. C. Cammack
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1984

Sign Panel Length	Number Mounting Beams	Sign Panel Overhang	Mounting Beam Spacing	
A		B	C	E
5' - 0"	2	9"	3' - 6"	
6' - 0"	2	12"	4' - 0"	
7' - 0"	2	15"	4' - 6"	
8' - 0"	2	18"	5' - 0"	
9' - 0"	2	22"	5' - 4"	
10' - 0"	2	24"	6' - 0"	
11' - 0"	2	24"	7' - 0"	
12' - 0"	2	30"	7' - 0"	
13' - 0"	2	30"	8' - 0"	
14' - 0"	2	30"	9' - 0"	
15' - 0"	2	36"	9' - 0"	
16' - 0"	3	6"	7' - 6"	7' - 6"
17' - 0"	3	12"	7' - 6"	7' - 6"
18' - 0"	3	12"	8' - 0"	8' - 0"
19' - 0"	3	12"	8' - 6"	8' - 6"
20' - 0"	3	18"	8' - 6"	8' - 6"

MOUNTING BEAM SPACING

Note:
1. For sections and detail not shown see S14B-4
2. For post and foundation details see "Overhead Signs, Lightweight, Post Details & Foundation" sheets.
3. Drilled holes, plugs, conduit and handhole required on illuminated signs only.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS LIGHTWEIGHT BALANCED-SINGLE STEEL POST CONNECTION AND MOUNTING DETAILS

S 14A-5

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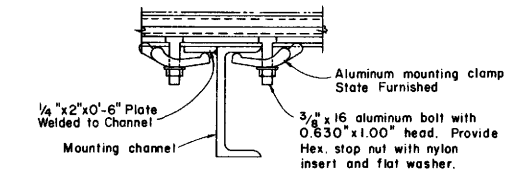
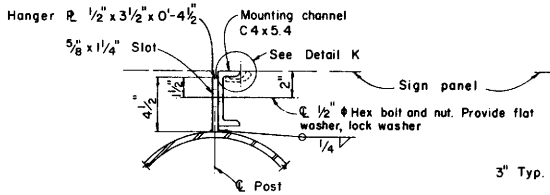
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 5013

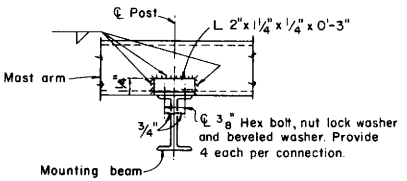
DATE APPROVED July 1, 1984



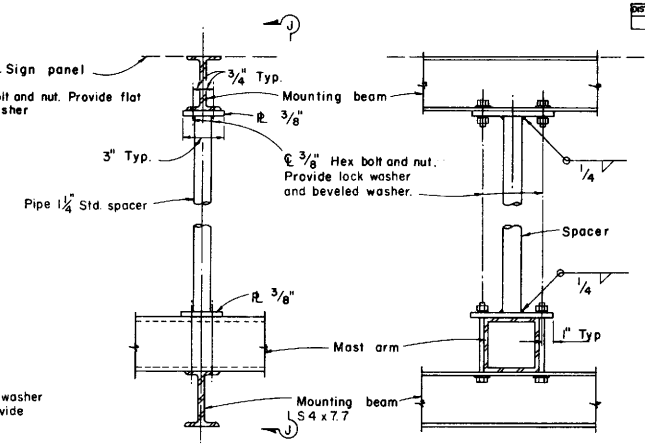
DETAIL K



DETAIL G
3"=1'-0"



DETAIL A

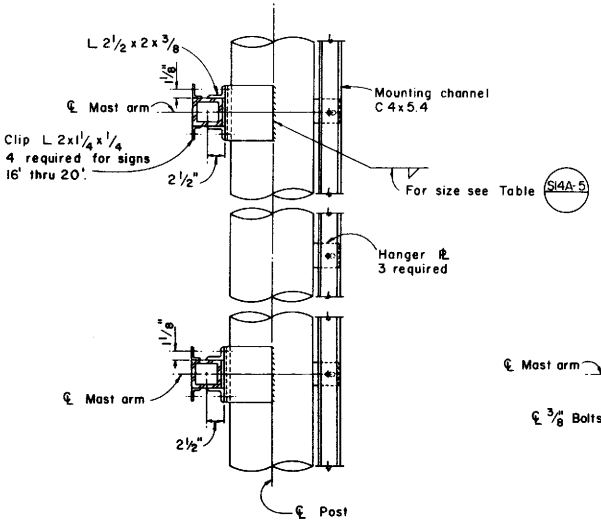


DETAIL H

VIEW J-J

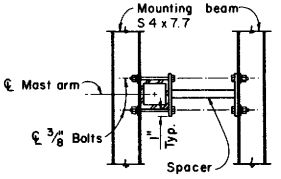
Note: Spacer required for double faced sign only.

Note: For sections and details not shown see S14A-5



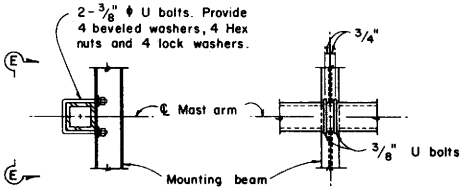
SECTION B-B

Note: Mounting channel and Hanger PL required for double faced signs 16' thru 20' only.



SECTION C-C

Note: Typical end mount for double faced signs.



SECTION D-D

VIEW E-E

Note: Typical connection to single faced signs.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
LIGHTWEIGHT
BALANCED-SINGLE STEEL POST
DETAILS

S14B-4

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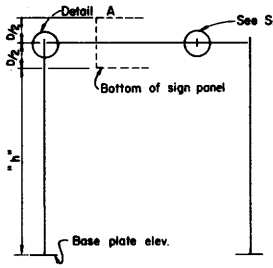
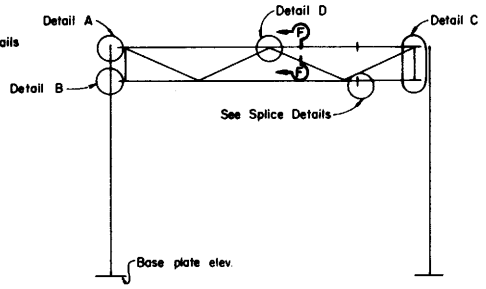
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS



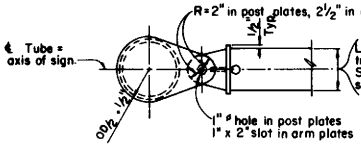
SINGLE CROSS BEAM SERIES

TYPE A-1

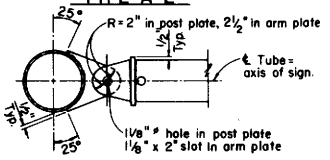


TRUSSED CROSS BEAM SERIES

TYPE A-2



PLAN



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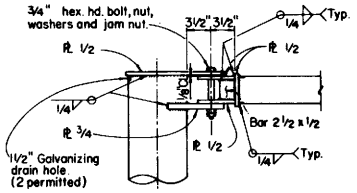
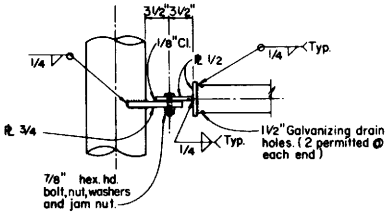
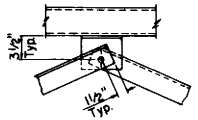


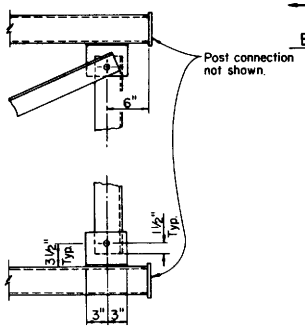
DETAIL A



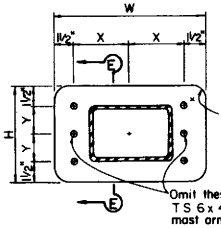
DETAIL B



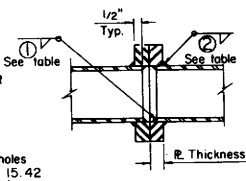
DETAIL D



DETAIL C



END VIEW

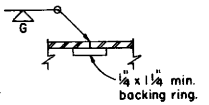


SECTION E-E

SPLICE DETAILS

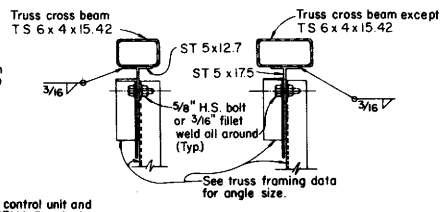
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1984

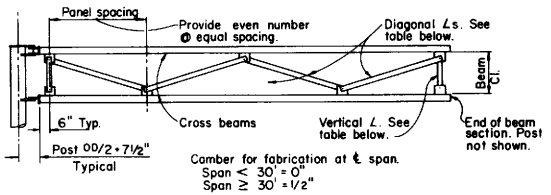


OPTIONAL WELDED SPLICE

SPLICE DATA									
TUBULAR CROSS BEAM SIZE	HIGH STRENGTH BOLTS				A-36 PLATES			WELDING	
	NO.	SIZE	X	Y	W	H	THICKNESS	①	②
TS 6 x 4 x 15.42	4	⅝"	4¼"	2"	11½"	7"	1"	3/16	5/16
TS 8 x 4 x 18.82	6	⅝"	5¼"	2"	1'-11½"	7"	1"	3/16	5/16
TS 8 x 6 x 22.04	6	⅝"	5¼"	2½"	1'-11½"	8"	1⅛"	3/16	⅜
TS 8 x 6 x 31.73	6	⅝"	4¼"	3½"	11½"	10"	1⅛"	¼	5/16
TS 10 x 6 x 25.44	6	⅝"	6½"	2½"	1'-4"	8"	1⅜"	3/16	⅜
TS 10 x 6 x 36.83	6	¾"	6½"	3"	1'-4"	9"	1⅝"	5/16	½



SECTION F-F



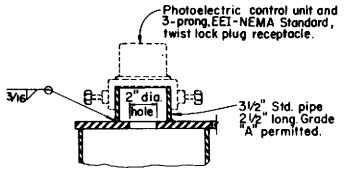
SIGN DEPTH	BEAM CLEARANCE	MAX. PANEL SPACING	VERTICAL ANGLE	DIAGONAL ANGLE
40"-70"	2'-0"	5'-6"	∠3½x2½x¼*	∠3½x2½x¼*
80"-100"	4'-6"	6'-6"	∠3½x2½x¼*	∠3½x2½x¼*

* Short leg outstanding.

TRUSS FRAMING DATA

Note:
For post connection to base ℄ see S20A-7 A
For cross beam to sign panel connections see S18A-8

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.



PHOTOELECTRIC CONTROL UNIT

For General Notes see "Foundation" sheet, S20B-9.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
LIGHTWEIGHT
TYPE A
CONNECTION DETAILS

S 15-8

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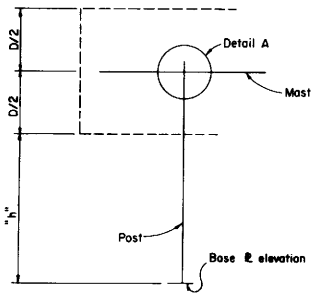
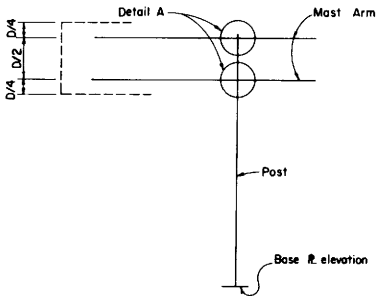
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

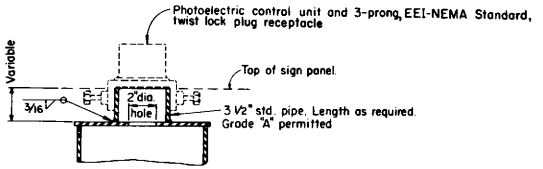
DATE APPROVED July 1, 1984



SINGLE ARM SERIES
TYPE B-1



DOUBLE ARM SERIES
TYPE B-2

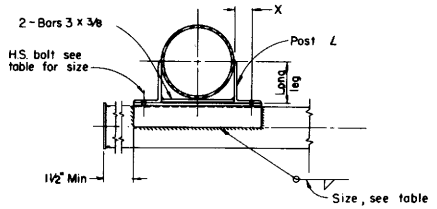


PHOTOELECTRIC CONTROL UNIT

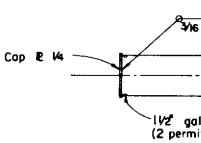
POST ANGLES			
POST SIZE	ANGLE	X	WELD
6	∠ 4 x 3 x 1/2	1 3/4"	1/4
8	∠ 5 x 3 x 1/2	1 3/4"	1/4
10	∠ 6 x 4 x 5/8,	2 1/2"	1/4
12	∠ 7 x 4 x 5/8	2 1/2"	5/16
14	∠ 8 x 4 x 3/4	2 1/2"	5/16

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

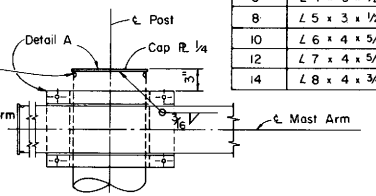
POST TO ARM FRAMING DATA



SECTION D-D



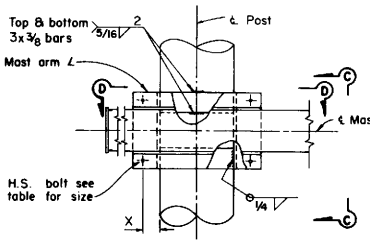
MAST ARM



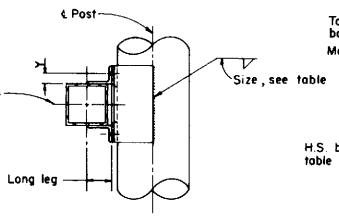
POST CAP

END DETAIL

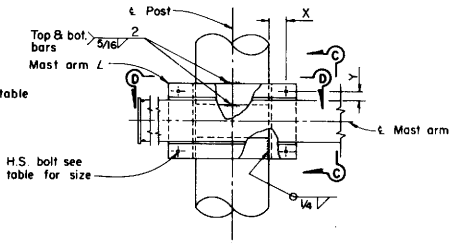
SEE PROJECT PLANS FOR:
1. Sign type and location.
2. Panel type and location on structure.
3. Post size and dimension "h".
4. Mast arm size.
5. Foundation type.
6. Illumination if required.



DETAIL A



VIEW C-C



DETAIL B

NOTE:
For post connection to base plate see S20A-7
For mast arm length and mast-arm-to-sign panel connections see S18A-8

For General Notes See S20A-7

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
LIGHTWEIGHT
TYPE B
CONNECTION DETAILS

S16-7

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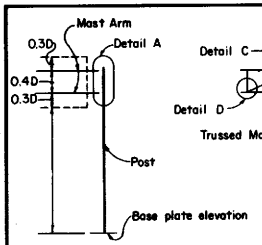
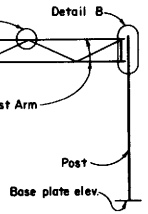
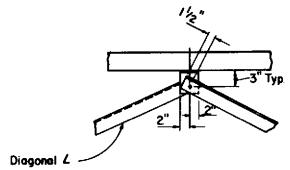


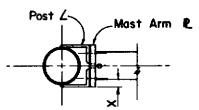
DOUBLE MAST ARM SERIES
TYPE C-1



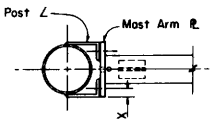
TRUSSED MAST ARM SERIES
TYPE C-2



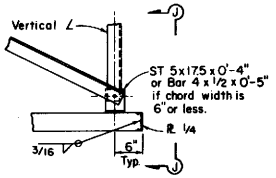
DETAIL C



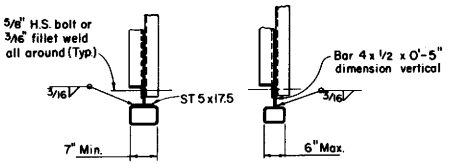
SECTION F-F



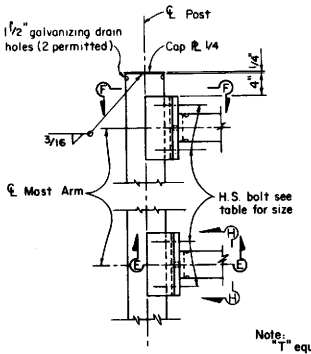
SECTION G-G



DETAIL D

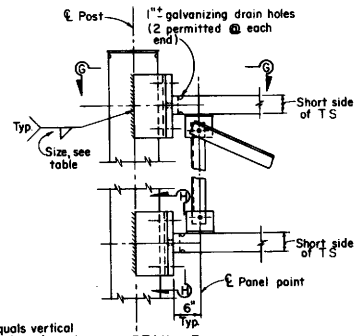


VIEW J-J

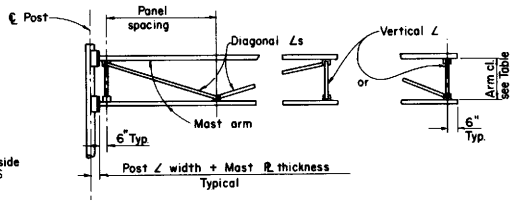


DETAIL A

Note:
"T" equals vertical dimension of mast arm.



DETAIL B



SIGN DEPTH INCHES	ARM CLEARANCE	MAX. PANEL SPACING	VERTICAL ANGLE	DIAGONAL ANGLE
D = 40"-70"	2'-0"	4'-4"	∠2 x 2 x 1/4	∠2 x 2 x 1/4
D = 80"-100"	3'-0"	6'-6"	∠3½ x 2½ x 1/4*	∠3½x2½)2x 1/4*

* Short leg outstanding

TRUSS FRAMING DATA

POST ANGLES			
POST SIZE	ANGLE	X	WELD
6	∠5 x 3 x 1/2	1¾"	1/4
8	∠6 x 4 x 5/8	2 1/4"	1/4
10	∠7 x 4 x 5/8	2 1/4"	1/4
12	∠8 x 4 x 3/4	2 1/4"	5/16
14	∠8 x 4 x 3/4	2 1/4"	5/16

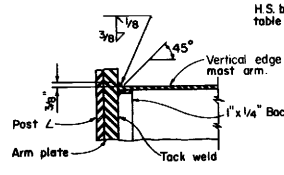
MAST ARM PLATE			
TWO ARMS	TRUSSED ARMS	PLATE	H.S. BOLT
TS 3 x 3 x 8.80		3/4"	1/2"
TS 4 x 4 x 12.02		1"	5/8"
TS 5 x 5 x 15.42		1"	3/4"
TS 6 x 6 x 18.82		1"	3/4"
TS 7 x 7 x 22.04	TS 5 x 3 x 16.84	1 1/4"	3/4"
	TS 6 x 4 x 21.94	1 1/4"	7/8"
	TS 7 x 5 x 27.04	1 1/4"	7/8"
	TS 8 x 6 x 31.73	1 1/4"	7/8"
	TS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

POST TO ARM FRAMING DATA

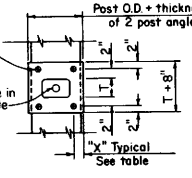
Note:
For post connection to base ℞ see S20A-7

For mast arm length and mast-arm-to sign panel connections see S18A-8

See Project Plans 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.



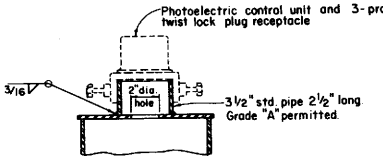
SECTION E-E



SECTION H-H

Note:
"T" equals vertical dimension of mast arm.

Note:
Bottom connection shown.
Top similar.



PHOTOELECTRIC CONTROL UNIT

For General Notes see S20A-7

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO 9013

DATE APPROVED July 1, 1984

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS LIGHTWEIGHT TYPE C CONNECTION DETAILS

S17-8

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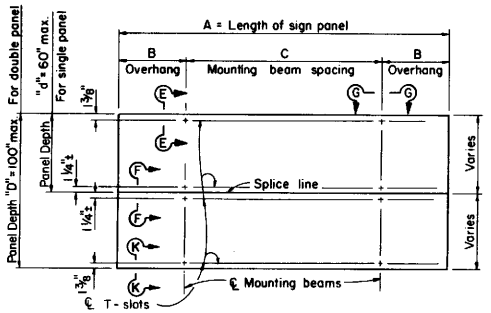
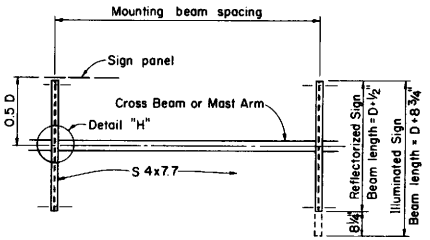
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

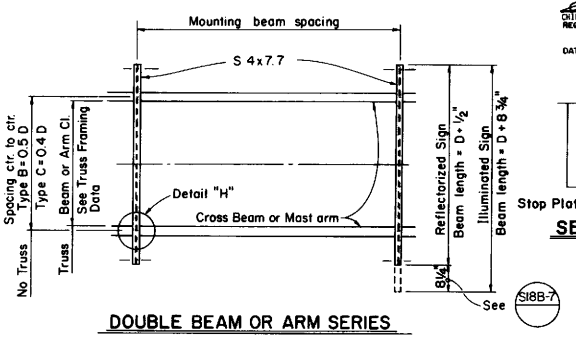
DATE APPROVED July 1, 1984



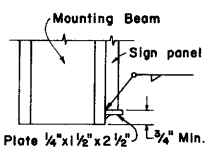
SIGN PANEL LENGTH 5'-0" TO 15'-0"



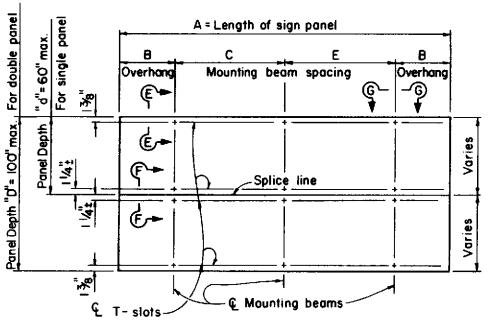
SINGLE BEAM OR ARM SERIES



DOUBLE BEAM OR ARM SERIES

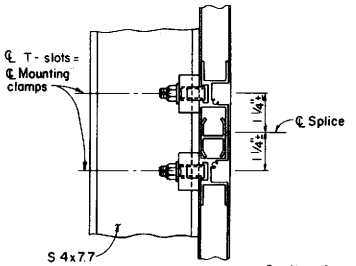


SECTION K - K

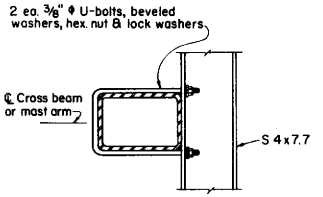


SIGN PANEL LENGTH 16'-0" TO 24'-0" *

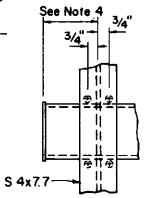
ELEVATION



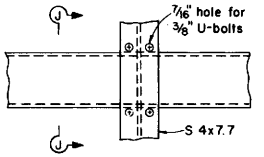
SECTION F-F



SECTION J-J



END ARM DETAIL
SINGLE POST SIGNS

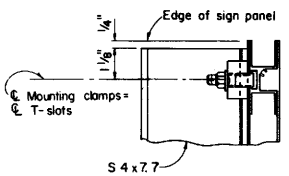


DETAIL H

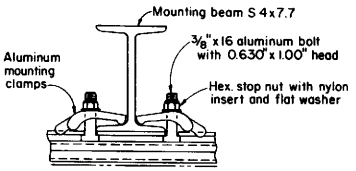
Sign Panel Length*	Number Mounting Beams	Sign Panel Overhang	Mounting Beam Spacing	
A		B	C	E
5'-0"	2	9"	3'-6"	
6'-0"	2	12"	4'-0"	
7'-0"	2	15"	4'-6"	
8'-0"	2	18"	5'-0"	
9'-0"	2	22"	5'-4"	
10'-0"	2	24"	6'-0"	
11'-0"	2	24"	7'-0"	
12'-0"	2	30"	7'-0"	
13'-0"	2	30"	8'-0"	
14'-0"	2	30"	9'-0"	
15'-0"	2	36"	9'-0"	
16'-0"	3	6"	7'-6"	7'-6"
17'-0"	3	12"	7'-6"	7'-6"
18'-0"	3	12"	8'-0"	8'-0"
19'-0"	3	12"	8'-6"	8'-6"
20'-0"	3	18"	8'-6"	8'-6"
21'-0"	3	18"	9'-0"	9'-0"
22'-0"	3	24"	9'-0"	9'-0"
23'-0"	3	30"	9'-0"	9'-0"
24'-0"	3	36"	9'-0"	9'-0"

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

MOUNTING BEAM SPACING



SECTION E-E



VIEW G-G

NOTES:

1. Laminated panel sign depths more than 60" requires additional mounting clamps located 1 1/4"± each side of panel splice line. Exact location is dependent on sign panel manufacturer.
2. Position sign panel so that mounting beams will clear truss connections and arm to post joints. Where interference cannot be avoided, 1/2" ϕ holes to pass the 3/8" ϕ U-bolts may be drilled through mast arm angles or truss connection members as necessary.
3. Torque aluminum sign panel mounting bolt to 100 in.-lbs.
4. 11" for Type C-1 and C-2. Others 4"
5. A stop plate is required at each mounting beam under sign panel.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
LIGHTWEIGHT
SIGN PANEL MOUNTING DETAILS
LAMINATED PANEL, TYPE A

S18A-8

S18A-8

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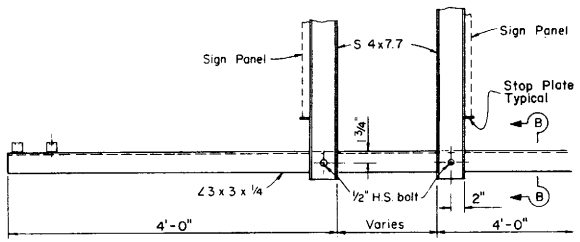
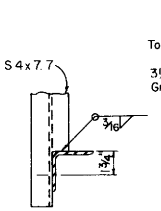
DIST	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013
DATE APPROVED July 1, 1984

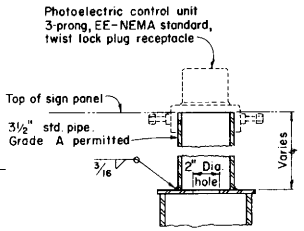


SIDE VIEW - DOUBLE FACED SIGN - END MOUNT

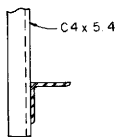
Note:
For details not shown see "Side View - Single Faced Sign Types A, B & C" details.



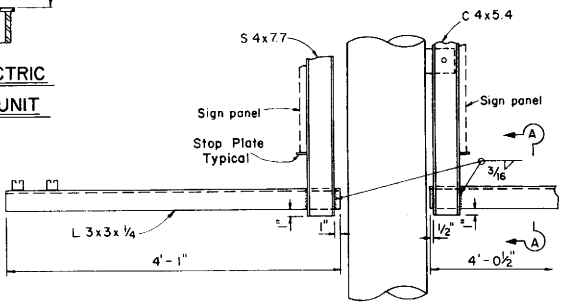
PART SEC. B-B



PHOTOELECTRIC CONTROL UNIT

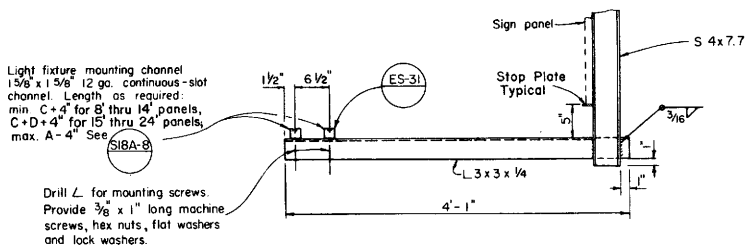


PART SEC. A-A



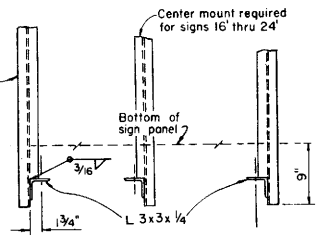
SIDE VIEW - DOUBLE FACED SIGN - CENTER MOUNT

(Required only on balanced single post signs 16' thru 20')



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

For signs 5'-6" (66") or less in length see sheet for "Fluorescent Sign Lighting Equipment (36 inch)."



FRONT VIEW

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
LIGHTWEIGHT

LIGHT FIXTURE MOUNTING DETAILS S 18 B-7

S 18B-7

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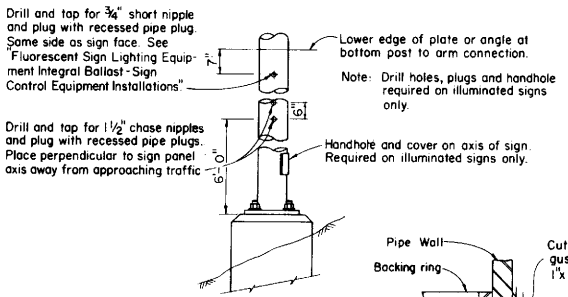
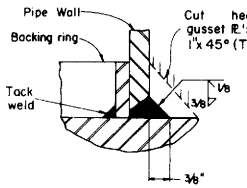
DISTRICT	COUNTY	ROUTE	P.M. Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

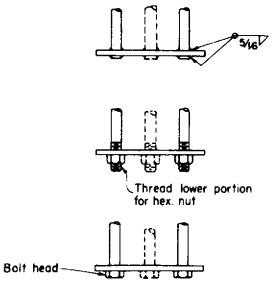
DATE APPROVED July 1, 1984



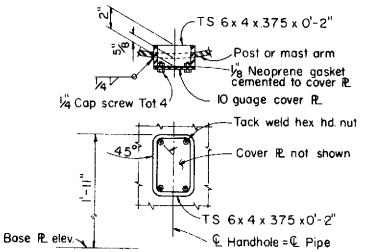
ELEVATION



DETAIL A



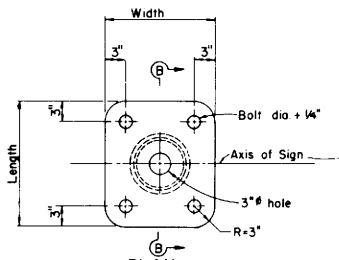
ALTERNATIVE BAR CONNECTIONS



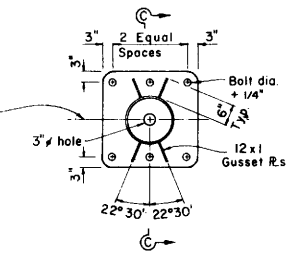
HANDHOLE & COVER DETAILS

POST SIZE	BASE PLATE	ANCHOR BOLTS (Min.)
6 @ 18.97	1½" x 1'-2" x 1'-2"	4 - 1¼"
6 @ 28.57	1½" x 1'-2" x 1'-2"	4 - 1½"
8 @ 28.55	1½" x 1'-6" x 1'-6"	4 - 1¾"
8 @ 43.39	2" x 1'-6" x 1'-6"	4 - 2"
10 @ 54.74	2" x 1'-8" x 1'-8"	4 - 2¼"
12 @ 65.42	2" x 1'-8 x 1'-8"	4 - 2½"
14 @ 72.09	2" x 2'-4" x 2'-4"	6 - 2"
14 @ 89.30	2" x 2'-4" x 2'-4"	6 - 2¼"

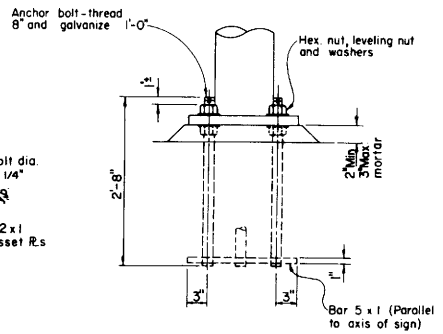
NOTES:
1. Footings shall be placed with long dimensions normal to axis of sign.
2. On single post signs the post shall be raked out of plumb with the use of the leveling nuts to make the bottom of the sign frame level.
3. 2" ϕ anchor bolts may be substituted for 1¾" ϕ bolts.
   2½" ϕ anchor bolts may be substituted for 2¼" ϕ bolts.



PLAN



PLAN



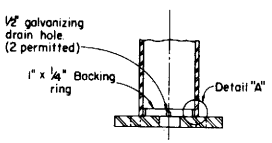
ANCHOR BOLT

GENERAL NOTES

DESIGN: A.A.S.H.O. Specifications for the Design and Construction of Structural Supports for Highway Signs, dated 1968.

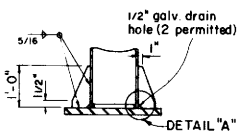
CONSTRUCTION: Standard Specifications and the special provision.

WELDING: All welding continuous unless otherwise noted on the plans. All welding to be done in accordance with the Standard Specifications.



SECTION B-B

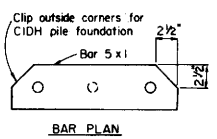
6" THRU 12" POSTS



SECTION C-C

14" POST

BASE PLATE DETAILS



BAR PLAN

ANCHORAGE DETAILS

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
LIGHTWEIGHT
POST DETAILS

S20A-7

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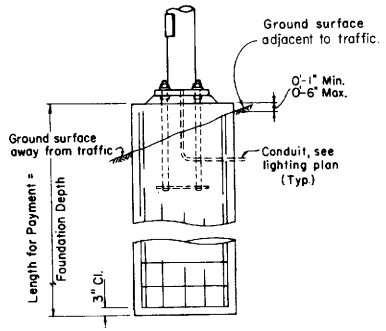
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS

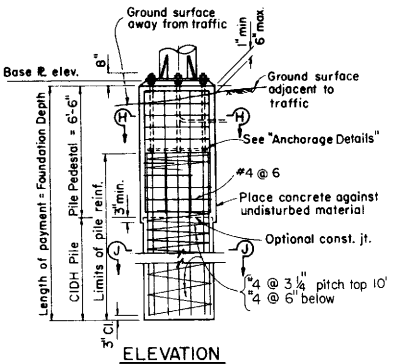
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE July 1, 1984

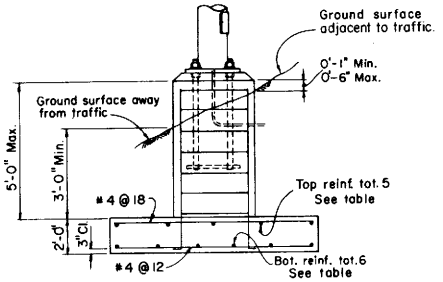
POST SIZE	PILE FOUNDATION				SPREAD FOOTING				
	Pedestal	Pile Dia.	Found. Depth	Reinf. Size	Pedestal	Footing	Reinf. Top	Reinf. Bot.	Reinf. L Bar
6 @ 18.97		24"	8'	#5	1'-10" x 1'-10"	4'-0" x 6'-0"	#4	#4	#5
6 @ 28.57		24"	9'	#5	1'-10" x 1'-10"	4'-0" x 7'-0"	#4	#4	#5
8 @ 28.55		30"	9'	#6	2'-2" x 2'-2"	5'-0" x 8'-0"	#4	#4	#5
8 @ 43.39		30"	11'	#7	2'-2" x 2'-2"	6'-0" x 9'-0"	#4	#5	#5
10 @ 54.74	2'-10" x 2'-10"	30"	13'	#8	2'-4" x 2'-4"	7'-0" x 10'-0"	#5	#7	#7
12 @ 65.42	2'-10" x 2'-10"	30"	15'	#10	2'-4" x 2'-4"	7'-0" x 12'-0"	#6	#8	#8
14 @ 72.09	3'-4" x 3'-4"	36"	15'	#10	2'-11" x 2'-11"	7'-0" x 13'-0"	#7	#9	#8
14 @ 89.30	3'-4" x 3'-4"	36"	16'	#10	2'-11" x 2'-11"	8'-0" x 14'-0"	#7	#9	#8



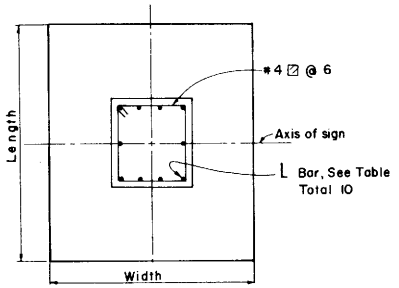
ELEVATION



ELEVATION



ELEVATION

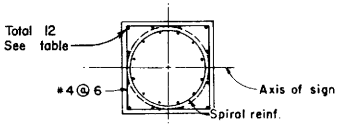


PLAN

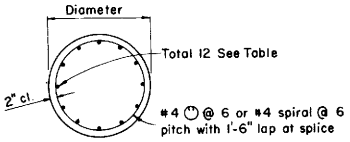
SPREAD FOOTING

NOTES:

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

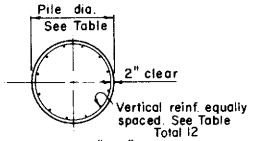


SECTION "H-H"



PLAN

6" & 8" POSTS



SECTION "J-J"

10" THRU 14" POSTS

PILE FOUNDATION

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
LIGHTWEIGHT
FOUNDATION

S 20B-9

S20B-9

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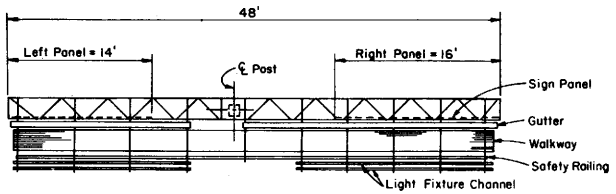
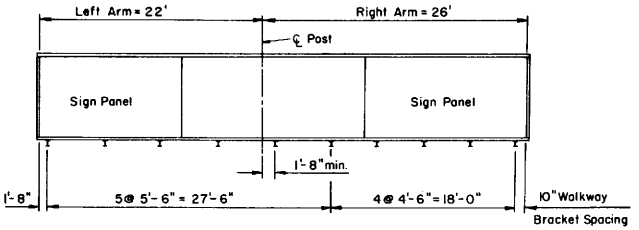
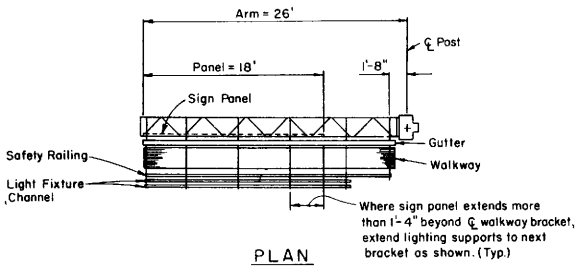


PLAN



SINGLE POST BUTTERFLY

EXAMPLE NO. 1



PLAN

SINGLE POST CANTILEVER

EXAMPLE NO. 2

INSTRUCTIONS TO FABRICATOR

PROJECT PLANS SHOW:

1. Sign structure location
2. Length of structure frame
3. Walkway length for two post signs
4. Panel size and locations on structure
5. Post type and height to bottom of frame
6. Base plate elevation.
7. Footing elevation or location of pile foundation
8. Photo electric cell location if required

REFER TO THE FOLLOWING SHEETS FOR DETAILS NOT SHOWN ON PROJECT PLANS:

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 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 details
S 9. Walkway details No. 1
S 10. Walkway details No. 2
S 11. Walkway safety railing details
S39. Foundations
ES29. Mercury sign lighting equipment
ES31. Fluorescent sign lighting equipment
ES32. Sign lighting equipment

WALKWAY BRACKETS:

Space all walkway brackets maintaining uniform spacing where possible. Maximum spacing shall not exceed 5'-6".

WALKWAY AND SAFETY RAILING: Walkway to be continuous for entire length of frame for single post signs. For 2 post signs see Project Plans. Safety railing to protect entire walkway, but continous for no more than 11' in one unit.

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

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

Date Approved July 1, 1984

GENERAL NOTES

SPECIFICATIONS:

DESIGN: A.A.S.H.O. Specifications for the Design and Construction of Structural Supports for Highway Signs, dated 1968.

CONSTRUCTION: Standard Specifications, 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.

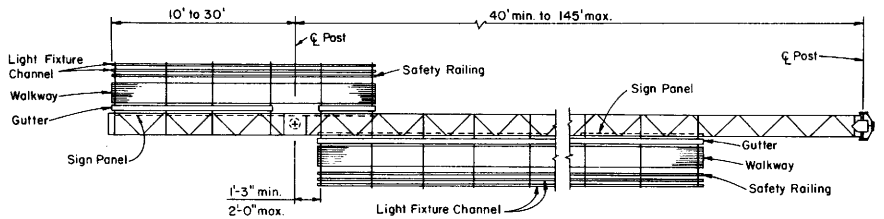
WALKWAY LOADING: Dead load + 500 lbs. concentrated live load.

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.

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

WELDING: All welding continuous unless otherwise noted on the plans. All welding to be done in accordance with the Standard Specifications



PLAN

TWO POST TYPE WITH CANTILEVER
(PART DOUBLE-FACED)

EXAMPLE NO. 3

Standard Plan Sheet No.
Detail No.

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
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
INSTRUCTIONS AND EXAMPLES

S 21-4

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

CHIEF, OFFICE OF STRUCTURES DESIGN
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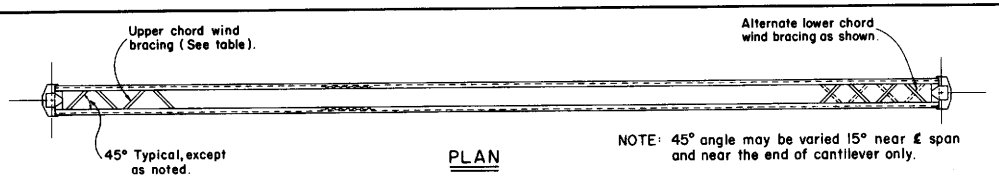
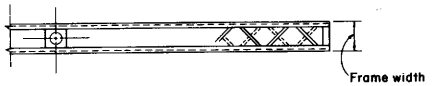
Date Approved July 1, 1984

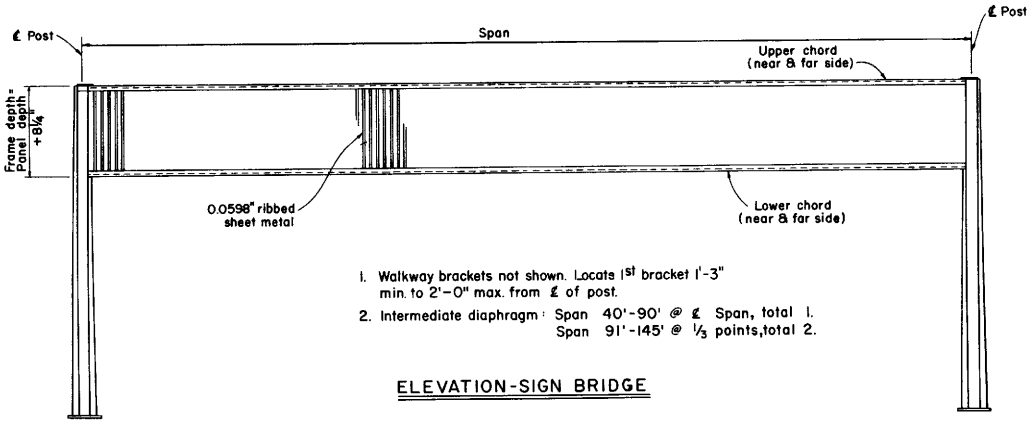


PLAN

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

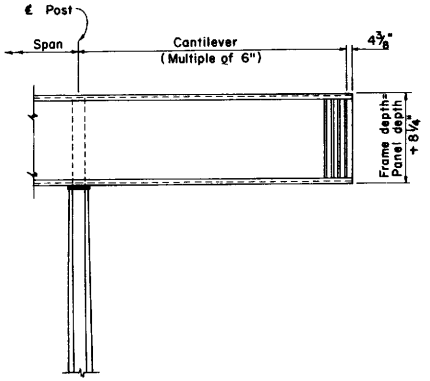


PLAN



1. Walkway brackets not shown. Locate 1st bracket 1'-3" min. to 2'-0" max. from ℄ of post.
2. Intermediate diaphragm: Span 40'-90' @ ℄ Span, total 1.
   Span 91'-145' @ ⅓ 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

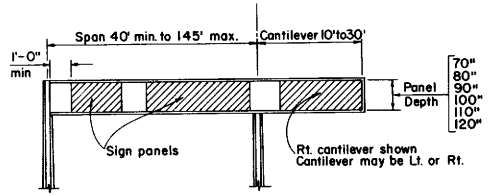
100" Panel Depth				110" Panel Depth				120" Panel Depth			
Span	Frame Width	Chord L's	Wind Bracing	Span	Frame Width	Chord L's	Wind Bracing	Span	Frame Width	Chord L's	Wind Bracing
40'-50'	2'-0"	4 x 4 x ⅜	1½ x 1½ x ¼	40'-50'	2'-0"	4 x 4 x ⅜	1½ x 1½ x ¼	40'-50'	2'-0"	4 x 4 x ⅜	1½ x 1½ x ¼
51'-60'		4 x 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

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

TABLE II

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

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
TWO POST TYPE
FRAME MEMBERS

S 22-2

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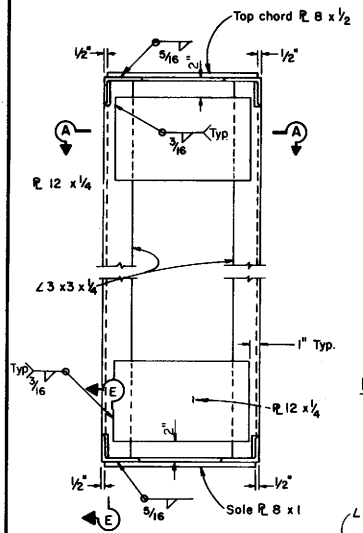
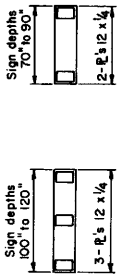
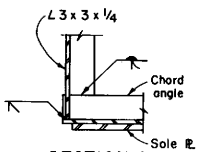


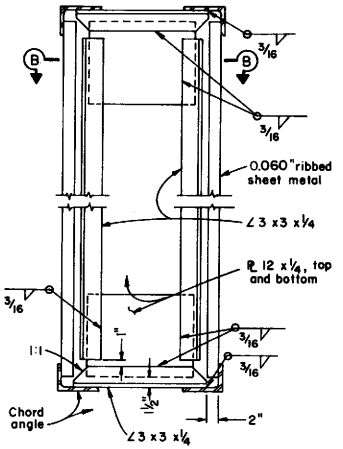
END VIEW



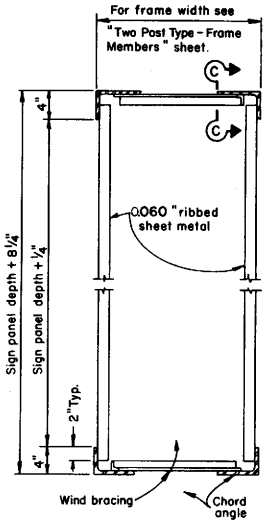
DIAPHRAGM PL LAYOUT



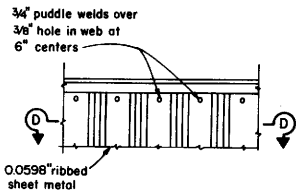
SECTION E-E



SECTION AT DIAPHRAGM



TYPICAL SECTION

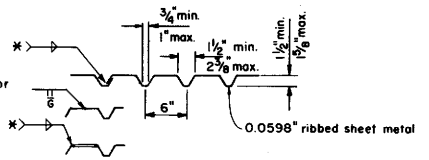


SECTION C-C

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

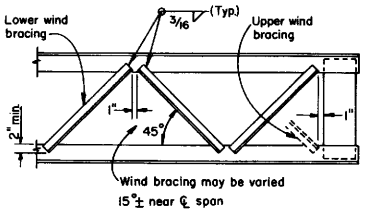
CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

Date Approved July 1, 1984



* Lap splice shall be continuous weld both sides. For weld qualification test, see Sheet S34 A-5.

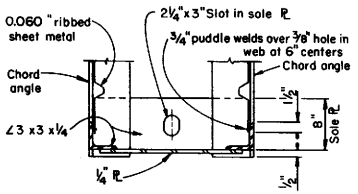
SECTION D-D



WIND BRACING DETAILS

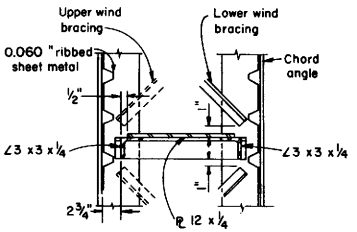
Chord Angle Splice Notes:

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



SECTION A-A

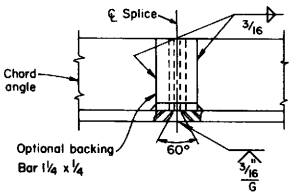
END DIAPHRAGM DETAILS



SECTION B-B

Note:
Details for top and bottom connections are similar.

INTERMEDIATE DIAPHRAGM DETAILS



WELDED CHORD SPLICE

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
TWO POST TYPE
FRAME DETAILS

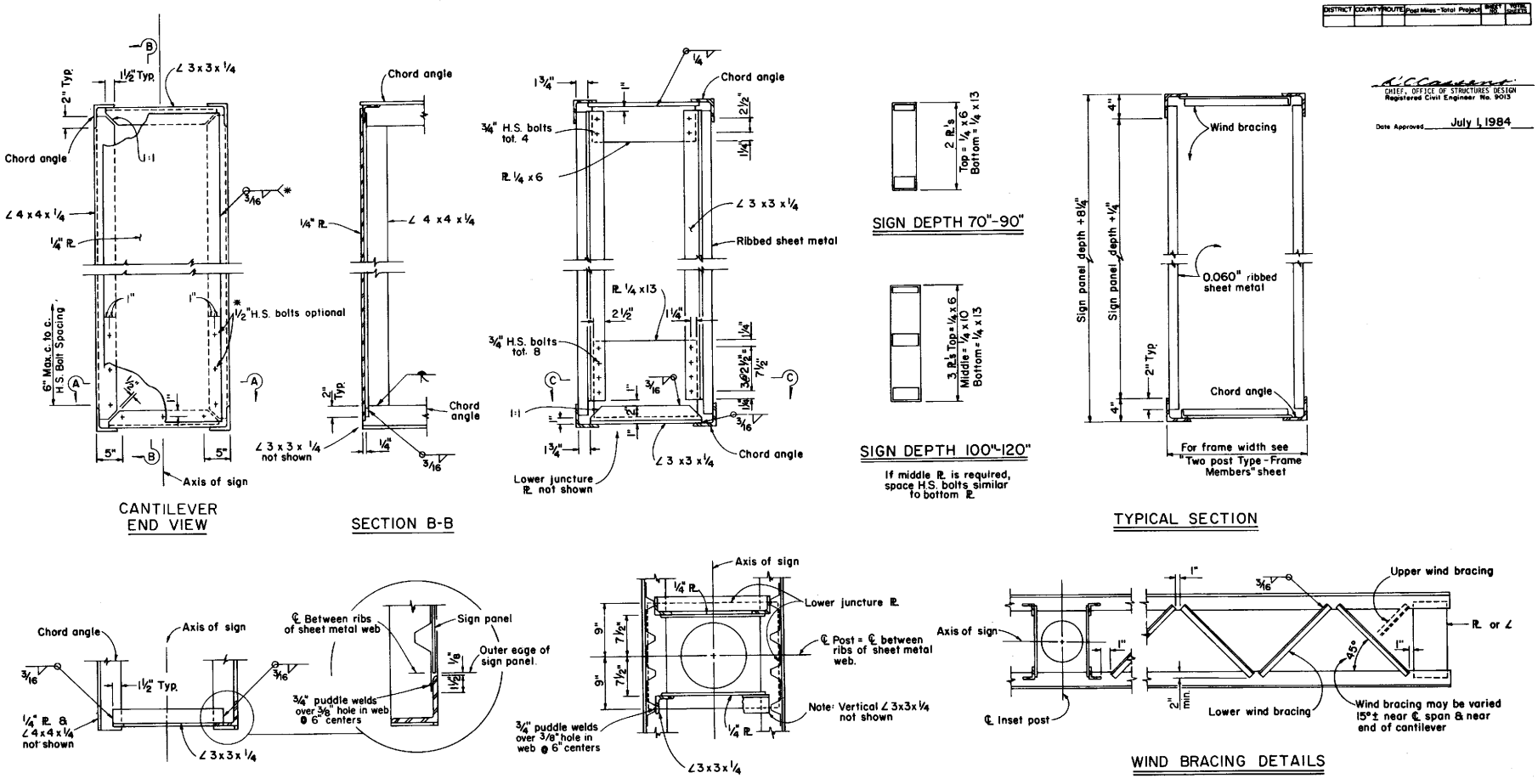
S 23-4

Return to Table of Contents

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

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

Date Approved July 1, 1984



STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
TWO POST TYPE WITH CANTILEVER FRAME DETAILS

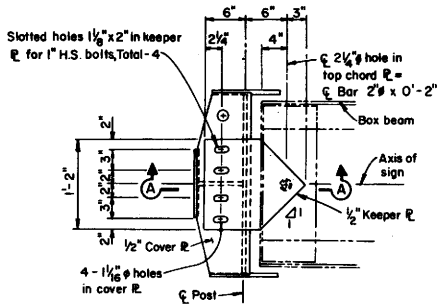
S 24-4

Return to Table of Contents

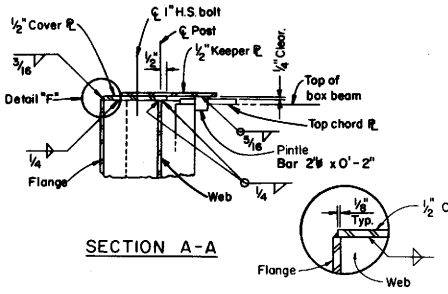
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

Date Approved July 1, 1984



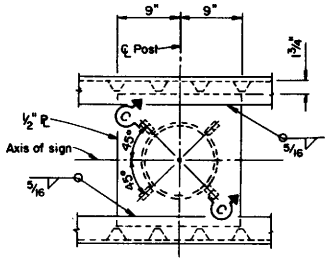
PLAN



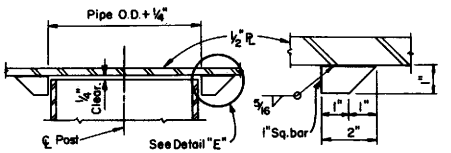
SECTION A-A

DETAIL F

UPPER JUNCTURE CONNECTION
END POST



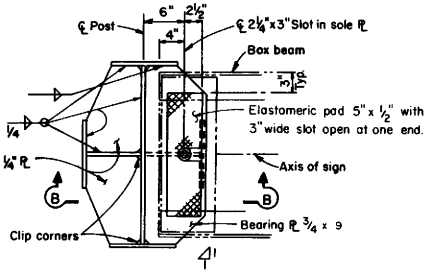
PLAN



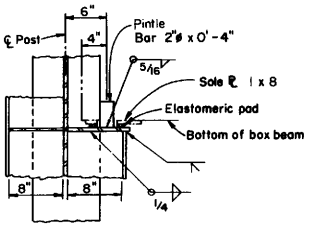
SECTION C-C

DETAIL E

UPPER JUNCTURE CONNECTION
INSET POST

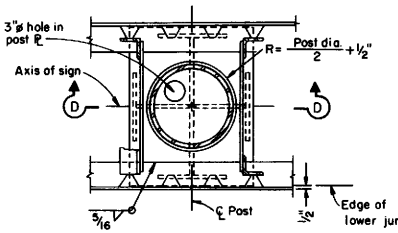


PLAN

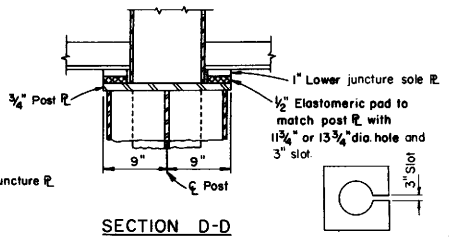


SECTION B-B

LOWER JUNCTURE CONNECTION
END POST

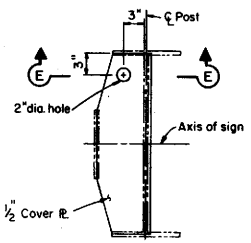


PLAN

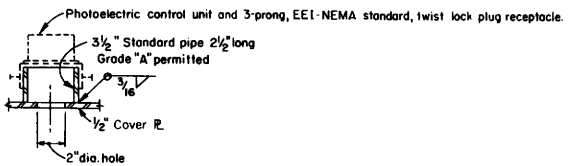


SECTION D-D

LOWER JUNCTURE CONNECTION
INSET POST



PHOTOELECTRIC CONTROL UNIT



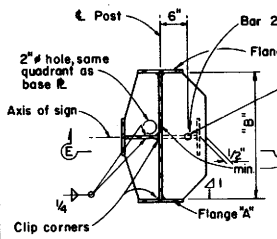
SECTION E-E

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

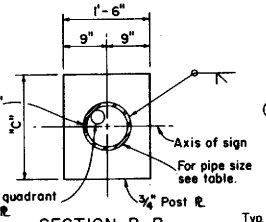
OVERHEAD SIGNS
BOX BEAM
TWO POST TYPE
FRAME JUNCTURE DETAILS | S25-4

Return to Table of Contents

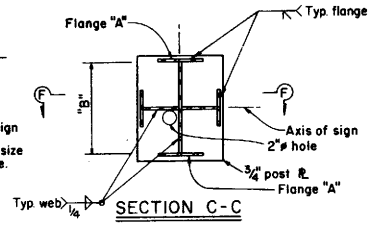
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS



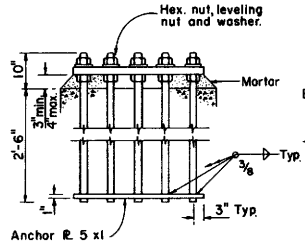
SECTION A-A



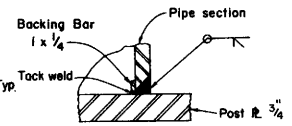
SECTION B-B



SECTION C-C



ANCHORAGE DETAILS

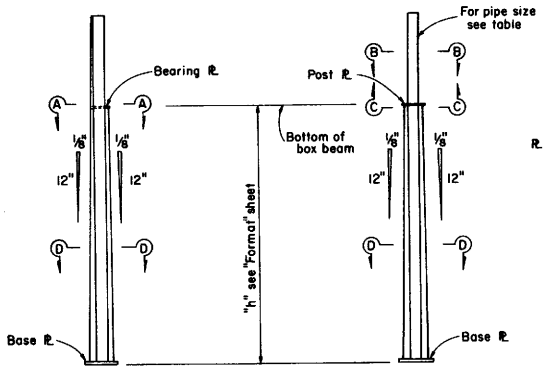


PIPE SECTION TO POST ℞

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9015

Date Approved July 1, 1984

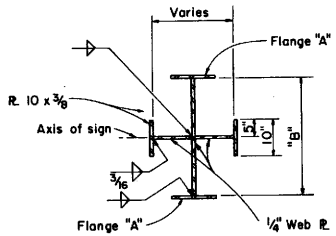
NOTE: For dimensions not shown see table



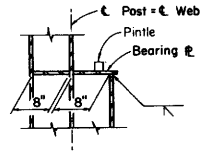
END POST
"A" & "B"

INSET POST
"C" & "D"

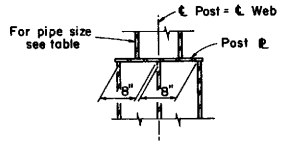
ELEVATION



SECTION D-D



SECTION E-E

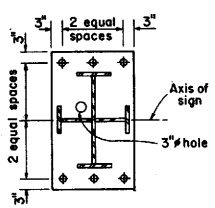


SECTION F-F

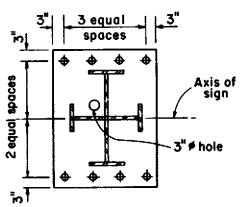
NOTE: Locate 3"ø hole for conduit in quadrant away from approaching traffic-center 2" from web plates.

Post Type	Base Plate	Anchor Bolts Dia.	Anchor Bolts Nº	Flange "A"	Post Plate "B"	Post Plate "C"	Inset Post Pipe Size
A-1	2" x 24"x 3'-4"	2 1/4"	6	10"x 3/8"	2'-2"		
A-2	2 1/2"x 24"x 3'-4"	2 1/4"	8	10"x 1/2"			
A-3	2 1/2"x 24"x 3'-4"	2 1/2"	8	10"x 3/4"			
A-4	2 1/2"x 24"x 3'-4"	2 1/2"	8	10"x 1"			
A-5	2 1/2"x 24"x 3'-4"	2 1/2"	8	10"x1 1/4"	2'-2"		
B-1	2" x 30"x 3'-9"	2 1/4"	8	10"x 1/2"	2'-8"		
B-2	2" x 30"x 3'-9"	2 1/2"	8	10"x 3/4"			
B-3	2 1/2"x 30"x3'-11"	2 1/2"	8	10"x 1"			
B-4	2 1/2"x 30"x3'-11"	2 1/2"	8	10"x1 1/4"			
B-5	2 1/2"x 30"x 3'-11"	2 1/2"	10	10"x1 1/2"	2'-8"		
C-1	2" x 24"x 2'-9"	2 1/4"	6	10"x 1/2"	1'-8"	2'-0"	10@43.7
C-2	2 1/2"x 30"x 3'-0"	2 1/4"	8	10"x 3/4"			10@58.0
C-3	2 1/2"x 30"x 3'-0"	2 1/2"	8	10"x 1"			10@76.9
C-4	2 3/4"x 30"x 3'-0"	2 1/2"	8	10"x1 1/4"			10@104.1
C-5	2 3/4"x 30"x 3'-0"	2 1/2"	10	10"x1 1/2"		2'-0"	10@109.9
C-6	2 3/4"x 38"x 3'-2"	2 1/2"	10	10"x1 3/4"		2'-1 1/2"	
C-7	2 3/4"x 38"x 3'-2"	2 1/2"	10	10"x 2"		2'-1 1/2"	
C-8	2 3/4"x 38"x 3'-2"	2 1/2"	10	10"x2 1/4"	1'-8"	2'-1 1/2"	10@109.9
D-1	2 1/2 x 24" x 3'-4"	2 1/2"	8	10"x 3/4"	2'-2"	2'-6"	12@65.4
D-2	2 3/4"x 30"x 3'-6"	2 1/2"	8	10"x 1"			12@80.9
D-3	2 3/4"x 30"x 3'-6"	2 1/2"	10	10"x1 1/4"			12@107.2
D-4	2 1/2 x 38" x 3'-6"	2 1/2"	10	10"x1 1/2"		2'-6"	
D-5	2 1/2 x 38"x 3'-6"	2 1/2"	10	10"x1 3/4"		2'-7 1/2"	
D-6	3" x 42"x 3'-11"	2 1/2"	10	10"x2"		2'-7 1/2"	
D-7	3" x 42"x 3'-11"	2 1/2"	10	10"x2 1/4"	2'-2"	2'-7 1/2"	12@107.2

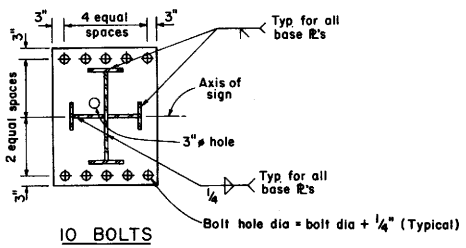
1. Thread upper 10" of anchor bolts and galvanize upper 1'-0".
2. Anchor ℞'s may be retained with hex. nut or formed head.
3. 2 1/2" ϕ anchor bolts may be substituted for 2 1/4" ϕ bolts.



6 BOLTS



8 BOLTS



10 BOLTS

TYPICAL BASE PLATES

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

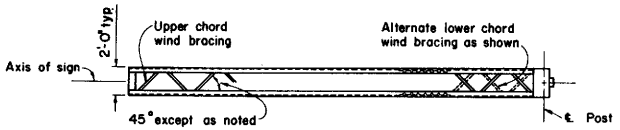
OVERHEAD SIGNS
BOX BEAM
TWO POST TYPE
POST DETAILS

S 26-5

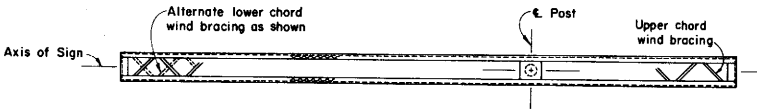
Return to Table of Contents

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

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



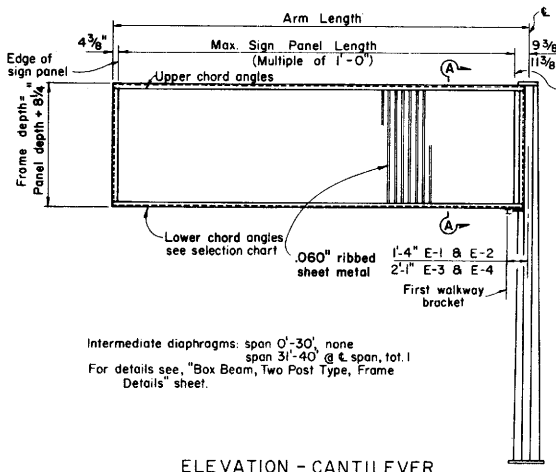
PLAN



PLAN

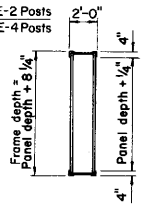
R. C. Cassidy
CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

Date Approved July 1, 1984

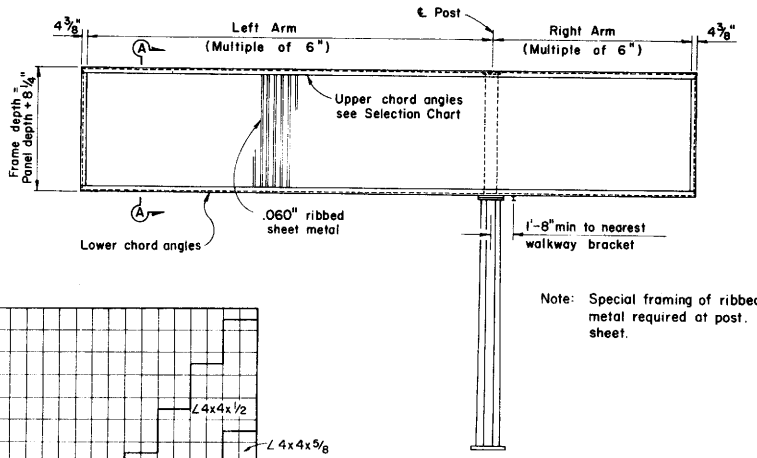


Intermediate diaphragms: span 0'-30', none
span 31'-40' @ ℄ span, tot. 1
For details see, "Box Beam, Two Post Type, Frame Details" sheet.

ELEVATION - CANTILEVER

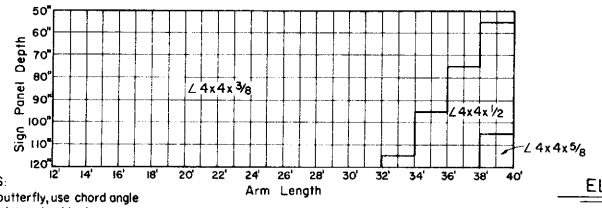


SECTION A-A



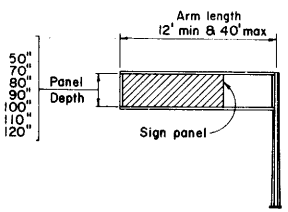
Note: Special framing of ribbed sheet metal required at post. See S32-4 sheet.

ELEV. - BUTTERFLY

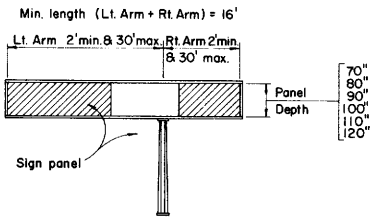


NOTES:
1. For butterfly, use chord angle size determined by longer arm for both sides.

UPPER & LOWER CHORD ANGLE SELECTION CHART

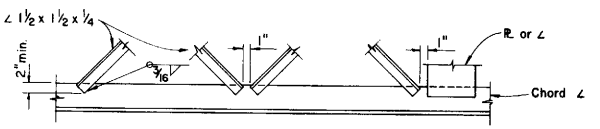


CANTILEVER



BUTTERFLY

RANGE OF STRUCTURE SIZES



WIND BRACING

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
SINGLE POST TYPE
FRAME MEMBERS

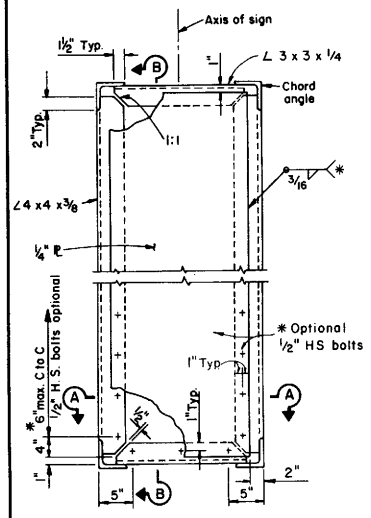
S 27-5

Return to Table of Contents

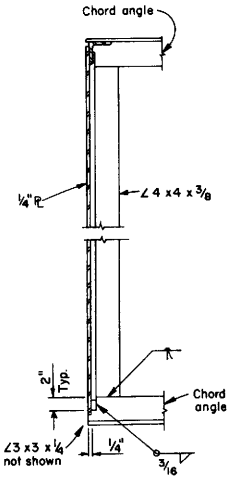
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

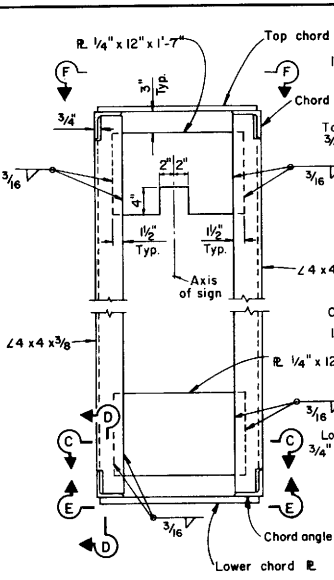
DATE July 1, 1984



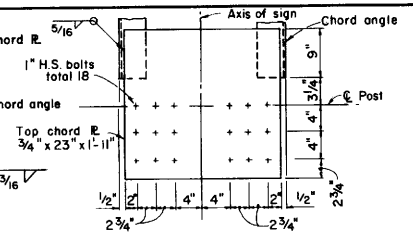
CANTILEVER END VIEW



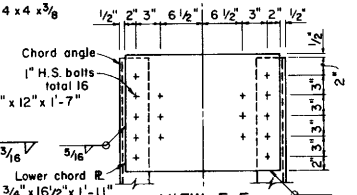
SECTION B-B



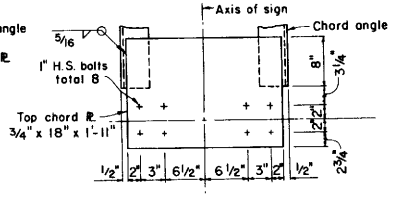
POST END VIEW



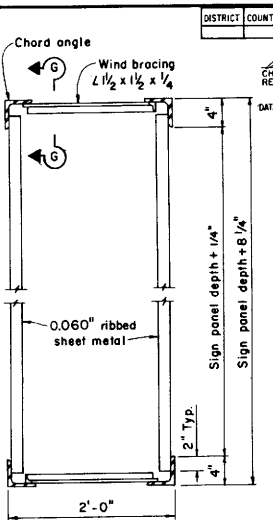
VIEW F-F



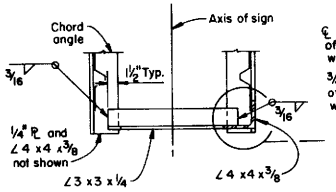
VIEW E-E
TYPE E-3 & E-4



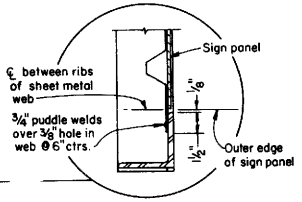
VIEW F-F



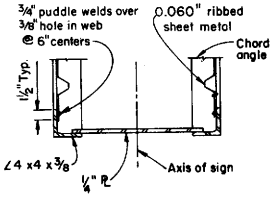
TYPICAL SECTION



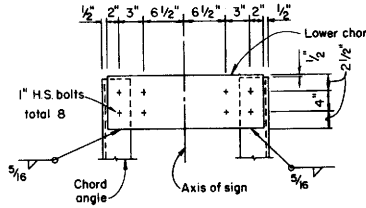
SECTION A-A



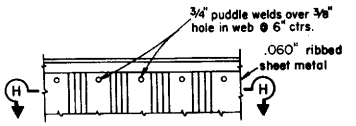
END DIAPHRAGM DETAILS
CANTILEVER END



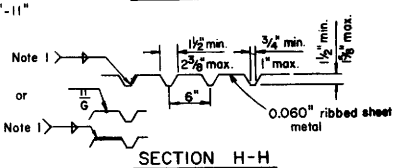
SECTION C-C



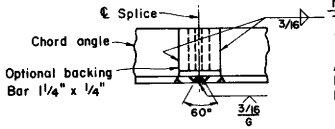
VIEW E-E
TYPE E-1 & E-2



SECTION G-G

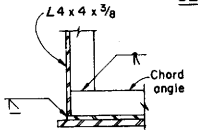


SECTION H-H



WELDED CHORD SPLICE

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



SECTION D-D

END DIAPHRAGM DETAILS
POST END

Notes:
1. Lap splice shall be continuous weld both sides. For weld qualification test, see Sheet S 34 A.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
SINGLE POST CANTILEVER
FRAME DETAILS

S 28-5

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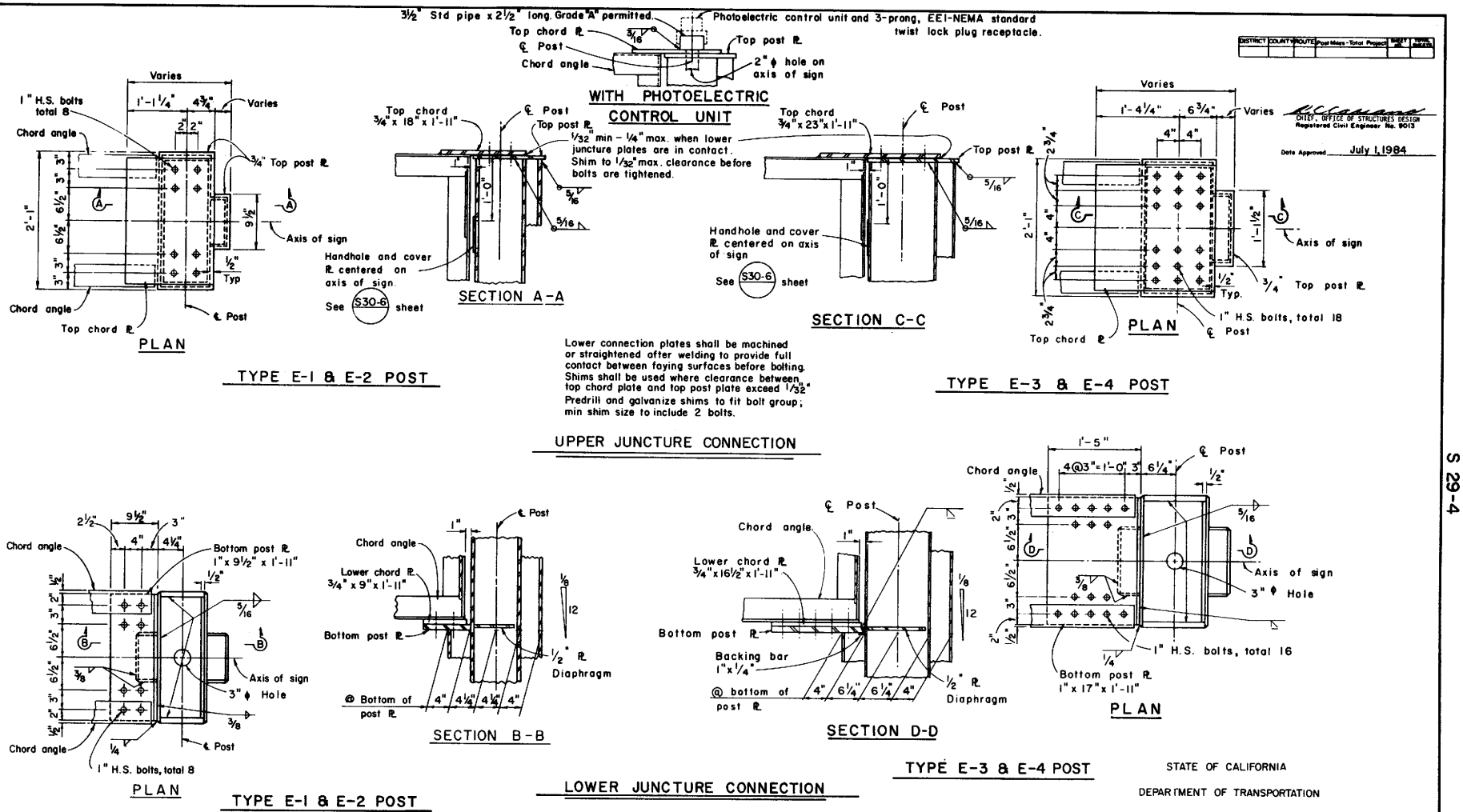
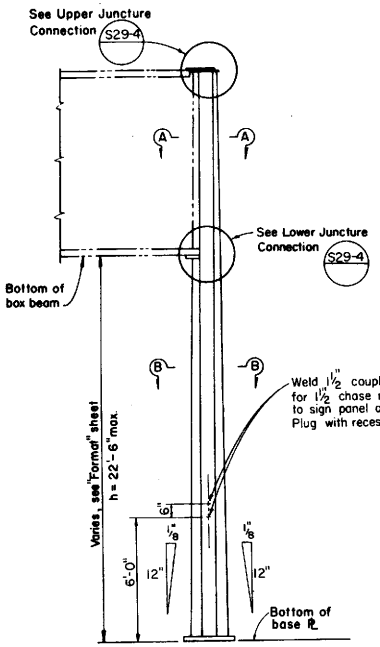
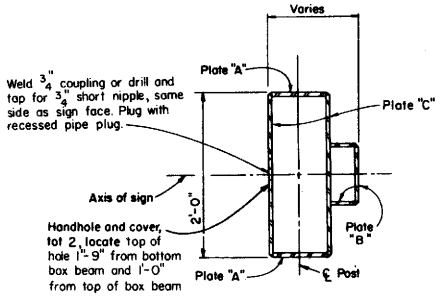
Return to Table of Contents



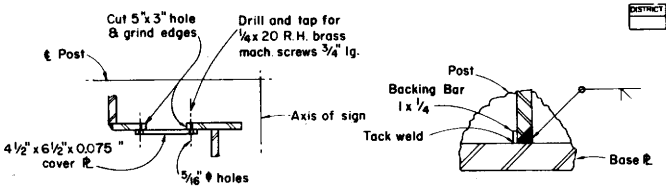
Return to Table of Contents



ELEVATION



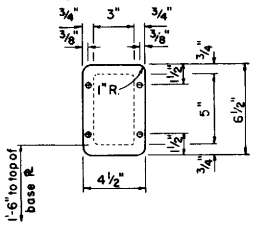
SECTION A-A



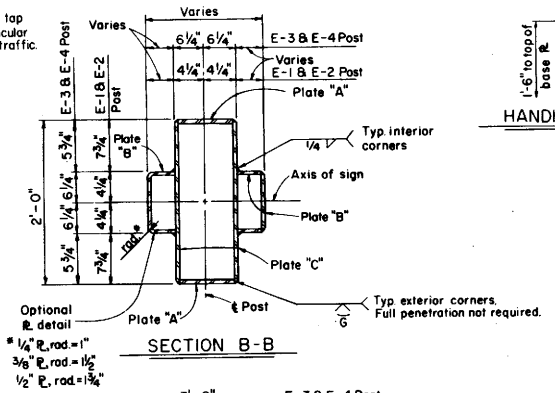
Note: Face handhole and cover PL away from traveled way except as shown See Section A-A.

POST TO BASE PLATE

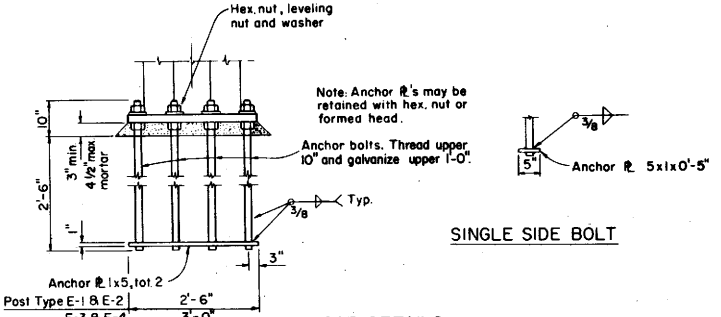
WELDING DETAILS



HANDHOLE AND COVER DETAIL

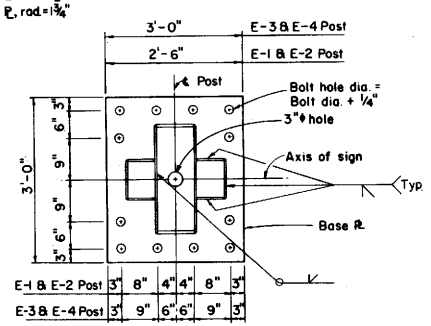


SECTION B-B



SINGLE SIDE BOLT

ANCHORAGE DETAILS



BASE PLATE

Post Type	Base Plate	Plate "A"	Plate "B"	Plate "C"	Anchor Bolts
E-1	30"x2"x3'-0"	1/2"	1/4"	3/8"	12-1 3/4"
E-2	30"x2 1/2"x3'-0"	1"	3/8"	1/2"	12-2"
E-3	3'-0"x2 1/2"x3'-0"	1"	3/8"	1/2"	12-2 1/4"
E-4	3'-0"x2 1/2"x3'-0"	1"	1/2"	5/8"	12-2 1/4"

2" ϕ Anchor bolts may be substituted for 1 3/4" ϕ bolts.

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

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

Date Approved July 1, 1984

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
SINGLE POST CANTILEVER
POST DETAILS

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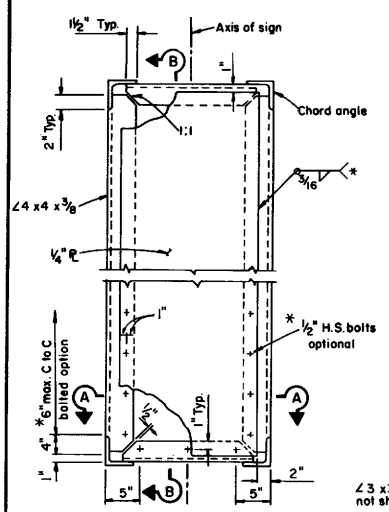
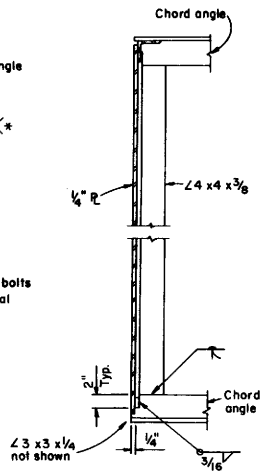
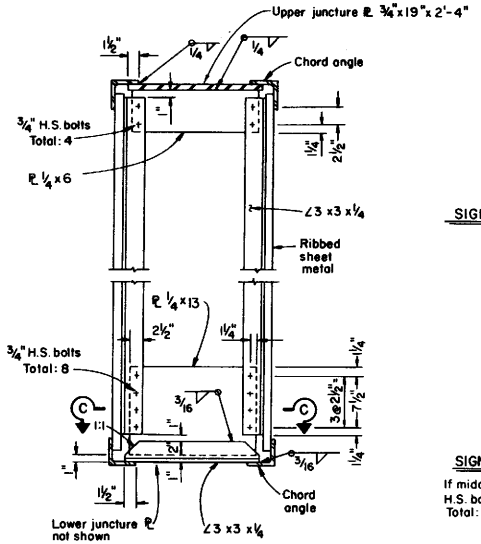


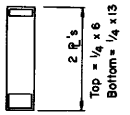
END VIEW



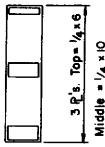
SECTION B-B



SECTION AT DIAPHRAGM

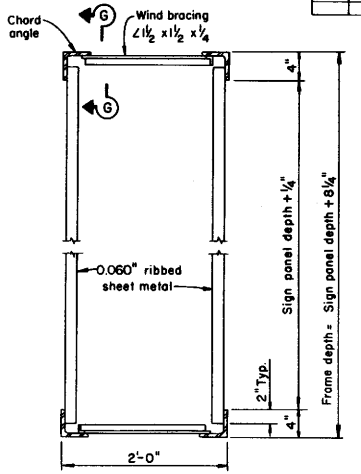


SIGN DEPTH 70"-90"



SIGN DEPTH 100"-120"

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

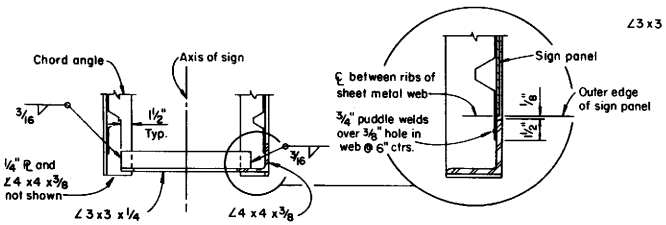


TYPICAL SECTION

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

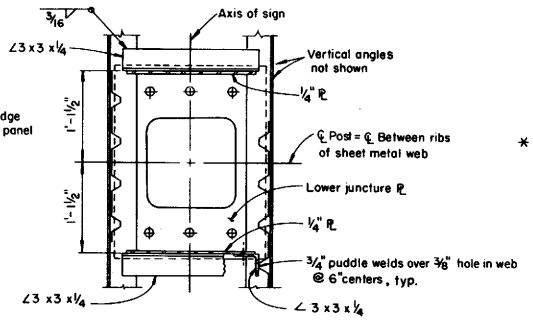
W. C. Cousins
CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9013

Date Approved JULY 1, 1984



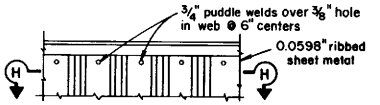
SECTION A-A

END DIAPHRAGM DETAILS

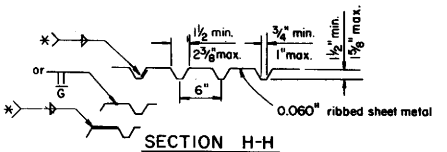


SECTION C-C

POST DIAPHRAGM DETAILS



SECTION G-G



SECTION H-H

* Lap splice shall be continuous weld both sides. For weld qualification test, see Sheet S 34 A-5.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS BOX BEAM SINGLE POST BUTTERFLY FRAME DETAILS

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

CHIEF, OFFICE OF STRUCTURES DESIGN
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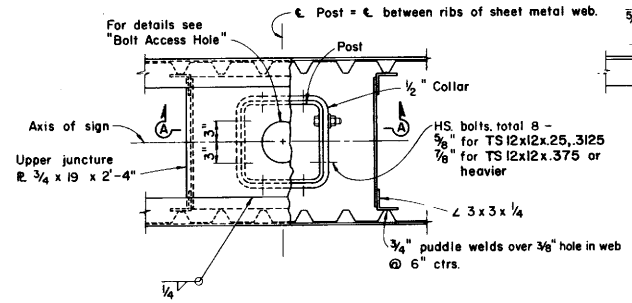
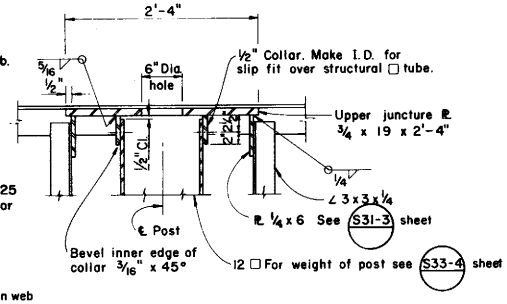
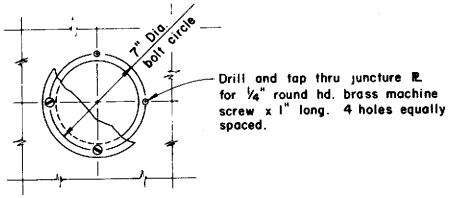


PLAN

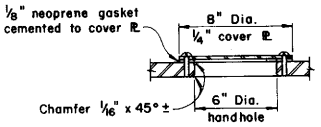


SECTION A-A

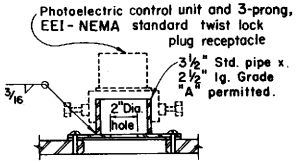
UPPER JUNCTURE CONNECTION



PLAN

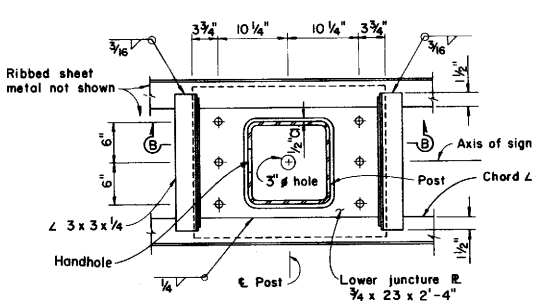


SECTION

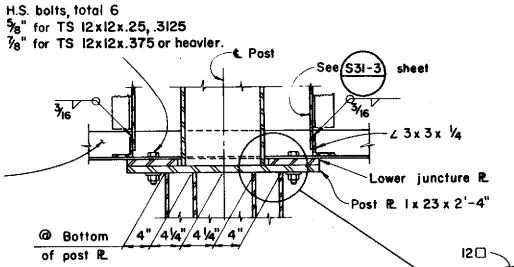


SECTION
With photoelectric control unit

BOLT ACCESS HOLE

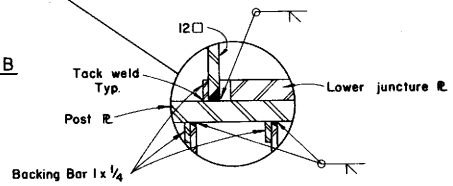


PLAN



SECTION B-B

Note: Lower connection plates shall be machined or straightened after welding to provide full contact between faying surfaces before bolting.



LOWER JUNCTURE CONNECTION

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
SINGLE POST BUTTERFLY
FRAME JUNCTURE DETAILS

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CHIEF OFFICE OF STRUCTURE DESIGN
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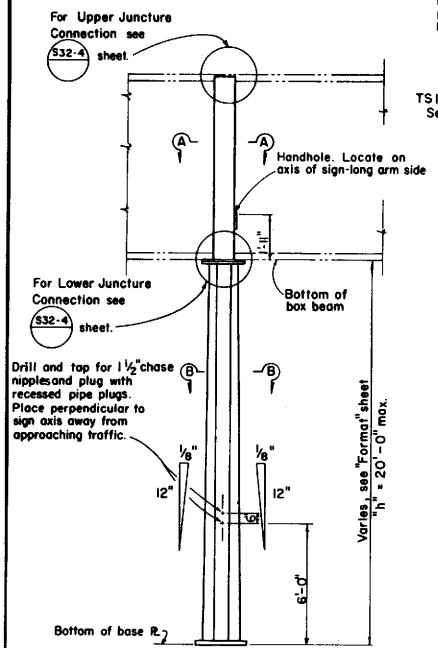
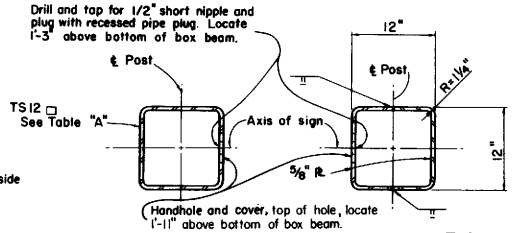
DATE July 1, 1984

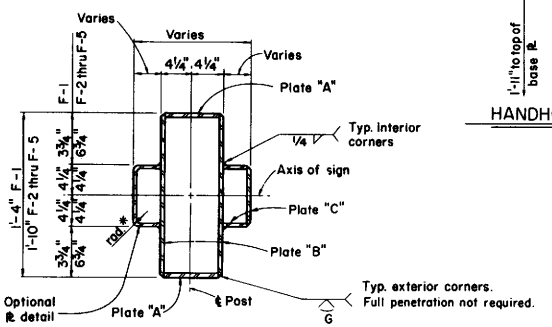


ELEVATION



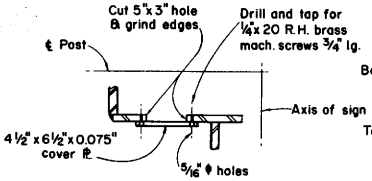
TYPE F-1 THRU F-3 TYPE F-4 & F-5

SECTION A-A

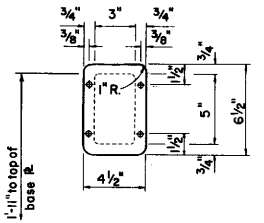


* 1/4" ℞, rad. = 1"
3/8" ℞, rad. = 1 1/2"

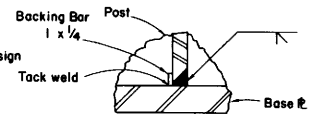
SECTION B-B



Note: Face handhole away from traveled way. On F-1 type posts locate handhole on ℄ Post in Plate "A".



HANDHOLE AND COVER DETAIL



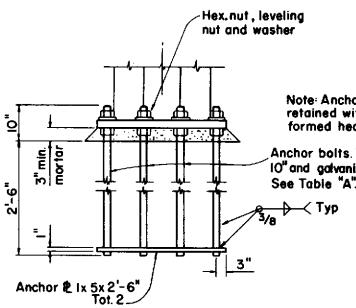
PLATES A, B & C
POST TO BASE PLATE

WELDING DETAILS

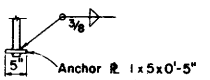
TABLE "A"

Post Type	Plate "A"	Plate "B"	Plate "C"	Base Plate	Anchor Bolts No. & Dia.*	Structural Tube
F-1	1/4" x 8"	1/4"	1/4"	2" x 30"x3'-0"	8 - 2"	12 x 12 x 0.3125
F-2	1 1/2" x 8"	1/4"	1/4"	2" x 30"x3'-0"	12 - 1 3/4"	12 x 12 x 0.375
F-3	1 1/2" x 8"	1/4"	1/4"	2" x 30"x3'-0"	12 - 2"	12 x 12 x 0.500
F-4	1 1/2" x 7 3/4"	3/8"	3/8"	2 1/2" x 30"x3'-0"	12 - 2 1/4"	See Section A-A
F-5	1 1/2" x 7"	3/4"	3/8"	2 3/4" x 30"x3'-0"	12 - 2 1/4"	

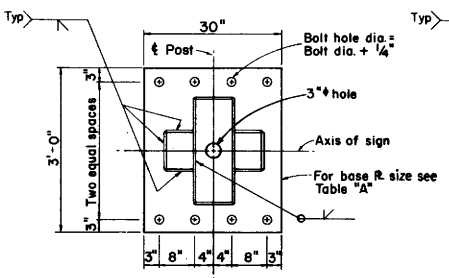
* 2" ϕ anchor bolts may be substituted for 1 3/4" ϕ bolts.



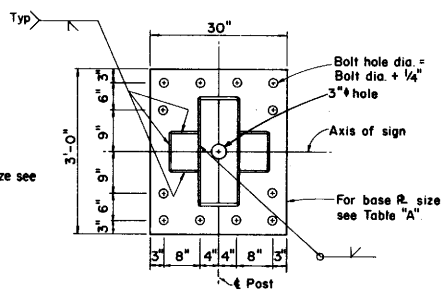
ANCHORAGE DETAILS



SINGLE SIDE BOLT



TYPE F-1



TYPE F-2 THRU F-5

BASE PLATE DETAILS

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OVERHEAD SIGNS
BOX BEAM
SINGLE POST BUTTERFLY
POST DETAILS

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CHIEF, OFFICE OF STRUCTURES DESIGN
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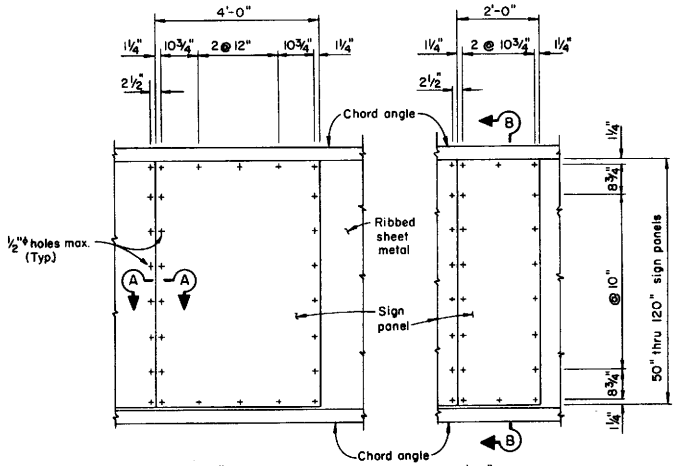
DATE July 1, 1984

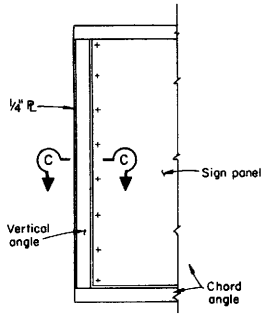


4'-0" PANEL

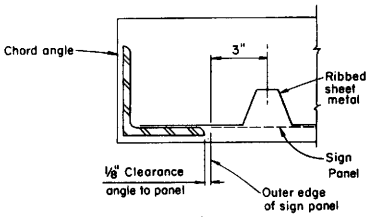
2'-0" PANEL

INTERIOR SPAN

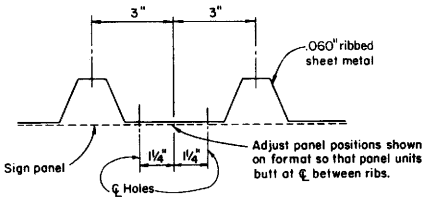
ELEVATION



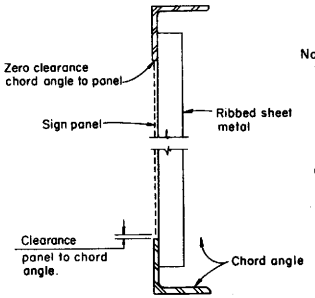
CANTILEVER ARM



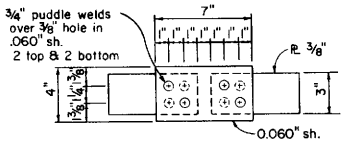
SECTION C-C



SECTION A-A

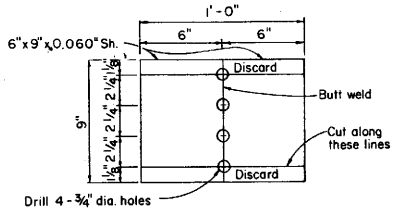


SECTION B-B



Note:
Two specimens req'd for each position to be welded.

TEST NO. 1



TEST NO. 2

WELD QUALIFICATION TESTS

Notes:

1. Sign panel mounting holes are ½" diameter max.
2. Holes shall be drilled in ribbed sheet metal by template. Sign panel may be considered a template
3. Test No. 2 shall be used for welder qualifications on square groove weld and fillet weld lap splices

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
SIGN PANEL MOUNTING DETAILS
SINGLE SHEET SIGN PANEL

S 34A-5

S 34A-5

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DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
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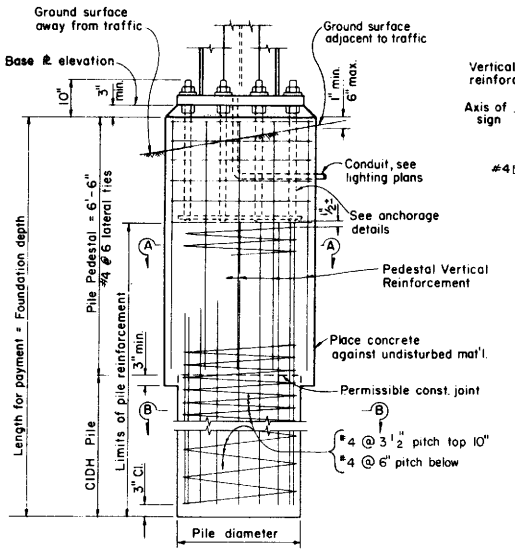
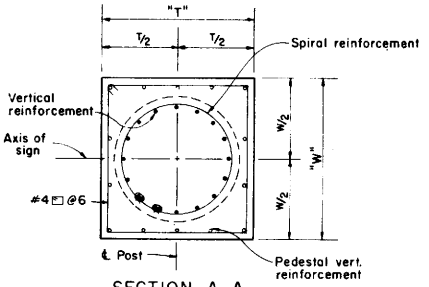
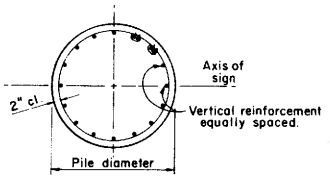


ELEVATION

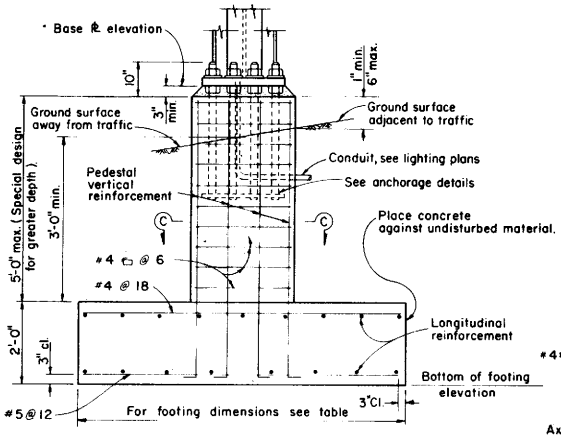


SECTION A-A



SECTION B-B

PILE FOUNDATION



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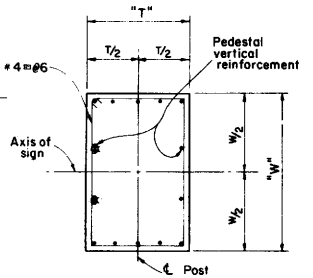

SPREAD FOOTING

SECTION C-C

SINGLE POST TYPE									
Post Type	Pedestal Size "T" x "W"	Pile Foundation				Spread Footing			
		Vertical Reinf.	Pile Dia.	Found-ation Depth	Pedestal Vert. Reinf.	Footing Dimension	Top Reinf. Longit	Top Reinf. Transv	Bottom Reinf. Longit	Bottom Reinf. Transv
E-1	3'-4"x 3'-8"	16-#8	36"	13'	14-#8	8'-0"x14'-0"	6-#5	#4@18	9-#7	5@12
E-2	3'-4"x 3'-8"	16-#9	↑	15'	14-#9	9'-0"x15'-0"	6-#6	↓	9-#9	↓
E-3	3'-8"x 3'-8"	16-#10		18'	14-#10					
E-4	3'-8"x 3'-8"	16-#11		20'	14-#11					
F-1	3'-4"x 3'-8"	16-#8		13'	14-#7	8'-0"x13'-0"	8-#4	4@18	10-#7	5@12
F-2	↑	16-#9		15'	14-#7	8'-0"x15'-0"	8-#5	↓	11-#8	↓
F-3		16-#9		16'	14-#8	8'-0"x16'-0"	9-#5		10-#9	
F-4		16-#11		19'	14-#9	8'-0"x19'-0"	9-#6		10-#11	
F-5	3'-4"x 3'-8"	16-#11	36"	22'	14-#10	8'-0"x20'-0"	10-#6	4@18	12-#11	5@12

TWO POST TYPE										
Post Type	Pedestal Size "T" x "W"	Pile Foundation				Spread Footing				
		Vertical Reinf.	Pile Dia.	Found-ation Depth	Pedestal Vertical Reinf.	Footing Dimension	Top Reinf. Longit	Top Reinf. Transv	Bottom Reinf. Longit	Bottom Reinf. Transv
A-1	3'-4"x 4'-0"	16-#8	36"	14'	14-#7	7'-0"x16'-0"	7-#5	#4@18	6-#9	#5@12
A-2	3'-4"x 4'-0"	16-#9	36"	16'	14-#8	8'-0"x17'-0"	10-#5	↑	10-#9	↑
A-3	3'-4"x 4'-0"	16-#11	36"	20'	14-#9	8'-0"x18'-0"	8-#6		9-#11	
A-4	3'-4"x 4'-0"	24*-#11	36"	21'	14-#9	8'-0"x20'-0"	8-#8		11-#11	
A-5	3'-4"x 4'-0"	24*-#11	36"	21'	14-#10	8'-0"x20'-0"	8-#8		11-#11	
B-1	3'-4"x 4'-5"	16-#11	36"	20'	14-#8	8'-0"x18'-0"	8-#6		9-#11	
B-2	3'-4"x 4'-5"	24*-#11	36"	22'	14-#9	8'-0"x20'-0"	10-#6		11-#11	
B-3	3'-4"x 4'-7"	28*-#11	36"	24'	14-#10	8'-0"x 21'-0"	7-#8		13-#11	
B-4	3'-10"x 4'-7"	24*-#11	42"	22'	14-#10	8'-0"x22'-0"	7-#8		14-#11	
B-5	3'-10"x 4'-7"	24*-#11	42"	23'	14-#10	8'-0"x 23'-0"	8-#8		15-#11	
C-1	3'-4"x 3'-5"	16-#9	36"	16'	14-#7	7'-0"x 16'-0"	6-#6		7-#11	
C-2	3'-4"x 3'-8"	16-#11	36"	19'	14-#9	8'-0"x 17'-0"	8-#6		9-#11	
C-3	3'-4"x 3'-8"	24*-#11	36"	21'	14-#10	8'-0"x 19'-0"	9-#6		11-#11	
C-4	3'-4"x 3'-8"	28*-#11	36"	24'	14-#10	8'-0"x 21'-0"	7-#8		13-#11	
C-5	3'-10"x 3'-10"	24*-#11	42"	22'	14-#11	8'-0"x 22'-0"	8-#8		15-#11	
C-6	3'-10"x 3'-10"	24*-#11	42"	23'	14-#11	8'-0"x23'-0"	8-#8		16-#11	
C-7	3'-10"x 3'-10"	28*-#11	42"	24'	14-#11	8'-0"x23'-0"	8-#8		12-#14	
C-8	3'-10"x 3'-10"	34*-#11	42"	25'	28*-#10	8'-0"x24'-0"	9-#8		13-#14	
D-1	3'-4"x 4'-0"	24*-#11	36"	21'	14-#9	8'-0"x 19'-0"	9-#6		10-#11	
D-2	3'-4"x 4'-2"	28*-#11	36"	24'	14-#10	8'-0"x21'-0"	7-#8		13-#11	
D-3	3'-10"x 4'-2"	24*-#11	42"	24'	14-#11	8'-0"x23'-0"	8-#8		16-#11	
D-4	3'-10"x 4'-2"	34*-#11	42"	27'	14-#11	8'-0"x23'-0"	8-#8		18-#11	
D-5	3'-10"x 4'-2"	34*-#11	42"	30'	28*-#10	8'-0"x25'-0"	9-#8		14-#14	
D-6	4'-2"x 4'-7"	34*-#11	42"	30'	14-#11	8'-0"x26'-0"	10-#8		14-#14	
D-7	4'-2"x 4'-7"	34*-#11	42"	30'	14-#11	8'-0"x26'-0"	10-#8	#4@18	15-#14	#5@12

* Bundled bars

NOTES:

1. Base plates, pedestals and footings; longer sides shall be normal to axis of sign.
2. For anchor bolt layout see S30-6
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 ground surface. Remainder to be placed against undisturbed material.
6. Pile footing - use foundation depth shown in table unless otherwise shown on "Format" sheet.
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.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS BOX BEAM AND CLOSED TRUSS ALTERNATIVE FOUNDATION

S 39-6

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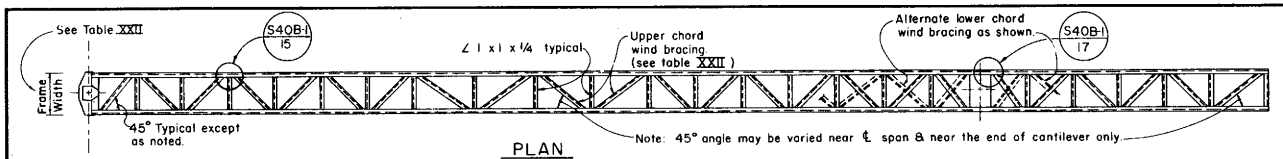
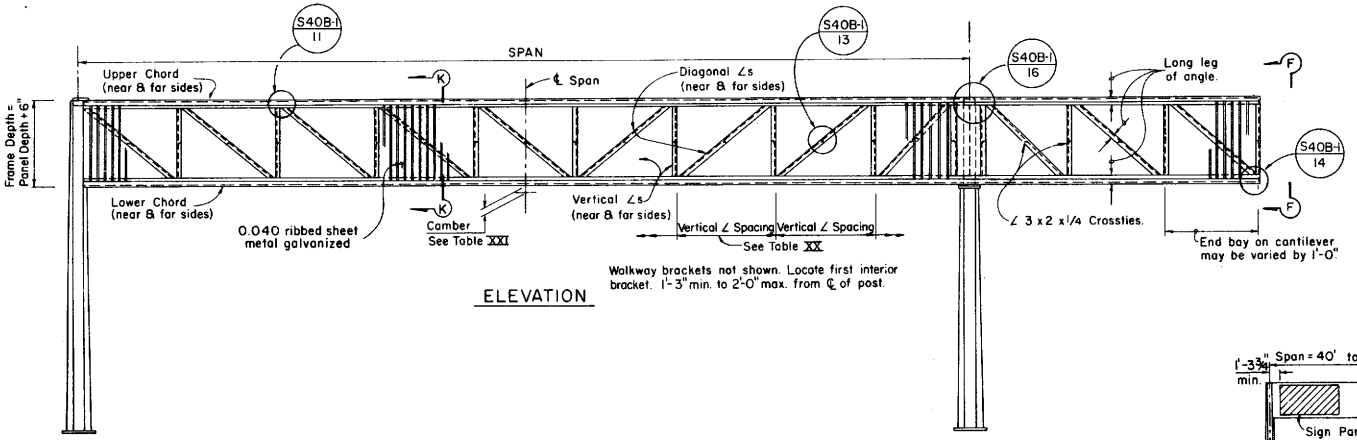


PLAN



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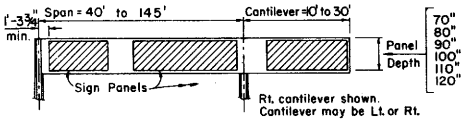

RANGE OF STRUCTURE SIZES

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"	5 x 3 x 7/16	3 x 3 x 5/16	3 x 3 x 1/4	1 1/2 x 1 1/2 x 1/4	2'-0"	5 x 3 x 7/16	3 x 3 x 5/16	3 x 3 x 1/4	1 1/2 x 1 1/2 x 1/4	2'-0"	5 x 3 x 7/16	3 x 3 x 5/16	3 x 3 x 5/16	1 1/2 x 1 1/2 x 1/4
51'-60'		5 x 3 x 7/16					5 x 3 x 7/16					5 x 3 x 7/16			
61'-70'		5 x 3 x 7/16					5 x 3 x 7/16					5 x 3 x 7/16			
71'-80'		5 x 3 x 7/16					5 x 3 x 7/16					5 x 3 1/2 x 1/2			
81'-90'		5 x 3 1/2 x 1/2					5 x 3 1/2 x 1/2					5 x 3 1/2 x 1/2			
91'-100'		5 x 3 1/2 x 5/8					5 x 3 1/2 x 5/8					5 x 3 1/2 x 5/8			
101'-110'		6 x 4 x 9/16					6 x 4 x 9/16					6 x 4 x 9/16			
111'-120'		6 x 4 x 5/8					6 x 4 x 5/8					7 x 4 x 5/8			
121'-132'		7 x 4 x 3/4				2'-6"	7 x 4 x 5/8			2 x 2 x 1/4	2'-6"	7 x 4 x 5/8			2 x 2 x 1/4
133'-145'	2'-6"	7 x 4 x 3/4			2 x 2 x 1/4	2'-6"	7 x 4 x 3/4			2 x 2 x 1/4	2'-6"	7 x 4 x 3/4			2 x 2 x 1/4

Span	100" Panel Depth					110" Panel Depth					120" Panel Depth				
	Frame Width	Chord ∠s	Vertical ∠s	Diagonal ∠s	Wind Bracing	Frame Width	Chord ∠s	Vertical ∠s	Diagonal ∠s	Wind Bracing	Frame Width	Chord ∠s	Vertical ∠s	Diagonal ∠s	Wind Bracing
40'-50'	2'-0"	5 x 3 x 7/16	3 x 3 x 5/16	3 x 3 x 5/16	1 1/2 x 1 1/2 x 1/4	2'-0"	5 x 3 x 7/16	3 1/2 x 3 1/2 x 5/16	3 1/2 x 3 1/2 x 5/16	1 1/2 x 1 1/2 x 1/4	2'-0"	5 x 3 x 7/16	3 1/2 x 3 1/2 x 5/16	4 x 3 1/2 x 5/16	1 1/2 x 1 1/2 x 1/4
51'-60'		5 x 3 x 7/16					5 x 3 x 7/16					5 x 3 x 7/16			
61'-70'		5 x 3 x 7/16					5 x 3 x 7/16					5 x 3 1/2 x 1/2			
71'-80'		5 x 3 1/2 x 1/2					5 x 3 1/2 x 5/8					5 x 3 1/2 x 5/8			
81'-90'		5 x 3 1/2 x 5/8					6 x 4 x 9/16					6 x 4 x 9/16			
91'-100'		6 x 4 x 9/16					6 x 4 x 9/16					7 x 4 x 5/8			
101'-110'		6 x 4 x 5/8					7 x 4 x 5/8					7 x 4 x 3/4			2 x 2 x 1/4
111'-120'		7 x 4 x 3/4				2'-6"	7 x 4 x 5/8			2 x 2 x 1/4	2'-6"	8 x 4 x 3/4			
121'-132'	2'-6"	7 x 4 x 3/4			2 x 2 x 1/4	2'-6"	7 x 4 x 3/4			2 x 2 x 1/4	2'-6"	8 x 4 x 3/4			
133'-145'	2'-6"	8 x 4 x 3/4			2 x 2 x 1/4	2'-6"	8 x 4 x 7/8			2 x 2 x 1/4	2'-6"	8 x 4 x 7/8			

TABLE XXII

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 XX

Fabrication Camber At ℄ Span	
Span	Camber
40' - 70'	1"
71' - 100'	1 3/4"
101' - 120'	2 1/4"
121' - 145'	2 3/4"

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

TABLE XXI

NOTE:

1. Frame widths shown are nominal. These widths may be varied by 1/4" to standardize fabrication methods.
2. For View F-F see S40D-1 sheet.
3. For Section K-K see S40B-1 sheet.
4. For Foundation details see S39-6 sheet.

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1984

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
TWO POST TYPE
FRAME MEMBERS

S40A-1

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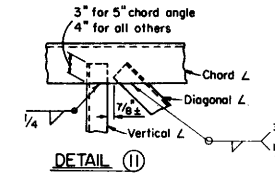
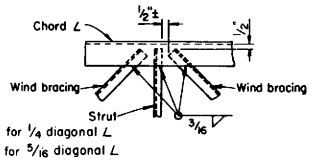


DETAIL (11)



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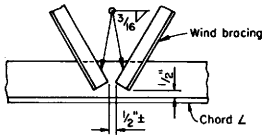

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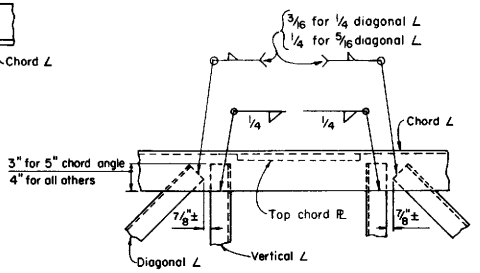

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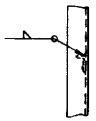

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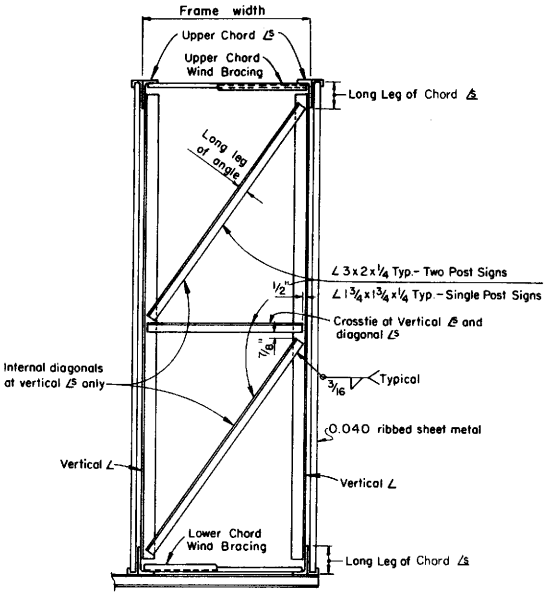
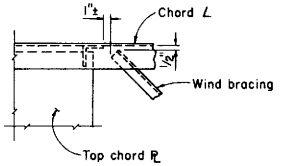


TYPICAL SECTION K-K



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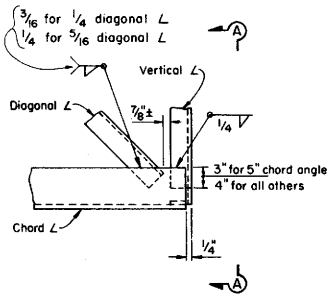

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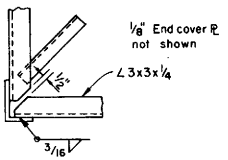
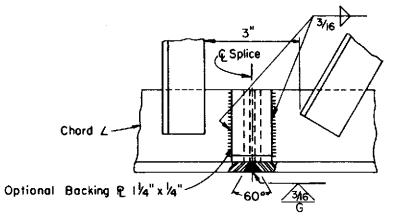


SECTION A-A



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

WELDED CHORD SPLICE

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 4, 1984

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
SINGLE AND TWO POST TYPE
GENERAL FRAME DETAILS | S40B-1

S40B-1

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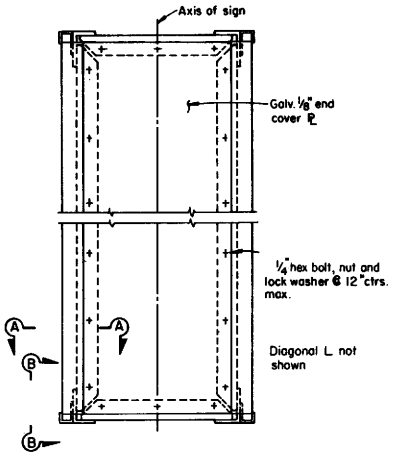
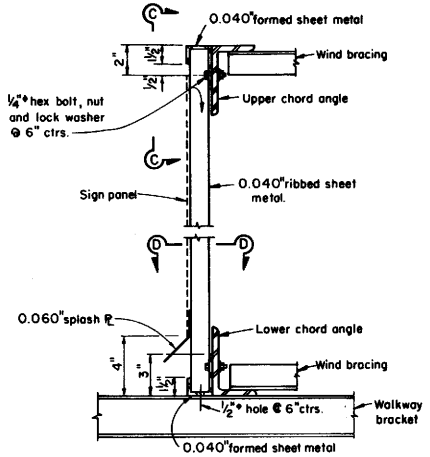
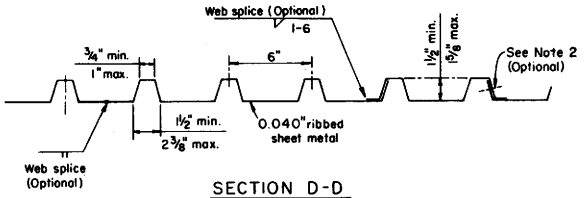


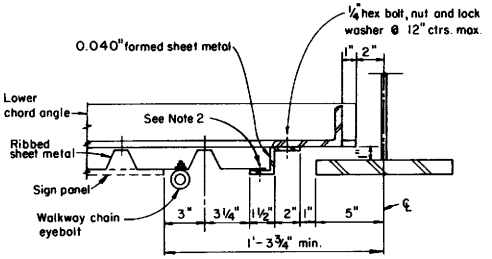
CANTILEVER END VIEW



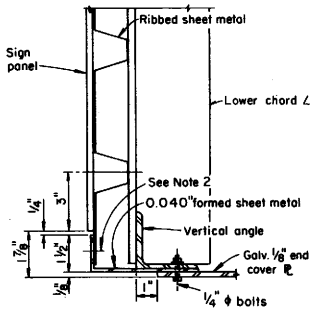
TYPICAL SECTION



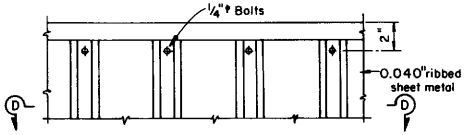
SECTION D-D



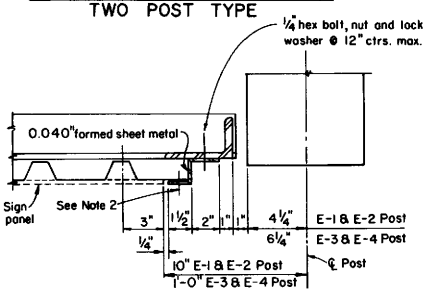
HORIZONTAL SECTION AT POST
TWO POST TYPE



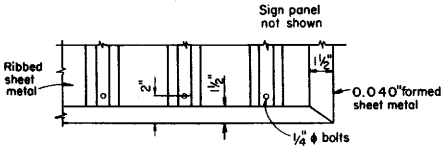
SECTION A-A



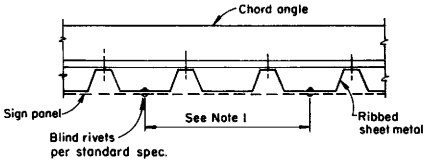
VIEW C-C



HORIZONTAL SECTION AT POST
CANTILEVER TYPE



VIEW B-B



MOUNTING DETAILS FOR
SINGLE SHEET SIGN PANELS

NOTES:

1. For rivet spacing and details not shown, see S34A-5
2. Approved blind rivets 3/16" dia. @ 6" ctrs.

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1984

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
RIBBED SHEET METAL DETAILS

S40C-1

S40C-1

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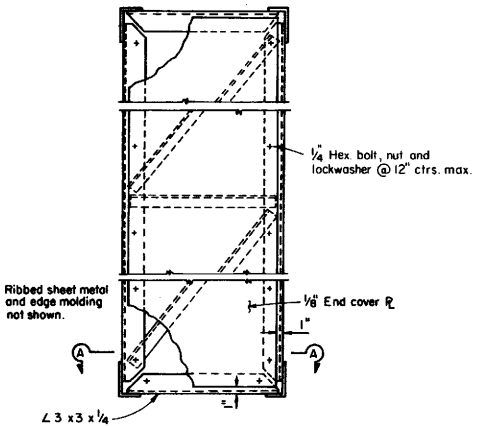
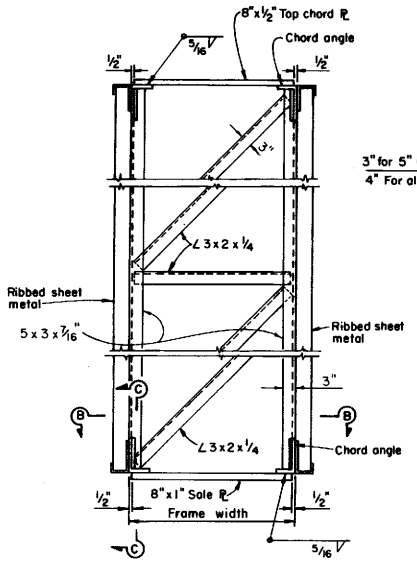
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

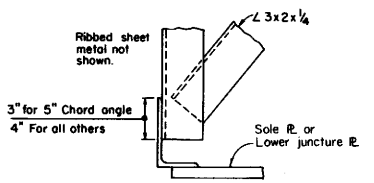
DATE APPROVED July 1, 1984



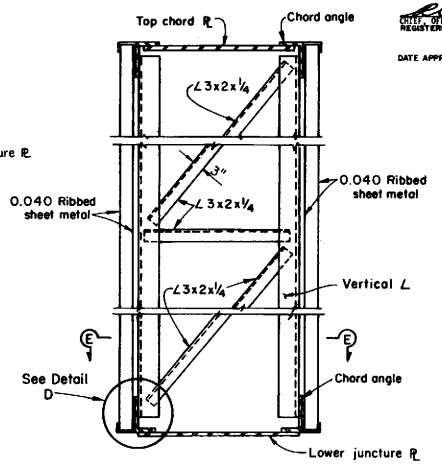
VIEW F-F
At Cantilever End



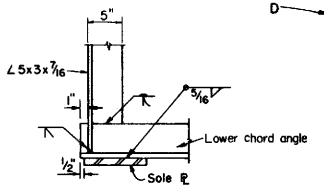
POST - END VIEW



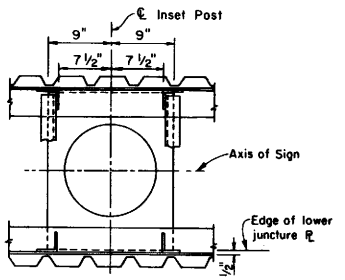
DETAIL D



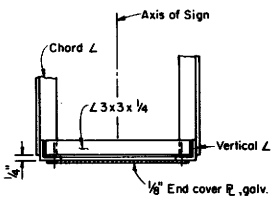
SECTION AT INSET POST



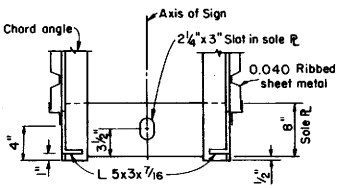
SECTION C-C



SECTION E-E



SECTION A-A



SECTION B-B

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
TWO POST TYPE
FRAME DETAILS

S40D-1

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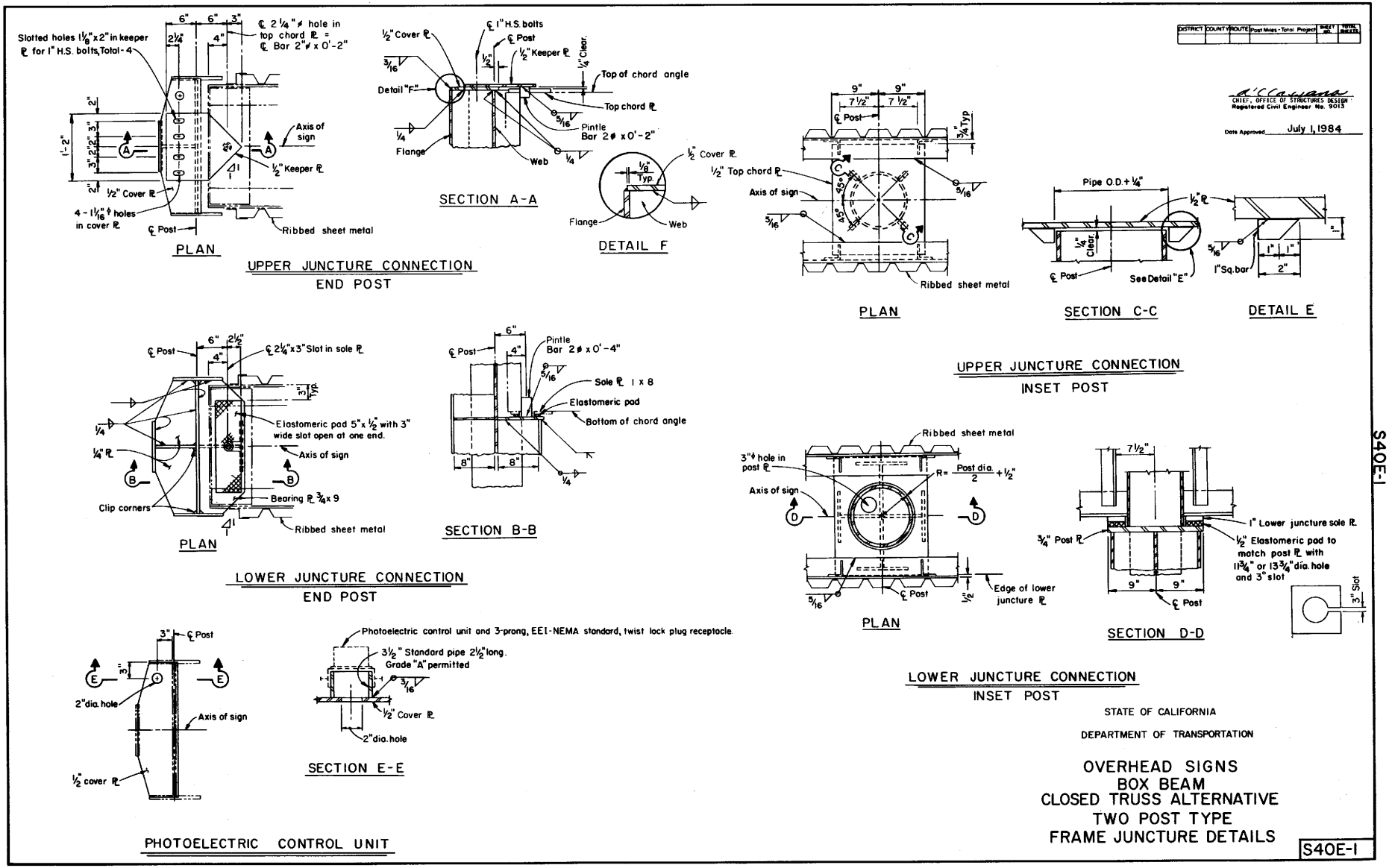

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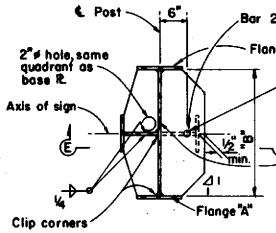
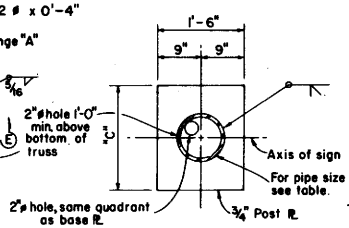
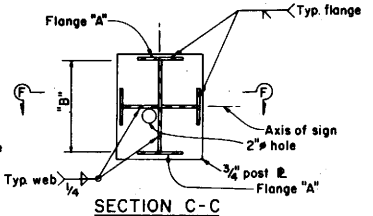


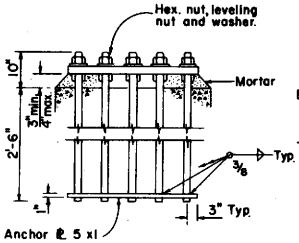
SECTION A-A



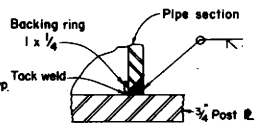
SECTION B-B



SECTION C-C



ANCHORAGE DETAILS



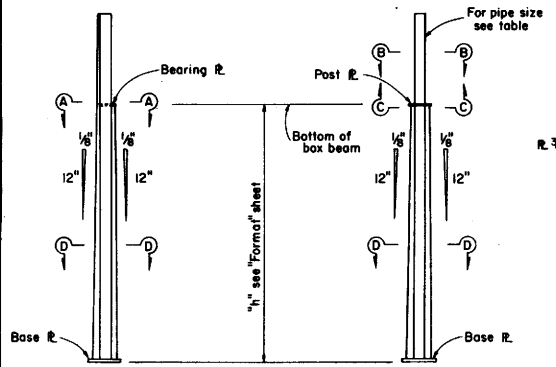
PIPE SECTION TO POST ℞

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

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 8013

Date Approved July 1, 1984

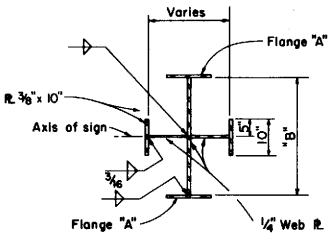
NOTE: For dimensions not shown see table



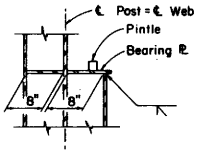
END POST
"A" & "B"

INSET POST
"C" & "D"

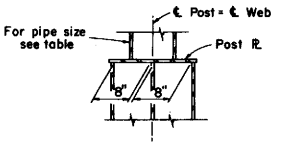
ELEVATION



SECTION D-D



SECTION E-E

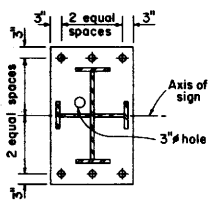


SECTION F-F

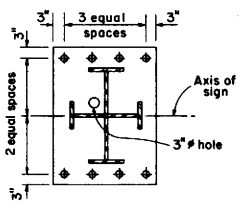
NOTE: Locate 3"ø hole for conduit in quadrant away from approaching traffic-center 2" from web plates.

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

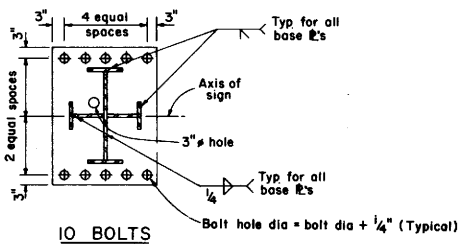
1. Thread upper 10" of anchor bolts and galvanize upper 1'-0"
2. Anchor ℞'s may be retained with hex. nut or formed head.
3. 2 1/2" ϕ anchor bolts may be substituted for 2 1/4" ϕ bolts.
4. For Foundation details see S39-8 sheet.



6 BOLTS



8 BOLTS



10 BOLTS

TYPICAL BASE PLATES

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
TWO POST TYPE
POST DETAILS

S40F-1

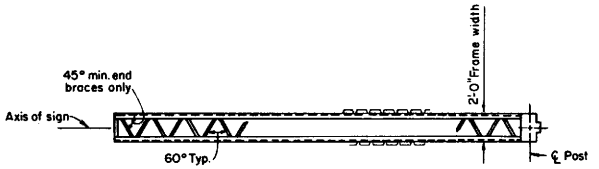
S40F-1

Return to Table of Contents

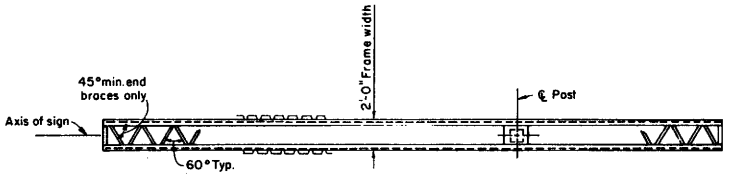
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1984



PLAN



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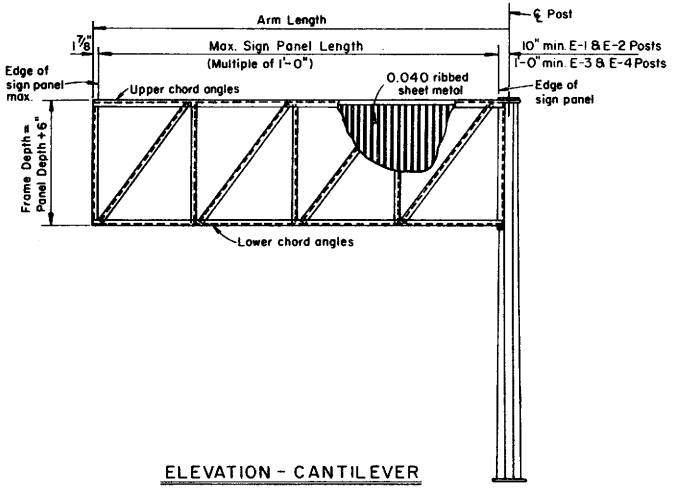
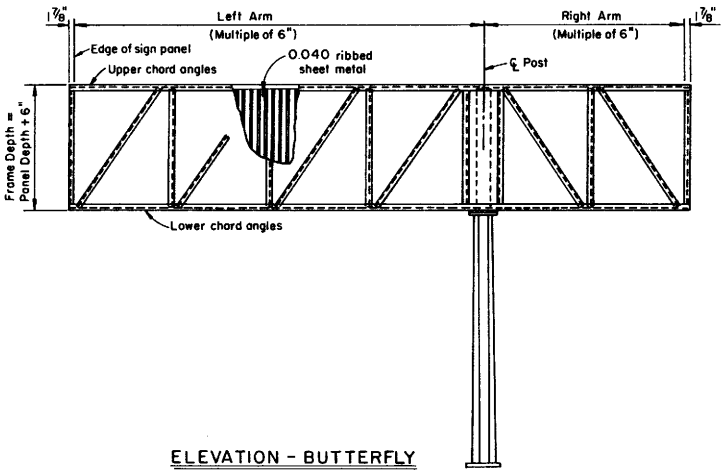
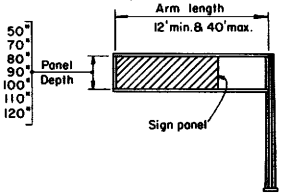


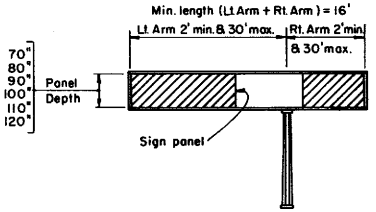
ELEVATION - CANTILEVER



ELEVATION - BUTTERFLY

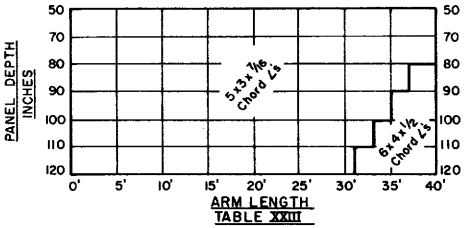


CANTILEVER



BUTTERFLY

RANGE OF STRUCTURE SIZES



UPPER & LOWER CHORD ANGLE SELECTION CHART

(See Notes)

NOTES:
1. For butterfly, use chord angle size determined by longer arm for both sides.
2. For size of vertical and diagonal angles, see S40H-1 and S40K-1 sheets.
3. For foundation details see S39-6 sheet.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
SINGLE POST TYPE
FRAME MEMBERS

S40G-1

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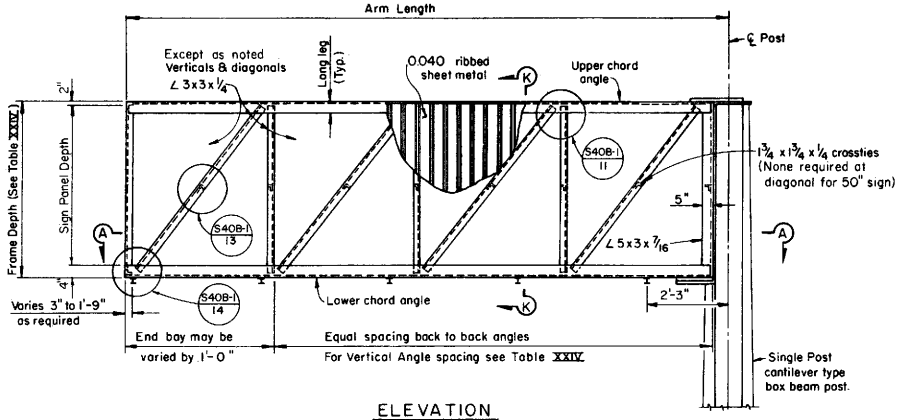
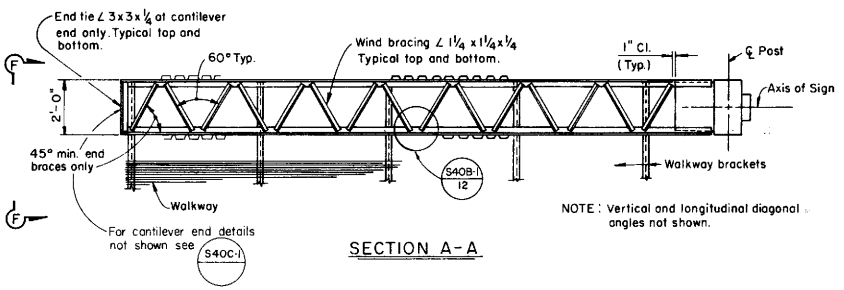
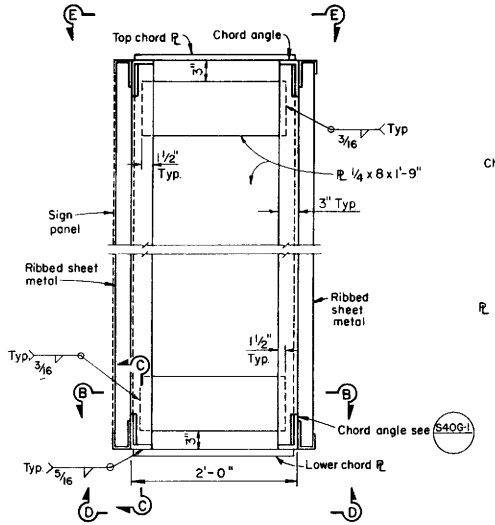


ELEVATION

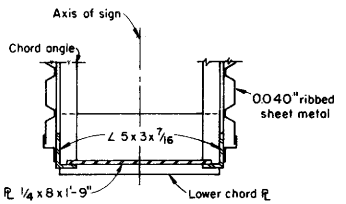


SECTION A-A

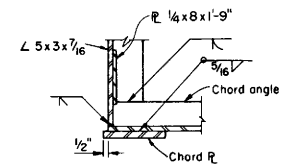


POST END VIEW

NOTE:
1. For Section K-K see S40B-1 sheet.
2. For View F-F at cantilever end, see S40D-1 sheet.



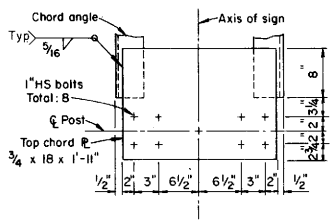
SECTION B-B



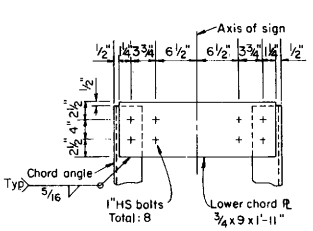
SECTION C-C

Sign Panel Depth	Frame Depth	Max. Vert. Angle Spacing
50"	4'-8"	4'-6"
70"	6'-4"	5'-6"
80"	7'-2"	6'-0"
90"	8'-0"	7'-0"
100"	8'-10"	7'-0"
110"	9'-8"	7'-6"
120"	10'-6"	7'-6"

TABLE XXIV

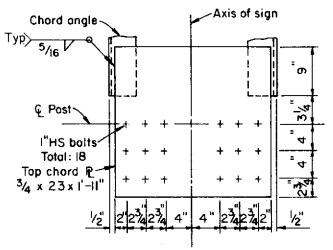


VIEW E-E

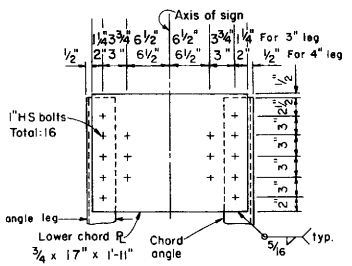


VIEW D-D

TYPE E-1 & E-2



VIEW E-E



VIEW D-D

TYPE E-3 & E-4

CHORD PLATE DETAILS

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1984

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
SINGLE POST CANTILEVER
FRAME DETAILS

S40H-1

S40H-1

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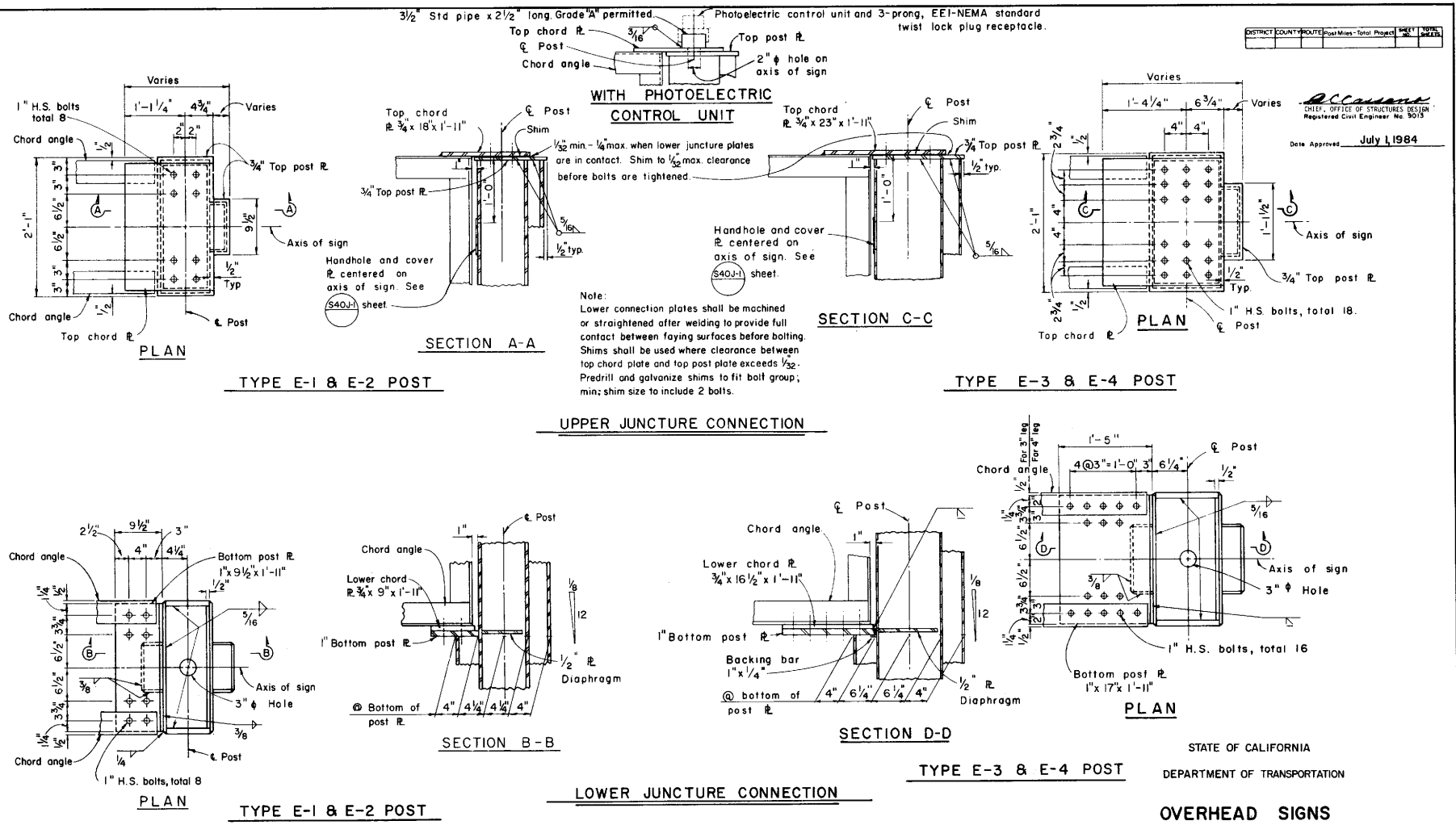
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS



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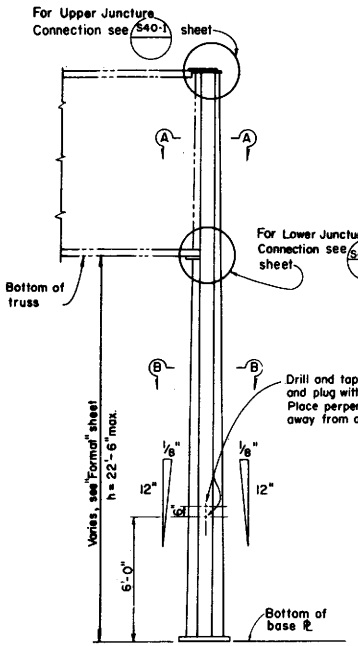
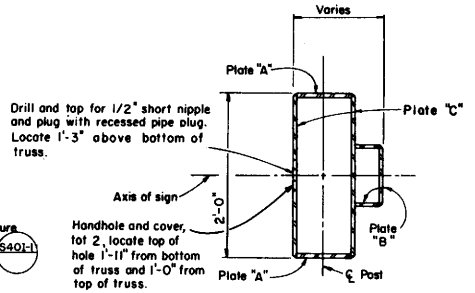
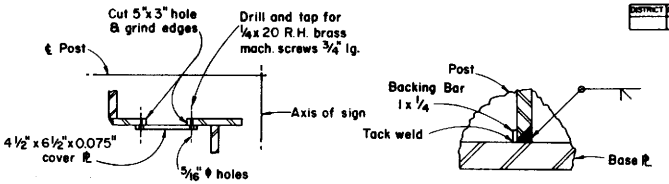


ELEVATION

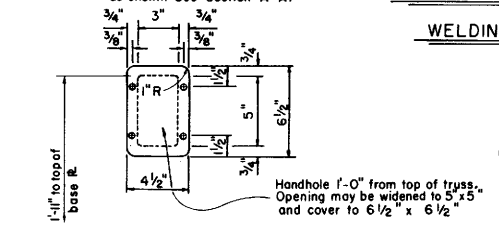


SECTION A-A



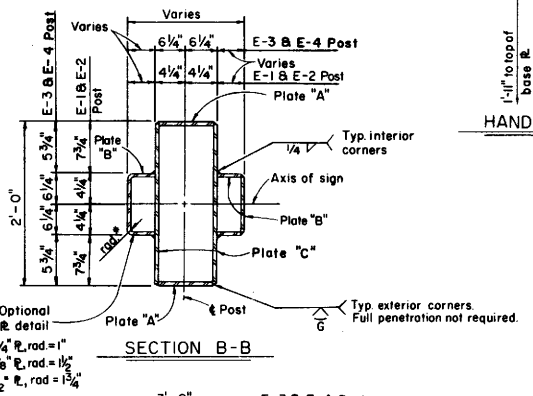
POST TO BASE PLATE

WELDING DETAILS

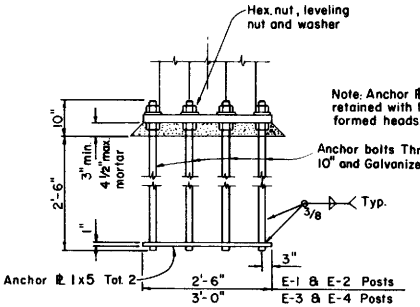


HANDHOLE AND COVER DETAIL

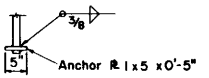
Note:
1. For Foundation details see S39-6 sheet.



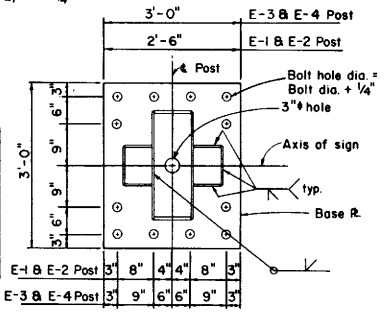
SECTION B-B



ANCHORAGE DETAILS



SINGLE SIDE BOLT



BASE PLATE

Post Type	Base Plate	Plate "A"	Plate "B"	Plate "C"	*Anchor Bolts
E-1	2"x30"x3'-0"	½"	¼"	3/8"	12-1¾"
E-2	2½"x30"x3'-0"	1"	3/8"	½"	12-2"
E-3	2½"x36"x3'-0"	1"	3/8"	½"	12-2¼"
E-4	2½"x36"x3'-0"	1"	½"	5/8"	12-2¼"

* 2"ϕ Anchor bolts may be substituted for 1¾"ϕ bolts.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM

CLOSED TRUSS ALTERNATIVE
SINGLE POST CANTILEVER
POST DETAILS

S40J-1

S40J-1

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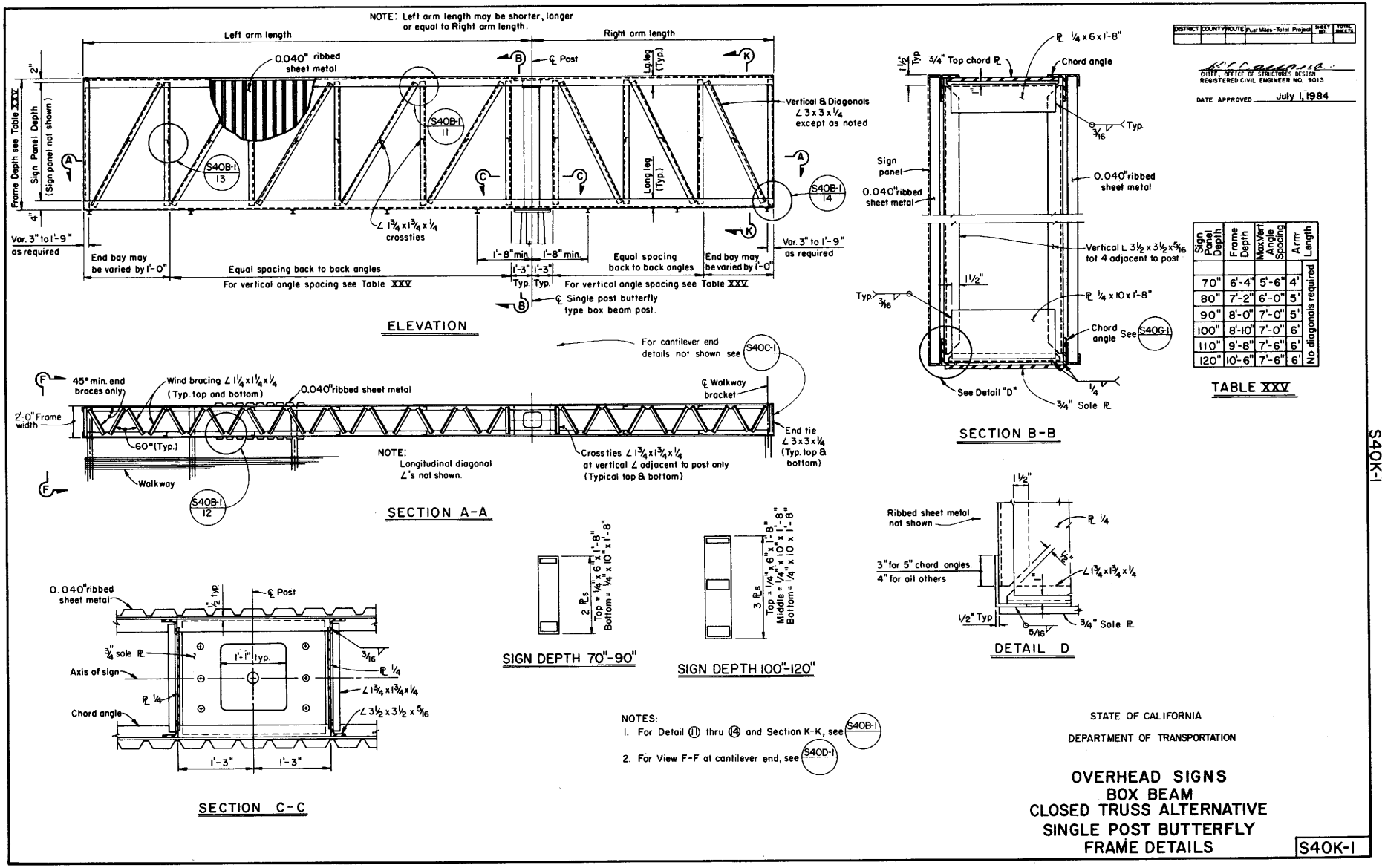

Sign Panel Depth	Frame Depth	Max Vert Angle Spacing	Arm Length
70"	6'-4"	5'-6"	4'
80"	7'-2"	6'-0"	5'
90"	8'-0"	7'-0"	5'
100"	8'-10"	7'-0"	6'
110"	9'-8"	7'-6"	6'
120"	10'-6"	7'-6"	6'
			No diagonals required

TABLE XXV

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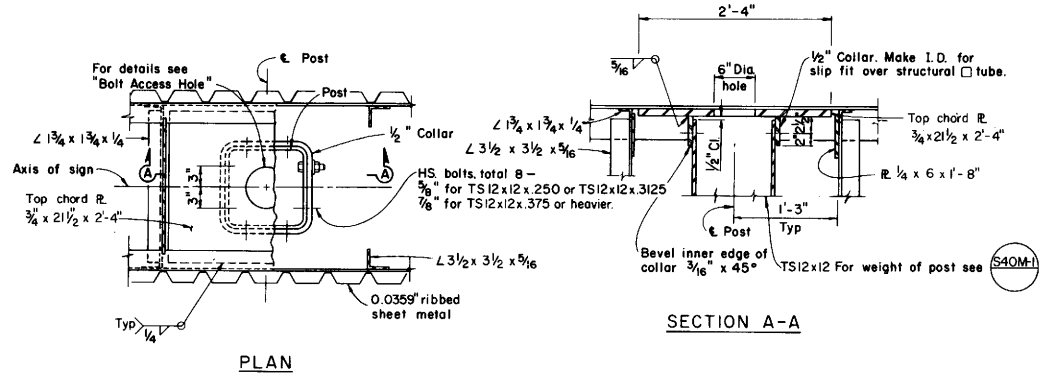
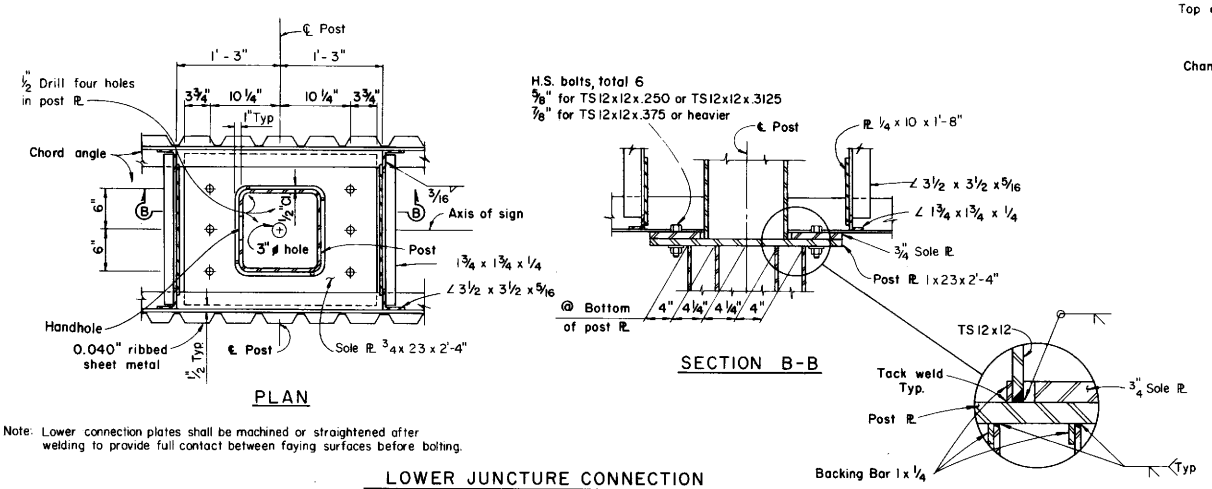
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
Registered Civil Engineer No. 9015

Date Approved July 1, 1984

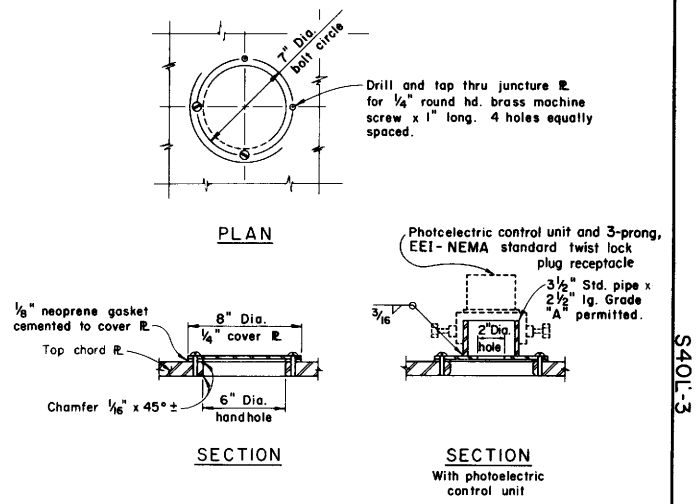


UPPER JUNCTURE CONNECTION



Note: Lower connection plates shall be machined or straightened after welding to provide full contact between faying surfaces before bolting.

LOWER JUNCTURE CONNECTION



BOLT ACCESS HOLE

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
SINGLE POST BUTTERFLY
FRAME JUNCTURE DETAILS

S40L-3

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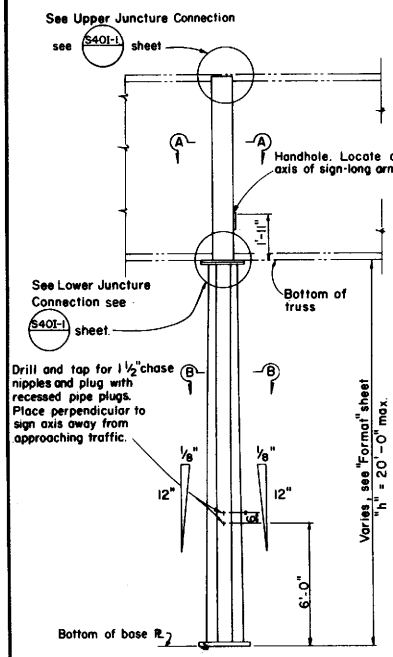
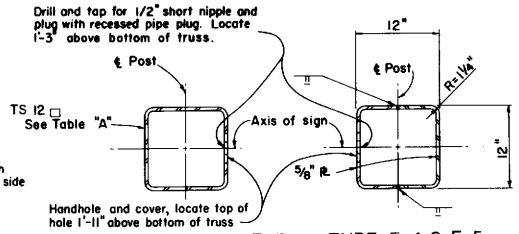
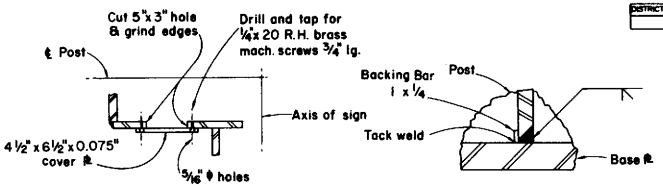


ELEVATION



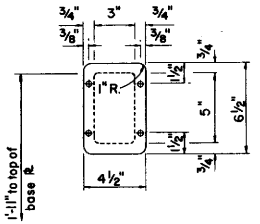
TYPE F-1 THRU F-3 TYPE F-4 & F-5



Note: Face handhole away from traveled way. On F-1 type posts locate handhole on ℄ Post in Plate "A".

PLATES A, B & C
POST TO BASE PLATE
WELDING DETAILS

SECTION A-A

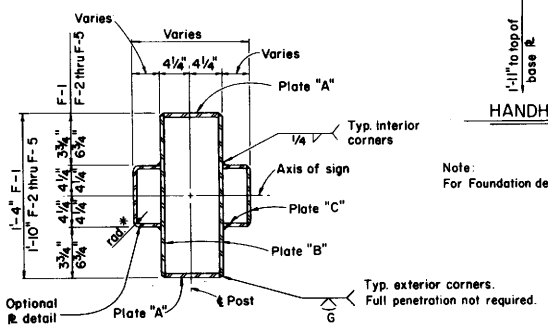


HANDHOLE AND COVER DETAIL

Note:
For Foundation details see S39-6 sheet

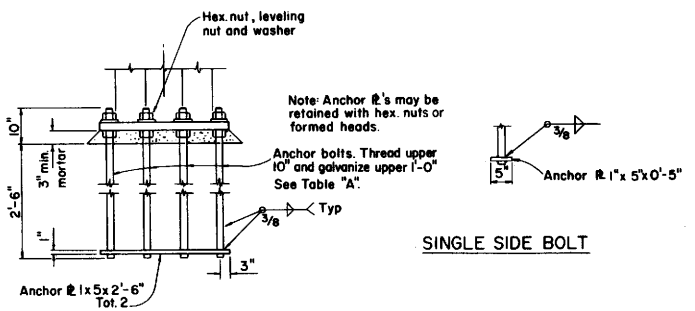
TABLE "A"						
Post Type	Plate "A"	Plate "B"	Plate "C"	Base Plate	Anchor Bolts* No. & Dia.	Structural Tube
F-1	1/4" x 8"	1/4"	1/4"	2" x 30" x 3'-0"	8 - 2"	12 x 12 x 0.3125
F-2	1/2" x 8"	1/4"	1/4"	2" x 30" x 3'-0"	12 - 1 3/4"	12 x 12 x 0.375
F-3	1 1/2" x 8"	1/4"	1/4"	2" x 30" x 3'-0"	12 - 2"	12 x 12 x 0.500
F-4	1 1/2" x 7 3/4"	3/8"	3/8"	2 1/2" x 30" x 3'-0"	12 - 2 1/4"	See Section A-A
F-5	1 1/2" x 7"	3/4"	3/8"	2 3/4" x 30" x 3'-0"	12 - 2 1/4"	

* 2" ϕ anchor bolts may be substituted for 1 3/4" ϕ bolts.



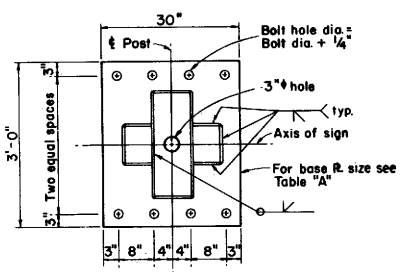
* 1/4" ℞, rad. = 1"
3/8" ℞, rad. = 1 1/2"

SECTION B-B

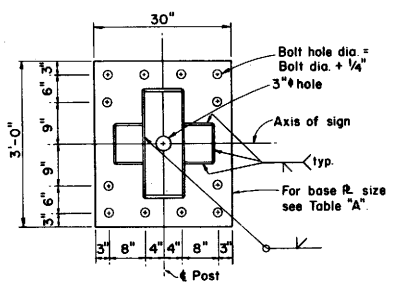


SINGLE SIDE BOLT

ANCHORAGE DETAILS



TYPE F-1



TYPE F-2 THRU F-5

BASE PLATE DETAILS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
BOX BEAM
CLOSED TRUSS ALTERNATIVE
SINGLE POST BUTTERFLY
POST DETAILS

S40M-1

S40M-1

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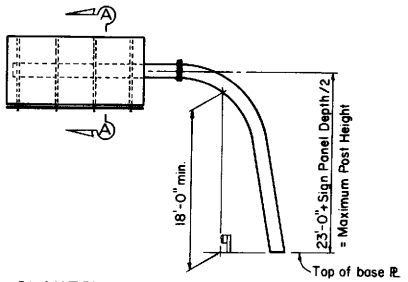
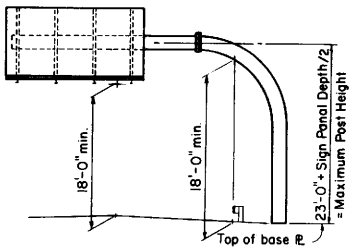
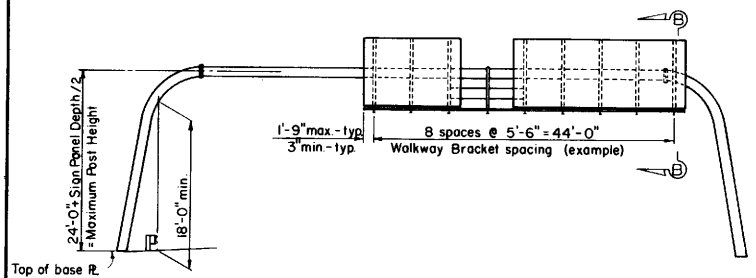


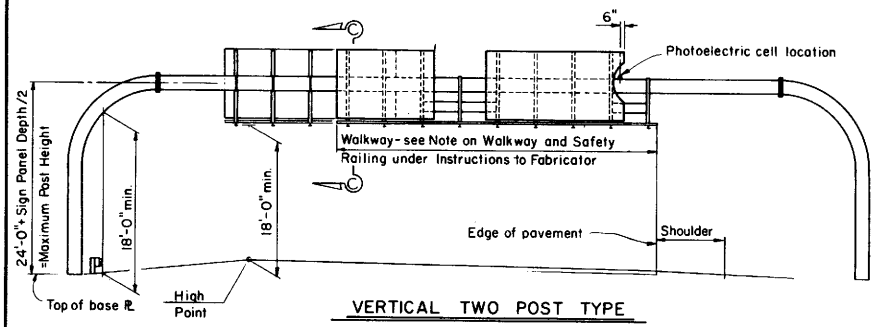
SLANTED SINGLE POST TYPE



VERTICAL SINGLE POST TYPE



SLANTED TWO POST TYPE



VERTICAL TWO POST TYPE

Instructions to Fabricator

Format sheet shows:

1. Sign structure location.
2. Length of structure span.
3. Panel size and location on structure.
4. Post height to bottom of panel or mast arm elevation.
5. Base plate elevation.
6. Photoelectric cell location if required
7. Walkway location.

INDEX

1. Instructions and examples.
2. Single Post Type - Layout and Pipe Selection.
3. Two Post Type — Layout and Pipe Selection.
4. Structural Frame Details No. 1.
5. Structural Frame Details No. 2.
6. Walkway Details (S9-12) sheet.
7. Safety Railing and Cable Details (S11-10) sheet.
8. Foundation Details.

Walkway Brackets:

Maintain uniform spacing where possible.
Maximum spacing shall not exceed 5'-6"
Minimum clear to field splice = 1' ±

Walkway and Safety Railing:

Walkway to extend full length of sign area and be continuous between signs. Extend walkway to Edge of Pavement if required. Safety railing to protect entire walkway.

Photoelectric Cell:

Place behind sign panel nearest right shoulder unless otherwise shown on Format sheet.

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 8013

APPROVED July 1, 1984

GENERAL NOTES

Specifications:

Design: A.A.S.H.O. Specifications for the Design and Construction of Structural Supports for Highway Signs, dated 1975.
Wind dynamics and resultant fatigue life were analyzed using Department of Transportation program WEFFLS as modified by Structures, Design.

Construction: Standard Specifications and the Special Provisions.

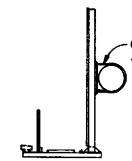
Wind Loading: 80 MPH velocity.

Soil Pressure:

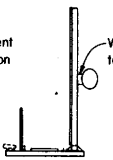
Minimum Vertical Clearance: 18'-0" above roadway and shoulders.

Maximum Height: 50'-0" from ground to center of sign panel. (Regardless of post height)

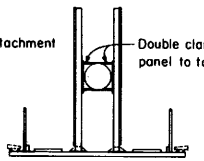
Welding: All welding continuous unless otherwise noted on the plans. All welding to be done in accordance with the Standard Specifications.



SECTION A-A



SECTION B-B



SECTION C-C

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATIONS

OVERHEAD SIGNS
TUBULAR
INSTRUCTIONS AND EXAMPLES

S40N

S40N

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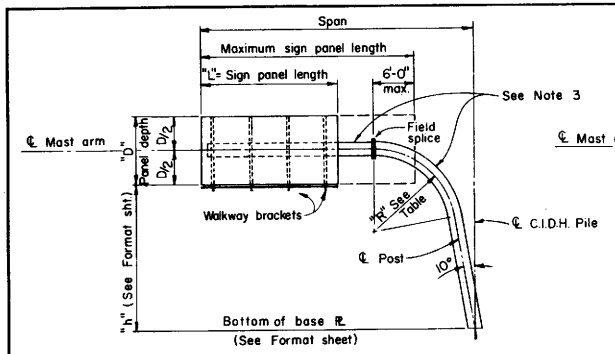
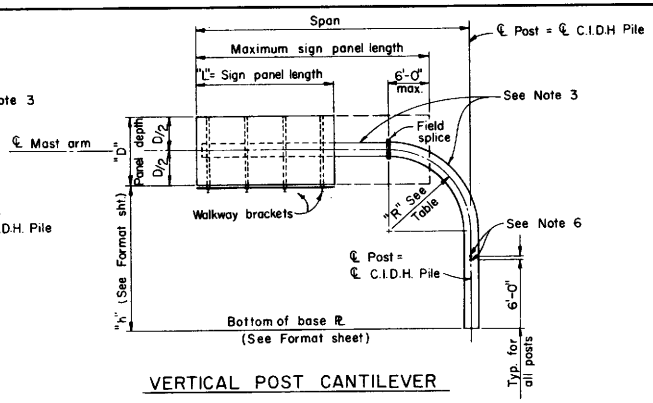


SLANTED POST CANTILEVER



VERTICAL POST CANTILEVER

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED July 1, 1984

NOTES:

1. The maximum sign panel overlap onto the post elbow shall not exceed 6'-0" from the field splice.
2. When several sign panels are to be installed with spaces between the panels, the total sign panel length is the sum of the individual sign panel lengths.
3. All posts between base plate and field splice are Extra Strong pipe. All mast arms are Standard pipe.
4. During sign erection the post shall be raked as necessary with the use of the leveling nuts to make the sign panel level.
5. At final position of post all top and bottom anchor bolt nuts shall be wrench tightened against base plate.
6. Drill and tap for 1½" chase nipples and plug with recessed pipe plugs. Place perpendicular to sign panel axis and away from approaching traffic.

SLANTED POST
PIPE SELECTION PROCEDURE

A. Enter table to proper column with known panel depth "D" and appropriate height "h"
B. Read down column to desired span length.
C. Determine Pipe Post "Dia" and "R" for elbow by reading to the left horizontally.

VERTICAL POST
PIPE SELECTION PROCEDURE

A. For vertical post cantilevers add 2'-0" to the vertical post span and enter table to proper column with known panel depth "D" and appropriate height "h."
B. Read down column to desired span length.
C. Determine Pipe Post "Dia" and "R" for elbow by reading to the left horizontally.

SLANTED POST CANTILEVER

PIPE POST		"D" →	70"		80"		90"		100"		110"		120"	
"R"	Dia.	"h" →	≤20	>20,≤23	≤20	>20,≤23	≤20	>20,≤23	≤20	>20,≤23	≤20	>20,≤23	≤20	>20,≤23
8'-0"	12"	Span (Ft.) →	0 - 17	0 - 18	0 - 18	0 - 19	0 - 20	0 - 18	0 - 21	0 - 21	0 - 20	0 - 19	0 - 18	0 - 18
8'-0"	14"		18 - 19	19	19 - 23	20	21 - 22	19	22 - 24	21	21 - 22	20 - 21	20 - 21	19 - 21
8'-0"	16"		20 - 22	20	24	21	23 - 26	20 - 23	25 - 28	22 - 25	23 - 28	22 - 25	22 - 25	22 - 24
10'-0"	18"		23 - 26	21 - 23	25 - 28	22 - 25	27 - 30	24 - 27	29 - 32	26 - 30	29 - 33	26 - 31	26 - 31	25 - 30
10'-0"	20"		27 - 29	24 - 26	29 - 31	26 - 28	31 - 34	28 - 30	33 - 36	31 - 33	34 - 38	32 - 34	32 - 35	31 - 34
12'-0"	24"		30 - 34	27 - 31	32 - 37	29 - 34	35 - 39	31 - 37	37 - 40	34 - 40	39 - 40	35 - 40	36 - 40	35 - 40

* Mast arm same diameter as post.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
TUBULAR
SINGLE POST TYPE
LAYOUT AND PIPE SELECTION

S40P

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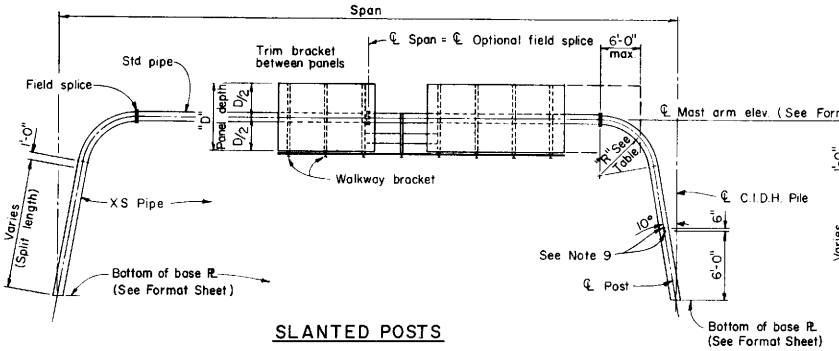
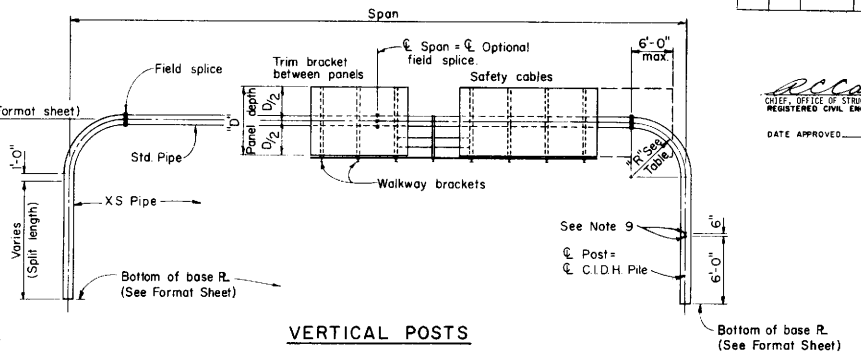


SLANTED POSTS



VERTICAL POSTS

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

R C Cassano
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED July 1, 1984

* Mast arm diameter same as post.

◯ Indicates camber type, see Table.

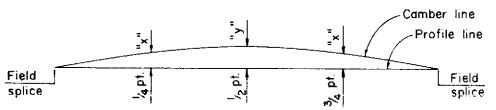
SLANTED POSTS (See Note 2)

*PIPE POST "R"	Dia.	Split	"D" → Span (Ft) 70"	80"	90"	100"	110"	120"
8'-0"	8"	5"	Ⓐ 50-57	Ⓐ 50-57				
8'-0"	10"	4" 6"	Ⓐ 58-67	Ⓐ 58-67	Ⓐ 50-67	Ⓐ 50-67	Ⓐ 50-60	Ⓐ 50-57
8'-0"	12"	4" 8"	Ⓑ 68-77	Ⓑ 67-77	Ⓑ 68-77	Ⓑ 68-77	Ⓑ 61-72	Ⓐ 58-70
8'-0"	14"	4" 8"	Ⓑ 78-84	Ⓑ 78-88	Ⓒ 78-89	Ⓒ 78-87	Ⓑ 73-85	Ⓑ 71-83
8'-0"	16"	0" 4" 8"	Ⓑ 85-89	Ⓑ 89-95	Ⓒ 90-100	Ⓒ 88-100	Ⓒ 86-93	Ⓒ 84-93
10'-0"	18"	0" 5" 8"	Ⓑ 90-96	Ⓒ 96-103	Ⓒ 101-108	Ⓒ 101-110	Ⓒ 94-107	Ⓒ 94-105
10'-0"	20"	0" 5"	Ⓑ 97-102	Ⓒ 104-108	Ⓒ 109-115	Ⓓ 111-120	Ⓓ 108-115	Ⓒ 106-110
12'-0"	24"	0" 5"	Ⓑ 103-115	Ⓒ 109-123	Ⓓ 116-129	Ⓓ 121-135	Ⓓ 116-140	Ⓓ 111-115 Ⓓ 116-135①

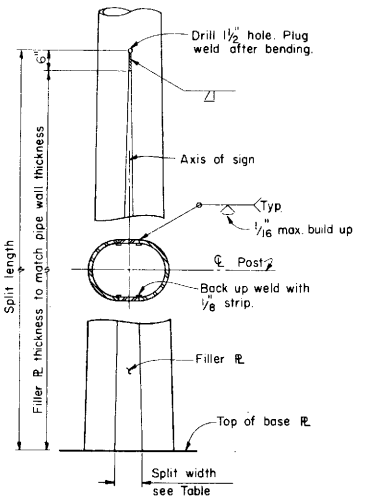
① May increase to 145' with total panel coverage limited to 75' camber type Ⓔ

CAMBER

Type	"x"	"y"
Ⓐ	1 1/2"	2"
Ⓑ	2 1/4"	3"
Ⓒ	2 3/4"	4"
Ⓓ	3 1/2"	5"
Ⓔ	4 1/2"	6"



CAMBER DIAGRAM



POST SPLIT DETAILS

NOTES:

1. The maximum sign panel overlap onto elbow shall not exceed 6'-0" from the field splice.
2. For vertical post type, add 8'-0" to the vertical post span and enter the table for slanted post type. This adjusted span (vertical span + 8') shall not exceed the maximum span shown on the table.
3. When several sign panels are to be installed with spaces between the panels the total sign panel length is the sum of the individual sign panel lengths only.
4. Maximum total sign panel coverage = 70% of slanted post span, 80% of vertical post span for spans up to 110' above 110', varies on a straight line to 60% of vertical post span at 140'
5. All posts between base plate and field splice are Extra Strong pipe. All mast arms are Standard pipe.
6. Before any portion of the sign frames are assembled in their final positions the Contractor shall demonstrate to the Engineer by preassembly or other approved methods that the span lengths of the frames in the no load condition match within 1/2" ± the field measured span lengths between foundations.
7. If the sign frames are erected as one unit, they shall be adequately suspended to avoid distortions or changes in span length between base plates.
8. At final position of post, all top and bottom anchor bolt nuts shall be wrench tightened against base plate.
9. Drill and tap for 1 1/2" chase nipples and plug with recessed pipe plugs. Place perpendicular to sign panel axis and away from approaching traffic.
10. Maximum difference between post heights on an idividual frame = 5'-0"
11. For standard pipe members (Mast Arms) with lengths greater than 80'-0" an optional field splice will be permitted at ℄ of span to facilitate hauling operations.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS TUBULAR TWO POST TYPE LAYOUT AND PIPE SELECTION

S40Q

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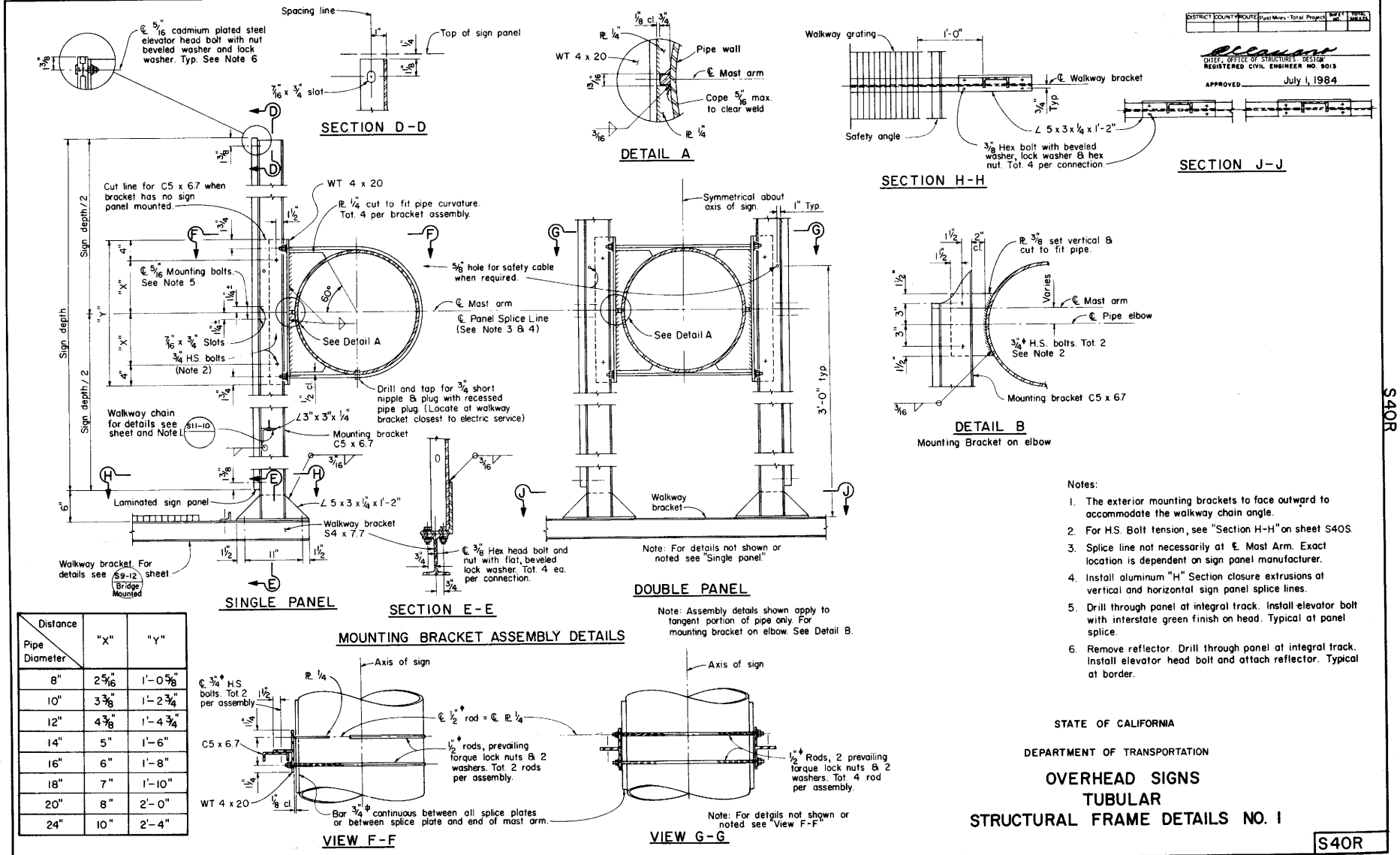
DISTRICT	COUNTY	ROUTE	Post Mileg - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 8013

APPROVED July 1, 1984



Distance / Pipe Diameter	"X"	"Y"
8"	2 5/16"	1'-0 5/8"
10"	3 3/8"	1'-2 3/4"
12"	4 3/8"	1'-4 3/4"
14"	5"	1'-6"
16"	6"	1'-8"
18"	7"	1'-10"
20"	8"	2'-0"
24"	10"	2'-4"

Notes:

1. The exterior mounting brackets to face outward to accommodate the walkway chain angle.
2. For H.S. Bolt tension, see "Section H-H" on sheet S40S.
3. Splice line not necessarily at ℄ Mast Arm. Exact location is dependent on sign panel manufacturer.
4. Install aluminum "H" Section closure extrusions at vertical and horizontal sign panel splice lines.
5. Drill through panel at integral track. Install elevator bolt with interstate green finish on head. Typical at panel splice.
6. Remove reflector. Drill through panel at integral track. Install elevator head bolt and attach reflector. Typical at border.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS TUBULAR STRUCTURAL FRAME DETAILS NO. 1

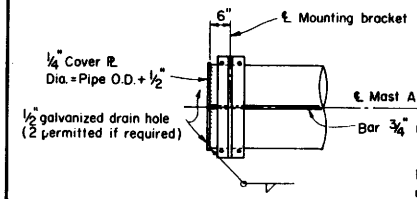
S40R

Return to Table of Contents

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

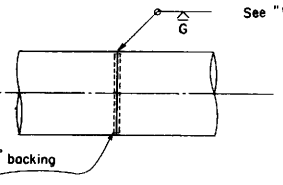
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 50173

APPROVED JULY 1, 1984

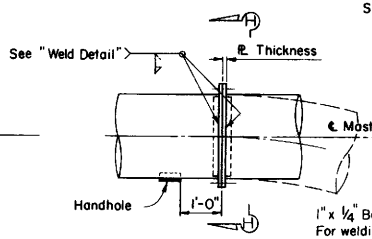


MAST ARM END DETAIL

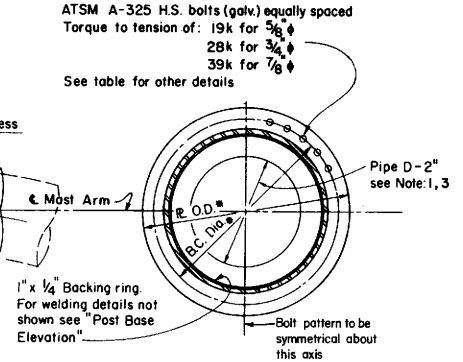
(For "Single Post Type" only)



SHOP SPLICE



FIELD SPLICE

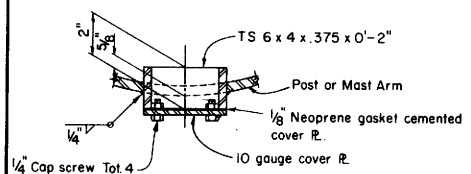


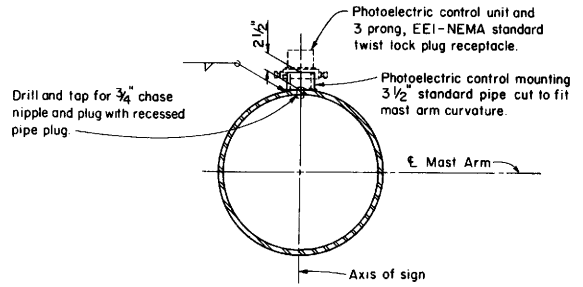
SECTION H-H

FIELD SPLICE				
Pipe Diameter	ℙ Thickness	H.S. Bolts	* B.C. Diameter	* ℙ O.D.
8"	1⅛"	13-⅝"	11⅛"	13⅝"
10"	1¼"	20-⅝"	13¼"	15¾"
12"	1¼"	17-¾"	15¼"	17¾"
14"	1¼"	19-¾"	16½"	19"
16"	1¼"	22-¾"	18½"	21"
18"	1⅜"	26-¾"	20½"	23"
20"	1⅜"	29-¾"	22½"	25"
24"	1½"	26-⅞"	27"	30"

*-See note 4

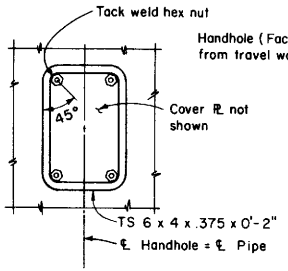
Note: Design based on capacity of Standard pipe.



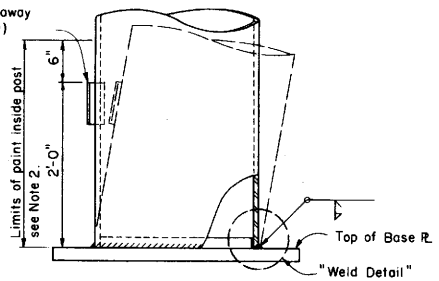


PHOTOELECTRIC CONTROL DETAILS

(See "Layout" sheet for location when required)

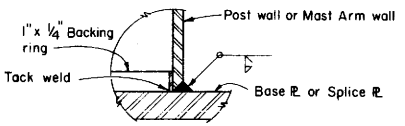


HANDHOLE & COVER DETAILS



POST BASE ELEVATION

(For Base ℙ Details see "Foundation Details" sheet.)



WELD DETAIL

Notes:

1. Place single thin bead of silicone caulking compound around hole prior to bolting. Caulking not to interfere with friction between plates in bolted area.
2. Prime and paint post interior from base ℙ to 6" above lower handhole — unless post is galvanized.
3. "D" is inside diameter of "extra strong pipe".
4. Field splice diameters marked "*" may be increased 2" to facilitate bolting.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS
TUBULAR
STRUCTURAL FRAME DETAILS NO. 2

S40S

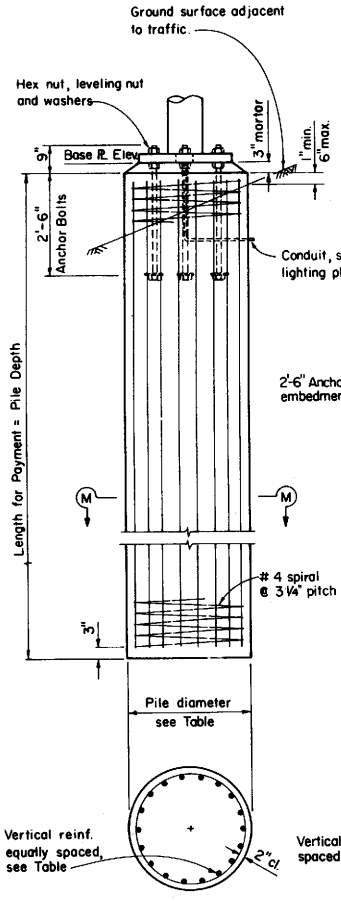
S40S

Return to Table of Contents

DISTRICT	COUNTY	ROUTE	POST MILES	SHEET NO.	TOTAL SHEETS

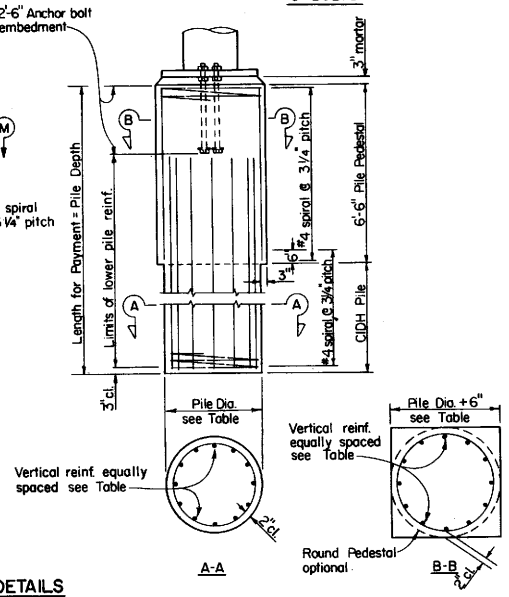
CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED JULY 1, 1984



SECTION M-M

CIDH PILE FOUNDATION DETAILS

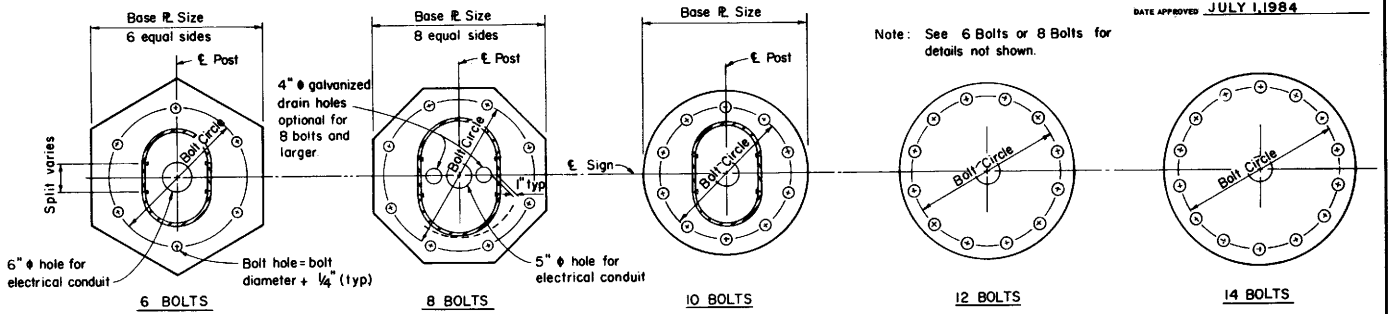


A-A

B-B

PEDESTAL / CIDH PILE FOUNDATION DETAILS

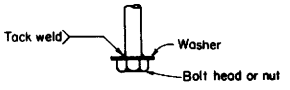
(CIDH Denotes cast in drilled hole)



BASE PLATE DETAILS

Post Type	Pipe Size	Split	Base Pl. Size	Bolt Circle	Anchor Bolts	Pile Dia.	Vertical Reinf.	Pile Depth
A	8 x-s	5"	2'-3"x2½"	23"	6-2¼"	36"	8-#9	11'
B	10 x-s	4"	2'-3"x2½"	23"	6-2¼"	36"	8-#9	12'
C	10 x-s	6"	2'-6"x2½"	25"	8-2¼"	36"P	11-#9	14'
D	12 x-s	–	2'-2"x2½"	22"	6-2¼"	36"	8-#9	12'
E	12 x-s	4"	2'-6"x2½"	25"	8-2¼"	36"P	11-#9	13'
F	12 x-s	8"	2'-8"x2¾"	27"	8-2¼"	36"P	12-#9	13'
G	14 x-s	–	2'-3"x2½"	23"	6-2¼"	36"	8-#9	13'
H	14 x-s	4"	2'-8"x2¾"	27"	8-2¼"	36"P	12-#9	14'
J	14 x-s	8"	36" Dia.x2¾"	29"	10-2¼"	36"P	15-#9	17'
K	16 x-s	–	2'-6"x2½"	25"	8-2¼"	36"P	11-#9	14'
L	16 x-s	4"	36" Dia.x2¾"	29"	10-2¼"	36"P	15-#9	15'
M	16 x-s	8"	40" Dia.x3"	33"	12-2½"	42"P	18-#9	24'
N	18 x-s	–	2'-8"x2¾"	27"	8-2¼"	36"P	12-#9	17'
O	18 x-s	5"	40" Dia.x3"	33"	12-2½"	42"P	18-#9	19'
P	18 x-s	8"	40" Dia.x3"	33"	12-2½"	42"P	18-#9	22'
R	20 x-s	–	36" Dia.x2¾"	29"	10-2¼"	36"P	15-#9	19'
S	20 x-s	5"	40" Dia.x3"	33"	12-2½"	42"P	18-#9	22'
T	24 x-s	–	40" Dia.x3"	33"	12-2½"	42"P	18-#9	22'
V	24 x-s	5"	42" Dia.x2½"	35¾"	14-2½"	42"P	26-#9	22'

Note: P denotes pedestal



ANCHORAGE DETAIL

Notes:

1. Thread upper 10" and galvanize upper 12" of the anchor bolts.
2. Pile shall be Class "A" P.C.C. and placed against undisturbed material.
3. Provide bolt template during installation of anchor bolts.
4. Prior to erection of the post, backfill which is equivalent to the surrounding material shall be in place.
5. Pile shall be formed 6" minimum below ground surface.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

OVERHEAD SIGNS TUBULAR FOUNDATION DETAILS

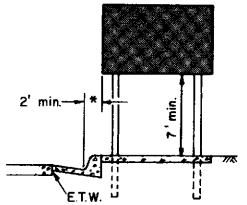
S40T

Return to Table of Contents

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

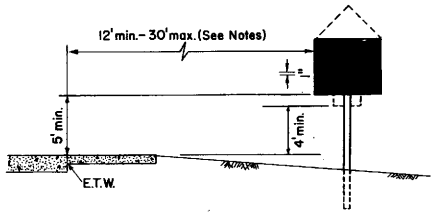
C D Bartell
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

DATE July 1, 1984



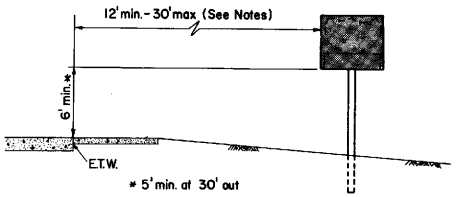
* 1' min. where lateral clearance limited.

URBAN LOCATIONS

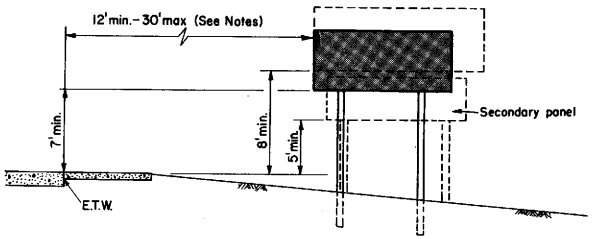


RURAL LOCATIONS

CONVENTIONAL HIGHWAYS AND INTERCHANGE AREAS



REGULATORY AND WARNING SIGNS
AND ROUTE SHIELDS



GUIDE SIGNS

FREEWAY AND EXPRESSWAY LOCATIONS

NOTES:

When clear roadside recovery areas are provided, signs shall be placed as far from the edge of traveled way as possible, up to a maximum of 30 feet. When possible they shall be placed in protected locations.

Signs in medians shall be placed at midpoint of median up to a maximum distance of 30' from edge of traveled way. When appropriate, signs for opposing directions shall be placed back to back.

E.T.W. = Edge of Traveled Way

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
TYPICAL INSTALLATION DETAILS NO. 1

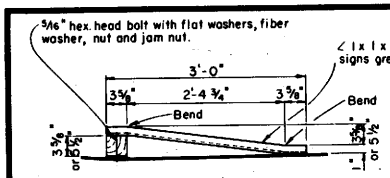
S41-3

Return to Table of Contents

DIST	COUNTY	ROUTE	POST MILE	Sheet No.	Total

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

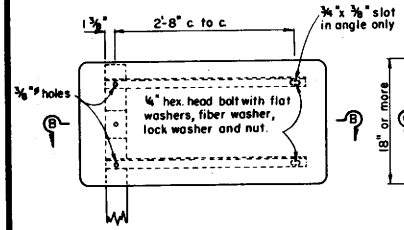
DATE APPROVED JULY 1, 1984



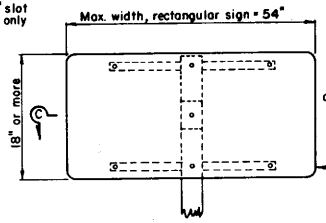
SECTION B-B

SECTION C-C

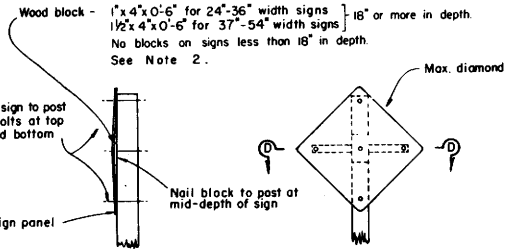
SECTION D-D



UNBALANCED



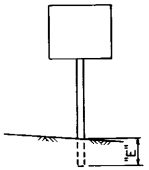
BALANCED



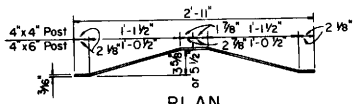
END VIEW

BALANCED

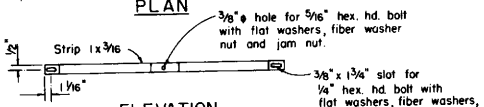
SINGLE POST INSTALLATION



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'

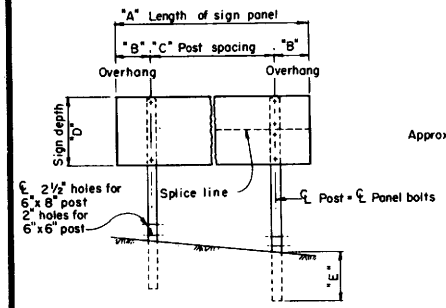


PLAN



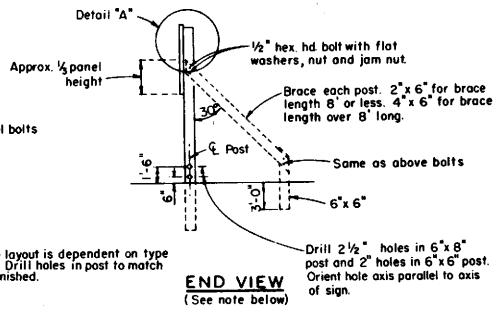
ELEVATION

BACK BRACE DETAILS
(See Note 2)



ELEVATION

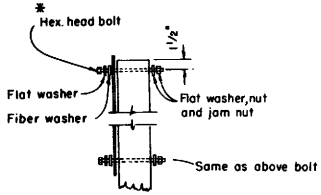
Note: Bolt hole layout is dependent on type of panel. Drill holes in post to match panel furnished.



END VIEW
(See note below)

Note: Use brace only when specified on sign format sheets.

TWO POST INSTALLATION



DETAIL A

* 5/16" Diameter for single sheet aluminum panel signs.
3/8" Diameter for laminated panel signs or framed single sheet aluminum panel signs.

POST SPACING TABLE

SIGN PANEL LENGTH	SIGN PANEL OVERHANG	POST SPACING
"A"	"B"	"C"
4'-8", 5'-0" & 5'-6"	7", 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"

Notes:

1. Place long dimension of post cross section normal to sign axis.
2. Balanced single post installations of unframed single sheet aluminum panel signs shall have blocks if 18" or more in depth and a combination of blocks and back braces if 18" or more in depth and 34" or more in width. Signs panels less than 18" in depth and 34" or more in width shall have back braces only.
3. For post size see sign layout, format or quantity sheets.
4. Balanced single post installations of Laminated Panel and Framed single sheet panel signs require back braces when 34" or more in width.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGN
WOOD POSTS
TYPICAL INSTALLATION DETAILS NO. 2 | S 42-15

S 42-15

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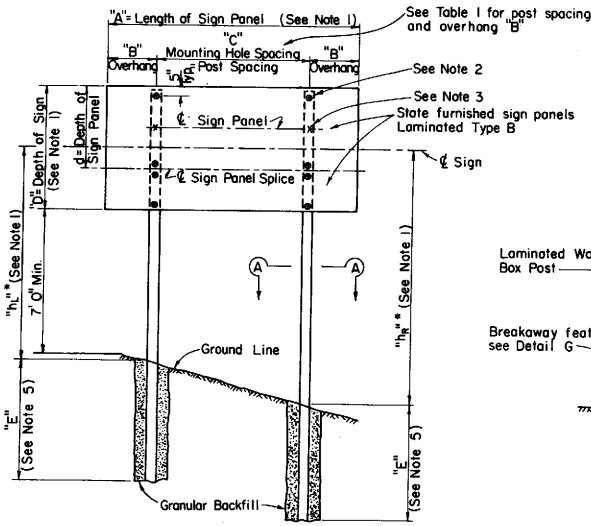
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

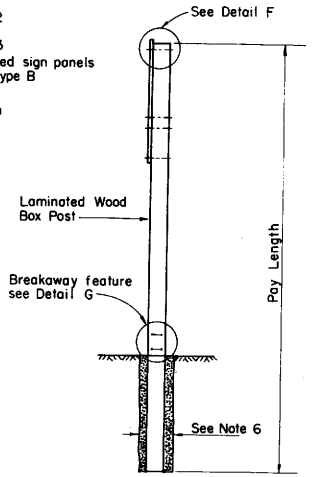
C Bartell
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

DATE July 1, 1984



ELEVATION

* Dimensions shown on project plans are for fabrication. At time of installation adjust these dimensions to provide a level sign approximately 7' above roadway shoulder.



END VIEW

TABLE 1

SIGN PANEL LENGTH (See Note 1) "A"	SIGN PANEL OVERHANG "B"	MOUNTING HOLE SPACING "C"
8'-0"	18"	5'-0"
9'-0"	22"	5'-4"
10'-0"	24"	6'-0"
11'-0"	24"	7'-0"
12'-0"	30"	7'-0"
13'-0"	30"	8'-0"
14'-0"	30"	9'-0"
15'-0"	36"	9'-0"
16'-0"	39"	9'-6"
17'-0"	39"	10'-6"
18'-0"	42"	11'-0"
19'-0"	45"	11'-6"
20'-0"	48"	12'-0"
21'-0"	51"	12'-6"
22'-0"	51"	13'-6"
23'-0"	54"	14'-0"
24'-0"	57"	14'-6"

NOTES:

1. See Project Plans for:
   Location of each sign.
   Length of sign panel "A".
   Depth of sign "D".
   Height "h_L" and "h_R" of centerline of sign above ground line at each post.
   Type of post, L or M.
   See Standard Plan S41-3 for other details.
2. "•" indicates location of 3/8" lag screws and existing holes in panels. Lag screws are to be embedded at least 1 1/2" into post using 1/4" diameter pilot holes.
3. "x" indicates location of additional 3/8" lag screws required when the depth of sign panel (d) and the length of sign panel (A) are as follows:

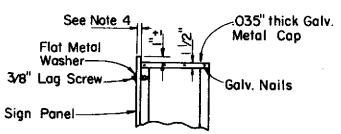
d	A
60"	17'-0" to 24'-0"
54"	19'-0" to 24'-0"
48"	21'-0" to 24'-0"
42"	24'-0"

4. State-furnished Type B laminated sign panels are 1 1/8" thick for sign lengths of 15 feet and less. Panels over 15 feet in length are 2 5/8" thick.
5. Embedment "E" for Type L posts shall conform to the requirements in Table 2. Embedment for Type M posts shall be 6 feet minimum.
6. Diameter of post holes for Type L posts shall be at least 30 inches. Diameter of post holes for Type M posts shall be at least 24 inches.

TABLE 2

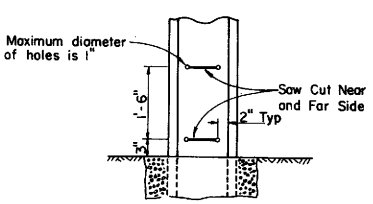
MINIMUM POST EMBEDMENT "E" FOR TYPE L POST

"h_L" or "h_R" (in feet)	TOTAL SIGN AREA (sq. ft.) 40 to 90	90+ to 140	140+ to 190	190+ to 240	240+ to 290
9 to 13	6'	6.5'	7.5'	8.5'	9'
13+ to 17	6'	7'	8'	9'	10'
17+ to 21	6'	7.5'	9'	9'	
21+ to 26	7'	8'	9'		

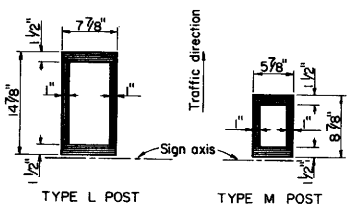


DETAIL F

GALV. METAL CAP



DETAIL G



TYPE L POST TYPE M POST

SECTION A-A

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
LAMINATED WOOD BOX POST
TYPICAL INSTALLATION DETAILS NO. 3

S43-A

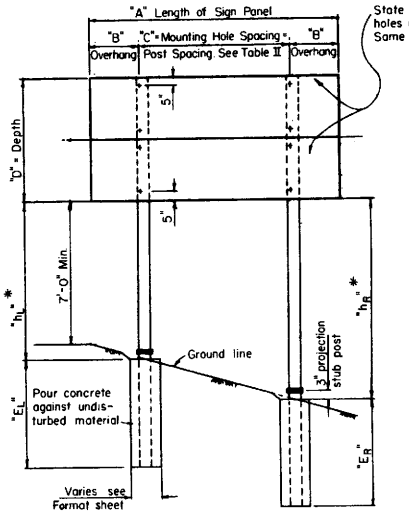
Return to Table of Contents

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

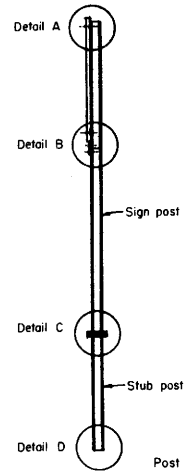
DATE APPROVED JULY 1, 1984

R.C. Lasson

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

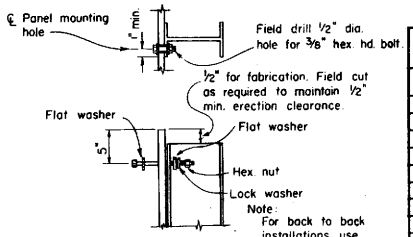


ELEVATION

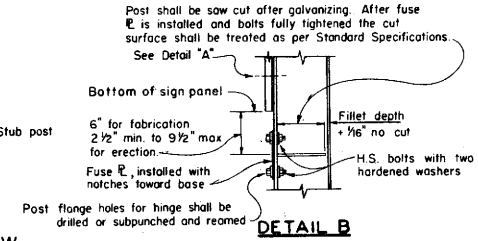


END VIEW

* Dimensions given on project plans 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"	6"	3'-6"
5'-0"	9"	3'-6"
6'-0"	12"	4'-0"
7'-0"	15"	4'-6"
8'-0"	18"	5'-0"
9'-0"	22"	5'-4"
10'-0"	24"	6'-0"
11'-0"	24"	7'-0"
12'-0"	30"	7'-0"
13'-0"	30"	8'-0"
14'-0"	30"	9'-0"
15'-0"	36"	9'-0"
16'-0"	39"	9'-6"
17'-0"	39"	10'-6"
18'-0"	42"	11'-0"
19'-0"	45"	11'-6"
20'-0"	48"	12'-0"
21'-0"	51"	12'-6"
22'-0"	51"	13'-6"
23'-0"	54"	14'-0"
24'-0"	57"	14'-6"

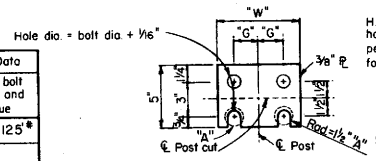
LAMINATED PANELS

TABLE II

Post Size	Base Connection Data: H.S. bolt size and torque	Base ℄ "W"	Base ℄ "T"	Base ℄ "R"	Fuse Plate Data: Fuse ℄ "W"	Fuse ℄ "G"	H.S. bolt size and torque
W6x12	5/8"x38'*	5"	1"	1 7/32"	4"	1 1/4"	5/8"x125'*
W6x15		7"					
W8x21	1"x85'*				5"	1 1/2"	
W8x24		8"					
W8x28			1 1/2"	1 7/32"			3/4"x250'*
W8x31							
W8x35		9"			7"	2 1/2"	
W10x39	1"x106'*						
W10x45				1 9/32"			

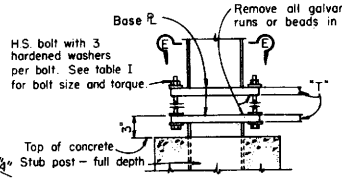
BASE PLATE & FUSE PLATE DATA

TABLE I

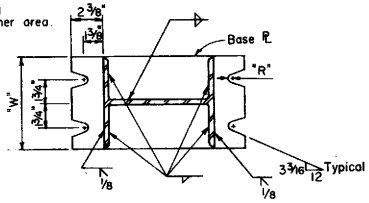


FUSE PLATE DETAIL

(See Table I for dimensions not shown) the faying surfaces marked "A" and the adjoining surfaces shall be roughened by abrasion.



DETAIL C



SECTION E-E

(Top plate shown – bottom plate similar)

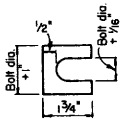
Notes: See Project Plans for:

1. Station of each sign.
2. Distance from edge of pavement or other layout line.
3. Length of Sign "A".
4. Depth of Sign "D".
5. Height "h" of each post or pole above foundation.
6. Depth of embedment "E" for each post.
7. Diameter of post hole.
8. Size of post.

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 position 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.

DETAIL D



Furnish shims .012" ± thick & .034" ± thick. Shim shall be fabricated from brass shim stock or strip conforming to ASTM-B36.

SHIM DETAIL

BREAK-AWAY STEEL POSTS

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

ROADSIDE SIGNS
STEEL POSTS
TYPICAL INSTALLATION DETAILS

S43-B

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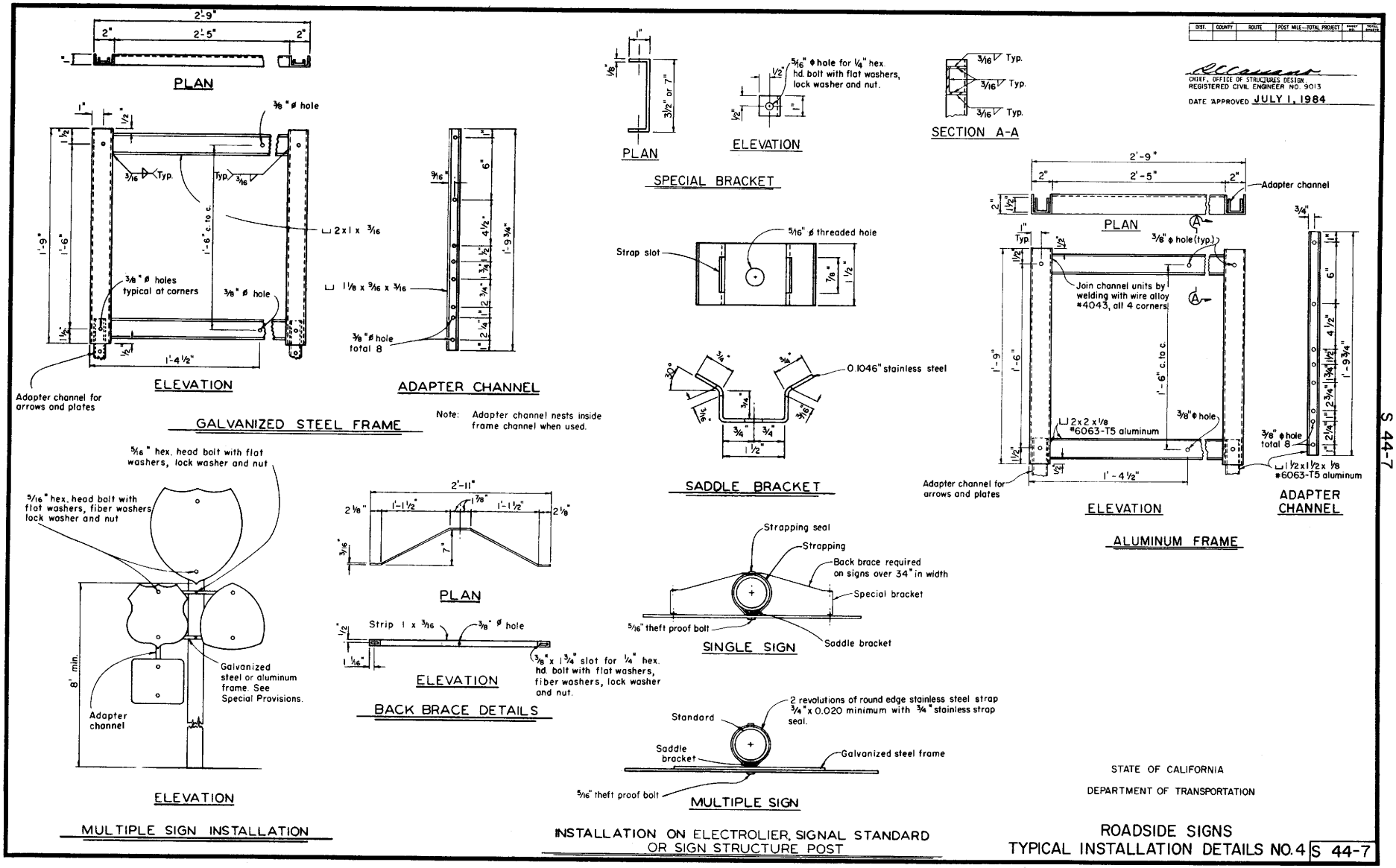

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DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

C D Bartell
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995
DATE July 1, 1984

ELECTROLIERS

STANDARD TYPES
15 ROADWAY
15 STRUCTURE
21 STRUCTURE
30 ROADWAY
31 ROADWAY
32 ROADWAY

NOTES:

1. Luminaires shall be provided with a 310-watt HPS lamp when installed on Type 21, 30, 31 and 32 standards, unless otherwise specified or indicated. Luminaires shall be provided with a 200-watt HPS lamp when installed on all other type standards, unless otherwise specified or indicated.
2. All Luminaires shall be the cutoff type, ANSI Type III Medium Cut Off Lighting Distribution, unless otherwise specified or indicated.
3. Variations noted adjacent to symbol on Project Plans.

Electrolier (See Project Notes).

Existing Electrolier to Remain in Place unless otherwise specified or indicated.

SOFFIT AND WALL MOUNTED LUMINAIRES

Pendant, 70 Watt HPS

Pendant, 100 Watt HPS

Flush, 70 Watt HPS

Flush, 100 Watt HPS

Wall Surface, 70 Watt HPS

Wall Surface, 100 Watt HPS

Existing Soffit or Wall Luminaire to Remain Unmodified.

Existing Soffit or Wall Luminaire to Modified as specified or indicated.

NOTE:

Arrow indicates "Street Side" of Luminaire or Glassware.

EQUIPMENT IDENTIFICATION

Illuminated Sign Identification Number: Sign Number – Place on Post or Structure.

Sign No. S1234 M

10HB 1.0

Transformer Rating (KVA).

Number and Type of Fixtures.

DO NOT Place on Standard or Structure.

D2345 - 25

Electrolier or Equipment Identification Number.

Mast Arm Length in Feet, if shown, Do Not Place on Standard or Structure.

Equipment Number – Place on Standard or Structure.

1½"C, 2#8, 15#14, 2DLC

Conduit and Conductor Identification:

Number and Size of Conductors and Cables.

Size of Conduit in Inches.

ø1, ø2, ø2P, etc. Traffic Phase Identification for Signal Faces, Detectors and Phase Diagrams.

1 2 3 Project Note Numbers

1 2 3 Equipment Description, Installation or Item Numbers

1 2 3 Conduit Run Numbers

19A - 3 - 70 Signal and Lighting Standard (Typical Designation).

Wind Velocity = 70 MPH

Case 3 Arm Loading

Standard Type

Standard Plan Sheet Number

Detail Number or Letter

ABBREVIATIONS AND EQUIPMENT DESIGNATIONS

PROPOSED	EXISTING	
AC+		An Ungrounded Conductor.
AC−		A Grounded Conductor.
AWG		American Wire Gage.
C		Conduit.
CMS	cms	Changeable Message Sign
DLC	dlc	Loop Detector Lead in Cable.
EMS	ems	Extinguishable Message Sign.
FBCA	fbca	Flashing Beacon Control Assembly
HB	hb	High Beam Sign Lighting Fixture.
HPS		High Pressure Sodium
IMC	imc	Intermediate Steel Conduit
LB	lb	Low Beam Sign Lighting Fixture.
LMA	lma	Luminaire Mast Arm
MC	mc	Mercury Contractor.
MLC	mlc	Magnetometer Detector Lead in Cable.
M/M	m/m	Multiple to Multiple Transformer.
MT	mt	Conduit with Pull Wire or Rope Only.
NC		Normally Closed
NO		Normally Open
PB	pb	Pull Box
PEC	pec	Photo Electric Control (Type I, II, III or IV as shown).
PED	ped	Pedestrian
PEU	peu	Photo Electric Unit
PPB	ppb	Pedestrian Push Button
RL		Relocated Equipment
RM	rm	Ramp Metering
SB	sb	Slip Base
SBI	sbi	Slip Base Insert
SMA	sma	Signal Mast Arm
S/M	s/m	Series to Multiple Transformer
SN		Solid Neutral
SP	sp	Service Point
SW	sw	Switch
WP	wp	Weather Proof
XFMR	xfmr	Transformer

STANDARD NOTES

AB Abandon. If Applied to Conduit, Remove Conductors.

BC Install Pull Box in Existing Conduit Run.

CB Install Conduit into Existing Pull Box.

CC Connect New and Existing Conduit. Remove Existing Conductors and Install Conductors as indicated.

CF Conduit to remain for Future Use. Remove Conductors. Install pull wire or rope.

FA Foundation is to be Abandoned.

LC Install Lighting Control.

MP Metering Point.

NS No Slip Base on Standard.

PEC Photoelectric Control.

RC Equipment to be Removed and Become the Property of the Contractor.

RE Remove Electrolier and Ballast. Tape Disconnects.

RR Remove and Reuse Equipment.

RS Remove and Salvage Equipment.

SB Install Slip Base on Standard.

SC Splice New to Existing Conductors.

SF Standard to remain for Future Use. Remove Luminaire, Pole Conductors and Ballast. Tape Disconnects.

SD Service Disconnect

TSP Telephone Service Point

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

SYMBOLS AND ABBREVIATIONS ES-1A

ES-1A

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

R D Bentall
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995
DATE July 1, 1984

CONDUIT

PROPOSED	EXISTING	
— — —	— — —	Conduit-Lighting, unless otherwise Indicated or Noted.
— - — - —	— - — - —	Traffic Signal Conduit.
— C — —	— c — —	Communication Conduit.
— S — —	— s — —	Sprinkler Control Conduit.
— T — —	— t — —	Telephone Circuit.
— F — —	— f — —	Fire Alarm Conduit.
— — —]	— — —]	Conduit Termination. (Detail C, ES-7B in Structures).
R	r	Conduit Riser in Structure.

SERVICE EQUIPMENT

PROPOSED	EXISTING	
— - — - —	— - — - —	Overhead Lines
■	U	Wood Pole. "U" Indicates Utility Owned.
(—	(- - -	Pole Guy- With Anchor.
▲	△	Pad Mount for Ground-Mounted Utility Transformer.
III		Service Enclosure Type.
		Service Enclosure. Door Indicates Front of Enclosure.

POLE-MOUNTED SERVICE DESIGNATION

Type of Installation.

TYPE K- 25' ← Pole Height above Grade.

SIGN LIGHTING EQUIPMENT

PROPOSED	EXISTING	
		Illuminated Sign-Single Post.
		Illuminated Sign- Two Post.
		Illuminated Sign-Mounted On Structure.
		Illuminated Sign With Roadway Luminaire Attached.
S	s	Incandescent Sign Light.

SIGNAL EQUIPMENT

PROPOSED	EXISTING	
		Pedestrian Signal.
		Pedestrian Push Button Post.
		Pedestrian Barricade.
		Traffic Signal Face, 3-Section: 8-Inch Red, Yellow and Green Sections.
		Traffic Signal Face With Angle Visor.
PV	L	Modifications of Basic Symbol: "L" Indicates All Non-Arrow Sections Louvered. "LG" Indicates Louvered Green Section Only. "PV" Indicates 12-Inch Programmed Visibility Sections. "12" Indicates All 12-Inch Sections.
		Traffic Signal Face With Back Plate.
		Traffic Signal Face With 12-Inch Red, Yellow and Green Left Arrow Sections.
		Traffic Signal Face With 12-Inch Up Green Arrow.
		Traffic Signal Face (5-Section) With 12-Inch Yellow and Green Right Arrows and 8-Inch Red, Yellow and Green Sections.
		Type I Standard and Attached Signals.
		Standard With Signal Mast Arm Only and Attached Signals.
		Left-Turn Signal and Sign Standard, Type 33.
		Standard With Luminaire and Signal Mast Arms and Attached Signals.
		Cantilever Flashing Beacons. Type 9 Frame, Unless Otherwise Specified or Indicated.
R	Y	Flashing Beacon. One-Way 1-Section With 12-Inch Lens and Visor. "R" Indicates Red Lens, "Y" Indicates Yellow Lens.
		Controller Cabinet. Door Indicates Front of Cabinet.
●	o	Guard Post

PULL BOXES

PROPOSED	EXISTING
3	9A(21)

3= No. 3 1/2

6 = No. 6

7 = No. 7 (Ceiling Pull Box)

8 = No. 8 (Pendant Soffit Pull Box)

9 = No. 9

9A = No. 9A

Pull Box-No. 5 Unless Otherwise Indicated or Noted as Below.

Pull Box-Additional Designations or Descriptions.

(C) = Communications Pull Box.

(E) = Pull Box with Extension.

(15) = Anchor Bolts and Conduit for Future Installation of Type 15 Standard.

(S) = Sprinkler Control Pull Box.

(21) = Anchor Bolts and Conduit for Future Installation of Type 21 Standard.

(T) = Pull Box with Traffic Cover

VEHICLE DETECTORS

50A P | 5 J 9 U

- Detector Type
- Detector identification number
- Vehicle Detector for Traffic Signals- Inductive Loop Detector, Unless Otherwise Indicated.
- U= Upper
- L= Lower
- Slot Number in Input File.
- Input file (I or J)
- Phase
- Detector type P=Loop C=Magnetic R=Magnetometer
- Type of installation (see ES-5A thru ES-5F)

□	□	Inductive Loop Detector. Outline and Location of Sawcuts Shown. (Type A Loop Illustrated)
		Magnetometer Detectors
		Magnetic Detector.
	D	Pressure Detector. Subscript "D" Indicates Directional Type.
		Termination Pull Box-No. 5 for Detector Cables.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

SYMBOLS AND ABBREVIATIONS ES-1B

ES-1B

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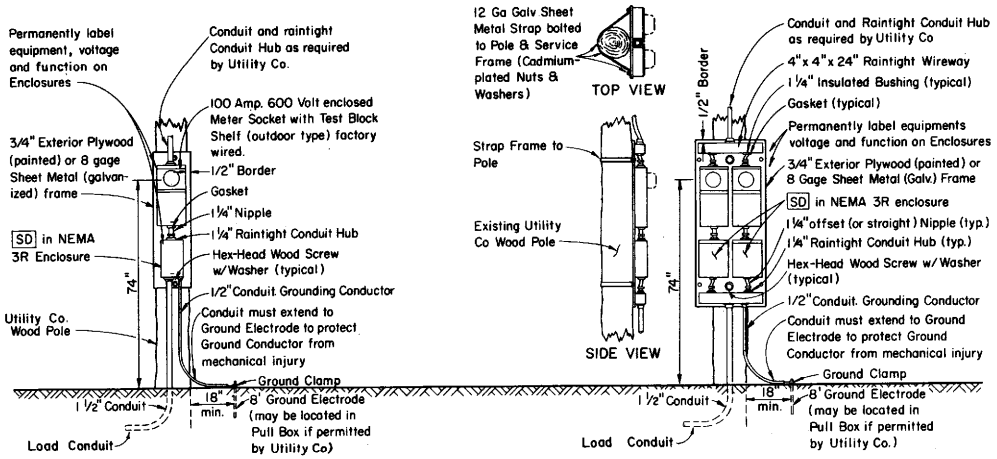
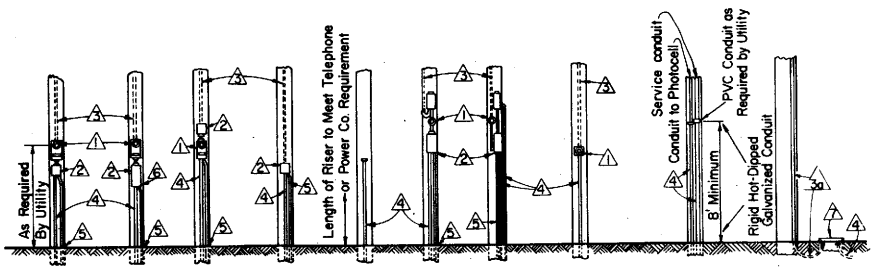
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

DATE July 1, 1984



TYPE SCE-1 SERVICE

TYPE SCE-2 SERVICE

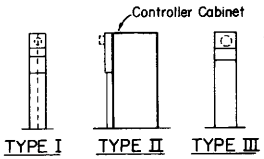


TYPE A SERVICE | TYPE B FLASHING BEACON | TYPE E SERVICE | TYPE F SERVICE | TYPE H SERVICE | TYPE J&JM SERVICE | TYPE JMA SERVICE | TYPE K SERVICE | TYPE SMUD SERVICE | TYPE PGE (RULE 16) SERVICE

POLE MOUNTED SERVICE INSTALLATIONS

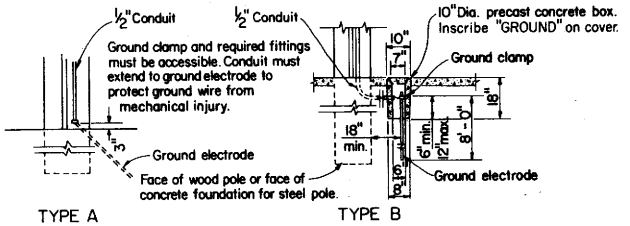
NOTES:

1. Meter socket
2. Service enclosure 60 Amp. size minimum, unless otherwise shown.
3. (a) Utility owned pole. Service riser (and contactor with PEC where required) furnished and installed by Utility.
   (b) State owned pole. Service riser and all other required equipment furnished and installed by Contractor.
4. Conduit, size as required.
5. Ground conduit, 1/2" C, 1-#6 AWG bare copper. See "SERVICE GROUNDING" detail.
6. Flashing Beacon Control Assembly.
7. Service pull box (#5 w/ext. unless otherwise noted) furnished & installed by Contractor. Exact location determined by utility.



TYPES OF SERVICE (TYPICAL)

Type I Service Equipment Enclosure mounted on Pedestal Type Wiring Gutter.
Type II Service Equipment Enclosure mounted on side of a Controller Cabinet.
Type III Complete Free-Standing Service Equipment Enclosure.



SERVICE GROUNDING

Use where serving utility requires 18" clearance between electrode and pole or service cabinet. Installation shown is for sidewalk or paved areas. In unpaved areas, omit special box and locate ground clamp above ground or locate ground clamp in nearest pull box.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
SERVICE EQUIPMENT

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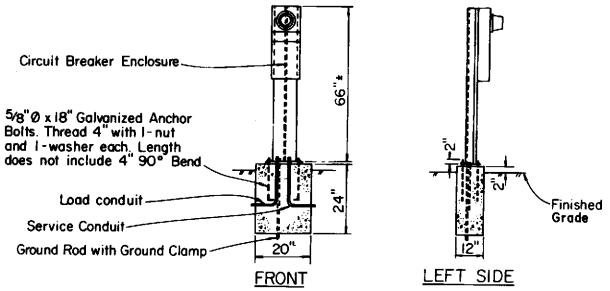
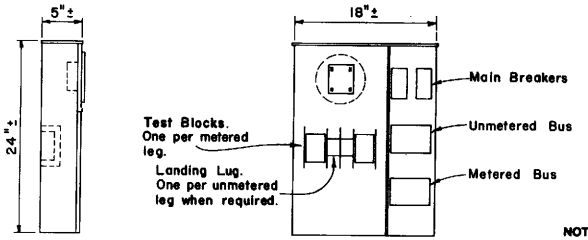
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

C. D. Bartell
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10993

DATE July 1, 1984



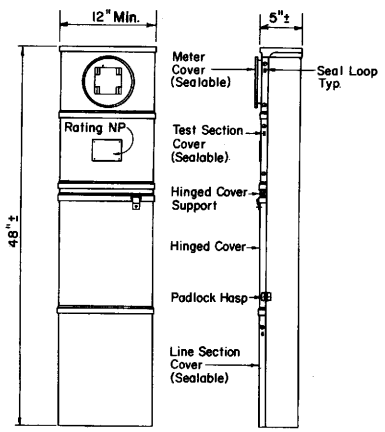
TYPE I SERVICE EQUIPMENT ENCLOSURE

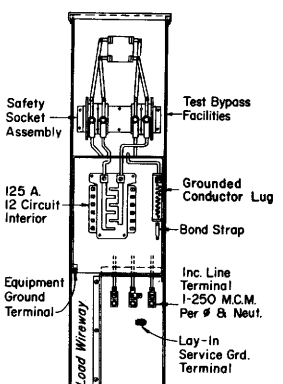


TYPE II-A SERVICE EQUIPMENT ENCLOSURE

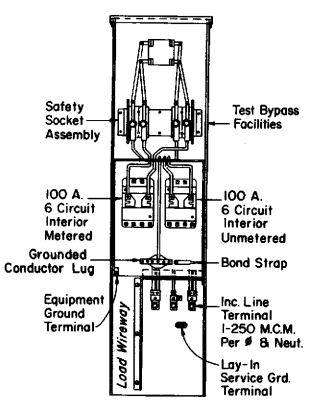
NOTES - TYPES I & II SERVICE EQUIPMENT ENCLOSURES

1. Service Equipment Enclosures and metering equipment shall meet the requirements of the serving utility. When the serving utility provides both metered and unmetered circuits, a separate bus shall be provided for each circuit.
2. Service Equipment Enclosures shall be factory wired and conform to NEMA Standards and to Section 86-2.11 "Service" of the Standard Specifications.
3. Service Equipment Enclosures shall be fabricated from galvanized sheet steel or fabricated from sheet steel and zinc or cadmium plated after fabrication.
4. Service Equipment Enclosures shall be NEMA 3-R Construction and shall be provided with Dead Front Panel and provisions for padlocking.
5. All control wiring shall be 600 volt No. 14 MTW stranded machine tool wire. Where subject to flexing, 19 strand shall be used.
6. All main busing shall be 125 amperes rated copper with silver plated contact areas.
7. An engraved phenolic nameplate indicating the function of each circuit breaker shall be installed on the dead front panel adjacent to the breaker. An external nameplate shall indicate service point number and voltage.
8. A Plastic Laminated Wiring Diagram shall be provided and attached to the inside of Front Door.
9. In unpaved areas, a raised PCC pad of 24" x 4" x width of service enclosure foundation or controller cabinet foundation shall be placed in front of Type I and Type II Service Equipment Enclosures.
10. Internal bussing, where shown, is typical only. Alternative designs of proposed service equipment enclosures shall be submitted to the Engineer for approval.
11. Circuit breakers may be mounted in the vertical or horizonal position.





FRONT VIEW
(LESS COVERS & DEADFRONT)
FOR
METERED CIRCUITS ONLY



FRONT VIEW
(LESS COVERS & DEADFRONT)
FOR
METERED AND UNMETERED CIRCUITS

TYPE II-B SERVICE EQUIPMENT ENCLOSURE

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
SERVICE EQUIPMENT

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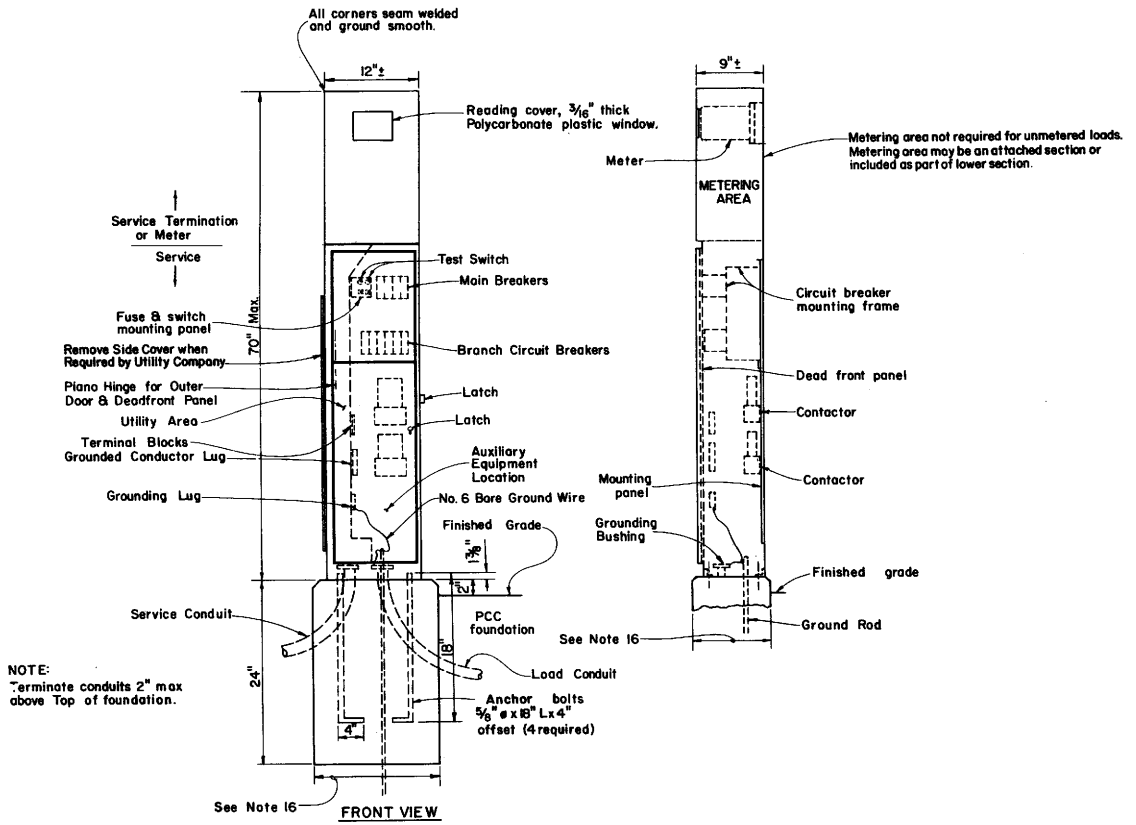
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

C D Bonfell
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995

DATE July 1, 1984

NOTES - TYPE III SERVICE EQUIPMENT ENCLOSURES

1. Service Equipment Enclosures and metering equipment shall meet the requirements of the serving utility. When the serving utility provides both metered and unmetered circuits, a separate bus shall be provided for each circuit. The meter area shall have a sealable, lockable, raintight cover that can be removed without the use of tools.
2. Service Equipment Enclosures shall be factory wired and conform to NEMA Standards and to Section 86-2.11, "Service" of the Standard Specifications.
3. Service Equipment Enclosures shall be fabricated from galvanized sheet steel or fabricated from sheet steel and zinc or cadmium plated after fabrication.
4. The dead front panels on Type III-A Service Equipment Enclosures shall have a continuous stainless steel piano hinge. The panel in front of the breakers shall be secured with captive screws; the lower panel shall be secured with a latch or captive screws.
5. The exterior door shall have provisions for padlocking with a State-furnished lock. The padlock hole shall be a minimum diameter of 7/16 inch.
6. Enclosures housing transformers of more than one (1) KVA shall have effective screened ventilation louvers of not less than fifty square inches. Screen shall be stainless steel No. 304, with a mesh No. 10 size.
   Secure screen after painting with at least four bolts and frame.
7. The enclosure shall have no screws, nuts or bolts on the exterior, except utility company sealing screws. All screws, nuts, bolts and washers shall be stainless steel.
8. Terminal lugs shall be copper, or tin-plated aluminum. Solid neutral terminal strip shall be copper with cadmium-plated screws. All terminals shall be compatible with either copper or aluminum conductors and sized to suit the conductors shown on the plan. The terminals shall include but not be limited to:
   a) Incoming terminals (land lugs).
   b) Neutral lugs.
   c) Solid neutral terminal strip.
   d) Ground lug.
   e) Terminal strips for conductors with the cabinet.
9. At least 6 standard single pole circuit breaker spaces (¾" nominal) shall be provided.
10. All control wiring shall be 600 volt No. 14 MTW stranded machine tool wire. Where subject to flexing, 19 strand shall be used.
11. All main busing shall be 125 amperes rated copper with silver plated contact areas.
12. A plastic laminated wiring diagram shall be provided with brass mounting eyelets and attached to the inside of the cabinet.
13. An engraved phenolic nameplate on the dead front panel shall be installed with stainless steel rivets or stainless steel screws;
    a) Adjacent to the breaker or device.
    b) At top of the exterior door panel indicating System No., Voltage Level and number of phases. Character size shall be a minimum of 3/16".
14. The plan shows the approximate location of devices within the enclosure. Components may be rearranged. However, the "working" clearances within the enclosure shall be maintained.
15. In unpaved areas a raised PCC pad 24" x 4" x width of foundation shall be placed in front of new service installation. Pad shall be set to elevation of foundation.
16. Foundation shall extend 2" min. beyond edge of enclosure.
17. Telephone Service Equipment shall meet the requirements of the serving telephone company.
18. Internal bussing, where shown, is typical only. Alternative designs of proposed service equipment enclosures shall be submitted to the Engineer for approval.
19. Circuit breakers may be mounted in the vertical or horizontal position.
20. Center of Meter Sockets on 480 Volt Service Equipment Enclosures can be up to 75 inches high.
21. On Type III AF and Type III BF Service Equipment Enclosures, the meter viewing windows are located on the front side of the Service Equipment Enclosure.
22. On Type III AR and Type III BR Service Equipment Enclosures, the meter viewing windows are located on the back side of the Service Equipment Enclosure.



TYPE III-AF SERVICE EQUIPMENT ENCLOSURE

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DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
SERVICE EQUIPMENT

ES-2C

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C D Bartell
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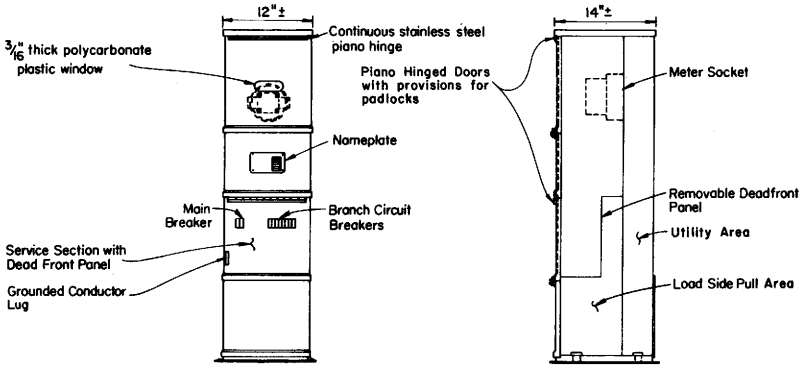
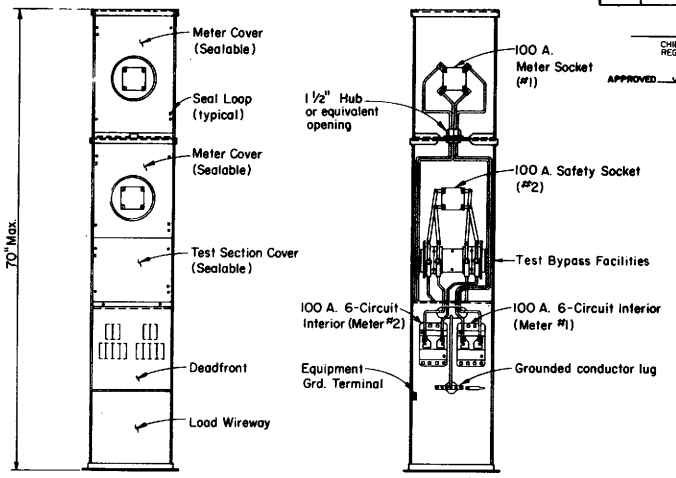
APPROVED July 1, 1984



FRONT VIEW SIDE VIEW

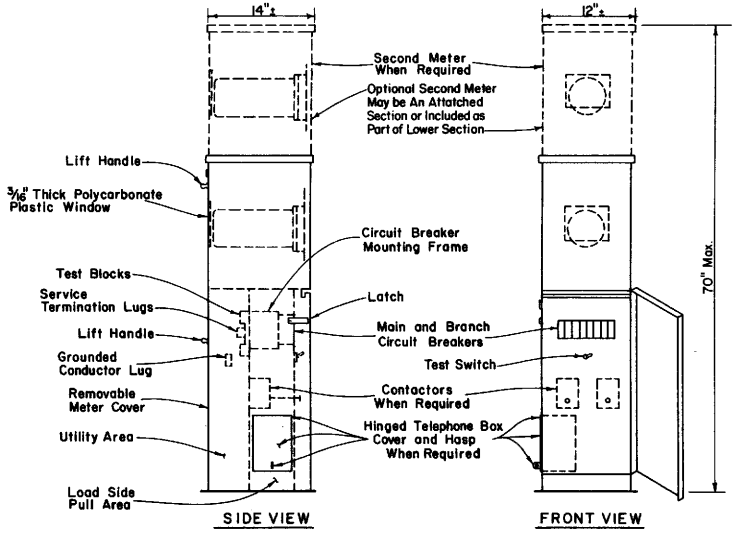
TYPE III-BF SERVICE EQUIPMENT ENCLOSURE
WITH PROVISIONS FOR ONE 100 A METER



FRONT VIEW
(LESS INTERNAL COVERS)

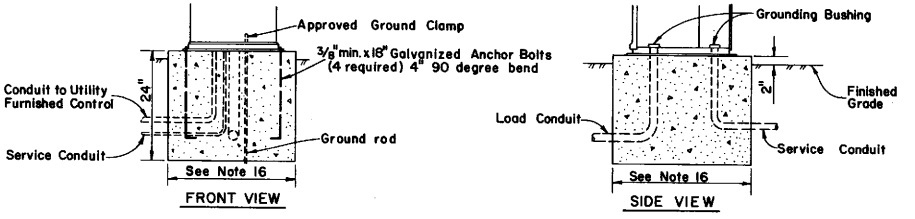
FRONT VIEW
(LESS EXTERNAL COVERS)

TYPE III-BF SERVICE EQUIPMENT ENCLOSURE
WITH PROVISIONS FOR TWO 100 A. METERS



SIDE VIEW FRONT VIEW

TYPE III-BR SERVICE EQUIPMENT ENCLOSURE



FRONT VIEW SIDE VIEW

TYPE III-B SERVICE EQUIPMENT ENCLOSURE FOUNDATION DETAILS

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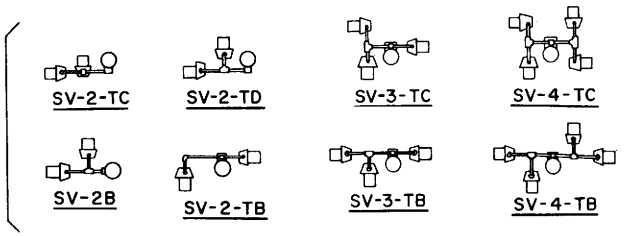
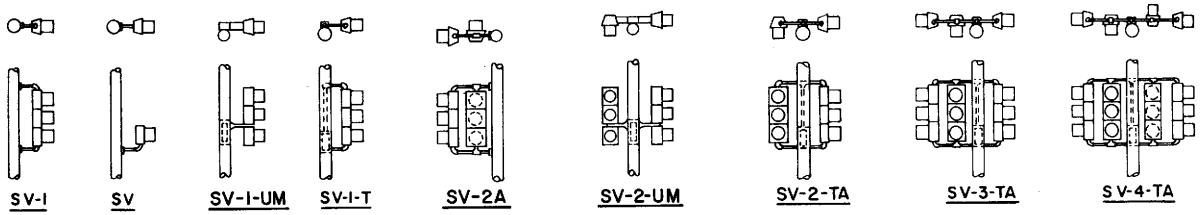
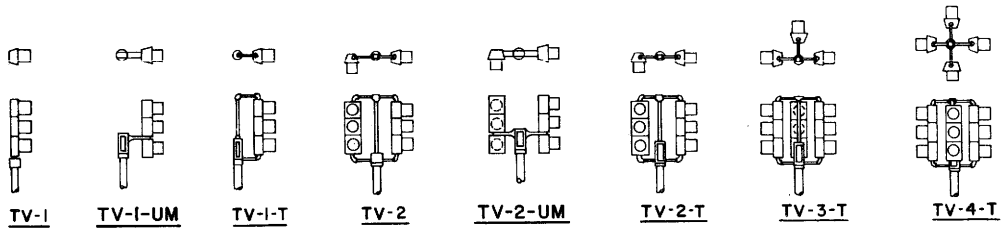
Plan View of Other Side Mountings





SIDE MOUNTINGS



TOP MOUNTINGS

ABBREVIATIONS

TV	Top mounted Vehicular signals
SV	Side mounted Vehicular signals
T	Terminal compartment
1,2,3,4	Number of signal faces (3-section, unless otherwise indicated)
UM	Unimount mounting hardware

NOTES

1. Mountings shall be oriented to provide maximum horizontal clearance to adjacent roadway.
2. Bracket arms shall be long enough to permit proper alignment of signals and backplate installation.
3. See Standard Plans ES-3D and ES-3E for attachment fittings details.
4. All arrow indications shall be 12 inches.
5. All programmed visibility signal heads shall be provided with backplates.

VEHICULAR SIGNALS AND MOUNTINGS

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SIGNAL HEADS AND MOUNTINGS

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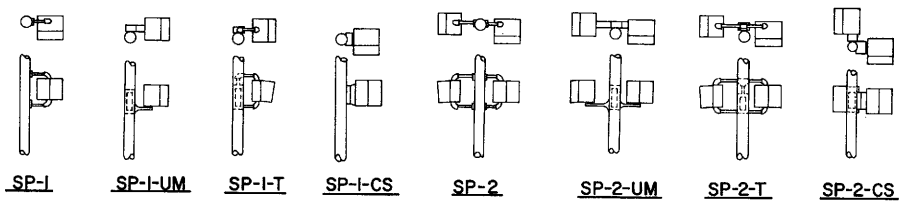
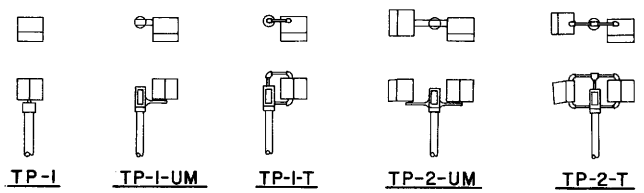
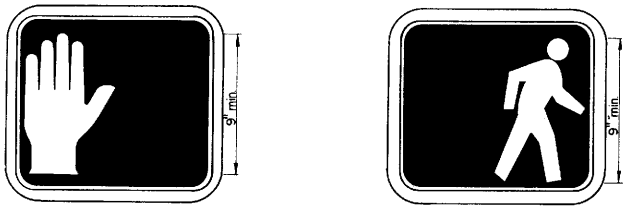


SIDE MOUNTINGS



TOP MOUNTINGS

PEDESTRIAN SIGNALS AND MOUNTINGS



PEDESTRIAN SIGNAL FACE

INTERNATIONAL SYMBOL

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.
4. See Standard Plans ES-3D and ES-3E for attachment fittings details.

ABBREVIATIONS

TP	Top mounted Pedestrian signal
SP	Side mounted Pedestrian signal
CS	Clamshell mounting hardware
T	Terminal compartment
1,2	Number of signal faces
UM	Unimount mounting hardware

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TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

SIGNAL HEADS AND MOUNTINGS

ES-3B

ES-3B

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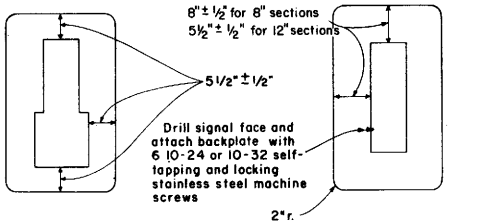
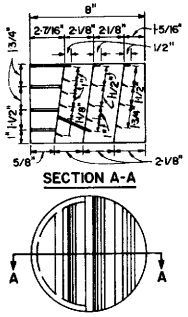


FOR COMBINATION 8" & 12" SECTIONS

FOR 8" & 12" SECTIONS

BACKPLATE

0.05 - inch minimum thickness.
3001-14 aluminum or plastic

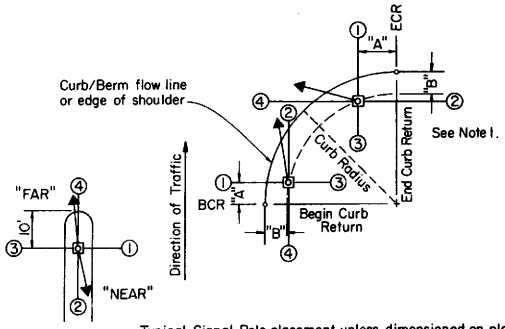


SECTION A-A

FRONT VIEW

DIRECTIONAL LOUVER

Directional louvers shall be oriented as directed by the Engineer and secured in place with one plated brass machine screw and nut.

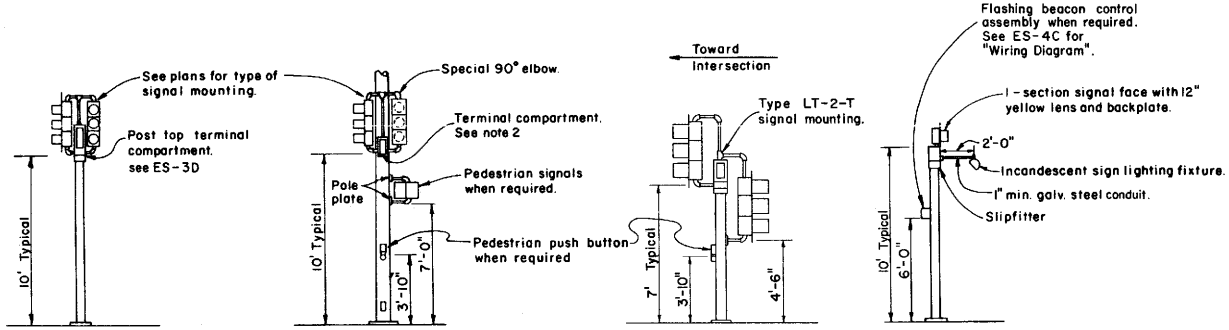


Typical Signal Pole placement unless dimensioned on plans.
(#) denotes side of pole signal head mountings or terminal compartments are to be placed.

SIGNAL STANDARD PLACEMENT DIMENSIONS & EQUIPMENT LOCATIONS

NOTES

1. For "A" and "B" dimensions, see Pole Schedule, or as directed by the Engineer.
2. Terminal compartment shall be located on side #3 of the standard unless otherwise shown.



TOP MOUNTED SIGNALS (TV)

Type 1A, 1B, 1C or 1D standard as indicated on the plans

SIDE MOUNTED SIGNALS (SV & SP)

Normally used on standards with luminaire and/or signal mast arm.

LEFT TURN LANE SIGNAL

Type 1A, 1B, 1C or 1D standard as indicated on the plans

ADVANCE FLASHING BEACON INSTALLATION

Type 1A, 1B, 1C or 1D standard as indicated on the plans

TYPICAL SIGNAL INSTALLATIONS

ABBREVIATIONS

LT = Left Turn signals

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TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

SIGNAL HEADS AND MOUNTINGS | ES-3C

ES-3C

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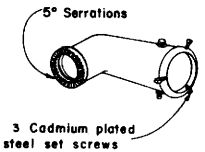
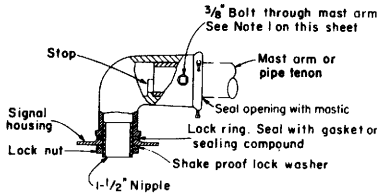
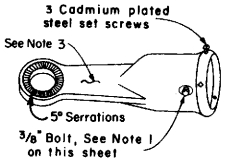
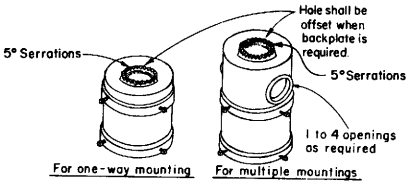




MAST ARM MOUNTING - TYPE "MAT"
For 2" pipe - See Note 1 on this sheet

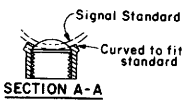


MAST ARM MOUNTING TYPE "MAS"
For 2" pipe - See Note 1 on this sheet

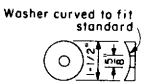


TOP MOUNTING
For 4" pipe - See Note 2 on this sheet

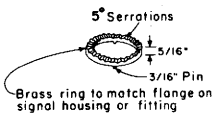
SIGNAL SLIP-FITTERS



SECTION A-A

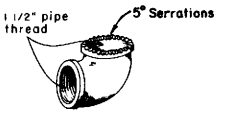


WASHER DETAIL "C"



LOCK RING

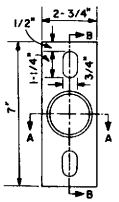
Use where locking ring is not integral with signal housing or fitting.

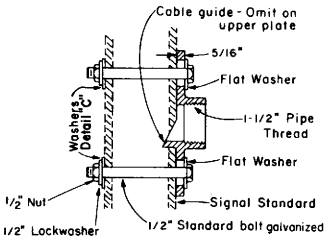


SPECIAL 90° ELBOW

One for each face, except those with special slip-fitter mounting

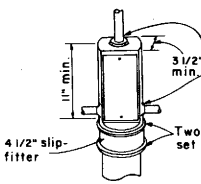
MISCELLANEOUS MOUNTING HARDWARE



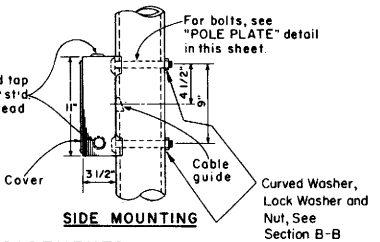


SECTION B-B

POLE PLATE
For Side Mountings



TOP MOUNTING



SIDE MOUNTING

TERMINAL COMPARTMENTS

NOTES

1. After mast arm signal has been plumbed and secured, drill 7/16" hole through mast arm in line with slip-fitter hole. Place a 3/8" galvanized bolt with washer under bolt head through hole and secure with washer, nut, and locknut. Seal openings between MAS, MAT or MAS-5 mountings and mast arm.
2. (a) Threaded top mounted slip fitter openings shall be 1 1/2" I.P.S.
   (b) Serrations in fittings shall match those on bottom of signal heads or in lock ring.
   (c) Top opening shall be offset when backplate is used.
3. Wireway shall have a cross-section area of 0.95 sq. in. minimum. Min. width of 0.50 in.

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SIGNAL HEADS AND MOUNTINGS

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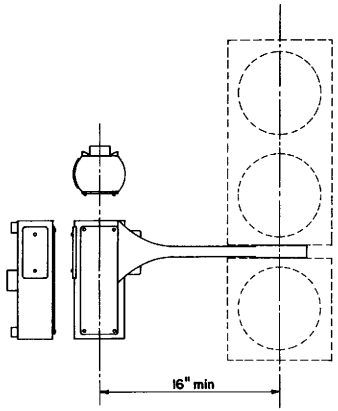
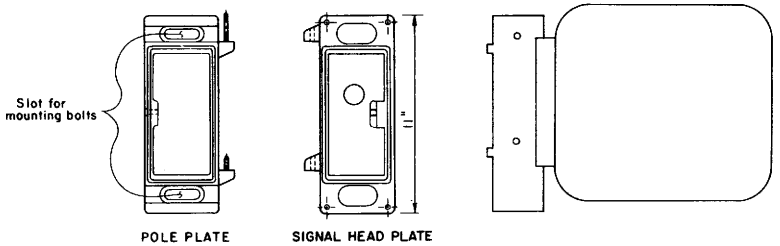


Typical Vehicular Signal Mounting



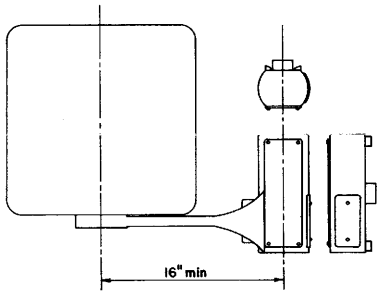
Typical Pedestrian Signal Mounting

CLAMSHELL MOUNTING HARDWARE (CS)

(To be used only when specified)

ABBREVIATIONS

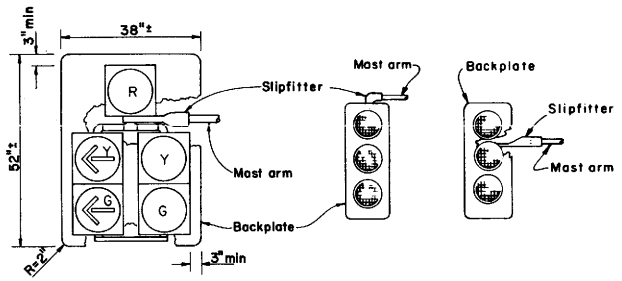
MAT	Mast Arm mounted vehicular signals Top attachment.
MAS	Mast Arm mounted vehicular signals Side attachment.
MAS-5	Mast Arm mounted vehicular signals Side attachment - 5 signal faces.
1,2,3,4,5	Number of signal faces. (3-section unless otherwise indicated)
CS	Clamshell mounting hardware.
UM	Unimount mounting hardware.



Typical Pedestrian Signal Mounting

UNIMOUNT MOUNTING HARDWARE (UM)

(To be used only when specified)



MAS-5 Side attachment

MAT Top attachment

MAS Side attachment

MAST ARM MOUNTINGS

NOTES

1. All arrow indications and all mast arm indications shall be 12-inch.
2. All mast arm mounted signal heads and all programmed visibility signal heads shall be provided with backplates.

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SIGNAL HEADS AND MOUNTINGS

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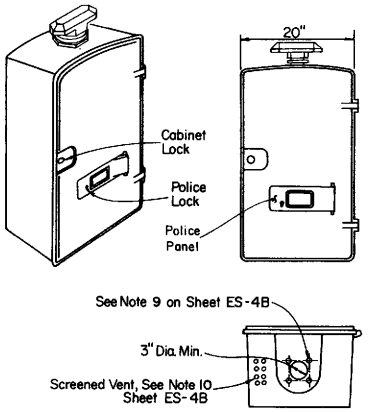
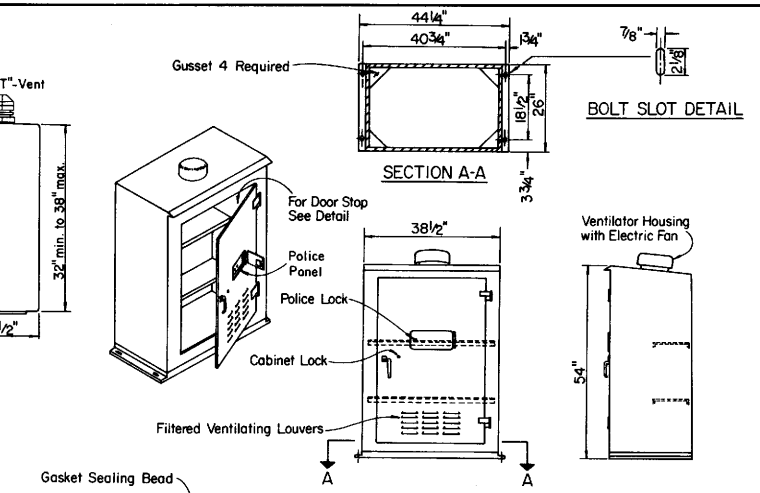
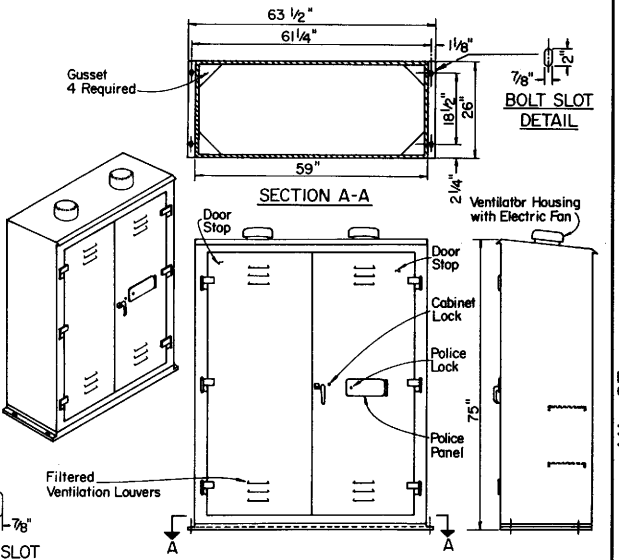


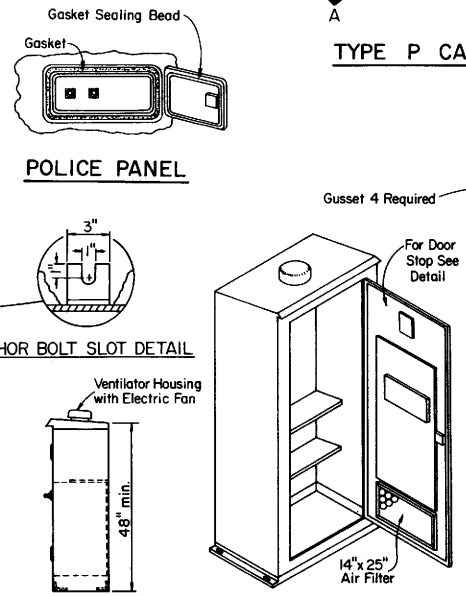
TYPE G CABINET



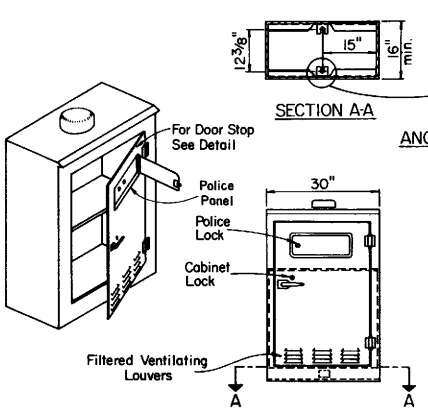
TYPE P CABINET



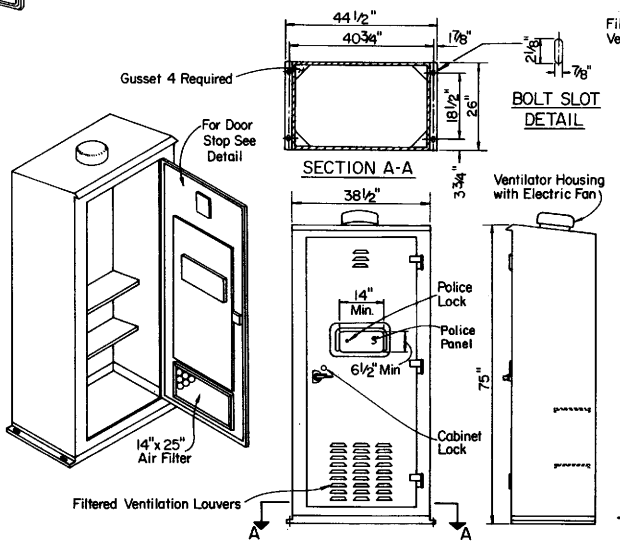
TYPE S CABINET



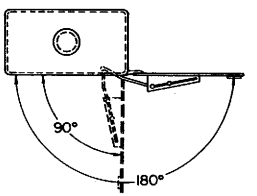
POLICE PANEL



TYPE M CABINET



TYPE R CABINET



PLAN VIEW SHOWING 2 POSITION DOOR STOP

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TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

CONTROLLER CABINET DETAILS

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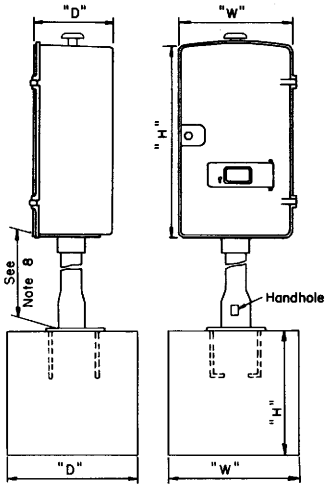
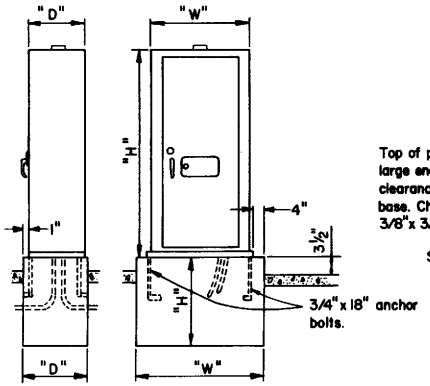
NOTES - CONTROLLER CABINETS

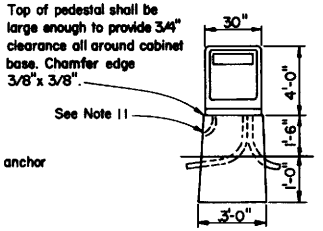
1. All cabinet dimensions are nominal.
2. Foundations shall be located to provide 2'-0" minimum clearance between face of curb and any portion of cabinet.
3. Type G, M, P, R and S cabinets shall be installed with the back toward the nearest lane of traffic.
4. All anchor bolts shall be bonded to metal conduit or equipment grounding conductor.
5. In unpaved areas, a raised P.C.C. pad shall be placed in front of each controller cabinet. Pad shall be 3'-0" x 3'-0" x 0'-4" for type G cabinets and shall be 3'-0" x 0'-4" thick x width of foundation for Type M, P, R and S cabinets.
6. In unpaved areas, the top of foundation for Type G, P, R and S cabinets shall be 6" above surrounding grade. Top of foundation for Type M cabinet shall be 18" above surrounding grade.
7. In sidewalks and other paved areas, top of foundation for Type G cabinet shall be level with surrounding grade. Top of foundation for Type P, R and S cabinets shall be 3½" above surrounding grade.
8. The steel pedestal, base plate, bolt circle and foundation for the Type G cabinet shall be the same as that shown for a Type I-C standard. Pedestal shall be 25"-30" in length. Anchor bolts shall be ¾" x 18" with a 2"-90° bend. Four bolts required per cabinet.
9. Type G cabinet shall be provided with a slipfitter to permit mounting on 4½" O.D. pedestal. Slipfitter shall be bolted to bottom of the cabinet.
10. Type G cabinet shall be provided with 8 screened, raintight holes, ½" diameter or larger, in the bottom of the cabinet.
11. A 1" drain shall be provided through the foundation of a Type M cabinet. Drain pipe shall be screened.
12. See Table for cabinet and foundation dimensions; "D"- Depth, "H"- Height, "W"- Width. See Table for anchor bolt spacing; "D"- Depth, "W"- Width.
13. All cabinet shelves shall be adjustable for vertical spacing and shall be removable. Type M, P, R and S cabinets cabinets shall be provided with a minimum of two shelves.
14. Anchor bolts for Type M, P, R, and S cabinets shall be ¾"x 18" with a 2"- 90° bend. Four bolts required per cabinet. Anchor bolts may be inside or outside cabinets.
15. An approved mastic or caulking compound shall be placed on the foundation prior to placing the cabinet to seal all openings between bottom of cabinet and foundation.
16. Controller units, plug-mounted equipment, shelf-mounted equipment and wall-mounted equipment shall be located to permit its safe and easy removal or replacement without removing any other piece of equipment.
17. Main breaker shall be rated for 30 amperes in Type G and M cabinets. It shall be rated at 60 amperes in Type P, R and S cabinets.
18. Cabinet fan may be installed at an alternate location near the top of the cabinet when approved by the Engineer.
19. Where telephone interconnect is specified, a minimum of 5" clear vertical space shall be provided inside the cabinet for the equipment.
20. Telephone interconnect conductors shall be enclosed in a ¾" or larger conduit through the foundation. Liquidtight flexible metal conduit shall be used to seperate telephone and power conductors in cabinets and pedestals.



P.C.C. FOUNDATION FOR TYPE G CABINET

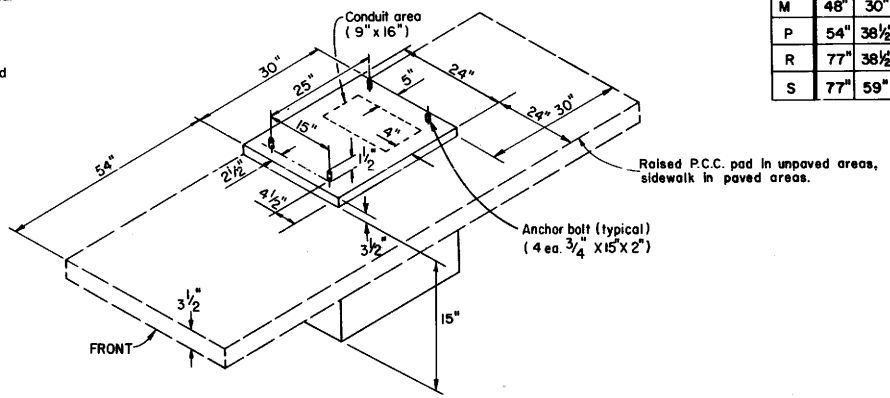


P.C.C. FOUNDATION FOR TYPE P, R and S CABINETS



P.C.C. PEDESTAL FOUNDATION FOR TYPE M CABINET

CABINET				FOUNDATION			BOLT MOUNTING	
TYPE	H	W	D	H	W	D	D	W
G	32"	20"	13½"	36"	24"	24"	BOLT PATTERN (AS REQ)	
M	48"	30"	16"	30"	36"	22"	12⅜"	
P	54"	38½"	26"	18"	50"	30"	18½"	40¾"
R	77"	38½"	26"	18"	50"	30"	18½"	40¾"
S	77"	59"	26"	18"	70"	30"	18½"	61¼"



FOUNDATION DETAILS
FOR
MODEL 332 AND 334 CABINETS

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DEPARTMENT OF TRANSPORTATION
TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
CONTROLLER CABINET DETAILS

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C D Bostel
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995
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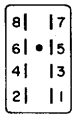
The Flash Transfer Relay shall intermate with a CINCH - JONES Socket S-408-SB or equal connected as follows:

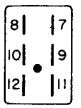
Pin No.	CIRCUIT	Pin No.	CIRCUIT
1	Coil	5	Common, Circuit #1
2	Coil	6	Common, Circuit #2
3	N.C. Circuit #1	7	N.O. Circuit #1
4	N.C. Circuit #2	8	N.O. Circuit #2



CONNECTOR SOCKET
FLASH TRANSFER RELAY

The FLASHER shall intermate with a CINCH-JONES Socket S-406-SB or equal connected as follows:

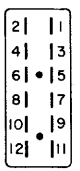
Pin No.	CIRCUIT	Pin No.	CIRCUIT
7	Load, Ckt. #1	10	AC⁻
8	Load, Ckt. #2	11	AC⁺
9	Chassis Ground	12	Not Used



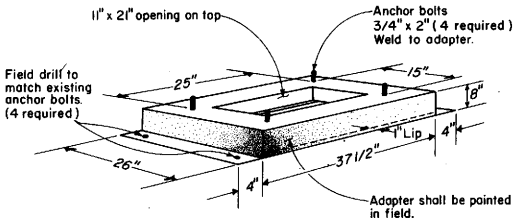
CONNECTOR SOCKET
SOLID STATE FLASHER UNIT

The Solid-state Switching devices shall intermate with a CINCH-JONES Socket S-2412-SB or equal connected as follows:

Pin No.	CIRCUIT	Pin No.	CIRCUIT
1	AC + Lights	7	Green or Walk Output
2	Chassis Ground	8	Yellow Input
3	Red or Dont Walk Output	9	DC + (15 to 24 volts)
4	Not Used	10	Green or Walk Input
5	Yellow Output	11	AC-
6	Red or Dont Walk Input	12	Not Used



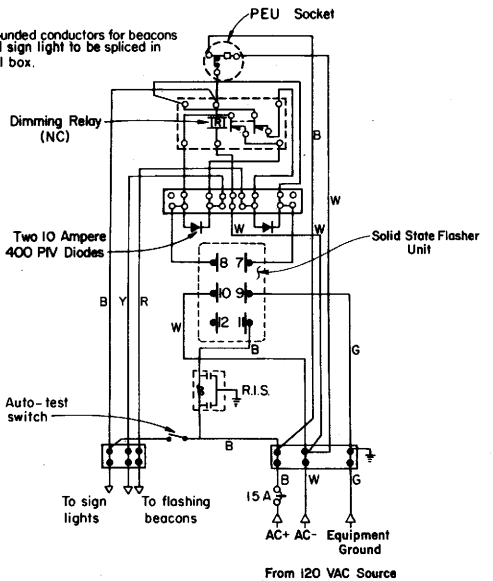
CONNECTOR SOCKET
SOLID STATE SWITCHING DEVICE



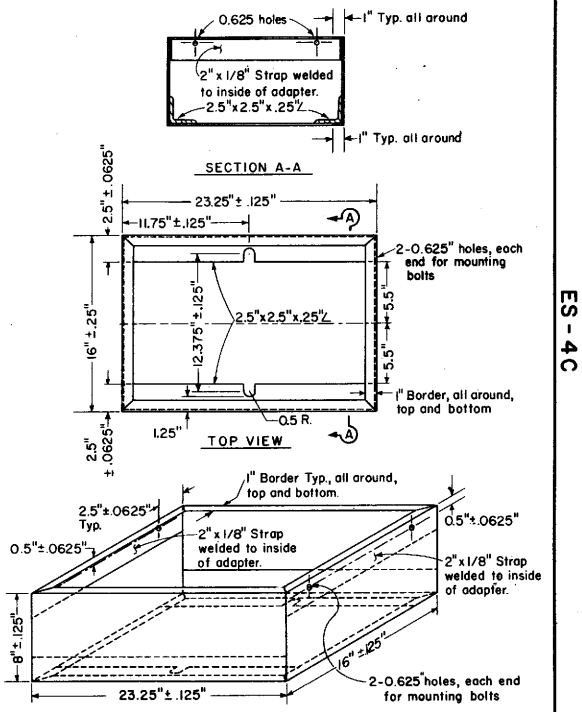
TYPE PR CABINET ADAPTER

1. Material: 0.1345" Thickness Steel Plate.
2. Mount adapter on Type P or Type R Cabinet Foundation.

Note:
Grounded conductors for beacons and sign light to be spliced in pull box.



WIRING DIAGRAM
FLASHING BEACON CONTROL ASSEMBLY



TYPE M CABINET ADAPTER

1. Mount adapter on Type M Cabinet Foundation
2. Mounting bolts shall be 3/8" min. size

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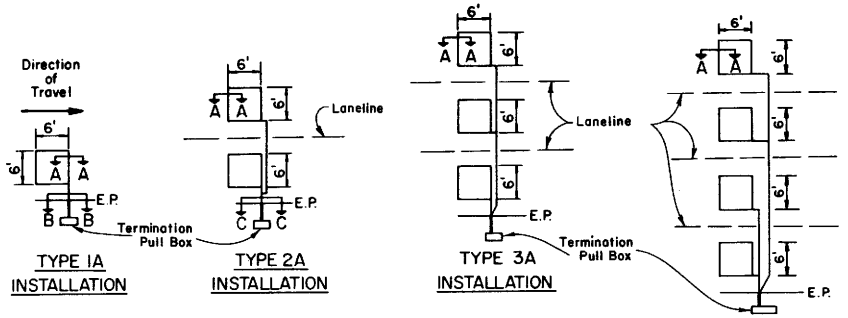
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

C D Bonbee
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995
DATE July 1, 1984

LOOP INSTALLATION PROCEDURE

1. Saw slots in pavement for loop conductors as shown in details.
2. Clean out slots with water (if necessary) and compressed air and allow slots to dry thoroughly before installing conductors.
3. Install termination pull box and curb or shoulder termination detail (see ES—5F).
4. Install loop conductor in slot using a 3/16" to 1/4" thick wood paddle.
5. Allow additional length of conductor for the run to termination pull box plus 5 feet of slack in pull box.
6. The additional length of each conductor for each loop shall be twisted together into a pair (at least 2 turns per foot) before being placed in the slot and conduit to termination pull box.
7. No more than 4 loop conductors (2 twisted pairs) shall be installed in one sawed slot.
8. Identify and tag loop circuit pairs in the termination pull box. Identify and tag with loop number, start (S) and finish (F) of conductor. Identify and tag lead-in cable with sensor number and phase.
9. Test each loop circuit for continuity, circuit resistance and insulation resistance at the pull box before filling slots.
10. Fill slots as shown in details.
11. Splice loop conductors to lead-in cable. All splices shall be soldered using rosen-core solder.
12. Lead-in cable shall be taped and waterproofed prior to installing in conduit to prevent moisture from entering the cable.
13. Lead-in cable shall not be spliced between the termination pull box and the controller cabinet terminals.
14. Test each loop circuit for continuity, circuit resistance and insulation resistance at the controller cabinet location. The loop circuit resistance shall not exceed 0.5 ohms plus 0.35 ohms per 100 feet of lead-in cable. The insulation resistance shall be performed between each circuit conductor and ground. The insulation resistance shall not be less than 100 megohms.
15. Where loop conductors are not to be spliced to a lead-in cable, the ends of the conductors shall be taped and waterproofed with an electrical insulating coating.
16. Distance between side of loop and a lead-in saw cut from adjacent detectors shall be 2 feet minimum. Distance between lead-in saw cuts shall be 6 inches minimum.
17. Loops shall be centered in lanes.
18. Adjacent loops on the same sensor unit channel shall be wound in opposite directions.



TYPE 1A INSTALLATION

TYPE 2A INSTALLATION

TYPE 3A INSTALLATION

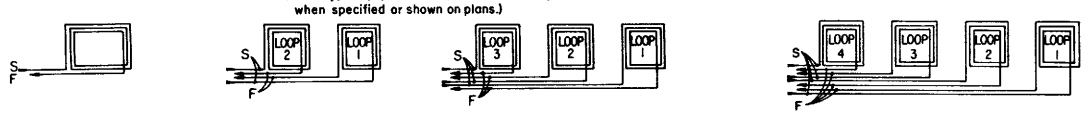
TYPE 4A INSTALLATION

SAWCUT DETAILS

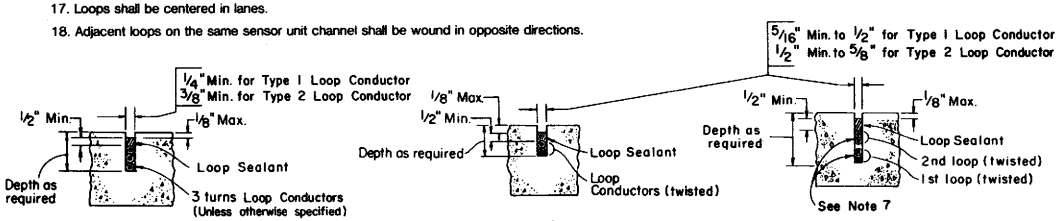
Type A loop detector configurations illustrated

1. 1A thru 4A = 1 Type A loop configuration in each lane.
2. 1B thru 4B = 1 Type B " " " " "
3. 1C = 1 Type C loop configuration entering lanes as required.
4. 1D thru 4D = 1 Type D loop configuration in each lane.
5. 1Q thru 4Q = 1 Type Q " " " " "

(Use Type B, C, D or Q loop detector configurations only when specified or shown on plans.)



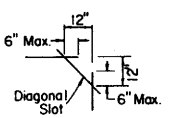
WINDING DETAILS



SECTION A-A

SECTION B-B

SECTION C-C



PLAN VIEW OF DIAGONAL SLOT AT CORNERS

SLOT DETAILS — TYPE 1 AND TYPE 2 LOOP CONDUCTOR

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C. D. Bartell
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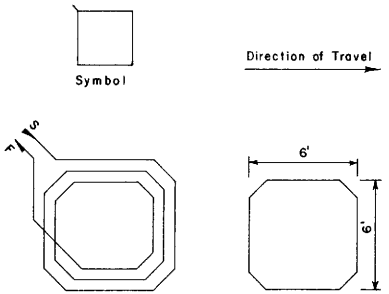
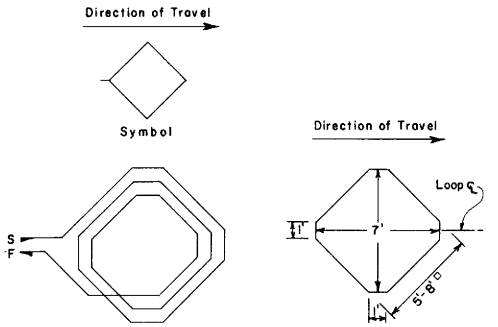


WINDING DETAIL SAWCUT DETAIL

TYPE A LOOP DETECTOR CONFIGURATION

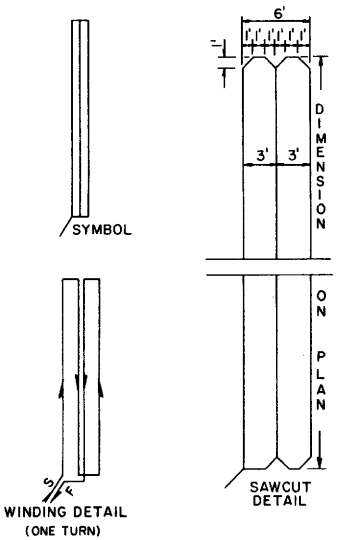


WINDING DETAIL SAWCUT DETAIL

TYPE B LOOP DETECTOR CONFIGURATION

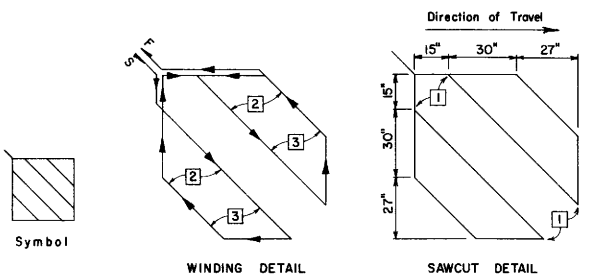
(Use only when specified or shown on the plans)

1. Install loop with loop center-line parallel to curb or laneline



TYPE C LOOP DETECTOR CONFIGURATION

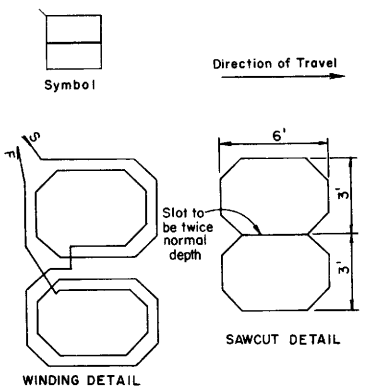
(Use only when specified or shown on the plans)



TYPE D LOOP DETECTOR CONFIGURATION

(Use only when specified or shown on the plans)

1. Round corners of acute angle sawcuts to prevent damage to conductors.
2. Install 3 turns when only one Type D loop is on a sensor unit channel.
3. Install 5 turns when one Type D loop is connected in series with 3 additional 6'X6' loops (Type 5DA or 5DQ installations) on a sensor unit channel.



TYPE Q LOOP DETECTOR CONFIGURATION

(Use only when specified or shown on the plans)

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Dist.	County	Route	Post Miles Total Project	Sheet No.	Total Sheets

C D Bartel
CHIEF, DIVISION OF TRAFFIC ENGINEERING
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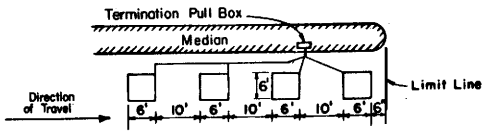
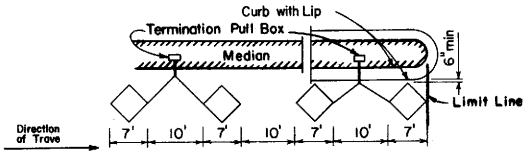


SAWCUT DETAIL

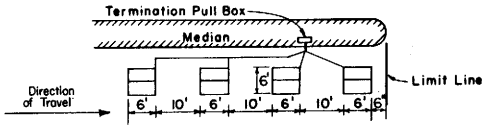
TYPE 5A LOOP INSTALLATION



SAWCUT DETAIL

TYPE 5B LOOP INSTALLATION

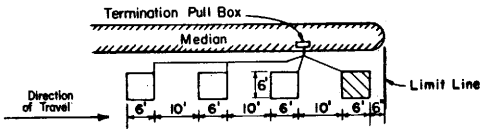
(Use only when specified or shown on plans)



SAWCUT DETAIL

TYPE 5Q LOOP INSTALLATION

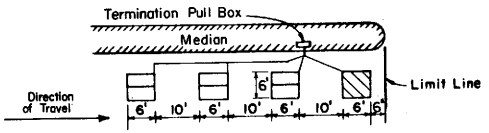
(Use only when specified or shown on plans)



SAWCUT DETAIL

TYPE 5DA LOOP INSTALLATION

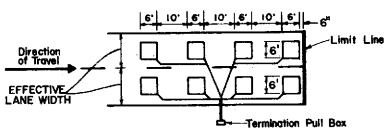
(Use only when specified or shown on plans)



SAWCUT DETAIL

TYPE 5DQ LOOP INSTALLATION

(Use only when specified or shown on plans)

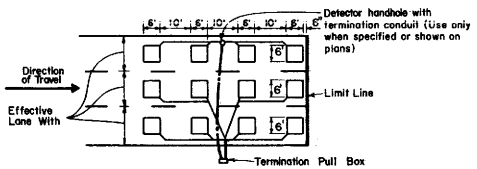


SAWCUT DETAIL

TYPE 6A LOOP INSTALLATION

(Use only when specified or shown on plans)

1. 6 A = 4-Type A loop configurations in each lane.
2. 6 B = 4-Type B " " " " " .
3. 6 C = 1-Type C " configuration " " " .
4. 6 D = 4-Type D " configurations " " " .
5. 6 Q = 4-Type Q " " " " " .



SAWCUT DETAIL

TYPE 7A LOOP INSTALLATION

(Use only when specified or shown on plans)

1. 7 A = 4-Type A loop configurations in each lane.
2. 7 B = 4-Type B " " " " " .
3. 7 C = 1-Type C " configuration " " " .
4. 7 D = 4-Type D " configurations " " " .
5. 7 Q = 4-Type Q " " " " " .

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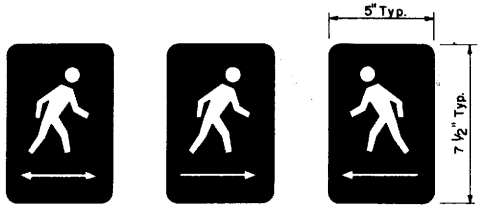
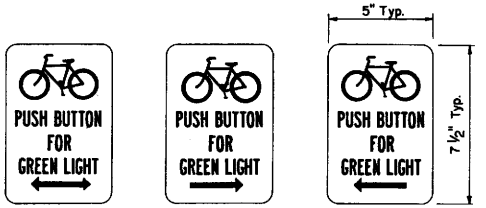
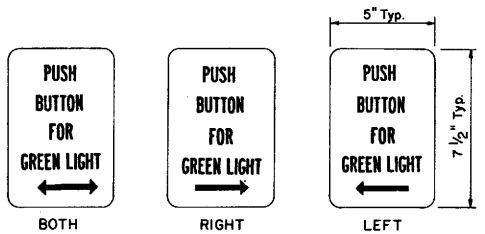


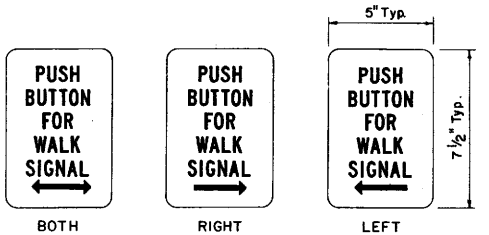
FOR INTERNATIONAL SYMBOL SIGNALS
White legend on black background.



FOR BICYCLE LANES
(Use Only When Specified)
Black legend on white background.

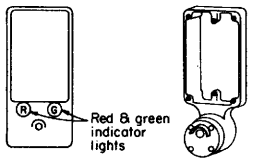


FOR 3-LIGHT SIGNALS
(Use Only When Specified)
Black legend on white background.



FOR WALK-DONT WALK SIGNALS
(Use Only When Specified)
Black legend on white background.

PEDESTRIAN PUSHBUTTON SIGNS
Signs shall be porcelain enameled.



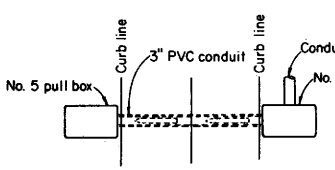
TYPE A
(Use Only When Specified)

TYPE B

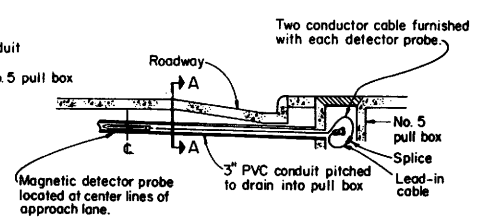
TYPE C
(Use Only When Specified)

PEDESTRIAN PUSH BUTTONS

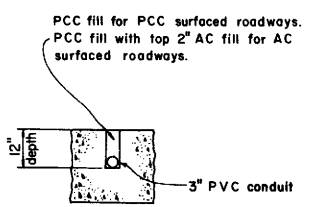
1. Shape back of casting to fit curvature of post.
2. Provide cover fitting for top of post, when PPB is mounted on pedestrian push button post.
3. Install pushbutton on crosswalk side of standard.



PLAN



ELEVATION



SECTION A-A

NON-DIRECTIONAL MAGNETIC VEHICLE DETECTOR INSTALLATION DETAILS

C D Bartell
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995
DATE July 1, 1984

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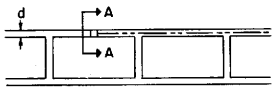
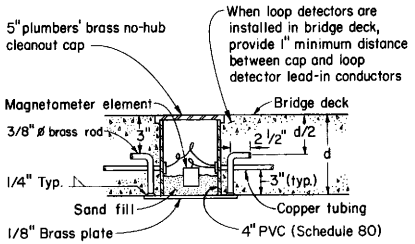
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

C. D. Bartell
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995

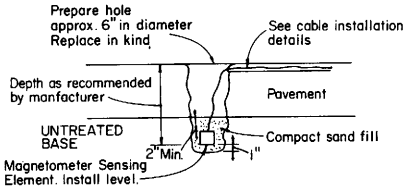
DATE July 1, 1984



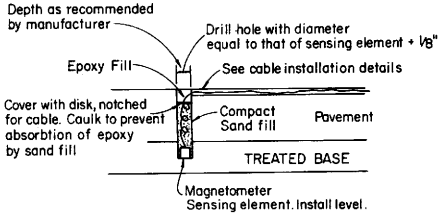
INSTALLATION DETAIL



SECTION A-A

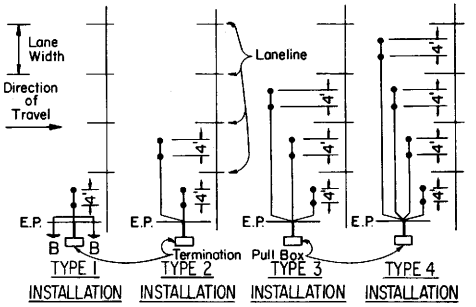


LIGHT DUTY ROADWAY
(WITH UNTREATED BASE)

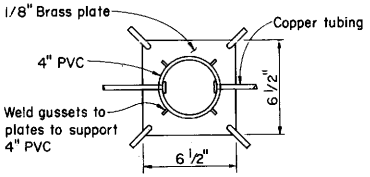


HEAVY DUTY ROADWAY
(WITH TREATED BASE)

MAGNETOMETER SENSING ELEMENT INSTALLATION DETAILS



LAYOUTS AND DIMENSIONS

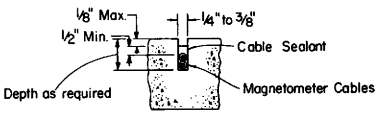


DETECTOR INSTALLATION IN BRIDGE DECK

MAGNETOMETER DETECTOR INSTALLATION PROCEDURE :

1. Prepare holes for sensing elements and saw slots in pavement for connecting cables as shown in details. Blow out and dry thoroughly with compressed air.
2. Install termination pull box. See termination details.
3. Install heads in holes and install cables in slots using a 3/16" to 1/4" thick wood paddle and run to adjacent pull box allowing 5 feet of slack at the pull box.
4. Identify cables by lane or sensor unit designation.
5. Splice sensing element cables to lead-in cables. All splices shall be soldered using rosin core solder.
6. Test each sensing element circuit at controller or count station cabinet before filling holes and slots. Excitation circuits shall have a resistance of 50 ohms* per head and detection circuits shall have a resistance of 300 ohms* per head. Measurements shall be made with a low range ohm-meter.
7. Fill slots and sensing element holes as shown in details.
8. Lead-in cable shall not be spliced between the termination pull box and the controller cabinet.
9. See Sheet ES-5F for curb termination details.

*Or other resistance per manufacturers' specifications



SECTION B-B

SLOT DETAILS

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
DETECTORS

ES-5E

ES-5E

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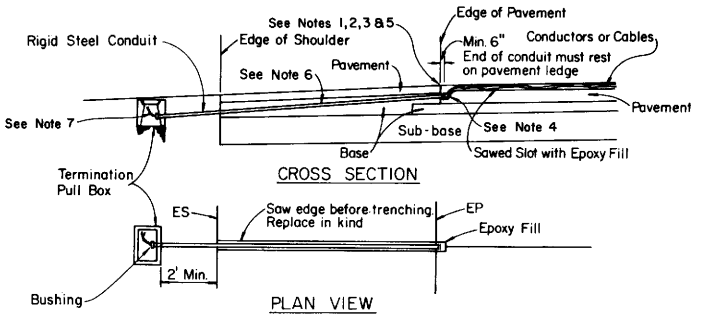
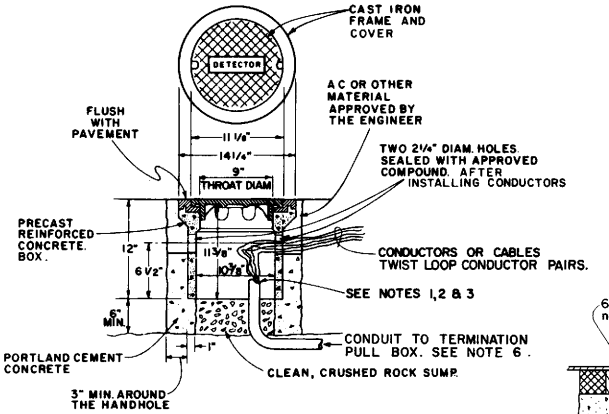
Dist.	County	Route	Post Miles Total Project	Sheet No.	Total Sheets

C D Bartell
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995
DATE July 1, 1984

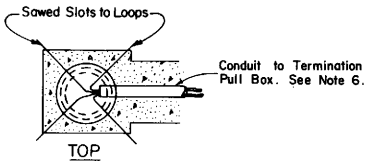


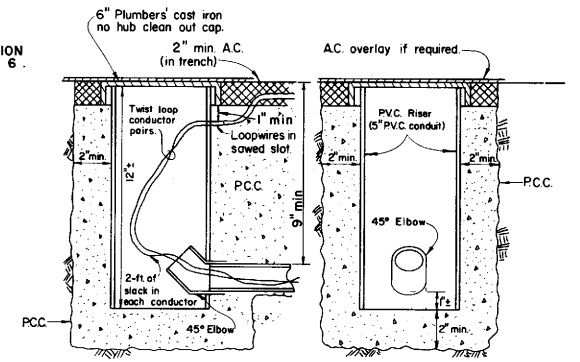
SHOULDER TERMINATION DETAILS



TYPE A DETECTOR HANDHOLE DETAILS

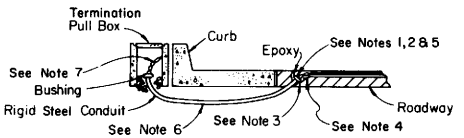
(Use only when specified)



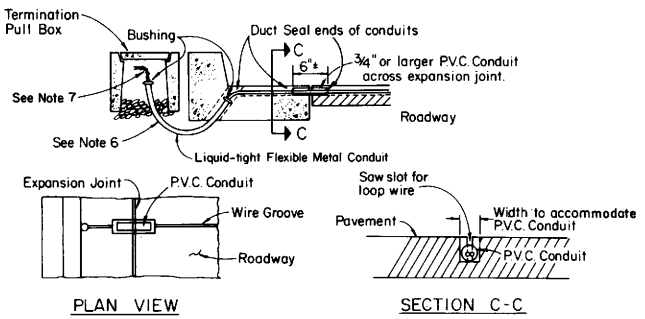


TYPE B DETECTOR HANDHOLE DETAILS

(Use only when specified)



CURB TERMINATION DETAILS TYPE A



CURB TERMINATION DETAILS TYPE B

(Use only when specified)

NOTES (This sheet only)

1. Non-metallic bushing shall be used at roadway end of conduit.
2. Tape wire 3 inches each side of roadway bushing.
3. Install duct seal compound to each end of roadway conduit before installing epoxy, or other approved materials.
4. Round all sharp edges where wire has to pass.
5. End of roadway conduit shall be 2 inches below roadway surface.
6. Conduit Size — Loop Conductors — Magnetometer Cables

Conduit Size	Loop Conductors	Magnetometer Cables
1" minimum	up to 2 pairs	up to 3 cables
1 1/2" minimum	3 to 4 pairs	4 to 8 cables
2" minimum	5 or more pairs	9 or more cables

7. Splice detector conductors or cables to lead-in cable for run to controller cabinet.

INSTALLATION REQUIREMENTS

1. Outline of trench shall be saw cut to a minimum depth of 3" except where A.C. overlay is to be placed.
2. The hole in the 5" P.V.C. riser shall not be larger than that required to insert the conduit elbow. The riser shall be slotted with the saw when loop slots are cut in pavement.
3. Each PVC riser shall be fabricated from 5" PVC conduit (Schedule 40 or 80). The riser shall be centered on the lane line, unless otherwise shown on the plans.
4. Entire length of trench, from PVC riser to adjacent pull box, shall be backfilled with P.C.C. except the top 2" in AC surfaced roadways shall be backfilled with AC.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

DETECTORS

ES-5F

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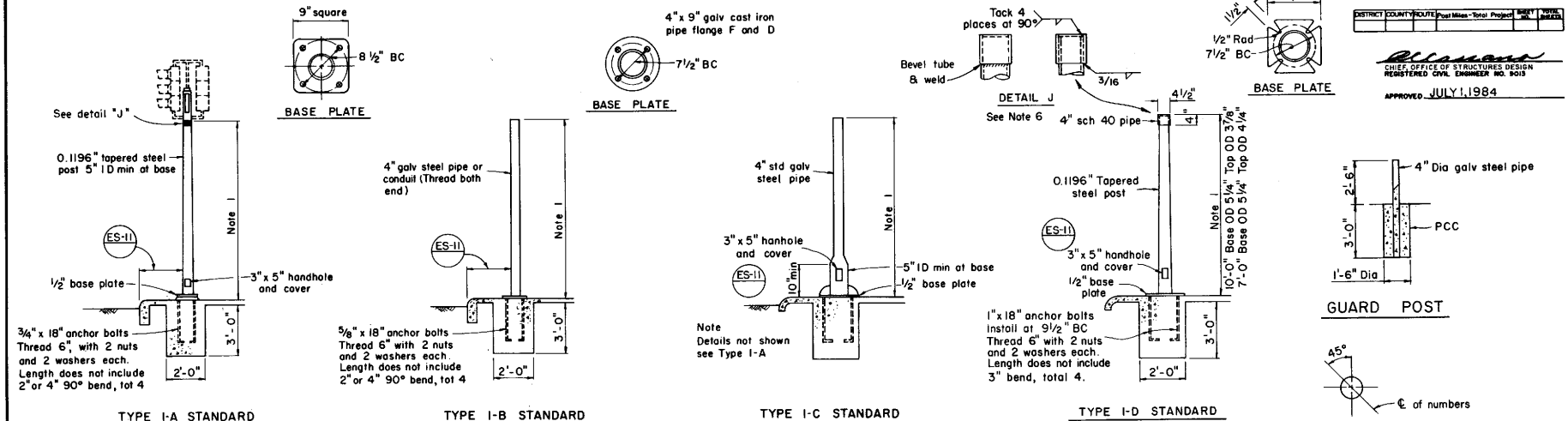
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

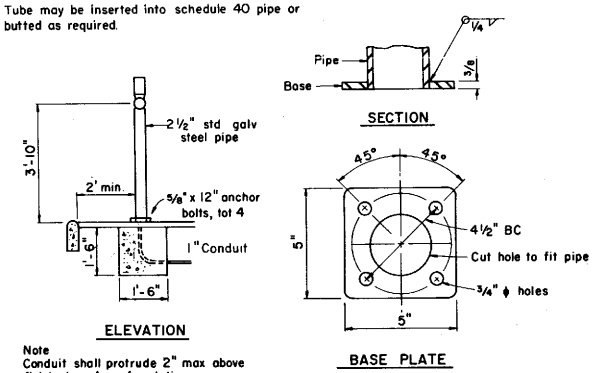
APPROVED JULY 1, 1984



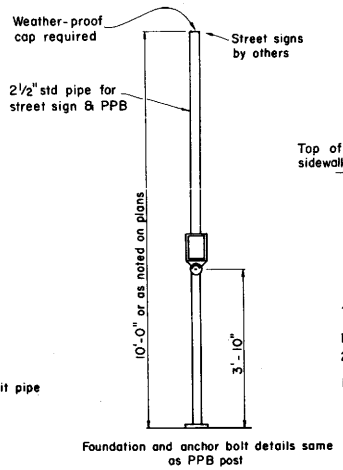
TYPE I SIGNAL STANDARDS

NOTES:

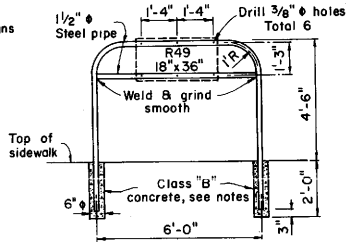
1. Standards shall be 10'-0" ±2" for vehicular signals and 7'-0" ±2" for pedestrian signals unless otherwise noted on plans.
2. Top of standards shall be 4 1/2" OD
3. Conduits shall extend 2" max above finished surface of foundation and for Type I-A, I-C and I-D shall be sloped toward handhole
4. Anchor bolts shall be bonded to conduit
5. Conduit between standard and adjacent pull box shall be 2" size minimum.
6. Tube may be inserted into schedule 40 pipe or butted as required.



PEDESTRIAN PUSH BUTTON POST



COMBINED STREET SIGN PEDESTRIAN PUSH BUTTON POST



PEDESTRIAN BARRICADE

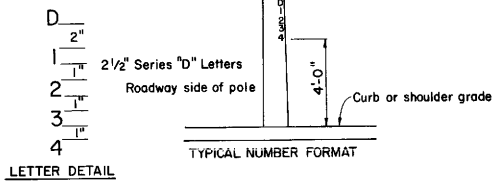
Notes:

2% calcium chloride may be added to concrete.

Pipe post to be set 1'-6" back from face of curb unless otherwise specified.

When side walk is existing, foundation may consist of 4-3/8" stud size anchorage devices placed on 4" minimum diameter circle. Use pipe flange to suit bolt circle.

NOTE:
Paint numbers on Roadway side facing traffic when electrolier or post is left of direction of traffic



LOCATION OF EQUIPMENT NUMBERS ON STANDARDS AND POSTS

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
TYPE I STANDARDS AND PUSHBUTTON POSTS

Standard Plan Sheet No.
Detail No.

ES-6A

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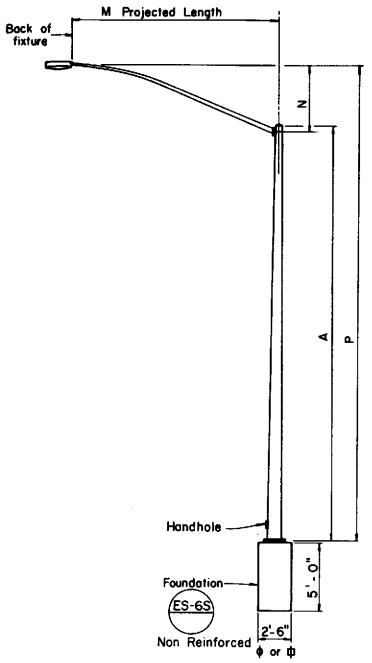
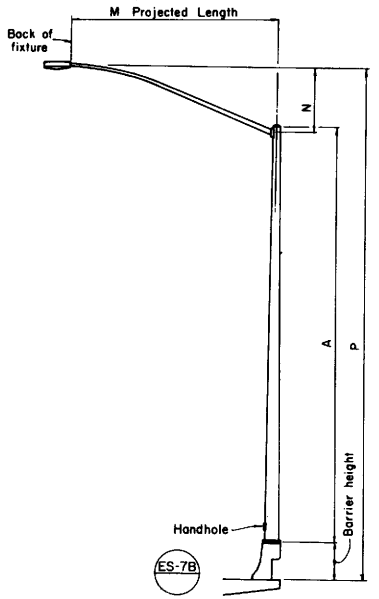
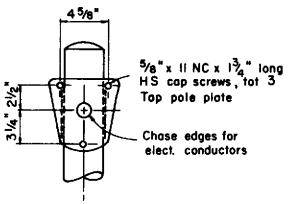
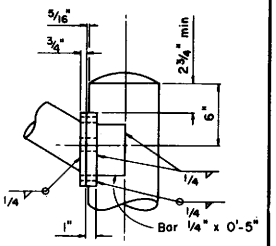


ELEVATION
TYPE 15

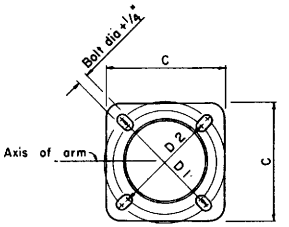


ELEVATION
TYPE 21 BRIDGE MOUNTED





DETAIL R
LUMINAIRE ARM CONNECTION



BASE PLATE
ES-6S Plan B

Pole Type	POLE DATA				BASE PLATE DATA						Luminaire Arm
	A Height	Min O D Base	Min O D Top	Thickness	C	D 1	D 2	Thickness	Anchor Bolts Size	Anchor Bolts Bolt Circle	
15	30'-0"	8"	3 7/8"	0.1196"	12"	11 1/2"	11"	1"	1" x 36" x 4"	11"	6'-15' ☐2
21	35'-0"	8 5/8"	3 7/8"	0.1196"	12"	12"	11 1/2"	1"	1 1/4" see note 2	12"	6'-15' ☐2

LUMINAIRE ARM DATA						
M Projected Length	N Rise	Min O D At Pole	Thickness	P Mounting Height Type 15	P Mounting Height Type 21 No Barrier	P Mounting Height Type 21 2'-8" Barrier
6'-0"	2'-0"±	3 1/4"	0.1196"	31'-6"±	36'-6"±	39'-2"±
8'-0"	2'-6"±	3 1/2"		32'-0"±	37'-0"±	39'-8"±
10'-0"	3'-3"±	3 7/8"		32'-9"±	37'-9"±	40'-5"±
12'-0"	4'-3"±	3 7/8"		33'-9"±	38'-9"±	41'-5"±
15'-0"	4'-9"±	4 1/4"		34'-3"±	39'-3"±	41'-11"±

Notes

1. ☐ Indicates arm length to be used unless otherwise noted on the plans.
2. For Anchorage Details see ES-7B
3. See ES-7B when type 15 is to be mounted on Bridge Railing
4. For type 15-SB, use type 15 standard with type 30 base plate details, sheet ES-6E.

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

R. C. Cassano
CHIEF, OFFICE OF STRUCTURE DESIGN
REGISTERED CIVIL ENGINEER NO. 9013
APPROVED JULY 1, 1984

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

LIGHTING STANDARDS
TYPES 15 & 21

ES-6B

ES-6B

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

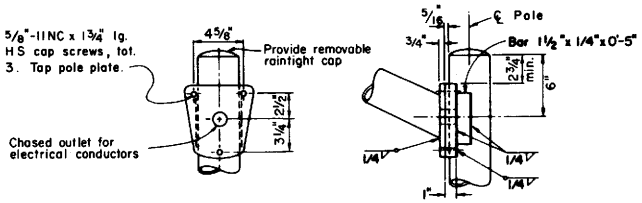
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED JULY 1, 1984

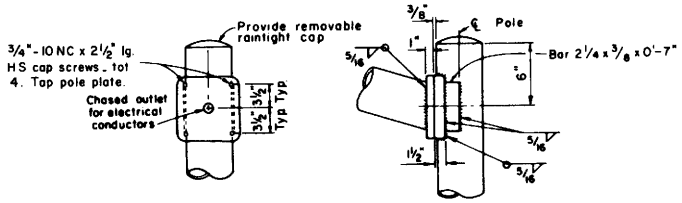
	LUMINAIRE ARM DATA			
	Projected Length	Thickness	Minimum OD @ Pole	Mounting Height
*	6'-0"	0.1196"	3¼"	36'-9"±
	8'-0"		3½"	37'-3"±
	10'-0"		3¾"	38'-0"±
	12'-0"		3¾"	39'-0"±
	15'-0"		4¼"	39'-6"±
**	20'-0"	0.1793"	5"	37'-0"±

* Type 30 - arm lengths 6'-15' max.

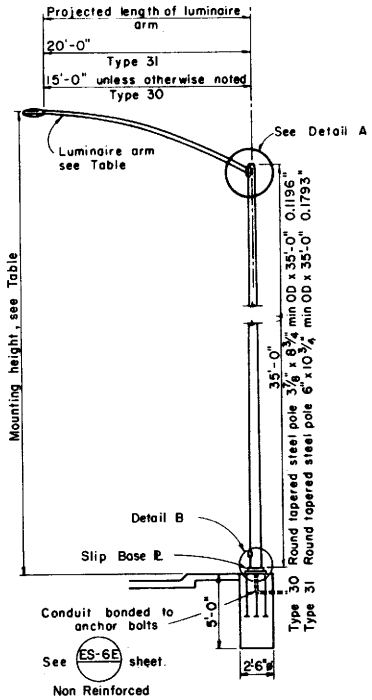
** Type 31 - arm lengths 20'



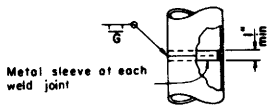
DETAIL A - TYPE 30



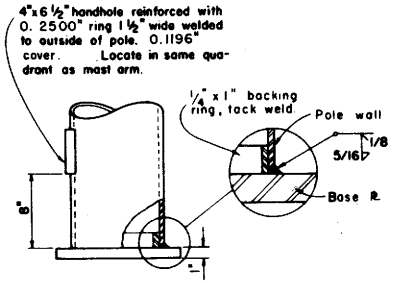
DETAIL A - TYPE 31



ELEVATION



POLE SPLICE



DETAIL B

Notes

1. Plates shall conform to ASTM A-36, except as noted.
2. In lieu of the torque requirements for HS bolts, cap screws shall be tightened by the turn-of-nut method 1/3 turn from snug tight condition. No washer will be required.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SPECIAL DETAILS LIGHTING STANDARDS TYPES 30 AND 31

ES-6D

ES-6D

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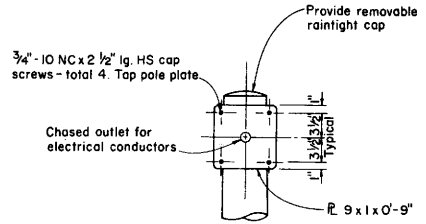
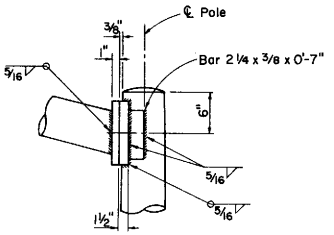
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

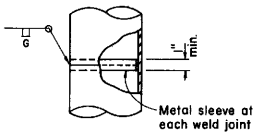
CHIEF, OFFICE OF STRUCTURAL DESIGN 1
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED JULY 1984

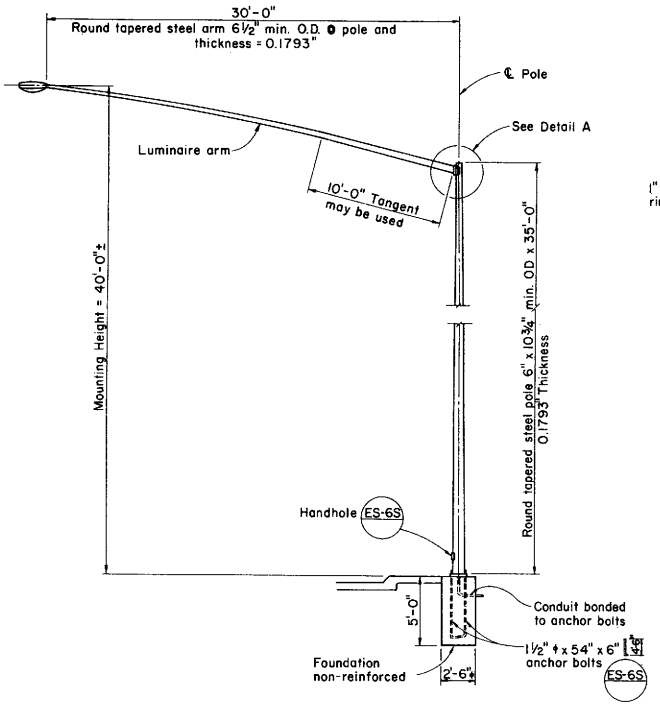


DETAIL A

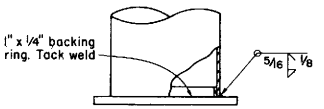




POLE SPLICE

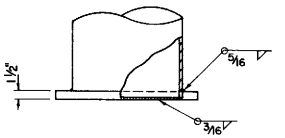


ELEVATION

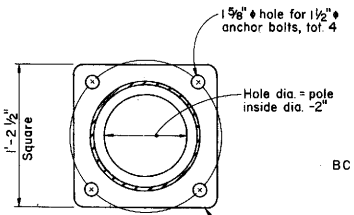


This detail shall be used for 2 ply poles

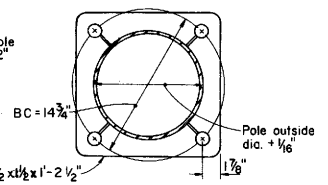
ELEVATION



ELEVATION



PLAN



PLAN

ALTERNATIVE BASE PLATE DETAILS

Notes

1. Plates shall conform to ASTM A-36, except as noted.
2. In lieu of the torque requirements for H.S. bolts, cap screws shall be tightened by the turn-of-nut method 1/3 turn from snug tight condition. No washer will be required.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

LIGHTING STANDARD
TYPE 32

ES-6DA

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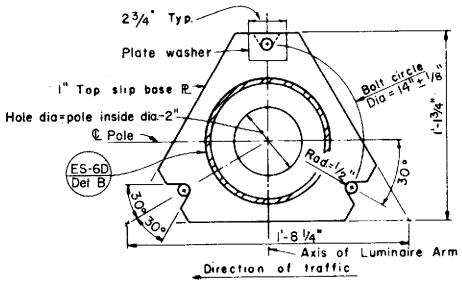
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE APPROVED JULY 1, 1984



PLAN - TYPICAL BASE PLATE

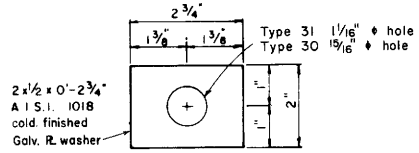
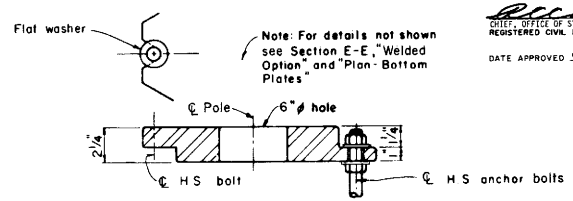
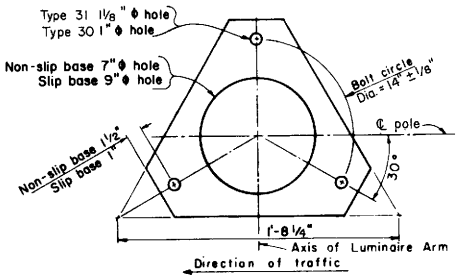


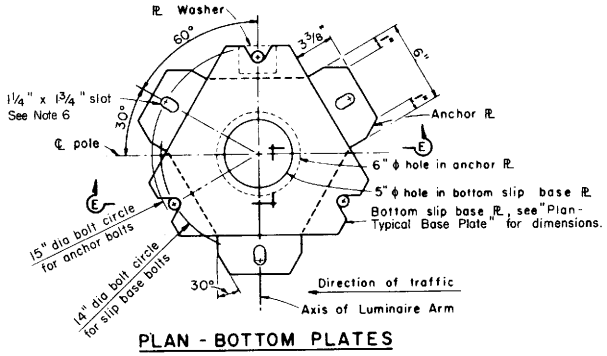
PLATE WASHER



CAST OPTION

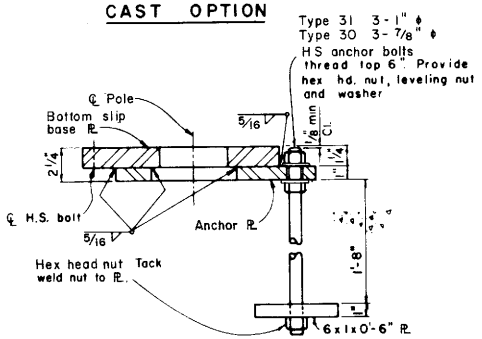


KEEPER PLATE



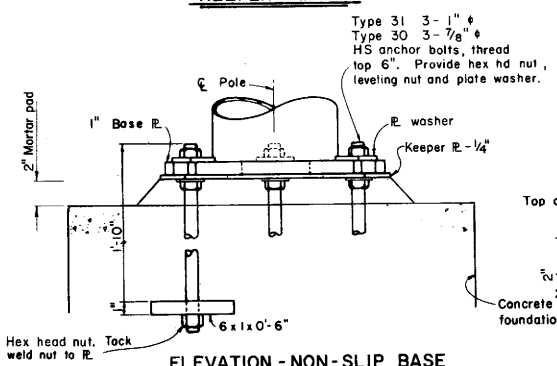
PLAN - BOTTOM PLATES

SLIP BASE PLATE DETAILS

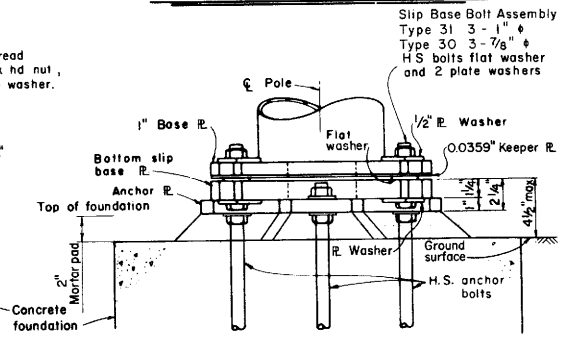


WELDED OPTION

SECTION E-E



ELEVATION - NON-SLIP BASE



ELEVATION - SLIP BASE

NOTES

1. Cast option shall conform to ASTM A-27 Grade 70-40
2. Torque 1" HS slip base bolts to 200 ft-lbs. Torque 7/8" HS slip base bolts to 150 ft-lbs.
3. 1" & 7/8" HS anchor bolts, wrench tighten, torque requirement waived.
4. HS bolts, nuts and washers and HS anchor bolts shall conform to ASTM A-325 or A-449
5. A slip base is to be furnished unless the plans or special provisions specify a non-slip base.
6. 7/8" ø anchor bolts in the slot hole require a hardened over size washer minimum 2 1/4"ø or 2 1/4" x 1 3/4"□. Two washers are required for each slotted hole. Place one washer on each side of anchor plate.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

LIGHTING STANDARDS TYPES 30 AND 31 BASE PLATE DETAILS

ES-6E

ES-6E

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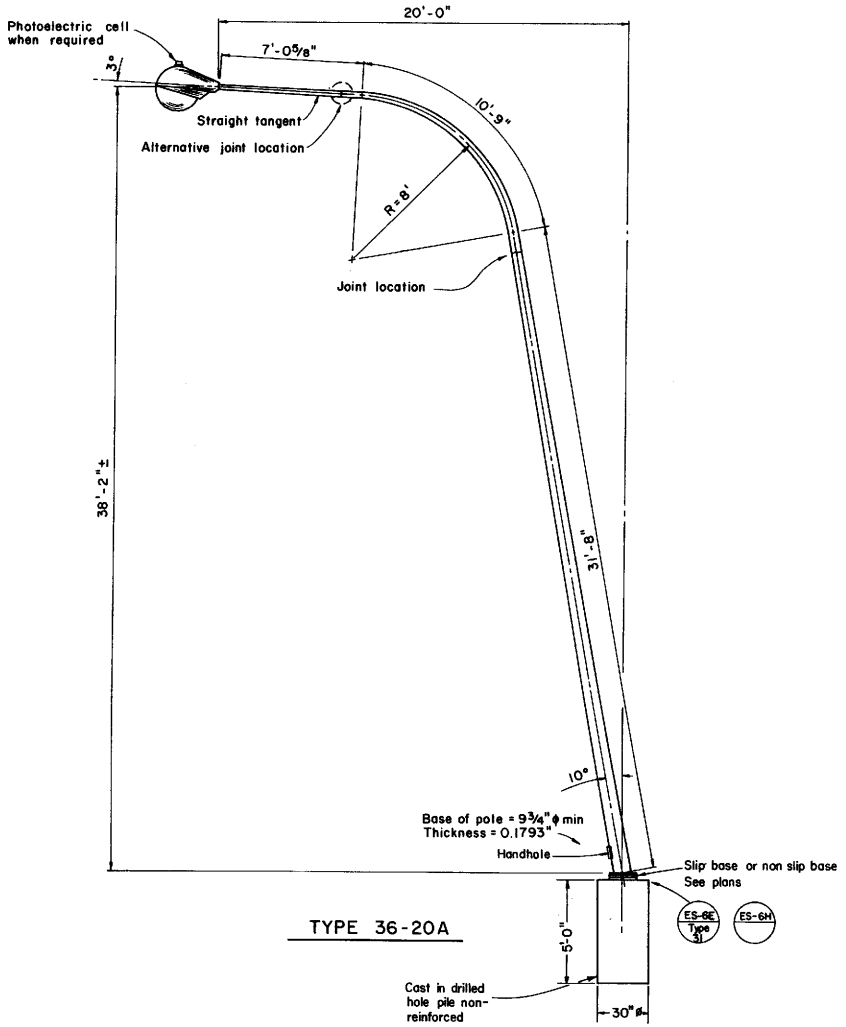
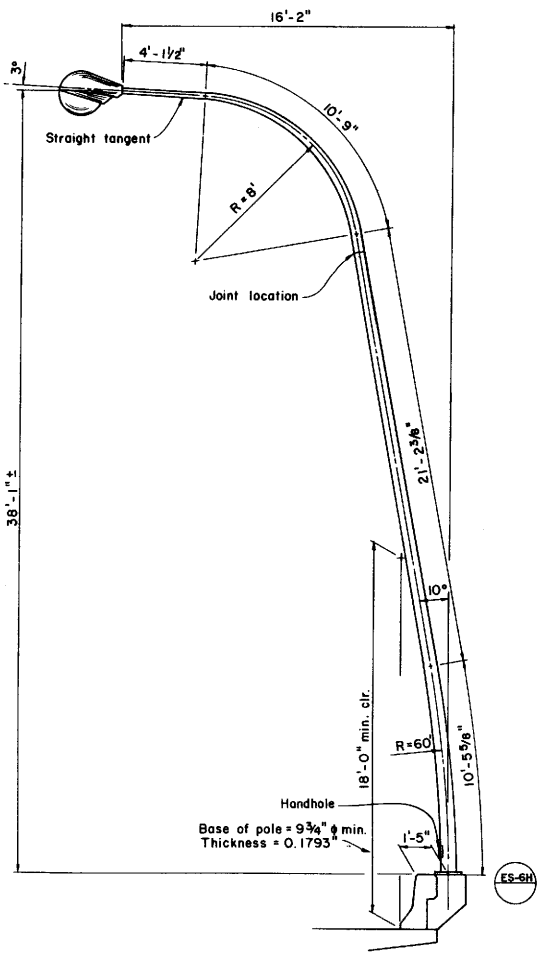


TYPE 36-20A



TYPE 35

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

CHIEF, OFFICE OF STRUCTURE DESIGN
REGISTERED CIVIL ENGINEER NO. 5013

APPROVED JULY 1, 1984

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

10 DEGREE LIGHTING STANDARDS

ES-6F

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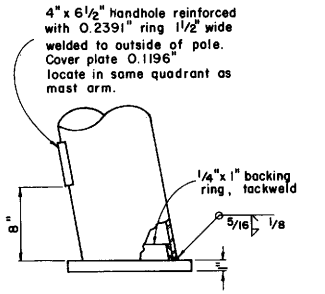
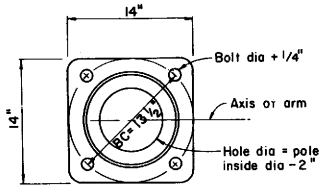
DISTRICT	COUNTY	ROUTE	P.M. Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED JULY 1, 1984

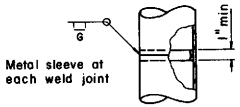


ELEVATION

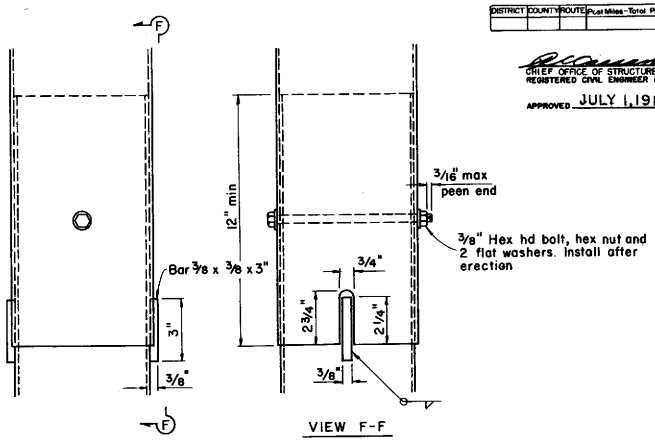


PLAN TYPE 35

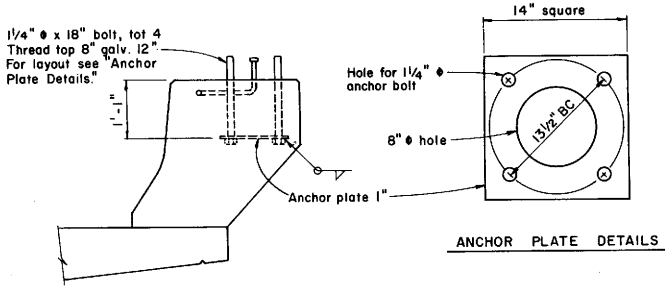
BASE PLATE DETAILS



POLE SPLICE



SLIP JOINT DETAILS



ANCHOR PLATE DETAILS

ANCHORAGE DETAILS

Type 35

NOTES:

1. Pole and arm configurations shown are the final form when erected in place. Provide camber as necessary.
2. Poles and arms shall be round, tapered steel tubes with a taper of 0.1375 to 0.1400 inches per foot.
3. Alternate slip joint or sleeve joint designs may be submitted with calculations to the Engineer for approval.
4. Knee radius 8'-0" min - 10'-0" max.
5. Tube bends shall be made in a manner to prevent buckling or crimpling.
6. A 2" pipe tendon 8" max long may be used for the luminaire connection.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

10 DEGREE LIGHTING STANDARDS DETAILS

ES-6H

ES-6H

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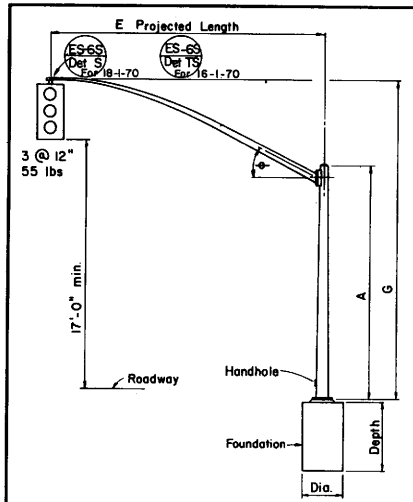
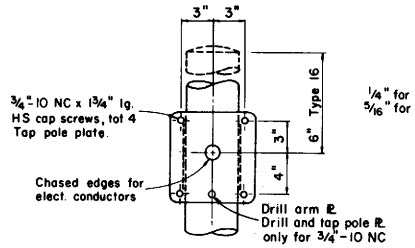
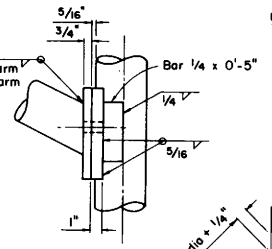


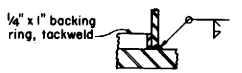
ELEVATION

TYPE 16-1-70
18-1-70

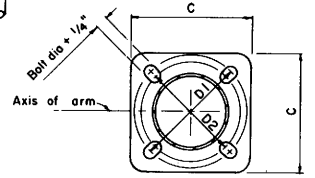


SIGNAL ARM CONNECTION FOR 15', 18' & 20' ARMS



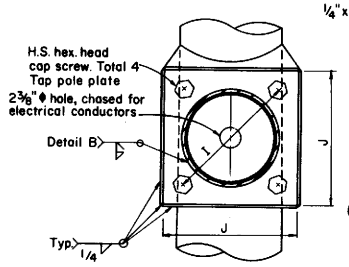


DETAIL B

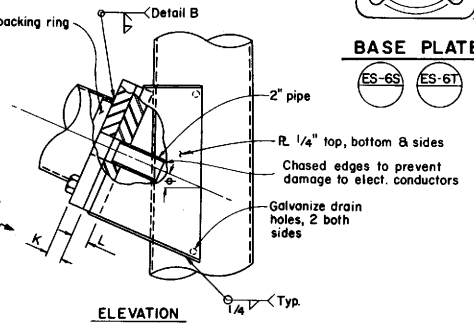


BASE PLATE

ES-6S ES-6T

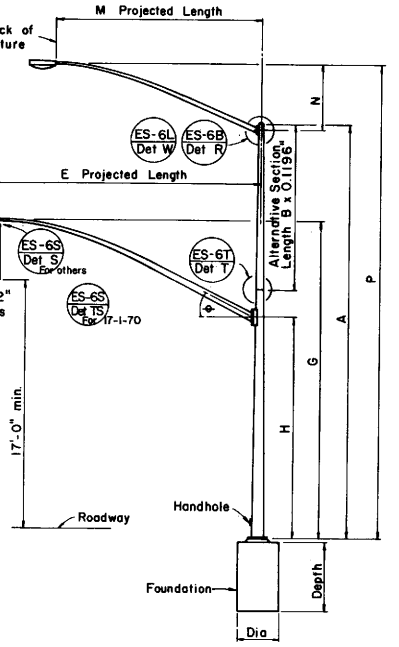


SECTION A-A



ELEVATION

SIGNAL ARM CONNECTION DETAILS FOR 25' & 30' ARMS



ELEVATION

TYPE 17-1-70, 17A-1-70
19-1-70, 19A-1-70

SIGNAL ARM DATA										
E Projected Length	G Mounting Height	H	Min O D At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm ℞ Thickness	L Pole ℞ Thickness	ϕ
15'-0"	22'-3"±	17'-6"	4 5/8"	0.1196"						
18'-0"	23'-3"±		5 1/4"							
20'-0"			5"	0.1793"						
25'-0"	22'-7"±	16'-0"	7 5/16"	0.1196"	11"	1"-8NCx2 1/2"	10 1/2"	1"	1 1/4"	23°
30'-0"	23'-0"±	16'-0"	8"		11"	1"-8NCx2 1/2"	10 1/2"	1"	1 1/4"	23°

LUMINAIRE ARM DATA					
M Projected Length	N Rise	Min O D At Pole	Thickness	P Mounting Height 30'-0" Pole	P Mounting Height 35'-0" Pole
6'-0"	2'-0"±	3 1/4"	0.1196"	31'-6"±	36'-6"±
8'-0"	2'-6"±	3 1/2"		32'-0"±	37'-0"±
10'-0"	3'-3"±	3 7/8"		32'-9"±	37'-9"±
12'-0"	4'-3"±			33'-9"±	38'-9"±
15'-0"	4'-9"±	4 1/4"		34'-3"±	39'-3"±

Pole Type	Load Case	Wind Velocity mph	POLE DATA: A Height	Min OD Base	Min OD Top	Thickness	Alternative Section B Length	Alternative Section Bottom	Alternative Section Top	BASE PLATE DATA: C	D1	D2	Thickness	Anchor Bolts Size	Anchor Bolts Bolt Circle	Luminaire Arm	Signal Arm	CIDH PILE FOUNDATION Diameter	Depth	Reinforced
16-1-70	1	70	18'-0"	8"	5 1/2"	0.1196"	None			12"	11 1/2"	11"	1"	1"x 36"x 4"	11"	None	[15] - 20'	2'-6"	5'-0"	No
17-1-70			30'-0"		3 7/8"	0.1793"	10'-0"	5 1/4"	3 7/8"	12"	11 1/2"	11"		1 1/4"x 44"x 4"		6'-15' [12]	15'	3'-6"		
17-1-70																6'-12' [12]	18'			
17-1-70						0.2391"										15'				
17-1-70													1 1/4"			6'-15' [15]	20'			
17A-1-70			35'-0"		4 1/2"		15'-0"		4 1/2"							6'-15' [15]	[15] 18' or 20'			
18-1-70			17'-0"	9 3/8"	7"	0.1793"	None	6 5/8"		16"	15"			1 1/2"x 54"x 6"	15"	None	25' or 30'	2'-6"	6'-0"	Yes
19-1-70			30'-0"		5 1/4"		10'-0"		5 1/4"							6'-15' [12]				
19A-1-70			35'-0"	10 3/4"	5 15/16"		15'-0"	8"	5 15/16"							6'-15 [15]				

☐ Indicates arm length to be used unless otherwise noted on plans

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE I ARM LOADING
WIND VELOCITY=70MPH ARM LENGTHS 15' TO 30'

ES-6J

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013
APPROVED JULY 1, 1984

ES-6J

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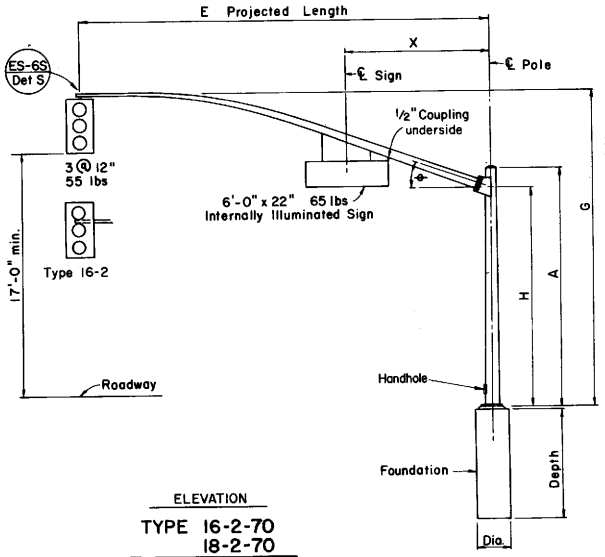
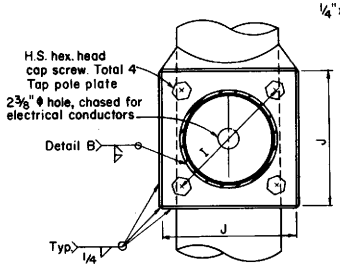
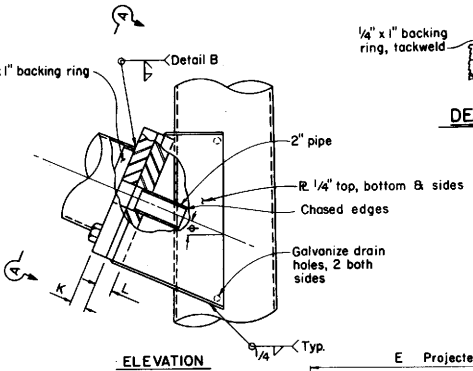


ELEVATION

TYPE 16-2-70
18-2-70

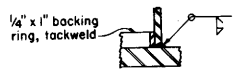


SECTION A-A



ELEVATION

SIGNAL ARM CONNECTION DETAILS



DETAIL B

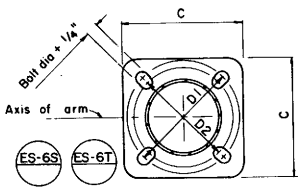
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

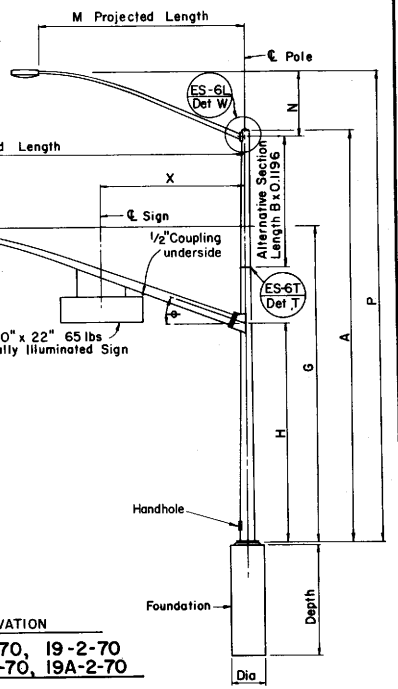
APPROVED JULY 1, 1984

LUMINAIRE ARM DATA					
M Projected Length	N Rise	Min O D At Pole	Thickness	P Mounting Height 30'-0" Pole	P Mounting Height 35'-0" Pole
6'-0"	2'-0"±	3 1/4"	0.1196"	31'-6"±	36'-6"±
8'-0"	2'-6"±	3 1/2"		32'-0"±	37'-0"±
10'-0"	3'-3"±	3 7/8"		32'-9"±	37'-9"±
12'-0"	4'-3"±			33'-9"±	38'-9"±
15'-0"	4'-9"±	4 1/4"		34'-3"±	39'-3"±

SIGNAL ARM DATA											
E Projected Length	G Mounting Height	H	Min O D At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm ℞ Thickness	L Pole ℞ Thickness	ϕ	X Max.
20'-0"	21'-9"±	16'-0"	6 5/8"	0.1196"	11"	1"-8NC x 2 1/2"	10 1/2"	1"	1 1/4"	23°	10'-6"
25'-0"	22'-7"±		7 5/16"								
30'-0"	23'-0"±		8"								



BASE PLATE



ELEVATION

TYPE 17-2-70, 19-2-70
17A-2-70, 19A-2-70

Pole Type	Load Case	Wind Velocity mph	POLE DATA A Height	Min OD Base	Min OD Top	Thickness	Alternative Section B Length	Alternative Section Bottom	Alternative Section Top	BASE PLATE DATA C	D1	D2	Thickness	Anchor Bolts Size	Anchor Bolts Bolt Circle	Luminaire Arm	Signal Arm	CIDH PILE FOUNDATION Diameter	Depth	Reinforced
16-2-70	2	70	17'-0"	9 3/8"	7"	0.1196"	None			16"	15"		1 1/4"	1 1/4" x 44" x 4"	15"	None	20'	3'-6"	5'-0"	No
17-2-70			30'-0"		5 1/4"		10'-0"	6 5/8"	5 1/4"							6'-15' [12]				
17A-2-70			35'-0"	10 3/4"	5 15/16"		15'-0"	8"	5 15/16"							6'-15' [15]				
18-2-70			17'-0"	9 3/8"	7"	0.1793"	None							1 1/2" x 54" x 6"		None	25' or 30'	2'-6"	6'-0"	Yes
19-2-70			30'-0"	10 3/4"	6 5/8"		10'-0"	8"	6 5/8"							6'-15' [12]				
19A-2-70			35'-0"		5 15/16"		15'-0"		5 15/16"							6'-15' [15]				

Camber the pole shaft to compensate for dead load pole deflection.

☐ Indicates arm length to be used unless otherwise noted on plans.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE 2 ARM LOADING
WIND VELOCITY=70MPH ARM LENGTHS 20' TO 30'

ES-6K

ES-6K

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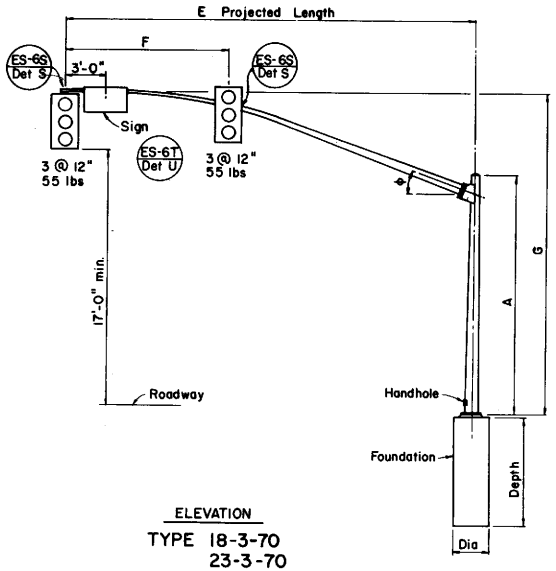
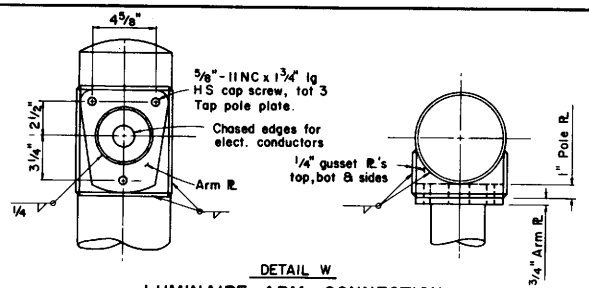


ELEVATION

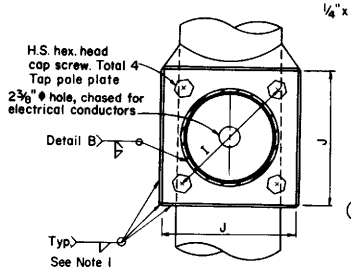
TYPE 18-3-70
23-3-70
27-3-70



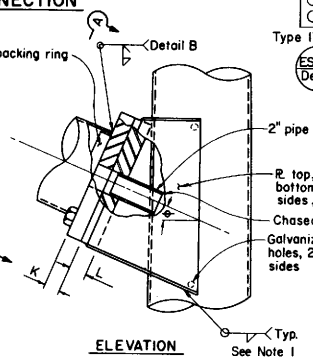
DETAIL W

LUMINAIRE ARM CONNECTION

DETAIL B



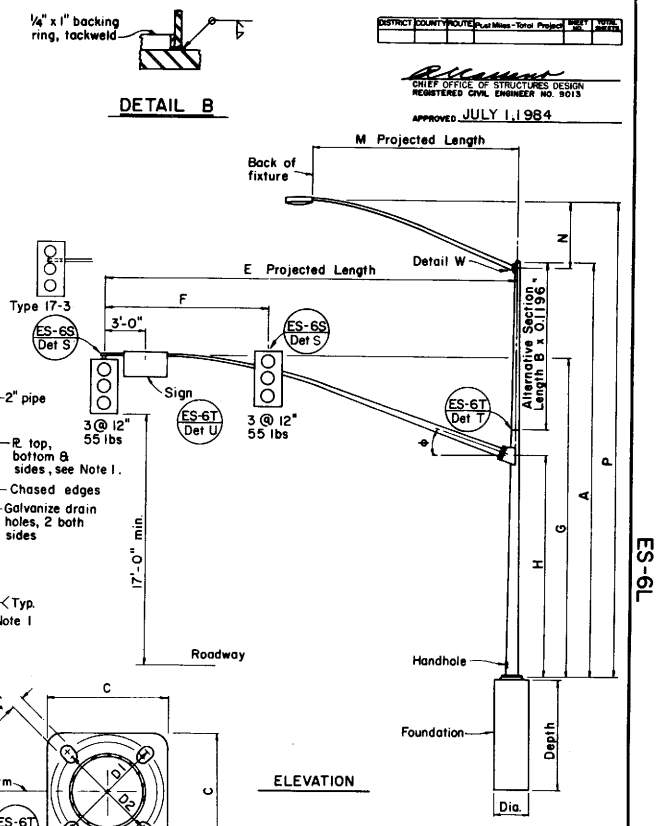
SECTION A-A



ELEVATION

SIGNAL ARM CONNECTION DETAILS

Note:
1. 5/16" plates and welds for 40' & 45' arms
1/4" for arms < 40'

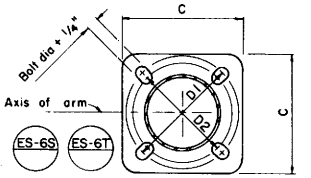


ELEVATION

TYPE 17-3-70, 24A-3-70
19-3-70, 26-3-70
19A-3-70, 26A-3-70
24-3-70

SIGNAL ARM DATA											
E Projected Length	F Min Spacing	G Mounting Height	H	Min O D At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm ℄ Thickness	L Pole ℄ Thickness	ϕ
20'-0"	8'-0"	21'-9" ±	16'-0"	6 5/8"	0.1196"	11"	1"-8NC x 2 1/2"	10 1/2"	1"	1 1/4"	23°
25'-0"	12'-0"	22'-7" ±	16'-0"	7 5/16"	0.1793"						
30'-0"				8"							
35'-0"	14'-0"	23'-0" ±		8 11/16"		13"		13"	1 1/4"	1 1/2"	21°
40'-0"	15'-0"			9 3/8"	0.2391"	13"	1 1/4"-7NC x 3"	13"	1 1/2"	1 3/4"	15°
45'-0"		23'-6" ±		10 1/16"							

LUMINAIRE ARM DATA					
M Projected Length	N Rise	Min O D At Pole	Thickness	P Mounting Height 30'-0" Pole	P Mounting Height 35'-0" Pole
6'-0"	2'-0" ±	3 1/4"	0.1196"	31'-6" ±	36'-6" ±
8'-0"	2'-6" ±	3 1/2"		32'-0" ±	37'-0" ±
10'-0"	3'-3" ±	3 7/8"		32'-9" ±	37'-9" ±
12'-0"	4'-3" ±			33'-9" ±	38'-9" ±
15'-0"	4'-9" ±	4 1/4"		34'-3"	39'-3" ±



BASE PLATE

Pole Type	Load Case	Wind Velocity mph	POLE DATA: A Height	Min OD Base	Min OD Top	Thickness	Alternative Section B Length	Bottom	Top	BASE PLATE DATA: C	D1	D2	Thickness	Anchor Bolts Size	Bolt Circle	Luminaire Arm	Signal Arm	CIDH PILE FOUNDATION Diameter	Depth	Reinforced
17-3-70	3	70	30'-0"	9 3/8"	5 1/4"	0.1793"	10'-0"	8 5/8"	5 1/4"	16"	15"	15"	1 1/4"	1 1/4" x 44" x 4"	15"	6'-15' [12']	20'	2'-6"	7'-0"	Yes
18-3-70			17'-0"	10 3/4"	8 7/16"		None													
19-3-70			30'-0"	11 3/8"	7 1/4"		10'-0"	8 5/8"	7 1/4"	17"	16 1/2"	15"			16 1/2"	None			8'-0"	
19A-3-70			35'-0"		6 5/8"		15'-0"		6 5/8"							6'-15 [12']	25' or [30']			
23-3-70			17'-0"		9"		None									6'-15' [15']				
24-3-70			30'-0"	12"	8"		10'-0"	9 3/8"	8"	18"	17 1/2"	16"	1 1/2"	1 3/4" x 60" x 6"	17 1/2"	None	35'			
24A-3-70			35'-0"		7 5/16"		15'-0"		7 5/16"							6'-15' [12']				
26-3-70			30'-0"		8"		10'-0"		8"			17"				6'-15' [15']				
26A-3-70			35'-0"		7 5/16"	0.2391"	15'-0"		7 5/16"							6'-15' [12']	40' or [45']	3'-6"		
27-3-70			17'-0"		9 3/4"		None									6'-15' [15']				
																None				

Camber the pole shaft to compensate for dead load pole deflection.

☐ Indicates arm length to be used unless otherwise noted on plans.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE 3 ARM LOADING
WIND VELOCITY=70MPH ARM LENGTHS 20' TO 45'

ES-6L

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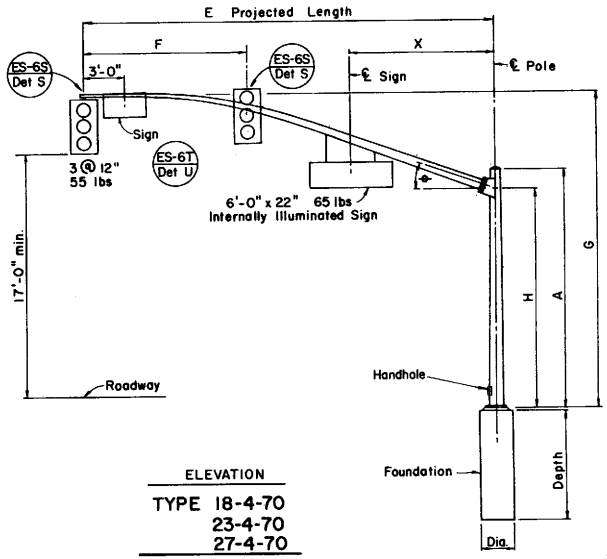
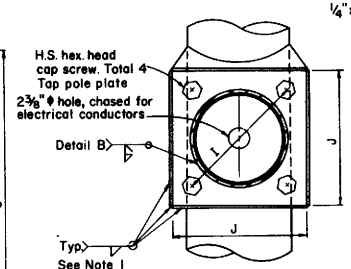
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013
DATE July 1, 1984

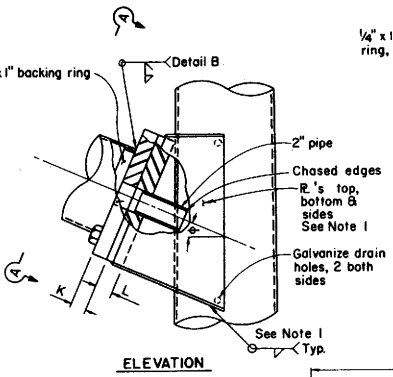


ELEVATION

TYPE 18-4-70
23-4-70
27-4-70

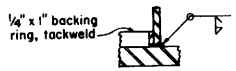


SECTION A-A



ELEVATION

SIGNAL ARM CONNECTION DETAILS

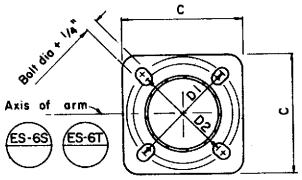


DETAIL B

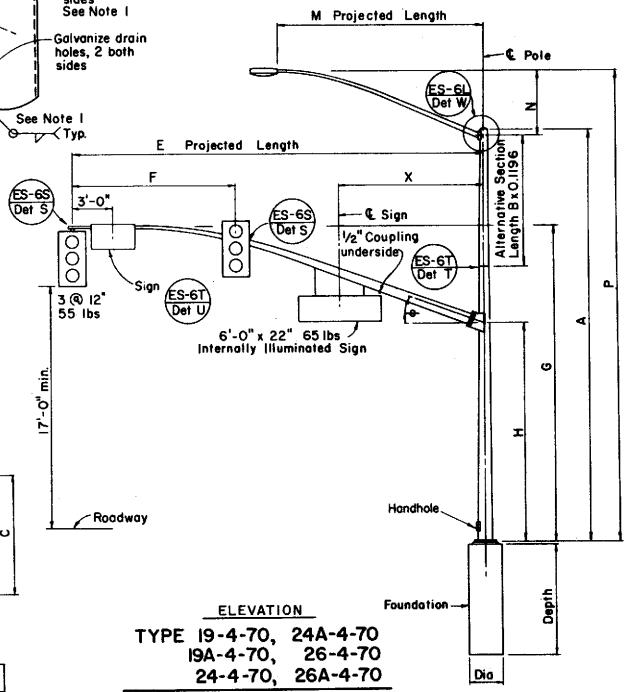
LUMINAIRE ARM DATA					
M Projected Length	N Rise	Min O D At Pole	Thickness	P Mounting Height 30'-0" Pole	P Mounting Height 35'-0" Pole
6' - 0"	2'-0"±	3 1/4"	0.1196"	31'-6" ±	36'-6" ±
8' - 0"	2'-6"±	3 1/2"		32'-0" ±	37'-0" ±
10' - 0"	3'-3"±	3 7/8"		32'-9" ±	37'-9" ±
12' - 0"	4'-3"±			33'-9" ±	38'-9" ±
15' - 0"	4'-9"±	4 1/4"		34'-3" ±	39'-3" ±

NOTE
1. 5/16" plates and welds for 40' & 45' arms. 1/4" for arms <40'

SIGNAL ARM DATA												
E Projected Length	F Min. Spacing	G Mounting Height	H	Min O D At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm R. Thickness	L Pole R. Thickness	ϕ	X Max
25'-0"	10'-0"	22'-7"±	16'-0"	7 5/16"	0.1793"	11"	1"-8NCx2 1/2"	10 1/2"	1"	1 1/4"	23°	10'-6"
30'-0"	12'-0"			8"								
35'-0"	14'-0"	23'-0"±		8 11/16"		13"		13"	1 1/4"	1 1/2"	21°	
40'-0"	15'-0"			9 3/8"	0.2391"	13"	1 1/4"-7NCx3"	13"	1 1/2"	1 3/4"	15°	13'-0"
45'-0"		23'-6"±		10 1/16"								



BASE PLATE



ELEVATION

TYPE 19-4-70, 24A-4-70
19A-4-70, 26-4-70
24-4-70, 26A-4-70

Pole Type	Load Case	Wind Velocity mph	POLE DATA A Height	Min OD Base	Min OD Top	Thickness	Alternative Section B Length	Alternative Section Bottom	Alternative Section Top	BASE PLATE DATA C	D1	D2	Thickness	Anchor Bolts Size	Anchor Bolts Bolt Circle	Luminaire Arm	Signal Arm	CIDH PILE FOUNDATION Diameter	Depth	Reinforced
18-4-70	4	70	17'-0"	10 3/4"	8 7/16"	0.1793"	None			17"	16 1/2"	15"	1 1/4"	1 3/4"x60"x6"	15"	None	25' or 30	2'-6"	8'-0"	Yes
19-4-70			30'-0"		6 5/8"	0.2391"	10'-0"	8"	6 5						16 1/2"	6'-15' 12				
19A-4-70			35'-0"		5 15/16"		15'-0"		5 15/16"							6'-12' 15				
23-4-70			17'-0"	11 3/8"	9"	0.1793"	None			18"	17 1/2"	16"	1 1/2"		17 1/2"	None	35'			
24-4-70			30'-0"	12 1/2"	8 1/4"		10'-0"	9 11/16"	8 1/4"							6'-15' 12				
24A-4-70			35'-0"		7 9/16"		15'-0"		7 9/16"							6'-15' 15				
26-4-70			30'-0"	12"	8"	0.2391"	10'-0"	9 3/8"	8"			17"				6'-15' 12	40' or 45	3'-6"		
26A-4-70			35'-0"	12 1/2"	7 9/16"		15'-0"	9 11/16"	7 9/16"							6'-15' 15				
27-4-70			17'-0"	12"	9 3/4"		None									None				

Camber the pole shaft to compensate for dead load pole deflection.

☐ Indicates arm length to be used unless otherwise noted on plans.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE 4 ARM LOADING
WIND VELOCITY=70MPH ARM LENGTHS 25' TO 45'

ES-6M

ES-6M

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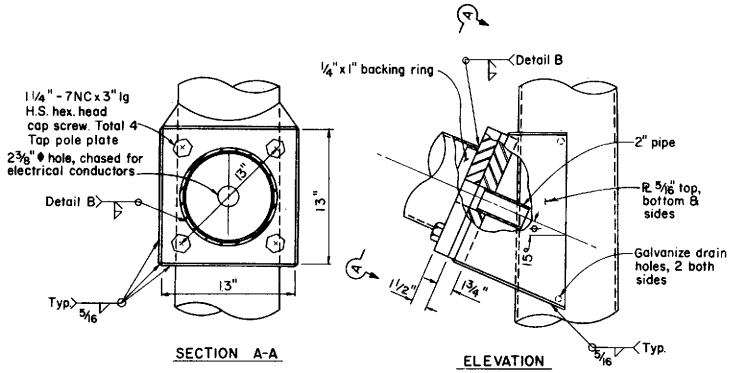
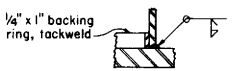
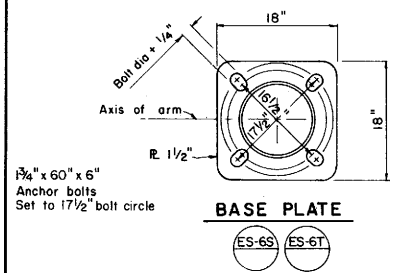


SIGNAL ARM CONNECTION DETAILS

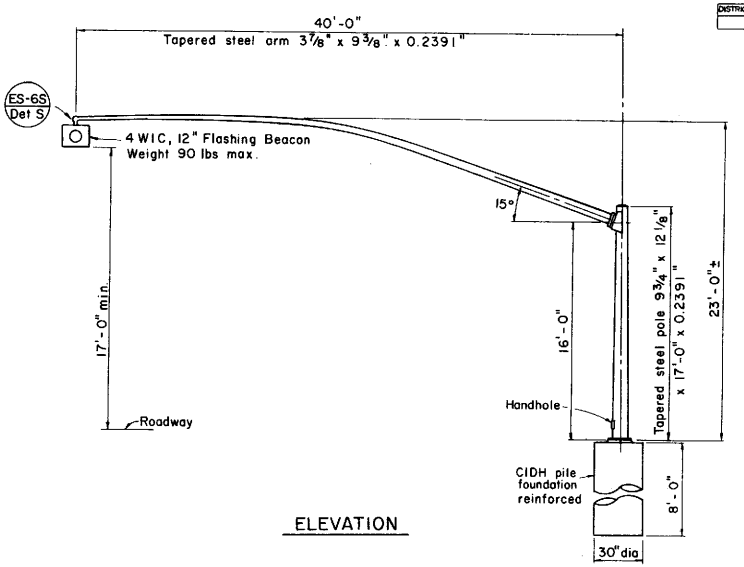


DETAIL B



BASE PLATE

ES-6S ES-6T



ELEVATION

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED JULY 1, 1984

NOTE
For details not shown see "Traffic Signal and Lighting Standards, ES 6S & ES 6T.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
TYPE 40-0-80

ES-6N

ES-6N

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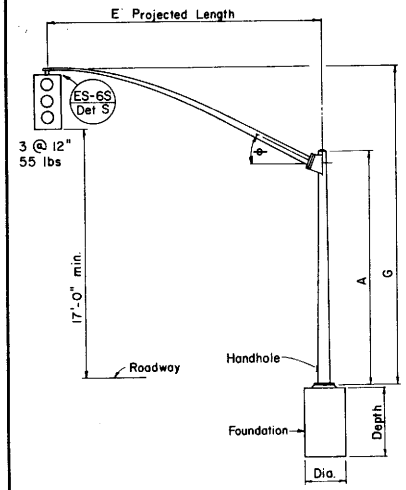
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

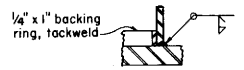
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED JULY 1, 1984

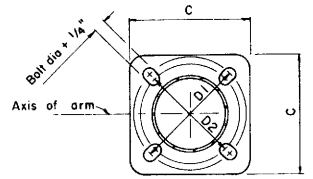


ELEVATION

TYPE 18-1-80

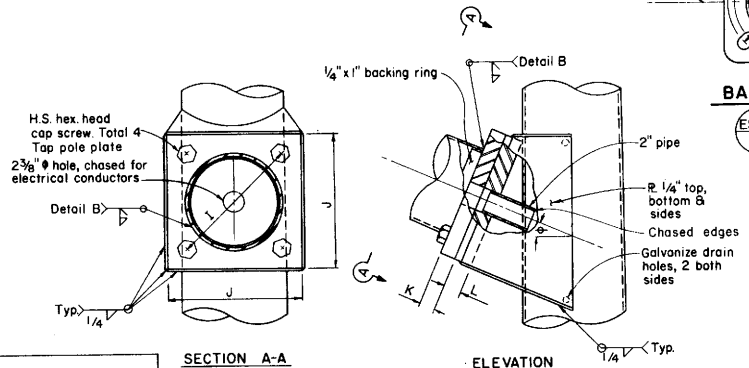


DETAIL B



BASE PLATE

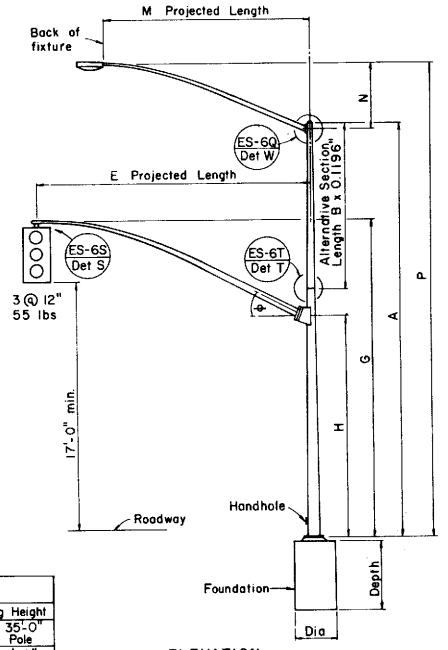
ES-6S ES-6T



SECTION A-A

ELEVATION

SIGNAL ARM CONNECTION DETAILS



ELEVATION

TYPE 19-1-80, 19A-1-80

SIGNAL ARM DATA										
E Projected Length	G Mounting Height	H	Min O D At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm PL Thickness	L Pole PL Thickness	ϕ
25'-0"	22'-7"±	16'-0"	7 5/16"	0.1196"	11"	1"-8NC-2 1/2"	10 1/2"	1"	1 1/4"	23°
30'-0"	23'-0"±		8"							

LUMINAIRE ARM DATA					
M Projected Length	N Rise	Min O D At Pole	Thickness	P Mounting Height 30'-0" Pole	P Mounting Height 35'-0" Pole
6'-0"	2'-0"±	3 1/4"	0.1196"	31'-6"±	36'-6"±
8'-0"	2'-6"±	3 1/2"		32'-0"±	37'-0"±
10'-0"	3'-3"±	3 7/8"		32'-9"±	37'-9"±
12'-0"	4'-3"±			33'-9"±	38'-9"±
15'-0"	4'-9"±	4 1/4"		34'-3"±	39'-3"±

Pole Type	Load Case	Wind Velocity mph	POLE DATA A Height	Min OD Base	Min OD Top	Thickness	Alternative Section B Length	Alternative Section Bottom	Alternative Section Top	BASE PLATE DATA C	D1	D2	Thickness	Anchor Bolts Size	Anchor Bolts Bolt Circle	Luminaire Arm	Signal Arm	CIDH PILE FOUNDATION Diameter	Depth	Reinforced
18-1-80	1	80	17'-0"	9 3/8"	7"	0.1793"	None			16"	15"		1 1/4"	1 1/4" x 44 1/2" x 4"	15"	None	25' or 30'	2'-6"	7'-0"	Yes
19-1-80			30'-0"	10 3/4"	6 5/8"		10'-0"	8"	6 5/8"					1 1/2" x 54" x 6"		6'-15' [12]				
19A-1-80			35'-0"		5 15/16"		15'-0"		5 15/16"							6'-12' [15]				

☐ Indicates arm length to be used unless otherwise noted on plans

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE I ARM LOADING
WIND VELOCITY=80MPH ARM LENGTHS 25' TO 30'

ES-60

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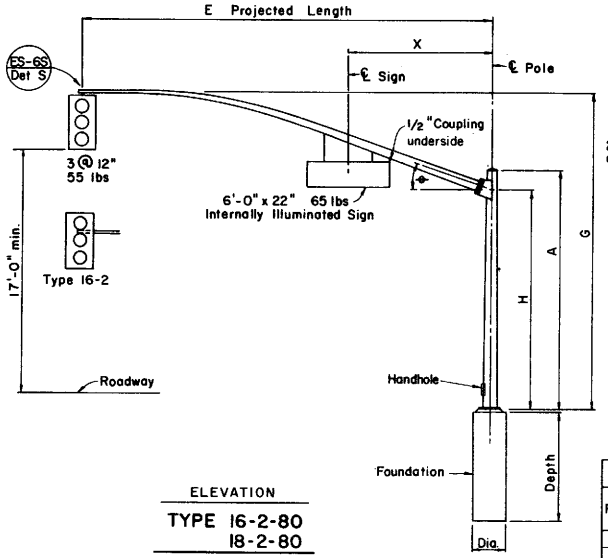
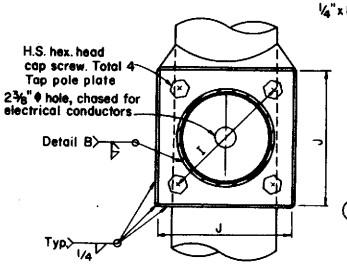
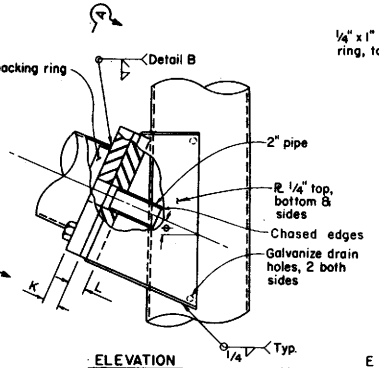


ELEVATION

TYPE 16-2-80
18-2-80

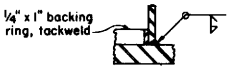


SECTION A-A



ELEVATION

SIGNAL ARM CONNECTION DETAILS

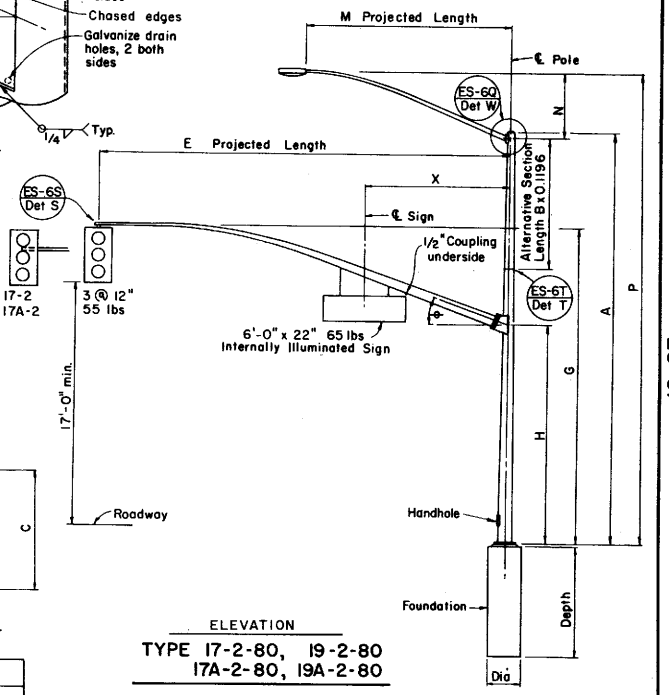


DETAIL B

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 30013

APPROVED JULY 1, 1984

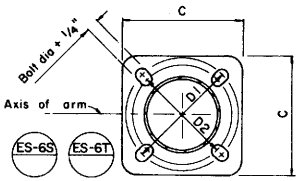


ELEVATION

TYPE 17-2-80, 19-2-80
17A-2-80, 19A-2-80

LUMINAIRE ARM DATA					
M Projected Length	N Rise	Min O D At Pole	Thickness	P Mounting Height 30'-0" Pole	P Mounting Height 35'-0" Pole
6'-0"	2'-0"±	3 1/4"	0.1196"	31'-6"±	36'-6"±
8'-0"	2'-6"±	3 1/2"		32'-0"±	37'-0"±
10'-0"	3'-3"±	3 7/8"		32'-9"±	37'-9"±
12'-0"	4'-3"±			33'-9"±	38'-9"±
15'-0"	4'-9"±	4 1/4"		34'-3"±	39'-3"±

SIGNAL ARM DATA											
E Projected Length	G Mounting Height	H	Min O D At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm ℞ Thickness	L Pole ℞ Thickness	⊖	X Max.
20'-0"	21'-9"±	16'-0"	6 5/8"	0.1793"	11"	1"-8NC x 2 1/2"	10 1/2"	1"	1 1/4"	23°	10'-6"
25'-0"	22'-7"±		7 5/16"								
30'-0"	23'-0"±		8"								



BASE PLATE

Pole Type	Load Case	Wind Velocity mph	POLE DATA A Height	Min OD Base	Min OD Top	Thickness	Alternative Section B Length	Alternative Section Bottom	Alternative Section Top	BASE PLATE DATA C	D1	D2	Thickness	Anchor Bolts Size	Anchor Bolts Bolt Circle	Luminaire Arm	Signal Arm	CIDH PILE FOUNDATION Diameter	Depth	Reinforced
16-2-80	2	80	17'-0"	9 3/8"	6 13/16"	0.1793"	None	8"	6 5/8"	16"	15"		1 1/4"	1 1/4" x 44" x 4"	15"	None	20'	3'-6"	5'-0"	No
17-2-80			30'-0"	10 3/4"	6 5/8"		10'-0"									6'-15' [12']		2'-6"	7'-0"	Yes
17A-2-80			35'-0"		5 15/16"		15'-0"		5 15/16"					1 1/2" x 54" x 6"		6'-15' [15']				
18-2-80			17'-0"		8 7/16"		None									None	25' or 30'			
19-2-80			30'-0"		6 5/8"		10'-0"	8"	6 5/8"							6'-15' [12']				
19A-2-80			35'-0"		5 15/16"	0.2391"	15'-0"		5 15/16"	17"	16 1/2"	15"		1 3/4" x 60" x 6"		6'-15' [15']				

Camber the pole shaft to compensate for dead load pole deflection.

☐ Indicates arm length to be used unless otherwise noted on plans.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE 2 ARM LOADING
WIND VELOCITY=80MPH ARM LENGTHS 20' TO 30'

ES-6P

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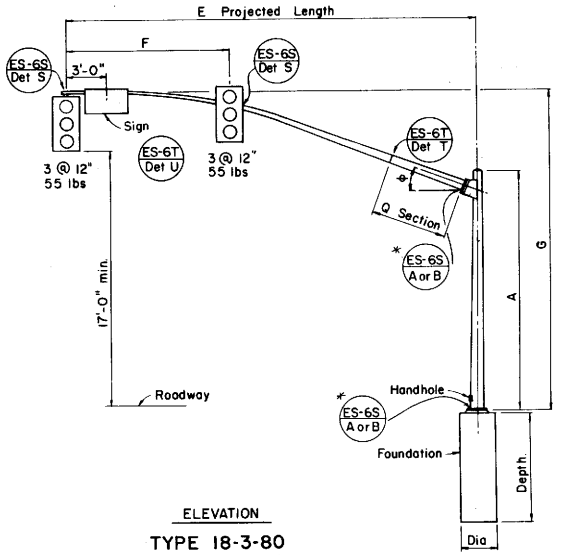
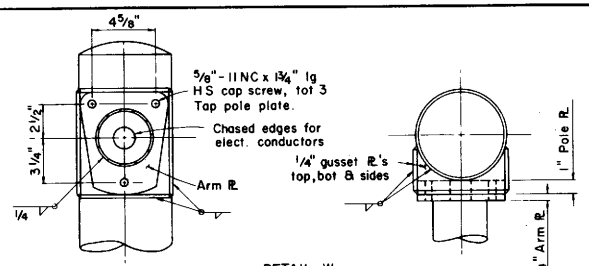


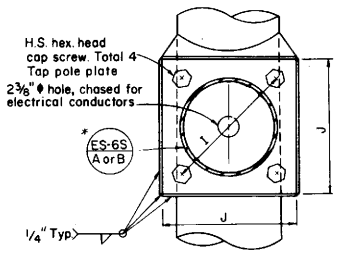
ELEVATION

TYPE 18-3-80
23-3-80
27-3-80

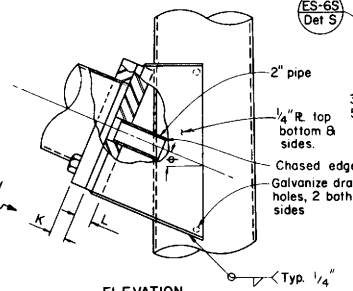


DETAIL W

LUMINAIRE ARM CONNECTION



SECTION A-A



ELEVATION

SIGNAL ARM CONNECTION DETAILS

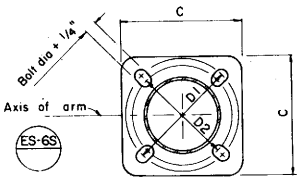
Note:

1. 0.2391" thick, 48 ksi yield steel may be substituted for 0.3125" thick, 40 ksi yield steel if Detail A with fatigue resistant weld is used. See Note 8 on Sheet ES-6S.

SIGNAL ARM DATA													
E Projected Length	F Min Spacing	G Mounting Height	H	Min O D At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm ℞ Thickness	L Pole ℞ Thickness	θ	Q Section Length	Q Section Thickness
20'-0"	8'-0"	21'-9" ±	16'-0"	6 5/8"	0.1793"	11"	1"-8NC-2 1/2"	10 1/2"	1"	1 1/4"	23°		
25'-0"	12'-0"	22'-7" ±		7 5/16"	0.2391"								
30'-0"		23'-0" ±		8"		13"		13"	1 1/4"	1 1/2"	21°		
35'-0"	14'-0"			8 11/16"									
40'-0"	15'-0"			9 3/8"	0.2391"	13"	1 1/4"-7NC-3"	13"	1 1/2"	1 3/4"	15°	10'-0"	*0.3125"
45'-0"		23'-6" ±		10 1/16" x 30'-0"								15'-0"	

*See Note 1

LUMINAIRE ARM DATA					
M Projected Length	N Rise	Min O D At Pole	Thickness	P Mounting Height 30'-0" Pole	P Mounting Height 35'-0" Pole
6'-0"	2'-0" ±	3 1/4"	0.1196"	31'-6" ±	36'-6" ±
8'-0"	2'-6" ±	3 1/2"		32'-0" ±	37'-0" ±
10'-0"	3'-3" ±	3 7/8"		32'-9" ±	37'-9" ±
12'-0"	4'-3" ±			33'-9" ±	38'-9" ±
15'-0"	4'-9" ±	4 1/4"		34'-3" ±	39'-3" ±



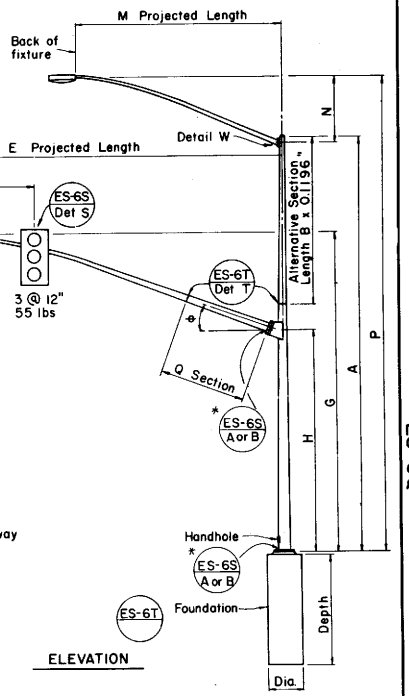
BASE PLATE

Pole Type	Load Case	Wind Velocity mph	POLE DATA A Height	Min OD Base	Min OD Top	Thickness	Alternative Section B Length	Alternative Section Bottom	Alternative Section Top	BASE PLATE DATA C	D1	D2	Thickness	Anchor Bolts Size	Anchor Bolts Bolt Circle	Luminaire Arm	Signal Arm	CIDH PILE FOUNDATION Diameter	Depth	Reinforced
17-3-80	3	80	30'-0"	10 3/4"	6 5/8"	0.1793"	10'-0"	8"	6 5/8"	16"	15"	15"	1 1/4"	1 1/2" x 54" x 6"	15"	6'-15' [12']	20'	2'-6"	7'-0"	Yes
18-3-80			17'-0"		8 7/16"	0.2391"	None													
19-3-80			30'-0"		6 5/8"		10'-0"	8"	6 5/8"	17"	16 1/2"	15"		1 3/4" x 60" x 6"	16 1/2"	None	25' or [30']		8'-0"	
19A-3-80			35'-0"		5 15/16"		15'-0"		5 15/16"							6'-15' [12']				
23-3-80			17'-0"		8 7/16"		None			18"	17 1/2"	16"	1 1/2"		17 1/2"	6'-15' [15']				
24-3-80			30'-0"	11 3/8"	7 1/4"		10'-0"	8 5/8"	7 1/4"							None	35'			
24A-3-80			35'-0"		6 5/8"		15'-0"		6 5/8"							6'-15' [12']				
26-3-80			30'-0"	12 1/8"	8"	*0.3125"	10'-0"	9 3/8"	8"			17"		2" x 66" x 6"		6'-15' [15']	40' or [45']	3'-6"		
26A-3-80			35'-0"		7 5/16"		15'-0"		7 5/16"							None				
27-3-80			17'-0"		9 3/4"		None													

Camber the pole shaft to compensate for dead load pole deflection.

*See Note 1

☐ Indicates arm length to be used unless otherwise noted on plans.



ELEVATION

TYPE 17-3-80, 24A-3-80
19-3-80, 26-3-80
19A-3-80, 26A-3-80
24-3-80

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE 3 ARM LOADING
WIND VELOCITY=80 MPH ARM LENGTHS 20' TO 45'

ES-6Q

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

APPROVED July 1, 1984

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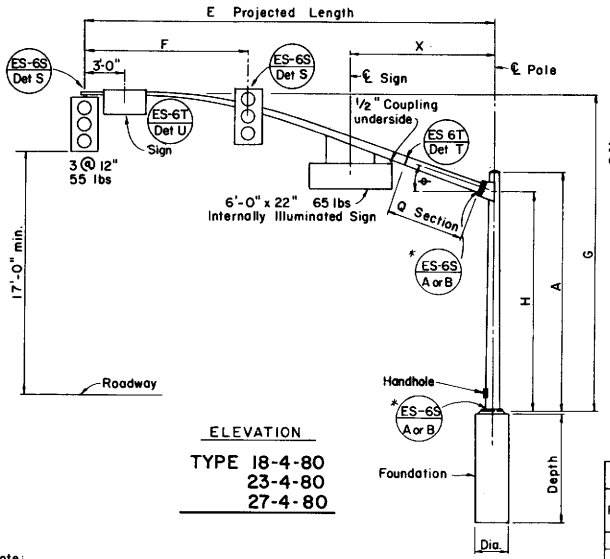
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

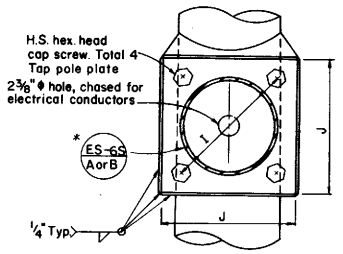
APPROVED July 1, 1984



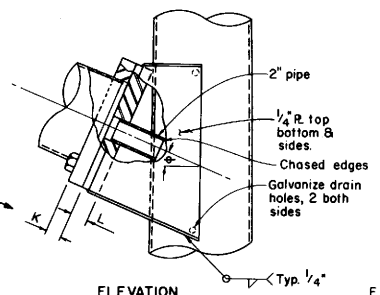
ELEVATION

TYPE 18-4-80
23-4-80
27-4-80

Note:
1. 0.2391" thick, 48 ksi yield steel may be substituted for 0.3125" thick, 40 ksi yield steel if Detail A with fatigue resistant weld is used. See Note 8 on Sheet ES-6S.



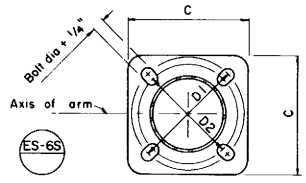
SECTION A-A



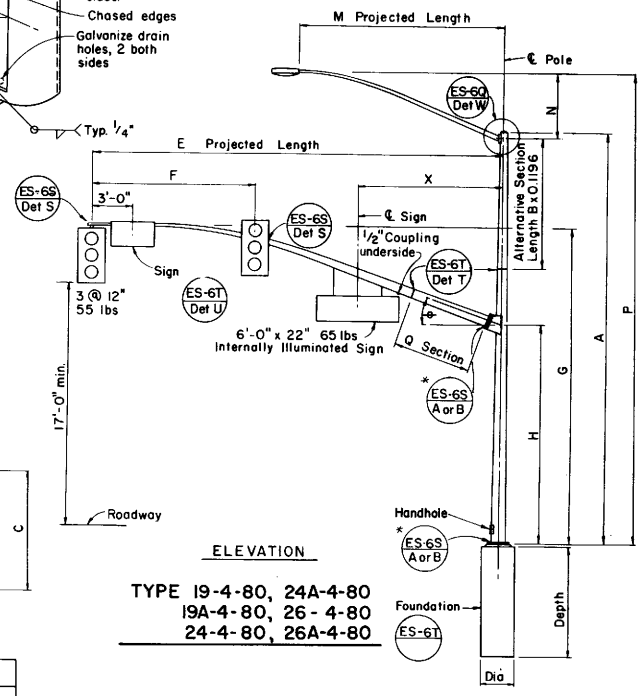
ELEVATION

SIGNAL ARM CONNECTION DETAILS

LUMINAIRE ARM DATA					
M Projected Length	N Rise	Min O D At Pole	Thickness	P Mounting Height 30'-0" Pole	P Mounting Height 35'-0" Pole
6' - 0"	2'-0"±	3 1/4"	0.1196"	31'-6" ±	36'-6" ±
8' - 0"	2'-6"±	3 1/2"		32'-0"±	37'-0"±
10' - 0"	3'-3"±	3 7/8"		32'-9"±	37'-9"±
12' - 0"	4'-3"±			33'-9"±	38'-9"±
15' - 0"	4'-9"±	4 1/4"		34'-3"±	39'-3"±



BASE PLATE



ELEVATION

TYPE 19-4-80, 24A-4-80
19A-4-80, 26-4-80
24-4-80, 26A-4-80

SIGNAL ARM DATA														
E Projected Length	F Min. Spacing	G Mounting Height	H	Min O D At Pole	Thickness	I Bolt Circle	HS Cap Screws	J Plate Size	K Arm ℞ Thickness	L Pole ℞ Thickness	ϕ	Q Section Length	Q Section Thickness	X Max
25'-0"	10'-0"	22'-7"±	16'-0"	7 5/16"	0.2391"	12"	1 1/4"-7NC x 3"	12"	1 1/4"	1 1/2"	23°			10'-6"
30'-0"	12'-0"	23'-0"±		8"		13"		13"			21°			
35'-0"	14'-0"			8 11/16"										
40'-0"	15'-0"			9 3/8"	0.2391" x 30'-0"	13"		13"	1 1/2"	1 3/4"	15°	10'-0"	*0.3125"	13'-0"
45'-0"		23'-6"±		10 1/16"								15'-0"		

*See Note 1

POLE DATA									BASE PLATE DATA									CIDH PILE FOUNDATION		
Pole Type	Load Case	Wind Velocity mph	A Height	Min OD Base	Min OD Top	Thickness	Alternative Section B Length	Alternative Section Bottom	Alternative Section Top	C	D1	D2	Thickness	Anchor Bolts Size	Anchor Bolts Bolt Circle	Luminaire Arm	Signal Arm	Diameter	Depth	Reinforced
18-4-80	4	80	17'-0"	10 3/4"	8 7/16"	0.2391"	None	8 11/16"		17"	16 1/2"	15"	1 1/4"	1 3/4"x60"x 6"	16 1/2"	None	25' or [30']	2'-6"	8'-0"	Yes
19-4-80			30'-0"	11 3/8"	7 5/16"		10'-0"		7 5/16"							6'-15' [12']				
19A-4-80			35'-0"		6 5/8"		15'-0"		6 5/8"							6'-15' [15']				
23-4-80			17'-0"	12"	9"		None	9 3/8"		18"	17 1/2"	16"	1 1/2"		17 1/2"	None	35'			
24-4-80			30'-0"		8"		10'-0"		8"							6'-15' [12']				
24A-4-80			35'-0"		7 5/16"		15'-0"		7 5/16"							6'-15' [15']				
26-4-80			30'-0"	12 1/8"	8"	*0.3125"	10'-0"		8"			17"		2"x66"x 6"		6'-15' [12']	40' or [45']	3'-6"		
26A-4-80			35'-0"		7 5/16"		15'-0"		7 5/16"							6'-15' [15']				
27-4-80			17'-0"		9 3/4"		None									None				

Camber the pole shaft to compensate for dead load pole deflection. *See Note 1

☐ Indicates arm length to be used unless otherwise noted on plans.

STATE OF CALIFORNIA
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TRAFFIC SIGNAL AND LIGHTING STANDARDS
CASE 4 ARM LOADING
WIND VELOCITY=80 MPH ARM LENGTHS 25' TO 45'

ES-6R

ES-6R

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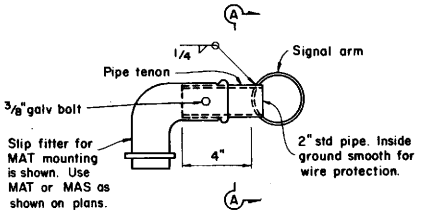
To accompany plans dated _____

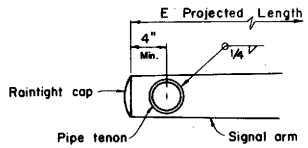
DISTRICT	COUNTY	ROUTE	Post Mile - Total Project	SHEET NO.	TOTAL SHEETS

R. Cumins
CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 8013

APPROVED July 1, 1984

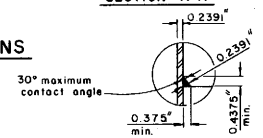


DETAIL S - SIDE TENON

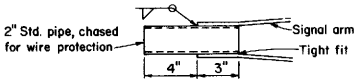


SECTION A-A

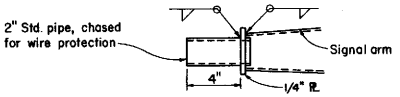
PIPE TENONS



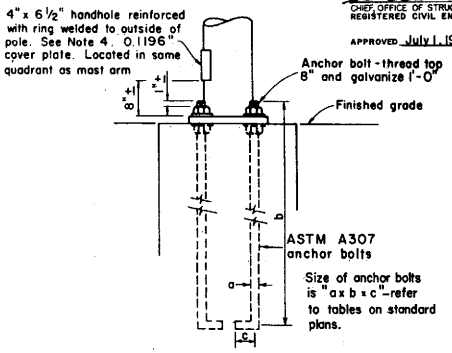
DETAIL F
Fatigue resistant weld



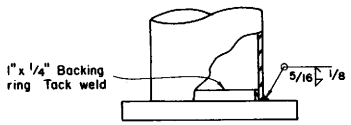
DETAIL TS-TIP TENON



DETAIL TL-TIP TENON
This detail supersedes Detail S when so designated

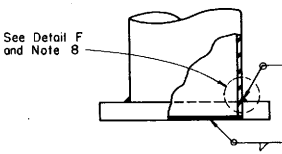


HANDHOLE AND ANCHORAGE DETAILS



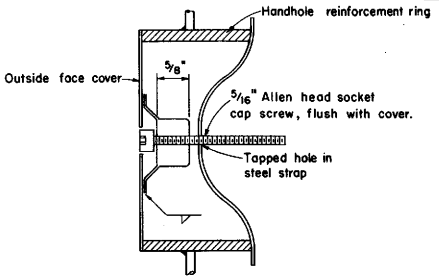
This detail shall be used for 2 ply poles

ELEVATION B



Weld Size	Wall Thickness
1/4"	0.1196"
5/16"	0.1793"
3/8"	0.2391"
7/16"	0.3125"
1/8"	0.1196"
3/16"	0.1797"
1/4"	0.2391"
5/16"	0.3125"

ELEVATION A



TAMPER RESISTANT HANDHOLE COVER

IDENTIFICATION NUMBER

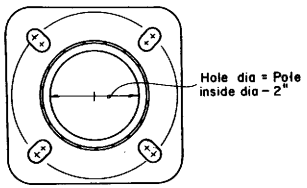
Rivet a stamped metal tag with each pole's identification number to shaft below handhole. 1/4" high number minimum.

Sample Identification Number

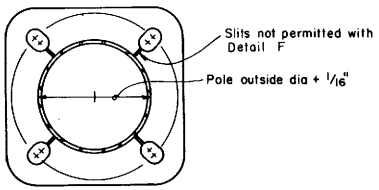
Type - Load Case - Design Wind Velocity - Signal Arm Length - Standard Plan Year - Only for poles with fatigue resistant welds

19A - 3 - 70 - 30 - 77 - F

Use SL for special load case



PLAN
DETAIL B



PLAN
DETAIL A

ALTERNATIVE BASE PLATE DETAILS

NOTES:

1. 4-ASTM A-307 anchor bolts are required for each pole. Provide a hex nut, leveling nut and 2 washers for each bolt.
2. Luminaire arms shall be round, tapered steel tubes, maximum taper 0.14 inches per foot, with an end section 2 3/8" OD for mounting hardware. Extensions of 2" std pipe about 7" long may be used at the option of the manufacturer.
3. Signal arms shall be round, tapered steel tubes, maximum taper 0.14 inches per foot.
4. Handhole reinforcement ring to be 1/4" x 1 1/2" for 0.1196" to 0.2391" poles, 3/8" x 2" for 0.3125".
5. In lieu of the torque requirements for HS bolts, cap screws shall be tightened by the turn-of-nut method 1/3 turn from a snug tight condition. No washer will be required.
6. Camber pole shafts for types 24 & 26 as required to compensate for dead load deflection.
7. Detail A base plate welding details may be used to weld signal arm to signal arm plate if the connection is normal. This does not include a skewed connection such as the luminaire arm connection.
8. Detail A with fatigue resistant weld, Detail F, is required when Contractor elects to substitute 0.2391" thick, 48 ksi yield steel for 0.3125" thick, 40 ksi yield steel in signal arm or pole. See Sheets ES-6Q and ES-6R.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
DETAILS NO 1

ES-6S

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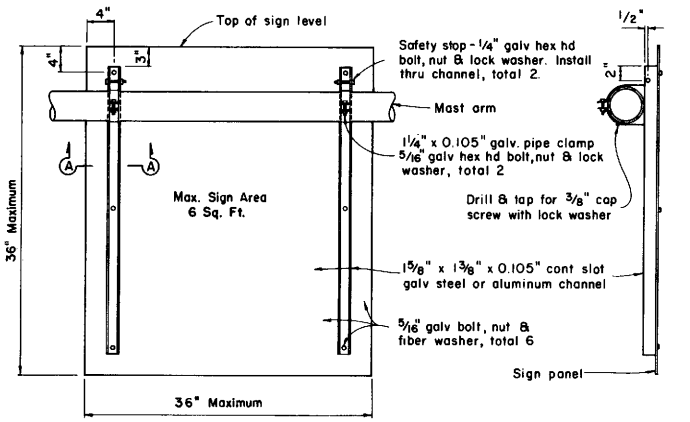
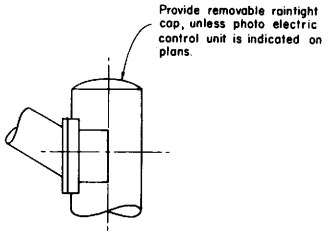
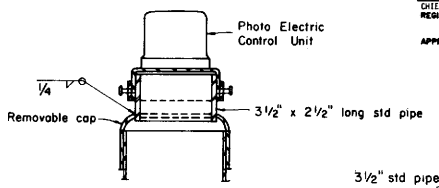


REAR VIEW — DETAIL U — SIDE VIEW

SIGN MOUNTING DETAILS

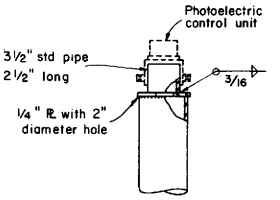


STANDARD TOP

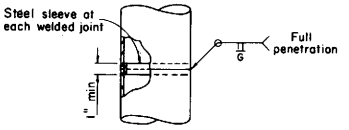


MOUNTING ADAPTER FOR PHOTO ELECTRIC CONTROL UNIT

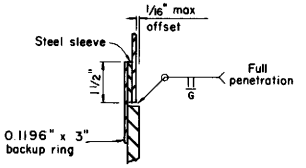
POLE TOP DETAILS



ALTERNATIVE MOUNTING ADAPTER

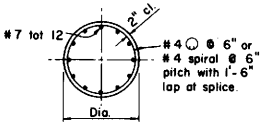


FOR UNIFORM TUBE THICKNESS

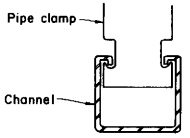


DETAIL T
AT TUBE THICKNESS CHANGE

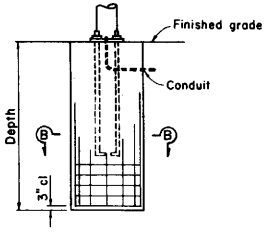
POLE SPLICES



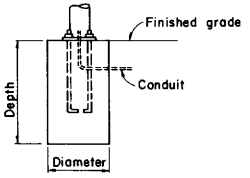
SECTION B-B



SECTION A-A



ELEVATION
REINFORCED PILE



ELEVATION
NON-REINFORCED PILE

CAST-IN-DRILLED HOLE PILE FOUNDATION

Poles To Be Installed On Reused Foundations

Bolt circles and anchor bolt sizes have been revised. The Contractor shall verify dependent dimensions before fabricating poles to be installed on reused foundations.

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

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 8013

APPROVED JULY 1, 1984

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND LIGHTING STANDARDS
DETAILS NO 2

ES-6T

ES-6T

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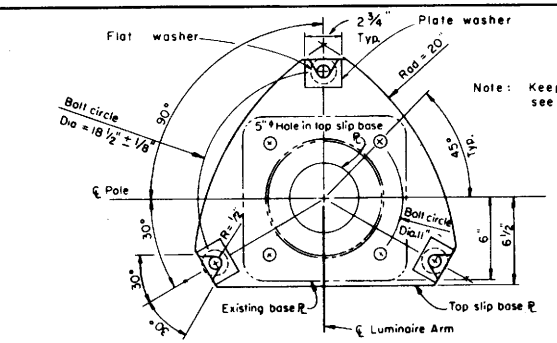
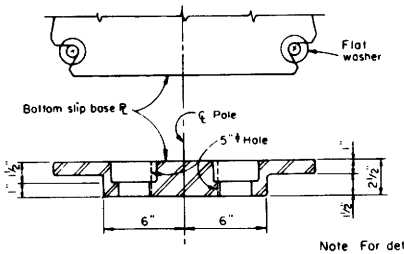


PLAN - TOP PLATES

Note: Keeper ℞ not shown see "Detail D"



SECTION C-C

CAST OPTION

Note For details not shown see "Bottom Base ℞ Details" and "Plan - Bottom Plates".

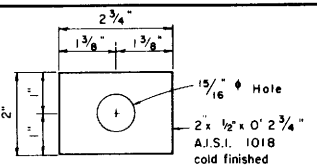
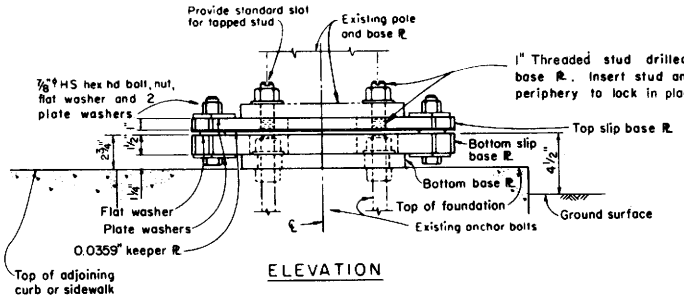


PLATE WASHER

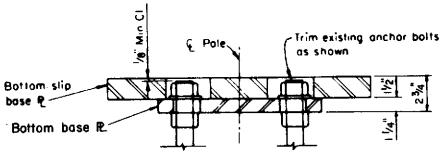
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 8015

APPROVED JULY 1, 1984



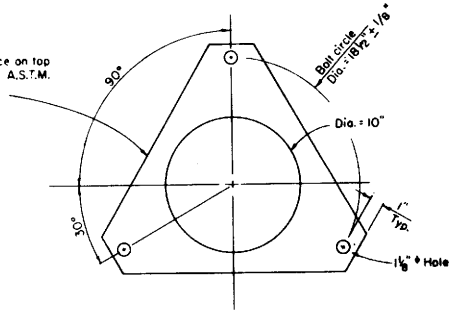
ELEVATION



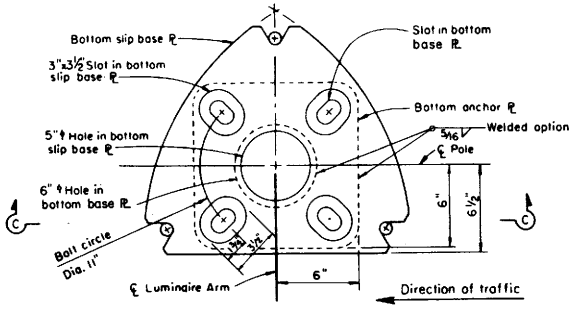
SECTION C-C

WELDED OPTION

0.0359" keeper ℞, place on top of middle flat washer A.S.T.M. A526, G90.



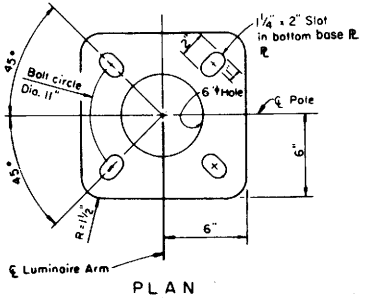
DETAIL D



PLAN - BOTTOM PLATES

Note: For Plate dimensions see "Plan - Top Plates".

SLIP BASE ℞ INSERT DETAILS



PLAN

BOTTOM BASE ℞ DETAILS

NOTES:

1. Torque 7/8" HS slip base bolts to 150 ft-lbs.
2. All new material to be galvanized after fabrication.
3. ℞'s shall conform to A.S.T.M. A-36, except as noted.
4. Cast option shall conform to A.S.T.M. A-27 Grade 70-40.
5. Flat washer shall conform to A.S.T.M. A-325.
6. The 1" threaded studs shall conform to the applicable requirements of A.S.T.M. A307 Grade A bolts.
7. Conduit riser (including bushing) shall protrude no more than 2 1/4" above top of footing.
8. When existing anchor bolts are 7/8"Ø provide an oversize hardened washer of 2 1/4" diameter at each slot hole.

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DEPARTMENT OF TRANSPORTATION

SLIP BASE INSERT FOR TYPE 10 & 15 LIGHTING STANDARDS

ES-6U

ES-6U

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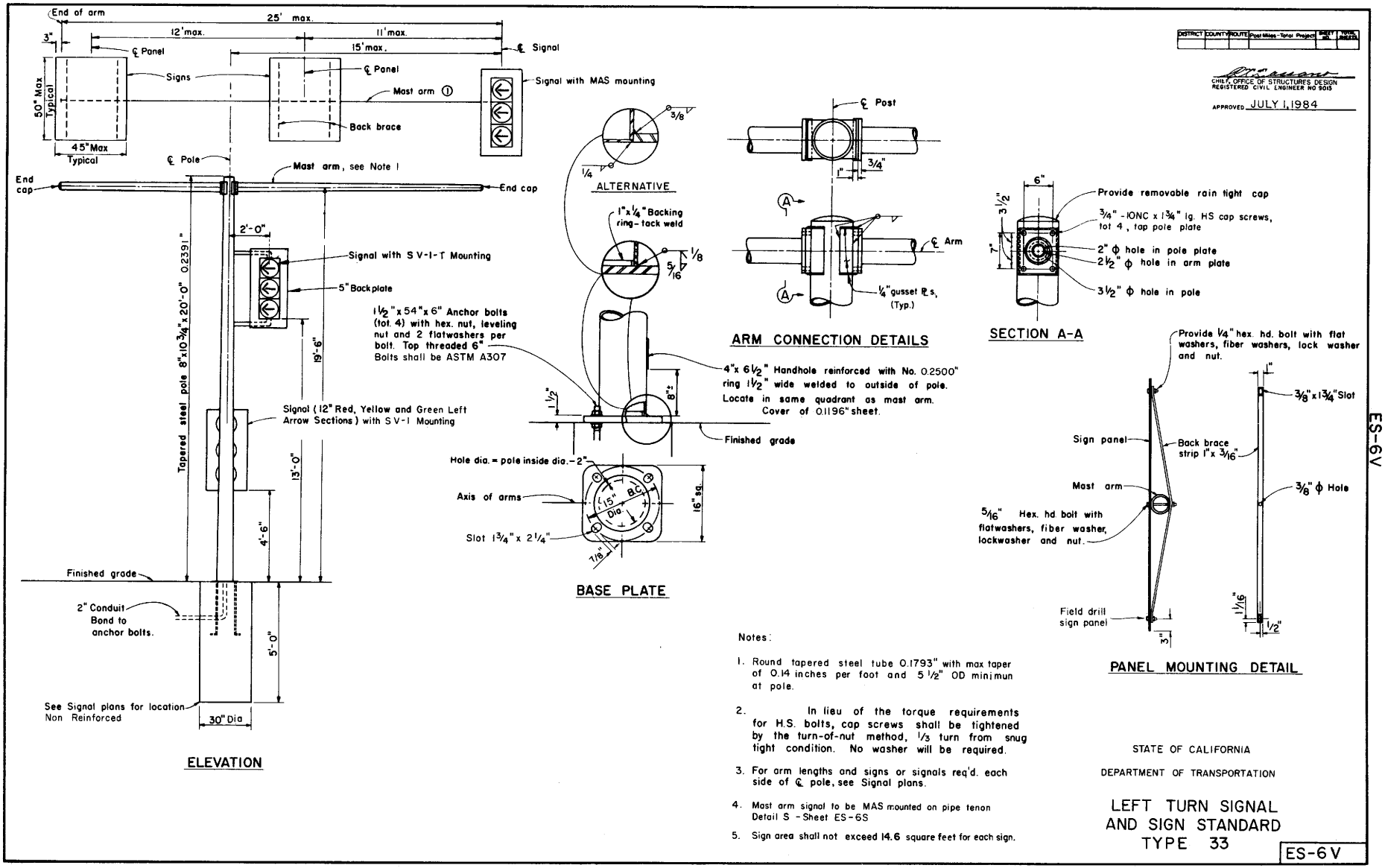

Notes:

1. Round tapered steel tube 0.1793" with max taper of 0.14 inches per foot and 5½" OD minimun at pole.
2. In lieu of the torque requirements for H.S. bolts, cap screws shall be tightened by the turn-of-nut method, ⅓ turn from snug tight condition. No washer will be required.
3. For arm lengths and signs or signals req'd. each side of ℄ pole, see Signal plans.
4. Mast arm signal to be MAS mounted on pipe tenon Detail S - Sheet ES-6S
5. Sign area shall not exceed 14.6 square feet for each sign.

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LEFT TURN SIGNAL AND SIGN STANDARD TYPE 33

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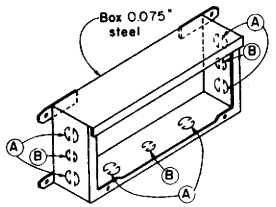
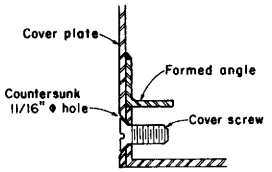
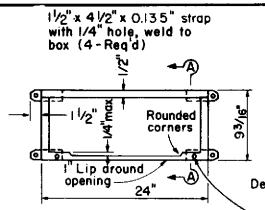
DATE July 1, 1984



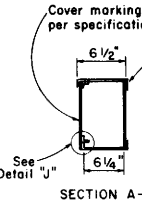


DETAIL J

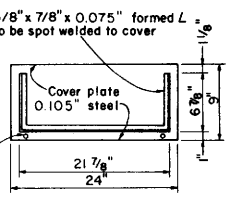


PLAN

3/8" Threaded hole on bottom lip for fastening cover plate Minimum thread length shall be 1/4" (2 Req'd.)



SECTION A-A



COVER DETAIL

Countersink holes to permit seating of stainless steel flathead screw 3/8" x 16 x 3/4" (2 Req'd.)

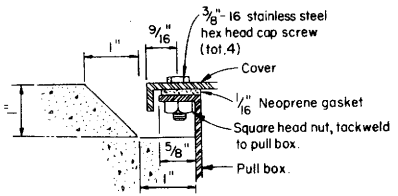
INSTALLATION NOTES:

Box axis shall be parallel to top of railing. Close box during pouring with 1/4" plywood of sufficient size to provide 1:1 chamfer on 3 sides of cover. Upper edge of plywood shall fit against lower edge of raintight hood.

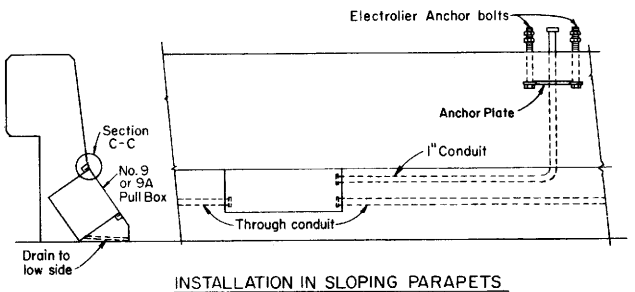
No.9 STRUCTURE PULL BOX

NOTES: No. 9 AND 9 A PULLBOX

1. All corner joints to be lapped and secured by spot welding or riveting.
2. Where cap screws are used to attach cover to box, either of the following methods of providing adequate threading may be used:
   a. Tack weld square nut to bottom of flange (Total 4), or
   b. Tack weld a 1/4" x 5/8" x 8" bar beneath flange (Total 2).
3. Pound knockouts flat after punching.
4. Multiple size knockouts will not be permitted.
5. Pull box covers shall be marked as shown on ES-8.

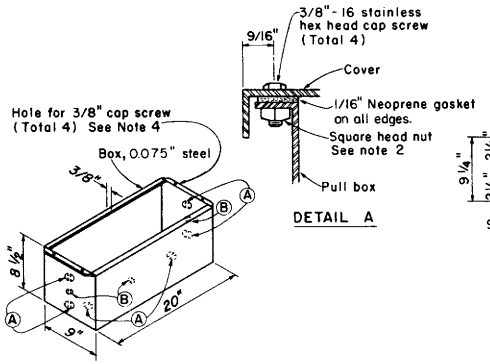


SECTION C-C



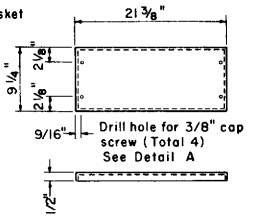
INSTALLATION IN SLOPING PARAPETS

For reinforcement in area of electrolier, see railing sheets. For electrolier anchor bolts, see ES-7B.



DETAIL A

No.9A STRUCTURE PULL BOX



COVER DETAIL

KNOCKOUT SCHEDULE
No.9 AND 9A PULLBOX

Ⓐ 1½" conduit, 2 each end, 2 on bottom.

Ⓑ 1" conduit, 1 each end, 1 on bottom.

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TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

ELECTRICAL DETAILS STRUCTURE INSTALLATIONS

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CHIEF, DIVISION OF TRAFFIC ENGINEERING
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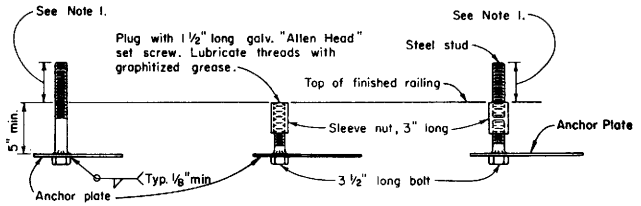
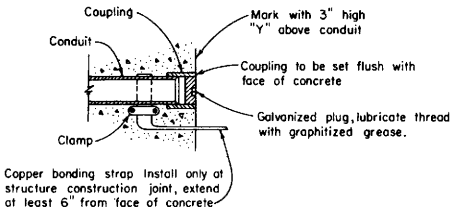


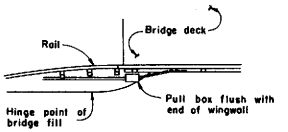
NOTES

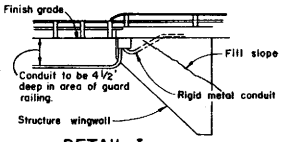
1. Anchor bolt or stud length shall be such that thread extends 1/2" maximum above nut on level base plate after grouting. See Detail "N".
2. Electrolier anchor bolts shall be held in position for pouring by means of anchor plates and suitable templates. Deviation from the true position, vertical and height, shall not exceed 1/16".

DETAIL B
ELECTROLIER ANCHOR BOLTS

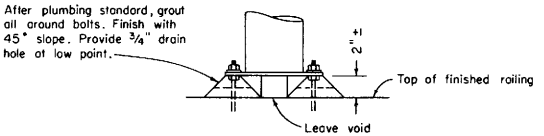


DETAIL C
CONDUIT TERMINATION





DETAIL I
CONDUIT TERMINATION



DETAIL N
GROUTING AT ELECTROLIER

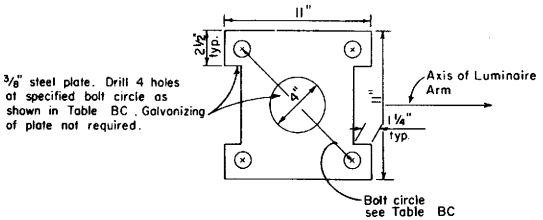


TABLE BC

Type	Bolt Circle	Anchor Bolt Diameter
15	11"	1"
21	12"	1 1/4"

ANCHOR PLATE

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DEPARTMENT OF TRANSPORTATION

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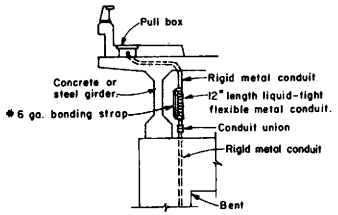
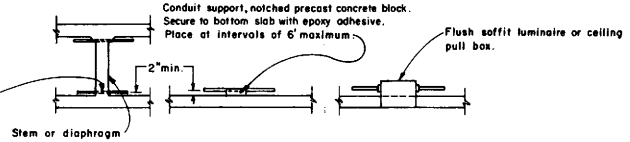
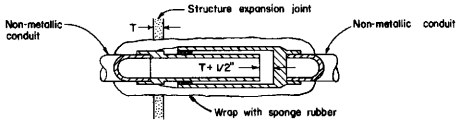


DETAIL R
CONDUIT RISER CONNECTION

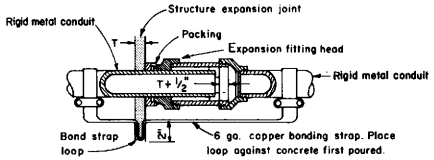
Conduit passing through girder or diaphragm of box girder section shall be either cast into concrete or passed through opening. Opening shall not be drainage opening and shall be only as large as required to install conduit. Conduit shall be run either parallel to or at right angles to girders.



DETAIL S
CONDUIT INSTALLATION WITHIN BOX GIRDER SECTIONS



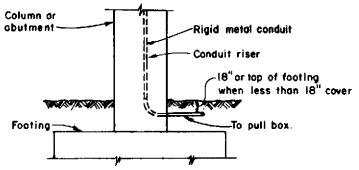
NON-METALLIC CONDUIT INSTALLATION



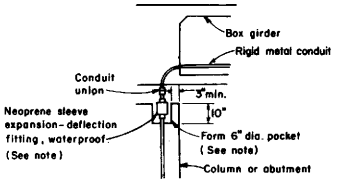
METALLIC CONDUIT INSTALLATION

NOTES:
1. Except for sidewalk joints, a conduit expansion fitting or expansion-deflection fitting shall be installed at each 1/2 inch or greater structure joint, hinge or abutment.
2. Fittings shall be installed parallel to superstructure girders.
3. Where lateral movement greater than 1/4" may occur, a neoprene sleeve expansion-deflection fitting shall be installed straddling the joint.
4. The external bond strap may be omitted when the fitting is provided with an internal bond equivalent to a No. 6 copper bond in metallic conduit or the #8 equipment grounding conductor in non-metallic conduit.

DETAIL X
CONDUIT EXPANSION FITTINGS

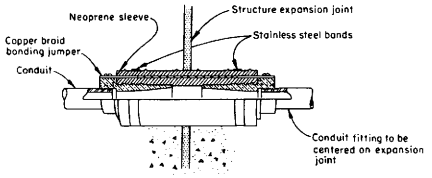


DETAIL T
LOWER END OF CONDUIT RISER AT COLUMN OR ABUTMENT



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.

DETAIL U
CONDUIT RISER CONNECTION AT COLUMN OR ABUTMENT



DETAIL Y
CONDUIT EXPANSION DEFLECTION FITTING

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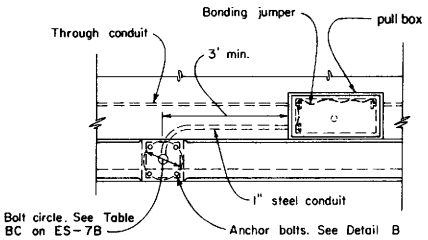
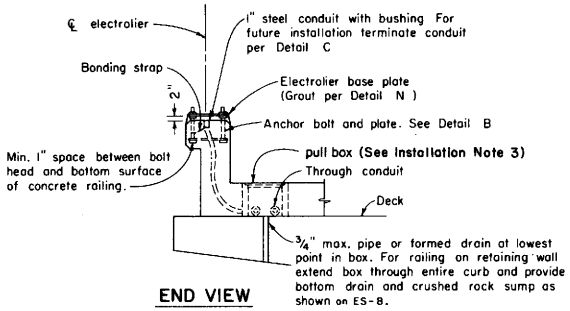


TOP VIEW

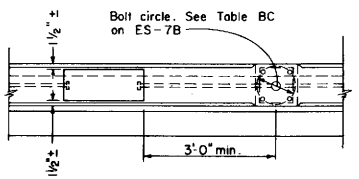


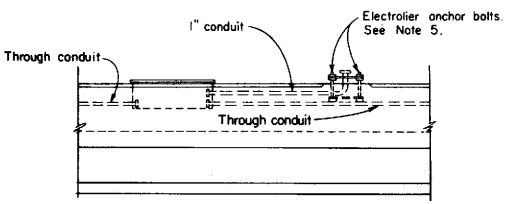
END VIEW

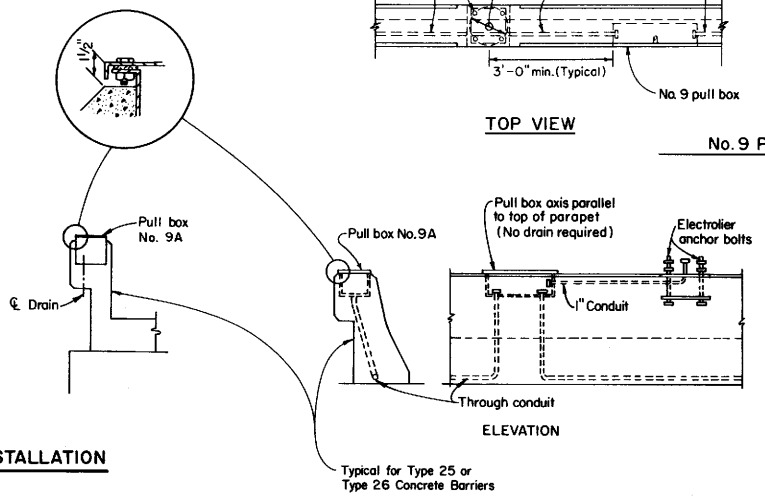
No. 3½, 5 or 6 PULL BOX INSTALLATION

INSTALLATION NOTES

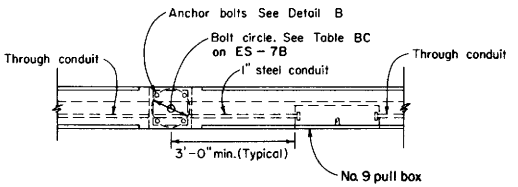
1. Axis of pull box shall be parallel to top of barrier, sidewalk, or railing.
2. Top of cover for boxes in barrier with sidewalk shall be flush.
3. Top of pull boxes in sidewalk areas shall be flush with top of sidewalk. **Modify base of pull box as required.**
4. Boxes in side of vertical barrier or railing shall be closed during pouring of P.C.C. with 1/4" plywood of sufficient size to provide 1:1 chamfer on 3 sides of cover. Upper edge of plywood shall fit against lower edge of raintight hood.
5. See railing sheets for reinforcement and structural details at electroliers and pull boxes.
6. Use drain in center if box is horizontal, or at low end if box is inclined. When box is mounted in sloping parapet drill 1/2 elongated drain hole inside at center or near end as required for drainage.
7. For reinforcing in area of electrolier, see railing sheets. For electrolier anchor bolts, see ES-7B.



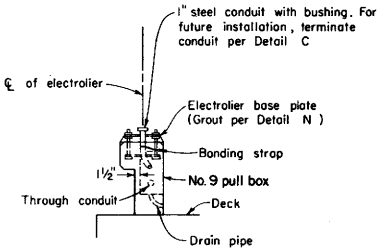




No. 9A PULL BOX INSTALLATION



TOP VIEW



END VIEW

No. 9 PULL BOX INSTALLATION

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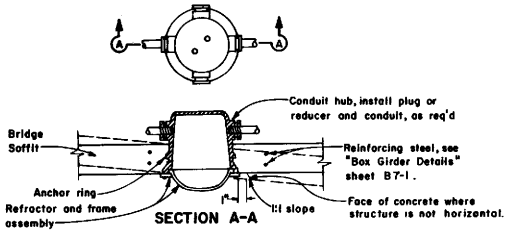
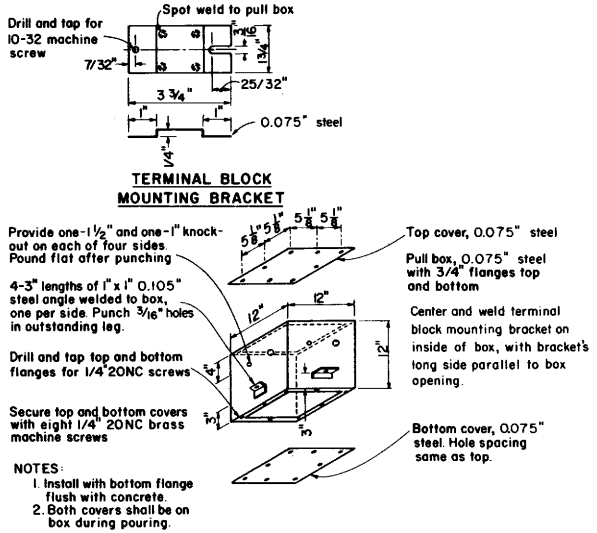


SECTION A-A

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.

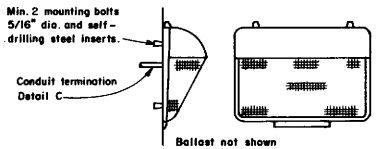
DETAIL F
FLUSH SOFFIT LUMINAIRE INSTALLATION



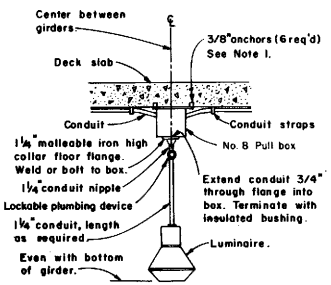
TERMINAL BLOCK MOUNTING BRACKET

NOTES:
1. Install with bottom flange flush with concrete.
2. Both covers shall be on box during pouring.

No. 7 CEILING PULL BOX

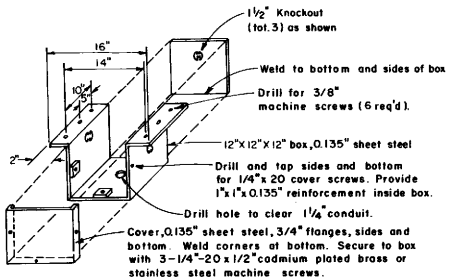


DETAIL W
WALL LUMINAIRE
(Typical)



NOTES:
1. Cast-in-place inserts or expansion anchor.
2. For future installation, omit suspension conduit and luminaire, close flange with galvanized plug.
3. If conduit smaller than the knockout size is used it shall be bonded to the box.

DETAIL P
PENDANT SOFFIT LUMINAIRE INSTALLATION



No. 8 PULL BOX

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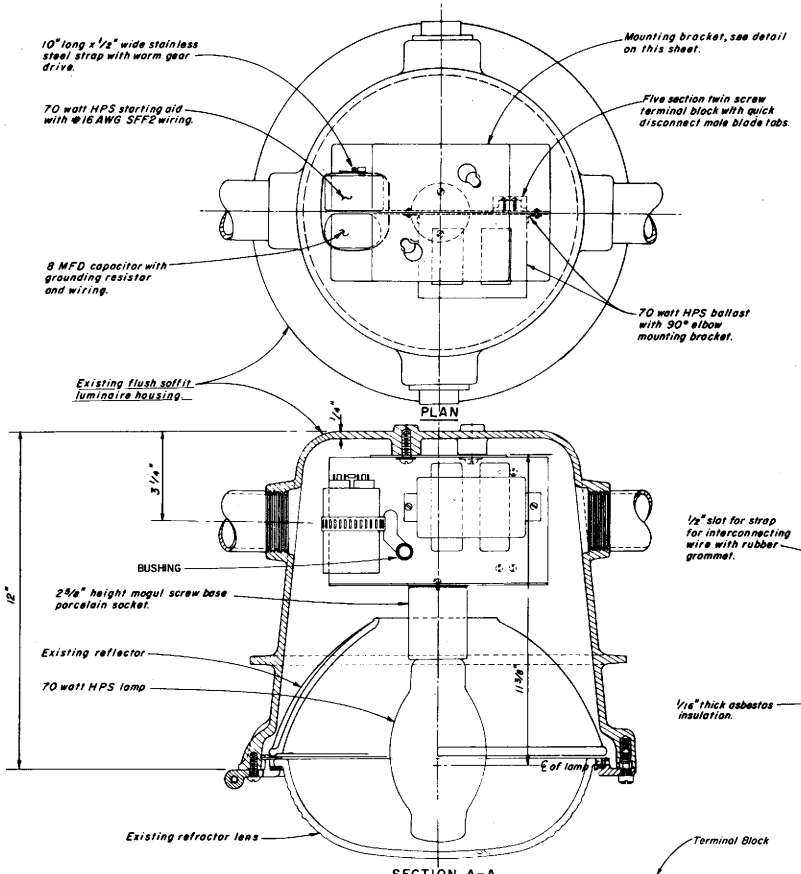
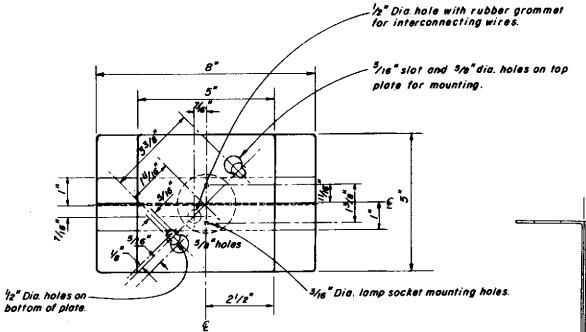
C. O. Bartell
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

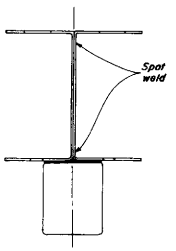
APPROVED JULY 1, 1984



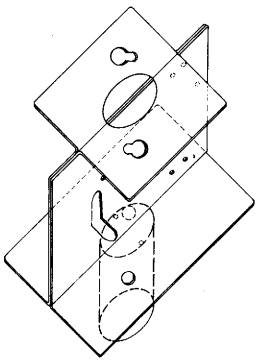
FLUSH SOFFIT LUMINAIRE ASSEMBLY



TOP VIEW

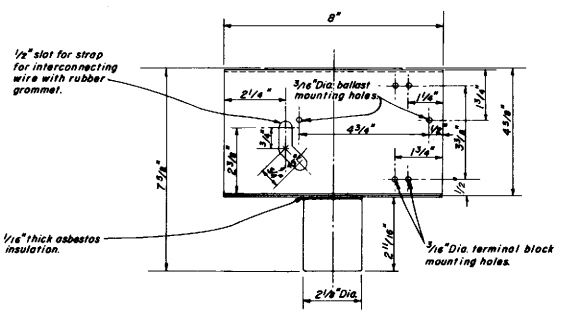


SIDE VIEW

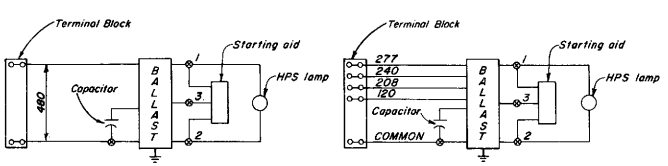


MOUNTING BRACKET DETAILS

Note: Pre-form two sheets 1/16" mild steel as shown, spotweld together in each corner with four spotwelds.



FRONT VIEW



WIRING DIAGRAM

FLUSH SOFFIT LUMINAIRE MODIFICATION

NOTES:

1. All fixture wiring shall be type SFF-2.
2. Use 8-32 machine screws, lockwashers and nuts for mounting ballast and terminal strips.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS

ELECTRICAL DETAILS
STRUCTURE INSTALLATIONS

ES-7F

ES-7F

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

C.D. Bartell
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995
DATE July 1, 1984

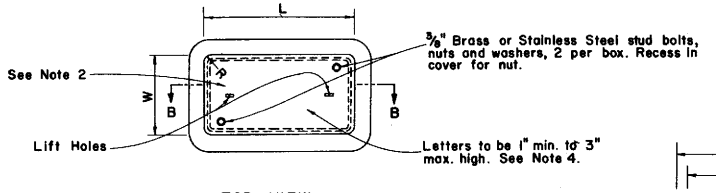
NOTES ON PULL BOXES

1. Use steel cover and special concrete footing, as shown, when box is to be installed where subject to vehicular traffic loads. Steel cover shall have embossed non-skid pattern.
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 placed with its top 0.10 foot above surrounding grade. 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.
4. Pull box covers shall be marked as follows.

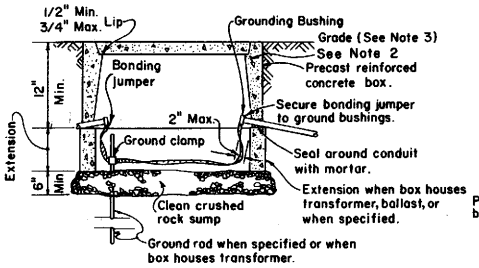
a. No. 3 1/2 pull box
   1) "SIGNAL" Traffic signal circuits with or without street and/or sign lighting circuits.
   2) "ST LIGHTING" Street and/or sign lighting circuits where no voltage is above 600 V.
   3) "SERVICE" Service circuits between service point and service disconnect.
   4) "SPRINKLER-CONTR" Sprinkler control circuits.
   5) "CALTRANS" On all pull boxes, excepting pull boxes marked "SPRINKLER-CONTR"

b. No. 5, 6, 9, or 9A pull boxes
   1) "TRAFFIC SIGNAL" Traffic signal circuits with or without street and/or sign lighting circuits.
   2) "STREET LIGHTING" Street and/or sign lighting circuits where no voltage is above 600 V.
   3) "STREET LIGHTING-HIGH VOLTAGE" Street and/or sign lighting circuits where voltage is above 600V.
   4) "SERVICE" Service circuits between service point and service disconnect.
   5) "SPRINKLER-CONTROL" Sprinkler control circuits.
   6) "RAMP METER" Ramp meter circuits.
   7) "COUNT STATION" Count and/or speed monitor circuits.
   8) "COMMUNICATION" Communication circuits.
   9) "CALTRANS" On all pull boxes, excepting pull boxes marked "SPRINKLER-CONTROL".

5. Bonding jumper for metal covers shall be 36" long, minimum.
6. The nominal dimensions of the opening in which the cover sets shall be the same as the cover dimensions except the length and width dimensions shall be 1/8 inch greater.
7. All covers and boxes shall be interchangeable with California Standard male and female gages. When interchanged with a standard male or female gage, the top surfaces shall be flush within 1/8 inch. Top outside edge of all concrete covers and pull boxes shall have a 1/4" min. radius
8. When pull box is installed in sidewalk area, the depth of the pull box shall be adjusted so that the top of the box is flush with the top of sidewalk.

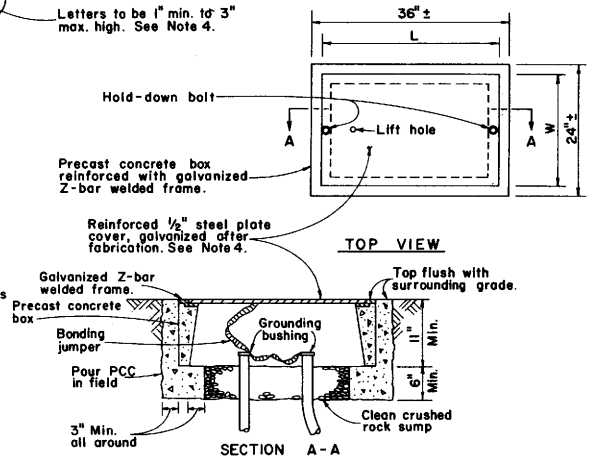


TOP VIEW



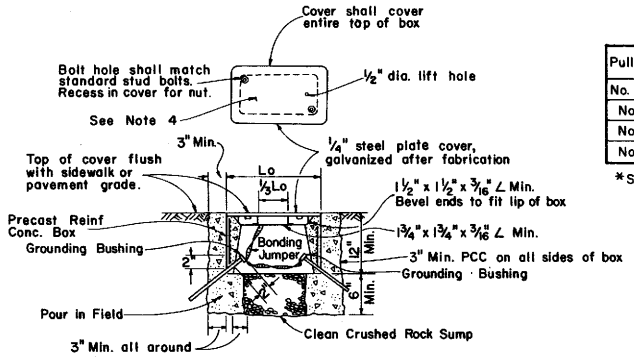
SECTION B-B

INSTALLATION DETAILS



NO. 6T - PULL BOX WITH TRAFFIC COVER

(CONCRETE BOX ONLY)



NO. 3 1/2 & NO. 5 PULL BOX WITH TRAFFIC COVER

(CONCRETE BOX ONLY)

DIMENSION TABLE

Pull Box	CONCRETE BOX Min.** Thickness	CONCRETE BOX Min. Depth Box and Extension	PLASTIC BOX Min.** Thickness	PLASTIC BOX Min. Depth Box and Extension	CONCRETE OR PLASTIC COVERS L***	W***	R	Edge Thickness	Edge Taper
No. 3 1/2	1"	No Extension	5/16"	No Extension	15 3/8"	10 1/8"	1 1/8"	1 3/4"	1/8"
No. 5	1"	22"	5/16"	20"	23 1/4"	13 3/4"	1 1/4"	2"	1/8"
No. 6	1 1/2"	24"	3/8"	20"	30 5/8"	17 5/8"	1 1/4"	2"	1/8"
No. 6T	2"	11"	Does Not Apply		33"±*	20"±*	0"	1/2"*	None

*Steel cover **Excluding conduit web. ***Top dimension.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
PULL BOX DETAILS

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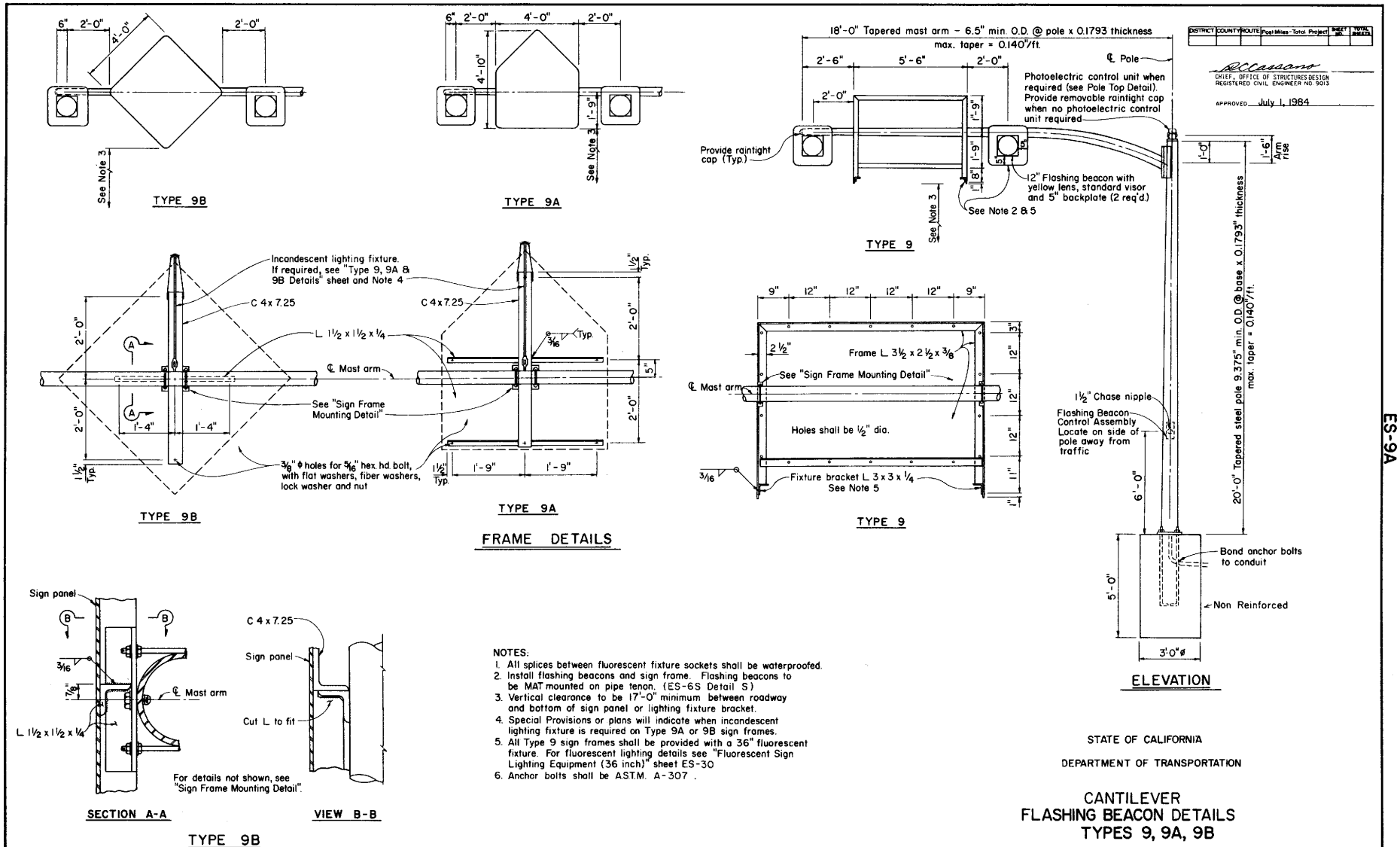

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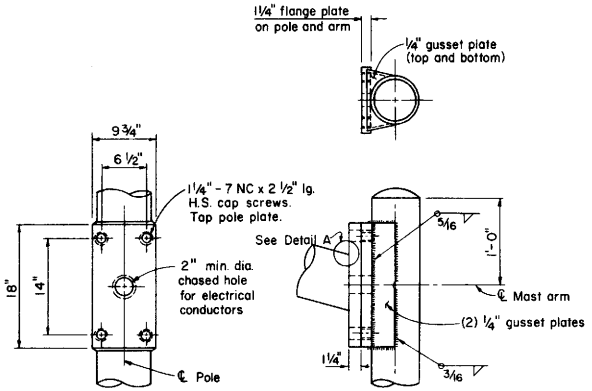
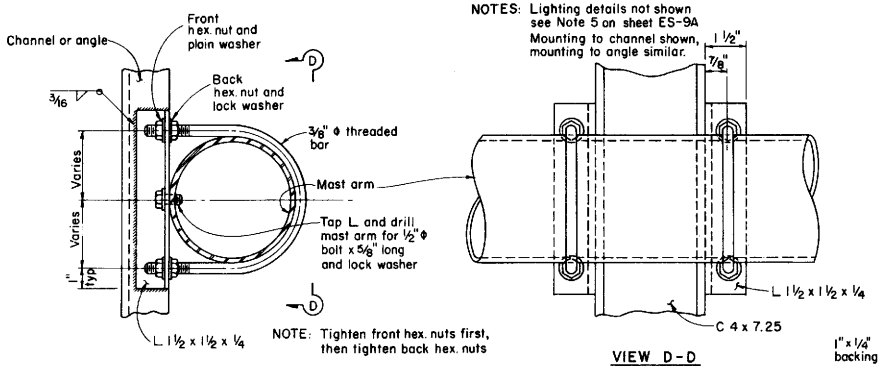
DISTRICT	COUNTY	ROUTE	Post Miles - Total Project	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

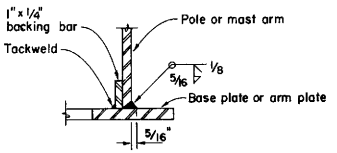
APPROVED July 1, 1984



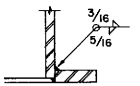
MAST ARM CONNECTION DETAILS



SIGN FRAME MOUNTING DETAILS
ALL TYPES

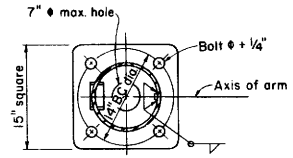


DETAIL A

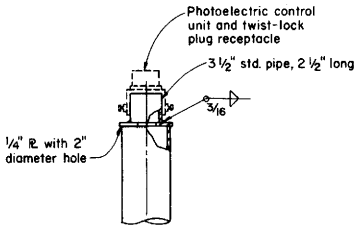


(For Pole-Base Plate only)

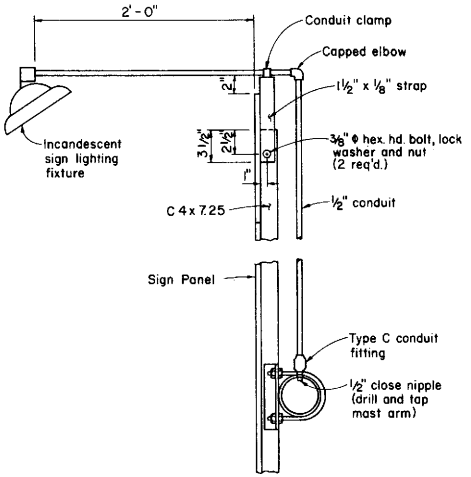
ALTERNATIVE DETAIL A



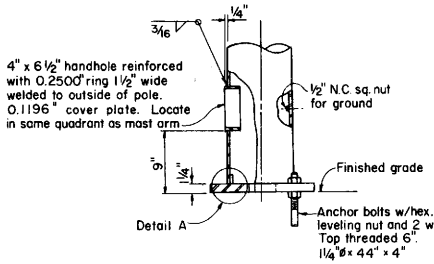
PLAN



POLE TOP DETAIL

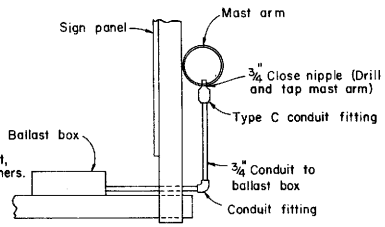


INCANDESCENT LIGHTING FIXTURE
TYPES 9A & 9B
(See Note 4 on sheet ES-9A)



ELEVATION

BASE PLATE AND ANCHORAGE DETAILS



FLUORESCENT LIGHTING FIXTURE
TYPE 9 FRAME

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CANTILEVER
FLASHING BEACON DETAILS
TYPES 9, 9A, 9B

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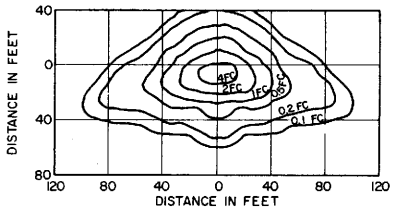
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

C.O. Bentzel
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

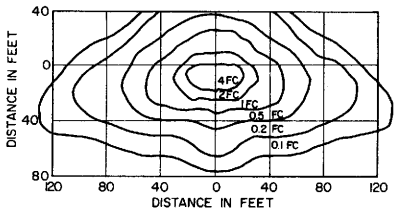
DATE July 1, 1984

ISOFOOTCANDLE CURVE — MINIMUM



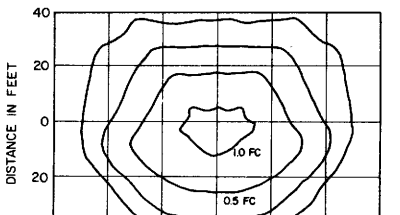
TYPE III MEDIUM SEMI-CUTOFF
Shielded Highway Lighting Luminaire
30' Mounting Height
LAMP OPERATED AT 22,000 LUMENS
200 WATT HIGH PRESSURE SODIUM LAMP ANSI DESIGNATION s66

ISOFOOTCANDLE CURVE — MINIMUM



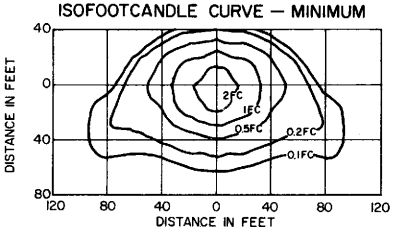
TYPE III MEDIUM SEMI-CUTOFF
Shielded Highway Lighting Luminaire
40' Mounting Height
LAMP OPERATED AT 37,000 LUMENS
310 WATT HIGH PRESSURE SODIUM LAMP
ANSI DESIGNATION s67

ISOFOOTCANDLE CURVE — MINIMUM



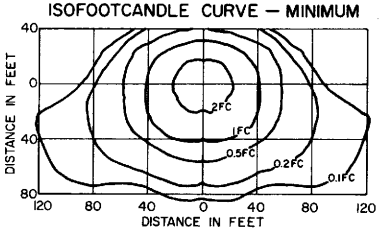
DETAIL "F" SOFFIT LUMINAIRE
17' Mounting Height
LAMP OPERATED AT 5,800 LUMENS
70 WATT HIGH PRESSURE SODIUM LAMP ANSI DESIGNATION s62

ISOFOOTCANDLE CURVE — MINIMUM



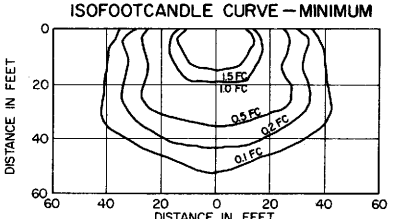
TYPE III MEDIUM CUTOFF
Cutoff Highway Lighting Luminaire
30' Mounting Height
LAMP OPERATED AT 22,000 LUMENS
200 WATT HIGH PRESSURE SODIUM LAMP
ANSI DESIGNATION S66

ISOFOOTCANDLE CURVE — MINIMUM



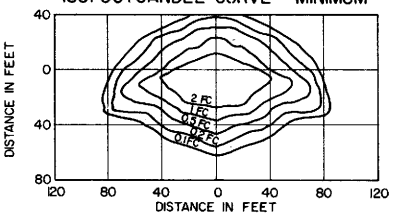
TYPE III MEDIUM CUTOFF
Cutoff Highway Lighting Luminaire
40' Mounting Height
LAMP OPERATED AT 37,000 LUMENS
310 WATT HIGH PRESSURE SODIUM LAMP
ANSI DESIGNATION S67

ISOFOOTCANDLE CURVE — MINIMUM



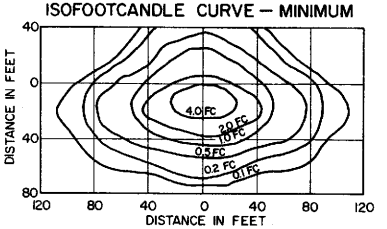
DETAIL "W" WALL LUMINAIRE
15' Mounting Height
LAMP OPERATED AT 9,500 LUMENS
100 WATT HIGH PRESSURE SODIUM LAMP ANSI DESIGNATION s54

ISOFOOTCANDLE CURVE — MINIMUM



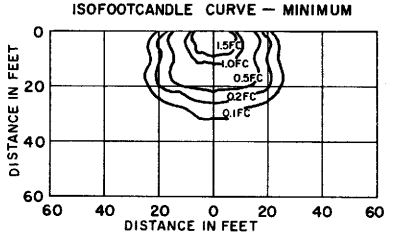
TYPE III MEDIUM SEMI-CUTOFF
Shielded Highway Lighting Luminaire
30' Mounting Height
LAMP OPERATED AT 27,500 LUMENS
250 WATT HIGH PRESSURE SODIUM LAMP ANSI DESIGNATION s50
250 WATT

ISOFOOTCANDLE CURVE — MINIMUM



TYPE III MEDIUM SEMI-CUTOFF
Shielded Highway Lighting Luminaire
40' Mounting Height
LAMP OPERATED AT 50,000 LUMENS
400 WATT HIGH PRESSURE SODIUM LAMP ANSI DESIGNATION s51

ISOFOOTCANDLE CURVE — MINIMUM



DETAIL "W" WALL LUMINAIRE
15' Mounting Height
LAMP OPERATED AT 5800 LUMENS
70 WATT HIGH PRESSURE SODIUM LAMP ANSI DESIGNATION S62

NOTE: Isolux diagrams show the minimum horizontal foot-candles required.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS ISOLUX DIAGRAMS

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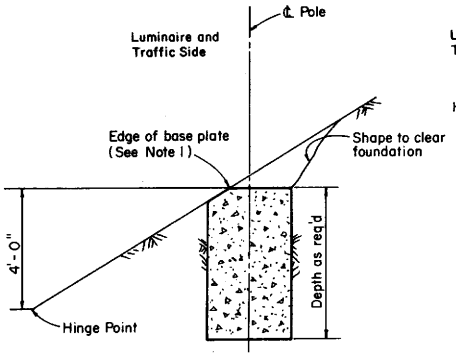
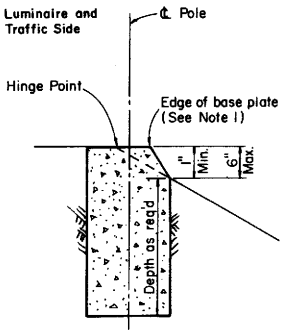
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

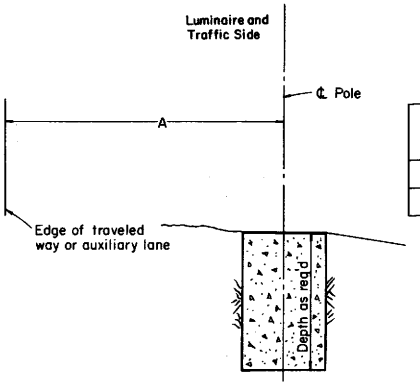
DATE July 1, 1984



CUT SLOPES
STEEPER THAN 4:1



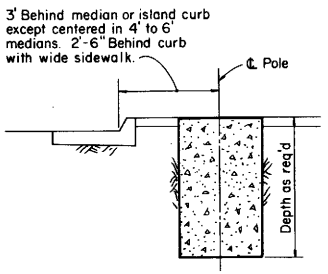
FILL SLOPES
STEEPER THAN 4:1



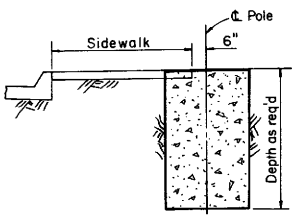
FLAT SECTIONS, CUT OR FILL SLOPES
4:1 OR FLATTER

Standard Type	set back (Dimension A)
32	30' min.
31	20' min.

FOUNDATIONS ADJACENT TO ALL ROADWAYS EXCEPT IN SIDEWALK, MEDIAN AND ISLAND AREAS



MEDIAN, ISLAND
OR WIDE SIDEWALK
(7' WIDE AND WIDER)



NARROW SIDEWALK
(LESS THAN 7' WIDE)

FOUNDATIONS IN SIDEWALK, MEDIAN AND ISLAND AREAS

NOTES:

1. Where a portion of the foundation is above grade the top edges shall have a 1" chamfer.
2. Pull boxes for electroliers and signal standards shall be located at the same station (± 5 feet) as the adjacent electrolier or signal standard.
   Pull boxes 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.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
FOUNDATION INSTALLATIONS

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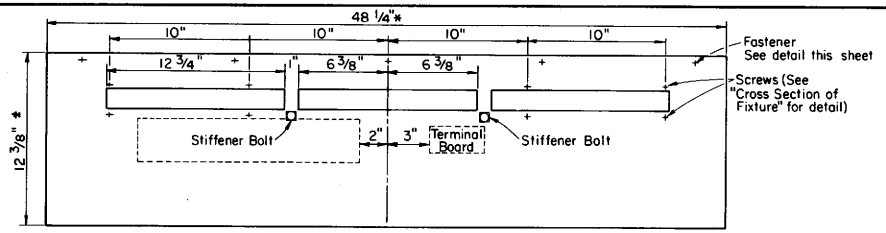
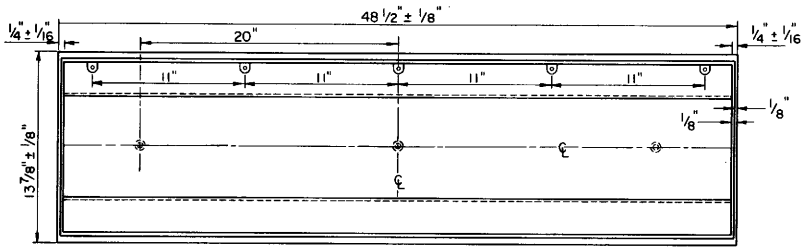


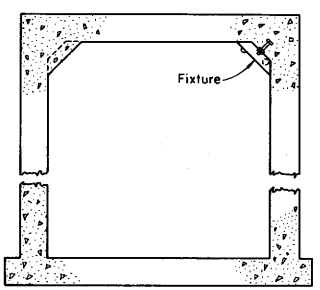
DOOR OF FIXTURE



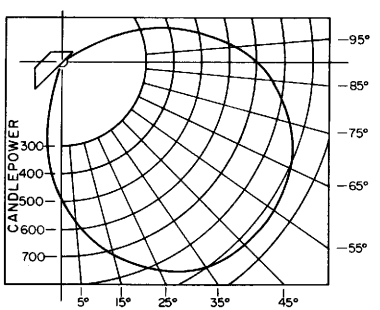
SHELL OF FIXTURE

*Dimensions of door shall vary to fit fixture shell within 1/16" of actual door recess dimensions

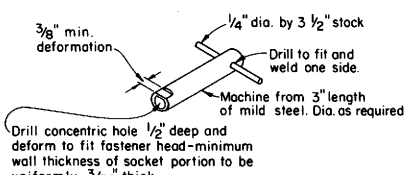
NOTES;
1. The max. tolerance between door and lens shall be 1/64 inch.
2. Casting dimensions of shell are nominal and are subject to such tolerances as are consistant with sound foundry practice.
3. For fixture locations see Highway or Structure Lighting Plan.



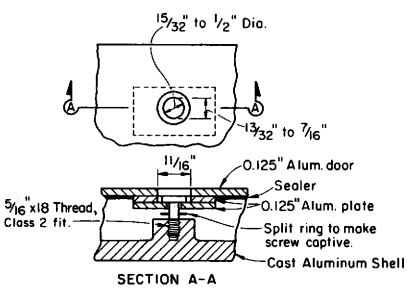
CROSS SECTION OF PEDESTRIAN U.C.



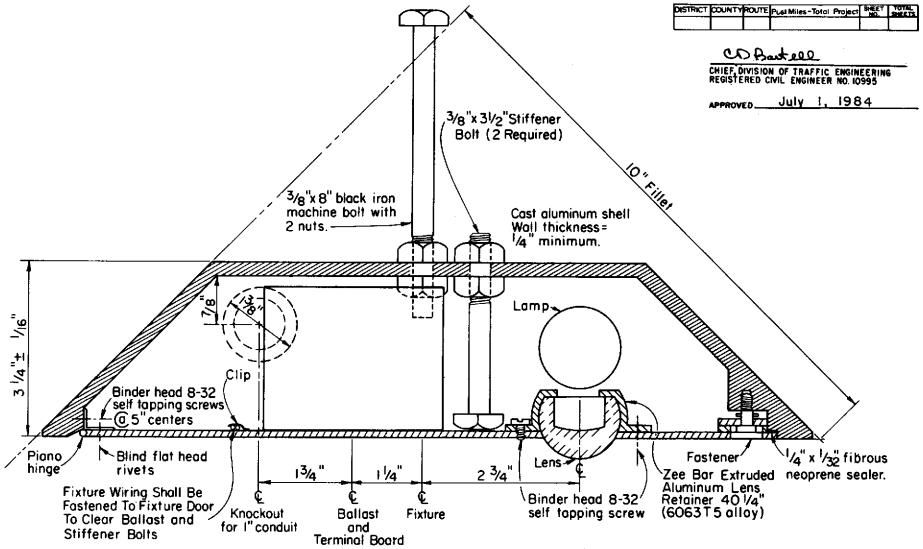
TYPICAL CANDLEPOWER DISTRIBUTION



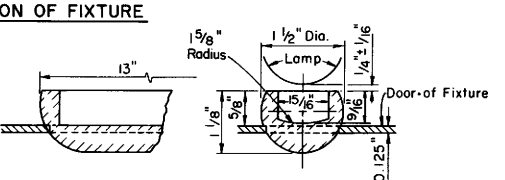
SPECIAL SOCKET WRENCH



FASTENER DETAIL



CROSS SECTION OF FIXTURE



FIXTURE LENS

NOTE:
When fixture shell is installed, stiffener bolts shall be set with about 1/8" clearance between bolt head and door before placing concrete.
When fixture door is mounted, stiffener bolts shall be reset to barely clear inside of fixture door and inside nut shall be tightened.

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

CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

APPROVED July 1, 1984

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

PEDESTRIAN UNDERCROSSING
FLUORESCENT
LIGHTING FIXTURE

ES-12

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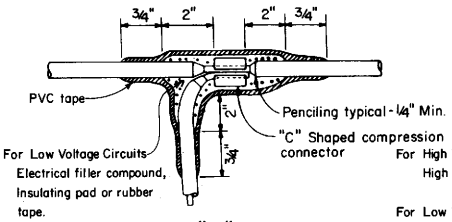
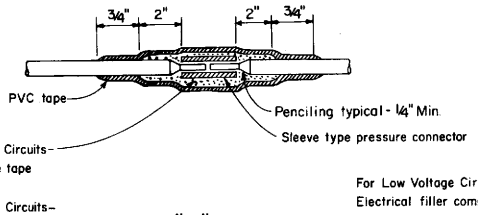
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

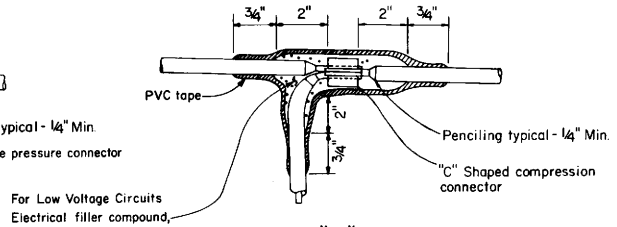
DATE July 1, 1984



TYPE "C" SPLICE
(Between 1 Free-End and 1 through Conductor)



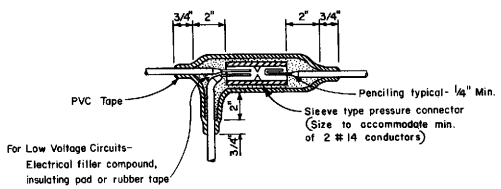
TYPE "S" SPLICE
(Between 2 Free-Ends)



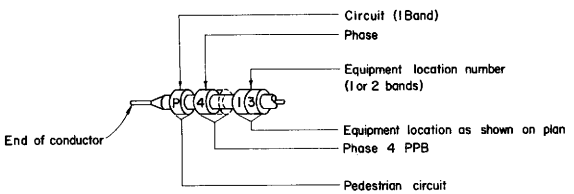
TYPE "T" SPLICE
(For 3 Free-Ends)

GENERAL NOTES

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



TYPE "ST" SPLICE
(For Signal Conductors)



TYPICAL BANDING OF CONDUCTOR ENDS

INSULATING METHODS

Low Voltage Circuits (0-600 Volts)

METHOD "A"

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

OR

METHOD "B"

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

High Voltage Circuits (Over 600 Volts)

1. Completely cover the splice area with an electrical insulating coating and allow to dry.
2. Apply high voltage tape to a minimum thickness equal to original insulation.
3. Apply 3 layers half lapped PVC tape.

LUMINAIRE BALLAST FUSING

Primary lines of multiple ballasts shall be provided with fused connectors. Fuse ratings shall be as noted below.

CIRCUIT VOLTAGE	FUSE VOLTAGE RATING	FUSE CURRENT RATING													
		HPS LAMP BALLASTS							MERCURY LAMP BALLASTS				MULTIPLE TO MULTIPLE TRANSFORMERS		
		70 WATT	100 WATT	150 WATT	200 WATT	250 WATT	310 WATT	400 WATT	175 WATT	250 WATT	400 WATT	700 WATT	1 KVA	2 KVA	3 KVA
120 V	250V	5	5	5	5	6	10	10	5	6	10	10	15	25	30
240V	250 V	5	5	5	5	5	5	5	5	5	5	10	10	15	25
480V	500-600V	5	5	5	5	5	5	5	5	5	5	5	6	6	10

NOTE: Fuses shall be slow-blowing type.

FUSE RATINGS FOR FUSED CONNECTORS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL AND HIGHWAY LIGHTING DETAILS
WIRING DETAILS AND FUSE RATINGS

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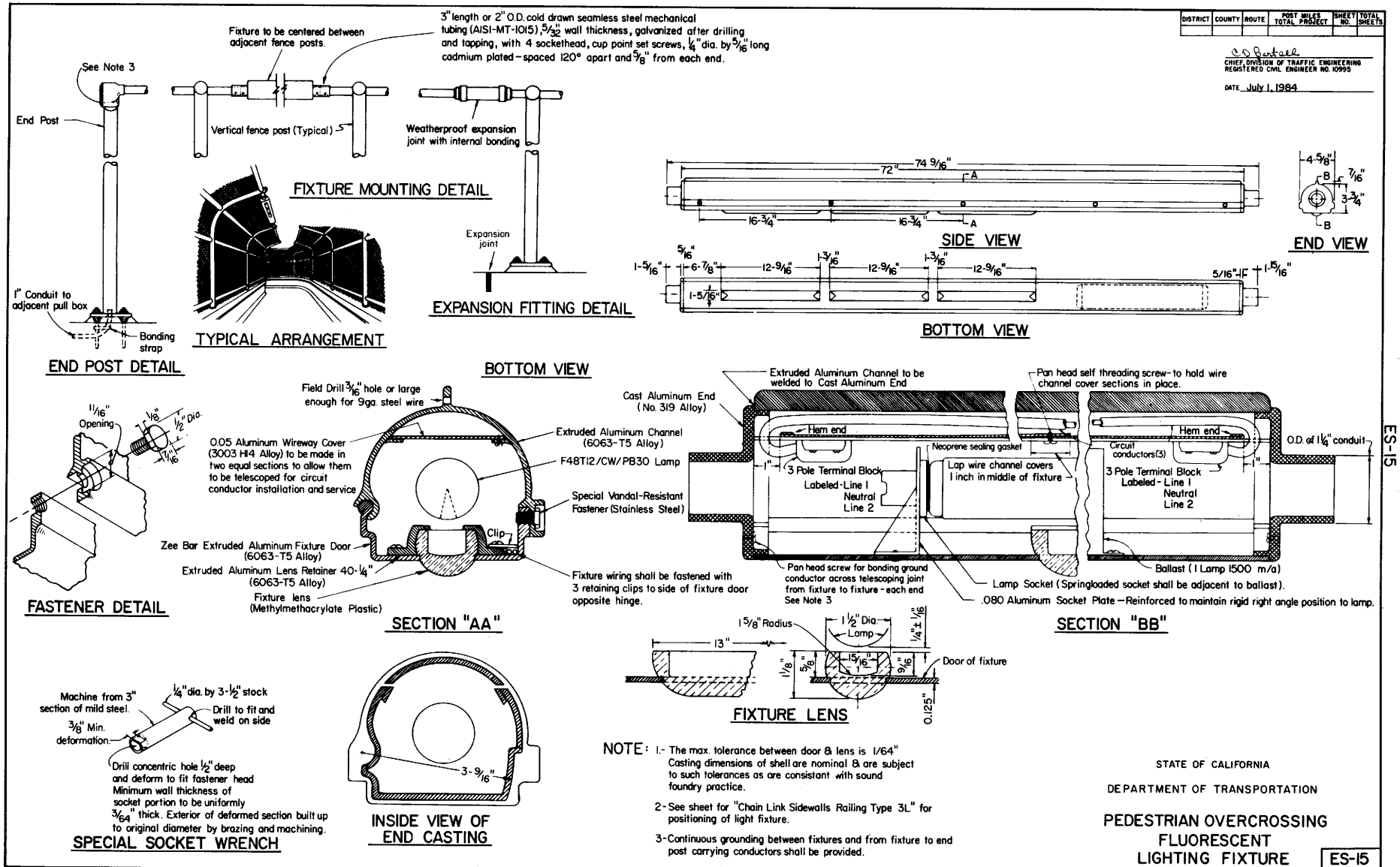
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

C. D. Bertall
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

DATE July 1, 1984



NOTE: 1.- The max. tolerance between door & lens is 1/64" Casting dimensions of shell are nominal & are subject to such tolerances as are consistant 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

DEPARTMENT OF TRANSPORTATION

PEDESTRIAN OVERCROSSING
FLUORESCENT
LIGHTING FIXTURE

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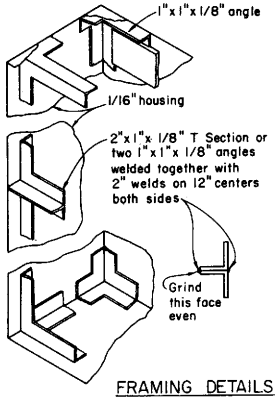
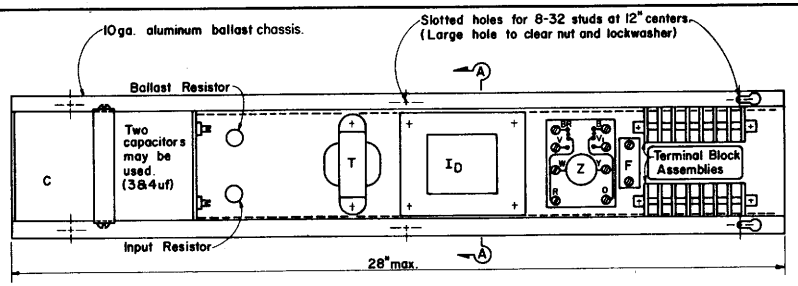
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

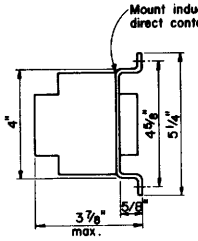
DATE July 1, 1984



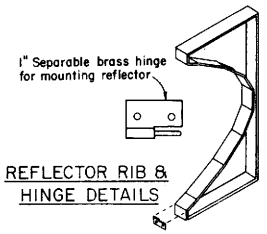
FRAMING DETAILS



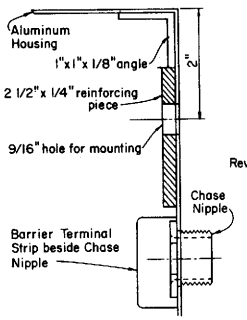
BALLAST CHASSIS COMPONENT LAYOUT



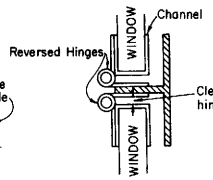
SECTION A-A



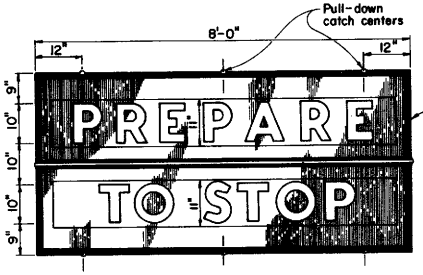
REFLECTOR RIB & HINGE DETAILS



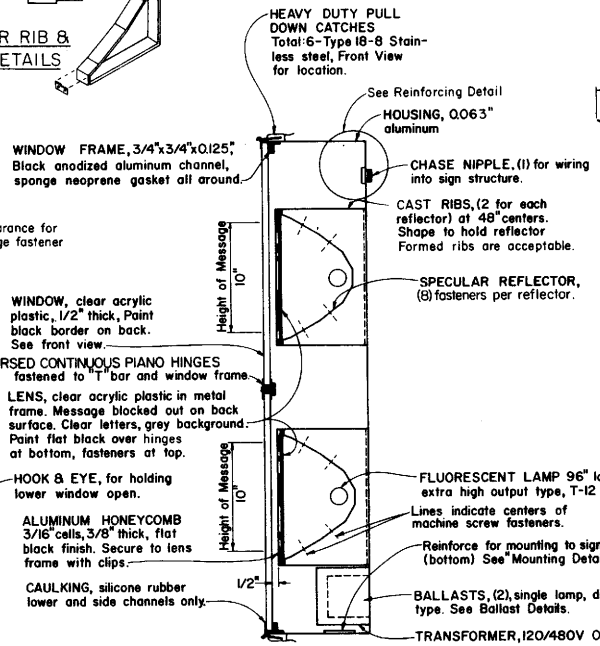
REINFORCING DETAILS



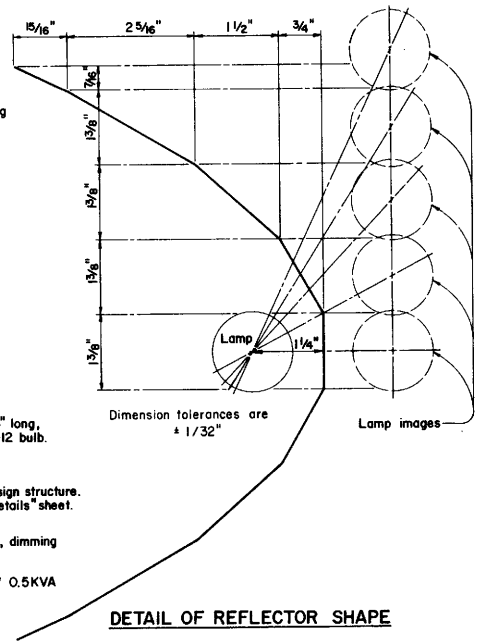
HINGE DETAIL



FRONT VIEW OF SIGN UNIT



CROSS-SECTION OF SIGN



DETAIL OF REFLECTOR SHAPE

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

EXTINGUISHABLE MESSAGE SIGN 10" LETTERS

ES-27A

ES-27A

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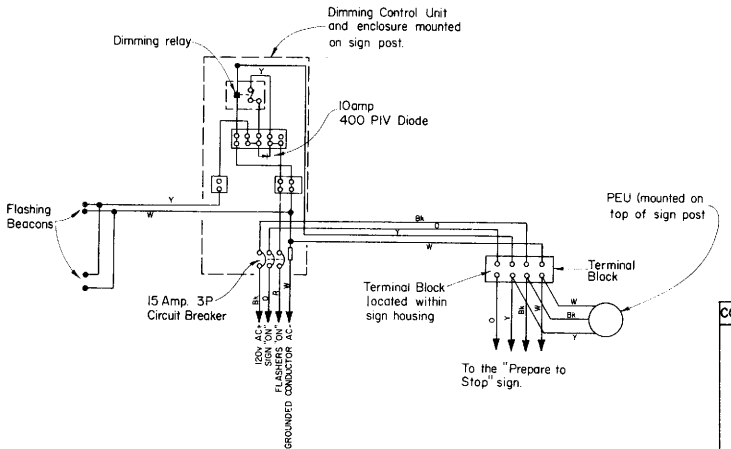
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995

APPROVED July 1, 1984

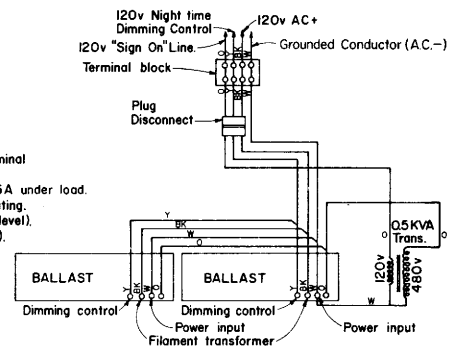


CONTROL CIRCUITS FROM CONTROLLER CABINET

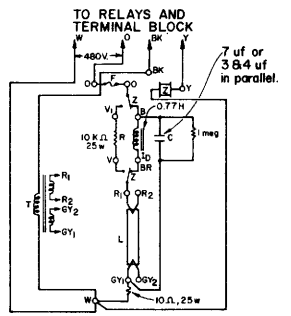
CONDUCTOR COLORS	
R	Red
O	Orange
Y	Yellow
G	Green
B	Blue
V	Violet
BK	Black
W	White
BR	Brown
GY	Gray

WIRING NOTES & SYMBOLS

- O Indicates point on terminal block (Letter at terminal indicates color of wires terminated there).
- T Heater transformer, windings R & GY, 4.0v at 1.25A under load.
- C Power factor correction capacitor, 660v AC rating.
- R Resistor (Ballast) 30ma. (for nighttime dimmed level).
- I_D Inductor (Ballast) 1400ma. (for daytime high level).
- Z Relay, DPDT, for dimming control (120v Coil)
- F Fuse, 8/10Amp., 250v, 13/32"D x 1½"L, slow-blowing type.



POWER AND CONTROL DIAGRAM



BALLAST WIRING DIAGRAM

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

EXTINGUISHABLE MESSAGE SIGN 10" LETTERS

ES-27B

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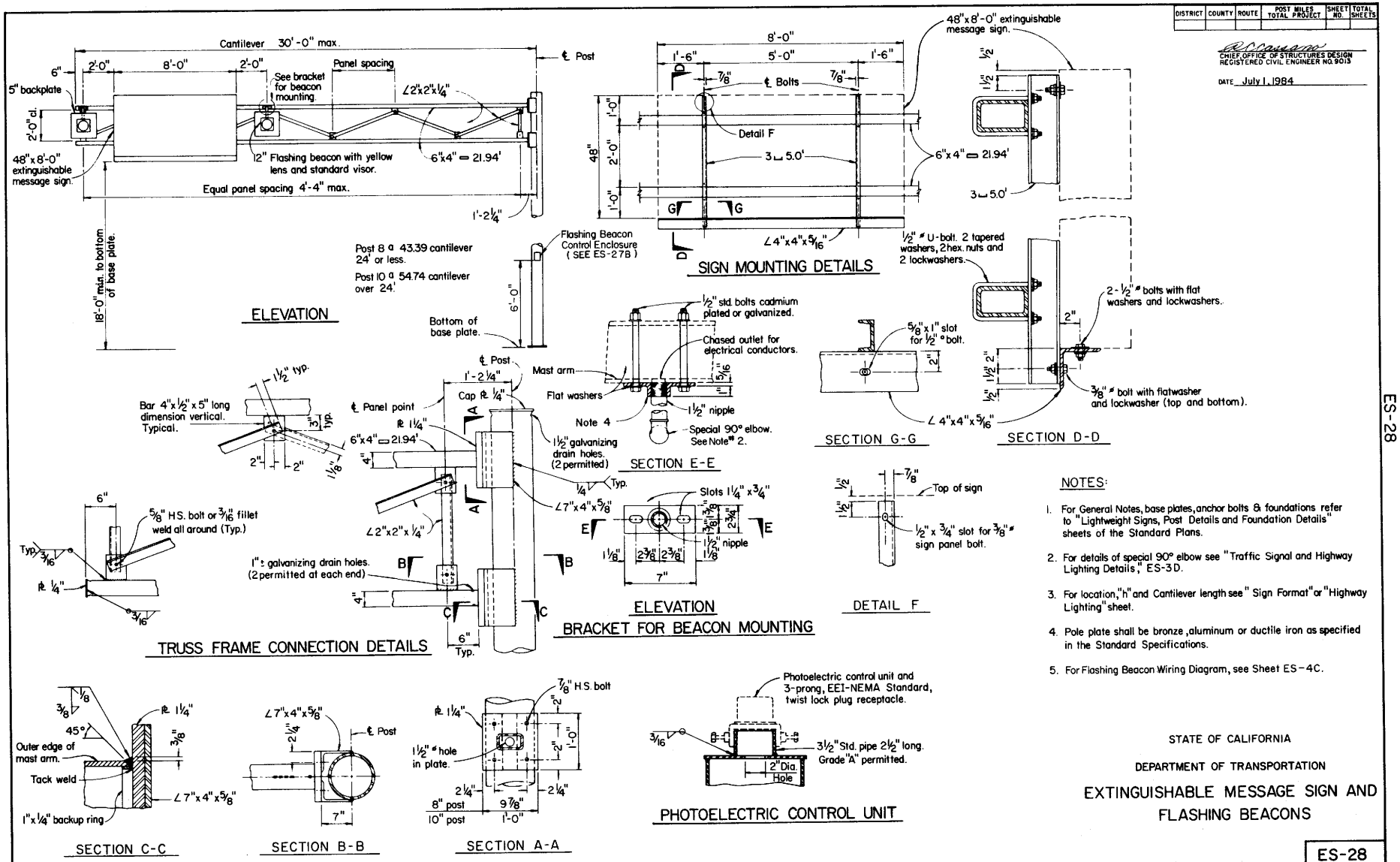
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURES DESIGN
REGISTERED CIVIL ENGINEER NO. 9013

DATE July 1, 1984



NOTES:

1. For General Notes, base plates, anchor bolts & foundations refer to "Lightweight Signs, Post Details and Foundation Details" sheets of the Standard Plans.
2. For details of special 90° elbow see "Traffic Signal and Highway Lighting Details," ES-3D.
3. For location, "h" and Cantilever length see "Sign Format" or "Highway Lighting" sheet.
4. Pole plate shall be bronze, aluminum or ductile iron as specified in the Standard Specifications.
5. For Flashing Beacon Wiring Diagram, see Sheet ES-4C.

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

EXTINGUISHABLE MESSAGE SIGN AND FLASHING BEACONS

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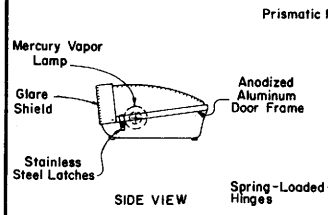
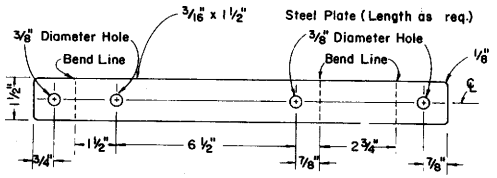
DIST.	COUNTY	ROUTE	POST MILE—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10225

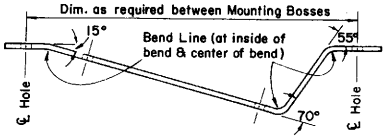
DATE APPROVED July 1, 1984



MERCURY SIGN LIGHTING FIXTURE



BEFORE BENDING (TOP VIEW)

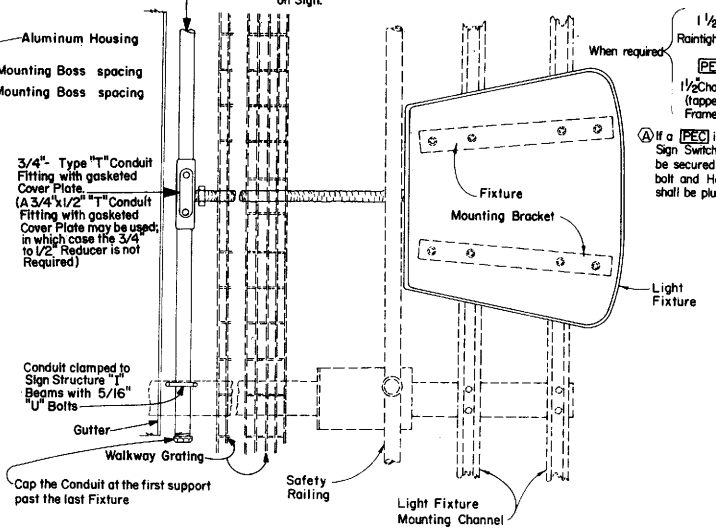


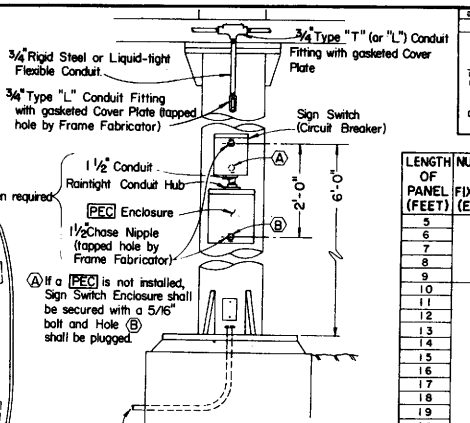
AFTER BENDING (SIDE VIEW)

FIXTURE MOUNTING BRACKET

NOTES:
1. Mounting Bracket shall be either hot dipped galvanized or cadmium-plated.
2. Dimensions and/or angles on Mounting Bracket may vary as determined by the manufacturer of the Sign Lighting Fixture.

NOTE: In the event the location of the Fixture restricts the proper operation of the Safety Railing, adjustment of the Fixture location shall be as directed by the Engineer.

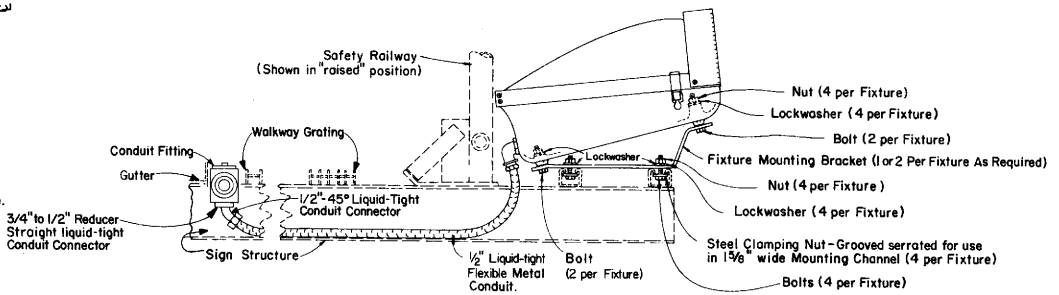




TYPICAL CONDUIT AND SIGN CONTROL INSTALLATION

LENGTH OF PANEL (FEET)	NUMBER OF FIXTURES (EACH)	FIXTURE SPACING (INCHES) SEE NOTE NO. 1	LAMP SIZE (WATTS)	SIGN LOAD (WATTS)
5	1	30	100	131
6		36		
7		42	175	216
8		48		
9		54		
10	2	24:72	100	262
11		26:80		
12		28:88		
13		30:96		
14		36:96	175	432
15		40:100		
16		44:104		
17		48:108		
18		52:112		
19		56:116		
20		60:120		
21		64:124		
22		68:128		
23	3	38:100		648
24		41:103		
25		44:106		
26		47:109		
27		50:112		
28		53:115		
29		56:118		
30		59:121		
31		62:124		
32		65:127		
33	4	39:106		864
34		42:108		
35		45:110		
36		48:112		
37		51:114		
38		54:116		
39		57:118		
40		60:120		
41		63:122		
42		66:124		
43	5	46:106		1080
44		48:108		
45		50:110		
46		52:112		
47		54:114		
48		56:116		

NOTES:
1. The first number listed is the dimension from the edge of the sign panel to the center of the end-most fixture. The second number listed is the dimension between centers of successive fixtures.
2. Where adjacent sign panels are spaced 1' or less the combination of these panels (and spaces) shall be considered a single panel.



LIGHT FIXTURE MOUNTING DETAIL

NOTE: All bolts, nuts, washers and other hardware shall be SAE grade 5 and cadmium plated.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

MERCURY SIGN LIGHTING EQUIPMENT

ES-29

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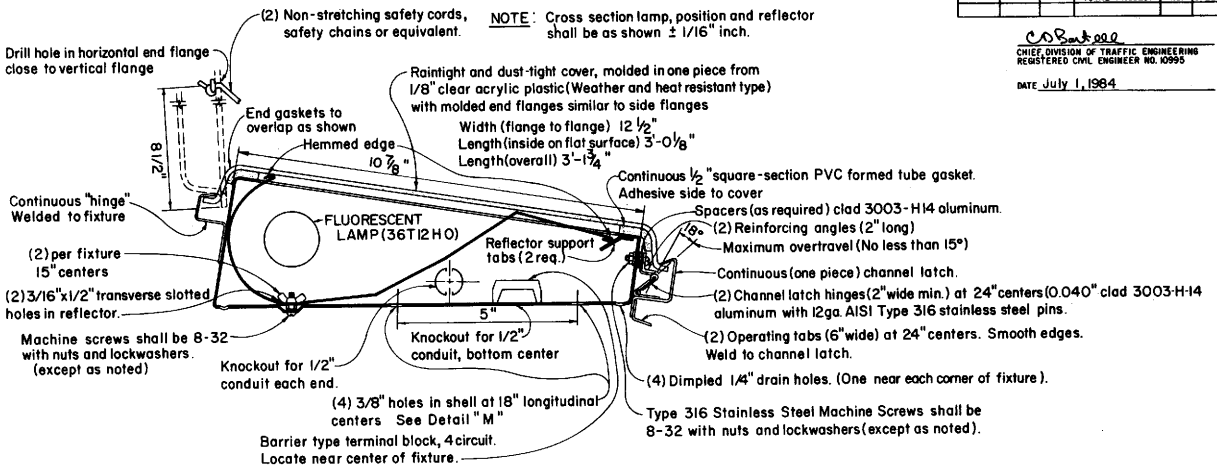
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 10995
DATE July 1, 1984

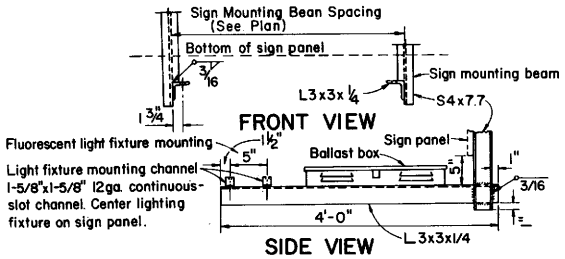
—NOTES—

1. Wiring between ballast box and nearest fixture and between fixtures shall be run in 1/2" liquid-tight flexible conduit.
2. Conduit shall be secured to nearest member using one-hole galvanized mallable iron or steel straps at 5 foot maximum centers and brass machine screws tapped into the member.
3. 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.
4. At the option of the Contractor, a cover and gaskets meeting the requirements for the cover of the 72" fluorescent sign lighting fixture (ES-31) may be supplied.
5. Ballasts shall be one, two or three lamp types as required, rated at 800 ma.
6. Each ballast shall be fused with a 1 1/4" x 1/4" slow-blow glass tube fuse.
7. Fuseholder shall be a panel mounted type, with screw type finger knob.
8. At the option of the Contractor, the fixture may be supplied with an integral ballast. The ballast box will not be required when fixtures with integral ballasts are supplied.

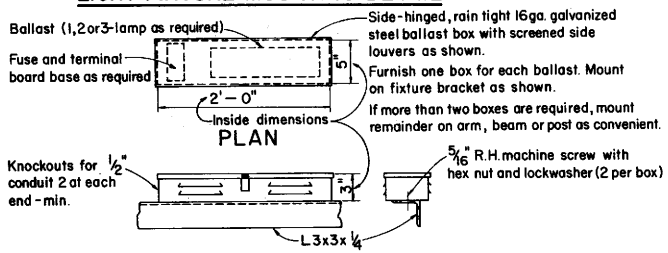
NOTE: Cross section lamp, position and reflector shall be as shown ± 1/16" inch.



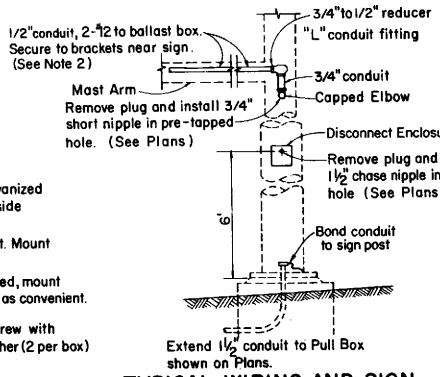
SECTION-LIGHTING FIXTURE



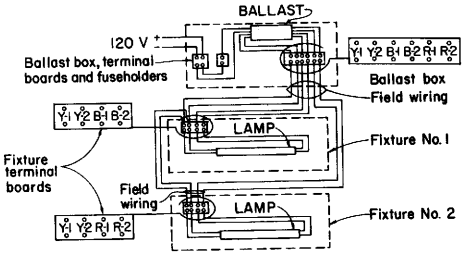
LIGHT FIXTURE MOUNTING DETAIL



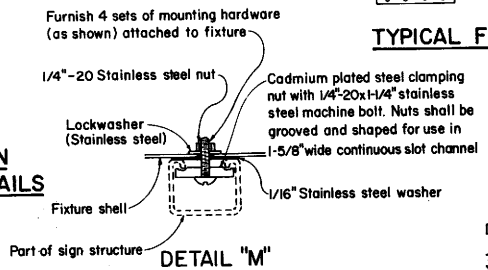
BALLAST BOX DETAILS



TYPICAL WIRING AND SIGN SWITCH INSTALLATION DETAILS



TYPICAL FIXTURE WIRING DIAGRAM (TWO LAMP)



DETAIL "M"

FIXTURE MOUNTING ON CONTINUOUS SLOT CHANNEL

SIGN LOAD (WATTS) AND FUSING

1	Lamp and ballast — 75 W	1 amp
2	Lamps and ballast — 150 W	2.5 amps
3	Lamps and ballast — 215 W	3 amps

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

36" FLUORESCENT SIGN LIGHTING EQUIPMENT

ES-30

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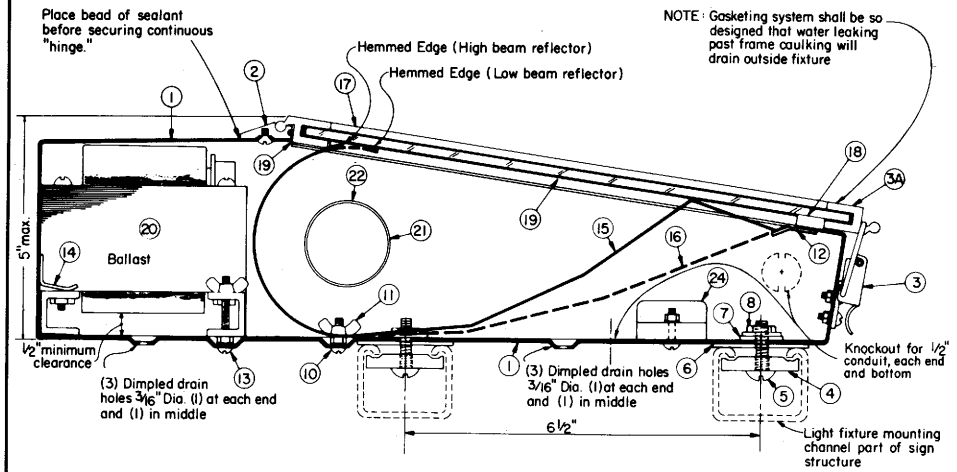
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995

DATE July 1, 1984



SECTION - LIGHTING FIXTURE

NOTES

1. Cross section, lamp position and reflector shape shall be as shown ± 1/16"
2. Details of design are typical. Variation may be accepted, if fuctionally equal to details shown.

FUSE SIZES

120/240-VOLT BALLASTS

	120-V	240-V
HIGH BEAM 1500 MA	5A	3A
LOW BEAM 800 MA	3A	2A

ITEM	PART NAME	QTY.	REMARKS
1.	HOUSING SHELL	1	Max. length 6'-2". Shall have a clean, well finished appearance. No painting reqd.
2.	CONTINOUS "HINGE"	1	Extruded anodized aluminum with soft neoprene strip gasket. Attach to housing shell using 8-32 (min.) mach. screws
	Channel Latch Components		
3	PULL-DOWN CATCH	3	Attach to housing shell using 8-32 (min) mach. screws.
3A	EXTRUDED FRAME	1	All sides
	Mounting Hardware		
4	CLAMPING NUT	6	Cadmium plated steel clamping nut grooved and serrated for use in 1 5/8" wide mounting channel.
5	CLAMPING BOLT	6	1/4-20x 1 1/4" machine bolt. Install at 3/4" centers in 3/8" holes in housing shell.
6	BOTTOM WASHER	6	1/16" Washer
7	FLAT AND LOCK WASHERS	6	
8	TIGHTENING NUT	6	1/4-20 Nut
	Reflector Mounting Hardware		
10	STUD, NUT & LOCKWASHER	2	8-32 (min) machine screw.
11	WING NUT	2	8-32 (min) machine screw.
12	SUPPORT TAB	3	0.064" Thick 2" wide at 24" centers.

ITEM	PART NAME	QTY.	REMARKS
	Ballast Mounting Hardware		
13	STUD NUT, LOCKWASHER AND WINGNUT	2	8-32 (min) machine screw. See top views.
14	RETAINING CLIP	2	0.064" Thick 1" wide each end of ballast channel. Weld to housing.
	Reflectors		
15	HIGH-BEAM	1	0.020" (min.) thickness, length = 69". Use for signs over 70" in vertical dimension. Transverse slotted holes (3/16" X 1/2") for reflector studs.
16	LOW-BEAM	1	0.020" (min.) thickness, length = 69". Use for signs 70" and smaller in vertical dimension. Traverse slotted holes (3/16" X 1/2") for reflector studs.
17	COVER	1	1/8" clear acrylic plastic (weather & heat resistant type)
18	LONGITUDINAL GASKET	2	Continuous 1/2" square-section PVC formed tube or closed cell neoprene foam install with adhesive side to cover.
19	END GASKET	2	
20	BALLAST	1	Locate at center of housing.
21	LAMPHOLDER	2	Mount on end of housing using gasketed sealing washers & machine screws.
22	LAMP	1	
23	FOLDING COVER SUPPORT ARMS	2	Locking type. Each end on outside (not shown).
24	FIELD WIRING TERMINAL BLOCK	1	Secure to housing shell with studs, nut & lockwasher at one end.

INSTALLATION DATA FOR 72" SIGN LIGHTING FIXTURE WITH INTEGRAL BALLASTS

LENGTH OF PANEL (FEET)	NUMBER OF FIXTURES (EA)	CONSECUTIVE SPACING FROM LEFT EDGE OF PANEL TO CENTER OF FIXTURES (INCHES)	OVER-HANG Inches at each end of panel	480V SIGN LOAD (WATTS) HB Fixture Panel Height 80-120 Inches	480V SIGN LOAD (WATTS) LB Fixture Panel Height 40-70 Inches	120V OR 240V SIGN LOAD (WATTS) HB Fixture Panel Height 80-120 Inches	120V OR 240V SIGN LOAD (WATTS) LB Fixture Panel Height 40-70 Inches
10	1	60	0	195	106	200	140
11	1	66	0	195	106	200	140
12	2	33.5 77	3.5	390	212	400	280
13	2	39 78	0	390	212	400	280
14	2	42 84	0	390	212	400	280
15	2	45 90	0	390	212	400	280
16	2	47.5 97	0	390	212	400	280
17	2	51 102	0	390	212	400	280
18	3	31 77 77	6	585	318	600	420
19	3	37 77 77	0	585	318	600	420
20	3	40 80 80	0	585	318	600	420
21	3	42 84 84	0	585	318	600	420
22	3	44 88 88	0	585	318	600	420
23	3	46 92 92	0	585	318	600	420
24	3	48 96 96	0	585	318	600	420
25	4	34.5 77 77 77	2.5	780	424	800	560
26	4	39 78 78 78	0	780	424	800	560
27	4	40.5 81 81 81	0	780	424	800	560
28	4	42 84 84 84	0	780	424	800	560
29	4	43.5 87 87 87	0	780	424	800	560
30	4	45 90 90 90	0	780	424	800	560
31	4	48 92 92 92	0	780	424	800	560
32	5	38 77 77 77 77	0	975	530	1000	700
33	5	40 79 79 79 79	0	975	530	1000	700
34	5	42 81 81 81 81	0	975	530	1000	700
35	5	42 84 84 84 84	0	975	530	1000	700
36	5	44 86 86 86 86	0	975	530	1000	700
37	5	44 89 89 89 89	0	975	530	1000	700
38	6	38 76 76 76 76 76	0	1170	636	1200	840
39	6	39 78 78 78 78 78	0	1170	636	1200	840
40	6	40 80 80 80 80 80	0	1170	636	1200	840
41	6	41 82 82 82 82 82	0	1170	636	1200	840
42	6	42 84 84 84 84 84	0	1170	636	1200	840
43	6	43 86 86 86 86 86	0	1170	636	1200	840
44	6	44 88 88 88 88 88	0	1170	636	1200	840
45	7	39 77 77 77 77 77 77	0	1365	742	1400	980
46	7	39 79 79 79 79 79 79	0	1365	742	1400	980
47	7	39 81 81 81 81 81 81	0	1365	742	1400	980

NOTE:

If the length of sign panel is not listed in the table, the number of fixtures to be provided shall be the number specified for the next larger increment of panel length in the table. Spacing of fixtures shall be as designated by the Engineer.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

72" FLUORESCENT SIGN LIGHTING EQUIPMENT

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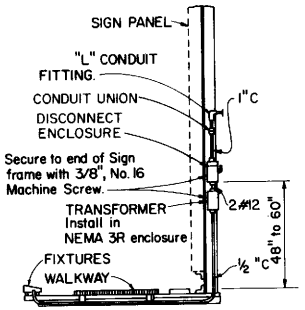
DISTRICT	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

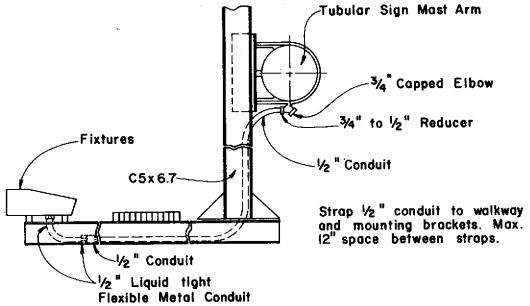
CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO 10995

DATE July 1, 1984



TYPICAL DETAIL BRIDGE MOUNTED SIGN

Disconnect enclosure shall be readily accessible from the sign walkway.



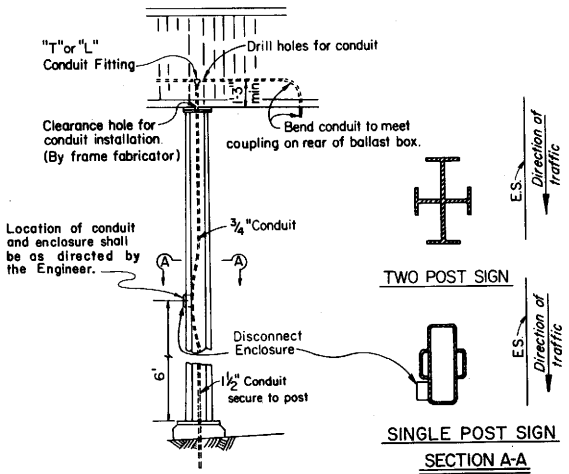
TYPICAL CONDUIT INSTALLATION FOR TUBULAR OVERHEAD SIGNS

CIRCUIT BREAKER SIZES

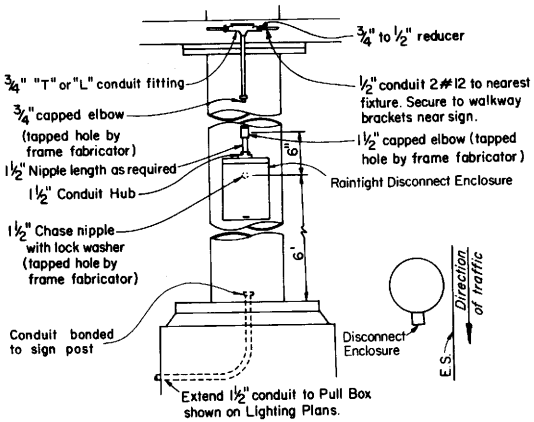
NUMBER OF FLUORESCENT FIXTURES		SIZE (AMPERES)		
HIGH BEAM	LOW BEAM	120V	240V	480V
1 - 4	1 - 7	15	15	15
5 - 9	8 - 16	20	15	15
10 - 14	17 - 24	30	15	15

MULTIPLE TO MULTIPLE TRANSFORMER SIZES

NUMBER OF FLUORESCENT FIXTURES		TRANSFORMER SIZE (K.V.A)
HIGH BEAM	LOW BEAM	
1 - 4	1 - 7	1
5 - 9	8 - 16	2
10 - 14	17 - 24	3



TYPICAL CONDUIT AND SIGN CONTROL INSTALLATION FOR BOX BEAM POST



TYPICAL CONDUIT AND SIGN CONTROL INSTALLATION FOR ROUND POST

NOTES

1. Wiring between fixtures shall be run in ½" liquid tight flexible metal conduit.
2. Flexible conduit shall be secured to the nearest walkway bracket using one-hole galvanized malleable iron or steel straps and brass machine screws tapped into the bracket.
3. See Standard Plans for Overhead Signs and Frame Juncture Details for photoelectric unit installation.
4. Enclosures and straps shall be secured by ¼" maximum size screws.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
SIGN LIGHTING EQUIPMENT

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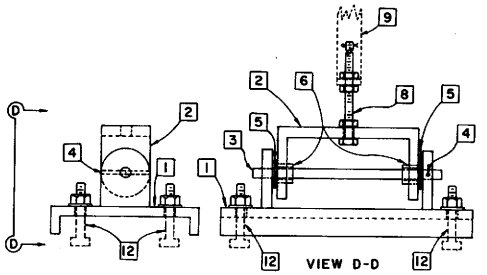
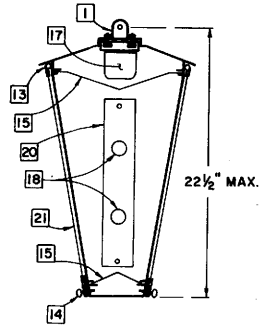
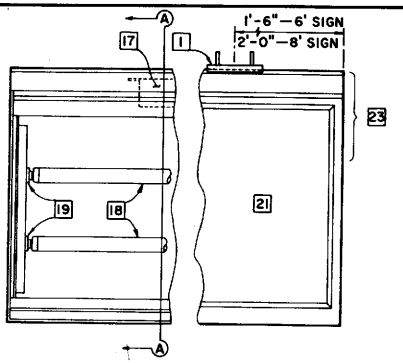
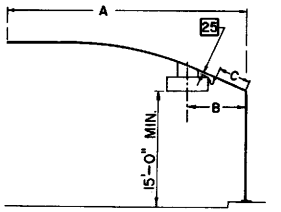


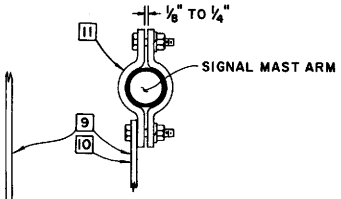


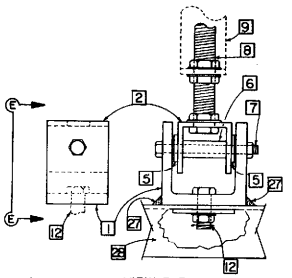


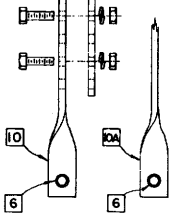


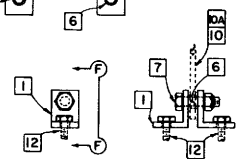
A	B 6' SIGN	B 8' SIGN	C
15	5'-2"	6'-2"	1'-3"
18	5'-3"	6'-3"	1'-4"
20	5'-3"	6'-3"	1'-4"
25	9'-1"	X	5'-6"
30	9'-6"	10'-6"	6'-0"
35	10'-6"	11'-6"	7'-0"
40	12'-6"	13'-6"	9'-0"
45	12'-6"	13'-6"	9'-0"

SIGN PLACEMENT

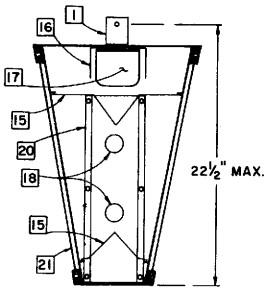


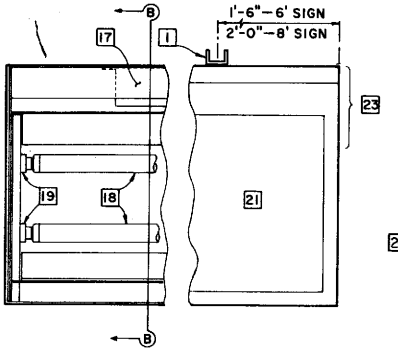


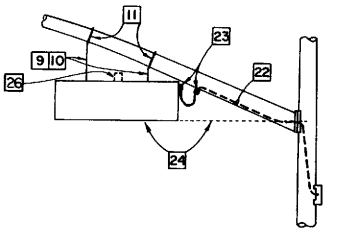




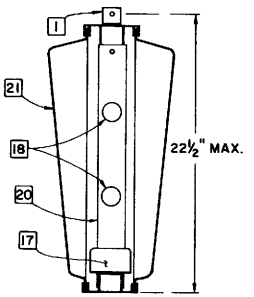
MOUNTING ASSEMBLY OPTIONS

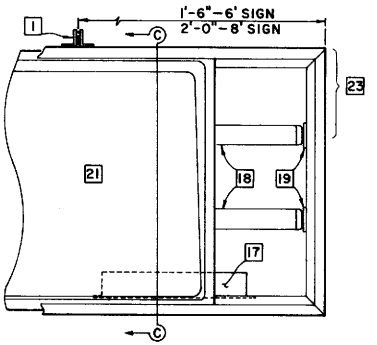






SIGN MOUNTING





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

CHIEF, DIVISION OF TRAFFIC ENGINEERING
REGISTERED CIVIL ENGINEER NO. 20886

APPROVED July 1, 1984

NOTES

1—LOWER MOUNTING ASSEMBLY, WITH GASKET
2—UPPER MOUNTING ASSEMBLY.
3—ROD, 1/2-INCH, STAINLESS STEEL.
4—LOCKING PIN, STEEL.
5—FLAT WASHER, STAINLESS STEEL.
6—BUSHING, BRONZE.
7—BOLT, 1/4-INCH STAINLESS STEEL, WITH SELF-LOCKING NUT.
8—BOLT, 1/2-INCH, STAINLESS STEEL, WITH THREE NUTS, AND COTTER KEY.
—LENGTH AS REQUIRED FOR PROPER MOUNTING OF SIGN.
9—BRACKET, 1/4-INCH X 1-1/2-INCH MINIMUM.
—LENGTH VARIABLE.
10—BRACKET, 2-PIECE ADJUSTABLE.
—1/4-INCH X 1-1/2-INCH MINIMUM.
—TWO 1/2-INCH HEX HEAD BOLTS WITH NUTS AND LOCKWASHERS.
11—CLAMP, 2-PIECE, SHAPED TO FIT MASTARM.
—1/4-INCH X 1-1/2-INCH MINIMUM.
—TWO 1/2-INCH HEX HEAD BOLTS WITH NUTS AND LOCKWASHERS.
12—MOUNTING BOLT, 1/4-INCH MINIMUM, WITH NUT AND LOCKWASHER, OR SELFLOCKING NUT AND COTTER KEY.
13—CONTINUOUS HINGE.
14—THUMB SCREW, 1/4-20. MINIMUM TWO PER SIDE ON 48-INCH CENTERS.
15—REFLECTOR, 0.040-INCH MINIMUM THICKNESS.
16—ALUMINUM STIFFENER.
17—FLUORESCENT BALLAST. (2 REQ.)
18—LAMP, F72T12CW FOR 6' SIGN
F96T12CW FOR 8' SIGN
19—LAMPHOLDER.
20—LAMPHOLDER TURRET.
21—SIGN PANEL, 15-INCH MINIMUM HEIGHT. MESSAGE IS SHOWN ELSEWHERE.
22—CORD, 16/3 TYPE SJT.
CONTINUOUS FROM SIGN TERMINAL BLOCK TO SIGNAL HEAD MOUNTING TERMINAL COMPARTMENT.
FORM A ONE-FOOT DRIP LOOP BETWEEN SIGN AND MASTARM.
23—CORD CONNECTOR.
90° ANGLE AT SIGN.
LOCATE IN UPPER 1/3 OF SIGN.
STRAIGHT AT MASTARM.
DRILL AND TAP BOTTOM OF MASTARM.
24—ADJUST FIXTURE LEVEL AND NO LOWER THAN CENTER OF SIGNAL ARM CONNECTION.
25—APPROXIMATE CLEARANCE, 1-INCH.
26—PHOTOELECTRIC CONTROL UNIT WHEN REQUIRED.
27—1/4" FILLET WELD, 1 1/4" LONG
28—SIGN FRAME

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
INTERNALLY ILLUMINATED STREET NAME SIGN

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